Planning Application to Meath County Council

Environmental Impact Assessment Report

Proposed Data Centre Campus
Townland of Bracetown and Gunnocks, Co. Meath

Prepared by

AWN Consulting

October 2019

NON-TECHNICAL SUMMARY

1.0 INTRODUCTION

This is the non-technical summary of an Environmental Impact Assessment (EIA) Report prepared by AWN Consulting (AWN) on behalf of EngineNode Ltd ('the Applicant') to accompany a planning application to Meath County Council (MCC) for four data storage facilities, an energy centre and associated ancillary development.

The proposed development is to be located on a greenfield site (area of 24.5 hectares) in the townland of Bracetown and Gunnocks, Co Meath. (see Figure 1.1)

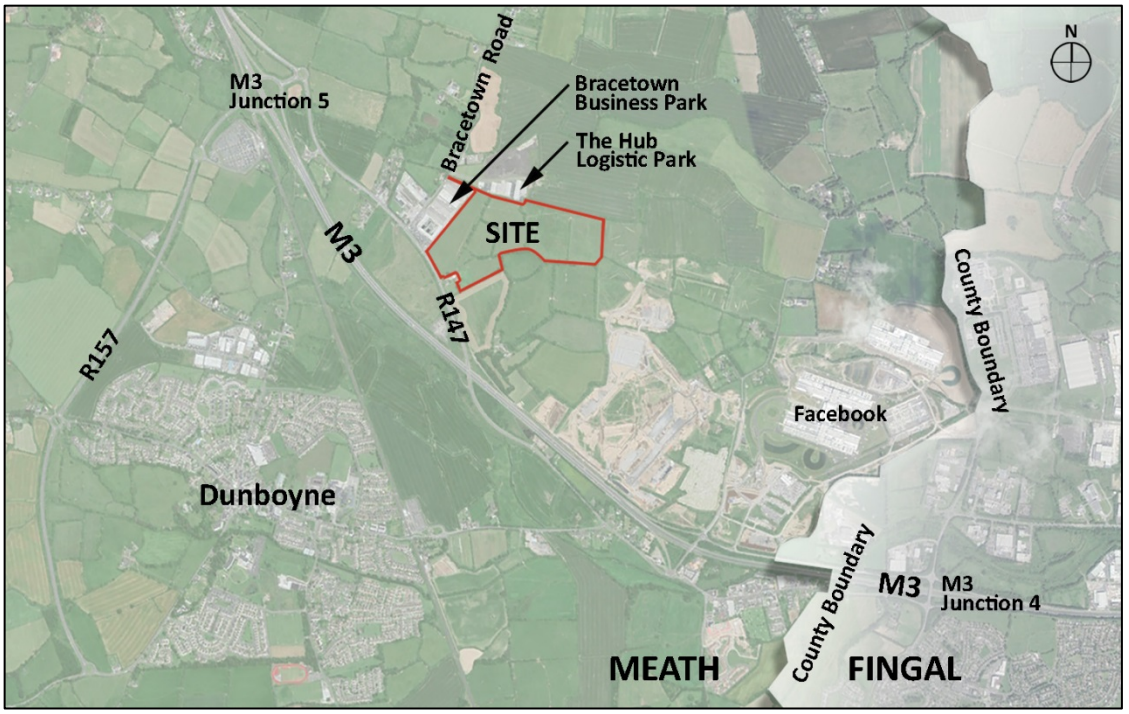


Figure 1.1 Proposed Development Lands (Red Boundary)

The area is currently zoned for E2 *General Industry and Employment / E3 Warehousing and Distribution* in the Meath CDP. A Masterplan (Revision One) has been accepted by MCC for lands at Portan Clonee and Pacetown, this plan includes the lands for the proposed datacentre development and the permitted expansion of an adjacent datacentre (Runways Information Services Limited) development (MCC Ref: RA180671). The Masterplan area is identified by a dashed blue line in Figure 1.2 below and the proposed development is shown by a red boundary.

The site covers approximately 60.5 acres or 14% of the E2 / E3 zoned lands within the Masterplan area.

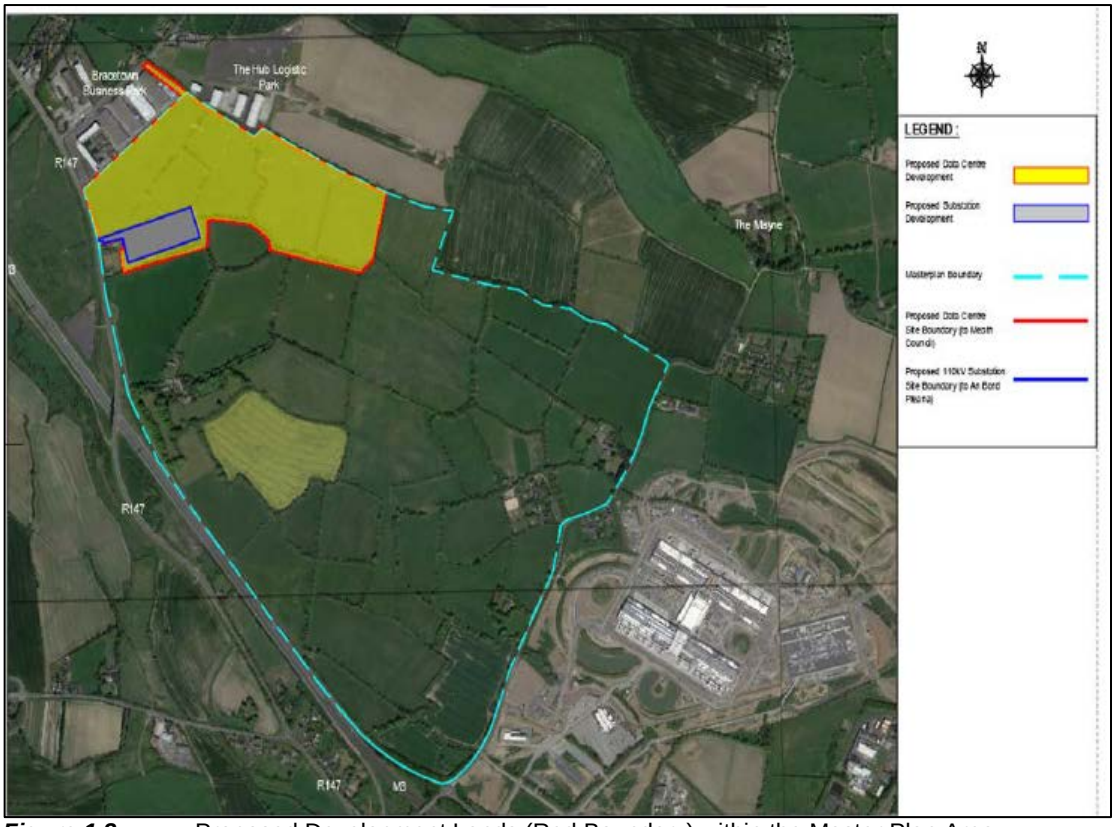


Figure 1.2 Proposed Development Lands (Red Boundary) within the Master Plan Area.

Methodology for Preparation of the EIAR

The requirement for EIA for certain types and scales of development is set out in the EIA Directives (2011/92/EU and 2014/52/EU), European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (the bulk of which came into operation in September 2018), the European Communities (Environmental Impact Assessment) Regulations 1989-2006, Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001-2017.

This EIA Report is prepared in accordance with the 2011 EIA Directive (2011/92/EU), as amended by the 2014 EIA Directive, the Environmental Protection Agency (EPA) Draft "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports"* (2017)and the EPA Draft *"Advice Notes for Preparing Environmental Impact Statements"* (2015). This EIA Report has also been prepared in accordance with the requirements of EIA Directives (2011/92/EU and 2014/52/EU, The "*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment"* (August 2018) and the European Commission *Guidance on the preparation of the Environmental Impact Assessment Report* have been considered in the preparation of the EIA report.

The cumulative impact of the development and the potential cumulative impacts of the proposed development with any/all relevant other planned or permitted developments (including the substation and grid options as outlined in Chapter 2) are discussed in each chapter.

Consultation

EngineNode and the project team have liaised with the relevant departments of MCC in advance of lodgement of this application. In addition, the relevant specialists

have liaised with statutory bodies including Irish Water, Bord Gáis, Eirgrid, ESB, etc. by correspondence during the course of the EIA Report preparation.

Regulatory Control

A licence is required for the Energy Centre based on the industrial Emissions Directive 2010 and Environmental Protection Agency (EPA) Act 1992 (as Amended) IE Directive 2010/75/EU. The combustion of fuels in installations with a total rated thermal input of greater than 50MW is an IE Licence category activity under both Annex 1 of the IE Directive 2010 and the first schedule of the EPA Act 1992, as amended.

The proposed data storage facilities will also require an EPA Greenhouse Gas (GHG) Emissions permit in accordance with the Environmental Protection Agency Act 1992, as amended.

Contributors to the EIA Report

The preparation and co-ordination of the EIA Report has been completed by AWN in conjunction with experienced specialists. The role and responsibility of each contributor, their qualifications and relevant experience are detailed in Chapter 1 (Introduction) of the EIA Report.

2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Bracetown Business Park is located to the north-east of the proposed development with further warehouse development (The Hub Logistics Park) currently being constructed to the north and north west of the site. Planning for data storage facilities (MCC Ref: RA180671) has been obtained for an extension of the Runways Information Services Limited campus to the west and south of the site and construction has commenced. The R147 and two detached private residential properties and agricultural buildings also form part of the western boundary.

Figure 2.1 also shows the location of a proposed substation compound (grey and outlined in blue) which together with a subsurface grid connection will form part of a separate application to Meath County Council or an Bord Pleanála (ABP). EngineNode is undertaking a pre- application determination process under Section 182E of the Planning and Development Act 2000 (as amended) as to whether or not this development would fall under the meaning of the Strategic Infrastructure Development (SID) and to confirm the planning process that would apply for this future application.

Figure 1.3 presents the proposed layout for the development.

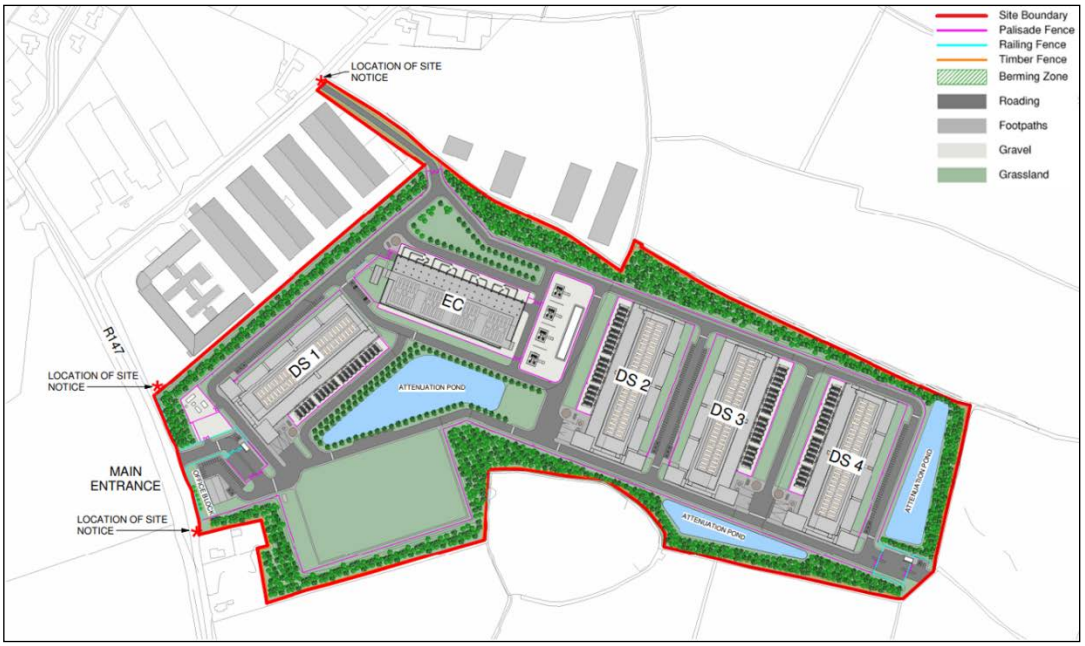


Figure 1.3. Site layout plan of the proposed development

The proposed development comprises four data storage facilities and associated infrastructure. EngineNode will have an office located adjacent to the site entrance on the R147. The proposed development will see the delivery of a high-quality environment on the site subject to a grant of planning permission, in compliance with the current MCC Development Plan and Masterplan for the site. The proposed development site shall be constructed on a phased basis over 10 years (8 years with 2 years for final landscaping).

Each data storage facility will require up to a maximum of 36 MW IT load. The data halls equipment, including servers and the air handling plant require energy to maintain server availability and the necessary environmental conditions. It is envisaged that this energy will be provided by electrical power from the grid, or onsite gas-powered engines located in the energy centre, or a combination of both. The Applicant intends to construct the energy centre for reasons of commercial need in order to respond flexibly to the evolving energy market and to ensure the capacity to have future security of supply and also to respond to any future grid capacity constraints.

The proposed energy centre will have 16 no. 40m high individual flues located inside 4 no. stacks together with SCR abatement technology to ensure on-going compliance with air quality requirements.

Each data storage facility will also have diesel powered back-up generators, as a contingency power measure in the event of a loss of electrical power/gas supply loss. The diesel generators will have 21.5 m high flues to meet air quality standards. These diesel generators will be located in an external plant compound at each data storage facility building. Air modelling has been undertaken to confirm the flue discharge will meet EPA standards with SCR abatement (Chapter 9 Air & Climate).

Fuel oil for the emergency boilers is the only required bulk chemical required on site. Each data storage facility service yard will have two intermediate storage tanks for fuel oil (520 m^3 per data storage facility). Tanks will be bunded in compliance with EPA guidelines and all transfer pipelines are above ground thereby limiting potential for accidental discharge to ground. Stormwater infrastructure also includes oil

interceptors to provide secondary management of any discharges outside of compound areas.

Further detail on the proposed development, site infrastructure and secondary facilities on the site are provided in Chapter 2 of the EIA Report.

Under the current Draft EPA EIA Report Guidelines 2017, the description of the existence of the project is required to define all aspects of the proposed lifecycle of the proposed development and a full description is included in Chapter 2 of the EIA Report.

Construction

The construction of the proposed development will comprise four main stages, namely:

- Site preparation works;
- Building Structure Construction;
- Commissioning.

Construction will be undertaken on a phased basis as outlined below in Figure 1.4



Figure 1.4 Intended Construction Phasing

The total peak construction population on site will be c.500 staff phased over a period of 8 years and 245 high quality jobs during operation. A Construction Environmental Management Plan (CEMP) will be provided prior to commencement of construction. The CEMP will incorporate mitigation measures outlined in the EIA report and which are required to be implemented by the contractor during construction works. The CEMP will include emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction. This is an active document which is continuously updated to manage risk during the construction programme.

The primary activities that will be required during the site preparation phase will be site clearance, excavations, infilling and levelling of the site to the necessary base level for construction, surveying and setting out for structures. There will be an estimated net infill of approximately 105,000 m^3.

Once site preparation is completed, building construction and commissioning for construction and commissioning of each data storage facility will take up to 24 months with each building being developed based on client requirements over a maximum of 10 years.

Building structures will comprise structural steel frames with concrete floors on metal decks. An early phase of landscape planting will be undertaken following the initial cut and filling works to include planting of trees in selected sensitive areas. Early growth and development in these areas will promote a good screening of construction works into operational phase.

Commissioning

Once the physical structures are in place, specialist contractors will be mobilised to complete the commissioning of the data storage facility and energy centre. Commissioning is expected to take approximately 4 weeks per 4MW of IT Infrastructure.

Operation

Once operational, each data storage facility will "go live" and serve data customers on an ongoing basis. The server systems and the supporting infrastructure will be monitored by site staff and faults identified and remedied as required. Staff are primarily required onsite for security, ongoing monitoring and maintenance of plant and equipment.

Once all four data storage facilities are operational, up to 245 no. full time employees will be present on site during the day including external staff, maintenance contractors and visitors, as required. Staff will be present on a shift basis, so numbers will vary throughout the day.

Decommissioning

The lifespan of the proposed development is not defined but it is anticipated that it will be at least 10 - 20 years. It is likely that regular maintenance and periodic upgrading of the facilities over time will enable it to continue to meet future demands. Upon closure all buildings, plant, equipment, drainage networks etc. at the site will be fully decontaminated and decommissioned in accordance with prevailing best practice. The buildings, once rendered environmentally safe, will more than likely be retained and sold on for future use following closure.

Description of other Developments

A list of the other developments in the vicinity of the proposed development are provided in Chapter 3 (Planning and Development Context). As described above the substation and associated grid connection (underground) will be undertaken under a separate planning application but have been considered in the cumulative impact assessment along with consented development.

Sustainability, Energy Efficiency and Resource Use

EngineNode is committed to running its business in the most environmentally friendly way possible. The proposed development has been designed to take into account these policies with energy efficiency central to the decision-making process, minimising power and water consumption.

Having the options in the future of either energy supply from the grid or the on-site gas-powered energy centre allows flexibility in sourcing (where feasible) accredited biogas from Gas Networks Ireland or renewable energy sources from the Grid.

The 200kW heating load for the administration building will be provided utilising heat recovery from the datacentre.

A typical data storage facility achieves approximately 65% server utilisation rates versus 15% at on-premises servers. This typically means companies moving their data storage to the cloud require less than a quarter of the server infrastructure they would need if provided on-premises. A typical on-premises data storage facility is 29% less efficient in their use of power compared to a typical large-scale data storage facility that uses world-class facility designs, cooling systems, and workload-optimised equipment. This represents a significant reduction in the amount of power required.

3.0 PLANNING AND DEVELOPMENT CONTEXT

The site for the proposed development is situated within the administrative area of MCC. The relevant national, regional and local planning policy with which the proposed development complies is outlined in Chapter 3.

The National Planning Framework (NPF) was published in February 2018 and contains policies which are supportive of the development of ICT infrastructure, with particular reference made to datacentres. National Strategic Outcome 6 of the NPF relates to the creation of "*A Strong Economy Supported by Enterprise, Innovation and Skills*". This strategic outcome is underpinned by a range of objectives relating to job creation and the fostering of enterprise and innovation. The proposed development, which comprises ICT infrastructure, is therefore considered to be wholly in accordance with this key body of national planning policy.

Irelands Framework for Sustainable Development *'Our Sustainable Future'* (launched 2012 with subsequent progress report in 2015), by the Department of the Environment, Community and Local Government provides a framework to ensure that development is undertaken in a sustainable manner.

'Our Sustainable Future' aims to ensure that development is carried out sustainably and in an environmentally sound manner which includes optimisation of natural resources, minimisation of waste, safe and sparing use of chemicals and the application of clean technology. All of these aspects were integral considerations in the design of the proposed development, where applicable and will be integral considerations in the operation of the proposed development on a day to day basis and are addressed within this EIA Report where appropriate.

The Draft Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Regional Assembly (EMRA) includes Regional Policy Objective (RPO) 8.23 which states that the Local Authority shall support the national objective to promote Ireland as a sustainable international destination for ICT infrastructures such as data storage facilities and associated economic activities at appropriate locations. The site is considered to be appropriate location for the development of data storage facilities, as evidenced by acceptance of the Master Plan (Revision One) and permitting of data storage facilities by the Planning Authority within this Master Plan Area.

The Regional Planning Guidelines (RPGs) for the Greater Dublin Area 2010 – 2022 set out the planned direction for growth up to 2022 by giving regional effect to the

National Spatial Strategy (NSS). The guidelines provide an overall strategic context for the Development Plans of each local authority in the Greater Dublin Area ('GDA)' including enterprise and employment creation. The RPGs supports economic development within the GDA and clustering of development within identified strategic employment areas.

The *Meath County Development Plan 2013-2019* (CDP) has defined the site of the proposed development as E2 General Industry and Employment / E3 Warehousing and Distribution. It is considered that the proposed data storage facility development accords with this zoning objective and the vision for these zoned lands as set out in the Development Plan. As required by MCC, a non-statutory Master Plan has been developed and submitted to MCC and approved prior to this application being made.

The Local Area Plan (LAP) for Dunboyne/Clonee/Pace Corridor, includes specific objectives to promote development of the lands in this area. Economic Development Strategy for County Meath 2014-2022.

The Economic Development Strategy (EDS) for County Meath 2014-2022 sets evidence-based measures aimed at accelerating the economic transformation, revitalisation and sustainable development of County Meath. The locality of the proposed development within the Dunboyne/Clonee/Pace corridor has been identified as a strategic area for development due to the favourable locations, ready-to-go sites, fibre-based broadband and telecoms, power and gas, water, easy access to the national motorway network and are in close proximity to Dublin Airport Dublin Port.

As part of the assessment of the impact of the proposed development, account has been taken of developments that are currently permitted or under construction within the vicinity of the proposed site. EngineNode and the project team have liaised with the relevant departments of MCC in advance of lodgement of this application. A number of pre-planning meeting was held with representatives of the MCC Planning, Environmental, Drainage and Roads/Transportation departments in attendance. In addition, the relevant project team specialists have liaised with the relevant departments of MCC by correspondence during the course of the EIA Report preparation.

In conclusion it is considered that the proposed development is in accordance with the policies and objectives of the National Spatial Strategy, Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly and the Meath County Development Plan.

4.0 ALTERNATIVES

The siting of the proposed facility at an existing greenfield site in Clonshaugh, as well as the overall design of the facility, have been carefully selected based on a suitably comprehensive assessment of alternative site locations, designs and processes. The proposed development will considerably enhance the utilisation of the site. Assessment of the design and location of the stacks and back-up generators in the project design have been considered to minimise environmental effects.

Do Nothing Alternative

The 'do nothing alternative' would result in no development occurring on site, and the site remaining greenfield. However, as the proposed site is zoned 'E2 - General

Industry and Employment/E3 - Warehousing and Distribution' in the Meath County Development Plan 2013 – 2019, it is likely that development on these lands would proceed at some point in the future.

Alternative Project Locations
The selection of Ireland as the preferred country location for this development was based largely on climatic conditions, the highly skilled local workforce, and strategic business considerations.

EngineNode overall preference is to locate these facilities in Meath is due primarily to the existence of suitably zoned lands, negligible environmental effects and proximity to other data storage facility facilities (clustering advantages). Candidate sites were considered as outlined in Chapter 4. It was concluded that the site in Clonee met the highest proportion of the necessary criteria with particular advantages including:

- Suitable zoning
- Adequate and suitable land
- Low environmental sensitivity
- Good access to transport routes and airport
- Site specifically designed for large scale industrial activities with good access to services and,
- Synergistic benefits of locating the proposed facility in relatively close proximity to an existing data storage facility at Clonee.

Alternative Design/Layouts
A number of alternative arrangements and configurations for the energy centre, data storage facilities, roadways and parking arrangements were considered.

Several different layouts were assessed for the energy centre and data storage facility location on the site. The layout chosen minimises any environmental and landscape effects. The final location of the energy centre was chosen based on its proximity to the gas supply and set back from the road to reduce visual and noise impact. The data storage facilities were orientated to maximise land use and minimise noise impact at the site boundaries for sensitive receptors.

Alternative Processes
In terms of the proposed technology, the designers for the proposed development have considered data server technology that is used by other operators in Ireland and around the world and represents state of the art technology.

EngineNode is committed to continually assessing and improving this technology particularly with respect to minimising power and water consumption, in accordance with the goals of Irelands Framework for Sustainable Development *'Our Sustainable Future'*. Designs are constantly evolving, and hardware is chosen with energy efficiency central to the decision-making process.

Both electrical power and gas-generated power were considered for the proposed development. The chosen design allows for either, or a combination of both, to be utilised allowing for flexibility in sourcing cost effective and sustainable supplies.

Alternative Mitigation
For each aspect of the environment, each specialist has considered the existing environment, likely effect of the construction and operation of the proposed

development and reviewed feasible mitigation measures to identify the most suitable measure appropriate to the environmental setting within the project design. The four established strategies for mitigation of effects have been considered: avoidance, prevention, reduction and offsetting (not required in this development). Mitigation measures have also been considered based on the effect on quality, duration of impact, probability and significance of effects.

For example, use of SCR abatement on flues was considered rather than increasing the stack height in order to minimise visual impact as much as possible whilst still meeting air quality standards.

5.0 POPULATION AND HUMAN HEALTH

This chapter evaluates the impacts if any, of the proposed development on population and human health. The potential receptors within the environs of the site include other industrial and commercial businesses in the area, as well as nearby residential developments and farms. These residential developments occur predominantly in a one-off development pattern typical of their rural setting. Part of the south western boundary of the site is shared by a residential development.

Overall, It is predicted that there will be a slight positive impact on local business activity and local employment during the construction phase with the increased presence of up to 500 no. construction workers using local facilities and indirect positive effects on employment in terms of construction material manufacture, maintenance contracts, equipment supply, landscaping etc. The positive impact will continue into the operational phase with c. 245 no. full-time employees anticipated to be on site during operation. The pumping station proposed as part of the development will facilitate infrastructure improvement for the adjacent business parks.

During construction, operation and decommissioning, there will be impacts in relation to noise, dust and traffic. Modelling has been undertaken to confirm the impact on the environment and human health and this is described in the relevant chapter of the EIAR.

In relation to air quality, the mitigation measures that will be put in place to manage dust during construction and the project design to manage emissions during operation will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health.

Construction noise and vibration will be typically limited to daytime periods only. Health effects are typically associated with long term exposure to elevated levels of noise and/or vibration which will not be the case for the proposed development. Construction sources would be expected to be the order of or below existing ambient levels in the vicinity of the site for the vast majority of the construction period. There are no health risks associated with operational noise resulting from the construction of the development subject to implementation of good site management practices and mitigation measures. During operation, the noise limits at the nearest noise sensitive locations are set in line with the EPA NG4 (2016) guidelines. In addition, the predicted operational noise levels associated with the normal operation of the facility are below those set by the WHO *Guidelines for Community Noise (WHO 1999)* document in order to avoid any daytime annoyance or speech interference

and/or night time sleep disturbance, etc. There are no health risks associated with operational noise resulting from the development.

There is no direct impact on any amenities as a result of the proposed development. As Gunnocks House is located within its own strong woodland setting, and large agricultural fields separate it from the proposed development site, the landscape character in the vicinity of the house will be substantially unaltered.

There proposed development will have no impact on power supply to local residential or business users.

The proposed development has the potential for an impact on the health and safety of workers employed on the site, particularly during the construction phase. The activities of contractors during the construction phase will carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) to minimise the likelihood of any impacts on worker's health and safety. During the operational phase of the development, the operator will implement an Environmental Safety and Health Management System and associated procedures at the facilities.

Overall, it is expected that the proposed development in combination with adjacent developments will have a ***long term, positive*** impact by providing employment opportunities and the associated economic and social benefits. This is in line with the planning objectives for the area.

6.0 LAND, SOILS, GEOLOGY AND HYDROGEOLOGY

Chapter 6 of the EIA Report assesses and evaluates the potential impacts of the proposed development on the land, geological and hydrogeological environment.

The site is underlain by a *Locally Important* limestone aquifer, In the western part of the site bedrock is generally overlain by clayey Gravels intermixed with Clay whereas in the eastern part of the site, the subsoil comprises generally firm/stiff gravelly Clays with cobbles. Based on the nature and thickness of overburden present vulnerability varies from *high* to *moderate* across the site following Geological Survey of Ireland classification. The groundwater body (Dublin GWB) is classified under the Water Framework Directive (WFD) Risk Score system as '*Good Status*' and its risk as '*Not at Risk*'.

The land has historically been used for agriculture and there is no evidence of soil or groundwater contamination based on previous site use or site investigation.

The proposed development is outside of the delineated drinking water protection area for the public water supply for Dunboyne, Clonee and their surrounds which is located c.600m to the west of the site across the M3, i.e. upgradient of the site. There are a number of domestic/agricultural wells in the surrounding lands. There are no areas of geological heritage or groundwater dependent terrestrial ecosystems which have potential to be impacted by the proposed development.

Based on the site geology and the design of the development, no dewatering, or groundwater abstraction is required as part of the construction or operation phase of the proposed development. The development design incorporates containment measures following EPA guidance on containment i.e. above ground storage of the

required diesel storage and all pipelines for transport of fuel are above ground. As a result, the only potential for discharge to ground is an accidental leak during refuelling or localised spill from a vehicle. As described previously, the contractor will be required to operate in compliance with a CEMP which includes measures for management of any accidental leaks form construction vehicles or temporary oil storage. During operation, any accidental leaks will be contained within the diesel fuel bunds or if outside of storage compounds, diverted into the stormwater infrastructure and treated within oil interceptors. The presence of hardstand minimises any potential for discharge to ground and therefore a very low risk to the underlying aquifer.

During development there will be a net import of c. 105,000 m^3 of clean fill to the site and therefore no reliance on the need to identify suitably authorised facilities for disposal of excess soil.

The development will result in a loss of agricultural land due to the change in land use. This is in line with the planning zonation for the area.

Following implementation of mitigation measures detailed in Chapter 6 of the EIA Report, the predicted impact during construction of the proposed development will be ***medium term*****,** ***imperceptible*** and ***neutral*** during construction **and** ***long term imperceptible*** and ***neutral*** during operation.

7.0 HYDROLOGY

This chapter of the EIA Report assesses and evaluates the potential impacts of the proposed development on the water and wastewater environment.

The site is drained by the Pace Stream which joins the Pinkeen Stream c. 2.5 river km downstream to the southeast. The Pinkeen Stream joins the River Tolka c. 1 km further downstream which ultimately discharges to north Dublin Bay over 30 km downstream.

The most recent published status (www.epa.ie - River Waterbody WFD Status 2010-2015) of the Tolka river, in the vicinity of the proposed development is '*Bad*' and its environmental risk is qualified by the WFD as '*At Risk*'.

A strategic flood risk assessment (SFRA) developed as part of the MCC Development plan shows that the proposed development is outside of any identified flood zones with no risk of fluvial, pluvial or coastal flooding event. The proposed development design incorporates adequate attenuation and SUDs to ensure there will be no increase in flooding off site as a result of increased hardstand on the site.

As the site is currently in agricultural use there is no existing infrastructure for water supply or wastewater. The proposed development includes a pumping station to connect the proposed development and adjacent existing Bracetown Business park to the existing Irish Water operated sewer. Consultation has been undertaken with Irish Water in regard to the expected design of the pumping station and expected wastewater discharge and required water supply requirements.

During construction, the CEMP will incorporate measures for management of silty water within run-off and buffer zones will be retained along any open drainage to minimise potential for blow off or run-off into open streams. During construction the CEMP will also incorporate measures for management of any accidental leaks from

construction vehicles or temporary oil storage as described in section 6 above. During operation, any accidental leaks will be contained within the diesel fuel bunds or diverted into the stormwater infrastructure which has oil interceptors for removal of any such fuel spills.

Following implementation of mitigation measures detailed in Chapter 7 of the EIA Report, the predicted impact during construction of the proposed development will be ***medium term, imperceptible*** and ***neutral*** during construction and ***long term imperceptible*** and ***neutral*** during operation.

8.0 BIODIVERSITY

This chapter provides an assessment of the impacts of the proposed development in question on the ecological environment, i.e. flora and fauna. The proposed development is to be located in Brace town, Co. Meath. The site is not directly adjacent to any areas of national or local environmental sensitivity.

The footprint of the proposed development comprises agricultural grassland fields divided by internal hedgerows and surrounded by outgrown hedgerows.

There are no rare or protected habitats recorded in the study area.

Bats were found to use the site for feeding and a badger sett was recorded outside the development area to the southern boundary.

The site may be considered of Low Local Ecological Value. There are no predicted significant impacts on local ecology.

None of the qualifying habitats or species of the European sites occur under the footprint of the proposed works areas.

There is limited connectivity with the River Tolka. There will be no indirect impacts on the European sites in North Dublin Bay.

The development is located in an area of low local ecological value and with the employment of avoidance measures with regard to cutting vegetation, there will be no impacts on bats or birds, and it is predicted to have a ***neutral*** and ***imperceptible*** effect on biodiversity.

An Appropriate Assessment Screening was undertaken for the project and concluded:

- The proposed Project is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
- The proposed Project is unlikely to indirectly significantly affect the Qualifying interests or Conservation Objectives of the European sites considered in this assessment.
- The proposed Project, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment in view of their conservation objectives.
- It is possible to conclude that significant effects can be excluded at the screening stage.

It can be concluded, on the basis of objective information, and in view of best scientific knowledge, that the proposed Project, either individually or in combination with other plans or projects, will have a significant effect on the relevant European sites.

9.0 AIR QUALITY AND CLIMATE

This chapter of the EIA Report evaluates the impacts which the proposed development may have on air quality & climate.

In terms of the existing air quality environment, data available from similar environments indicates that levels of nitrogen dioxide (NO_2) and PM_{10}/$PM_{2.5}$ are, generally, well within the National and European Union (EU) ambient air quality standards.

Air dispersion modelling was carried out using the United States Environmental Protection Agency's regulatory model AERMOD. The aim of the study was to assess the contribution of operational emissions of NO_2 from the proposed development to off-site levels of this pollutant. The modelling was undertaken to assess the impact to ambient air quality from the following three scenarios:

- Normal Operations Scenario: This involved continuous operation (24 hours per day, 365 days per year) of 14 gas engines (16 gas engines will be in place on site, with 2 engines acting as a backup, with only 14 ever operational at one time) as well as scheduled testing of 80 standby diesel generators for the data storage facility buildings.

- Emergency Operations Scenario: Emergency operation of 64 of the 80 diesel generators (the remaining four generators serving as "catcher" generators) for up to 100 hours per year. As the standby diesel generators are not intended to operate in parallel with the gas engines at any time, the gas engines were assumed to be running for the remaining 8,660 hours per year.

- Cumulative Emergency Operations Scenario: Operations as per *Emergency Operations Scenario* above and including the emergency operation of the 90 standby diesel generators associated with CLN1, CLN2, CLN3, CLN5 and CLN6 in the neighbouring Runways Information Services Limited data storage facility for up to 100 hours per year. In addition, the testing of the 90 standby diesel generators at the neighbouring site was also incorporated into the modelling and was assumed to occur on a weekly basis, 2 generators at a time for one hour each.

Modelling results are based on conservative predicted operational assumptions.

Air Quality

<u>USEPA Methodology</u>
The modelling assessment has found that ambient NO_2 concentrations as a result of the Normal Operations Scenario, Emergency Operations Scenario and the Cumulative Emergency Operations Scenario are in compliance with the relevant ambient air quality limit values at all locations at or beyond the site boundary. The impacts to air quality from operation of the proposed development are therefore deemed long-term and slight negative. For the Normal Operations Scenario, emissions from the site assuming continuous operation of 14 gas engines as well as

scheduled weekly testing of the standby diesel generators will lead to an ambient NO_2 concentration (including background) which is 46% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 77% of the annual limit value at the worst-case location at or beyond the site boundary.

For the Emergency Operations Scenario, emissions from the site assuming scheduled weekly testing as well as emergency operation of the back-up generators for 100 hours per year and continuous operation of the gas engines for 8,660 hours per year will lead to an ambient NO_2 concentration (including background) which is 47% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 81% of the annual limit value at the worst-case location at or beyond the site boundary.

For the Cumulative Emergency Operations Scenario, emissions from the gas engines and all back-up generators modelled assuming scheduled weekly testing as well as emergency operation of the back-up generators for 100 hours per year will lead to an ambient NO_2 concentration (including background) which is 64% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 82% of the annual limit value at the worst-case location at or beyond the site boundaries.

UK EA Methodology

The results for the Emergency Operations Scenario indicate that in the worst -case year, the back-up generators can operate for up to 531 hours per year before there is a likelihood of an exceedance of the ambient air quality standard (at a 95th percentile confidence level). However, the UK guidance recommends that there should be no running time restrictions placed on these generators which (aside from testing) are only used to provide power on site only during an emergency scenario.

Climate

Based on the scale and temporary nature of the construction works, the potential impact on climate change and transboundary pollution from the construction of the proposed development is deemed to be short-term and not significant in relation to Ireland's obligations under the EU 2020 target.

No significant on-site CO_2 emissions will occur as a result of the construction of the proposed development. Whilst the use of electricity for the proposed development would indirectly result in emissions equivalent to an upper limit of 0.54% of Ireland's national annual CO_2 emissions the overall impact to climate is deemed ***negative, long-term*** and ***imperceptible***.

Human Health

Best practice dust mitigation measures will be put in place during construction of the proposed development to ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. The impact of construction of the proposed development is likely to be ***short-term*** and ***imperceptible*** with respect to human health.

As demonstrated by the dispersion modelling results, pollutant concentrations with the proposed development operational are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health.

10.0 NOISE AND VIBRATION

This chapter assesses the anticipated noise and vibration impact associated with the proposed development at nearby noise sensitive locations.

The existing noise climate has been surveyed at nearby noise sensitive receptors over the course of typical day and night-time periods. Road traffic movements, both distant and local, were noted as the most significant source of noise during both daytime and night-time periods. Other noise sources included aircraft activities and other typical noise sources expected in a suburban environment (e.g. pedestrian activity, dogs barking, distant plant noise etc.)

During the construction phase of the proposed development there will be some impact on nearby noise sensitive properties due to noise emissions from site activity and traffic. The application of noise limits and limits on the hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum. The resultant impact is ***slight*****,** ***negative*** and ***medium-term*****.**

The primary sources of noise during the operational phase of the proposed development include the introduction of additional building services plant for general site operation, additional building services plant (i.e. generators) for emergency site operation and the introduction of additional vehicular traffic on existing public roads. Proprietary noise and vibration control measures will be employed in order to ensure that emissions from building services plant do not exceed the relevant criteria at nearby noise sensitive locations. The resultant noise impact is ***imperceptible*** *to* ***moderate*****,** ***negative*** and ***long-term*** while being within all adopted noise criteria.

No significant sources of vibration will be present during the operational phase. There are therefore no predicted vibration impacts at neighbouring dwellings during the operational phase. The resultant vibration impact is ***imperceptible, neutral*** and ***long- term****.*

11.0 LANDSCAPE AND VISUAL

The proposed development will be located within a site area that currently has both agricultural and urban fringe landscape characteristics. The agricultural areas present as substantially flat fields bound by trees and hedges, and with occasional dwellings and groups of dwellings and farm buildings. The M3 motorway runs close to the lands, and the built edges of Ongar, Blanchardstown and Mulhuddart, together with the industrial areas at Damastown and Portan (Runways Information Services Limited), and the settlement of Dunboyne, are also part of the wider setting.

In general, the proposed development will represent an intensification of the built urban edge that will be consistent with the emerging trend in the locality and with the land use zoning for the area.

From the agricultural areas north of the development site, the proposed development will present as new built elements that are partially visible on the skyline but typically at distance across open fields and also behind intervening tree and hedgerows. Landscape and visual effects will be ***slight*** to ***moderate***.

In the vicinity of Dunboyne, the development will be intermittently visible beyond the urban foreground, the intervening fields, motorway, trees and hedgerows. Buildings will be partially visible on the skyline, but typically at or below the general skyline formed by tree canopies and intermediate buildings. Landscape and visual effects will be ***slight***.

Closer to the development, at the existing business parks, along the R147 and the motorway, the proposed development will be more prominent. These areas already incorporate substantial built elements and the landscape is already modified and is therefore less sensitive to development of this nature. Landscape and visual effects will typically be ***moderate***.

During construction, potential impacts will arise from site disturbance and clearance, excavation and ground works, construction vehicles and plant, material import, the emergence of new structures, and site landscaping. Construction activity will be similar in nature to that on the nearby Runways Information Services Limited Phase 2 development site. From the agricultural setting to the north of the development site, and from the built environs of Dunboyne, the site area is partly screened by layers of intervening trees, hedgerows and built elements, and only the taller parts of building will become apparent within the landscape context. In the more immediate vicinity of the site, from the existing business parks, the R147 and the M50, the scale of the emerging structures will be more readily apparent. It is considered that the landscape and visual effects during construction will be *short term,* ***slight*** **to** ***moderate*** and ***negative*****.**

On completion, the development site will have changed from its current substantially agricultural character to that of a newly built campus style high tech facility comprising high quality clean-lined industrial buildings and associated landscape development. The proposed development will be perceived both as an intensification of the existing business park developments at Bracetown and as a continuation of the emerging trend of new high-tech developments within the wider setting. A series of photomontages illustrate the appearance of the proposed development from a selection of representative vantage points within the visual context of the development site. Given the existing mixed agricultural and urban fringe context, existing and emerging industrial developments, and the nature of the proposed development, it is considered that the landscape and visual impact during operation will range from ***slight*** to ***moderate***, and from ***negative*** to ***neutral****.*

The primary mitigation for landscape and visual impacts are in the architectural design, massing and composition of the built elements on the site, and in the perimeter and internal site landscaping. The buildings are designed as high quality contemporary industrial buildings set within an attractive landscaped campus environment comprising attenuation pond areas together with native tree planting and ground cover, and wildflower meadow planting. The development also includes perimeter landscaped berms that will act as a visual buffer in closer proximity to the development, and as an additional layer of landscape screening from the wider setting.

The lands are zoned for development as proposed and the scheme provides for an appropriate and high-quality response to the permitted land use.

12.0 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE

This chapter assesses the predicted impacts of the proposed development on archaeological, architectural and cultural heritage using a number of sources including the Record of Monuments and Place, the Meath County Council Development Plan 2017-2023, the National Inventory of Architectural Heritage, the topographical files of the National Museum of Ireland, the Excavations Database, cartographic and documentary sources.

There are no impacts on recorded archaeological, architectural or cultural heritage sites associated with the proposed development and no sites of archaeological potential were noted during the field survey. However, the site has not been subject to significant development in the past and it is possible that subsurface archaeological features survive.

A geophysical survey has been undertaken of areas that will be subject to development or construction-related impacts. The survey indicated the potential presence of sub-surface archaeological remains. As such the following mitigation measures are incorporated in the project design:

- Archaeological test trenching will be undertaken based on the results of the geophysical survey.

- Should archaeological features or material be uncovered during archaeological testing or any phase of construction, ground works should cease immediately and the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht should be informed. Time must be allowed for a suitably qualified archaeologist to inspect and assess any material. If it is established that archaeologically significant material is present, the National Monuments Service may require that further archaeological mitigation be undertaken.

13.0 TRAFFIC AND TRANSPORTATION

This chapter assesses the impact that the proposed development will have on the surrounding road network during construction and operation.

The surrounding road network in the vicinity of the site includes the R147, the CR580, and the M3. The site is currently serviced by Bus and Rail. Bus Eireann services 109, 109B and 105 stops along the R147, just north of its t-junction with the CR580. Rail services operate from the M3 Parkway station, with services to Clonsilla, Docklands and Hansfield.

The potential impact of the proposed development has been considered for both the construction and operational stages based on Transport Infrastructure Ireland (TII) guidelines set out in the Traffic & Transport Assessment Guidelines (2014).

A number of traffic surveys were carried out on the local road network in August 2019, which were factored up in accordance with TII Project Appraisal Guidelines – Unit
5.3: Travel Demand Projections (2016) to establish opening (2029), future (2034) and Horizon (2044) year traffic flows in the area.

Following this step, and in order to establish baseline (do-nothing) flows, further adjustments were made to these flows to account for approved surrounding development in the area not accounted for in the surveys.

The trip generation of the proposed development during the construction stage was estimated based on construction traffic recorded at a similar data storage facility site. The construction staging for the proposed development will be such that the worst case construction impact will occur in Q4 2022 when Data storage facility 1 is partially operational and undergoing the process of fitting out the final data halls, the Energy Centre is partially operational and undergoing the process of fitting out the final elements of equipment, and Data storage facility 2 is at peak construction.

Therefore, the worst-case construction traffic impact for the proposed development has been assessed for Q4 2022. The impact of the construction phase of the development was found to be ***medium-term, negative*** and ***not significant*** during peak construction.

The operational stage trip generation potential was estimated for the proposed development based on a first principles assessment of the expected staff numbers and shift times. A worst-case scenario trip generation was assumed. The impact of the operational phase of the development was assessed in terms of the traffic impact the proposed development would have on five key junctions located in the vicinity of the site.

Theses junctions were analysed using ARCADY and PICADY (junction capacity analysis computer modelling programs) for 2029 (opening year), 2034 (future year) and 2044 (horizon year) with and without the proposed development in place

The traffic impact of the operational phase of the proposed development was found to be *long-term*, *neutral* and *imperceptible*. However, mitigation measures to improve capacity at the t-junction of the Bracetown Business Park Access Road (CR580) with the R147 are discussed that would improve capacity and lessen the traffic impact caused, for the most part, by background traffic growth.

14.0 MATERIAL ASSETS

This chapter of the EIA Report evaluates the impacts, if any, which the proposed development may have on Material Assets. The impacts on the various material assets described above have been considered in the following chapters of this EIA Report as follows:

- Chapter 5 Population and Human Health;
- Chapter 9 Air Quality & Climate;
- Chapter 13 Traffic & Transportation; and
- Chapter 15 Waste Management.

Ownership and Access

The proposed development site is under third party ownership. A letter of consent, to apply for development on the lands from the site owner, is included with the planning application.

The 'main access' (R147) proposed as a part of this proposal is temporary in nature, pending the development of the distributor road to the east of the site. The R147 access will be retained as a secondary service access once the latter is developed.

Power and Electrical Supply
The four data storage centres will require up to 144 MW IT load. it is proposed to construct an energy centre in the northeast of the site. This and connection to the electricity grid will service the power needs of the data storage facilities. The energy centre will primarily comprise 16 no. lean-burn gas engines which are the most efficient form of internal combustion engines. In the event of a loss of power to the site, 72 no. diesel-powered back-up generators (i.e. 18 no. generators per data storage facility building) will be activated to provide power pending restoration of mains power. Based on the Operator's experience, the back-up generators will rarely be used.

Telecommunications
The proposed development will connect to the existing telecommunication lines that run close to the site. There is sufficient capacity in the network for the proposed development.

Surface Water Infrastructure
Rainwater runoff from building roofs, yards and the proposed internal road network will be collected in newly constructed storm water drainage network and attenuated within 3 no. surface water retention ponds/attenuation ponds (capacity of 6,957 m^3).

Foul Drainage
Foul sewage will be collected from site (data storage facilities, offices and energy centre washroom facilities and canteen) and discharged through a new pumping station to the foul drainage network which runs along the R147 and ultimately discharges to Ringsend WWTP.

Water Supply
Water will be sourced from the 450mm diameter mains supply located along the R147. This mains supply has capacity to supply adequate water for the proposed development.

15.0 WASTE MANAGEMENT

This chapter has been prepared to address issues associated with waste management during the construction and operational phases of the proposed development.

An assessment was carried out of the potential impacts associated with resource consumption and waste management during the construction and operational phases of the proposed development. The receiving environment is largely defined by MCC as the local authority responsible for setting and administering waste management activities in the area through regional and development zone-specific policies and regulations.

During the construction phase, typical construction waste materials will be generated which will be source segregated on-site into appropriate skips/containers and removed from site by suitably permitted waste contractors to authorized waste facilities. Where possible, materials will be reused on-site to

minimize raw material consumption. Source segregation of waste materials will improve the re-use opportunities of recyclable materials off-site. Site preparation, excavations and levelling works required to facilitate construction of foundations, access roads and the installation of services will generate c. 50,000m^3 of excavated material. It is currently proposed that all excavated material will be reused on site. The importation of c. 155,000m^3 of fill materials will be required for construction of foundations and other ground preparation works. The ground investigation report shows there was no evidence of subsurface contamination encountered during the site investigation works.

A carefully planned approach to waste management and adherence to the site-specific Construction and Demolition Waste Management Plan during the construction phase will ensure that the effect on the environment will be ***medium-term, neutral*** and ***imperceptible*.**

Dedicated areas have been allocated for storage of waste materials generated during the operational phase of the development. This waste will be generated from the building staff and will comprise of typical commercial waste types. The waste storage areas have been allocated to ensure a convenient and efficient management strategy with source segregation a priority. Waste will be collected from the waste storage areas by permitted waste contractors and removed off-site for re-use, recycling, recovery or disposal.

With mitigation in place and a high rate of reuse, recycling and recovery achieved, the predicted impact of the operational phase on the environment will be ***long-term, neutral*** and ***imperceptible***.

16.0 INTERACTIONS – INTERRELATIONSHIPS BETWEEN THE ASPECTS

This chapter of the EIA Report addresses potential interactions and inter-relationships between the environmental factors discussed in the preceding chapters. This covers both the construction and operational phase of the proposed development.

In the main, the majority of EIA Report chapters have already included and described assessments of potential interactions between aspects however this section of the assessment presents a summary and assessment of the identified interactions. In summary, the majority of interactions are ***neutral***.

1.0 INTRODUCTION AND SCOPING

1.1 PREAMBLE

This Environmental Impact Assessment Report (EIAR) has been prepared by AWN Consulting on behalf of EngineNode Ltd ("EngineNode") herein referred as 'the Applicant') to accompany a planning application to Meath County Council (MCC) for four data storage facilities, office / administration building, and associated ancillary development.

The proposed development is to be located on a greenfield site (area of 24.5 hectares) in the townland of Bracetown and Gunnocks, Co Meath. (see Figure 1.1) and is currently zoned for E2 *General Industry and Employment / E3 Warehousing and Distribution* in the Meath County Development Plan 2013 - 2019 (MCDP). A Masterplan (Revision One) has been approved by MCC for lands at Portan Clonee and Pacetown which includes the lands for the proposed data storage facility development and a permitted expansion of a data storage facility development (MCC Ref: RA180671). The Masterplan area is identified by a dashed blue line in Figure 1.1 below.

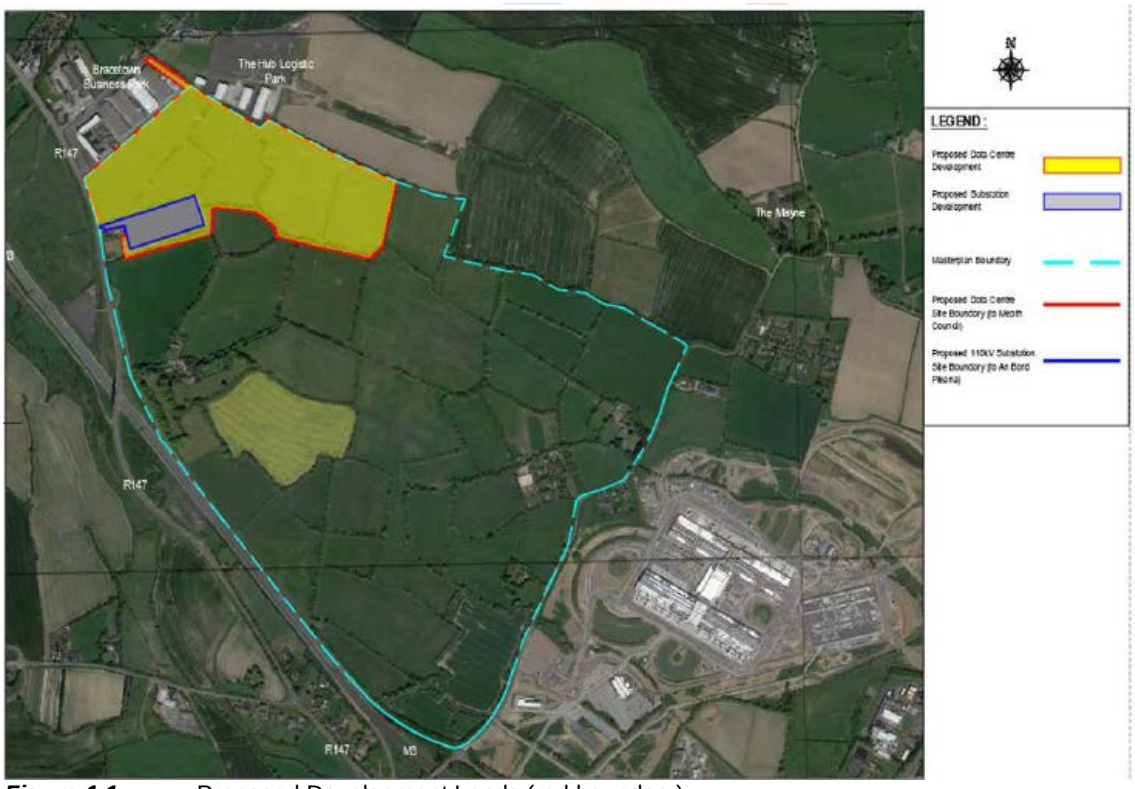


Figure 1.1 Proposed Development Lands (red boundary)

The data storage facility will facilitate the secure storage, and distribution of information to individuals, businesses and organisations.

A detailed description of the proposed development and a site layout plan is presented in Chapter 2 of this EIAR.

The application is for a ten-year permission for a data storage facility campus. A 10-year permission is sought due to the nature of this specific development. The proposed development will respond to current and future use demands in the area.

The logistics of the site and use of the buildings mean that their delivery must be programmed on a phased basis over the duration of a 10-year planning permission. The site will host four data storage facilities with associated energy supply facilities and the commercial reality is that the overall orderly development of the site will take longer than 5 years.

The extended planning permission will furthermore reinforce the zoning objectives of the MCDP including the phasing of the subject lands allowing suitable roll out in line with utilities and roads envisioned for the area. These Local Authority ambitions have been captured and incorporated in the submitted Masterplan documentation.

1.2 CONTEXT

1.2.1 Legislative Requirements

The requirement for EIA for certain types and scales of development is set out in the EIA Directives (2011/92/EU and 2014/52/EU), European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (the bulk of which came into operation in September 2018), the European Communities (Environmental Impact Assessment) Regulations 1989-2006, Planning and Development Act 2000 - 2019 (as amended) and the Planning and Development Regulations 2001-2019. It should be noted that this EIA Report is prepared in accordance with the 2011 EIA Directive (2011/92/EU), as amended by the 2014 EIA Directive.

The EIA Directives list those projects for which an EIA is mandatory (Annex I) and those projects for which an EIA may be required (Annex II). With regard to Annex II projects, Member States can choose to apply thresholds or use case by case examination or a combination of both to assess where EIA is required. In Ireland, a combination of both has been applied.

The project proposed is not listed under Annex I EIA Directives and it is below the relevant threshold as set out in the Planning and Development Regulations 2001-2019 for Annex II projects. The threshold for "*industrial estate development projects, where the area would exceed 15 hectares"* as set out in Part 2 of Schedule 5 of the Regulations was considered to be most relevant threshold in the context of the proposed development in the subject location

The main objective of an EIA, as set out in Article 3(1) of the 2014 EIA Directive, is to identify, describe and assess the direct and indirect significant impacts of a project on population and human health, biodiversity, land, soils, water, air & climate (including noise), material assets, cultural heritage and the landscape and the interaction between the aforementioned factors. The EIA Report reports on the findings of the EIA process to date and informs the Planning Authority, statutory consultees, other interested parties and the public in general about the likely effects of the project on the environment.

This EIA Report has been prepared in accordance with the requirements of EIA Directives (2011/92/EU and 2014/52/EU). The "*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment"* (August 2018) and the European Commission *Guidance on the preparation of the Environmental Impact Assessment Report* have been considered in the preparation of the EIA report.

Using the Grouped Format Structure, the EIA Report examines each environmental aspect in a separate chapter. Each chapter generally covers the following:

- Receiving Environment;
- Characteristics of the Proposed Development;
- Potential Impacts of the Proposed Development;
- Do-Nothing Scenario;
- Remedial and Mitigation Measures;
- Predicted Impacts of the Development; and
- Residual Impacts.

A Non-Technical Summary of the findings of the EIA Report is provided as a separate document.

Cumulative impacts for each environmental topic are assessed in each chapter of this EIA Report. The cumulative impact considers the impact of the proposed development, substation and associated infrastructure and permitted developments in the surrounding area.

Interactions i.e. the interrelationship between each environmental aspect, are assessed as they occur in each chapter. The final chapter of the EIA Report, Chapter 16 shows where interactions have been identified and how they have been addressed.

1.2.2 Need for the Development

EngineNode is seeking to build a significant data storage facility development to meet growing global demand for Cloud Computing space. The digital economy is seen as key by Government and Enterprise for sustained growth from overseas investor in Ireland and there is a strong demand for more data storage facility space to meet demand in Ireland. The digital economy provides high value jobs and the location of this facility in Meath will provide 500 construction staff phased over a period of 10 years and 245 high quality jobs during operation.

1.3 COMPANY PROFILE

The facility is being developed by EngineNode. EngineNode is a developer and operator of data storage facility facilities. Its affiliates have developed and operated a number of data storage facility facilities internationally. The company is committed to running its business in the most efficient and environmentally friendly way possible.

1.4 CONSULTATION AND SCOPING

EngineNode and the project team have liaised with the relevant departments of MCC in advance of lodgement of this application and pre-planning meetings were held with MCC and representatives of the Planning, Roads/Transportation, Environmental and Water Services departments attended.

In addition, the relevant specialists have liaised with statutory bodies during the course of the EIA Report preparation. Other consultees are referred to in individual chapters.

1.5 CONTRIBUTORS TO THE EIAR

The preparation and co-ordination of this EIA Report has been completed by AWN Consulting in conjunction with specialist subcontractors. Specialist inputs were provided by the following (Table 1.1):

Table 1.1 Roles and Responsibilities in the EIA Report

Role		
EIA		AWN
Engineering Design		Clifton Scannell Emerson Associates (CSEA)
Architectural Design		Kavanagh Tuite Architects (KTA)
EIA Chapter No.	**Chapter Title**	**Consultant**
	Non-Technical Summary	AWN – Input from each specialist
Chapter 1	Introduction	AWN – Teri Hayes
Chapter 2	Description of the Proposed Development	AWN -Teri Hayes
Chapter 3	Planning and Development Context	AWN – Jonathan Gauntlet
Chapter 4	Alternatives	AWN – Teri Hayes & Jonathan Gauntlet
Chapter 5	Population and Human Health	AWN – Emma Carroll with specialist input from Damian Kelly and Dr Edward Porter & Ciara Nolan
Chapter 6	Land, Soils, Geology & Hydrogeology	AWN Teri Hayes & Marcelo Allende
Chapter 7	Hydrology (including Stage 1 Flood Risk Assessment)	AWN Teri Hayes & Marcelo Allende
Chapter 8	Biodiversity (including AA Screening Report)	Moore Group – Ger O'Donohoe
Chapter 9	Air Quality & Climate	AWN – Dr Edward Porter and Ciara Nolan
Chapter 10	Noise & Vibration	AWN – Damian Kelly
Chapter 11	Landscape and Visual	Brady Shipman Martin - John Kelly
Chapter 12	Archaeological, Architectural and Cultural Heritage	CRDS Ltd. – Dr Stephen Mandal
Chapter 13	Traffic & Transportation	CSEA –Elaine Conlon
Chapter 14	Waste Management	AWN – Emma Carroll & Elaine Neary
Chapter 15	Material Assets	AWN – Elaine Neary & Jonathan Gauntlet
Chapter 16	Cumulative Impact	AWN – Input from each specialists
Chapter 17	Interactions- Interrelationship between the Aspects	AWN – Input from each specialists

Project Manager Teri Hayes, BSc MSc PGeo. Teri is a Director with AWN Consulting with 25 years of experience in water resource management and environmental assessment and risk analysis. Teri is a member of the International Association of Hydrogeologists (Irish Group) – former president and a professional member of the Institute of Geologists of Ireland She has project managed and contributed to numerous environmental impact assessments and design of appropriate mitigation measures, acted as an expert witness at public hearings, lectured in EIA for postgraduate classes and provided expert advice on EIA sections for planning authorities and ABP.

Land, Soils, Geology, Hydrogeology & Hydrology, Teri Hayes, (as above)

Biodiversity/Appropriate Assessment, Ger O'Donohoe, Ger is a Consultant Ecologist with Moore Group. Ger graduated from GMIT in 1993 with a B.Sc. in Applied Freshwater & Marine Biology and completed an M.Sc. in Environmental Sciences, graduating from TCD in 1999. Ger has over 20 years of experience as an environmental consultant with experience in the planning and management of

numerous complex Environmental Impact Assessments for large scale developments nationwide. He has wide ranging experience as an expert witness at public hearings.

Air Quality & Climate, Dr. Edward Porter is Director with responsibility for Air Quality with AWN Consulting and has completed Chapter 9. He holds a BSc from the University of Sussex (Chemistry), has completed a PhD in Environmental Chemistry (Air Quality) in UCD where he graduated in 1997 and is a Full Member of the Royal Society of Chemistry (MRSC CChem), the Institute of Environmental Sciences (MIEnvSc) and the Institute of Air Quality Management (MIAQM). He specialises in the fields of air quality, EIA and air dispersion modelling.

Air Quality & Climate, Ciara Nolan is an environmental consultant in the air quality section of AWN Consulting Ltd. She holds an MSc. (First Class) in Environmental Science from University College Dublin and has also completed a BSc. in Energy Systems Engineering. She is an Associate Member of both the Institute of Air Quality Management and the Institution of Environmental Science. She specialises in the fields of ambient and indoor air monitoring, EIA and air dispersion modelling. She has been active in the field of air quality for over 2 years, with a primary focus on consultancy.

Noise & Vibration, Damian Kelly is a Director and Principal Acoustic Consultant with AWN Consulting. Damian holds a BSc from DCU and an MSc from Queens University Belfast. He has over 18 years' experience as an acoustic consultant. He is a member of the Institute of Acoustics. He has extensive knowledge in the field of noise modelling and prediction, having prepared the largest and most complex examples of road and industrial noise models currently in existence in Ireland. He was also co-author of the EPA document "*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities" (2012)* and advised in relation to the noise limits applied to commercial developments by the various local authorities in the Dublin region.

Landscape and Visual, John Kelly, BArch (Hons) MRIAI. John is a qualified Architect and Managing Partner of Brady Shipman Martin and has over 25 years' experience of direct involvement in the planning, design and environmental assessment of major infrastructure, industrial, educational, commercial, tourism, leisure and energy projects, as well as large scale mixed-use masterplans. John utilises and develops photographic, surveying and digital methodologies that assist in establishing a thorough understanding of the three-dimensional characteristics of sites and their context.

Planning and Alternatives, Jonathan Gauntlet is an Environmental Consultant in AWN Consulting and has over 9 years' experience in environmental compliance, environmental licensing, and planning. Recent experience includes a variety of projects including EIA Reporting and IE Licencing. Jonathan has a BsocSc (Environmental Planning) and BBA (Economics) from the Waikato University in New Zealand and has experience working in the environmental consultancy and regulatory fields from Ireland, the UK and New Zealand.

Cultural Heritage, Dr Stephen Mandal holds an honours science in geology (1991) and a PhD in geoarchaeology (1995) from Trinity College Dublin. He is founder and managing director of CRDS Ltd (established in 1997; incorporated in 1999), archaeological, cultural and architectural heritage consultants. He has over 25 years' experience in the management of archaeological projects of all scale, from EIAR to large scale excavations. He is a professional member of the Institute of

Archaeologists of Ireland, the Institute of Geologists of Ireland, and the European Federation of Professional Geologists.

Traffic & Transportation, Elaine Conlan (BAI, BA) is a traffic engineer with ten years' experience in the traffic and transportation field. She has a BAI. in Engineering (General Civil, Mechanical, Computer and Electronics, specialisation in Mechanical) and BA in Mathematics a from Trinity College Dublin. She has worked in consulting for seven years in Ireland and Australia and has been involved in a variety of projects. These projects include providing the required Traffic and Transportation input to many Development Planning Applications (including a number of data storage facility applications), highway upgrade projects, tender designs, accident investigation, parking studies, traffic impact assessments, traffic management, traffic control, sustainable transport planning and road safety auditing.

Traffic & Transportation, Geoff Emerson, B.E., M.Sc., C.Eng., MIEI, FConsEI is a Director with Clifton Scannell Emerson Associates. Geoff has 20+ years' experience in Civil, Structural and Transportation Consulting Engineering and Project Management acting as Project Manager for strategic Road Schemes, Street Upgrades, Quality Bus Network Schemes, Sustainable Transport Schemes, Transportation Catchment Studies & Bridge Design. Geoff has also had significant experience in large-scale site developments for private clients including Green Property Ltd, Menolly Homes Ltd and Bennett Developments. Recent Structural and Engineering experience includes the N3 Mulhuddart Overbridge and Midlands Prison Extension (€26m). Clients include National Transport Authority, Fingal County Council, South Dublin County Council, Kilkenny County Council, Louth County Council, Dun Laoghaire Rathdown County Council, Meath County Council, National Roads Authority and Dublin Transportation Office. Previously while working with RPS he was involved in the M50 South – Eastern Motorway scheme.

Waste Elaine Neary (BA, MApplSc, MCIWM) is Principal Consultant and Chartered Waste Management with AWN; she has a BA in Natural Sciences from Trinity College Dublin and a Masters in Applied Science in Environmental Science from UCD. She is a full Member of the Chartered Institute of Waste Management (CIWM) and an affiliate member of the Institute of Environmental Management and Assessment (IEMA). She has over 14 years' experience in the provision of waste consultancy services specialising in detailed waste design, preparation of construction and demolition waste management strategies, operational waste management plan and waste management assessments for EIA/EIARs.

1.6 IMPACT PREDICTIONS

The quality, magnitude and duration of potential impacts are defined in accordance with the criteria provided in the Environmental Protection Agency (EPA) 'Revised Guidelines on Information to be Contained in Environmental Impact Assessment Reports (EIARs)' (2017) as outlined in Table 1.2.

Table 1.2 Glossary of Impacts following EPA Guidelines (2017)

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences

Impact Characteristic	Term	Description
	Not significant	An effect which causes noticeable changes in the character of the environment but without noticeable consequences
	Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment.
	Profound	An impact which obliterates sensitive characteristics
Duration of Effects	Momentary Effects	Effects lasting from seconds to minutes
	Brief Effects	Effects lasting less than a day
	Temporary Effects	Effects lasting less than a year
	Short-term Effects	Effects lasting one to seven years.
	Medium-term Effects	Effects lasting seven to fifteen years
	Long-term Effects	Effects lasting fifteen to sixty years
	Permanent Effects	Effects lasting over sixty years
	Reversible Effects	Effects that can be undone, for example through remediation or restoration
Probability of Effects	Likely Effects	The effects that can reasonably be expected to occur as a result of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Type of Effects	Indirect Effects	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	`Worst case' Effects	The effects arising from a project in the case where mitigation measures substantially fail
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant impact is of greater significance than the sum of its constituents

1.7 DIFFICULTIES IN COMPILING THE SPECIFIED INFORMATION

There were no significant difficulties in the compiling of the specified information for this EIAR. Any minor difficulties are addressed in each of the following EIAR chapters.

1.8 ADDITIONAL ASSESSMENTS REQUIRED

This section addressed the additional approvals and assessments required under other EU Directives and legislation.

- **EPA Greenhouse Gas (GHG) Emissions Permit** – the proposed development will require a permit under the Greenhouse Gas Emissions Directive (2003/87/EC) when in operation.

- **IED Licence** - A licence is required for the energy centre based on the industrial Emissions Directive 2010 and Environmental Protection Agency (EPA) Act 1992 (as Amended) IE Directive 2010/75/EU.: The combustion of fuels in installations with a total rated thermal input of greater than 50MW is an IE Licence category activity under both Annex 1 of the IE Directive 2010 and the first schedule of the EPA Act 1992, as amended. *Capacity* in this context relates to the amount of fuel the generators use, not the amount of electricity they produce.

- **Appropriate Assessment Screening Report** – a screening report has been completed for the proposed development, as required under the Habitats and Birds Directive (92/43/EEC and 79/409/EEC), the results of which are presented in Chapter 8 Biodiversity and provided under separate cover with the planning submission.

1.9 SCHEDULE OF MITIGATION MEASURES

A schedule of mitigation measures to be included in the Construction Environmental Management Plan (CEMP) is included in Appendix 1.1.

APPENDIX 1.1

SCHEDULE OF MITIGATION MEASURES

Prepared by

AWN CONSULTING

Project Phase	Mitigated By	Justification	Mitigation Measures
Land, Soil and Geology			
Construction	Management	Environmental Pollution	The excavation will require site levelling. Overall there is a net import of soil. A suitable area will be allocated for temporary stockpiling of excavated and infill materials which will be located away from any surface water courses or site boundaries.
Construction	Management	Environmental Pollution	No contaminated soil is expected based on site investigation undertaken. However, should soils be identified during works which require to be taken off site This will be removed for reuse or disposed of by contractors licensed under the Waste Management Act of 1996 and amendments.
Construction	Management	Soil and Water Protection	Previous uses of the site and site testing has not indicated any evidence of contamination at the site. However, any contaminated soil or suspected contaminated soil will be isolated from clean soil pending testing to confirm its classification and removal to a licenced facility.
Construction	Management	Soil and Water Protection	Only material of a known clean origin will be sourced for infill. Should any material be considered suspect it will be tested prior to use as infill material.
Construction	Management	Soil and Water Protection	As recommended in Inland Fisheries Ireland (2016) "Guidelines on protection of fisheries during construction works in and adjacent to waters", where stripping occurs, the resulting excavated fractions will be separated into subsoil and topsoil stockpiles. Temporary storage of spoil will be managed to reduce release of dust and uncontrolled surface water run-off which may contain sediment etc.
Operational	Protection	Soil and Water Protection	Fuel oil for the emergency boilers is the only required bulk chemical storage required on site. Each data storage facility building service yard will have bunded storage tanks for fuel oil including double lined overground delivery pipeline to the belly tanks for diesel fired standby generators within the data storage facility. All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25 % of the total volume of the substance stored and will be designed in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004).
Construction	Management	Soil and Water Protection	Concrete will be delivered to site and tankers will not be allowed to be washed out on the site. Out areas will be provided to ensure protection of water quality.
Operational	Management	Soil and Water Protection	The development will require licencing through the EPA based on the energy centre thermal input. As such the site will operate under the strict guidance required for licenced facilities which includes regular checking of containment measure.
Operational	Prevention	Soil and Water Protection	A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad.
Operational	Prevention	Soil and Water Protection	A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.
Operational	Protection	Soil and Water Protection	All staff will be trained in spill containment measures and emergency response.
Operational	Prevention	Soil and Water Protection	Fuel unloading areas will be provided at each service yard. Bulk oil storage will be fuly bunded in compliance with best guidance. oil interceptor to mitigate for any accidental spills. which will be surrounded by a drainage channel to capture any run-off.
Hydrology			
Construction	Management	Water Protection	Effluent generated on the site from the contractor's sanitary facilities will be contained and disposed of appropriately off site or where feasible directed to the existing off-site foul sewer network, once connected. These facilities will be connected to the IW foul drainage system once the pumping station is commissioned. In the short term, portable sanitary facilities will be provided with waste collected and disposed of appropriately.
Construction	Prevention	Infrastructure protection	All sewer connections will be made with the approval of IW and the Local Authority and checked prior to commissioning.
Construction	Prevention	Infrastructure protection	The connection to public water supply on site will be carried out in full compliance with the requirements of MCC and IW.
Construction	Prevention	Surface Water Protection	An outline construction management plan (CEMP) will be prepared for the proposed development prior to commencement of construction. This CEMP will ensure effective stormwater management during construction and will address potentially polluting activities and include emergency response procedures. All relevant personnel working on the site will be trained in the implementation of the procedures. A summary of items covering are provided below: • During the construction phase, surface water run-off collected in excavations will be diverted to settlement ponds and will not be allowed to directly discharge directly to the existing field drainage. A buffer distance with no storage of soils

			will be maintained along field ditches and streams in compliance with fisheries guidelines "Guidelines on protection of fisheries during construction works in and adjacent to waters" Inland Fisheries Ireland (2016); • Aggregate and infill materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination. • As recommended in Inland Fisheries Ireland (2016) "Guidelines on protection of fisheries during construction works in and adjacent to waters" there will be no direct discharges to surface waters during construction and a buffer protecting open water will be maintained; • Oil and fuel storage tanks shall be stored in designated areas within the contractor's compound, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal; and, • Concrete will be delivered to site and tankers will not be allowed to be washed out on the site. Out areas will be provided to ensure protection of water quality.
Operational	Management	Surface and groundwater Protection	The water main system will be metered as directed to facilitate detection of leakage and prevention of water loss.
Operational	Management	Surface and groundwater Protection	Surface drainage will be discharged using a network of swales along the edge of the internal road network. These drains and swales will discharge to 3 no. surface water retention pond/attenuation pond which will be designed using a hydro-brake vortex control device to restrict discharge to greenfield run-off rates.
Operational	Management	Surface and groundwater Protection	Attenuation ponds will be constructed to retain a constant volume of water to promote settling and reduce conveyance of suspended solids and other particles to the receiving waters (refer to engineering report for calculations). Stormwater will discharge through oil interceptors to allow mitigation of any accidental release of hydrocarbons to ground.
Operational	Management	Surface and ground Water Protection	All staff will be trained in spill containment measures and emergency response.
Operational	Management	Surface and ground Water Protection	Fuel unloading areas will be provided at each service yard which will be surrounded by a drainage channel to capture any run-off. A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad. A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.
Operational	Management	Surface and ground Water Protection	Fuel oil for the emergency boilers is the only required bulk chemical storage required on site. Each data storage facility building service yard will have bunded storage tanks for fuel oil including double lined overground delivery pipeline to the belly tanks for diesel fired standby generators within the data storage facility. All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25 % of the total volume of the substance stored and will be designed in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004).
Operational	Management	Surface and ground Water Protection	The development (including energy centre) will require licencing through the EPA based on the energy centre thermal input. As such the development including the energy centre will operate under the strict guidance required for licenced facilities which includes regular checking of containment measure.
Biodiversity			
Construction and Operation	Protection	Ecological Protection (Biodiversity))	Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March 1st to August 31st.
Construction and Operation	Protection	Ecological Protection (Badgers)	A badger sett outside of the redline boundary was identified in the baseline assessment. To negate any impact :1) Creating a buffer / boundary to protect the sett 30 metres from the sett entrances prior to the commencement of construction 2) No illumination of the badger sett as this would inhibit activity for a longer period at night.

Construction and Operation	Protection	Ecological Protection (Bats)	Three species of bat were noted within the site during a site survey undertaken in July 2019. To negate any impacts on these populations: 1) Examination of all mature trees for the presence of bats prior to felling or other surgery. This must be carried out by a bat specialist with appropriate experience of such assessments. If bats are discovered, it will be necessary to acquire a licence to derogate from the Department of Culture, Heritage and the Gaeltacht through the National Parks and Wildlife Service. All work to exclude bats must be done according to the conditions of the licence and by a licensed bat specialist. It is an offence to disturb or destroy a bat roost without written approval and under the guidance of a specialist. 2) Provision of bat boxes and planting around the attenuation ponds 3) consideration of lighting of mature trees or the attenuation ponds 4) Nine bat boxes shall be attached to the mature trees within the lands that will be retained. The boxes proposed are 9 x 2F Schwegler woodcrete bat boxes. These must be erected no less than 3 metres from the ground in an uncluttered area, away from lighting and not directly over a busy road. One box should face south and the remainder may be in any direction. The boxes must be in place prior to the removal of the mature trees within the footprint. There shall be planting around the attenuation ponds to provide feeding areas for bats, Alder and willow would be ideal for shelter and to deal with wet conditions when water is high within the ponds. All lighting shall be motion activated and LED based. Lighting should not be exceed 2700 Kelvin to reduce the blue light component and should exclude UV elements when manufactured.
Air, Dust and Climatic Factors			
Construction	Management	Dust Management	At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance. As the prevailing wind is predominantly south-westerly, locating construction compounds and storage piles downwind (to the north-east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.
Construction	Prevention	Dust Management	When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favorable in general for the suppression of dust for a significant period of the year. The following measures should be taken in order to avoid dust nuisance occurring under unfavorable meteorological conditions: • The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised; • During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions; • The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board will also include head/regional office contact details; • It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses; • A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out; • It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein; and, • At all times, the procedures put in place will be strictly monitored and assessed.
Construction	Management	Dust Management	The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed, and satisfactory procedures implemented to rectify the problem.
Construction	Prevention	Dust Management	Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is

			to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002). • A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads; • Access gates to the site shall be located at least 10m from sensitive receptors where possible; • Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and, • Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.
Construction	Prevention	Dust Management	Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust. • During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and, • During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.
Construction	Prevention	Dust Management	The location and moisture content of storage piles are important factors which determine their potential for dust emissions. • Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors; • Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002); • Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.
Construction	Prevention	Dust Management	Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures: • Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust; • At the main site traffic exits, a wheel wash facility shall be installed if feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.
Construction	Management	Dust Management	The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be: • The specification of a site policy on dust and the identification of the site management responsibilities for dust issues; • The development of a documented system for managing site practices with regard to dust control; • The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; • The specification of effective measures to deal with any complaints received.
Operational	Management and Prevention	Emissions	The stack heights of the gas engines and standby diesel generators for the proposed development have been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the emissions and achieve compliance with the EU ambient air quality standards at all off-site locations (including background concentrations). Selective catalytic reduction (SCR) abatement technology will be fitted to each gas engine to minimise NO2 emissions. No additional mitigation measures are proposed for the operational phase of the development.

Noise and Vibration			
Construction	Management	Noise Pollution	Management of noise and vibration on site will be minimised and managed through the implementation of the following measures: - Limit the hours during which the site activities likely to create high levels of noise or vibration are permitted; - Establish channels of communication between the contractor/developer, Local Authority and residents. Appoint a site representative responsible for matters relating to noise and vibration; - Monitoring typical levels of noise and vibration during critical periods and at sensitive locations, and; - All site access roads will be kept even so as to mitigate the potential for vibration from lorries.
Construction	Management	Noise Pollution	It is envisaged that a variety of practicable noise control measures will be employed. These may include: - selection of plant with low inherent for generation of noise and/or vibration - erection of barriers as necessary around items such as generators or high duty compressors; - situate any noisy plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.
Construction	Management	Noise Pollution	Vibration from construction activities be limited to the values set out in Chapter 9 Noise and Vibration of the EIAR. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitude of vibration slightly greater than those in the EIAR are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.
Operational	Management	Noise Pollution	Noise from external plant will be minimised by the following measures: • Purchasing low noise generating equipment, and; • Incorporating appropriately specified in line attenuators for stacks and exhausts where necessary. With due consideration as part of the detailed design process, this approach will result in the site operating well within the constraints of the best practice guidance noise limits that have been adopted as part of this detailed assessment.
Landscape and Visual Assessment			
Construction	Management	Landscape Protection	The principal mitigation measures during construction are in ensuring a managed and orderly construction site, appropriate storage of materials, and ensuring debris is not carried onto the public roads by construction vehicles. Where the site adjoins the public road, site hoarding will be established and maintained in an orderly manner so as to minimise the effect of the construction site on along the public road.
Operational	Management	Landscape Protection	Landscape and visual mitigation measures are inherent in the architectural and landscape design of the proposed development. Mitigation therefore focusses on the successful and complete implementation of the architectural and landscape designs as proposed.
Construction	Management	Landscape Protection	Trees and vegetation outside of the site shall be protected in accordance with BS:5837:2012 during construction works.
Archaeological, Architectural and Cultural Heritage			
Construction	Protection	Protection of Local Heritage	Prior to the commencement of construction works (including enabling works), the following will be required: - A suitably qualified archaeological consultant will be required to oversee the works and undertake the required archaeological testing, excavations, monitoring and reporting. - Archaeological testing (under license to the National Monuments Service) should be undertaken of the anomalies identified by the geophysical survey. Given the nature and extent of features uncovered, limited test excavation of areas where no features were positively identified should also be undertaken, to alleviate the risk of them being uncovered during the construction phase(s).

			- Any archaeological features identified by testing in areas where they will be impacted on, directly or indirectly, by the development, will require permission from National Monuments for archaeological excavation (preservation by record) of these remains. - Financial, logistical and time provision should be made for archaeological excavation, if required, prior to the commencement of the construction phase of the development.
Traffic and Transportation			
Construction	Prevention	Traffic Congestion	During the construction phase of the development, the following measures will be put in place to reduce the impact on the surrounding environment: 1. The contractor will be required to provide wheel cleaning facilities, and regular cleaning of the sites construction and main access road will be carried out. 2. Temporary car parking facilities for the construction workforce will be provided within the site and the surface of the car park will be prepared and finished to a standard sufficient to avoid mud spillage onto adjoining roads. 3. Monitoring and control of construction traffic will be ongoing during construction works. Construction traffic will be managed to avoid unnecessary trips during peak hours.
Operational	Prevention	Traffic Congestion	T-junction of Bracetown Business Park Access Road, R147 (south), R157, and R147 (north) With the current junction geometry, layout and priority control, the T-junction of Bracetown Business Park Access Road, R147 (south), R157, and R147 (north) will operate with an RFC value approaching or slightly exceeding 1 in the Future and Horizon years with or without the development. Modelling has deduced that, if signalised, this junction would operate at satisfactory levels of capacity for all other case scenarios modelled in Section 13.5.2 of Chapter 13 of the EIAR. Considering the capacity results relating to this junction with the current priority arrangement (tabulated in section 13.5.2 of Chapter 13 of the EIAR), MCC may wish to consider the signalisation of this junction prior to the future and horizon years, in order to maintain its functionality into the future.
Material Assets: Water Supply, Drainage & Utilities			
Construction	Management	Continuation of Services	Ongoing consultation with MCC, Irish Water, EirGrid, ESB Networks, Gas Networks Ireland and other relevant service providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth construction schedule without disruption to local and business community.
Construction	Management	Surface Water Infrastructure	During the construction phase, any surface water run-off collecting in excavations or from exposed soil will likely contain a high sediment load. This will be diverted to settlement ponds and will not be allowed to enter surface water infrastructure as installed during the course of the development. A suitable area will be allocated for temporary stockpiling of excavated materials pending removal for reuse which will be located away from any surface water courses or other sensitive receptors. Aggregate materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination. Liquid materials will be stored within temporary bunded areas, doubled skinned tanks or bunded containers
Construction	Management	Surface Water Infrastructure	Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.
Construction	Management	Foul Sewer Infrastructure	Portable toilets will be provided for construction staff until connection with the public sewer is completed.
Construction	Management	Surface Water & Foul Sewer Infrastructure	Strict quality control measures will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.
Operational	Management	Foul Sewer Infrastructure	Foul drainage for the proposed development will be in accordance with the Building Regulations Technical Guidance Document H for design and construction.

Waste Management			
Construction	Management	Environmental Pollution	A project specific C&D WMP has been prepared in line with the requirements of the guidance document issued by the Department of Environment Heritage and Local Government (DoEHLG). Adherence to the high-level strategy presented in this C&D WMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the construction phase of the Proposed Development. Prior to commencement of construction, the contractor(s) will be required to refine/update this document to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream.
Construction	Management	Environmental Pollution	The main contractor will endeavour to ensure that surplus material is reused on site. It is not anticipated that there will be surplus material that will require removal from site. In the unlikely event that there is surplus material that is not required for reuse onsite, it will be reused or recovered off-site insofar as is reasonably practicable. Where there is no suitable reuse or recovery option available, it will be disposed of at an authorised facility.
Construction	Management	Environmental Pollution	Building materials will be chosen with an aim to 'design out waste'
Construction	Management	Environmental Pollution	On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated: o Concrete rubble (including ceramics, tiles and bricks); o Plasterboard; o Metals; o Glass; and o Timber.
Construction	Management	Environmental Pollution	Left over materials (e.g. timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible
Construction	Management	Environmental Pollution	All waste materials will be temporarily stored in skips or other suitable receptacles in designated areas of the site
Construction	Management	Environmental Pollution	Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required)
Construction	Management	Environmental Pollution	A person responsible for waste management will be appointed by the main contractor(s) to ensure effective management of waste during the excavation and construction works
Construction	Management	Environmental Pollution	All construction staff will be provided with training regarding the waste management procedures
Construction	Management	Environmental Pollution	All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal
Construction	Management	Environmental Pollution	All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities
Operational	Management	Environmental Pollution	All waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas of the site.
Operational	Management	Environmental Pollution	On-site segregation of all waste materials into appropriate categories including (but not limited to): • Dry Mixed Recyclables; • Organic food/green waste; • Mixed Non-Recyclable Waste; • Batteries (non-hazardous and hazardous); • Waste electrical and electronic equipment (WEEE) including computers, printers and other ICT equipment; and • Cleaning chemicals (solvents, pesticides, paints, adhesives, resins, detergents, etc.).

Operational	Management	Environmental Pollution	All waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly labelled with the approved waste type to ensure there is no cross contamination of waste materials
Operational	Management	Environmental Pollution	All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available
Operational	Management	Environmental Pollution	All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities
Operational	Management	Environmental Pollution	All waste leaving the site will be recorded and copies of relevant documentation maintained

2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION

The applicant, EngineNode Ltd ("EngineNode") is applying to Meath County Council (MCC) for four data storage facilities, an energy centre, and associated ancillary development on a greenfield site in the townland of Bracetown and Gunnocks, Co Meath. The land is zoned E2 *General Industry and Employment / E3 Warehousing and Distribution* in the Meath CDP.

The project description is presented as required by the relevant planning legislation, 2011 EIA Directive (2011/92/EU), as amended by the 2014 EIA Directive (2014/52/EU) (herein referred to as the EIA Directive) and the current Draft EPA "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports"* (2017) (herein referred to the as the EPA Draft EIA Report Guidelines 2017) and the EPA Draft "*Advice Notes for Preparing Environmental Impact Statements"* (2015) (herein referred to as the EPA Draft Advice Notes for EIS 2015).

This chapter summarises the proposed development (construction, operation and decommissioning).

The planning package includes complete elevations and floor plans site, layout plans including utilities and building drawings. Further details of the design are included in the Engineering Report.

2.2 CURRENT SITE

The proposed data storage facilities and energy centre covers an area of 24.5 hectares and is located along the R147 in the townlands of Bracetown and Gunnocks, to the north of Clonee, Co Meath.

Figure 2.1 below presents the lands subject to this planning application (red line boundary) within the Masterplan area (blue dashed line). The proposed development land is currently agricultural land but is zoned as suitable for commercial/industrial development (E2/E3).

Bracetown Business Park is located to the north-east of the proposed development with further warehouse development (The Hub Logistics Park) currently being constructed to the north and north west of the site. Planning for data storage facilities (Runways - Planning Ref. RA/180671)) has been obtained for lands to the west and south of the site and construction has commenced. The R147 and two detached private residential properties and agricultural shed also form part of the western boundary.

Figure 2.1 also shows the location of a proposed substation compound (grey and outlined in blue) which together with a subsurface grid connection will form part of a separate application to Meath County Council or An Bord Pleanála (ABP). EngineNode is undertaking a pre- application determination process under Section 182E of the Planning and Development Act 2000 (as amended) as to whether or not this development would fall under the meaning of the Strategic Infrastructure Development (SID) and to confirm the planning process that would apply for this

future application (under Section 182A of the Planning and Development Act 2000 (as amended)).

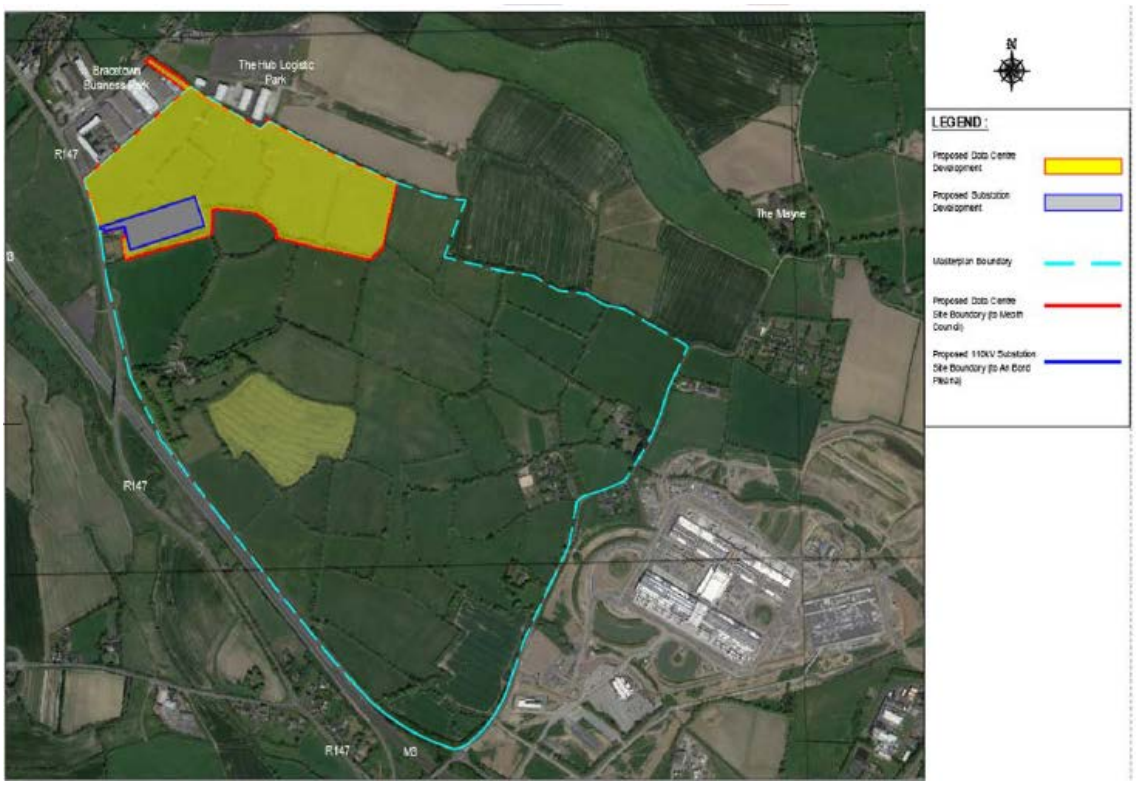


Figure 2.1 Proposed Development Lands (Red boundary)

The site gradient varies between 71.75 metres OD at its highest and 67 metres OD at its lowest. The gradient is 1 in 175 west to east and 1 in 135, north to south. Infilling will be required to provide suitable foundation level for the proposed development. The land is drained by a series of agricultural ditches which ultimately discharge to the Pinkeen river (part of the Tolka catchment)

2.3 PROPOSED DEVELOPMENT

Figure 2.2 presents the site layout for the proposed development. The application is for a ten-year permission for a data storage campus. The proposed development comprises four data storage facilities and associated infrastructure. The site perimeter will consist of berming and landscaping incorporating local species and required security infrastructure (Chapter 11 Landscape).

A 10-year permission is sought due to the nature of this specific development and to match market demand over that period. The proposed development will respond to current and future use demands in the area. The logistics of the site and use of the buildings mean that their delivery must be programmed on a phased basis over the duration of a 10-year planning permission. The site will host four data storage facilities with associated energy supply facilities and the commercial reality is that the overall orderly development of the site will take longer than 5 years.

The proposed development will see the delivery of a high-quality environment on the site, subject to a grant of planning permission, in compliance with the current Development Plan and Masterplan (Revision One) for the local area.

Each data storage facility will require up to a maximum of 36 MW IT load (45 MW Total Load).

The data halls equipment, including servers and the air handling plant require energy to maintain server availability and the necessary environmental conditions. It is envisaged that this energy will be provided by electrical power from the grid, or onsite gas-powered engines located in the energy centre, or a combination of both. The Applicant intends to construct the energy centre for reasons of commercial need in order to respond flexibly to the evolving energy market and to ensure the capacity to have future security of supply and also to respond to any future grid capacity constraints.

Each data storage facility will also have diesel powered back-up generators, as a contingency power measure in the event of a loss of electrical power/gas supply loss. These diesel generators will be located in an external plant compound at each data storage facility.

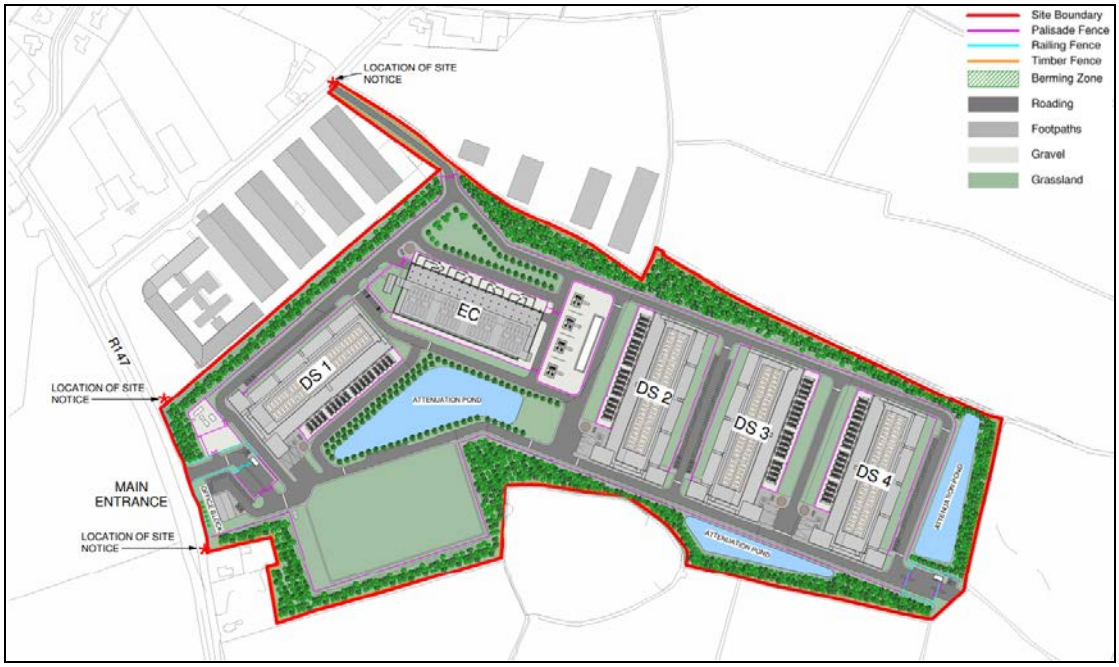


Figure 2.2 Site Layout for the Proposed Development

The proposed development site is intended to be constructed on a phased basis over 8 years with approximately 2 years for final landscaping. The anticipated phased development is set indicatively in Figure 2.2 and Table 2.1 below.

Table 2.1 Phasing of the Proposed Development

Phase	Building Name	Construction Start	Duration (months)	Construction End
1	DS1/EC/ Substation	1st Quarter 2021	26	3rd Quarter 2023
2	DS2	4th Quarter 2022	26	2nd Quarter 2025
3	DS3	4th Quarter 2024	26	2nd Quarter 2027
4	DS4	4th Quarter 2026	26	2nd Quarter 2029



Figure 2.3 Intended Construction Phasing

The facility will consist of the following primary aspects;

2.3.1 Data Storage Facilities

A data storage facility is a centralised hub for the secure storage, management and distribution of information to individual businesses and organisations. With the levels of online activity increasing rapidly this facility will enable EngineNode to meet its clients growing demands. The proposed data storage facilities offer clients the latest in power, and connectivity with hardened security to control access to client information.

Each data storage facility, when completed, will allow EngineNode's clients store their information at a secure and reliable facility off their premises more efficiently than traditional forms of in-house data storage systems. Data storage facilities are typically constructed on a relatively large scale which results in significant benefits in terms of economies of scale and energy efficiency.

Data storage facilities have;

- high levels of reliability with built in redundancy systems;
- 24/7 monitoring of the facility and its systems by staff;
- lower network latency and higher bandwidth at lower cost;
- specialist network and facilities engineers typically not viably employed by individuals, businesses or organisations, and;
- high levels of energy efficiency.

The data halls will be air cooled by air handling units with facility for evaporative or free air cooling during unusual high temperature periods (temperatures typically greater than 25 degrees Celsius). Roof chillers are included in the design for potential alternative cooling methodology if required by an individual data storage user. In this design the chillers will be roof mounted and chilled water supplied through a closed loop system to the air handling units. The closed system minimises water usage and wastewater generation.

As evidenced by the numerous other data storage facilities recently developed in Ireland, our temperate climate is ideally suited to data storage facilities. The naturally cool ambient temperature means the data halls require less cooling than if the facility were located in regions of the world subject to greater temperature and humidity variation.

A summary of the data storage facility is as follows:

- 4 no data storage facilities, each with a footprint of 10,377 m^2. Each building is intended to have ancillary rooms to serve the data halls, office and welfare facilities and a loading bay/service yard.

- Each data storage facility is intended to have backup generators (18 per building) situated along one elevation of the building. These will provide the necessary power to ensure the data halls operate optimally even in the event of a failure of supply from the energy centre. The diesel generators will have associated 21.5 m high flues to meet air quality standards. Each diesel generator will have a double lined belly tank. An overground fuel line will extend from the bunded fuel storage within the service yard provided for each building.

- Each data storage facility will have its own external service yard with fully bunded oil tanks facility, sprinkler tanks and humidifier water tanks. Storm drainage from the loading area at each service yard will discharge through an oil interceptor.

2.3.2 Energy Centre

The data halls equipment, including servers and the air handling plant which require power to maintain server availability and the necessary environmental conditions. As stated above, it is envisaged that this energy will be provided by electrical power from the grid, or onsite gas-powered engines located in the energy centre, or a combination of both.

The energy centre will primarily comprise 16 no. lean-burn gas engines which are the most efficient form of internal combustion engines. A summary of the design is as follows:

- The energy centre (footprint of 8,834m^2) comprises a single-storey cladded building which will be 20.5m high. It will contain 16 no. approx. 10 MW natural gas fired generators, 14 duty with 2 for standby and maintenance;
- The energy centre will be fully self-sufficient in terms of its power and cooling requirements. Cooling is provided through roof mounted blast coolers which will be behind a plant screen. The energy centre is to be connected to the national gas network via an AGI installation to be located in the western corner of the site;
- 16 no. associated 40m high individual flues located inside 4 no. stacks are required to meet air quality requirements. Air modelling has been undertaken to confirm the flue discharge will meet air quality standards with SCR abatement (Chapter 9 Air & Climate);
- 1 no. 1 MW standby diesel generator located inside the building with a 21.5m high generator stack complete with an indoor bunded diesel storage tank

- Acoustic modelling has been undertaken to ensure compliance with noise guidelines. Mitigation is incorporated in the building structure (Chapter 10, Noise);
- The energy centre will have associated transformers located in bunded areas, and;
- An ancillary building will house offices and welfare facilities and associated parking.

2.3.3 Storage of Chemicals

Fuel oil for the emergency boilers is the only required bulk chemical required on site. Each data storage facility service yard will have two bunded intermediate storage tanks for fuel oil (520m^3 per data storage facility) distribution pumps, overground delivery pipeline to the belly tanks for diesel fired standby generators within each data storage facility. All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25% of the total volume of the substance stored and will designed in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004). Fuel oil will be delivered to the site by HGV road tankers, with an average of three tankers expected to be travelling to and from the site per month. A dedicated tanker unloading area will be provided at each service yard which will be surrounded by a drainage channel to capture any run-off. A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad. A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.

The energy centre will have internal storage and appropriate bunding for gas oil, lube oil, and finished (waste) oil (2 no. 20m^3 tanks), and a sprinkler tank (250 m^3) and pump house.

2.3.4 Office Building and Car Parking

EngineNode will have an office block with a footprint of 326m^2 which will be adjacent to the site entrance on the R147. The building comprises the following main components:

- Reception Area;
- General Office Areas for staff and management;
- Offices space for clients and project teams;
- Canteen;
- Welfare Facilities, and;
- Conference Rooms/Meeting Rooms.

2.3.5 Off Site Traffic Movements

There will be a small increase in traffic owing to staff movements to and from the proposed development once operational. The operational access will be from the R147 on western boundary of the site (subject to the proposed new distributor road for the lands south and east of the site being completed).

The wider area has excellent links to the national primary routes. Further details in relation to the potential impact of the proposed development (construction and operation) in terms of traffic are presented in Chapter 13 Traffic and Transportation.

2.3.6 Waste Management

Chapter 14 contains a description of waste management relating to the proposed development. A detailed Operational Waste Management plan will be prepared in advance of the commencement of the activity at the site to ensure best practice is followed in the management of waste from the proposed development.

The engineering report shows a total net infill of soil of 105,000m^3.

2.4 DESCRIPTION OF PROCESS INPUTS AND OUTPUTS

The primary inputs to the proposed development are power (provided by electricity from the grid through the proposed substation), gas (for the generators in the energy centre), water (mains) and diesel fuel (for the on-site emergency generators as required). The main outputs are warm air, stormwater, wastewater and emissions from the gas generator stacks and emergency diesel stacks when the generators are in operation.

2.4.1 Inputs

Power

The four data storage facilities will require up to 144 MW IT load. This requirement will be provided by power from the national grid, gas generators within the energy centre and with diesel generators as a contingency. An above ground (gas) installation (AGI) will be provided along the northwest boundary. Application for a required substation and associated subsurface grid lines to facilitate electrical supply will form part of a separate application.

Emergency Back Up Fuel

In the event of a loss of power supply, the emergency generators are designed to automatically activate and provide power to the data storage facility. The generators will be supplied by low sulphur diesel. A total of c. 520m³ of fuel oil per data storage facility is anticipated to be stored externally at each data storage facility for emergency use. The total fuel store will be 2,080m³. This is below the tonnage required to be registered as a lower tier Seveso site subject to consultation with the HSA.

2.4.2 Outputs

Air

One of the primary outputs from the facility will be excess warm air which will be removed continually by motorised fans in the AHU system. All fans will have variable speed controls on fan motors.

Stormwater & Wastewater

Stormwater currently discharges through a series of land drains to the Pinkeen River. Post development, it is proposed to drain the site using a network of SuDs swales along the edge of the internal road network where possible. Reinforced grass-crete or similar will also be used along parts of the road network to increase infiltration on less heavily trafficked access roads. These drains and swales will discharge to 3 no. surface water retention pond/attenuation pond where the discharge will be controlled using a vortex flow control to limit the maximum discharge for the 1% Annual Exceedance Pollution event (1:100-year return period. The attenuation ponds to be constructed to retain a constant volume of water to promote settling and reduce

conveyance of suspended solids and other particles to the receiving waters. An attenuation volume of 6957 m³ is designed as part of the proposed development. Further details are provided in Chapter 7 of the EIAR and within the CSEA engineering report prepared for planning.

There is no trade effluent proposed for this development. Foul sewage will be collected from site (data storage facility, offices and energy centre washroom facilities and canteen) and discharged through a new pumping station which will be constructed as part of this proposed development, to the foul drainage network which runs along the R147 and ultimately discharges to Ringsend WWTP.

A 450 diameter mains runs along the R147 and has capacity to supply adequate water for the proposed development. Total annual water usage for the proposed development is 36,105m^3. Peak daily usage will be 97.21l/s and average demand 16.5l/s.

Consultation with Irish Water have confirmed that sufficient water and wastewater capacity is available.

Emissions from Engine and Boiler Stacks

Exhaust gases from the gas engines in the energy centre are discharged to the atmosphere via 4 no. 40m high stacks (with 4 individual flues in each stack).

As outlined above it is anticipated that the back-up generators will rarely be used however, they will be maintained for emergency readiness by being tested once a week individually i.e. each generator will be turned on four times per month for one hour to maintain operational readiness when required waste exhaust gases will be vented to air via the 21.5m stacks along the eastern edge of the building.

An assessment of the impact of these emissions is presented in Chapter 9 Air Quality and Climate.

Wastes

Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. Waste which is not suitable for recycling is typically sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which is typically exported for conversion into recycled products (e.g. paper mills and glass recycling). A more detailed description is provided in Chapter 15 Waste.

2.5 EXISTENCE OF THE PROJECT

Under the current Draft EPA Guidelines on the information to be contained in EIA Reports, the description of the existence of the project is required to define all aspects of the proposed lifecycle of the facility under the following headings:

- Construction;
- Commissioning;
- Operation;
- Decommissioning; and
- Description of Other Developments.

The following sections present a description of each of these aspects.

2.5.1 Description of Construction

The construction of the facility will comprise three main stages, namely;

- Initial site preparation works;
- Building construction, and
- Commissioning.

A brief description of the construction works proposed is set out below.

The total peak construction population on site will be c. 500 staff phased over a period of up to c. 8 years and up to circa 245 high quality jobs during operation. Site staff will include management, engineers, construction crews, supervisors and significant maintenance contractor employment.

Further details are including in Chapter 13 Traffic & Transportation.

2.5.1.1 Working Hours

It is anticipated that the construction of the facility will be completed during normal construction hours i.e. 8am to 6pm Monday to Friday. However, it is possible that the contractor may wish to carry out certain operations outside these hours i.e. Half days on Saturday or evening hours during long summer days etc. Such occurrences will be kept to a minimum and take place over a short timeframe and as such are unlikely to cause excessive disturbance.

2.5.1.2 Site Preparation

The primary activities required during site preparation will be establishment of the contractors' compound and cutting and filling of various parts of the site to provide the necessary base level for construction. It is estimated that this will take approximately 6 months.

It is proposed to locate the construction compound for Phase 1 in Phase 2 area, compound for Phase 2 in Phase 3 area, compound for Phase 3 in Phase 4 area and compound for Phase 4 within Phase 4 area (to be confirmed by the site contractor). The compound will provide office, portable sanitary facilities, equipment storage, parking etc for contractors for the duration of the works. The construction compound will be fenced off for health and safety reasons so that access is restricted to authorised personnel only.

Other works required will include surveying and setting out for structures, rerouting of services, vegetation removal, archaeological recording works and setting up of the construction site with fencing, site compounds etc.

In advance of site preparation, a strategy will be developed in order to efficiently move spoil generated from cutting excavations and soil import to locations where landscaping is required around the facility. A combination of bulldozer, excavators, trucks and other soil shifting plant will complete the cutting and filling aspect. It is not envisaged that rock breaking will be required.

The expected construction phasing is shown in Figure 2.3 above.

2.5.1.3 Noise, Vibration and Dust Nuisance Prevention

With regard to construction activities, reference will be made to BS5228: Noise control on construction and open sites, which offers detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures can be considered and applied during the construction of the proposed development, such as:

- limiting the hours during which site activities are likely to create high levels of noise are permitted, e.g. soil/rock excavations (if required);
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise, and;
- monitoring typical levels of noise during critical periods and at sensitive locations.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- selection of plant with low inherent potential for generation of noise;
- erection of barriers as necessary around items such as generators or high duty compressors, and;
- siting of noisy plant as far away from sensitive properties as permitted by site constraints.

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of dust produced will be deposited close to the generated source.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented.

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only.

- If required, any area/road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions.

- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. Indeed, on any un-surfaced site road, this will be 15-20 kph, and on hard surfaced roads as site management dictates.

- In dry conditions vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.

- Wheel washing facilities will be provided for vehicles exiting the site in order to ensure that mud and other wastes are not tracked onto public roads.

- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.

- If required, topsoil mounds will be seeded with grass to prevent dust blow off.

- At all times, these procedures will be strictly monitored and assessed. In the event of dust emissions occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

2.5.1.4 Water Discharges

Welfare facilities will be provided for the contractors on site during the construction works. These facilities may be connected to the existing foul drainage system on site or portable sanitary facilities will be provided with waste collected and disposed of appropriately.

Any surface water run-off collecting in excavations will likely contain a high sediment load. This will be diverted to settlement ponds and will not be allowed to directly discharge directly to existing field drains or open water courses.

2.5.1.5 Material Sourcing, Transportation and Storage

Materials
Key materials will include steel, concrete, glass, composite cladding, piping, electrical cabling, process equipment and architectural finishes. A 'Just In Time' delivery system will operate to minimise storage of materials on site.

Sourcing
Where possible it is proposed to source general construction materials from the local Dublin area to minimise transportation distances. Specialised data storage facility and energy centre equipment will likely be imported.

Storage
Aggregate materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination. Liquid materials will be stored within temporary bunded areas, doubled skinned tanks or bunded containers (all bunds will conform to standard bunding specifications - BS8007-1987) to prevent spillage.

Transportation
Construction materials will be brought to site by road. Construction materials will be transported in clean vehicles. Lorries/trucks will be properly enclosed or covered during transportation of friable construction materials and spoil to prevent the escape material along the public roadway.

2.5.1.6 Building Construction Works

Once site preparation is completed, building construction and commissioning for Construction and commissioning of each data storage facility will take up to 24 months with each building being developed based on client requirements over an estimated 8-year period.

Foundations and Structure
Following the completion of site preparation, all structures will require shallow spread foundations. The proposed depth of the excavations is anticipated to be 2-5m. Building structures will comprise structural steel frames with concrete floors on metal decks.

Cut and Fill
An estimate of the cut and fill requirement are as follows:

Table 2.2 Cut and Fill

	Volume (m^3)
Cut (incl. Utility Trenches)	50,000
Fill	155,000
Total Estimate (Net Fill)	**105,000**

Much of the excavated material will be reused for landscaping works. Infill materials for construction will comprise clean inert fill.

Contractors will be required to submit and adhere to a method statement indicating the extent of the areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works.

Where stripping occurs, the resulting excavated fractions will be separated into subsoil and topsoil stockpiles. Temporary storage of spoil will be managed to prevent accidental release of dust and uncontrolled surface water run-off which may contain sediment etc.

Waste Management during Construction
Chapter 15 contains a detailed description of waste management relating to construction of the proposed development. A detailed Construction and Demolition Waste Management Plan will be prepared prior to construction to ensure best practice is followed in the management of waste from the proposed development.

Power Supply
Power supply for the purposes of construction will be provided by a temporary grid feed of 10-15 MVA.

Roads, Services and Landscaping
The internal road system will initially be composed of hard cored material, rolled and compacted sufficiently to support initial construction including civil/structural sub grade works.

The site landscaping strategy is to retain all existing perimeter vegetation, other than the R147 frontage and part of the eastern boundary where an access site entrance will be established. Existing tree and hedgerow boundary vegetation will be augmented by additional native tree planting to establish wider and stronger vegetation screening. Landscape berms, with extensive mixed native woodland tree planting and ground cover planting, will be established along the boundaries facing the Bracetown Business Park and The Hub Logistic Park, and will also extend onto the northern part of the R147 frontage.

An early phase of landscape planting will be undertaken following the initial cut and filling works to include planting of trees in selected sensitive areas. Early growth and development in these areas will promote a good screening of construction works into operational phase.

2.5.1.7 Construction Impacts and Mitigation Measures

Each of the following EIAR chapters (Chapters 3 to 15) include an assessment of the potential impact of construction works on their individual environmental aspect and set out the relevant mitigation measures relating to that aspects.

A Construction Environmental Management Plan (CEMP) will be in place to ensure mitigation outlined in the EIA report are required to be implemented by the contractor during construction works. The CEMP will also include emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction.

The primary impacts from construction which require mitigation are;

- Management of run-off water in terms of silt;
- Effects on the road network (due to construction workers and other staff attending site during preparation, construction and commissioning phases;
- Impacts on the flora and fauna of the site i.e. changes to site for construction resulting in loss of habitat, and;
- Impacts on human beings in terms of nuisances relating to the air quality of the environs due to dust and other particulate matter generated from excavation works and impacts on the noise environment due to plant and equipment involved in construction.

Mitigation measures to address potential impacts and to be included in the CEMP are presented in each individual EIAR chapter.

2.5.2 Description of Commissioning

Once the physical structures are in place, specialist contractors will be mobilised to complete the commissioning of the data storage facility and energy centre. Commissioning is expected to take approximately 4 weeks per 4MW of IT Infrastructure. As the construction phase will be complete prior to commissioning, site construction staff will be demobilised.

2.5.3 Operation of the Project

The majority of this detail is provided in sections 2.3 to 2.5 above.

Once operational, each data storage facility will “go live” and serve data customers on an ongoing basis. The server systems and the supporting infrastructure will be monitored by site staff and faults identified and remedied as required. Staff are primarily required onsite for security, ongoing monitoring and maintenance of electrical equipment.

It is proposed that up to 245 staff will be onsite during the day when fully operational. During the night shift a reduced number of staff will be required, with c.2 in the energy centre and circa 11 in each data storage facility. It is proposed to provide 245 car parking spaces on site. Included within this will be 14 no. spaces provided for disabled parking and 14 no. e-charging spaces (with cabling for a further 7 spaces) and 79 bicycle places.

It is anticipated that the facility will operate on 2 no. 12 hour shift basis (7am to 7pm, 7pm to 7am). Working hours are expected to be 24 hours a day, 7 days a week.

2.5.4 Decommissioning of the Project

It is intended that the proposed development will have a long lifespan. Regular maintenance and upgrading of the facility over time will enable it to continue to meet future demands.

Upon closure it is anticipated that the facility will be suitable for re-use or sold to a third party as would any other industrial site. All plant and equipment would simply be decommissioned, removed and recycled/disposed as appropriate. The costs associated with the closure of the facility will be met by EngineNode.

2.6 REGULATORY CONTROL

In advance of the preparation of this application, the project team have reviewed EPA licence requirements and the energy centre will require an EPA Industrial Emissions (IE) licence as the thermal input is greater than 50MW.

As the facility is over 20 MW, a greenhouse gas emission permit (for the generators) will also be sought from the EPA as appropriate.

2.7 SUSTAINABILITY ENERGY EFFICIENCY & RESOURCE USE

EngineNode is committed to running its business in the most environmentally friendly way possible. The proposed development has been designed to take into account these policies with energy efficiency central to the decision-making process, minimising power and water consumption.

2.7.1 Resource Use

Having the options in the future of either energy supply from the grid or the on-site gas-powered energy centre allows flexibility in sourcing either accredited biogas from Gas Networks Ireland or renewable energy sources from the electrical grid.

The 200kW heating load for the administration building will be provided utilising heat recovery from the datacentre.

2.7.2 Energy Efficiency Benefits of Data storage facilities

A typical data storage facility achieves approximately 65% server utilisation rates versus 15% at on-premises servers. This typically means companies moving their data storage to the cloud require less than a quarter of the server and data storage infrastructure they would need if provided on-premises, with the associated benefit of reduced energy consumption overall.

A typical on-premises data storage facility is 29% less efficient in their use of power compared to a typical large-scale data storage facility that uses world-class facility designs, cooling systems, and workload-optimized equipment.

Adding these together (fewer servers and related infrastructure used, plus better power efficiency), cloud customers need 16% of the power required by those on-

premises infrastructure. This represents an 84% reduction in the amount of power required.

2.8 HEALTH AND SAFETY & SEVESO

2.8.1 Design and Construction Health and Safety

The facility has been designed in accordance with the Safety Health and Welfare at Act 2005 and the Health and Safety and Welfare at Work (General Application) Regulations SI 299 of 2007 and associated regulations.

The plant has been designed by skilled personnel in accordance with internationally recognised standards, design codes, legislation, good practice and experience.

2.8.2 General Operational Health and Safety

Prior to start up a comprehensive set of operational health and safety procedures will be established (based on those used at other similar facilities). This will ensure a smooth roll out of operations at the facility.

The facility will not be a Seveso/COMAH facility. The only substance stored on site controlled under Seveso/COMAH will be diesel for generators and the amounts proposed do not exceed the relevant thresholds of the Seveso directive.

An Emergency Response Plan will be developed and implemented at the energy centre in consultation with local emergency services.

2.9 MAJOR ACCIDENTS/DISASTERS

The 2014 EIA Directive and associated Draft EPA EIA Guidelines requires that the vulnerability of the project to major accidents, and/or natural disasters (such as earthquakes, landslides, flooding, sea level rise etc.) is considered in the EIA Report. The site has been assessed in relation to the following external natural disasters; landslides, seismic activity and volcanic activity and sea level rise/flooding as outlined below. The potential for major accidents to occur at the facility has also been considered with reference to Seveso/COMAH.

Landslides, Seismic Activity and Volcanic Activity
There is a negligible risk of landslides occurring at the site and in the immediate vicinity due to the topography and soil profile of the site and surrounding areas. There is no history of seismic activity in the vicinity of the site. There are no active volcanoes in Ireland so there is no risk of volcanic activity. Further detail is provided in Chapter 6 Land, Soils, Geology & Hydrogeology.

Flooding/Sea Level Rise
The potential risk of flooding on the site was also assessed. A Stage 1 Flood Risk Assessment was carried out and it was concluded that the development is not at risk of flooding. Furthermore, it is not expected that the proposed development would adversely impact on flood risk for other neighbouring properties. Further detail is provided in Chapter 7 Hydrology and Appendix 7.1 Stage 1 Flood Risk Assessment.

Seveso/COMAH
As detailed in Section 2.6, the facility will not be a Seveso/COMAH facility. The only substance stored on site controlled under Seveso/COMAH will be diesel for generators and the amounts proposed do not exceed the relevant thresholds of the Seveso directive.

Minor Accidents/Leaks
There is a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction and operational phases. However, the implementation of the mitigation measures set out in Chapters 6 and 7 will ensure the risk of an accident is low and that the residual effect on the environment is imperceptible.

2.10 POTENTIAL IMPACTS OF THE DEVELOPMENT

The proposed data storage development is to be located on lands zoned for commercial development.

The development, when operational, will generate limited additional traffic, air, noise and water emissions, wastes generation from activities etc.

During construction, there is the potential for nuisance impacts from traffic, dust, and noise, if not carefully managed. EngineNode. will require contractors to undertake works in compliance with a Construction Environmental Management Plan (CEMP) to ensure each of these potential impacts are minimised. The CEMP will include mitigation measures included in this EIAR.

Each chapter of this EIA Report assesses the potential impact of the construction and operation of these developments on the receiving environment. Please refer to each specialist EIA Report chapter respectively

2.10.1 Residual Impacts

The residual impacts of the proposed development following the implementation of mitigation measures have been addressed in each of the chapters.

2.10.2 Do Nothing Scenario

Each of the chapters addresses the Do-Nothing scenario as required in the EPA 2017 guidelines. The Do-Nothing scenario is to retain the site as greenfield and also considers future development due to zoning.

2.11 RELATED DEVELOPMENT AND CUMULATIVE IMPACTS

The proposed development is for four data storage facilities and single storey energy centre on an existing industrial site. These will be built on a phased basis to meet customer demand. On completion of the proposed developments, the current site area will be fully built out. In each of the chapters, the impact of the entire planned development has been considered.

As part of the assessment of the impact of the proposed development, account has also been taken of developments that are currently permitted or under construction within the neighbouring industrial parks and surrounding areas. A list of the other

developments considered is provided in Chapter 3 Planning and Development Context. Also considered within the cumulative impact assessment is the future planned application for the substation (included within the redline for the proposed development) and associated subsurface grid options. Figure 2.4 below presents the location of the substation and two options proposed for the subsurface grid connection to either the 220kV line or the 110kV line. EngineNode is undertaking a pre-application determination process under Section 182E of the Planning and Development Act 2000 (as amended) as to whether or not this development would fall under the meaning of the Strategic Infrastructure Development (SID) and to confirm the planning process that would apply for this future application.

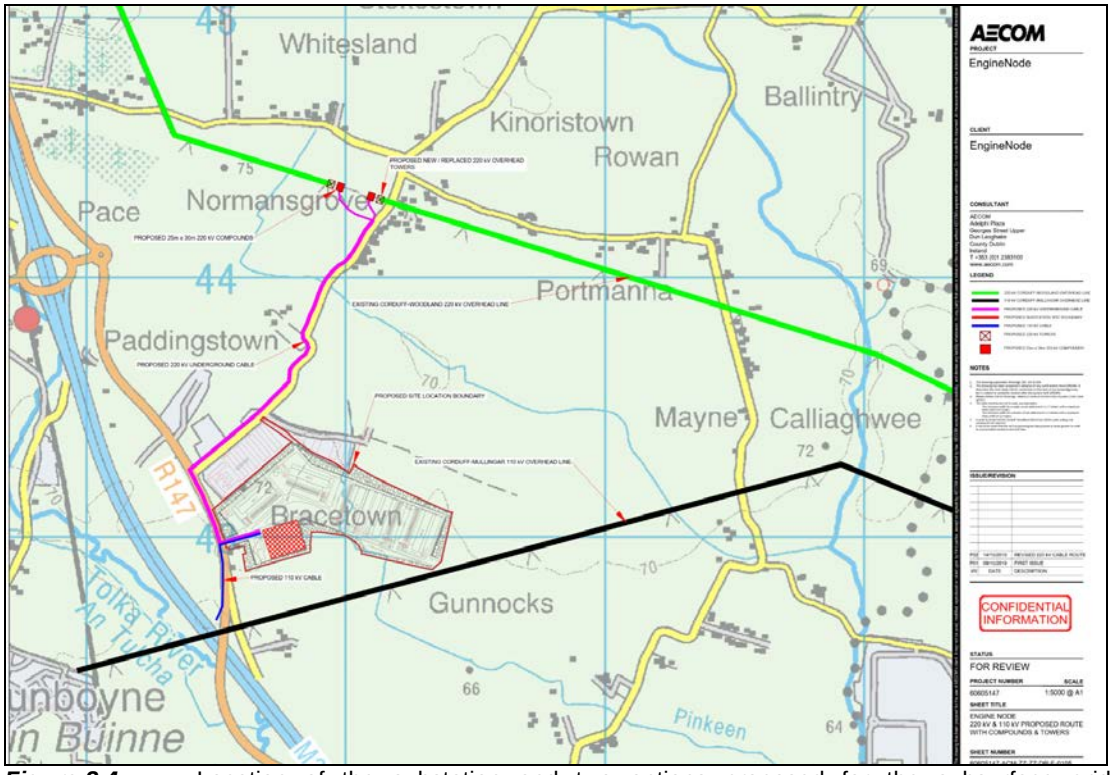


Figure 2.4 Location of the substation and two options proposed for the subsurface grid connection to either the 220-kV line (Pink line) or the 110 kV line (blue line).

Option 1 220 kV GIS Substation Development (Pink Line)

The development will comprise a new 220kV Gas Insulated Substation (GIS) development which consists of a 220kV substation compound (circa 11,520 square metres) including:

- 1 no Indoor Gas Insulated Switchgear (GIS) two storey building equipped with 8 no. 220kV bays and rated for the system voltage of 220 kV;
  - Approximate Building dimensions (L: 50 metre W: 14.4 metre H: 16.5 metre)
- Two 220kV underground cables which will connect the proposed Substation development to existing transmission system;
- Oil-filled step-down 220/20 kV power transformers positioned within bunded enclosures; (height circa 6 metres);
- 8 no. lightning protection masts (height circa 15 metres);
- Single storey buildings used for control and ancillary;
- Internal access roads;
- A 2.6-metre-high palisade fence;
- Drainage infrastructure; and

- All associated and ancillary site development works.

The proposed Substation development will be supplied with two 220 kV power supplies, which will likely be connected to the existing 220 kV transmission over head lines in the area adjacent to the data storage campus. The substations will be connected via two underground cable feeders.

The substation also connects to the HV/MV power transformers via overhead busbar bays, in turn the transformers supply electricity at 20 kV to the substation main MV switchgear.

The 220 kV underground cable feeders will comprise a double 220 kV circuit installed underground in HDPE ducting. The 220kV cables will be a standard XLPE (cross-linked polyethylene) copper cable. XLPE does not contain oil, therefore there is no risk of migration of oil into ground in the event of a failure.
The installation of the HDPE ducting will require the excavation of one or two trenches along the final connection route; the trench will contain two 220 kV circuits. The trenches will typically run parallel to each other along the length of the route, the separation of the 2 circuits will typically vary from 0.5m to c. 3m depending on the existing ground conditions and existing underground services.
The typical optimum depth of excavation required to facilitate installation of the ducting is 1.35m below ground level (bgl) but may increase to up to c. 3.0m at utility crossings. The typical optimum width of each trench is 0.8m, however this may vary depending on ground conditions and existing services.
A typical cross section of the trench utilising flat and trefoil duct arrangement for the 220 kV cables is illustrated in Figure 2.5.

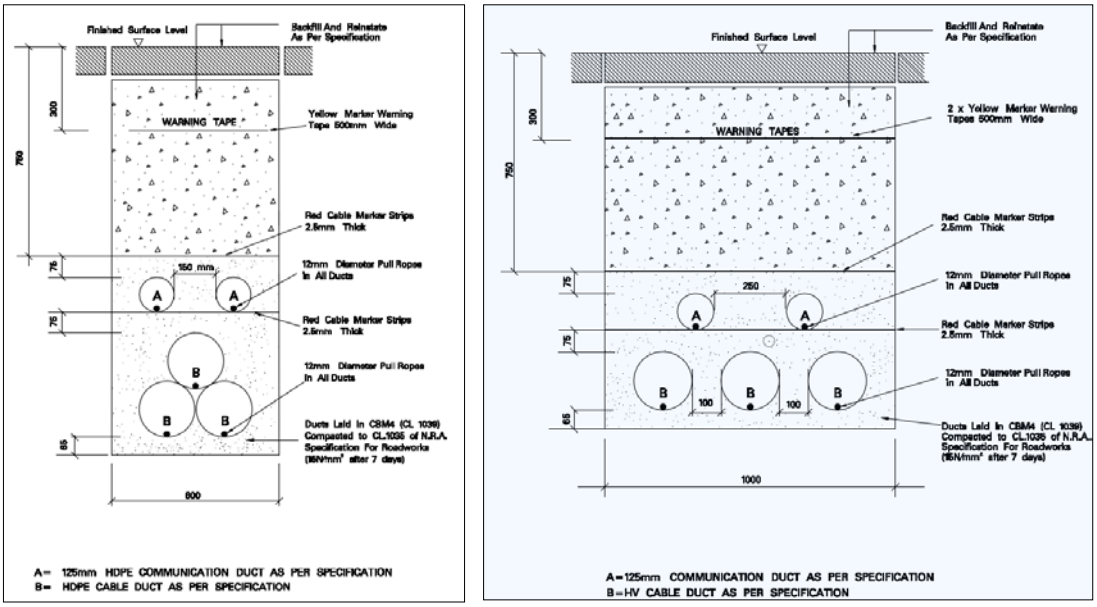


Figure 2.5 Typical Cross Section of Trench with Flat and trefoil Duct arrangement for 220 kV underground cable

Option 2 110 kV GIS Substation Development (Blue Line)

The development will comprise a new 110kV Gas Insulated Substation (GIS) development which consists of a 110kV substation compound (circa 10,200 square metres) including:

- 1 no Indoor Gas Insulated Switchgear (GIS) two storey building equipped with 8 no. 110kV bays and rated for the system voltage of 110 kV;
  - Approximate Building dimensions (L: 45 metre W: 12.4 metre H: 13.9 metre)
- Two 110kV underground cables which will connect the proposed Substation development to existing transmission system;
- Oil-filled step-down 220/20 kV power transformers positioned within bunded enclosures; (height circa 6 metres);
- 8 no. lightning protection masts (height circa 15 metres);
- Single storey buildings used for control and ancillary;
- Internal access roads;
- A circa 2.6-metre-high palisade fence;
- Drainage infrastructure; and
- All associated and ancillary site development works.

The proposed Substation development will be supplied with two 110 kV power supplies, which will likely be connected to the existing 110 kV transmission over head lines in the area adjacent to the data storage facility. The substations will be connected via two underground cable feeders. The substation also connects to the HV/MV power transformers via underground cables, in turn the transformers supply electricity at 20 kV to the substation main MV switchgear.
The 110 kV underground cable feeders will comprise a double 110 kV circuit installed underground in HDPE ducting. The 110kV cables will be a standard XLPE (cross-linked polyethylene) copper cable. XLPE does not contain oil, therefore there is no risk of migration of oil into ground in the event of a failure.
The installation of the HDPE ducting will require the excavation of one or two trenches along the final connection route; the trench will contain two 110 kV circuits. The trenches will typically run parallel to each other along the length of the route, the separation of the 2 circuits will typically vary from 0.5m to c. 3m depending on the existing ground conditions and existing underground services.
The typical optimum depth of excavation required to facilitate installation of the ducting is 1.25m below ground level (bgl) but may increase to up to c. 3.0m at utility crossings. The typical optimum width of each trench is 0.6m, however this may vary depending on ground conditions and existing services.
A typical cross section of the trench utilising trefoil duct arrangement for the 110 kV cables is illustrated in Figure 2.6.

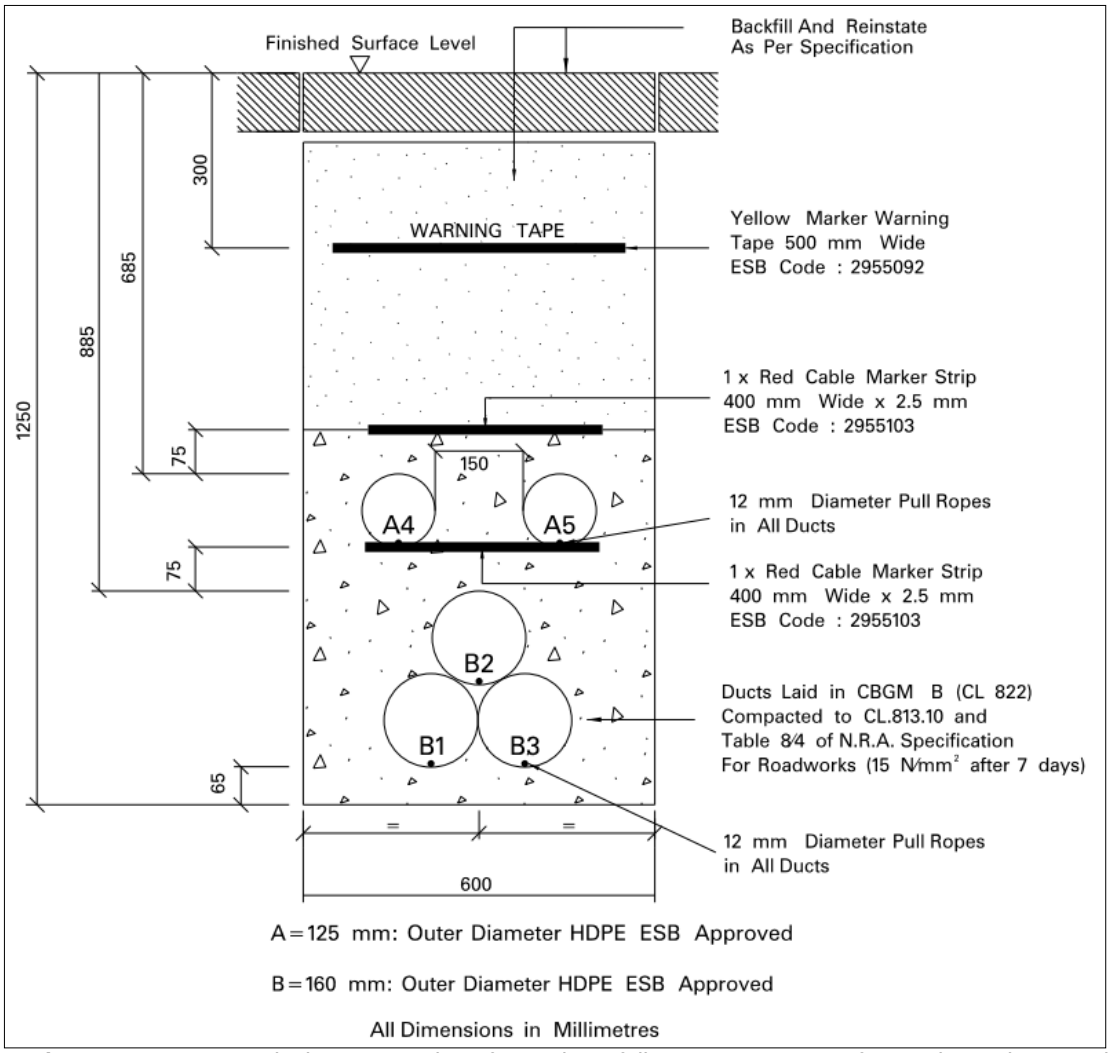


Figure 2.6 Typical Cross Section of Trench Trefoil Duct Arrangement for 110 kV underground cables

Option 3 220 kV GIS Substation Development

The development will comprise a new 220kV Gas Insulated Substation (GIS) development which consists of a 220kV substation compound (circa 11,520 square metres) including:

- 1 no Indoor Gas Insulated Switchgear (GIS) two storey building equipped with 8 no. 220kV bays and rated for the system voltage of 220 kV;
  - Approximate Building dimensions (L: 50 metre W: 14.4 metre H: 16.5 metre)
- Two 220kV underground cables which will connect the proposed Substation development to existing transmission system;
- Oil-filled step-down 220/20 kV power transformers positioned within bunded enclosures; (height circa 6 metres);
- 8 no. lightning protection masts (height circa 15 metres);
- Single storey buildings used for control and ancillary;
- Internal access roads;
- A 2.6-metre-high palisade fence;
- Drainage infrastructure; and
- All associated and ancillary site development works.

The proposed Substation development will be supplied via two 220 kV underground grid connections. These 220kV cable installations will connect the proposed substation with an existing substation located at Ard Cluain, Main Street, Clonee. The route of the proposed 220kV grid connection will follow the R147 north from the Ard Cluain substation to the proposed substation. The route of the proposed grid connection is c. 2km in length. Figure 2.6 illustrates the route of the proposed grid connection (pink line).

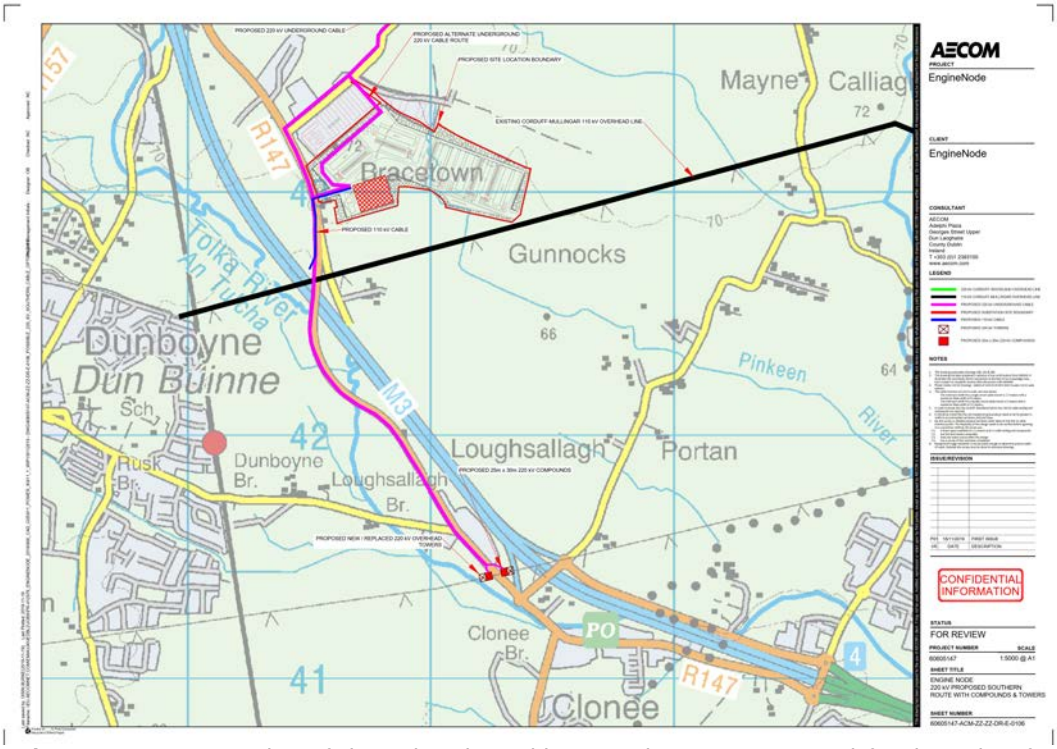


Figure 2.6 Location of the substation grid connection route proposed for the subsurface grid connection.

The 220 kV underground grid connection will comprise a double 220 kV circuit installed underground in HDPE ducting. The 220kV grid connection will be a standard XLPE (cross-linked polyethylene) copper cable. XLPE does not contain oil, therefore there is no risk of migration of oil into ground in the event of a failure.

The installation of the HDPE ducting will require the excavation of one or two trenches along the final connection route; the trench will contain two 220 kV circuits. The trenches will typically run parallel to each other along the length of the route, the separation of the 2 circuits will typically vary from 0.5m to c. 3m depending on the existing ground conditions and existing underground services.

The typical optimum depth of excavation required to facilitate installation of the ducting is 1.35m below ground level (bgl) but may increase to up to c. 3.0m at utility crossings. The typical optimum width of each trench is 0.8m, however this may vary depending on ground conditions and existing services.

A typical cross section of the trench utilising flat and trefoil duct arrangement for the 220 kV grid connection is illustrated in Figure 2.5 above.

3.0 PLANNING AND DEVELOPMENT CONTEXT

3.1 INTRODUCTION

This chapter describes the proposed development within the context of the relevant Meath County Council (MCC) planning policy. The following sections describe how the proposed development complies with the stated and statutory requirements of MCC with respect to planning and sustainable development.

The relevant national, regional and local planning policy with which the proposed development complies is defined by the:

- National Planning Framework: Project Ireland 2040 (2018);
- Our Sustainable Future - A Framework for Sustainable Development for Ireland (2012)
- Draft Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly (2018);
- Regional Planning Guidelines for the Greater Dublin Area (2010-2022);
- Meath County Development Plan 2013-2019 (MCDP);
- Dunboyne / Clonee / Pace Local Area Plan 2009 – 2015; and
- Economic Development Strategy for County Meath 2014-2022.

3.2 NATIONAL, REGIONAL AND LOCAL PLANNING CONTEXT

3.2.1 National Planning Framework: Project Ireland 2040

The National Planning Framework (NPF) for Ireland was published in February 2018 and contains National Strategic Outcomes' (NSO) which are supportive of the development of ICT infrastructure, with particular reference made to data centres.

NSO5 *"A Strong Economy Supported by Enterprise, Innovation and Skills"* is a key strategic outcome underpinned by a range of objectives relating to job creation and the fostering of enterprise and innovation.

The NPF identifies that data innovation is important for future growth and identifies Ireland as an attractive destination for data centres due to climatic factors and current and future renewable energy sources. The proposed data centre development is supported by the NSO5:

> *Promotion of Ireland as a sustainable international destination for ICT infrastructures such as data centres and associated economic activities.*

The proposed development as described in Chapter 2 (Description of The Proposed Development) comprises four data storage facilities, office / administration building, energy centre and associated ancillary development covers an area of 24.5 hectares, in a location which is well suited and serviced to accommodate such a use.

The NPF also states under NSO5 that:

> *"Ireland is very attractive in terms of international digital connectivity, climatic factors and current and future renewable energy sources for the development of international digital infrastructures, such as data centres. This sector underpins Ireland's international position as a location for ICT and creates added benefits in relation to establishing a threshold of demand for sustained development of renewable energy sources."*

The NPF notes that the data centre sector underpins Ireland's international position as a location for ICT and creates added benefits by establishing 'a threshold of demand for sustained development of renewable energy sources". The proposed development will have a flexibility in supply during its lifeline which will allow for flexibility in sourcing of power including renewable sources where feasible.

The NPF is clear that it is favourably disposed to the location of ICT infrastructure in Ireland; the proposed development is considered to be in accordance with this national planning policy.

3.2.2 Our Sustainable Future - A Framework for Sustainable Development for Ireland

Irelands Framework for Sustainable Development *Our Sustainable Future* (launched 2012 with subsequent progress report in 2015), by the Department of the Environment, Community and Local Government provides a framework to ensure that development is undertaken in a sustainable manner.

Our Sustainable Future aims to ensure that development is carried out sustainably and in an environmentally sound manner which includes optimisation of natural resources, minimisation of waste, safe and sparing use of chemicals and the application of clean technology.

All of these aspects were integral considerations in the design of the proposed development, where applicable and will be integral considerations in the operation of the proposed development on a day to day basis and are addressed within this EIA Report where appropriate.

3.2.3 Draft Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly

The Draft Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Regional Assembly (EMRA) includes Regional Policy Objective (RPO) 8.23 which states the following:

> *Local Authorities shall:*
> - *Promote and facilitate the sustainable development of a high-quality ICT network throughout the Region in order to achieve balanced social and economic development, whilst protecting the amenities of urban and rural areas.*

- *Support the national objective to promote Ireland as a sustainable international destination for ICT infrastructures such as data centres and associated economic activities at appropriate locations.*

It is clear from the above that the RSES supports the development of data centres at appropriate locations, the site is considered to be appropriate location for the development of data centres. This appropriateness is discussed further in this chapter.

3.2.4 Regional Planning Guidelines for the Greater Dublin Area (2010 – 2022)

The Regional Planning Guidelines (RPGs) for the Greater Dublin Area 2010 – 2022 set out the planned direction for growth up to 2022 by giving regional effect to the National Spatial Strategy (NSS). The RPGs provide an overall strategic context for the Development Plans of each local authority in the Greater Dublin Area (GDA) including enterprise and employment creation.

The RPGs make the distinction between the Metropolitan Area and the Hinterland Area of the GDA. Dunboyne, Clonee and Pace are located in the Metropolitan Area which includes Dublin and its adjoining built up, suburban area.

The subject site is identified within the Secondary Economic Growth Towns of Ashbourne/Dunboyne. It is noted that Dunboyne, located strategically on the edge of the Gateway Core, has yet to realise its long-term potential but plays an important role in this economic growth area given its status and location on a developing rail line.

The RPGs supports economic development within the GDA and clustering of development within identified strategic employment areas.

3.2.5 Meath County Development Plan 2013-2019

The Meath County Development Plan 2013-2019 (MCDP) sets out a coherent spatial planning framework for the County within the context of national and regional policies.

The plan covers the administrative area of County Meath situated in north Leinster, along the east coast of Ireland. The county occupies a land area of over 230,000 hectares and is the second largest county in Leinster. It adjoins Dublin to the south and this geographical proximity and the strong functional relationship between the two counties results in Meath being a vital component of the GDA.

The aim of the MCDP is to drive the present-day evolution of the county and to establish a framework for the coordinated and sustainable economic, social, cultural and environmental development of County Meath.

The relative policies and objectives of the MCDP in relation to Water, Drainage, Environmental Services, Transport, Waste, Cultural Heritage, Natural Assets, Environment have been addressed in the relevant chapters of this EIA Report.

Core Strategy

The MCDP outlines the purpose of the Core Strategy is to show that the development objectives in the MCDP are consistent, as far as practicable, with the national and regional development objectives that are set out in the NSS and RPGs for the GDA.

The vision of the MCDP is for:

> *Meath to be a county that fosters sustainability throughout its vibrant communities, dynamic economy and unique cultural and natural heritage.*

This vision is supported by a number of Core Principles relevant to the proposed development as shown in Table 3.1 below.

Table 3.1 MCDP Relevant Core Principles

Core Principle 1	To develop Meath's critical role in the Dublin and Mid East Region and its role as part of the Dublin City National Economic Gateway maximising on its proximity to Dublin Airport.
Core Principle 3	To promote sustainable economic development to support the population of County Meath in accordance with the guidance and recommendations set out in the Economic Development Strategy for County Meath 2014-2022.
Core Principle 5	To encourage mixed use settlement forms and sustainable centres, in which employment, housing and community services are located in close proximity to each other and to strategic public transport corridors
Core Principle 9	To consolidate population growth and employment in areas best served by public transport and a range of transport modes.

The proposed development site is located to the north of the M3 Motorway at Clonee in terms of the settlement hierarchy Clonee is identified as a village with nearby Dunboyne as a Large Growth Town II. This area is designated as having strong potential for economic growth due to its interconnected multi-modal corridors and close proximity to the National Gateway core.

The proposed development is supported by the objectives outlined in Table 3.2 below.

Table 3.2 MCDP Core Strategy Relevant Objectives and Policies

CS OBJ 1	To provide and promote a strategic economic development strategy that identifies a hierarchy of employment centres related to the overall development strategy of the County which will encourage a more balanced and sustainable pattern of employment across the county in accordance with the recommendations of the Economic Development Strategy for County Meath.
CS OBJ 2	To facilitate and encourage the sustainable development of designated core economic areas, such as would allow the creation of a critical mass, in terms of residential population and economic activities, sufficient to service the proposed expanded economic function of such centres. The promotion and facilitation of large scale employment generating developments will occur within the Primary Economic Areas/ Primary Economic Growth Areas and Secondary Economic Growth Areas. From a County Meath perspective, the stated centres are: i. Navan Core Economic Area with Navan as a Primary Economic Growth . Town and including the Secondary Economic Growth Town of Kells and the town of Trim); ii. Drogheda Core Economic Area; iii. Secondary Economic Growth Towns of Ashbourne / Dunboyne; and;

	iv. The Environs of Maynooth and Kilcock located in the administrative area of Meath (in addition to Dunboyne / Pace and Clonee) are included in the Gateway Core Economic Area corresponding with the Metropolitan Area. Maynooth and Leixlip are identified as a Core Economic Area with the towns of Kilcock and Celbridge providing a supporting role.

The subject site is zoned as E2 General Industry and Employment / E3 Warehousing and Distribution in the MCDP. The land use zoning objectives are outlined in Table 3.3. The site zoning map is provided in Figure 3.1, within which the proposed development site is outlined in red.

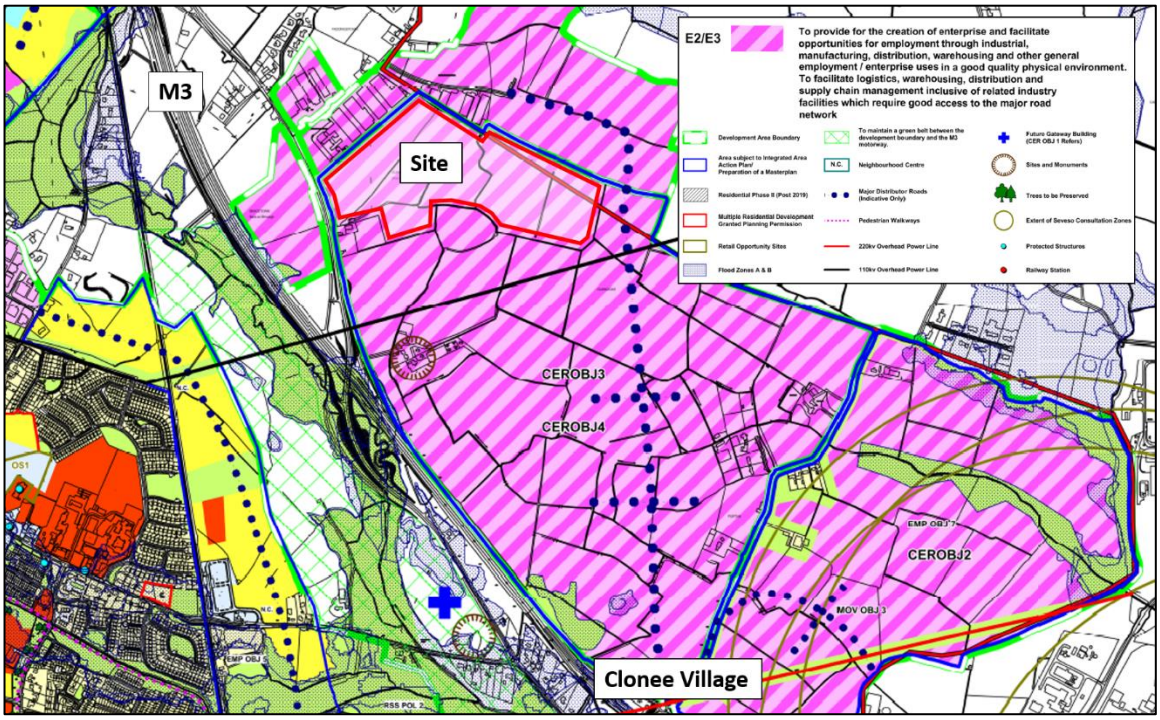


Figure 3.1 Meath CDP proposed development Zoning

Table 3.3 identifies the permitted uses for the zone and although 'data centre' is not specifically mentioned 'science and technology' and 'telecommunications storage depot' is listed under E2 and E3 respectively. Science and Technology based enterprise is defined as:

> *Knowledge based process and activity in which research and innovation plays a fundamental role in the ultimate output i.e. data processing, film production, software development, commercial laboratory, information technology.*

The MCDP and planning documents has referred to a data centre as:

> *A facility used to house computer systems and associated components, such as telecommunications and storage systems. It generally includes redundant or backup power supplies, redundant data communications connections, environmental controls (e.g. air conditioning, fire suppression) and security devices.*

Based on the above description of a data centre its generally assumed to be broadly consistent with a use of 'science and technology' or 'telecommunications storage depot'.

There is a substantial data centre development within this E2/E3 zoned land that sets a precedent for the proposed development. This is located to the southeast of the subject site (MCC Ref: RA150605), additionally there is an expansion to that data centre currently under construction (MCC Ref: RA180671).

The guidance and policy for E2 lands is to apply a more flexible approach to large scale office type development in excess of 200 sq. m. GFA on undeveloped land in excess of 3 hectares subject to conditions. The proposed development is on lands in excess of 3 ha and in excess of 200 sq. m. GFA. The conditions set out in this guidance have been considered and addressed as a part of the project design:

- A non-statutory Masterplan (Revision One) has been developed and submitted to MCC prior to this application being made. That provides detail on "*the provision of the necessary physical infrastructure, the appropriate density and design of layout and the interface between proposed uses and existing development."*
- The proposed development and nearby developments in the vicinity of the site are classified as light industrial in nature, the potential nuisance impact from the proposed in terms of *noise, vibration, smell, fumes, smoke, soot, ash, dust or grit* have been addressed in the appropriate chapters of this EIA Report Chapter 9 (Air and Climate) and Chapter 10 (Noise and Vibration).
- The site is located next to an appropriate public transport corridor and adequate road network, this is discussed further in Chapter 13 (Transport) of this EIA Report.
- A viable Mobility Management Plan will be provided prior to commencement of construction.

Table 3.3 MCDP Land Use Zoning

E2 General Enterprise & Employment	Objective To provide for the creation of enterprise and facilitate opportunities for employment through industrial, manufacturing, distribution, warehousing and other general employment / enterprise uses in a good quality physical environment. Permitted Uses Agri – Business, Bring Banks, Builder's Providers, Car Park (incl. Park and Ride), CHP / Waste to Energy Facilities, Domestic Fuel Depot, Energy Installation, Enterprise & Business Start Ups, Enterprise / Training Centre, Factory Shop, Furniture Showroom (only where product displayed is manufactured on site), Go Kart Track, Industry – General, Industry – Light, Heavy Vehicle Park, Logistics, Mart / Co-op, Motor Repair / Servicing, Plant & Tool Hire, Recycling Facility (Civic & Amenity), Science & Technology Based Enterprise, Telecommunication Structures, Transport Depot, Warehousing, Water Services / Public Services. Open for Consideration Uses Abattoir, Car Dismantler / Scrap Yard, Childcare Facility, Construction & Demolition Waste Recycling Facility, Garden Centre, Leisure Facilities, Motor Sales, Offices 100 – 1,000 sq. m., Petrol Station, Restaurant / Café, Veterinary Surgery, Waste Recycling / Transfer / Sorting Centre, Wholesale Warehousing / Cash and Carry. Uses which are 'open for consideration' or not identified as 'permitted' under the E2 zoning objective will only be considered where they do not compromise the objective of the overall zoning objective of E2 lands, for general enterprise and employment uses.
E3 Warehousing &	Objective

Distribution	To facilitate logistics, warehousing, distribution and supply chain management inclusive of related industry facilities which require good access to the major road network. Permitted Uses Bring Banks, Car Park (incl. Park and Ride), CHP / Waste to Energy Facilities, Distribution & Supply Chain Management, Domestic Fuel Depot, Energy Installation, Fuel Depot, Heavy Vehicle Park, Logistics, Plant Storage, Recycling Facility (Civic & Amenity), Telecommunication Storage Depot, Transport Depot, Warehousing, Water Services / Public Services, Wholesale Warehousing / Cash and Carry. Open for Consideration Uses Agri – Business, Childcare Facility, Enterprise & Business Start Ups, Enterprise/Training Centre, Garden Centre, Industry – Light, Petrol Station, Restaurant / Café, Waste Recycling / Transfer / Sorting Centre.

Settlement Strategy and Housing

The nearby approved data centre provide precedent for development in this area. The development is a natural extension of the Damastown Industrial area and the land is appropriately zoned.

Additionally, the MCDP as adopted, classified Dunboyne and Clonee as a single settlement for the purposes of the settlement hierarchy and population and household distribution.

It is also made clear that the Dunboyne/Dunboyne North and Clonee area, is located within the Metropolitan Area of Dublin. The below settlement objectives in the MCDP supports the proposed development of this area.

Table 3.4 MCDP Relevant Settlement Strategy Policies and Objectives

SS OBJ 3	To seek the consolidation of development within the existing built up footprint of urban centres in the Metropolitan Area of County Meath including around the public transport interchange at M3 Parkway rail station in Dunboyne North in order to achieve a more compact urban form and secure the use of rural areas for agricultural, horticultural and equestrian farmlands and amenity facilities, subject to the requirements of ED POL 13.
SS OBJ 9	To ensure that Dunboyne develops as a key settlement centre in the Metropolitan Area of the Greater Dublin Area and to ensure that the settlement grows in a manner that is balanced, self sufficient and supports a compact urban form and the integration of land use and transport.

Economic Development Strategy

It is the policy of the Council to facilitate economic development and the growth of employment in the county through support for objectives which promote economic, social, and cultural development and in assisting the provision of employment opportunities for all.

The proposed development is located in a Secondary Economic Growth Centre adjacent to Dunboyne North which is one of the 5 no. strategic sites on County Meath identified for economic development and employment. This is due to being positioned in a unique access rich environment proximate to both public rail and motorway links in the National Gateway area of the county. The proposed development is supported by the objectives and policies in Table 3.5 below.

The development in this area has been promoted through additional lands have been zoned for E2/E3 purposes. The proposed development will act on the potential of the undeveloped lands and provide construction jobs, direct and indirect employment in the area.

It is expected that development in this area will be non-people intensive in order to limit the generation of traffic. The potential impact of the proposed development due to transport has been addressed in Chapter 13 (Transport) and the accompanying Traffic Impact Assessment.

Table 3.5 MCDP Relevant Economic Development Policies and Objectives

Policy/Objective	Summary	Compliance
ED POL 3	To encourage and facilitate the successful development of the 5 no. key strategic employment sites in the County as identified in the Economic Development Strategy for County Meath 2014-2022. These are to develop as regional anchors of enterprise and employment creation, promoting a mix of employment types and thereby reducing the need for residents of County Meath to commute outside the County for employment.	The area is identified as a key strategic employment site, the proposal will bring Foreign Direct Investment into the Clonee / Dunboyne area
ED POL 9	To promote innovative economic sectors and encourage clustering which positively exploits synergies between interconnected companies and / or which forge synergies with adjoining third level education institutions including lifelong learning synergies and start up technology enterprises given Meath's locational advantages being close to a number of high quality third level campuses where research and development activity is forstered.	The site is located near to a number of high quality third level campuses where research and development activity is fostered. The proposed development enhances the existing clusters of similar development in the surrounding area.
ED OBJ 4	To ensure that sufficient and suitable land is zoned for logistics, distribution and supply chain management industries at Ashbourne, Dunboyne / Clonee, Kells, Enfield and Stamullen and in addition to land zoned for large scale and general industry.	The proposed development will realise the potential of the currently undeveloped lands within the secondary economic growth area and bring employment to the area.

Water, Drainage & Environmental Services

The availability of water supply and wastewater treatment and disposal are critical infrastructure requirements for any development. The MCDP sets out a number of environmental objectives and policies relevant to the proposed development set out in Table 3.5 and addressed further in the relevant chapters of this EIA Report.

There is no trade effluent proposed for this development. Foul sewage will be collected from site (data storage facilities, offices and energy centre washroom facilities and canteen) and discharged through a new pumping station to the foul drainage network which runs along the R147 and ultimately discharges to Ringsend WWTP.

The following measures have been incorporated into the development design to ensure the proposed development is compliance with the objectives and policies:

- The new drainage system provides for a separate foul and surface water drainage system;
- Hydrocarbon interceptors have been included in the design to maintain the quality of the foul and surface water discharge;
- Suitable SuDS measures including pervious paving and attenuation storage;
- Chapter 7 (Hydrology) of this EIA Report takes into consideration the relevant River Basin Management Plan and Programme of Measures, and;
- Chapter 9 (Air Quality and Climate) and Chapter 10 (Noise and Vibration) outlines the modelling of the proposed development that has been undertaken to ensure compliance with good practice and relevant legislation.

Table 3.6 MCDP Relevant Water, Drainage & Environmental Services Policies and Objectives

Policy/Objective	Summary	Compliance
WS POL 7	To ensure that in the case of all developments where public mains are available or likely to be available, the development will be required to connect into them.	The development will connect to public mains.
WS POL 14	To implement the policies developed for the Greater Dublin Area by the Greater Dublin Strategic Drainage Study and to ensure that all developments will have regard to the policies as expressed in the Greater Dublin Strategic Drainage Study.	The development will implement the policies developed for the Greater Dublin Strategic Drainage Study.
WS POL 17	To ensure that all new developments have access to or are provided with satisfactory drainage systems in the interests of public health and to avoid the pollution of ground and surface waters.	The development will provide satisfactory drainage systems.
WS POL 19	To protect groundwater resources having regard to the County Meath Groundwater Protection Plan.	The proposed development will not adversely impact on groundwater resources.
WS POL 20	To ensure through the implementation of the River Basin Management Plans and their associated programmes of measures, and any other associated legislation, the protection and improvement of all drinking water, surface water and ground waters throughout the county.	Through appropriate SuDs features and the use of hydrocarbon interceptors, as well as monitoring of site emissions, the proposed development will not adversely impact on drinking water, surface water (the Pinkeen Stream) and ground waters resources.
WS POL 25	To protect, maintain and improve the natural character of the watercourses and rivers in the county Meath.	The proposed development site are located at the source of the Pinkeen Stream. Through appropriate SuDs features and the use of hydrocarbon interceptors, as well as monitoring of site emissions, the development will not adversely impact on the natural character of the watercourse.
WS OBJ 8	To generally require new developments to provide for the separation of foul and surface water drainage networks within the application site.	Foul water and surface water will be separated.
WS OBJ 17	To require the use of Sustainable Urban Drainage Systems in accordance with the Greater Dublin Regional Code of Practice for Drainage Works for new developments (including extensions).	The development will implement the Sustainable Urban Drainage Systems in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.

WM POL 7	To encourage the recycling of construction and demolition waste and the reuse of aggregate and other materials in future construction projects.	A construction and demolition waste management plan will be developed for the proposal that will include the recycling of construction and demolition waste and the reuse of aggregate where possible.
WM OBJ 17	To require developers to prepare construction and demolition waste management plans for new construction projects over certain thresholds which shall meet the relevant recycling/recovery targets for such waste in accordance with the national legislation and national and regional waste management policy.	A construction and demolition waste management plan will be developed for the proposal.
PC POL 1	To seek to preserve and maintain air and noise quality in the county in accordance with good practice and relevant legislation.	A detailed depth air and noise assessment has been undertaken to ensure that air and noise quality in the county is maintained and preserved.
WS SOBJ 9	To promote compliance with environmental standards and objectives established— (i) for bodies of surface water, by the European Communities (Surface Waters) Regulations 2009; (ii) for groundwater, by the European Communities (Groundwater) Regulations 2010; which standards and objectives are included in river basin management plans.	The development includes measures to protect both surface water and groundwater quality.
NH POL 12	To have regard to the geological and geomorphological heritage values of County Geological Sites listed in Appendix 13 and avoid inappropriate development, through consultation with the Geological Survey of Ireland.	The development has no impacts om areas of geological and geomorphological heritage values.

Energy & Communications

The proposed development is proposing to supply its electricity requirements through the ESB National Grid and on-site gas generation, utilising the national gas network.

The proposed development will incorporate an Energy Efficient Design from the outset in order to maximise energy efficiency. Waste heat will be utilised to service the ancillary offices.

The MCPD supports the improvement of ICT infrastructure across the County as detailed. Table 3.7 below shows the relevant policies and objectives from this section of the MCDP.

Table 3.7 MCDP Relevant Energy & Communications Policies and Objectives

Policy/Objective	Summary	Compliance
EC POL 6	To encourage that development proposals maximise energy efficiency through siting, layout, design or which incorporate best practice in energy technologies, conservation and implementation of smart technology.	The proposed development has maximised the potential of the site and energy efficient design principals have been incorporated throughout the design stage.
EC POL 9	To support the development of innovative	Waste heat will be utilised to service

	energy efficient technologies such as district-heating and combined heat and power.	the ancillary offices. However, the site location limits the design options and the possible ways in which the heat produced can be recovered and reused for use outside of the site boundary.
EC POL 10	To facilitate the provision of charging infrastructure for electric vehicles.	Charging points for electric vehicles will be provided.
EC POL 11	To support and facilitate the development of enhanced electricity and gas supplies, and associated networks, to serve the existing and future needs of the County.	The site will have potential to generate its own electricity supply from the onsite energy centre.
EC POL 16	To require that the location of local energy services such as electricity, be underground, where appropriate.	All electrical cables will be underground.
EC POL 25	To facilitate the delivery of a high capacity Information and Communications Technology (ICT) infrastructure and broadband network and digital broadcasting throughout the county.	The proposed development adds to the stock of ICT within the county.
EC POL 31	To require the provision of communications cables underground, especially in the urban environment, and generally within areas of public open space, in the interest of visual amenity.	All communication cables will be underground.
EC OBJ 1	To ensure that all plans and projects associated with the generation or supply of energy or telecommunication networks will be subject to an Appropriate Assessment screening and those plans or projects which could, either individually or in-combination with other plans and projects, have a significant effect on a Natura 2000 site (or sites) undergo a full Appropriate Assessment.	An Appropriate Assessment screening has been carried out for the Proposed development. The report concluded that a Natura Impact Statement is not required.

3.2.6 Dunboyne / Clonee / Pace Local Area Plan

This Local Area Plan (LAP) relates to the Dunboyne/Clonee/Pace Corridor, this is seen as a single entity in based on the geographical proximity of each settlement, their location within the railway corridor, and strong urban influence from the GDA and location in the Metropolitan Area.

The purpose of the LAP is to give effect to the provisions of the MCDP as they relate to this area. MCC has stated its commitment to placing sustainable development principles at the heart of its decision making.

The local area plan reiterates the specific zoning objectives for the development of lands between Portan, Clonee and Bracetown. The below objectives have been identified from this zone and are important to development in this area. These have been addressed by updating and submission to MCC of the non-statutory Masterplan (Revision One) (Revision One) that was previously been provided for this area.

Table 3.8 Dunboyne / Clonee / Pace LAP Relevant objectives and Policies

EMP OBJ 7	It is a requirement of the Local Area Plan that the development of the employment generating lands at Portan, Clonee identified on Map Number 3 will be subject to the provisions of a Framework Plan to be agreed with the Executive of the

	Planning Authority and specific servicing and access arrangements set out in the Movement Section of this Local Area Plan. Any uses proposed shall have regard to and be consistent with the range of uses indicated as being appropriate to E2 'General Enterprise & Employment' Category 1 (Primary & Secondary Economic Centres) and E3 'Warehousing & Distribution' as provided for in Volume I of the Meath County Development Plan 2013-2019.
CER OBJ 3	To facilitate the development of lands between Portan Clonee and Bracetown for E2 'General Industry & Employment' and E3 'Warehousing & Distribution' as provided for in Volume I of the County Development Plan. A Master Plan and a detailed Roads Needs Assessment of said lands shall accompany any planning application for the development of these lands. This Master Plan shall obtain the prior written agreement of the Executive of the Planning Authority. The Master Plan shall accompany any application for planning permission on these lands and shall address land use, transportation, connectivity, urban design, recreation, environmental impacts including flood risk, phasing and implementation issues to the satisfaction of the Executive of the Planning Authority. Development shall be contingent on the phased delivery of the distributor road. The Master Plan shall address the following: A Design Concept for the lands; i. Guidance for high quality design throughout the development; ii. Building heights and densities; iii. A landscape plan for the development and landscape management plan (post-completion of the development); iv. Flood Risk Assessment which takes account of the most up to date available CFRAM data Draft Variation No. 3 of the Meath County Development Plan, 2013-2019 A Transport Assessment which addresses the following issues: Access arrangements to the Development Site; 1. Provision of safe cycle ways and pedestrian routes throughout the Development Site; 2. Provision and access for Service Vehicles to the Site. The Master Plan shall be agreed in writing with the Executive of the Planning Authority in advance of the lodging of any planning application.
CER OBJ 4	To facilitate the development of lands between Portan Clonee and Bracetown for E2 "General Industry & Employment" and E3 "Warehousing and Distribution" purposes solely for the development of major employment proposals, primarily FDI, requiring a significant site area, having regard to this strategic location within the county, as provided for in Volume I of the County Development Plan.

3.2.7 Economic Development Strategy for County Meath 2014-2022

The Economic Development Strategy for County Meath 2014-2022 (EDS) sets evidence-based measures aimed at accelerating the economic transformation, revitalisation and sustainable development of County Meath.

The locality of the proposed development within the Dunboyne/Clonee/Pace corridor has been identified as a strategic area for development due to the favourable locations, ready-to-go sites, fibre-based broadband and telecoms, power and gas, water, easy access to the national motorway network and are in close proximity to Dublin Airport and Dublin Port.

The zoning, and location of the proposed development location is clearly a strategic site with the potential for development. Strategic sites are opportunities for economic and employment development around the county, including for the ability to attracting more foreign direct investment into the county.

The potential for the development of data centres within Meath is seen as a strength due to the capacity to accommodate these larger developments.

The EDS identifies a number of Actions required to deliver the strategy, including:

- *Constructive engagement between Meath County Council and businesses (including developers/landowners). Fundamental to this action is to ensure that officials continually think about how best the Council can serve businesses and wealth creators, who have the capacity to help deliver the identified sites and create jobs.*
- *Promotion of the hierarchy of economic centres and targeted sectors in Meath with the objective of facilitating significant new enterprise employment in Meath (map shown earlier).*
- *Meath County Council to undertake an assessment of the available infrastructure and services on all of the identified sites with employment potential, in conjunction with the relevant landowners, the goal being to complete the proposed site services matrix and to plan for how best* to address any deficiencies identified through framework plans.

3.3 MASTERPLAN (REVISION ONE) / FRAMEWORK PLAN

A Masterplan (Revision One) has been prepared by Clifton Scannell Emerson Associates (CSEA) on behalf of the applicant to comply with objective CER OBJ 3 of the Dunboyne, Clonee & Pace Local Area Plan 2009-2015 (Table 3.8). This Masterplan (Revision One) outlines the multi-disciplinary design rationale for the proposed data storage facility campus expansion within the wider context of the neighbouring E2 / E3 zoned lands.

The Masterplan (Revision One) has been prepared in consultation with the Planning Authority and builds on previous Masterplans submitted for the boundary. The site covers approximately 60.5 acres or 14% of the E2 / E3 zoned lands within the Masterplan (Revision One) area.

3.4 PLANNING PERMISSIONS

As part of the assessment of the impact of the proposed development, account has been taken of developments that are currently permitted, or under construction and substantial projects for which planning has been submitted within the surrounding areas.

The MCC Planning Department website was consulted in order to generate a list of relevant planning permissions from the surrounding areas of the proposed development within the previous five years. The outcome of this search is presented in Table 3.9 below.

There is no recent planning history on the proposed development site, which is currently undeveloped agricultural land.

Table 3.9 Planning Search relevant to the proposed development site

Planning Reference, Applicant & Location	Development Description	Decision & Decision Date
RA/150605 Runways Information Services Limited Lands at Portan, Gunnocks and Clonee County Meath	Construction of a data centre campus in two phases within 10 years which consists of: Three data centre buildings containing 8 no. data halls with a gross floor area of 50,800 m2 and with a data capacity of 36MW per building (each building is 25,400 m2 and contains 4 no. data halls) together with associated mechanical and electrical spaces and parking. 1 No. single storey ancillary administration/office building with gross floor area of 6,424 m2 linking and accessing the data centre buildings. Ground-level emergency back-up generators (with internal fuel tanks). New site access and temporary construction access and car parking arrangements off the Kilbride Road (L5028). Closure of existing accesses (following the demolition of 2no. residential units). Upgrade to L5028 Kilbride Road to provide cycle path and pedestrian footpath between the R147 and the proposed new site access. Installation of temporary electrical infrastructure to service the data centre campus before final connection. Ancillary site works including underground electricity 20kV cables between substation and data centres. An Environmental Impact Statement (EIS) has been prepared for the Proposed development and has been submitted with this planning application.	Decision to grant by Meath County Council subject to conditions on 23rd July 2015
DA70730 Bennett Developments Ltd. Kilsaran Concrete Portan Clonee Co. Meath	An industrial/light industrial/warehousing development and associated access roads on a 30.71 hectare site to the north of the N3. The development will consist of the construction of an industrial/light industrial/warehousing development with a total gross floor area of 74,334sq.m. The development will include the construction of 13 no. double/triple height detached and subdivided warehouse units with a total gross floor area of 62,794 sq. m. and the development of 5 no. own door units with a total gross floor area of 11,540 sq. m. The proposed development include ancillary office space and outdoor storage yard and associated plant. The proposal involves the demolition of 2 no. habitable houses on the western boundary of the site. The proposed development also includes the partial realignment of the Kilbride Road (CR589) to include a new roundabout and a proposed new access road. The entire development is to be served by 944 no. surface car parking spaces. The proposed development includes all site development works including the construction of a foul treatment plant and pump station, a water treatment plant and pump station, a fire and potable water storage/retention tank, eight electricity sub-stations and four ground water wells with associated housing of pumps for the four wells, associated service roads, service yards, pedestrian accesses, foul sewer drainage network, surface water drainage with attenuation feature lake	Decision to grant by Meath County Council subject to conditions on 22nd September, 2015
VA0018 Runways Information Services Limited Lands at Portan, Gunnocks and Clonee	Strategic Infrastructure Development application to ABP for a 220kV substation compound and associated loop-in connection to the existing Corduff-Woodland No. 1 overhead 200kV line.	Granted by ABP subject to conditions on 22th October 2015

County Meath		
RA160433 Runways Information Services Limited Land Of Portan, Gunnocks & Clonee Co. Meath	Minor Amendment to previously approved Data Centre Campus application (ref: RA/150605) comprising two elements: 1. a 16sq metre illuminated entrance sign to the immediate north of the main Data Centre Kilbride Road entrance; and 2. a 3.5m high Weather Transmitter mounted on the roof of Datahall CLN-1.1, projecting 2m above the building's perimeter screen wall and associated works.	Granted Permission with conditions by Meath County Council on 14th June, 2016.
RA160843 Axial Properties Ltd. Bracetown Business Park Clonee Co. Meath	Retention permission is sought for 1.) A single storey pitched roof structures and covered double dock levellers with associated ramp to north-west elevation of block 1. 2.) A dock leveller with associated ramp to south-west elevation of Block 2. 3.) A dock leveller with associated ramp to north-east elevation of Block 3. 4.) A single storey pitched roof structures to south-east elevation of Block 4	Granted Permission with conditions by Meath County Council 4th August 2016
RA160937 Runways Information Services Limited Portan, Gunnocks and Clonee County Meath	The development will consist of the minor alteration to the previously approved road layout as part of Data Centre Campus Reference RA/150605 and ABP Reference PL 17.245347 involving the relocation of a landscaping berm and associated works to provide a new internal two lane access road to a secondary entrance for emergency and incidental service use only at the south east corner of the site. (The above mentioned application is concurrent with a separate planning application to Fingal County Council for a secondary access road for emergency incidential service use only to the previously approved Clonee Date Centre Campus Reference RA/150605 and ABP Reference PL 17.245347, comprising a new entrance and associated works on Damastown Road, 2.4m height perimeter security fencing with associated entrance gate, CCTV and intercom system)	Granted Permission with conditions by Meath County Council on 17th October, 2016.
RA161021 Shire Pharmaceuticals (Ireland) Limited Piercetown, Craddockstown and Ballymagillin Townlands, Dunboyne, County Meath	Permission for a two storey Biopharmaceutical Production Building sized 17,445 square metres in total and 19.5 metres high with roof mounted plant and equipment. A three storey laboratory and administration building sized 12,453 square metres and 22 metres high including roof mounted penthouse and plant and equipment. A permanent staff and visitor car park for 496 cars and a temporary construction related car park for 420 cars. The temporary car park will be decommissioned upon completion of the facility. A single storey link building sized 1,751 square metres and 12.4 metres high. Including ancillary site works.	Granted Permission with conditions by Meath County Council on 28th October, 2016.
RA151340 Beko Ireland Unit 16, (granted as Unit E01) The Hub Logistics Park Gunnockstown & Bracetown, Clonee, Co. Meath	Retention permission for the following amendments to Unit E01 previously approved planning Reg. Ref. No. DA/50233 at Gunnocks & Bracetown, Clonee, Co. Meath. (1) Retention of revised site layout. (2) Retain revised elevation treatment to unit E01. (3) Retention of first floor offices and ancillary storage area	Granted Permission with conditions by Meath County Council 10th December 2016

RA170114 Axial Properties Ltd. Block 4 (Unit 15) Bracetown Business Park Clonee, Co. Meath	A single storey pitched roof structure and dock leveller with associated ramp and ancillary site works to the north-west elevation	Granted Permission with conditions by Meath County Council 30th March 2017
RA170887 Shire Pharmaceuticals (Ireland) Limited Piercetown, Craddockstown and Ballymagillin Townlands, Dunboyne, County Meath	Revised design and configuration of previously permitted Biopharmaceutical Manufacturing Facility, Planning Register Reference No. RA/161021. A revised design and configuration of the permitted facility to a three storey Biopharmaceutical Production Building sized 10,083 square metres in total and 25.3 metres high and related external plant and equipment including boiler stacks 26 metres high. A single storey Warehouse Facility sized 2,625 square metres in total and 17.3 metres high with roof mounted plant and equipment and associated docking and yard areas. A three storey laboratory and administration building sized 7,022 square metres and 25.3 metres high including roof mounted plant and equipment. Ancillary site works include a bunded tank farm, water and waste water, pipe bridges, cooling towers, gas storage facilities, emergency generators, a waste recycling compound (15 metres wide by 30 metres long) and structures, items of plant and equipment and their associated yards, internal roads and services, fencing, exterior lighting, landscaping and landscape berms, and underground water attenuation tank and building mounted and ground mounted signage. Ancillary site buildings include a single storey sprinkler pump house sized 106 square metres and 6.2 metres high and associated tanks, a single storey waste water pump house sized 7 square metres and 3.2 metres high, a gas reducing station and compound, a covered bicycle facility for 100 bicycles and 3 no. flagpoles 15 metres high, 2 no. Waste Management/Storage buildings 243 square metres and 7.2m high each and a single storey bunded drum storage building sized 122 square metres and 6.2 metres high and a single storey waste water building sized 60 square metres and 6.2 metres high, a single storey covered walkway 180 metres long and 5 metres high joining the car park to the proposed facility and a new bus shelter at the site entrance. The proposed new works include a single storey security building sized 129 square metres and 5.2 metres high to the centre of the site and a single storey security	Granted Permission with conditions by Meath County Council 14th September 2017
RA170586 Axial Properties Ltd Bracetown Business Park, Bracetown, Clonee, Co. Meath	The proposed development will consist of an extension to existing office accommodation to the rear of Lacken Plaza at Bracetown Business Park, including the demolition of an existing single storey office wing (approx 700sqm GFA) and replacement with a three storey office block (approx. 3,189sqm GFA) together with a new entrance foyer to Lacken Plaza (approx. 33sqm GFA), with associated elevational changes to existing office block. Other consequential modifications include removal of an existing mobile phone mast; minor relocation of existing gas tanks (1no.above ground and 3 no. below ground level); relocation of 4 no. car parking spaces (displaced by proposed foyer) to rear of building (total car parking remains unchanged by proposed development at 367 no. spaces); minor adjustment to the alignment of the internal access route; and all associated and ancillary site development works	Granted Permission with conditions by Meath County Council 17 January 2018

	including site services. The proposed development will result in the existing office development being increased from 8,416sqm GFA to 10,938sqm GFA.	
RA180048 Runways Information Services Limited Lands at Portan, Gunnocks & Clonee, County Meath - bounded to the south by the R147, to the west by the Kilbride Road, to the north by The Mayne and to the east by lands at Damastown Industrial Park	The development will consist of alterations to a previously approved Data Centre Campus application (Meath County Council ref: RA/150605/An Bord Pleanala ref: PL17.245347) comprising the following elements: 1) Alterations to the layout, design, external lighting and siting of the previously consented entrance guardhouse of the Data Centre Campus (granted under reg. ref: RA/150605 and ABP reg. ref: PL17.245347) involving the extension of the guardhouse canopy and adddition of Corten steel to the facade and canopy of the building; 2) Proposed boundary treatment improvements including: 3.0m high weathered steel Corten Picket fencing on a concrete base wall (Type 1); 3.0m high mesh boundary fencing with matching gates (Types 2 and 3) and associated works; 3) CCTV cameras; 4) 3.0m high fence and matching gates along the internal substation access road; 5) 600mm high oak bollards on the edge of road/pathways; and 6) All other associated works. The above application is concurrent with a separate planning application to Fingal County Council for alterations to the previously approved boundary treatments under register reference FW16A/0127	Granted Permission with conditions by Meath County Council on 13th April, 2018.
PL17.301172 Runways Information Services Limited Lands at Portan, Gunnocks and Clonee County Meath	Request to alter previously approved 220kV substation compound and associated loop-in connection to the existing Corduff-Woodland No. 1 200kV overhead line, Clonee, Co. Meath (planning application reference number 17.VA0018). The proposed amendments relate to Outdoor Air Insulated Switchgear (AIS) equipment, Outdoor AIS equipment and associated site works.	Amendments granted by An Bord Pleanála on 2nd May 2018
RA180671 Runways Information Services Limited (RISL) Portan, Gunnocks, Loughsallagh & Clonee Co. Meath	The proposed development will consist of an expansion of the existing approved data centre Campus (Meath County Council ref: RA/150605 / An Bord Pleanala ref: PL 17.245347) comprising the following elements (a) Construction of two single-storey data centre buildings with a gross floor area (GFA) of circa 57,400m2; (b) A single storey administration / office building with a GFA of circa 5,710m2 which is physically linked to the proposed data centre buildings; (c) Site infrastructure to include entrance gates and appropriate signage, a security guardhouse of circa 60m2 and associated canopy; (d) Road works including a new permanent site access, internal roadways, underpass & footpaths, circa 276 no. car parking spaces, bicycle parking facilities, upgrades to a section of the L5028 Kilbride Road together with an emergency access via the L10101 to include resurfacing only a section of the road and additional of circa 1 no. passing bay; (e) General drainage networks and arrangements and a connection to the existing public sewer network; (f) Surface level back-up generators with internal fuel tanks; (g) Hard & soft landscaping incorporating perimeter fencing to include both external and internal circa 3.0 metre high architecturally designed metal fencing and matching gates; (h) Temporary construction access and associated car parking arrangements off the Kilbride Road (L5028); and (i) Associated & ancillary site works. Planning permission is being sought for a 10 year period. An Environmental Impact Assessment Report (EIAR) has been prepared for the proposed development and has been submitted with this application.	Granted Permission with conditions by Meath County Council on 27th July 2018.
RA181060	The construction of a 45m high telecommunications support	Granted

Three Ireland (Hutchison) Ltd Bracetown Business Park, Bracetown, Clonee, Co. Meath	structure carrying antennas and transmission dishes, with associated equipment units, and security fencing. Significant further information/revised plans submitted on this application	Permission with conditions by Meath County Council 8 May 2019
PL17 .304613 Three Ireland (Hutchison) Ltd Bracetown Business Park, Bracetown, Clonee, Co. Meath	Construction of a 45m high telecommunications support structure carrying antennas, transmission dishes and all associated site works	Case is due to be decided by 7 October 2019

3.5 PRE-PLANNING CONSULTATION MEATH COUNTY COUNCIL

Prior to the submission of this application a series of pre-planning meetings were undertaken with MCC where a range of issues were discussed. These meetings allowed for a discussion on the in scale, nature and extent of the proposed development to ensure the requirements of the Local Authority were incorporated into the design of the facility.

3.6 CONCLUSIONS

The proposed development is in accordance with the policies and objectives of the National Spatial Strategy, Draft Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly, the Regional Planning Guidelines for the Greater Dublin Area, and the Meath County Development Plan 2013 - 2019.

The development is an appropriate land use for the area and meets the requirements of the MCDP zoning objectives. The development will minimise the potential environmental impacts as described in various chapters of this EIA Report.

4.0 ALTERNATIVES

4.1 INTRODUCTION

EIA legislation and the prevailing guidelines and best practice require that EIARs describe reasonable 'alternatives' for projects with regard to their environmental effects addressing:

- Do Nothing Alternative;
- Alternative project locations;
- Alternative designs/layouts;
- Alternative processes; and
- Alternative mitigation.

This chapter describes the alternatives that were considered for the proposed development, where applicable, under each of these headings and the reasons for the selection of the chosen option including consideration of environmental effects.

4.2 DO NOTHING ALTERNATIVE

The proposed development site is currently an undeveloped greenfield site used for agricultural purposes. The proposed site is zoned 'E2 - General Industry and Employment/E3 - Warehousing and Distribution' in the Meath County Development Plan 2013 – 2019. The Do-Nothing scenario would result in the project not proceeding at this time. Given the zoning of this land, it is likely that development on these lands would proceed at some point in the future.

4.3 ALTERNATIVE PROJECT LOCATIONS

EngineNode undertook a detailed assessment of a number of different locations in order to determine the most appropriate location for the proposed development.

There were two main components to assessing alternative project locations namely:

1. Selection of preferred country; and
2. Selection of preferred site location.

4.3.1 Selection of Preferred Country

The selection of Ireland as the preferred country location for this development was based largely on climatic conditions, the highly skilled local workforce, and strategic business considerations. As has been well documented in relation to other similar data storage facilities developed in Ireland and due to the relatively cool climate in Ireland, data storage facility equipment requires significantly less cooling in this type of environment compared with many other countries.

As a result, data storage facilities in Ireland require far less air conditioning and temperature control systems which means substantially less power and water demand

requirements. This has the effect of reduced air and noise emissions compared with countries with a warmer climate and less demand on the water and power supply networks.

4.3.2 Selection of Preferred Site Location

EngineNode's overall preference is to locate these facilities in Meath due primarily to the existence of suitably zoned lands, negligible environmental effects, availability of fibre, power and other utilities and proximity to the other data storage facilities (clustering advantages).

Candidate sites were assessed in terms of:

1. Site zoning and suitability of neighbouring activities (high technology, clean industry, non-intrusive industry i.e. avoiding areas close to quarrying and other potential sources of noise and vibration etc.);
2. Availability of suitable land type and quantity of lands (including cost to acquire lands);
3. Proximity of the site to a gas supply line for additional source of power (grid supply);
4. Available water supply and wastewater discharge capacity;
5. Potential impacts on the environment including impacts on human health, soil, water and hydrology, biodiversity, air quality, noise, heritage, visual amenity and local traffic;
6. Proximity of the site to developed transport infrastructure, including road networks and an international airport (Dublin Airport);
7. Suitability of ground conditions for construction of the development; and
8. Availability of required infrastructure and emergency services for operation of the facilities.

Several alternative sites were considered within the West Dublin and Kildare areas. The sites considered were both greenfield and vacant industrial sites.

The above factors were critical in selecting this site in Clonee. It was concluded that this site met the highest proportion of the necessary criteria of the candidate sites with particular advantages including:

- Suitable zoning;
- Adequate and suitable land;
- Low environmental sensitivity;
- Good access to transport routes and airport;
- Site specifically designed for large scale industrial activities with good access to services, including a gas and grid supply. The extent of lands available allowed the Applicant to cluster several data storage facilities together, allowing the clustering of these developments in line with policy ED POL 9 of the Meath County Development Plan 2013 – 2019; and,
- Synergistic benefits of locating the proposed facility in relatively close proximity to an existing data storage facility at Clonee.

4.4 ALTERNATIVE DESIGN/LAYOUTS

In the preparation for the proposed development, a number of alternative arrangements and configurations for the data storage facilities, energy centre, roadways and parking arrangements were considered.

Each arrangement considered the environmental sensitivities associated with surrounding land use i.e. the proximity to the residential areas and other businesses in the area.

Several different layouts were assessed for the data storage facilities and energy centre location on the site. The layout chosen was done so to minimise any environmental and landscape effects. The data storage facilities were orientated to maximise land use and minimise noise impact at the site boundaries for sensitive receptors. The final location of the energy centre was chosen based on its proximity to the gas supply and set back from the road to reduce visual and noise impact.

Site layout considerations were primarily made based on the following factors:

- Minimising potential impacts on the environmental and visual impact sensitivities associated with the surrounding land uses;
- Location of diesel tanks proximal to area of usage and therefore minimise risk of accidental loss to ground;
- Location of the proposed energy centre and its proximity to the existing gas supply line; and,
- Orientation of the data storage facilities and energy centre to optimise the use of the space available and minimise visual and noise impact.

A number of iterations for the layout were considered before the proposed development site layout was chosen. Two are shown below which show the proposed development layout with the energy centre in the northeast corner of the site (Figure 4.1; Chosen Layout) and the second with the energy centre closer to the site access (i.e. located in the north-western corner of the site) (Figure 4.2; Alternative Layout). The Chosen Layout places the energy centre at the north-east of the site, which results in 1 no. data storage facility placed at the north-west portion of the site, with the remaining 3 no. data storage facilities arranged along the north-eastern portion of the site, south-west of the energy centre. The Alternative Layout places the energy centre to the north-west of the site, with the 4 no. data storage facilities arranged along the north-eastern portion of the site.

The energy centre has flue heights of 40m and as such its location on the site is significant in the visual impact of the development. A summary of the considerations is shown in Table 4.1 below.

Table 4.1. Comparison of alternatives for the proposed development

Aspect	Options	Environmental Considerations/constraints
Location of energy centre	Energy centre at north east of site	• This location provides greater distance to residential properties giving a reduction in noise impact.

Aspect	Options	Environmental Considerations/constraints
		• This location would maximise the massing of buildings reducing visual impact on the R147 and nearby residential properties. • This location is slightly less preferable in terms of air quality when compared to the Alternative Layout. Emissions from normal operations of the site lead to NO_2 concentrations (including background) that are 46% of the 1-hour limit value of 200 µg/m$_3$ (measured as a 99.8th percentile) and 77% of the annual limit value of 40 µg/m$_3$ at the worst-case location. This is within the limit values for NO_2 and will not pose an issue to air quality at receptor locations.
	Energy centre at north west of site	• Compared to the north-eastern location of the energy centre, this location is slightly preferable in terms of noise quality. • This location would not take advantage of the massing of buildings in terms of reducing visual impact on the R147 and nearby residential properties. • This location is slightly preferable in terms of air quality. In the Alternative Layout, emissions from normal operations of the site lead to NO_2 concentrations (including background) that are 46% of the 1-hour limit value of 200 µg/m$_3$ (measured as a 99.8th percentile) and 55% of the annual limit value of 40 µg/m$_3$ at the worst-case location. This is within the limit values for NO_2 and will not pose an issue to air quality.

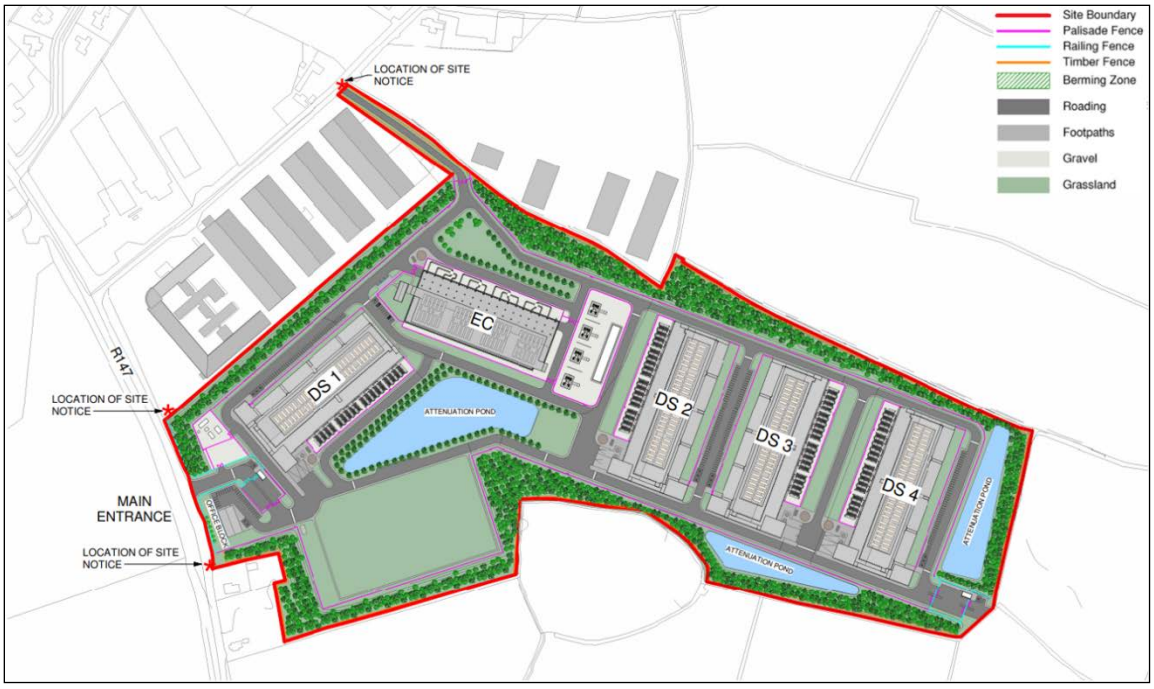


Figure 4.1. Chosen Layout for the proposed development

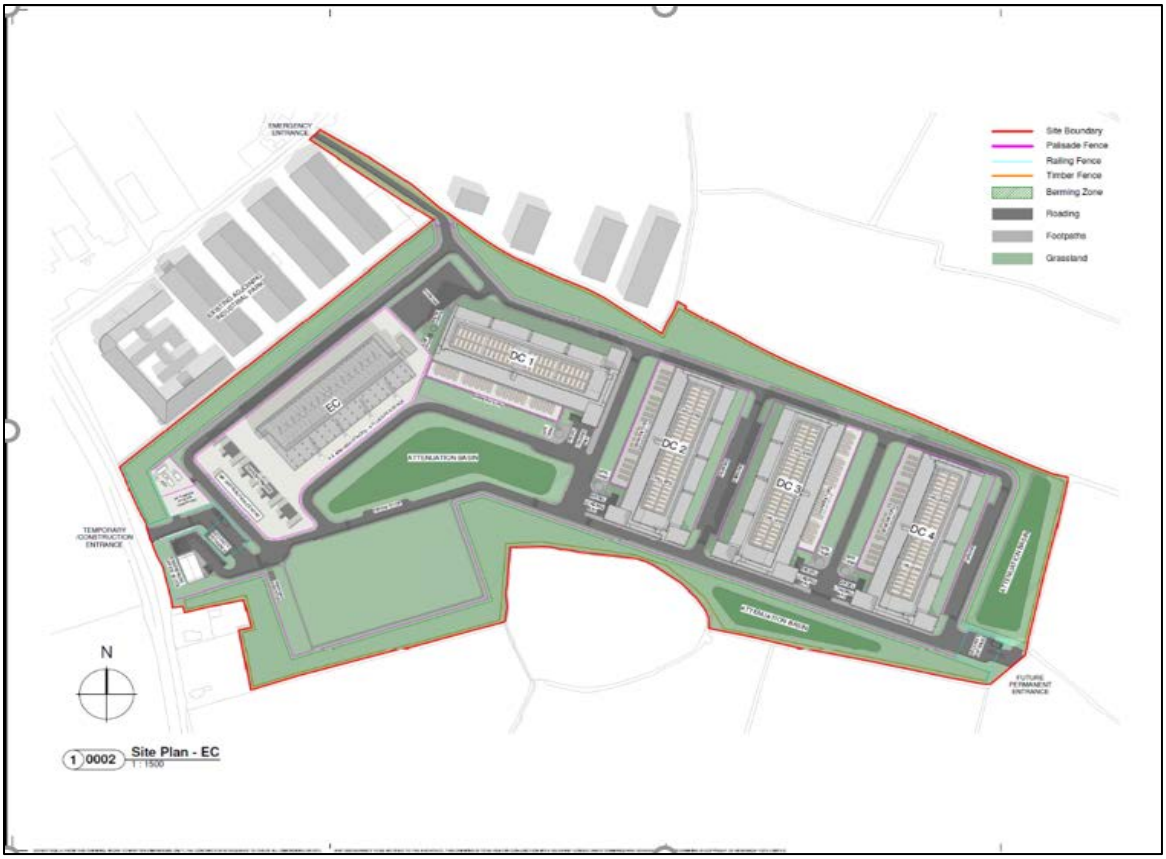


Figure 4.2. Alternative Layout for the proposed development

In addition, abatement measures were considered to minimise flue heights e.g. use of SCR abatement on energy centre flues to reduce flue heights to the minimal feasible in order to meet air quality standards i.e. 40m. The flue heights have been modelled in an iterative fashion (i.e. with incremental increases in flue heights modelled) to ensure that an adequate flue height was selected to aid dispersion of the emissions.

Several arrangements were considered in the development of the chosen site design/layout, however the configuration shown in Figure 4.1 represents the most practical configuration for reasons of the proposed development in relation to the environmental sensitivity of the site's surroundings for the reasons described in Table 4.1 above.

4.5 ALTERNATIVE PROCESSES/TECHNOLOGIES

In terms of the proposed technology, the designers for the proposed development have considered data server technology that is used by other operators in Ireland and around the world and represents state of the art technology.

Alternative technologies are considered on an ongoing basis as a part of each of its designs based on many factors including technical feasibility, environmental impact, efficiency, security, reliability and cost.

EngineNode is committed to continually assessing and improving this technology particularly with respect to minimising power and water consumption, in accordance with the goals of Irelands Framework for Sustainable Development *'Our Sustainable Future'*. Designs are constantly evolving, and hardware is chosen with energy efficiency central to the decision-making process.

Both electrical power and gas-generated power were considered for the proposed development. The chosen design allows for either, or a combination of both, to be utilised allowing for flexibility in sourcing cost effective and sustainable supplies.

4.6 ALTERNATIVE MITIGATION

For each aspect of the environment, each specialist has considered the existing environment, likely impacts of the proposed development and reviewed feasible mitigation measures to identify the most suitable measure appropriate to the environmental setting the project design. In making a decision on the most suitable mitigation measure the specialist has considered relevant guidance and legislation. In each case, the specialist has reviewed the possible mitigation measures available and considered the use of the mitigation in term of the likely residual impact on the environment. The four established strategies for mitigation of effects have been considered: avoidance, prevention, reduction and offsetting (not required in this development). Mitigation measures have also been considered based on the effect on quality, duration of impact, probability and significance of effects.

For example, use of SCR abatement on flues was considered rather than increasing the flue height in order to minimise visual impact as much as possible whilst still meeting air quality standards.

The selected mitigation measures are set out in each of the EIAR Chapters 5-15.

4.7 CONCLUSIONS

The proposed development site is an ideal location for the proposed development from both an environmental perspective and a planning perspective.

The site is currently zoned as 'E2 - General Industry and Employment / E3 - Warehousing and Distribution' is therefore in keeping with the policies and objectives of the Meath County Development Plan 2013 – 2019 (as discussed in Section 3.2.5 of Chapter 3).

The siting of the proposed facility at an existing greenfield site in Clonee, as well as the overall design of the facility, have been carefully selected based on a suitably comprehensive assessment of alternative site locations, designs and processes. The proposed development will considerably enhance the utilisation of the site. Assessment of the design and location of the flues and abatement of generator emissions in the project design have been considered to minimise environmental effects.

In conclusion it is considered that the proposed development site has significant capacity for development and is highly suitable for a data storage facility.

5.0 HUMAN HEALTH AND POPULATION

5.1 INTRODUCTION

This Chapter of the EIAR has been prepared by AWN Consulting (AWN) to assess the likely impacts associated with Human Health for the proposed development.

In accordance with the Draft EPA EIAR Report Guidance (2017), this chapter has considered that:

> *"in an EIAR the assessment of impacts on population and human health should refer to the assessment of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under environmental factors of air, water soil etc"*.

In accordance with the Draft EPA EIA Report Guidelines (2017) and EPA Draft Advice Notes for EIS (2015), this chapter has considered the *"existence, activities and health of people"* with respect to *"topics which are manifested in the environment such as employment and housing areas, amenities, extended infrastructure or resource utilisation and associated emissions"*. Natural hazards are considered in Chapter 2 (Section 2.7) and Chapter 6. Issues examined in this chapter include:

- Demography;
- Population;
- Employment;
- Social Infrastructure;
- Landscape, Amenity and Tourism;
- Natural Resources;
- Air Quality;
- Noise & Vibration;
- Material Assets;
- Traffic; and
- Health and Safety.

Where these topics are dealt with in further detail elsewhere in this EIA Report, the relevant chapters have been cross referenced in this Chapter.

5.2 METHODOLOGY

The effects of the proposed development on the population and human health are analysed in compliance with the requirements of the EPA Draft EIA Report Guidelines 2017.

5.3 RECEIVING ENVIRONMENT

The proposed development is to be located on a c. 24.5-hectare site along the R147 in the townlands of Bracetown and Gunnocks, to the north of Clonee (refer to Figure 1.1). The site is not directly adjacent to any areas of national or local environmental sensitivity.

The potential receptors within the environs of the site include other industrial and commercial businesses in the area, as well as nearby residential developments and farms. While the most notable concentrations of residential settlements occur in

Dunboyne, south west of the site, there are also residential developments in the area surrounding the proposed development site. These residential developments occur predominantly in a one-off development pattern typical of their rural setting. Part of the south western boundary of the site is shared by a residential development.

The surrounding area is described in further detail in Chapter 2 (Description of Development).

5.4 CENSUS AND DEMOGRAPHICS

The most recent census of population was carried out by the CSO on the 24th April 2016. The previous census was completed on the 10th of April 2011 and before that on 23rd April 2006. The census compiles data for the whole state as well as smaller individual areas including counties, cities, towns and electoral divisions. The proposed development site is located in County Meath, adjacent to the Dublin county border. Taking into consideration the location of the proposed development, the census information on population, age profile, employment and social class, has been analysed in relation to the Meath East and Dublin West regions. Further, data from the Dunboyne electoral division (CSO Area Code ED 11009) will be examined.

5.4.1 Population and Demographics

The latest census data shows that the population in the Meath East area grew by 5.0% between the years 2011 and 2016 compared with only 3.8% nationally. Growth of 7.2% was seen in the Dublin West region over the same period. Dunboyne, the electoral division within which the site is located, saw a slightly higher rate of growth than the Meath East region, with an increase of 5.1% (Table 5.1). Projections for the National and the County populations are predicted to continue this trend of moderate to high population growth into the short-term future.

Table 5.1 Population change at National, primary and secondary hinterland level from 2011 – 2016 (*Source: www.cso.ie*)

Area	2011	2016	% Change 2011-2016
State	4,588,252	4,761,865	+ 3.8%
Meath East	86,572	91,142	+ 5.0%
Dublin West	113,179	121,897	+ 7.2%
Dunboyne	9,578	10,094	+ 5.1%

Age Profile

The age profile of the population in the area is an important parameter as it provides a good insight into the potential labour force, the demand for schools, amenities, other facilities and the future housing demand.

Table 5.2 shows the age profiles Nationally and in Meath East and Dublin West for 2016.

Table 5.2 Age profile at National and County level 2016 (*Source: www.cso.ie*)

Area	0-14	15-24	25-44	45-64	65+	Total Persons
State	21%	12%	30%	24%	13%	4,761,865
Meath East	24%	12%	29%	24%	11%	91,142
Dublin West	25%	11%	36%	20%	7%	121,897

This table shows that both Nationally, and in the Meath East and Dublin West areas, the dominant age grouping is 25-44 at 30%, 29% and 36% of the total population, respectively, indicating a young working age population in the area which is above the national level. This also reflects that the overall labour force population (15-64 age group) in Meath East and Dublin West is reflective of the National level of 66%, at 68% and 67% respectively. This is in keeping with census data from 2011 and 2006.

Employment

Table 5.3 presents the employment statistics in 2016 compared with 2011. The data shows that unemployment decreased significantly in the County, as well as nationally, reflecting the economic recovery in recent years.

Table 5.3 Employment statistics Nationally and at County level in 2011 and 2016 (*Source: www.cso.ie*)

	At Work	Looking for first regular job	Unemployed having lost or given up previous job	Total in labour force	% Unemployment
2011 Labour Force					
State	1,807,360	34,166	390,677	3,608,662	11.8
Meath East	36,017	500	6,416	56,500	11.4
Dublin West	49,399	1,101	9,457	75,864	12.5
2016 Labour Force					
State	2,006,641	31,434	265,962	3,755,313	7.9
Meath East	40,128	448	3,788	58,231	6.5
Dublin West	55,958	894	6,514	80,166	8.1

The 2016 census data shows that the majority of people in employment in the Meath East area are in 'Managerial and Technical' employment (31.6%) with the least represented social class being 'Unskilled' workers at (3.5%). In the Dublin West area, the majority of people in employment in 'Managerial and Technical' employment (31.2%) with the least represented social class being 'Unskilled' workers at (3.1%).

At a local level, the dominant social class in the Dunboyne area is 'Managerial and Technical' labour (37.1%) with 'Unskilled' being the least representative (2.7%).

Education

Census data presenting the highest level of education completed by people living in the Dunboyne community and the Meath East and Dublin West areas is presented in Table 5.4. (*Note the table presents key milestone education levels and excludes lower secondary, technical or vocational qualification, advanced certificate/completed apprenticeship, higher certificate, ordinary bachelor degree/national diploma, Ph.D./higher or where information was not stated*).

Table 5.4 Highest level of education completed locally and at County level in 2016 for key educational levels. (*Source: www.cso.ie*)

Area	No formal education	Primary education	Upper secondary	Honours Bachelor's Degree, Professional qualification or both	Postgraduate Diploma or Degree	Total Persons
Dunboyne	40	433	1,191	862	743	6,239
Meath East	733	5,314	11,330	5,957	4,661	57,184
Dublin West	879	4,843	13,193	9,690	8,961	71,889

5.4.2 Labour Force Survey

The Labour Force Survey (LFS) is a large-scale, nationwide survey of households in Ireland carried out every three months. It generates labour force estimates which include the official measure of employment and unemployment for the state.

The National results for Q1 2019 showed that there were 2,301,900 people employed in the State with 114,400 registered as unemployed. This represents a 2.9% increase in employment since the start of 2018.

In both Q1 2018 and Q1 2019, the majority of people were employed in the wholesale and retail trade and repair of motor vehicles and motorcycles sectors, with industry, and human health and social work activities following closely.

5.5 SOCIAL INFRASTRUCTURE

Businesses
The site is currently used for agricultural purposes. Bracetown Business Park is located to north-east of the site with further warehouse development (The Hub Logistics Park) currently being constructed to the north and north west of the site. Planning permission for data centres (Planning Ref. RA/180671) has been obtained for lands to the west and south of the site. These adjoin an existing Runways Information Services Limited facility.

Residential Dwellings
Figure 5.1 presents the residential areas immediately surrounding the proposed development area. Beyond this, the most notable cluster of residential developments occurs in Dunboyne, south west of the proposed development site.



Figure 5.1 Residential Developments

Table 5.5 Residential Developments Locations

Location A	Residential locations to the south of the proposed site.
Location B	Number of private residences located to the north west of the development lands.
Location C	Number of residential units on the opposite side of the R147 to the west of the proposed development lands.

Schools

There are a number of primary and secondary schools in the vicinity of the proposed development including:

- St. Peter's College c. 1.2km south-south-west of the site;
- Dunboyne Junior Primary School c. 1.2km south-south-west of the site;
- Dunboyne Senior National School c. 1.2km south-south-west of the site;
- St. Peter's National School, c. 1.6km southwest of the site; and
- Gaelscoil Thulach na nÓg c. 1.7km south-south-west of the site.

The closest third level institution in the area is Technical University Dublin Blanchardstown, located c. 5.9km east-south-east of the site.

Health

The nearest hospital to the site is Connolly Hospital Blanchardstown located c. 7.4km to the southeast of the site. Family Practitioners, a local GP service, is located c. 1.2km southwest of the site.

Security
There is a Garda station located on the Summerhill Road in Dunboyne c. 1.5km southwest of the site. The closest fire station is c. 6.2km southeast of the site on the Snugborough Road in Blanchardstown.

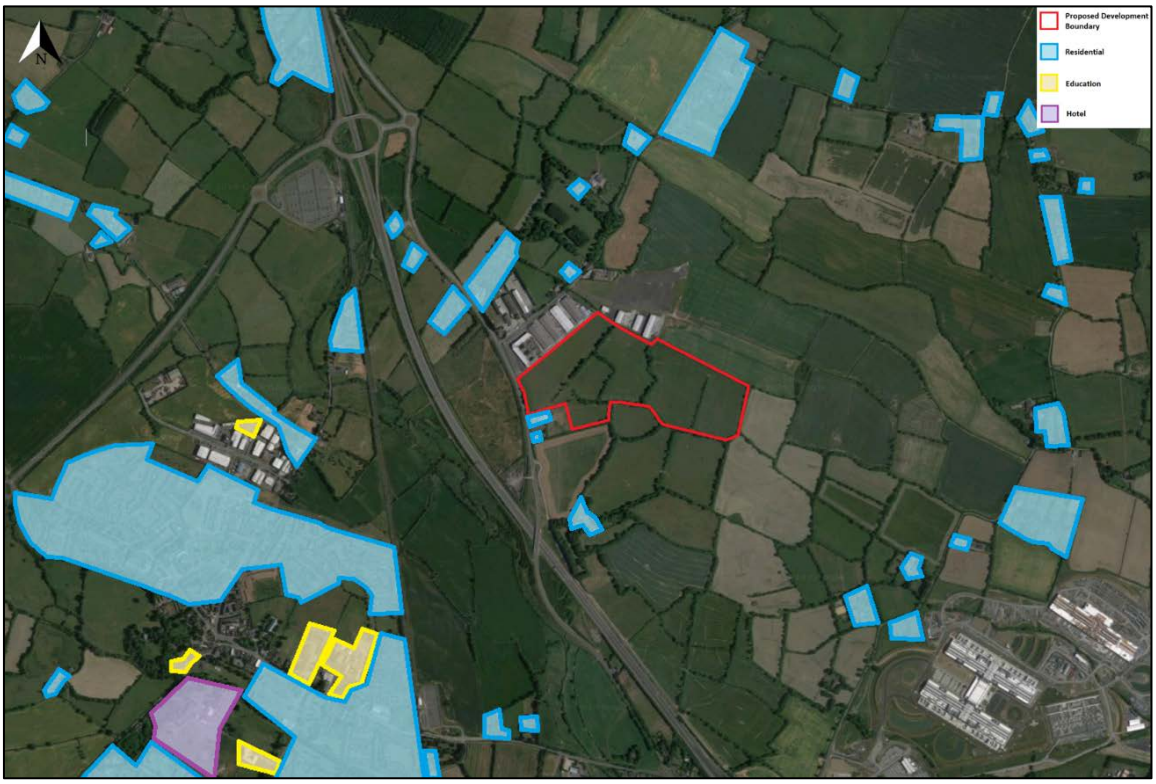


Figure 5.2 Sensitive social infrastructure within c. 1km of the proposed development

5.6 LANDSCAPE, AMENITY AND TOURISM

In terms of landscape amenity, there are no listed or scenic views, no landscape or amenity designations or protected trees pertaining to the site, and no protected structures or National Monuments on the site. There is a protected structure, Gunnocks House, (RPS No. MH051- 100) c. 400m south of the site. Normansgrove House, a protected structure (RPS No. MH050-106) is located c. 475m north of the site. These protected structures are both described in Chapter 11 and in Chapter 12 of this EIAR.

The majority of the land surrounding the proposed development is zoned as E2 General Industry and Employment / E3 Warehousing. A significant area further to the south and east is permitted for development but is still in greenfield. The site itself is greenfield, with an existing industrial area along its north-eastern and north-western boundary. The site is bounded by the R147 to the east. Beyond this, the lands surrounding the site are dominated by undeveloped agricultural lands. The site is not considered to be significant or sensitive from a landscape and visual aspect. The development is suitable for the zoning of the lands and Masterplan for the area. and has an established industrial park (to the north), and regional road and motorway developments (to the west). It is considered that the impact of the proposed development on landscape amenity will vary from ***not significant/slight*** to ***moderate***, and ***negative***. Further discussion is presented in Chapter 11 (Landscape and Visual).

Tourism is not a major industry in the immediate environs of the site. Dunboyne town centre provides a small commercial district along Main Street, c. 1.5km south west of

the site. The closest shopping centres of note is the Blanchardstown Centre c. 5.7km south-east of the site. Dunboyne Castle Hotel and Spa is located c. 1.7km south east of the site. Dublin Airport is located c. 12.5km east of the site.

5.7 NATURAL RESOURCES

Natural resources and land use in the hinterland of the proposed development have also been considered as they may have implications for the development of the lands.

The site itself is currently in agricultural use. In terms of extractive industries, the closest quarries are Huntstown Quarry in Finglas (c. 9.5km east of the site) and Fortunestown Quarry in Belgard (c. 14.9km south-south-east of the site), both of which are operated by Roadstone Ltd. There are no anticipated impacts on these facilities from the proposed development. Further detail on extractive industries is presented in Chapter 7 (Land, Soils, Geology and Hydrogeology).

5.8 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

The impact of construction, commissioning, operation and decommissioning of the proposed development are considered below.

5.8.1 Potential Impacts on Businesses and Residences

The main potential impacts on local businesses and residences associated with the proposed development will be in relation to air quality, noise, visual impact and traffic. The potential impacts and mitigation measures to address them are dealt with within the corresponding chapters of this EIAR as follows:

- Chapter 9 – Air Quality and Climate
- Chapter 10 – Noise and Vibration
- Chapter 11 – Landscape and Visual Impact
- Chapter 13 – Traffic and Transportation

The proposed development will result in increased employment during construction and operation. It is also anticipated that the proposed development will have indirect positive effects on employment in terms of construction material manufacture, maintenance contracts, equipment supply, landscaping etc. This may result in a short-term pressure for housing supply locally. The provision of the wastewater pumping station as port of the proposed development will benefit the adjacent business park.

5.8.2 Potential Impacts on Human Health from Air Quality

As outlined in Chapter 9 (Air Quality and Climate), National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are based on the protection of the environment as well as the protection of human health. Additional factors such as natural background levels, environmental conditions and socio-economic factors are also considered in the limit values which are set (see Chapter 9, Table 9.1). The ambient air quality standards established are designed to minimise harmful effects to health.

5.8.2.1 Construction Phase

As detailed in Chapter 9 (Air Quality & Climate), best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure compliance with all EU ambient air quality legislative limit values which are based on the protection of human health. Similar mitigation measures and impact assessment will apply for decommissioning.

5.8.2.2 Operational Phase

As detailed in Chapter 9 Air Quality & Climate, air dispersion modelling was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the dispersion modelling results, emissions from the site, assuming scheduled testing as well as emergency operation of the back-up diesel generators and continuous operation of the gas engines, are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health either from the proposed development itself or cumulatively with surrounding development. Conservative assumptions were made when determining the input data for the air modelling assessment and the approach used in the study leads to an over-estimation of the actual levels that will arise. In relation to the spatial extent of air quality impacts from the site, ambient concentrations will decrease significantly with distance from the site boundary.

The potential impact to air quality during the operational phase of the proposed development as a result of air emissions from the gas engines and emergency diesel generators was assessed by modelling. In section 9.6 of Chapter 9, an iterative stack height determination was undertaken as part of the air dispersion modelling study to ensure that an adequate release height was selected for all emission points to aid dispersion of the plume and ensure compliance with the ambient air quality limit values at all locations beyond the site boundary. The mitigation measures within the design of the proposed development will ensure that the emissions comply with all EU ambient air quality legislative limit values which are based on the protection of human health.

5.8.3 Potential Impacts on Human Health from Noise & Vibration

Exposure to Excessive noise is becoming recognised as a large environmental health concern. According to the 2015 European Commission report ‘Noise Impacts on Health’, (European Commission, 2015), the most common effects of noise on the vulnerable include;

- Annoyance
- Sleep Disturbance
- Heart and circulation problems
- Quality of Life
- Cognitive Process
- Hearing

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes.

Noise and vibration impacts associated with the development have been fully considered within Chapter 10 of the EIA Report. Modelling of construction and operation has been undertaken to assess likely impact at residential and commercial boundaries. Commentary on the impact assessment and related noise levels are summarised below with respect to potential environmental health impacts.

5.8.3.1 Construction Phase

As detailed in Chapter 10 (Noise and Vibration), there will be some impact on nearby commercial and residential receptors during construction (Figure 10.5- 10.9). due to noise emissions from site activity and traffic. The application of noise limits and limits on the hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum. Due to the distance between the site and the nearest sensitive locations, vibration impacts generated during construction are expected to be negligible. Construction noise and vibration will be typically limited to daytime periods only. In terms of health effects these are typically associated with long term exposure to elevated levels of noise and/or vibration which will not be the case in relation to construction sources which would be expected to be the order of or below existing ambient levels in the vicinity of the site for the vast majority of the construction period. There are no health risks associated with operational noise resulting from the construction of the development subject to implementation of good site management practices and mitigation measures as required, as outlined in the relevant sections of the noise assessment and referenced documents.

5.8.3.2 Operational Phase

In essence, the noise levels from the proposed development at the nearest noise sensitive locations are predicted to be within relevant noise criteria that have been adopted here for the operation of the proposed data storage facilities and associated infrastructure. The noise limits at the nearest noise sensitive locations are set in line with the EPA NG4 (2016) guidelines. In addition, the predicted operational noise levels associated with the normal operation of the facility are below those set by the WHO *Guidelines for Community Noise (WHO 1999)* document in order to avoid any daytime annoyance or speech interference and/or nighttime sleep disturbance, etc. Taking the above into consideration, operational noise predictions from the facility are below the adopted criteria that are based on the thresholds below which, there is no evidence of significant effects in relation long-term exposure to noise on human health. There are no potential health risks associated with operational noise resulting from the development.

The proposed development will not generate any perceptible levels of vibration during operation and therefore there will be no impact from vibrations on human health.

5.8.4 Potential Impacts on Local Amenities and Tourism

The location of the proposed development adjacent to an existing industrial/commercial park and permitted data centre campus will have an impact on use of local amenities through greater use by employees. This will be in line with the general change of land use in the local area. It is considered that there will be a ***long-term***, ***moderate*** impact on the landscape amenity areas identified in Section 5.6.

It is not anticipated that the development will have any impact on local tourism.

5.8.5 Potential Impacts on Material Assets

The proposed development will require power supply. It is intended that the energy centre proposed as part of the proposed development and grid will supply power to site. The requirements for power supply have been detailed in Chapter 14 (Material Assets). Consultation has been undertaken with the utility providers (gas and electric) regarding capacity in the area network for the required power demand. There is no predicted impact on power supply to local residential or business users.

5.8.6 Potential Impacts from Additional Traffic

The World Health Organisation Report 'Health Effects and Risks of Transport Systems: The Hearts Project' (World Health Organisation, 2006) states that road traffic is a major cause of adverse health effects - ranking with smoking and diet as one of the most important determinants of health in Europe. The report states;

> *"Traffic-related air pollution, noise, crashes and social effects combine to generate a wide range of negative health consequences, including increased mortality, cardiovascular, respiratory and stress-related diseases, cancer and physical injury. These affect not only transport users but also the population at large, with particular impact on vulnerable groups such as children and elderly people, cyclists and pedestrians"*

In the Department of Communications, Climate Action & Environment document *Cleaning Our Air – Public Consultation to Inform the Development of a National Clean Air Strategy* vehicle emissions are included as a key source of health impacts in Ireland (DOCCA&E, 2017).

An assessment of the additional traffic movements associated with the proposed development during the construction and operational phases is presented in Chapter 13 (Traffic and Transportation).

The increase in traffic volumes associated with the construction and operational phases of development is not likely to have any adverse transport-related environmental effects in terms of noise, air quality, vibrations, etc.

The traffic assessment shows that the additional traffic movements associated with the proposed development were found to be ***medium-term, negative*** and ***not significant*** for the construction phase and ***long-term, neutral*** and ***imperceptible*** for the operational phase.

Chapter 13 also includes information on traffic accidents over the last 5 years in the vicinity of the site. Based on the collision data analysis, it can be concluded that there are no accident black spots or notable accident patterns that would indicate a road safety design flaw on the road infrastructure surrounding the site.

5.8.7 Unplanned Events/Impacts on Health and Safety

The proposed development has been designed in accordance with the Safety, Health and Welfare at Work Act 2005 (S.I. 10 of 2005) as amended and the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. 299 of 2007) as amended and associated regulations. The plant has been designed by skilled personnel in accordance with internationally recognised standards, design codes, legislation, good practice and experience based on a number of similar existing facilities operated by the operator.

The proposed development has the potential for an impact on the health and safety of workers employed on the site, particularly during the construction phase. The activities of contractors during the construction phase will be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) as amended to minimise the likelihood of any impacts on worker's health and safety.

During the operational phase of the development, the operator will implement an Environmental Safety and Health (EH&S) Management System and associated procedures at the facility. Full training in the EH&S Management System and relevant procedures will be provided to all employees.

The 2014 EIA Directive, 2018 EIA Regulations and associated EPA Draft EIA Report Guidelines 2017 require that the vulnerability of the project to major accidents and/or natural disasters (such as earthquakes, landslides, flooding, sea level rise etc.) is considered in the EIA Report.

The site has been assessed in relation to the following external natural disasters; landslides, seismic activity, volcanic activity and sea level rise/flooding as outlined below. The potential for major accidents to occur at the facility has also been considered with reference to Seveso/Control of Major Accident Hazards (COMAH) Regulations.

There is a negligible risk of landslides occurring at the site and in the immediate vicinity due to the topography and soil profile of the site and surrounding areas. There is no history of seismic activity in the vicinity of the site. There are no active volcanoes in Ireland so there is no risk of volcanic activity.

The potential risk of flooding on the site was also assessed. A Stage 1 Flood Risk Assessment was carried out and concluded that the development is not at risk of flooding. Furthermore, the proposed development design has adequate attenuation etc. to ensure there is no potential impact on flood risk for other neighbouring properties.

The proposed development will not be a Seveso/COMAH facility. The only substance stored on site controlled under Seveso/COMAH will be diesel for generators and the amounts proposed do not exceed the relevant thresholds of the Seveso Directive. The proposed development site is not located within the consultation distance of any COMAH establishment that is notified to the HSA.

There is a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction and operational phases. However, the implementation of the mitigation measures set out in Section 6.6 of Chapter 6 (Land, Soils, Geology and Hydrogeology) and Section 7.6 of Chapter 7 (Hydrology) of the EIA Report will ensure the risk of a minor accident is low and that the residual effect on the environment is imperceptible.

5.9 DO NOTHING SCENARIO

If the proposed development were not to proceed it is likely that the lands would be developed in time for another development in line with the zoning of the site for E2 General Industry and Employment / E3 Warehousing and Distribution.

5.10 REMEDIAL AND MITIGATION MEASURES

The impacts on the local population in terms of residents and businesses are considered to be mainly positive in the sense of creating direct employment opportunities and indirect additional business, both during the construction and operational phases.

Mitigation measures proposed to minimise the potential impacts on human health in terms of air quality and climate, traffic, noise and vibration are discussed in the relevant sections of Chapters 9, 10 and 13 respectively.

5.11 RESIDUAL IMPACTS

It is expected that the proposed development in combination with adjacent development will have a ***long term, neutral, not significant impact*** on the immediate hinterland with positive changes in terms of employment opportunities and the associated economic and social benefits.

All other environmental aspects relating to the human environment which have the potential to impact on the local population such as air quality and climate, noise and vibration, material assets and traffic are addressed in Section 5.8 and in more detail in the relevant chapters of this EIA Report.

Measures outlined in Section 5.8.7 will be put in place to ensure the health and safety of all site personnel during both construction and operational phases.

5.12 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

5.12.1 Predicted Impacts on Businesses and Residences

5.12.1.1 Construction Phase

It is predicted that there will be a slight positive impact on local business activity during the construction phase with the increased presence of up to 500 no. construction workers using local facilities. The positive impact during the operational phase will be less with c. 245 no. full-time employees anticipated to be on site during operation.

5.12.1.2 Operational Phase

The completed development will also have a positive impact in the provision of additional capacity in cloud computing and data storage, the demand for which remains high. The operator offers a broad set of global compute, storage, database, analytics, application and deployment services that help organisations (both locally, nationally and internationally) operate faster, lower ICT costs and scale applications. The provision of these services will also improve individuals online experience and accessibility.

5.12.2 Predicted Impacts on Human Health from Air Quality

5.12.2.1 Construction Phase

Impacts on human health from air quality are typically associated with long-term exposure to elevated levels air with quality exceeding EU ambient air quality legislative limit values (which are based on the protection of human health). Assessment of the construction programme for the proposed development in combination with background air quality and consideration of known future scenarios concluded that air quality will be below EU ambient air quality legislative limit values The predicted impacts with regard to human health from air quality are therefore concluded to be ***neutral*** and ***imperceptible.***

5.12.2.2 Operational Phase

As detailed in Chapter 9 Air Quality & Climate, air dispersion modelling was undertaken to assess the impact of the development with reference to EU ambient air quality standards which are based on the protection of human health. As demonstrated by the dispersion modelling results, emissions from the site, assuming scheduled testing as well as emergency operation of the back-up diesel generators and continuous operation of the gas engines, are compliant with all National and EU ambient air quality limit values and, therefore, will not result in a significant impact on human health either from the proposed development itself or cumulatively with surrounding development. The predicted impacts with regard to human health from air quality are therefore concluded to be ***neutral*** and ***imperceptible.***

5.12.3 Predicted Impacts on Human Health from Noise & Vibration

5.12.3.1 Construction Phase

Impacts on human health from noise and vibration are typically associated with long term exposure to elevated levels of noise and/or vibration. Assessment of the construction programme for the proposed development in combination with background noise and consideration of known future scenarios concluded that noise is expected to be below existing ambient levels for the vast majority of the construction period. The predicted impacts with regard to human health from noise and vibration are therefore concluded to be ***neutral*** and ***imperceptible.***

5.12.3.2 Operational Phase

As detailed in Section 5.8.3.2, the noise levels from the proposed development at the nearest noise sensitive locations are predicted to be within relevant noise criteria that have been adopted here for the operation of the proposed data storage facilities and associated infrastructure. The noise limits at the nearest noise sensitive locations are set in line with the EPA NG4 (2016) guidelines. In addition, the predicted operational noise levels associated with the normal operation of the facility are below those set by the WHO *Guidelines for Community Noise (WHO 1999)* document in order to avoid any daytime annoyance or speech interference and/or nighttime sleep disturbance, etc. Taking the above into consideration, operational noise predictions from the facility are below the adopted criteria that are based on the thresholds below which, there is no evidence of significant effects in relation long-term exposure to noise on human health. There are no health risks associated with operational noise resulting from the development.

The proposed development will not generate any perceptible levels of vibration during operation and therefore there will is no predicted impact from vibrations on human health.

The impacts are concluded as ***neutral*** and ***imperceptible.***

5.12.4 Predicted Impacts on Human Health from Additional Traffic

An assessment of the additional traffic movements associated with the proposed development during the construction and operational phases is presented in Chapter 13 (Traffic and Transportation).

The increase in traffic volumes associated with the construction and operational phases of development is not likely to have any adverse transport-related environmental effects in terms of noise, air quality, vibrations, etc.

The predicted impact on human health from additional traffic is ***medium-term, negative*** and ***not significant*** for the construction phase and ***long-term, neutral*** and ***imperceptible*** for the operational phase.

5.13 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact of the proposed development together with any/all relevant other planned or permitted developments (including the substation and grid options as outlined in Chapter 2) are discussed in Sections 5.13.1 and 5.13.2 below for construction and operational phases.

5.13.1 Construction Phase

The construction phase of the proposed development together with any/all relevant other planned or permitted developments will have a ***positive*** impact in terms of employment.

Other impacts are traffic, dust and noise. The traffic assessment shows that the additional traffic movements will result in a cumulative impact of ***negative*** and ***not significant*** for the construction phase.

In terms of health effects these are typically associated with long term exposure to elevated levels of noise and/or vibration or air quality exceeding EU ambient air quality legislative limit values (which are based on the protection of human health). Assessment of the construction programme for the proposed development in combination with background noise and air quality and consideration of known future scenarios concluded that noise is expected to be below existing ambient levels for the vast majority of the construction period and air quality below EU ambient air quality legislative limit values The cumulative impacts with regard to human health are therefore concluded to be ***neutral, and imperceptible.***

5.13.2 Operational Phase

The proposed development in combination with with any/all relevant other planned or permitted developments will have a ***positive*** *impact* in terms of employment opportunities and the associated economic and social benefits. Traffic modelling has shown there will be a cumulative ***neutral*** and ***imperceptible*** impact for the operational phase.

The mitigation measures within the design of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. The substation and grid will have no likely air quality impacts during operation. All surrounding development will be required as part of legislative and planning requirements to meet National and EU air quality standards.

Operational noise levels from the proposed development and surrounding development have been modelled and shown be in line with the EPA NG4 (2016) guidelines at nearest receptors. In addition, the predicted operational noise levels associated with the normal operation of the proposed facility are below those set by the WHO *Guidelines for Community Noise (WHO 1999)* document in order to avoid any daytime annoyance or speech interference and/or night time sleep disturbance, etc. Taking the above into consideration, operational noise predictions are below the adopted criteria that are based on the thresholds below which, there is no evidence of significant effects in relation long-term exposure to noise on human health.

Traffic assessment modelling of the proposed development in combination with with any/all relevant other planned or permitted developments *is considered long-term, neutral and imperceptible.*

The cumulative impact is therefore concluded as ***neutral*** and ***imperceptible*** with respect to human health.

6.0 HYDROLOGY

6.1 INTRODUCTION

This chapter presents an assessment of the existing environment and the likely impacts of the proposed development on hydrology within the local environment.

In assessing likely potential and predicted impacts, account has been taken of both the importance of the attributes and the predicted scale and duration of the likely impacts. Where an impact is identified, planned mitigation measures are identified and assessed.

6.2 METHODOLOGY

The Assessment has been carried out generally in accordance with the following guidelines:

- EPA Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017);
- EPA 'Draft Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (2015);
- National Roads Authority (NRA) 'Guidelines on Procedures for the Assessment and Treatment of Hydrology for National Road Schemes' (2009).

In the EIA assessment, consideration is given to both the importance of an attribute and the magnitude of the potential environmental impacts of the proposed activities on that attribute. Appendix 6.1 presents the impact assessment criteria provided in the IGI publication[1].

The principal attributes (and impacts) to be assessed include the following:

- Surface watercourses near the site and potential impact on surface water quality arising from the proposed development related works including any discharge of surface water run-off;
- Localised flooding (potential increase or reduction) and floodplains including benefitting lands and drainage districts (if any).

Sources of Information

The collection of baseline regional data was undertaken by reviewing the following sources:

- Current EPA on-line database -Envision water quality monitoring data for watercourses in the area; and,
- River Basin District (ERBD) Management Plan;

[1] The NRA/IGI criteria for rating the magnitude and significance of impacts at EIA stage on the soils/ geological related attributes are also relevant in determining attribute importance and impact assessment and are presented in Appendix 6.1.

- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW));
- Office of Public Works (OPW) flood mapping data (www.floodmaps.ie);
- Dublin City Council (2005), Greater Dublin Strategic Drainage Study: Technical Documents of Regional Drainage Policies. Dublin: Dublin City Council;
- DoEHLG & OPW (2009) Flood Risk Management Guidelines for Planning Authorities;
- 'Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors' (CIRIA 532, 2001);
- "Guidelines on protection of fisheries during construction works in and adjacent to waters" Inland Fisheries Ireland (2016);
- Meath County Council 92018), Making Meath Climate Ready: Our climate Action Strategy, and;
- Project Runways Expansion EIAR (2018).

Site specific data was derived from a site walkover and the following sources:

- IGSL Site Investigations (May 2019);
- Various design site plans and drawings.

Figure 6.1 below presents the location of the proposed development site.

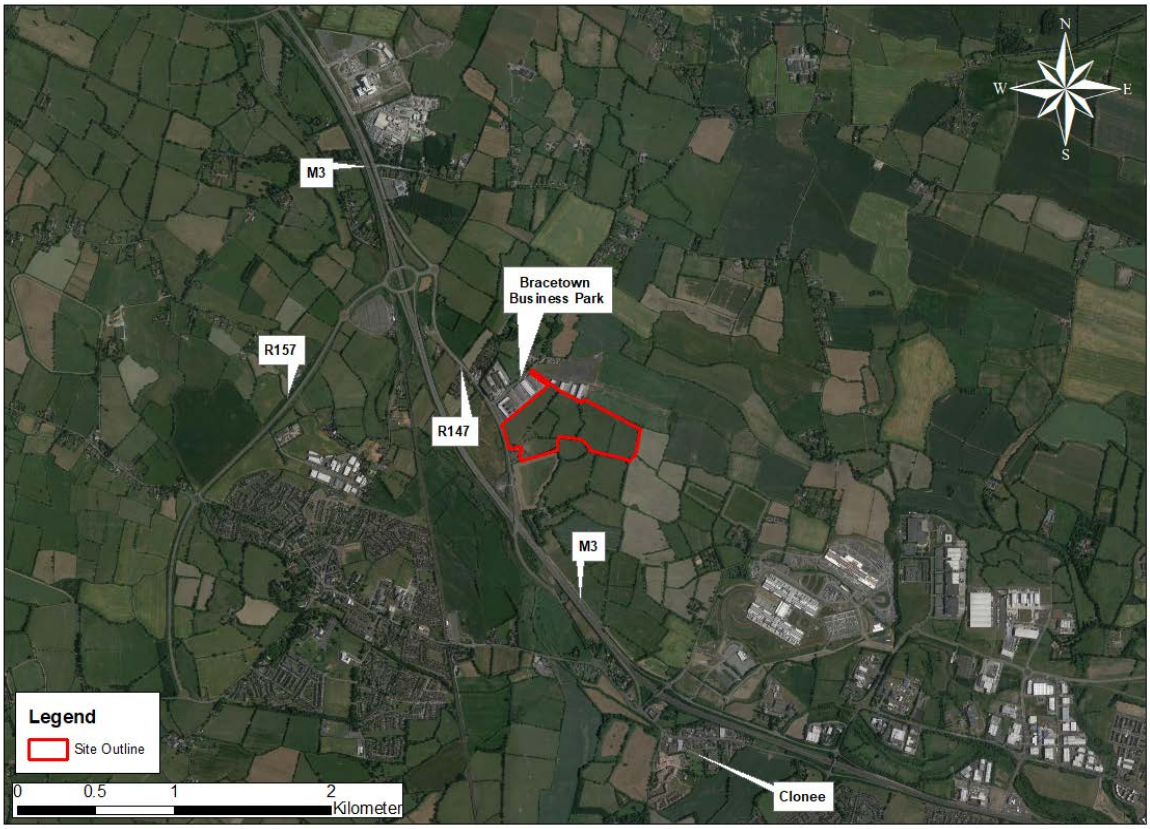


Figure 6.1 Site location indicated by redline boundary

6.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The description of the proposed development is presented in detail in Chapter 2 – Description of Development. The proposed development comprises four data centres, an energy centre and associated ancillary development on a greenfield site along the R147 in the townland of Bracetown and Gunnocks, to the north of Clonee, Co Meath. Specific aspects of the development in relation to surface water include:

- Increase in hardstand area and infrastructure for stormwater attenuation;
- Increase in foul sewage discharge to the public sewer. Note there is no trade effluent discharge;
- Increase in water supply requirement;
- Cut and fill during construction resulting in increased risk of run-off containing suspended solids, and;
- Potential for contamination of surface water due to an accidental leak during construction or operation.

6.4 THE RECEIVING ENVIRONMENT

6.4.1 Site Description

The site is a large greenfield area which is located in Bracetown, Dunboyne, Co. Meath just off the M3 Motorway. The surrounding environment can be described as a mix of agricultural and industrial (to the west). The site is circa 25 hectares in area and is zoned as industrial/commercial (E2 - General Industry and Employment / E3 - Warehousing and Distribution as per the Meath County Development Plan 2013-2019 (MCDP)).

6.4.2 Topography

The proposed development site gradient varies between 71.75 metres Ordnance Datum (mOD) at its highest and 67 mOD at its lowest. The gradient is 1 in 175 west to east and 1 in 135, north to south. This is in line with the topography of the surrounding area which slopes gently to the southeast.

6.4.3 Wastewater

As the site is currently a greenfield site, there is no connection with the municipal foul sewer.

6.4.4 Water Supply

As the site is currently a greenfield site, there is no connection with the local water network.

6.4.5 Regional Surface Water Environment

The site lies within the River Tolka catchment. Figure 6.2 below presents the hydrological environment of the EngineNode site and surrounding area. The site is drained by the Pace Stream from north to south. Pace Stream joins the Pinkeen Stream c. 2.5 river km downstream to the southeast. The Pinkeen Stream joins the River Tolka c. 1 km further downstream. The River Tolka discharges to north Dublin Bay over 30 km downstream.

The site does not have hydrological connection with the Rye Water Valley/Carton SAC (6.45km to the South) which is part of the Liffey catchment.



Figure 6.2 Hydrological Environment

6.4.6 Local Drainage

The site is drained by a network of agricultural ditches which ultimately flows toward the Pace Stream downstream the site. Upstream of the site, the Pace stream is diverted by a local ditch in the north of the site (refer to Figure 6.3 below).

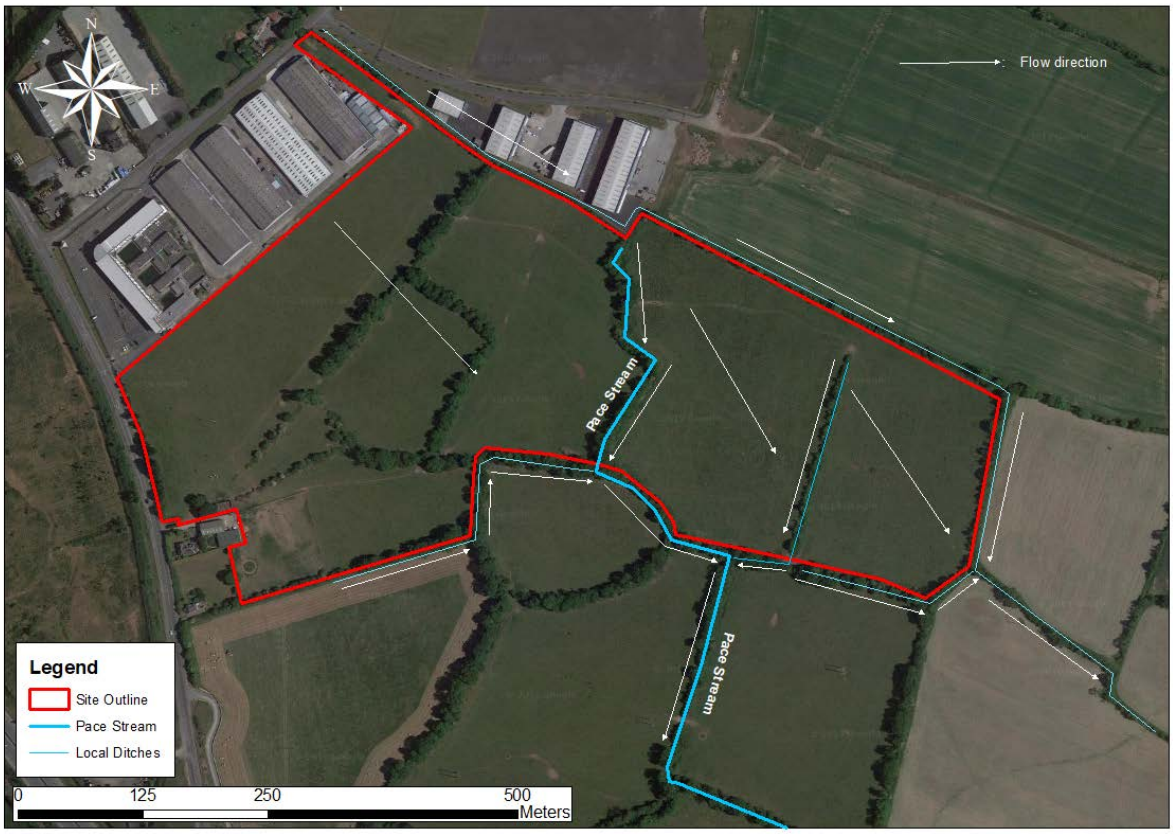


Figure 6.3 Local drainage

6.4.7 Surface Water Quality

The EU Water Framework Directive (2000/60/EC) European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]).

The WFD requires 'Good Water Status' for all European waters to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'good ecological status' and 'good chemical status'. In 2018, the River Basin Management Plan for Ireland 2018-2021 was published. The impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD and include a programme of measures to address and alleviate these pressures.

The most recent published status (www.epa.ie - River Waterbody WFD Status 2010-2015) of the Tolka river, Pinkeen stream and Pace stream in the vicinity of the proposed development is '*Bad*' and its environmental risk is qualified by the WFD as '*At Risk*'.

The available results of the biological water quality monitoring at the EPA water quality monitoring locations are provided in Table 6.1 and the legends to explain the Biological Rating System (Q Values) are provided in Table 6.2.

Table 6.1 EPA Q Ratings for the Tolka River and Pinkeen Stream

River Station			Biological Quality Rating (Q Values)										
Code	**River**	**Location**	**1973**	**1975**	**1977**	**1979**	**1981**	**1983**	**1985**	**1987**	**1988**	**1989**	**1991**	**1994**
RS09T010700	Tolka	Clonee Br	3-4	2-3	3-4	2-3	3	2-3	2-3		2		2	2-3
RS09T010800	Tolka	Mulhuddart Br	2	2-3	3-4	3	3	3	2	3	2	2-3	2-3	3
RS09P020400	Pinkeen	Br S of Nuttstown Cross												

River Station			Biological Quality Rating (Q Values)										
Code	**River**	**Location**	**1996**	**1998**	**2002**	**2005**	**2007**	**2008**	**2010**	**2013**	**2015**	**2016**	**2017**	**2018**
RS09T010800	Tolka	Clonee Br												
RS09T010800	Tolka	Mulhuddart Br	2-3	3	3	3	2-3		2-3		2	2	2-3	2-3
RS09P020400	Pinkeen	Br S of Nuttstown Cross	3	2-3										

Table 6.2 Monitoring results for the Tolka River

Q Value	WFD Status	Pollution Status	Condition
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2	Bad	Seriously polluted	Unsatisfactory

As can be seen from the monitoring data in Table 6.2, the Tolka River was classified as '*Seriously Polluted*' according to River Waterbody WFD Status 2010-2015. However, an improving to a '*Moderately Polluted*' status is observed during 2017 and 2018 monitoring rounds.

6.4.8 Flood Risk

A strategic flood risk Assessment (SFRA) was developed as part of the MCDP. In thus it shows that the site as being outside any identified flood zones and does not indicate the site is at risk from any fluvial pluvial or coastal flooding event.

There are no historic flood events recorded in the vicinity of the site, as can be seen in Figure 6.4 below.

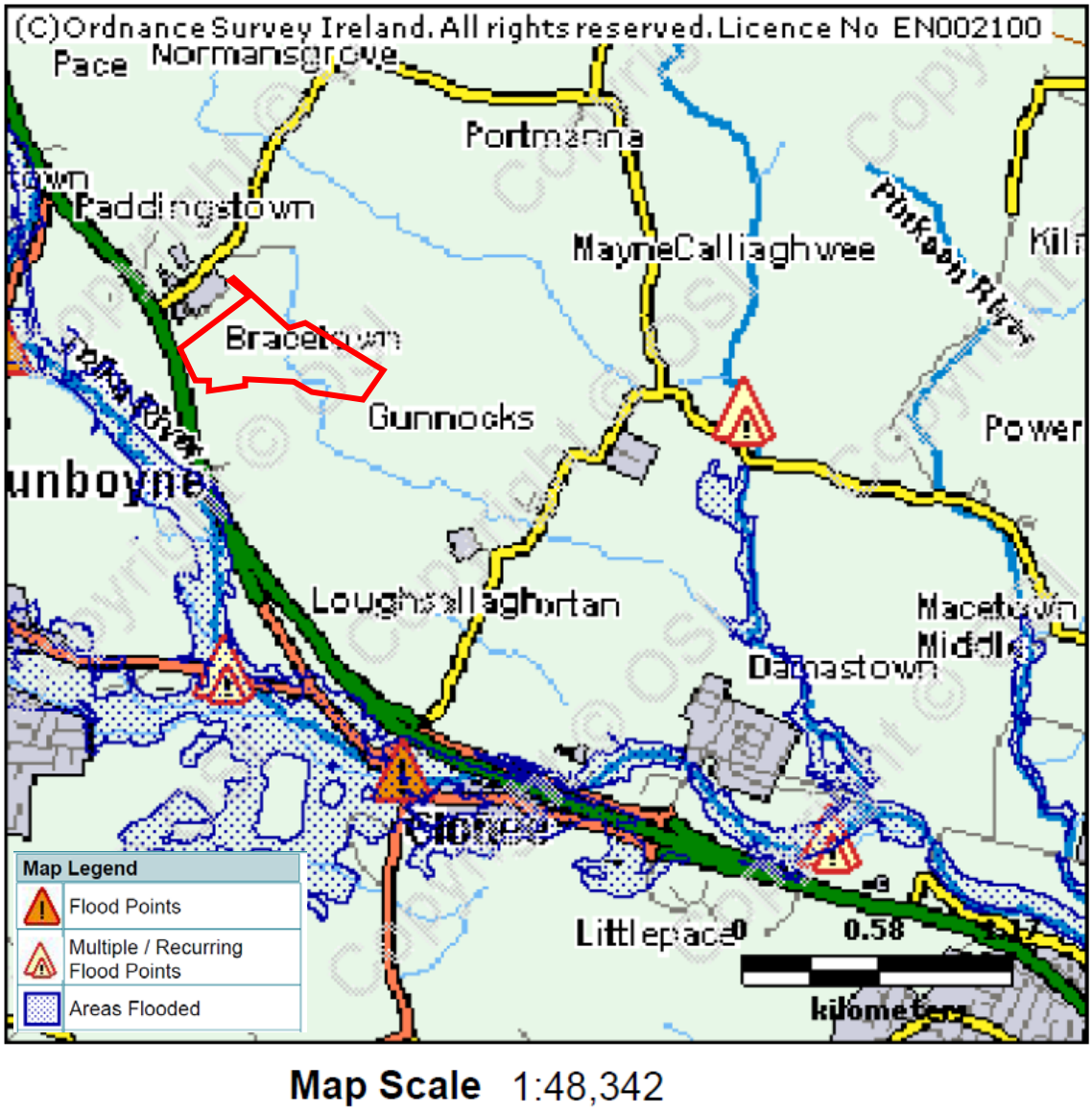


Figure 6.4 Flood Risk Map (source: www.floodmaps.ie)

6.4.9 Areas of Conservation

There are no proposed Special Areas of Conservation (pSAC), Special Protection Areas (SPAs) or Natural Heritage area (NHA) within the study area boundary. According to the NPWS (2019) on-line database, the following area of conservation are located closest to the subject site.

Table 6.3 Details of European sites within the potential zone of impact of the project.

Site Code	Site Name	Distance (km)[2]
001398	Rye Water Valley/Carton SAC	6.45
000206	North Dublin Bay SAC	19.02
000210	South Dublin Bay SAC	18.52
004024	South Dublin Bay and River Tolka Estuary SPA	16.25
004006	North Bull Island SPA	19.02

The nearest European site to the proposed development is the Rye Water Valley/Carton SAC (Site Code 000199). There is no connectivity to the Rye Water as the site is drained by ditches which flow to the Pinkeen River which discharges to the River Tolka.

The River Tolka discharges to north Dublin Bay approximately 22.6 river km downstream. There are four European sites located in Dublin Bay, namely: South Dublin Bay SAC (Site Code 000210); North Dublin Bay SAC (Site Code 000206); South Dublin Bay and River Tolka Estuary SPA (Site Code 004024); North Bull Island SPA (Site Code 004006).

The Royal Canal (pNHA) is located c. 6km south. As the canal is lined there is no hydrological connection with the proposed development site.

6.4.10 Rating of Site Importance of Hydrological Features

Based on the NRA methodology (2009) (refer to Appendix 6.1), criteria for rating site importance of hydrological features, the importance of the hydrological attributes at this site is rated as '*Medium*' to '*Low*' importance with medium to low quality or value on a local scale, due to the status of the river waterbodies in the vicinity of the site, which are classified as 'Bad' by the WFD but a slight improving to 'Poor' status can be observed during the last two years.

6.5 IMPACTS OF THE PROPOSED DEVELOPMENT

The potential impacts of the construction and operational phases of the proposed development in terms of wastewater, water supply and surface water are outlined below.

6.5.1 Wastewater

6.5.1.1 Construction Phase

There are no predicted adverse impacts on wastewater during construction. Welfare facilities will be provided for the contractors on site during the construction works. These facilities may in time be connected to the Irish Water (IW) foul drainage system once the pumping station is installed (along the R147 site entrance). During initial stages of

[2] Distances indicated are the closest geographical distance between the proposed Project and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

construction, portable sanitary facilities will be provided with waste collected and disposed of appropriately.

There are no predicted adverse impacts on wastewater during construction. The predicted impact during construction is considered to be ***short term – imperceptible***.

6.5.1.2 Operational Phase

There are no predicted adverse impacts on wastewater during operation. Foul sewage will be collected from site (data storage facilities, offices and energy centre washroom facilities and canteen) and discharged through a new pumping station to the foul drainage network which runs along the R147 and ultimately discharges to Ringsend WWTP. The WWTP is due to be upgraded and will have adequate capacity. Consultation with Irish Water has been undertaken by the project engineers and confirmed the capacity is available for the proposed development.

There are no predicted adverse impacts on wastewater during operation. The predicted impact during operation is considered to be ***long term – imperceptible***.

Copies of the application to Irish Water are included with Chapter 14.

6.5.2 Water Supply

6.5.2.1 Construction Phase

There are no predicted adverse impacts on water supply during construction. IW has confirmed there is adequate capacity to facilitate construction requirements into the existing network. The predicted impact during construction is considered to be ***short term – imperceptible.***

6.5.2.2 Operational Phase

There are no predicted adverse impacts on water supply during operation. IW has confirmed there is adequate capacity to facilitate operation requirements into the existing network. The predicted impact during operation is considered to be ***long term – imperceptible***.

Copies of the application to Irish Water are included with Chapter 14.

6.5.3 Surface Water

6.5.3.1 Construction Phase

Surface Water Runoff

During the construction phase, any surface water run-off collecting in excavations or from exposed soil will likely contain a high sediment load. This will be diverted to settlement ponds and will not be allowed to directly discharge directly to the existing field ditches which flow towards the Pace stream. Buffer zones will be applied.

The excavation will require soil removal. A suitable area will be allocated for temporary stockpiling of excavated materials pending removal for reuse which will be located away from any surface water courses or other sensitive receptors. After a heavy rainfall event runoff can occur from these stockpiles, this runoff can be heavily silted and can impact on land drains if uncontrolled.

Aggregate materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination.

Previous uses of the site and site testing has not indicated any evidence of contamination at the site.

Uncontrolled Discharges

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

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.

Liquid materials will be stored within temporary bunded areas, doubled skinned tanks or bunded containers

The predicted impact during construction is considered to be ***short term – imperceptible*** and ***neutral*** i.e. a change which does not impact on the quality of the environment.

6.5.3.2 Operation Phase

Increase in Hardstand

There will be an increase in hardstand as a result of the development of the facilities of c.153,480m^2. Rainfall which had previously discharge to ground and field drains will be collected using a network of swales along the edge of the internal road network. Reinforced grass-crete or similar will also be used along parts of the road network to increase infiltration on less heavily trafficked access roads. These drains and swales will discharge to 3 no. surface water retention pond/attenuation pond to a maximum rate of the 1% Annual Exceedance Pollution event (1:100-year return period).

Oil Unloading and Storage

Fuel oil for the emergency boilers and a single tank in the energy centre is the only required bulk chemical storage required on site. Each data storage facility service yard will have bunded storage tanks (c. 520m^3) of fuel oil per data centre is anticipated to be stored externally at each data centre building for emergency use. The total fuel store will be 2,080m^3 (including the energy centre tank). All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25 % of the total volume of the substance stored.

Fuel oil will be delivered to the site by HGV road tankers, with a maximum of three tankers expected to be travelling to and from the site per month. A dedicated tanker unloading area will be provided at each service yard which will be surrounded by a drainage channel to capture any run-off. A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad. A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.

The energy centre will include appropriate bunding for gas oil, lube oil, and finished (waste) oil. Drums will be stored on drip trays / pallets as appropriate. Storage is within the building itself.

As such the impact is considered to be ***long term, imperceptible*** and ***neutral***.

6.6 MITIGATION MEASURES

In order to minimise the potential impacts from the development, the following mitigation measures will be undertaken.

6.6.1 Wastewater

6.6.1.1 Construction Phase

Effluent generated on the site from the contractor's sanitary facilities will be contained and disposed of appropriately off site or where feasible directed to the existing off-site foul sewer network. These facilities will be connected to the IW foul drainage system once the pumping station is commissioned. In the short term, portable sanitary facilities will be provided with waste collected and disposed of appropriately.

All sewer connections will be made with the approval of IW and the Local Authority and checked prior to commissioning.

6.6.1.2 Operational Phase

During the operational phase, wastewater will be collected from site (data storage facilities, offices and energy centre washroom facilities and canteen) and discharged through a new pumping station to the foul drainage network which runs along the R147 and ultimately discharge to Ringsend WWTP.

All sewer connections will be made with the approval of IW and the Local Authority and checked prior to commissioning.

6.6.2 Water Supply

6.6.2.1 Construction Phase

A connection to public watermains off site is required. This connection to public water supply on site will be carried out in full compliance with the requirements of MCC and IW.

6.6.2.2 Operational Phase

A connection to public watermains off site is required. This connection to public water supply on site will be carried out in full compliance with the requirements of MCC and IW.

The water main system will be metered as directed to facilitate detection of leakage and prevention of water loss.

6.6.3 Surface Water

6.6.3.1 Construction Phase

An outline construction management plan (CEMP) will be prepared for the proposed development. This CEMP will ensure effective stormwater management during construction and will address potentially polluting activities and include emergency response procedures. All relevant personnel working on the site will be trained in the implementation of the procedures. A summary of items covering are provided below:

- During the construction phase, surface water run-off collected in excavations will be diverted to settlement ponds and will not be allowed to directly discharge directly to the existing field drainage. A buffer distance with no storage of soils will be maintained along field ditches and streams in compliance with fisheries guidelines "Guidelines on protection of fisheries during construction works in and adjacent to waters" Inland Fisheries Ireland (2016);
- Aggregate and infill materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination.
- As recommended in Inland Fisheries Ireland (2016) "Guidelines on protection of fisheries during construction works in and adjacent to waters" there will be no direct discharges to surface waters during construction and a buffer protecting open water will be maintained;
- Oil and fuel storage tanks shall be stored in designated areas within the contractor's compound, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal; and,
- Concrete will be delivered to site and tankers will not be allowed to be washed out on the site. Out areas will be provided to ensure protection of water quality.

6.6.3.2 Operation Phase

Surface drainage will be discharged using a network of swales along the edge of the internal road network. These drains and swales will discharge to 3 no. surface water retention pond/attenuation pond which will be designed using a hydro-brake vortex control device to restrict discharge to greenfield run-off rates.

The attenuation ponds will be constructed to retain a constant volume of water to promote settling and reduce conveyance of suspended solids and other particles to the receiving waters (refer to engineering report for calculations) summarised below:

Attenuation pond depths and hardstanding areas are detailed in Table 6.4 below.

Table 6.4 Attenuation Pond depths and hardstanding areas

Catchment Area (m^2)	Wet Pond Invert Level (m OD)	Ground Level (m OD)	Depth of Wet Pool (m)	Overall Attenuation Pond Depth (m)
(1) 68,890	68.275	70.000	0.175	**1.90**
(2) 38,690	67.160	69.000	0.290	**2.13**
(3) 45,900	66.020	68.350	0.230	**2.56**

The development will require licencing through the EPA based on the energy centre thermal input. As such the site will operate under the strict guidance required for licenced facilities which includes regular checking of containment measure.

Fuel oil for the emergency boilers is the only required bulk chemical storage required on site. Each data storage facility service yard will have bunded storage tanks for fuel oil including double lined overground delivery pipeline to the belly tanks for diesel fired standby generators within the data centre. All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25 % of the total volume of the substance stored and will be designed in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004).

Fuel unloading areas will be provided at each service yard which will be surrounded by a drainage channel to capture any run-off. A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad. A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.

All staff will be trained in spill containment measures and emergency response.

6.7 MONITORING

As the conceptual site model shows the likely impact of the proposed development during construction or operation on hydrological regime is negligible, no surface water monitoring is proposed unless required by any future EPA licencing.

6.8 RESIDUAL IMPACTS

With the design and mitigation measures in place, the proposed development will not have a long-term impact on the water, wastewater or hydrological environment (in terms of level, flow and quality). Accordingly, the residual impact is considered to be ***imperceptible*** and ***neutral***.

6.9 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments (including the substation and grid options (described in Chapter 2)) are discussed in Sections 6.9.1 and 6.9.2 below.

6.9.1 Construction Phase

Impacts to water during construction are associated with spillage and leakage of oils and fuels and potential silt deposition in watercourses due to disturbance of land. With standard mitigation in place (as outlined in Section 6.6 above) to manage run-off using sediment ponds, stockpiling of soil away from open water, and management of accidental discharges, there is a low potential for construction at the proposed development to impact on receiving waters. Contractors for the proposed EngineNode data centre development will be contractually required to operate in compliance with a project-specific CEMP which will include the mitigation measures outlined in this EIA Report. With these measures in place, there will be no change in water body status, water quality or flow as a result of construction for the proposed project and the impact as described above are concluded as being of ***imperceptible*** significance with a ***neutral*** impact *o*n water. All other developments will be required, during construction, to protect water quality in compliance with legislative standards for receiving water quality and as such the cumulative impact is considered to be of ***imperceptible*** significance with a ***neutral*** impact *o*n water

6.9.2 Operational Phase

The operation of the proposed development will have an ***imperceptible*** significance with a ***neutral*** impact on quality due to the mitigation measures in place to protect water quality and manage stormwater discharge within the design for the proposed development. The proposed development has incorporated suitable containment measures for proposed oil storage, incorporated interceptors in areas of potential accidental spills/leaks and provided sufficient attenuation to manage run-off rates to greenfield run-off rates. The impact is considered to be of ***imperceptible*** significance with a ***neutral*** impact on water. All other developments are required during operation to meet legislative requirements in relation to water quality and mitigate for hardstand in terms of run-off rates. As such the cumulative impact is considered to be of ***imperceptible*** significance with a ***neutral*** impact on water

APPENDIX 6.1

CRITERIA FOR RATING SITE ATTRIBUTES – ESTIMATION OF IMPORTANCE OF HYDROLOGY ATTRIBUTES

NATIONAL ROADS AUTHORITY (NRA, 2009)

Table 1 Criteria for rating Site Attributes - Estimation of Importance of Hydrology Attributes (NRA)

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

7.0 LAND, SOILS, GEOLOGY AND HYDROGEOLOGY

7.1 INTRODUCTION

This chapter presents an assessment of the existing environment and the likely impacts of the proposed development on land, soils, geology and hydrogeology within the local environment.

In assessing likely potential and predicted impacts, account has been taken of both the importance of the attributes and the predicted scale and duration of the likely impacts. Where an impact is identified, planned mitigation measures are identified and assessed.

7.2 METHODOLOGY

The Assessment has been carried out generally in accordance with the following guidelines:

- EPA Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017);
- EPA 'Draft Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (2015);
- Institute of Geologists of Ireland (IGI) 'Guidelines for the preparation of Soils Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013); and
- National Roads Authority (NRA) 'Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (2009).

In the EIA assessment, consideration is given to both the importance of an attribute and the magnitude of the potential environmental impacts of the proposed activities on that attribute. Appendix 7.1 presents the impact assessment criteria provided in the IGI publication[1].

The principal attributes (and impacts) to be assessed include the following:

- Geological heritage sites in the vicinity of the perimeter of the subject site;
- Landfills, industrial sites in the vicinity of the site and the potential risk of encountering contaminated ground;
- The quality, drainage characteristics and range of agricultural uses of soil around the site;
- Quarries or mines in the vicinity, the potential implications (if any) for existing activities and extractable reserves;
- The extent of topsoil and subsoil cover and the potential use of this material on site as well or requirement to remove it off-site as waste for disposal or recovery;

[1] The NRA/IGI criteria for rating the magnitude and significance of impacts at EIA stage on the soils/ geological related attributes are also relevant in determining attribute importance and impact assessment and are presented in Appendix 7.1.

- High-yielding water supply springs/ wells in the vicinity of the site to within a 2km radius and the potential for increased risk presented by the proposed development;
- Classification (regionally important, locally important etc) and extent of aquifers underlying the site perimeter area and increased risks presented to them by the proposed development e.g. removal of subsoil cover, removal of aquifer (in whole or part), drawdown in water levels, alteration in established flow regimes, change in groundwater quality;
- Natural hydrogeological/ karst features in the area and potential for increased risk presented by the activities at the site; and,
- Groundwater-fed ecosystems and the increased risk presented by operations both spatially and temporarily.

Sources of Information

Desk-based geological information on the substrata (both quaternary deposits and bedrock geology) underlying the extent of the site was obtained through accessing national databases and site archives. The collection of baseline regional data was undertaken by reviewing the following sources:

- Geological Survey of Ireland (GSI) - on-line mapping, Geo-hazard Database, Geological Heritage Sites & Sites of Special Scientific Interest, Bedrock Memoirs and 1:100,000 mapping;
- Teagasc soil and subsoil database;
- Ordnance Survey Ireland - aerial photographs and historical mapping;
- Environmental Protection Agency (EPA) – website mapping and database information;
- National Parks and Wildlife Services (NPWS) – Protected Site Register;
- Meath County Council - illegal landfill information; and
- Project Runways Expansion EIAR (2018).

Site specific data was derived from the following sources:

- IGSL Site Investigations (May 2019);
- Various design site plans and drawings.

Figure 7.1 below presents the location of the proposed development site.

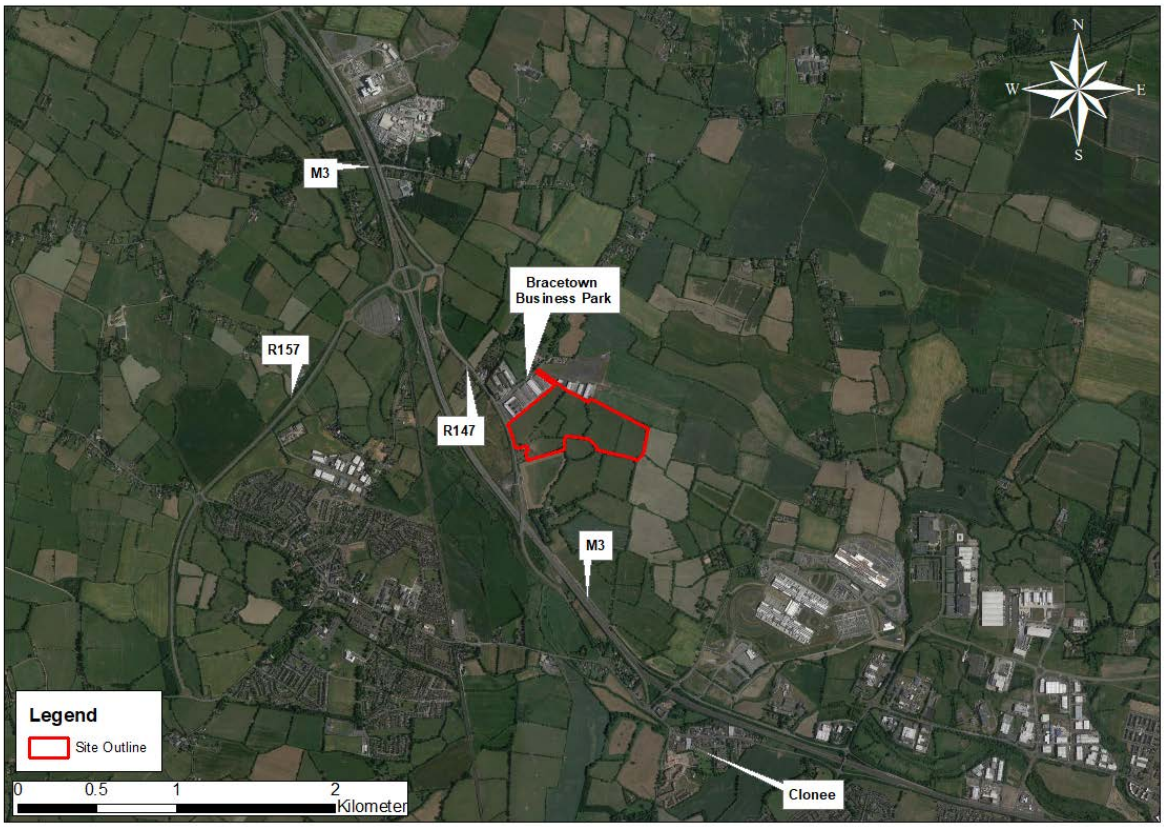


Figure 7.1 Site location indicated by redline boundary

7.3 THE RECEIVING ENVIRONMENT

7.3.1 Site Description

The site is a large greenfield area which is located in Bracetown, Dunboyne, Co. Meath just off the M3 Motorway. The surrounding environment can be described as a mix of agricultural and industrial (to the west). The site is 24.5 hectares in area and is zoned as industrial/commercial (E2 - General Industry and Employment/E3 - Warehousing and Distribution as per the Meath County Development Plan 2013-2019 (MCDP)). It is proposed that this site will be used as a data storage facility. Currently, the site is agricultural land with no buildings located within the site boundary.

7.3.2 Topography

The proposed development site gradient varies between 71.75 metres Ordnance Datum (mOD) at its highest and 67 mOD at its lowest. The gradient is 1 in 175 west to east and 1 in 135, north to south. This is in line with the topography of the surrounding area which slopes gently to the southeast.

7.3.3 Drainage

The site drainage comprises internal field drains and the Pace stream which crosses the site north to south. The internal ditches drain toward the Pace Stream which joins the

Pinkeen Stream c. 2.5km downstream to the southeast. The Pinkeen Stream joins the River Tolka c. 1 km further downstream. The River Tolka discharges to north Dublin bay over 30 km downstream. The hydrological environment is presented in detail in Chapter 6 – Hydrology.

7.3.4 Land Use

The site is located within a primarily agricultural area with some industrial & commercial units to the west and a low density of residential units with farm buildings. The site is bounded to the west by the R147. The lands for the proposed data storage facility development and a permitted expansion of a data storage facility development (MCC Ref: RA180671) are located within an area identified (blue outline in Chapter 1 Figure 1.1) within a Masterplan for Portan, Clonee and Pacetown.

According to the EPA (2019) there are no licensed IPPC or IED facilities in the immediate vicinity of the site. Figure 7.2 below shows the site and surrounding catchment with EPA licenced sites identified (Source – EPA Online Maps). Takeda/Shire is the only upgradient licenced facility (1,500m upgradient of the site). This is a new facility which commenced operation in 2019. There is no record of any landfills and only one licenced waste facility located in the vicinity of the subject site (Padraig Thornton Waste Disposal Ltd (Waste Licence Number W0206-01) approximately 1.6km west of the site.

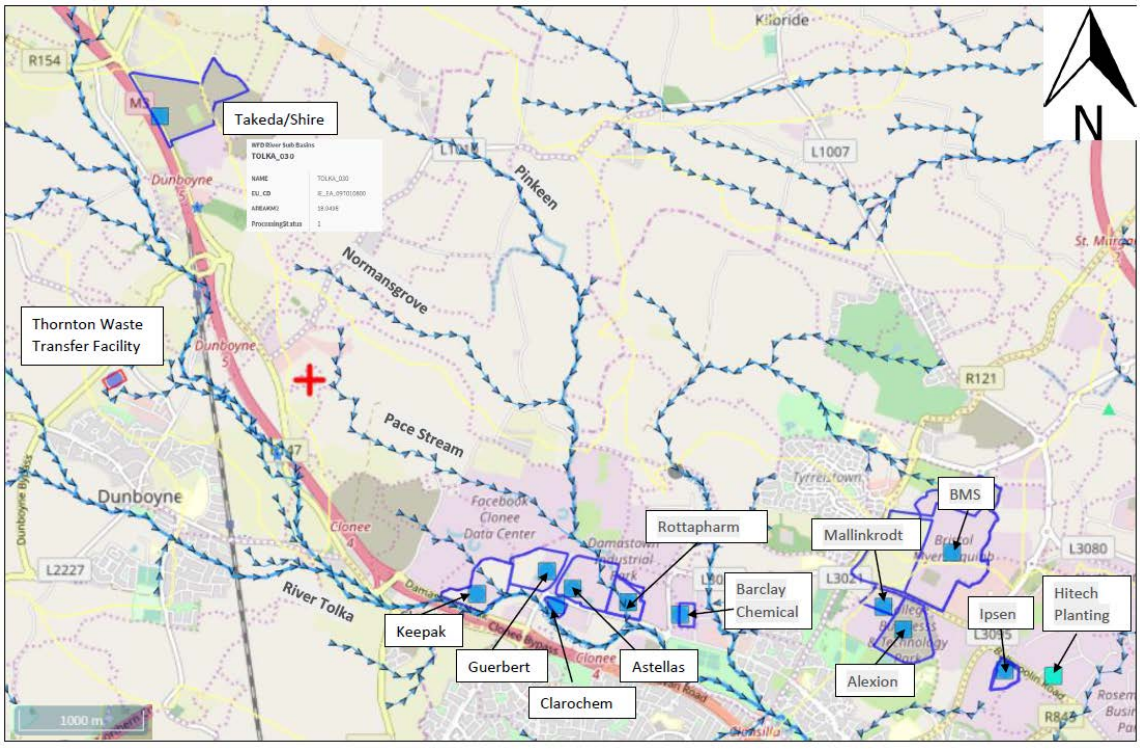


Figure 7.2 EPA Licenced Facilities (Site located at red cross; facilities highlighted in blue. Source EPA Online Maps, 2019)

Historical Ordnance Survey (O.S) maps were examined to review previous uses of the site and the likelihood of any residual contamination to be present at the site. O.S maps were available from 1830 - the historic 6" maps (Figure 7.3) and 1900 from the historic

25" maps. Also, aerial maps from 1995 (and 2000 were reviewed. The historic maps indicate that the subject site was continuously used as farmland. No evidence was noted to indicate industrial processes/quarrying/waste disposal have been undertaken at the site.

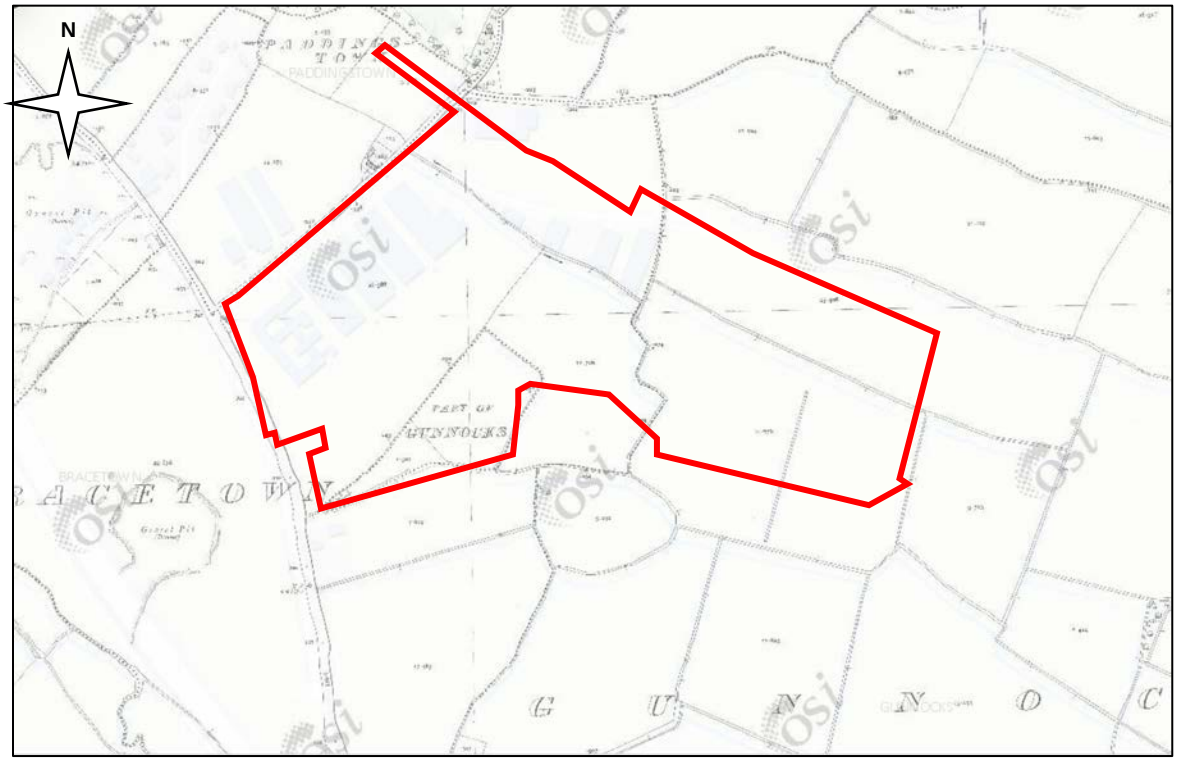


Figure 7.3 Historic 25" Cassini Mapping (c. 1845)

7.3.5 Soils

The Teagasc soil mapping indicates that the soils are comprised primarily of fine loamy drift with limestones (BminDW and BminPD). The EPA have classed this area as agricultural land used for pastural farming and as a non-irrigated arable land. The soil mapping for the site is presented below as Figure 7.4.

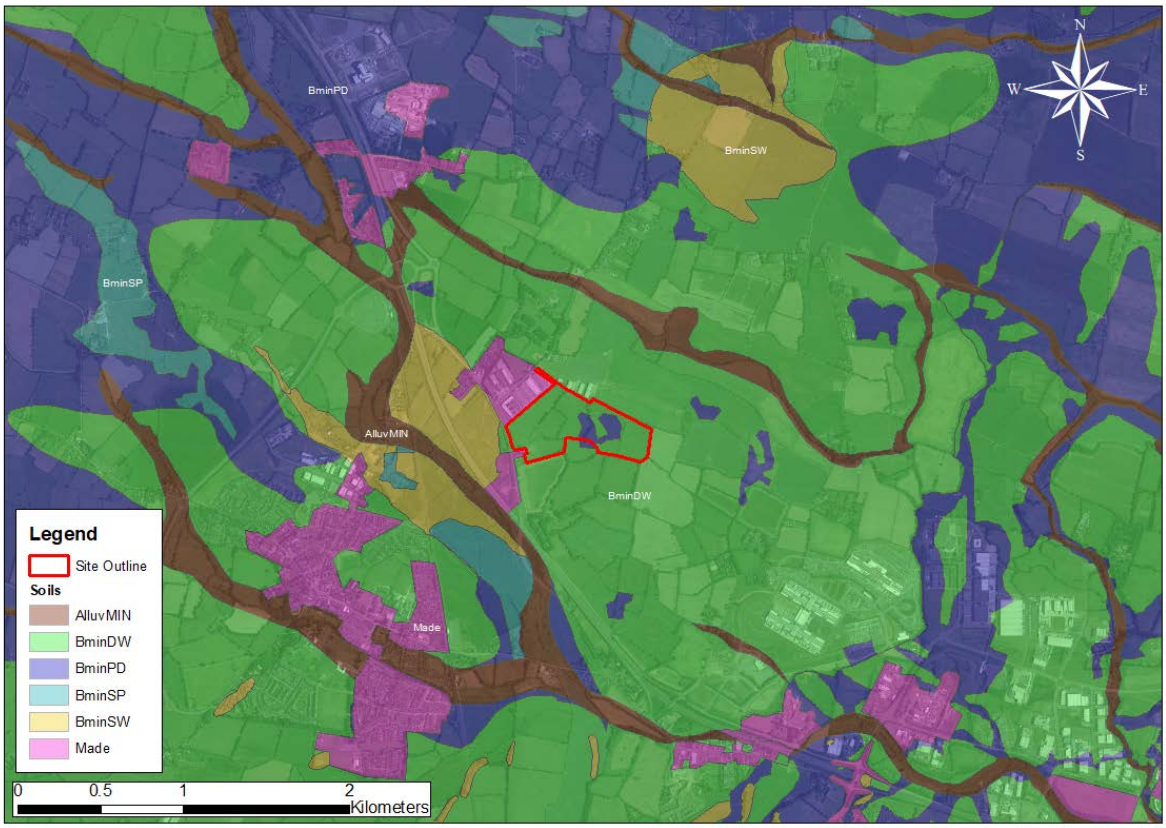


Figure 7.4 Teagasc Soils Map

7.3.6 Subsoils (Quaternary)

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

The GSI / Teagasc mapping database of the subsoils in the area of the subject site indicates one principal soil type, as shown in Figure 7.5 below. The subsoil type present across the site is:

- Limestone till Carboniferous (TLs). The subject site is composed of limestone till. This till is made up of glacial clays which are less permeable than alluvium subsoils.

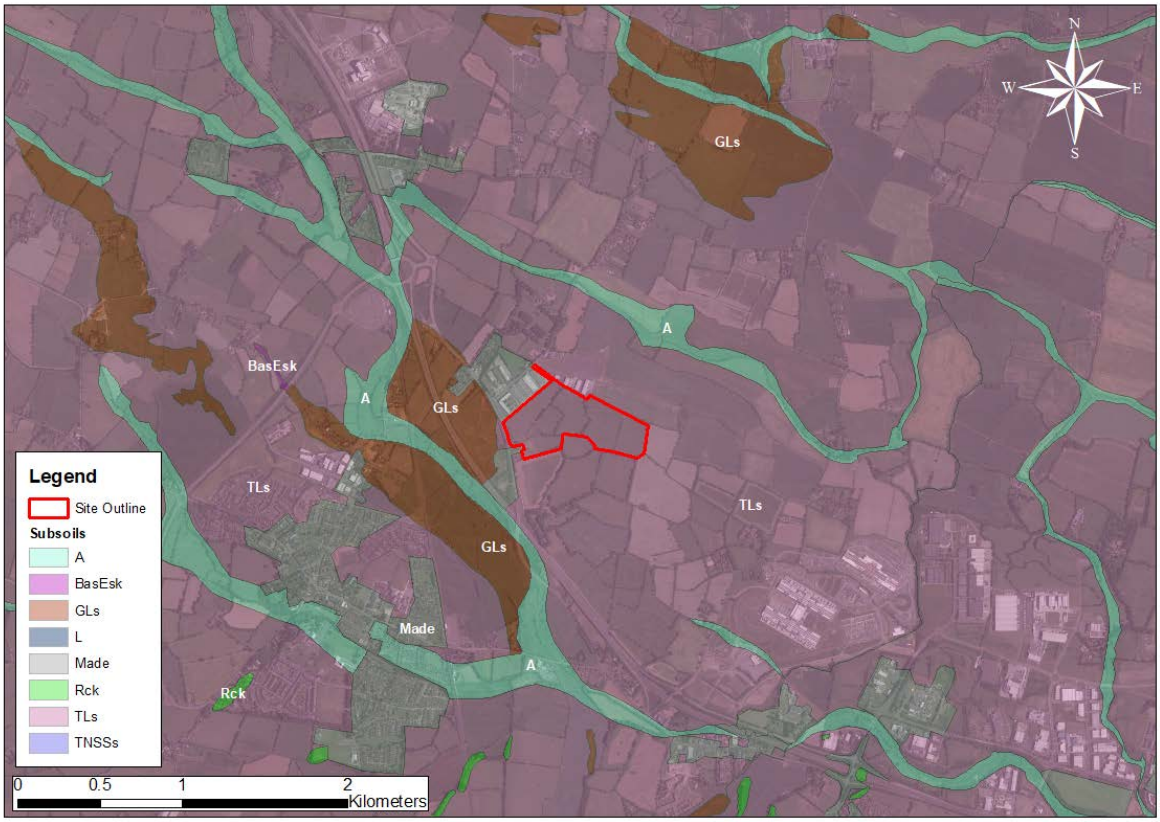


Figure 7.5 Subsoils Map

Site investigations were undertaken in March-May 2019 by IGSL within the development area. These investigations consisted of 5 no. cable percussive boreholes, 3 no. rotary core holes and 10 no. mechanically excavated trial pits. 2 no. standpipes were installed into boreholes and 4 no. infiltration tests completed (refer to Table 7.1, Figure 7.6 and Appendix 7.2 for location of SI data points and soil and water quality results).

Table 7.1 Site investigations points (source: IGSL report, 2019)

Site	Ground Level (mAOD)	Type	Depth (mbgl)	Depth to Bedrock (mbgl)
BH01	70.47	Cable percusive borehole	4.9	-
BH02	69.86	Cable percusive borehole	5.1	-
BH03	68.75	Cable percusive borehole	4.8	-
BHSP01	68.14	Cable percusive borehole w/ stand pipe	4.3	-
BHSP02	69.64	Cable percusive borehole w/ stand pipe	4.9	-
RC01	n.d.	Rotary coreholes	10.9	5.5
RC02	n.d.	Rotary coreholes	12.7	5.6
RC03	n.d.	Rotary coreholes	11.8	4.5
TP01	70.68	Trial pit	3	-
TP02	70.68	Trial pit	3.3	-
TP03	70.8	Trial pit	2.5	-
TP04	70.32	Trial pit	3	-
TP05	69.64	Trial pit	3	-
TP06	69.13	Trial pit	2.5	-
TP07	68.45	Trial pit	3	-

Site	Ground Level (mAOD)	Type	Depth (mbgl)	Depth to Bedrock (mbgl)
TP08	69.18	Trial pit	3	-
TP09	69.2	Trial pit	3	-
TP10	68.82	Trial pit	3	-
SA01	71.33	Trial pit for infiltration test	2	-
SA02	67.58	Trial pit for infiltration test	2	-
SA03	68.55	Trial pit for infiltration test	2	-
SA04		Trial pit for infiltration test	2	-



Figure 7.6 Site investigations points (source: IGSL report, 2019)

A summary of the trial investigation logs show the site vertical profile is as follows:

- Topsoil: Topsoil is generally 0.1-0.4m thick
- Subsoil: Below the topsoil, the western part of the site is primarily made up of gravelly clays with medium cobbles content and secondarily clayey gravels with sands. The eastern part of the site comprises mostly firm/stiff gravelly clays with cobbles.
- Bedrock: Bedrock was encountered in three rotary boreholes (RC01, RC02 and RC03) at depth between 4.5-5.6m below ground level (mbgl). Shallow bedrock was found in the southeast of the site (RC03, 4.5mbgl).

No indications of contamination were recorded during the site investigation works.

7.3.7 Bedrock Geology

Reference to the GSI Bedrock Geology Map indicates that the site is underlain by Lower Carboniferous (Chadian to Brigantian Stage) Calp Limestones which is referred to as Lucan Formation (Rock Unit code: CDCLP). This geological formation comprises dark grey, fine grained, argillaceous limestones with interbedded fossiliferous shales. The Bedrock Geology Map is included as Figure 7.7 below.

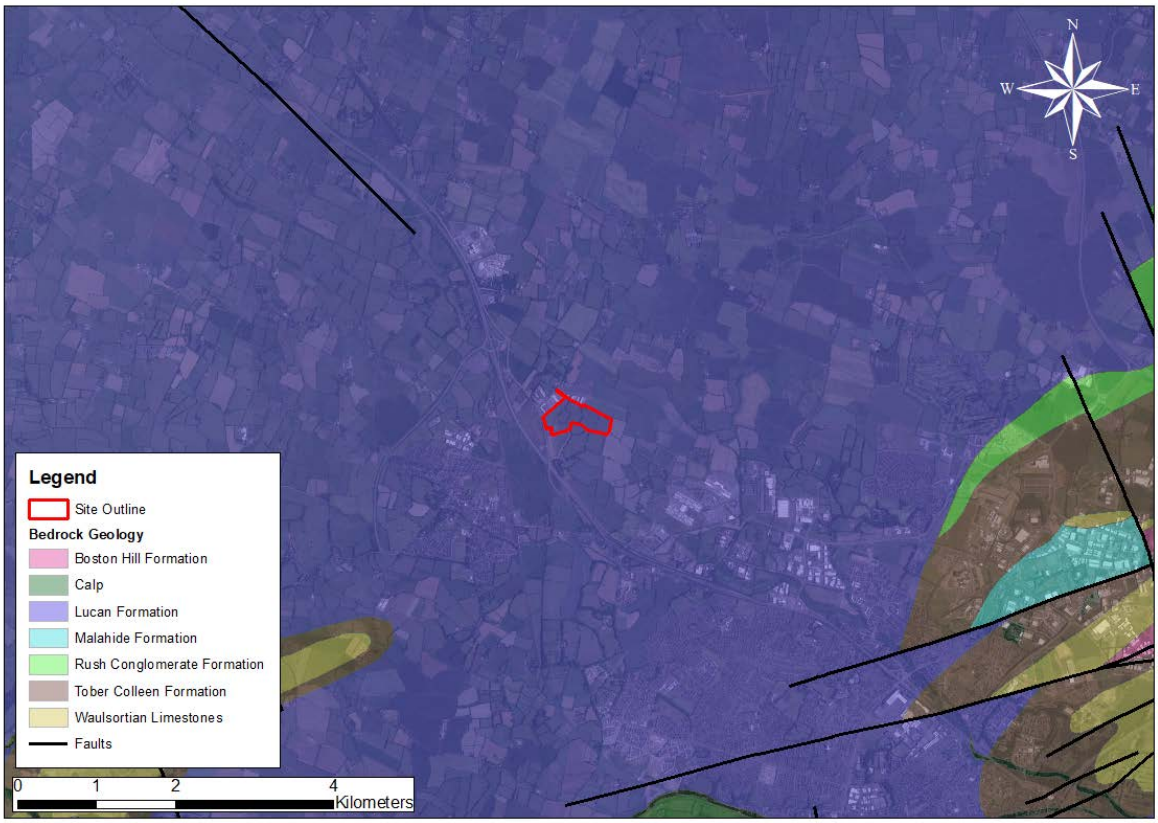


Figure 7.7 Bedrock Geology Map

IGSL described the bedrock as a strong, medium to thinly bedded, grey/dark, gray/black, fine-grained Limestone into calci-siltite limestone with subordinate mudstone with many incipient fractures throughout.

7.3.8 Aquifer Classification

The GSI classifies the principal aquifer types as:

Bedrock Aquifer

- Lk - Locally Important Aquifer – Karstified.
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones.
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive.
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones.
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive.

- Rkd - Regionally Important Aquifer (karstified diffuse).

Gravel Aquifer

- Lg - Locally Important Aquifer - Sand & Gravel.
- Rg - Regionally Important Aquifer - Sand & Gravel.

Reference to the GSI National Draft Bedrock Aquifer Map for the site (refer to Figure 7.8 below) indicates that the site is underlain by a Locally Important Bedrock Aquifer (LI), which is described by the GSI as bedrock as 'moderately productive only in local zones.'

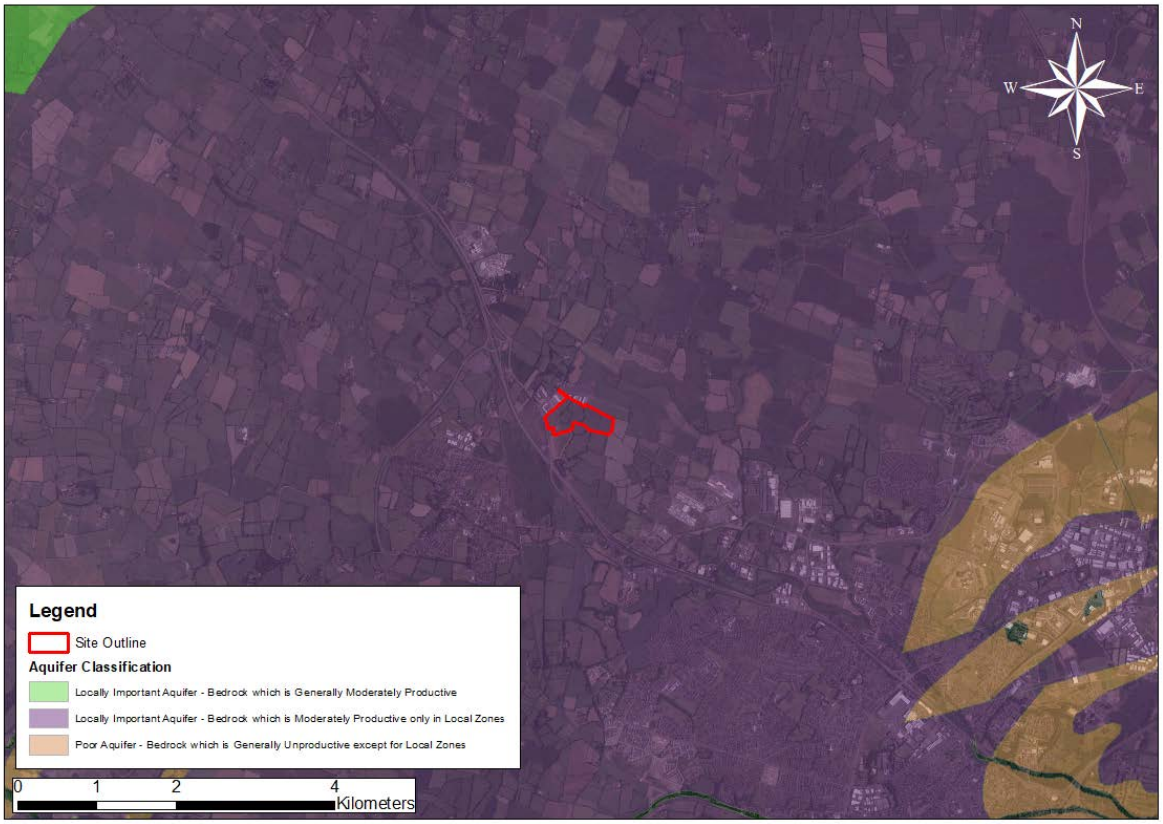


Figure 7.8 Aquifer Classification Map

7.3.9 Aquifer Vulnerability

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrological characteristics that determine the ease with which groundwater may be contaminated generally by human activities.

The GSI (2019) online mapping shows the site crosses two groundwater vulnerability categories. The west of the site is categorised as '*Moderate*' generally indicating 5-10 metres of overburden material overlying the bedrock aquifer (refer to Figure 7.9 below). The eastern section of the site is categorised as '*Low*' vulnerability generally referring to areas with >10 meters of overburden. The vulnerability assessment is categorised as shown in Table 7.2. Site investigation confirmed bedrock in three rotary boreholes (RC01, RC02 and RC03) at depth between 4.5-5.6m below ground level (mbgl) which would indicate "High" to "Moderate" vulnerability on site. The site investigation

undertaken for the Project Runways Expansion which is located adjacent to the development site encountered bedrock in eight rotary drilled boreholes at depths between 2.8-6.2m below land surface.



Figure 7.9 Aquifer Vulnerability Map

Table 7.2 Vulnerability Mapping Guidelines

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

7.3.10 Groundwater Levels and Flow Direction

During site investigations, localised perched water ingress was recorded at some trial pit locations mostly as seepage at depths between 1.2-2.8m below ground level. Two

borehole locations were installed with standpipes (BHSP01 & BHSP02, refer to Section 7.4.5); standing water tables measured in May 2019 recorded levels of 0.7mbgl & 1.1mbgl in BHSP01 & BHSP02 respectively. These standpipes were screened into overburden subsoil therefore they are not representatives of bedrock aquifer conditions. There is no continuous water table within the overburden due to the clayey nature of the soil.

Project Runaways Expansion EIAR (submitted as part of MCC Planning Ref. RA150605) site investigations recorded groundwater levels in boreholes screened into bedrock and overburden. An assessment of this information indicates that groundwater flow within the bedrock unit is to south-southeast in line with the regional gradient,

7.3.11 Groundwater Wells

There is no licencing system for wells in Ireland at present and as such no complete data set. The GSI Well Card Index is a record of wells drilled in Ireland, kept by the Geological Survey of Ireland. It is noted that this record is not comprehensive as licensing of wells is not currently a requirement in ROI. This current index, however, indicates there are no groundwater wells, boreholes or dug wells within the subject site boundary. In the immediate vicinity the site, specifically in the northwest side, there are three boreholes drilled in 1899 recorded in the GSI Well Card; yield information of these boreholes is not provided by the GSI Well Card. Known well locations are shown below on Figure 7.10.



Figure 7.10 Groundwater Wells recorded on the GSI database.

The closest known abstraction wells are the farmstead at Gunnocks (shallow hand dug well) and three wells close to Bracetown Park (two shallow dug wells and a bedrock well).

7.3.12 Source Protection Areas

The public water supply for Dunboyne, Clonee and their surrounds is located c.600m to the west of the site across the M3 (i.e. upgradient of the site, refer to Figure 7.11 below). According to a technical report from 2004 (Dunboyne Water Supply – Groundwater Source Protection Zones, GSI, 2004), the supply consists of 4 no. boreholes and an infiltration gallery. Total abstraction rate of the system is c.900m^3/d. Figure 7.11 below shows the source protection area relative to the proposed development site.



Figure 7.11 Groundwater Drinking Source Protection Area (shown in green)

7.3.13 Groundwater Quality

The Water Framework Directive (WFD) Directive 2000/60/EC, was adopted in 2000 as a single piece of legislation covering rivers, lakes, groundwater and transitional (estuarine) and coastal waters. In addition to protecting said waters, its objectives include the attainment of 'Good Status' in water bodies that are of lesser status at present and retaining 'Good Status' or better where such status exists at present. 'Good Status' was to be achieved in all waters by 2015, as well as maintaining 'high status' where the status already exists. The EPA co-ordinates the activities of the ERBDs, local authorities and state agencies in implementing the directive, and operates a groundwater quality monitoring programme undertaking surveys and studies across the Republic of Ireland.

Presently, the groundwater body in the region of the site (Dublin GWB) is classified under the WFD Risk Score system (EPA, 2019) as 'Good Status' and its risk as 'Not at Risk.

7.3.14 Hydrogeological Features

There is no evidence of springs or karstification at the vicinity of the site according to the GSI Karst and well database.

7.3.15 Geological Heritage

According to GSI Geological Heritage Sites & Sites of Special Scientific Interest, there are no heritage site recorded by the GSI in the vicinity of the site.

However, two heritage sites not yet audited by the Council were identified near the site:

- Southeast Till Plain, located at Dunshaughlin, Ratoath c. 2.5km to the north of the site.
- Priest Town Tectonite located at Priest town c. 4km to the northeast of the site.

7.3.16 Economic Geology

The EPA Extractive Industry Register and the GSI mineral database were consulted to determine whether there were/ are any mineral sites close to the subject site. One mineral site was identified in Bracetown, c. 200m to the west of the site across the R147. The site is described as a gravel pit which contains unsorted sands and gravels (refer to Figure 7.12 below).

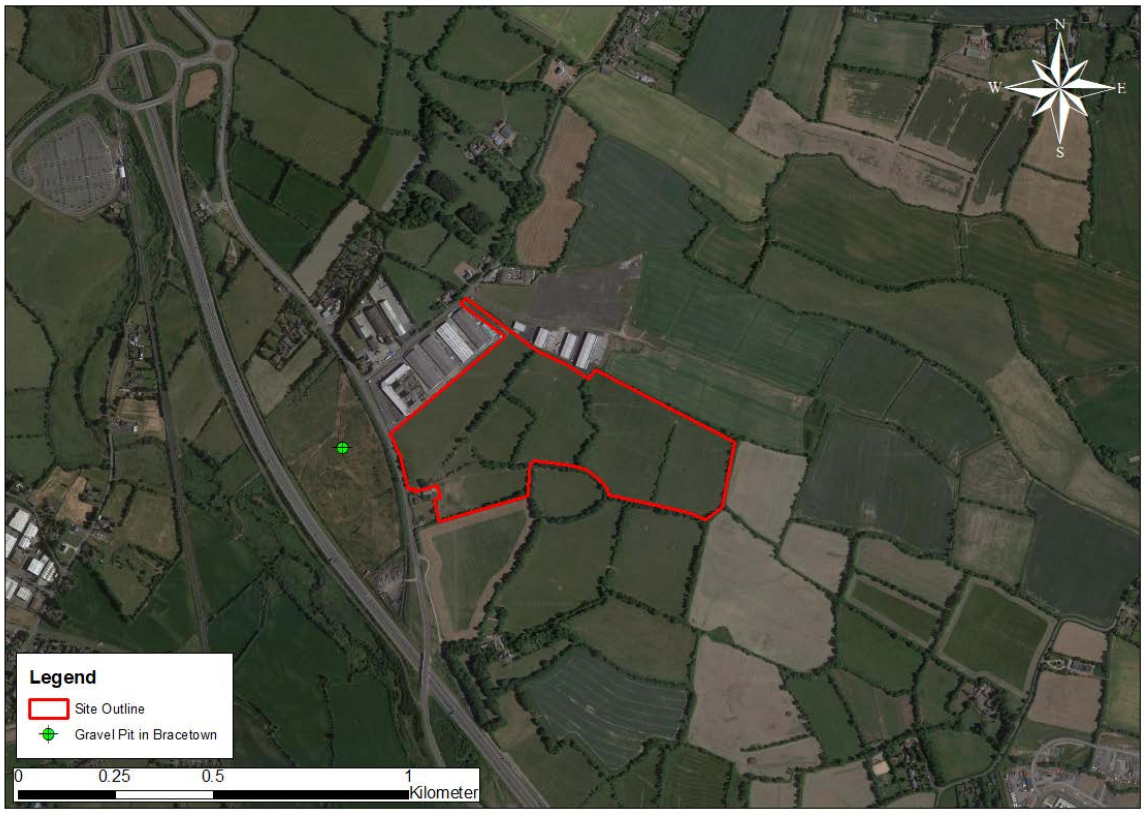


Figure 7.12 Mineral Activities in the Vicinity of the Site showing a gravel pit (green)

There are no active quarries at or adjacent to the proposed development site.

7.3.17 Radon

According to the EPA (now incorporating the Radiological Protection Institute of Ireland) the site location is a Very Low Radon Area where is it estimated that less than 1% of dwellings will exceed the Reference Level of 200 Bq/m3. This is the lowest of the five radon categories which are assessed by the EPA.

7.3.18 Geo-Hazards

Much of the Earth's surface is covered by unconsolidated sediments which can be especially prone to instability. Water often plays a key role in lubricating the slope failure. Instability is often significantly increased by man's activities in building houses, roads, drainage and agricultural changes. Landslides, mud flows, bog bursts (in Ireland) and debris flows are a result. In general, Ireland suffers few landslides. Landslides are more common in unconsolidated material than in bedrock, and where the sea constantly erodes the material at the base of a cliff landslides and falls lead to recession of the cliffs. Landslides have also occurred in Ireland in recent years in upland peat areas due to disturbance of peat associated with construction activities. The GSI landslide database was consulted and there are no recorded landslide in the vicinity of the proposed development. Due to the local topography and the underlying strata there is a negligible risk of a landslide event occurring at the site.

In Ireland, seismic activity is recorded by the Irish National Seismic Network. The Geophysics Section of the School of Cosmic Physics at the Dublin Institute for Advanced Studies (DIAS) has been recording seismic events in Ireland since 1978. The station configuration has varied over the years. However, currently there are five permanent broadband seismic recording stations in Ireland and operated by DIAS. The seismic data from the stations comes into DIAS in real-time and are studied for local and regional events. Records since 1980 show that the nearest seismic activity to the proposed location was in the Irish sea (1.0 – 2.0 Ml magnitude) and ~55 km to the south in the Wicklow Mountains. There is a very low risk of seismic activity to the proposed development site.

There are no active volcanoes in Ireland so there is no risk from volcanic activity.

7.3.19 Areas of Conservation

There are no proposed Special Areas of Conservation (pSAC), Special Protection Areas (SPAs) or Natural Heritage area (NHA) within the immediate surrounds of the study area boundary.

According to the NPWS (2019) on-line database, the following area of conservation is located closest to the subject site:

- The Ryewater River SAC (001398) and National Heritage Area (NHA) – approximately 6.45km south of the site.

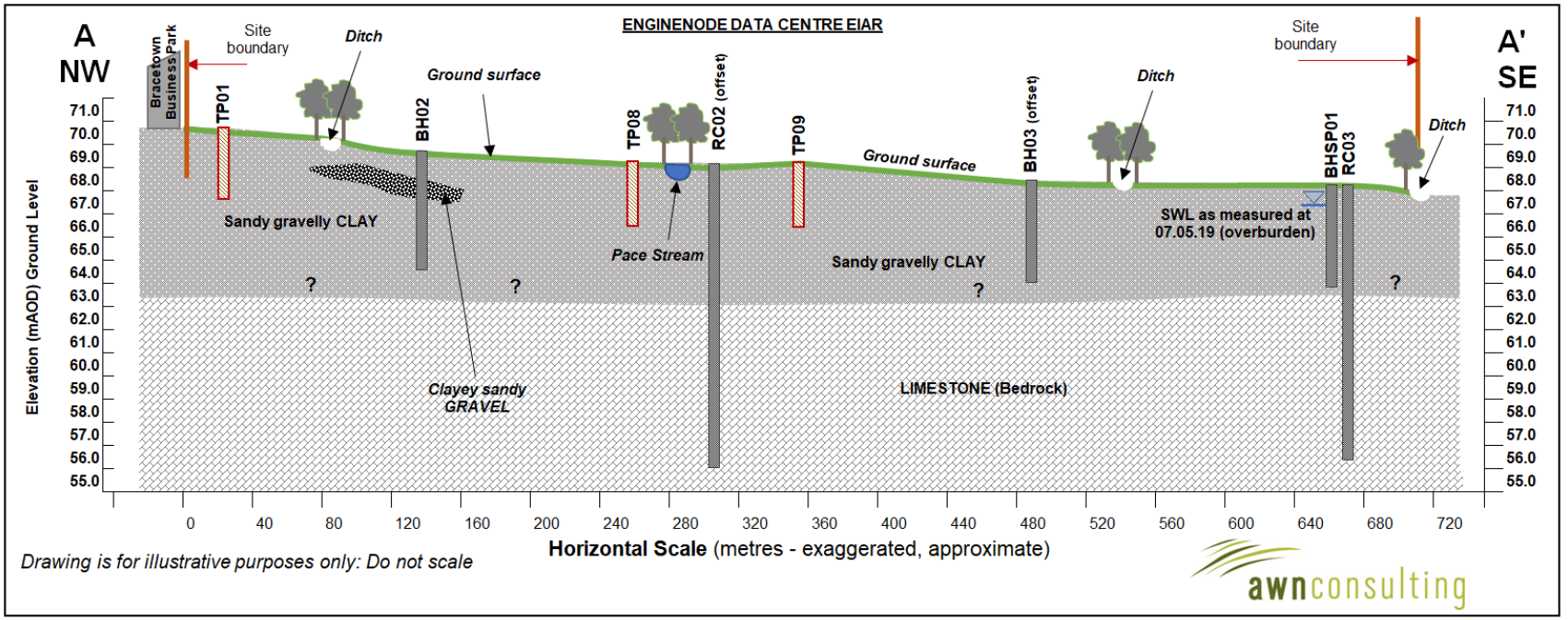
This SAC belongs to Ryewater catchment which drains towards the Liffey river. Therefore, there is no hydrological link between the development site and this SAC.

7.3.20 Conceptual Model

Local cross sections for the development site are presented below as Figure 7.13 (A-A' northwest to southeast) and Figure 7.14 (B-B' west to east). Also, a regional cross section is presented as Figure 7.15 (C-C' west to east). These cross sections and the description below present the conceptual site model (CSM):

- Bedrock was encountered at a shallow depth between the site (4.5-5.6mbgl) and comprises strong, medium to thinly bedded, grey, fine-grained limestone. The limestone is classified by the GSI as a Locally Important Bedrock Aquifer (LI), which is described as 'moderately productive only in local zones
- In the western part of the site bedrock is generally overlain by clayey Gravels intermixed with Clay whereas in the eastern part of the site, the subsoil comprises generally firm/stiff gravelly Clays with cobbles. As such the vulnerability varies from high to moderate across the site. Poorer surface drainage is noted in the areas underlain by clay.
- Groundwater flow within the bedrock unit is to south-southeast in line with the regional gradient. There is no continuous perched water table within the overburden deposits
- The groundwater body in the region of the site (Dublin GWB) is classified under the WFD Risk Score system (EPA, 2019) as '*Good Status*' and its risk as '*Not at Risk*'.

- The site drainage comprises internal drainage ditches which discharge to the Pace stream which crosses the site north to south. The Pace Stream joins the Pinkeen Stream c. 2.5 river km downstream to the southeast.
- There are no evidence of soil or groundwater contamination based on previous site use or site investigation.
- The public water supply for Dunboyne, Clonee and their surrounds is located c.600m to the west of the site across the M3, i.e. upgradient of the site. The proposed development is outside of the delineated drinking water protection area. There are a number of domestic/agricultural wells in the surrounding lands.
- There are no groundwater dependent terrestrial ecosystems which have potential to be impacted by the proposed development.



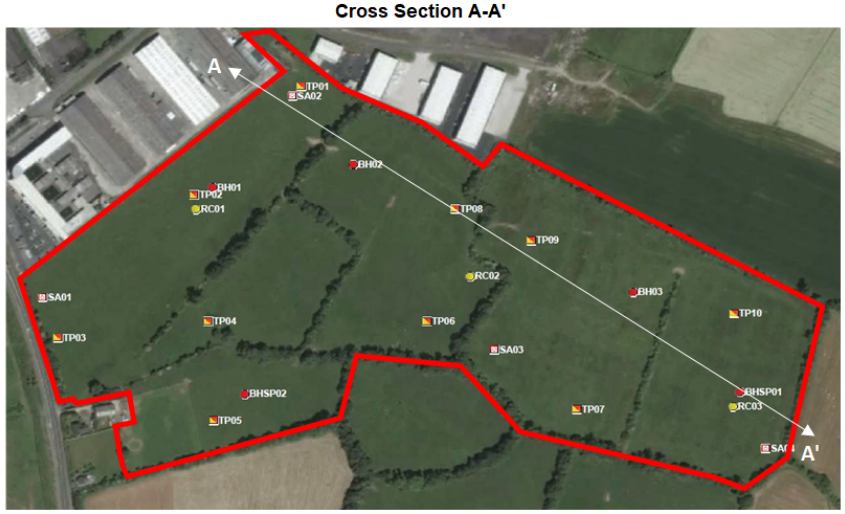
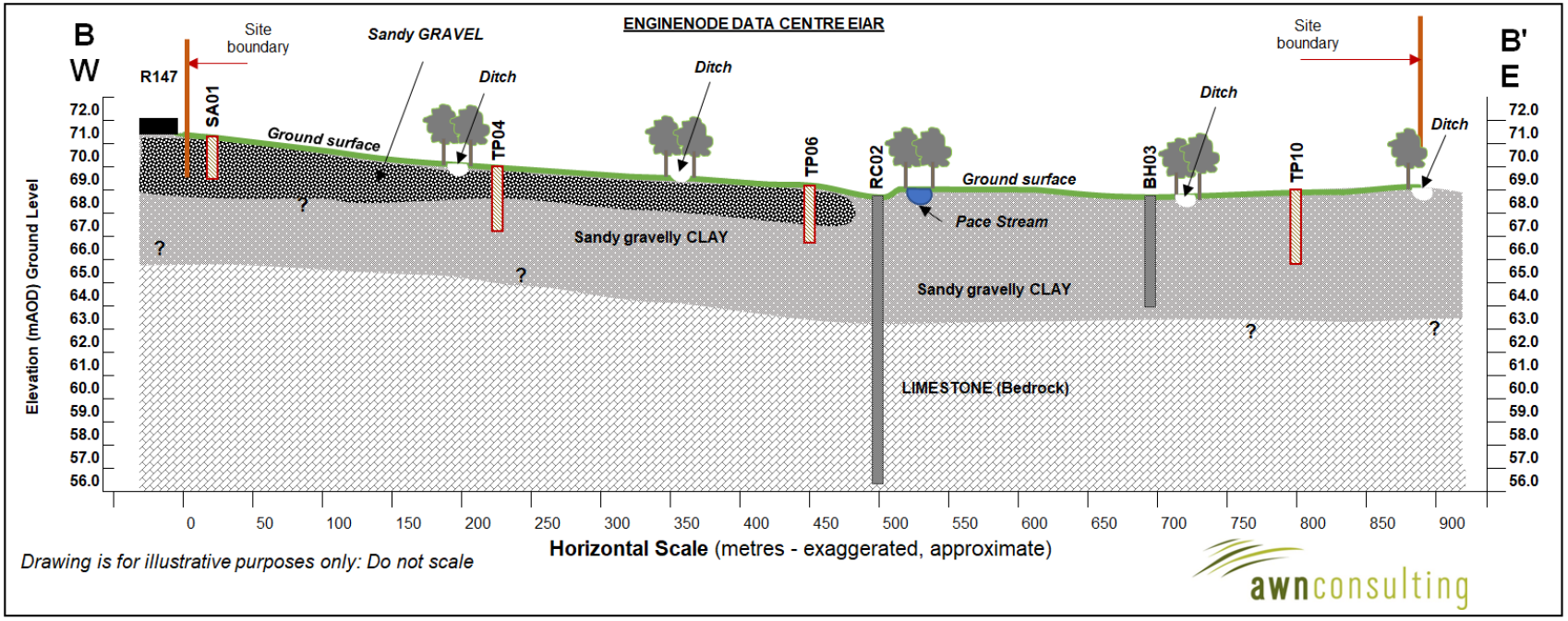


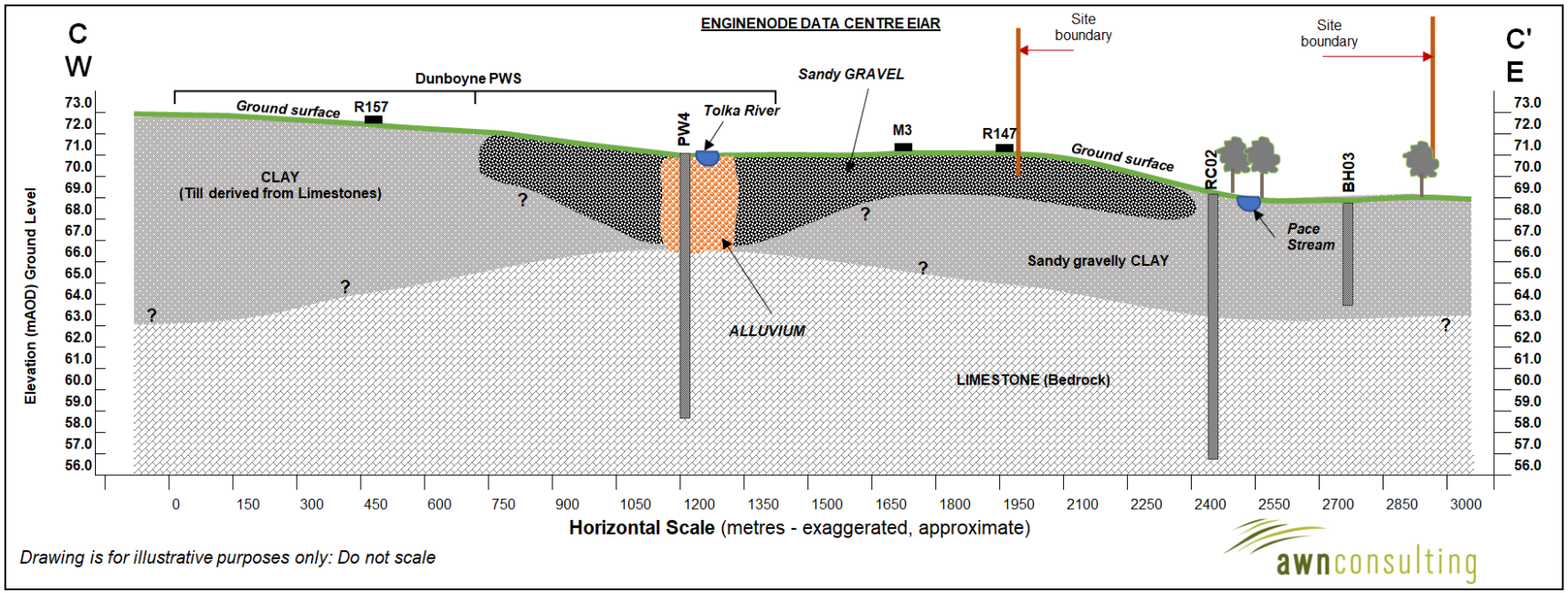
Figure 7.13 Cross Section A-A' (NW-SE)



Cross Section B-B'



Figure 7.14 Cross Section B-B' (W-E)



Cross Section C-C'



Figure 7.15 Cross Section C-C' (W-E) Note (where depths are estimated they are shown as ?)

7.3.21 Rating of Site Importance of Geological/Hydrogeological Features

Based on the NRA methodology (2009) (refer to Appendix 7.1), criteria for rating site importance of geological features, the importance of the bedrock and soil features at this site is rated as '*Medium*' importance with medium significance or value on a local scale, due to the presence of a small existing gravel pit in Bracetown, c. 200m to the west of the site across the R147.

Based on the NRA/IGI criteria for rating the importance of hydrogeological features (refer to Appendix 7.1) the importance of the hydrogeological features at this site is rated as '*High*'. This is based on the assessment that the aquifer beneath the site is a Locally Important (Ll) bedrock aquifer which is Moderately Productive. This aquifer includes a supply for Dunboyne, Clones and their surrounds; its source protection area is located c.600m to the east of the site across the M3 (i.e. upgradient of the site).

7.4 IMPACTS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed development is provided in Chapter 2 of this EIA Report. Activities associated with the proposed development which are relevant to the land, soils, geology and hydrogeological environment are detailed in Table 7.3.

It is noted that based on the site geology and nature of the development requiring only shallow excavations for foundations and attenuation ponds are required, no dewatering, or groundwater abstraction is required as part of the construction or operation phase of the proposed development. Relevant site activities are summarised below for construction and operation phases.

Table 7.3 Site Activities Summary

Phase	Activity	Description
Construction	Discharge to Ground	Run-off from construction areas percolating to ground. Potential for contamination as a result of any accidental leaks from construction traffic or fuel storage
	Earthworks: Excavation of Superficial Deposits	Cut and fill will be required to facilitate construction, expansion of drainage network and ancillary works. Subsoil stripping and localised stockpiling of soil will be required for short periods of time during construction. It is estimated that approximately 50,000m^3 of topsoil, soils and stones will be excavated to facilitate construction of the development. All topsoil will be reused onsite. Import of 105,000m^3 will be required.
Operation	Increase in hard standing area	Altering of local recharge due to increase in hard standing area.
	Storage of hazardous Material	Bulk fuel oil storage (diesel) is required for each building Storage will be within a double lined tank within an adequately sized bund serviced from a contained refuelling pad. Diesel will be piped (above ground) from the bulk storage tanks to the back-up generator units (each generator will have its own internal double-skinned belly tank) downgradient the offloading area and prior to discharge from the site.

Assessment of impacts during construction and operation are outlined below. The implementation of the mitigation measures outlined in Section 7.6 below together with

design measures will ensure that impacts during the construction phase as well as during the operational phase are minimised.

7.4.1 Construction Phase

7.4.1.1 Soil Removal

The cut and fill requirements are as follows:

Table 7.4 Cut and fill summary

	Volume (m^3)
Cut (incl Utility Trenches)	50,000
Fill	155,000
Total Estimate (Net Fill)	**105,000**

Much of the excavated material will be reused for landscaping works. Infill materials for construction will comprise clean inert fill. There is no evidence that historical spillages have occurred in the area of the proposed development based on the site previous use for agriculture and site investigation data.

Contractors will be required to submit and adhere to a method statement indicating the extent of the areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works.

Where stripping occurs, the contractor will be required to ensure that the resulting excavated fractions will be separated into subsoil and topsoil stockpiles. Temporary storage of spoil will be managed to prevent accidental release of dust and uncontrolled surface water run-off which may contain sediment etc.

7.4.1.2 Accidental Spill and Leaks

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

- Spillage or leakage of oils and fuels stored on site;
- Spillage or leakage of oils and fuels from construction machinery or site vehicles;
- Spillage of oil or fuel from refuelling machinery on site; and,
- The use of concrete and cement.

Accidental spillages may result in contamination of soils and groundwater underlying the site, should contaminants be unmitigated and migrate through the subsoils and impact underlying groundwater.

7.4.2 Operational Phase

7.4.2.1 Increase in Hardstand

There will be an increase in hardstand as a result of the development of the facilities of c.153,480m^2. Rainfall which had previously discharge to ground and field drains will be collected using a network of swales along the edge of the internal road network.

Reinforced grass-crete or similar will also be used along parts of the road network to increase infiltration on less heavily trafficked access roads. These drains and swales will discharge to 3 no. surface water retention pond/attenuation pond to a maximum rate of the 1% Annual Exceedance Pollution event (1:100-year return period).

7.4.2.2 Oil Unloading and Storage

Fuel oil for the emergency boilers and a single tank in the energy centre is the only required bulk chemical storage required on site. Each data storage facility service yard will have bunded storage tanks (c.520m³) of fuel oil per data storage facility is anticipated to be stored externally at each data storage facility building for emergency use. The total fuel store will be 2,080m³ (including the energy centre tank). All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25 % of the total volume of the substance stored.

Fuel oil will be delivered to the site by HGV road tankers, with a maximum of three tankers expected to be travelling to and from the site per month. A dedicated tanker unloading area will be provided at each service yard which will be surrounded by a drainage channel to capture any run-off. A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad. A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.

The energy centre will include appropriate bunding for gas oil, lube oil, and finished (waste) oil. Drums will be stored on drip trays / pallets as appropriate. Storage is within the building itself.

7.4.2.3 Change in Land Use

There will be an overall reduction in agricultural land as a result of development. The land is zoned for industrial development.

7.4.3 Impacts Assessment

7.4.3.1 Construction Phase

There will be a temporary impact on the local soils and hydrogeological environment associated with the soil movement required during construction. The potential for any impact in the underlying aquifer as a result of a localised construction leak of fuel is small based on the presence of natural soil cover at the site, The impact is considered to be ***temporary***, ***imperceptible*** (no measurable change in the attribute) and ***neutral*** i.e. a change which does not impact on the quality of the environment.

7.4.3.2 Operation Phase

There will be no planned discharge to ground or abstraction from the aquifer for thus development. The increase in hardstand will have a local impact on recharge patterns but no impact on the aquifer as a whole.

There will be a local loss of agricultural soil however, the area of development is small in the context of the overall agricultural land available in the region. The land is zoned for industrial development.

It is not anticipated that any impacts will arise following the implementation of the mitigation measures discussed in Section 7.5 below. As such the impact is considered to have a **long term**, **imperceptible** and **neutral**.

7.5 MITIGATION MEASURES

In order to minimise the potential impacts from the development, the following mitigation measures will be undertaken.

7.5.1 Construction Phase

An outline construction environmental management plan (CEMP) will be prepared for the proposed development. This CEMP will ensure effective soil and water management during construction. The CEMP will cover potentially polluting activities and include an emergency response procedure. All relevant personnel working on the site will be trained in the implementation of the procedures.

7.5.1.1 Soil Removal and Infill - Management of Stockpiles

The excavation will require soil excavation and infill. A suitable area will be allocated for temporary stockpiling of excavated materials pending removal for reuse which will be located away from any surface water courses or other sensitive receptors. Previous uses of the site and site testing has not indicated any evidence of contamination at the site. However, any contaminated soil or suspected contaminated soil will be isolated from clean soil pending testing to confirm its classification and removal to a licenced facility. Soils taken off site will be removed for reuse or disposed of by contractors licensed under the Waste Management Act of 1996 and amendments.

Only material of a known clean origin will be sourced for infill. Should any material be considered suspect it will be tested prior to use as infill material.

Where stripping occurs, the resulting excavated fractions will be separated into subsoil and topsoil stockpiles. Temporary storage of spoil will be managed to reduce release of dust and uncontrolled surface water run-off which may contain sediment etc.

7.5.1.2 Accidental Spills and Leaks

As recommended in Inland Fisheries Ireland (2016) “Guidelines on protection of fisheries during construction works in and adjacent to waters” there will be no direct discharges to surface waters during construction and a buffer protecting open water will be maintained.

Oil and fuel storage tanks will be stored in designated areas within the contractors compound, and these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) will be diverted for collection and safe disposal.

Concrete will be delivered to site and tankers will not be allowed to be washed out on the site. Out areas will be provided to ensure protection of water quality.

7.5.2 Operational Phase

The development will require licencing through the EPA based on the energy centre thermal input. As such the site will operate under the strict guidance required for licenced facilities which includes regular checking of containment measure.

Fuel oil for the emergency boilers is the only required bulk chemical storage required on site. Each data storage facility service yard will have bunded storage tanks for fuel oil including double lined overground delivery pipeline to the belly tanks for diesel fired standby generators within the data storage facility. All bunds will be capable of containing 110% of the volume of the largest drum/tank within the bund or 25 % of the total volume of the substance stored and will be designed in accordance with the EPA's guidelines for the storage and transfer of materials for scheduled activities (EPA, 2004).

Fuel unloading areas will be provided at each service yard which will be surrounded by a drainage channel to capture any run-off. A class 1 oil-water full retention separator will be installed to capture any oil in the run-off from the pad. A standard operating procedure for fuel unloading will be in place at the site and tanks will be fitted with high level alarms to prevent overfilling.

All staff will be trained in spill containment measures and emergency response.

7.6 MONITORING

As the conceptual site model shows the likely impact of the proposed development during construction or operation on groundwater regime is negligible, no groundwater monitoring is proposed unless required under a future EPA licence.

7.7 DO-NOTHING SCENARIO

As the site is zoned for development it is likely that the land use will change over time even if this development does not go ahead. The associated impact of any such development will be similar to the proposed development for the underlying land soils and hydrogeological regime.

7.8 RESIDUAL IMPACTS

The proposed development will have an imperceptible residual impact on the Land, Soils, Geology and Hydrogeology environment due to the implementation of the mitigation measures outlined in the above. Accordingly, there will be no negative impact (either short term, long term, direct or indirect) as a result of this proposed development on the surrounding land, soils, geology and hydrogeology environment. The residual impact is considered to be **neutral** and **imperceptible.**

7.8 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments (including the substation and grid options (described in Chapter 2)) are discussed in Sections 7.9.1 and 7.9.2 below.

7.8.1 Construction Phase

The potential for impact on land, soils and groundwater during construction primarily arises from accidental leaks and spills to ground or dewatering. The proposed development does not require dewatering and with standard mitigation in place (as outlined in Section 7.5) for management of accidental discharges, the effect due to construction in this area is considered to be a ***neutral*** on quality and an ***imperceptible*** significance. Contractors for the proposed development will be contractually required to operate in compliance with a CEMP which will include the mitigation measures outlined in this EIA report. Other developments will also have to incorporate measures to protect soil and water quality in compliance with legislative standards for receiving water quality. As a result, there will be no cumulative potential for change in soil quality or the natural groundwater regime. The cumulative impact is considered to be ***neutral*** *and* ***imperceptible***.

7.9.1 Operational Phase

Overall there will be a local change in recharge pattern due to the increase in hardstand from these proposed and planned developments. However, based on the overall size of the underlying aquifer and measures to protect soil and water quality there will be no overall change on the groundwater body status. The operation of the proposed development is concluded to have a ***long-term, imperceptible*** significance *with a* ***neutral*** impact on soil and water quality.

The proposed development includes measures to protect against any accidental discharges to ground e.g. adequate containment measures for oil storage, use of hardstand in loading areas and drainage through oil interceptors. As such the impact will be ***neutral*** and ***imperceptible*** in relation to soil and water*.* All developments will be required to manage sites in compliance with legislative standards for receiving water quality. Therefore, the cumulative impact is concluded to be ***neutral*** and ***imperceptible*** in relation to soil and water*.*

Overall there will be a loss of agricultural land which is in line with the zoning of the area and the Masterplan therefore the cumulative impact on land is considered to be ***neutral*** and ***not significant****.*

APPENDIX 7.1

NRA CRITERIA FOR RATING THE MAGNITUDE AND SIGNIFICANCE OF IMPACTS AT EIA STAGE

APPENDIX 7.2

GEOTECHNICAL REPORT

Prepared by

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Consulting Engineers

EngineNode Data Centre
Clonee
Co. Meath

Geotechnical Report

Report No. 21674

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Report

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FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project (EngineNode Data Centre, Clonee) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930 (1999), BS 1377 (Parts 1 to 9) and Engineers Ireland Specification & Related Documents for Ground Investigation in Ireland (2006). A new National Annex for use in the Republic of Ireland is currently in circulation for comment and will be adopted in the near future. In the mean time, the following Irish (IS) and European Standards or Norms are referenced:

- IS EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- IS EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- IS EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- IS EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- IS EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

Reporting

Recommendations made and opinions expressed in this report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points.

This report has been prepared for CSEA Consulting Engineers and the information should not be used without prior written permission. The recommendations developed in this report specifically relate to the proposed development. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

Boring Procedures

Unless otherwise stated, ‘shell and auger' or cable percussive boring technique has been employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing complies with the recommendations of IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variations is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Rotary Drilling Procedures
Rotary drilling methods have been used to recover bedrock samples in line with Section 3.5 of IS EN 1997-2:2007 and IS EN ISO 22475-1. Where cable percussive boreholes terminated prematurely on an obstruction within overburden, open hole drilling methods (odex or symmetrix) were utilized to advance the drillholes through the superficial deposits with coring in bedrock. The key objectives of the rock sampling were to obtain high core recovery (TCR), minimize sample disturbance and facilitate accurate identification of strength, weathering and discontinuity characteristics.

In-Situ Testing
Standard penetration tests were conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Groundwater
The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging
Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Retention of Samples
Samples shall be retained for a period of 60 days following approval of the final factual report, as detailed in the Scope of Works.

1.0 Introduction and Objectives

It is proposed to construct a data centre at a large site in Clonee, Co. Meath.

The site location is as shown on Figure 1 with the approximate site outline shown in red.

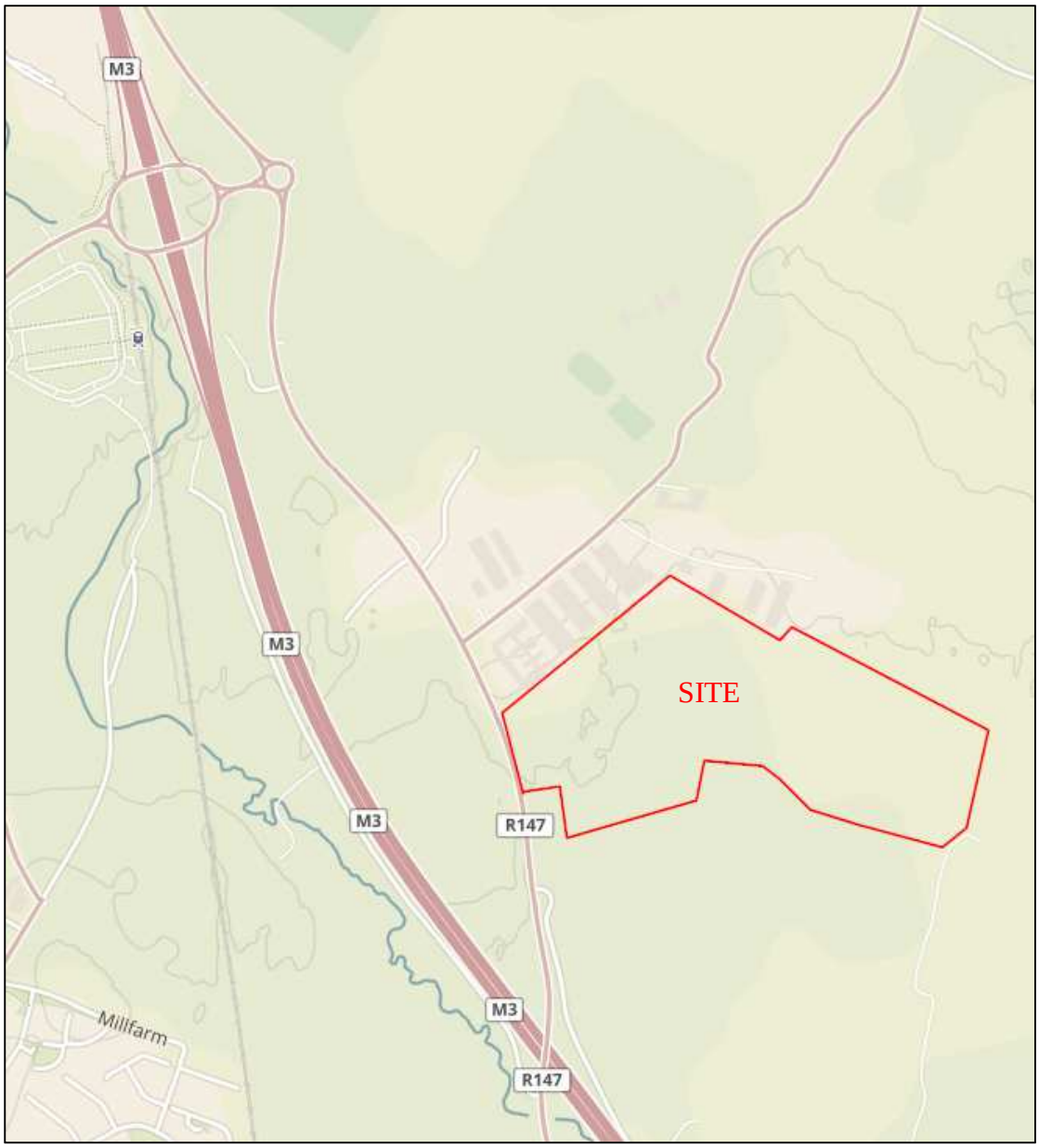


Figure 1 – Site Location

IGSL Limited were appointed by Clifton Scannell Emerson and Associates (CSEA) to conduct a ground investigation at the site. The objectives of the investigation were to ascertain the ground and groundwater conditions, and to produce a report which will form part of a due diligence.

Fieldworks were undertaken during March / April 2019.

2.0 Scope of Works

The programme of exploratory works included the following:

- 5 no. cable percussive boreholes
- 3 no. rotary coreholes
- 10 no. mechanically excavated trial pits
- 10 no. dynamic cone penetrometer (DCP) tests
- 4 no. infiltration tests
- Groundwater monitoring at borehole locations
- A programme of geotechnical and chemical laboratory testing

The exploratory hole locations are shown on the as-surveyed site plan in Appendix 7 of this report.

2.1 Cable Percussive Boreholes

Boreholes were constructed in 5 locations (BH01 to BH03, BHSP01 and BHSP02), using a Dando 2000 rig equipped with 200 mm casing.

A hand dug inspection pit was excavated at each location prior to commencing drilling works and the locations were scanned for services using a CAT detection tool.

During the course of boring, in-situ Standard Penetration Tests (SPT) were undertaken at regular intervals. Samples were also recovered to assist in the visual description of recovered soils and to provide specimens for laboratory testing.

Instances of groundwater ingress were recorded and monitored for a further 20 minutes to permit the water to rise. Standpipes were installed in two boreholes (BHSP01 and BHSP02) in order to permit long term groundwater monitoring.

The boreholes encountered Topsoil overlying soft clayey subsoil to depths of between 0.5 and 1.0 metres below existing ground level (m BGL).

Within the western portion of the site, boreholes BH01, BH02 and BHSP02 encountered granular deposits (clayey sandy gravel) directly below the Topsoil / subsoil. These deposits extended to depths of between 1.8 and 2.2 m BGL. In-situ Standard Penetration Tests (SPT) within the gravel deposits produced “N” values in the range 15 to 42, indicating medium dense and dense soils.

Within the eastern portion of the site, boreholes BH03 and BHSP01 encountered deposits of stiff brown sandy gravelly clay below the Topsoil / subsoil layer. These soils were present to depths of 2.1 and 2.0 m BGL respectively and were characterised by an SPT “N” value of 17 in both boreholes, indicating a stiff consistency.

All boreholes encountered basal deposits of grey-black sandy very gravelly clay with a cobble content. These were typically high strength (very stiff consistency) and were characterised by “N” values in the range 25 to 48. All boreholes terminated within these deposits, recording “Refusal” (“N” value > 50) in the final SPTs.

Groundwater was encountered in all boreholes in the form of seepage or slow ingress. Water strike depths were in the range 1.4 to 4.2 m BGL. During the subsequent 20 minute monitoring period, water levels rose to a shallowest depth of 1.2 m BGL (at BH SP02).

The borehole records are presented in Appendix 1 of this report.

2.2 Rotary Coreholes

Rotary coring was undertaken at 3 no. locations (RC01 to RC03). Symmetrix "open hole" techniques were used to advance through the overburden soils, reverting to coring techniques on encountering the first indications of bedrock.

The recovered rock core was inspected by a qualified engineering geologist and logged in detail at IGSL's laboratory. Records detailing the Total Core Recovery (TCR), Solid Core Recovery (SCR) and Rock Quality Designation (RQD) were produced. Core records also include a fracture log (spacing between successive core joints measured from the cores) of the core recovered.

All cores were labelled and photographed for inclusion in the report. Photographs are presented digitally for ease of browsing and to permit close examination at high resolution.

The rotary coreholes identified the weathered bedrock horizon at depths of between 4.5 and 5.5 m BGL and coring was advanced to depths of between 10.9 and 12.7 m BGL.

The bedrock was described as slightly to locally moderately weathered, medium strong to strong fine grained argillaceous LIMESTONE with zones of mudstone and shale.

Total Core Recovery (TCR) was excellent throughout (100%), with Solid Core Recovery (SCR) within the upper two metres was variable, dipping below 30% within weathered mudstone / shale zones. The SCR improved with depth, with values in the range 70 to 90% measured. RQD values were generally in the range 25 to 60%, locally reducing to 0% within non-intact (highly weathered) zones.

Typical core recovery is shown in Figure 2.



Figure 2 – Core recovery at RC01 (5.5 - 8.3 m BGL)

Uniaxial Compressive Strength (UCS) tests on intact sections of core yielded UCS values in the range 66 to 88 MPa. Point load tests undertaken on rock core samples yielded Is_{50} values typically in the range 3 to 6 MPa. These suggest equivalent UCS values of the order of 60 to 120 MPa. The results of UCS and point load tests therefore indicate that the limestone bedrock is predominately Strong in accordance with BS EN ISO 14689-1.

Corehole records and photographs are included in Appendix 2 of this report.

2.3 Trial Pits

Trial pitting was performed at 10 locations (TP01 to TP10) using a wheeled JCB excavator. The trial pits were logged and sampled by an IGSL geotechnical engineer in accordance with BS 5930 (1999+A2:2010).

Pit sidewalls were assessed in terms of their short term stability and any instances of groundwater ingress were recorded. Bulk soil samples were also recovered to provide specimens for laboratory testing.

The samples were placed in heavy duty polyethene bags and sealed before being transported to Naas for laboratory testing. For this project, environmental samples were obtained and placed in appropriate containers.

The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs in Appendix 3 include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

The ground conditions in the trial pits generally reflected those in the cable percussive boreholes. Topsoil was encountered in all locations and this was underlain by subsoil, which was organic (rooty) in places. The subsoil was generally in a soft or firm condition, and typically extended to a depth of up to 0.6 m BGL. At TP08 and TP10, soft and soft to firm soils were present to depths of 1.1 and 0.9 m BGL respectively.

Within the western portion of the site, trial pits TP02 to TP06 encountered clayey sandy gravel with cobbles below the Topsoil / subsoil layers. These were present to depths of between 1.5 and 2.5 m BGL, although it is noted that trial pit TP03 terminated within gravel soils at a depth of 2.5 m BGL. The exception to this occurred at TP01 (north-west corner of the site), where no gravel soils were encountered.

Within the eastern portion of the site (TP07 to TP10), the Topsoil / subsoil layers were underlain by further deposits of brown sandy gravelly clay. These were described as being in a predominately firm condition and were present to depths of between 1.1 and 1.8 m BGL.

Similar to the boreholes, all trial pits terminated in stiff or very stiff grey / black sandy gravelly clay, which also contained cobbles. A depth of 3.0 m BGL was achieved in all cases. The exception to this was the aforementioned trial pit TP03, where the gravel soils collapsed during excavation and prevented excavation below 2.5 m BGL.

Groundwater was encountered in most trial pits in the form of seepage or slow flow at depths of between 1.2 and 2.8 m BGL. It is noted that higher flow rates occurred within gravel soils.

2.4 TRL Dynamic Cone Penetrometer

DCP testing was undertaken at all trial pit locations (DCP-TP01 to DCP-TP10) in order to estimate the in-situ CBR values for the subgrade soils. Tests commenced at a depth of 0.5 m BGL, ensuring prior removal of the topsoil layer.

The Dynamic Cone Penetrometer (DCP) apparatus was designed by TRL for the rapid in-situ measurement of the structural properties of existing road pavements. However, the apparatus is also widely used to obtain measurements of the CBR values of the sub-grade, particularly in granular soils which are too coarse for laboratory testing where the maximum particle size is limited to 20mm. The DCP-CBR relationship stipulated in TRRL Road Note 8 is based on publications by Kleyn and Van Heerden.

The results of each test are presented in terms of the DCP blow-count (mm/blow) against depth of penetration and the depth range for calculation purposes is generally related to a specific soil layer.

The DCP test records are included in Appendix 4. It is noted that the most onerous (weakest) depth range has generally been selected for the purpose of CBR calculation. However, alternative depth ranges can be selected and the equivalent CBR calculated using the equation provided on the record.

2.5 Infiltration Tests

Infiltration testing was performed in four locations (SA01 to SA04) to ascertain the suitability of the sub-soils for soakaway purposes. Testing was performed in accordance with BRE Digest 365 'Soakaway Design'.

To obtain a measure of the infiltration rate of the sub-soils, water was poured into each test pit to ensure total saturation of the sub-soils. This procedure was repeated twice more, and records were taken of the fall in water level against time. The results for the final stages of testing, following the saturation periods, are enclosed in Appendix 5.

The infiltration rate is the volume of water dispersed per unit exposed area per unit of time, and is generally expressed as metres/minute or metres/second.
Three test pits exhibited negligible infiltration. However, test SA02 encountered a stratum of gravel between 0.4 and 1.6 m BGL, which yielded an infiltration rate of 0.005 m/min.

2.6 Groundwater Monitoring

Standpipes were installed in boreholes BHSP01 and BHSP02 in order to permit long term monitoring of groundwater levels.

The site was re-visited post-fieldwork and readings taken of the groundwater levels in the standpipes. The standpipe installation details and groundwater monitoring results are summarised on Table 1.

Location	Hole Depth (m BGL)	Top of Response Zone (m BGL)	Base of Response Zone (m BGL)	Groundwater Level (07/05/2019)
BHSP01	4.3	1.0	4.3	0.70
BHSP02	4.9	1.0	4.9	1.10

Table 1 – Summary of Groundwater Monitoring

2.7 As-Built Survey

On completion of fieldworks, the location (x,y) and elevation (z) of each exploratory location was determined by detailed survey using GPS Realtime Kinetic survey instrument.

The National Grid survey co-ordinates and ground levels related to Malin Head Datum are presented on the exploratory hole records and these were used to plot the as-built locations on the Site Plan in Appendix 8 of this report.

3.0 Laboratory Testing

Laboratory testing was performed on selected samples to assist in soil classification. Laboratory test results are segregated and presented as follows:

- Appendix 6 – Geotechnical Laboratory Testing
- Appendix 7 – Chemical Test Reports (Chemtest Laboratory)

Geotechnical Tests were undertaken in the IGSL laboratory and comprised:

- Moisture Content
- Atterberg Limits (Plasticity Index)
- Particle Size Distribution (PSD)
- Moisture Condition Value (MCV)
- Dry Density / Moisture Content Relationship (Compaction Test)

Chemical and environmental tests included:

- Sulphate and pH Analysis of soils (Chemtest Laboratory)

3.1 Particle Size Distributions

Grading curves for show marked variations in soil composition, highlighting the presence of both cohesive (silt/clay) and granular (gravel) soils. The PSD results indicate that the gravelly clay soils are well-graded, exhibiting typical “straight line” grading curves.

The grading curves for granular soils were generally dominated by the gravel fraction, with low fines (silt/clay) contents (typically less than 10%).

For practical reasons cobbles and boulders were omitted from test specimens.

3.2 Index Properties (Atterberg Limits)

Moisture contents for the upper soils were variable, with some values of between 20 and 30% measured for the near-surface soils.

Within the underlying gravelly clay soils, moisture contents were more consistent and generally lower, with typical values of 10 to 11%.

The results of plastic and liquid limit tests classify the test specimens as predominantly low to intermediate plasticity clay (CL to CI), and locally non-plastic silt.

3.3 Moisture Condition Value (MCV)

MCV tests provide a rapid indication of the potential for soil reusability at the current moisture content. For the purposes of preliminary assessment, an MCV of 8 or greater is a typical requirement of earthworks specifications for soils to be reused as engineering fill.

A total of seven samples were tested. The results illustrated the variability in the upper soils, as shown on Table 2.

Location	Depth (m BGL)	Moisture Content (%)	Soil Type	MCV
BHSP01	1.0	18	Sandy gravelly CLAY	8.4
BH03	1.0	27	Sandy gravelly CLAY	4.0
TP01	1.0	12	Sandy gravelly CLAY	9.2
TP02	0.5	34	Sandy gravelly CLAY	<1
TP06	2.0	12	Sandy gravelly CLAY	2.4
TP08	0.5	14	Sandy gravelly CLAY	2.2
TP10	0.5	28	Sandy gravelly CLAY	7.6

Table 2 – Summary of MCV results

Table 2 shows that 3 of the 7 samples were in the range 7 to 9, indicating potential suitability for reuse as engineering fill. However, the remaining 4 tests yielded considerably lower MCV values.

Where MCV values were low, these either related to near-surface samples (TP02) or where the moisture contents were exceptionally high (BH03, TP02). It is also noted that the lowest results relate to soils that were classified as either low plasticity clay or non-plastic silt. These soils are generally sensitive to disturbance and can soften dramatically with small increases in moisture content.

3.4 Compaction Test (Dry Density / Moisture Content Relationship)

Compaction testing was undertaken to determine the dry density of soil when it is compacted in a specific manner over a range of moisture content values. The results are plotted as a graph of moisture content against dry density to determine the optimum moisture content (OMC) i.e. the moisture content at which the maximum dry density is achieved.

Testing was performed in accordance with method 3.3 of BS 1377: Part 4: 1990. In this test, soil passing the 20 mm sieve is compacted into a one litre compaction mould, in three layers, with a vibrating hammer.

The results are summarised in Table 3, which also shows the dry density and moisture content values for the sample in its "as-received" condition. The dry density of the as-received sample is expressed as a percentage of the optimum.

Location	Depth (m BGL)	As Sampled Moisture Content (%)	Soil Type	Dry Density at Natural Moisture Content (Mg/m^3)	Maximum Dry Density (Mg/m^3)	NDD/ MDD (%)	Optimum Moisture Content (%)
TP01	0.5	11	Sandy gravelly CLAY	2.02	2.02	100	11
TP06	2.0	28	Sandy gravelly CLAY	1.51	1.65	92	18
TP08	0.5	16	Sandy gravelly CLAY	1.90	2.00	95	8

Table 3 – Summary of Compaction Test Results

Table 3 shows that the Optimum Moisture Content (OMC) was in the range 8 to 11% for two samples. At TP06, the achieved density was comparatively low and the as-received moisture content exceptionally high. It is though that this material had been influenced by water ingress

originating within the overlying gravel soils and is likely to be misrepresentative of the indigenous gravelly clay soils as a whole.

Optimum moisture contents of the order of 11% would be considered more typical of the gravelly clay soils encountered at this site.

3.5 Sulphate and pH Analysis

The results of chemical testing showed very low concentrations of soluble sulphates. In addition, the pH values indicated near neutral conditions.

Since the soluble sulphate concentrations were significantly below 0.5 g/l, and pH values were above 2.5, a Design Sulphate Class of DS-1 may be assumed in accordance with Table C1 of BRE Special Digest 1 Concrete in Aggressive Ground: 2005.

Assuming a static groundwater table, an ACEC (Aggressive Chemical Environment for Concrete) Classification of AC-1s is applicable.

4.0 Discussion and Recommendations

4.1 General

The investigation showed the surface soils to comprise Topsoil and organic (rooty) subsoil. These were in a generally soft / firm condition and extended to depths of typically 0.5 to 0.6 m BGL (locally up to 1.1 m BGL).

The boreholes and trial pits within the western and central portions of the site showed the presence of gravel soils, which extended to depths of up to 2.5 m BGL. Within the eastern portion of the site, no gravel soils were in evidence and instead, firm and stiff gravelly clay soils were present.

The underlying main body of soil comprised stiff and very stiff deposits of grey-black gravelly clay with cobbles. This is glacial till, commonly referred to as the Dublin "boulder clay". The high strength of these deposits is due to over-consolidation during the glaciation period of the ice age.

Groundwater was observed in the form of seepage or slow flow in the majority of trial pits and boreholes. However, inflow was more substantial within gravel soils. Monitoring of standpipes has shown water to be present within the upper metre.

The trial pits remained generally stable when excavating through firm/stiff gravelly clay soils. However, some instability occurred within gravel soils, particularly where groundwater was present.

4.2 Structural Foundations

The Topsoil and near-surface soft or soft to firm subsoils should be discounted as suitable foundation bearing strata. Consideration could instead be given to the construction of shallow foundations on the underlying firm to stiff gravelly clay soils or medium dense sandy gravels, which are generally present within 1.0 to 1.2 metres of existing ground level.

An allowable bearing pressure of the order of 125 to 150 kPa may be assumed for the firm to stiff clay or medium dense gravel soils. It is expected that the foundation excavations within the western and central portion of the site will encounter predominately gravel soils within the upper 1 to 2 metres, while those in the eastern portion will encounter mainly gravelly clay.

If higher bearing pressures are required, the underlying stiff to very stiff grey-black gravelly clay (glacial till) would be expected to support pressures of the order of 200 to 250 kPa at their horizon (typically 1.8 to 2.5 m BGL). These soils become stiffer with depth and bearing pressures in excess of 300 kPa could be assumed within the deeper very stiff glacial tills (c. 3 to 4 m BGL).

Limestone bedrock was confirmed to be present in three locations at depths of between 4.5 and 5.5 m BGL. Considerably higher bearing pressures could be presumed for foundations constructed on the medium strong to strong bedrock, which would be expected to readily support bearing pressures of the order of 1000 to 1500 kPa.

It is noted that while the majority of trial pits remained stable during excavation (typically 45 minutes), pits formed within gravel soils were prone to collapse. Therefore, provision should be made for temporary trench control measures when excavating for foundations.

4.3 Groundwater

During the investigation, water ingress occurred in the trial pits. While these were limited to slow flow or seepage with clay soils, more rapid inflows occurred within the gravel deposits. Groundwater monitoring post-fieldwork has recorded standing water levels as shallow as 0.7 m BGL. Therefore, groundwater ingress should be expected within foundation excavations and dewatering measures will be required, particularly within gravel soils.

Where groundwater ingress occurs in gravelly clay soils, it is recommended that foundation excavations are blinded immediately in order to minimise water-softening of the base. Foundation trenches that contain water should be pumped dry and any water-softened material over-excavated prior to pouring foundations or lean mix concrete.

4.4 Pavements and Hard Standings

The results of in-situ DCP tests indicated variable CBR values at the test depth of 0.5 m BGL. Lowest values of 3.5% were obtained in two locations.

Sub base and capping thicknesses should be designed in accordance with NRA HD 25-26/10. In accordance with the standards, the lowest CBR value should be adopted. Therefore, a CBR of no higher than 3.5% should be provisionally considered for this site. It will also be imperative that any soft or organic soils are removed prior to placing the capping layer. Road construction should only commence on sandy gravelly clay or sandy gravel soils that are free from organics and are in a dry (drained) condition.

Prior to construction, it is strongly recommended that plate bearing tests are conducted on the prepared subgrade in order to confirm the design CBR value prior to placement of the capping layer.

Laboratory testing (Atterberg Limits) has classified the fine grained soils as low to intermediate plasticity clays. Groundwater has been shown to be present within the upper metre in the standpipes. It is noted that groundwater can have a catastrophic softening effect on exposed subgrade, particularly in low plasticity soils. It will be imperative to maintain a dry subgrade before construction of the capping layer. Adequate drainage measures should be implemented before construction so that the groundwater table is kept below (ideally 0.5 metres below) subgrade level. Stripped subgrade should also be protected from surface water ingress or disturbance from unnecessary pedestrian or vehicular traffic. The time between stripping to formation level and placement of the capping layer should be minimised.

Low plasticity soils are particularly susceptible to dilation and rapid weakening as a result of dynamic compaction. Where groundwater is present at or near proposed subgrade, any proof rolling of the subgrade soils should be performed statically using a smooth roller in order to avoid vibratory disturbance. Initial placement of the capping layer should also be carried out using a static roller for the same reason.

Any residual zones of soft subgrade should be removed and replaced with 6F capping or starter layer material (Class 6A / 6B). Plate bearing tests should be considered during construction to verify or validate the stiffness / density of the formation soils.

It is important that argillaceous sedimentary rocks (i.e. muddy limestone, calcareous mudstone, shale, etc.) are not used in sub-base, capping or as a starter layer. These have high potential to give rise to degradation (i.e. poor durability and soundness) and slaking and therefore would not be suitable. All granular fills (particularly Series 600 and 800 material) should be thoroughly examined, tested and approved in advance of being used in the pavement construction.

4.5 Chemical Attack on Buried Concrete

The results of Sulphate and pH testing showed low sulphate levels (< 0.5 g/l) with near-neutral pH levels.

With reference to Table C1 of BRE Special Digest 1: 2005, the level of Sulphate suggests a design Sulphate Class of DS-1. Assuming a static groundwater table, an ACEC (Aggressive Chemical Environment for Concrete) Classification of AC-1s is applicable, since the pH levels are greater than 5.5. In terms of concrete to I.S. EN 206-1:2013, the chemical testing demonstrates that concrete could be manufactured to Class XA1.

4.6 Soil Infiltration

Infiltration testing was performed in four locations to ascertain the suitability of the sub-soils for soakaway purposes. Testing was performed in accordance with BRE Digest 365 'Soakaway Design'.

The soils exhibited no infiltration in three of the four tests. However, test SA02 (north-western portion of the site) recorded steady infiltration within the gravel soils.

Since no infiltration was recorded within the gravelly clay soils, it will important to utilise the higher infiltration rates of the gravel deposits if constructing conventional soakaways. Soakaways are therefore most likely to be located within the western portion of the site where the gravel deposits were most extensive.

5.0 References

1. BS 5930:1999 +A2:2010 Code of Practice for Site Investigations; British Standards Institute
2. Manual of Contract Documents for Highway Works, Volume 5, Section 3, Ground Investigation, Part 4: Specification
3. BRE Special Digest 1: 2005 – Concrete in aggressive ground
4. EN 1997-3; Eurocode 7: Geotechnical Design – Part 3: Design assisted by field testing; 1997
5. BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute;1990.
6. BRE Digest 365, September 1991, British Research Establishment
7. Manual of Contract Documents for Road Works, Volume 1: Specification for Road Works (March 2007)
8. Manual of Soil Laboratory Testing, Volume 3; K.H. Head
9. ISRM – Suggested Methods for Determining Point Load Strength
10. ISRM – Suggested Methods for Determining the Uniaxial Compressive Strength and Deformability of Rock Materials
11. TRL Report 447- Sulfate specification for structural backfills
12. CIRIA C580
13. Specification for Roadworks Series 600 – Specification for Roadworks

Appendix 1

Cable Percussive Boreholes

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BH01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,622.29 E 743,247.36 N	**RIG TYPE**	DANDO 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	70.47	**BOREHOLE DEPTH (m)**	4.90
		DATE COMMENCED	29/03/2019
		DATE COMPLETED	29/03/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
		BORED BY	P.THOMAS
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		70.37	0.10						
	Soft brown very sandy SILT/CLAY with occasional fine gravel		69.97	0.50						
1	Dense grey/brown fine to coarse clayey sandy GRAVEL with cobbles				AA111607	B	1.00		N = 42 (5, 9, 10, 10, 10, 12)	
			68.67	1.80						
2	Very stiff black sandy gravelly CLAY with cobbles				AA111608	B	2.00		N = 50 (3, 12, 15, 17, 12, 6)	
3					AA111609	B	3.00		N = 44 (3, 5, 5, 14, 17, 8)	
4					AA111610	B	4.00		N = 41 (5, 6, 7, 9, 11, 14)	
			65.57	4.90					N = 50/150 mm (8, 12, 22, 28)	
5	Obstruction End of Borehole at 4.90 m									
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.1	4.3	0.5	
4.7	4.9	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.60	2.60	No	2.00	20	Slow

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21674.GPJ IGSL.GDT 7/5/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BH02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,778.50 E 743,277.44 N	**RIG TYPE**	DANDO 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	69.86	**BOREHOLE DEPTH (m)**	5.10
		DATE COMMENCED	01/04/2019
		DATE COMPLETED	01/04/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
		BORED BY	P.THOMAS
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		69.76	0.10						
	Soft grey/brown sandy SILT/CLAY with occasional gravel		68.86	1.00						
1	Medium dense grey/brown fine to coarse silty sandy GRAVEL				AA111611	B	1.00		N = 15 (2, 2, 2, 3, 3, 7)	
2			67.66	2.20	AA111612	B	2.00		N = 20 (1, 2, 2, 4, 5, 9)	
	Stiff dark grey very gravelly very sandy SILT/CLAY with occasional cobbles									
3					AA111613	B	3.00		N = 25 (3, 5, 8, 6, 6, 5)	
			66.06	3.80						
	Very stiff to hard black sandy gravelly CLAY with some cobbles									
4					AA111614	B	4.00		N = 37 (8, 7, 10, 10, 8, 9)	
			64.76	5.10	AA111615	B	5.00		N = 50/150 mm (9, 14, 25, 25)	
5	Obstruction End of Borehole at 5.10 m									
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4	4.2	1	
4.9	5.1	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.50	1.50	No	No	20	Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

BOREHOLE NO. **BH03**
SHEET Sheet 1 of 1

CO-ORDINATES 703,092.68 E
743,136.36 N
GROUND LEVEL (m AOD) 68.75

RIG TYPE DANDO 2000
BOREHOLE DIAMETER (mm) 200
BOREHOLE DEPTH (m) 4.80

DATE COMMENCED 02/04/2019
DATE COMPLETED 02/04/2019

CLIENT EngineNode
ENGINEER Clifton Scannell Emerson Associates

SPT HAMMER REF. NO.
ENERGY RATIO (%)

BORED BY P.THOMAS
PROCESSED BY F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		68.65	0.10						
	Soft grey/brown sandy SILT/CLAY with some fine gravel		68.25	0.50						
1	Stiff brown sandy gravelly CLAY				AA111616	B	1.00		N = 17 (3, 4, 5, 6, 4, 2)	
2			66.65	2.10	AA111617	B	2.00		N = 26 (2, 4, 5, 5, 7, 9)	
	Stiff to very stiff black sandy gravelly CLAY with occasional cobbles									
3					AA111618	B	3.00		N = 25 (3, 4, 6, 5, 6, 8)	
4					AA111619	B	4.00		N = 35 (5, 6, 8, 11, 9, 7)	
			63.95	4.80					N = 50/150 mm (6, 12, 15, 35)	
5	Obstruction End of Borehole at 4.80 m									
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.7	3.9	0.5	
4.6	4.8	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.40	1.40	No	No	20	Seepage

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21674.GPJ IGSL.GDT 7/5/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BHSP01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,214.01 E 743,023.68 N	**RIG TYPE**	DANDO 2000
GROUND LEVEL (m AOD)	68.14	**BOREHOLE DIAMETER (mm)**	200
		BOREHOLE DEPTH (m)	4.30
		DATE COMMENCED	02/04/2019
		DATE COMPLETED	03/04/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
		BORED BY	P.THOMAS
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		68.04	0.10						
	Soft grey/brown sandy SILT/CLAY with occasional gravel		67.44	0.70						
1	Stiff dark brown sandy gravelly SILT/CLAY				AA111620	B	1.00		N = 17 (2, 4, 3, 5, 5, 4)	
			66.14	2.00						
2	Very stiff grey/black gravelly CLAY with cobbles				AA111621	B	2.00		N = 31 (3, 5, 5, 5, 9, 12)	
3					AA111622	B	3.00		N = 48 (6, 7, 10, 10, 12, 16)	
4					AA111623	B	4.00		N = 50/225 mm (11, 14, 19, 23, 8)	
			63.84	4.30						
	Obstruction End of Borehole at 4.30 m									
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.6	3.9	1	
4.1	4.3	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
4.20	4.20	No	3.90	20	Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
03-04-19	4.30	1.00	4.30	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21674.GPJ IGSL.GDT 7/5/19

GEOTECHNICAL BORING RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**BOREHOLE NO.**	**BHSP02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,663.41 E 743,009.21 N	**RIG TYPE**	DANDO 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	69.64	**BOREHOLE DEPTH (m)**	4.90
		DATE COMMENCED	03/04/2019
		DATE COMPLETED	03/04/2019
CLIENT	EngineNode	**SPT HAMMER REF. NO.**	
ENGINEER	Clifton Scannell Emerson Associates	**ENERGY RATIO (%)**	
		BORED BY	P.THOMAS
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		69.54	0.10						
	Brown very sandy SILT/CLAY with gravel and occasional cobbles		68.84	0.80						
1	Medium dense grey fine to coarse silty sandy GRAVEL with occasional cobbles				AA111624	B	1.00		N = 21 (6, 5, 5, 5, 4, 7)	
2			67.44	2.20	AA111625	B	2.00		N = 33 (3, 4, 5, 7, 7, 14)	
	Very stiff to hard black sandy gravelly CLAY with some cobbles									
3					AA111626	B	3.00		N = 41 (5, 7, 8, 9, 12, 12)	
4					AA111627	B	4.00		N = 42 (6, 6, 5, 10, 11, 16)	
			64.74	4.90						
5	Obstruction End of Borehole at 4.90 m				AA111628	B	4.90		N = 50/150 mm (8, 14, 23, 27)	
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.4	1.6	0.75	
4.7	4.9	2	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.50	1.50	1.70	1.20	20	Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
03-04-19	4.90	1.00	4.90	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 21674.GPJ IGSL.GDT 7/5/19

Appendix 2

Rotary Corehole Records

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 1 of 2
CO-ORDINATES		**DATE DRILLED**	07/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	07/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**DRILLED BY**	IGSL
ENGINEER	Clifton Scannell Emerson Associates	**LOGGED BY**	D.O'Shea
CORE DIAMETER (mm)	78		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY				
1												
2									2.00			
								SYMMETRIX DRILLING: No recovery, observed by driller as returns of black sandy gravelly CLAY				
3												
4												
5									5.50			
	5.50							Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.35m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, moderately weathered at fissile mudstone/shale zones at (5.50-5.54m & 6.06-6.08m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally open, locally clay-smeared, locally calcite-veined (1-30mm thick). Dips are 10°-20° & locally 70-80°.				
6		100	95	34								
	6.35											
7		100	95	52								
	7.65											
	7.80	100	67	0								
8		100	93	55								
9												
	9.40											

REMARKS

Hole cased 0.0-5.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.40	5.40	N/S			Seepage

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 2 of 2
CO-ORDINATES		**DATE DRILLED**	07/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	07/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**DRILLED BY**	IGSL
ENGINEER	Clifton Scannell Emerson Associates	**LOGGED BY**	D.O'Shea
CORE DIAMETER (mm)	78		

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.90	100	95	95				End of Borehole at 10.90 m	10.90			
11												
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.0-5.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
5.40	5.40	N/S			Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
08-05-19	10.90	5.50	5.00	Water level recorded 5 mins after end of drilling.

IGSL RC FI 10M 21674.GPJ IGSL.GDT 23/5/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 1 of 2
CO-ORDINATES		**DATE DRILLED**	08/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	08/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**INCLINATION (deg)**	-90
ENGINEER	Clifton Scannell Emerson Associates	**CORE DIAMETER (mm)**	78
		DRILLED BY	IGSL
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown CLAY	1.50			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	2.80			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of black sandy gravelly CLAY	5.60			
3												
4												
5	5.60											
6	6.00	100	48	25				Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.35m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, moderately weathered at fissile mudstone/shale zones at (6.72-6.75m, 6.90-7.01m, 7.72-7.74m, 7.84-7.91m, 8.23-8.30m, 8.55-8.61m, 8.87-8.90m, 9.91-9.93m, 10.96-11.00m, 11.07-11.19m, 11.58-11.60m & 11.97-12.11m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally open, locally clay-smeared, locally calcite-veined (1-10mm thick). Dips are 10°-20° & locally 70-80°.				
	6.85	100	56	36								
7	7.45	100	27	0								
8	8.55	100	77	29								
9		100	76	54								

REMARKS

Hole cased 0.0-5.60m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.50	2.50	N/S			Seepage

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 2 of 2
CO-ORDINATES		**DATE DRILLED**	08/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	08/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**INCLINATION (deg)**	-90
ENGINEER	Clifton Scannell Emerson Associates	**CORE DIAMETER (mm)**	78
		DRILLED BY	IGSL
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.15											
		100	83	34								
11	11.60											
		109	79	43								
12	12.70								12.70			
								End of Borehole at 12.70 m				
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.0-5.60m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.50	2.50	N/S			Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
08-05-19	12.70	5.60	2.50	Water level recorded 5 mins after end of drilling.

IGSL RC FI 10M 21674.GPJ IGSL.GDT 23/5/19

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**DRILLHOLE NO**	**RC03**
		SHEET	Sheet 1 of 2
CO-ORDINATES		**DATE DRILLED**	09/05/2019
GROUND LEVEL (mOD)		**DATE LOGGED**	10/05/2019
RIG TYPE	Knebel		
FLUSH	Air/Mist		
CLIENT	EngineNode	**INCLINATION (deg)**	-90
ENGINEER	Clifton Scannell Emerson Associates	**CORE DIAMETER (mm)**	78
		DRILLED BY	IGSL
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of brown CLAY	1.00			
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of grey brown sandy gravelly CLAY	1.70			
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of black sandy gravelly CLAY				
3												
4	4.50								4.50			
5		100	55	34				Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.35m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, moderately weathered at fissile mudstone/shale zones at (4.69-4.75m, 4.99-5.06m, 5.17-5.19m, 5.44-5.57m, 6.08-6.14m, 6.18-6.22m, 6.33-6.36m, 6.72-6.76m, 6.87-6.90m, 6.98-7.09m, 7.56-7.60m, 7.99-8.04m, 8.48-8.52m, 8.77-8.80m, 9.41-9.43m, 9.54-9.57m, 10.46-10.48m, 10.67-10.69m, 10.85-10.94m & 11.28-11.31m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally open, locally clay-smeared, locally calcite-veined (1-15mm thick). Dips are 10°-20° & locally 70-80°.				
	5.70	100	50	26								
6	6.50	100	42	0								
7	7.15	100	86	66								
8	8.50	100	89	63								
9	9.55	100	97	50								

REMARKS

Hole cased 0.0-4.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 21674

CONTRACT EngineNode Data Centre

DRILLHOLE NO RC03
SHEET Sheet 2 of 2

CO-ORDINATES

GROUND LEVEL (mOD)

RIG TYPE Knebel
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE DRILLED 09/05/2019
DATE LOGGED 10/05/2019

CLIENT EngineNode
ENGINEER Clifton Scannell Emerson Associates

DRILLED BY IGSL
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	10.25											
11		100	72	53								
	11.80								11.80			
12								End of Borehole at 11.80 m				
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.0-4.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
09-05-19	11.80	4.50	3.85	Water level recorded 5 mins after end of drilling.

IGSL RC FI 10M 21674.GPJ IGSL.GDT 23/5/19

RC01 Box 1 of 2 – 5.50-8.30m



RC01 Box 2 of 2 – 8.30-10.90m



RC02 Box 1 of 3 – 5.60-8.55m



RC02 Box 2 of 3 – 8.55-11.15m



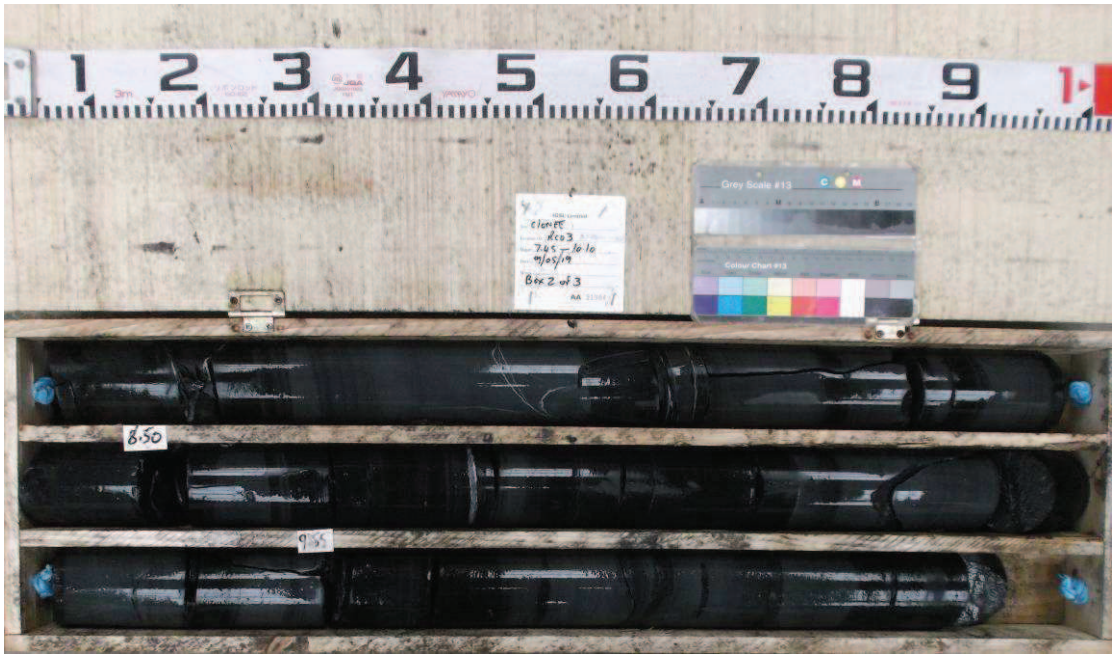
RC02 Box 3 of 3 – 11.15-12.70m



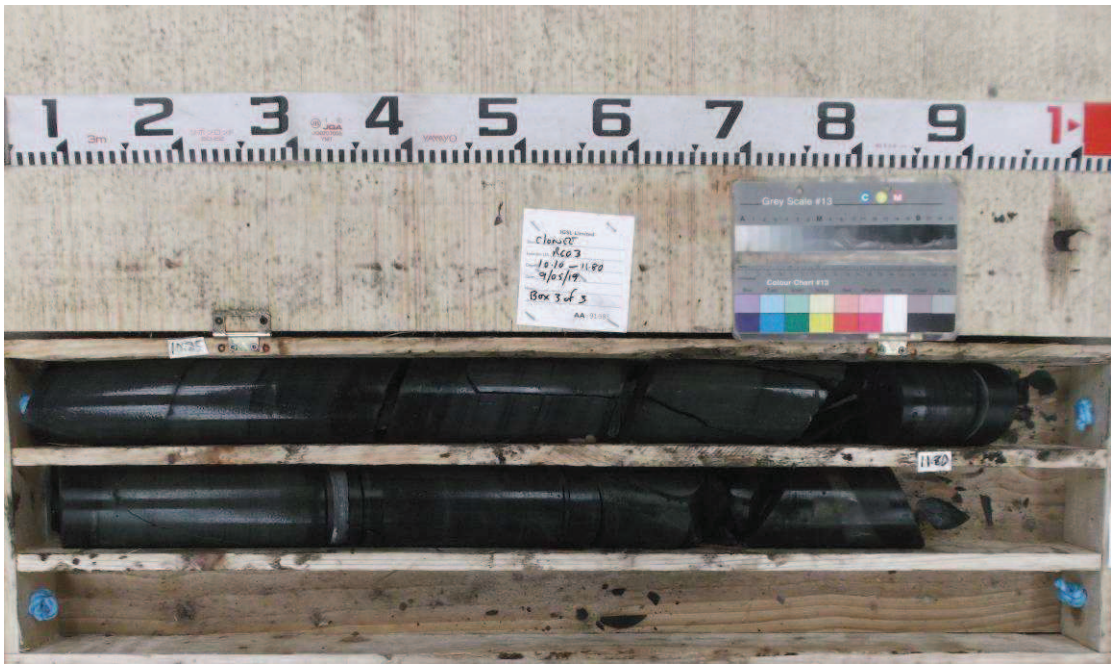
RC03 Box 1 of 3 – 4.50-7.45m



RC03 Box 2 of 3 – 7.45-10.10m



RC03 Box 3 of 3 – 10.10-11.80m



Appendix 3

Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**CO-ORDINATES**	702,718.91 E 743,365.80 N
		DATE STARTED	28/03/2019
		DATE COMPLETED	28/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	70.68
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	70.48						
Firm light brown slightly gravelly silty CLAY with low cobble content. Gravel is fine to medium and subangular to subrounded.					112101	B	0.50-0.50		
1.0					112102	B	1.00-1.00		
Stiff black sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.		1.30	69.38	1 (Seepage)					
2.0					112103	B	2.00-2.00		
3.0 End of Trial Pit at 3.00m		3.00	67.68		112104	B	3.00-3.00		
4.0									

Groundwater Conditions
Seepage @ 1.3m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**CO-ORDINATES**	702,602.78 E 743,238.23 N
		DATE STARTED	28/03/2019
		DATE COMPLETED	28/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	70.68
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	70.48						
Firm light brown slightly gravelly silty CLAY. Sand is fine to medium. Gravel is fine to medium and subangular to subrounded.		0.70	69.98		112105	B	0.50-0.50		
Brown slightly clayey sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.		1.70	68.98		112106	B	1.00-1.00		
Stiff black sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.		2.70	67.98	1 (Seepage)	112107	B	2.00-2.00		
Stiff to very stiff brown mottled black very sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		3.30	67.38		112108	B	3.00-3.00		
End of Trial Pit at 3.30m									

Groundwater Conditions
Seepage @ 2.7m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**CO-ORDINATES**	702,455.01 E 743,069.41 N
		DATE STARTED	28/03/2019
		DATE COMPLETED	28/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	70.80
		EXCAVATION METHOD	JCB
ENGINEER	Clifton Scannell Emerson Associates		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	70.60						
Firm brown silty slightly gravelly CLAY. Gravel is fine to coarse and subangular to subrounded. Sand is fine to coarse.		0.70	70.10		112109	B	0.50-0.50		
Greyish brown slightly clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.					112110	B	1.00-1.00		
					112111	B	2.00-2.00		
End of Trial Pit at 2.50m		2.50	68.30		112112	B	2.50-2.50		

Groundwater Conditions
Moderate @ 2.1m

Stability
Pit collapsed at 2.50m

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**CO-ORDINATES**	702,621.44 E 743,092.34 N
		DATE STARTED	01/04/2019
		DATE COMPLETED	01/04/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	70.32
		EXCAVATION METHOD	JCB
ENGINEER	Clifton Scannell Emerson Associates		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.10	70.22						
Brown SILT/CLAY with roots									
Grey brown silty sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.		0.60	69.72		117170	B	0.50-0.50		
1.0					117171	B	1.00-1.00		
Stiff black slightly sandy gravelly CLAY with low cobble content. Sand is fine to medium. Gravel is fine to medium and subangular to rounded.		1.80	68.52						
2.0					117172	B	2.00-2.00		
3.0 End of Trial Pit at 3.00m		3.00	67.32		117173	B	3.00-3.00		
4.0									

Groundwater Conditions

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP05**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**CO-ORDINATES**	702,629.87 E 742,977.92 N
		DATE STARTED	01/04/2019
		DATE COMPLETED	01/04/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	69.64
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Soft brown SILT/CLAY with occasional fine gravel and roots		0.20	69.44						
Grey brown silty very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse and subangular to rounded.		0.50	69.14		117174	B	0.50-0.50		
1.0					117175	B	1.00-1.00		
Light brown sandy very silty GRAVEL with medium cobble content		1.40	68.24						
2.0					117176	B	2.00-2.00		
Stiff black very gravelly CLAY (Possibly claybound gravel)		2.50	67.14	1 (Moderate)					
3.0 End of Trial Pit at 3.00m		3.00	66.64		117177	B	3.00-3.00		
4.0									

Groundwater Conditions
Moderate @ 2.5m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP06**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**CO-ORDINATES**	702,864.10 E 743,097.65 N
		DATE STARTED	28/03/2019
		DATE COMPLETED	28/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	69.13
		EXCAVATION METHOD	JCB
ENGINEER	Clifton Scannell Emerson Associates		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
		0.40	68.73						
Grey clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded. Cobbles are subangular to subrounded.					112117	B	0.50-0.50		
1.0				1 (Slow)	112118	B	1.00-1.00		
		1.50	67.63						
Stiff to very stiff black sandy gravelly silty CLAY. Gravel is fine to coarse and subangular to subrounded. Sand is fine to coarse.									
2.0					112119	B	2.00-2.00		
		2.50	66.63						
End of Trial Pit at 2.50m									
3.0									
4.0									

Groundwater Conditions
Slow @ 1.2m

Stability
Pit collapsing from 0.50-1.50m in sandy gravel

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP07**
		SHEET	Sheet 1 of 1
LOGGED BY	FC	**CO-ORDINATES**	703,032.89 E 742,999.34 N
		DATE STARTED	01/04/2019
		DATE COMPLETED	01/04/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	68.45
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.10	68.35						
Soft brown sandy SILT/CLAY with occasional gravel		0.40	68.05						
Firm brown/grey sandy SILT/CLAY with some gravel and occasional cobbles					AA117189	B	0.50		
1.0					AA117190	B	1.00		
Stiff to very stiff dark grey and black sandy gravelly CLAY with some cobbles		1.80	66.65						
2.0					AA117191	B	2.00		
3.0 End of Trial Pit at 3.00m		3.00	65.45		AA117192	B	3.00		
4.0									

Groundwater Conditions
Pit was dry

Stability
Pit was stable.

General Remarks

IGSL TP LOG 21674.GPJ IGSL.GDT 7/5/19

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP08**
		SHEET	Sheet 1 of 1
LOGGED BY	DW	**CO-ORDINATES**	702,892.54 E 743,228.26 N
		DATE STARTED	28/03/2019
		DATE COMPLETED	28/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	69.18
		EXCAVATION METHOD	JCB
ENGINEER	Clifton Scannell Emerson Associates		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	68.98						
Brown SILT/CLAY with roots		0.50	68.68						
Soft to firm dark grey very sandy SILT/CLAY with occasional gravel and cobbles					112113	B	0.50-0.50		
1.0					112114	B	1.00-1.00		
Stiff to very stiff black sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		1.10	68.08						
2.0					112115	B	2.00-2.00		
					112116	B	2.80-2.80		
3.0 End of Trial Pit at 3.00m		3.00	66.18						
4.0									

Groundwater Conditions
Seepage @ 1.2m

Stability
Unstable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP09**
		SHEET	Sheet 1 of 1
LOGGED BY	FC	**CO-ORDINATES**	702,977.97 E 743,193.68 N
		DATE STARTED	01/04/2019
		DATE COMPLETED	01/04/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	69.20
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
TOPSOIL		0.15	69.05						
Soft brown sandy SILT/CLAY with occasional gravel		0.40	68.80						
Firm dark grey very sandy SILT/CLAY with occasional gravel and cobbles					AA111709	B	0.50		
					AA111710	B	1.00		
Firm to stiff grey very sandy gravelly SILT/CLAY with cobbles		1.70	67.50	1 (Seepage)					
					AA111711	B	2.00		
End of Trial Pit at 3.00m		3.00	66.20		AA111712	B	3.00		

Groundwater Conditions
Slight water seepage noted 1.70-2.00m

Stability
Pit was stable .

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**TP10**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**CO-ORDINATES**	703,205.08 E 743,114.10 N
		DATE STARTED	01/04/2019
		DATE COMPLETED	01/04/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	68.82
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
		0.40	68.42						
Soft light brown gravelly sandy SILT. Sand is fine to medium. Gravel is fine to coarse and angular to subangular.					117166	B	0.50-0.50		
		0.90	67.92						
1.0 Firm grey sandy very gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to subrounded.					117167	B	1.00-1.00		
		1.80	67.02						
2.0 Stiff to very stiff black sandy very gravelly CLAY with low cobble content. Sand is fine to medium. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.				1 (Seepage)	117168	B	2.00-2.00		
		3.00	65.82						
3.0 End of Trial Pit at 3.00m					117169	B	3.00-3.00		
4.0									

Groundwater Conditions
Seepage @ 2.8m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**SA01**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**CO-ORDINATES**	702,437.10 E 743,115.89 N
		DATE STARTED	29/03/2019
		DATE COMPLETED	29/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	71.33
		EXCAVATION METHOD	JCB
ENGINEER	Clifton Scannell Emerson Associates		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Brown silty very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		0.40	70.93		117101	B	0.90-0.90		
Brown silty very sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		1.60	69.73	1 (Seepage)	117102	B	1.80-1.80		
End of Trial Pit at 2.00m		2.00	69.33						

Groundwater Conditions
Seepage @ 2.0m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**SA02**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**CO-ORDINATES**	703,243.96 E 742,958.84 N
		DATE STARTED	29/03/2019
		DATE COMPLETED	29/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	67.58
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Brown silty very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse and subangular to subrounded.		0.40	67.18		117103	B	0.90-0.90		
Firm to stiff grey slightly gravelly CLAY.		1.60	65.98		117104	B	1.80-1.80		
End of Trial Pit at 2.00m		2.00	65.58						

Groundwater Conditions

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**SA03**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**CO-ORDINATES**	702,940.19 E 743,066.60 N
		DATE STARTED	29/03/2019
		DATE COMPLETED	29/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	68.55
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm grey / black sandy very gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to rounded.		0.50	68.05		112122	B	0.90-0.90		
1.0 Stiff black gravelly CLAY with low cobble content. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.		1.50	67.05						
				1 (Seepage)	112123	B	1.80-1.80		
2.0 End of Trial Pit at 2.00m		2.00	66.55						
3.0									
4.0									

Groundwater Conditions
Seepage @ 2.0m

Stability
Stable

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 21674

CONTRACT	EngineNode Data Centre	**TRIAL PIT NO.**	**SA04**
		SHEET	Sheet 1 of 1
LOGGED BY	SH	**CO-ORDINATES**	
		DATE STARTED	29/03/2019
		DATE COMPLETED	29/03/2019
CLIENT	EngineNode	**GROUND LEVEL (m)**	
ENGINEER	Clifton Scannell Emerson Associates	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.40							
Firm grey / black sandy very gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse and subangular to rounded.					117106	B	0.80-0.80		
1.0 Stiff black gravelly CLAY with low cobble content. Gravel is fine to coarse and subangular to rounded. Cobbles are subrounded to rounded.		1.50			117107	B	1.60-1.60		
2.0 End of Trial Pit at 2.00m		2.00		1 (Seepage)					
3.0									
4.0									

Groundwater Conditions
Seepage @ 2.0m

Stability
Stable

General Remarks

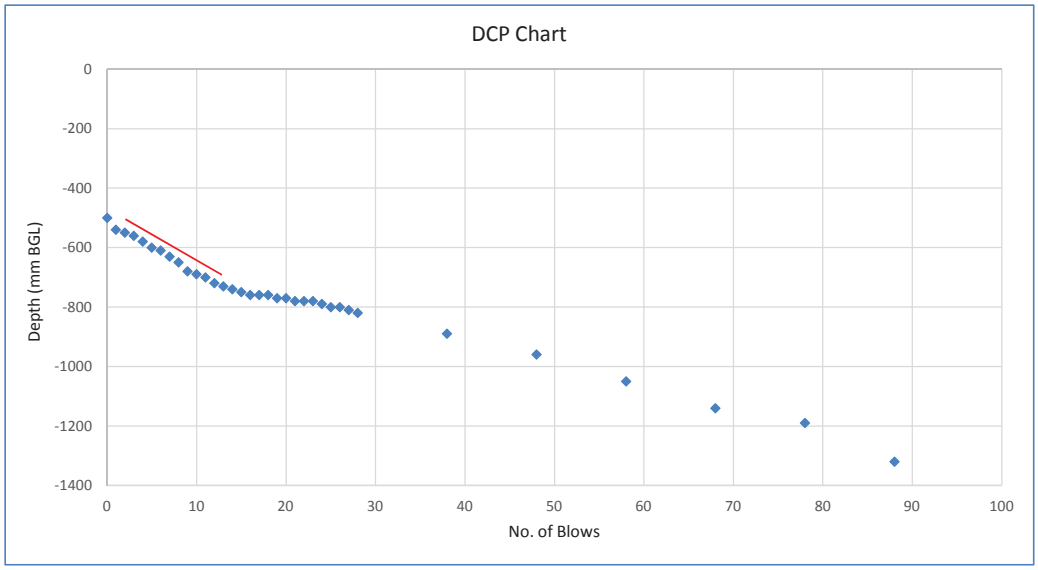
Appendix 4

TRL DCP Probe Records

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP01
Ref No.	DCP TP01		
Client	EngineNode	**DCP Zero Reading**	100 mm
Location	TP01		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Light brown gravelly silty CLAY	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	100	1	21	380			
1	1	140	1	22	380			
1	2	150	1	23	380			
1	3	160	1	24	390			
1	4	180	1	25	400			
1	5	200	1	26	400			
1	6	210	1	27	410			
1	7	230	1	28	420			
1	8	250	10	38	490			
1	9	280	10	48	560			
1	10	290	10	58	650			
1	11	300	10	68	740			
1	12	320	10	78	790			
1	13	330	10	88	920			
1	14	340						
1	15	350						
1	16	360						
1	17	360						
1	18	360						
1	19	370						
1	20	370						



	From	to	Penetration	mm / blow
Depth range (mm)	540	720	180	16.36
Blows	1	12	11	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

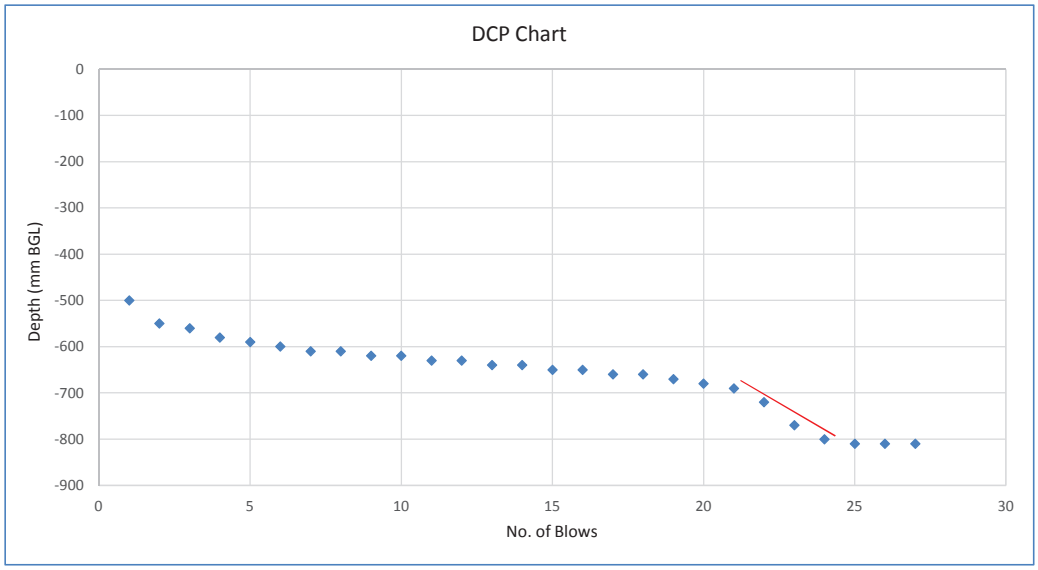
Log10(CBR) = 1.197

CBR = 15.737

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP02
Ref No.	DCP TP02		
Client	EngineNode	**DCP Zero Reading**	140 mm
Location	TP02		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Light brown slightly gravelly silty CLAY	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	140	10	30	360			
1	1	190	10	40	410			
1	2	200	10	50	440			
1	3	220	10	60	450			
1	4	230	5	65	450			
1	5	240	5	70	450			
1	6	250						
1	7	250						
1	8	260						
1	9	260						
1	10	270						
1	11	270						
1	12	280						
1	13	280						
1	14	290						
1	15	290						
1	16	300						
1	17	300						
1	18	310						
1	19	320						
1	20	330						



	From	to	Penetration	mm / blow
Depth range (mm)	690	800	110	36.67
Blows	21	24	3	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

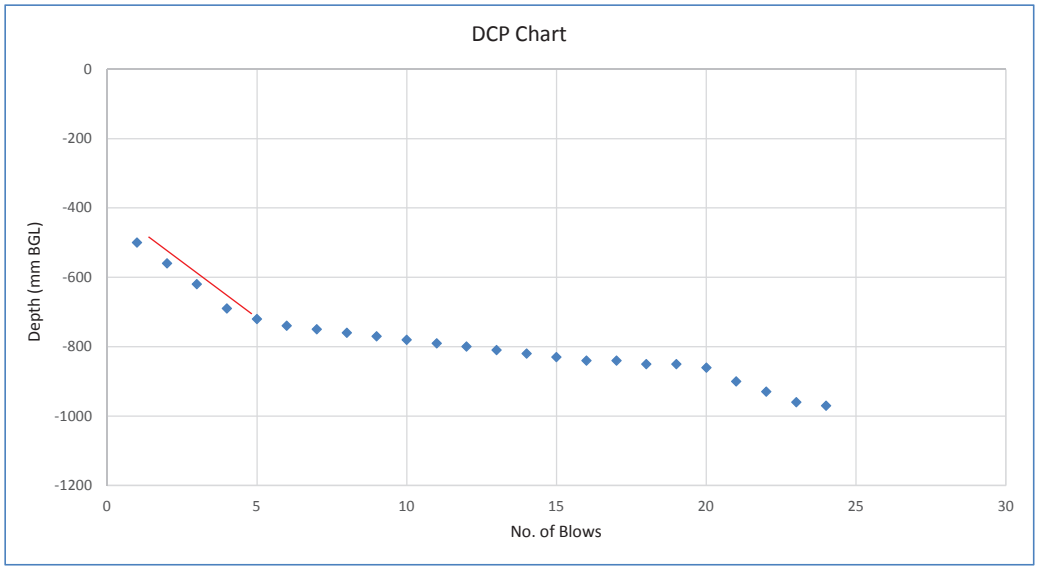
Log10(CBR) = 0.827

CBR = 6.708

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP03
Ref No.	DCP TP03		
Client	EngineNode	**DCP Zero Reading**	140 mm
Location	TP03		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Brown silty slightly gravelly CLAY	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	140	10	40	570			
1	1	200	10	50	600			
1	2	260	10	60	610			
1	3	330						
1	4	360						
1	5	380						
1	6	390						
1	7	400						
1	8	410						
1	9	420						
1	10	430						
1	11	440						
1	12	450						
1	13	460						
1	14	470						
1	15	480						
1	16	480						
1	17	490						
1	18	490						
2	20	500						
10	30	540						



	From	to	Penetration	mm / blow
Depth range (mm)	500	720	220	55.00
Blows	1	5	4	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

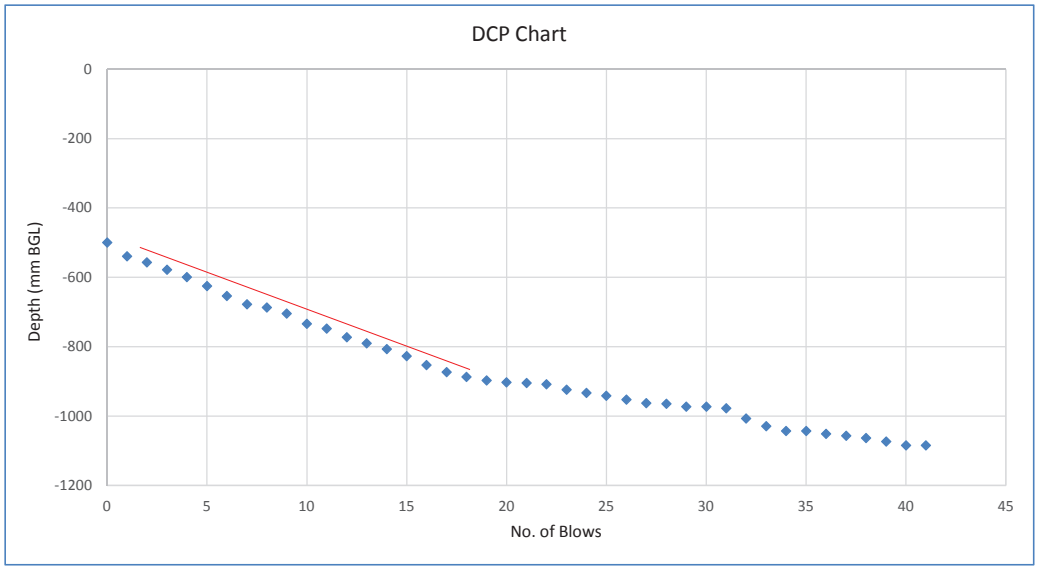
Log10(CBR) = 0.640

CBR = 4.370

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP04
Ref No.	DCP TP04		
Client	EngineNode	**DCP Zero Reading**	127 mm
Location	TP04		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Grey brown silty sandy GRAVEL	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	127	1	21	532	1	42	712
1	1	166	1	22	535	1	43	712
1	2	184	1	23	551			
1	3	205	1	24	560			
1	4	226	1	25	569			
1	5	252	1	26	580			
1	6	281	1	27	590			
1	7	305	1	28	592			
1	8	314	1	29	600			
1	9	332	1	30	600			
1	10	361	1	31	605			
1	11	375	1	32	634			
1	12	400	1	33	656			
1	13	417	1	34	670			
1	14	434	1	35	670			
1	15	454	1	36	678			
1	16	480	1	37	684			
1	17	500	1	38	690			
1	18	514	1	39	701			
1	19	524	1	40	712			
1	20	530	1	41	712			



	From	to	Penetration	mm / blow
Depth range (mm)	539	887	348	20.47
Blows	1	18	17	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

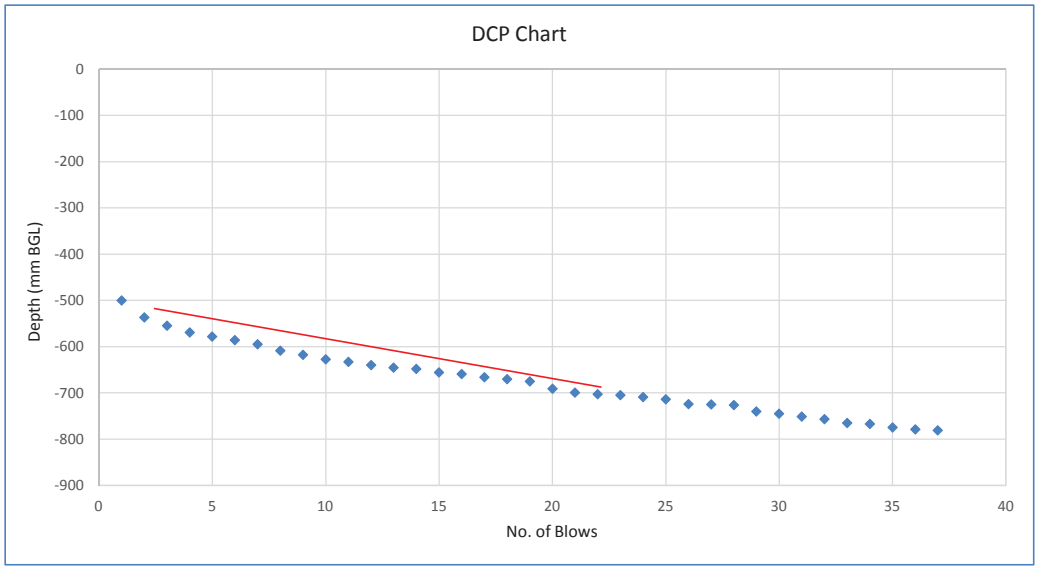
Log10(CBR) = 1.094

CBR = 12.420

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP05
Ref No.	DCP TP05		
Client	EngineNode	**DCP Zero Reading**	75 mm
Location	TP05		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Grey brown silty very sandy GRAVEL	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	75	1	21	278			
1	1	112	1	22	280			
1	2	130	1	23	284			
1	3	144	1	24	289			
1	4	153	1	25	299			
1	5	161	1	26	300			
1	6	170	1	27	301			
1	7	184	1	28	315			
1	8	193	1	29	320			
1	9	202	1	30	326			
1	10	208	1	31	332			
1	11	215	1	32	340			
1	12	220	1	33	342			
1	13	223	1	34	350			
1	14	231	1	35	354			
1	15	234	1	36	356			
1	16	241						
1	17	245						
1	18	250						
1	19	266						
1	20	274						



	From	to	Penetration	mm / blow
Depth range (mm)	537	703	166	8.30
Blows	2	22	20	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

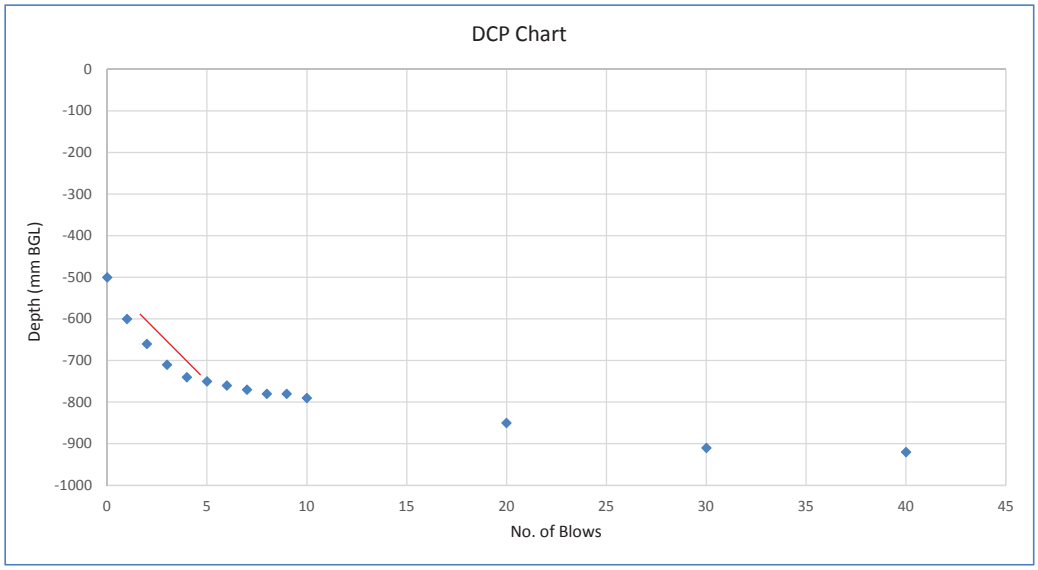
Log10(CBR) = 1.509

CBR = 32.250

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP06
Ref No.	DCP TP06		
Client	EngineNode	**DCP Zero Reading**	90 mm
Location	TP06		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Grey clayey gravelly SAND	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	90						
1	1	190						
1	2	250						
1	3	300						
1	4	330						
1	5	340						
1	6	350						
1	7	360						
1	8	370						
1	9	370						
1	10	380						
10	20	440						
10	30	500						
10	40	510						



	From	to	Penetration	mm / blow
Depth range (mm)	600	740	140	46.67
Blows	1	4	3	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

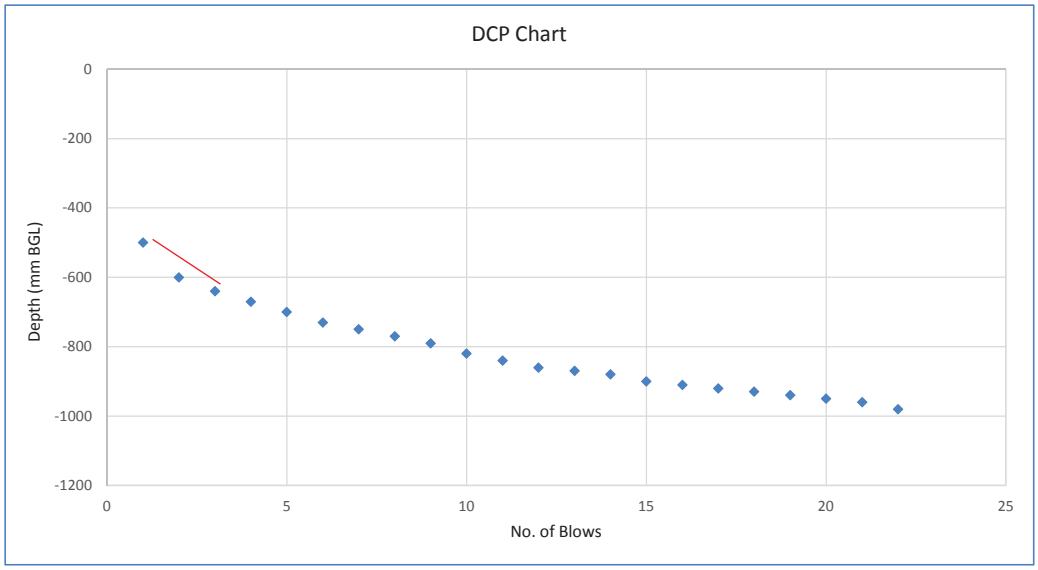
Log10(CBR) = 0.716

CBR = 5.198

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP07
Ref No.	DCP TP07		
Client	EngineNode	**DCP Zero Reading**	100 mm
Location	TP07		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Light brown gravelly sandy CLAY	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	100	10	20	580			
1	1	200						
1	2	240						
1	3	270						
1	4	300						
1	5	330						
1	6	350						
1	7	370						
1	8	390						
1	9	420						
1	10	440						
1	11	460						
1	12	470						
1	13	480						
1	14	500						
1	15	510						
1	16	520						
1	17	530						
1	18	540						
1	19	550						
1	20	560						



	From	to	Penetration	mm / blow
Depth range (mm)	500	640	140	70.00
Blows	1	3	2	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

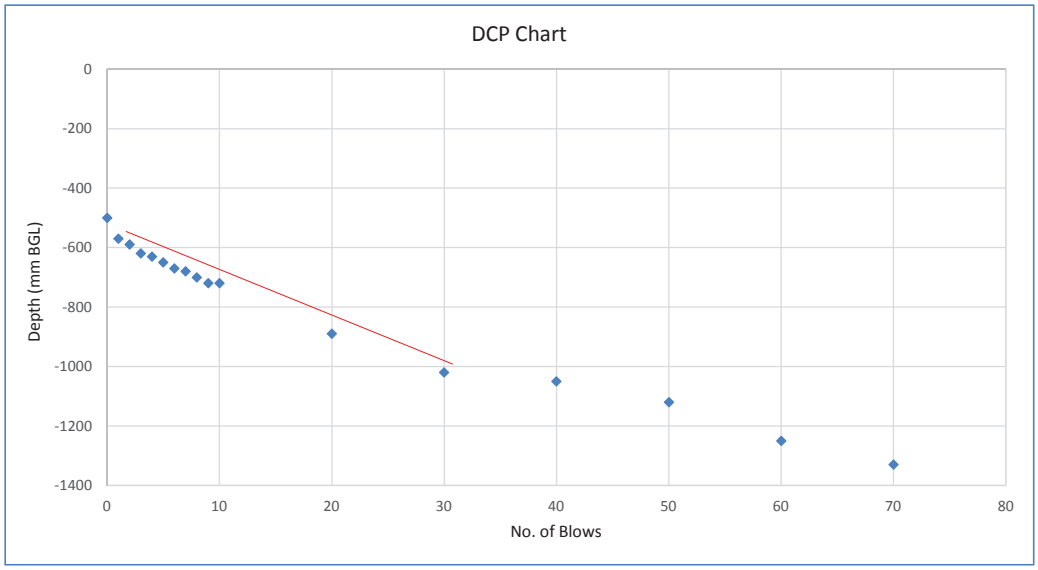
Log10(CBR) = 0.530

CBR = 3.386

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP08
Ref No.	DCP TP08		
Client	EngineNode	**DCP Zero Reading**	130 mm
Location	TP08		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Dark grey very sandy gravelly CLAY	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	130						
1	1	200						
1	2	220						
1	3	250						
1	4	260						
1	5	280						
1	6	300						
1	7	310						
1	8	330						
1	9	350						
1	10	350						
10	20	520						
10	30	650						
10	40	680						
10	50	750						
10	60	880						
10	70	960						



	From	to	Penetration	mm / blow
Depth range (mm)	570	1020	450	15.52
Blows	1	30	29	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

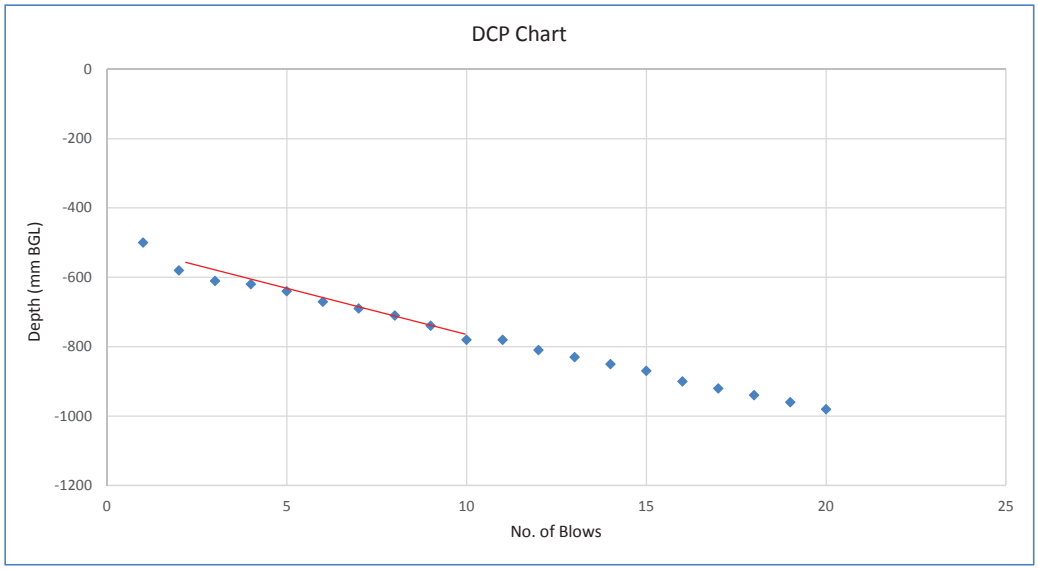
Log10(CBR) = 1.221

CBR = 16.646

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP09
Ref No.	DCP TP09		
Client	EngineNode	**DCP Zero Reading**	100 mm
Location	TP09		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Light brown gravelly sandy CLAY	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	170	10		580			
1	1	180						
1	2	210						
1	3	220						
1	4	240						
1	5	270						
1	6	290						
1	7	310						
1	8	340						
1	9	380						
1	10	380						
1	11	410						
1	12	430						
1	13	450						
1	14	470						
1	15	500						
1	16	520						
1	17	540						
1	18	560						
1	19	580						



	From	to	Penetration	mm / blow
Depth range (mm)	580	780	200	25.00
Blows	2	10	8	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

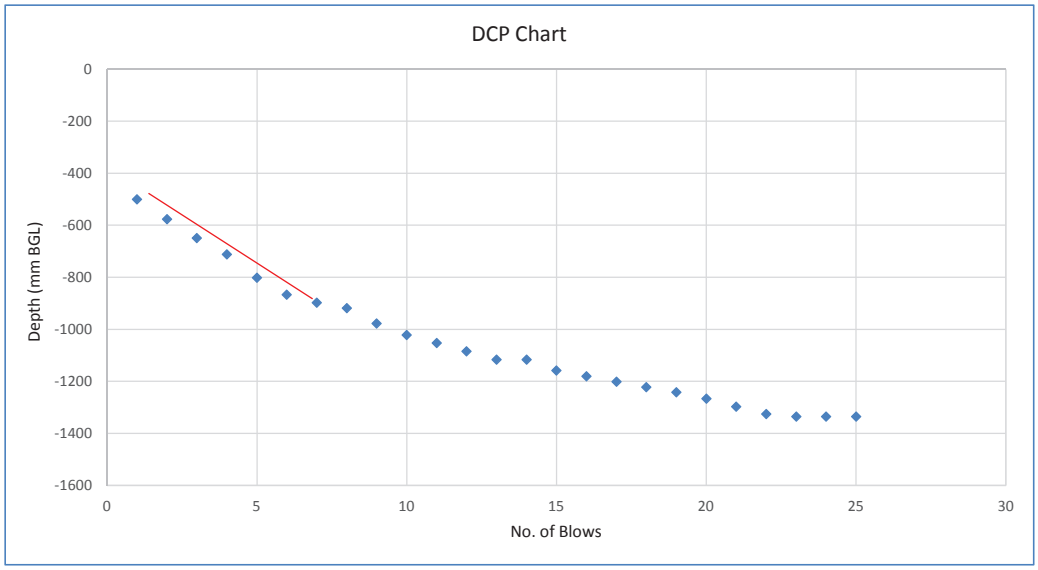
Log10(CBR) = 1.002

CBR = 10.055

Dynamic Cone Penetrometer

Contract	21674	**Date: 1/4/2019**	**Test No.** DCP TP10
Ref No.	DCP TP10		
Client	EngineNode	**DCP Zero Reading**	124 mm
Location	TP10		
Direction		**Start of Test at:**	0.5 m BGL
Soil Description	Light brown gravelly sandy SILT	**Approximate Chainage**	N/A

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	124	1	21	950			
1	1	200	1	22	960			
1	2	273	1	23	960			
1	3	336	1	24	960			
1	4	426						
1	5	491						
1	6	521						
1	7	542						
1	8	602						
1	9	646						
1	10	677						
1	11	708						
1	12	740						
1	13	741						
1	14	782						
1	15	804						
1	16	825						
1	17	846						
1	18	866						
1	19	890						
1	20	921						



	From	to	Penetration	mm / blow
Depth range (mm)	500	897	397	66.17
Blows	1	7	6	

TRRL RN8 Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 0.556

CBR = 3.594

Appendix 5

Infiltration Test Records

Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre Contract No.: 21675
Test No.: SA01
Client: Clifton Scannell Emerson Associates
Date: #########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	TOPSOIL	Not Encountered
0.40	1.60	Brown silty very sandy GRAVEL.	
1.60	2.00	Brown silty very sandy GRAVEL with low cobble content.	

Notes:

Field Data

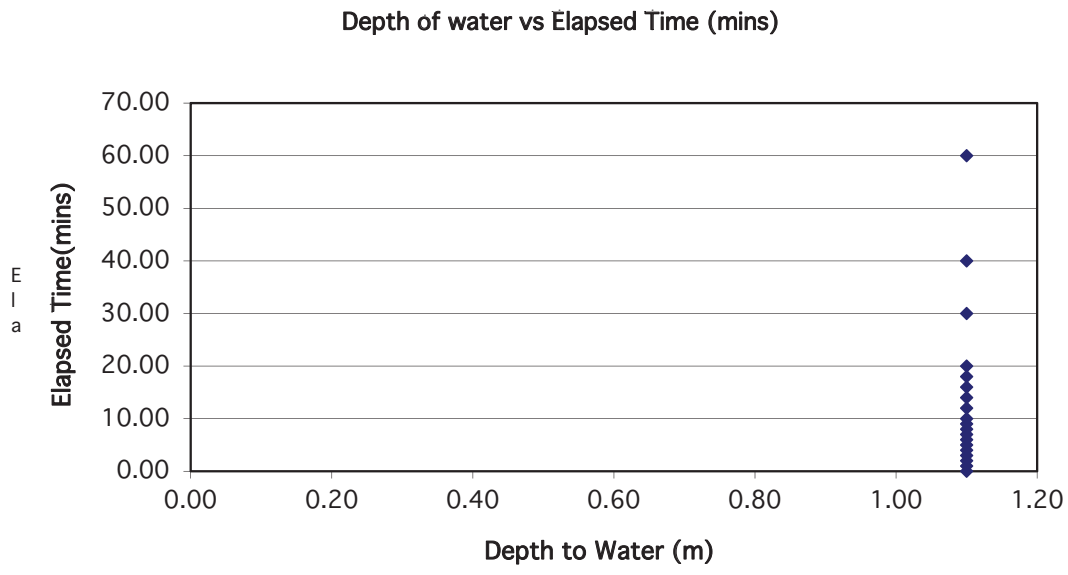
Depth to Water (m)	Elapsed Time (min)
1.10	0.00
1.10	1.00
1.10	2.00
1.10	3.00
1.10	4.00
1.10	5.00
1.10	6.00
1.10	7.00
1.10	8.00
1.10	9.00
1.10	10.00
1.10	12.00
1.10	14.00
1.10	16.00
1.10	18.00
1.10	20.00
1.10	30.00
1.10	40.00
1.10	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.00	m
Initial depth to Water =	1.10	m
Final depth to water =	1.10	m
Elapsed time (mins)=	60.00	
Top of permeable soil	0.00	m
Base of permeable soil	2.00	m
Base area=	0.3	m2
*Av. side area of permeable stratum over test perio	2.34	m2
Total Exposed area =	2.64	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre Contract No.: 21675
Test No.: SA02
Client: Clifton Scannell Emerson Associates
Date: #########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	TOPSOIL	Not Encountered
0.40	1.60	Brown silty very sandy GRAVEL.	
1.60	2.00	Firm to stiff grey slightly gravelly CLAY.	

Notes:

Field Data

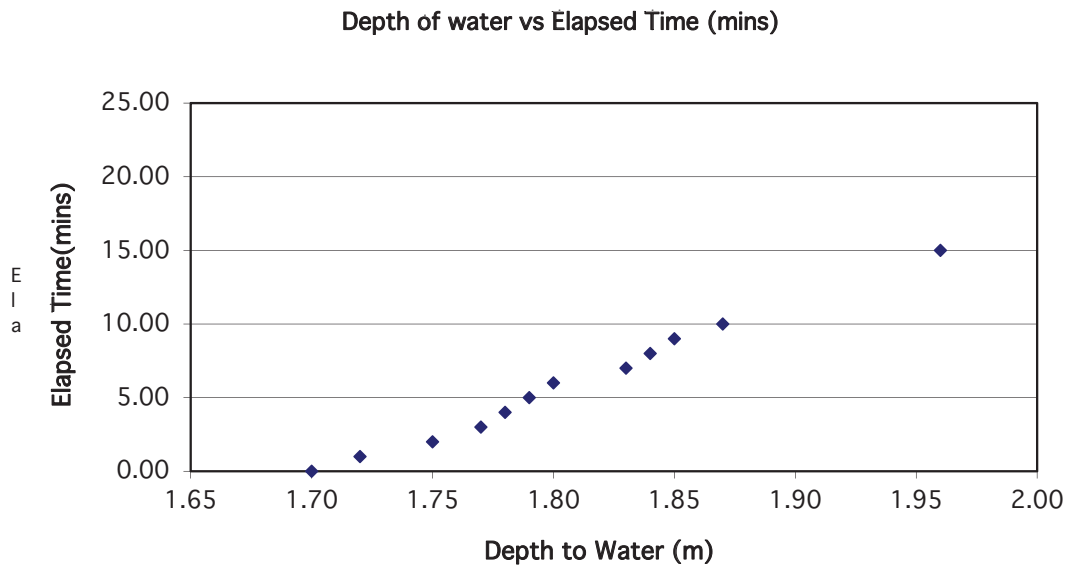
Depth to Water (m)	Elapsed Time (min)
1.70	0.00
1.70	1.00
1.72	2.00
1.75	3.00
1.77	4.00
1.78	5.00
1.79	6.00
1.80	7.00
1.83	8.00
1.84	9.00
1.85	10.00
1.87	15.00
1.96	20.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.00	m
Initial depth to Water =	1.70	m
Final depth to water =	1.96	m
Elapsed time (mins)=	20.00	
Top of permeable soil	0.00	m
Base of permeable soil	2.00	m
Base area=	0.3	m2
*Av. side area of permeable stratum over test perio	0.442	m2
Total Exposed area =	0.742	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0.00526 m/min or 8.76E-05 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre Contract No.: 21675
Test No.: SA03
Client: Clifton Scannell Emerson Associates
Date: #########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.50	TOPSOIL	Seepage @ 2.0m
0.50	1.50	Firm grey / black sandy very gravelly CLAY.	
1.50	2.00	Firm to stiff black gravelly CLAY with low cobble content.	

Notes:

Field Data

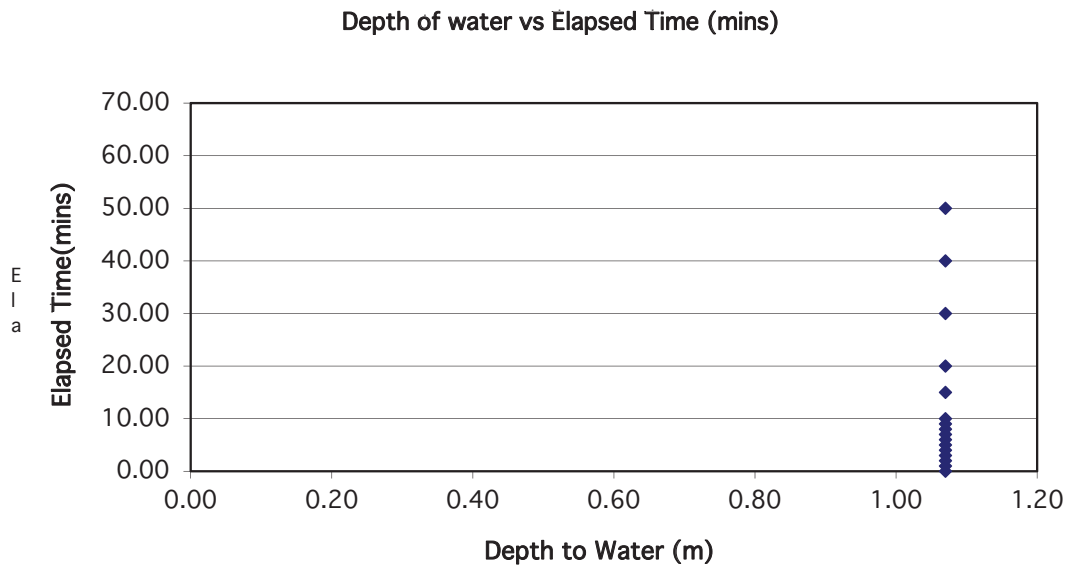
Depth to Water (m)	Elapsed Time (min)
1.07	0.00
1.07	1.00
1.07	2.00
1.07	3.00
1.07	4.00
1.07	5.00
1.07	6.00
1.07	7.00
1.07	8.00
1.07	9.00
1.07	10.00
1.07	15.00
1.07	20.00
1.07	30.00
1.07	40.00
1.07	50.00
1.07	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.00	m
Initial depth to Water =	1.07	m
Final depth to water =	1.07	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.3	m2
*Av. side area of permeable stratum over test perio	2.418	m2
Total Exposed area =	2.718	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: EngineNode Data Centre Contract No.: 21675
Test No.: SA04
Client: Clifton Scannell Emerson Associates
Date: #########

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	TOPSOIL	Seepage @ 2.0m
0.40	1.50	Firm grey / black sandy gravelly CLAY.	
1.50	2.00	Firm to stiff black gravelly CLAY with low cobble content.	

Notes:

Field Data

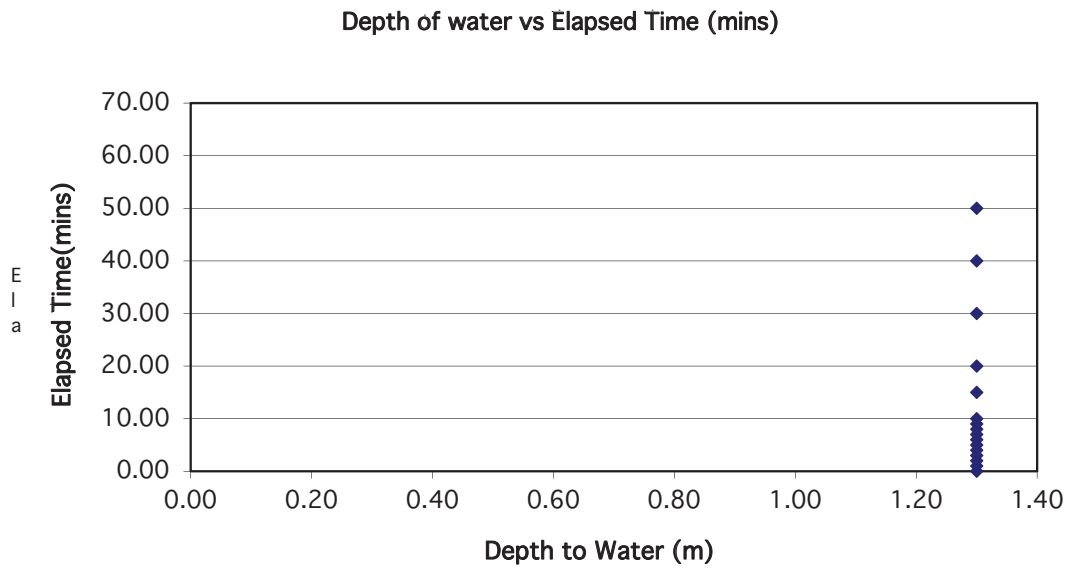
Depth to Water (m)	Elapsed Time (min)
1.30	0.00
1.30	1.00
1.30	2.00
1.30	3.00
1.30	4.00
1.30	5.00
1.30	6.00
1.30	7.00
1.30	8.00
1.30	9.00
1.30	10.00
1.30	15.00
1.30	20.00
1.30	30.00
1.30	40.00
1.30	50.00
1.30	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.30	m
Length of Pit (L)	1.00	m
Initial depth to Water =	1.30	m
Final depth to water =	1.30	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.3	m2
*Av. side area of permeable stratum over test perio	1.82	m2
Total Exposed area =	2.12	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Appendix 6

Geotechnical Laboratory Testing

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2*, 4.3, 4.4 & 5.3

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

Report No. **R100734** Contract No. 21674 Contract Name: Engine Node Data Centre , Clonee,Co.Meath

Customer CSEA

Samples Received: 19/04/09 Date Tested: 10/04/19

BH/TP	Sample No.	Depth (m)	Lab. Ref	Sample Type	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH02	AA11613	3.0	A19/1607	B	8.9	27	15	12	45	WS	4.4	C L	Dark brown/black sandy gravelly CLAY
BH03	AA111616	1.0	A19/1609	B	10	49	23	26	78	WS	4.4	C I	Black sandy slightly gravelly CLAY
BH03	AA111618	3.0	A19/1608	B	17	31	15	16	57	WS	4.4	C L	Black slightly sandy, gravelly, CLAY
BH SP01	AA111620	1.0	A19/1610	B	18	38	18	20	60	WS	4.4	C I	Mottled brown slightly sandy gravelly CLAY
BH SP02	AA111627	4.0	A19/1612	B	22	45	28	17	46	WS	4.4	M I	Mottled grey/brown slightly sandy, gravelly, SILT
TP01	AA112101/2	1.0	A19/1613	B	10	37	20	17	41	WS	4.4	C I	Black slightly sandy, gravelly, CLAY
TP02	AA112105	0.5	A19/1614	B	31	48	29	19	47	WS	4.4	M I	Brown sandy gravelly CLAY
TP04	AA117172	2.0	A19/1618	B	11	31	15	16	51	WS	4.4	C L	Dark brown/black slightly sandy, slightly gravelly, CLAY
TP06	AA112119	2.0	A19/1621	B	11	26	15	11	53	WS	4.4	C L	Dark brown/black slightly sandy, slightly gravelly, CLAY
TP08	AA112113/4	0.5	A19/1622	B	15	34	21	13	37	WS	4.4	C L	Mottled brown sandy gravelly CLAY
TP08	AA112115	2.0	A19/1623	B	11	32	17	15	48	WS	4.4	C L	Grey/brown slightly sandy, slightly gravelly, CLAY
TP10	AA117166	0.5	A19/1624	B	27	55	28	27	74	WS	4.4	C H	Brown sandy gravelly CLAY
SA03	AA112122	1.0	A19/1627	B	11	33	18	15	47	WS	4.4	C L	Mottled dark brown sandy gravelly CLAY
SA04	AA117106	1.0	A19/1628	B	16	39	20	19	59	WS	4.4	C I	Black slightly gravelly sndy CLAY

Notes:
Preparation: WS - Wet sieved; AR - As received; NP - Non plastic
Liquid Limit Clause: 4.3 Cone Penetrometer definitive method; 4.4 Cone Penetrometer one point method
Sample Type: B - Bulk Disturbed; U - Undisturbed

Remarks:

NOTE: *Clause 3.2 of BS1377 is a "withdrawn" standard due to publication of ISO17892-1:2014
Opinions and interpretations are outside the scope of accreditation.
The results relate to the specimens tested. Any remaining material will be retained for one month.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports

H Byrne (Laboratory Manager)

Approved by	Date	Page
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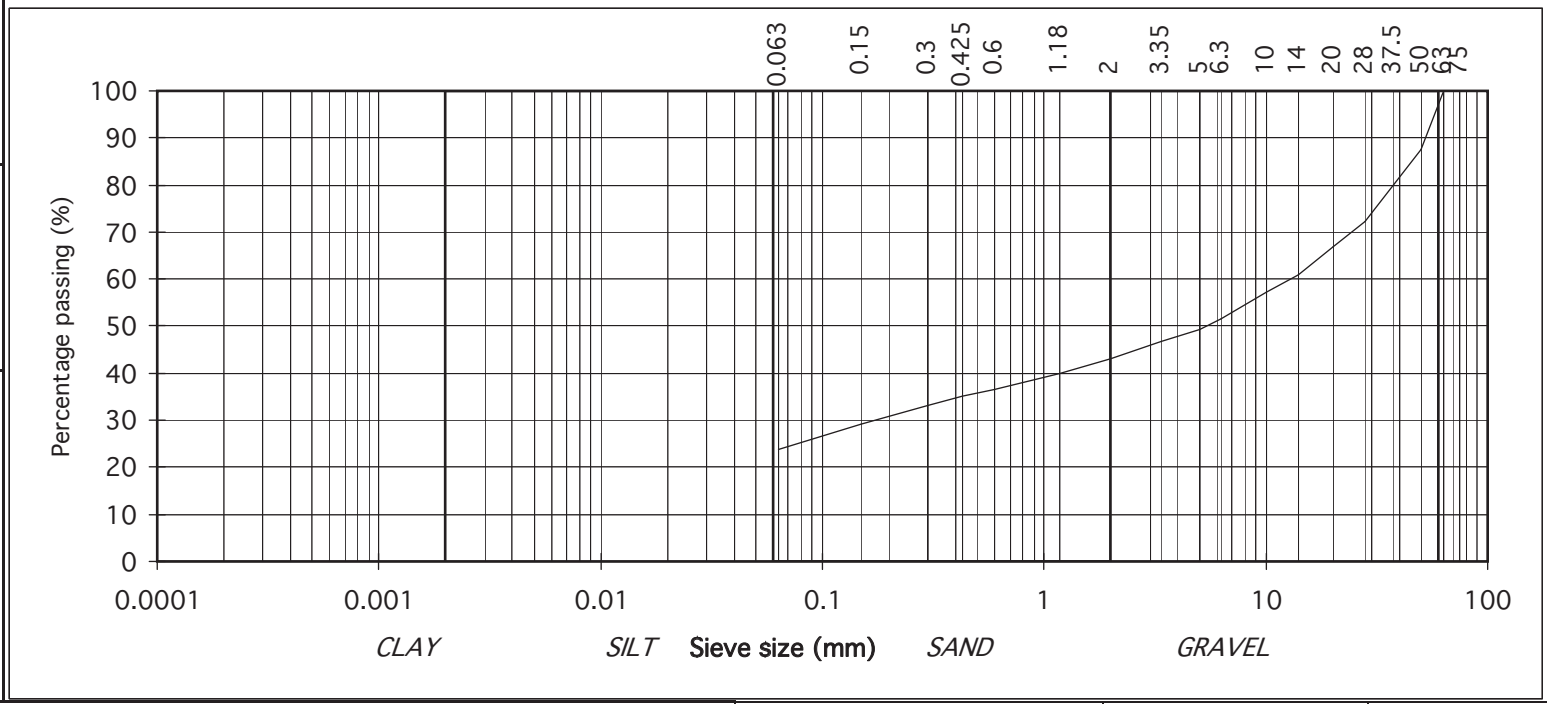
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	88	GRAVEL
37.5	80	
28	72	
20	67	
14	61	
10	57	
6.3	51	
5	49	
3.35	47	
2	43	
1.18	40	SAND
0.6	37	
0.425	35	
0.3	33	
0.15	29	
0.063	24	SILT/CLAY

Contract No: 21674 Report No. R100822
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : BH01
Sample No. AAA111608 Lab. Sample No. A19/1606
Sample Type: B
Depth (m) 2.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Mottled brown slightly sandy, gravelly, SILT/CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution

Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

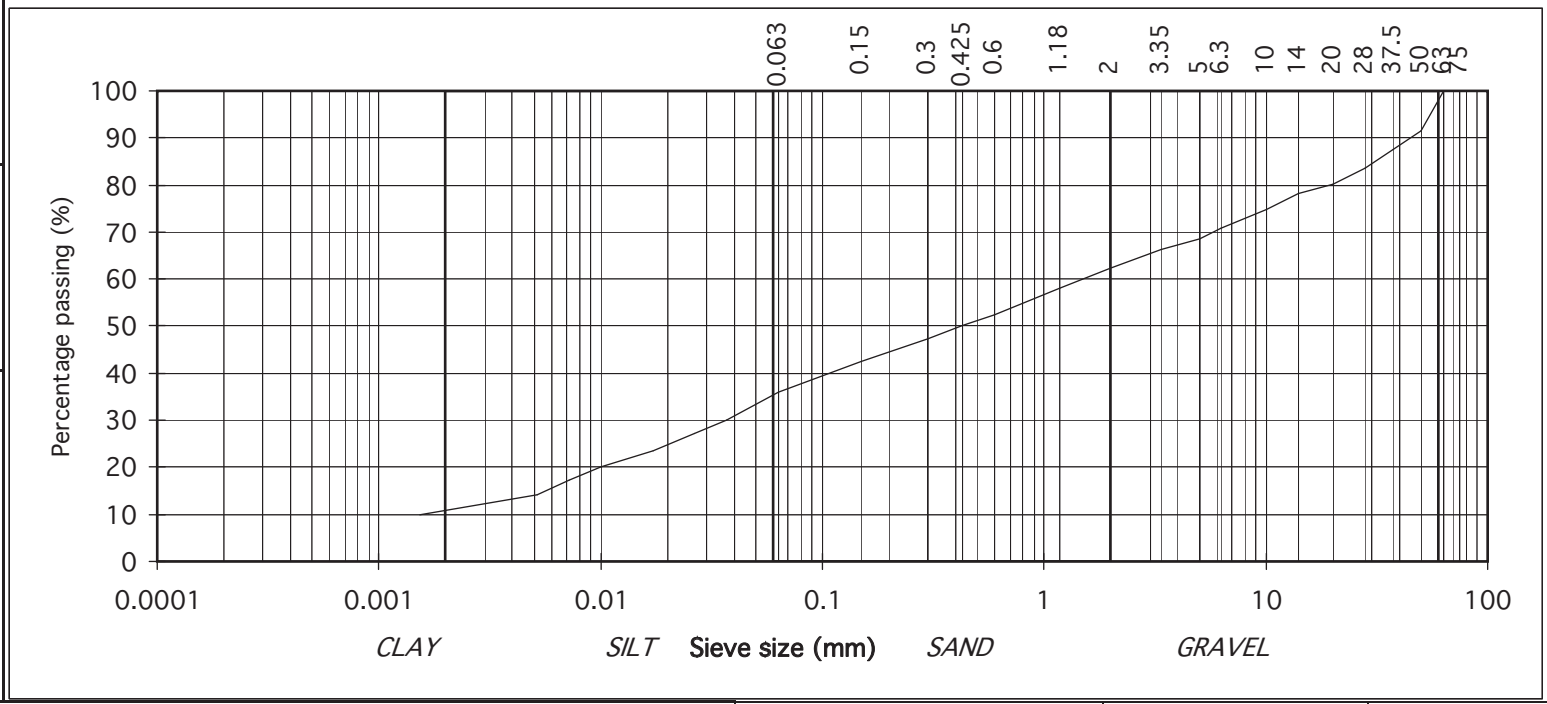
ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	91	GRAVEL
37.5	88	
28	84	
20	80	
14	78	
10	75	
6.3	71	
5	69	
3.35	66	
2	62	
1.18	58	SAND
0.6	52	
0.425	50	
0.3	47	
0.15	42	
0.063	36	SILT/CLAY
0.037	30	
0.027	27	
0.017	24	
0.010	20	
0.007	17	
0.005	14	
0.002	10	

Contract No:	21674	Report No.	R100823
Contract:	Engine Node Data Center , Clonee , Co.Meath		
BH/TP :	BH03		
Sample No.	AA111618	Lab. Sample No.	A19/1609
Sample Type:	B		
Depth (m)	3.00	Customer:	CSEA
Date Received	09/04/2019	Date Testing started	10/04/2019
Description:	Black slightly sandy, gravelly, CLAY		

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

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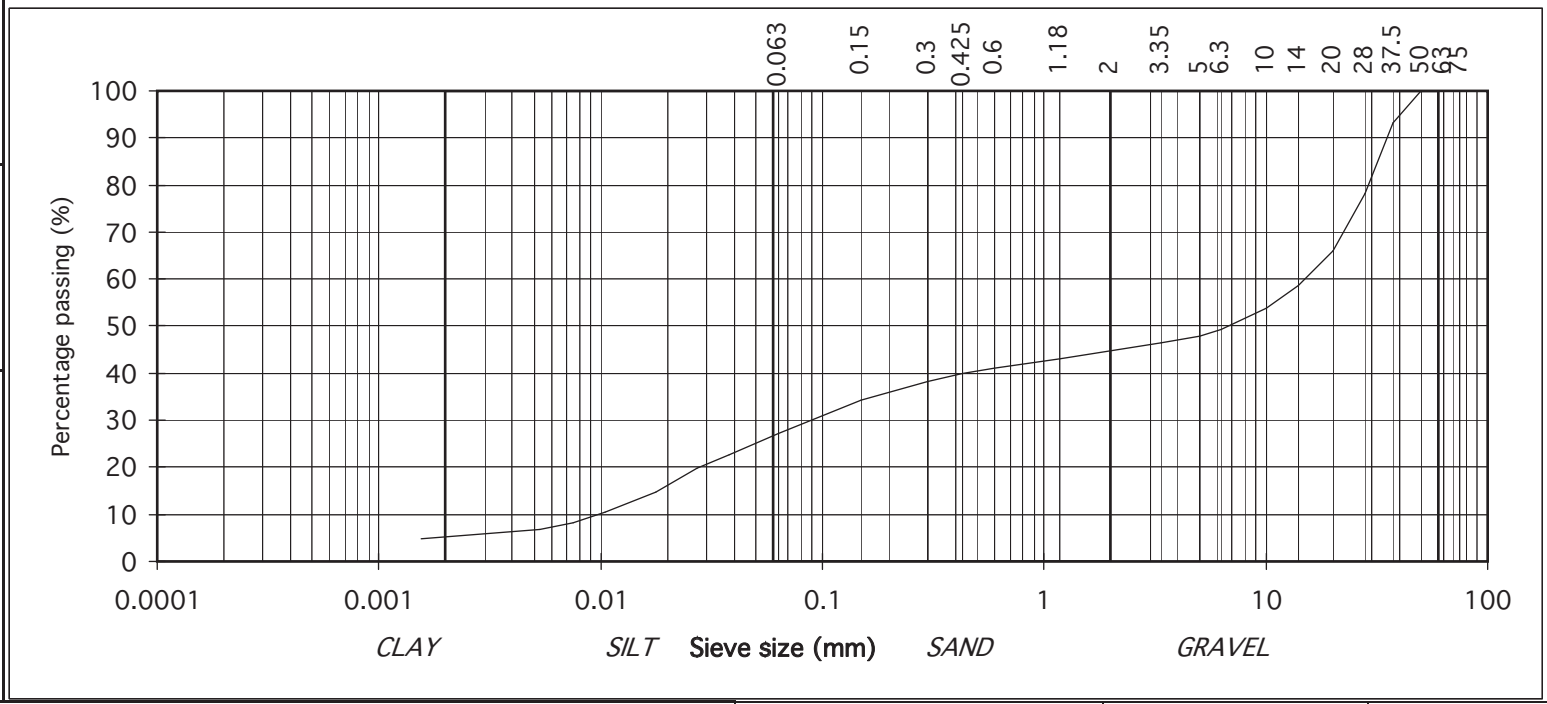
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	93	
28	78	
20	66	
14	59	
10	54	
6.3	49	
5	48	
3.35	47	
2	45	
1.18	43	SAND
0.6	41	
0.425	40	
0.3	38	
0.15	34	
0.063	27	SILT/CLAY
0.038	23	
0.027	20	
0.018	15	
0.010	11	
0.007	8	
0.005	7	
0.002	5	

Contract No: 21674 Report No. R100910
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : BH SP02
Sample No. AA111627 Lab. Sample No. A19/1612
Sample Type: B
Depth (m) 4.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Mottled grey/brown slightly sandy, gravelly, SILT

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

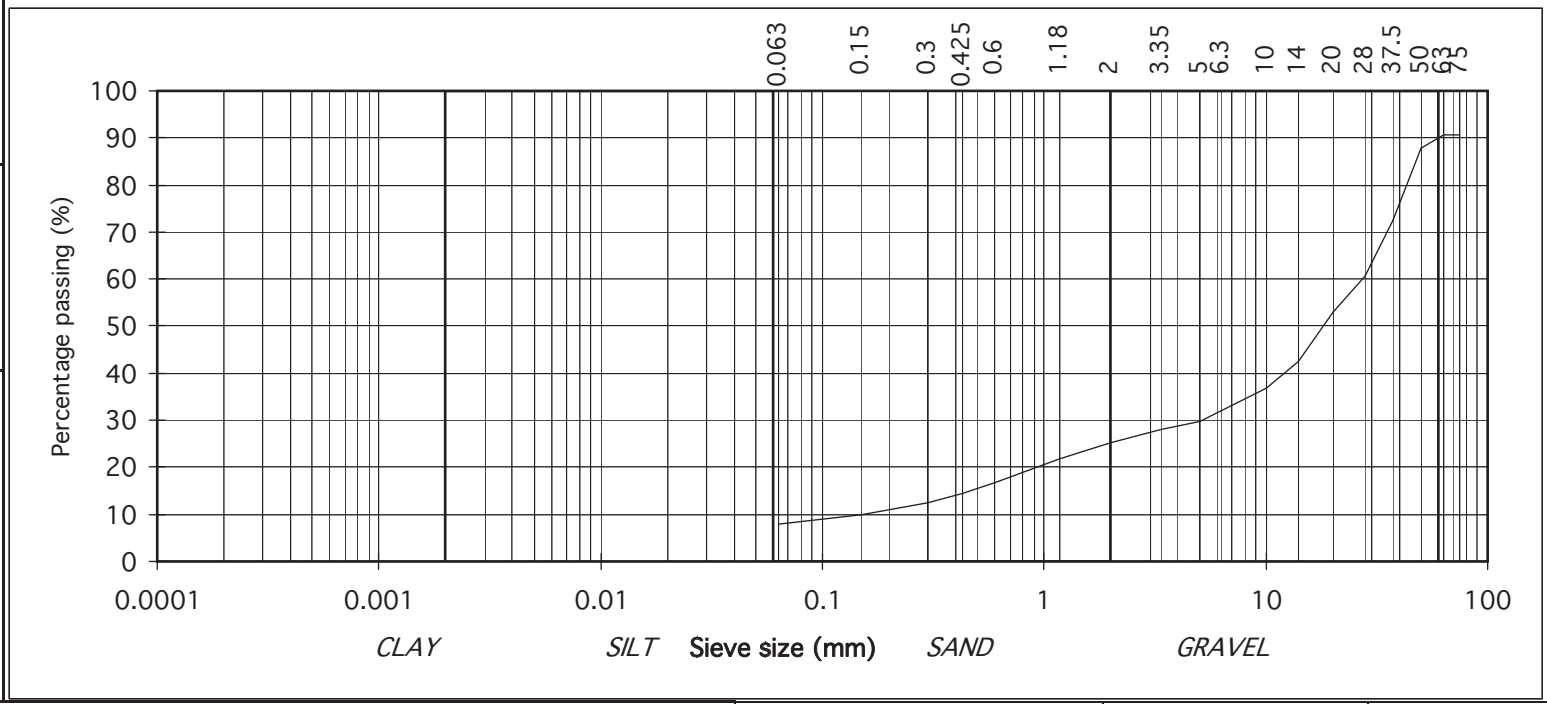
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	91	COBBLES
63	91	
50	88	GRAVEL
37.5	72	
28	61	
20	53	
14	43	
10	37	
6.3	32	
5	30	
3.35	28	
2	25	
1.18	22	SAND
0.6	17	
0.425	14	
0.3	12	
0.15	10	
0.063	8	SILT/CLAY

Contract No: 21674 Report No. R100909
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : BH SP02
Sample No. AA111625 Lab. Sample No. A19/1611
Sample Type: B
Depth (m) 2.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Brown clayey/silty, sandy, GRAVEL with some cobbles

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

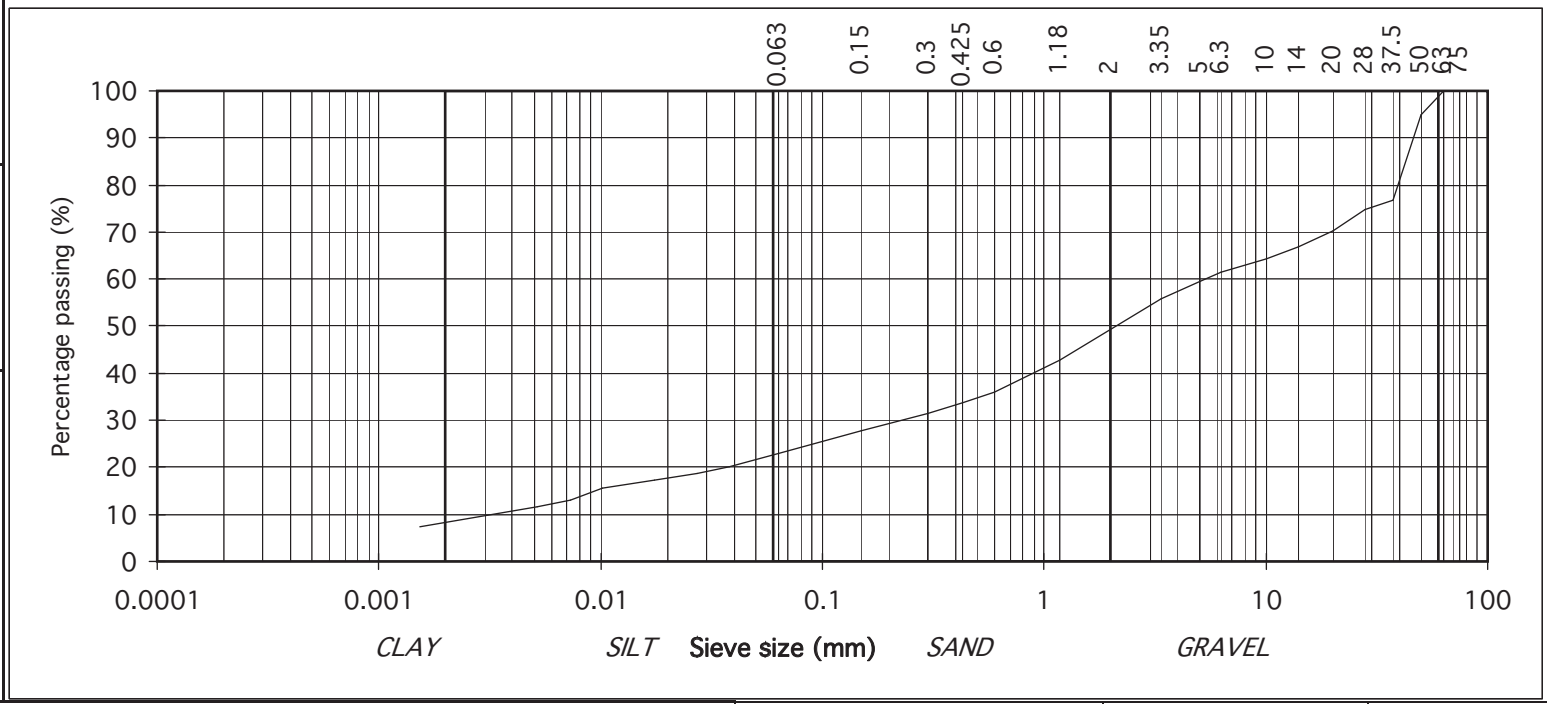
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	95	GRAVEL
37.5	77	
28	75	
20	70	
14	67	
10	64	
6.3	61	
5	59	
3.35	56	
2	49	
1.18	43	SAND
0.6	36	
0.425	34	
0.3	32	
0.15	28	
0.063	23	SILT/CLAY
0.038	20	
0.027	19	
0.017	17	
0.010	16	
0.007	13	
0.005	12	
0.002	7	

Contract No: 21674 Report No. R100824
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP01
Sample No. AA112101/2 Lab. Sample No. A19/1613
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Black slightly sandy, gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

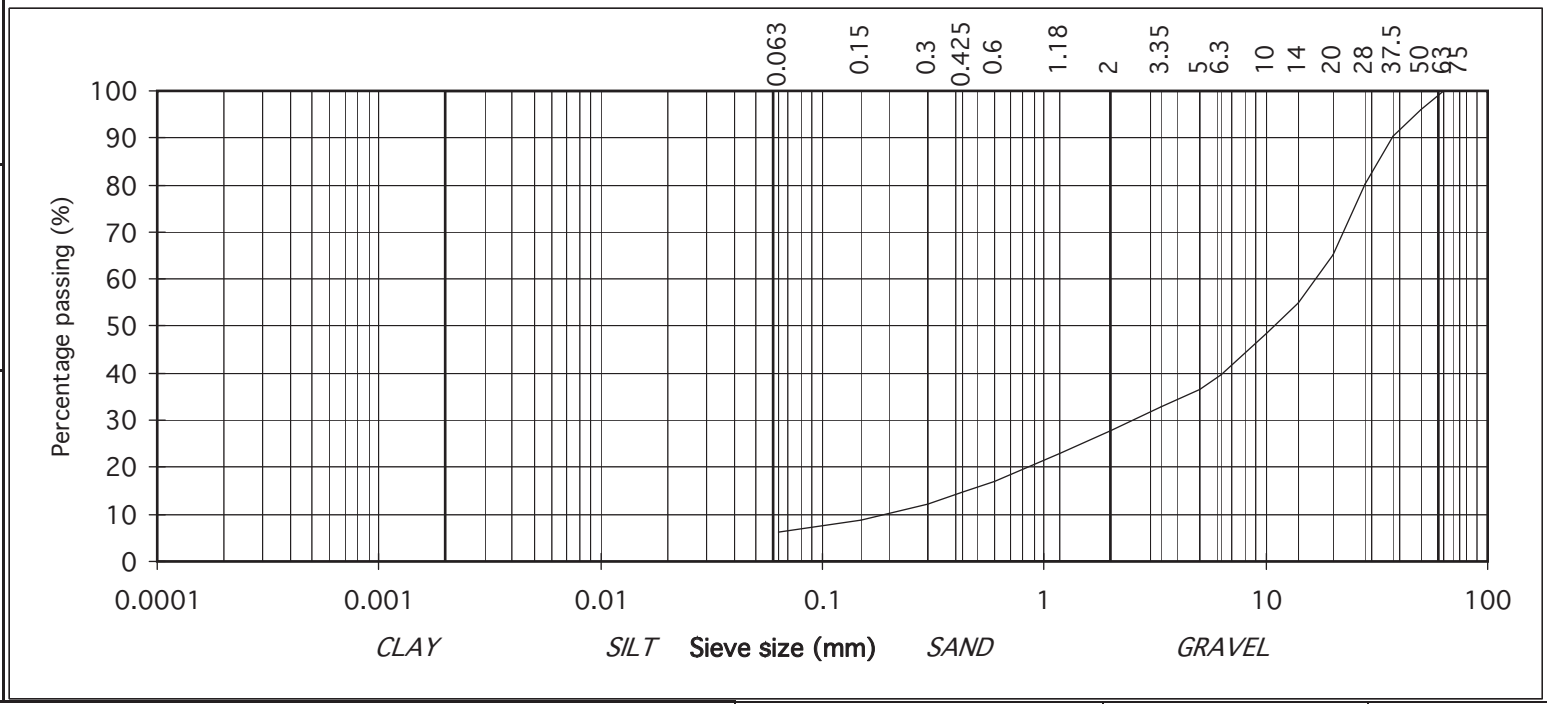
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	96	GRAVEL
37.5	90	
28	80	
20	65	
14	55	
10	48	
6.3	40	
5	36	
3.35	33	
2	28	
1.18	23	SAND
0.6	17	
0.425	15	
0.3	12	
0.15	9	
0.063	6	SILT/CLAY

Contract No: 21674 Report No. R100906
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP02
Sample No. AA112106 Lab. Sample No. A19/1615
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Grey/brown clayey/silty, very sandy, GRAVEL

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

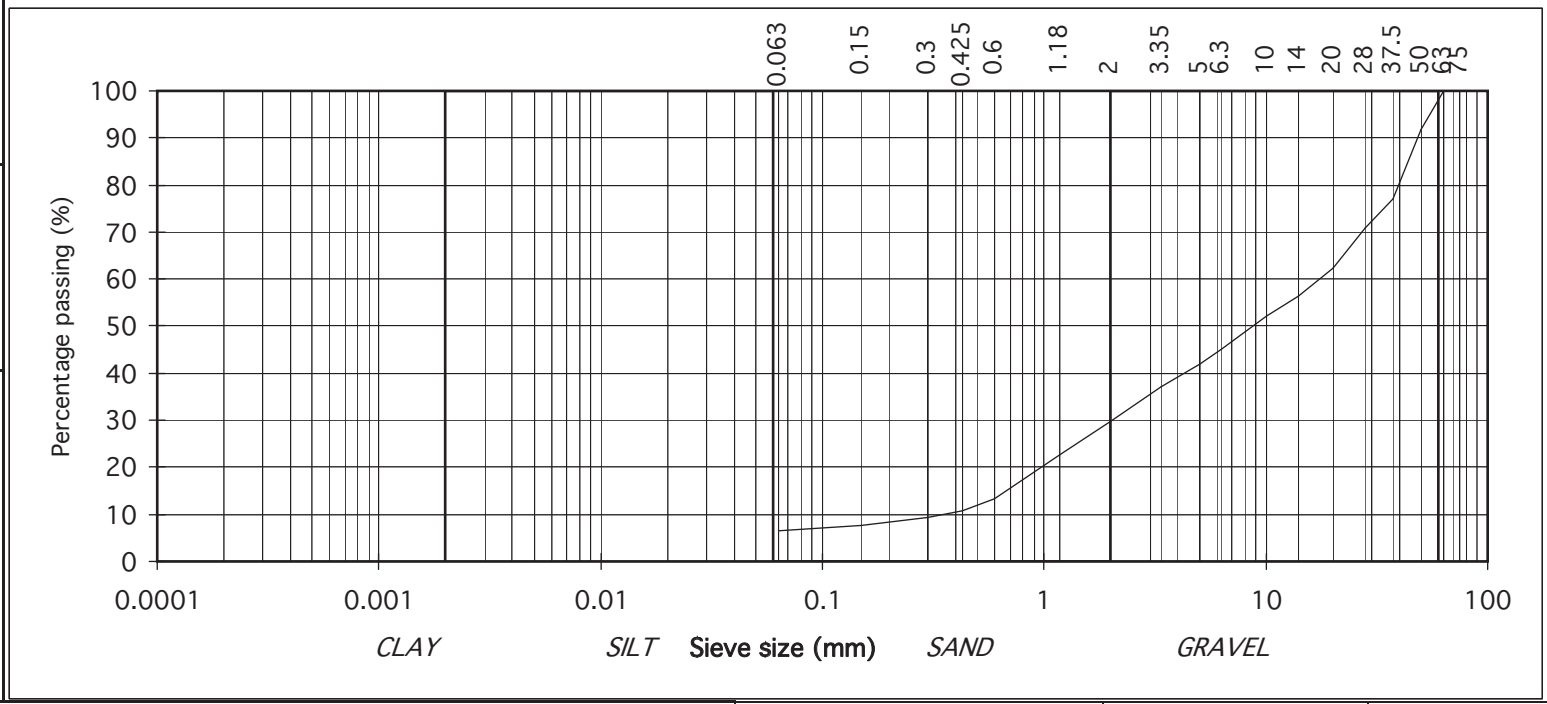
ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	92	GRAVEL
37.5	77	
28	71	
20	62	
14	56	
10	52	
6.3	45	
5	42	
3.35	37	
2	30	
1.18	23	SAND
0.6	13	
0.425	11	
0.3	9	
0.15	8	
0.063	7	SILT/CLAY

Contract No: 21674 Report No. R100825
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP03
Sample No. AA112110 Lab. Sample No. A19/1616
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Brown clayey/silty, very sandy, GRAVEL

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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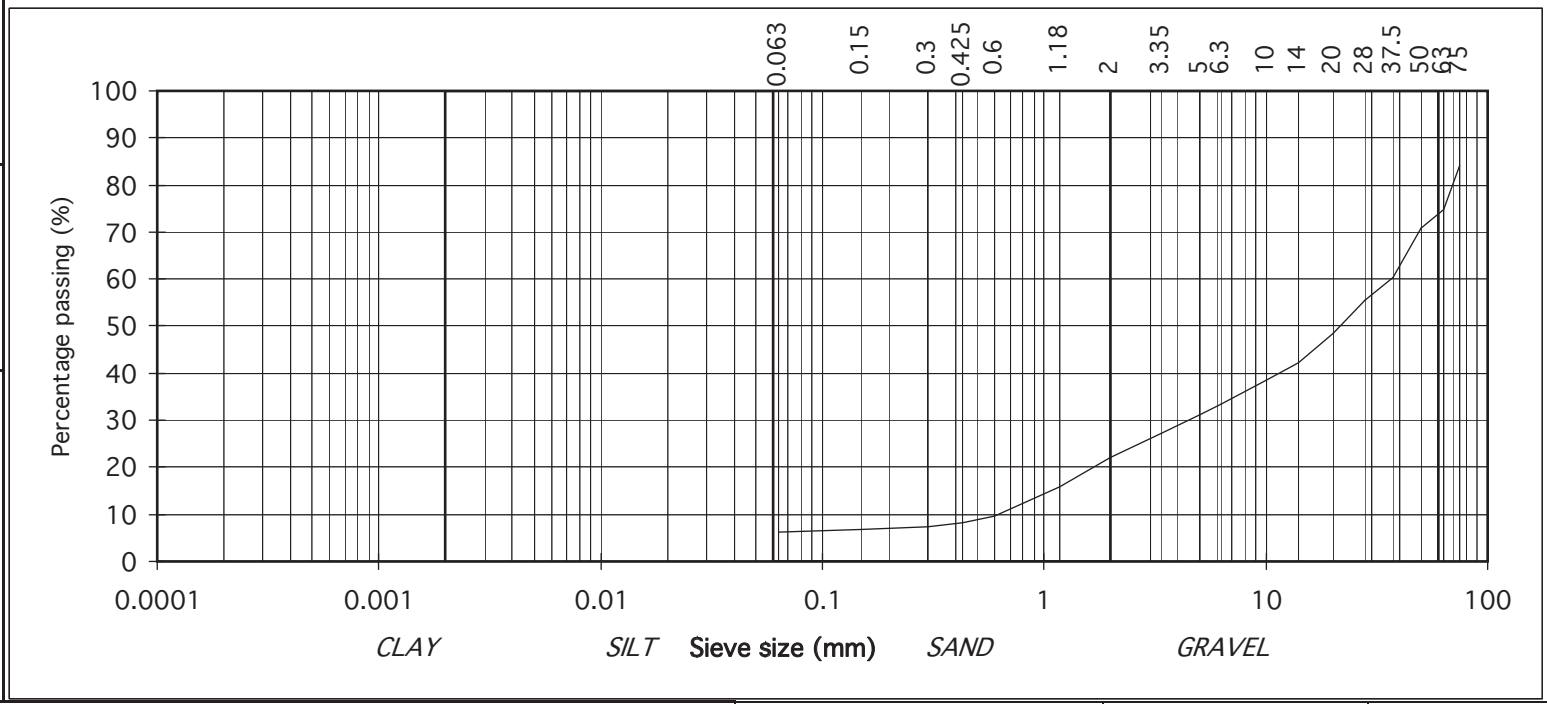
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	84	COBBLES
63	75	
50	71	GRAVEL
37.5	60	
28	55	
20	48	
14	42	
10	38	
6.3	33	
5	31	
3.35	27	
2	22	
1.18	16	SAND
0.6	10	
0.425	8	
0.3	7	
0.15	7	
0.063	6	SILT/CLAY

Contract No: 21674 Report No. R100911
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP04
Sample No. AA117171 Lab. Sample No. A19/1617
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Dark brown clayey/silty, sandy, GRAVEL with many cobbles

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

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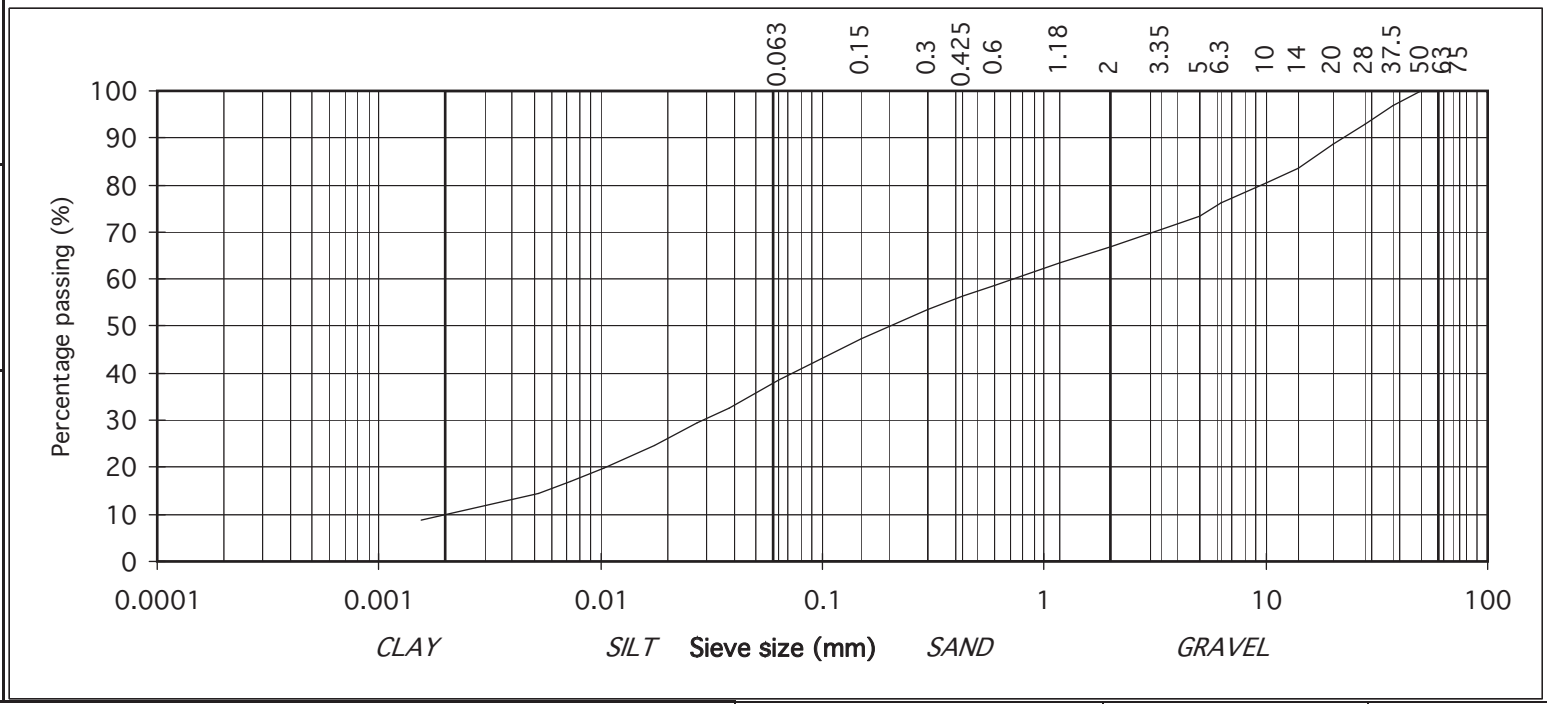
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	97	
28	93	
20	89	
14	83	
10	80	
6.3	76	
5	73	
3.35	71	
2	67	
1.18	63	SAND
0.6	59	
0.425	56	
0.3	54	
0.15	47	
0.063	39	SILT/CLAY
0.038	33	
0.027	29	
0.017	25	
0.010	20	
0.007	17	
0.005	14	
0.002	9	

Contract No:	21674	Report No.	R100907
Contract:	Engine Node Data Center , Clonee , Co.Meath		
BH/TP :	TP04		
Sample No.	AA117172	Lab. Sample No.	A19/1618
Sample Type:	B		
Depth (m)	2.00	Customer:	CSEA
Date Received	09/04/2019	Date Testing started	11/04/2019
Description:	Dark brown/black slightly sandy, slightly gravelly, CLAY		
Remarks	Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016		



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	30/04/19	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

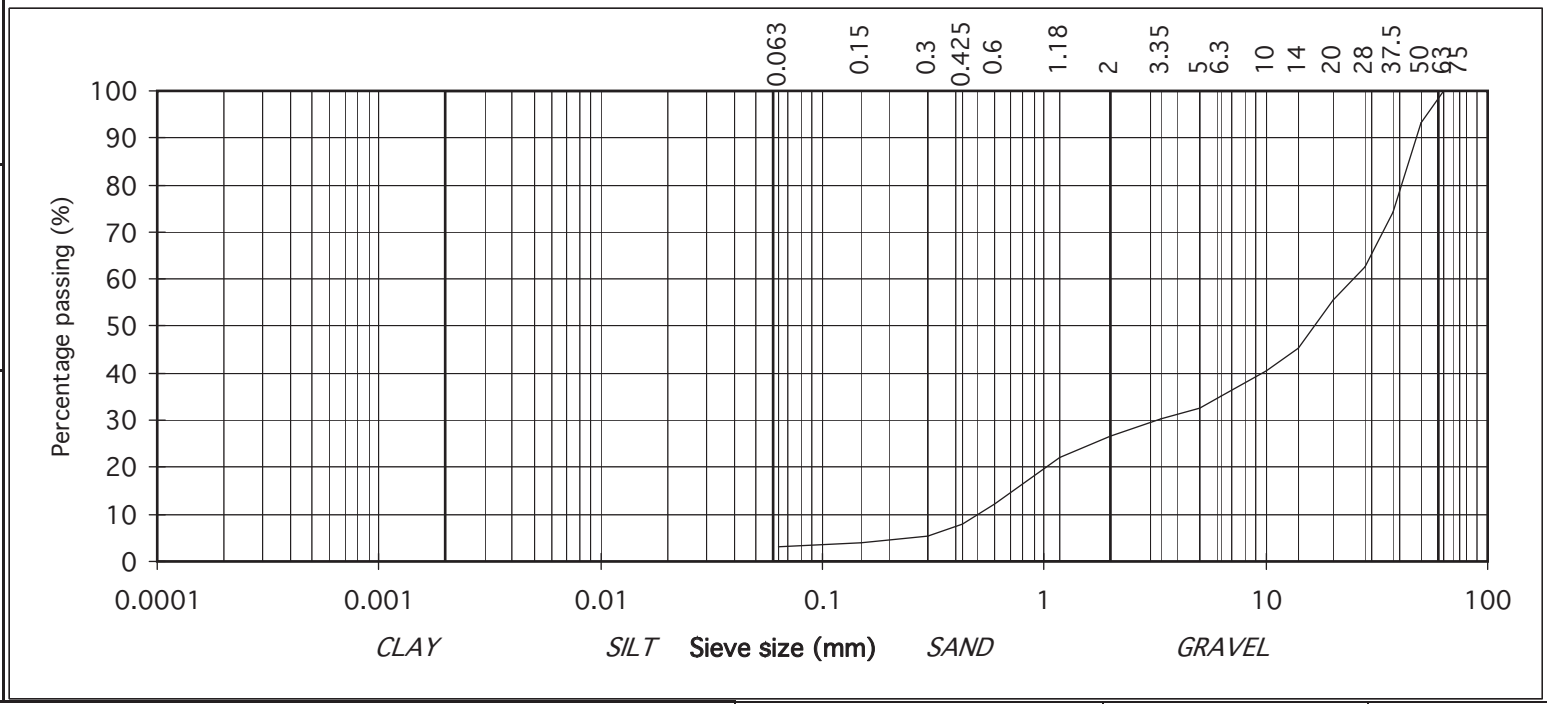
ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	93	GRAVEL
37.5	74	
28	63	
20	56	
14	45	
10	41	
6.3	35	
5	33	
3.35	30	
2	27	
1.18	22	SAND
0.6	12	
0.425	8	
0.3	5	
0.15	4	
0.063	3	SILT/CLAY

Contract No: 21674 Report No. R100826
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP06
Sample No. AA112118 Lab. Sample No. A19/1620
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Black slightly clayey/silty, very sandy, GRAVEL

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
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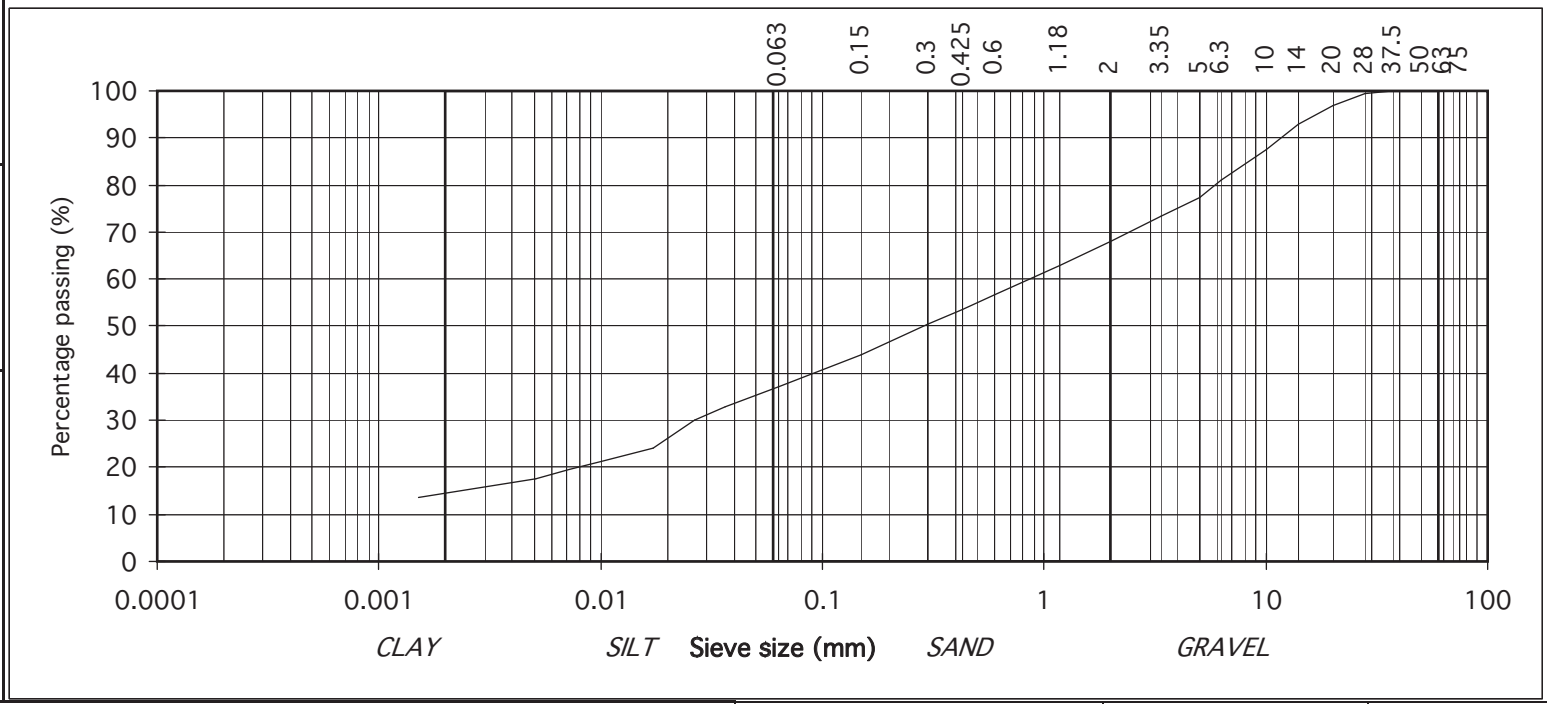
Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	99	
20	97	
14	93	
10	88	
6.3	81	
5	77	
3.35	73	
2	68	
1.18	63	SAND
0.6	57	
0.425	54	
0.3	50	
0.15	44	
0.063	37	SILT/CLAY
0.037	33	
0.026	30	
0.017	24	
0.010	21	
0.007	19	
0.005	17	
0.002	13	

Contract No:	21674	Report No.	R100908
Contract:	Engine Node Data Center , Clonee , Co.Meath		
BH/TP :	TP06		
Sample No.	AA112119	Lab. Sample No.	A19/1621
Sample Type:	B		
Depth (m)	2.00	Customer:	CSEA
Date Received	09/04/2019	Date Testing started	11/04/2019
Description:	Dark brown/black slightly sandy, slightly gravelly, CLAY		
Remarks	Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016		



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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

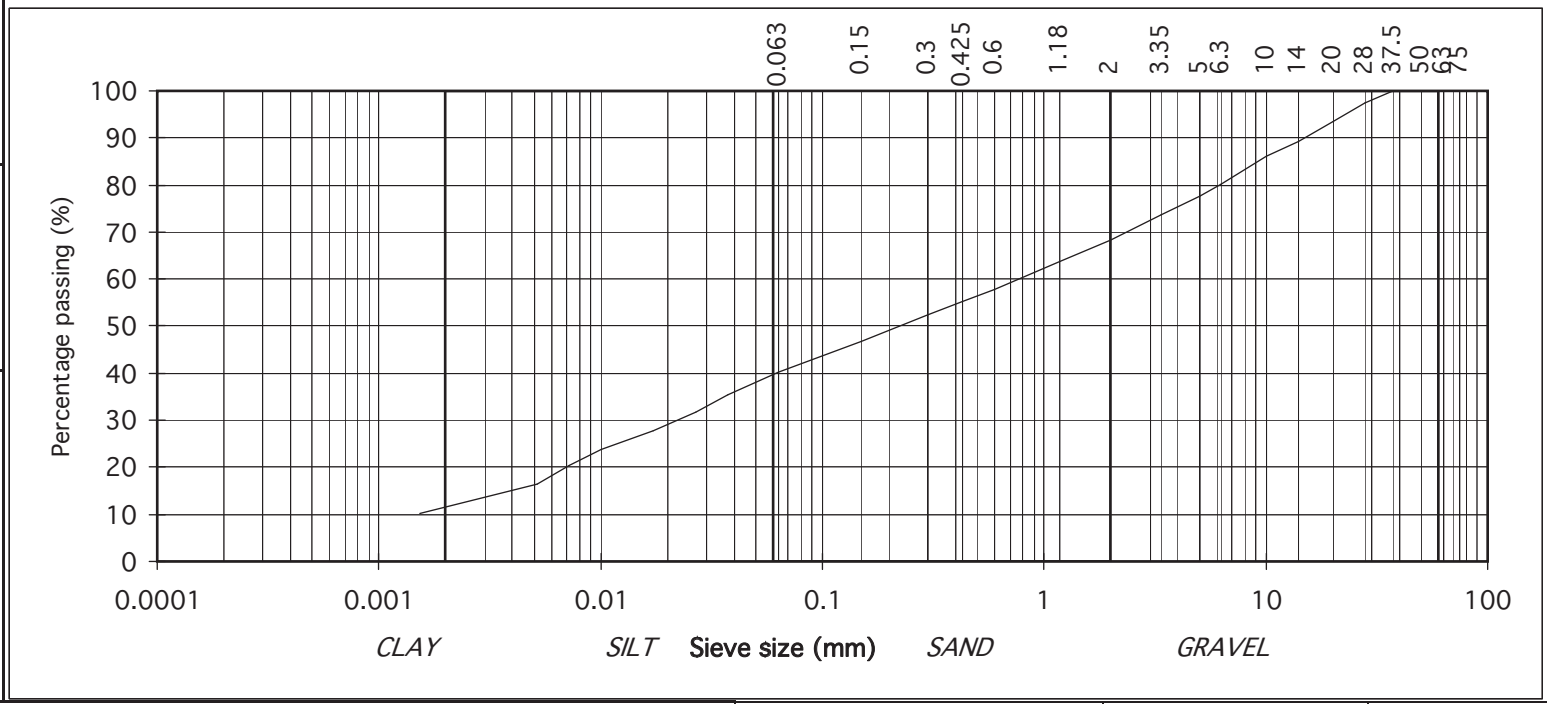
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	97	
20	93	
14	89	
10	86	
6.3	80	
5	78	
3.35	74	
2	68	
1.18	64	SAND
0.6	58	
0.425	55	
0.3	52	
0.15	47	
0.063	40	SILT/CLAY
0.037	35	
0.027	32	
0.017	28	
0.010	24	
0.007	20	
0.005	16	
0.002	10	

Contract No: 21674 Report No. R101194
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : TP08
Sample No. AA112115 Lab. Sample No. A19/1623
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Grey/brown slightly sandy, slightly gravelly, CLAY

Remarks Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 Sample size did not meet the requirements of BS1377



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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

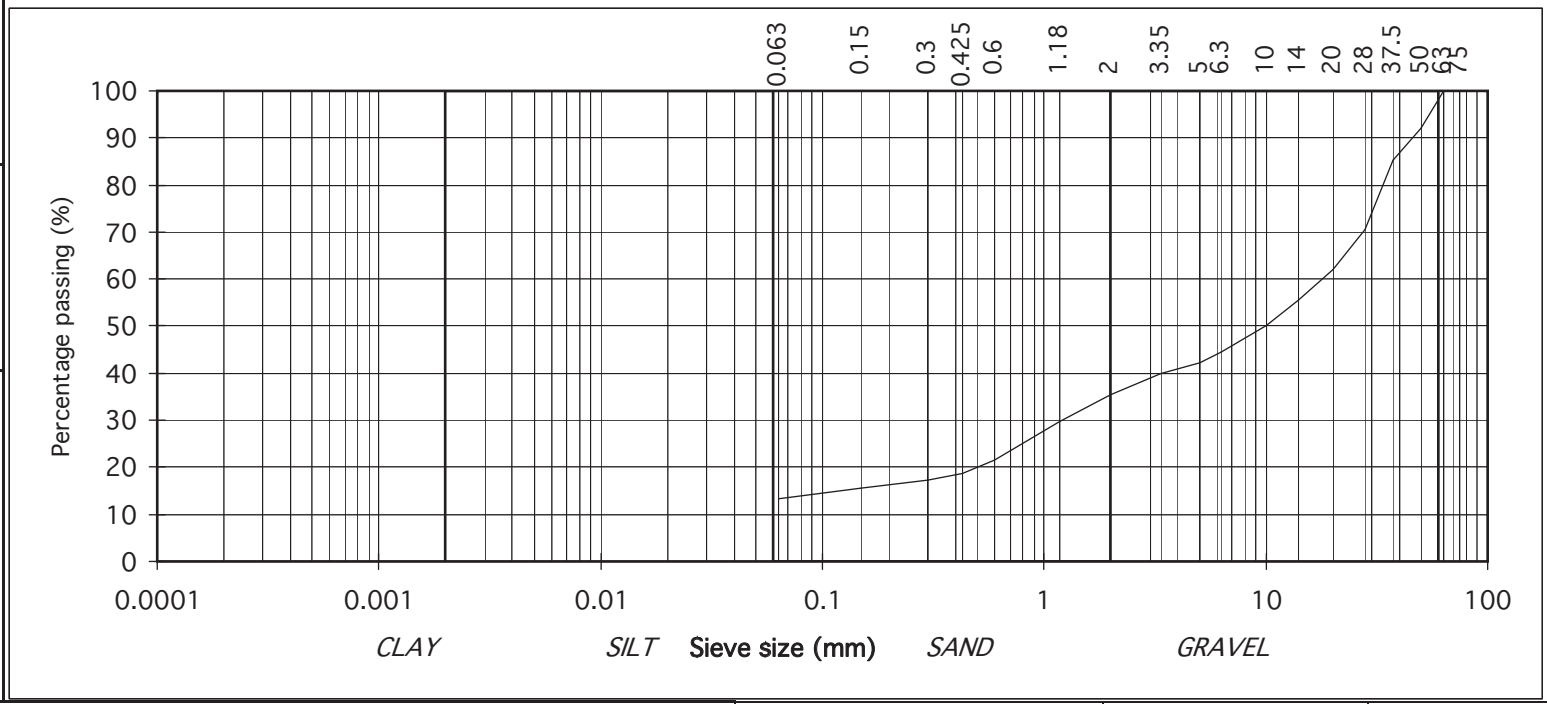
ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 137T

particle size	% passing	
75	100	COBBLES
63	100	
50	92	GRAVEL
37.5	85	
28	71	
20	62	
14	56	
10	50	
6.3	45	
5	42	
3.35	40	
2	35	
1.18	30	SAND
0.6	22	
0.425	19	
0.3	17	
0.15	16	
0.063	13	SILT/CLAY

Contract No: 21674 Report No. R100827
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : SA01
Sample No. AA117101 Lab. Sample No. A19/1625
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 10/04/2019
Description: Brown clayey/silty, very sandy, GRAVEL

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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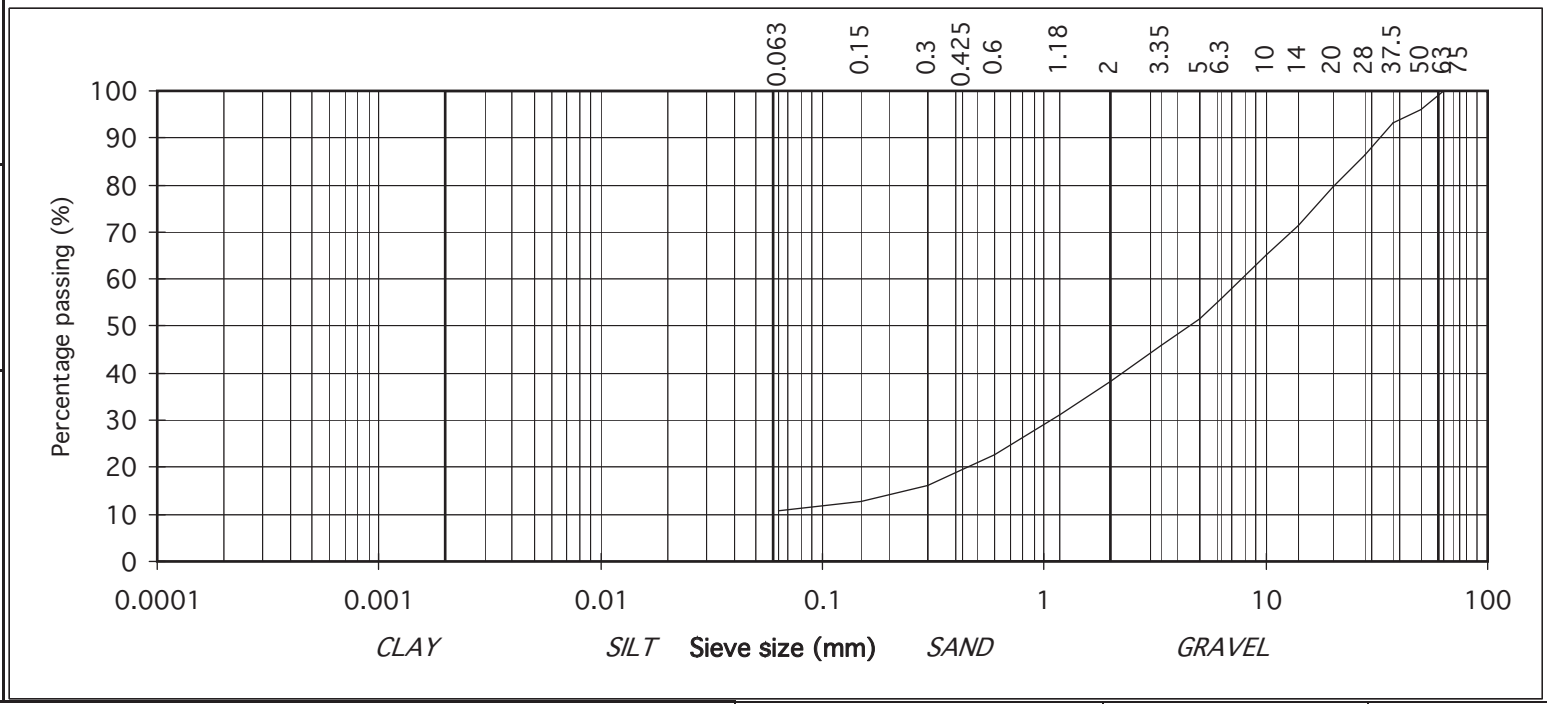
TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5
(note: Sedimentation stage not accredited)

particle size	% passing	
75	100	COBBLES
63	100	
50	96	GRAVEL
37.5	93	
28	86	
20	80	
14	72	
10	65	
6.3	56	
5	51	
3.35	46	
2	38	
1.18	31	SAND
0.6	23	
0.425	20	
0.3	16	
0.15	13	
0.063	11	SILT/CLAY

Contract No: 21674 Report No. R100828
Contract: Engine Node Data Center , Clonee , Co.Meath
BH/TP : SA02
Sample No. AA117103 Lab. Sample No. A19/1626
Sample Type: B
Depth (m) 1.00 Customer: CSEA
Date Received 09/04/2019 Date Testing started 11/04/2019
Description: Brown clayey/silty, very sandy, GRAVEL

Remarks

Note: Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016



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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

IGSL Ltd
Materials Laboratory
Unit J5,M7 Business Park
Naas
Co. Kildare
045 899324

Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R100830**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	BHSP01
Sample No.	AA111620
Depth (m)	1.00
Sample Type:	B
Lab Sample No.	A19/1610
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	19/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	18
% Particles > 20mm (By dry mass):	0
MCV:	8.4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Mottled brown slightly sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Ltd Materials Laboratory	Approved by	Date	Page
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Unit J5,M7 Business Park
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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R100754**
Contract No.	21674
Contract Name:	Engine Node Data Centre Clonee Meath
Customer:	CSEA
BH/TP	BH03
Sample No.	AA111616
Depth (m)	1.00
Sample Type:	B
Lab Sample No.	A19/1609
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	10/04/19
Sample Cert:	N/A
Moisture Content (%):	27
% Particles > 20mm (By dry mass):	0
MCV:	4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Black sandy slightly gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R100829**
Contract No.	21674
Contract Name:	Clonee, Co.Meath
Customer:	CSEA
BH/TP	TP01
Sample No.	AA112101/2
Depth (m)	1.00
Sample Type:	B
Lab Sample No.	A19/1613
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	12
% Particles > 20mm (By dry mass):	37
MCV:	9.2
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Black slightly sandy, gravelly, CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R100831**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	TP02
Sample No.	AA112105
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A19/1614
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	19/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	34
% Particles > 20mm (By dry mass):	0
MCV:	>1
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R100832**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	TP06
Sample No.	AA112119
Depth (m)	2.00
Sample Type:	B
Lab Sample No.	A19/1621
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	10/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	12
% Particles > 20mm (By dry mass):	0
MCV:	2.4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Dark brown/black slightly sandy, slightly gravelly, CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R100833**
Contract No.	21674
Contract Name:	Engine Node Data Centre Clonee Meath
Customer:	CSEA
BH/TP	TP08
Sample No.	AA112113/4
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A19/1622
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	16/04/19
Sample Cert:	N/A
Moisture Content (%):	14
% Particles > 20mm (By dry mass):	0
MCV:	2.2
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Mottled brown very sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No.	**R100753**
Contract No.	21674
Contract Name:	Engine Node Data Center , Clonee , Co.Meath
Customer:	CSEA
BH/TP	TP10
Sample No.	AA117166
Depth (m)	0.50
Sample Type:	B
Lab Sample No.	A19/1624
Source (if applicable)	unknown
Material Type (if applicable):	B
Sample Received:	09/04/19
Date Tested:	10/04/19
Sample Cert:	N/A
Moisture Content (%):	28
% Particles > 20mm (By dry mass):	1.4
MCV:	7.6
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly CLAY

The result relates to the specimen tested.
Any remaining material will be retained for one month.
Sampling and opinions and interpretations are outside the scope of accreditation.

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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IGSL Ltd
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M7 Business Park
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Test Report

Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No. R101193 Contract No. 21674

Contract Name: Engine Node Data Centre Clonee Meath

Lab Contract No. 21674 Location: TP01

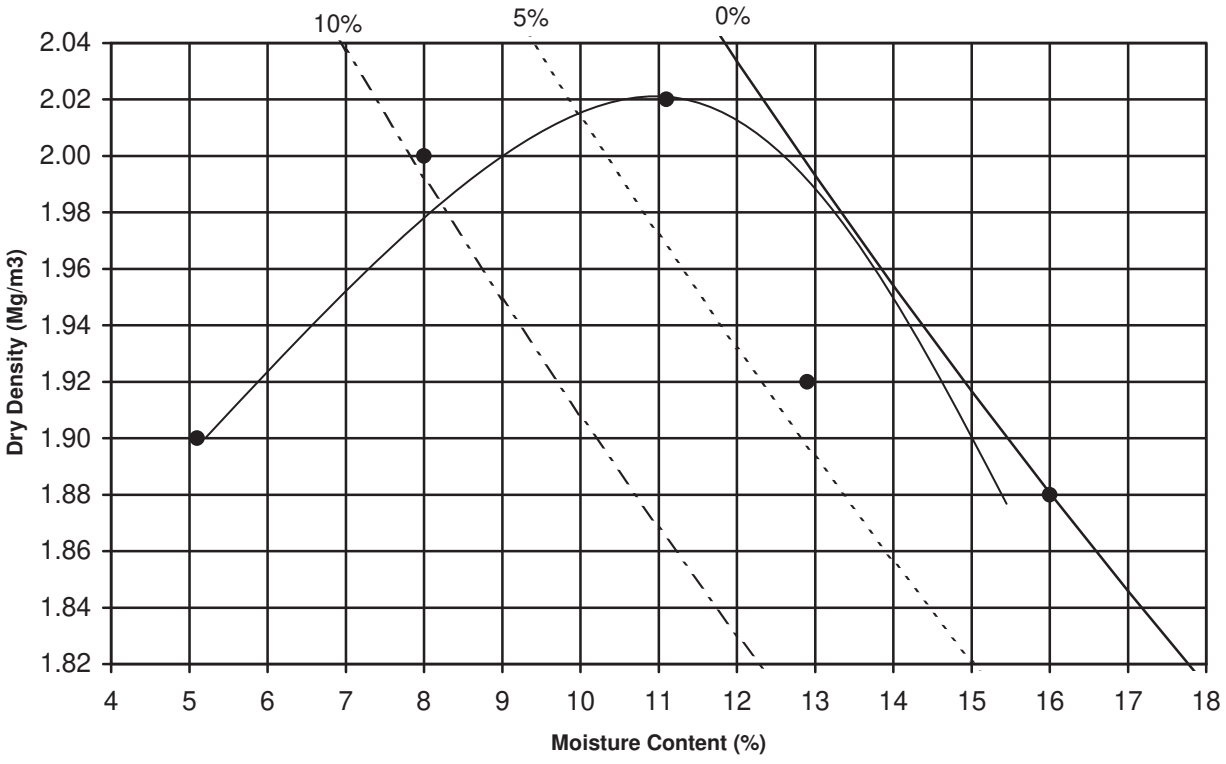
Sample No. AA112101/2 Depth (m) 0.5 Material Type B

Lab sample no. A19/1613 Customer: CSEA

Date Received: 09/04/2019 Test Method: 2.5 KG Rammer

Date Tested: 26/04/2019 BS1377:Part 4:1990 3.3

Dry Density (Mg/m^3)	2.02	1.90	2.00	1.92	1.88	0.00	
Moisture Content (%)	11	5.1	8.0	13	16	0	



Maximum Dry Density (Mg/m^3): 2.02 Optimum Moisture Content (%): 11

Description: Mottled brown sandy, slightly gravelly, CLAY

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m^3): 2.69 Particle Density: Assumed

% retained on 20/37.5mm sieve: 6.8

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

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IGSL Ltd
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Test Report

Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No. R101192 Contract No. 21674

Contract Name: Engine Node Data Centre Clonee Meath

Lab Contract No. 21674 Location: TP06

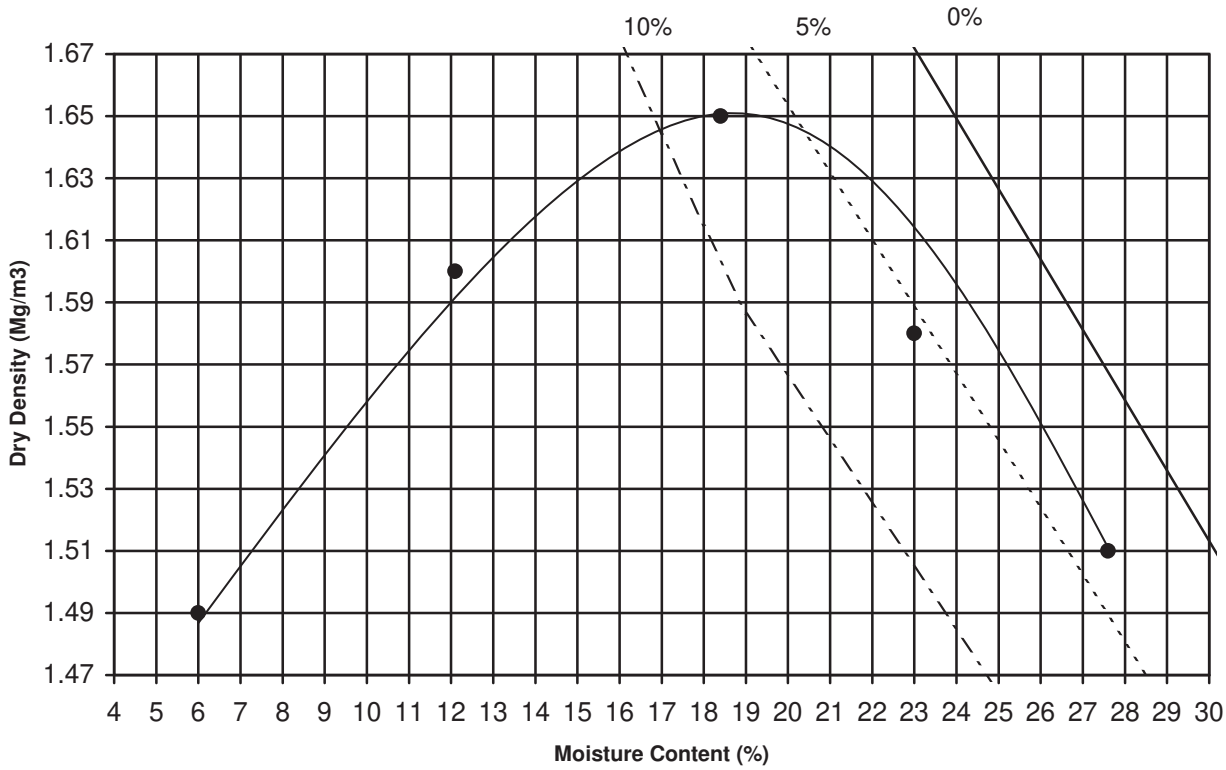
Sample No. AA112119 Depth (m) 2 Material Type B

Lab sample no. A19/1621 Customer: CSEA

Date Received: 09/04/2019 Test Method: 2.5 KG Rammer

Date Tested: 26/04/2019 BS1377:Part 4:1990 3.3

Dry Density (Mg/m^3)	1.51	1.49	1.60	1.65	1.58	0.00	
Moisture Content (%)	28	6.0	12	18	23	0	



Maximum Dry Density (Mg/m^3): 1.65 Optimum Moisture Content (%): 18

Description: Dark brown/black slightly sandy, slightly gravelly, CLAY

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m^3): 2.65 Particle Density: Assumed

% retained on 20/37.5mm sieve: 6.3

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

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Test Report

Dry Density/Moisture Content Relationship

Tested in accordance with BS1377:Part 4:1990

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No. R101191 Contract No. 21674

Contract Name: Engine Node Data Centre Clonee Meath

Lab Contract No. 21674 Location: TP08

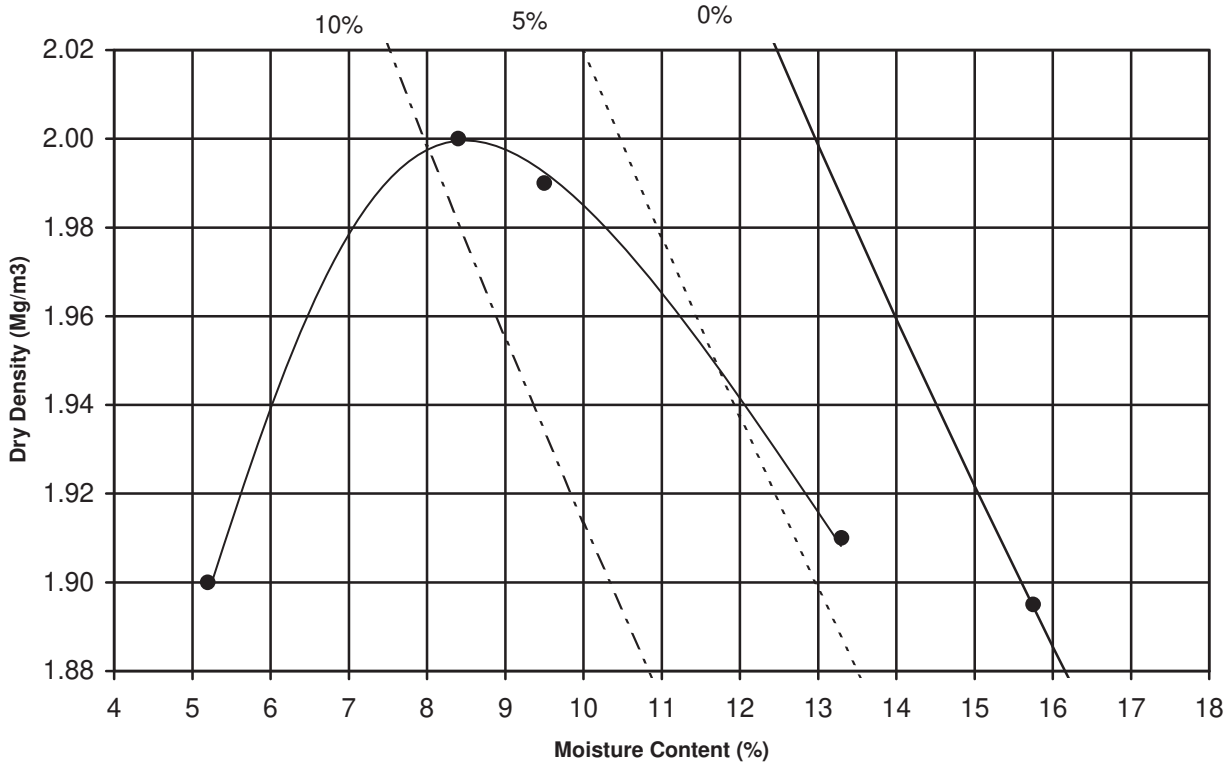
Sample No. AA112113 Depth (m) 0.5 Material Type B

Lab sample no. A19/1622 Customer: CSEA

Date Received: 09/04/2019 Test Method: 2.5 KG Rammer

Date Tested: 26/04/2019 BS1377:Part 4:1990 3.3

Dry Density (Mg/m^3)	1.90	1.91	1.99	2.00	1.90	0.00	
Moisture Content (%)	16	13	10	8.4	5.2	0	



Maximum Dry Density (Mg/m^3): 2.00 Optimum Moisture Content (%): 8

Description: Mottled brown sandy gravelly CLAY

Sample Preparation: Material passing 20mm ~~Single~~ / Separate samples used

Particle Density (Mg/m^3): 2.70 Particle Density: Assumed

% retained on 20/37.5mm sieve: 25

Persons authorised to approve reports
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

The result relates to the specimen tested.
Opinions and interpretations are outside the scope of accreditation

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(Diametrial) POINT LOAD STRENGTH INDEX TEST DATA

Contract: EngineNode Data Centre
Contract no. 21674
Date of test: 24/5/19

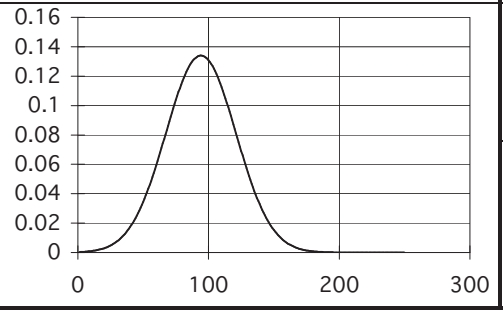
Sample Type: Core

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC01	6.2	78	28.0	1.222	4.60	5.62	112	d	//
	8.1	78	26.0	1.222	4.27	5.22	104	d	//
	10.7	78	16.0	1.222	2.63	3.21	64	d	//
RC02	6.7	78	11.0	1.222	1.81	2.21	44	d	//
	9.2	78	28.0	1.222	4.60	5.62	112	d	//
	11.7	78	19.0	1.222	3.12	3.81	76	d	//
RC03	4.6	78	31.0	1.222	5.10	6.22	124	d	//
	9.7	78	24.0	1.222	3.94	4.82	96	d	//
	9.9	78	28.0	1.222	4.60	5.62	112	d	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	9	9
Minimum	2.21	44
Average	4.71	94
Maximum	6.22	124
Standard Dev.	1.34	27
Upper 95% Confidence Limit	7.33	146.66
Lower 95% Confidence Limit	2.08	41.62

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name:	EngineNode Data Centre
Job Number:	21674
Hole No:	RC01
Depth (m):	10.20m

Sample Description

Colour:	Grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

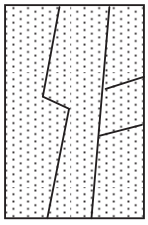
Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

Sample Measurements

Length	202	
Diameter (Ø)	78.1	mm

Sketch of Failure Surfaces



Testing

Load Rate	4.3	kN/min
Load at Failure (P)	319	kN

Strength Calculations

Uniaxial Compressive Strength $= \dfrac{319000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 66.59 (Mpa)

Bulk Density $=$ 2.65 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name:	EngineNode Data Centre
Job Number:	21674
Hole No:	RC02
Depth (m):	9.60m

Sample Description

Colour:	Grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

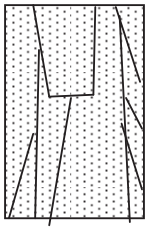
Sample Measurements

Length	199	
Diameter (Ø)	78	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	422	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{422000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 88.31 (Mpa)

Bulk Density = 2.67 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet | *I.G.S.L.*

Sample Identification

Contract Name:	EngineNode Data Centre
Job Number:	21674
Hole No:	RC03
Depth (m):	7.80m

Sample Description

Colour:	Grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

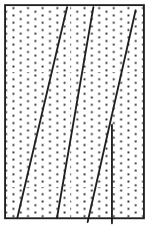
Sample Measurements

Length	200	
Diameter (Ø)	78.1	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	383	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{383000}{4788.19385}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 79.95 (Mpa)

Bulk Density $=$ 2.66 (Mg/m^3)

Notes:

Appendix 7

Chemical Laboratory Testing

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	19-12730-1
Initial Date of Issue:	23-Apr-2019
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	21674 Engine Node Data Centre Clonee Meath

Quotation No.:		**Date Received:**	11-Apr-2019
Order No.:		**Date Instructed:**	12-Apr-2019
No. of Samples:	5		
Turnaround (Wkdays):	7	**Results Due:**	24-Apr-2019
Date Approved:	23-Apr-2019		

Approved By:



Details: Robert Monk, Technical Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 21674 Engine Node Data Centre Clonee Meath

Client: IGSL				**Chemtest Job No.:**	19-12730	19-12730	19-12730	19-12730	19-12730
Quotation No.:				**Chemtest Sample ID.:**	810274	810275	810276	810277	810278
				Sample Location:	BH-SP1	BH2	TP4	TP6	Sample X
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	1.00	3.00	2.00	1.00	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	12	9.0	11	6.3	23
pH	U	2010		N/A	[A] 8.6	[A] 8.5	[A] 8.3	[A] 8.7	[A] 8.5
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	0.020	0.059	< 0.010	< 0.010

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
810274			BH-SP1		A	Amber Glass 250ml
810275			BH2		A	Amber Glass 250ml
810276			TP4		A	Amber Glass 250ml
810277			TP6		A	Amber Glass 250ml
810278			Sample X		A	Amber Glass 250ml

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix 8

As-Surveyed Site Plan



ExpertGPS

Engine Node Date Centre

50 0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 m

Scale: 1 : 4000.

MN

2°51'

8.0 BIODIVERSITY; FLORA & FAUNA

8.1 INTRODUCTION

This chapter provides an assessment of the impacts of the proposed development on the ecological environment, i.e. flora and fauna. It has been compiled in compliance with the European Communities Legal requirements with regard to Environmental Impact Assessment and follows the revised Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017) and Draft Advice Notes for preparing Environmental Impact Statements (EPA, 2015).

8.2 METHODOLOGY

This chapter of the EIAR concentrates on ecological features within the development area of particular significance, primarily designated habitats and species. This includes habitats/species listed in Annex I, II and IV of the EU Habitats Directive, rare plants listed in the Flora Protection Order and other semi-natural habitats of conservation value.

The obligation to undertake appropriate assessment derives from Article 6(3) and 6(4) of the Habitats Directive. The first test is to establish whether, in relation to a particular plan or project, appropriate assessment is required. This is termed AA screening. Its purpose is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, alone and in combination with other plans or projects, could have significant effects on a Natura 2000 site in view of the site's conservation objectives.

A Report for the purposes of Appropriate Assessment Screening was undertaken by Moore Group for the proposed development which is presented as Appendix 8.1 to this chapter.

8.2.1 Policy & Guidance

8.2.1.1 EU Habitats Directive

The "Habitats Directive" (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) is the main legislative instrument for the protection and conservation of biodiversity within the European Union and lists certain habitats and species that must be protected within wildlife conservation areas, considered to be important at a European as well as at a national level. A "Special Conservation Area" or SAC is a designation under the Habitats Directive. The Habitats Directive sets out the protocol for the protection and management of SACs.

The Directive sets out key elements of the system of protection including the requirement for "Appropriate Assessment" of plans and projects.

8.2.1.2 EU Birds Directive

The "Birds Directive" (Council Directive 79/409/EEC and Council Directive 2009/147/EC on the Conservation of Wild Birds) provides for a network of sites in all member states to protect birds at their breeding, feeding, roosting and wintering areas. This directive identifies species that are rare, in danger of extinction or vulnerable to changes in habitat and which need protection (Annex I species).

Appendix I indicates Annex I bird species as listed on the Birds Directive. A "Special Protection Area" or SPA, is a designation under The Birds Directive.
Special Areas of Conservation and Special Protection Areas form a pan-European network of protected sites known as Natura 2000 sites and any plan or project that has the potential to impact upon a Natura 2000 site requires appropriate assessment.

8.2.1.3 Wildlife Acts (1976 - 2012)

The primary domestic legislation providing for the protection of wildlife in general, and the control of some activities adversely impacting upon wildlife is the Wildlife Act of 1976. The aims of the wildlife act according to the National Parks and Wildlife Service are "... to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims." All bird species are protected under the act. The Wildlife (Amendment) Act of 2000 amended the original Act to improve the effectiveness of the Act to achieve its aims.

Both the Habitats Directive and the Birds Directive have been transposed into Irish law by one set of regulations (i.e. The European Communities (Birds and Natural Habitats) Regulations 2011 to 2015).

8.2.2 Habitat Survey

The habitat survey was carried out in three stages, firstly through desktop research to determine existing records in relation to habitats and species present in the study area. This included research on the National Parks and Wildlife Service (NPWS) metadata website, the National Biodiversity Data storage facility (NBDC) database and a literature review of published information on flora and fauna occurring in the proposed development area.

Other environmental information for the area was reviewed, e.g. in relation to soils, geology, hydrogeology and hydrology. Interactions in terms of the chapters on these topics presented in this EIAR were important in the determination of source vector pathways and links with potentially hydrologically connected areas outside the proposed development site.

The second phase of the survey involved a site visit to establish the existing environment in the footprint of the proposed development area. Areas which were highlighted during desktop assessment were investigated in closer detail according to the Heritage Council Best Practice Guidance for Habitat Survey and Mapping (Smith *et al*., 2011). Habitats in the proposed development area were classified according to the Heritage Council publication "A Guide to Habitats in Ireland" (Fossitt, 2000). This publication sets out a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. This form of classification uses codes to classify different habitats based on the plant species present. Species recorded in this report are given in both their Latin and English names. Latin names for plant species follow the nomenclature of "An Irish Flora" (Parnell & Curtis, 2012).

Habitats were surveyed on the 18th April, 13th June and 17th September 2019 by conducting a study area walkover covering the main ecological areas identified in the desktop assessment including the proposed data storage facilities site and the route options of potential grid connections. The survey dates are within the optimal survey periods for botanical species. A photographic record was made of features of interest.

Signs of mammals such as badgers and otters were searched for while surveying the study area noting any sights, signs or any activity in the vicinity especially along adjacent boundaries.

Badgers were surveyed during the mid-April survey with the western portion of the site surveyed. The eastern portion was not accessible due to the presence of a herd of bullocks and was surveyed in July along with a bat survey by Brian Keeley.

A dedicated Bat Detector Survey was undertaken by Brian Keeley and the resulting report is presented as Appendix 8.2. Specific methodology for the bat survey is presented in the appendix and is not repeated here.

Birds were surveyed using standard transect methodology and signs were recorded where encountered during the field walkover surveys.

Following desktop assessment an evaluation of the development area and determination of the potential impacts on the flora and fauna of the area is based on the following guidelines and publications:

- EPA Draft EIA Report Guidelines 2017;
- Assessment of plans and projects significantly affecting Natura 2000 sites (EC, 2002);
- Managing Natura 2000 Sites (EC, 2000) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2000);
- Managing Natura 2000 Sites (EC, 2018) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2018);
- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, Rev. Feb. 2010); and
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2016).

The following resources assisted in the production of this chapter of the report:

- Ordnance Survey Ireland maps;
- OSI, Google and Bing Aerial photography (1995 – 2019);
- NPWS Mapviewer: http://www.npws.ie/en/MapsData/;
- Designated sites (SACs, SPAs, NHAs);
- Records of protected species from 10km squares; and
- National Biodiversity Data storage facility Records and Maps.

Other environmental information for the area was reviewed, e.g. in relation to soils, geology, hydrogeology and hydrology. Interactions in terms of the chapters on these topics presented in this EIA Report were important in the determination of source vector pathways and links with potentially hydrologically connected areas outside the proposed development site.

8.3 RECEIVING ENVIRONMENT

The subject site is located to the east of Bracetown Business Park and to the south of the adjacent ‘Hub Logistic Park’ at Bracetown, Co. Meath.

The proposed development area is improved farmland with open grassland fields, the eastern fields being heavily grazed by cattle. There are internal outgrown hedgerows and treelines and associated drainage ditches.

The following is a description of the flora and fauna of the existing environment in the study area.

8.3.1 Designated Conservation Areas

Department of the Environment, Heritage and Local Government (2009) Guidance on Appropriate Assessment suggests an assessment of European sites within a zone of impact of 15 km.

This distance is a guidance only and the zone of impact has been identified taking consideration of the nature and location of the proposed development to ensure all European sites with connectivity to it are considered in terms of a catchment-based assessment.

The zone of impact may be determined by connectivity to the proposed development in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The guidance provides that, at the screening stage, it is necessary to identify the sites and compile information on their qualifying interests and conservation objectives. In preparation for this, the potential for source pathway receptor connectivity is firstly identified and detailed information is then provided on sites with connectivity.

European sites that are located within 15 km of the Project are listed in Table 8.1 and presented in Figures 8.1 and 8.2, below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 12th July 2019.

Table 8.1 Details of European sites within the potential zone of impact of the project.

Site Code	Site Name	Distance (km)[1]
001398	Rye Water Valley/Carton SAC	6.45
000206	North Dublin Bay SAC	19.02
000210	South Dublin Bay SAC	18.52
004024	South Dublin Bay and River Tolka Estuary SPA	16.25
004006	North Bull Island SPA	19.02

The nearest European site to the proposed Project site is the Rye Water Valley/Carton SAC (Site Code 000199). There is no connectivity to the Rye Water as the site is drained by ditches which flow to the Pinkeen River which discharges to the River Tolka.

The River Tolka discharges to north Dublin Bay approximately 22.6 river km downstream. There are four European sites located in Dublin Bay, namely: South Dublin Bay SAC (Site Code 000210); North Dublin Bay SAC (Site Code 000206);

[1] Distances indicated are the closest geographical distance between the proposed Project and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

South Dublin Bay and River Tolka Estuary SPA (Site Code 004024); North Bull Island SPA (Site Code 004006).

It is unlikely that these European sites would be affected, however, they are considered in the Appropriate Assessment Screening process.

The potential grid connection link on the west side of the R147 was screened out given that no works will take place within 10m of the River Tolka if this option becomes feasible. There is no connectivity between the other grid options considered and any European sites and they were screened out of the assessment (Appendix 8.1).

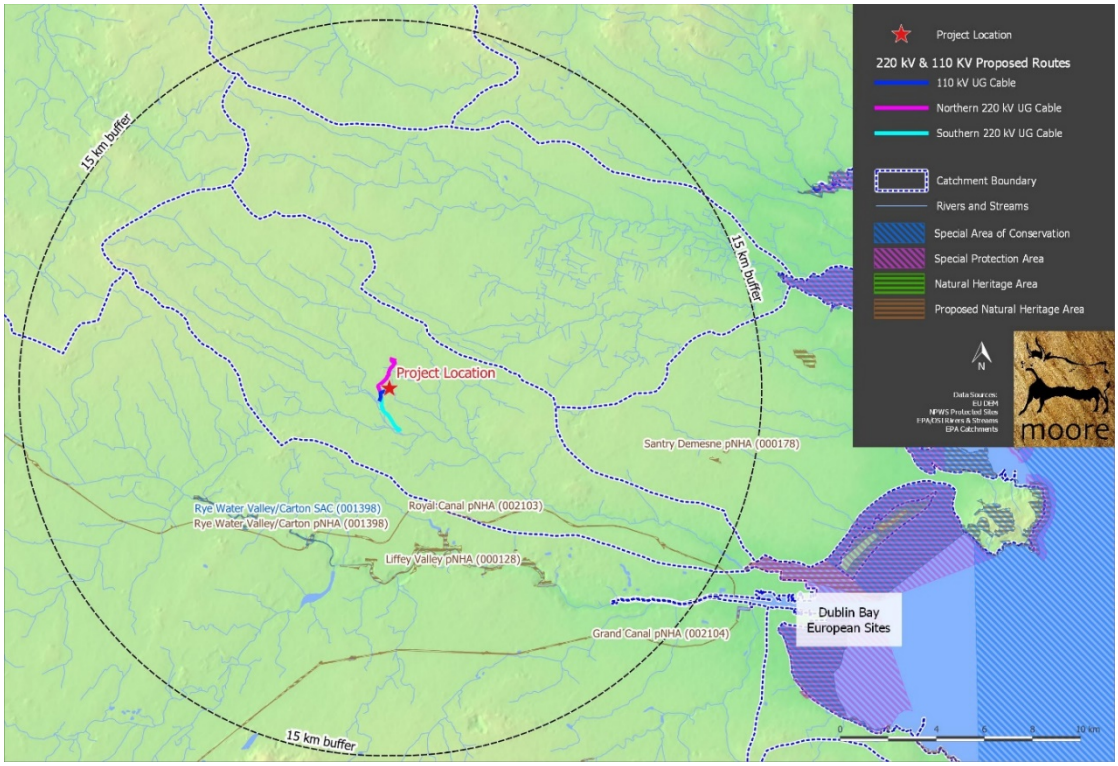


Figure 8.1 Site Location in relation to nearby European sites.

8.3.2 Non-Designated Habitats

The proposed development area is improved farmland with open grassland fields, the eastern fields being heavily grazed by cattle. There are internal and treelines and associated drainage ditches and surrounding outgrown hedgerows.

The main habitats are presented on the recent aerial photography in Figure 8.2. A list of habitats recorded and their corresponding Fossitt codes is presented in Table 8.2.

Table 8.2 Details of habitats recorded and their corresponding Fossitt codes.

Habitat	Habitat Category	Habitat Type
(F) Freshwater	(FW) Watercourses	(FW4) Drainage ditches
(G) Grassland	(GA) Improved grassland	(GA1) -Improved agricultural grassland
	(WS) Scrub/Transitional Woodland	(WS1) Scrub
	(WL) Linear woodland	(WL1) Hedgerows



Figure 8.2 Habitats recorded in the proposed development area.

8.3.2.1 Drainage Ditches (FW4)

There are two main drainage ditches associated with the site. The water course to the north follows the outer northern boundary and then the eastern boundary to join the Pace Stream to the southeast. There are two internal drainage ditches; the first is associated with the meandering hedgerow No. 2 and is culverted at the point where it joins a drainage ditch leading to the Pace Stream to the south. The second is associated with internal hedgerow No. 4. It is stagnant and the adjacent hedgerow has grown out to shade and in some parts completely cover the ditch which contains no macrophyte growth.

The upper reaches of the Pace Stream draining the southern boundary of the site comprises drainage ditches where the water is slow moving and stagnant in places with ponding and the adjacent hedgerows have grown out to shade and cover the ditches. The ditches have relatively sparse macrophyte growth with occasional Watercress (*Rorippa nasturtium-aquaticum*) being the predominant species present.

All watercourse banks are colonised with dense Ivy (*Hedera helix*) and Bramble scrub (*Rubus fruticosus* agg.) with occasional stands of Nettle (*Urtica diocia*) and Cleavers (*Galium aparine*). There has been recent clearance of Gorse along the southern drainage ditches leading to the Pace Stream.

8.3.2.2 Improved agricultural grassland (GA1)

The entire site comprises Improved agricultural grassland (GA1) with varying degrees of management. At the time of surveying, the four most western fields, comprising the approximate area of the western half of the site, were being used for sileage/low level grazing, while the two most eastern fields (equating to approximately the other half of the site) were being heavily grazed by a herd of bullocks.

The western portion of the site was grazed up to recently and the grass forb is low and species poor in the open field areas with tall grasses, predominantly Rye grasses (*Lolium* spp.), Meadow foxtail (*Alopecurus pratensis*) and Cocksfoot (*Dactylis glomerata*) along with Thistles (*Cirsium vulgare* and *C. arvense*). Typical improved grassland species present include Nettle (*Urtica diocia*), Broad dock (*Rumex obtusifolius*), Common Sorrel (*Rumex acetosa*), Broad plantain (*Plantago major*), Stitchwort (*Stellaria holostea*), Yarrow (*Achillea millefolium*), Dandelion (*Taraxacum officinale* agg.) and Germander Speedwell (*Veronica persica*).

The two eastern fields presented a wetter species composition with spreads of Soft rush (*Juncus effuses*) more creeping buttercup (*Ranunculus repens*), Common Sorrel, Thistles and Nettle present.

8.3.2.3 Scrub (WS1)

There are small patches of scrub which are comprised of Hawthorn (*Crataegus monogyna*), Willow (*Salix* spp.) and Bramble (*Rubus fruticosus* agg.) toward the western end of the site associated with remnant field boundaries. Bramble and nettle scrub also occurs in small patches under unmanaged sections of hedgerow.

8.3.2.4 Hedgerows/Treelines (WL1/WL2)

The site is surrounded by perimeter Hedgerows (WL1) have become overgrown in many sections, particularly along the southern and eastern boundaries and in the case of the internal lines No.s 1, 2 and 3 the understory has either been grazed out or managed to present more of a treeline with wide gaps.

The predominant species is Ash (*Fraxinus excelsior*) along with Sycamore (*Acer pseudoplatanus*), Hawthorn (*Crataegus monogyna*), Elder (*Sambucus nigra*), with abundant Bramble, and Cleavers, Ivy and Nettle understorey.

The understorey of denser pockets is populated with grass (*Dactylis glomerata*), Cleavers (*Galium aparine*), Cow parsley (*Anthriscus sylvestris*) along with Bush vetch (*Vicia sepium*) and Lesser celandine (*Ranunculus ficaria*). The northern perimeter hedgerow boundary was notable for a rich growth of Honeysuckle (*Lonicera periclymenum*).

8.3.3 Fauna

8.3.3.1 Badgers

A 4-entrance badger sett was recorded outside the site boundary in the hedgerow to the south central boundary, see Figure 8.2. This sett has a relatively substantial spoil heap that is emanating from one entrance. There is another large entrance that had bedding in its mouth in July 2019 (absent in August). The other entrances in the southern field are of less significance. This sett is deemed to be a likely main sett and is considered on the evidence to be a breeding sett.

A badger was seen during surveying on July 9th running into the sett and then turning to look out. The badger had a mud-covered face and had been digging.

Within the fields that form the footprint of the proposal there are badger tracks along the trees and scrub and there was evidence of digging in July and August. Paw prints leading to gateways and past the near-complete hedgerow and ditch towards the east of the site testify to the widespread use of the lands by badgers.

There were no signs of badger setts and limited suitability for badger habitats along the grid connection routes considered.

8.3.3.2 Otters

There were no signs of otters in the study area. There are no records for otters for the NBDC records for the 2km square (O04G) in which the project site is located.

8.3.3.3 Bats

In all, three species of bat were noted within the site (see Appendix 8.2). These were Common and Soprano pipistrelles and Leisler's bats. These are potentially the three most commonly encountered bat species in Ireland and are found within all counties and into city centres as well as in rural areas. The pipistrelle species are probably the two most common bat species.

None of the bats were seen to enter or leave the trees on site but a soprano pipistrelle was noted late into the morning around trees towards the southern edge of the centre of the proposal. It is also possible that all bats moved towards the farmyard to roost.

All three species noted within the site will avail of buildings. There are several trees with high roost potential, but bats were not present here during this survey.

There was a moderate to low level of bat activity within the site given the fact that this is pasture occupied by bullocks and occasionally sheep.

8.3.3.4 Birds

All birds are protected under the Wildlife Acts. Species recorded included regular passerines such as Great Tit (*Parus major*), Chaffinch (*Fringilla coelebs*), Blackbird (*Turdus merula*), Wren (*Troglodytes troglodytes*). A list of breeding bird species recorded during fieldwork in April and June 2019 is presented in Table 8.3.

Table 8.3 Details of birds encountered during fieldwork in April and June 2019.

Birds	Scientific Name	BWI	Habitat Type
Blackbird	*Turdus merula*	Green	Dense woodland to open moorland, common in gardens
Chaffinch	*Fringilla coelebs*	Green	Hedgerows, gardens and farmland
Great Tit	*Parus major*	Green	Woods, hedges, gardens
Goldfinch	*Carduelis carduelis*	Green	Open woodland, gardens and farmland
Woodpigeon	*Columba palumbus*	Green	Gardens, woods, hedges
Wren	*Troglodytes troglodytes*	Green	Low cover anywhere, especially woodlands

The Mammal specialist noted a long-eared owl fledgling calling from within the site during site visits in mid-July and another two towards (possibly in) the Runways Information Services Limited site located c. 1.3 km to the southeast.

8.3.3.5 Other Mammals

There are numerous burrows throughout the site and historical signs of fox were recorded along with rabbits. These species are of low ecological concern and are not protected.

8.3.5 Habitat Evaluation

The ecological value of the site was assessed following the guidelines set out in the Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment (2016) and according to the Natura Scheme for evaluating ecological sites (after Nairn & Fossitt, 2004). Additionally, the TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) outlines the methodology for evaluating ecological impacts Judgements on the evaluation were made using geographic frames of reference, e.g. European, National, Regional or Local.

Due cognisance of features of the landscape which are of major importance for wild flora and fauna, such as those with a "*stepping stone*" and ecological corridors function, as referenced in Article 10 of the Habitats Directive were considered in this assessment.

There are no rare or protected habitats recorded in the study area inside the proposed development boundary. The development area may be considered of Low Local Ecological Value.

The nearest European site to the proposed Project site is the Rye Water Valley/Carton SAC (Site Code 000199). There is no connectivity to the Rye Water as the site is drained by ditches which flow to the Pinkeen River which discharges to the River Tolka.

The River Tolka discharges to north Dublin Bay approximately 22.6 river km downstream. There are four European sites located in Dublin Bay, namely: South Dublin Bay SAC (Site Code 000210); North Dublin Bay SAC (Site Code 000206); South Dublin Bay and River Tolka Estuary SPA (Site Code 004024); North Bull Island SPA (Site Code 004006).

Given the distance of removal between the proposed development site and the River Tolka Estuary and the employment of SuDS systems in the design of the Data Storage Facility, it is highly unlikely that there would be a significant effect on the European sites in Dublin Bay.

The potential grid connection link on the west side of the R147 was screened out given that no works will take place within 10m of the River Tolka if this option becomes feasible. There is no connectivity between the other grid options considered and any European sites and they were also screened out of the assessment.

There are no predicted significant impacts on local ecology.

8.4 CHARACTERISTICS OF THE DEVELOPMENT

The proposed development consists of the construction of a data storage facility and associated ancillary development.

A full description of the proposed development is provided in Chapter 2 (Description of the Proposed Development).

8.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

8.5.1 Impacts on Habitats

There will be a minor loss of scrub and modified grassland habitats. The potential effects on local ecology are ***neutral*** and ***imperceptible*** for the construction and operational phases.

There will be a loss of internal hedgerow/treelines. With appropriate timing to avoid impacts on Bats and Birds the effects hedgerow/treelines are considered ***neutral*** and ***imperceptible.***

8.5.2 Impacts on Fauna

None of the qualifying habitats or species of the European sites occur under the footprint of the proposed works areas.

Potential Impacts on Badgers and Badger Setts
Construction of a data storage facility will involve the loss of mature trees and hedgerow within the footprint including the near-complete hedgerow and ditch to the eastern edge of the site either through direct loss from construction or from loss of feeding and immediate contact with the buildings or associated roads. The badgers will retain the sett within the hedgerow south of the site, but they will lose some of the surrounding feeding grounds. There will also be an increase in the volume of traffic immediately around the sett and a greater level of human activity and a decrease in bovine activity and consequently invertebrates.

Construction equipment may damage or destroy setts if they travel over a tunnel that is not deep in the ground and may also dig out tunnels or chambers while undertaking earthworks.

Potential Impacts on Bats
There will be a loss of feeding for bats from the changes to the vegetation on site. There is also the potential of roost loss albeit that bats were not seen to enter any trees during this assessment (it is important to consider that this is a snapshot of bat presence on site at a particular date in a given year (2019)). Felling may create a risk of temporary roost loss and if bats were present at this time this could create a risk for bats themselves. A number of trees for removal offer roost potential even if they were devoid of bats in July 2019. This does not rule out their use as bat roosts at other times.

Foxes and rabbits are not legally protected and will move to adjacent suitable habitats.

8.6 DO NOTHING SCENARIO

Given the proposed development is located in an area of low ecological value, the do nothing scenario would have a neutral impact on biodiversity.

8.7 REMEDIAL AND MITIGATION MEASURES

Birds and Vegetation
Potential impacts on birds will be avoided by cutting of vegetation outside the bird nesting season March 1st to August 31st.

Badgers
1) Creating a buffer / boundary to protect the sett 30 metres from the sett entrances prior to the commencement of construction

To ensure the protection of sett tunnels and chambers from accidental collapse a cordon of 30 metres shall be maintained around the sett entrances that must be observed by all heavy plant. Any entry into this area must be with small vehicles only and the fence must be re-instated to prevent accidental entry by construction plant.

2) No illumination of the badger sett

No lighting shall fall on the badger sett within the nearby ditch as this would inhibit activity for a longer period at night.

Bats
1) Examination of all mature trees for the presence of bats prior to felling or other surgery.

2) Provision of bat boxes and planting around the attenuation ponds

3) No lighting of mature trees or the attenuation ponds

4) All mature trees must be examined for the presence of bats prior to demolition. This must be carried out by a bat specialist with appropriate experience of such assessments. If bats are discovered, it will be necessary to acquire a licence to derogate from the Department of Culture, Heritage and the Gaeltacht through the National Parks and Wildlife Service.

All work to exclude bats must be done according to the conditions of the licence and by a licensed bat specialist. It is an offence to disturb or destroy a bat roost without written approval and under the guidance of a specialist.

5) Nine bat boxes shall be attached to the mature trees within the lands that will be retained. The boxes proposed are 9 x 2F Schwegler woodcrete bat boxes. These must be erected no less than 3 metres from the ground in an uncluttered area, away from lighting and not directly over a busy road. One box should face south and the remainder may be in any direction. The boxes must be in place prior to the removal of the mature trees within the footprint.

There shall be planting around the attenuation ponds to provide feeding areas for bats, Alder and willow would be ideal for shelter and to deal with wet conditions when water is high within the ponds.

All lighting shall be motion activated and LED based. Lighting should not be exceed 2700 Kelvin to reduce the blue light component and should exclude UV elements when manufactured.

Foxes and rabbits are not legally protected and will move to adjacent suitable habitats.

8.8 PREDICTED IMPACTS OF THE DEVELOPMENT

The proposed development will have a ***neutral imperceptible*** effect on designated sites within the zone of impact of the development site.

There will be no significant impact on birds once the appropriate avoidance measures are employed.

There will be a ***moderate negative*** impact upon the resident badgers with the loss of an area from their feeding territory. The loss of feeding and a staged increase in construction within the lands may in time lead to exclusion of badgers from this immediate area if development were to expand into adjoining fields. This will not affect the conservation status of the species in Ireland.

There will be no appreciable impact on the local bat fauna. There will be no long-term loss to the conservation status of the bat species present.

8.9 RESIDUAL IMPACTS

The proposed development is located in an area of low ecological value and as such predicted to have a ***neutral imperceptible*** effect on biodiversity.

Interactions are addressed in Chapter 16 of this EIA Report.

8.10 CUMULATIVE IMPACT ASSESSMENT

The cumulative impact of the proposed development during construction and operation in combination with the proposed substation development and subsurface grid connection options and consented developments in the vicinity of the proposed development area (as outlined in Chapter 2) are discussed in sections 8.10.1 and 8.10.2 below.

8.10.1 Construction Phase

The developments are located in an area of low ecological value. Overall there will be a loss of internal hedgerow/treelines. With appropriate standard mitigation in place as required under legislation and planning compliance the cumulative impact on local ecology will be *neutral* and *imperceptible* during construction. Mitigation measures to protect local biodiversity include seasonal constraints on cutting of hedgerows in order to avoid impact on birds and bats and management of run-off to protect water quality.

8.10.2 Operational Phase

The Screening for an Appropriate Assessment, (provided in Appendix 8.1), considered the in-combination effects with the proposed substation development and subsurface grid connection options and consented developments. The Report for AA screening concluded that: there will be no in-combination effects and that can be excluded, on the basis of objective information, and in view of best scientific

knowledge, that the proposed Project, either individually or in combination with other plans or projects, will have a significant effect on the relevant European sites, and therefore cumulative impacts, can be ruled out.

Operation of the developments will not affect the conservation status of any species and the cumulative impact is considered to have a ***neutral imperceptible*** effect on designated sites within the zone of impact of the developments

8.11 REFERENCES

- CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland. Institute of Ecology and Environmental Management.
- Department of the Environment, Heritage and Local Government (2010) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010).
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APPENDIX 8.1

APPROPRIATE ASSESSMENT SCREENING

MOORE GROUP – ENVIRONMENTAL SERVICES (2019)

Report for the purposes of Appropriate Assessment Screening

as required under Article 6(3) of the Habitats Directive
(Council Directive 92/43/EEC)

Proposed Data Centres at Bracetown, Co. Meath

Prepared by: Moore Group – Environmental Services

10th October 2019

On behalf of Enginenode
& Meath County Council

Project Proponent	EngineNode
Project	Proposed Data Centres at Bracetown, Co. Meath
Title	Report for the purposes of Appropriate Assessment Screening Proposed Data Centres at Bracetown, Co. Meath

Project Number	19117	**Document Ref**	19117 Enginen Node DSF AAS1 Rev1.docx	
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Moore Archaeological and Environmental Services Limited				

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Appendix A – Finding of No Significant Effects Report

Abbreviations

AA	Appropriate Assessment
EEC	European Economic Community
EPA	Environmental Protection Agency
EU	European Union
GIS	Geographical Information System
kV	Kilovolt
NHA	Natural Heritage Area
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
OSI	Ordnance Survey Ireland
pNHA	proposed Natural Heritage Area
SAC	Special Area of Conservation
SPA	Special Protection Area

1. Introduction

1.1. General Introduction

This Appropriate Assessment screening report has been prepared to support an application for planning permission for the proposed Project. This report contains information required for the competent authority to undertake screening for Appropriate Assessment (AA) on the potential for the construction and operation of a Data Centres at Bracetown, Co. Meath (hereafter referred to as the proposed Project) to significantly affect European sites.

Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (referred to as the Habitats Directive):

I). whether a plan or project is directly connected to or necessary for the management of the site, and
II). whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives.

Also, having regard to the provisions of the Planning and Development Act 2000 (section 177U and 177V). The purpose of a screening exercise under section 177U of the PDA 2000 is to determine whether it is necessary to carry out an "appropriate assessment" of the implications for a European site of the proposed project. The trigger for the requirement for an "appropriate assessment" is that the project, either individually or in combination with other plans or projects, is "likely to have a significant effect" on the European site.

If the effects are deemed to be significant, potentially significant, or uncertain, or the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation. If potential impacts clearly can be avoided through the modification or redesign of the plan or project, then the screening process is repeated on the altered plan or project.

When screening the project, there are two possible outcomes:

- the project poses no risk of a significant effect and as such requires no further assessment; and
- the project has potential to have a significant effect (or this is uncertain) and AA of the project is necessary.

This desktop report has been prepared by Moore Group - Environmental Services for Enginenode and Meath County Council and assesses the potential for the proposed Project to impact on sites of European-scale ecological importance in accordance with Articles 6(3) and 6(4) of the Habitats Directive. The report was compiled by Ger O'Donohoe (B.Sc. Applied Aquatic Sciences (GMIT, 1993) & M.Sc. Environmental Sciences (TCD,

1999)) who has 25 years' experience in environmental impact assessment and has completed numerous Appropriate Assessment Screening Reports and Natura Impact Statements on terrestrial and aquatic habitats.

1.2. Legislative Background - The Habitats and Birds Directives

It is necessary that the proposed Project has regard to Article 6 of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (referred to as the Habitats Directive). This is transposed into Irish Law by the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. 477) (referred to as the Habitats Regulations).

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) is the main legislative instrument for the protection and conservation of biodiversity in the European Union (EU). Under the Directive, Member States are obliged to designate Special Areas of Conservation (SACs) which contain habitats or species considered important for protection and conservation in a EU context.

The Birds Directive (Council Directive 79/409/EEC and Council Directive 2009/147/EC on the Conservation of Wild Birds), is concerned with the long-term protection and management of all wild bird species and their habitats in the EU. Among other things, the Directive requires that Special Protection Areas (SPAs) be established to protect migratory species and species which are rare, vulnerable, in danger of extinction, or otherwise require special attention.

Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas, designated under the Birds Directive, form a pan-European network of protected sites known as Natura 2000. The Habitats Directive sets out a unified system for the protection and management of SACs and SPAs. These sites are also referred to as European sites.

Articles 6(3) and 6(4) of the Habitats Directive set out the requirement for an assessment of proposed plans and projects likely to affect Natura 2000 sites.

Article 6(3) establishes the requirement to screen all plans and projects and to carry out a further assessment if required (Appropriate Assessment (AA)):

> ***Article 6(3):*** *"Any plan or project not directly connected with or necessary to the management of the site 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 conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

> ***Article 6(4):*** *"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of the Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species the only considerations which may be raised are those relating to human health or public safety, to the beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."*

2. Methodology

The Commission's methodological guidance (EC, 2002) promotes a four-stage process to complete the AA and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

Stages 1 and 2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of Article 6(3) or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Stage 1 Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 site and considers whether it can be objectively concluded that there are not likely to be significant effects on a Natura 2000 site. Mitigation measures (i.e., measures intended to avoid or reduce the harmful effects of the project on the site concerned) cannot be taken into account at this stage.

Stage 2 Appropriate Assessment: In this stage, there is a consideration of the impact of the project with a view to ascertain whether there will be any adverse effect on the integrity of the Natura 2000 site either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are predicted impacts, an assessment of the potential mitigation of those impacts is considered.

Stage 3 Assessment of Alternative Solutions: This stage examines alternative ways of implementing the project that, where possible, avoid any adverse impacts on the integrity of the Natura 2000 site.

Stage 4 Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the sites will be necessary.

To ensure that the proposed Project complies fully with the requirements of Article 6 of the Habitats Directive and all relevant Irish transposing legislation, Moore Group compiled this report to inform the screening for AA

of the proposed Project to be undertaken by the competent authority to determine if the next stage (Stage 2) of the AA process is required.

2.1. Guidance

This report has been compiled in accordance with guidance contained in the following documents:

- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. (Department of Environment, Heritage and Local Government, 2010 rev.).
- Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 & PSSP 2/10.
- Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission Environment Directorate-General, 2001); hereafter referred to as the EC Article Guidance Document.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC Environment Directorate-General, 2000); hereafter referred to as MN2000.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC, 2018).

2.2. Data Sources

Sources of information that were used to collect data on the Natura 2000 network of sites, and the environment within which they are located, are listed below:

- The following mapping and Geographical Information Systems (GIS) data sources, as required:
    - National Parks & Wildlife (NPWS) protected site boundary data;
    - Ordnance Survey of Ireland (OSI) mapping and aerial photography;
    - OSI/Environmental Protection Agency (EPA) rivers and streams, and catchments;
    - Open Street Maps;
    - Digital Elevation Model over Europe (EU-DEM);
    - Google Earth and Bing aerial photography 1995-2019;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie including:
    - Natura 2000 - Standard Data Form;
    - Conservation Objectives;
    - Site Synopses;
- National Biodiversity Data Centre records;
    - Online database of rare, threatened and protected species;
    - Publicly accessible biodiversity datasets.
- Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2013); and

- Relevant Development Plans in neighbouring areas;
    - Meath County Development Plan 2013 - 2019

3. Description of the proposed Project

This report presents a screening assessment for a proposed Project consisting of the construction and operation of a Data Centres at Bracetown, Co. Meath.

Figure 1 shows the proposed Project location and Figure 2 shows a detailed view of the proposed Project route on recent aerial photography. Figure 3 is a plan of the proposed Project.

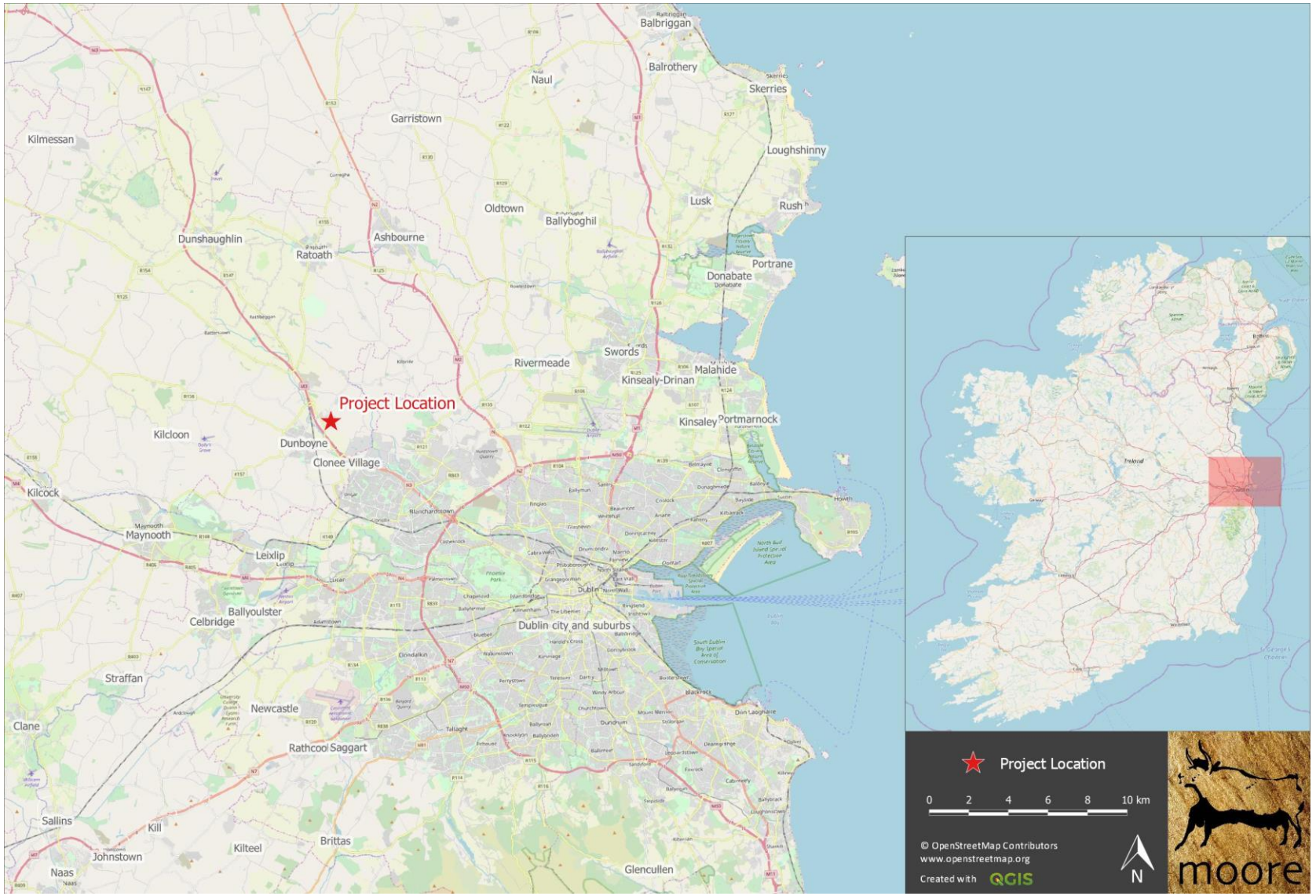


Figure 1. Showing the proposed Project location near Bracetown.



Figure 2. Showing the proposed Project on recent aerial photography.



Figure 3. Plan of the proposed Project.

4. Identification of Natura 2000 Sites

4.1. Description of Natura Sites Potentially Affected

Department of Environment, Heritage and Local Government (2009) Guidance on Appropriate Assessment recommends an assessment of European sites within a zone of impact of 15 km. This distance is a guidance only and the zone of impact has been identified taking consideration of the nature and location of the proposed Project to ensure all European sites with connectivity to it are considered in terms of a catchment-based assessment.

The zone of impact may be determined by connectivity to the proposed Project in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The guidance provides that, at the screening stage, it is necessary to identify the sites and compile information on their qualifying interests and conservation objectives. In preparation for this, the potential for source pathway receptor connectivity is firstly identified and detailed information is then provided on sites with connectivity. European sites that are located within 15 km of the proposed Project are listed in Table 1 and presented in Figure 4, below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 12th July 2019.

Table 1 European Sites located within 15km or the potential zone of impact[1] of the Project.

Site Code	Site name	Distance (km)[2]
001398	Rye Water Valley/Carton SAC	6.45
000206	North Dublin Bay SAC	19.02
000210	South Dublin Bay SAC	18.52
004024	South Dublin Bay and River Tolka Estuary SPA	16.25
004006	North Bull Island SPA	19.02

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project. A review of the Environmental Protection Agency's (EPA) Water Framework Directive (WFD) catchment data indicates that the proposed Project is located in the River Tolka catchment. Downstream within this catchment are the Dublin Bay European sites, including South Dublin Bay and River Tolka Estuary SPA (Site Code 004024), North Dublin

[1] All European sites potentially connected irrespective of the nature or scale of the proposed Project.

[2] Distances indicated are the closest geographical distance between the proposed Project and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

Bay SAC (Site Code 000206) and North Bull island SPA (Site Code 004006), which are located over 22.6 river km downstream.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, 22.6 river km.

Having considered the above, significant effects on any European sites as a result of the proposed Project can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

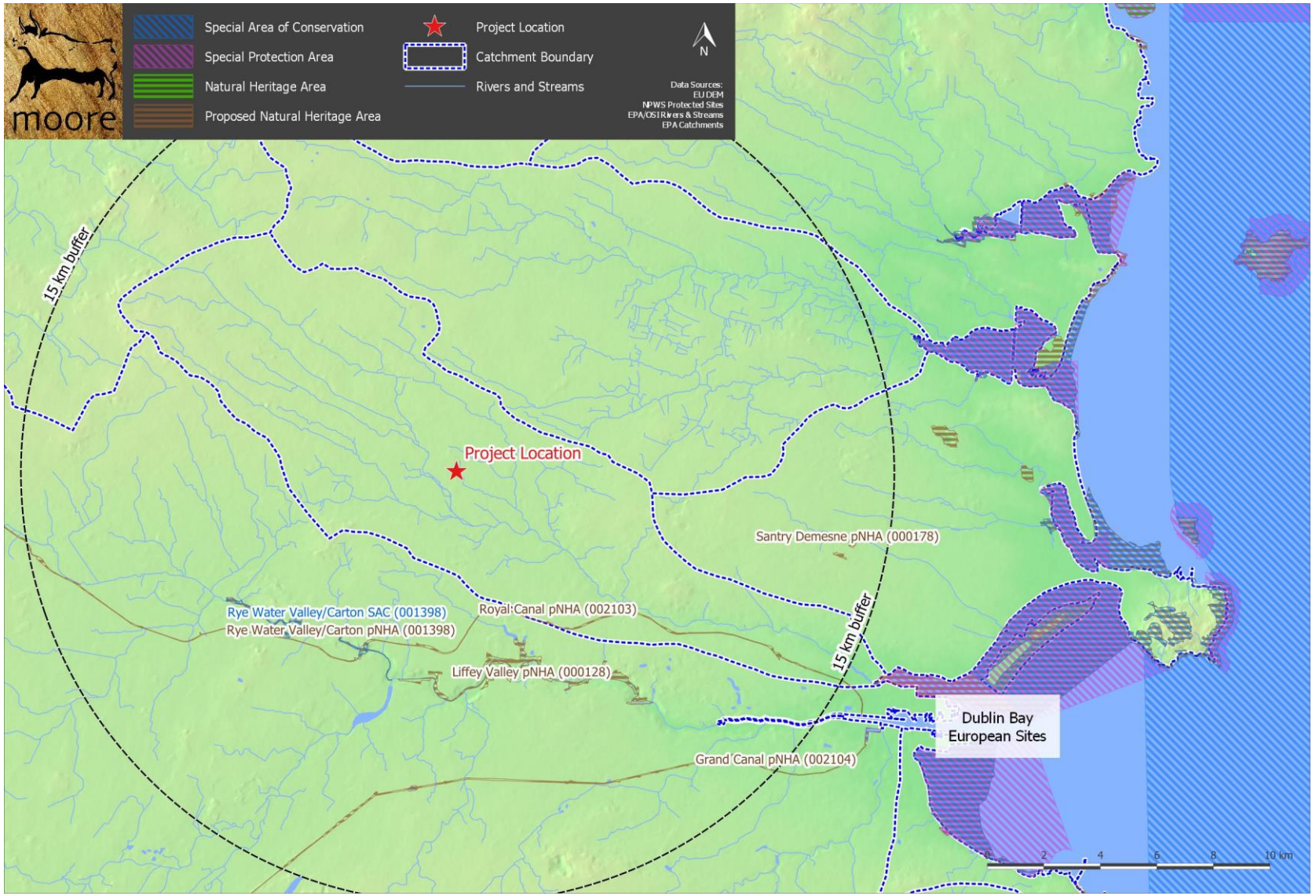


Figure 4. Showing European sites and NHAs/pNHAs within 15 km of the proposed Project.

4.2. Ecological Network Supporting Natura 2000 Sites

An analysis of the proposed Natural Heritage Areas (pNHA) and designated Natural Heritage Areas (NHA) in terms of their role in supporting the species using Natura 2000 sites was undertaken. It was assumed that these supporting roles mainly related to mobile fauna such as mammals and birds which may use pNHAs and NHAs as "stepping stones" between Natura 2000 sites.

Article 10 of the Habitats Directive and the Habitats Regulations 2011 place a high degree of importance on such non-Natura 2000 areas as features that connect the Natura 2000 network. Features such as ponds, woodlands and important hedgerows were taken into account during the rest of the AA process.

There are proposed Natural Heritage Areas associated with Dublin Bay, however, for the purposes of this AA screening report these areas are dealt with under their higher conservation status designations as European Sites.

5. Identification of Potential Impacts & Assessment of Significance

The proposed Project is not directly connected with or necessary to the management of the sites considered in the assessment and therefore potential impacts must be identified and considered.

5.1. Potential Impacts

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 22.6 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

5.2. Assessment of Potential In-Combination Effects

Cumulative impacts or effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects.

As part of the Screening for an Appropriate Assessment, in addition to the proposed Project, other relevant plans and projects in the area must also be considered at this stage. This step aims to identify at this early stage any

possible significant in-combination effects of the proposed development with other such plans and projects on European sites.

A review of data made available through the planning section of the Meath County Council website indicates that, within the last three years, there have been 5 applications for planning granted permission in the vicinity of Bracetown and 8 for the townland of Gunnocks relating to the Facebook data centre, details below.

File Number	Applicant Name	Development Address	Development Description
FS18050	Axial Properties Ltd,	Bracetown Business Park, Clonee, Co Meath	proposed three storey extension to the existing office building, to be known as Block C.
RA170114	Axial Properties Ltd.	Block 4 (Unit 15), Bracetown Business Park, Clonee, Co. Meath	a single storey pitched roof structure and dock leveller with associated ramp and ancillary site works.
RA170586	Axial Properties Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the proposed development will consist of an extension to existing office accommodation.
RA181060	Three Ireland (Hutchison) Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the construction of a 45m high telecommunications support structure.
RA181241	Conor Delaney, Delpin Enterprises Ltd	Bracetown, Dunboyne, Co. Meath	the importation of clay only for land reclamation and reinstatement purposes. The development also consist of the construction of a temporary entrance to facilitate access off main road.

The majority of these Projects are small scale or as in the case of the last listed have been assessed in terms of AA Screening and a determination made that there would be no significant impacts on European sites considered or in combination effects on European sites considered.

FS18127	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a single storey data centre building of approximately 63,000m2 containing two main data halls bars each connected by a central administration building.
FS18128	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a security guard house with area of circa 60m2 serving a new data centre building.
FS19004	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Control Building.
FS19005	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Diesel Generator Building.

FS19006	Runways Information Services Limited,	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Customer Control Building.
RA160937	Runways Information Services Limited	Portan, Gunnocks and Clonee, County Meath	The development will consist of the minor alteration to the previously approved road layout as part of Data Centre Campus.
RA180048	Runways Information Services Limited	Lands at Portan, Gunnocks & Clonee, County Meath - bounded to the south by the R147, to the west by the Kilbride Road, to the north by The Mayne and to the east by lands at Damastown Industrial Park.	the development will consist of alterations to a previously approved Data Centre Campus.
RA180671	Runways Information Services Limited (RISL)	Portan, Gunnocks, Loughsallagh & Clonee, Co. Meath	the proposed development will consist of an expansion of the existing approved Data Centre Campus.

These applications have been assessed under the Habitats Directive legislation where required and a finding of no significant effects was determined in each case. There are no predicted impacts from the proposed Project on European sites and therefore there are no predicted in-combination or cumulative effects.

The Meath County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of impact of the Project site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable

mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the development area and surrounding townlands in which the development site is located, would be avoided.

Any new applications for the Project area will be assessed on a case by case basis by Meath County Council which will determine the requirement for AA Screening as per the requirements of Article 6(3) of the Habitats Directive.

6. Conclusion

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 22.6 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

It has been objectively concluded by Moore Group Environmental Services that:

1. The proposed Project is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
2. The proposed Project is unlikely to indirectly significantly affect the Qualifying interests or Conservation Objectives of the European sites considered in this assessment.
3. The proposed Project, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment in view of their conservation objectives.
4. It is possible to conclude that significant effects can be excluded at the screening stage.

It can be concluded, on the basis of objective information, and in view of best scientific knowledge, that the proposed Project, either individually or in combination with other plans or projects, will have a significant effect on the relevant European sites.

It is the view of Moore Group Environmental Services that it is not necessary to undertake any further stage of the Appropriate Assessment process.

A finding of no significant effects report is presented in Appendix A in accordance with the EU Commission's methodological guidance (European Commission, 2002).

7. References

Department of the Environment, Heritage and Local Government (2010) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010).

European Commission (2000) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

European Commission Environment DG (2002) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43EEC. European Commission, Brussels.

European Commission (2007) Guidance document on Article 6(4) of the 'Habitats Directive '92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission. European Commission, Brussels.

European Commission (2018) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

NPWS (2019) National Parks and Wildlife Service Metadata available online at https://www.npws.ie/maps-and-data

Appendix A

FINDING OF NO SIGNIFICANT EFFECTS REPORT

Finding no significant effects report matrix

Name of project or plan

Proposed Data Centres at Bracetown, Co. Meath

Name and location of the Natura 2000 site(s)

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project. A review of the Environmental Protection Agency's (EPA) Water Framework Directive (WFD) catchment data indicates that the proposed Project is located in the River Tolka catchment. Downstream within this catchment are the Dublin Bay European sites, including South Dublin Bay and River Tolka Estuary SPA (Site Code 004024), North Dublin Bay SAC (Site Code 000206) and North Bull island SPA (Site Code 004006), which are located over 22.6 river km downstream.

Description of the project or plan

This report presents a screening assessment for a proposed Project consisting of the construction and operation of a Data Centres at Bracetown, Co. Meath.

Is the project or plan directly connected with or necessary to the management of the site(s)

No

Are there other projects or plans that together with the projects or plan being assessed could affect the site

A review of data made available through the planning section of the Meath County Council website indicates that, within the last three years, there have been 5 applications for planning granted permission in the vicinity of Bracetown and 8 for the townland of Gunnocks relating to the Facebook data centre, details below.

File Number	Applicant Name	Development Address	Development Description
FS18050	Axial Properties Ltd,	Bracetown Business Park, Clonee, Co Meath	proposed three storey extension to the existing office building, to be known as Block C.
RA170114	Axial Properties Ltd.	Block 4 (Unit 15), Bracetown Business Park, Clonee, Co. Meath	a single storey pitched roof structure and dock leveller with associated ramp and ancillary site works.
RA170586	Axial Properties Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the proposed development will consist of an extension to existing office accommodation.
RA181060	Three Ireland (Hutchison) Ltd	Bracetown Business Park, Bracetown, Clonee, Co. Meath	the construction of a 45m high telecommunications support structure.

RA181241	Conor Delaney, Delpin Enterprises Ltd	Bracetown, Dunboyne, Co. Meath	the importation of clay only for land reclamation and reinstatement purposes. The development also consist of the construction of a temporary entrance to facilitate access off main road.

The majority of these Projects are small scale or as in the case of the last listed have been assessed in terms of AA Screening and a determination made that there would be no significant impacts on European sites considered or in combination effects on European sites considered.

FS18127	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a single storey data centre building of approximately 63,000m2 containing two main data halls bars each connected by a central administration building.
FS18128	Runways Information Services Limited (RISL),	lands within the townlands of Portan, Gunnocks, Loughsallagh and Clonee, Co Meath	construction of a security guard house with area of circa 60m2 serving a new data centre building.
FS19004	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Control Building.
FS19005	Electricity Supply Board (ESB),	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Eirgrid Diesel Generator Building.

FS19006	Runways Information Services Limited,	Gunnocks Townland, Clonee, Co Meath	Bracetown Substation has three separate control buildings. These buildings are identified as the Eirgrid Control Building, Eirgrid Diesel Generator Building and Customer Control Building. This application relates to the Customer Control Building.
RA160937	Runways Information Services Limited	Portan, Gunnocks and Clonee, County Meath	The development will consist of the minor alteration to the previously approved road layout as part of Data Centre Campus.
RA180048	Runways Information Services Limited	Lands at Portan, Gunnocks & Clonee, County Meath - bounded to the south by the R147, to the west by the Kilbride Road, to the north by The Mayne and to the east by lands at Damastown Industrial Park.	the development will consist of alterations to a previously approved Data Centre Campus.
RA180671	Runways Information Services Limited (RISL)	Portan, Gunnocks, Loughsallagh & Clonee, Co. Meath	the proposed development will consist of an expansion of the existing approved Data Centre Campus.

These applications have been assessed under the Habitats Directive legislation where required and a finding of no significant effects was determined in each case. There are no predicted impacts from the proposed Project on European sites and therefore there are no predicted in-combination or cumulative effects

The Meath County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of impact of the Project site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the development area and surrounding townlands in which the development site is located, would be avoided.

Any new applications for the Project area will be assessed on a case by case basis by Meath County Council which will determine the requirement for AA Screening as per the requirements of Article 6(3) of the Habitats Directive.

THE ASSESSMENT OF SIGNIFICANCE OF EFFECTS

Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 site.

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 22.6 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

Explain why these effects are not considered significant.

See above

List of agencies consulted: provide contact name and telephone or e-mail address

The requirement for Appropriate Assessment Screening was determined during pre-planning discussions with Meath County Council.

Response to consultation

N/A.

DATA COLLECTED TO CARRY OUT THE ASSESSMENT

Who carried out the assessment

Moore Group Environmental Services.

Sources of data

NPWS database of designated sites at www.npws.ie

National Biodiversity Data Centre database http://maps.biodiversityireland.ie

Level of assessment completed

Desktop Assessment.

Where can the full results of the assessment be accessed and viewed

Meath County Council Planning Section.

OVERALL CONCLUSIONS

There is no potential for connectivity to nearest European site to the proposed Project, Rye Water Valley/Carton SAC (Site Code 001398), which is located in a different catchment to that of the proposed Project.

There are no predicted effects on any European sites given the distance between the proposed Project and any downstream European Sites, over 22.6 river km downstream.

Having considered the above, significant effects on any European sites as a result of the proposed Project have been ruled out and potential significant effects on European sites have been excluded at a preliminary screening stage.

It has been objectively concluded by Moore Group Environmental Services that:

1. The proposed Project is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
2. The proposed Project is unlikely to indirectly significantly affect the Qualifying interests or Conservation Objectives of the European sites considered in this assessment.
3. The proposed Project, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment in view of their conservation objectives.

4. It is possible to conclude that significant effects can be excluded at the screening stage.

It is the view of Moore Group Environmental Services that it is not necessary to undertake any further stage of the Appropriate Assessment process.

It can be excluded, on the basis of objective information, and in view of best scientific knowledge, that the proposed Project, either individually or in combination with other plans or projects, will have a significant effect on the relevant European sites.

APPENDIX 8.2

BADGER & BAT SURVEY

BRIAN KEELEY

A Badger And Bat Evaluation of the Bracetown site Clonee, County Meath Proposed by EngineNode for Construction of A Data Centre



Brian Keeley B.Sc. (Hons) in Zool. August 2019

Introduction

Most of Ireland's mammals enjoy protection under the Wildlife Act (1976) and the more recent updating of this legislation (Wildlife (Amendment) Act 2000, S.I. No. 94 of 1997, S.I. No. 378 of 2005, European Communities (Natural Habitats) (Amendment) Regulations, 2005). In conjunction with the enactment of the Habitats Directive into Irish legislation, all native mustelid species and bat species are protected with further protection given to otters and lesser horseshoe bats.

Determining the mammal fauna of an area may involve a high level of assessment if the aim of the survey is to catalogue all mammals but this is too detailed for the aim of creating mitigation for a new road alignment. This assessment is specific to the presence of badgers and their setts and bats within lands proposed for the construction of a data centre in what is currently agricultural lands on the border of county Meath and county Dublin. This would lie adjacent to an approved Data Centre under construction in 2019

The survey undertaken within the site allows a targeting of mitigation measures to the appropriate or most efficient sites to prevent accidental death or injury and to determine if it would be possible to provide safe passage across long-established routes through a new development.

Fieldwork for the current report on badger and bat distribution was carried out by Brian Keeley, an ecologist with over a quarter of a century of fieldwork experience. This report addresses the main issues affecting the badger fauna considered in this assessment and created by construction and the presence of the infrastructure and buildings and associated cabling.

Construction activities and subsequent operation of the database and the associated new roads create a number of significant short-term and long-term risks for the resident badger and bat population, in addition to impacts upon other vertebrates and invertebrates. The construction itself may involve the removal of key features of the surrounding environment and of the habitats of badgers, bats and other mammal species, such as trees, hedgerow lines and grassland in which to feed. The most damaging operation is the potential for the destruction of badger dwellings (setts) during the vegetation clearance and early earthworks and of the accidental exclusion or killing of bats roosting within trees upon the site.

In relation to badgers, the clearance of hedgerow poses the risk of the removal of the badgers' home burrow and the associated burrows (all of which are known as setts) that are used seasonally or occasionally throughout the year. In winter, this is especially risky if the sett is not identified before hedgerow removal operations, as this is the time when badger cubs are born. In the classification used in this report, setts are considered to fall into four categories, which are best elaborated by long-term studies but can be interpreted to a relatively good accuracy in terms of status based on basic observations.

The basic sett type within which badgers are typically present throughout the year is the main sett. This is almost always the sett within which cubs are born. Bedding outside the entrance to these setts often identifies their use as such and paw prints and dung pits or latrines nearby also assist in their categorisation. There are typically a number of entrances to a main sett, some of which may be disused. Paths leading from the main sett are often very easy to trace for some distance.

Annexe setts are similar in construction to main setts and are typically accessed by a number of entrances. They are often discernibly connected to a main sett by well-worn paths, which is within 150 metres of the annexe sett. Badgers do not necessarily use this type of sett throughout the year and they may be inactive at the time of any short-term study.

Subsidiary setts are again not always active throughout the year. There may be a number of entrances to the sett and they are not clearly associated with any other sett.

The last type of sett, the outlier sett, may only have one entrance and has no path leading to it. This type of sett is only sporadically used and may even be in areas subject to flooding or seasonally unsuitable to badger use. These setts may be overlooked if they have remained inactive for several weeks and this may be true of such setts in early winter during which time this survey was carried out.

Setts may be under threat from construction if they lie directly in the footprint of a building, cabling or a new road. Setts outside of this land take area may also be threatened with damage from the normal activities of the heavy plant equipment required to build the scheme. For example, if a badger sett entrance were located outside of the land take but led to a system of tunnels that lay under the working area of the heavy plant, there is a clear risk that the tunnels would be crushed under the repeated movement of equipment.

These tunnels may occasionally go two metres or deeper underground but are also liable to surface to shallower depth to avoid rocky substrate or water. Thus, badger setts may be affected by the immediate impact upon them from the excavation and removal of the soil within which they are established or by the indirect destruction of tunnels that lie under the construction corridor of the road or building.

The population of badgers in Ireland has been revised downwards in recent years as badger social groups are now considered to be smaller than in original assessments undertaken and this number has reduced as a consequence of the Department of Agriculture activities in culling. Areas where agriculture is of less intensity may provide safer conditions for badgers in terms of state control measures, but urban areas create a risk of interference that may be more persistent than in rural areas. Nonetheless, badgers survive in many urban areas including public parks, gardens, along the rivers in built-up areas or in the grounds of schools, colleges, convents etc.

In relation to bats, there is the potential of losses of commuting routes and feeding areas where development greatly modifies the availability of insect prey, creates a barrier to movement or removes access to roost sites, rendering feeding sites too distant from any alternative roosts used. In this scheme, there would be no building removal but there would be tree losses to accommodate the infrastructure and buildings.

Methodology

Badgers

The lands at Bracetown were examined on July 9th, 2019 to determine whether there was an active sett within the lands, whether there was evidence of badger movement through the site and to predict the potential impacts of construction upon the badger fauna within the lands. The fields were examined within the footprint of the project and in adjoining hedgerow to determine whether there was evidence of badger setts and feeding and commuting. The distribution of badger setts was assessed against the proposed construction to determine if the setts lie within the footprint of the proposals and if their presence is incompatible with the project.

The landowner accompanied the surveyor for the initial examination of the site and provided a lifelong experience of the land and the historical presence of badgers within the farm.

The lands were again examined on 8th August for all badger signs to determine if all badger activity and occupancy had been covered within the July survey. The entire site was covered for a second time with special emphasis upon the middle hedgerow that would be removed as part of the proposal for the site.

Bats

The site was assessed for the presence of bats on July 9th, 2019 by means of an inspection of all mature trees and by a bat detector assessment commencing prior to sunset (which was at 21.53 hours) and continuing for two hours before resuming from 04.00 am with dawn occurring at 05.10 am. An Echometer 3 (EM3) was held throughout the assessment and the GPS attachment assisted in plotting the species of bat noted.

Additional to this, a Song Meter 2 Bat + (SM2) was positioned within the lands at the base of a mature tree to determine the level of bat activity within the site throughout the night. Signals recorded on the EM3 and SM2 were stored on SDHC cards and transferred to a HP laptop for analysis. Signals were identified with Kaleidoscope and included a manual verification of all calls.

The site was walked repeatedly to check for emerging, commuting and feeding bats. The dawn assessment concentrated on identifying possible roosts sites in trees (or if bats left the site entirely).

Survey constraints

The bat survey was undertaken in the ideal period to identify maternity roosts and high bat activity. The weather conditions are typically highly suited to bats at this time of year (it was dry and suitably warm (18^{o} Celsius as sunset and 14^{o} Celsius at sunrise) on the night of survey albeit that summer 2019 was more unsettled than is typical for July).

The badger survey was undertaken in a typically unsuitable and inappropriate time of year. Summer is when vegetation reaches it densest and setts may be obscured by dense scrub including bramble, blackthorn or even nettles. For this reason, the survey was undertaken over two months to overcome any visibility problems. Furthermore, the assistance of the landowner in identifying badger setts that had been known for decades and a very good level of understanding of the farm and its nature overcame any seasonal issues. While visibility was reduced, it is considered that a full and comprehensive assessment of the site was feasible and was carried out successfully.

Results

Badgers

There is a 4-entrance sett in the northwestern part of the near-circular field that lies to the south of the proposal. This sett has a relatively substantial spoil heap that is emanating from one entrance. There is another large entrance that had bedding in its mouth in July 2019 (absent in August). The other entrances in the southern field are of less significance. This sett is deemed to be a likely main sett and is considered on the evidence to be a breeding sett (see Figure 1 and Plate 1).

A badger was seen during surveying on July 9th running into the sett and then turning to look out. The badger had a mud-covered face and had been digging.

Within the fields that form the footprint of the proposal there are badger tracks along the trees and scrub and there was evidence of digging in July and August. Paw prints leading to gateways and past the near-complete hedgerow and ditch towards the east of the site testify to the widespread use of the lands by badgers.

Bats

In all, three species of bat were noted within the site (see Figures 2 and 3 and Tables 1 and 2). These were common and soprano pipistrelles and Leisler's bats. These are potentially the three most commonly encountered bat species in Ireland and are found within all counties and into city centres as well as in rural areas. The pipistrelle species are probably the two most common bat species.

None of the bats were seen to enter or leave the trees on site but a soprano pipistrelle was noted late into the morning around trees towards the southern edge of the centre of the proposal. It is also possible that all bats moved towards the farmyard to roost. All three species noted within the site will avail of buildings. There are several trees with high roost potential, but bats were not present here during this survey (see Plate 2).

There was a moderate to low level of bat activity within the site given the fact that this is pasture occupied by bullocks and occasionally sheep.

Potential Impacts of the Proposal on Badgers and Badger Setts

Construction of a data centre will involve the loss of mature trees and hedgerow within the footprint including the near-complete hedgerow and ditch to the eastern edge of the site either through direct loss from construction or from loss of feeding and immediate contact with the buildings or associated roads. The badgers will retain the sett within the hedgerow south of the site, but they will lose some of the surrounding feeding grounds. There will of also be an increase in the volume of traffic immediately around the sett and a greater level of human activity and a decrease in bovine activity and consequently invertebrates.

Construction equipment may damage or destroy setts if they travel over a tunnel that is not deep in the ground and may also dig out tunnels or chambers while undertaking earthworks.

Potential Impacts of The Proposal Upon Bats

There will be a loss of feeding for bats from the changes to the vegetation on site. There is also the potential of roost loss albeit that bats were not seen to enter any trees during this assessment (it is important to consider that this is a snapshot of bat presence on site at a particular date in a given year (2019). Felling may create a risk of temporary roost loss and if bats were present at this time this could create a risk for bats themselves. A number of trees for removal offer roost potential even if they were devoid of bats in July 2019. This does not rule out their use as bat roosts at other times.

Mitigation Measures

1. **Badgers**

    1) Creating a buffer / boundary to protect the sett 30 metres from the sett entrances prior to the commencement of construction

    To ensure the protection of sett tunnels and chambers from accidental collapse a cordon of 30 metres shall be maintained around the sett entrances that must be observed by all heavy plant. Any entry into this area must be with small vehicles only and the fence must be re-instated to prevent accidental entry by construction plant.

    2) No illumination of the badger sett

    No lighting shall fall on the badger sett within the nearby ditch as this would inhibit activity for a longer period at night.

2. **Bats**

    1) Examination of all mature trees for the presence of bats prior to felling or other surgery.

    2) Provision of bat boxes and planting around the attenuation ponds

    3) No lighting of mature trees or the attenuation ponds

    1) All mature trees must be examined for the presence of bats prior to demolition. This must be carried out by a bat specialist with appropriate experience of such assessments. If bats are discovered, it will be necessary to acquire a licence to derogate from the Department of Culture, Heritage and the Gaeltacht through the National Parks and Wildlife Service.

All work to exclude bats must be done according to the conditions of the licence and by a licensed bat specialist. (It is an offence to disturb or destroy a bat roost without written approval and under the guidance of a specialist).

2) 9 bat boxes shall be attached to the mature trees within the lands that will be retained. The boxes proposed are 9 x 2F Schwegler woodcrete bat boxes. These must be erected no less than 3 metres from the ground in an uncluttered area, away from lighting and not directly over a busy road. One box should face south and the remainder may be in any direction. The boxes must be in place prior to the removal of the mature trees within the footprint.

There shall be planting around the attenuation ponds to provide feeding areas for bats, Alder and willow would be ideal for shelter and to deal with wet conditions when water is high within the ponds.

All lighting shall be motion activated and LED based. Lighting should not be exceed 2700 Kelvin to reduce the blue light component and should exclude UV elements when manufactured.

Impacts of the Proposal following Mitigation

There will be a moderate negative impact upon the resident badgers with the loss of an area from their feeding territory. The loss of feeding and a staged increase in construction within the lands may in time lead to exclusion of badgers from this immediate area if development were to expand into adjoining fields. This will not affect the conservation status of the species in Ireland.

There will be no appreciable impact on the local bat fauna. There will be no long-term loss to the conservation status of the bat species present.

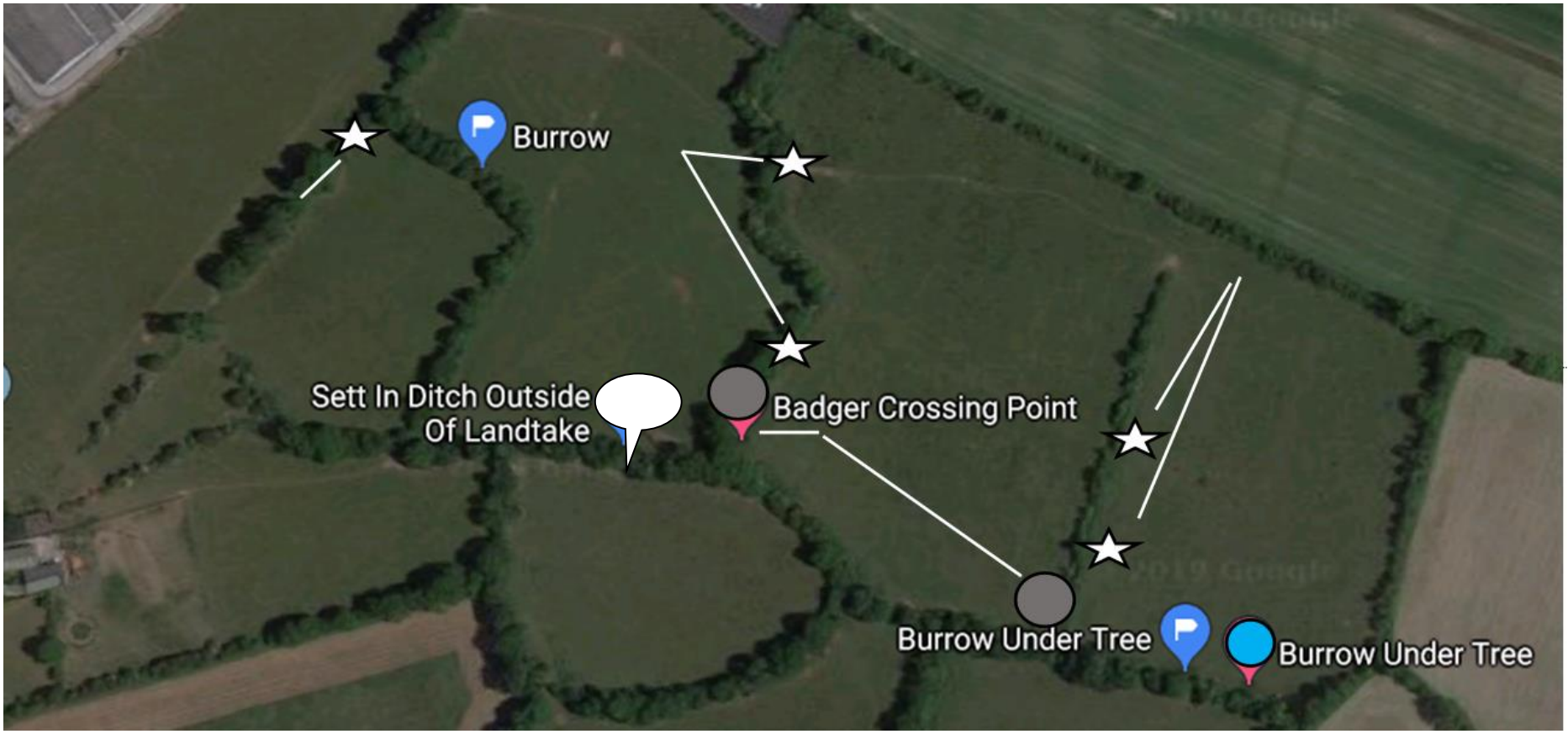


Figure 1: Badger evidence within the site and adjoining lands

All burrows shown above were almost certainly rabbit burrows and only one sett was noted. This is denoted by the white marker above. Two areas where badger paw prints and other signs (including tunnelled vegetation) indicated crossing points in ditches or wetter land are shown with grey markers. The stars indicate digging or badger paw prints.



Plate 1: Badger sett in hedgerow adjacent to the site



Plate 2: Bat roost potential in trees within the proposal site



Figure 2: Bat activity within the site after sunset 9th July 2019 and for the following two hours



Figure 3: Bat activity within the site for the hour prior to dawn 10th July 2019



Figure 4: Indicative development layout–

please see the latest layouts for a more through consideration of the proposal

Table 1: Bat activity and species composition through the night recorded by a static SM2 July 9th 2019 at Bracetown

DATE	TIME	AUTO ID	MANUAL ID
09/07/2019	22:03:45	NYLE	NYLE
09/07/2019	22:08:45	NYLE	NYLE
09/07/2019	22:10:15	NYLE	NYLE
09/07/2019	22:20:45	PIPY	NYLE
09/07/2019	22:21:15	NYLE	NYLE
09/07/2019	22:21:45	NYLE	NYLE
09/07/2019	22:22:15	PIPY	NYLE
09/07/2019	22:22:45	NYLE	NYLE
09/07/2019	22:23:45	PIPI	PIPI
09/07/2019	22:25:45	NYLE	NYLE
09/07/2019	22:26:45	PIPI	PIPI
09/07/2019	22:27:15	PIPI	PIPI
09/07/2019	22:27:45	NYLE	NYLE
09/07/2019	22:31:00	NYLE	NYLE
09/07/2019	22:37:30	NYLE	NYLE
09/07/2019	22:38:00	PIPI	PIPI NYLE
09/07/2019	22:38:30	NYLE	NYLE
09/07/2019	22:39:00	NYLE	NYLE
09/07/2019	22:40:30	NYLE	NYLE
09/07/2019	22:47:30	PIPI	PIPI
09/07/2019	22:51:30	NYLE	NYLE
09/07/2019	22:52:00	NYLE	NYLE
09/07/2019	22:55:00	NYLE	NYLE
09/07/2019	22:55:30	NYLE	NYLE
09/07/2019	23:19:30	PIPI	PIPI
09/07/2019	23:28:30	PINA	PIPI
09/07/2019	23:29:00	NYLE	NYLE
09/07/2019	23:38:00	NoID	NYLE
09/07/2019	23:54:00	PIPI	PIPI NYLE
09/07/2019	23:54:30	PIPI	PIPI
10/07/2019	00:07:30	NoID	NYLE
10/07/2019	00:37:30	NYLE	NYLE
10/07/2019	00:45:30	PIPI	PIPI
10/07/2019	01:04:00	PIPI	PIPI
10/07/2019	01:49:30	NoID	PIPI
10/07/2019	01:57:30	NoID	NYLE
10/07/2019	02:03:00	PIPY	PIPY
10/07/2019	02:07:30	NYLE	NYLE
10/07/2019	02:21:30	PIPY	PIPY
10/07/2019	02:22:00	PIPY	PIPY
10/07/2019	02:23:30	NoID	NYLE
10/07/2019	02:50:30	NoID	NYLE
10/07/2019	02:51:30	PIPI	PIPI
10/07/2019	03:05:00	NYLE	NYLE

10/07/2019	03:12:30	NYLE	NYLE
10/07/2019	03:23:30	PIPY	PIPY
10/07/2019	03:42:30	PIPY	PIPY
10/07/2019	03:55:30	NoID	NYLE
10/07/2019	03:57:00	PIPI	PIPI
10/07/2019	04:01:00	NYLE	NYLE
10/07/2019	04:03:00	NYLE	NYLE
10/07/2019	04:03:30	NYLE	NYLE
10/07/2019	04:04:00	NYLE	NYLE
10/07/2019	04:08:30	NoID	NYLE
10/07/2019	04:10:30	PIPI	PIPI
10/07/2019	04:15:00	NoID	NYLE
10/07/2019	04:29:30	PIPY	PIPY
10/07/2019	04:30:00	PIPI	PIPI
10/07/2019	04:30:30	PIPI	PIPI
10/07/2019	04:31:00	PIPI	PIPI PIPY
10/07/2019	04:33:30	NYLE	NYLE
10/07/2019	04:34:00	NYLE	NYLE

Table 2: Bat activity and species composition recorded by the handheld EM3

DATE	TIME	AUTO ID	MANUAL ID
09/07/2019	22:14:02	NYLE	NYLE
09/07/2019	22:14:33	NYLE	NYLE
09/07/2019	22:30:55	NYLE	NYLE
09/07/2019	22:31:56	NYLE	NYLE
09/07/2019	22:36:34	NYLE	NYLE
09/07/2019	23:28:34	PIPI	PIPI
09/07/2019	23:32:08	PIPI	PIPI
09/07/2019	23:34:10	PIPI	PIPI
09/07/2019	23:37:16	PIPI	PIPI
09/07/2019	23:38:48	PIPI	PIPI
09/07/2019	23:39:19	PIPI	PIPI
09/07/2019	23:39:49	PIPI	PIPI
09/07/2019	23:40:50	PIPI	PIPI
09/07/2019	23:41:21	PIPI	PIPI
09/07/2019	23:47:01	NYLE	NYLE
09/07/2019	23:48:03	PIPI	PIPI
09/07/2019	23:48:33	NYLE	NYLE
09/07/2019	23:50:05	PIPI	PIPI NYLE
09/07/2019	23:51:39	PIPI	PIPI
09/07/2019	23:52:10	PIPI	PIPI NYLE
10/07/2019	03:59:43	NYLE	NYLE
10/07/2019	04:05:16	PIPI	PIPI
10/07/2019	04:16:22	NYLE	NYLE
10/07/2019	04:16:53	NYLE	NYLE
10/07/2019	04:17:53	PIPY	PIPY
10/07/2019	04:29:30	PIPY	PIPY
10/07/2019	04:30:31	PIPI	PIPI PIPY
10/07/2019	04:31:01	PIPI	PIPI
10/07/2019	04:38:08	PIPY	PIPY
10/07/2019	04:38:38	PIPY	PIPI PIPY
10/07/2019	04:39:09	PIPY	PIPY
10/07/2019	04:41:44	PIPY	PIPY

Table 3: BCIreland data: search results 20 Aug 2019

Search parameters: Roosts Transects Ad-hoc observation sites with observations of all bats within 10000m of O0300843121. There are no recorded roosts within 1 km of the site			
Roosts			
Name	Grid reference	Address	Species observed
33 Inchicore Rd	O1234	Inchicore Rd; Dublin 8; County Dublin	Unidentified bat
36 Oaklawn Wood	O0036	Leixlip; County Kildare	Nyctalus leisleri
Abbotstown House	O092393	Abbotstown Avenue; Finglas West; Dublin 11; County Dublin	Nyctalus leisleri
Airlie Stud Stable Block; Adamstown; Co. Dublin	O020336	Airlie Stud Stable Block; Adamstown; Co. Dublin	Unidentified bat
Anna Liffey House	O0436	Lucan; County Dublin	Pipistrellus spp. (45kHz/55kHz); Plecotus auritus
Avalon	O005413	Dunboyne; County Meath	Myotis mystacinus; Pipistrellus pygmaeus
Bailiff\\\'s/Superintendent\\\'s Lodge	O109356	Phoenix Park; County Dublin	Pipistrellus pygmaeus
Beech Tree Roost St Catherine's Park	O014359	Leixlip; County Kildare	Myotis daubentonii
Bennetstown Bridge	O010438	Bennetstown; Dunboyne; County Meath	Myotis nattereri
Blanchardstown Hospital	O0839	Dublin 15	Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz)
Castleknock College	O0868736557	Castleknock; County Dublin	Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
Church at St. Mary's Hospital	O106347	Phoenix Park; Dublin 20; County Dublin	Plecotus auritus
Crodaun; cottage	N9700035000	Celbridge Gateway Site; Celbridge; Co. Kildare	Pipistrellus pipistrellus (45kHz)
Deerfield House; Phoenix Park	O1100035500	Phoenix Park; Dublin	Plecotus auritus
Dunboyne Bridge	O014420	Dunboyne; County Meath	Myotis nattrreri
Esker House	O037343	Lucan; County Dublin	Pipistrellus spp. (45kHz/55kHz); Plecotus auritus
Farmleigh House	O092363	OPW; Farmleigh House; Phoenix Park; Dublin	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pygmaeus

Farmyard Surgalstown	O1263347811	FarmyardSurgalstownKilsallaghanFingalCo. Dublin	Pipistrellus pipistrellus (45kHz)
Fieldstown House	O1140750479	Fieldstown HouseFieldstownRolestownFingalCounty Dublin	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
Hunter Residence	O043412	Main street; Clonee; County Meath	Pipistrellus pygmaeus; Unidentified bat
Kingsfurze	O0835	Old lucan rd; Palmerstown; Dublin 20	Unidentified bat
Knockmary Hill Lodge	O104347	Phoenix Park; Dublin 8; County Dublin	Pipistrellus spp. (45kHz/55kHz)
Large Clock Tower	O091362	Farmleigh Estate; Phoenix Park; County Dublin	Pipistrellus pipistrellus (45kHz)
Laundry Gate Lodge	O120357	Phoenix Park; Dublin 8; County Dublin	Pipistrellus pygmaeus
Lime Tree Roost; St Catherines Park	O016360	Leixlip; County Kildare	Pipistrellus pipistrellus (45kHz)
Lorrha Lodge	O004427	Summerhill Rd; Dunboyne; County Meath	Nyctalus leisleri
Lucan Spa Hotel Roost	O024351	Lucan; Co. Dublin	Pipistrellus spp. (45kHz/55kHz)
Luttrellstown Castle cave	O0512036930	Luttrellstown CastleCastleknockFingalDublin	Myotis daubentonii
Luttrellstown Castle folly	O0512336956	LuttrellstownCastleknockFingalDublin	Myotis natterreri; Plecotus auritus
Mc Kee Barracks	O1335	Phoenix Park; Dublin 7	Myotis mystacinus
Mock church tower	O117361	Ratra House (Civil Defence School) Training area; Phoenix Park; County Dublin	Nyctalus leisleri
Oak tree with damaged branch	N9780433455	Donaghcumper House; Donaghcumper; Celbridge; County Kildare	Nyctalus leisleri
Old shower block	O121345	Magazine Fort; Phoenix Park; County Dublin	Pipistrellus spp. (45kHz/55kHz)
OPW Storage Areas	O120357	Ãras an uachtarain; Phoenix Park; County Dublin	Plecotus auritus
Owner unknown	o0445538942	The Stables; Allandale; Hansfield rd; Clonsilla	Pipistrellus pipistrellus (45kHz)
Robertstown House	O084511	Robertstown; Ashbourne; County Meath	Plecotus auritus

Shed at Deerkeeper\'s Lodge	O114343	Phoenix Park; County Dublin	Plecotus auritus
Small clock tower	O091362	Farmleigh Estate; Phoenix Park; Dublin 8; County Dublin	Nyctalus leisleri
St Brigids Castleknock	O089371	Castleknock; Dublin	Plecotus auritus
St Marys	O1335	Phoenix Park; Dublin	Nyctalus leisleri
St Peters Yellow walls	O079438	Yellow walls; castleknock; County Dublin	Pipistrellus spp. (45kHz/55kHz)
Stirling Road Bridge	O014420	Dunboyne; County Meath	Myotis natterreri
Tandys Lane Farmhouse; Adamstown; Co. Dublin	O025334	Tandys Lane farmhouse; Tandys Lane; Adamstown; Lucan; Co. DUblin.	Plecotus auritus; Unidentified bat
Tierney Residence	O0541	Damastown; Naul County Dublin	Unidentified bat
US Ambassador\\\'s residence and outbuildings	O109355	Phoenix Park; County Dublin	Plecotus auritus
Warrenstown House; Blanchardstown Road North; Blanchardstown; Dublin 15	O079403	Warrenstown House; Blanchardstown Road North; Blanchardstown; Dublin 15	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz)
Woodlands Station	N950481	Pipestown; County Meath	Pipistrellus pipistrellus (45kHz)
Transects			
Name	Grid reference start	Species	
Abbotstown Bridge Transect	O0930038300	Myotis daubentonii; Unidentified bat	
Ashbourne Town Transect	O0639752231		
Ashtown Station Transect	O1105037450	Myotis daubentonii	
Cardiff Bridge Transect	O1260037700	Myotis daubentonii; Unidentified bat	
Carton Estate Transect	N959381	Myotis daubentonii; Pipistrellus pipistrellus (45kHz); Unidentified bat	
Castleknock Transect; Spot 10	O0826538006	Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz)	

Castleknock Transect; Spot 2	O0742037740		
Castleknock Transect; Spot 3	O0752137740	Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz);Unidentified bat	
Castleknock Transect; Spot 4	O0762137780	Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus	
Castleknock Transect; Spot 5	O0772337822	Myotis spp.; Nyctalus leisleri; Pipistrellus nathusii; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz)	
Castleknock Transect; Spot 6	O0782637869	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz)	
Castleknock Transect; Spot 7	O0792937914	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz)	
Castleknock Transect; Spot 8	O0803437956	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz);Unidentified bat	
Castleknock Transect; Spot 9	O0815437985	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz)	
Castletown Estate Transect	N9920434119	Myotis daubentonii; Nyctalus leisleri;Pipistrellus spp. (45kHz/55kHz);Unidentified bat	
Celbridge Gateway Site	N9700035000	Myotis natterreri;Nyctalus leisleri;Pipistrellus pipistrellus (45kHz)	
Collins Bridge Transect	O0280036750	Myotis daubentonii;Nyctalus leisleri;Unidentified bat	
Cope Bridge Leixlip Transect	O0079337067	Myotis daubentonii;Unidentified bat	
Deey Bridge Transect	N979374	Myotis daubentonii;Unidentified bat	
Dunboyne Loughsallagh Bridge Transect	O0280041700	Unidentified bat	
Fieldstown R122 Rolestown Transect	O1174450227	Myotis daubentonii;Unidentified bat	
Grandard Bridge Transect	O0940038100	Myotis daubentonii;Unidentified bat	
Kilmainham Section (Inchicore) Transect	O1280033200	Myotis daubentonii;Unidentified bat	
Leixlip Bridge Transect	O0075035810	Myotis daubentonii;Unidentified bat	
Lyreen River; NUI Maynooth campus	N933376	Pipistrellus pipistrellus (45kHz);Pipistrellus pygmaeus	
Mill Race; NUI	N932377	Pipistrellus pipistrellus (45kHz);Pipistrellus pygmaeus	

Maynooth campus		
Milltown Bridge on Broadmeadow Transect	O0721051770	Myotis daubentonii;Pipistrellus nathusii
N74 (13) 2006-	N9328645525	Nyctalus leisleri;Pipistrellus pipistrellus (45kHz);Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz);Unidentified bat
N74 (14) 2006-	N9391951701	Nyctalus leisleri;Pipistrellus pipistrellus (45kHz);Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz);Unidentified bat
O04 (15) 2004-	O0351	Nyctalus leisleri;Pipistrellus pipistrellus (45kHz);Pipistrellus spp. (45kHz/55kHz);Plecotus auritus
O04 (16) 2004-2008	O064462	Nyctalus leisleri;Pipistrellus pipistrellus (45kHz);Pipistrellus spp. (45kHz/55kHz)
O04 (17) 2004-2008	O097466	Nyctalus leisleri;Pipistrellus pipistrellus (45kHz);Pipistrellus pygmaeus;Pipistrellus spp. (45kHz/55kHz)
O04 (18) 2004-2008	O096524	Nyctalus leisleri;Pipistrellus nathusii;Pipistrellus pipistrellus (45kHz);Pipistrellus spp. (45kHz/55kHz)
Pike Bridge Transect	N9612637359	Myotis daubentonii;Unidentified bat
Rye Bridge Transect	O004358	Myotis daubentonii;Unidentified bat
Smullen Bridge Transect	N9410037400	Myotis daubentonii;Unidentified bat
War Memorial Garden Transect	O1170034150	Myotis daubentonii;Unidentified bat

Ad-hoc observations		

Survey	Grid reference	Date	Species
BATLAS 2010	O016368	30/09/2008	Pipistrellus pygmaeus
BATLAS 2010	O0537	15/08/2008	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
BATLAS 2010	O112362	30/09/2008	Nyctalus leisleri
BATLAS 2010	O119345	30/09/2008	Pipistrellus spp. (45kHz/55kHz)
BATLAS 2010	O115361	30/09/2008	Myotis daubentonii; Myotis mystacinus/brandtii; Myotis natterreri; Pipistrellus nathusii; Pipistrellus pipistrellus (45kHz)
BATLAS 2010	O100358	30/09/2008	Myotis natterreri
BATLAS 2010	N9784234085	16/05/2008	Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus; Unidentified bat

BATLAS 2010	O120353	30/09/2008	Myotis daubentonii; Pipistrellus spp. (45kHz/55kHz)
BATLAS 2010	O095362	30/09/2008	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz)
BATLAS 2010	O0721051770	15/08/2008	Myotis spp.; Nyctalus leisleri
BATLAS 2010	O062366	25/09/2008	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
BATLAS 2010	O115344	30/09/2008	Nyctalus leisleri; Pipistrellus spp. (45kHz/55kHz); Plecotus auritus
BATLAS 2010	O010361	30/09/2008	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pygmaeus
BATLAS 2010	O0438	15/08/2008	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
BATLAS 2010	O110356	30/09/2008	Plecotus auritus
BATLAS 2010	O110361	30/09/2008	Myotis daubentonii; Myotis mystacinus/brandtii; Myotis natterreri; Pipistrellus nathusii; Plecotus auritus
BATLAS 2010	O0637	15/08/2008	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
BATLAS 2010	O099353	30/09/2008	Myotis natterreri
BATLAS 2010	O0332535533	16/05/2008	Myotis daubentonii; Pipistrellus pygmaeus
BATLAS 2010	O103362	30/09/2008	Pipistrellus spp. (45kHz/55kHz)
BATLAS 2010	O112366	30/09/2008	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
BATLAS 2010	O1267233130	28/08/2008	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus spp. (45kHz/55kHz)
BATLAS 2010	O063359	30/06/2008	Myotis daubentonii; Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
BATLAS 2010	O107362	30/09/2008	Nyctalus leisleri; Pipistrellus spp. (45kHz/55kHz)
BATLAS 2010	O117361	30/09/2008	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
BATLAS 2010	O066387	17/09/2008	Pipistrellus pygmaeus
BATLAS 2010	O108347	30/09/2008	Plecotus auritus
Dublin Bat Group surveys	O1137	08/09/1999	Nyctalus leisleri

Dublin Bat Group surveys	O1137	08/09/1999	Myotis daubentonii; Pipistrellus pygmaeus
Dublin Bat Group surveys	N982367	04/02/2001	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
Dublin Bat Group Telephone and Follow-up Surveys	O0900037000	07/04/2002	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIA survey- Paul Scott (Scott Cawley)	O092393	31/07/2008	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIA survey- Paul Scott (Scott Cawley)	O117358	2008-00-00	Myotis daubentonii; Myotis mystacinus/brandtii; Myotis natterreri; Myotis spp.; Nyctalus leisleri; Pipistrellus nathusii; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIA survey- Paul Scott (Scott Cawley)	O097364	05/08/2007	Myotis spp.; Nyctalus leisleri; Pipistrellus spp. (45kHz/55kHz)
EIA survey- Paul Scott (Scott Cawley)	O125373	11/06/2009	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIA survey- Paul Scott (Scott Cawley)	O109398	02/08/2005	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIA survey- Paul Scott (Scott Cawley)	O117358	2008-06-00	Myotis daubentonii; Myotis mystacinus/brandtii; Myotis natterreri; Myotis spp.; Nyctalus leisleri; Pipistrellus nathusii; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIA survey- Paul Scott (Scott Cawley)	O112360	21/05/2007	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIA survey- Paul Scott (Scott Cawley)	N979333	11/07/2007	Myotis daubentonii; Myotis natterreri; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIA survey- Paul Scott (Scott Cawley)	O037343	28/04/2011	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus spp. (45kHz/55kHz); Unidentified bat
EIA survey- Paul Scott (Scott Cawley)	O113344	08/05/2007	Nyctalus leisleri; Pipistrellus spp. (45kHz/55kHz)
EIA survey- Paul Scott (Scott Cawley)	N979333	16/07/2008	Myotis daubentonii; Myotis natterreri; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIA survey- Paul Scott (Scott Cawley)	O023414	01/05/2014	Myotis mystacinus/brandtii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIA survey- Paul Scott (Scott Cawley)	O117358	2007-06-00	Myotis daubentonii; Myotis mystacinus; Myotis mystacinus/brandtii; Myotis natterreri; Nyctalus leisleri; Pipistrellus nathusii; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus;

			Plecotus auritus
EIA survey- Paul Scott (Scott Cawley)	O088364	20/07/2007	Pipistrellus pygmaeus
EIA survey- Paul Scott (Scott Cawley)	N961374	22/07/2008	Myotis daubentonii; Myotis mystacinus; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIA survey- Paul Scott (Scott Cawley)	O098331	27/05/2011	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIA survey- Paul Scott (Scott Cawley)	O104368	10/08/2007	Pipistrellus pygmaeus
EIA survey- Paul Scott (Scott Cawley)	O120357	13/08/2007	Myotis daubentonii; Myotis mystacinus; Myotis spp.; Nyctalus leisleri; Pipistrellus nathusii; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIA survey- Paul Scott (Scott Cawley)	O055383	26/07/2006	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIA survey- Paul Scott (Scott Cawley)	N994367	13/10/2010	Myotis daubentonii; Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz)
EIA survey- Paul Scott (Scott Cawley)	O112360	21/05/2007	Nyctalus leisleri
EIA survey- Paul Scott (Scott Cawley)	N979333	11/09/2007	Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIA survey- Paul Scott (Scott Cawley)	O1215437466	16/07/2012	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz)
EIA survey- Paul Scott (Scott Cawley)	O094354	18/07/2007	Pipistrellus pygmaeus
EIS and Road Surveys - Conor Kelleher	O0700035000	22/06/2005	Myotis daubentonii
EIS and Road Surveys - Conor Kelleher	O1300034000	12/07/2006	Pipistrellus pipistrellus (45kHz)
EIS and Road Surveys - Conor Kelleher	O0900038000	22/06/2005	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS and Road Surveys - Conor Kelleher	O1300044000	14/09/2002	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS and Road Surveys - Conor Kelleher	O1000037000	07/04/2002	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS and Road Surveys - Conor Kelleher	O0700035000	22/06/2005	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus

EIS surveys - Brian Keeley	O0550036800	09/09/2005	Myotis daubentonii; Myotis natterreri; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS surveys - Brian Keeley	O1280037400	06/06/2006	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS surveys - Brian Keeley	N9650038401	30/09/2005	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS surveys - Brian Keeley	O0450038150	03/09/2005	Myotis daubentonii; Myotis mystacinus; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS surveys - Brian Keeley	O1218437790	13/09/2010	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS surveys - Brian Keeley	O0980035800	02/09/2005	Myotis mystacinus; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS surveys - Brian Keeley	O1056537449	04/05/2013	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS surveys - Brian Keeley	O0780035800	01/09/2005	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS surveys - Brian Keeley	N9650038400	01/02/2004	Myotis daubentonii; Myotis mystacinus/brandtii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS surveys - Brian Keeley	O0760035200	10/08/2006	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIS surveys - Brian Keeley	O0280035800	01/09/2005	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS surveys - Brian Keeley	O1169651225	03/08/2012	Myotis daubentonii; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS Surveys - Caroline Shiel	O1100035500	04/06/2007	Nyctalus leisleri
EIS Surveys - Niamh Roche	N954526	26/05/2000	Pipistrellus pipistrellus (45kHz)
EIS Surveys - Niamh Roche	O1060047900	09/05/2006	Pipistrellus pipistrellus (45kHz)
EIS Surveys - Niamh Roche	N969525	2003-09-00	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIS Surveys - Niamh Roche	O1040048000	09/05/2006	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
EIS Surveys - Niamh	O02300349	02/08/2007	Pipistrellus pipistrellus (45kHz)

Roche	00		
EIS Surveys - Niamh Roche	O001469	24/05/2000	Nyctalus leisleri
EIS Surveys - Niamh Roche	O0220034900	02/08/2007	Myotis spp.
EIS Surveys - Niamh Roche	N993476	25/05/2000	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz)
EIS Surveys - Niamh Roche	O1060047900	09/05/2006	Pipistrellus pygmaeus
EIS Surveys - Niamh Roche	N964526	26/05/2000	Pipistrellus pygmaeus
EIS Surveys - Niamh Roche	O1040047800	09/05/2006	Myotis mystacinus/brandtii; Pipistrellus pipistrellus (45kHz)
EIS Surveys - Niamh Roche	O010360	08/07/2002	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS Surveys - Niamh Roche	O1040047800	09/05/2006	Myotis mystacinus/brandtii
EIS Surveys - Niamh Roche	O0230035200	02/08/2007	Nyctalus leisleri
EIS Surveys - Niamh Roche	O000469	24/05/2000	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS Surveys - Niamh Roche	O0230035200	02/08/2007	Pipistrellus pygmaeus
EIS Surveys - Tina Aughney	O0200040000	02/05/2007	Myotis natterreri; Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS Surveys - Tina Aughney	O0300038000	02/05/2007	Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
EIS Surveys - Tina Aughney	O0200041000	02/05/2007	Myotis natterreri; Myotis spp.; Nyctalus leisleri; Pipistrellus pygmaeus
EIS Surveys - Tina Aughney	O0100043000	02/05/2007	Myotis natterreri; Myotis spp.
EIS Surveys - Tina Aughney	O0200039000	02/05/2007	Myotis natterreri; Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS Surveys - Tina Aughney	N9734	18/05/2008	Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS Surveys - Tina	O04000380	02/05/2007	Myotis daubentonii; Nyctalus leisleri; Pipistrellus

Aughney	00		pygmaeus
EIS Surveys - Tina Aughney	O0300039000	02/05/2007	Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
EIS Surveys - Tina Aughney	O0200042000	02/05/2007	Myotis natterreri; Pipistrellus pygmaeus
EIS Surveys - Tina Aughney	O0300035000	14/05/2002	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pygmaeus; Plecotus auritus
Faith Wilson	O0233	31/08/2009	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
Faith Wilson	O0640	07/10/2007	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
Faith Wilson	O0739	07/10/2007	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
Faith Wilson	O087384	09/10/2007	Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus
Faith Wilson	O0133	01/09/2009	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
Faith Wilson	O047338	12/07/2010	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
Faith Wilson	O066403	07/10/2007	Myotis daubentonii; Pipistrellus pygmaeus
Faith Wilson	O083389	11/08/2008	Myotis daubentonii; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
Faith Wilson	O0836	11/06/2008	Myotis spp.; Nyctalus leisleri; Pipistrellus spp. (45kHz/55kHz)
Faith Wilson	O095380	09/10/2007	Pipistrellus pipistrellus (45kHz)
Niamh Roche	O088349	20/04/2006	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus
Niamh Roche	N933372	16/09/2009	Myotis daubentonii
Niamh Roche	N933377	16/09/2009	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus