Microsoft

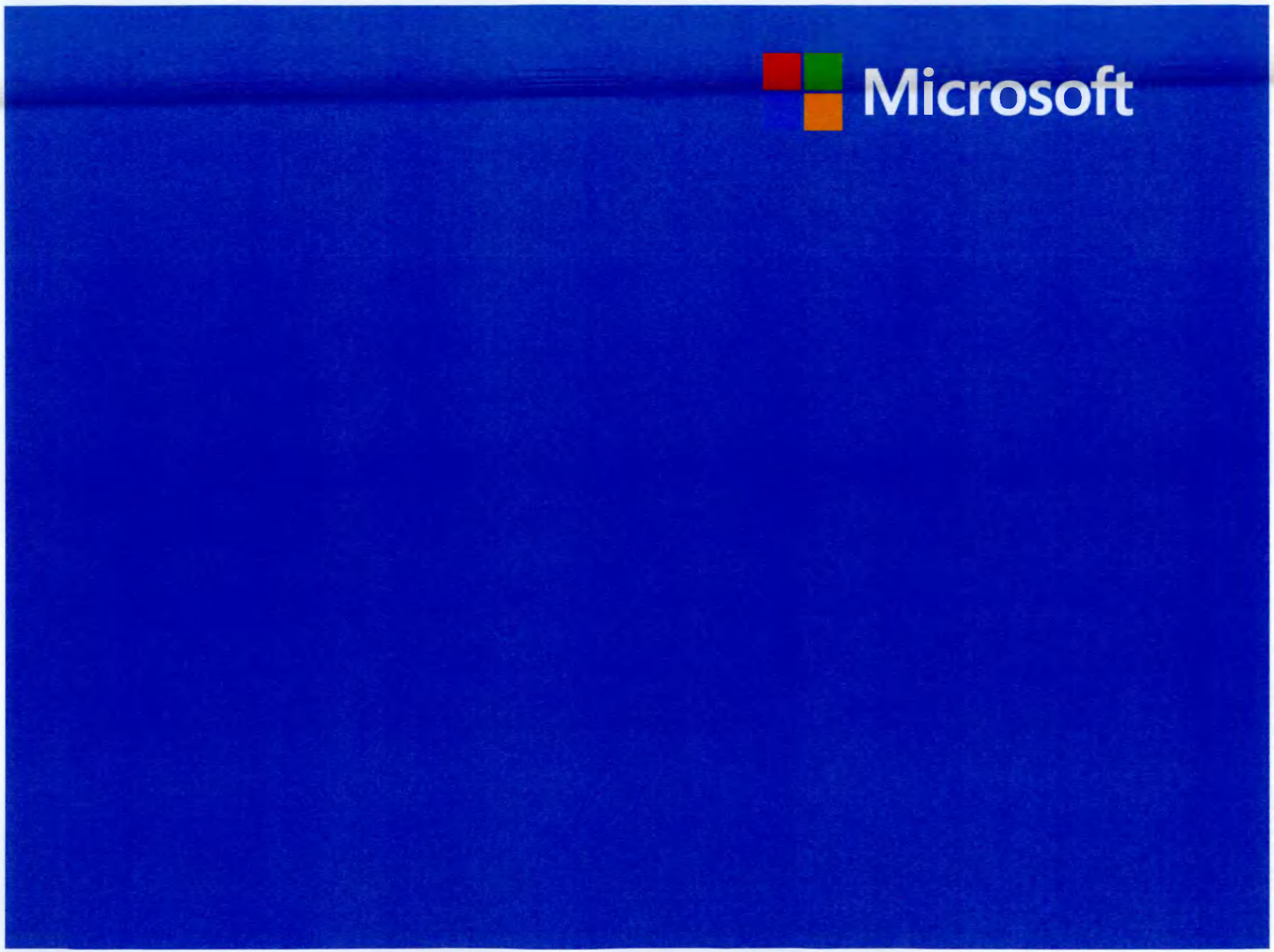
MICROSOFT OPERATIONS IRELAND LTD
GRANGE CASTLE BUSINESS PARK

DUB14 & DUB15 DATA CENTRES
& CENTRAL ADMINISTRATION BUILDING

AMENDMENT TO PERMISSION
SD20A/0283

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
VOLUME I
WRITTEN STATEMENT

JULY 2021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MICROSOFT OPERATIONS IRELAND

DATA CENTRES DUB14 & DUB15
(AMENDMENT TO PERMISSION SD20A/0283)

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

VOLUME I – MAIN REPORT

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1 INTRODUCTION AND METHODOLGY

1.1 INTRODUCTION

This Environmental Impact Assessment Report (EIAR) has been prepared on behalf of Microsoft (MS) Ireland Operations Ltd. to accompany an application to South Dublin County Council (SDCC) for modifications to the previously approved scheme SD20A/0283 which was for the construction of 2 data centres (DUB 14 & DUB15) along with a Central Office Administration Building as an extension to the existing Microsoft Data Centre Campus at Grange Castle International Business Park, Clondalkin, Co Dublin. The final grant of permission in respect of this application was confirmed by SDCC on 10th May 2021.

The scope of the planning application subject to this EIAR is limited to specific amendments to the SD20A/0283 permission. These are detailed in the statutory planning notices as follows:

1. *Approved Central Administration Building (CAB): Proposed relocation of building to the east by approx. 7m. Proposed reconfiguration and setting out of building plans at all levels (including roof level) resulting in increase in building footprint of approximately 170m2 (from 1,424m2 to 1,594m2) associated changes to building elevations (design and finishes).*
    - *Approved single storey Cafeteria Element: Proposed additional basement level below cafeteria to accommodate plant, proposed 9 no. rooflights (2.8 m diameter) and 9 no. rooflight (1.8m diameter), inclusion of MEP Plant on roof level including new flue extending approx. 1m above parapet.*
    - *Approved four-storey Office element: Parapet at roof level to be raised by approx. 1.1m (increased from approved 19.5m in height to proposed 20.6m)*
    - *Overall increase in GIFA of 395m2*
    - *Reconfiguration of area available for PV panels and sedum roof finish in order to accommodate required MEP equipment at roof levels.*
2. *Approved Data Centres – DUB14 and DUB15: Proposed reconfiguration and setting out affecting building locations and plans at all levels (including roof level) resulting in reduction in overall building footprint (for each building) by 48m2 (from 13,442m2 to 13,394m2), associated changes to staircases design, building elevations (design and finishes. Increase in parapet height of Vent Houses (at roof level) by approx. 350mm and omission of previously proposed zone of sedum roof finish. Overall decrease in GIFA of 1,352m2 in respect of DUB 14 and decrease of 1,453m2 in respect of DUB 15. All plant equipment at ground level - reduced in height compared to approved layout so that the screening is deemed not required.*
3. *DUB 14: Reduction in height of approved flues by approx. 650mm, reduction in number of flues from 11 no. approved to 8 no. proposed.*

3.a) DUB 15: Change to level of ground floor and associated increase in overall building height of approx. 700mm (parapet height increased from approved +83.0m O.D. to proposed +83.7m O.D.).

4. *Reconfiguration of associated external plant at ground level (including generators / E-Houses & transformers) flues, omission of approved Modular Electrical Rooms (MERs) and associated screening serving approved Data Centres DUB14 &15.*
5. *Relocation, modifications to design and expansion of approved Water Treatment Building and associated plant to include: 4 no. Water Treatment Tanks, 2 sprinkler tanks and relocated approved pump house (contained in the main Water Treatment Plant building) and 1 generator with additional proposed flue stack (height 30.75m) and 1 no. transformer.*
6. *Gas Generator Compound – Relocation & reconfiguration of previously approved gas generator compound including:*
    - *Additional 4 no. generators (from 20 no. approved to 24 no. proposed).*
    - *Omission of approved 5 no. E-houses.*
    - *Additional 7 no. electrical rooms.*
    - *Additional 7 no. flues (from 5 no. approved to 12 no. proposed).*
7. *Modifications to approved layout of internal site roads, yards and footpaths.*
8. *Relocation and modifications to design of approved Sprinkler Tanks and Pump Houses: Pump House serving DUB 14: relocated into proposed Water Treatment Building and compound, redesign of approved larger tank into proposed two smaller tanks. Pump House serving DUB 15: Relocated to south of DUB15 the north facilitate space for electrical equipment redesign of approved larger tank into proposed two smaller tanks.*
9. *Relocation of Approved Gas Networks Ireland (GNI) gas skid & compound including approved 3 no. kiosk buildings.*
10. *Modifications to approved car park layouts and landscaping design.*
11. *Modifications to location and design of approved bicycle shelters.*
12. *Modifications to site development works, including underground water and building services provision, landscaping, internal security and compound enclosure fencing, and associated works.*

The application main site (Site A on Figure 1.1) comprises lands directly west of the existing MS data centre campus where the previous permission for Data Centres DUB09, DUB10, DUB12 & DUB13 is nearing completion. The application site currently comprises a temporary construction car parking and compound associated with the current construction phase.

The application site also comprises a stand-alone site (Site B) located in the north-east of the Business Campus and north of the main Campus entrance. This currently vacant site is permitted under the parent permission SD20A/0283 to accommodate a new temporary construction parking area associated with the construction of DUB14 and DUB15, with workers being brought to the construction site by shuttle bus from this car park. The permitted temporary car park is included again as part of the amendment planning application (and EIAR) for consistency.

The overall application site extends to c.16.23 ha.

Figure 1.1 View of Approved Entrance to North of Site

Figure 1.2: Site Location

Figure 1.3 Adjoining Data Centres

Figure 1.4 View from SW from Nangor Road

1.2 BACKGROUND & NEED FOR THE DEVELOPMENT

Between 2007 and 2016 MS were granted planning permission for the construction of 11 data centres at Grange Castle International Business Park. DUB03, DUB04 and DUB05 data centres were first completed in 2008-2010 in the facility north-east of Aryzta within the Business Park.

The demand for online services has expanded exponentially over the last ten years. As one of the largest cloud operators in the world, Microsoft has invested substantially in building a resilient cloud-based infrastructure to keep pace with this ever-growing worldwide trend. As a result, additional data centre development is required and hence the proposed development is to add an additional two Data Centres to complete a total of 12 no. at its Grange Castle Campus.

Hence, over a number of permissions granted between 2013 and 2016 a new MS data centre campus comprising DUB06, DUB07, DUB08, DUB09, DUB10, DUB12, & DUB13 has been established within the Business Park.

The proposal for DUB09, DUB 10, DUB12 and DUB 13 represented Phase 3 of the data centre campus masterplan. Permission was granted for this phase under SD16A/0088 in June 2016. To date DUB09, DUB10 & DUB12 have been completed and are operational. DUB13 is expected to be completed in 2021.

An application for permission for a further phase of data centre development – comprising DUB14 & DUB15, and with a new administrative building for the overall MS campus - Ref SD20A\0283 - was lodged on November 2nd 2020.

While the application was under consideration with SDCC, Microsoft appointed ARUP to lead the detail design phase of the project. At design development - and as a result of further targeted briefing sessions with a range of key project stakeholders – certain modifications were required to be made to the original design.

For the most part, these changes are only minor deviations from the planning approved proposals (both in terms of drawings and reports), however in the interest of providing full clarity, it was felt that the sum of changes proposed were likely a material change to the permitted development merited an amendment application to SDCC.

A full planning history for the MS data centre campus is included in Appendix 1.1 (EIAR Vol II).

The current proposal represents Phase 4 of the MI Data Centre campus with DUB14 and DUB15 essential for the continual increase in demand for data storage.

Figure 1.5 View of Western Façade (Central Administration Building in Foreground)

MICROSOFT COMMITMENT TO ENVIRONMENTAL PRINCIPLES

Microsoft considers itself a global corporate citizen and as such seeks to develop principled pragmatic business approaches to challenging issues including the environmental challenges faced by society today. By working with its partners, customers, governments and leading environmental organisations Microsoft brings the power of information technology and cloud computing to bear in addressing the world's environmental challenges.

Microsoft is committed to software and technology innovation that helps people and organisations around the world address their environmental impact.

In this respect Microsoft intends to:

- minimize the environmental impact of its business operations and its products
- create technology solutions that help individuals and business around the world address their environmental impact.

Such aims are encapsulated in the recently published Microsoft 2015 Citizenship Report. This report sets out the company's achievements as well as setting further goals in the following areas:

- Ethical Business Conduct and Governance
- Empowering Communities
- Human Rights
- Responsible Sourcing and Manufacturing
- Environmental Sustainability

Microsoft Environmental Goals 2030-2050

Microsoft environmental goals are based in seven principles, or elements, for the continuous innovation and to take additional steps on an ongoing basis:

i) Grounding in science and math. MI intends to address carbon issues grounded in ongoing scientific advances and an accurate reliance on the basic but fundamental mathematical concepts involved.

Microsoft intends to measure and be carbon negative by 2030 for all three scopes:

- Scope 1: the direct emissions that your activities create.
- Scope 2: the indirect emissions that come from the production of the electricity or heat you use.
- Scope 3: the indirect emissions that come from all the other activities in which you're engaged, including the emissions associated with producing the food you eat, or manufacturing the products that you buy.

ii) Taking responsibility for the carbon footprint, so by 2030 they intent to cut the emissions by more than half and remove more carbon than they emit each year.

a. By 2025, Microsoft will shift to 100% supply of renewable energy.
b. They will electrify their global campus operations vehicle fleet by 2030.
c. In July 2020, Microsoft will start phasing in their current internal carbon tax to cover our scope 3 emissions.
d. Starting in July, all business divisions will also pay an internal carbon fee for all their scope 3 emissions. This will both increase incentives across the company to reduce all scope 3 emissions and fund the added work to reduce their own scope 3 emissions and invest in carbon removal activities.
e. By July of 2021, Microsoft will begin to implement new procurement processes and tools to enable and incentivize their suppliers to reduce their scope 1, 2, and 3 emissions.
f. By 2030 Microsoft will remove more carbon than it emits, setting them on a path to remove by 2050 all the carbon the company has emitted either directly or by electrical consumption since it was founded in 1975.

iii) Investing for new carbon reduction and removal technology. Microsoft will invest in a new Climate Innovation Fund to accelerate the development of carbon reduction and removal technologies that will help the world become carbon negative.

iv) Empowering customers around the world. Microsoft will develop and deploy digital technology to help their suppliers and customers reduce their carbon footprints, through learnings and with the power of data science, artificial intelligence, and digital technology.

v) Ensuring effective transparency. Microsoft will publish an annual Environmental Sustainability Report that provides transparency on their progress, based on strong global reporting standards.

vi) Using their voice on carbon-related public policy issues. Microsoft will support new public policy initiatives to accelerate carbon reduction and removal opportunities, and use their voices to speak out on four public policy issues:

- The need to expand global basic and applied research efforts on carbon, funded by governments, and reorient them towards targeted outcomes and enhanced cross-border collaboration to develop the breakthrough technologies needed to achieve net zero global emissions.
- The removal of regulatory barriers to help catalyse markets to enable carbon-reduction technologies to scale more quickly.
- The use of market and pricing mechanisms so people and businesses can make more informed carbon decisions.
- The empowerment of consumers through transparency based on universal standards to inform purchasers about the carbon content of goods and services.

vii) Enlisting employees. Encouraging the staff to participate in Microsoft's carbon reduction and removal efforts.

Microsoft Datacentres Volume Programme

Another remarkable initiative is the commitment to certify LEED Gold all new Microsoft's data centres through the LEED Volume Programme. Approved in 2017, the programme is responsible to streamline the sustainability standards of design and construction and permit Microsoft to apply LEED Certification in dozens of projects simultaneously, optimising time and resources.

All Microsoft's datacentres will save a minimum of 55% of energy use reduction, through efficient architecture and innovative building systems as will continuing to increase server efficiency. Adiabatic cooling systems use harvested rainwater, helping to reduce the demand for potable water to cool the building. The need of water use is also reduced through the reuse of rainwater for toilet and urinal flushing.

The landscaping of all new datacentres will not require irrigation after 2 years of planting, as only native and adapted plants will be specified.

Microsoft new datacentres will implement sedum roofs on the administration building roofs which will slow down storm water run-off and reduce the heat island effect. Selecting materials with high solar reflectance index for pavements, hardscape and roofs also impact on the temperature of the surfaces and reduces the heat island effect.

The external lighting of the Microsoft datacentres under the LEED Volume were designed to minimise the lighting pollution and increase night sky access, improve night-time visibility, and reduce the consequences of development for wildlife and people.

Microsoft will undertake an indoor air testing after construction and before occupancy of all new datacentres to ensure to MI staff that the building will be a healthy place to work.

A Life Cycle Assessment will be developed for each new Microsoft datacentres as an important tool to educate the design team on the environmental impacts of their decisions and compare different building strategies. The Life Cycle Assessment results provide the following environmental indicators: the global warming potential, depletion of the stratospheric ozone layer, acidification of land and water sources, eutrophication, formation of tropospheric ozone, depletion of non-renewable energy resources.

Microsoft have also pioneered a new concept to integrate fuel cells directly into server racks, which they expect to effectively cut data centre energy intensity in half by eliminating transmission losses and other inefficiencies.

Microsoft are continually working with industry partners to pilot and commercialize new energy technologies for the next generation of efficient data centre designs including at the data centre campus at Grange Castle Business Park. In turn this will further reduce their environmental footprint.

Allowance has been made on the campus for future connectivity to a district heating system and will be extended pending the availability of the Local Authority system.

1.3 LEGISLATIVE REQUIREMENT

Certain public and private projects that are likely to have significant effects on the environment are subject to EIA requirements derived from EIA Directive 85/337/EC (as amended by Council Directive 97/11/EC, Directive 2003/35/EC, Directive 2009/31/EC, Directive 2011/92/EU and Directive 2014/52/EU.

The EIA Directives have been transposed into the Irish land use planning consent system by way of the Planning & Development Acts 2000 (as amended), and the Planning & Development Regulations 2001-20.

One of the most recent amendments to the Regulations - the European Union (Planning and Development)(Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) - transposed Directive 2014/52/EU into Irish law.

Complementary to the legislation is a range of guidelines produced by the EU and government agencies to inform the carrying out of EIA:

- EU Guidance on EIA Screening (DG Environment 2001).
- Guidance on EIA Scoping (DG Environment 2001).
- EIA Review Checklist (DG Environment 2001).
- Guidelines on Information to be Contained in an Environmental Impact Statement (EPA 2002).
- Study on the Assessment of Indirect & Cumulative Impacts as well as Impact Interaction (DG Environment 2002).
- Environmental Impact Assessment (EIA), Guidance for Consent Authorities Regarding Sub-Threshold Development (DoEHLG 2003).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (EPA 2003).
- Development Management Guidelines (DoEHLG, 2007).
- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA 2017)
- Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems - Key Issues Consultation Paper (Department of Environment, Community and Local Government, 2017).
- Circular letter PL 1/2017 - Advice on Administrative Provisions in Advance of Transposition (Department of Housing, Planning and Local Government, 2017).
- Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017)
- Environmental Impact Assessment of Projects – Guidance on Screening (European Commission 2017)
- Environmental Impact Assessment of Projects – Guidance on Scoping (European Commission 2017)
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018).

1.4 DEFINITION OF EIA

Article 1(1)(g) of Directive 2014/52/EU , defines *"Environmental Impact Assessment"* (EIA) as a *"process"* consisting of:

(i) the preparation of an environmental impact assessment report by the developer, as referred to in Article 5(1) and (2);

(ii) the carrying out of consultations as referred to in Article 6 and, where relevant, Article 7;

(iii)the examination by the competent authority of the information presented in the environmental impact assessment report and any supplementary information provided, where necessary, by the developer in accordance with Article 5(3), and any relevant information received through the consultations under Articles 6 and 7;

(iv)the reasoned conclusion by the competent authority on the significant effects of the project on the environment, taking into account the results of the examination referred to in point (iii) and, where appropriate, its own supplementary examination; and

(v) the integration of the competent authority's reasoned conclusion into any of the decisions referred to in Article 8a.'

Article 171A of the 2018 Regulations defines *'environmental impact assessment' as:*

"... a process
(a) consisting of:

(i) the preparation of an environmental impact assessment report by the applicant in accordance with this Act and regulations made thereunder,

(ii) the carrying out of consultations in accordance with this Act and regulations made thereunder,

(iii)the examination by the planning authority or the Board, as the case may be, of-

I) the information contained in the environmental impact assessment report,

II) any supplementary information provided, where necessary, by the applicant in accordance with section 172(1D) and (1E), and

III) any relevant information received through the consultations carried out pursuant to subparagraph (ii),

(iv)the reasoned conclusion by the planning authority or the Board, as the case may be, on the significant effects on the environment of the proposed development, taking into account the results of the examination carried out pursuant to subparagraph (iii) and, where appropriate, its own supplementary examination, and

(v) the integration of the reasoned conclusion of the planning authority or the Board, as the case may be, into the decision on the proposed development, and

(b) which includes:

(i) an examination, analysis and evaluation, carried out by the planning authority or the Board, as the case may be, in accordance with this Part and regulations made thereunder, that identifies, describes and assesses, in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the proposed development on the following:

(I) population and human health.
(II) biodiversity, with particular attention to species and habitats protected under the Habitats Directive and the Birds Directive.
(III) land, soil, water, air and climate.
(IV) material assets, cultural heritage and the landscape.
(V) the interaction between the factors mentioned in clauses (I) to (IV), and

(ii) *as regards the factors mentioned in subparagraph (i)(I) to (V), such examination, analysis and evaluation of the expected direct and indirect significant effects on the environment derived from the vulnerability of the proposed development to risks of major accidents or disasters, or both major accidents and disasters, that are relevant to that development.*

1.5 EIA SCREENING

Section 176(A) of the Act defines *'screening for environmental impact assessment'* as

".. a determination—
(a) as to whether a proposed development would be likely to have significant effects on the environment, and
(b) if the development would be likely to have such effects, that an environmental impact assessment is required."

Section 172 of the Act states that an EIA shall be carried out in respect of an application for consent for a proposed development where either of the following are relevant:

- the proposed development would be of a class specified in Part 1 of Schedule 5 of the Planning and Development Regulations.
- **the proposed development would be of a class specified in Part 2 of Schedule 5 of the Planning and Development Regulations.**
- the proposed development would be of a class specified in Part 2 of Schedule 5 of the Planning and Development Regulations 2001 but does not equal or exceed the relevant quantity, area or other limit specified in that Part, but is concluded, determined or decided that proposed development is likely to have a significant effect on the environment.

The subject development does not fall within any development classes set out in Part 1 of Schedule 5.

The following development class set out in Part 2 of Schedule 5 is noted:

10(a) Industrial estate development projects, where the area would exceed 15 hectares.

It is noted that the application site in this instance is c.16.23 ha and therefore of itself, but also in combination with the remainder of the MS Data Centre Campus which it seeks to extend would form an Industrial Estate Development Project with a development area in excess of 15ha.

1.6 EIA SCOPING

Section 173(2) (a) of the Planning and Development Act 2000 (as amended) provides that a formal request for scoping may be submitted to the planning authority. However, the *'Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* (2017), confirm that this is not mandatory.

The EIAR team carried out a scoping exercise to identify the key issues that may be considered likely to have a significant effect on the environment. Regard was also had to EIAR carried out for other developments in the wider area.

In accordance with the draft EPA Guidelines (2017), those issues that do not meet the threshold of significance have been 'scoped out'. The following issues have been identified in the context of the proposed development:

- Population & Human Health
- Biodiversity
- Lands, Soils & Geology
- Hydrology & Water Services
- Noise & Vibration
- Air & Climate
- Landscape & Visual

- Traffic & Transportation
- Material Assets
- Waste Management
- Cultural Heritage

1.7 EIAR OBJECTIVES

The EIA process is based on the following four principles:

- *Pursuing Preventative Action*

An assessment of anticipated likely and significant impacts was undertaken during the screening and the considerations of alternatives stages of the EIA process. This involved forming a preliminary opinion with respect to the approximate magnitude and character of the likely environmental impacts. This assessment was based on the knowledge, experience and expertise of the EIA team with reference to EIA guidance material and local information.

- *Maintaining Environmental Focus and Scope*

The EIA process has focussed on those issues where environmental impact is likely to occur and have significant effects.

- *Informing the Decision*

The EIAR has been developed and is presented in such a way as to facilitate the authority decision on the acceptability of the proposed development in the full knowledge of the project's likely significant impacts on the environment, if any.

- *Public & Stakeholder Participation*

Participation is provided through the statutory planning process which allows for public participation and consultation while receiving advice from other key stakeholders and statutory authorities with specific environmental responsibilities.

1.8 EIAR FORMAT AND CONTENT

This EIAR is sub divided as follows:

- Environmental Impact Assessment Report
- Appendices to Environmental Impact Assessment Report
- Non-Technical Summary.

The EIAR has been prepared in the Grouped Format as set down in the EPA *"Guidelines on Information to be contained in an EIS"* (2002) and the *'Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports'* (2017). In general, the EIAR follows the framework presented in the EPA *"Advice Notes on Current Practice in the Preparation of Environmental Impact Statements"* (September 2003).

The structure and responsibility of the EIAR chapters is outlined below:

Chapter	Title	Consultant
1.0	Introduction & Methodology	McGill Planning Ltd.
2.0	Alternatives	McGill Planning Ltd.
3.0	Description of Development	McGill Planning Ltd.
4.0	Population & Human Health	McGill Planning Ltd.
5.0	Biodiversity	Moore Ecology
6.0	Lands, Soils & Geology	Arup Engineers
7.0	Hydrology & Water Services	Arup Engineers
8.0	Noise & Vibration	AWN Consulting
9.0	Air Quality & Climate Impact	AWN Consulting
10.0	Landscape & Visual	BSM Landscape Architects
11.0	Traffic & Transportation	TPS Transport Consultants
12.0	Material Assets	McGill Planning Ltd.
13.0	Waste Management	McGill Planning Ltd.
14.0	Cultural Heritage	Reliqua Archaeologists
15.0	Interactions	McGill Planning Ltd.
16.0	Schedule of Mitigations Measure	McGill Planning Ltd.

Table 1.1 List of EIAR Chapters

1.9 METHODOLOGY

The preparation of this EIAR requires the co-ordination and synthesis of associated yet diverse elements of the overall assessment. To facilitate this process, a schematic structure is proposed in order to provide a coherent documentation of the varied aspects of the environment considered. The grouped format structure of the Environmental Impact Assessment Report is listed below with a brief outline of each specific stage.

Methodology
The specific approach or techniques used to analyse impacts or describe environments.

Receiving Environment (Baseline Situation)
Dynamic description of the specific environment into which the proposal will fit, taking account of other developments likely to occur. The context, character, significance and sensitivity of the baseline is described. The likely evolution of baseline environmental characteristics without implementation of the proposed project.

Characteristics of the Proposed Development
Description of the physical characteristics of a project having regard to

- the site location
- the size, design and appearance of the proposed project
- the cumulation with other proposed projects
- the use of natural resources
- the production of waste

- emissions and nuisances
- the potential risk of accidents.

The description of the development should take account of the full 'life-cycle' including construction, commissioning (if relevant), operation, changes to the project and potential decommission.

Potential Impacts
The potential impact of the proposal comprises a general description of the possible types of impacts which proposals of this kind would be likely to produce. Impact assessment addresses direct, indirect, secondary, cumulative, transboundary, short, medium and long term, permanent, temporary, positive and negative effects as well as impact interactions. This includes consideration of a 'Do Nothing' impact which describes the environment as it would be in the future if the development is not carried out.

Mitigation Measures
A description of any specific remedial or reductive measures considered necessary and practicable resulting from the assessment of potential impacts described above.

Predicted Impacts
An assessment of the net specific impact of the proposal, noting the direct, indirect, secondary, cumulative, transboundary, short, medium and long term, permanent, temporary, positive and negative effects as well as impact interactions which the proposed development may have. The predicted impact assumes all mitigation measures are fully and successfully applied. A 'Worst Case' impact is also considered. A 'Worst Case' impact is an impact arising where a development or its mitigation measures substantially fail.

Monitoring
A description of any post development monitoring of effects of the environment which might be necessary.

Reinstatement
A description of any post development reinstatement measures which might be necessary.

1.10 COMPETENCY

For the preparation of this EIAR, the applicant engaged McGill Planning Ltd. to project manage and coordinate the preparation of the EIAR with a team of qualified specialists engaged to prepare individual chapters, as listed in the table below. Details of the competency, qualifications and experience of the authors is also outlined:

Chapter	Consultant	Lead Consultant	Qualifications
Introduction & Methodology	McGill Planning Ltd.	Trevor Sadler	Master of Regional & Urban Planning (MRUP), BA (Hons), RTPI, MIPI.
Alternatives			
Project Description			
Populations & Human Health			
Waste Management			
Material Assets			
Interactions			
Summary of Mitigations Measure			
Biodiversity	Moore Ecology	Ger O'Donohoe	B.Sc. M.Sc (Environmental Sciences)
Lands, Soils & Geology	Arup	Greg Balding Cathal Mac an tSearraigh Gerry Baker Alex Nutley	BA (Mod) MSc EurGeol PGeo. BE (Hons) CEng BA (Hons) MSc Master of Engineering (MEng).
Hydrology & Water Services			
Noise & Vibration	AWN Consulting	Damian Kelly	BSc (Hons) MSc MIOA
Air & Climate		Edward Porter	C Chem MRSC MIAQM MI EnvSc
Landscape & Visual Assessment	BSM	Thomas Burns	B.Agr.Sc. Landscape; Dip. EIA Management; Ad. Dip. Planning and Environmental Law. Member of the Irish Landscape Institute.
Traffic & Transportation	TPS Consulting Engineers	Michael Moran	MSc, MICE, MIHT
Cultural Heritage	Reliqua Archaeologists	Neil O'Flanagan	BA (Hons) MA Modern History (UCD) PhD Urban Research (ANU) MSc Spatial Planning (DIT)

Table 1.2 EIAR Consultants List

1.11 DIFFICULTIES IN COMPILING THE SPECIFIED INFORMATION

There were no significant difficulties in completing the Environmental Impact Assessment Report. Any minor difficulties are presented in each of the respective chapters. While every effort has been made to ensure that the content of this EIAR is consistent there may be instances where typographical errors and/or minor inconsistencies do occur. These are unlikely to have any material impact on the overall findings and assessment contained in this EIAR.

1.12 ADDITIONAL WORKS

The approved application included for the following infrastructure to provide power to the proposed development:

- Expansion of existing electrical sub-station compound (originally granted under SD07A0632) to provide 3 no. additional transformer bays. 3no. E-Houses and 1no. Control room, 2no. Auxiliary transformers
- Provision of a gas generator compound (to serve DUB15) containing 18 no. generators, 5 no. E- houses and 5 no. flues (c.25m maximum height) - amended in this application to:

  - Additional 4 no. generators (from 20 no. approved to 24 no. proposed)
  - Omission of approved 5 no. E-houses
  - Additional 7 no. electrical rooms
  - Additional 7 no. flues (from 5 no. approved to 12 no. proposed)
- Provision of a Gas Networks Ireland gas skid including 3 no. kiosk buildings.

Grid connection for electricity is available on site via the existing sub-station which will be extended as part of this application. Some internal modifications to the switchgear within the existing sub-station to facilitate the additional transformers and load will be required to be carried out by Eirgrid as statutory undertaker. However, it is understood that there will be no additional external works required by Eirgrid to facilitate the development and no new connection of external circuit that would require separate planning permission or would be subject to SID (Strategic Infrastructure Development) or EIAR.

Similarly, the gas generator and gas skid proposed as part of the development will facilitate gas connection to the site directly from the existing Gas Networks Ireland line that already serves the business park. The physical connection to the existing network adjoining the site will be carried out by Gas Networks Ireland as the statutory undertaker under existing exempted development provisions in the Planning & Development Regulations, 2001-2020.

1.13 ADDITIONAL ASSESSMENTS

Appropriate Assessment
A screening report has been completed as required under the Habitats and Birds Directive (92/43/EEC and 19/409/EEC). It is included as appendix to the Biodiversity Chapter 5 of this EIAR.

Flood risk Assessment
A Stage 1 Site Specific Flood Risk Assessment has been carried out and is included as an appendix to the Water Services Chapter 7 of this EIAR.

1.14 REGULATORY CONTROL

The proposed data centre activity itself is not an EPA regulated activity that requires an EPA Industrial Emissions licence (formerly IPPC licence). However, the gas generators, before being operational, will need to comply with the emission limit values set out in the Industrial Emissions Directive (2020/75/EU) and will be subject to an EPA licence in this regard.

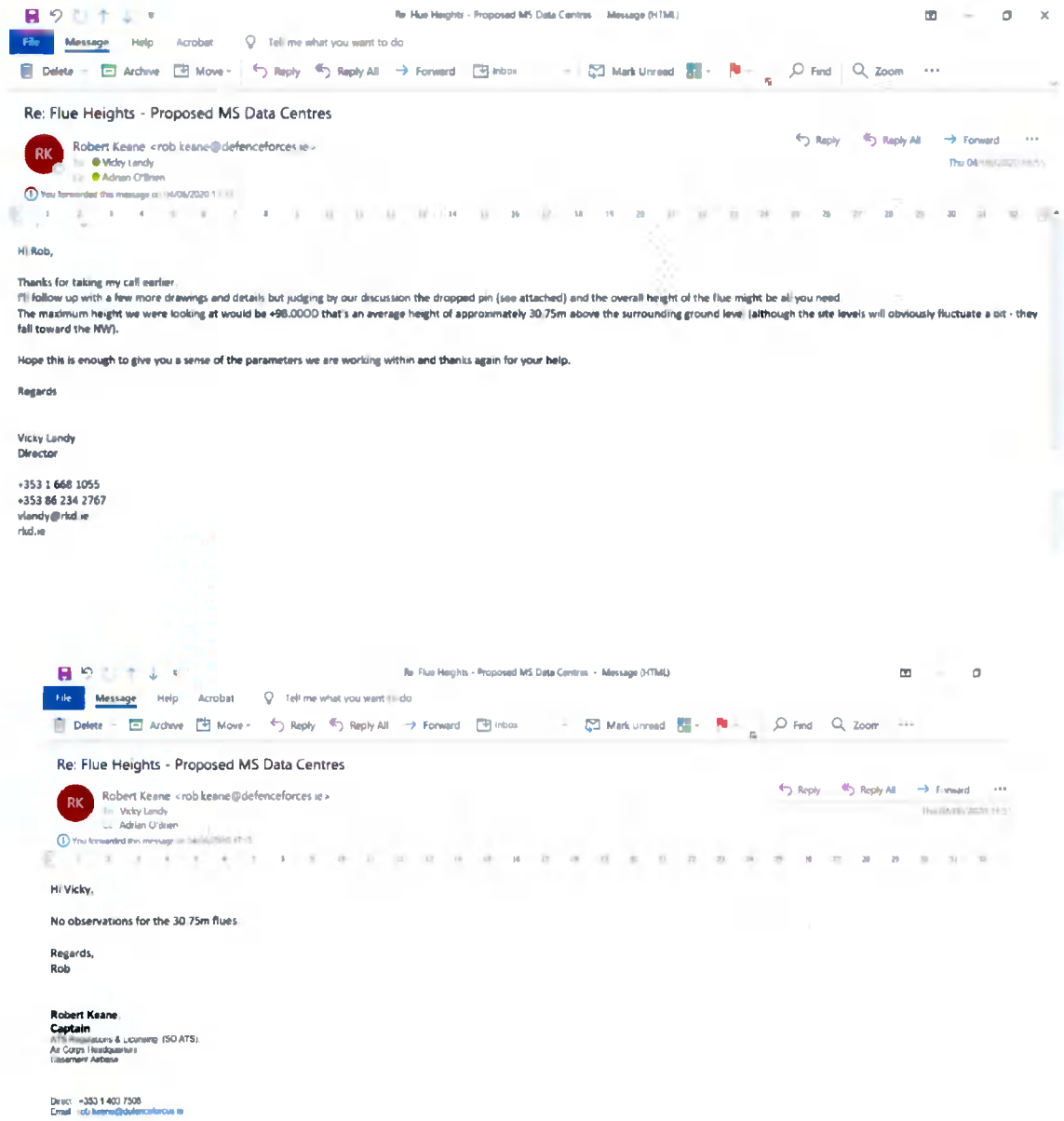
The back-up generators will also be registered with the EPA in accordance with the Medium Combustion Directive (EU 2015/2193). The data centres will also require an EPA Greenhouse Gas (GHG) Emissions Permit which will be applied for post-planning.

1.15 CONSULTATION

A formal pre application consultation meeting was conducted with representatives of SDCC Planning Department led by Senior Executive Planner Tracy McGibbon on 14th June 2021 as part of the preparation of this application (i.e. for the proposed modifications to previously approved scheme SD20A\0283).

Prior to this date two fewer formal presentations were made to SDCC by Microsoft's representatives on 22nd October 2019 and 14th January 2020 where very high level proposals were discussed in terms of proposed building uses on the site.

The Department of Defence were consulted again, in relation to Casement Aerodrome flight paths and Inner Zone limits in June 2020 and we refer to Figure 1 below which confirms no objection to the proposal from the Irish Air Corps particularly in relation to the proposed maximum height for flues.



Re: Flue Heights - Proposed MS Data Centres

Robert Keane <rob.keane@defenceforces.ie>
Vicky Landy
Adrian O'Brien

Hi Rob,

Thanks for taking my call earlier.
I'll follow up with a few more drawings and details but judging by our discussion the dropped pin (see attached) and the overall height of the flue might be all you need.
The maximum height we were looking at would be +98.000D that's an average height of approximately 30.75m above the surrounding ground level (although the site levels will obviously fluctuate a bit - they fall toward the NW).

Hope this is enough to give you a sense of the parameters we are working within and thanks again for your help.

Regards

Vicky Landy
Director

+353 1 668 1055
+353 86 234 2767
vlandy@rkd.ie
rkd.ie

Re: Flue Heights - Proposed MS Data Centres

Robert Keane <rob.keane@defenceforces.ie>
Vicky Landy
Adrian O'Brien

Hi Vicky,

No observations for the 30.75m flues

Regards,
Rob

Robert Keane
Captain

Figure 1.3 Correspondence with Department of Defence

The Department of Defence were also consulted, in relation to Casement Aerodrome flight paths and Inner Zone limits in June 2016 and we refer to Figure 1.1 below which confirms no objection to the proposal from the Irish Air Corps.

1.16 AVAILABILITY OF THE EIAR

A copy of this EIAR document and Non-Technical Summary of the EIAR document is available for purchase at the Council office at a fee not exceeding the reasonable cost of reproducing the document.

Additionally, prior to lodging this application, the required information has been issued for the Department of Housing, Planning and Local Government's EIA Portal.

2 ALTERNATIVES

2.1 TERMS OF REFERENCE

This section of the EIAR has been prepared by McGill Planning Ltd. and examines the evolution of the proposed development through the various reasonable alternatives examined. It is a requirement of the EIA Directive as amended to present an outline of the main alternatives considered and a justification of the final proposed amendments to the approved development.

2.2 INTRODUCTION

The *Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment* (2018) state the following:

> *"The Directive requires that information provided by the developer in an EIAR shall include a description of the reasonable alternatives studied by the developer. These are reasonable alternatives which are relevant to the project and its specific characteristics. The developer must also indicate the main reasons for the option chosen taking into account the effects of the project on the environment.*
> *Reasonable alternatives may relate to matters such as project design, technology, location, size and scale."*

This section of the EIAR document provides an outline of the main alternatives examined throughout the design and consultation process under the following headings:

- Alternative Locations
- Alternative Uses
- Alternative Designs and Layouts
- Alternative Processes

This serves to indicate the main reasons for choosing the development proposed, taking into account and providing a comparison of the environmental effects. The type of alternatives depends on the nature of the project proposed and the characteristics of the receiving environment.

The 2018 Guidelines also note that it is generally sufficient for the developer to provide a broad description of each main alternative studied and the key environmental issues. Furthermore, a 'mini- EIA' is not required for each alternative studied.

2.3 ALTERNATIVE LOCATIONS

The 2018 Guidelines note that some projects may be "site specific" so the consideration of alternative sites may not be relevant.

This point is also made in the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA 2017), which states that in some instances alternative locations may not be applicable or available for a specific project which is identified for a specific location.

With regard to locations, the considerations of alternatives in many cases will already have been addressed and decided at strategic planning level during the adoption of city/county/local developments plans. Furthermore, these plans will have been subject to Strategic Environmental Assessment which will have taken into account the environmental considerations associated with, for example, the cumulative impact of an area zoned for industry on a sensitive landscape.

In this regard we note that the approved development and amendments proposed on an allocated within Grange Castle Business Park and is zoned for development in the current County Development Plan, 2016-22.

The subject lands are zoned for "EE" to provide for enterprise and employment related uses". Data Centre and Office-based industry are permitted uses on this zoning. The proposed changes to the development is in accordance with the zoning and other relevant policies and objectives of the Development Plan. It is also noted that several other data centre developments have been granted in the area under the current Development Plan on lands subject to the same EE zoning including CyrusOne (SD18A/0134; SD20A/0244) and EdgeConnex (SD16A/0214, SD16A/0345, SD17A/0141).

In summary, the development of the subject lands for industrial development of a type, scale and extent as proposed in this current data centre application have been pre-empted in the current County Development Plan.

As a result, the further consideration of alternative site locations for the approved development are not considered essential with respect to the EIAR legislation.

Nevertheless it is noted, that in advance of the preparation of this application Microsoft Ireland undertook a detailed assessment of a total of five no. sites (of which the subject site was one) towards determining the most appropriate location to establish the proposed two new Data Centre Facilities.

The other sites considered were:

- Newhall, Naas Co. Kildare
- Great Connell, Newbridge Co. Kildare
- Steelstown Co. Kildare
- Maynooth, Laraghbryan East, Co. Kildare

Detailed Site Due Diligence Studies and Risk Assessments were carried out on all locations. The site at Grange Castle emerged as the preferred option due to a lower risk evaluation than the other sites considered under the following headings:

- Site Test Fit Suitability
- Zoning
- Topography
- Archaeology
- Electrical Power Supply
- Water
- Fibre
- Cooling Water
- Roads
- Existing Overhead Cables
- Flora & Fauna
- Existing Water Features
- Ownership
- Permitting
- Flood Risk
- Site Access & Infrastructure

Having regard to these various environmental and development considerations, Grange Castle was considered the most appropriate location for the proposed data centres on account of the established data centre facilities in the vicinity of the site and suitable access and transport connections.

The proposed application comprises effectively Phase 4 of the new data centre campus (commenced in Phase 1 with DUB06 facility). The existing site has adequate capacity to accommodate the extension and all necessary utilities and infrastructure are already in place. As such it was deemed the most suitable of the five no. sites evaluated.

Furthermore, we note that (operationally) the proposed data centres need to be located proximate to the existing data centres in order not to exceed the network lag time of 1.6 seconds for them to operate correctly.

Given the previous planning precedents and the built context now within the MS Grange Castle Data Centre Campus, it would appear that the full build-out with the additional proposed 2 no. Data Centres is a logical strategy and would be considered appropriate to the context and in accordance with proper planning and sustainable development for the location.

The positioning of the proposed Central Administration at the entrance to the Business Park is deliberate and strategic as it is considered the most visually prominent location and would provide an enhanced architectural identity to the Business Park.

Any other locations would have been less visible and impactful to the public realm and so were discounted as being less suitable options. It also is a sensible location strategically for Microsoft as it is located centrally within the masterplan of all of their Data Centres - to the south and East of the DUB03 & DUB04 Data Centres and to the West of the more recent Data Centre developments DUBS 06/07/08/09/10/12/13.

2.4 DO-NOTHING ALTERNATIVE

As highlighted above the site is zoned for 'EE' to facilitate enterprise and employment development. The consideration of an alternative location would equate to a 'do-nothing' alternative for the subject site.

Upon completion of the construction of the adjoining MS data centres DUB09, DUB10, DUB12 & DUB13, the temporary construction parking area would be removed and the lands would remain idle.

As the lands are zoned for enterprise and employment, and are located within an existing Business Park campus, the long term vacancy of these lands would be considered contrary to the policies and objectives of the County Development Plan as relate to this location.

2.5 ALTERNATIVE USES

As noted above the site is zoned EE to facilitate enterprise and employment development. Data centre and Office-based industry are permitted uses.

The following policies of the Development Plan are also noted:

> *ET3 Objective 2:*
> *To prioritise high tech manufacturing, research and development and associated uses in the established Business and Technology Cluster to the west of the County (Grange Castle and Citywest areas) to maximise the value of higher order infrastructure and services that are required to support large scale strategic investment.*
>
> *ET3 Objective 3:*
> *To support the phased expansion of the established Business and Technology Cluster to accommodate strategic high-tech manufacturing investments, research and development and associated uses.*

The location of the development on appropriately zoned land within an existing accessible and fully serviced Business Park and with an established cluster of similar uses in the area makes it ideal for the proposed data centre use proposed, and is an incremental extension of the existing MS Data Centre campus in place.

As a result, the consideration of alternative uses for the proposed data centre development were not considered necessary or justified.

2.6 ALTERNATIVE DESIGNS AND LAYOUTS

Under the direction of RKD Architects, a number of appraisals were carried out to determine the most effective design for the proposed two data centres, initially it was envisaged that two single storey Data Centres would be the full extent of the development i.e. the Gateway Administration building was not part of the proposed scope. Some images of these previous proposals are included below:

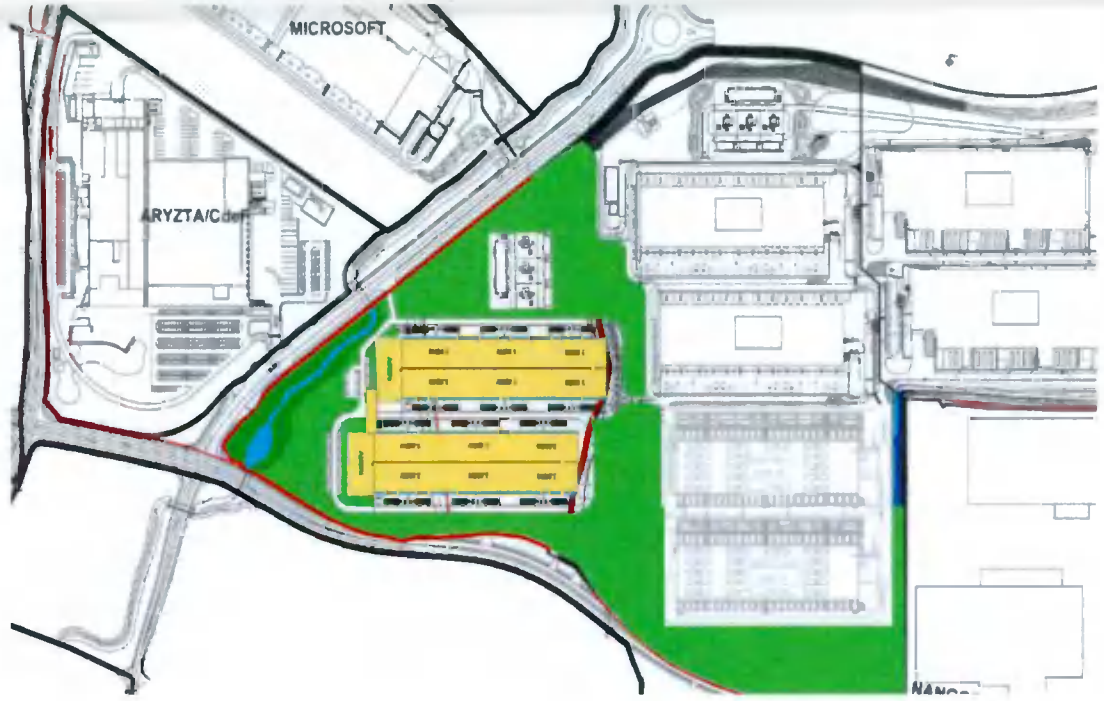


Figure 2.1 Single storey data centres option

Option 1 – Two single storey data centres orientated East-West and sited in the centre of the site, giving ample surrounding space over to landscaping. The footprint of Data Centres is larger and less efficient than the design as currently proposed with significant visual impact to the New Nangor Road.

The positioning allows for a wide landscaped buffer zone around the data centres which supports the intention to create a parkland-like setting. However, the size and scale of the Data Centres results in a large, centralised mass on the site that lacks permeability and visual engagement with the public realm. The New Nangor Road / Internal Park Road junction, the entrance to the business park in particular appears ignored with carparking the first visual point of interest past the wetland area.

The lack of a Gateway building as part of this proposal leaves the development lacking a focal point, both visually and in terms of a destination for employees to avail of Staff Cafeteria and welfare facilities. In addition, the new substation to the north of the data centres lacks integration with the rest of the development, which has been addressed by conceiving it as an extension to the existing substation to the North-east.

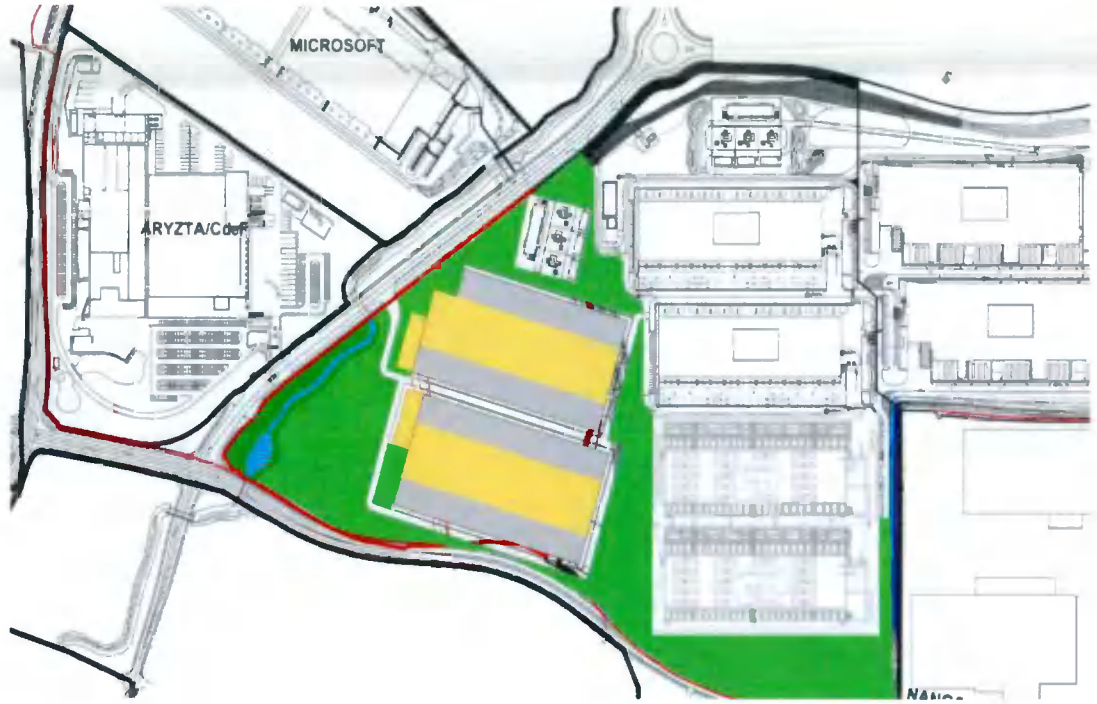


Figure 2.2 Double storey data centres option

Option 2 – Two double storey data centres angled. Considered preferable to Option 1 as the footprint of the Data Centres has been reduced, nonetheless we concluded that this option still presented an unsatisfactory presence to the New Nangor Road / Internal Park Road junction with no Gateway Administration Building included.

The angling of the Data Centres would create a pinch point between the northern block and the existing Data Centres. Also, the southern boundary of the development would be left very close to the New Nangor road which would both increase its visual impact and potentially hinder the provision of an ecological corridor of sufficient width at the site edge.

The new substation is pushed further north where it would have greater visual prominence from the business campus road and this removes the meadow in this part of the site, left alone in Option 1. One significant positive is that while the more efficient Data Centre model reduces the footprint, the height of the double storey version also still compares favourably to the adjacent existing Data Centres.

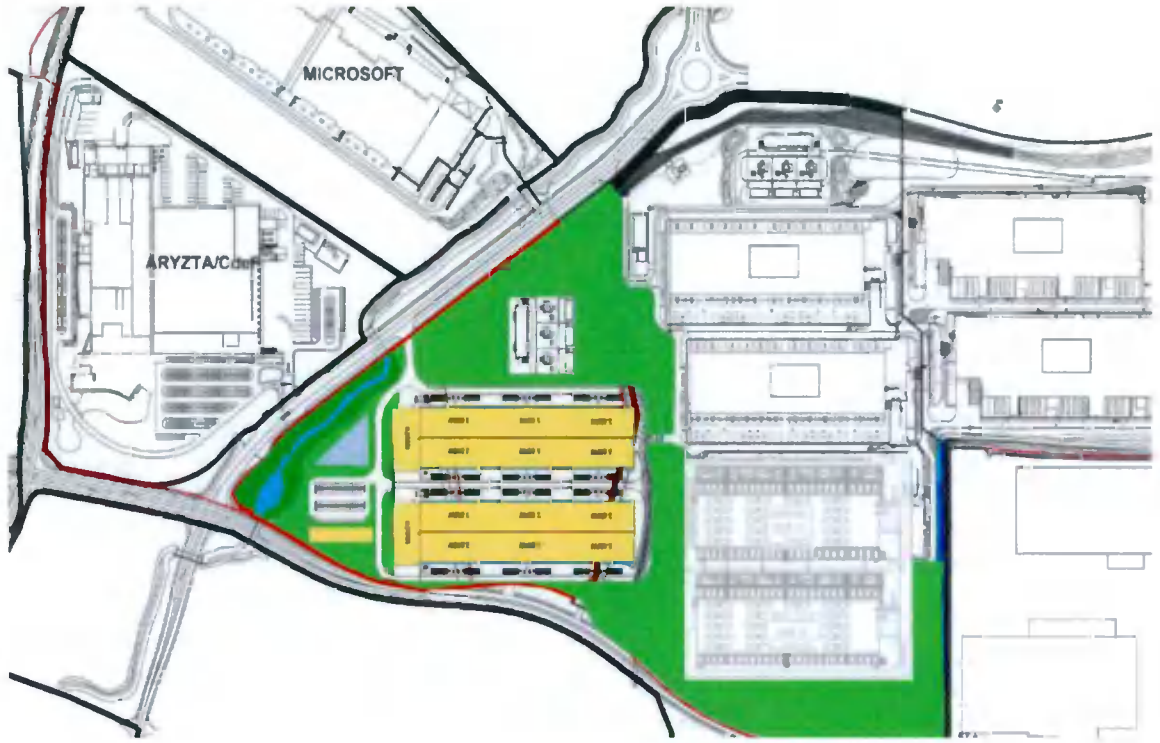


Figure 2.3 Double storey data centres & Admin office option

Option 3 – Two single storey data centres and small central administration block. This proposal introduced the concept of the central administration function serving the campus as a whole. It was felt, however, that the dominance in terms of size and scale of the proposed Data Centre Buildings would have dwarfed the proposed Administration Building, thus undermining its architectural presence and importance to the public realm. In addition, while the Administration Building faces the New Nangor Road, it does not address the junction and entrance of the business park which instead overlooks car parking.

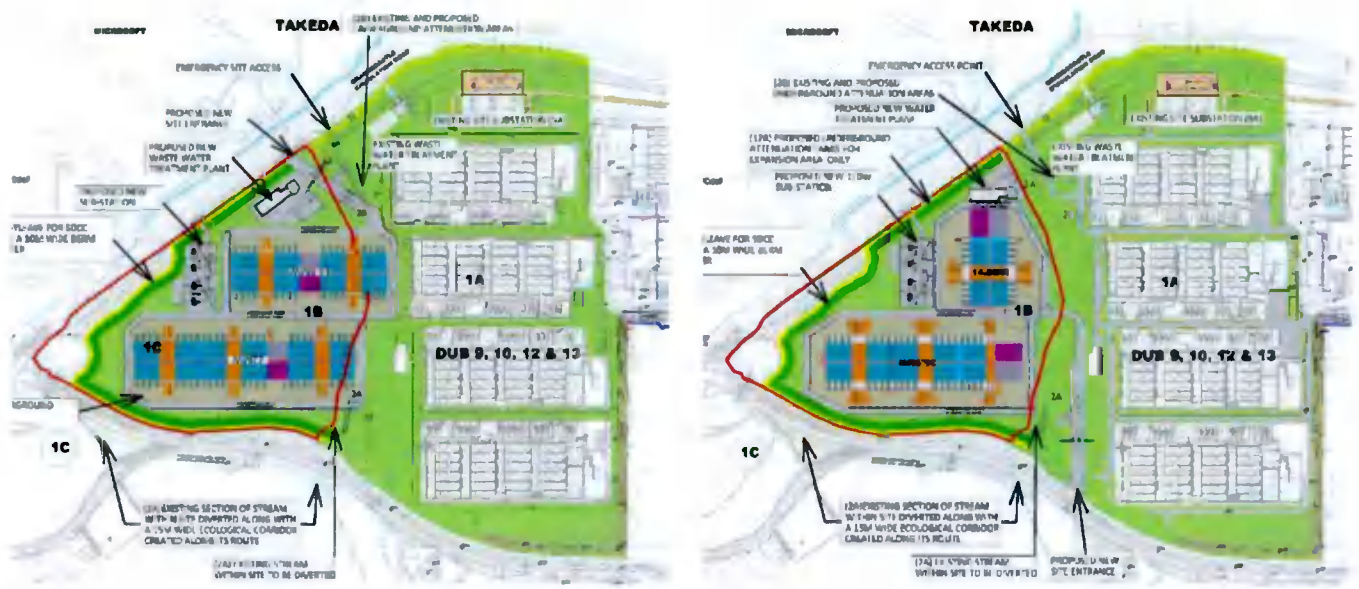


Figure 2.4 Alternative data centre options

Options 4 & 5 – Further studies examined multiple combinations of Data Centre blocks of different capacities. These were discounted for a variety of reasons with the most prevalent being the lack of a Central Administration Building, public realm engagement, future-proofing capacity and the complication and inefficiencies inherent in constructing two different Data Centres of this scale.

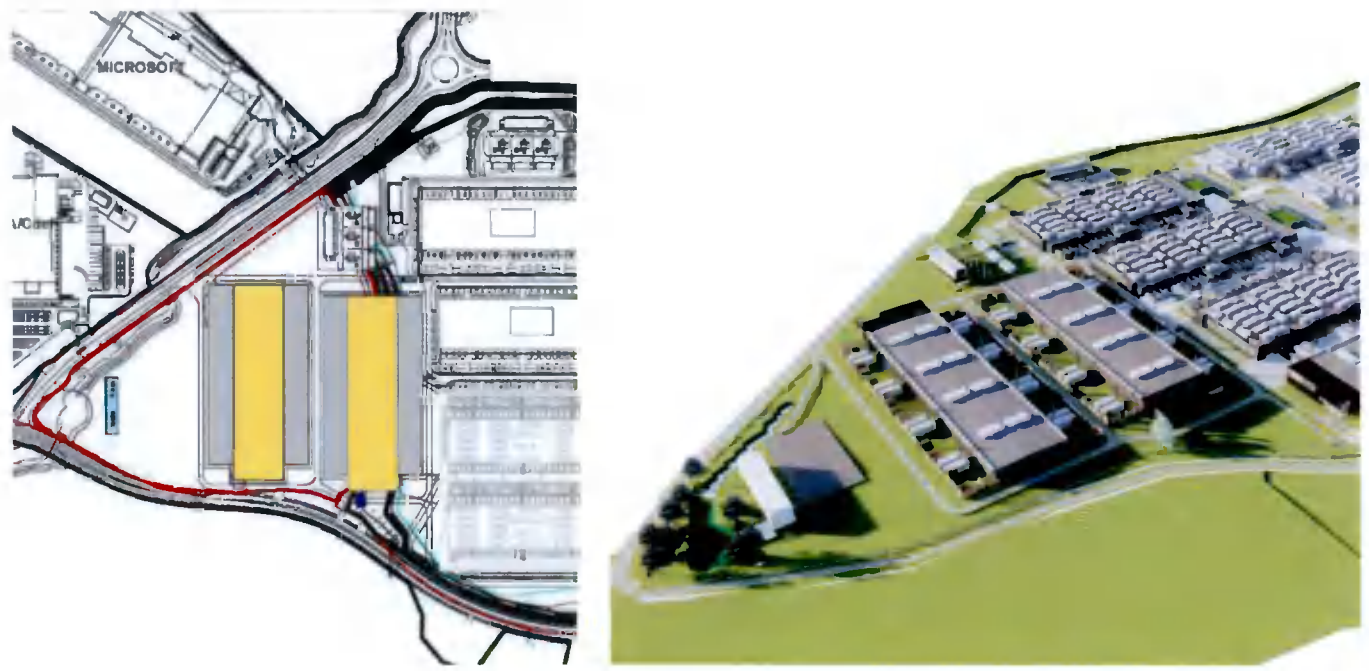


Figure 2.5 Further double storey data centres & Admin office options

Option 6 – Two double storey data centres and small central administration block. By adjusting the orientation of the Data Centres this proposal activates the public faces of the development by locating of the facilities housing the most staff at the New Nangor Road, Internal Park Road, and the park entrance at the junction of the two.

Each Data Centre features an Administration block containing offices and canteen facilities at one end, depicted in black in the above 3D image. These, along with the Central Administration block, would have greater scope for architectural expression than the main Data Centre facades and would provide a greater level of engagement with the public realm on each side of the site.

However, the Central Administration block still suffers from the same comparative scale issues in relation to the Data Centres as in Option 3. In addition, the size of the blocks created pinch points at the site boundaries, limiting the ability to create ecological corridors.

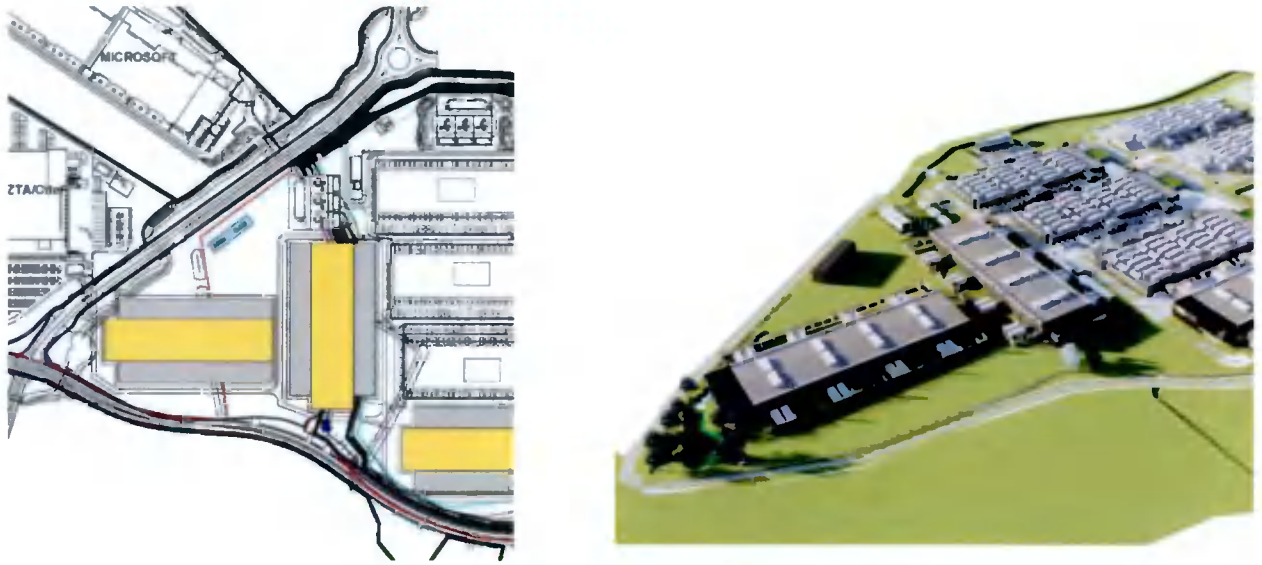


Figure 2.6 Further double storey data centres & Admin office options

Option 7 – Two double storey data centres and small central administration block. By re-orientating one of the Data Centres and pulling the other to the West in place of the Central Admin. Block this proposal sought to create more space for an ecological corridor along the New Nangor Road.

As with Option 6 the proposal was ultimately discounted due the preference to locate the Central Admin. Block at the corner of the site, where it could address the entrance to the business park, the internal park road and the New Nangor Road all at once and act as a landmark building for the site and business park.

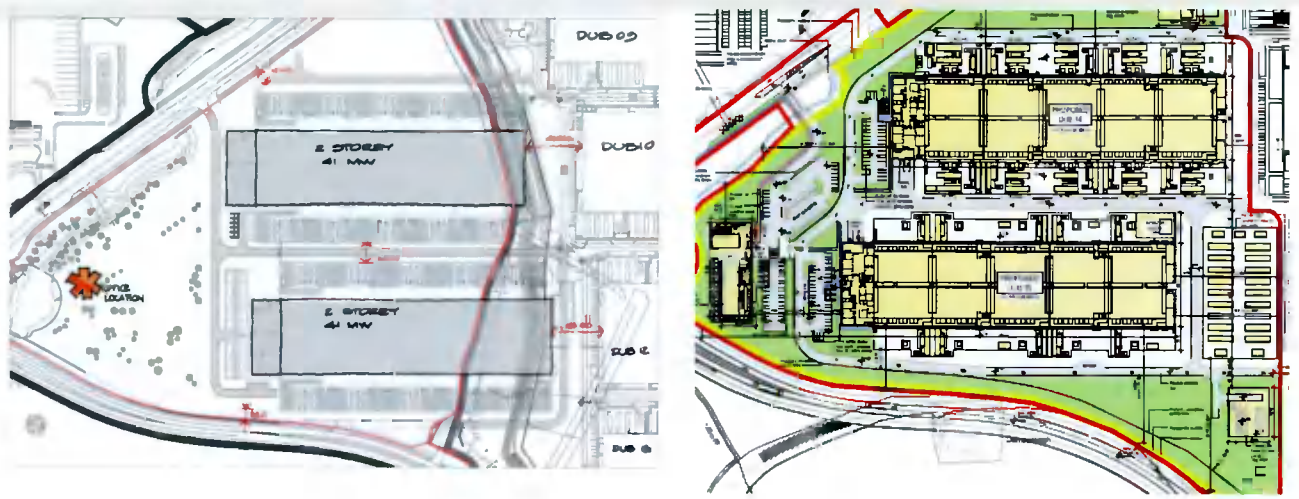


Figure 2.7 Double storey data centres &'Gateway' type Central Administrative Building

Option 8 (Approved Design) – Two double storey data centres and a 'Gateway' Centralised administration office. This proposal settled on the proposal for a larger Admin. Block containing offices, Staff Cafeteria, and welfare facilities for the entire campus. It would act as a visual and functional focal point for the site and its location at the gateway to the business park, surrounded by landscaping, would allow it to engage with the public realm on all three sides.

The model and orientation for the Data Centres was also refined, although it would emerge that an attenuation area under the Southern block would necessitate a shift to the West and a tightening of the site layout as per the final proposal.

With regard to the permitted layout and design(which this current application provides for minor alterations to) we would note the following aspects:

- The location and design of the backup generators and flues have been carefully considered in order to reduce visual impact from the adjoining roads, and to reduce noise impact as much as possible.
- The design and location of the Central Administrative building will bring a positive architectural feature building at the entrance to the Business Park which will help visually screen much of the data centres and supporting infrastructure behind.
- A comprehensive landscaping plan including bunding and significant tree planting will also help to visually screen the development from public areas.
- The development has been stepped back from the bank of the Griffeen by 10m to allow for a biodiversity protection zone in accordance with the County Development Plan requirement. The proposed bridge over the Griffeen has been carefully designed to allow for fauna to travel underneath.

Option 9 (Amended Design) – The chosen design is similar to the approved layout of Option 8. It has a number of amendments to the design, noted as follows:

1 **Approved Central Administration Building (CAB):** Proposed relocation of building to the east by approx. 7m. Proposed reconfiguration and setting out of building plans at all levels (including roof level) resulting in increase in building footprint of approximately 170m2 (from 1,424m2 to 1,594m2) associated changes to building elevations (design and finishes).

- **Approved single-storey Cafeteria Element**: Proposed additional basement level below cafeteria to accommodate plant, proposed 9 no. rooflights (2.8 m diameter) and 9 no. rooflight (1.8m diameter), inclusion of MEP Plant on roof level including new flue extending approx. 1m above parapet.
- **Approved four-storey Office element:** Parapet at roof level to be raised by approx. 1.1m (increased from approved 19.5m in height to proposed 20.6m)
  - Overall increase in GIFA of 395m2
  - Reconfiguration of area available for PV panels and sedum roof finish in order to accommodate required MEP equipment at roof levels

2 **Approved Data Centres** – DUB14 and DUB15: Proposed reconfiguration and setting out affecting building locations and plans at all levels (including roof level) resulting in reduction in overall building footprint (for each building) by 48m2 (from 13,442m2 to 13,394m2), associated changes to staircases design, building elevations (design and finishes. Increase in parapet height of Vent Houses (at roof level) by approx. 350mm and omission of previously proposed zone of sedum roof finish. Overall decrease in GIFA of 1,352m2 in respect of DUB 14 and decrease of 1,453m2 in respect of DUB 15. All plant equipment at ground level - reduced in height compared to approved layout so that the screening is deemed not required

3 **DUB 14:** Reduction in height of approved flues by approx. 650mm, reduction in number of flues from 11 no. approved to 8 no. proposed.

3.a) DUB 15: Change to level of ground floor and associated increase in overall building height of approx. 700mm (parapet height increased from approved +83.0m O.D. to proposed +83.7m O.D.).

4 Reconfiguration of **associated external plant** at ground level (including generators / E-Houses & transformers) flues, omission of approved Modular Electrical Rooms (MERs) and associated screening serving approved Data Centres DUB14 &15.

5 Relocation, modifications to design and expansion of approved **Water Treatment Building and associated plant** to include: 4 no. Water Treatment Tanks, 2 sprinkler tanks and relocated approved pump house (contained in the main Water Treatment Plant building) and 1 generator with additional proposed flue stack (height 30.75) and 1 no. transformer.

6 **Gas Generator Compound** – Relocation & reconfiguration of previously approved gas generator compound including:

- Additional 4 no. generators (from 20 no. approved to 24 no. proposed)
- Omission of approved 5 no. E-houses
- Additional 7 no. electrical rooms
- Additional 7 no. flues (from 5 no. approved to 12 no. proposed)

7 Modifications to approved layout of **internal site roads, yards and footpaths.**

8 Relocation and modifications to design of **approved Sprinkler Tanks and Pump Houses:** Pump House serving DUB 14: relocated into proposed Water Treatment Building and compound, redesign of approved larger tank into proposed two smaller tanks. Pump House serving DUB 15: Relocated to south of DUB15 the north facilitate space for electrical equipment redesign of approved larger tank into proposed two smaller tanks.

9 Relocation of **Approved Gas Networks Ireland (GNI) gas skid & compound** including approved 3 no. kiosk buildings.

10 Modifications to approved **car park layouts and landscaping** design.

11 Modifications to location and design of approved **bicycle shelters.**

12 Modifications to site development works, including underground water and building services provision, landscaping, internal security and compound enclosure fencing, and associated works.

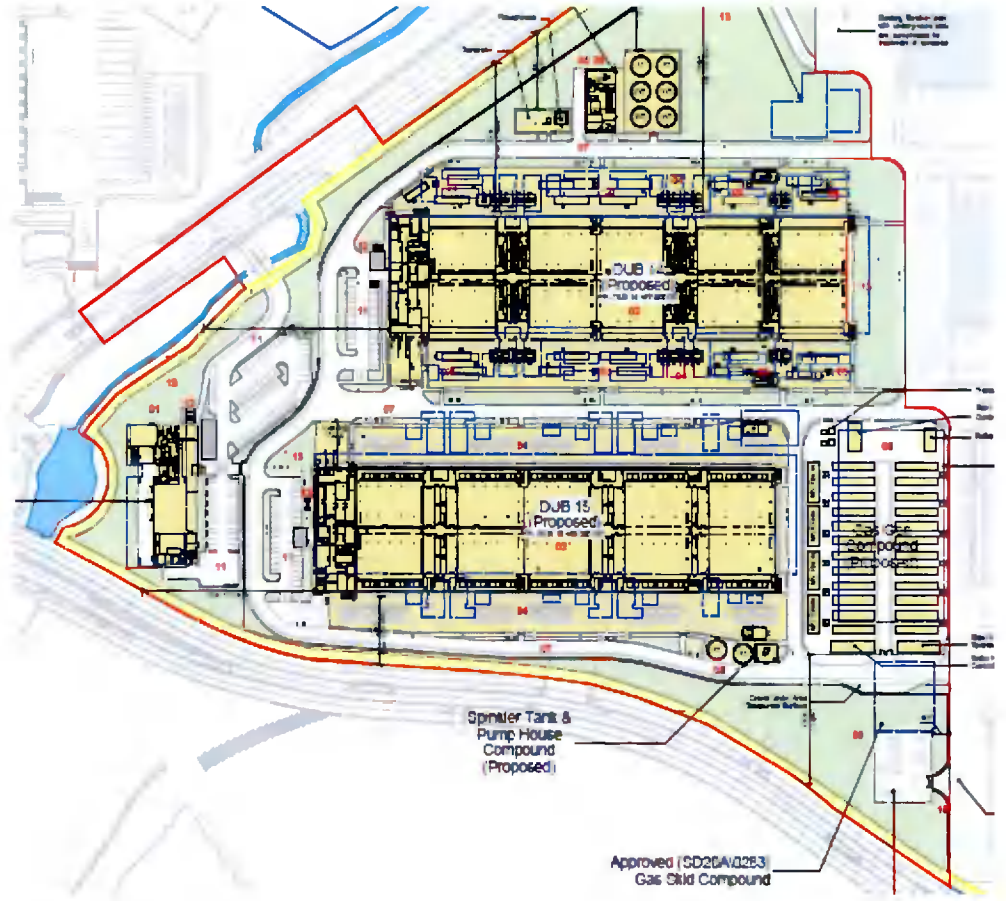


Figure 2.8 Proposed Amended Site Plan

2.7 ALTERNATIVE PROCESSES

In tandem with the exponential growth in data centre demand has been significant progress in data centre design and efficiency.

Each successive phase of development at the MS data centre campus has incorporated current design innovations aimed at optimising energy savings and minimising environmental impact. These principles are enshrined in the 2015 Citizenship Report summarised in Chapter 1 of this EIAR.

In relation specifically to power supply, it is noted that several options were explored before deciding on the combination of upgraded grid power with natural gas generation as a backup on a temporary basis.

As the development is located in what is noted as a constrained area in terms of electrical grid capacity a standby gas generation plant is planned to meet the requirements of the utilities flexible demand policy. Microsoft worked with ESB Networks to secure extra capacity on the distribution network to provide power to the datacentre proposal. The gas plant which will be required to produce standby electricity for more sustained periods (circa 500 hours annual).

Demand management was considered as an alternative. However, moving datacentre demand away from Ireland would impact the long-term growth strategy at the site. It was not considered as a workable alternative strategy to mitigate short-term transmission capacity shortfall.

Renewable energy was ruled out due to the intermittent nature of the energy supply. The site is too small for a utility scale solar and wind generation. The addition of a battery would not allow renewable energy sources to provide a reliable energy supply to the site.

3 DESCRIPTION OF DEVELOPMENT

3.1 INTRODUCTION

This section of the EIAR has been prepared by McGill Planning Ltd. with input from the project team including RKD Architects. The section describes the nature of the proposed development in accordance with the requirements of the relevant EIA legislation and guidance on preparation and content of EIAR.

3.2 CHARACTERISTICS OF THE SITE

The proposed development will be located in Grange Castle International Business Park in Clondalkin, West Dublin. The Business Park is situated 2km west of Clondalkin village on the outskirts of Dublin City (10km south west of the city centre), approximately 16 km south of Dublin International Airport. The Business Park lies between the M4 and M7 and is proximate to the M50.

There are two landholdings that comprise the application site in this instance:

A. A site of c.13.07 ha located to the west of the existing MS Data Centre Campus within the Business Park. The
B. A site of c.3.16 ha located in the north-eastern corner of the Business Park, north of the main entrance to the Park and south of the Grand Canal.

Figure 3.1: Sites A & B

Site A is the main development site which will contain the approved data centres, central administrative building and associated works. Site B will provide the approved temporary car parking for workers during the construction period of the project.

The western half of Site A borders the Griffeen River and is predominantly vacant land that also contains a hardstanding area and a temporary construction road associated with the construction of MS Data Centres DUB09, DUB10, DUB12 & DUB13 to the east and which is nearing completion.

The eastern half of Site A was the location of the former Ballybane Pitch & Putt course but which has accommodated the temporary construction car park associated with the construction of MS Data Centres DUB09, DUB10, DUB12 & DUB13.

South of the temporary road is the vacant dwelling (the removal of which is permitted development under SD20A\0283) and attendant areas. The southern boundary of Site A has also been redefined with the completion of the New Nagor Road realignment. A low wall and metal railing marks the boundary along the redesigned road. It is also noted that during the completion of the road works the local Baldonnel stream which previously ran to the east of the pitch and putt course was diverted to the west along the new road with a new connection to the Griffeen river to the southwest of Site A.

Figure 3.2 – Site Context to Adjacent Microsoft Data Centres to the East

Site B is located c.1.2km to the northeast of Site A and north of the main entrance to the Business Park. This site is flat, grassed and currently vacant. It lies east of the Business Park Attenuation Lake. To the north is the Grand Canal and Greenway. A buffer of trees and planting c.45m deep separates the site from the greenway.

3.3 PROPOSED DEVELOPMENT

The development will comprise the following changes to previously approved scheme SD20A\0283:

1. Approved Central Administration Building (CAB): Proposed relocation of building to the east by approx. 7m. Proposed reconfiguration and setting out of building plans at all levels (including roof level) resulting in increase in building footprint of approximately 170m2 (from 1,424m2 to 1,594m2) associated changes to building elevations (design and finishes).
    - Approved single storey Cafeteria Element: Proposed additional basement level below cafeteria to accommodate plant, proposed 9 no. rooflights (2.8 m diameter) and 9 no. rooflight (1.8m diameter), inclusion of MEP Plant on roof level including new flue extending approx. 1m above parapet.
    - Approved four-storey Office element: Parapet at roof level to be raised by approx. 1.1m (increased from approved 19.5m in height to proposed 20.6m)
    - Overall increase in GIFA of 395m2
    - Reconfiguration of area available for PV panels and sedum roof finish in order to accommodate required MEP equipment at roof levels.
2. Approved Data Centres – DUB14 and DUB15: Proposed reconfiguration and setting out affecting building locations and plans at all levels (including roof level) resulting in reduction in overall building footprint (for each building) by 48m2 (from 13,442m2 to 13,394m2), associated changes to staircases design, building elevations (design and finishes. Increase in parapet height of Vent Houses (at roof level) by approx. 350mm and omission of previously proposed zone of sedum roof finish. Overall decrease in GIFA of 1,352m2 in respect of DUB 14 and decrease of 1,453m2 in respect of DUB 15. All plant equipment at ground level - reduced in height compared to approved layout so that the screening is deemed not required.
3. DUB 14: Reduction in height of approved flues by approx. 650mm, reduction in number of flues from 11 no. approved to 8 no. proposed.

3.a) DUB 15: Change to level of ground floor and associated increase in overall building height of approx. 700mm (parapet height increased from approved +83.0m O.D. to proposed +83.7m O.D.).

4. Reconfiguration of associated external plant at ground level (including generators / E-Houses & transformers) flues, omission of approved Modular Electrical Rooms (MERs) and associated screening serving approved Data Centres DUB14 &15.
5. Relocation, modifications to design and expansion of approved Water Treatment Building and associated plant to include: 4 no. Water Treatment Tanks, 2 sprinkler tanks and relocated approved pump house (contained in the main Water Treatment Plant building) and 1 generator with additional proposed flue stack (height 30.75m) and 1 no. transformer.
6. Gas Generator Compound – Relocation & reconfiguration of previously approved gas generator compound including:
    - Additional 4 no. generators (from 20 no. approved to 24 no. proposed).
    - Omission of approved 5 no. E-houses.
    - Additional 7 no. electrical rooms.
    - Additional 7 no. flues (from 5 no. approved to 12 no. proposed).
7. Modifications to approved layout of internal site roads, yards and footpaths.
8. Relocation and modifications to design of approved Sprinkler Tanks and Pump Houses: Pump House serving DUB 14: relocated into proposed Water Treatment Building and compound, redesign of approved larger tank into proposed two smaller tanks. Pump House serving DUB 15: Relocated to south of DUB15 the north facilitate space for electrical equipment redesign of approved larger tank into proposed two smaller tanks.
9. Relocation of Approved Gas Networks Ireland (GNI) gas skid & compound including approved 3 no. kiosk buildings.
10. Modifications to approved car park layouts and landscaping design.
11. Modifications to location and design of approved bicycle shelters.
12. Modifications to site development works, including underground water and building services provision, landscaping, internal security and compound enclosure fencing, and associated works.

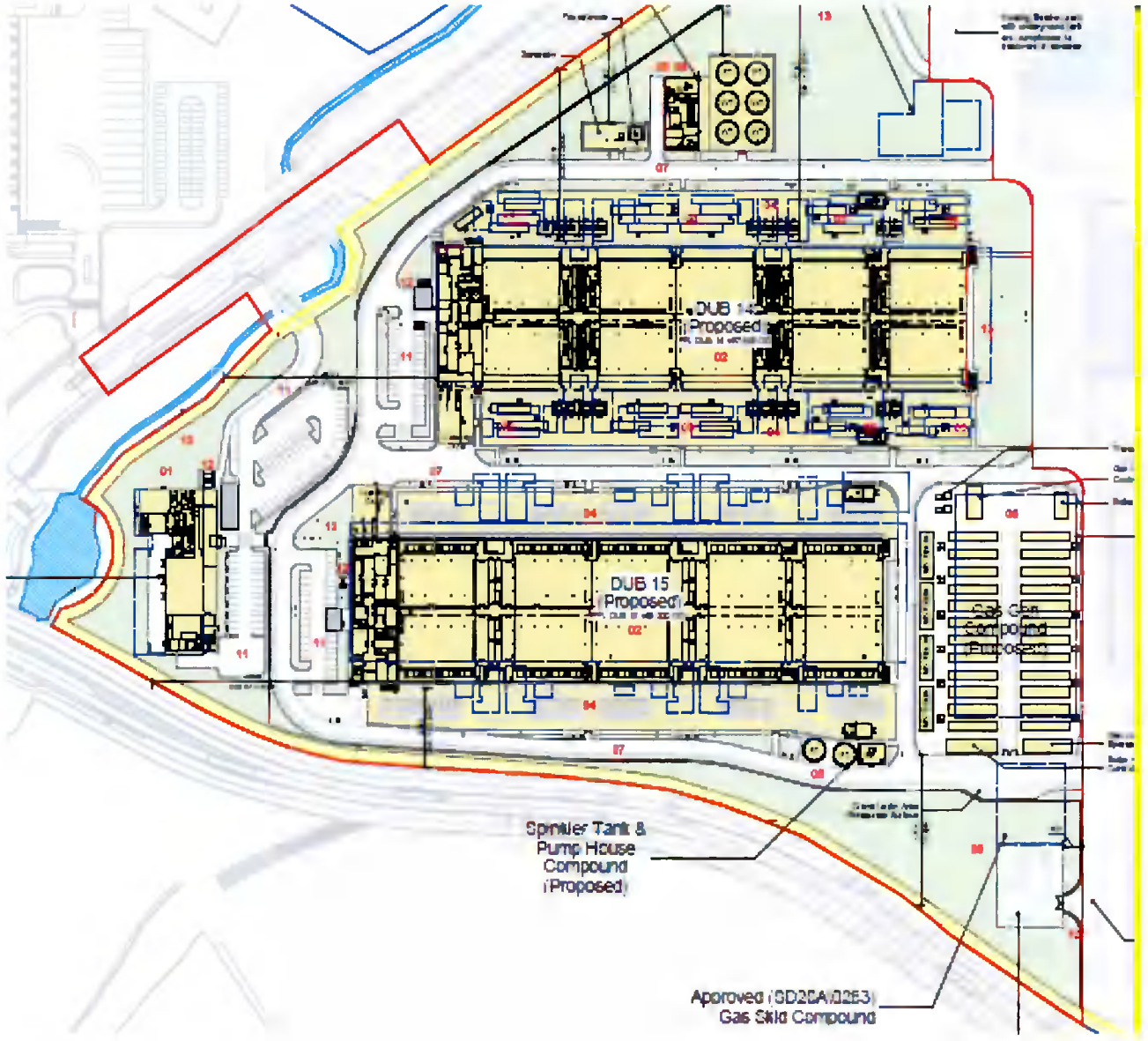


Figure 3.3:Proposed Amended Site Plan

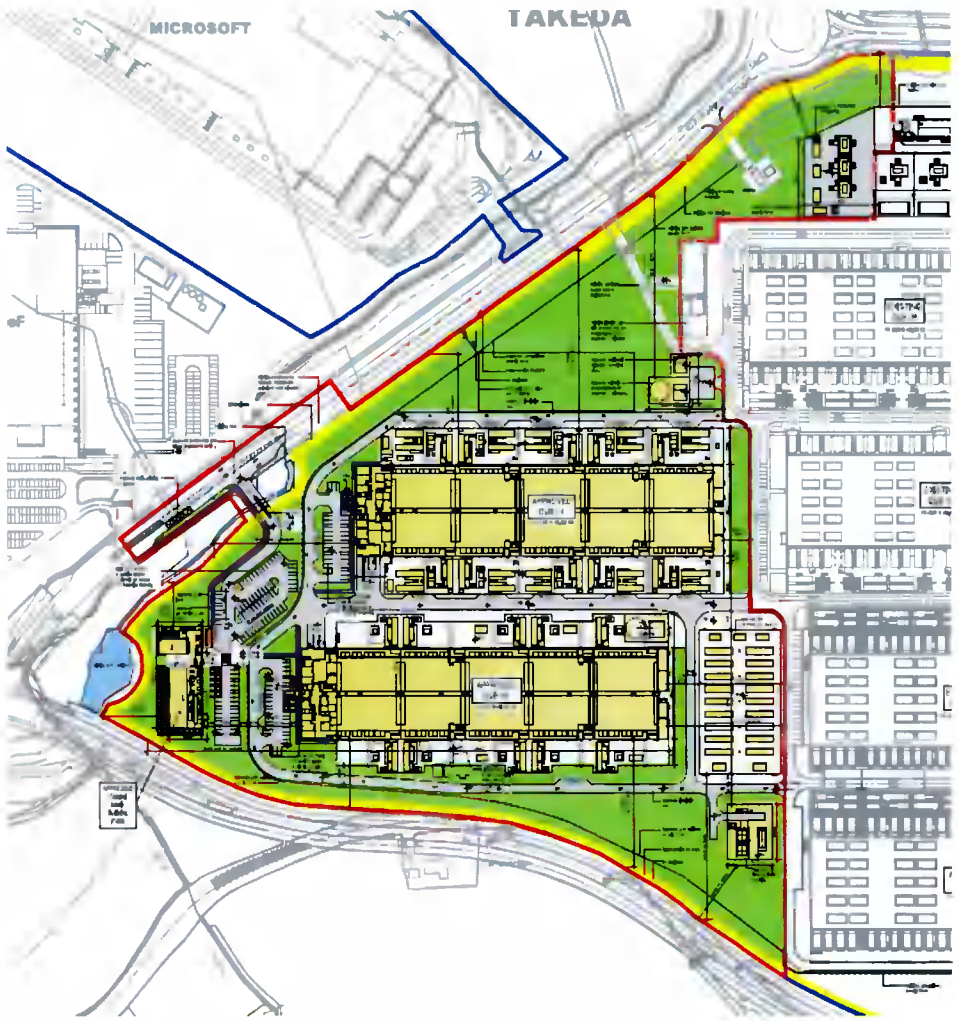


Figure 3.4 Approved Site Layout SD20A\0283

3.4 FACILITY & PROCESSES

Data Centres

A data centre is a centralised computer server system designed to provide information storage, management and distribution functions to individuals businesses and organisations. With ever increasing levels of online activity and ever larger volumes of data, the global demand for data storage is increasing rapidly. The proposed facility will enable Microsoft to meet this demand.

The technology for the MS data centre campus is based on a concept known as 'Colo' (Colocation facility) which in simple terms are individual highly isolated colocation room buildings which house the IT racks and data centre network devices.

The Colo will allow individuals, business' or organisations store their information at a secure and reliable facility off their premises for minimal cost and complexity compared to the traditional forms of in house data storage systems. Data Centres are typically constructed on a relatively large scale compared to other forms of industry which results in significant benefits in terms of economies of scale.

Colo systems have:

- much higher 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.

The Colos are conditioned primarily utilising outside air, via roof mounted air handling units via internally mounted air handling units. Conditions in Ireland are conducive to this free cooling strategy, which essentially moves outside air across the servers to cool and then exhaust the higher temperature air to atmosphere.

There are other small areas in the building which require additional cooling, i.e. the CNR Rooms, but the majority of the building is serviced by outside air cooling.

During the warmest periods of the year (at temperatures exceeding 24 degrees Celsius) evaporative cooling systems (integrated into the Air Handling Units) have been incorporated into the design. These units use water to cool the air. It is anticipated that these systems will be required very infrequently and when used will use recycled rainwater.

Each Colo is comprised of four MW cells and each cell is comprised of two maintenance zones (MZ) which is a discrete unit of data centre power, IT and network availability. Each site will have 4 core network rooms (CNR). These provide connectivity to the wider area network to satellite locations within the region and the campus spine.

Each Colo is supported by a dedicated electrical plant room, which provides the necessary power to ensure the Colos operate optimally at all times.

The major step forward in the proposed technology is that it is significantly more energy efficient. The EIAR team understands the facility will achieve a PUE (Power Utilisation Effectiveness) of approximately 1.3 compared to PUE's of 1.35 for previous phases. In simple terms each unit of IT power consumed requires less electricity from the grid. This has been achieved by simplifying the design and building resilience into the IT systems rather than the supporting electrical and mechanical systems. (The design also represents improved ventilation and lighting designs and mechanisms to reduce electrical distribution losses).

The Air Handling Units at the facility incorporate electronically commutated fans which are typically 20% more efficient than conventional AC fans and motors. The fans meet the highest applicable European fan/motor efficiency ratings.

Central Administration Building

Although each of the Data Centres will contain administration, and small staff canteen facility, it is intended that the Gateway Administration Building would be a central focal point for all staff providing a staff restaurant facility, gym and other shared office facilities / meeting rooms etc. At the upper levels, office space shall be provided for Microsoft Engineering and Operations staff providing management

and support services for the operational staff based in the Data Centres. The prominent corner location offers an opportunity for a dynamic building form that will announce the entrance into Grangecastle Business Park. The proposal is to provide a focal point for staff on the site with amenity facilities along with the administration staff to be housed.

An opportunity exists to utilise the existing landscape features forming a connection to the existing boundary buffer landscape treatment. The architectural intention is that the proposed Gateway Administration Building shall be a landmark building with a high-quality design and of a size and scale significant enough to provide a stronger identity to the point entry to the Business Park. The predominant building use in the area is Data Centre, as building types these are the large scale and somewhat monolithic structures. The Gateway Building would address the entrance and the existing wetland/water feature to providing a transition in scale and greater visual permeability to the Grange Castle Business Park.

3.5 STAFF & PARKING

The parking proposals as outlined below are unchanged from the approved proposals (SD20A\0283).

Although large in scale, Data Centres do not typically require large numbers of staff to run them (typically 40-60 persons per building). Nonetheless, taken cumulatively the number of staff present within the Microsoft Campus is typically approximately 550 no. across all existing data centres.

The proposed two new Data Centres adding a further c.130 staff to that total. Microsoft have considered that as the workforce has grown there is now a requirement for some staff facilities to be centrally located in a proposed "Gateway Administration Building" to be located at the South West corner of the site at the junction of the Nangor Road and the internal Grange Castle Business Park Road (on a site acquired from South Dublin County Council in 2019).

Although each of the Data Centres will contain a small staff canteen facility, it is intended that the Gateway Administration Building would be a central focal point for all staff providing a staff restaurant facility, gym and other shared office facilities / meeting rooms etc. At the upper levels, office space shall be provided for Microsoft Engineering and Operations staff providing management and support services for the operational staff based in the Data Centres.

The prominent corner location offers an opportunity for a dynamic building form that will announce the entrance into Grangecastle Business Park. The proposal is to provide a focal point for staff on the site with amenity facilities along with the administration staff to be housed.

The new data centre facilities as per the existing data centre campus will operate on a three 8 hour shift basis. Working hours are expected to be 24 hours a day 7 days a week. It is also anticipated that a relatively high volume of "transient" contract workers (including maintenance and other process specialists) will also attend site on a daily basis.

168 permanent car parking spaces and 40 cycle parking spaces are approved in the parent permission. These spaces will be used by shift staff, contract workers and will also be used by staff travelling between the data centres on internal staff site vehicles provided by MI.

3.6 PROCESS INPUTS

The primary inputs to the proposed development are power, water and diesel fuel (for emergency generators as and when required).

Power

The approved development will have a maximum operational electrical demand of 60MW for each data centre. Up to 150 MW of electricity will be required in order to operate and maintain the temperature, humidity and power supply in the facility.

The power requirements for the proposed development will be provided via a connection to an existing substation on the site and the utility 110kv Substation (Corkagh) No additional external grid connections are required to facilitate the proposed development.

The approved development required the expansion of the existing customer yard within the substation to facilitate the addition of 3 No additional approved 110kv/20kV transformers.

As the development is located in what is noted as a constrained area in terms of electrical grid capacity a standby gas generation plant (comprising 24 generator with 12 flue stacks (6 on each side, holding 2 flues, c.25m high) is planned to meet the requirements of the utilities flexible demand policy. The capacity of the plant will be60MW.

The CAB building has an internal substation to supply the building fed from the DUB HV network and a standby generator on the lower roof plant area with an exhaust flue discharge at high level in the façade cladding/screening at the edge of the building to minimise risks of recirculating gases into the air intakes.

Water

Surface Water Drainage

The proposed development will result in an increase in surface water runoff from the site. The proposed development will ultimately discharge to the River Griffeen to the west of the site.

The proposed drainage system has been designed in accordance with Greater Dublin Strategic Design System (GDSDS) specifications. Storm water runoff from roofs will be harvested for re use and to reduce demands on the public water supply infrastructure. Storm water runoff from hard paved surfaces will be collected and attenuated on site in a sub-surface water attenuation infrastructure prior to discharged at a controlled rate to the Griffeen River.

All roads, fuel supply areas and hard standings will drain through Class 1 full retention petrol interceptors and silt traps prior to controlled discharge at outfall manholes. All fuel storage will be in self-contained double bunded tanks.

Foul Water

The site of the proposed development is currently a Greenfield site. However, service and infrastructure have already been installed within the Business Park for foul water. The foul water is connected to the off-site South Dublin County Council sewer located on the western boundary of the site. Foul drainage is ultimately treated at the Dublin City Wastewater Treatment plant at Ringsend.

Water Supply
The proposed water main network will connect into an existing 300mm diameter water mains supply located on the western boundary of the site.

A fire water ring main will also be installed for the Proposed Development to provide firefighting water to hydrants in the event of a fire.

Fuel
In the event of a loss of power supply i.e. power blackout, emergency generators are designed to automatically activate and provide power to the plant. The 21 no. generators will be supplied by diesel and will have 8 no. flues each c.30.15m high. Each generator will be supplied with a diesel tank.

3.7 PROCESS OUTPUTS

The main outputs are waste air, water and emissions from the flues (when the generators are in operation).

Air
One of the primary outputs from the facility will be excess air which is removed continually by motorised fans in the AHU system. It is estimated that approximately 6,300 m3/s warm air in total will be emitted by the facility. The utilisation of outside air is the most efficient means of cooling and conditioning the server space. It is considered that this is more efficient as a collective treatment as opposed to the maintenance of existing non-efficient individual data centres operated by standalone companies – hence the push for colocation data centres or Colo's.

As part of the initial development of the project, MS considered the offload/reuse/exchange of waste heat from cooling of the data centre with neighbouring industrial facilities or other potential users within the environs of the business park. However, at that time of no feasible outlet could be found. In order to move a step closer to achieving such a system, the design of the proposed development has been amended such that waste heat can be collected and supplied to 3rd parties in future.

Provision for an energy recovery and distribution system has been incorporated to utilise the exhaust waste heat produced by the server space cooling process. Water can be routed through a future heat exchanger system, and then distributed as low grade waste heat to a potential district heating system external to the project. The proposed development includes for installation of the necessary underground services pipework to allow connection of a district heating scheme in the future.

Water
Surface Water Drainage
Due to a variety of measures such as the design of the car park with hydrocarbon interceptors, the speed restrictions in place and the fact that no refuelling will be carried out on site, the likelihood of any spills entering the water environment from vehicles on site is negligible.

Foul Water
All foul water will be discharged to the main sewage system in the area (as described above). This increase in flow to the existing public foul sewer is not expected to have a negative effect on the foul drainage system in the area.

Water Supply
Rainwater Harvesting from all new roof areas excluding green roof zones will reduce the demands for potable water supply from the Irish water infrastructure. We are currently awaiting information from Irish Water in relation to a new connection application.

The water system will be metered to facilitate detection of leakage and the prevention of water loss. Dual & low flush toilets and water economy outlets and water saving measures will also be proposed.

Emissions from the Generator Flues
As outlined above it is anticipated that the backup generators will rarely be used however, they will be maintained for emergency readiness by being tested once a month i.ie each generator will be turned on for a period of one hour per month to maintain operational readiness, when required waste exhaust gases will be vented to air via 25m stacks along the northern and southern edge of the buildings. An assessment of the impact of these emissions is presented in Chapter 9 Air Quality and Climate.

3.8 SECONDARY PROCESSES & ACTIVITIES

Off Site Traffic Movements
As outlined above there will be a modest increase in traffic within the industrial estate owing to staff movements to and from the proposed development once operational. This traffic will use the existing road network which has more than adequate capacity.

Security
All traffic accessing the data centres will access the data centre campus through the existing main access barriers. Those accessing just the central administrative building will do so via the proposed new access from the estate road. A maximum speed limit of 10km/hour will be in place on the access roads. Barriers and by-parting gates will be maintained by security personnel 24/7. Security will ensure that the procedure for accessing the facility is followed at all times.

A record will be maintained of all personnel visiting the site including deliveries and waste disposal. All visitors to site will be monitored and supervised at all times. A palisade fence will be constructed around the perimeter of the data centre facility.

Lighting
The external lighting has been designed in accordance with S1 requirements of IS EN 13201-2, using high efficiency LED lighting poles, with minimal building mounted luminaires. The lighting design has been optimised to reduce glare, spillage or other light nuisance to adjacent sites and/or public roads. The use of low energy LED lighting is in accordance with E4 Objective 1 of the South Dublin Count Council Development Plan.

Bat friendly lighting with 0-3lux in the outer spill area of the proposed temporary car park will be employed, including design features such as directional cowls to direct the light into the car park area and away from the Grand Canal corridor.

Waste Management
Chapter 13 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.

3.9 DECOMMISSIONING

It is envisaged that the proposed development will have a long lifespan of 15-25 years or more. 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 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 Microsoft Ireland

3.10 HEALTH & SAFETY / SEVESO

The Proposed Development has been designed in accordance with relevant H&S legislation including the Safety, Health and Welfare at Work Act 2005 (as amended) and the Safety, Health and Welfare at Work (General Application) Regulations 2007 as amended.

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 Microsoft in Ireland and throughout the Globe.

MS operates Quality, Environmental Safety and Health management system approved to all internationally recognised quality, environmental, health and safety systems.

Prior to start up a comprehensive set of operational 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 proposed development will not be a Seveso/COMAH facility subject to the Control of Major Accident Hazards (COMAH) Regulations.

The only controlled substance stored on site will be diesel in bulk storage tanks. The amounts proposed to be stored do not exceed the relevant thresholds of the Seveso Directive.

In relation to other Seveso sites in the wider area, we note that the development is located outside the consultation distances which stipulate notification to the Health & Safety authority as COMAH establishments under the 2015 COMAH Regulations.

Seveso / COMAH site	Distance to Proposed Development site
Brenntag Chemicals Distribution (Ireland) Ltd. Greenogue Business Park, Rathcoole, Dublin 24	2.6kms
Irish Distillers Ltd., Robinhood Road, Clondalkin, Dublin 22	6kms
Johnston Logistics Limited (Rathcoole) Blackchurch Business Park, Rathcoole, Co. Dublin	6.5kms
Kayfoam Woolfson Bluebell Industrial Estate, Naas Road, Dublin 12	6.8kms

Table 3.1: Seveso Site Locations

3.11 MAJOR ACCIDENTS / NATURAL DISASTERS

The 2014 EIA Directive (as transcribed into Irish Planning Legislation) requires that the vulnerability of the project to major accidents and/or natural disasters is also considered as part of the EIA. The site has been assessed in relation to a variation of possible natural disasters such as the following:

- Flooding
- Sea level rise
- Landslides
- Earthquake/seismic activity
- Volcanic activity

In relation to flooding it is noted that a Site Specific Floodrisk Assessment has been carried out and is detailed in the EIAR Chapter 7 (Water Services). The assessment concludes that the site is not at risk of flooding and with the proper attenuation provided will ensure that flood risk to other lands upstream or downstream of the development is minimised.

There is negligible potential for sea level rise to impact the development (even with worse scenario climate change predictions) given the location and topography of the site. Equally the potential for landslides is equally unlikely given the topography and substratum profile of the site and adjoining areas, and meteorological conditions.

Earthquakes and volcanoes are negligible risks given the lack of seismic activity in the area and country overall, and the lack of any active volcanoes.

In relation to Casement Aerodrome, located c.1.6km to the south, the application site is outside the Department of Defence Security Zone and outside the Inner Approach Areas and Critical Safety Zones where development is restricted. The site is located at the edge of the Department of Defence Inner Zone Limit which requires that new development proposals include for consultation with the Department to ensure no endangerment or interference with the safety of aircraft or the safe and efficient navigation thereof. We note that consultation has been held with the Department in this regard and that no issues have been raised (see Chapter 1 for further details).

Equally it is noted that the proposed development nor the substances that will be stored on site to facilitate the development will not be of a type or quantity that would exceed the thresholds of the Seveso Directive. This includes the storage of fuel for generators. In relation to local accidents/spillages related to storage of fuels, there will be proper mitigation measures put in place (in accordance with standard practice) to ensure such events do not occur. These are detailed further in Chapters 6 and 7 on lands, soils, geology and water services.

3.12CONSTRUCTION PROCESSES

A detailed Construction & Environment Management Plan will be agreed with the planning authority prior to commencement of development. The following provides a summary of the main aspects of the construction period.

Worker Numbers & Working Hours

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

- Initial site preparation works;
- Building construction;
- Commissioning

It is anticipated that the construction population on site will range from 250 to 400 operatives per shift with a likely peak construction stage figure of c.550.

It is anticipated that the construction of the facility will be completed during normal construction hours although these may extend during peak construction phases. Specific working hours will be agreed with the planning authority.

Construction Phasing

It is anticipated that the subject works will commence in early 2021 subject to the grant of permission and is expected to take c.24 months to complete with a number of construction phases anticipated.

- Commence Enabling Works – Summer 2021
- Commence Site Construction works (subject to planning permission) – Autumn 2021
- Complete Construction Works – Winter 2024

However it is noted that the construction may take longer due to a range of unknown factors and is a best case / post-Covid19 scenario. In any event a standard 5 year planning permission will be sought which will allow additional time to complete the development should unforeseen delays occur.

Construction Parking

Construction worker parking (totalling 802 spaces) is to be provided in a dedicated temporary parking site within the Business Park. This temporary construction car park would connect with the development site for DUB 14/15 and the Microsoft office development by means of a shuttle bus service operating during shift change over times and designated time periods for specialist construction operatives that are allocated specific times for implementing their section of the project delivery.

The travel distance between the temporary construction car park and the construction site is less than 5 minutes by shuttle bus.

Site Preparation

A contractor's compound will be established for the construction of the overall development. The compound will provide offices, portable sanitary facilities, equipment storage, 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. The compound will be moved progressively as phases of the development are completed.

Site access roads, along with some site clearance have already been completed as part of construction of DUB09/ DUB10/ DUB12 /DUB13. During the initial works required for the current proposal further vegetation clearance, surveying and setting out for structures, rerouting of etc will be required.

In advance of site preparation works, a strategy will be developed in order to efficiently move material arising from excavations to locations where landscaped berms are required around the facility. The sequence will start with clearance of the critical areas including the site access routes, contractor's compound etc. A combination of bulldozer, excavators, trucks and other soil shifting plant will then commence the main site vegetation clearance and cutting and filling aspect.

Noise & Dust 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 excavations.
- 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;
- 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.

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 until the drainage system is established.

Any surface water run-off collecting in excavations will be pumped from the excavation and treated by use of suitably sized grit chambers and a 3 chamber Class I hydrocarbon interceptor prior to discharge to the Local Authority surface water drainage network in compliance with the requirements outlined in the Water Chapter of this EIAR. See Chapter 7 for a full description of mitigation measures proposed.

Materials Sourcing, Transportation & Storage

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.

Where possible it is proposed to source general construction materials from the Dublin area to minimize transportation distances.

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.

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.

Building Construction Works

Foundations and Structure

Following the completion of site levelling, all structures will require deep concrete pad foundations. Building structures will comprise structural steel frames with concrete floors on metal decks.

Cut and Fill

It is envisaged that all spoil generated during site preparation will be re-used in the landscaping and levelling of the site where possible. In the worst case scenario i.e. construction during a period of extended poor weather, a quantity could require removal.

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

Chapter 14 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 and agreed with the planning authority in advance of the works to ensure best practice is followed in the management of waste from the proposed development.

Roads, Services and Landscaping

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

An extensive programme of soft and hard landscaping will be undertaken in stages throughout construction works. 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 Phase

Once the physical structures are in place, specialist contractors will be mobilised by Microsoft to complete the commissioning of the Colos and related plant. Commissioning is expected to take several months.

Construction Impacts

Each of the EIAR chapters 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 will also be prepared in agreement with the planning authority to minimise the impact of all aspects of the construction works on the local environment. The CEMP will include emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction.

The primary impacts from construction are anticipated to include:

- Temporary impacts on the soils and geology of the site during construction i.e. some loss of protection of the underlying aquifer to contaminants during construction;
- Effects on the road network of the industrial estate and its environs 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. removal of hedgerows and treelines for construction resulting in loss of habitat (minimised where possible);
- Impacts on the surface water network on site due to realignment of drainage systems;
- 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. There is the potential for vibration impacts associated with rock breaking etc

Mitigation measures to address each of these potential impacts are presented in each individual EIAR chapter.

3.13CUMULATIVE IMPACT

The Proposed Project is located within an active business park, where other sites are in varying stages of being complete, under-constructing (including on adjoining Microsoft Campus, e.g. SDCC reg. ref. no.: SD16A/0088) and/or having received grant of permission for development yet to be commenced (e.g. Takeda Extension SDCC reg. ref. no.: SD20A/0147).

This also includes a permission for three Data Centres and associated development on 16.5 hectares immediately south of the R134 Nangor Road and the Site (SDCC reg. ref. no.: SD20A/0121). A further proposed development (SDCC reg. ref. no.: SD20A/0124) for a distribution warehousing on a 7.4 hectare at Profile Park, which is pending decision, is located south of R134 and southwest of the Site.

The Proposed Project will be constructed and operate within the context of the existing Business Park and above permitted / planned developments.

4 POPULATION AND HUMAN HEALTH

4.1 INTRODUCTION

Population and Human Health are one of the most important aspects of the environment to be considered. Any likely significant impact on human beings that may be potentially caused by a development proposal must therefore be comprehensively addressed.

The principal concern is that human beings experience no significant unacceptable diminution in an aspect, or aspects of "quality of life" as a consequence of the construction and operation of the proposed development.

This section of the EIAR details the herewith environment of the subject lands, in terms of population and labour force profile and community aspects.

Impacts on population and human health are also key considerations in several other chapters of this EIAR; Water Services (Chapter 7), Nosie & Vibration (Chapter 8), Air & Climate (Chapter 9), Traffic & Transportation (Chapter 11) & Waste Management (Chapter 13).

4.2 METHODOLOGY

The majority of data examined in this assessment is based on the Census 2016, 2011 and the 2006 Census of Population, which are the most recent sources of demographic and socio-economic information for the area issued by the Central Statistics Office (CSO).

In this section, recent demographic trends are examined at State, County and Electoral Division (ED) and Small Area Population (SAP) levels.

There are approximately 18,500 Small Areas across the country, each of which consists of a small pocket of the population (approximately 80-100 households on average) and so provides the most detailed layer of population data ever available for Ireland.

The subject site is located within SAP 267049001, which in turn is located within Clondalkin-Dunawley ED, which extends east towards Clondalkin village and includes residential estates north of the New Nangor Road.

In addition, a desktop examination of the area in the vicinity of the application site was also undertaken including maps, aerial photography.

4.3 RECEIVING ENVIRONMENT

Location & Land Uses

The proposed development will be located in Grange Castle International Business Park in Clondalkin, West Dublin.

The Business Park is situated 2km west of Clondalkin village on the outskirts of Dublin City (10km south west of the city centre), approximately 16 km south of Dublin International Airport. The Business Park lies between the M4 and M7 and is proximate to the M50.

The main application site is located some 3.5kms to the south of Adamstown rail station which served by both inter city and regional rail services operating the Dublin to Cork service and the Dublin, Kildare to Portlaosie rail service. During the morning and evening peak periods this station is served by 8 train services making the site an ideal location for accessing this site by rail who can use the cycle ways on the R120 and the R134 to access the proposed Microsoft application site.

Kilshogue railway station (completed but not yet operational) is located c.750m northeast of the main entrance to the Business Park.

In addition, the site is adjacent to several bus stops both within the Grange Castle Business Park and on the R134. The 7230 and 7714 bus stops are located on the business park estate road to the north of the Microsoft site. These stops are served by the Dublin Bus route 13 which connects this business park site with Harristown, Glasnevin, Drumcondra, Dublin City Centre, St James Hospital, Bluebell, Clondalkin and Deansrath.

This service operates every 30 minutes from 0530hrs to 2320hrs Monday to Friday and every 15 minutes at peak times. This service also operates on Saturday from 0600hrs to 2320hrs and on Sunday from 0700hrs to 2320hrs.

The 3413 and 3414 bus stops located on the R134 are less than 10 minutes' walk from the proposed Microsoft development site. These stops are served by the Dublin Bus Route 68 which provides a bus service from Greenogue Business Park to Dublin City Centre via Newcastle, Cherrywood Villa, Clondalkin and Camden Street.

This bus service operates every 30 minutes from 0625hrs to 2330hrs Monday to Friday and every 40 minutes on Saturday and every 90 minutes on Sunday.

Nearby towns and villages include Lucan 2.5 km to the north, Tallaght 3 km to the south east, Saggart 4 km to the south west, Newcastle 3 km to the west, all within South County Dublin and Leixlip, Co. Kildare 6 km to the North West.

The Business Park and its extension to the south of the New Nangor Road - Grange Castle South Business Park is occupied by a variety of businesses.

These include two large existing biotechnology facility campuses – Pfizer Ireland and Takeda Pharma Ireland Ltd. A further biopharmaceutical warehousing facility, Grifols Worldwide Ltd was also recently

opened north of the proposed development. A link road between the subject site and the Grifols development has recently been constructed.

Microsoft's existing data centres (DUB03 - DUB05) are located within the Business Park to the west. Aryzta AG (Cuisine de France) operates south of DUB03 - DUB05.

Kilcarbery Business Park is located south of the application site and contains a number of small to medium sized business providing manufacturing, warehouse/distribution and offices. Profile Business Park and Grange Castle South Business Park south of the New Nangor Road are partially developed and include a Google and Digital Realty data centres. A new Amazon data centre is also expected to be developed in the short term.

Figure 4.1: Site location

There are relatively few residential properties in the immediate vicinity of the application site. The nearest occupied properties to the main site are 600-700m to the east along New Nangor Road including Nangor Lea a small development of 6 apartments located to the rear of the petrol station beside Kilcarbery Business Park.

There are also single dwellings along the Newcastle Road (R120) 500m to the northwest. On the eastern side of the R136 (Grange Castle Road) c.100m from the proposed temporary car park are residential estates in Kilamhuddrick.

On the application is a vacant dwelling to be demolished as part of this development. There are also a number of individual properties south of the New Nangor Road also to be demolished in conjunction with forthcoming development at Grange Castle South Business Park.

Clondalkin village is the main settlement in the environs of the site, located c.2km to the east. All dwellings in the area are connected to the SDCC public water supply and foul and storm drain network.

Figure 4.2: Location of residential properties

Equally there are no schools in the immediate environs of the site. The population of the surrounding areas is serviced by schools in the villages and towns of Clondalkin, Adamstown, Lucan, Tallaght and Rathcoole, the nearest schools being in Adamstown c.1.75km to the north and Clondalkin c.1.5km to the east. The nearest childcare facility is at Castlebagot House (Little Genius Creche) c.1km to the south.

The nearest hospital to the facility is located at the Adelaide and Meath Hospital incorporating the National Children's Hospital, Tallaght, Dublin 24, c.6km to the south. Peamount healthcare facility is located c.1.5km to the south-west.

As the proposed development is located within a largely industrial/enterprise area and as such tourist activities are not typically located in the locality. The wider area does contain a small number of hotels and other tourist accommodation (B&B's etc.) which generally increases towards the East in the direction of Dublin city and its many tourist sites.

There are two golf courses in the vicinity of the site, Grange Castle Golf Club c.800m to the east and Newcastle golf centre c.1km to the west.

The wider area however offers a variety of recreational facilities that are provided by natural heritage such as the Grand Canal, Liffey Valley and Wicklow and Dublin Mountains. Dublin City Centre is the centre of tourist activity in the region providing entertainment and accommodation for visitors to the area. Further discussion of impact on Landscape amenity is presented in Chapter 10 of this EIAR.

There are two landholdings that comprise the application site in this instance:

A. A site of c.13.07 ha located to the west of the existing MS Data Centre Campus within the Business Park. The
B. A site of c.3.16 ha located in the north-eastern corner of the Business Park, north of the main entrance to the Park and south of the Grand Canal.

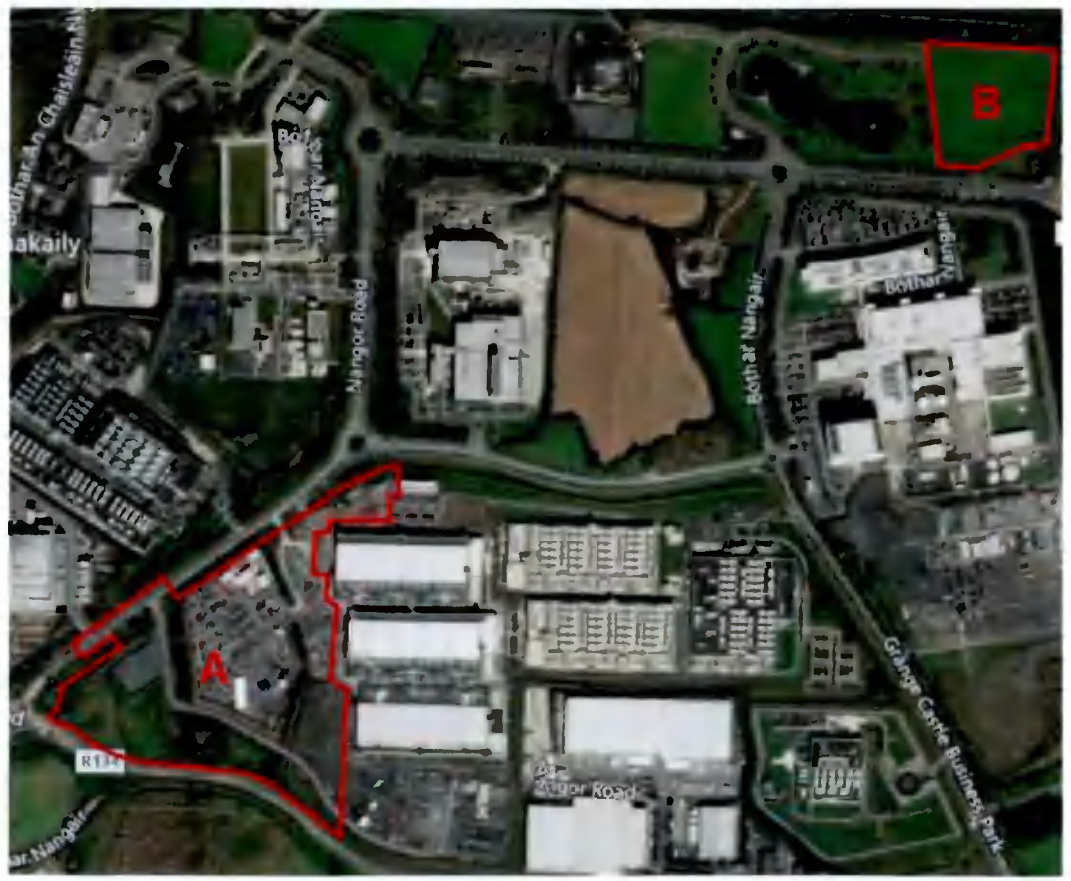


Figure 4.3: Sites A & B

Site A is the main development site which will contains the data centres, central administrative building and associated works. Site B will provide a temporary car parking for workers during the construction period of the project.

The western half of Site A borders the Griffeen River and is predominantly vacant land that also contains a hardstanding area and a temporary construction road associated with the construction of MS Data Centres DUB09, DUB10, DUB12 & DUB13 to the east and which is nearing completion.

The eastern half of Site A was the location of the former Ballybane Pitch & Putt course but which has accommodated the temporary construction car park associated with the construction of MS Data Centres DUB09, DUB10, DUB12 & DUB13.

South of the temporary road is the vacant dwelling and attendant areas which is to be removed. The southern boundary of Site A has also been redefined with the completion of the New Nagor Road realignment. A low wall and metal railing marks the boundary along the redesigned road. It is also noted that during the completion of the road works the local Baldonnel stream which previously ran to the east of the pitch and putt course was diverted to the west along the new road with a new connection to the Griffeen river to the southwest of Site A.

Site B is located c.1.2km to the northeast of Site A and north of the main entrance to the Business Park. This site is flat, grassed and currently vacant. It lies east of the Business Park Attenuation Lake. To the north is the Grand Canal and Greenway. A buffer of trees and planting c.45m deep separates the site from the greenway.

Population & Age Profile

The following demographic and population information is extracted from statistical data obtained from the Central Statistics Office 2016, 2011 and 2006 national surveys with regards to the South Dublin County area.

Table 4.1 illustrates the increase in populations between the surveyed years of 2006, 2011 and 2016. Increased population figures are experienced at state (12.3% increase), South Dublin County (12.9% increase), Dublin Regional (13.5% increase) levels.

Area	2006	2011	2016	Change (2006-2016)	% Change 2006-2016
State	4,239,848	4,588,252	4,761,865	522,017	12.3
Dublin	1,187,176	1,273,069	1,347,359	160,183	13.5
South Dublin	246,935	265,205	278,767	31,832	12.9
Clondalkin-Dunawley ED	10,873	10,877	11,323	450	4.1
SA 267049001	-	253	282	29	11.5

Table 4.1 Population Change at State, Primary and Secondary Hinterland Level

The age profile of the population of the Dublin Region in 2016 shows a slightly lower percentage within the 0-14 age group than the state average (19% compared to 21%). However South Dublin was higher at 23%. At ED and SAP level the figures are higher again (26% and 25% respectively).

The proportion of the population in the 65+ age bracket in Dublin equates to just 12% with South Dublin slightly lower again at 11%. This compares to the higher State figure of 13%. The figures are lower again at ED and SAP level (6.8% and 3.9% respectively).

These results indicate a young population in the County which reflects the significant in-migration during the 2000s and the 'baby boom' during the economic downturn.

Strong rates of population growth in the County indicates increased future employment demand.

Employment Profile

	State	SDCC	Clondalkin-Dunawley ED	SA 267049001
At work	53.4	5.5	52.2	60.6
Looking for first regular job	0.8	1	1.3	0.5
Unemployed having lost or given up previous job	7.1	7.6	12.4	16
Student	11.4	11.1	10.8	6.1
Looking after home/family	8.1	7.9	8.8	7
Retired	14.5	12.7	8.1	5.2
Unable to work due to permanent sickness or disability	4.2	3.9	6.2	4.7
Other	0.4	0.3	0.4	0
Total	100	100	100	100

Table 4.2 % Population aged 15 years and Over by Principal Economic Status

The above table indicates a high level of unemployment in the local area which is approximately twice the State average.

Socio-Economic Profile

Social class is an indicator of the socio-economic character of the area. The below tables indicate that at local level the proportion of the population in professional, managerial and technical employment is much lower than the state average.

	State	SDCC	Clondalkin-Dunawley ED	SA 267049001
Professional workers	8.1	7.3	2.3	0.7
Managerial and technical	28.1	28.3	15.6	17.7
Non-manual	17.6	19.4	19.2	11.7
Skilled manual	14.1	14.9	19.3	11.7
Semi-skilled	10.5	9.4	13.1	11.7
Unskilled	3.6	3.2	5.1	5.3
All others gainfully occupied and unknown	18	17.56	25.5	41.1
Total	100	100	100	100

Table 4.3 % Population by Social Class

	State	SDCC	Clondalkin-Dunawley ED	SA 267049001
A Employers and managers	15.5	17.3	9.2	8.1
B Higher professional	7.1	6.7	1.9	1.1
C Lower professional	11.7	11.7	6.1	7.4
D Non-manual	18	21.2	24.1	18
E Manual skilled	9.3	9.6	13	3.5
F Semi-skilled	8.6	8	10.9	10.6
G Unskilled	3.6	3.5	5.5	5.7
H Own account workers	5.2	5.5	4.6	2.5
I Farmers	4.9	0.2	0.1	0
J Agricultural workers	0.5	0.06	0.03	0
Z All others gainfully occupied and unknown	15.6	16.3	24.7	43.1
Total	100	100	100	100

Table 4.4 % Population by Socio Economic Group

The above figures indicate that while South Dublin and the State are very similar in terms of percentage of socio-economic groups at local level the majority of the workforce at local level are in the unskilled and semi-skilled category.

The development of additional high skilled jobs in the Grange Castle Business Park, such as the current proposal, in tandem with improved educational provision, will provide the opportunity to improve these figures at local level to better reflect national and county levels.

4.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

4.5 POTENTIAL IMPACTS

Construction Phase
It is anticipated that the subject works will commence in Summer 2021 subject to the grant of permission and is expected to take c.24 months to complete with a number of construction phases anticipated.

Positive socio-economic impacts on the wider community relate to the uptake of employees during both construction and operation stages of development. It is estimated that at peak construction period c.550 staff per shift may be employed at the site.

Indirect employment and economic benefit will be provided through service industries such as construction materials, fuel, food and employee accommodation during construction which is likely to be absorbed into the local economy.

It is likely that the proposed facility may create some demand for additional housing in the wider area for its employees although most are expected to travel from their current places of residences . The workforce will be drawn from a wide geographical area and therefore it is not likely to have any direct impact on the population of the hinterlands.

However, it is expected that the proposed development will have effects on employment in relation to both direct employment from the facility itself and indirect employment created by the multiplier effect. The high degree of accessibility of the site will mean the beneficial impacts of the development will be spread over a wider geographical area.

The three main potential impacts on local residences and businesses associated with the proposed development will be in relation to traffic, noise, air (dust), and visual impact. These impacts are dealt with in the corresponding chapters of this EIAR.

There will be ongoing noise disturbance and potential for dust and emissions as a result of construction traffic and other activities throughout the construction process. However, there will be limits on noise and hours of operation, along with implementation of appropriate noise, vibration and dust control measures, which will ensure that impact is kept to a minimum.

Furthermore, given the distance between the site and the nearest sensitive locations, negative impacts generated during construction are expected to be negligible to slight negative, and temporary.

Operational Phase
The proposed development will permanently change the use of the land from vacant to data centre and administrative use.

Temporary and permanent employment will contribute to the local economy and demand for services. It is estimated that c.130 no. jobs will be created during the operation of the facility. Additional contract staff will also be employed.

The majority of staff will be employed in the standard day shift when the Central Administration Building is fully operational.

It is anticipated that the increase in employment may provide the need for some accommodation and other necessary services in the wider area. However, the development is not expected to materially increase the population of the area.

The proposed development is not expected to directly impact the amenity of residential properties in the wider area in terms of noise, air or visual impact given the distance from same. In terms of amenity impact on passing the site additional landscaping measures including building and planting will screen the data centre buildings while the new administrative building will be a positive and attractive architectural addition to the area. Additional operational traffic impact will not be materially significant.

The equipment and materials present during operation at the site will determine the risks to health and safety that may occur during this phase. As the proposed facility is a data server centre, the main equipment at the site during the operational phase will be I.T service related which, other than its power connections, do not typically introduce significant risk hazards. There will be no operator exposure concerns as there will be no production materials generated on site. The proposed facility has been designed to the highest standard with safety as a key priority so there will be little risk of fires or other related events. Mitigation measures are included below.

4.6 POTENTIAL CUMULATIVE IMPACTS

Overall, the cumulative impacts of the proposed development on the population and human health are envisaged to be positive. The proposed development will create direct and indirect employment opportunities for local residents and people living in the wider catchment area. The significant new population will contribute to the economic viability of the area, increasing in spending and a range of new employment services and facilities will add to the viability and vibrancy of the area.

4.7 MITIGATION MEASURES

The previous sections have outlined the potential impacts of the proposed development on humans and related aspects such as noise, air quality and landscape/visual impact. The potential impact of these aspects and their associated mitigation measures are dealt with in the corresponding chapters of this EIAR. Of the remaining potential impacts relating to the human environment only concerning Health and Safety require mitigation measures. These are outlined in the following sections.

Construction Phase
In accordance with the Safety, Health, and Welfare at Work (Construction) Regulations, a safety management system will be put in place on-site to minimise any risks to both construction personnel and site visitors. The site will not be accessible to the public and will have strict procedures in place for allowing entrance to visitors and contractors.

Traffic mitigation measures proposed to reduce the impact of additional traffic to and from the development are outlined in Chapter 11.

Similarly mitigation measures to reduce impact on human health as a result of construction noise, vibration and dust emissions are outlined in Chapters 8 and 9. Measures will reflect best construction practice including pro-active control of dust and other air pollutants to minimise generation of emissions at source. The measures will ensure compliance with all EU ambient air quality legislative limit values. A comprehensive suite of mitigation measures will be outlined in a Construction and Environment Management Plan to be agreed with the planning authority prior to commencement of development.

Operational Phase

The operation of the proposed facility will be carried out in strict accordance with all Irish and European regulations governing safety in the workplace with specific regard to the regulations implemented under the Safety, Health & Welfare at Work Act, 2005.

Full relevant training in the operating procedures for equipment and processes will be provided to each employee. In the case of a fire the extensive building sprinkler systems will come into operation and necessary personnel will be fully trained to deal with such emergencies. Also, the buildings have been designed so that any fire will be contained within its zone by a fire wall in order to prevent it spreading and therefore any damage and impact will be localised.

4.8 PREDICTED IMPACTS

Construction Phase

The construction phase will create a large construction site with short to medium term and slight negative impact on the immediate local environment and the amenity of existing residents as a result of noise and disturbance from construction and construction traffic.

Operational Phase

It is expected the proposed development will have a positive long term impact on the immediate hinterland and the Dublin Region through continued expanding employment and the associated economic and social benefits. No material change in terms of local population is expected given that the vast majority of workers will travel from existing places of residence.

Health and Safety issues which may cause risks and hazards during the construction and operational phase of the development will be given due consideration. All necessary mitigation measures will be put in place to ensure the health and safety of all site personnel. All other environmental aspects relating to the human environment which could have an adverse impact on the local population such as noise, air & water and visual impacts have been addressed in the relevant chapters of this EIAR.

4.9 'DO NOTHING' SCENARIO

In a 'Do Nothing' scenario the application lands within the Business Park would remain vacant. There would be no additional construction and operational employment created directly and indirectly. The population and amenity of the area will remain unchanged.

4.10'WORST CASE' SCENARIO

The 2014 EIA Directive (as transcribed into Irish Planning Legislation) requires that the vulnerability of the project to major accidents and/or natural disasters is also considered as part of the EIA. The site has been assessed in relation to a variation of possible natural disasters such as the following:

- Flooding
- Sea level rise
- Landslides
- Earthquake/seismic activity
- Volcanic activity

In relation to flooding it is noted that a Site Specific Floodrisk Assessment has been carried out and is detailed in the EIAR Chapter 7 (Water Services). The assessment concludes that the site is not at risk of flooding and with the proper attenuation provided will ensure that flood risk to other lands upstream or downstream of the development is minimised.

There is negligible potential for sea level rise to impact the development (even with worse scenario climate change predictions) given the location and topography of the site. Equally the potential for landslides is equally unlikely given the topography and substratum profile of the site and adjoining areas, and meteorological conditions.

Earthquakes and volcanoes are negligible risks given the lack of seismic activity in the area and country overall, and the lack of any active volcanoes.

In addition to natural disasters is the potential for major accidents in relation to Seveso sites subject to the Control of Major Accident Hazards (COMAH) Regulations. The development is not located in the vicinity of any existing Seveso sites, the nearest being within Greenogue Business Park c.3km to the

south-west (Brenntag Chemicals). The application site is located significantly outside the HSA consultation zone for same.

In relation to Casement Aerodrome, located c.1.6km to the south, the application site is outside the Department of Defence Security Zone and outside the Inner Approach Areas and Critical Safety Zones where development is restricted. The site is located at the edge of the Department of Defence Inner Zone Limit which requires that new development proposals include for consultation with the Department to ensure no endangerment or interference with the safety of aircraft or the safe and efficient navigation thereof. We note that consultation has been held with the Department in this regard and that no issues have been raised (see Chapter 1 for further details).

Equally it is noted that the proposed development nor the substances that will be stored on site to facilitate the development will not be of a type or quantity that would exceed the thresholds of the Seveso Directive. This includes the storage of fuel for generators. In relation to local accidents/spillages related to storage of fuels, there will be proper mitigation measures put in place (in accordance with standard practice) to ensure such events do not occur. These are detailed further in Chapters 6 and 7 on lands, soils, geology and water services.

4.11MONITORING & REINSTATEMENT

No monitoring required.

4.12DIFFICULTIES IN COMPILING INFORMATION

No specific difficulties were encountered while undertaking this assessment.

5 BIODIVERSITY

5.1 INTRODUCTION

This chapter provides an assessment of the impacts of the proposed development on the ecological environment, i.e. biodiversity, flora and fauna. It has been compiled in compliance with EIA Directive (2011/92/EU) as amended by Directive 2014/52/EU, the Planning and Development Act 2000 as amended, and the European Commission's guidance on the preparation of the EIA Report, and follows the Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017).

5.2 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.

The Appropriate Assessment process was commenced by Moore Group for the proposed development and a Report for AA Screening prepared, which is presented as Appendix 5.1 to this chapter.

5.2.1 Policy & Guidance

5.2.1.1 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.

5.2.1.2 EU Birds Directive

The "Birds Directive" (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 Birds 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.

5.2.1.3 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 Wildlife Act 1976. The Wildlife (Amendment) Act of 2000 amended the original Wildlife Act 1976 to improve the effectiveness of the Wildlife Act 1976 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 as amended).

5.2.1.4 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 as defined by the area of the proposed development, site boundaries and surrounding buffer zones up to 150 m away. This included research on the National Parks and Wildlife Service (NPWS) metadata website, the National Biodiversity Data Centre (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 site visits 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 12 June 2019, 9 June 2020 and 11 August 2020 by conducting study area walkovers covering the main ecological areas identified in the desktop assessment. Surveys were completed initially by the author Ger O'Donohoe M.Sc. of Moore Group and John Curtin B.Sc. of Éire Ecology during summer months. The summer survey dates are within the optimal survey periods for botanical species. A photographic record was made of features of interest. There have been no changes to the environment of the proposed development and the surveys carried out are still current and relevant to this application.

A Bat Survey of the former residence to be demolished 'Mountain View' on the Nangor Road was undertaken by John Curtin of Éire Ecology and the results of the survey are presented as Appendix 5.2 to this chapter. The specific methodologies are presented in the report and not repeated here. The report presents the results a site visit by John Curtin on the 17 June 2020 during which all accessible areas of the buildings to be demolished were inspected for signs of bat use or presence.

Searches for Badgers in the proposed development areas and an Otter survey along the Griffeen River were completed by Ger O'Donohoe during summer surveys in 2020. The otter survey commenced upstream of the adjacent Nangor Road intersection to the west of Grange Castle and continued downstream on both side of the accessible bank as far as the Grifols Facility.

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 Guidelines on the Information to be Contained in Environmental Impact Assessment Reports 2017;
- European Commission Guidance on the Preparation of the EIA Report (2017) as well as the European Commission Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013);
- 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, 2019).

The following resources assisted in the production of this chapter of the report:

- Ordnance Survey Ireland maps;
- OSI, Google and Bing Aerial photography (1995 – 2020);
- NPWS Mapviewer: http://www.npws.ie/en/MapsData/;
- Designated sites (SACs, SPAs, NHAs);
- Records of protected species from 10km squares; and
- National Biodiversity Data Centre 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.

5.2.1.4 Site Evaluation and Impact Determination

The TII Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) outlines the methodology for evaluating ecological impacts of the project in the present report. According to the TII Guidelines, the Ecological Study should address:

- Designated conservation areas and sites proposed for designation within the zone(s) of influence of any of the route options,
- All the main inland surface waters (e.g. rivers, streams, canals, lakes and reservoirs) that are intersected by any of the route corridor options, including their fisheries value and any relevant designations,
- Aquifers and dependent systems and turloughs and their subterranean water systems,
- Any known or potentially important sites for rare or protected flora or fauna that occur along or within the zone(s) of influence of any of the route options,
- Any other sites of ecological value, that are not designated, along or in close proximity to any of the route corridor options,
- Any other relevant conservation designations or programmes (e.g. catchment management schemes, habitat restoration or creation projects, community conservation projects, etc.),
- Any other features of particular ecological or conservation significance along any of the route options.

Further guidance is provided in the Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019).

5.3 RECEIVING ENVIRONMENT

The proposed development comprises an extension to the existing MS Data Centre Campus which is comprised of recolonised improved grassland with pockets of mixed woodland and scrub of relatively low local ecological value. A new access bridge will clear span the Griffeen River which is of higher local

value and appropriate construction management will be employed during that phase of the proposed development. A temporary car park is to be located at the north easter corner of the business park in improved grassland which will be surfaced with crushed gravel and retuned to grassland following development.

Department of 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 relevant Natura 2000 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 1 below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 1 July 2021.

Site Code	Site name	Distance (km)[1]
000206	North Dublin Bay SAC	18.14
000210	South Dublin Bay SAC	15.63
000397	Red Bog, Kildare SAC	14.60
001209	Glenasmole Valley SAC	8.57
001398	Rye Water Valley/Carton SAC	5.07
002122	Wicklow Mountains SAC	10.26
004006	North Bull Island SPA	18.13
004024	South Dublin Bay and River Tolka Estuary SPA	15.04
004040	Wicklow Mountains SPA	13.39

Table 5.1: European Sites located within the potential zone of impact[2] of the Project.

The Proposed Development is located is located within Grange Castle Business Park. A new clear span bridge is proposed to facilitate entry to the subject site over the Griffeen River.
There are nine European sites located within 15km of the Project site:

- 000397 Red Bog, Kildare SAC
- 001209 Glenasmole Valley SAC
- 001398 Ryewater Valley/Carton SAC
- 002122 Wicklow Mountains SAC
- 004040 Wicklow Mountains SPA

The Wicklow Mountain SAC and SPA can be screened out at this stage due to the distance of removal at 10.26km and 13.39km respectively, and the lack of connectivity with the proposed development site. Similarly, there is no pathway or connectivity to the Red Bog, Kildare SAC or with the Glenasmole Valley SAC or the Ryewater Valley/Carton SAC.

The following sites within Dublin Bay are over 15 km:

- 000206 North Dublin Bay SAC
- 000210 South Dublin Bay SAC
- 004006 North Bull Island SPA
- 004024 South Dublin Bay and River Tolka Estuary SPA

There is a tentative pathway to European sites located in Dublin Bay hydrologically via municipal sewer and via the Griffeen River. However, wastewater from the proposed development will be treated at Ringsend WWTP and there is no predicted increase in discharge rates for both surface water and wastewater runoff as a result of the proposed works.

Therefore, the potential zone of impact of effects on water quality from the Proposed Development could extend to Dublin Bay. However, given the capacity for dilution of any potential pollutants in the local surface water drainage network and in Dublin Bay, the zone of impact of potential water quality effects would not extend beyond Dublin Bay. Additionally, the distance of removal and degree of dilution via the Griffeen River to Dublin Bay is significant at over 30 river km downstream.

5.3.1 Habitat Descriptions

The proposed development boundary and habitats contained within are presented in the Habitat Map in Figure 5.1 below. The proposed data storage facility site is located on improved grassland (GA1), with small pockets of woodland (WD1), patches of scrub (WS1) and scattered trees.

Artificial habitats found on site include the buildings and surfaces associated with the developed adjacent date centre campus (BL3) and an existing temporary crushed gravel car park (ED2) located in the main development area which facilitates parking for the ongoing adjacent development . These are not outlined on the Habitat Map but are obvious from recent aerial photography. An artificial pond associated with the drainage system of Grange Castle Business Park is noted but located nearby the proposed temporary car park but outside the redline boundary of the site.

The proposed temporary car park area is comprised of improved grassland (GA1) which is currently used as amenity grassland albeit with a less intensive mowing regime.

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

[2] All European sites potentially connected irrespective of the nature or scale of the proposed development.

The Griffeen River (FW1) is landscaped within the Grange Castle Business Park and will be crossed by a clear span bridge to gain access to the main data storage facility site. It presents the highest areas of ecological value in the main proposed development site.

A list of habitats recorded and their corresponding Fossitt codes is presented in Table 2.

Habitat	Habitat Category	Habitat Type
(F) Freshwater	(FW) Watercourses	(FW1) Upland rivers
(G) Grassland	(GA) Improved grassland	(GA1) Improved grassland
(W) Woodland	(WD) Modified woodland	(WD1) Mixed broadleaved woodland
	(WS) Scrub/transitional woodland	(WS1) Scrub
	(WL) Linear woodland/scrub	(WL1) Hedgerows
(ER) Exposed rock and disturbed ground	(ED) Disturbed ground	(ED2) Spoil and bare ground
(B) Cultivated and built land	(BL) Built land	(BL3) Buildings and artificial surfaces

Table 5.2: Habitat types present according to Fossitt (2000).

5.3.1.1 Griffeen River (FW1)

The Griffeen River flows along the northern boundary of the proposed development site and is culverted under the business park road flowing north toward the River Liffey. The river course is a diverted channel and has exposed limestone bedrock in places. The channel is approximately 1-2m with and 20-30cm deep with a narrow flood plain at the base of steep grassy banks.

The river substrate is comprised predominantly of cobbles and occasional boulders and instream vegetation is sparse with occasional Fool's water-cress (*Apium nodiflorum*) and Yellow Iris (*Iris pseudacorus*). Bankside vegetation is dominated by Great Willowherb (*Epilobium hirsutum*) and Meadowsweet (*Filipendula ulmaria*) with occasional Common reed (*Phragmites australis*).

5.3.1.2 Improved grassland (GS1)

The entire open field area has been disturbed over the years and presents a sward of mixed grasses. Perennial ryegrass (*Lolium perenne*) dominates the grassy component of this habitat along with Cocksfoot (*Dactylis glomerata*) and to a lesser extent, Yorkshire fog (*Holcus lanatus*) with False oat-grass (*Arrhenatherum elatius*) and Red Fescue (*Festuca rubra*). Typical characteristic species for this habitat found on site include; Meadow buttercup (*Ranunculus acris*), Nettle (*Urtica dioica*), Broad-leaved Dock (*Rumex obtusifolius*), Common sorrel (*Rumex acetosa*), Red clover (*Trifolium pratense*), Ribwort plantain (*Plantago lanceolata*), Creeping thistle *(Cirsium arvense*) and Spear thistle (*C. vulgare*). The grassland is rank and succeeding to scrub in places with occasional Nettle (*Urtica diocia*) and Bramble scrub patches. Hogweed (*Heracleum sphondylium*) is frequent along with Rapeseed (*Brassica napus*) and Ragwort (*Senecio jacobaea*).

5.3.1.3 Mixed broadleaved woodland (WL1)

This habitat occurs at the southern extent of the site and is associated with the original hedgerow boundary in that area. Tree species includes Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Wych elm (*Ulmus glabra*), Hawthorn (*Crataegus monogyna*) interspersed with Elder (*Sambucus nigra*), Blackthorn (*Prunus spinosa*) and Apple (*Malus* spp.) along with Willow (*Salix caprea*) and Dog Rose (*Rosa canina*). The ground layer is dominated by Ivy (*Hedera helix*), Bramble (*Rubus fruticosus* agg.), Cleavers (*Galium aparine*) and occasional Wood rush (*Luzula campestris*).

There has been some clearance and management of the wooded areas and bare ground has colonised with Rapeseed, Willowherb and Thistles.

5.3.1.4 Scrub (WS1)

Scrub on site is dominated by bramble and nettle particularly in the woody area along the norther boundary of the site bordering the Griffeen River. There are occasional scrubby trees of Hawthorn and Elder. Tutsan (*Hypericum androsaemum*) is frequent along with Dogwood (*Cornus sanguinea*), Bindweed (*Calystegia sepium ssp. sepium*), Cow parsley (*Anthriscus sylvestris*) and Bush vetch (*Vicia sepium*).

5.3.1.5 Hedgerow (WL1)

This habitat occurs in landscaped section of the main campus and along the boundary of the existing temporary car park is associated with the original hedgerow boundary in that area. There are remnant hedgerows within the adjacent developed campus which are ear-marked for conservation and landscaping to promote biodiversity. Tree species includes Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Wych elm (*Ulmus glabra*), Hawthorn (*Crataegus monogyna*) interspersed with Elder (*Sambucus nigra*) and Blackthorn (*Prunus spinosa*).

5.3.1.5 Invasive Species

There were no invasive species recorded on the proposed development sites.

There is a storage berm in the former front garden of the residence to be demolished adjacent to the Nangor Road which is undergoing treatment for Japanese knotweed under the direction of South Dublin County Council. The treatment regime is nearing end and the site will be cleared under licence by the treatment specialist.

5.3.1.6 Summary

There are no Annexed habitats on or adjacent to the proposed development site. There were no rare or protected flora species recorded on the site. There are no rare or protected habitats recorded within the study area.

The Grand Canal corridor is a proposed Natural Heritage Area and as such is of concern from indirect impacts such as lighting in the proposed temporary car park in that area.

The Griffeen River is considered of Local Importance (higher value) due to its connectivity with the River Liffey c. 5km downstream from the proposed development site. It is also noted that the Griffeen River is exceptional among most urban rivers in the area in that it supports Atlantic Salmon (*Salmo Salar*) listed under Annex II and V of the EU Habitats Directive, Sea Trout in addition to Brown Trout (both *Salmo trutta*) populations throughout.

The habitats under the footprint of the proposed development are of relatively low local ecological value with the mature trees along remnant hedgerows being of value to nesting birds.

5.3.2 Fauna

5.3.2.1 Otters

There are no records for otters on the Baldonnell Stream to the south of Grange Castle or the Griffeen River on the NBDC website. However, there are historic records for the Grand Canal. The NPWS in their submission on a previous application reference artificial holts previously installed on the stretch of the Griffeen River downstream in the Grange Business Park. This highlights the potential of the downstream environment in terms of otter usage.

The survey for otters for the proposed development did not reveal any signs along the length of the Griffeen River surveyed. There is a landscaped ponded area adjacent to the Nangor Road intersection at the north-western corner of the main development site area but it has limited accessibility to otters and no signs were recorded during fieldwork. This area has public seating and accessibility and is used by dog walkers.

5.3.2.2 Bats

The review of existing bat records (sourced from NBDC) within a 2km of the study area shows that five of the nine known resident Irish species have been observed locally including Common pipistrelle (*Pipistrellus sensu lato*), Soprano Pipistrelle (*Pipistrellus pygmaeus*) Brown Long-eared Bat (*Plecotus auritus*) Daubenton's Bat (*Myotis daubentonii*) and Leisler's bat (*Nyctalus leisleri*).

Potential bat roosts in the area include Grange Castle, Grange Cottage and outhouses adjacent to the Griffeen River near the entrance to the Takeda site to the north.

The remnant hedgerows are of moderate roosting potential to bats. However, a bat survey undertaken for the same proposed development site in 2015 (07/08/15) by this author did not record commuting bats in the area.

The current bat survey of the residence and sheds to be demolished adjacent to the Nangor Road did not reveal any signs of roosting bats.

The area of greatest value to bats is the ecological corridor of the Grand Canal to the north of the proposed temporary car park. A search for species in a polygon covering the proposed car park area and adjacent Grand Canal corridor reveals four species of bat using the corridor; Daubenton's Bat (*Myotis daubentonii*), Leisler's bat (*Nyctalus leisleri*), Pipistrelle (*Pipistrellus sensu lato*) and Soprano Pipistrelle (Pipistrellus pygmaeus).

5.3.2.3 Badgers

There are no badger setts within the proposed development site areas.

5.3.2.4 Birds

Species recorded included regular passerines such as Great Tit (*Parus major*), Chaffinch (*Fringilla coelebs*), Blackbird (*Turdus merula*), Wren (*Troglodytes troglodytes*). Common Buzzards (*Buteo buteo*) was observed flying high over the site.

No rare or endangered species of bird was recorded breeding within the subject site.

5.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

5.5 POTENTIAL IMPACTS

Construction Phase

Habitats
There will be a loss of improved grassland which is considered imperceptible and neutral in the context of proposed green areas within the Project design.

The Woodland areas within the site boundary are relatively small and are considered of low value at a local level. The minor loss is considered imperceptible and neutral.

The Scrub areas are considered of low value at a local level. The minor loss is considered imperceptible and neutral.

A new access to the main data centre site will be facilitated by the placement of a clear span bridge. Significant effects on t e Griffeen River could be considered in terms of local effects on water quality form elevated suspended solids or hydrocarbon pollutants potentially entering the river during construction work.

Bats
No bats were recorded roosting in the buildings to be demolished. The hedgerows on site have few features that would act as potential roosting sites.

The area of the proposed temporary car park is surrounded by access roads which are lit by street lamps located between 5 and 15m of the corridor and the proposed car park will not add to the existing level of lighting. Therefore there will be no significant effect on bats commuting in the Grand Canal corridor.

Badgers
There will be no direct or indirect impact on badgers.

Birds
All birds are protected under the Wildlife Acts. Potential impacts on nesting birds can be avoided by timing the cutting of vegetation as required by the Wildlife Acts.

Operational Phase

Habitats
There will be no discharges to the Griffeen River. It has been noted that the proposed development is to be connected to the existing municipal sewer network for both wastewater and surface water.

There is tentative connectivity via the municipal sewers to Dublin Bay. However, adverse effects on the Dublin Bay European sites are highly unlikely given:

- The distance between the proposed Project and the nearest European sites, over 30 river km;
- Wastewater from the proposed development will be treated at Ringsend WWTP and there is no predicted increase in discharge rates for both surface water and wastewater runoff as a result of the proposed works.

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 have been excluded at the screening stage.

Bats
The hedgerows on site have few features that would act as potential roosting sites.

There will be no significant effect on bats commuting in the Grand Canal corridor.

Badgers

There will be no significant effect on badgers in the wider area during operation.

Birds
It is unlikely the proposed development will have a significant negative effect on the local bird population given the abundance of similar parkland and green areas surrounding the site.

5.6 POTENTIAL CUMULATIVE IMPACTS

In addition to the proposed Project, other relevant plans and projects in the area must also be considered. This step aims to identify at this early stage any possible significant in-combination or cumulative effects of the proposed development with other such plans and projects on biodiversity.

A review of the National Planning Application Database was undertaken. The first stage of this review confirmed that there were no data outages in the area where the proposed Project is located. The database was then queried for developments granted planning permission within 100m of the Project site within the last three years. These are presented in Table 5.3 below.

Planning Ref.	Description of development	Comments
SD17A/0392	Amendment and completion of the permission granted under SD17A/0141 to facilitate a 125sq.m extension to the north and south of the permitted stand-alone single storey data hall of 1,515sq.m to create an extended stand-alone single storey data hall of 1,640s.qm. The permitted data hall will remain located as per SD17A/0141 - that is to the north of the data hall and its extension and to the west of the temporary gas powered generation plant permitted under Reg. Ref. SD16A/0214, SD16A/0345 and SD17A/0027 and to the immediate east of the R120. This amendment application will increase the height of the compound and data hall building by 1.2m - 1.96m and it will remain single storey. Internal alterations to the data hall layout are also proposed. No changes are proposed to the plant at roof level; associated support services, with a slight repositioning to the north of the 4 no. standby generators with associated flues (each 15m high). The development will include a revised location for the sprinkler tank and pump room, as well as revisions and extensions to the permitted service road and new access gate to provide vehicular access to the data hall and 3 car parking spaces permitted under SD17A/0141. The development will also include modifications to the landscaping to all frontages permitted under SD16A/0214, SD16A/0345 and SD17A/0141. This application also includes for revisions to the former access off the R120 that will allow emergency access only from this point into the site. It will continue to maintain local access to the rear of the property to the south of this former access as permitted and will reduce the number of car parking spaces permitted under SD16A/0214 from 26 to 25 car parking spaces. The development will continue to include ancillary site works, connections to existing Grange Castle infrastructural services as well as fencing and signage. No changes to the permitted attenuation pond is proposed. An Environmental Impact Assessment Report (EIAR) has been submitted with this application.	A screening report was prepared which screened out the need for Stage 2 AA and the Council concurred with the findings. No potential for in-combination effects.
SD18A/0027	A new car sales show room building with car display, valet, service, and ancillary areas; a new perimeter wall and fence with a new entrance and gates,	No potential for in-combination effects given the scale and location of the project.

Planning Ref.	Description of development	Comments
	external car parking compound and all associated site works.	
SD18A/0092	Amendments to the previously approved application SD17A/0354: Increase of total main building floor area over both floors of 163sq.m, minor amendments to building elevation including changes to external doors and windows to both electrical building and main building, the relocation of the approved electrical building and reduction in area, the relocation of the approved nitrogen tank and the inclusion of a CO2 tank compound of approximately 28sq.m, removal of approved pump house from site plan, removal of piperack connection to existing piperack, relocation of bicycle shelter, relocation and reduction of car parking spaces from 81 to 47 (of these 2 are accessible and 4 are E-Car spaces). An EIAR (Environmental Impact Assessment Report) will be submitted with this application, all on an 8.2 hectare site at Grange Castle Business Park. This application relates to development which comprises of an activity which requires an Industrial Emissions Licence in accordance with the First Schedule of the EPA Act 1992 as amended.	A screening report was prepared which screened out the need for Stage 2 AA and the Council concurred with the findings.
SD18A/0134	Demolition of the existing single storey house of 'Erganagh' and the construction of a two storey data centre and delivery bays with associated three storey office block and services that will have a gross floor area of 35,426sq.m on an overall site of 9.2 hectares. The two storey data centre facility and delivery bay (32,419sq.m) will be separated into two adjoined blocks over two floors with a single data hall on each floor of each data centre with service and technical space around each data hall (4 data halls overall) with a two storey delivery bay attached to the east of the data centre block. A three storey office block and delivery bay (2,882sq.m) is attached to the west of the data centre block. The data centre will be served by services and plant to the north of the data centre blocks that will include 32 standby generators with 2 associated flues per generator (64 in total) and grouped into 16 towers of flour flues each (each 20m high). There are proposed to be 32 acoustically attenuated chillers located on the upper level plant gantries to the north of the data hall blocks (eight on each gantry). The development will also include a new substation with associated transformer yard and single storey transformer building (125sq.m) that will be located to the northeast of the site. The development will be accessed from the Grange Castle South Access Road from the north via the Baldonnel Road and will also include ancillary site development works, including 2 attenuation ponds, to connect to existing Grange Castle infrastructural services as well as fencing, signage, services road, entrance gate, 70 car parking spaces including 3 disabled car parking spaces, and 30 sheltered bicycle parking spaces. The development will be enclosed with landscaping to all frontages including a wetland to the west all on a site	The Screening Statement for Appropriate Assessment assessed Qualifying Interests, their threats, and their underpinning conditions for all European Sites potentially affected by the development, and concluded there would be no likelihood of significant effects on any European Sites as a result of the development, either alone or in combination with other plans or projects. No potential for in-combination effects.

Planning Ref.	Description of development	Comments
	(9.2ha) located within lands in the Grange Castle Business Park South and the residential properties of Erganagh, Kent Cottage and Weston Lodge on land with the townlands of Aungierstown and Ballybane; Ballybane; and Milltown and bounding Baldonnel Road to the west and south and Grange Castle South Access Road to the north, Baldonnel, Dublin 22. An Environmental Impact Assessment Report (EIAR) has been submitted with this application.	
SD18A/0169	New single storey electrical building at a height of 4.15m with an area of 136sq.m., an external utility yard for 2 low voltage containerised generators, 2 step up transformers and an above ground, double-skinned, bunded, bulk storage fuel tank for the purpose of standby power generation. Modifications to existing berm and the addition of a new grassed berm are also to be included all on a 10.3 hectare site. This application relates to development on a site which carries out an activity that requires an Industrial Emissions Licence in accordance with the First Schedule of the EPA Act 1992 as amended.	The Screening Statement for Appropriate Assessment assessed Qualifying Interests, their threats, and their underpinning conditions for all European Sites potentially affected by the development, and concluded there would be no likelihood of significant effects on any European Sites as a result of the development, either alone or in combination with other plans or projects. No potential for in-combination effects.
SD18A/0298	"Amendment and completion of the permissions granted under Reg. Ref. SD16A/0214, SD16A/0345, SD17A/0141 and SD17A/0392 as well as the construction of two new single storey data halls and associated office areas and plant, with a gross floor area of 5,823sq.m. 1 new single storey data hall (1,857sq.m) plus single storey offices (719sq.m) will be located to the immediate east of the data hall that was permitted and subsequently extended under Reg. Ref. SD17A/0141 and SD17A/0392. The new data hall will include plant at roof level; associated support services, 4 standby generators with associated flues (each 15m high) and service road. 1 new single storey data hall (3,005sq.m) plus delivery bay (242sq.m) will be located to the north of the extended data centre granted under Reg. Ref. SD17A/0141 and SD17A/0392 and to the south of the permitted attenuation pond. The new data hall will include plant at roof level; associated support services, 8 standy generators with associated flues (each 15m high) and service road. Relocation and redesign of the two storey ESB substation (556sq.m) with associated transformer yard and single storey transformer building (180sq.m) permitted under SD16A/0345 to the immediate north of the entrance into the site from Grange Castle Business Park.	The Screening Statement for Appropriate Assessment assessed Qualifying Interests, their threats, and their underpinning conditions for all European Sites potentially affected by the development, and concluded there would be no likelihood of significant effects on any European Sites as a result of the development, either alone or in combination with other plans or projects. No potential for in-combination effects.
SD18A/0323	Construction of a two storey data centre with three storey central service spine (7,246sq.m) with plant at roof level, that includes a reception area (274.4sq.m), shipping area (264.3sq.m) and three data halls (each 582.5sq.m - total 1,747.5sq.m) plus service spine and ancillary space at ground floor; storage (476sq.m) at mezzanine level above the shipping area; and office (560sq.m), three data halls (each 582.5sq.m - total 1,747.5sq.m) plus service spine and ancillary space at first floor level; and service spine at second floor level	The Screening Statement for Appropriate Assessment assessed Qualifying Interests, their threats, and their underpinning conditions for all European Sites potentially affected by the development, and concluded there would be no likelihood of significant effects on any European Sites as a result of the development, either alone or in

Planning Ref.	Description of development	Comments
	only. The new data centre will include plant at roof level; associated support services, 7 standby generators with associated flues (each 17.29m high). The development with include a single storey sub-station (74.5sq.m), transformer 26.8sq.m and bin compound (33sq.m) and will connect to existing Grange Castle infrastructural services the will include a new access road that will provide independent vehicular access to the site off the northern spine road that provides access to the existing data centre granted under SD15A/0034. The development will include ancillary site works as well as fencing, signage, entrance gate, 22 car parking spaces that include 2 disabled car parking spaces, as well as sheltered bicycle parking. The development will also include modifications to the attenuation pond, and to the landscaping previously permitted under SD15A/0034. Temporary permission is also sought for 72 temporary construction worker parking spaces, temporary construction compound and temporary construction access from Grange Castle Business Park lands to the west. An Environmental Impact Assessment Report (EIAR) has been submitted with this application.	combination with other plans or projects. No potential for in-combination effects.
SD19A/0004	Enabling works to facilitate the future development of the site; topsoil strip and a cut and fill operation across the site; temporary construction access will be created off the R120 to facilitate the works within the townland of Ballymakaily to the west of the Newcastle Road (R120).	Having regard to the nature, scale and location of the proposed development, the distance from a Natura 2000 site and absence of linkages to same, a Stage 2 AA is not required.
SD19A/0042	Phased development that will include 4 single storey data halls all with associated plant at roof level; 32 standby generators with associated flues (each 15m high); associated office and service areas; service road infrastructure and car parking; ESB sub-station/transformer yard with an overall gross floor area of 17,685sq.m; temporary gas powered generation plant within a walled yard containing 19 generator units with associated flues (each 17m high) to be located to the west of the proposed data halls on a site within the townland of Ballymakaily; Phase 1, 2 single storey data halls (6,950sq.m.) with roof plant and 16 stand-by generators with associated flues (each 15m high) as well as associated water tower and pump room and other services; single storey goods receiving area/store and single storey office area (1,522sq.m.) located attached and to the north-east of the data halls; temporary gas powered generation plant with 15 generators with associated flues (each 17m high) to be located within a compound to the west of the proposed data halls; attenuation pond; two storey ESB sub-station (494sq.m) with associated transformer yard and single storey transformer building (247sq.m) within compound; Phase 2, 2 single storey data halls (6,950sq.m.) with roof plant and 16 stand-by generators with associated flues (each 15m high) as well as associated water tower and pump room and other services; single storey goods receiving area/store and single storey office area (1,522sq.m)	The Screening Statement for Appropriate Assessment assessed Qualifying Interests, their threats, and their underpinning conditions for all European Sites potentially affected by the development, and concluded there would be no likelihood of significant effects on any European Sites as a result of the development, either alone or in combination with other plans or projects. No potential for in-combination effects.

Planning Ref.	Description of development	Comments
	located attached and to the east of the data halls under this Phase and attached and to the north of the offices proposed under Phase 1; 4 additional generators with associated flues (each 17m high) to be constructed within the temporary gas powered generation plant; also ancillary site works; connections to existing infrastructural services as well as fencing; signage; vehicular access off the realigned R120 to provide a new vehicular access into the site as well as internal service roads and entrance gates; car park for 39 car parking spaces (including 4 disabled car parking spaces); sheltered bicycle parking to serve the development. The development will be enclosed with landscaping to all boundaries of the overall site of 22.1ha. Application for enabling works to facilitate this development has been made under Reg. Ref. SD19A/0004. An Environmental Impact Assessment Report (EIAR) has been submitted with this application. An EPA-Industrial Emissions (IE) licence will be applied for to facilitate the operation of Phase 2 of the permission.	
SD19A/0153	3 new buildings. Block A: two storey with six industrial and office units; Block B: two storey with one industrial and office unit; Block C: three storey with ground floor café and office, first floor offices, second floor gym and ancillary areas; new perimeter wall and fence with two revised entrances and gates; surface car parking and all associated site works.	Following examination of the relevant information and the nature of the work proposed. In its opinion and applying precautionary principles the author does not believe that there is likely to be any significant effects to the Natura 2000 sites and specifically the Dublin Bay Natura 2000 sites.
SD19A/0300	Single storey ESB substation (27sq.m) that will be accessed from the north off the Grange Castle South Access Road via the Baldonnel Road and off the permitted internal road granted under Reg. Ref. SD18A/0134, An Bord Pleanála Ref. ABP-302813-18 to the south; the proposal will result in a minor and temporary amendment to the landscaping and fencing permitted under Reg. Ref. SD18A/0134, An Bord Pleanála Ref. ABP-302813-18 that granted permission for a two storey data centre and delivery bays with associated three storey office block and services within the overall lands; no other changes to the permission granted under this decision are proposed under this application.	Having regard to the nature, scale and location of the proposed development, the distance from a Natura 2000 site and absence of linkages to same, a Stage 2 AA is not required.
SD19A/0342	Retention and continuance of the use for a further two years of the temporary gas powered generation plant which is located to the rear of the Takeda Ireland complex, is sited within a walled yard of 2,836sq.m containing 12 generator units with associated flues (each 15m high) which was permitted for a period of three years on the 10th January 2017 under Condition no.3 of permission granted under Reg. Ref. SD16A/0345; vehicular access to the generation plant will remain from the permitted service road into the EdgeConneX site and Grange Castle Business Park as originally permitted.	Having regard to the nature, scale and location of the proposed development, the distance from a Natura 2000 site and absence of linkages to same, a Stage 2 AA is not required.
SD20A/0049	Retain the two rooftop lattice telecommunications support structures carrying antennas and link dishes.	Having regard to the nature, scale and location of the proposed development, the

Planning Ref.	Description of development	Comments
		distance from a Natura 2000 site and absence of linkages to same, a Stage 2 AA is not required.
SD20A/0082	784 photovoltaic panels on the roof of the existing building with all associated site works.	Having regard to the nature, scale and location of the proposed development, the distance from a Natura 2000 site and absence of linkages to same, a Stage 2 AA is not required.
SD20A/0121	Construction of 3 two storey data centres with mezzanine floors at each level of each facility and associated ancillary development that will have a gross floor area of 80,269sq.m on an overall site of 16.5hectares.	A screening report was prepared which screened out the need for Stage 2 AA and the Council concurred with the findings.
SD20A/0124	(1) Demolition of existing single storey dwelling (c.108.5sq.m); (2) construction of a Distribution Warehouse Building comprising warehousing and ancillary areas at ground floor and support offices, staff areas and plant across two floors; (3) the development will be accessed from the existing Profile Park estate road; (4) provision of car parking, cycle parking, security gatehouse, landscaping and boundary treatments (including security fencing and gates); (5) all associated site development and services works (including diversion/culverting/reprofiling of existing stream on site); (6) total gross floor area of the development c.17,006sq.m.	A screening report was prepared which screened out the need for Stage 2 AA and the Council concurred with the findings.
SD20A/0147	Construction of P3 Phase II expansion of the existing P3 biopharma production facility which includes the construction of a circa 2,155sq.m, two storey biopharma production facility	A screening report was prepared which screened out the need for Stage 2 AA and the Council concurred with the findings
SD20A/0244	Retention of single storey client control room (248.5sq.m) associated with the planned future substation that will be located to the north-east of the permitted data centre development granted under Reg. Ref. SD18A/0134/ABP Ref. ABP-302813-18; the development will form an amendment and modification of the permission granted for a single storey transformer building (125sq.m) under Reg. Ref. SD18A/0134/ABP Ref. ABP-302813-18; no other changes to the permission granted under this decision are proposed under this application on a site within the townland of Aungierstown & Ballybane.	A screening report was prepared which screened out the need for Stage 2 AA and the Council concurred with the findings
SD20A/0283	Demolition of existing single storey vacant house, garage and outhouse (total gross floor area (GFA) c.291.2sq.m) and removal of existing temporary construction car park; Construction of a single 1-4 storey Central Administration Building and 2 2-storey (with mezzanine) data centres (DUB14 & DUB15) all to be located west of data centres DUB9, DUB10, DUB12 & DUB13 within the MS campus; The Central Administration Building (c.6.03m to c.19.85m high) will comprise central office administration, with staff cafeteria, staff gym and reception (GFA c.3,520sq.m), with provision of PV panels on the roof; each data centre (c.15.6m high to parapet height and c.18.65m	A screening report was prepared which screened out the need for Stage 2 AA and the Council concurred with the findings

Planning Ref.	Description of development	Comments
	to top of roof plant) will include data halls, admin blocks (comprising offices, canteen, loading dock, storage and ancillary areas) and a variety of mechanical and electrical plant areas/structures including Modular Electrical Rooms (MERs), battery rooms and transformer areas. GFA of DUB14 is c.28,072sq.m and GFA of DUB15 is c.28,173sq.m (c.56,246sq.m in total); DUB14 will also include 21 diesel generators and associated sub-stations (E-houses) and 11 mechanical flues (each c.30.75m high); Provision of a gas generator compound (to serve DUB15) containing 20 generators, 5 E-houses and 5 flues (c.25m max height); Provision of a Gas Networks Ireland gas skid including 3 kiosk buildings; Expansion of existing electrical sub-station compound (originally granted under SD07A/0632) to provide 3 additional transformer bays. 3 E-houses and 1 control room, 2 auxiliary transformers; 2 sprinkler tank and pump house areas, 1 additional rainwater harvesting plant; Provision of 168 permanent car parking spaces and 40 cycle parking spaces; Provision of additional western access to the MS campus (to serves the Central Administration Building) from the Business Park estate road (including bridge over the Griffeen River) with existing temporary access to be extinguished; Physical integration with the remainder of the existing MS campus (including internal access roads and landscaping) with associated modifications to the western boundary of the DUB09/DUB10/DUB12/DUB13 data centre development as permitted under SD16A/0088; Provision of a new temporary construction car park (with 802 car spaces, shuttle bus stop and shelter) on site north of the main entrance to the business park; Total gross floor area of the development will be c.59,766sq.m; All associated site development works, drainage and services provision, landscaping, boundary treatments (including security fencing) and associated works; An Environmental Impact Assessment Report (EIAR) has been submitted with this application; The application relates to a development which comprises an activity requiring an integrated pollution prevention and control (IE) licence.	
SD20A/0295	Amendments and modifications to the permitted data centre development granted under Reg. Ref. SD18A/0134 - ABP Ref. ABP-302813-18 and the temporary substation permission granted under SD19A/0300 to include: Demolition of the two storey dwelling of Weston House; single storey dwelling and outbuildings/ stables of Weston Lodge; and the single storey dwelling and converted garage of Kent Cottage. Retention of sprinkler tank and pump house to the south-west of Building A Data Centre to replace 4 sprinkler tanks; Retention of 40kW(p) PV panels on the roof of Building A Data Centre; Retention of revised size of northern attenuation pond and loss of permitted landscaping to its south; Retention of ramped access to rear of temporary substation	Having regard to the modest nature of the proposed development, and the distance of the site from nearby sensitive receptors, the proposed development will not cause any impacts on Natura 2000 sites and the Appropriate Assessment is not required.

Planning Ref.	Description of development	Comments
	permitted under SD19A/0300; Retention of revised flue arrangement for Building A Data Centre from 2 associated flues per generator to 1 associated flue per generator (16 in total) and grouped into 8 towers of two flues each (each 20m high); Retention of revised position of security fence to north, west and south of Building A Data Centre; and retention and modifications of landscape berm along Baldonnel Road and to east of Weston House. Development will consist of new works to include: Modifications of permitted vehicular entrance to the data centre to include a new single storey guard house (37sq.m) and two internal entrance gates; Modification to car parking so that the permitted entrance to the parking area from the east is closed off; Modifications of flue arrangement for Building B Data Centre from 2 associated flues per generator to 1 associated flue per generator (16 in total) and grouped into 8 towers of two flues each (each 20m high); Modifications to permitted landscape scheme to north and south of Building A Data Centre; Removal of roadside entrance to Erganagh House (demolished), Kent Cottage, and the former scaffolding yard; and removal of roadside entrance to Weston House and its replacement with a new agricultural gate and fence to be erected to facilitate access for maintenance and security purposes only all on a site of 9.7Ha located within lands in the Grange Castle South Business Park and the residential properties of Weston House, Kent Cottage and Weston Lodge as well as the former scaffolding yard on land within the townlands of Aungierstown and Ballybane; Ballybane; and Milltown and bounding Baldonnel Road to the west and south and Grange Castle South access road to the north, Baldonnel, Dublin 22.	
SD20A/0295	Amendments and modifications to the permitted data centre development granted under Reg. Ref. SD18A/0134 - ABP Ref. ABP-302813-18 and the temporary substation permission granted under SD19A/0300 to include: Demolition of the two storey dwelling of Weston House; single storey dwelling and outbuildings/ stables of Weston Lodge; and the single storey dwelling and converted garage of Kent Cottage. Retention of sprinkler tank and pump house to the south-west of Building A Data Centre to replace 4 sprinkler tanks; Retention of 40kW(p) PV panels on the roof of Building A Data Centre; Retention of revised size of northern attenuation pond and loss of permitted landscaping to its south; Retention of ramped access to rear of temporary substation permitted under SD19A/0300; Retention of revised flue arrangement for Building A Data Centre from 2 associated flues per generator to 1 associated flue per generator (16 in total) and grouped into 8 towers of two flues each (each 20m high); Retention of revised position of security fence to north, west and south of Building A Data Centre; and retention and modifications of landscape berm along Baldonnel Road and to east of Weston House. Development will consist of new works to include: Modifications of permitted vehicular entrance to the data centre to include a new single storey guard house (37sq.m) and two internal entrance gates; Modification to car parking so that the permitted entrance to the parking area from the east is closed off; Modifications of flue arrangement for Building B Data Centre from 2 associated flues per generator to 1 associated flue per generator (16 in total) and grouped into 8 towers of two flues each (each 20m high); Modifications to permitted landscape scheme to north and south of Building A Data Centre; Removal of roadside entrance to Erganagh House (demolished), Kent Cottage, and the former scaffolding yard; and removal of roadside entrance to Weston House and its replacement with a new agricultural gate and fence to be erected to facilitate access for maintenance and security purposes only all on a site of 9.7Ha located within lands in the Grange Castle South Business Park and the residential properties of Weston House, Kent Cottage and Weston Lodge as well as the former scaffolding yard on land within the townlands of Aungierstown and Ballybane; Ballybane; and Milltown and bounding Baldonnel Road to the west and south and Grange Castle South access road to the north, Baldonnel, Dublin 22.	Having regard to the modest nature of the proposed development, and the distance of the site from nearby sensitive receptors, the proposed development will not cause any impacts on Natura 2000 sites and the Appropriate Assessment is not required.

Table 5.3: Planning applications granted permission in the vicinity of the Proposed Development.

5.7 MITIGATION MEASURES

Construction Phase

Potential impacts on nesting birds will be avoided by timing the cutting of vegetation as required by the Wildlife Acts.

Bat friendly lighting with 0-3lux in the outer spill area of the proposed temporary car park will be employed, including design features such as directional cowls to direct the light into the car park area and away from the Grand Canal corridor.

The requirements for the protection of the Griffeen River will be again highlighted in the updated Construction Management Plan and a Method Statement including the proposed measures for the protection of water quality.

Specific measures will include maintaining the buffer zone of no development in areas outside the specific water course crossing and the protection of water quality during the access bridge construction and placement works to avoid elevated suspended solids being washed downstream.

Standard measures for the protection of fisheries will be included in the CMP per the IFI Guidelines (IFI, 2016)[3].

Silt curtains will be placed along the upper bank along the river bank to prevent siltation of the Griffeen River during the bridge installation. The works area will be fenced with Terram or equivalent geo-textile fencing, secured to the ground to prevent the wash-out of suspended solids from the site to the open channel. Where possible, this will be set back from the riparian corridor of the water course to allow the retention of a buffer-zone of riparian vegetation along the channel.

There will be no stockpiling of spoil within 10m of the upper level of the river banks.

All chemicals and hydrocarbons will be stored as per the conditions of the existing CMP away from the river.

Concrete pouring will be restricted in the proximity of the open channel within and adjacent to the site.

Washing out of concrete vehicles on site will be prohibited as they are the greatest potential source of high alkalinity in watercourses. Consequently, it is a requirement that all concrete vehicles washout takes place off site.

The CMP will be updated in consideration of standard best practice and, as expanded on by the contractor, will align with the guidance set out in the following documents:

- CIRIA – Guideline Document C532 Control of Water Pollution from Construction Sites (CIRIA, 2001)[4]; and
- CIRIA – Guideline Document C624 Development and Flood Risk - guidance for the construction industry (CIRIA, 2004)[5]; and
- CIRIA (2015) Environmental Good Practice on Site C692 (4th Edition) (C762)[6].

Operational Phase
The consideration of the promotion of Biodiversity has been included in the Landscape Strategy for the site drawn up by Brady Shipman Martin.

5.8 PREDICTED IMPACTS

Habitats
The development is located in an area of low to moderate ecological value and as such predicted to have a neutral imperceptible effect on biodiversity. Specific local mitigation measures include the avoidance of cutting of vegetation during the bird nesting season with regard to the construction phase.

With the employment of appropriate mitigation measures with regard to water quality and the protection of the Griffeen River during all aspect of construction and operation, the Proposed Development will have a neutral imperceptible and long-term effect on the Griffeen River.

With the employment of appropriate mitigation measures with regard to local biodiversity, the Proposed Development will have a neutral imperceptible and long-term effect on biodiversity.

Bats
There is no evidence of a current or past bat roost on site, therefore no significant negative effects on these animals are expected to result from the proposed redevelopment.

Badgers
There will be no significant impact on badger populations and the predicted impact will be neutral and imperceptible.

Birds
Potential impacts on nesting birds can be avoided by timing the cutting of vegetation as required by the Wildlife Acts with a neutral imperceptible impact.

5.9 'DO NOTHING' SCENARIO

If the proposed development were not to procced there would be no impacts on biodiversity.

5.10 WORST CASE SCENARIO

A worst case scenario would arise if a significant pollution event were to occur with regard to the Griffeen River.

5.11 MONITORING & REINSTATEMENT

There is no requirement for monitoring with regard to Biodiversity. The proposed temporary car park will be levelled with crushed gravel and reinstated to grassland after the required service period has elapsed.

5.12 DIFFICULTIES IN COMPILING INFORMATION

There were no difficulties in compiling information on biodiversity.

[3] IFI (2016) Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters
[4] CIRIA, 2001. Guidance Document C532 Control of Water Pollution from Construction Site: https://www.ciria.org
[5] CIRIA, 2004. Guidance Document C624 Development and Floor Risk – guidance for the construction industry: https://www.ciria.org
[6] CIRIA, 2015. Environmental Good Practice on Site C692 (4th Edition): https://www.ciria.org

5.13 REFERENCES

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Collins, J (ed)(2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

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Fossitt, J. (2000) A Guide to Habitats in Ireland. The Heritage Council.

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Smith, G.F., O'Donoghue, P., O'Hora, K. and E. Delaney (2011) Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council.

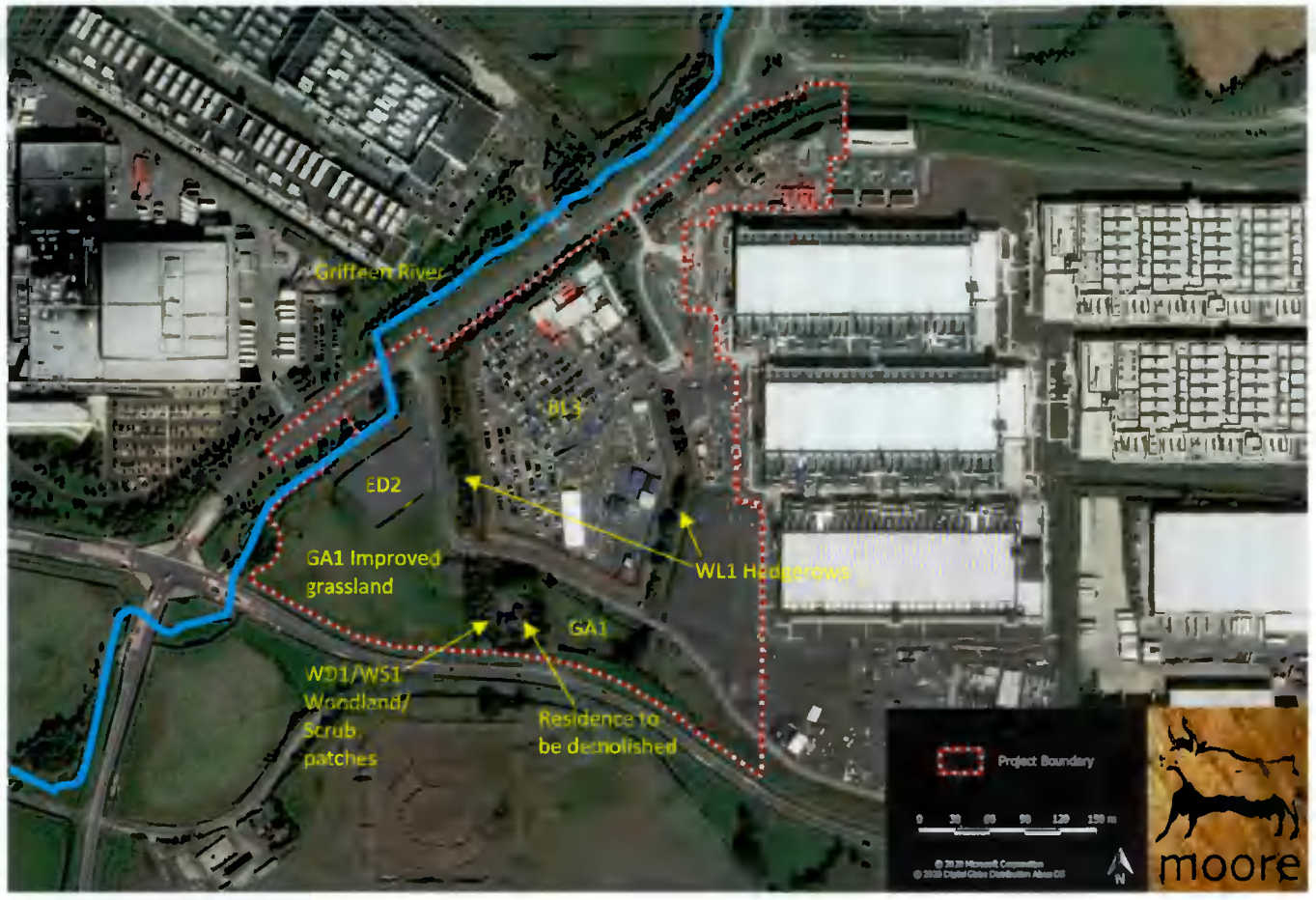

Figure 5.1a: Habitat Map showing the main data centre site area.

Figure 5.1b: Habitat Map showing the proposed temporary car park site area.

6 LAND, SOIL & GEOLOGY

6.1 INTRODUCTION

The permitted Microsoft Dub 14-15 Data Centre Development, as proposed to be amended, is to be located on a site within Grange Castle Business Park, Clondalkin, Dublin 22 (Site A Figure 6.1). This chapter of the EIAR assesses and evaluates the potential impacts on the land, soil and geological aspects of the site and surrounding areas. In assessing likely potential and predicted impacts, account is taken of both the importance of the attributes and the predicted scale and duration of the likely impacts.

Figure 6.1: Aerial View of Grange Castle Business Park with the site outlined in red. (Bing Maps)

6.2 METHODOLOGY

The appraisal methodology for the EIAR is completed in accordance with the EPA 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2017). The EPA document entitled 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003) is also followed in this geological assessment and classification of environmental impacts. Due consideration is also given to the guidelines provided by the Institute of Geologists of Ireland (IGI) in the document entitled 'Guidelines for the Preparation of Soils and Geology Chapters of Environmental Impact Statements (IGI 2013 (in preparation)).

In addition, the document entitled 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009) is referenced where the methodology for assessment of impact is appropriate.

The rating of potential environmental impacts on the soils and geology environment is based on the matrix presented in Table 6.1 below which takes account of the quality, significance, duration and type of impact characteristic identified.

In the EIAR 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 cited attribute. These impact ratings presented in Table 6.1 below are in accordance with impact assessment criteria provided in the EPA (2017) publication.

The duration of each impact is considered to be either temporary, short-term, medium term, long-term, or a permanent impact. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts were seen as impacts lasting one to seven years; medium-term impacts lasting seven to fifteen years; long-term impacts lasting fifteen to sixty years; and permanent impacts lasting over sixty years.

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
	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
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	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 not 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
	'Worst Case'	The impacts arising from a development in the case where the mitigation measures may substantially fail

Table 6. 1 Glossary of Impacts following EPA Guidance Documents

The NRA criteria for rating the magnitude and significance of impacts at EIA stage on the geological related attributes are also relevant in determining impact assessment and area presented in Table 6.2 below.

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

Table 6.2 Criteria for rating impact magnitude at EIAR stage – Estimation of magnitude of impact on soil/ geology attribute (NRA, 2009)

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 subject 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;

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 databases and other archives where available. Data was sourced from the following:

- 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
- National Monuments Service – Recorded archaeological monuments
- Department of Communications, Energy and Natural Resources – Current and prospecting mining facilities
- South Dublin County Council - Landfill information.

Relevant documentation consulted as part of this assessment included the following:

- Site walkovers
- Site specific ground investigation
    - Grangecastle Ground Investigation – GII, 2019
    - DUB14/15 Ground Investigation – CGL, 2021

Technical Limitations

This section outlines whether any limitations were noted during the environmental assessment from a land, soils and geology perspective.

The baseline data described and considered in this assessment includes existing data from desk study information available at the time in the region as well as dedicated field surveys commissioned specifically for the proposed development. The data collected provides comprehensive information on land and soils within the study area.

The baseline data from the intrusive investigation provides valuable information on the existing land and soils environment at point locations within the study area. Between each point the baseline data from the intrusive investigation has been assessed by conservative interpretation. While land and soils can vary, the exploratory locations have been selected following the completion of the comprehensive review of all existing information available at the time.

Based on the comparability of the results from the investigations commissioned specifically for the proposed development and the desk study of existing information on the baseline conditions, the information and understanding on the baseline conditions is deemed sufficient and there were no technical limitations.

6.3 RECEIVING ENVIRONMENT

Site Area Description

The proposed development is to be located on currently undeveloped lands in Grangecastle Business Park, Clondalkin, Dublin 22. The majority of the site is currently being used as a construction compound and temporary car parking facility for other data centre developments on adjacent lands. The site is c. 16.23 hectares and is bounded by the recently realigned Nangor Road to the southern boundary, Grangecastle estate roads to the northern and western boundary and Microsoft data centre campus development to the eastern boundary. (Fig 6.1)

Topography and Geomorphology

The original site topology was relatively flat with a gradual fall of 3m across the site from c60.00m OD on the south east corner to c.66m OD on the northern boundary. Various council approved soil deposits and temporary road surfaces from adjacent construction activity have recently changed the original site topology. A series of mounds of material were noted during the site walkover and are located along the temporary infrastructure within the site. These mounds have likely been generated from the adjacent construction.

There are a number of geomorphology features across the region including mega scale glacial lineation in the north of the region, streamlined bedrock, numerous meltwater channels, hummocky sands and gravel deposits, drumlins, eskers and glaciofluvial terraces throughout the region, however none are identified within the study area.

Historic Land Use

The OSI 6-inch mapping from 1837 -1842 indicates the proposed development is likely to have been a greenfield site with very few developments or dwellings in the surrounding area. Three watercourses are shown to traverse through the proposed development with additional watercourses in the study area. A quarry is shown approximately 200m west of the proposed development.

The OSI 25-inch mapping shows the proposed development and study area generally remains unchanged with minor alterations to field boundaries.

The OSI 6-inch Cassini map shows the proposed development remains a greenfield site. The field boundaries have been altered within the study area and a new development is noted within the southeast part of the study area. A 10kV powerline is noted traversing the site from west to east. Additional development is evident in the study area, particularly to the southwest of the proposed development.

The aerial imagery from 1995 shows the proposed development has been partially developed. The western extents of the proposed development are predominantly used for agricultural purposes. The eastern extent of the proposed development has been developed for recreational purposes with the construction of the Ballybane pitch and putt course with additional development noted to the southwest corner of the proposed development. The remaining fields within the proposed development are shown to be agricultural fields. The development previously shown in the 6-inch Cassini map has had a building removed. There has been some development in the study area most notably with the construction on the Kilcarberry Business Park, to the east of the proposed development.

The aerial imagery from 2000 shows the proposed development remains unchanged with industrial development noted to the east of the proposed development.

The aerial imagery from 2005 shows the junction between New Nangor Rd and Baldonnell Rd is under construction which impacts the western field of the proposed development. The imagery also shows that one of the watercourses running along the western extent of the proposed development has been diverted away from the proposed development. It is evident that there is trafficking through the fields within the proposed development, likely to facilitate construction of the proposed road network surrounding the proposed development. In the surrounding area, construction has finished on the Kilcarberry Business Park.

Significant industrial and commercial development has occurred within the study area from the aerial imagery from 2013 to 2018. The pitch and putt course is no longer in use. The watercourse that intersects the eastern site boundary appears to have been diverted as a result of the adjacent development. The imagery shows one of the residential properties has been removed and is used as part of the construction site for adjacent developments. Mounds of material are visible in the western most field of the site. A structure is now shown in the northeast corner of the site boundary. Construction on the extension of Baldonnell Rd is complete. The junction between Baldonnell Rd and New Nangor Rd is still under construction. East of the site, three datahalls have been constructed. West of the site two large developments have been constructed.

The aerial imagery from 2021 shows the former pitch and putt field has been mostly paved over and appears to be used for parking and as a contractor's compound. An access road is now shown to pass through the proposed development from Baldonnell Rd to the adjacent development. A paved area is shown in the western field of the site. Temporary surfacing comprises permeable gravel finishes and surface water drainage from this section of the site flows towards the original Baldonnel Stream. The one remaining residential property is still shown. East of the site, three additional datahalls have been constructed. In the surrounding area, construction of New Nangor Rd has finished and the junction appears to be nearing completion. A development appears to be starting construction just south of New Nangor Road.

There are no known illegal/historic landfills within 500 metres of the site.

Figure 6.2 Historical 6" Map 1837 to 1842 (Ref OSI Online)

Soils

The main soils within the study area, as classified by Teagasc (Teagasc et al. 2017) are predominantly topsoils consisting of poorly drained mineral soils (BminPD) and deep well drained mineral soils (BminDW) along with made ground deposits associated with urban developments. A summary of soils within the Study Area is listed in Table 6.3.

Strata	Description	Location	Importance	Justification for Importance rating
Topsoil -BminPD	Mineral poorly drained (Mainly basic)	Widespread	Low	Poorly drained and or low fertility soils
Made	Made Ground	Widespread	Low	Poorly drained and or low fertility soils

Strata	Description	Location	Importance	Justification for Importance rating
Topsoil - BminSW	Renzinas/Lithosols	Widespread	Low	Poorly drained and or low fertility soils
Topsoil -BminDW	Deep well drained mineral (Mainly basic)	Widespread	High	Well drained and/or high fertility soils

Table 6.3 Summary of soils within the Study Area

Subsoils

Superficial deposits (subsoil) comprise of the unconsolidated geological deposits which overlie the solid geology. The subsoils within the study area, as classified by the GSI Quaternary mapping (GSI 2016) and are listed in Table 6.4. The main subsoils encountered within the study area are glacial tills derived from limestones. Areas of bedrock outcrop or subcrop are noted to western boundary of the proposed development and gravels derived from limestone to the north of the Proposed Development.

Strata	Description	Location	Importance	Justification for Importance rating
TLs	Till derived from Limestone	Widespread	Low	Low value on a local scale
Gls	Gravels derived from Limsetone	North	Low	Low value on a local scale
Rck	Bedrock outcrop or subcrop	West	Low	Low value on a local scale

Table 6.4 Summary of subsoils within the Study Area

Bedrock Geology

The GSI generalised 1:100,000 bedrock map identifies the bedrock at the site as the Lucan Formation and is listed in Table 6.5. The Lucan Formation typically comprises dark-grey to black, fine grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey.

Rock outcrops are noted to the west of the site, with the nearest outcrop located approximately 300m away. The GSI Geourban depth to bedrock maps shows the depth to bedrock is 1 to 3m within the study area. No major structural bedrock features were identified within this section of the study area.

There are no karst features identified within the study area in the GSI karst database (GSI 2021) nor is this predominantly Limestone bedrock particularly susceptible to karst. Consequently, the risk of karst is deemed negligible due to the geology of the region not being known to contain karst features and will not be further assessed.

Formation	Description	Location	Importance	Justification for Importance rating
Lucan Formation	Dark Limestone and Shale	Widespread	Low	Low value on a local scale

Table 6.5 Summary of rock formations within the Study Area

Historic and Project Specific Ground Investigation

Site specific ground investigations were completed in 2019 by Ground Investigation Ireland Ltd. and in 2021 by Causeway Geotechnical Ltd.

The ground conditions encountered during the investigations are summarised below with reference to in-situ and laboratory test results completed during the survey.

The sequence of strata encountered were consistent across the site and are generally comprised of;

- Topsoil
- Made Ground
- Glacial Deposits
- Weathered Rock
- Bedrock

Further information on the sequence of strata encountered is listed in Table 6.6.

Strata type	Depth to top of strata (m BGL)	Thickness (m)
Topsoil – Soft slightly sandy gravelly CLAY with roots and rootlets	0	0 – 0.5
Made Ground – Soft to stiff gravelly silty CLAY and sandy fine to coarse GRAVEL with occasional rope and plastic fragments.	0 – 0.3	0 – 2.9
Silt – Firm to stiff slightly sandy slightly gravelly SILT	0.6 - 2	0 - 0.6
Glacial Deposits – Soft to very stiff brownish grey and brown sandy gravelly CLAY with cobbles and soft to very stiff greyish black to black slightly sandy gravelly CLAY with cobbles and boulders.	0 - 3	0.5 – 3.4
Gravel – Medium dense to stiff sandy, occasionally clayey, angular, occasionally subangular to subrounded, fine to coarse GRAVEL	0.6 – 3.5	0 - 1.1
Weathered Rock – Grey weathered LIMESTONE	1.5 – 1.8	0 – 0.5
Bedrock – Weak to medium strong thinly laminated argillaceous LIMESTONE, occasionally with medium spaced beds of weak thinly laminated calcareous MUDSTONE	1.4 – 4.9	-

Table 6.6 Summary of soils within the Study Area

Groundwater: A number of groundwater installations were installed as part of the 2021 ground investigation. At the time of writing this chapter, groundwater was noted as shallow as 1.3m below existing ground level from readings taken over a nine week period between March to June 2021. Groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors.

Geo-environmental Classification

Various samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as hazardous or non-hazardous. This allowed for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.).

The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

As part of the 2021 ground investigation, 141 samples were tested from 60 locations across the site area, comprising:

- 60 samples from Made Ground within the above ground soil mounds
- 18 samples from Made Ground below ground surface
- 63 samples from natural glacial soils

Nine of the 141 samples (6%) were classified as non-hazardous with the remaining samples classifying as inert. None of the samples tested were classified as hazardous.

Feature	Description	Importance	Justification for Importance rating
Potentially Contaminated land	Areas of non-hazardous material identify during the ground investigation	Medium	Degree or extent of soil contamination is moderate on a local scale

Table 6.7 Summary of Potentially Contaminated Land within the Study Area

Geological Heritage Areas

Geological Heritage Areas are designated as part of the Irish Geological Heritage Programme; a partnership with the GSI (2019c) and the (then) Department of Environment, Heritage and Local Government. There are 3 no of designated geological heritage sites identified within the region, they include Belgard Quarry, Lucan Esker and Newcastle Burial Channel. However, no Geological Heritage Areas were identified within the study area.

Mineral/Aggregate Resources

The following datasets were consulted in order to assess the effect of the proposed development on the economic geology of the study area:

- GSI: aggregate potential mapping (GSI 2016);
- GSI: mineral localities (GSI 2014); and
- GSI active quarries (GSI 2019).

A summary of the crushed rock aggregate potential and granular aggregate potential is listed in Table 6.8. There are no active pits, mines or quarries and no mineral localities identified within the study area. The crushed rock aggregate potential ranges from moderate to high. Very low to low granular aggregate potential was identified within the northern extents of the study area. Considering the location of the Proposed Scheme within an urban/industrial setting, it is unlikely that there will be many opportunities to extract mineral or aggregate resources.

Feature	Potential	Location	Importance	Justification for Importance rating
Granular Aggregate Potential	Very low	North of Study Area	Low	Uneconomical extractable mineral resource
Granular Aggregate Potential	Low	North of Study Area	Low	Uneconomical extractable mineral resource
Crushed rock aggregate potential	Moderate	West of study area	Medium	Sub-economic extractable mineral resource
Crushed rock aggregate potential	High	East of study area	Medium	Extractable mineral resource
Crushed rock aggregate potential	Very High	West of study area	Medium	Extractable mineral resource

Table 6.8 Summary of Aggregate Resources within the Study Area

Summary of Features of Importance

The feature importance ranking based on the NRA Guidelines established for the baseline conditions has been summarised below.

Features with an importance ranking of low are not considered further as they will not result in a significant effect according to Box 5.4 of the NRA Guidelines. These are however summarised in Table 6.9 for completeness. Features with an importance ranking of medium or higher are summarised in Table 6.10 and the effect of the proposed development on these features will be assessed in Section 6.7.

Category	Feature	Location	Description	Importance	Justification for Importance rating
Topsoil - BminPD	Mineral poorly drained (Mainly basic)	Widespread	Poorly drained and or low fertility soils	Low	Low value on a local scale
Made	Made Ground	Widespread	Poorly drained and or low fertility soils	Low	Low value on a local scale
Topsoil - BminSW	Renzinas/Lithosols	Widespread	Poorly drained and or low fertility soils	Low	Low value on a local scale
Subsoils quality and significance	TLs	Till derived from Limestone	Widespread	Low	Low value on a local scale
Subsoils quality and significance	Rck	Bedrock outcrop or subcrop	Approximately 300m west	Low	Low value on a local scale
Bedrock quality and significance	Lucan Formation	Dark Limestone and Shale	Widespread	Low	Low value on a local scale
Mineral Aggregate Resources	Granular Aggregate Potential	Very low	North of Study Area	Low	Uneconomical extractable mineral resource
Mineral Aggregate Resources	Granular Aggregate Potential	Low	North of Study Area	Low	Uneconomical extractable mineral resource

Table 6.9 Summary of Land, Soils & Geology Features with Low Importance within the Study Area

Category	Feature	Location	Description	Importance	Justification for Importance rating
Soil Fertility	Topsoil - BminDW	West of Proposed Development	Deep well drained mineral (Mainly basic)	High	Well drained and/or high fertility soils
Contaminated land	Potentially Contaminated Land	Proposed Development	Areas of non-hazardous material identify during the ground investigation	Medium	Degree or extent of soil contamination is moderate on a local scale
Economic Geology	Crushed rock aggregate potential	West of study area	Moderate	Medium	Sub-economic extractable mineral resource
Economic Geology	Crushed rock aggregate potential	East of study area	High	Medium	Extractable mineral resource
Economic Geology	Crushed rock aggregate potential	West of study area	Very High	Medium	Extractable mineral resource

Table 6.10 Summary of Land, Soils & Geology Features with medium to high importance within the Study Area

6.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

6.5 DO NOTHING' SCENARIO

Should the Data Centre Development not proceed there will be no change to the environmental profile of the site in relating to Soils, Geology and Hydrogeology.

6.6 WORST CASE SCENARIO

The worst-case scenario on the environmental profile of Soils and Geology arising from the development of the Data Centres occurs during the construction phase. Contamination of the soils and ground water could be activated by material spillages or oil and fuel spillages during construction activities. Following the NRA criteria for rating the magnitude and significance of impacts on the geological and hydrogeological related attributes, the magnitude of impact resulting from the ultimate development is considered Negligible.

6.7 POTENTIAL IMPACTS

Construction Phase

The construction activities relevant to soils and geology include:

- Excavation for foundations and site infrastructure
- Breaking of rock using hydraulic breakers
- Filling activities for buildings and infrastructure
- Reuse and processing of site material
- Importation, exportation and disposal of materials
- Dewatering

The potential land and soils effects during the construction phase for the relevant construction activities are presented in this section, along with their effect significance. These potential effects also relate and interact with other environmental factors which are described within the EIAR.

Construction activities will have the following potential effects on land and soils as discussed below and summarised in Table 6.11.

- Loss and damage of topsoil and subsoil
- Excavation of Potentially Contaminated Ground
- Loss of solid geology
- Accidental Spills and Leaks
- Earthworks haulage
- Effect on the surrounding ground

Loss and Damage to Topsoil: Topsoil is a non-renewable source which if removed or damaged can result in a permanent irreversible negative impact.

There are a number of ways this could happen:

- There is the potential for construction materials on site to be spilled resulting in the pollution of the topsoil. For example, raw or uncured concrete and grouts, washed down water from exposed aggregate surfaces, cast-in-place concrete from concrete trucks, fuels, lubricants and hydraulic fluids for equipment used on the development site, bitumen and sealants used for waterproofing concrete surfaces can all potentially impact on soils and groundwater during construction stage.
- Excavations in areas of contaminated ground the construction works may mobilise pollution contained in the soils into the nearby topsoil.
- Permanent damage of topsoil through waterlogging, sealing, washout of fines and erosion. This would be due to the trafficking of plant, regrading of slopes, laying of hardstanding surfaces and storage of materials in areas not intended to be paved as part of the Proposed Development.
- Excavation and disposal of topsoil instead of its reuse or reinstatement.

Where the proposed development results in the need for topsoil to be removed and/or stripped, all of the above impacts are likely to occur at these locations.

The magnitude of these impacts of Proposed Development on the topsoil is small adverse as it results in a permanent irreversible loss of a small proportion of locally high fertility topsoil and/or a high proportion of locally low fertility topsoil within the study area. As the topsoil is of medium importance the resulting significance of this permanent small adverse impact is **slight**.

Excavation of Potentially Contaminated Land: The excavation of made ground will result in the production of excess material that requires placement elsewhere in the development or removal off-site and or the mobilisation of possible contaminants.

Exposure of locations of contamination and excavation of contaminated soil may potentially lead to a risk to the surrounding environment or underlying soil if not dealt with in an appropriate manner in accordance with the Environmental Protection Agency guidance on Land Contamination. No hazardous contamination was identified as part of the previous site-specific ground investigation. If contaminated soil/water is encountered, it will be required to be removed to a licensed waste facility.

The magnitude of this impact is Small Adverse as it results in a permanent excavation of a small proportion of made ground on a local scale. As the made ground is of medium importance the resulting significance of this impact is **slight**.

Loss of Solid Geology: Excavation of rock will be required to construct the proposed development in isolated areas. This will involve the use of ripping and hydraulic breaking methods to extract the rock. Where possible, excavated material will be reused in the proposed development if it can be shown to fulfil an appropriate engineering specification. If the excavated rock does not meet an appropriate engineering specification, it could be reused in landscaping. Given the small quantity of rock which may be excavated, it is considered a medium importance. Therefore, this has been assigned a **slight** effect upon the local environment.

Accidental Spills 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.
- The use of concrete and cement during pad foundation construction.

Accidental spillages may result in contamination of soils and groundwater underlying the site, should contaminants migrate through the subsoil's and impact underlying groundwater. Soil stripping and pad foundation construction will also reduce the thickness of subsoils. Concrete (specifically, the cement component) is highly alkaline and any spillage which migrates though subsoils would be detrimental to groundwater quality.

Earthworks Haulage: During earthworks, heavily loaded large earthmoving vehicles will travel through the proposed development, causing ground vibrations, soil compaction and disturbance of natural ground on unfinished road surfaces. This will also result in increased traffic on the roads to and from the

proposed development site, although internal haul roads (access tracks) would be used where possible. Increased noise, dust and vibration will also be generated. These works are expected to have a low importance given the volume of the material for removal is low on a local scale. The magnitude of the impact of this would be small adverse. The significance of the potential effect is **imperceptible**.

Effect on the surrounding ground: The soil and rock excavation during the construction process at the proposed development has the potential to induce movement and settlement of surrounding ground. The removal of the bedrock will be carried out using mechanical excavation during the construction which could result in minor ground vibrations with effects felt in the immediate vicinity of the works. These works are expected to have a low importance given the underlying soils are a firm to stiff clay and the distance to key receptors. The magnitude of the impact of this activity would be small adverse. The significance of the potential effect is **imperceptible**.

Loss of Future Quarry or Pit Reserve: The sterilisation of land through development or the excavation of soil and rock during construction can diminish future quarry and pit reserves which have been shown to have been utilised in the past in the area such as the quarries west of the site. This can result in a permanent irreversible loss of the *in-situ* characteristics of the land, soils and geology area. The magnitude of this impact is negligible as it results in an insufficient permanent irreversible change on a local scale to affect the integrity of the land and soils above the do-nothing scenario. As the aggregate potential is of medium to high importance the resulting significance of this negligible impact is **imperceptible** and will not be considered further.

A summary of the predicted construction impacts are provided in Table 6.11. Note that the quality of all the impacts are negative and the scale is local.

Feature	Description	Importance	Effect	Duration	Magnitude	Significance
Soil Fertility	Topsoil - BminDW	High	Loss or damage of topsoil and subsoil	Permanent	Small adverse	Slight
Contaminated land	Potentially Contaminated Land	Medium	Degree or extent of soil contamination is moderate on a local scale	Permanent	Small adverse	Slight
Topsoil and subsoils quality and significance	Heavily loaded vehicles moving through the site	Medium	Earthworks Haulage	Temporary	Small adverse	Imperceptible
Topsoil and subsoils quality and significance	Ground vibrations	Medium	Effect on the surrounding ground	Temporary	Small adverse	Imperceptible
Economic Geology	Crushed rock aggregate potential	Medium	Loss of future quarry or pit reserve	Permanent	Negligible	Imperceptible
Economic Geology	Crushed rock aggregate potential	High	Loss of future quarry or pit reserve	Permanent	Negligible	Imperceptible
Economic Geology	Crushed rock aggregate potential	Very High	Loss of future quarry or pit reserve	Permanent	Negligible	Imperceptible

Table 6.11 Summary of Predicted Construction Phase Impacts at Proposed Development

Operational Phase

There is a potential for leaks and spillages during operation and maintenance of the development. Any accidental emissions of chemicals or oil, petrol or diesel leaks could cause contamination if the emissions enter the surrounding waterways, soil and groundwater environment. Incorporation of hard stand areas will reduce local recharge to ground. The significance of the effect is **imperceptible** on any of the land and soil important features such as the topsoil.

6.8 MITIGATION MEASURES

The following sections outline the mitigation and monitoring measures designed to avoid or minimise those impacts identified in Section 6.7 for the construction and operational phases of the proposed development.

Construction Phase

The mitigation strategy outlined in this section will be implemented during the construction phase of the proposed development. The strategy will be incorporated into the overall Construction Environment Management Plan (CEMP).

Construction techniques that comply with the requirements of statutory bodies (South Dublin County Council and EPA) in terms of noise, vibration, soil and groundwater contamination and disposal of contaminated material for both soil and rock cuttings will be adopted.

Regulatory Compliance: The adopted construction techniques will comply with the requirements of statutory bodies (South Dublin County Council and EPA) and construction will be completed in accordance with the CEMP.

- Good housekeeping (daily site clean-ups, use of disposal bins, etc.) will be carried out on site during construction, and the proper use, storage and disposal of all substances and their containers will help prevent soil contamination. For all activities involving the use of potential pollutants or hazardous materials, there will be a requirement to ensure that the material such as concrete, fuels, lubricants and hydraulic fluids will be carefully handled and stored to avoid spillages. Potential pollutants will also be adequately secured against vandalism and will be provided with proper containment according to codes of best practice. Any spillages will be

immediately contained, and contaminated soil removed from site and disposed of in a licensed waste facility.

- Excavations in made ground will be monitored by an appropriately qualified person to ensure that any hotspots of contamination encountered are identified, segregated and disposed of appropriately. Any identified hotspots will be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure that the hotspot does not cross- contaminate clean soils elsewhere throughout the site.
- Potential soil and water pollution will be minimised by the implementation of good construction practices. Such practices will include adequate bunding for oil containers, wheel wash and dust suppression on site roads, and regular plant maintenance. The Construction Industry Research and Information Association (CIRIA) provides guidance on the control and management of water pollution from construction sites in their publication Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (Masters-Williams et al, 2001) and this will be reflected in the CEMP. An Emergency Response Plan has been prepared and included in the CEMP and will be further developed by the appointed contractor prior to the commencement of works and regularly updated, identifying the actions to be taken in the event of a pollution incident. The Emergency Response Plan will address the following:
    - Containment measures;
    - Emergency discharge routes;
    - List of appropriate equipment and clean-up materials;
    - Maintenance schedule for equipment;
    - Details of trained staff, location and provision for 24-hour cover;
    - Details of staff responsibilities;
    - Notification procedures to inform the relevant environmental protection authority;
    - Audit and review schedule;
    - Telephone numbers of statutory water undertakers and local water company; and
    - List of specialist pollution clean-up companies and their telephone numbers.

Loss or damage of topsoil: Excavated topsoil will be stockpiled in accordance with TII standards using appropriate methods to minimise the effects of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. Any surplus suitable material excavated that is not required elsewhere for the proposed development, will be reused for other projects where possible, subject to appropriate approvals/notifications or removed off site to a suitable licensed facility.

In order to reduce the compaction and erosion of topsoil outside the areas of direct construction, haul routes will be along predetermined routes within the proposed development and deliveries will be along predetermined routes outside the proposed development. Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to its original condition. Where practical, compaction of any soil or subsoil which is not part of the works or to remain in-situ within the proposed development will be avoided.

The Contractor will ensure that any topsoil or subsoil is assessed for re-use within the proposed development ensuring the appropriate handling, processing and segregation of the material. Where practical the removal of soil from the proposed development will be avoided. All earthworks will be undertaken in accordance with TII Specification for Road Works (SPW) Series 600 Earthworks and project specific earthworks specifications ensuring that all excavated material and imported material is classified using the same methodology so as to allow maximum opportunity for the reuse of materials on site.

Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.

Excavation of Potentially Contaminated Ground: Any excavations within made ground should follow the criteria outlined in the CEMP. The CEMP will be updated by the contractor prior to the commencement of construction. Excavations in made ground will be monitored by an appropriately qualified person to ensure that any localised areas of contamination encountered are identified, segregated and disposed of appropriately and to ensure soils are consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations. Any identified localised areas of contamination will be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure that the contaminated material does not cross-contaminate clean soils elsewhere throughout the site.

All excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants in order to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be disposed of by a licensed waste disposal contractor.

Any dewatering in areas of contaminated ground will be designed to minimise the mobilisation of contaminants into the surrounding environment. Where dewatering in such areas is unavoidable the water will be adequately treated prior to discharge.

Loss of Solid Geology: All excavated material, where possible will be reused within the proposed development. The appointed contractor will ensure acceptability of the material for reuse for the proposed development with appropriate handling, processing and segregation of the material in accordance with the CEMP. This material would have to be shown to be suitable for such use and subject to appropriate control and testing according to earthworks specifications.

Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. Any surplus suitable material excavated that is not required elsewhere for the proposed development, will be used for other projects where possible, subject to appropriate approvals/notifications.

Fuel and Chemical Handling: To minimise any impact on the surrounding environment and underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be

stored within temporary bunded areas. Oil and fuel storage tanks shall be stored in designated areas, 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.
Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (or where possible off the site) which will be away from surface water gullies or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank.

An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as "Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001) will be complied with.

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. The pouring of concrete will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite. In the case of drummed fuel or other chemical which may be used during construction containers should be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

Earthworks haulage: Earthworks haulage will be along predetermined routes within the proposed development and any deliveries to site will be along existing national, regional and local routes for importation and exportation of materials, in accordance with the Construction Traffic Management Plan (CTMP) included in the CEMP. Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to its original condition. Where practicable, compaction of any soil or subsoil which is to remain in situ along the sites will be avoided.

Earthworks operations shall be carried out such that surfaces will be designed with adequate falls, profiling and drainage to promote safe runoff and prevent ponding and flooding. Runoff will be controlled through erosion and sediment control structures appropriate to minimise the water effects. Care will be taken to ensure that surfaces are stable to minimise erosion.

Excavations in made ground will be monitored by an appropriately qualified person to ensure that any contaminated material is identified, segregated and disposed of appropriately. Any material from identified hotspot locations shall be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure that the hotspot does not cross-contaminate clean soils elsewhere. All excavations will be monitored in accordance with good practice and guidelines at the time of the works.

Any excavation and stockpiled material shall be monitored during earthworks to ensure the stability of slopes and to ensure that the soils excavated for disposal are consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations.

Implementation of the CEMP will be monitored on an ongoing basis.

A summary of the predicted construction residual impacts post implementation of mitigation measures is provided in Table 6.12. Note that the quality is negative and the scale local for all impacts.

Feature	Description	Importance	Effect	Duration	Pre-Mitigation Magnitude	Pre-Mitigation Significance	Post-Mitigation Magnitude	Post-Mitigation Significance
Soil Fertility	Topsoil - BminDW	High	Loss or damage of topsoil and subsoil	Permanent	Small adverse	Slight	Negligible	Imperceptible
Contaminated land	Potentially Contaminated Land	Medium	Degree or extent of soil contamination is moderate on a local scale	Permanent	Small adverse	Slight	Negligible	Imperceptible
Topsoil and subsoils quality and significance	Heavily loaded vehicles moving through the site	Medium	Earthworks Haulage	Temporary	Small adverse	Imperceptible	Negligible	Imperceptible
Topsoil and subsoils quality and significance	Ground vibrations	Medium	Effect on the surrounding ground	Temporary	Small adverse	Imperceptible	Negligible	Imperceptible
Economic Geology	Crushed rock aggregate potential	Medium	Loss of future quarry or pit reserve	Permanent	Negligible	Imperceptible	Negligible	Imperceptible

Feature	Description	Importance	Effect	Duration	Pre-Mitigation Magnitude	Pre-Mitigation Significance	Post-Mitigation Magnitude	Post-Mitigation Significance
Economic Geology	Crushed rock aggregate potential	High	Loss of future quarry or pit reserve	Permanent	Negligible	Imperceptible	Negligible	Imperceptible
Economic Geology	Crushed rock aggregate potential	Very High	Loss of future quarry or pit reserve	Permanent	Negligible	Imperceptible	Negligible	Imperceptible

Table 6.12 Summary of Predicted Construction Phase Impacts following the implementation of Mitigation and Monitoring Measures at Proposed Development

Operational Phase

Fuel and Chemical handling: Emissions from fuel spills or leaks or runoff from rainwater that has passed over impermeable surfaces will be prevented from directly entering the surrounding watercourse, soil and/or underlying groundwater. All surface water runoff from the development will be directed to full retention or bypass fuel interceptors prior to discharge receiving environments.

In order to minimise any impact on the underlying subsurface strata from material spillages, oil and fuel storage tanks will be stored above ground in designated areas with an impervious base. All fuel containers will be self-bunded with double skin containment structures. Drainage from fuel storage areas will drain directly to forecourt fuel separators which incorporate automatic lockdown valves monitored by the facilities BMS network.

Environmental Management Plan: An environmental management plan will apply to the development during the operational phase incorporating mitigation measures and emergency response measures.

6.9 RESIDUAL IMPACTS

With the employment of the above mitigation measures and standard good construction practices, it is considered that there will be no significant residual impacts on land and soils as a result of the construction and operation of the proposed development.

6.10 POTENTIAL CUMULATIVE IMPACTS

This section considers the potential for cumulative effects arising from the proposed development in association with other developments. Specifically, it considers a worst-case scenario, where both the proposed development and other developments for which construction timelines are not known are under construction and/or operation at the same time.

Planning Ref	Description of development	Comments
SD17A/0019	Construction of a new predominantly single storey Pharma production facility at a height of 15.95m with partial 2 storey plant room and enclosed roof top plant platform, single storey electrical building 126sq.m, an external utility yard for tanks and equipment and a single storey pump house 16sq.m	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase
SD17A/0118	The erection of 2 illuminated, 1.75m high x 4.7m wide takeda company logo signs at heights of 36.945 metres to the north elevation and 30.945 metres to the east elevation of the existing 37.07 metre high production building and associated works.	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase
SD17A/0318	The provision of a temporary (for 3 years\) 18MW gas powered electricity generator compound to provide electricity to the DUB08 data centre located within the Microsoft Data Centre Campus in advance of the upgrade of electricity infrastructure locally.	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase
SD17A/0354	Construction of a new facility to include the construction of two storey biopharma production facility to a maximum height of 7.8m, a single storey electrical building of 126sq.m, an external utility yard for tanks and equipment and a single storey pump house of 16sq.m	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase

Planning Ref	Description of development	Comments
SD17A0388	Amendments to the previously approved application SD17A/0019 consisting of: removal of escape stair to the west elevation of the main building and inclusion of escape ladder, re-arrangement of nitrogen storage area and decreased size of nitrogen tank, removal of VOC stack, removal of louvre screen to main building roof and replaced with steel handrail, inclusion of extra flues to main building roof, removal of pump house from site, rearrangement of fencing to perimeter of main building. Amendments also include some changes to external doors and windows to both the electrical and main building.	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase
SD17A/0402	Amendments (2,186sq.m) approx. to previous Planning Ref; SD16A/0250 and amendments (188.2sqm) approx. to previous Planning Ref: SD13A/0186. Previous Planning Ref's also include SD15A/0243 and SD15A/0352. All proposed amendments are on a 11 hectare site.	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase
SD20A/0147	Construction of P3 Phase II expansion of the existing P3 biopharma production facility which includes the construction of circa 2,155sq.m, two storey biopharma production facility	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase
SD20A/0121	Construction of 3 two storey data centres with mezzanine floors at each level of each facility and associated ancillary development that will have a gross floor area of 80,269sw.m on an overall site of 16.5 hectares	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase
SD20A/0124	Demolition of existing single storey dwelling and construction of a Distribution Warehouse Building comprising warehousing and ancillary areas at ground floor and support offices, staff areas and plant across two floors with the total gross floor area of the development c.17,006sq.m.	No significant cumulative effects in relation to Land, Soils and Geology have been identified during the construction or operational phase

Table 6.13 Summary of cumulative effects on the Proposed Development

6.11 DIFFICULTIES IN COMPILING INFORMATION

There are no known difficulties in compiling information for this section of the EIAR.

6.12 REFERENCES

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7 HYDROLOGY AND WATER SERVICES

7.1 INTRODUCTION

The permitted Microsoft Dub 14-15 Data Centre Development, proposed to be amended, is to be located on a site within Grange Castle Business Park, Clondalkin, Dublin 22 (Site A Figure 7.1). Arup Consulting Engineers has prepared this chapter of the EIAR which assesses and evaluates the potential impacts on the hydrological and hydrogeological regimes and aspects of the site and surrounding areas. In assessing likely potential and predicted impacts, account is taken of both the importance of the attributes and the predicted scale and duration of the likely impacts.

Figure 7.1: Aerial View of Grange Castle Business Park with the site outlined in red. (Bing Maps)

7.2 METHODOLOGY

The appraisal methodology for the EIAR is completed in accordance with the EPA 'Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, 2017). The EPA document entitled 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003) and the EPA document entitled 'Draft Guidelines on the Information to be contained in Environmental Impact Statement' (EPA, 2002) was also followed in this hydrology and water assessment and classification of environmental impacts. Due consideration is also given to the guidelines provided by the Institute of Geologists of Ireland (IGI) in the document entitled 'Guidelines for the Preparation of Soils and Geology Chapters of Environmental Impact Statements' (IGI 2013).

In addition, the document entitled 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, now Transport Infrastructure Ireland (TII)) (TII, 2009) is referenced where the methodology for assessment of impact is appropriate.

The rating of potential environmental impacts on the hydrology and water environment is based on the matrix presented in Table 7.2 below which takes account of the quality, significance, duration and type of impact characteristic identified.

In the EIAR 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 cited attribute. The impact ratings presented in Table 7.1 below are in accordance with impact assessment criteria provided in the EPA (2002) publication.

The duration of each impact is considered to be either temporary, short-term, medium term, long-term, or a permanent impact. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts were seen as impacts lasting one to seven years; medium-term impacts lasting seven to fifteen years; long-term impacts lasting fifteen to sixty years; and permanent impacts lasting over sixty years.

Impact Characterist	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
	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
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	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 not 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
	'Worst Case'	The impacts arising from a development in the case where the mitigation measures may substantially fail

Table 7.1 Glossary of Impacts following EPA Guidance Documents

The TII criteria for rating the magnitude and significance of impacts at EIA stage on the hydrogeological related attributes are also relevant in determining impact assessment and area presented in Table 7.2 below.

Magnitude of Impact	Criteria	Typical Hydrology Examples	Typical Hydrogeology Examples
Large Adverse	Results in loss of attribute	Loss of extensive change to a waterbody or water dependent habitat	Removal of large proportion of aquifer
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Partial loss of fishery	Potential medium risk of pollution to groundwater from routine runoff
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted flood peak level of >10mm	Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow and ecosystems
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either	Slight reduction in amenity value	No measurable changes in attributes

Table 7.2 Criteria for rating impact magnitude at EIAR stage – Estimation of magnitude of impact on hydrology and hydrogeology attribute (TII, 2009)

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

- Water dependant ecosystems and the increased risk presented by operations both spatially and temporally;
- Water supply abstractions in the vicinity of the site to within a 2Km radius and the potential for increased risk presented by the proposed development;
- Water bodies such as rivers, lakes, canals, groundwater bodies with particular attention to any potential deterioration in the status under the Water Framework Directive (WFD);
- Flood plains and existing flood mitigation measures protecting residential and commercial properties;
- Important amenity sites for water based leisure activities including fishing;
- Classification (regionally important, locally important) and extent of aquifers underlying the site perimeter area and increased risks presented to them by the proposed development associated with aspects such as for example 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 and karst features in the area and potential for increased risk presented by the activities at the site; and

Guidance and Legislation

This assessment has been undertaken with due regard to the overarching EIAR guidance (described in Chapter 1 *EIA Methodology*). Topic specific guidance in the following documents was also considered and applied:

- Transport Infrastructure Ireland (TII) (2009) *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*;
- Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (2009) *The Planning System and Flood Risk Management; Guidelines for Planning Authorities*;
- Inland Fisheries Ireland (2016) *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*.

Water resource management in Ireland is dealt with in the following key pieces of legislation which were taken into consideration in this assessment:

- The European Union Water Framework Directive (WFD), 2000/60/EC;
- European Communities Environmental Objectives (Surface Water) (Amendment) Regulations 2015 (S.I. No.386 of 2015)[1];
- European Communities (Surface Water) (Amendment) Regulations 2019 (S.I. No. 77/2019);
- European Communities (Quality of Salmonid Waters) Regulations 1998 (S.I. No. 293 of 1998)[2];
- European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. 268 of 2006);
- European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009 (S.I. No. 55 of 2009);
- The Groundwater Directive, 2006/118/EC;
- European Communities Environmental Objectives (Groundwater) Regulations 2016 (S.I. No. 366 of 2016);
- European Communities (Drinking Water) Regulations 2014 (S.I. No. 122 of 2014);
- European Communities (Drinking Water) (Amendment) Regulations 2017 (S.I. No. 464/2017);
- The European Communities (Water Policy Regulations 2003 (S.I. 722 of 2003);
- The Habitats Directive (92/43/EEC);
- The European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011);
- Water Services Acts (2007 - 2014);
- The EU Floods Directive, 2007/60/EC;
- European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122/2010);
- Arterial Drainage Act, 1945 (as amended).

Sources of Information

The existing environment of the site was analysed using data collected from a desk study, following the statutory guidance summarised above. The relevant site information has been derived from several different sources, including:

- Latest EPA water quality monitoring data for water bodies in the area available from the catchments.ie webportal;
- ERBD Management Plan – Liffey Water Management Unit and Programme of Measures – ERBD
- 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 flood mapping data (www.floodmaps.ie);
- Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites (Eastern Regional Fisheries Board (ERFB))
- Dublin City Council (2005) Greater Dublin Strategic Drainage Study: Technical Documents of Regional Drainage Policies. Dublin: Dublin City Council
- Greater Dublin Regional Code of Practice for Drainage Works: Version Draft 6.0 (Wicklow County Council, SDCC, Meath County Council, Kildare County Council, FCC, Dún Laoghaire- Rathdown County Council and Dublin City Council)
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001)
- Water Features, Rivers and Streams, EPA (gis.epa.ie);
- Rainfall and Flood Estimation Applications, OPW (opw.hydronet.com);
- Flood history of the site from the OPW National Flood Hazard Mapping website (floodinfo.ie/map/floodmaps/);
- Catchment Flood Risk Assessment and Management (CFRAM) Mapping produced by the OPW (floodinfo.ie/map/floodmaps/);
- Preliminary Flood Risk Assessment (PFRA) Mapping produced by the OPW (www.myplan.ie);
- Geological Survey of Ireland (GSI) Web-mapping portal including data on aquifer classifications, groundwater recharge and vulnerability, karst features, water supply wells and source protection zones

A site due diligence was completed by Hanley Pepper between January and March 2019 and various walkover were completed in this period to assess the surface water environment at the proposed development location.

[1] European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI No 272 of 2009) as amended by the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012 (SI No. 327 of 2012); and the European Communities Environmental Objectives (Surface Water) (Amendment) Regulations 2015) (SI No 386 of 2015).

And defined as "European Communities Environmental Objectives (Surface Waters) Regulations 2009 – 2015"

[2] "European Communities (Quality of Salmonid Waters) Regulations 1988 (SI No 293 of 1988)"

Relevant documentation consulted as part of this assessment included the following:

- Site walkovers
- Site specific ground investigation
    - Grangecastle Ground Investigation – GII, 2019
    - DUB14/15 Ground Investigation – CGL, 2021

Technical Limitations

This section outlines whether any limitations were noted during the environmental assessment from a hydrology and hydrogeology perspective.

The baseline data described and considered in this assessment includes existing data from desk study information available at the time in the region as well as dedicated field surveys commissioned specifically for the proposed development. The data collected provides comprehensive information on hydrogeology within the study area.

The baseline data from the intrusive investigation provides valuable information on the existing hydrogeological environment at point locations within the study area. Between each point the baseline data from the intrusive investigation has been assessed by conservative interpretation. While hydrogeological conditions can vary, the exploratory locations have been selected following the completion of the comprehensive review of all existing information available at the time.

Based on the comparability of the results from the investigations commissioned specifically for the proposed development and the desk study of existing information on the baseline conditions, the information and understanding on the baseline conditions is deemed sufficient and there were no technical limitations.

7.3 RECEIVING ENVIRONMENT

Site Area Description

The proposed development (Site A) is to be located on currently undeveloped lands in Grange Castle Business Park, Clondalkin, Dublin 22. The majority of the site is currently being used as a construction compound and temporary car parking facility for other data centre developments on adjacent lands. The site is c. 16.23 hectares and is bounded by the recently realigned Nangor Road to the southern boundary, Grange Castle estate roads to the northern and western boundary and Microsoft data centre campus development to the eastern boundary. (Fig 7.1)

Topography

The original site topography was relatively flat with a gradual fall of 3m across the site from approx. 60m OD on the south east corner to approx. 66m OD on the northern boundary. Various council approved soil deposits and temporary road surfaces from adjacent construction activity have recently changed the original site topography. A series of mounds of material were noted during the site walkover and are located along the temporary infrastructure within the site. These mounds have likely been generated from the adjacent construction.

Some recent topographical changes have been made to the eastern half of the site (previously a pitch and putt course). This part of the site has been modified to provide a temporary car parking facility associated with the construction of DUB 9-13 data centres within the existing campus to the east of Site A. A temporary access road is also constructed within this part of the site to allow access to additional construction car parking within the existing campus site to the east. Temporary surfacing comprises permeable gravel finishes and surface water drainage from this section of the site flows towards the original Baldonnel Stream.

Land Use

A detailed overview of the historical land use is provided in Chapter 6 of this EIAR.

As referenced in previous sections, some recent topographical changes have been made to the eastern half of the site (previously a pitch and putt course). This part of the site has been modified to provide a temporary car parking facility associated with the construction of DUB 9-13 data centres within the existing campus to the east of Site A. A temporary access road is also constructed within this part of the site to allow access to additional construction car parking within the existing campus site to the east. Temporary surfacing comprises permeable gravel finishes and surface water drainage from this section of the site flows towards the original Baldonnel Stream.

Drainage

The proposed development is located within the Eastern River Basin District (ERBD). The most significant drainage system in the vicinity of the subject site is the River Griffeen. The Griffeen River rises on Saggart Hill in South Dublin. It flows towards Lucan until it reaches the Griffeen Valley Park. It flows under the Grand Canal through a siphon system and passes through several housing estates, Lucan Village Park and Vessey Park before reaching Griffeen Valley Park. After leaving the park it flows past Lucan house and demesne and enters the River Liffey at the Lucan Weir.

The site currently consists of fields and temporary stoned carparks with mostly overgrown drains (ditches) at the field boundaries. These drains were used for agricultural land drainage improvement in the past. No flow was present in the drains at the time of the site visit and the majority were dry. The topography of the area is relatively flat with a gentle slope in a northwesterly direction towards the River Griffeen. Any surface water is anticipated to drain North West towards the River Griffeen.

The River Griffeen Flows along the North Western boundary of the site. Under South Dublin County Council Development Plans there is a requirement to provide a 10m riparian strip on each side of the River.

On the Eastern boundary of the site, the original course of the Baldonnell Stream exists. This stream was diverted along the southern side of the recently realigned R134 Nangor Road.

Surface Water Legislation

The proposed development is located within the ERBD, as defined under the 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 Water Framework Directive (WFD) established a framework for the protection of all waters including rivers, lakes, estuaries, coastal waters, groundwater, and their dependent wildlife/habitats. One of the key aims of the WFD is achieving "good status" for all water bodies. The quality of surface waters in Ireland is examined regularly by the EPA to monitor performance against a number of biological and chemical thresholds.

In 2009 the ERBD River Management Plan (RMP) 2009-2015 was published. In the ERB RMP, 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 strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations. These include the following:

- Statutory Instrument (SI) No. 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988
- Local Government (Water Pollution) Acts 1977-1990
- SI No. 258 of 1988 Water Quality Standards for Phosphorus Regulations 1998
- SI No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009

Surface Water Quality Context

In accordance with the WFD, each river catchment within the ERBD was assessed and a water management plan detailing the programme of measures was put in place for each.

The River Griffeen is part of the Liffey_170 WFD sub-basin (EU Code IE_EA_09L012100) which is assigned an overall 'Good' status for the period 2013-2018. The water body is at Good ecological and chemical status for that period. The nearest monitoring point on the River Griffeen is in Lucan Village (RS09G010600) for which the most recent data shows a Poor biological quality (Q Value of 3) in 2019.

The significant pressures identified for the Liffey_170 water body include Urban Run-off and Urban Waste Water discharges from Combined Sewer Overflows (CSO).

Flooding

In accordance with the guidelines produced by the Department of the Environment, Heritage and Local Government - The Planning System and Flood Risk Management (FRM) Guidelines for Planning Authorities, November 2009, a Stage 3 assessment was carried out. The Stage 3 Assessment is a Detailed Flood Risk Assessment (including quantitative model). The purpose of the assessment is to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation.

This detailed Stage 3 flood risk assessment for the site at Grange Castle is based on a combined 1D and 2D HEC-RAS hydraulic model. The FRA undertaken by SLR Consultants in relation to the application site has involved the following elements:

- Design Flood Levels;
- Modelling Approach;
- Modelling Parameters;
- Sensitivity Analysis;
- Model Outcomes;
- Detailed Flood Risk;
- Stage 3 findings.

The findings of the site-specific FRA Report which has been prepared for the existing site at Grange Castle, the baseline scenario, to support the planning application for the site concludes the following,
The results of the flood risk assessment undertaken, and the outcome of the modelling indicates that:

- For both the 1:100 and 1:1000 flows in the River Griffeen and the realigned Baldonnell Stream in the vicinity of and at the site, are contained within the existing river channel and culverts / bridge;
- The extent of Flood Zones A and B have been identified at the site;
- The Highly Vulnerable parts of the proposed development are located in Flood Zone C at the site;
- Due to the Highly Vulnerable nature of the proposed development the design flood level has been identified as the 1:1000 flood level +20% increase for Climate Change under the Mid-Range Future Scenario for Climate Change in Ireland;
- The 1:1000 event plus climate change design flood level is identified at 66.83 mOD; and
- A freeboard of at least 600 mm should be applied to the design flood level for the Highly Vulnerable parts of the development.

The lowest proposed floor level associated with the development is the DUB14 data centre and the Centralised Administration Building which have a proposed ground floor level of 67.80 mOD which is above the freeboard and 1:1000 event.

Foul Water

For the proposed development, it is proposed to connect foul water drainage to the existing Irish Water / South Dublin County Council 450mm sewer located to the western boundary of the site as identified in Fig 7.2. This sewer flows in a northerly direction before turning east along the Grange Castle estate road. Foul drainage from Grange Castle Business Park gravity flows in a 525mm diameter pipe prior to being pumped into a primary gravity sewer to the North West of Grange Castle. The Irish Water / South Dublin County Council main sewer ultimately discharges to Ringsend wastewater treatment plant.

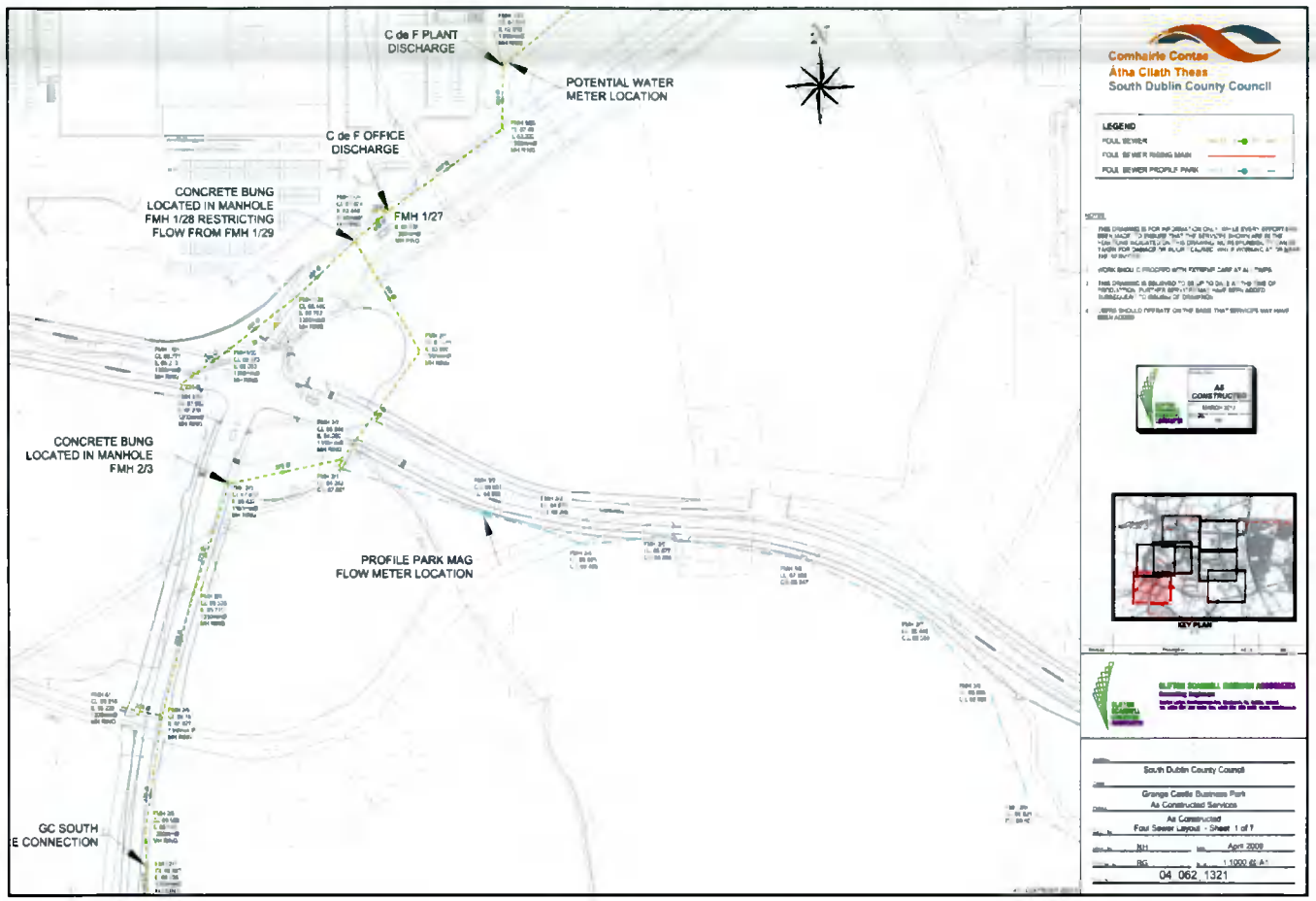

Figure 7.2 Irish Water / South Dublin County Council Foul Sewer Infrastructure.

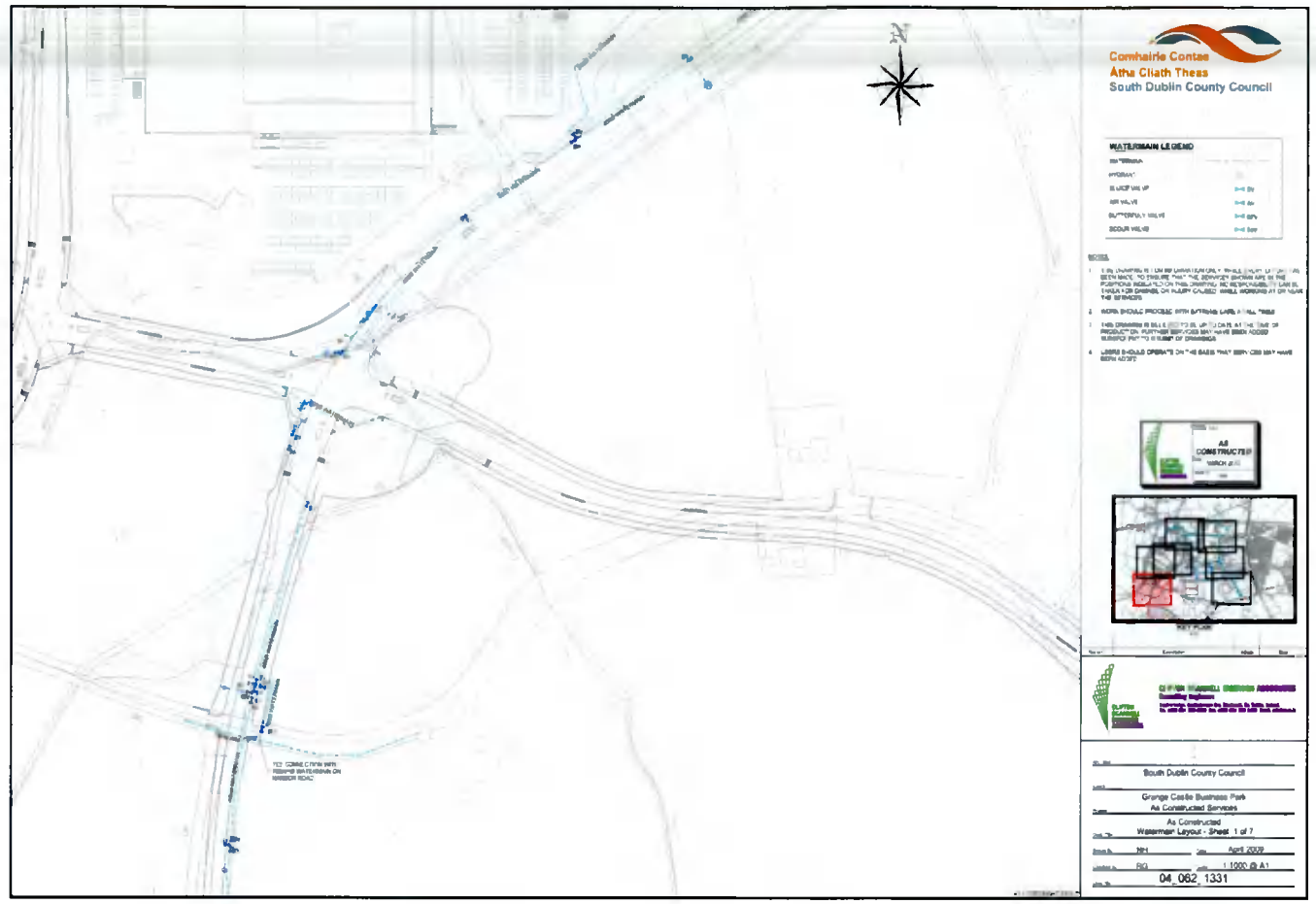

Figure 7.3 Irish Water / South Dublin County Council Water Infrastructure.

Water Supply

Grange Castle Business Park is served from South Dublin County Council's Belgard Reservoir. The Park is designed with a water supply capacity of 12 million litres per day available to service development within the park. Water supply to the surrounding areas is provided by Irish Water and SDCC through mains supply. Figure 7.3 shows infrastructure available for supply to the Site.

Water supply from Irish Water infrastructure will connect to an existing 240mm diameter watermain on the north west boundary of the site.

Groundwater – Aquifer Classification & Vulnerability

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils. The potential of rock to store and transport water is governed by permeability of which there are two types, inter-granular and fissure permeability. Intergranular permeability is found in sediments, sands, gravels and clays as are also present at the subject site, and fissure permeability, which is found in bedrock, where water moves through (and is stored in) cracks, fissures, fracture planes and solution openings for example.

Aquifers are generally classified as rocks or subsoils that contain sufficient void spaces and which are permeable enough to allow water to flow through them in significant quantities.

Aquifer Classification

The bedrock aquifer map of the site taken from the GSI website is shown in Figure 7.5 with the main development site boundary (Site A) marked in red. The Geological Survey of Ireland (GSI) has classified Irish bedrock aquifers in terms of regional importance and well productivity. The aquifer classification

system used by the GSI has three main aquifer categories, with each category sub-divided into two or three classes (DELG/EPA/GSI, 1999).

Regionally Important (R) Aquifers

I. Karstified aquifers (Rck)
II. Fissured Bedrock (Rf)
III. Extensive sand/gravel (Rg)

Locally Important (L) Aquifers

I. Sand/gravel (Lg)
II. Bedrock which is generally moderately productive (Lm)
III. Bedrock which is moderately productive only in local zones (Ll)

Poor (P) Aquifers

I. Bedrock which is generally unproductive except for local zones (Pl)
II. Bedrock which is generally unproductive (Lu)

As shown in Figure 7.5, the area in question within the Grange Castle Business Park is classified as a locally important aquifer- bedrock which is moderately productive only in local zones (Ll).

The lower permeability glacial till soils which overlay the bedrock (gravelly clay/ boulder clay) lead to slow infiltration and restricted recharge to bedrock aquifers. The glacial till is not classified as an aquifer by the GSI.

Groundwater bodies (GWB) were delineated and described by the GSI in 2004 (GSI, 2004) as Water Framework Directive (WFD) groundwater management units to manage and protect groundwater and linked surface waters. The site is underlain by the Dublin GWB (IE_EA_G_008). The Dublin GWB is classified as being at Good WFD chemical and quantitative status.

Figure 7.5. Bedrock Aquifer Classification (GSI online)

Bedrock Aquifer Vulnerability

Aquifer vulnerability of a groundwater body is the term used to describe the intrinsic geological and hydrogeological characteristics which determine the ease with which a groundwater body may be contaminated by human activities.

The vulnerability is determined by the travel time and the attenuation capacity of the overlying deposits. The groundwater vulnerability is determined mainly by the permeability and thickness of the subsoils that underlie the topsoil. For example, bedrock with a thick, low permeability overburden is less vulnerable than bedrock with a thin high permeability, gravel overburden.

The bedrock aquifer vulnerability map of the site is shown in Figure 7.6. The GSI classify Aquifer Vulnerability in terms of the geological and hydrogeological characteristics that determine the ease with

which groundwater may be contaminated by human activities. The criteria with which aquifers are classified is described in the publication "Groundwater Protection Schemes" (DELG/EPA/GSI, 1999) and reproduced here as Table 7.3.

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)	(<30m 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	Not applicable
Moderate (M)	Not applicable	>10.0m	5.0-10.0m	Not applicable	Not applicable
Low (L)	Not applicable	Not applicable	>10.0m	Not applicable	Not applicable

Table 7.3: Aquifer vulnerability criteria (DELG/EPA/GSI, 1999)

As shown in Figure 7.6, the site footprint (Site A) is in an area which is split between High vulnerability (orange) to the east and Extreme vulnerability (pink). From the above table this indicates that rock may be close to the surface or that the overburden consists of higher permeability granular material.

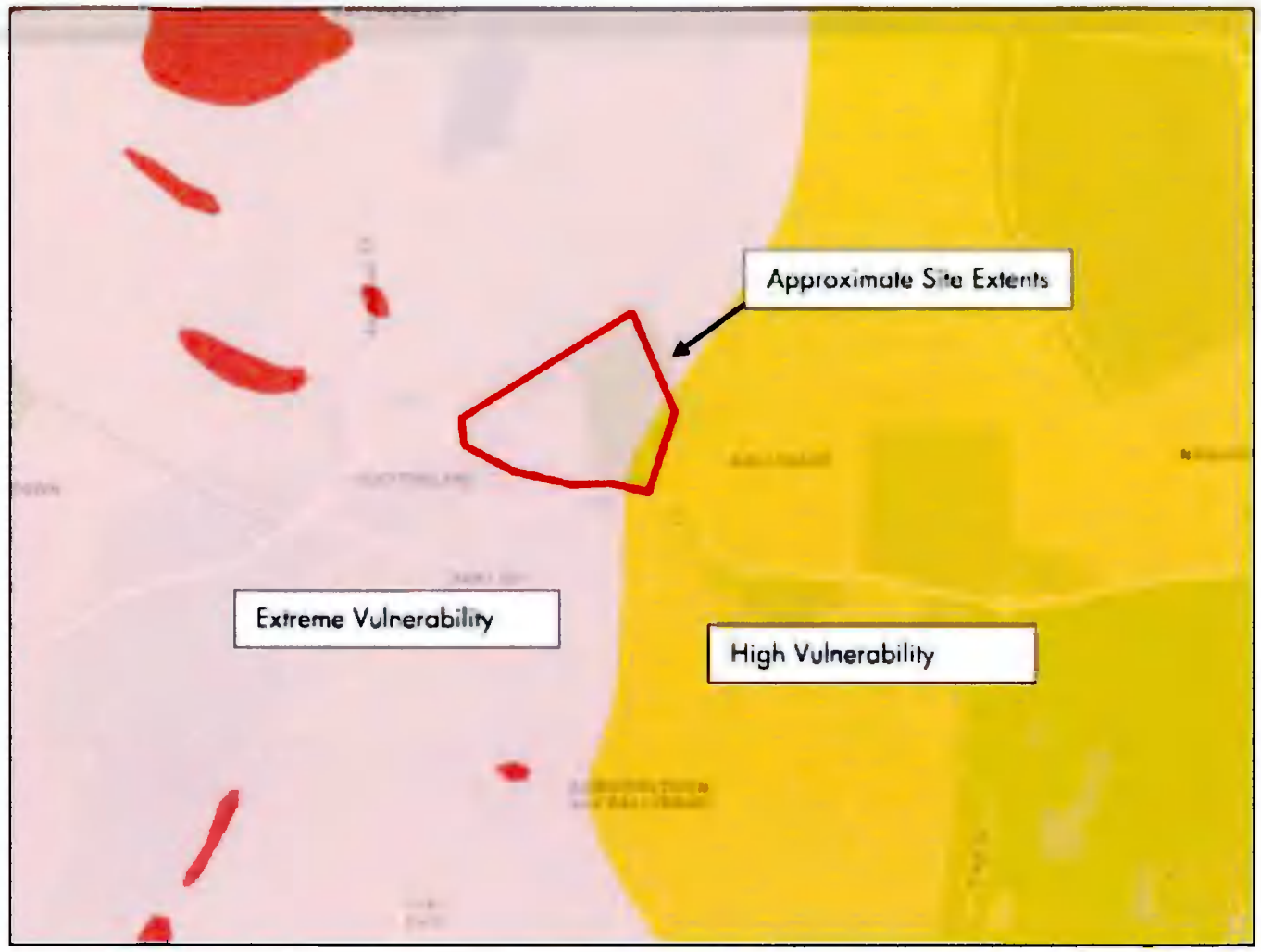

Figure 7.6: Bedrock Aquifer Vulnerability (Ref. GSI Online)

Regional Recharge

Recharge is the amount of rainfall that replenishes the aquifer. It is a function of the effective rainfall (i.e. rainfall minus evaporation and run off), the permeability and thickness of the subsoil and the aquifer characteristics.

The recharge for the locally important aquifer (Ll) is capped at 200mm/yr however actual recharge rates on the GSI recharge map for this area are 68mm/yr.

Regional Groundwater Abstractions

Groundwater resources describe any large spring, well or borehole which is used as a groundwater abstraction source by domestic, agricultural, commercial, industrial, local authority or group water scheme users. The GSI keeps a record of groundwater wells drilled (GSI 2019b). However, the record does not state which wells are currently used for abstraction. In addition to these abstractions, Dublin City Council (DCC) also maintains a database of groundwater and surface water abstractions. However, this data is not available to the public. The EPA have also launched a register of water abstractions,

whereby people who abstract 25m^3 (cubic metres) of water or more per day are required to register their water abstraction. However, this data is not available to the public.

Source Protection Zones (SPZ) reports have been produced by the GSI (GSI 2019b) in conjunction with the EPA for groundwater sources, particularly public water supplies, group water schemes or important industrial supplies. The reports aim to guide development planning and regulation to provide protection to groundwater sources. To date no SPZ reports have been produced with regard to any sites within the study area.

Groundwater Quality and Levels

Groundwater quality samples were analysed as part of the project-specific GI carried out by Causeway (2021). Groundwater is not used extensively for residential or industrial purposes in the area. The majority of potable water used within the region is abstracted elsewhere and piped to the region, and therefore groundwater abstraction is not considered further in this Chapter.

As part of the project-specific GI carried out by Causeway, nine set of groundwater readings were taken during and post fieldworks. A summary of the groundwater readings across the proposed development is outlined in Table 7.4. This shows there is a relatively shallow groundwater-table with water being less than 3m from surface.

Location	06/04/21	08/04/21	10/04/21	12/04/21	13/04/21	14/04/21	15/04/21	23/04/21	20/05/21	18/06/21
BH120	1.95	1.95	1.91	1.95	1.94	1.98	2.00	1.97	1.94	1.92
BH121						Dry	Dry	Dry	Dry	Dry
BH123	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
BH124			1.45	1.40	1.38	1.38	1.32	1.52	n/a	1.55
BH130	2.76	2.76	2.78	2.75	2.75	2.78	2.76	1.86	2.61	n/a
BH131		1.71	1.70	1.72	1.71	1.72	1.73	1.76	n/a	1.77
BH133	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
BH134		4.00	4.00	3.99	3.99	4.00	4.00	4.04	4.04	4.04

Table 7.4: ***Groundwater Level Monitoring (water level shown as m below ground level)***

Hydro-ecology Designated Sites

The National Parks and Wildlife Services (NPWS) is responsible for the designation of environmentally protected sites in Ireland and maintains a publicly available database of these sites. These sites include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs). In addition to these sites, the NPWS also maintains a database of proposed Natural Heritage Areas (pNHAs). Only the water related impacts on dependant designated sites are assessed within this Chapter.

Site Name	SAC Site Code	Distance (km)	Status
River Liffey	n/a	3.40	pNHA
Grand Canal	n/a	0.65	pNHA
Red Bog, Kildare SAC	000397	14.60	SAC
Glenasmole Valley SAC	001209	8.58	SAC
Rye Water Valley/Carton SAC	001398	5.07	SAC
Wicklow Mountains SAC	002122	10.26	SAC
Wicklow Mountains SPA	004040	13.39	SAC

Table 7.5: ***Groundwater Dependant Habitats within the Study Area***

Further information regarding the designated sites within the region are detailed in **Chapter 5 –** *Biodiversity*.

Summary of Features of Importance

The feature importance ranking based on the TII Guidelines established for the baseline conditions has been summarised in **Table 7.5.** The importance category considers the impact of changes in water level or water quality on the feature, for example SACs, NHAs and salmonid waters may be sensitive to such changes. The importance ranking does not consider the ecological importance of the feature.

Features with an importance ranking of low are not considered further as they will not result in a significant effect according to Box 5.4 of the TII Guidelines. These are however included for completeness.

Category	Feature	Description	Importance	Justification for Importance rating
Watercourse	River Liffey	Good water quality status	Very High	Attribute has a high quality or value on a regional scale
Watercourse	Griffeen River	Tributary to River Liffey	Medium	Attribute has a high quality or value on a local scale
Locally Important Aquifer	Bedrock which is moderately productive only in local zones (Ll)	Underlies entire site	Medium	Attribute has a medium quality or value on a local scale
Designated site	River Liffey	pNHA - Located approximately 3.40km north of Proposed Development	Very high	River, wetland or surface water body with a high value on a regional or national scale
Designated site	Grand Canal	pNHA - Located approximately 650m north of Proposed Development	Very high	River, wetland or surface water body with a high value on a regional or national scale
Designated site	Red Bog, Kildare SAC	SAC - Located approximately 14.6km from Proposed Development	Extremely high	River, wetland or surface water body protected by EU legislation

Category	Feature	Description	Importance	Justification for Importance rating
Designated site	Glenasmole Valley SAC	SAC - Located approximately 8.6km from Proposed Development	Extremely high	River, wetland or surface water body protected by EU legislation
Designated site	Rye Water Valley/Carton SAC	SAC - Located approximately 5.1km from Proposed Development	Extremely high	River, wetland or surface water body protected by EU legislation
Designated site	Wicklow Mountains SAC	SAC - Located approximately 10.3km from Proposed Development	Extremely high	River, wetland or surface water body protected by EU legislation
Designated site	Wicklow Mountains SPA	SAC - Located approximately 13.4km from Proposed Development	Extremely high	River, wetland or surface water body protected by EU legislation

*Table 7.6: **Summary of Features of Importance***

7.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

Surface Water Drainage

Site A of the proposed development will result in an increase in surface water runoff from the site. The proposed development will ultimately discharge to the Griffeen River to the west of the site.

The proposed drainage system has been designed in accordance with Greater Dublin Strategic Design System (GDSDS) specifications. Storm water runoff from roofs will be harvested for reuse and to reduce demands on the public water supply infrastructure. Storm water runoff from hard paved surfaces will be collected and attenuated on site in a sub-surface water attenuation infrastructure prior to discharged at a controlled rate to the Griffeen River.

All roads, fuel supply areas and hard standings will drain through Class 1 full retention petrol interceptors and silt traps prior to controlled discharge at outfall manholes. All fuel storage will be in self-contained double bunded tanks.

Foul Water

The site of the proposed development is currently a brownfield site. However, service and infrastructure have already been installed within the Business Park for foul water. The foul water is connected to the off-site Irish Water / South Dublin County Council sewer located on the western boundary of the site. Foul drainage is ultimately treated at the Dublin City Wastewater Treatment plant at Ringsend.

Water Supply

The proposed water main network will connect into an existing 300mm diameter water mains supply located on the western boundary of the site.

7.5 DO NOTHING' SCENARIO

Should the Data Centre development not proceed there will be no change to the environmental profile of the site in relating to hydrology and hydrogeology.

7.6 WORST CASE SCENARIO

The worst-case scenario on the environmental profile of hydrology and hydrogeology arising from the development of the Data Centre occurs during the construction phase. Contamination of the soils and groundwater could be activated by material spillages or oil and fuel spillages during construction activities. Following the TII criteria for rating the magnitude and significance of impacts on the water and hydrogeological related attributes, the magnitude of impact resulting from the ultimate development is considered Negligible.

7.7 POTENTIAL IMPACTS

The potential impacts of the construction and operational phases of the proposed development on the hydrology and water environment are outlined in the following paragraphs. Due to the inter-relationship between this section and Section 6.0 (Soils and Geology) the following impacts discussed will be considered applicable to both.

Construction Phase

The key civil engineering works at the proposed development will involve the excavation of material for foundations and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials. Other construction activities will include site storage of cement and concrete materials, oils and fuels.

The potential impacts in relation to water have been assessed under the following headings:

- Loss or Damage of Proportion of Aquifer
- Change to Groundwater Regime
- Loss or damage of a groundwater dependant habitat
- Increased runoff and sediment loading
- Contamination of local water courses
- Impact of gas generation

Loss or Damage of Proportion of Aquifer: The removal of a proportion of an aquifer can reduce its ability to provide baseflow to groundwater dependant habitats and or water supplies and results in an irreversible loss of the in-situ characteristics of the land, soils, geology and hydrogeology. Likewise, the mobilisation of contaminants into the aquifer either through accidental spillage or disturbance of contaminated ground during excavation will reduce the quality of the groundwater within the aquifer.

The underlying limestone bedrock is defined as a locally important aquifer. During the construction of the Proposed Development a large section of the top of rock will be exposed during foundation excavation. The displacement of a proportion of an aquifer can reduce its ability to provide baseflow to groundwater dependant habitats and or water supplies and results in an irreversible loss of the in-situ characteristics of the land, soils, geology and hydrogeology. The magnitude of this impact is negligible as it results in an insufficient permanent irreversible change on a local scale to affect the integrity of the underlying aquifer. These activities are localised and considered insufficient to affect the overall integrity of the underlying aquifer, therefore, loss of aquifer due to excavation will have a localised permanent effect which is considered imperceptible.

Change to Groundwater Regime: Localised pumping of excavations is expected to be required as part of the construction phase at structures and deep trenches in order to allow works to be carried out in dry excavations. This could lead to a temporary change in the groundwater levels and flow within the locally important aquifer underlying the Proposed Scheme.

Since the pumping is expected to be limited and localised and temporary, the magnitude of this impact is considered negligible. As the importance of the locally important aquifer is medium, the resulting significance is **imperceptible** and therefore will not be considered further.

Loss or Damage of Water Dependant Habitat: The River Liffey is a proposed Natural Heritage Area (pNHA) and is located approximately 3.4km downstream from the Proposed Development. Surface water runoff and groundwater quality in the underlying aquifer may be temporarily altered, due to accidental spillages during construction related activities (i.e. fuels or lubricants) or due to mobilisation of contaminants during the removal of contaminated soil. The magnitude of this potential temporary effect on the water quality of the pNHA is considered to be small adverse due to the significantly higher flow in the River Liffey and the downstream dilution effect along the River Griffeen and the distance to the R. Liffey (3.4km). The River Liffey pNHA is of very high importance and therefore, this leads to a potential temporary negative impact with significance rating of **Moderate.**

The Grand Canal is a pNHA and is located approximately 650m north of the Proposed Development. The Grand Canal is not considered to be hydraulically connected to the Proposed Development. There is not considered to be a potential effect to either the surface water regime, groundwater regime associated with the pNHA from the construction phase of the works.

Increased Runoff and Sediment Loading: Surface water runoff during the construction phase may contain increased silt levels from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and access roads.

During the construction phase there is potential for a slight increased runoff rate from the site due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

The potential for impact from construction run-off and sediment loading is assessed for both the River Griffeen and River Liffey due to the direct hydraulic connection between the two water bodies.

The potential impact related to increased runoff and sediment loading to surface water receptors is considered to be a temporary negative **Moderate** impact.

Contamination of local water courses: During the construction phase, 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.
- The use of concrete and cement

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

In relation to the contamination of local watercourses is considered to be a temporary negative **Moderate** impact.

Summary of potential impact on features of importance during construction phase: The potential effects on the water features during the construction phase before any mitigation are summarised in Error! Reference source not found. **7.6.** Though the magnitude of the potential effect may vary depending on the scale of activities and location of the activity relative to the effected important feature, only the maximum magnitude of the effect of the proposed development is considered.

Feature	Importance	Effect	Quality	Duration	Scale	Magnitude	Significance
River Liffey	Very High	Water quality	Negative	Temporary	Local	Moderate Adverse	Moderate
Griffeen River	Medium	Water quality	Negative	Temporary	Local	Small Adverse	Slight
Aquifer (LI)	Medium	Flow regime & Water Quality	Negative	Temporary & Permanent	Local	Negligible	Imperceptible
River Liffey (pNHA)	Very high	Impact on water quality or	Negative	Temporary	Local	Small Adverse	Moderate

Feature	Importance	Effect	Quality	Duration	Scale	Magnitude	Significance
Grand Canal (pNHA)	Very high	hydrological regime	Negative	Temporary	Local	Negligible	Imperceptible
Red Bog, Kildare SAC	Extremely High		Negative	Temporary	Local	Negligible	Imperceptible
Glenasmole Valley SAC	Extremely High		Negative	Temporary	Local	Negligible	Imperceptible
Rye Water Valley/Carton SAC	Extremely High		Negative	Temporary	Local	Negligible	Imperceptible
Wicklow Mountains SAC	Extremely High		Negative	Temporary	Local	Negligible	Imperceptible
Wicklow Mountains SPA	Extremely High		Negative	Temporary	Local	Negligible	Imperceptible

Table 7.6: ***Summary of Predicted Construction Phase Effects***

Operational Phase

Surface Water Runoff: Without proper control measures, surface water can ingress into the surrounding environment. South Dublin County Council requires all new developments to adhere to the practice of Sustainable Urban Drainage Systems (SuDS) for the control of surface water on site. This is highlighted in the Greater Dublin Strategic Drainage Strategy[8].

There is a potential for leaks and spillages of fuel and oils due to the vehicle movements and parking in the car park. Any accidental emissions of oil, petrol or diesel could cause contamination if the emissions enter the water environment.

In relation to surface water run off the potential impact is considered to be a permanent **imperceptible** impact.

Foul Water: The proposed development will lead to an increase in foul water discharge. Currently the South Dublin County Council public foul sewer system has sufficient capacity to cater for the proposed development.

In relation to foul water the potential impact is considered to be a permanent **imperceptible** impact.

Water Supply: The proposed development will result in an increased demand for water from the Irish Water supply system within the Business Park. Application has been made to Irish water under application reference CDS20004546 and we are currently awaiting a response from Irish Water.

In relation to water supply, the potential impact on the water is considered to be a permanent **imperceptible** impact.

7.8 MITIGATION MEASURES

The following sections outline the mitigation and monitoring measures designed to avoid or minimise those impacts identified in Section 7.7 for the construction and operational phases of the proposed development.

Construction Phase

The employment of good construction management practices will minimise the risk of adverse impacts on the hydrological regime, water quality and flood risk. As part of the assessment of the required construction mitigation, good practice construction measures which will be implemented for the proposed development were considered.

A project-specific Construction and Environmental Management Plan will be established and maintained by the contractors during the construction and operational phases of the proposed Project. The Plan will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. As a minimum, the manual will be formulated in consideration of the standard best international practice including but not limited to:

- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors10
- Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 200511
- BPGCS005, Oil Storage Guidelines.12
- Eastern Regional Fisheries Board, (2006), Fisheries Protection Guidelines: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites.7
- CIRIA 697, The SUDS Manual, 2007.13
- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 200414
- The Forest Service (2000), Forest and Water Quality Guidelines, Department of the Marine and Natural Recourses15

Specific environmental control measures to minimise the effect on the hydrological regime, water quality and flooding as outlined in the CEMP include:

- Good housekeeping (site clean-ups, use of disposal bins, etc.) will be implemented on the site;
- No materials will be stored in flood plains or in areas which would impede flood flow paths;
- Where possible, soil excavation will not be completed during periods of prolonged or heavy rain;
- Earthworks operations shall be carried out such that surfaces shall be designed with adequate falls, profiling and drainage to promote safe run-off and prevent ponding and flooding;

- All construction compounds will be in areas that are at low risk of flooding (outside the 1 in 100-year flood zone);
- No refuelling or fuel storage within 10m of watercourse and only on a sealed surface, This is in accordance with the buffer zone guidelines in Table 7.4, If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment;
- Secure oil and chemical storage in over-ground bunded areas, limited to the minimum volume required to serve immediate needs with specified delivery and refuelling areas;
- Emergency spill kits retained onsite at sensitive locations;
- Cessation of work and development of measures to contain and/or remove pollutant should an incident be identified;
- Silt traps will be employed and maintained in appropriate locations;
- Temporary interception bunds and drainage ditches will be constructed up slope of excavations to minimise surface runoff ingress and in advance of excavation activities;
- Weather warnings will be monitored during construction to ensure that there is no flood risk to construction workers installing the cable ducts. A risk assessment will be carried out in the case of a weather warning to determine what works can proceed, and what works need to be postponed; and
- The temporary foul drainage at the construction compounds will comprise self-contained sanitary facilities, with wastewater stored and tankered off-site to appropriately licensed treatment facilities.
- Silt pollution caused by working in surface water will be minimised or prevented by keeping water out of the works area using appropriate isolation techniques, such as cofferdams, flume pipes and by-pass channels;
- Dewatering, where required, will incorporate the use of filter media; there will be no direct discharges into the watercourses
- To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be bunded and located at appropriate locations across the Proposed Development. Drainage from the bunded area(s) will be diverted for collection and safe disposal at an appropriate location.
- No concrete batching facility will be required at the site. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater.
- The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such wash waters will be discharged to groundwater.
- Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.
- Mitigation measures are being implemented to reduce the demand on potable water by implementing an industrial water management process utilising treated harvested rainwater
- Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses[15], which are shown in Table 7.7:

Average slope leading to aquatic zone	Buffer zone width on each side of the aquatic zone	Buffer zone width for highly erodable soils
Moderate (even to 1in 7 / 0-15%)	10 m	15 m
Steep (1 in 7 to 1 in 3 / 15-30%)	15 m	20 m
Very steep (1 in 3 / >30%)	20 m	25 m

Table 7.7 – Proposed Buffer Zones

A summary of the predicted construction effects following the implementation of mitigation measures is provided in Table 7.8. The quality is negative and the scale is local for all impacts.

Feature	Importance	Effect	Duration	Pre-mitigation Magnitude	Pre-mitigation Significance	Post-mitigation on Magnitude	Post-mitigation Significance
River Liffey	Very High	Water quality	Temporary	Moderate Adverse	Moderate	Negligible	Imperceptible
Griffeen River	Medium	Water quality	Temporary	Small Adverse	Slight	Negligible	Imperceptible
Aquifer (Ll)	Moderate	Flow Regime and water quality	Temporary & Permanent	Negligible	Imperceptible	Negligible	Imperceptible
River Liffey (pNHA)	Very high	Impact on water quality or	Temporary	Small Adverse	Moderate	Negligible	Imperceptible
Grand Canal (pNHA)	Very high		Temporary	Negligible	Imperceptible	Negligible	Imperceptible

Feature	Importance	Effect	Duration	Pre-mitigation Magnitude	Pre-mitigation Significance	Post-mitigation on Magnitude	Post-mitigation Significance
Red Bog, Kildare SAC	Extremely High	hydrological regime	Temporary	Negligible	Imperceptible	Negligible	Imperceptible
Glenasmole Valley SAC	Extremely High		Temporary	Negligible	Imperceptible	Negligible	Imperceptible
Rye Water Valley/Carton SAC	Extremely High		Temporary	Negligible	Imperceptible	Negligible	Imperceptible
Wicklow Mountains SAC	Extremely High		Temporary	Negligible	Imperceptible	Negligible	Imperceptible
Wicklow Mountains SPA	Extremely High		Temporary	Negligible	Imperceptible	Negligible	Imperceptible

Table 7.8 – Summary of Predicted Construction Effects Following the Implementation of Mitigation and Monitoring Measures

Operational Phase

The mitigation measures which will be implemented during the operational phase are outlined below:

Surface Water Drainage: Due to a variety of measures such as the design of the car park with hydrocarbon interceptors, the speed restrictions in place, the likelihood of any spills entering the water environment from vehicles on site is negligible.

Foul Water: All foul water will be discharged to the main sewage system in the area (as described above). This increase in flow to the existing public foul sewer is not expected to have a negative effect on the foul drainage system in the area.

Water Supply: Rainwater harvesting from all new roof areas will reduce the demands for potable water supply from the Irish water infrastructure. We are currently awaiting information from Irish Water in relation to a new connection application.

The water system will be metered to facilitate detection of leakage and the prevention of water loss. Dual & low flush toilets and water economy outlets and water saving measures are also be proposed.

7.9 MONITORING & REINSTATEMENT

Construction Phase

As referenced in section 7.7, a project-specific Construction and Environmental Management Plan (CEMP) will be established and maintained by the contractors and campus owners during the construction and operational phases. The Plan CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. This is in keeping with industry standards for such developments. Visual monitoring will be undertaken as part of the regular site audits during the construction of the proposed development to ensure existing surface water drainage runoff and natural infiltration to ground is not affected by the proposed development.

The Contractor is required to monitor the weather forecasts to inform the programming of earthworks and stockpiling of materials.

Particular regard will be given to trench excavations and other works which may be vulnerable to the generation or conveyance of run-off, and for the protection of site personnel, plant and equipment.

Operational Phase

Considering operational works are predominately related to the maintenance of the proposed development, no monitoring measures are required during the operational phase, as there will be no potential for ongoing adverse impacts on water and hydrology.

The maintenance programme for the drainage system will be set out in the Operation and Maintenance manual which will be prepared during the detailed design. Regular maintenance will consist of regular inspections, silt or oil removal if required more frequently than once per year, vegetation management, sweeping of surfaces, and litter and debris removal.

7.10 POTENTIAL CUMULATIVE IMPACTS

This section considers the potential for cumulative effects arising from the proposed development in association with other developments. Specifically, it considers a worst-case scenario, where the proposed development and other developments for which construction timelines are not known are under construction and/or operation at the same time. It is assumed that the other projects will implement best industry standards to protect water quality during the construction phase of the project.

Planning Ref	Description of development	Comments
SD17A/0019	Construction of a new predominantly single storey Pharma production facility at a height of 15.95m with partial 2 storey plant room and enclosed roof top plant platform, single storey electrical building 126sq.m, an external utility yard for tanks and equipment and a single storey pump house 16sq.m	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase

Planning Ref	Description of development	Comments
SD17A/0118	The erection of 2 illuminated, 1.75m high x 4.7m wide takeda company logo signs at heights of 36.945 metres to the north elevation and 30.945 metres to the east elevation of the existing 37.07 metre high production building and associated works.	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase
SD17A/0318	The provision of a temporary (for 3 years) 18MW gas powered electricity generator compound to provide electricity to the DUB08 data centre located within the Microsoft Data Centre Campus in advance of the upgrade of electricity infrastructure locally.	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase
SD17A/0354	Construction of a new facility to include the construction of two storey biopharma production facility to a maximum height of 7.8m, a single storey electrical building of 126sq.m, an external utility yard for tanks and equipment and a single storey pump house of 16sq.m	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase
SD17A0388	Amendments to the previously approved application SD17A/0019 consisting of: removal of escape stair to the west elevation of the main building and inclusion of escape ladder, re-arrangement of nitrogen storage area and decreased size of nitrogen tank, removal of VOC stack, removal of louvre screen to main building roof and replaced with steel handrail, inclusion of extra flues to main building roof, removal of pump house from site, rearrangement of fencing to perimeter of main building. Amendments also include some changes to external doors and windows to both the electrical and main building.	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase
SD17A/0402	Amendments (2,186sq.m) approx. to previous Planning Ref; SD16A/0250 and amendments (188.2sqm) approx. to previous Planning Ref: SD13A/0186. Previous Planning Ref's also include SD15A/0243 and SD15A/0352. All proposed amendments are on a 11 hectare site.	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase
SD20A/0147	Construction of P3 Phase II expansion of the existing P3 biopharma production facility which includes the construction of circa 2,155sq.m, two storey biopharma production facility	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase
SD20A/0121	Construction of 3 two storey data centres with mezzanine floors at each level of each facility and associated ancillary development that will have a gross floor area of 80,269sw.m on an overall site of 16.5 hectares	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase
SD20A/0124	Demolition of existing single storey dwelling and construction of a Distribution Warehouse Building comprising warehousing and ancillary areas at ground floor and support offices, staff areas and plant across two floors with the total gross floor area of the development c.17,006sq.m.	No significant cumulative effects in relation to water and hydrology have been identified during the construction or operational phase

Table 7.9 – Potential Cumulative Effects

7.11 RESIDUAL IMPACTS

Construction Phase: Following the implementation of the mitigation and monitoring measures outlined above, no significant residual effects on water quality, flooding and hydrology are envisaged during the construction phase.

Operation Phase: No significant residual effects on water quality, flooding and hydrology are envisaged during the operational phase.

7.12 DIFFICULTIES IN COMPILING INFORMATION

The technical limitations in compiling the report are outlined in Section 7.2.

7.13 REFERENCES

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8 NOISE AND VIBRATION

8.1 INTRODUCTION

The following chapter presents an assessment of the impacts of the proposed development comprising amendments to the permitted data centres DUB14/15 with administration building and associated generators at Grange Castle International Business Park, Clondalkin, Dublin 22, in terms of the noise impact on the local environment.

In this study the noise impact of the proposed DUB14 and DUB15 and associated gas generation developments will be assessed in light of relevant guidelines and existing noise criteria that apply to the previously permitted elements of the Grange Castle campus. The development will consist of 2 no. data centres with fixed plant and emergency generator plant at ground level (associated with DUB14 only) and a gas generation facility. The proposed development will have a maximum operational electrical demand of 60MW for each data centre. Up to 150 MW of electricity will be required in order to operate and maintain the temperature, humidity and power supply in the facility. The development will contain offices, computer and associated support areas, electrical component rooms, plant and associated equipment.

This noise impact assessment will consider the above proposed development with due consideration of the potential cumulative impacts that may be associated with the proposed, existing and permitted MI data centres in the area, namely DUB03, DUB04, DUB05, DUB06, DUB07, DUB08, DUB09, DUB10, DUB11, DUB12 and DUB13.

Figure 8.1 illustrates the existing and approved facilities in the context of the surrounding environment.

Figure 8.1: Existing, Proposed & Approved Site Buildings in Local Context

The DUB 14/15 site is bounded by the wider MS Grange Castle campus to the east and north. The southern boundary of the site is formed with the New Nangor Road with lands for other data centre facilities beyond. The west of the site is bounded by the Cuisine de France facility and the MS DUB03/04/05 development beyond.

The nearest residential noise sensitive locations to the existing, approved and proposed MI sites are the residential noise sensitive locations to the south of the site along the New Nangor Road (including the Nangorlea Apartments and other detached dwellings). There are also a number of residential dwellings to the east of the site on the opposite side of the R136. The following methodology has been adopted for this assessment:

- Review previous assessments and appropriate guidance in order to identify appropriate noise criteria for the site;
- Carry out a review of noise monitoring at a number of critical locations (e.g. in the vicinity of nearest sensitive properties/boundaries) to identify existing levels of noise in the vicinity of the development;
- Develop a 3D noise model to consider the proposed DUB 14/15/Gas Generation and other associated buildings;
- Comment on the predicted levels and compare against the appropriate criteria and existing noise levels and outline required mitigation measures (if any).

Appendix 8.1 presents a glossary of the acoustic terminology used throughout this document. In the first instance it is considered appropriate to review some basic fundamentals of acoustics.

8.2 METHODOLOGY

Fundamentals of Acoustics

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0 dB (for the threshold of hearing) to 120 dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3 dB.

The frequency of sound is the rate at which a sound wave oscillates per second, and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For

example, hearing sensitivity decreases markedly as frequency falls below 250 Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the 'A-weighting' system has been found to provide one of the best correlations with perceived loudness. SPL's measured using 'A-weighting' are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 5.5.3 (remark: in this figure SPL is indicated as LpA).

The 'A' in 'dB LpA' or in 'dB(A)' denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text .

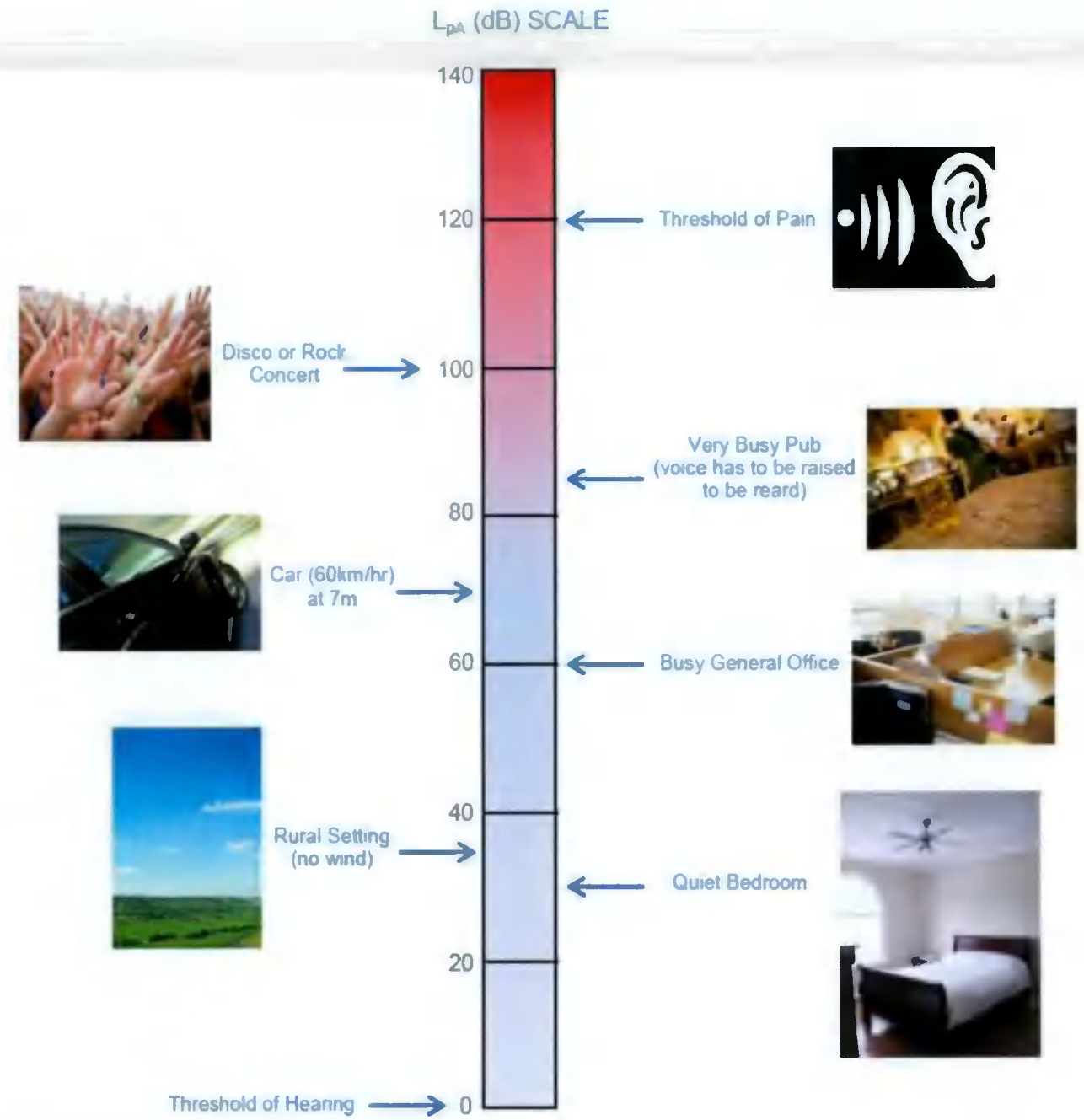

Figure 8.2: dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2016))

Noise Calculations

The noise data in terms of sound power levels (L_{wA} or SWL) from the current site is available as a 3D noise model in the noise calculation software '*iNoise*', the noise data for the proposal is added to the existing model. This software enables to calculate the resulting SPL of the industrial activities at any location in the vicinity, both for individual locations (e.g. residential noise sensitive locations) and for grids (contour plots).

8.3 RECEIVING ENVIRONMENT

A series of noise surveys have been undertaken as part of the planning application prepared for previous MI Dub projects project. This information has been used to inform this aspect of the presented assessment. Full details of the noise monitoring campaign are presented in Appendix 8.2 of this document. Review of the data confirms that the noise criteria proposed in this assessment are appropriate considering the prevailing noise environment.

Location A Located on the north eastern boundary of the Balybane pitch and putt course.

Location B Located at a location south east of the proposed development along the R134. This location would be representative of the various noise sensitive locations located along the R134 to the south of the proposed development including Grange Castle golf course.

Location C Located in the vicinity of a number of private residences in the Grangecastle Green estate. The monitoring location was located on a common green area.

Location D Located at a position along Lynch Lane to the north of the site.

Location E Located to the south of the site in the vicinity of the nearest residential dwellings to the proposed new Dub 09/10/12/13 development along the New Nangor Road (R134). Noise monitoring was conducted at this location for an extended period in order to establish average noise levels over typical weekday and weekend day, evening and night-time periods.

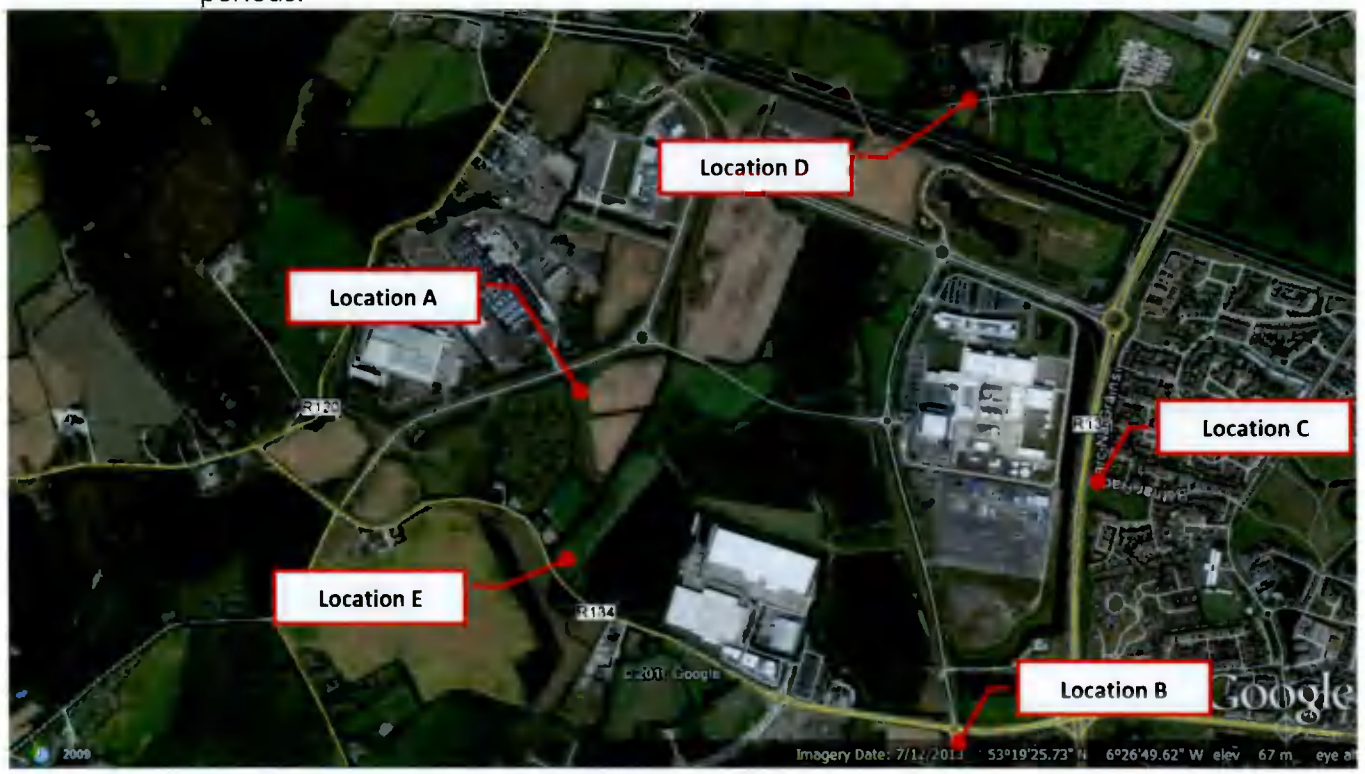

Figure 8.3: Noise Monitoring Locations

Average daytime, evening and night time noise levels at the monitoring locations are presented in Tables 8.1 and 8.2. See Appendix 8.2 for further details.

Location	Period	Measured Noise Levels (dB(A) re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{AFmax}	L_{AF90}	L_{AF95}
A	Day	55	71	50	49
	Evening	50	67	42	41
	Night	50	70	40	40
B	Day	61	77	53	52
	Evening	52	65	46	45
	Night	49	64	43	43
C	Day	54	74	51	51
	Evening	51	71	49	48
	Night	47	61	46	45
D	Day	52	79	50	50
	Evening	49	73	47	47
	Night	46	76	45	44

Table 8.1: Review of Noise Monitoring Data (Locations A, B, C and D)

Date	Period	Measured Noise Levels (dB(A) re. $2x10^{-5}$ Pa) Note 1			
		L_{Aeq}	L_{AFmax}	L_{AF90}	L_{AF95}
Fri 4 March	Day	57	75	51	51
	Evening	52	65	46	46
	Night	47	72	42	42
Sat 5 March	Day	53	72	45	44
	Evening	49	69	43	42
	Night	46	68	40	39
Sun 6 March	Day	51	82	40	39
	Evening	49	67	42	41
	Night	47	66	39	39
Mon 7 March	Day	58	82	50	48
	Evening	50	73	43	43
	Night	48	67	38	37
Tue 8 March	Day	58	76	50	48

Table 8.2: Review of Noise Monitoring Data (Locations E)

In terms of the various locations the following significant noise sources (in subjective order of influence) were noted:

Location		
A	B	C
Traffic movements. Cuisine de France. Aircraft from Baldonnell. Wind generated noise. Distant road traffic noise.	Road traffic on R134. Aircraft from Baldonnell. Wind generated noise. Distant road traffic noise. Distant commercial activities.	Local traffic movements. Local activities. Distant traffic noise.
Location		
D	E	
Local traffic movements. Local activities. Occasion distant train movements. Distant industrial site. Distant traffic noise.	Road traffic on R134. Aircraft from Baldonnell. Wind generated noise. Distant road traffic noise. Distant commercial activities.	

Table 8.3: Significant Noise Sources

The existing Microsoft facilities while a source of noise in the area were not the dominant noise source at any of the locations where monitoring was undertaken for this assessment. The overall noise levels at each location are influenced by a variety of sources to varying degrees.

8.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

When considering a development of this nature, the potential noise and vibration impact on the surroundings must be considered for each of two distinct stages:

- construction phase, and;
- operational phase.

As stated, the construction phase will involve extensive excavation over the development site and the erection of new buildings over a phased construction period.

The primary sources of outward noise in the operational context are deemed long term and will involve:

- building services noise;
- emergency site operations, and;
- additional vehicular traffic on public roads.

These issues are discussed in detailed in the following sections.

8.5 POTENTIAL IMPACTS

Construction Phase

Criteria for Rating Noise Impacts

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted in BS5228 – 1 calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

BS5228 – 1 sets out guidance on permissible noise levels relative to the existing noise environment. Table 8.4 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1. These are construction noise levels only and not the cumulative noise level due to construction plus existing ambient noise.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends Note D	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Table 8.4: Example Threshold of Potential Significant Effect at Dwellings

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate periods (i.e. daytime, evening and night-time) the ambient noise level is determined and rounded to the nearest 5dB. Baseline monitoring carried out as part of this assessment would indicate that the categories detailed in Table 8.5 are appropriate in terms of the nearest noise sensitive locations being considered in this instance.

Period	Baseline Noise Category	Construction Noise Threshold Value $L_{Aeq,T}$ (dB)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	A	65
Evening (19:00 to 23:00hrs)	A	55
Night time (23:00 to 07:00hrs)	A	45

Table 8.5: Rounded Baseline Noise Levels and Associated Categories

If the construction noise level exceeds the appropriate category value, then a potential significant effect is indicated.

This assessment process determines if a significant construction noise impact is likely. Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise are set out in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[1], which should not be exceeded at noise sensitive locations during the construction phase of the development. Table 8.6 sets out these levels.

Days and Times	Noise Levels (dB re. $2x10^{-5}$ Pa)	
	$L_{Aeq(1hr)}$	L_{Amax}
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00 to 16:30hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60*	65*

Table 8.6: Maximum Permissible Noise Levels at the Facade of Dwellings during Construction

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

In exceptional circumstances there may be a requirement that certain construction works are carried out during evening and night-time periods. In these instances, the relevant evening (60dB L_{Aeq1hr}) and night-time (50dB $L_{Aeq,1hr}$) will apply.

Therefore, based on the above the following construction noise criteria are proposed for the site in relation to day to day works during the stated construction hours:

70dB $L_{Aeq,1hr}$ at noise sensitive location
75dB $L_{Aeq,1hr}$ at commercial property

Criteria for Rating Vibration Impacts

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

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. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example, rock breaking and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up to 12mm/s and 5mm/s respectively. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*; and
- British Standard BS 5228-2: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. Below these values minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. BS 5228-2 also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

The TII document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* also contains information on the permissible construction vibration levels as follows:

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Table 8.7: Allowable vibration during construction phase

Operational Phase

Criteria for Rating Noise Impacts

It is considered appropriate to consider the noise limits applied to other aspects of the MS campus. Condition 10 of the Final Grant of Permission (Reg Ref.SD16A/0088 Grant Date 13 June 2016) states the following in relation to noise emissions:

> ***10 Noise and Air Quality***
>
> *(a) The equipment which would generate noise at the facility and the associated abatement measures shall be designed that tonal noise does not arise at the noise sensitive locations due to the facility operation. Appropriate attenuation measures, including management*

[1] *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

procedures and a maintenance programme for the external plant items, shall be put in place to ensure that tonal noise does not create a nuisance at residential properties on the Nangor Road.

(b) The applicant shall ensue that where emergency generators are to be tested once a month for the duration of 1 hour only, it is carried out between the hours of 9.00 and 17.00. It is recommended that there is a set routine for such testing so that the procedure becomes part of the normal accepted timetable for the community.

(c) If there is necessity to test the generators over a period of 4 hours once a year, such testing shall only take place between the hours of 9.00 and 17.00.

(d) The testing shall take place in sequential batches on consecutive days which shall be in conjunction with, but not at the same time as, the testing of the emergency generators to DUB03, DUB04, DUB05, DUB06, DUB07, DUB08 and DUB11. This is in order to ensure that testing dies not take place randomly and over a prolonged period of several days.

(e) Residents of the adjacent Nangor Road dwelling housed on the R120 and any other residents likely to be affected, shall be provided with adequate prior warning of any proposed testing times.

(f) The applicant shall undertake mitigation measures to limit noise and air pollution as set down in Sections 5.5 and 5.6 of the Environmental Impact Statement submitted with the planning application.

REASON: In the interests of preventing the creation of an air and noise nuisance and protecting the residential amenity of dwelling houses in the vicinity.

Condition 10(f) refers to the noise limits as set out in Section 5.5 of the Environmental Impact Statement Report (EIAR). These limits are presented in the following sections.

The EIAR noise chapter states the following limits in relation to operational phase noise emissions (non-emergency).

"The cumulative noise from the Microsoft sites will not exceed the following criteria at noise sensitive residences:

Period	*Noise Criteria*
Daytime (07:00 to 19:00hrs)	*55dB $L_{Ar,T}$*
Evening (19:00 to 23:00hrs)	*50dB $L_{Ar,T}$*
Night-time (23:00 to 07:00hrs)	*45dB $L_{Aeq,T}$*

Table 8.8: Cumulative Noise Levels

The $L_{Ar,T}$ parameter stated in the EIAR for day and evening periods is the rated sound level, equal to the $L_{Aeq,T}$ during the specified time interval (T), plus specified adjustments for tonal character of the sound. Given however the planning condition 10(a) prohibit tones, the relevant noise criteria parameter can be summarised as $L_{Aeq,T}$ for all periods with no tonal characteristics.

The EIAR noise chapter states the following limits in relation to operational phase noise emissions for emergency site operation (i.e. grid failure):

> *"In terms of emergency operation of generators on site (i.e. during an electricity grid failure) the following noise limit is applicable to site operations at noise sensitive residences:*
>
> - *Emergency Situation: 55 dB(A) $L_{Aeq,15min}$."*

Section 4.4.1 of the EPA NG4 document contains the following comments in relation to emergency plant items:

> *"In some instances, licensed sites will have certain items of emergency equipment (e.g. standby generators) that will only operate in urgent situations (e.g. grid power failure). Depending upon the context, it may be deemed permissible for such items of equipment to give rise to exceedances in the noise criteria/limits during limited testing and emergency operation only. If such equipment is in regular use for any purposes other than intermittent testing, it is subject to the standard limit values for the site".*

It is therefore considered that a noise criterion of 55dB $L_{Aeq,T}$ on generator units is appropriate in emergency scenario at residential dwellings.

In light of the guidance contained in the various documents discussed above, Table 8.9 presents the external noise limits that are relevant to the development.

Daytime (07:00 to 19:00hrs)	Evening (19:00 to 23:00hrs)	Night-time (23:00 to 07:00hrs)
55dB $L_{Aeq,T}$ (+ No Tones)	50dB $L_{Aeq,T}$ (+ No Tones)	45dB $L_{Aeq,T}$ (+ No Tones)

Table 8.9: Operational Noise Criteria

For emergency operation of generators on site (i.e. during an electricity grid failure) the following noise limit is applicable to site operations:

- Emergency Situation at Dwellings: 55 dB $L_{Aeq,15min}$.

Criteria for Rating Significance

The '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014) have been referenced in order to categorise the potential effect of changes in the ambient noise levels during the operational phases of the Proposed Development.

The Guidelines state that for any assessment, the potential significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. Due to varying factors which effect human response to environmental noise (prevailing environment, noise characteristics, time periods, duration and level etc.) assigning a subjective response must take account of these factors.

The scale adopted in this assessment is shown in Table 8.10 below is based on an example scale within the IEMA guidelines. The corresponding significance of impact presented in the Draft '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' (EPA, 2017) is also presented.

Noise Level Change dB(A)	Subjective Response	Long Term Impact Classification (IEMA, 2014)	Impact Guidelines on the Information to be contained in EIA Report's (EPA)
≥ 0	No change	Negligible	Imperceptible
≥ 0 and < 3	Barely perceptible		Not Significant
≥ 3 and < 5	Noticeable	Minor	Slight – Moderate
≥ 5 and < 10	Up to a doubling or halving of loudness	Moderate	Moderate – Significant
≥10	More than a doubling or halving of loudness	Major	Significant – Profound

Table 8.10: Noise Impact Scale – Operational Noise Sources

The significance table reflects the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

It is considered that the ratings specified in the above table provide a good indication as to the likely significance of changes on noise levels in this case and have been used to assess the impact of operational noise.

Criteria for Rating Vibration Impacts

Guidance as to an acceptable magnitude of vibration during the operational phase of the development is best taken from British Standard *BS 6472 (1992): Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).* The Standard contains recommendations that continuous vibration in residential buildings should not exceed nominally 0.3mm/s by daytime and 0.2mm/s by night-time.

It should be noted that the proposed development will not give rise to any significant levels of vibration off site and therefore the associated impact is not significant.

Forecasting Methods

Construction noise calculations have been conducted generally in accordance with BS 5228: 2009+A1:2014: *Code of practice for noise control on construction and open sites - Noise.* Prediction calculations for operational building services noise, car park activity and vehicle movements on site have been conducted generally in accordance with ISO 9613 (1996): *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.*

Changes in road traffic noise on the local road network have been considered using prediction guidance contained within *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.

Assessment of Construction Noise Impacts

General Construction Activities

It is predicted that the construction programme will create typical construction activity related noise on site. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators.

The proposed general construction hours are 07:00 to 18:00hrs, Monday to Friday and 08:00 to 14:00hrs on Saturdays. Occasional weekday evening and night works may also be required, however evening activities will be significantly reduced in order to manage any associated noise impacts in an appropriate manner and a more stringent construction noise criteria will be applicable during any evening works that may be required. As a result, noise emissions from evening activities are expected to be significantly lower than for other general daytime activities.

Due to the nature of daytime activities undertaken on a construction site of this nature, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Due to the proximity of sensitive locations to site works however, there is little likelihood of structural or even cosmetic damage to existing neighbouring dwellings as a result of vibration.

Due to the fact that the construction programme has been established in outline form only, it is difficult to calculate the actual magnitude of noise emissions to the local environment. However, it is possible to predict typical noise levels using guidance set out in BS 5228-1. Table 8.11 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme.

For the purposes of the assessment we have assumed that standard good practice measures for the control of noise from construction sites will be implemented. These issues are commented upon in further detail in the mitigation section of this report.

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance (dB $L_{Aeq,1hr}$)
1 – Site Preparation	Pneumatic Breaker (C5.6)	95
	Rock Breaker (C9.12)	85
	Wheeled Loader Lorry (C2 28)	74
	Tracked Semi-Mobile Crusher (C9.14)	90
	Track Excavator (C2 22)	72
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
2 – Foundations	Large Rotary Bored Piling Rig – Cast In-Situ (C3.14)	83
	Tracked Excavator (C3.24)	74
	Concrete Pump (C3.25)	78
	Compressor (C3 19)	75
	Poker Vibrator (C4 33)	78
3 – Steel Erection	Tower Crane (C4.48)	76

Phase	Item of Plant (BS 5228-1 Ref.)	Construction Noise Level at 10m Distance (dB $L_{Aeq,1hr}$)
	Sarens SCG 120 Crane	86
	Articulated lorry (C11.10)	77
4 – General Construction	Hand tools	81
	Pneumatic Circular Saw (D7.79)	75
	Internal fit – out	70
5 - Landscaping	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68

Table 8.11: Typical Noise Levels associated with Construction Plant Items (BS5228-1)

A number of representative noise sensitive locations have been considered in relation to the proposed development as illustrated in Figure 8.4.

Ref	Description	Co-Ordinates (ITM)	
		E	N
A	No longer noise sensitive	703,145	731,142
B	No longer noise sensitive	703,365	730,933
C	--	703,503	730,911
D	No longer noise sensitive	703,604	730,914
E	--	703,796	730,873
F	Warehouse	703,772	731,216
G	--	704,537	730,903
H	--	704,519	731,549
I	--	704,499	731,711
J	--	704,061	730,943
K	--	703,912	732,082

Table 8.12: Noise Assessment Locations

Figure 8.4: Noise Assessment Locations

Location	Construction Phase (dB $L_{Aeq,1hr}$)				
	Site Preparation	Foundations	Steel Erection	General Construction	Landscaping
C	59	48	49	45	44
E	57	46	47	42	41
F	53	42	43	38	37
G	44	33	35	30	29
H	45	34	35	30	29
I	45	34	35	30	29
J	50	39	40	35	34
K	47	36	37	32	31

Table 8.13: Review of potential daytime construction noise impact

There are no items of plant that would be expected to give rise to noise levels that would be considered out of the ordinary or in exceedance of the levels outlined in the above tables or give rise to a potential significant impact. The impact on the noise environment due to construction activities will be transient and short-term in nature and mitigation measures will be implemented to minimise the impact of construction activities on the noise environment.

It is anticipated that the construction of the facility will be completed during normal construction hours i.e. 07:00 to 18:00hrs Monday to Friday and 08:00 to 14:00hrs on Saturdays. However, it is possible that the contractor may wish to carry out certain operations outside these hours i.e. 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. A more stringent construction noise criteria (as per Section 10.29) will be applicable during any evening works that may be required.

Construction Traffic

In terms of the additional construction traffic on local roads that will be generated as a result of the proposed development the following comment is presented: Considering that in order to increase traffic noise levels by 1dB traffic volumes would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to the construction phase associated with various phases of the development, as outlined in the relevant sections of Chapter 11 will not result in a significant noise impact.

Review of Construction Impacts

In terms of noise associated with these construction activities the associated effect is stated to be:

Quality	***Significance***	***Duration***
Negative	*Slight*	*Short Term*

In terms of vibration due to the distance of activities from the site to the nearest sensitive locations and controlling vibration levels to those detailed in Table 8.14 the associated effect is stated to be

Quality	*Significance*	*Duration*
Neutral	*Imperceptible*	*Short Term*

Assessment of Operational Noise Impacts

The primary sources of outward noise in the operational context are deemed medium term and will involve:

- building services noise;
- emergency site operations; and
- additional vehicular traffic on public roads.

These issues are discussed in detailed in the following sections. See Appendix 8.3 for details of the noise modelling undertaken for this assessment and associated assumptions.

Building Services Noise / Emergency Site Operation

Four scenarios have been developed to consider the noise impact of the proposed operations. These are as follows:

- Scenario A – Day to Day Operations;
- Scenario B – Day to Day Operations (with Gas Generation), and;
- Scenario C – Emergency Operation (with all generators) (and Gas Generation)
- Scenario D – Generator Testing (and Gas Generation)

Scenario A would be considered to be the most representative of the day to day operation. Scenario B considers periods when proposed gas generation facilities will be operational along with the day to day plant that services the proposed buildings. Scenario C is representative of an emergency situation when a power outage or issue with supply from the national grid has occurred. It should be noted that such an event is an extremely rare occurrence. In Scenario C it is noted that the gas generation is also assumed to be operational.

Scenarios D consider the impact associated with the occasional testing of proposed back-up emergency generators on the site. Typically, only two generator units will be tested at any one time. The assessment presented here assumes the closest generators to existing noise sensitive locations are running when presenting expected noise levels associated with the generator testing.

Figure 8.4 highlights the nearest noise sensitive locations at which predictions have been carried out. Various noise contours are also presented for scenarios A, B, C and D in order to demonstrate the noise impact of the proposed development over a wider area.

The results of the iterations of the noise model are presented in Table 8.15. Note all plant will be selected such that no tonal noise emissions are evident at noise sensitive locations.

Location	Predicted dB $L_{Aeq,T}$			
	Scenario A	Scenario B	Scenario C	Scenario D
C	45	45	52	46
D	43	45	51	43
E	39	41	49	40
F	46	47	68	46
G	29	29	44	29
H	30	30	46	30
I	29	29	45	29
J	36	37	52	36
K	40	40	48	40

Table 8.14: Predicted Plant Noise Levels for Various Scenarios

The above predicted levels are based on a situation where the receiver is downwind of all noise sources and that all plant is operating on full duty (which will rarely if ever be the case). For the purposes of the assessment against the adopted criteria this is a robust worst-case assumption.

Comment on Adopted Noise Criteria Day to Day Operations

The predicted noise levels have been compared to the relevant daytime noise criteria as adopted for this assessment. It should be noted that the back-up generator testing shall take place only between 09.00 and 17.00hrs. Residents of the adjacent dwelling houses shall be provided with adequate prior warning of the proposed testing times exceeding 1 hour in duration.

The tables below present the predicted noise levels at the assessment locations for the various scenarios identified. The predicted noise levels are compared against the relevant noise criteria identified Table 8.7. Note the predicted noise levels consider all plant associated with the site operating. In most instances this will not be the case and plant will be typically operating at lower duties that those assumed here. It is considered that the predicted levels presented here are conservative and levels experienced on the ground will most likely be lower.

Ref	Description	Predicted Noise Level dB(A) for Scenario A	Period	Criterion dB $L_{Aeq,T}$	Complies?
C	--	45	Day	55	✓
			Evening	50	✓
			Night	45	✓
D	No longer noise sensitive	43	Day	N/A	✓
			Evening		✓
			Night		✓
E	--	39	Day	55	✓
			Evening	50	✓
			Night	45	✓
F	Warehouse	46	Day	55	✓
			Evening	55	✓
			Night	55	✓

Ref	Description	Predicted Noise Level dB(A) for Scenario A	Period	Criterion dB $L_{Aeq,T}$	Complies?
G	--	29	Day	55	✓
			Evening	50	✓
			Night	45	✓
H	--	30	Day	55	✓
			Evening	50	✓
			Night	45	✓
I	--	29	Day	55	✓
			Evening	50	✓
			Night	45	✓
J	--	36	Day	55	✓
			Evening	50	✓
			Night	45	✓
K	--	40	Day	55	✓
			Evening	50	✓
			Night	45	✓

Table 8.15: Review of Scenario A – Day to Day Operation (with DUB 14/15)

Review of the predicted noise levels conclude the adopted criteria are satisfied based on the assumptions outlined in this document.

Ref	Description	Predicted Noise Level dB(A) for Scenario A	Period	Criterion dB $L_{Aeq,T}$	Complies?
C	--	45	Day	55	✓
			Evening	50	✓
			Night	45	✓
D	No longer noise sensitive	45	Day	N/A	✓
			Evening		✓
			Night		✓
E	--	41	Day	55	✓
			Evening	50	✓
			Night	45	✓
F	Warehouse	47	Day	55	✓
			Evening	55	✓
			Night	55	✓
G	--	29	Day	55	✓
			Evening	50	✓
			Night	45	✓
H	--	30	Day	55	✓
			Evening	50	✓
			Night	45	✓
I	--	29	Day	55	✓
			Evening	50	✓
			Night	45	✓
J	--	37	Day	55	✓
			Evening	50	✓
			Night	45	✓
K	--	40	Day	55	✓
			Evening	50	✓

Ref	Description	Predicted Noise Level dB(A) for Scenario A	Period	Criterion dB $L_{Aeq,T}$	Complies?
			Night	45	✓

Table 8.16: Review of Scenario B – Day to Day Operation (with DUB 14/15) with Gas Generation

Review of the predicted noise levels conclude the adopted criteria are satisfied based on the assumptions outlined in this document.

Ref	Description	Predicted Noise Level dB(A) for Scenario C	Period	Criterion dB $L_{Aeq,T}$	Complies?
C	--	52	Emergency	55	✓
D	No longer noise sensitive	51		55	✓
E	--	49		55	✓
F	Warehouse	68		N/A	✓
G	--	44		55	✓
H	--	46		55	✓
I	--	45		55	✓
J	--	52		55	✓
K	--	48		55	✓

Table 8.17: Review of Scenario C – Emergency Operation (with DUB 14/15)

This prediction location is representative of a commercial property within the adjacent Kilcarbery Business Park. The predicted level at this façade during an emergency operation scenario is the order of 68 dB $L_{Aeq,T}$. Review of the façade of the building confirms that no windows are located along this façade. The inherent sound insulation of the building envelope will attenuate the noise levels such that internal levels are within typical acoustic design guidance that is espoused for commercial premises such as these.

Review of the predicted noise levels conclude the adopted criteria are satisfied based on the assumptions outlined in this document.

Figure 8.5: Commercial Façade Facing Grangecastle Site

Ref	Description	Predicted Noise Level dB(A) for Scenario D	Period	Criterion dB $L_{Aeq,T}$	Complies?
C	--	46	Generator Testing (Daytime Only)	55	✓
D	No longer noise sensitive	43			✓
E	--	40			✓
F	Warehouse	46			✓
G	--	29			✓
H	--	30			✓
I	--	29			✓
J	--	36			✓
K	--	40			✓

Table 8.17i: Review of Scenario D – Generator Testing (with DUB 14/15) with Gas Generation

Scenario A All locations comply with the adopted criteria in relation to day to day operations. Figure 8.6 presents a noise contour for Scenario A.

Scenario B All locations comply with the adopted criteria in relation to day to day operations. Figure 8.7 presents a noise contour for Scenario B.

Scenario C All locations are within the relevant adopted emergency operation limit in the rare event that a power loss to the site occurs. Figure 8.8 presents a noise contour for Scenario C.

Scenario D All locations are within the relevant adopted daytime limits by a during periods when generators are undergoing routine testing. Figure 8.9 presents a noise contour for Scenario D.

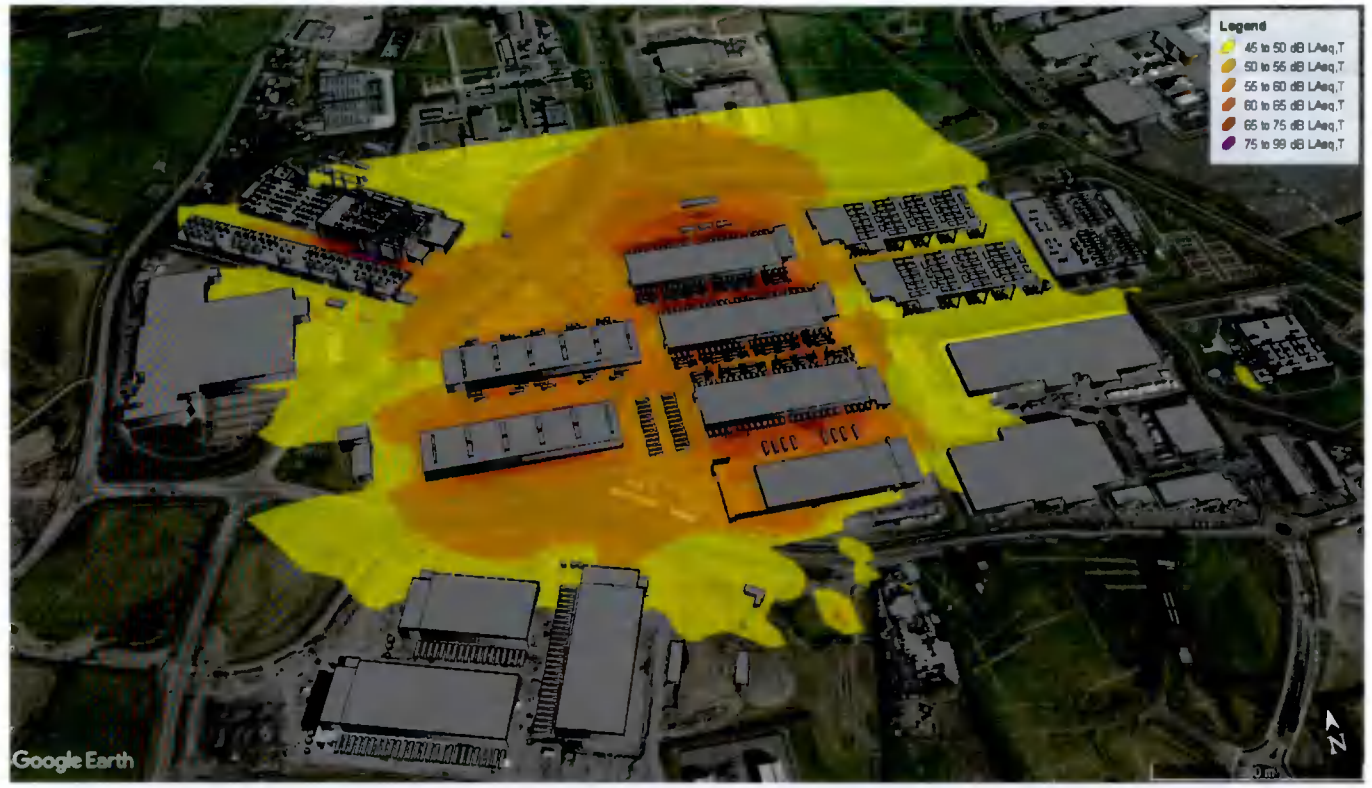

Figure 8.6: Scenario A – Day to Day (with DUB 14 and 15) Contour (Extent of 45dB(A) Contour)

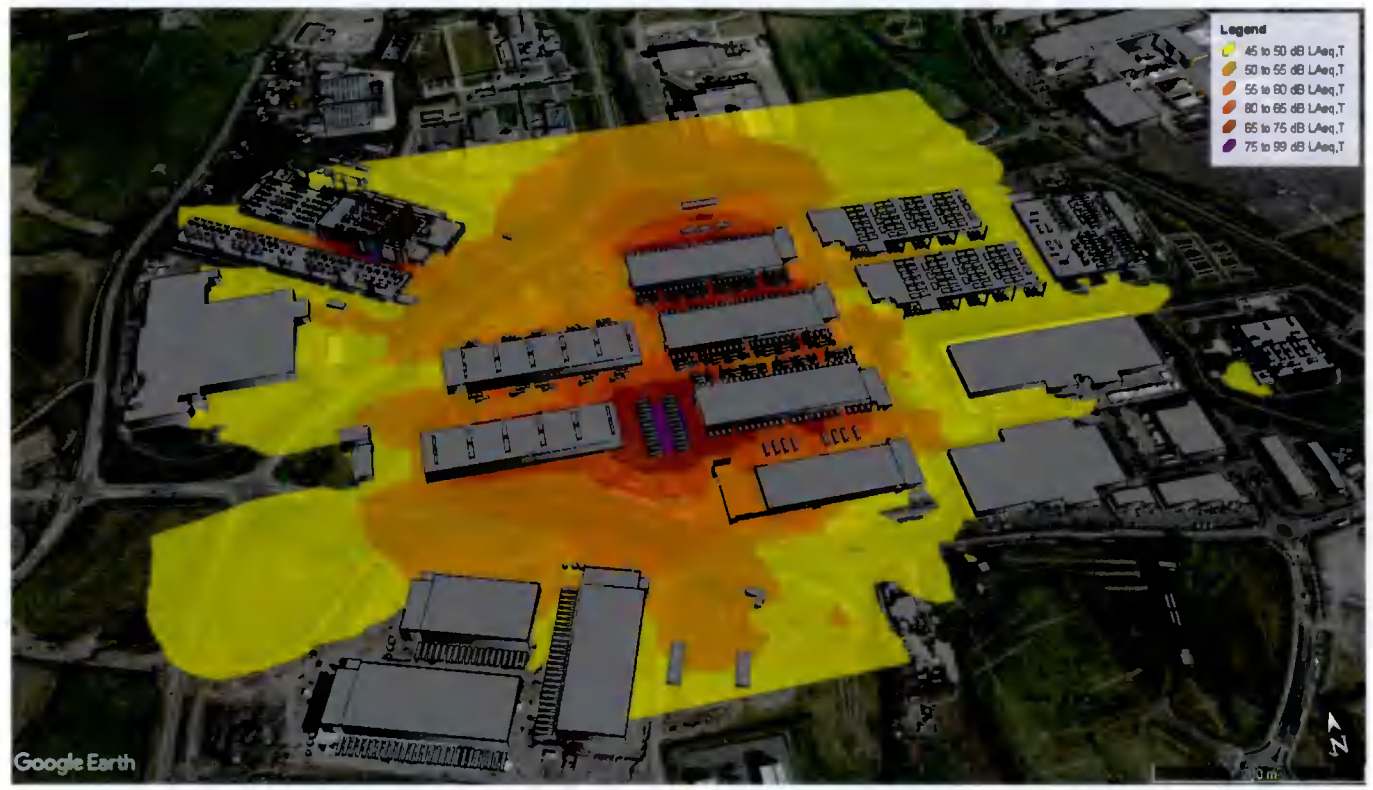

Figure 8.7: Scenario B – Day to Day (with DUB 14 and 15) with Gas Generation Contour (Extent of 45dB(A) Contour)

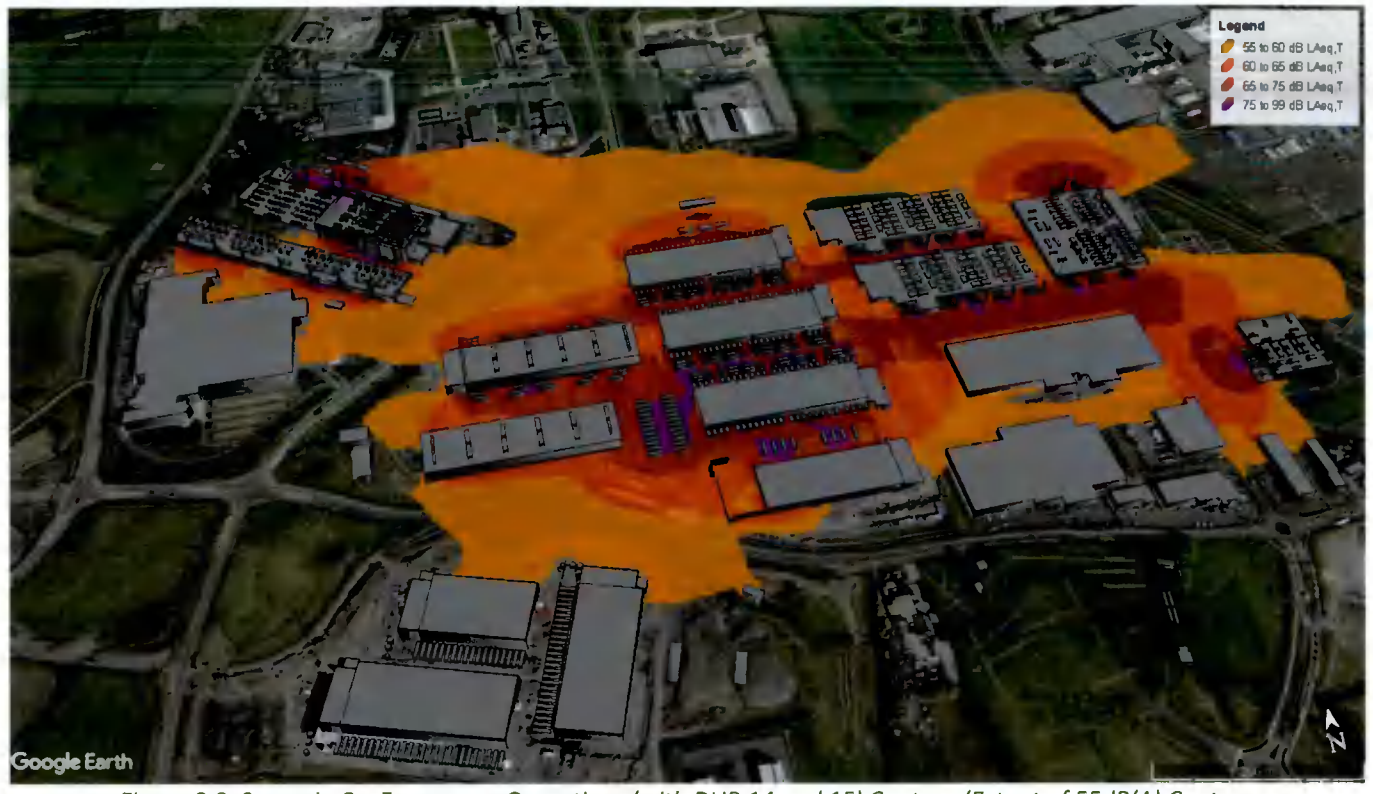

Figure 8.8: Scenario C – Emergency Operations (with DUB 14 and 15) Contour (Extent of 55dB(A) Contour

Figure 8.9: Scenario D – Generator Testing (with DUB 14 and 15) Contour (Extent of 55dB(A) Contour

Review of increases in noise level

The table below presents the predicted changes in noise level associated with the proposed development compared to the permitted development (i.e. up to DUB 13) at the nearest noise sensitive locations to the site.

Loc.	Scenario B – Typical Operation			
	Permitted Development to Date dB $L_{A90,T}$	Proposed Development dB $L_{Aeq,T}$	Change in Noise Level (dB)	EPA Glossary of Impacts
C	45	45	0	Imperceptible
E	38	41	2	Not Significant
G	29	29	0	Imperceptible
H	30	30	0	Imperceptible
I	29	29	0	Imperceptible
J	36	37	1	Not Significant
K	40	40	0	Imperceptible

Table 8.18: Review of Changes in Noise Level (Permitted vs. Proposed Development)

Review of Predicted Changes in Existing Noise Levels

Review of the predicted increases in noise level at the nearest noise sensitive locations conclude that the associated impact is '*not significant*' or '*imperceptible*' at all locations for day to day operations with gas generation. In essence the existing soundscapes that are encountered at the nearest noise sensitive locations are predicted to remain unchanged in terms of ambient noise levels with the development of the data storage facility introducing a low level of plant noise at the nearest locations assessed. In terms of noise associated with day to day activities the associated effect is stated to be as follows:

Quality	***Significance***	***Duration***
Negative	*Not Significant*	*Long Term*

Additional vehicular traffic on public roads

In terms of the additional traffic on local roads that will be generated as a result of this development the following comment is presented: Considering that in order to increase traffic noise levels by 1dB traffic volumes would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to this development will not result in a significant noise impact. The resultant noise impact as follows:

Quality	***Significance***	***Duration***
Neutral	*Imperceptible*	*Long Term*

Vibration

There is no source of vibration associated with the day to day operation of the development that will give rise to impacts at nearby sensitive locations. In terms of these the operational phase of the development the associated effect is stated to be:

Quality	*Significance*	*Duration*
Neutral	*Imperceptible*	*Long Term*

8.6 POTENTIAL CUMULATIVE IMPACTS

The environmental noise survey takes account of noise emissions from existing developments. It was noted that the existing ambient noise levels in the area were dominated primarily by road traffic on the surrounding road network.

The noise criteria proposed for new building services plant items has been derived with consideration of existing site noise emissions levels to ensure that cumulative noise emissions do not exceed the relevant noise criteria.

The potential cumulative noise emissions from the proposed development and neighbouring Google Ireland Data Centre, DUB69 and Cyrus One Data Centre have been considered. Reference is made to Section 10 of the Cyrus One EIAR and Section 10 of the DUB69 EIAR which present noise predictions to nearby shared residential receptors.

The closest shared receptors to the two neighbouring sites are the receivers R2, R5 and R6. Table 10.17 presents the predicted cumulative noise levels to these two receivers and compares to the proposed noise criteria.

Receiver Reference (Ref. Figure 8.4)	Predicted Noise Level, (dB $L_{Aeq,T}$)				Noise Criteria (dB(A)) (Night)	Complies?
	Microsoft	DUB69	Cyrus One	Cumulative		
C Note A	45	35	24	45	45	✓
D Note B	45	35	24	45		✓

Table 8.19: Assessment of predicted noise levels at receptors for typical site operation

Note A NSL R11 in DUB59 assessment R6 in Cyrus One assessment.
Note B NSL R13 in DUB69 assessment R6 in Cyrus One assessment.

Predicted cumulative plant noise emissions are therefore within the adopted criteria.

8.7 MITIGATION MEASURES

In order to sufficiently ameliorate the likely noise impact, a schedule of noise control measures has been formulated for both construction and operational phases associated with the proposed development.

Construction Phase
With regard to construction activities, reference has been made to BS5228 Parts 1 and 2, which offer detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures will be considered and applied during the construction of the proposed development. As an example, the following measures will be implemented on site:

- limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- monitoring levels of noise and/or vibration during critical periods and at critical sensitive locations; and
- all site access roads will be kept even so as to mitigate the potential for vibration from lorries.

Furthermore, a variety of practicable noise control measures will be employed, such as:

- selection of plant with low inherent potential 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.

We would recommend that vibration from construction activities to off-site residences be limited to the values set out above. 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. Magnitudes of vibration slightly greater than those in the table 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%.

Appendix 8.4 presents an indicative construction noise and vibration management plan that will be implemented in terms of the day to day operation of the site. This will focus on opening up and maintaining lines of communication with the local community to address issues in relation to noise and/or vibration and to advise the community of periods where specific activities take place that have an increased potential in giving rise to issues off site.

Operational Phase

Building services noise / emergency site operation

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.

Additional vehicular traffic on public roads

The noise impact assessment outlined previously has demonstrated that mitigation measures are not required.

8.8 PREDICTED IMPACTS

This section summarises the likely noise and vibration impact associated with the proposed development, taking into account the mitigation measures.

Construction Phase

During the construction phase of the proposed development there will be some impact on nearby noise sensitive properties due to noise emissions from site traffic and other activities. The application of noise limits and 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. Also, it is reiterated that any construction noise impacts will be slight, negative and short-term in nature. Also, it is considered that as the proposed development progresses from initial ground works that construction noise impacts will reduce from slight to not significant.

Operational Phase

Building services noise / emergency site operation

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the adopted criterion at the façade of any nearby noise sensitive locations. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements. The resultant noise impact is negative, not significant and long-term.

Additional vehicular traffic on public roads

Any change in noise levels associated with vehicles at road junctions in the vicinity of the proposed development is expected to be imperceptible. The resultant noise impact is neutral, imperceptible and long-term.

8.9 'DO NOTHING' SCENARIO

The existing noise and vibration climate will remain essentially unchanged on site and at nearby sensitive locations.

8.10 WORST CASE SCENARIO

Mitigation measures incorporated into the design of the plant do not offer the levels of attenuation required. Noise levels at nearby noise sensitive locations may exceed the relevant noise limits outlined in this assessment.

8.11 MONITORING & REINSTATEMENT

It is required that the appointed contractor monitor levels of noise and vibration during the construction phase at nearby sensitive locations and/or development site boundaries if significant noise and vibration impacts are envisioned.

8.12 DIFFICULTIES IN COMPILING INFORMATION

N/A

8.13 REFERENCES

- EPA Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIA Reports) (2017) and draft revised Guidelines on information to be contained in Environmental Impact Statements; and Advice Notes for preparing EIS (2015).
- '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014).
- *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise.*
- Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*
- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.*
- British Standard BS 5228-2: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Vibration.*
- BS 4142:2014: *Methods for rating and assessing industrial and commercial sound.*
- BS 8233:2014: *Guidance on sound insulation and noise reduction for buildings.*
- Environmental Protection Agencies *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)* (January 2016).

- ISO 1996-2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.*
- British Standard *BS 6472 (1992): Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).*
- ISO 9613 (1996): *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.*
- *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.
- BS EN 1793-1:1998: *Road traffic noise reducing devices – Test method for determining the acoustic performance – Part 1: Intrinsic characteristics of sound absorption*
- BS EN 1793-2:1998: *Road traffic noise reducing devices – Test method for determining the acoustic performance – Part 2: Intrinsic characteristics of airborne sound insulation.*
- BS EN 1794-1:2003: *Road traffic noise reducing devices. Non-acoustic performance. Mechanical performance and stability requirements*
- BS EN 1794-2:2003: *Road traffic noise reducing devices. Non-acoustic performance. General safety and environmental requirements.*

9 AIR AND CLIMATE

9.1 INTRODUCTION

The following chapter presents an assessment of the impacts of the proposed development of two data centres with administration building and associated generators at Grange Castle International Business Park, Clondalkin, Dublin 22, in terms of the air and climate impact.

The nearest residential air sensitive locations to the existing, approved and proposed sites are as follows:

- A small apartment scheme called Nangor Lea (6 apartments within a converted house) located behind the petrol station on the New Nangor Road south of the DUB11 site and beside the Kilcarbery Business Park.
- A number of single detached dwellings located along the R134 (Nangor Road) southwest of Kilcarbery Business Park.
- A number of single detached dwellings along the R120 west of, and behind, DUB03, DUB04 & DUB05 and Cuisine De France.

The site is bounded by IDA lands to the north. To the east is the Pfizer facility, vacant land and the R136 Outer Ring Road dual carriageway. East of the dual carriageway is the western extent of Clondalkin residential area. The southern side of the site is formed with the boundary of the Kilcarbery Business Park and the R134. The west of the site contains the Ballybane pitch and putt course, DUB 03-05 and Cuisine de France beyond.

The dispersion model study consisted of the following components:

- Review of emission data and other relevant information needed for the modelling study;
- Review of background ambient air quality in the vicinity of the facility;
- Air dispersion modelling of significant substances released from the site;
- Identification of predicted concentrations of released substances at sensitive receptors in the immediate environment;
- Evaluation of the environmental significance of these predicted concentrations, including consideration of whether these concentrations are likely to exceed relevant ambient air quality standards guidelines.

9.2 METHODOLOGY

Air dispersion modelling was carried out by AWN Consulting for and on behalf of MS using the United States Environmental Protection Agency's regulated model AERMOD (version 19191). The modelling of air emissions from the site was carried out to assess the concentrations of Nitrogen Dioxide (NO_2) and the consequent impact on human health. The assessment of the worst-case scenario was undertaken in order to quantify the cumulative impact of the proposed development and the existing facility on ambient air quality concentrations. To obtain all the meteorological information required for use in the model, data collected during 2016 - 2020 from Casement Aerodrome has been incorporated into the modelling.

The air dispersion modelling input data consisted of information on the physical environment, design details for all emission points on-site and five full years of meteorological data. Using this input data, the model predicted ambient concentrations at various receptors for each hour of the meteorological year. This study adopted a worst-case approach which will lead to an over-estimation of the actual levels that will arise.

Emissions from the site have been modelled using the AERMOD dispersion model which has been developed by the U.S. Environmental Protection Agency (USEPA) and the American Meteorological Society (AMS). The model is recommended as an appropriate model for assessing the impact of air emissions from industrial facilities in the EPA Guidance document "Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (2020)" (EPA, 2020a).

The model is a "new-generation" steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement of the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources. Fundamentally, the model has made significant advances in simulating the dispersion process in the boundary layer. This will lead to a more accurate reflection of real world processes and thus considerably enhance the reliability and accuracy of the model particularly under those scenarios which give rise to the highest ambient concentrations.

Due to the proximity to surrounding buildings, the PRIME Building Downwash Program (BPIP Prime) was used as a preprocessor to incorporate the influence of buildings in the model. The model then considers the influence (wake effects) of these buildings on dispersion in each wind direction considered.

The AERMOD model incorporated the following features:

- Discrete receptors were identified at which concentrations would be modelled. The impact of the gas generators was assessed at the following discrete receptor locations:
  - Nearby residential receptors
  - Boundary of the site;
- A receptor grid was identified at which concentrations would be modelled. The receptors were mapped with sufficient resolution to ensure all localised "hot-spots" were identified without adding unduly to processing time. Modelling was carried out covering an area of 8 km x 8 km with the site at the centre. An outer grid was mapped with 200 m resolution. The inner (fine) grid consisted of receptors every 100 m extended to 2.5 km from the site. The total calculation points for the gridded modelling including discrete receptors are 2,522.
- All on-site buildings and significant process structures were mapped into the computer to create a three dimensional visualisation of the site and its emission points. Buildings and process structures can influence the passage of airflow over the emission stacks and draw plumes down towards the ground (termed building downwash). The stacks themselves can influence airflow in the same way as buildings by causing low pressure regions behind them (termed stack tip downwash). Both building and stack tip downwash were incorporated into the modelling.
- Hourly-sequenced meteorological information has been used in the model covering the years 2016 – 2020 from Casement Aerodrome as shown in Figure 9.1. AERMOD incorporates a meteorological pre-processor AERMET which allows AERMOD to account for changes in the plume behaviour with height

using information on the surface characteristics of the site. AERMET calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, temperature scale, convective boundary layer (CBL) height, stable boundary layer (SBL) height, and surface heat flux.

- Terrain has been mapped out in the model using SRTM 30m resolution data although in general the area is one of gentle terrain.

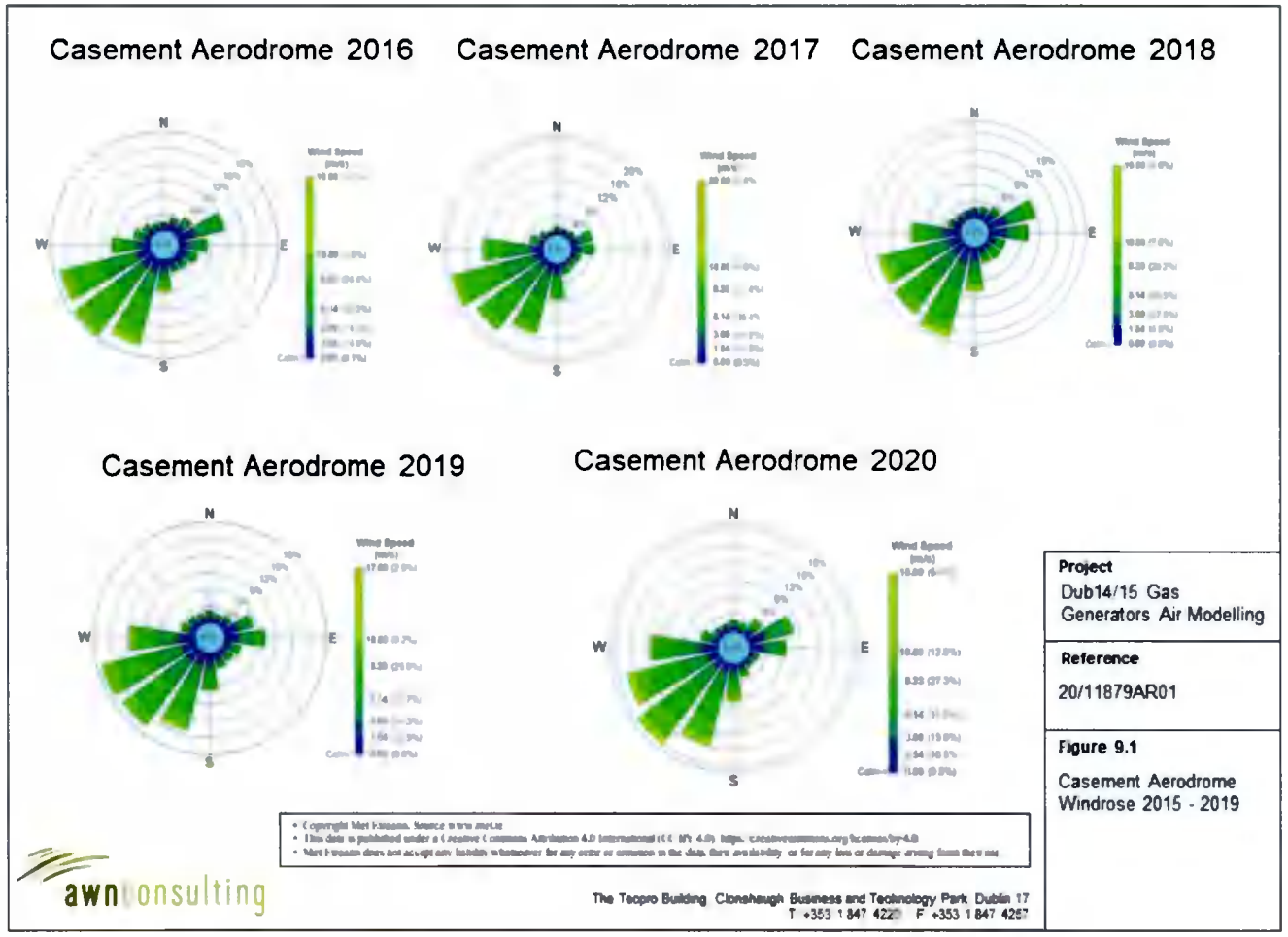

Figure 9.1: Casement Aerodrome Windrose (2016 – 2020)

Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, 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 health- or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 9.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011 incorporating European Commission Directive 2008/50/EC, which has set limit values for nitrogen dioxide (NO_2) (see Table 9.1).

Pollutant	Regulation Note1	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	40% until 2003 reducing linearly to 0% by 2010	200 µg/m^3 NO_2
		Annual limit for protection of human health	40% until 2003 reducing linearly to 0% by 2010	40 µg/m^3 NO_2
		Critical limit for protection of vegetation	None	30 µg/m^3 NO + NO_2

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Table 9.1: EU Air Quality Standards (based on European Commission Directive 2008/50/EC) (transposed as S.I. 180 of 2011)

Climate Agreements

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) (UNFCC 1992) and the Kyoto Protocol (UNFCC, 1997). The Paris Agreement (UNFCC, 2015), which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the European Union (EU) enacted '*Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013*' (hereafter referred to as the Regulation) (European Parliament and Council of Europe, 2018). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. The ETS is an EU-wide scheme which regulates the GHG emissions of larger industrial emitters including electricity generation, cement manufacturing and heavy industry. The non-ETS sector includes all domestic GHG emitters which do not fall under the ETS scheme and thus includes GHG emissions from transport, residential and commercial buildings and agriculture. Ireland's obligation under the Regulation is a 30% reduction in non-ETS GHG emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Act was enacted by the Oireachtas (the Act) (Oireachtas, 2015). The purpose of the Climate Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient*

and environmentally sustainable economy by the end of the year 2050' (3.(1) of No. 46 of 2015). This is referred to in the Climate Act as the '*national transition objective*'.

The Climate Act makes provision for a national mitigation plan, and a national adaptation framework. The mitigation plan, referred to as the '*national low carbon transition and mitigation plan*', which is required to be submitted to Government for approval every five years, outlines a range of objectives:

- To specify the manner in which it is proposed to achieve the national transition objective;
- Specify the policy measures required to manage GHG emissions and the removal of GHGs at a level that is appropriate for furthering the achievement of the national transition objective;
- Take into account any existing obligations of the State under the law of the EU or any international agreement; and
- Specify the sectoral mitigation measures for the purpose of reducing GHG emissions and enabling the achievement of the national transition objectives.

The adaptation plan, referred to as the '*national climate change adaptation framework*', which is required to be submitted to Government for approval every five years, outlines a range of objectives:

- To specify the national strategy for the adaptation measures in different sectors which reduces the vulnerability of the State to the negative effects of climate change and to avail of the positive effects of climate change that may occur; and
- Take into account any existing obligations of the State under the law of the EU or any international agreement.

In addition, the Climate Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019. The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP. In June 2020 the Government published the 'Programme for Government – Our Shared Future' (Government of Ireland 2020). In relation to climate, there is a commitment to an average 7% per annum reduction in overall GHG emissions from 2021 to 2030 (51% reduction over the decade) with an ultimate aim to achieve net zero emissions by 2050. Policy changes will include the acceleration of the electrification of the transport system, including electric bikes, electric vehicles and electric public transport, alongside a ban on new registrations of petrol and diesel cars from 2030. In addition, there will be a policy to ensure an unprecedented model shift in all areas by a reorientation of investment to walking, cycling and public transport. The 2021 Climate Bill was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.
The purpose of the 2021 Climate Bill, if enacted, is to provide for the approval of plans 'for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050'. The 2021 Climate Bill also 'provide for carbon budgets and a sectoral emissions ceiling to apply to different sectors of the economy'. The 2021 Climate Bill defines the carbon budget as 'the total amount of greenhouse gas emissions that are permitted during the budget period'.

It is anticipated that legislation will also be introduced, separately, to ban the sale of new fossil fuel cars by 2030. The 2021 Climate Bill removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. The National Long Term Climate Action Strategy may include the following:

- Projected greenhouse gas emission reductions and the enhancement of sinks for a minimum of 30 years;
- Projected sector specific greenhouse gas emission reductions and enhancement of removals by sector, and
- An assessment of potential opportunities in relevant sectors.

In relation to carbon budgets, the 2021 Climate Bill states *'A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')'*. The carbon budget is to be produced for 3 sequential budget periods with the third carbon in draft format. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change.

In relation to the decarbonization target strategy, the Minister for the Environment, Community and Local Government (the Environment Minister) shall prepare and submit to government the decarbonisation target range once the carbon budget takes effect. The Climate Change Advisory Council (Advisory Council) is to advise and make recommendations on the following:

- The preparation of a climate action plan;
- The preparation of a national long term climate action strategy
- The preparation of a national adaptation framework
- The finalization and revision of a carbon budget, and
- Compliance with any existing obligations of the State under EU law or any international agreements.

The Advisory Council is to conduct a review by 15 September in each year of the progress made during the preceding year in:

- Achieving reductions in greenhouse gas emissions;
- Adhering to the carbon budget for that period, and
- Advancing the national 2050 climate objective.

The Minister with responsibility for each sector, will give an account of the following matters during the period to which the annual report relates including:

- Sector specific progress under the most recent CAP and any significant failure to implement such policies and measures, or to achieve sector specific targets;
- Whether there has been a reduction or increase in GHG emissions based on the EPA report;
- Compliance with the decarbonization target range and any measures to address many failure to comply with the target.

The Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority. Each local authority shall consult and co-operate with an adjoining local authority in making a local authority climate action plan and co-ordinate the mitigation measures and adaptation measures to be adopted, where appropriate. Each local authority is also required to consider any significant effects the implementation of the local authority climate action plan may have on the adjoining local authority,

Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The initial objective of the Protocol was to control and reduce emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_X), Volatile Organic Compounds (VOCs) and Ammonia (NH_3). To achieve the initial targets Ireland was obliged, by 2010, to meet national emission ceilings of 42 kt for SO_2 (67% below 2001 levels), 65 kt for NO_X (52% reduction), 55 kt for VOCs (37% reduction) and 116 kt for NH_3 (6% reduction). In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$.

European Commission Directive 2001/81/EC and the National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National EPA Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005. The data available from the EPA in 2018 (EPA, 2020d) indicated that Ireland will comply with the 2020 emissions ceilings for SO_2, but will fail to comply with the ceiling for NH_3, NO_X and NMVOCs. Directive (EU) 2016/2284 "*On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC*" was published in December 2016. The Directive will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO_2, NO_x, NMVOC, NH_3, $PM_{2.5}$ and CH_4. In relation to Ireland, 2020 emission targets are 25 kt for SO_2 (65% on 2005 levels), 65 kt for NO_X (49% reduction on 2005 levels), 43 kt for VOCs (25% reduction on 2005 levels), 108 kt for NH_3 (1% reduction on 2005 levels) and 10 kt for $PM_{2.5}$ (18% reduction on 2005 levels). In relation to 2030, Ireland's emission targets are 85% below 2005 levels for SO_2, 69% reduction for NO_x, 32% reduction for VOCs, 5% reduction for NH_3 and 41% reduction for $PM_{2.5}$.

9.3 RECEIVING ENVIRONMENT

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality "*Air Quality Monitoring Annual Report 2019*" (EPA, 2020b) details the range and scope of monitoring undertaken throughout Ireland. As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2020b). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, Grangecastle is categorised as Zone A (EPA, 2020b).

With regard to NO_2, continuous monitoring data from the EPA (EPA, 2020b), at suburban Zone A background locations in Rathmines, Dun Laoghaire, Swords and Ballyfermot show that current levels of NO_2 are below both the annual and 1-hour limit values, with annual average levels ranging from 15 - 22 $\mu g/m^3$ in 2019 (see Table 9.2). Sufficient data is available for the station in Ballyfermot to observe long-term trends since 2014 (EPA, 2020b), with annual average results ranging from 16 – 20 $\mu g/m^3$. Based on these results, an estimate of the background NO_2 concentration in the region of the proposed development in 2020 is 17 $\mu g/m^3$. In relation to the annual average background, the ambient background concentration was added directly to the process concentration with the short-term peaks assumed to have an ambient background concentration of twice the annual mean background concentration.

Station	Station Classification Council Directive 96/62/EC	Averaging Period	Year					
			2014	2015	2016	2017	2018	2019
Rathmines	Urban Background	Annual Mean NO_2 ($\mu g/m^3$)	17	18	20	17	20	22
		99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	105	105	88	86	87	-Note 1
Ballyfermot	Suburban Background	Annual Mean NO_2 ($\mu g/m^3$)	16	16	17	17	17	20
		99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	93	127	90	112	101	-Note 1
Dun Laoghaire	Suburban Background	Annual Mean NO_2 ($\mu g/m^3$)	15	16	19	17	19	15
		99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	86	91	105	101	91	-Note 1
Swords	Suburban Background	Annual Mean NO_2 ($\mu g/m^3$)	14	13	16	14	16	15
		99.8th%ile 1-hr NO_2 ($\mu g/m^3$)	137	93	96	79	85	-Note 1

Note 1 Data not yet available.

Table 9.2: Trends In Suburban Dublin (Zone A) Air Quality - Nitrogen Dioxide ($\mu g/m^3$)

In summary, existing baseline levels of NO_2 based on extensive long-term data from the EPA and Dublin City Council are expected to be below ambient air quality limit values in the vicinity of the proposed development.

The Plume Volume Molar Ratio Method (PVMRM) was used to model NO_2 concentrations. The PVMRM is currently a non-regulatory option in AERMOD which assumes that the amount of NO converted to NO_2 is proportional to the ambient ozone concentration (Hanrahan, 1999a, 1999b). The PVMRM uses both plume size and O_3 concentration to derive the amount of O_3 available for the reaction between NO and O_3. NO_X moles are determined by emission rate and travel time through the plume segment. The concentration is usually limited by the amount of ambient O_3 that is entrained in the plume. Thus, the ratio of the moles of O_3 to the moles of NO_X gives the ratio of NO_2/NO_X that is formed after the NO_X leaves the stack. In addition,

it has been assumed that 10% of the NO_X in the stack gas is already in the form of NO_2 before the gas leaves the stack (in reality the levels are usually closer to 5% (Hanrahan 1999a, 1999b)). The model has also assumed a final equilibrium ratio for NO_2/NO_X of 0.90 which again is pessimistic and more likely to be in the range 0.7 – 0.8 (Hanrahan, 1999a, 1999b). The equation used in the algorithm to derive the ratio of NO_2/NO_X is:

NO_2/NO_X = (moles O_3/ moles NO_X) + 0.10

Representative ozone data for Dublin was used in the PVMRM model.

Climate

Anthropogenic emissions of greenhouse gases in Ireland included in the Kyoto Protocol are outlined in the most recent review by the EPA (EPA, 2019). The largest share of emissions in 2018 is from agriculture (33.9% of total emissions), fuel combustion for power generation (17.5% of total emissions) and transport (20.1% of total emissions). Industry, manufacturing and commercial sources account for 13.5% of emissions.

Greenhouse gases have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. In order to compare different greenhouse gases, emissions are calculated on the basis of their Global Warming Potential (GWPs) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The GWP100 for CO_2 is the basic unit (GWP = 1) whereas CH_4 has a global warming potential equivalent to 28 units of CO_2 and N_2O has a GWP100 of 265.

2018 is the sixth year where compliance with the European Union's Effort Sharing Decision "EU 2020 Strategy" (Decision 406/2009/EC) was assessed. Ireland had non-Emission Trading Scheme (non-ETS) sectors emissions of 45.4 Mt CO_{2eq} in 2018, when emissions covered by the EU's ETS stationary and aviation operators were removed. Based on the latest data, the EPA in 2020 indicates that compliance with the EU 2020 targets will be very challenging (EPA, 2020) for the non-ETS sector with levels in 2020 likely to be between 2% - 4% below 2005 levels compared to a target of 20% below 2005 levels by 2020.

Electricity providers are included within the EU-wide Emission Trading Scheme (ETS) and thus GHG emissions from these electricity generators are not included when determining compliance with Ireland's targeted 30% reduction in the non-ETS sector i.e. electricity associated GHG emissions will not count towards the Ireland's national targets. Thus, any potential increase in electricity generation due to proposed facility demand will have no impact on Ireland's obligation to meet the 30% reduction in the non-ETS sector.

In terms of wider energy policy, as outlined in the EPA publication "*Ireland's Greenhouse Gas Projects 2019-2040*" (EPA, 2020c) under the *With Additional Measures* scenario, emissions from the energy industries sector are projected to decrease by 34% to 7 Mt CO_{2eq} over the period 2019 to 2030 including the proposed increase in renewable energy generation to approximately 70% of electricity consumption.

In terms of the current operation of the ETS, the European Commission (EC, 2020) reported that the ETS Carbon Market reported a fall of 4.1% in emissions in 2018 (amounting to 73 million tonnes CO_{2eq}) relative to 2017 levels. The Commission (EC, 2019) noted that much of the revenue raised by the cap and trade scheme was going towards climate and energy objectives:

*"In 2018, a strengthened carbon price signal led to a record amount of revenues for Member States from the selling of ETS allowances. The generated amount equalled some EUR 14 billion - more than doubling the revenues generated in 2017. Member States spent or planned to spend close to 70% of these revenues on advancing climate and energy objectives - well above the 50% required in the legislation" (*EC, 2019)

In terms of the current project, as the the facility will have greater than 20MW thermal input capacity onsite, a GHG emission permit will be required which will be regulated under the ETS scheme. Thus, the emissions will not be included when determining Ireland's compliance with the targeted 30% reduction in the non-ETS sector.

As outlined in the *Regulation (EU) 2018/842*, any new electricity provider will be treated as a "new entrant" under Phase IV of the ETS (i.e. an electricity generator obtaining a GHG emissions permit for the first time after 30th June 2018). The new electricity provider will be required to purchase allocations in the same manner as existing players in the market using the European Energy Exchange. EU leaders have also decided that during Phase IV (2021-2030) 90% of the revenue from the auctions will be allocated to the Member States on the basis of their share of verified emissions with 10% allocated to the least wealthy EU member states. The revised EU ETS Directive has enshrined in law the requirement that at least 50% of the auctioning revenues or the equivalent in financial value should be used for climate and energy related purposes.

9.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

9.5 POTENTIAL IMPACTS

Construction Phase

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. It is expected that climatic emissions from truck movements and the operation of generators and machinery will not be significant.

Operational Phase

Risk Of Accidents / Disasters Including Those Caused By Climate Change

There is no significant risk of accidents / disasters including those caused by climate change due to air emissions or greenhouse gases released to atmosphere as part of the operational phase of the project.

Operational Phase – Air Quality

The proposed gas generator compound will have 24 emergency generators with 10 no. stacks which each will have a height of 25m. Operational hours for the gas generators was assumed to be 8 hours per day, seven days per week with four hours in the morning peak and four hours in the evening peak. The worst-case scenario modelled for the cumulative assessment includes operation of the gas generators as outlined above in addition to the operation of the backup diesel generators for 200 hours per year calculated according to USEPA protocol. Batch testing once per month of all emergency generators on site (at 33% loading for 15 minutes, in triplicate, sequentially) was also included in the worst-case scenario. In reality, it is unlikely that the emergency generators would be used for emergency operations for more than 48 hours per year. Secondly, the testing of the emergency generators will last no longer than 5-10 minutes at very low load. Thus, the worst-case approach used in this study will lead to an over-estimation of the actual levels that will arise.

USEPA Guidance suggests that for emergency operations, an average hourly emission rate should be used rather than the maximum hourly rate (USEPA 2011). For the purpose of modelling the impact from the site's emergency generators on NO_2 concentrations, a worst-case assumption was made that the emergency generators would operate for up to 200 hours per year. In line with USEPA guidance, the maximum hourly emission rates from the emergency generators were reduced by $\frac{200}{8760}$ to give an hourly average emission rate and the generators were modelled as running continuously over a period of one full year. This approach accounts for the worst-case meteorological conditions by assuming continuous operation of the emergency generators whilst the reduction in emissions is a simple way of accounting for the low probability that the emergency generators would actually be operating in a given hour.

A second methodology has been published by the UK Environment Agency. The consultation document is entitled "*Diesel Generator Short-Term NO_2 Impact Assessment*" (UK EA, 2016). The methodology is based on considering the statistical likelihood of an exceedance of the NO_2 hourly limit value (18 exceedances are allowable per year before the air standard is deemed to have been exceeded). The assessment assumes a hypergeometric distribution to assess the likelihood of exceedance hours coinciding with the operational hours. The cumulative hypergeometric distribution of 19 and more hours per year is computed and the probability of an exceedance determined. The guidance suggests that the 98th%ile confidence level should be used to indicate if an exceedance is likely. The guidance suggests that the assessment should be conducted at the nearest residential receptor or at locations where people are likely to be exposed and that there should be no running time restrictions on these generators when providing power on site during an emergency.

Both the methodology advised in USEPA guidance as well as the approach described in the UK EA guidance have been applied in this study to ensure a robust assessment of predicted air quality impacts from the emergency generators. Results for both methodologies are reported in this chapter.The batch testing assumes that once per month, 3 generators are tested each hour until all generators on the site have been tested e.g. Hour 1 - Generators 1, 2 and 3 from DUB03 are run together, Hour 2 - Generators 4, 5 and 6 from DUB03 are run together and so on until all generators in DUB03 – DUB15 have been tested each month. The source information for the modelled emission points has been summarised in Table 9.3.

In terms of climatic impacts, on-site emissions of greenhouse gases are not expected to be significant for two reasons. Firstly, testing of each back-up generator will be for 1 hour per month at one-third load and thus will be in operation for at most 0.1% of the time at one-third load. Secondly, it is expected that actual emergency operation of the back-up generators will be very low. Given historical evidence it is likely that emergency operation will last no longer than 24 hours in any given year (less than 0.3% of the time). In relation to the gas generators, greenhouse gas emissions will be modest and will replace emissions from electricity power stations which are typically combined-cycle gas turbines (CCGT). Thus, given the likely very low usage of the emergency generators the likely on-site emissions of greenhouse gases will not be significant.

Stack Reference	Height Above Ground Level (m)	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temp (K)	Max Volume Flow (Nm^3/hr)	Exit Velocity (m/sec actual)	NO_2	
							Conc. (mg/Nm^3)	Mass Emission (g/s)
DUB03 Generators	31.5	0.6	0.28	784.15	9,402	26.5	1,445	3.77 Note 1 0.22 Note 2
DUB04 Generators	18.1	0.6	0.28	833.15	11,606	34.8	2,600	8.38 Note 1 0.48 Note 2
DUB05 Generators	25	0.6	0.28	833.15	11,606	34.8	2,600	2.52 Note 1 0.191 Note 2
DUB06 Generators	25	0.6	0.28	833.15	11,606	34.8	2,600	2.52 Note 1 0.191 Note 2
DUB11 Generators	30	0.6	0.28	833.15	11,606	34.8	2,600	2.52 Note 1 0.191 Note 2
DUB07 Generators	25	0.6	0.28	833.15	11,606	34.8	2,600	2.52 Note 1 0.191 Note 2
DUB08 Generators	25	0.6	0.28	833.15	11,606	34.8	2,600	2.52 Note 1 0.191 Note 2
DUB09 Generators	25	0.8	0.50	733.85	9,801	23.4	2,816	1.40 Note 1 0.175 Note 2
DUB10 Generators	25	0.8	0.50	733.85	9,801	23.4	2,816	1.40 Note 1 0.175 Note
DUB12 Generators	24	0.8	0.50	733.85	9,801	23.4	2,816	1.40 Note 1 0.175 Note 2
DUB13 Generators	23.25	0.8	0.50	733.85	9,801	23.4	2,816	1.40 Note 1 0.175 Note 2
DUB14 & DUB15 Generators	30.75	0.8	0.50	733.85	9,801	23.4	2,816	1.40 Note 1 0.175 Note 2
Gas Generators	25	0.7	0.385	633.15	13,742	36.9	95	0. 97 Note 3

Note 1 30% load emission rates for weekly batch testing of generators – triplicate of generators tested sequentially for 15 minutes each hour until all generators onsite.

Note 2 Reduced emission rates based on USEPA protocol (assuming 200 hours / annum) used to predict 1-hour mean NO_2 concentrations during emergency operation of generators

Note 3 Operational hours 4 hours in morning peak and four hours in evening peak, 7 days per week.

Table 9.3: Summary of Source Information for NO_2

Gas Generators At Boundary Of The Site

NO_2 (USEPA Methodology)

The NO_2 modelling results for the operation of the gas generators at the worst-case boundary receptors are detailed in Table 9.4. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for NO_2. For the worst-case year, emissions from the gas generators lead to an ambient NO_2 concentration (including background) which is 51% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 49% of the annual limit value at the worst-case receptor. The geographical variations in the 1-hour mean (99.8th%ile) and annual mean NO_2 ground level concentrations are illustrated as concentration contours in Figures 9.2 and 9.3.

Pollutant / Year	Annual Mean Background ($\mu g/m^3$)	Averaging Period	Process Contribution NO_2 ($\mu g/m^3$)	Predicted Environmental Concentration NO_2 ($\mu g/m^3$)	Standard ($\mu g/m^3$) Note 1
NO_2 / 2016	34	99.8th%ile of 1-hr means	61.5	95.5	200
	17	Annual Mean	2.1	19.1	40
NO_2 / 2017	34	99.8th%ile of 1-hr means	59.2	93.2	200
	17	Annual Mean	2.5	19.5	40
NO_2 / 2018	34	99.8th%ile of 1-hr means	58.2	92.2	200
	17	Annual Mean	2.2	19.2	40
NO_2 / 2019	34	99.8th%ile of 1-hr means	59.1	93.1	200
	17	Annual Mean	2.1	19.1	40
NO_2 / 2020	34	99.8th%ile of 1-hr means	68.1	102.1	200
	17	Annual Mean	2.7	19.7	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011)

Table 9.4: Dispersion Model Results at Worst-case Boundary Receptors – NO_2

NO_2 (UK EA Methodology)

The NO_2 modelling results for the continuous operation of the gas generators at the worst-case residential receptors are detailed in Table 9.5 based on the UK EA methodology. The methodology, based on considering the statistical likelihood of an exceedance of the NO_2 hourly limit value assuming a hypergeometric distribution, has been undertaken at the worst-case residential receptor. The cumulative hypergeometric distribution of 19 and more hours per year is computed and the probability of an exceedance determined as outlined in Table 9.5. The results have been compared to the 98th%ile confidence level to indicate if an exceedance is likely at various operational hours. The results indicate that in the worst-case year, the emergency generators can operate continuously in any given year without the likelihood of an exceedance of the ambient air quality standard (at a 98th%ile confidence level). In addition, the UK guidance recommends that there should be no running time restrictions on these generators when providing power on site during an emergency.

Pollutant / Meteorological Year	Hours of operation (Hours) (98th%ile) Allowed Prior To Exceedance Of Limit Value	UK Guidance – Probability Value = 0.02 (98th%ile)Note 1
NO_2 / 2016	8760	0.02
NO_2 / 2017	8784	
NO_2 / 2018	8760	
NO_2 / 2019	8760	
NO_2 / 2020	8760	

Note 1 Guidance Outlined In "Diesel Generator Short-term NO_2 Impact Assessment" (EA, 2016)

Table 9.5: Hypergeometric Statistical Results Worst-case Residential Receptors – NO_2

9.6 POTENTIAL CUMULATIVE IMPACTS

Cumulative Generators At Boundary Of The Site

The cumulative impact scenario assessed the combined impact of the proposed development as outlined above as well as emissions from two nearby IED licenced sites, Pfizer Ireland Ltd (Pfizer) and Takeda Ireland Ltd. (Takeda). Both Pfizer and Takeda have main air emission points which are licensed by the EPA to emit air pollutants. These emission points emit air pollutants on an essentially continuous basis over the course of a year. Other nearby facilities, such as ADSIL, Cyrus One and Google Ireland, have emission points which are classified as potential emission points as these will only operate under exceptional circumstances (except for testing purposes) and thus will not be in operation on a day-to-day basis. For this reason, the emission points associated with the nearby data storage facilities were not considered for the purpose of this assessment.

Cumulative NO_2 (USEPA Methodology)

The NO_2 modelling results for the operation of the gas generators, backup diesel generators, the Takeda facility and the Pfizer facility at the worst-case boundary receptors are detailed in Table 9.6. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for NO_2. For the worst-case year, the cumulative emissions lead to an ambient NO_2 concentration (including background) which is 73% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 71% of the annual limit value at the worst-case receptor. The geographical variations in the 1-hour mean (99.8th%ile) and annual mean NO_2 ground level concentrations are illustrated as concentration contours in Figures 9.6 and 9.7.

Pollutant / Year	Annual Mean Background (µg/m³)	Averaging Period	Process Contribution NO_2 (µg/m³)	Predicted Environmental Concentration NO_2 (µg/m³)	Standard (µg/m³) Note 1
NO_2 / 2016	34	99.8th%ile of 1-hr means	105.6	139.6	200
	17	Annual Mean	8.3	25.3	40
NO_2 / 2017	34	99.8th%ile of 1-hr means	101.2	135.2	200
	17	Annual Mean	11.6	28.6	40
NO_2 / 2018	34	99.8th%ile of 1-hr means	100.3	134.3	200
	17	Annual Mean	8.6	25.6	40
NO_2 / 2019	34	99.8th%ile of 1-hr means	105.3	139.3	200
	17	Annual Mean	10.2	27.2	40
NO_2 / 2020	34	99.8th%ile of 1-hr means	111.4	145.4	200
	17	Annual Mean	10.1	27.1	40

Note 1 Air Quality Standards 2011 (from EU Directive 2008/50/EC and S.I. 180 of 2011)

Table 9.6: Dispersion Model Results at Worst-case Boundary Receptors – Cumulative NO_2

Cumulative NO_2 (UK EA Methodology)

The NO_2 modelling results for the continuous operation of the gas generators, testing of the back-up diesel generators, operation of the back-up generators, and including the cumulative impact from the Pfizer facility and Takeda facility at the worst-case residential receptors are detailed in Table 9.7 based on the UK EA methodology. The methodology, based on considering the statistical likelihood of an exceedance of the NO_2 hourly limit value assuming a hypergeometric distribution, has been undertaken at the worst-case residential receptor. The cumulative hypergeometric distribution of 19 and more hours per year is computed and the probability of an exceedance determined as outlined in Table 9.7. The results have been compared to the 98th%ile confidence level to indicate if an exceedance is likely at various operational hours. The results indicate that in the worst-case year, the emergency generators can operate for up to 93 hours per year before there is a likelihood of an exceedance of the ambient air quality standard (at a 98th%ile confidence level). Figure 9.6 shows the statistical distribution predicted for the 98th%ile (based on 94 hours of operation per year). However, the UK guidance recommends that there should be no running time restrictions on these generators when providing power on site during an emergency.

Pollutant / Meteorological Year	Hours of operation (Hours) (98th%ile) Allowed Prior To Exceedance Of Limit Value	UK Guidance – Probability Value = 0.02 (98th%ile)Note 1
NO_2 / 2016	100	0.02
NO_2 / 2017	173	
NO_2 / 2018	93	
NO_2 / 2019	150	
NO_2 / 2020	101	

Note 1 Guidance Outlined In "Diesel Generator Short-term NO_2 Impact Assessment" (EA, 2016)

Table 9.7: Hypergeometric Statistical Results Worst-case Residential Receptors – Cumulative NO_2

9.7 MITIGATION MEASURES

Construction Phase

In order to sufficiently ameliorate the likely air quality impact, a schedule of air control measures has been formulated for both construction and operational phases associated with the proposed development

Air - Construction Phase

In order to ensure that no dust nuisance occurs, a series of measures will be implemented. In summary, the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust must 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. On any un-surfaced site road, this will be 20 kph, and on hard surfaced roads as site management dictates.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks carrying potentially dusty material will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance 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.

Climate – Construction Phase

Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to short-term and temporary nature of these works the impact on climate will not be significant.

Air - Operational Phase

The stack heights of the gas generators have been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the plume. With the proposed layout and stack heights the air impact assessment outlined above has demonstrated that mitigation measures are not required.

Climate – Operational Phase

On-site emissions of greenhouse gases are not expected to be significant due to the infrequent testing and emergency operation of the diesel back-up generators. Thus, given the likely very low usage of the emergency generators no mitigation measures for the emergency generators will be required. MS is committed to minimising carbon related impacts where practicable and will be keen to operate the facility in as efficient manner as possible.

Up to 150 MW of electricity will be required in order to operate and maintain the temperature, humidity and power supply in the facility. The operation of the Co-location facilities (COLO's) required the utilisation of outside air, via roof mounted air handling units and only if deemed necessary will evaporative cooling (within the AHU's) be employed to maintain internal temperature and humidity conditions. Climatic conditions in Ireland are conductive to this free cooling strategy which moves outside air across the servers to cool and then exhaust the higher temperature air to atmosphere. Thus, on a global scale, the location of this facility in Ireland will help minimise greenhouse gas emissions compared to less favourable locations.

Secondly, the operation of the COLO's units is more efficient than individual data centres operated by standalone companies and thus again this facility will help to minimise greenhouse gas emissions compared to a myriad of smaller units.

MS is also keen to investigate the option to offload/reuse/exchange the generated waste heat with neighbouring industrial facilities or other potential users within the environs of the business park. This is in line with MS stated policy of minimising carbon related impacts where practicable.

An additional mitigating factor is the significant increase in the renewable fraction of electricity in recent years. The renewable fraction in gross electricity consumption increased from 12.9% in 2010 to 33.2% in 2018. The current government policy is to obtain a penetration rate of 40% in gross electricity consumption by 2020 (SEAI, 2020).

9.8 PREDICTED IMPACTS

This section summarises the likely air quality and climate impacts associated with the proposed development, taking into account the mitigation measures.

Construction Phase

When the dust minimisation measures detailed in the mitigation section of this chapter are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

Due to the size and nature of the construction activities, CO_2 and N_2O emissions during construction will have a negligible impact on climate

Operational Phase

The main study conclusions are presented below for each scenario:

Gas Generators

Emissions from the gas generator development will lead to an ambient NO_2 concentration (including background) which is 51% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 49% of the annual limit value at the worst-case boundary receptor.

The aviation report conducted a review of the plume model based on a previous iteration of this report. Due to a change in the gas generator supplier there is a slightly different volume flow and exit temperature compared to the assessment contained within the aviation report. However, the difference is very small and the actual oxygen content for both scenarios in unchanged as is the stack heights of the gas generators. Furthermore, the diesel generators are not affected by this update in any way. Thus, the author is confident that any changes due to the change in gas generator supplier will be insignificant and will not have any bearing on the aviation report.

Emergency Operations

Emergency operations were assessed based on the operation of all standby diesel generators for up to 200 hour per year using the USEPA methodology (USEPA, 2011). Emissions from the site under the emergency scenario with concurrent operation of the gas generators and the nearby Pfizer and Takeda facilities will lead to an ambient NO_2 concentration (including background) which is 71% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 45% of the annual limit value at the nearest residential receptors.

The emergency generators were also assessed using the UK EA methodology (EA, 2016) with the impacts assessed at the nearest residential receptors. The results were compared to the 98th%ile confidence level to indicate if an exceedance was likely at various operational hours. The results indicated that in the worst-case year, the emergency generators can operate for up to 93 hours per year before there is a likelihood of an exceedance of the ambient air quality standard (at a 98th%ile confidence level). However, the UK guidance recommends that there should be no running time restrictions on these generators when providing power on site during an emergency.

Conclusion

Operations from the Grange Castle Server Centre including the proposed gas generator compound development will not result in any off-site exceedance of the applicable ambient air quality standards.

On-site climatic emissions associated with this facility are not expected to be significant.

This study has incorporated conservative assumptions designed to overestimate the predicted concentrations at sensitive receptors. In relation to the spatial extent of emissions from the site, ambient concentrations, decrease significantly away from the immediate area of the site.

9.9 'DO NOTHING' SCENARIO

The 'Do Nothing' scenario without the proposed gas generator compound development will not result in any off-site exceedance of the applicable ambient air quality standards.

9.10 WORST CASE SCENARIO

The 'Worst Case' scenario with the proposed gas generator compound development assumes that the backup diesel generators will all operate at 80% load for 200 hours per year. In addition, the 'worst case' scenario assumes that the gas generators will operate 8 hours per day seven days per week. In reality, both of these scenarios are 'worst case' and the actual operations will be lower and the ambient pollutants lower than that reported in this assessment.

9.11 MONITORING & REINSTATEMENT

No monitoring or reinstatement will be required.

9.12 DIFFICULTIES IN COMPILING INFORMATION

No specific difficulties were encountered while undertaking this assessment.

9.13 REFERENCES

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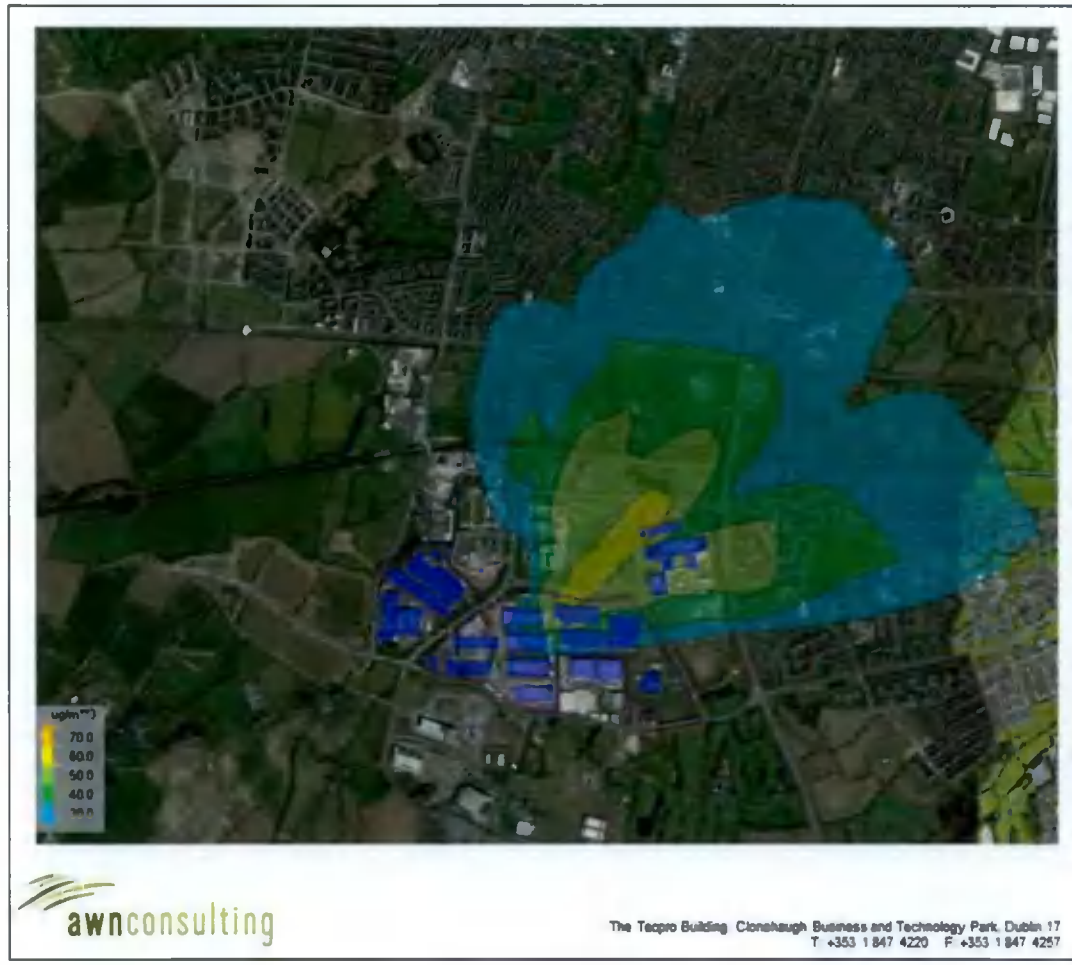
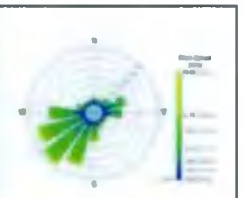




Background Mapping from Google Earth

99.8th%ile of 1-Hour Mean NO_2 Concentrations (excluding background) Maximum Concentration at Boundary = 68.1 µg/m³

Boundary Of Facility

Scale 1:20,000

N

Project
Dub14/15 Gas Generators Air Modelling

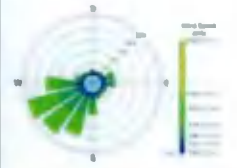
Reference
20/11879AR01

Figure 9.2
99.8th%ile of 1-Hour NO_2 Concentrations (µg/m³) (Year 2020)

awnconsulting

The Tecpro Building, Clonshaugh Business and Technology Park, Dublin 17
T: +353 1 847 4220 F: +353 1 847 4257

Figure 9.2: Gas Generators – 99.8th%ile of 1-Hour NO_2 Concentrations (µg/m³) (Year 2020)



Background Mapping from Google Earth

Annual Mean NO_2 Concentrations (excluding background) Maximum Concentration at Boundary = 2.5 µg/m³

Boundary Of Facility

Scale 1:13,000

N

Project
Dub14/15 Gas Generators Air Modelling

Reference
20/11879AR01

Figure 9.3
Annual Mean NO_2 Concentrations (µg/m³) (Year 2017)

awnconsulting

The Tecpro Building, Clonshaugh Business and Technology Park, Dublin 17
T: +353 1 847 4220 F: +353 1 847 4257

Figure 9.3: Gas Generators – Annual Mean NO_2 Concentrations (µg/m³) (Year 2017)

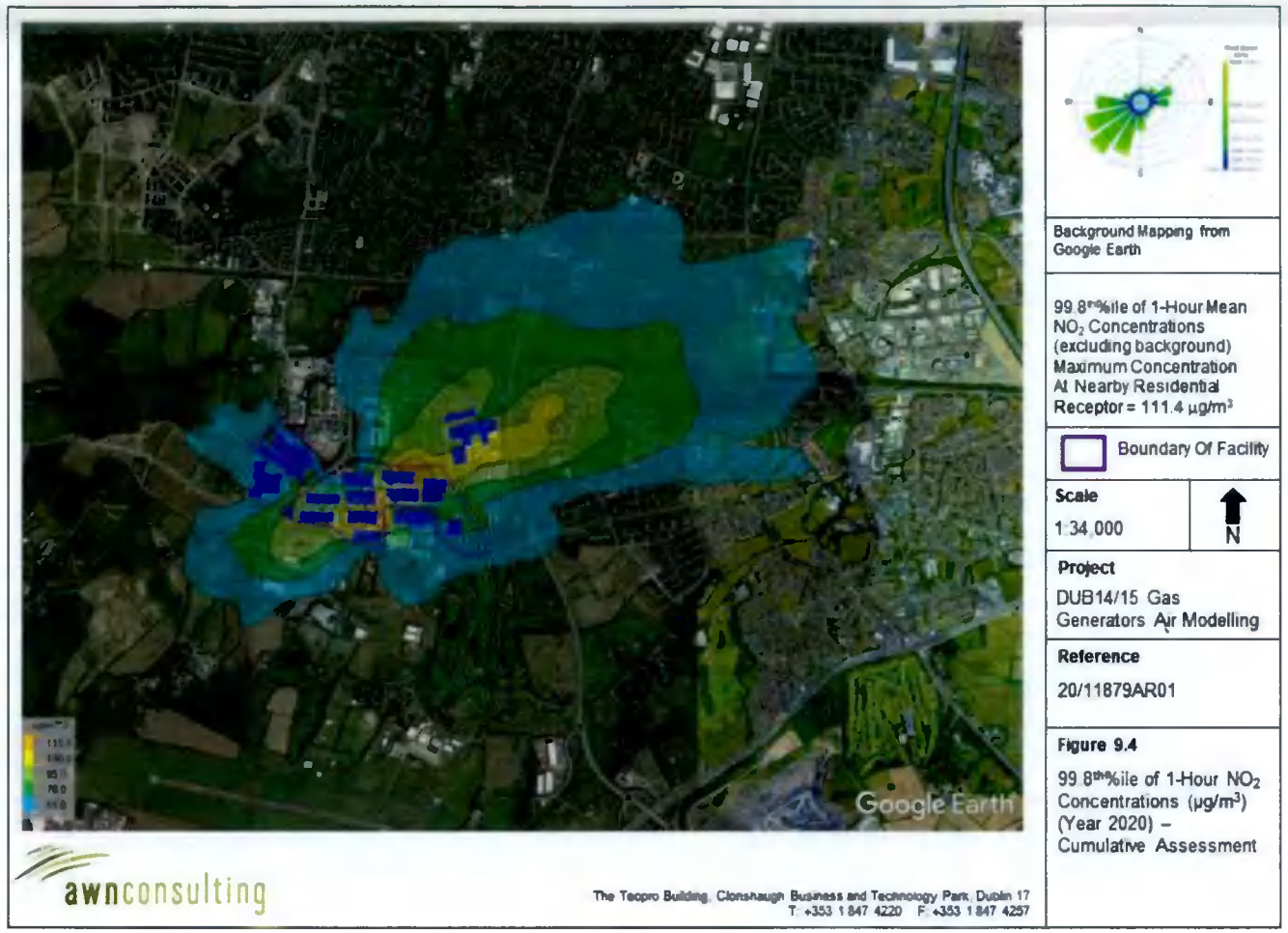


Figure 9.4: Cumulative Operations – 99.8th%ile of 1-Hour NO_2 Concentrations (µg/m³) (Year 2020)

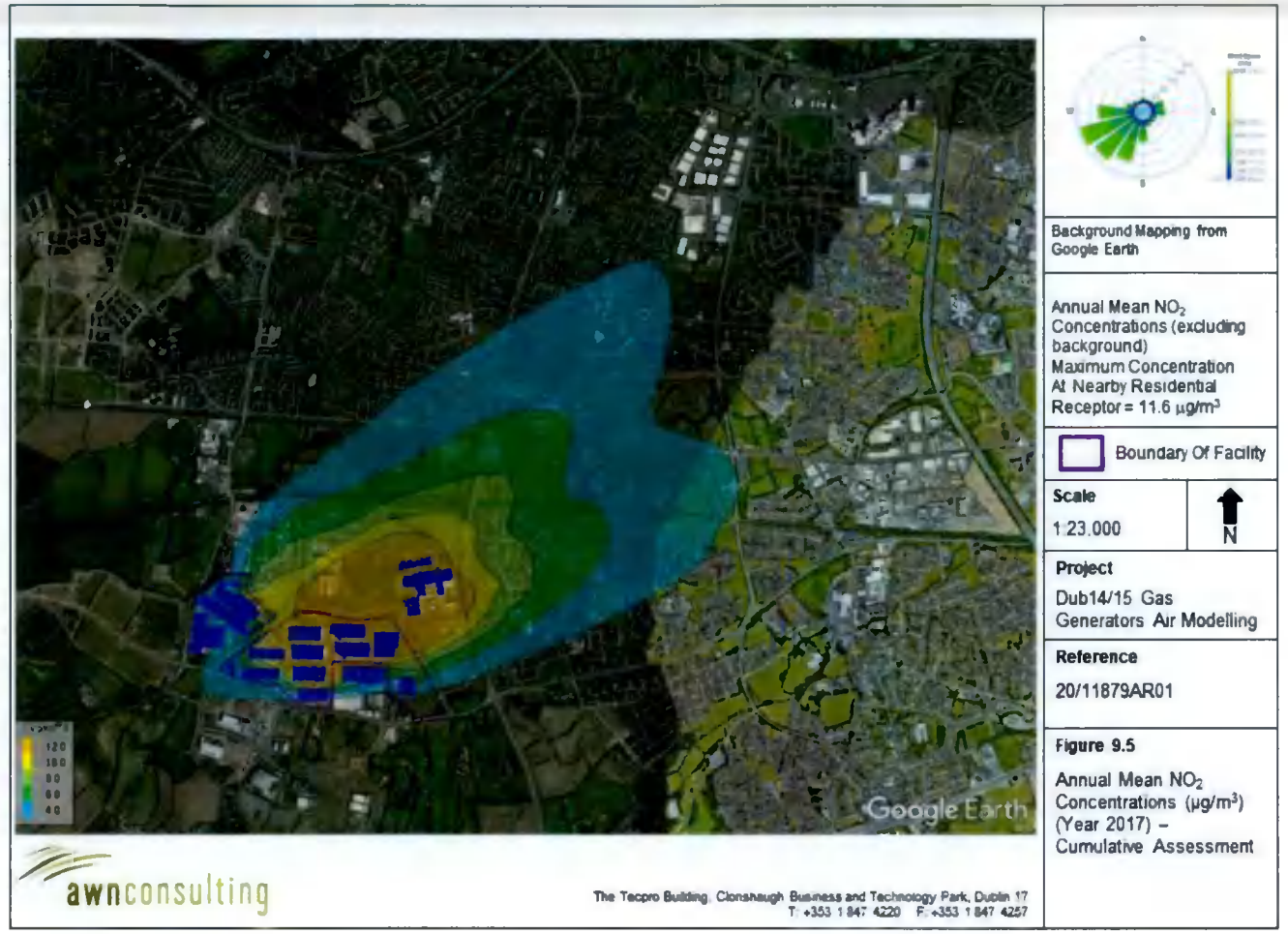


Figure 9.5: Gas Generators – Annual Mean NO_2 Concentrations (µg/m³) (Year 2017)

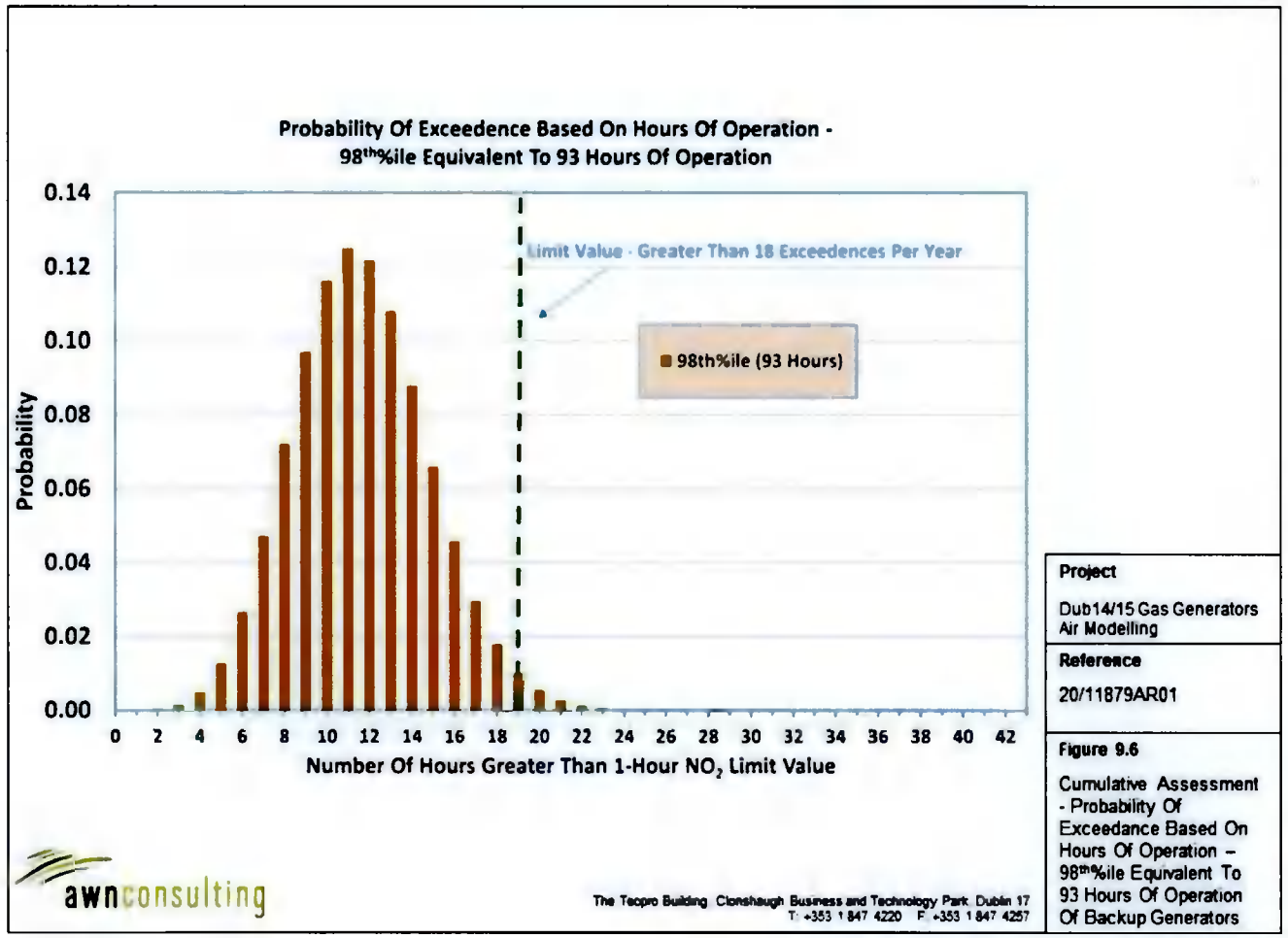


Figure 9.6: Cumulative Assessment – Probability of Exceedance Based On Hours Of Operation

10LANDSCAPE & VISUAL

10.1INTRODUCTION

Microsoft Ireland is seeking modifications to previously approved scheme SD20A\0283, which was for 2 data centres (DUB-14, DUB-15) and a Central Office Administration Building as an extension to the existing Microsoft Data Centre Campus at Grange Castle International Business Park, Clondalkin, Co Dublin. The final grant of permission in respect of this application was confirmed by SDCC on 10 May 2021.

The detail of the proposed modifications (hereafter the Proposed Project) is set out in Chapter 3 of the EIAR and Section 3.4 of this chapter.

This Chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of Proposed Project on landscape and visual environment during the Construction and Operational Phases. The chapter was prepared by Thomas Burns of Brady Shipman Martin (BSM), planning, landscape and environmental consultants.

10.2METHODOLOGY

A survey of the potential visibility of the proposed development was carried out in 2020, with visits to the site and its surrounds in June and September 2020 and in May 2021. Analysis was carried out to identify locations from which views of the proposed development may be likely, or sensitive.

Analysis identified five (5) representative locations where there was a potential for the proposed development to be visible. Photomontages showing the 'as existing' view and the 'as proposed' view of the permitted and the proposed development have been prepared for each location. Where the permitted / proposed development is not visible in the view, its location is indicated in red outline for reference purposes. The location of the views and the associated Photomontages are provided at the end of this Chapter of the EIAR.

Assessment of Landscape and Visual Impacts
The assessment of landscape visual impacts has regard to the Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports prepared by the Environmental Protection Agency (EPA, 2017) and to the EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU) on the assessment of the effects of certain public and private projects on the environment.

Assessment of potential effects involves:

- Classifying the sensitivity of the receiving environment; and
- Describing and classifying the magnitude of change in the environment resulting from the Proposed Project.

These factors are combined to provide a classification of significance of effects for the impact assessment.

Sensitivity of Landscape and Visual Environment
The sensitivity of the landscape and visual environment is a function of its existing land use, existing and emerging patterns and scale, enclosure, visual characteristics and values. The nature and scale of the Proposed Project is taken into account, as are trends of change and relevant policy framework. Five categories are used to classify sensitivity, as set out in Table 10.1.

Magnitude of Change in Landscape and Visual Environment
The magnitude of change is a factor of the scale, extent and degree of change imposed on the landscape and visual environment by the Proposed Project, with reference to its key elements, features and characteristics and the affected surrounding character areas. Five categories are used to classify magnitude of change, as set out in Table 10.1.

Description of Baseline Sensitivity	Rating	Description of Magnitude of change arising from Proposed Project
Landscapes / views / viewpoints (towards or from a landscape feature or area) that are recognized in policy or otherwise designated as being of national value. The composition, character and quality of the landscape / view are such that its capacity for change is very low. The principle management objective for the landscape / view is its protection from change.	Very High	Change that is large in extent, resulting in the loss of or major alteration to key elements, features or characteristics of the townscape / view, and / or introduction of large elements considered totally uncharacteristic in the context. Such development results in fundamental change in the landscape/view.
Landscapes / views that are recognized in policy or otherwise designated as being of value, or highly valued by people that experience them regularly. The composition, character and quality of the landscape / view may be such that its capacity to accommodate change may or may not be low. The principle management objective for the landscape / view is its protection from change that reduces landscape value / visual amenity.	High	Change that is moderate to large in extent, resulting in major alteration to key elements, features or characteristics of the landscape / view, and / or introduction of large elements considered uncharacteristic in the context. Such development results in change to the landscape / view.
Landscapes / views that may not have features or characteristics that are of particular value, but have no major detracting elements, and which thus provide some landscape value / visual amenity. These landscapes / views may	Medium	Change that is moderate in extent, resulting in partial loss or alteration to key elements, features or characteristics of the landscape / view, and / or introduction of elements that may be prominent but not necessarily substantially

Description of Baseline Sensitivity	Rating	Description of Magnitude of change arising from Proposed Project
have capacity for appropriate change and the principle management objective is to facilitate change to the composition that does not detract from landscape value / visual amenity, or which enhances them.		uncharacteristic in the context. Such development results in change to the landscape / view.
Landscapes / views that have no valued feature or characteristic, and where the composition and character are such that there is capacity for change. This category includes landscapes / views experienced by people involved in activities with no particular focus on the landscape. For such landscapes / views the principle management objective is to facilitate change that does not detract from landscape value / visual amenity or enhances them.	Low	Change that is moderate or limited in scale, resulting in minor alteration to key elements, features or characteristics of the landscape / view, and / or introduction of elements that are not uncharacteristic in the context. Such development results in minor change to the landscape/view.
Landscapes / views that have no valued feature or characteristic, or in which the composition may be unsightly (e.g. in derelict landscapes). For such landscapes / views the principle management objective is to facilitate change that repairs, restores or enhances landscape value / visual amenity.	Negligible	Change that is limited in scale, resulting in no alteration to key elements features or characteristics of the landscape / view, and / or introduction of elements that are characteristic of the context. Such development results in no change to the landscape / view.

Table 10.1 Rating of Landscape Sensitivity and Magnitude of Change

Significance of Effects on Landscape and Visual Environment

To classify the significance of effects the magnitude of change is measured against the sensitivity of the landscape/view based on the guidance in the EPA Draft Guidelines and presented in Figure 3.5 (of the guidelines) as adapted and provided in Table 10.2 in this Chapter of the EIAR.

Determining significance of effects that are rational and justifiable is also based on the professional judgement, expertise and experience of the author.

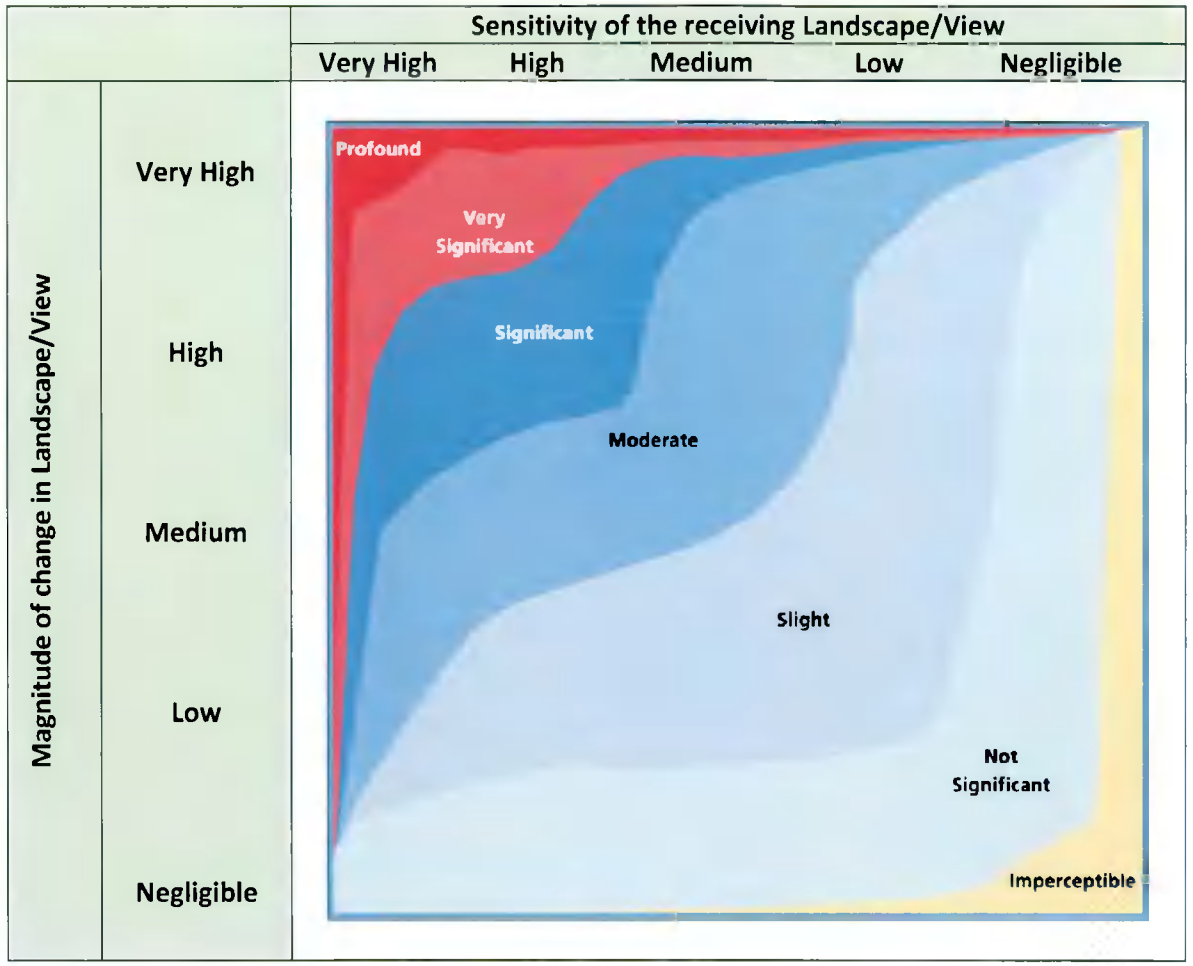


Table 10.2: Guide to Classification of Significance of Landscape and Visual Effects

10.3 RECEIVING ENVIRONMENT

Site Context and Description

The application site for the Proposed Project is located within the southwestern portion of Grangecastle Business Park, which is located west of Clondalkin in west Dublin. The Business Park is bounded to the north by the Grand Canal; to the west by R120 Newcastle Road; to the south by the R134 Nangor Road with Grangecastle Business Park South, Profile Park Datacentre Cluster and Grangecastle Golf Course south of the R143; and, to the east by the R136 Outer Ring Road, with residential areas of Clondalkin beyond. The area surrounding Clondalkin is characterised by a number of large residential developments and the large public park at Corkagh Demesne.

The business park is an established and maturing setting for a range of international companies, primarily involved in large-scale information technology data storage facilities, bio-pharmaceutical technology, and food research development. As well as Microsoft, the business park is also home to facilities for companies such as Pfizer, Takeda, Google, Grifols, and others (refer to Figure 10.1).

The site is located immediately east of western business park road and existing Microsoft developments (DUB-10, 12 and 13) to the east. The recently upgraded R134 Nangor Road defines the southern boundary of the site (refer to Figure 10.1).

The Microsoft Campus is located within the southern portion of Grangecastle Business Park, with Takeda and Grifols to the north; Aryzta to the west and Pfizer to the east (refer to Figure 10.1). The Grand Canal, which runs east to west to the north of the Business Park, is approximately 900m north of the Proposed Project. The Site for the DUB-14 & DUB-15 development is positioned between existing Microsoft Data Centre developments located both to the immediate east and to the west – west of the Business Park road and north of Aryzta. A Site for a proposed temporary construction carpark is located close to the Grand Canal corridor in the northwest corner of the Business Park (refer to Figure 10.1).

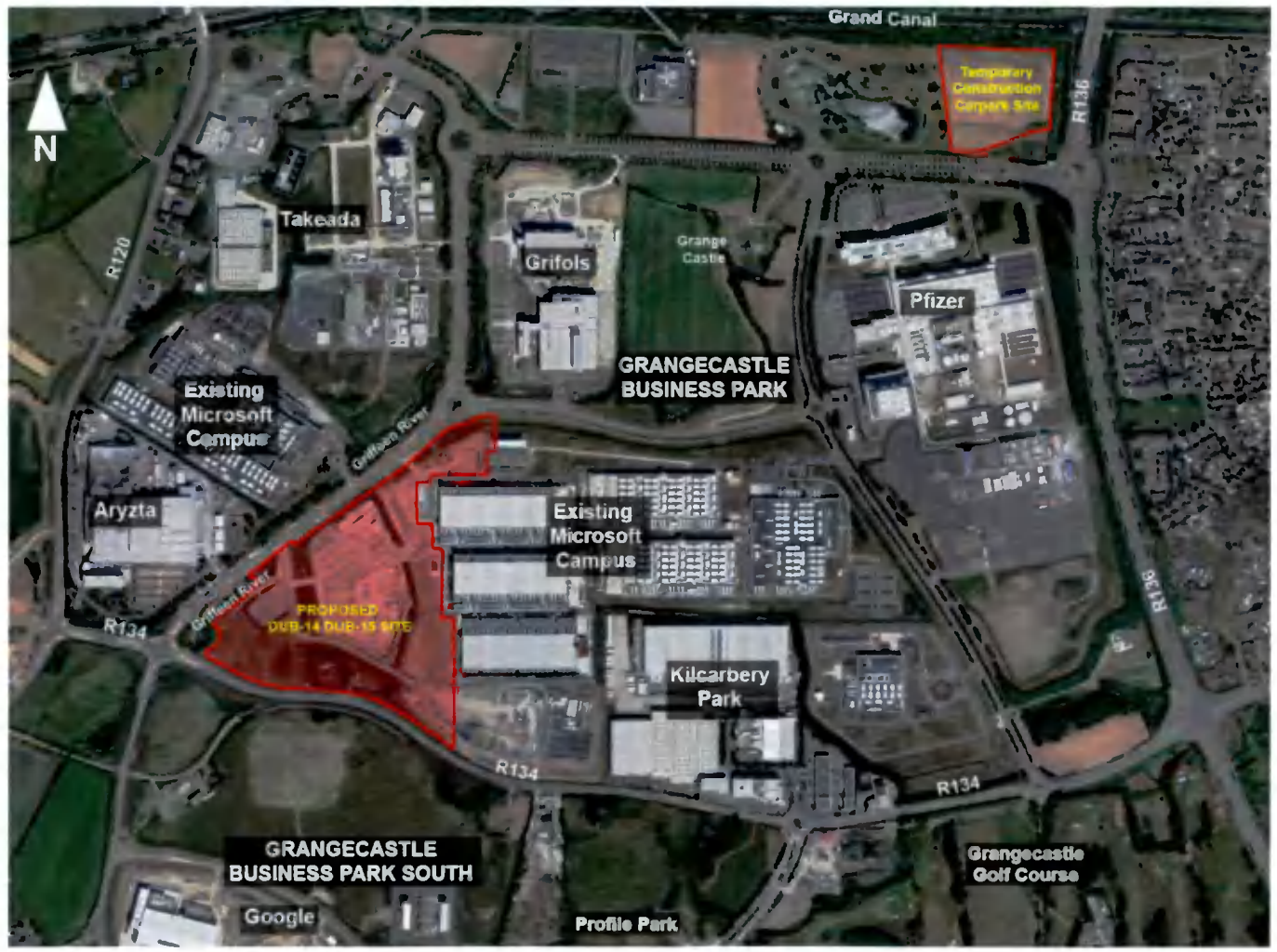


Figure 10.1 – Site Context (Main Site Area and Temporary Construction Carpark Area)

The Site is relatively flat and open. A large portion of the existing Site for the Proposed Project is currently a temporary compound / carpark area for the construction of the adjoining DUB-10 / DUB-12 / DUB-13 Project. Otherwise the remainder of the Site is under grass (in part previously a pitch & putt course) and includes a vacant house and associated garden with surrounding planting (refer to Figure 10.2). The corridor of the Griffeen River runs along part of the western boundary before it crosses under the Business Park road and proceeds north through the Business Park. The river corridor is enclosed in dense relatively young tree and shrub planting and a small amenity area with ponds and walkways is located at junction of the Business Park road and R134 Nangor Road, at the southwest corner of the Site.

North of the Griffeen River crossing a section of mature tree-lined hedgerow (Hedgerow 1 – Figure 10.2) continues along the Site boundary with the Business Park road and a second mature hedgerow (Hedgerow 2 – Figure 10.2) runs north south along the line of a former small stream (now diverted) close to the eastern boundary of the Site. Recently completed and planted landscape berms runs along the southeast corner of the Site and between the existing Microsoft lands to the east and R134 Nangor Road to the south.

Views to and from the Site are dominated by surrounding Business Park developments, including existing Microsoft facilities to the east and west, as well as Aryzta, Takeda, Grifols and other surrounding developments, including those emerging at Grangecastle Business Park South and Profile Park.

Figure 10.2 – Site Description (Main Site Area)

Landscape and Visual Planning Considerations

The entire Business Park, including the application site is zoned Objective EE "to *provide for enterprise and employment related* uses" under the *South Dublin County Council Development Plan 2016-2022"* (refer to Figure 10.3). While lands to the north of the Grand Canal and west of the R120 Newcastle Road are agricultural in nature, they are zoned for strategic development and enterprise and employment respectively. The Grand Canal is an important amenity and proposed Natural Heritage Area (pNHA), however, there are no views of the Site (or the temporary construction carpark area) from the canal corridor, which is screened from the Business Park by an approximate 20m wide belt of tree planting along the northern boundary of the Business Park.

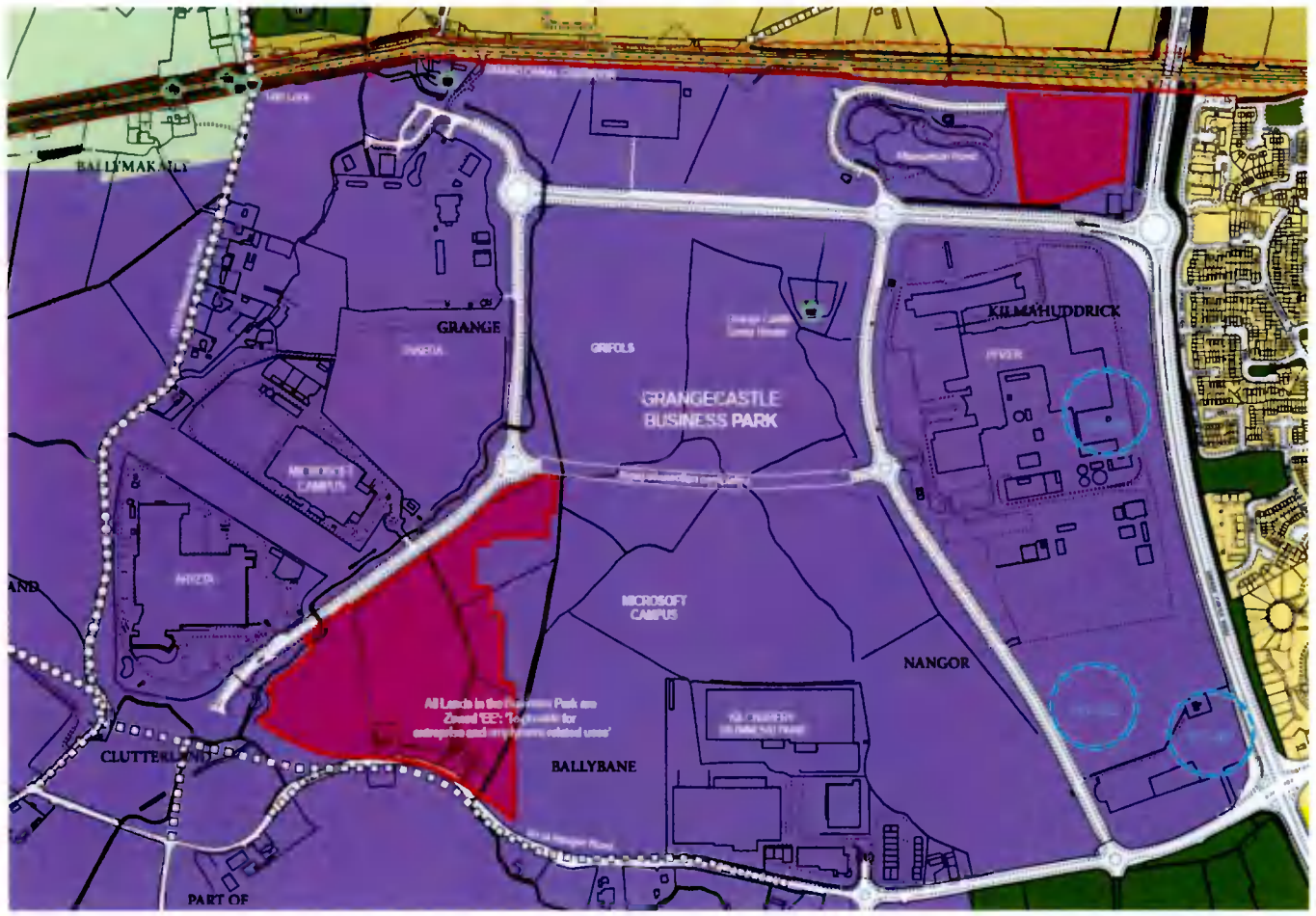


Figure 10.3: Extract from SDCC Land Use Zoning Map (Annotated)

The Proposed Project relates to modifications to previously approved scheme SD20A\0283, which was for 2 data centres (DUB-14, DUB-15) and a Central Office Administration Building as an extension to the existing Microsoft Data Centre Campus at Grange Castle International Business Park.

The Landscape Character Assessment of South County Dublin locates the Site within an 'Urban Fringe / Periurban' landscape character type (LCT) in the 'Newcastle Lowlands' landscape character area (LCA). Being within the developed urban area, the Site is not considered to have landscape character sensitivities.

There are no views or prospects or trees or vegetation listed for protection in the vicinity of the Site. There a number of Protected Structures located within and in the vicinity of Grangecastle Business Park as outlined in Table 10.3. As noted in the table there is no visual connection between these structures and the Site.

Map/RPS Ref.	Location	Description	Distance to site from Proposed Project and likely visibility
118	12th Lock Grand Canal, Ballymakaily	Stone two-storey Industrial Building	800m north/ northwest. Entirely screened by intervening development in Business Park.
119	Lock House, 12th Lock Grand Canal, Ballymakaily	Victorian Style House	800m north/ northwest. Entirely screened by intervening development in Business Park.
120	Grange Cottage, Grange, Clondalkin	Detached six-bay single-storey Farm House and Outbuildings	750m north/ northwest. Entirely screened by intervening development in Business Park.
125	12th Lock, R120 Lucan	Single-storey Canal Lock, 12th lock	800m north/ northwest. Entirely screened by intervening development in Business Park.
127	Leck Bridge, 12th Lock Grand Canal, Ballymakaily	Bridge with Stone Capping *(Note: This structure has been widened as part of recent road upgrade works)*	800m north/ northwest. Entirely screened by intervening development in Business Park.
132	Grange Castle, Clondalkin	Stone Tower House (Ruin) (RM)	700m to northeast. Entirely screened by intervening development in Business Park.

Table 10.3: SDCC Record of Protected Structures in the Vicinity of the Site (refer to Figure 10.3)

While no specific landscape objectives apply to the Site, the County Development Plan does include the following general objectives, which are of landscape relevance:

Green Infrastructures:

- **G2 Objective 1**: *'To reduce fragmentation of the Green Infrastructure network and strengthen ecological links between urban areas, Natura 2000 sites, proposed Natural Heritage Areas, parks and open spaces and the wider regional Green Infrastructure network.'*
- **G2 Objective 2**: *'To protect and enhance the biodiversity value and ecological function of the Green Infrastructure network.'*
- **G2 Objective 6**: *'To protect and enhance the County's hedgerow network, in particular hedgerows that form town/and, parish and barony boundaries, and increase hedgerow coverage using locally native species.'*
- **G2 Objective 9**: *'To preserve, protect and augment trees, groups of trees, woodlands and hedgerows within the County by increasing tree canopy coverage using locally native species and by incorporating them within design proposals and supporting their integration into the Green Infrastructure network.'*

- **G3 Objective 3**: '*To ensure the protection, improvement or restoration of riverine floodplains and to promote strategic measures to accommodate flooding at appropriate locations, to protect ground and surface water quality and build resilience to climate change.*'

Heritage Conservation & Landscape Objectives:

- **HCL 15 Objective 3**: *'To protect existing trees, hedgerows, and woodlands which are of amenity or biodiversity value and/ or contribute to landscape character and ensure that proper provision is made for their protection and management in accordance with Living with Trees: South Dublin County Council's Tree Management Policy 2015-2020.'*

Overall Landscape and Visual Sensitivity

The Site for the Proposed Project is located adjacent to existing and on-going development at the Microsoft Campus within the established setting of Grangecastle Business Park. The Site, and entire Business Park, is zoned for provision of enterprise and employment related uses.

It is noted that the Proposed Project relates to modifications to previously approved scheme SD20A\0283, which was for 2 data centres (DUB-14, DUB-15) and a Central Office Administration Building as an extension to the existing Microsoft Data Centre Campus at Grange Castle International Business Park.

There are no landscape, visual or amenity designations pertaining to the site. However, the strongly planted corridor of the Griffeen River runs along the western boundary of the Site. The Site is also open in views from R134 Nangor Road to the south. There is no visual connection between the Site and a number of protected structures and the Grand Canal corridor to the north of the site.

Having regard to the criteria set out in Table 10.1 of this chapter, the receiving landscape and visual environment is assessed as being of low sensitivity.

10.4CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Microsoft Ireland is seeking modifications to previously approved scheme SD20A\0283, which was for 2 data centres (DUB-14, DUB-15) and a Central Office Administration Building as an extension to the existing Microsoft Data Centre Campus at Grange Castle International Business Park, Clondalkin, Co Dublin.

A detailed description of the proposed amendments is outlined in Chapter 3 of this EIAR.

10.5POTENTIAL IMPACTS

Construction Phase

Tree and Vegetation Removal: Some existing mature trees and sections of mature hedgerow will be removed from the main Site area under the permitted scheme. There are no changes to permitted tree / vegetation removal and no requirement for additional tree or vegetation removal for the Proposed Project. The permitted tree and vegetation removal is mainly around the garden of the house to be demolished and along the southernmost 240m section of the eastern hedgerow (H2 – Figure 10.2).

Construction of the permitted access / bridge over the River Griffeen will also require removal of approximately 16 to 20m width of relatively young vegetation along the upper banks of the river. Approximately 150m length of scrub hedgerow will be removed from the centre of the Site (west of existing temporary construction carpark). Approximately 200m of recently constructed and planted berm (Spring 2020) will be removed to facilitate tie-in between the Proposed Project and the existing / under-construction Microsoft DUB-13 Data Hall area to the east.

Site Establishment and Development: Site construction works will require establishment of construction fencing, hoarding, compounds, removal of soils, earthworks, grading of the Site, provision of roads and services, etc. Although mainly ground based activity, this will involve traffic and machinery movements, creation and movement of soil and material stockpiles, provision of site lighting and general site constructional activity. The Proposed Project entails no changes to that required for the permitted scheme.

Construction: General construction works will require scaffolding, working at height, use of machinery and cranes, and will see gradual emergence of structures and buildings, with associated activity and site lighting – increasingly at greater height.

The final stage of construction will include for decommissioning of construction areas, removal of temporary construction carparking / compound areas, hoarding, etc. and implementation of landscape earthworks, planting and grass seeding.

The Proposed Project entails no changes to that required for the permitted scheme.

Potential Construction Phase Impacts

The change of use of the Site from its current state to that of a construction site has the potential to result in the following impacts:

- Visual impacts due to vegetation removal and site disturbance and from the introduction of new structures, access roads, machinery, materials, storage, associated earthworks, car parking, lighting and hoarding; and
- Change of landscape character due to the change in use.

The Proposed Project entails no changes to that required for the permitted scheme.

Operational Phase

New buildings and a range of associated structures will be established on the Site and in the receiving environment. Operational aspects will include daily access and egress by traffic, site management activities, external and internal lighting, and development of the proposed landscape.

While the Proposed Project includes for changes to a many aspects of the permitted development, the proposed modifications are not significant in terms of the overall nature and scale of permitted development.

Potential Operation Phase Impacts

Permission exists for a similar development on these lands and the proposed modifications are not significant in an overall context.

The Proposed Project has the potential to result in the following operation phase impacts:

- Visual impacts due to the modifications to permitted buildings and built structures: and
- Visual impact due to changes to landscape proposals - earth modelling, trees and vegetation, etc.

It is considered that the Proposed Project will not result in any change to the character of the permitted development.

- Visual impacts due to the introduction of new buildings and built structures:
- Visual impacts due to the introduction of new roads, mechanical plant and lighting ;
- Visual impact of landscape proposals - earth modelling, trees and vegetation, etc.; and
- Change of character due to the change in use.

10.6POTENTIAL CUMULATIVE IMPACTS

The Proposed Project is located within an active business park, where other sites are in varying stages of being complete, under-constructing (including on adjoining Microsoft Campus, e.g. SDCC reg. ref. no.: SD16A/0088) and / or having received grant of permission for development yet to be commenced (e.g. Takeda Extension SDCC reg. ref. no.: SD20A/0147)

This also includes a permission for three Data Centres and associated development on 16.5 hectares immediately south of the R134 Nangor Road and the Site (SDCC reg. ref. no.: SD20A/0121). A further proposed development (SDCC reg. ref. no.: SD20A/0124) for a distribution warehousing on a 7.4 hectare at Profile Park, which is pending decision, is located south of R134 and southwest of the Site.

The Proposed Project represents modifications to an existing permitted development on the site, will be constructed and operated within the context of the existing Business Park and above permitted / planned developments.

10.7MITIGATION MEASURES

Construction Phase

The existing permitted development on the site included for a range of construction stage landscape and visual mitigation measures as follows.

Mitigation of potential negative landscape and visual impacts in the construction phase include for the following measures:

- Securing of the construction site with fencing and hoarding to screen low level views of site works and construction;
- Provision of fencing in accordance with BS5837: 2012 for the protection of all trees, hedgerows and vegetation, including the corridor of the Griffeen River adjoining the Site;
- Tree and hedgerow planting will be provided around the temporary construction carpark in the northeast corner of the Business Park; and
- Retention of topsoil for the creation of landscape berms and for reinstatement of disturbed landscape areas, including the temporary construction carpark located in northeast of the Business Park.

The Proposed Project entails no changes to the above measures as set out for the permitted scheme.

Operational Phase

The existing permitted development on the site included for a range of operation stage landscape and visual mitigation measures as follows.

The mitigation of potential negative landscape and visual impacts has influenced the design and layout of the Proposed Development (refer to Landscape Drawing – extract on Figure 10.4). As a result, the following landscape and visual mitigation measures have been incorporated into the Proposed Project:

- Application of a high-quality architectural design and treatment for the Central Administration / Gateway Building to be located at the entrance to the Business Park;
- Provision of a high-quality landscape setting for the Central Administration / Gateway Building appropriate to the location at the entrance to the Business Park. This includes the planting of semi- mature native Scot's Pine trees within a meadow landscape along the R134;
- Setback of all development – other than the bridge crossing from the riparian and ecological corridor of the Griffeen River;
- Minimisation of disturbance / extent of vegetation removal (for provision of proposed bridge) from along the corridor of the Griffeen River;
- Retention of existing mature tree-lined hedgerow along Site boundary with Business Park road, and augmentation with new woodland planting belt on Site;

- Retention of section of existing mature hedgerow and associated drainage ditch within north-western portion of the Site. The section of hedgerow and ditch is retained with a wide meadow strip which connects to the tree-lined hedgerow on the western boundary with the Business Park road;
- Extension of the existing planted screening berm (at DUB-13) along the Site boundary with R134 Nangor Road for screening of the Data-Centres and associated plant areas;
- Provision for a large meadow areas on the western boundary of the Site – providing for wildlife refuge and connectivity between retained hedgerows and proposed plantings;
- Incorporating of SuDS measures, including infiltration swales, surface water management tree pits, and biodiversity areas; and
- Reinstatement of the area of the temporary construction carpark to match existing.

The Proposed Project entails no changes to the approach in the above measures as set out for the permitted scheme. However, the modifications result in some localised changes in the distribution and location of these measures.

In addition to the above measures which related to the permitted scheme, the Proposed Project includes for provision of:

- a central landscaped courtyard area for employees. The courtyard, which is located to the east of DUB14, includes for ornamental and sensory gardens, potential for growing of herbs and plants for use in the on-site restaurant, for opportunities for relaxation and social engagement; and for enhancement of the green infrastructure network; and
- walking and seating opportunities within and around the species-rich grasslands and wetland areas to be provided within the northern area of the Proposed Project.

The measures set out above have been developed taking account of the relevant green infrastructure and heritage objectives of South Dublin Development Plan as set out at Section 10.3 of this Chapter of the EIAR.

Figure 10.4: Extract from Landscape Masterplan (BSM, 2021

10.8PREDICTED IMPACTS

Construction Phase

The permitted scheme provides for some existing mature trees and sections of mature hedgerow to be removed from the main Site area. However, significant planting and hedgerows along the Griffeen River and Business Park road will be retained, protected by appropriate fencing.

The Proposed Project entails no changes to that required for the permitted scheme.

Site construction works will give rise to visual impact from provision of fencing, hoarding, compounds, removal of soils, earthworks, grading of the Site, provision of roads and services, etc. Likewise general construction works will give rise to visual impact from scaffolding, working at height, use of machinery and cranes, and from gradual emergence of structures and buildings, with associated activity and site lighting – increasingly at greater height.

The Proposed Project entails no changes to that required for the permitted scheme.

A temporary construction car park is to be located at the northeast corner of the Business Park. The location is well-screened – especially from the Grand Canal corridor, however, it will be partly visible from nearby Business Park road. Tree and hedgerow planting is included with the provision of the temporary carpark and these will help integrate the facility.

The Proposed Project entails no changes to that required for the permitted scheme.

At the end of construction all construction aspects will be decommissioned and remaining construction areas, including the temporary construction carpark, will be reinstated with topsoil and landscaped.

The Proposed Project entails no changes to that required for the permitted scheme.

For the most part construction activity associated with the Proposed Project will be similar in character and landscape and visual effects to other on-going construction works located both within Grangecastle Business Park and in the area south of the Business Park.

The Proposed Project entails no changes to that required for the permitted scheme.

The existing landscape environment is of Low Sensitivity and the effects of the construction stage are assessed as being of Low Magnitude. Therefore, the Proposed Project will only have a Slight Negative Impact in terms of change of character and impact on landscape.

The Proposed Project entails no changes to that required for the permitted scheme

The existing visual environment is of Low Sensitivity and the effects of the construction stage are assessed as being of Medium Magnitude. Therefore, the Proposed Project will only have a Slight to Moderate Negative Impact in terms of visual impact – and these are limited to roads within the Business Park and TO a short section of the R134 Nangor Road south of the Site.

The Proposed Project entails no changes to that required for the permitted scheme.

Negative Impact in terms of visual impact – and these are limited to roads within the Business Park and TO a short section of the R134 Nangor Road south of the Site.
The Proposed Project entails no changes to that required for the permitted scheme.

The Proposed Project entails no changes to that required for the permitted scheme.

Operation Phase

The proposed development will primarily impact on views from R134 Nangor Road to the south (which itself has been upgraded and widened in recent years) and in views from the Business Park Road within Grangecastle Business Park. Permission has been recently granted for a similar Data-centre project on lands south of the R134 Nangor Road and as such, no impacts arise from south of R134. It is recognised that the wider area around Nangor Road is continuing to experience notable change in character as development expands on zoned lands.

Despite localised modifications, the Proposed Project entails no changes to the overall presentation of the permitted scheme.

The Proposed Project includes two key elements. First are two additional Data halls (DUB-14 & DUB-15), which are located alongside, and in-keeping with the nature and scale of similar development on the existing Microsoft Ireland lands to the immediate east. Second the Proposed Project includes a Central Administration / Gateway Building prominently located to front the western entrance off the R134 Nangor to the Business Park. This office building presents a high-quality architectural response that in visual terms, positively defines and frames the entrance to the Business Park. The location of the Central Administration / Gateway Building also helps in integrating the Data-halls within the overall Microsoft development and in screening the halls from the R134 junction with the Business Park (refer to Photomontage Views 1 and 2 (Figures 10.5.1A/B/C and Figures 10.5.2A/B/C)).

The Proposed Project entails no changes to that required for the permitted scheme.

Retention of existing Vegetation along the Site boundary with the Griffeen River and the Business Park road has a significant effect in reducing impact of the Proposed Project on views from within the Park and in ensuring that the development is in keeping with the nature of development in the Business Park as a whole (refer to Photomontage Views 1 and 2 (Figures 10.5.3A/B/C and Figures 10.5.4A/B/C)).

The Proposed Project entails no changes to that required for the permitted scheme.

The Proposed Project will also be visible travelling west along the R134 Nangor Road. Therefore, it is proposed to provide an approximately 3m high berm along the Site boundary, which will be planted with mixed native species. This is in-keeping with the approach taken elsewhere on the existing Microsoft

Ireland lands, including along the adjoining section of boundary with DUB-13 (refer to Photomontage View 5 (Figures 10.5.5A/B/C).

The Proposed Project entails no changes to that required for the permitted scheme.

In overall terms, aspects of the Proposed Project will be prominently visible and these have been designed as high-quality architectural elements defining the entrance to the Business Park. Elsewhere vegetation has been retained, augmented and / or proposed to provide for appropriate visual buffer and screening and for provision of an enhanced green infrastructure network.

The Proposed Project entails no changes to that required for the permitted scheme.

The overall visual impact within the Business Park and surrounding area is considered to be consistent with the nature and scale of similar impacts as could be expected from any general site development within the Park. The landscape scheme is also consistent with and appropriate to the landscape of the Business Park.

The Proposed Project entails no changes to that required for the permitted scheme.

The existing landscape environment is of Low Sensitivity and the effects of the operation stage are assessed as being of Medium Magnitude. The Proposed Project will have a Slight to Moderate impact in terms of change of character and impact on landscape. However, given the architectural quality of the proposed central Administration / Gateway Building, the residual nature of the impact on the visual environment is assessed as being Positive in the receiving environment.

The existing visual environment is of Low Sensitivity and the effects of the operation stage are assessed as being of Medium Magnitude. Therefore, the Proposed Project will have Moderate visual impact, which again given the architectural quality of the proposed central Administration / Gateway Building, is assessed as being Positive in the receiving environment.

Landscape and Visual Planning Effects

It is considered that the Proposed Project does not impact negatively on the landscape-related green infrastructure and heritage objectives of the County Development Plan (see Section 10.3 of this Chapter of the EIAR).

The Proposed Project entails no changes to that required for the permitted scheme.

The most significant trees, hedgerows and plantings – most notably those along the Griffeen River and retained, protected and augmented. Notwithstanding the land use zoning applying to the Site, significant areas are given over the landscape and habitat creation, with retention of existing key vegetation, proposed berming and screening planting on the southern boundary, provision of large areas of new meadow – some open and encouraging wet habitat areas – others dry meadow with native tree planting, and augmentation of retained hedgerows. In this manner the Proposed Project protects and enhances green infrastructure on and surrounding the Site.

The Proposed Project entails no changes to that required for the permitted scheme.

10.9 'DO NOTHING' SCENARIO

Should the Proposed Project not proceed it is noted that permission already exists for a broadly similar development, which would have broadly similar effects on the landscape and visual environment.

10.10 WORST CASE SCENARIO

The worst-case scenario for landscape and visual aspects would arise should the landscape proposals not be implemented or fail entirely. However, this is considered a highly unlikely possibly due to the location of the Site within an established high-quality Business Park environment, and the experience of the Applicant in completing other phases of similar development with associated landscape measures adjoining the Site.

10.11 MONITORING & REINSTATEMENT

The implementation and reinstatement of all landscape proposals will be monitored during implementation and inspected, maintained and monitored for the twelve month defects period. Any materials or plants which fail within this period will be replaced. Thereafter the landscape at the Proposed Project will be maintained as part of the overall landscape aftercare operations across all Microsoft Ireland lands within Grangecastle Business Park.

10.12 DIFFICULTIES IN COMPILING INFORMATION

There are no known difficulties in compiling information for this section of the EIAR.

10.13 REFERENCES

- BS 5837:2012 Trees in relation to design, demolition and construction. Recommendations.
- Landscape Character Assessment of South County Dublin Plan, Updated 2016.
- South Dublin Development Plan 2016-2022.

PHOTOMONTAGES

for

Project No. 6816
Microsoft DUB 14-15

for

Client: RKD Architects

Date: 14 July 2021
Document Number: RP01

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Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

CONTENTS AMENDMENT RECORD

This report has been issued and amended as follows:

REVISION	DESCRIPTION	DATE	PREPARED BY	CHECKED BY
00	View Location Map and 5 no. of Photomontages	15 June 2020	BP	TB
01	Revision to 3 no. of Phtoomontages, views renumbered	16 June 2020	BP	TB
02	Revision to 1 Photomontage	16 June 2020	BP	TB
03	Revision to 1 Photomontage	30 June 2020	BP	TB
04	Revision to 1 Photomontage	13 July 2020	BP	TB
05	Revision to all Photomontages. Change to figure numbers	27 October 2020	BP	TB
06	Added cumulative images			
07	Revision to All Photomontages	25 June 2021	BP	TB
08	Added as Permitted Version	25 June 2021	BP	TB
09	Revision to 3 no. of Photomontages	14 July 2021	BP	TB

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Year:	20	20	20	20	20	20		21	21	21
FIGURE NUMBER	**REVISION**									
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10.5.1B		01	01	03	04	05	05	07	05	05
10.5.1C							06	07	07	08
10.5.1D									07	08
10.5.2A	00	00	00	00	00	00	00	00	00	00
10.5.2B	00	01	01	01	01	05	06	07	05	05
10.5.2C							06	07	07	08
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10.5.3A	00	00	00	00	00	00	00	00	00	00
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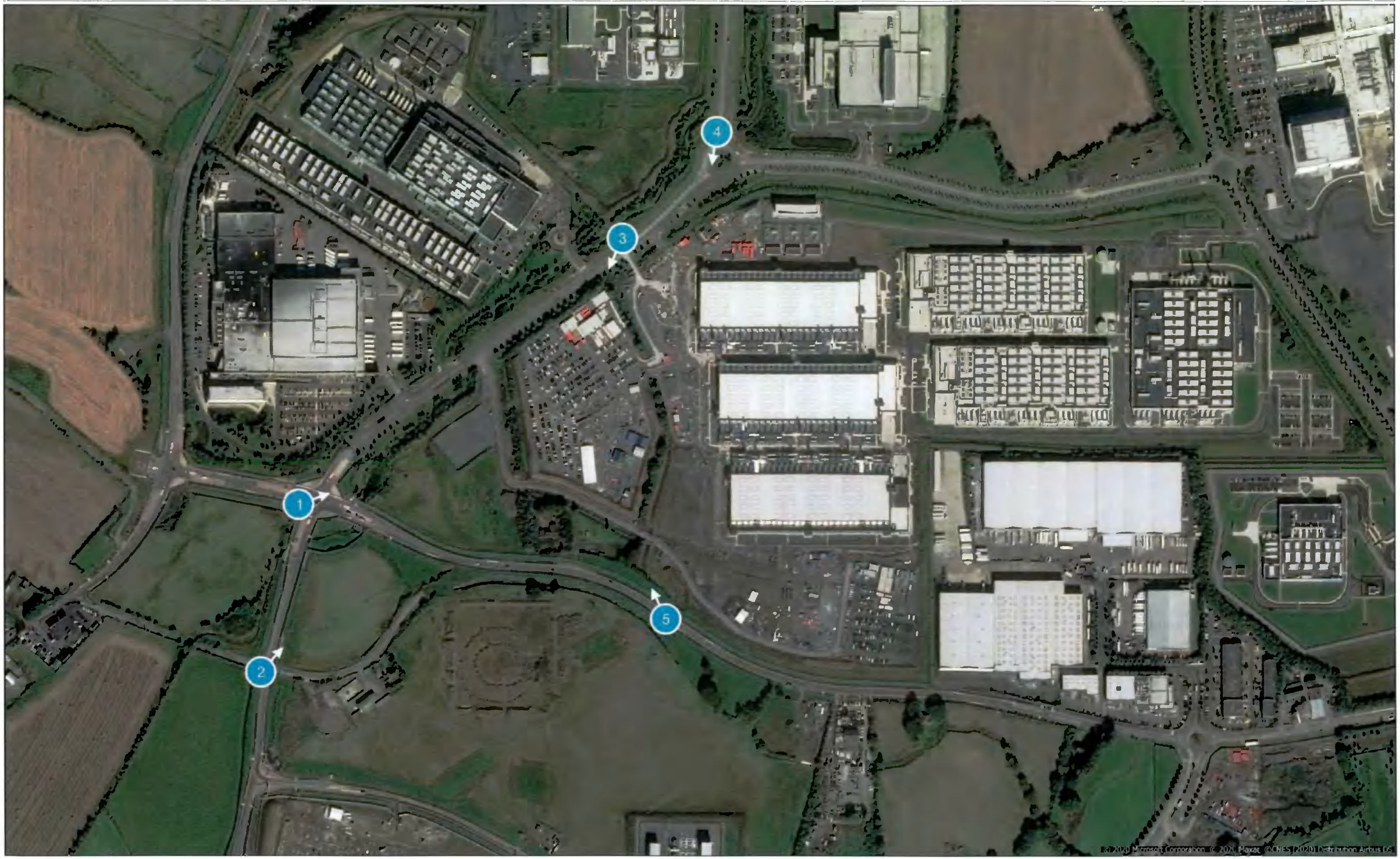

Figure: 10.5 View Location Map

Rev: 01

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Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.1A

Rev: 03
View 1
As Existing

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.1B

Rev: 05
View 1
As Permitted

BSM Brady Shipman Martin. Built. Environment. Est. 1968

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.1C

Rev: 08
View 1
As Proposed

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Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.1D **Rev: 08**

View 1

Cumulative showing as Approved DUB13

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Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.2A

Rev: 00
View 2
As Existing

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Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.2B

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View 2
As Permitted

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Project Number:	6816	Document Number:	RP01	Revision:	09
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< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.2C

Rev: 08
View 2
As Proposed

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Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.2D **Rev: 08**

View 2

Cumulative showing as Approved DUB13

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Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.3A **Rev: 00**

View 3
As Existing

BSM Est 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.3B **Rev: 05**

View 3
As Permitted

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.3C

Rev: 07
View 3
As Proposed

BSM Est. 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.4A

Rev: 02
View 4
As Existing

BSM Est 1968 Brady Shipman Martin. Built. Environment.

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

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Figure: 10.5.4B

Rev: 05
View 4
As Permitted

BSM Brady Shipman Martin. Built. Environment. Est 1968

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.4C

Rev: 07
View 4
As Proposed

BSM Brady Shipman Martin. Built. Environment. Est. 1968

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

					ANGLE OF VISION / LENS FOCAL LENGTH				
< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm		70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.5A

Rev: 00
View 5
As Existing

BSM Brady Shipman Martin. Built. Environment. Est 1968

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

					ANGLE OF VISION / LENS FOCAL LENGTH				
< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm		70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.5B

Rev: 06
View 5
As Permitted

BSM Brady Shipman Martin. Built. Environment. Est. 1968

Project Number:	6816	Document Number:	RP01	Revision:	09
Project Name:	MICROSOFT DUB 14-15	Document Title:	PHOTOMONTAGES	Date:	14 July 2021

< 73.7° / 24mm	< 65.5° / 28mm	< 54.4° / 35mm	< 39.6° / 50mm	< 28.8° / 70mm	ANGLE OF VISION / LENS FOCAL LENGTH	70mm / 28.8° >	50mm / 39.6° >	35mm / 54.4° >	28mm / 65.5° >	24mm / 73.7° >

Figure: 10.5.5C

Rev: 08
View 5
As Proposed

BSM Brady Shipman Martin. Built. Environment. Est. 1968

11 TRAFFIC AND TRANSPORTATION

11.1 INTRODUCTION

TPS M Moran & Associates as specialist traffic consultants have been retained to undertake a Traffic Impact Assessment (TIA) relating to the development of 2 data centres (DUB14 and DUB15) at Grange Castle International Business Park, Clondalkin, Dublin 22.

This proposed development is in addition to data centres DUB 06, 07, 08, 09, 10, 11, 12, and 13 granted planning permission to the east of proposed data centre site. In addition, to the proposed 2 data server centres it is also proposed to seek planning permission for a central administration building to the west of these data centres.

It is noted that permission has already been granted for this development under SD20A\0283 and that the current application relates to amendments to said permission, none of which will have a material impact on the predicted construction or operational traffic generation of the proposed development. Nevertheless the traffic impact is assessed again as part of this EIAR for consistency.

The existing data centres within the overall existing MS Data Centre campus currently employ some 550 full time staff over a number of working shifts.

For the purposes of this TIA we have assumed that this proposed development, if granted planning permission, would be complete within 24 months.

As part of this TIA we will also assess the traffic associated with the proposed temporary construction car park (802 car parking spaces) that will accommodate construction personnel associated the construction of these data centres and office building.

11.2 METHODOLOGY

In this TIA we will identify the existing traffic conditions and assess the relative level of impact the proposed development (both the construction and operational phase) is likely to have on the local road network.

We will also identify the traffic operation of the existing business park during the critical AM and PM peak periods on the adjacent road network.

Within this report reference will be made to some of the historic traffic data and assessments that supported the previously permitted data centres adjacent data centres within this site.

The methodology used within this Traffic Impact Assessment (TIA) complies with best practise for Traffic Impact Assessments indicated within key publications, which include:

- 'Traffic and Transport Assessment Guidelines' National Roads Authority (May 2014)
- 'Guidelines for Traffic Impact Assessments' The Institution of Highways and Transportation.
- The Design Manual for Urban Roads and Streets.

This report, which addresses the likely traffic impact of the proposed development during both the construction and operational phases, will generally be structured as follows:

- Assessment of the existing traffic conditions on the road network in the vicinity of the proposed development site.
- Assessment of the trip rates for the proposed development.
- Assignment of the trip distribution patterns associated with the proposed development onto the adjacent road network.
- Proposed access arrangements.
- Capacity and operational assessments of the likely impact of the proposed development on the adjacent road network.

Background information used within this report has been derived from technical information and layout plans prepared by RKD Architects for the scheme.

11.3 RECEIVING ENVIRONMENT

The application site is located to the south west of the existing Grange Castle Business Park, Clondalkin, Co. Dublin. The vacant site is located on lands zoned for Industrial use within South Dublin County Council's Development Plan 2016-2022. This site is bounded to the north by the Grange Castle Business Park internal access spine road. The site is also located opposite the Aryzta Cuisine De France headquarter manufacturing plant.

The location of the proposed Microsoft data centres and office development which forms this planning application is shown generally outlined in yellow within Figure 11.1 below:

Figure 11.1 Proposed Microsoft Development Site

Grange Castle Business Park covers an area of approximately 120 hectares and currently accommodates Microsoft, Takeda, Aryzta and Pfizer. The business park is located approximately 13km to the west of Dublin City Centre, 3km to the west of Clondalkin and 3km to the west of the M50.

To the south is Kilcarbery & Profile Park Business Parks, to the west of the site is a pitch & putt course and further west are primarily agricultural lands. To the north is the Grand Canal and the Dublin-Cork railway line and to the east is the established residential area of Clondalkin.

There are 3 main entrances into Grange Castle Business Park with the north eastern access from the R136 via a 3-arm at grade roundabout junction which connects with the north and southbound carriageways of the R136.

The R136 functions as a two-lane dual carriageway regional road within South Dublin Road County Council's road hierarchy. This road provides a link between the N4 to the north of the site and the N7 and the N81 to the south. The R136 in this area accommodates dedicated bus lanes in both directions. Cycle lanes and footpaths are also provided on both sides of this carriageway.

This north eastern access road serving the Grange Castle Business Park functions as a dual carriageway with two 7.0 metre wide lanes provided in both directions. A 1.5m cycle path and a 1.5m footpath are provided along the length of this carriageway. Street lighting, road furniture and road marking are also provided.

To the south of the Grange Castle Business Park are additional vehicular access to the business park via the R134 (Nangor Road). The south eastern access also takes the form of a 4-arm at grade roundabout junction. This roundabout junction connects the east and westbound carriageways of the R134, the access road serving the Grange Castle Golf Club as well as the access road serving the business park from the south. This business park access road is a single 9.0 metre wide carriageway with pedestrian footpaths and cycle ways and provides access to numerous business park units within the business park.

To the south west of the Grange Castle Business is a more recently upgraded access to the business park taking the form of a 4 arm traffic signal junction which connects with the upgraded Nangor Road and the Baldonnell Road.

The upgraded Nangor Road also connects with the R120 Lock Road which has also been upgraded to provide high capacity road links and junctions within this area. These new traffic signal junctions operate with the Microprocessor Optimised Vehicle Actuated (MOVA) signal system. These new road links and junctions also contain new provisions for cyclists, pedestrians and public transport users.

Within The Grange Castle Business Park Site the existing Microsoft data centres are accessed from this business park internal spine route by means of a simple priority 'T' junction which is located some 50.0 metres to the south of a 4 arm 40.0metre ICD at grade roundabout junction which provides access to the Pfizer Pharmaceutical plant with western arm of this junction connecting with other internal road links within the Grange Castle Business Park.

The only permitted traffic movement out of the existing Microsoft site access arm of this junction is a left turn only. This site access contains a good standard of visibility into both the leading and non-leading traffic directions of the Grange Castle Business Park access road.

In addition, the junction geometry permits the inbound and outbound traffic movements of all classification of vehicles. Street lighting and shared pedestrian and cycle ways and footpaths which include tactile paving is located either side of this access.

The general layout of the Existing Microsoft data centre site access at its junction with the Grange Castle Business Park are shown within Figures 11.2 to 11.4 below.

Figure 11.2: Northbound view from existing Microsoft Data Centre access into internal spine road.

Figure 11.3: Southbound view from Microsoft Data Centre access into spine road.

Figure 11.4 View from internal spine road into existing Microsoft Data Centre Access.

Thus, from the above it can be considered that the principal of direct vehicular access from the surrounding road network with associated traffic movements to serve land use development in this area is well established.

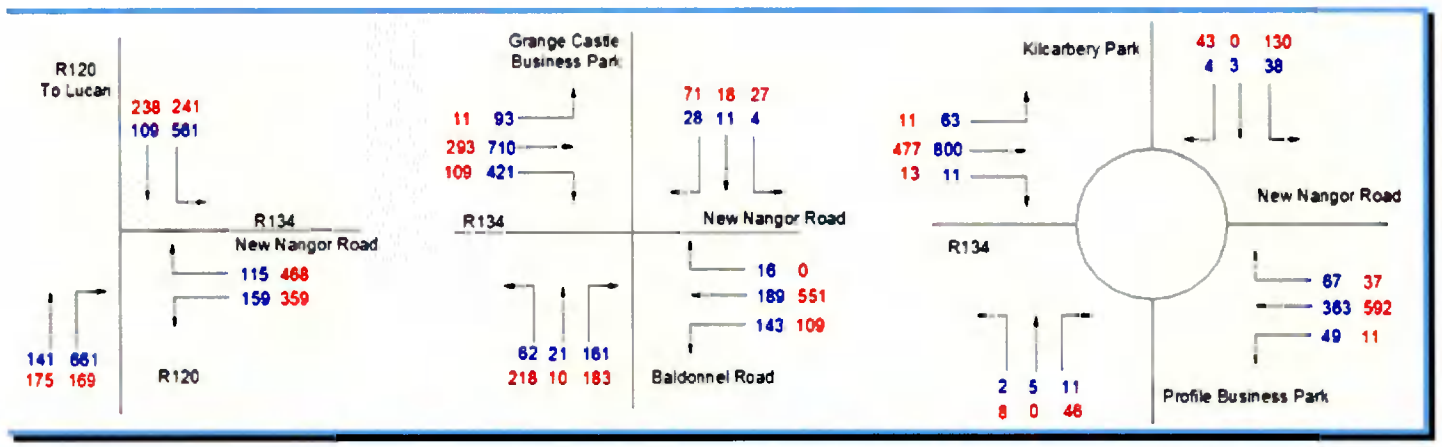
In addition, no queues or delays were observed within the above road links or junctions in the vicinity of this access with free flow traffic condition operating in this area.

In order to assess the current traffic conditions in the vicinity of the proposed Microsoft Data Centre and Office development site we have carried out traffic and transportation related surveys at the following locations:

- R120/ R136 traffic signal junction.
- R134/Grange Castle Business Park/New Nangor Road/Baldonnell Road traffic signal junction.
- R134/Kilcarbery Park/New Nangor Road/Profile Business Park roundabout junction.
- R134/Grange Castle Business Park/Nangor Road/ Grange Castle Golf Club roundabout junction.
- R134/R136/Nangor Road East/R136 traffic signal junction.

These traffic surveys were undertaken between the hours of 0600hrs–1900hrs. The periods over which the traffic counts were carried out were chosen for the reason that over this time period the AM and PM peak traffic conditions can be identified, as well as the peak periods associated with the construction phase of this development.

These traffic surveys identified the peak traffic periods within this area as being 0800hrs – 0900hrs in the AM and 1700hrs – 1800hrs in the PM peak. Details of these recorded existing AM and PM peak periods that over the period of the traffic surveys occurred are shown in Figures 11.5 below:



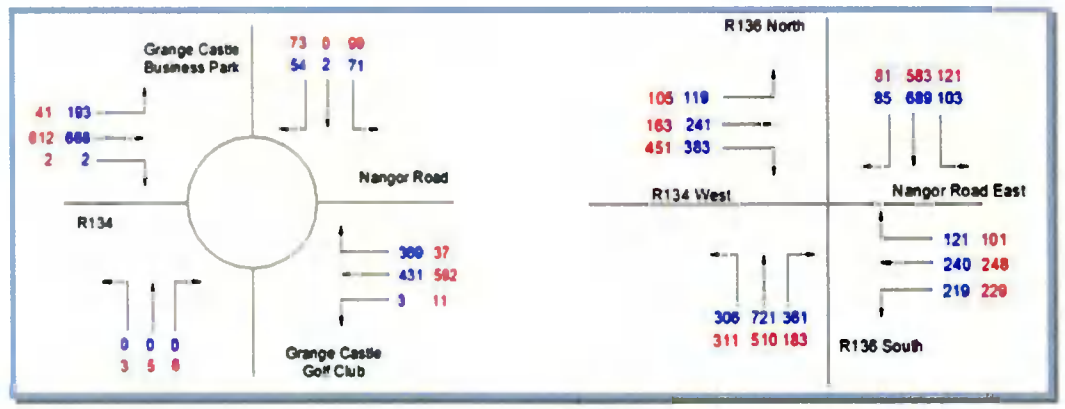


Figure 11.5 Existing AM and PM Peak Hour Traffic Turning Movements

Note.
AM Peak Hour shown in Blue
PM Peak Hour shown in Red

The Grange Castle Business Park is located some 3.5kms to the south of Adamstown rail station which served by both inter city and regional rail services operating the Dublin to Cork service and the Dublin, Kildare to Portlaoise rail service.

During the morning and evening peak periods this station is served by 8 train services making the site an ideal location for accessing by passengers who can then use the cycle ways on the R120 and the R134 to access the proposed Microsoft application site.

The extent of the cycle trip is some 11.0 minutes and the possible route is shown within Figure 11.6 below.

Figure 11.6 Cycle route from Adamstown Station to site

In addition, the site is adjacent to several bus stops both within the Grange Castle Business Park and on the R134. The 7230 and 7714 bus stops are located on the business park estate road to the north of the Microsoft site. These stop are served by the Dublin Bus route 13 which connects this business park site with Harristown, Glasnevin, Drumcondra, Dublin City Centre, St James Hospital, Bluebell, Clondalkin and Deansrath.

This service operates every 30 minutes from 0530hrs to 2320hrs Monday to Friday and every 15 minutes at peak times. This service also operates on Saturday from 0600hrs to 2320hrs and on Sunday from 0700hrs to 2320hrs

The 3413 and 3414 bus stops located on the R134 are less than 10 minutes walk from the proposed Microsoft development site. These stops are served by the Dublin Bus Route 68 which provides a bus service from Greenogue Business Park to Dublin City Centre via Newcastle, Cherrywood Villa, Clondalkin and Camden Street.

This bus service operates every 30 minutes from 0625hrs to 2330hrs Monday to Friday and every 40 minutes on Saturday and every 90 minutes on Sunday.

11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

This amended Microsoft development seek planning permission for amendments to permission SD20A\0283 for data centres DUB14 and DUB15, and central administration building, all located west of existing data centres DUB09, DUB10, DUB12 and DUB13.

Each data centre will contain offices, computer and associated support areas, electrical component rooms, plant and associated equipment, plant at roof level and 36 surface parking spaces adjacent to each data centre.

To the west of these proposed data centres and within the same site, Microsoft are also seeking planning permission for an administration office of some 3520sq metres.

Planning consent is also sought for the ancillary site works for connection to infrastructural services, as well as fencing, landscaping, perimeter service roads around the buildings.

It is proposed to access these permitted data centres from the previously discussed existing access serving off the Grange Castle Business Park which is located to the east of the site.

We have within previous planning applications for the existing data centres permitted by the Local Authority indicated that some 20 employees operate within each data centre during a typical single working shift from 0800hrs to 1700hrs. In addition, some 15 contractors or suppliers may attend the date centre within these working shifts.

In contrast to the above, the proposed office development is likely to give rise to more daily or peak hour trips. In order to determine the extent of the trips the above development land use may generate over these periods the TRICS 2020(a) trip rate database (Trip Rate Information Computer System) has been reviewed.

TRICS 2020(a) is a database, which uses traffic survey information to estimate traffic generation for land use development planning purposes.

The database consists of over 7500 traffic surveys, which therefore yields empirical rather than theoretical daily, AM and PM peak hour trip rate generation figures.

The TRICS 2020(a) Database trips for the proposed office land use development derived from similar office developments in Ireland and the UK is shown in Figure 11.7 below with a copy of the TRICS 2020(a) output file attached within Appendix 11.1

TOTAL VEHICLES | Estimate TRIP rates

Survey Start/End: 06:00-22:00
Trip rate parameter range available: 178 - 120000 (units: sqm)

State TRP Figure & Extrapolate Results: ON

Estimated TRIP rate value per 3500 SQM
Estimated TRIP rates shown in shaded column (for 3500 SQM)

TRIP RATE VALUE PER 100 SQM	ARRIVALS Total Rate: 3.666 Peak: 08:00-09:00			Total 128.233	DEPARTURES Total rate: 3.527 Peak: 17:00-18:00			Total 123.465	TOTALS Total rate: 7.193 Peak: 08:00-09:00			Total 251.698
	No. Days	Ave. GFA	Trip Rate	Estimated Trip rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip rate	No. Days	Ave. GFA	Trip Rate	Estimated Trip rate
00:00-01:00												
01:00-02:00												
02:00-03:00												
03:00-04:00												
04:00-05:00												
05:00-06:00												
06:00-07:00	2	65050	0.402	14.070	2	65050	0.061	2.152	2	65050	0.463	16.222
07:00-08:00	67	6902	0.445	15.592	67	6902	0.059	2.066	67	6902	0.504	17.658
08:00-09:00	69	6711	0.857	29.978	69	6711	0.105	3.681	69	6711	0.962	33.659
09:00-10:00	69	6711	0.566	19.804	69	6711	0.143	5.011	69	6711	0.709	24.815
10:00-11:00	69	6711	0.214	7.483	69	6711	0.144	5.034	69	6711	0.358	12.517
11:00-12:00	69	6711	0.156	5.457	69	6711	0.134	4.694	69	6711	0.290	10.151
12:00-13:00	69	6711	0.186	6.508	69	6711	0.224	7.854	69	6711	0.410	14.362
13:00-14:00	69	6711	0.201	7.052	69	6711	0.203	7.090	69	6711	0.404	14.142
14:00-15:00	69	6711	0.158	5.541	69	6711	0.185	6.478	69	6711	0.343	12.019
15:00-16:00	69	6711	0.108	3.764	69	6711	0.269	9.418	69	6711	0.377	13.182
16:00-17:00	69	6711	0.110	3.847	69	6711	0.535	18.738	69	6711	0.645	22.585
17:00-18:00	69	6711	0.086	2.993	69	6711	0.759	26.561	69	6711	0.845	29.554
18:00-19:00	66	6988	0.046	1.594	66	6988	0.318	11.126	66	6988	0.364	12.720
19:00-20:00	1	120000	0.047	1.633	1	120000	0.227	7.933	1	120000	0.274	9.566
20:00-21:00	1	120000	0.036	1.254	1	120000	0.089	3.121	1	120000	0.125	4.375
21:00-22:00	1	120000	0.048	1.663	1	120000	0.072	2.508	1	120000	0.120	4.171

Figure 11.7 Office Land Use Trip Generation.

The projected daily traffic levels that would be expected to be generated by the 3500sq metres of office development on the subject site shown within Table 1.0 above, generates the highest trips during the AM peak hour of 0800hrs to 0900hrs and during the PM peak hour of 1700hrs to 1800hrs.

These AM and PM peak hour trip generation periods are further summarised within Table 11.1 below:

Time Period	Inbound	Outbound	Total
AM Peak Hour	30	4	34
PM Peak Hour	3	27	30

Table 11.1 3500Sqm Office Development AM and PM Peak Hour Trip generation.

It can be seen from Table 11.1 above that the proposed office development within this development site does not generate significant projected AM or PM peak hour trips.

11.5 POTENTIAL IMPACTS

Construction Phase

Having established the likely trips associated with the proposed Microsoft data centres and office development we shall now assess the likely trips associated with the construction of these land uses.

It is proposed to provide a temporary car park consisting of 802 parking spaces to facilitate the construction of the Microsoft DUBS 14/15 and associated Microsoft office development. This temporary car park is already permitted under SD20A\0283 and will be located towards the northern sector of the Grange Castle Business Park. The general location of this temporary construction car park is shown within Figure 11.8 below.

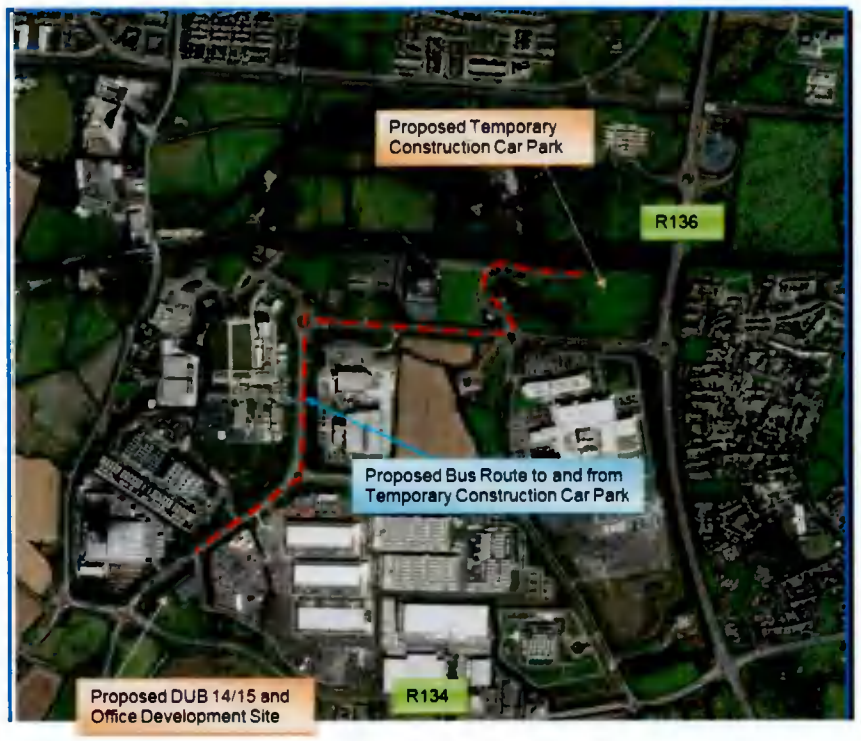


Figure 11.8 Route from Construction Car Park to Site

This permitted temporary construction car park would connect with the development site for DUB 14/15 and the Microsoft office development by means of a shuttle bus service operating during shift change over times and designated time periods for specialist construction operatives that are allocated specific times for implementing their section of the project delivery.

The travel distance between the permitted temporary construction car park and the construction site is less than 5 minutes by shuttle bus. The shuttle bus route between the temporary construction car park site and the development site is shown dotted in red within Map 1.0 above. The shuttle bus will route via existing road links and junctions within the Grange Castle Business Park.

From previous experience the majority of construction operatives would access the temporary construction car park from the Greater Dublin Area with this area making up some 38% of construction workers.

The areas of Meath and Kildare can be expected to make up over 24% of the construction workers with the remaining operatives accessing the site from the northwest, west and mid western regions of the country.

As previously discussed, it is proposed to provide 802 car parking spaces to accommodate the construction workers involved with this project. These construction workers would operate within two shifts as follows:

- 0700hrs-1500hrs
- 1500hrs-2300hrs

As with the construction of the previous data centre, construction car and van pooling will be encouraged throughout the construction phases of the development to reduce the traffic impact on the surrounding environment. From our experience of similar multinational developments within the Kildare and Greater Dublin Area a car or van sharing ratio of 1.5 operatives per vehicle is not unreasonable.

We would expect construction operatives to arrive at the temporary construction car park some 10 to 15 minutes prior to the start of a shift, park up and board the shuttle bus to the development site. Due to COVID 19 restriction less than 30 construction operatives may travel on these typically 55 seat buses.

In addition, a Construction Management Plan will be prepared by the contractor, when appointed, that will require construction traffic including both construction plant and materials deliveries to be programmed to avoid peak traffic periods on the surrounding local and strategic road network.

The various phases of construction generate different thresholds of on-site construction activity and the extent of on-site construction operatives. Table 11.2 below indicates the various extent of stages within the site and likely extent of on-site operatives and off-site parking demand with the temporary construction car park.

Phase	Type of Works	Operative Demand	Temporary Parking Demand
1	Site Preparation	Low	Low
2	Construction	Medium to high	High
3	Commissioning	Low	Low to Medium
4	Handover	Low	Low

Table 11.2 Construction Phases

During Phase 1 or the Site Preparation construction operatives would be involved in the undertaking site setting up compounds, site clearance works, site excavations, importation of materials for the foundation construction, site levelling and setting out.

During the peak construction at Phase 2 it is projected that a maximum some 550 construction operatives could attend on site during a designated shift involved in the construction of the various floors and structures, structural frame construction and outlying material infill and landscaping.

The Commissioning and handover Phases outlined as 3 and 4 above within Table 1.0 will involve specialist contractors accessing the site to install technical material and equipment and in conjunction with specialist consultants approving handover stages of the DUB 14/15 and the Microsoft office development.

This commissioning will overlap with the handover of the site where Low to Medium levels of operatives can be expected to attend on site.

During Phase 1, 2 and 3 we can expect the construction population on site to range from 250 to 400 operatives per shift which can be accommodated within the temporary construction car park.

Operational Phase

It is proposed to access the 2 data centres from the existing vehicular access located to the east of the existing data centres which takes the form of a simple priority T junction arrangement from the estate road within the business park.

The proposed access to Microsoft office development within the application site would be accessed from the Grange Castle Business Park estate road which bounds the site to the north. This access would incorporate a priority left / right staggered T junction arrangement with this estate road and the Aryzta Cuisine De France headquarter site access to the west.

The general location of this proposed Microsoft office access from the northern estate road within the business park is shown within Figures 11.9 – 11.10 below.

Figure 11.9: Northbound view into estate road from proposed Microsoft office access.

Figure 11.10 Southbound view from proposed Microsoft office access into estate road.

It is proposed to extend the existing ghost island provided within this junction currently used by right turning traffic accessing the Aryzta development from the southbound carriageway of the estate road to facilitate the right turning traffic accessing the Microsoft development site from the northbound carriageway of this estate road.

The minor arm of this junction connecting from the estate road to the Microsoft site would also connect into the existing pedestrian and cycle facilities along this estate road. The existing access to the north of this proposed Microsoft access would be closed as part of this application.

In addition, it is proposed to provide an employee shuttle bus service that would route within the application connecting the Microsoft office and the existing and proposed data centres.

The site access junction, associated infrastructure for pedestrians and cyclist, the internal site access routes, parking and set down areas can be designed to meet the standards set out within the Design Manual for Urban Roads and Streets.

DMURS places the emphasis not on road link or junction capacity but the sharing of the available road space. DMURS was launched by the Department of Transport and the Department of Environment in March 2013 with the focus on pedestrians, cyclists, and public transport.

The DMURS 2019 manual sets out design guidance and standards for constructing new and reconfiguring existing urban roads, streets and access points in Ireland, incorporating good planning and design practice.

The manual aims to end the practice of designing streets as traffic corridors, and instead focus on the needs of pedestrians, cyclists and public transport users.

11.6 POTENTIAL CUMULATIVE IMPACTS

In order to assess the impact of the traffic associated with the proposed Microsoft development on the critical road links and junctions in the vicinity of the proposed development, this being the existing date centre access and the eastern estate within the business park, we have modelled these junctions using the computer modelling program PICADY. This is a program developed by the Transport Research Laboratory and used by traffic engineers to assess the capacity and delay at priority junctions.

PICADY output results consist of tables of demand flows for each time segment of the time-period analysis. These tables contain start and finish times for each arm, traffic demand data, capacity, ratio of flow to capacity findings, start queue length, end queue length, and queuing delay.

This traffic-modelling period covers the AM and PM peak hour periods through this junction with the traffic associated within the proposed data centres added to this recorded traffic turning movements on the surrounding road network.

A copy of the PICADY9 data and results are attached as Appendix 11.2 to this report with a summary of the output results shown within Tables 11.3 to Table 11.4 below. These results show the busiest or worst case traffic period within each modelled period.

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalized level of service
B-AC	75	664	0.113	75	0.1	6.720	A
C-AB	35	530	0.066	35	0.1	7.988	A
C-A	116			116			
A-B	91			91			
A-C	461			461			

Table 11.3 AM Peak Estate Road and Existing Data Centre Access.

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-AC	54	770	0.070	54	0.1	5.527	A
C-AB	40	626	0.063	40	0.1	6.753	A

C-A	188		188
A-B	56		56
A-C	91		91

Table 11.4 PM Peak Estate Road and Existing Data Centre Access.

From the above summary tables it is indicated that the critical junction serving the existing and proposed data centre sites within the business park can accommodate the projected levels of traffic associated with the proposed data centre development.

The relative Level of Service within this junction is identified as A within the above PICADY9 assessments representing "all most free flow urban traffic conditions", as set out within the Highway Capacity Manual.

Urban Level of Service gauges, in a qualitative manner, the extent of congestion within a road link. Variables such as travel time and traffic speed form part of the qualitative description. Level of Service A represents almost free flow traffic conditions with Level of Service F indicating the road link is over capacity. As such, it is evident that the existing road network can cater for the traffic associated with the construction associated with the future Microsoft Data Centre.

We have also modelled the proposed Microsoft office site access of the existing business park estate located to the north of the application. This traffic modelling also includes the Aryzta Cuisine De France headquarter site access within these AM and PM peak hour PICADY9 assessments.

A copy of the PICADY9 data and results are attached as Appendix 11.3 to this report with a summary of the output results shown within Tables 11.5 and Table 11.6 below. These results show the busiest or worst case traffic period within each modelled period.

08:30 - 08:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	17	481	0.034	17	0.0	8.531	A
A-B	50			50			
A-C	96			96			
A-D	33			33			
AB-C	101			101			
AB-D	33	683	0.048	33	0.1	6.095	A
D-ABC	22	565	0.039	22	0.0	7.293	A
C-D	11			11			
C-A	50			50			
C-B	11			11			
CD-A	61			61			
CD-B	11	657	0.017	11	0.0	6.125	A

Table 11.5 AM Peak Estate Road and Microsoft Office Access.

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-ACD	66	470	0.140	66	0.2	9.791	A
A-B	11			11			
A-C	28			28			
A-D	11			11			
AB-C	39			39			
AB-D	11	663	0.017	11	0.0	6.071	A
D-ABC	44	524	0.084	44	0.1	8.252	A
C-D	11			11			
C-A	132			132			
C-B	11			11			
CD-A	143			143			
CD-B	11	688	0.016	11	0.0	5.850	A

Table 11.6 PM Peak Estate Road and Microsoft Office Access.

From the above summary tables it is indicated that this junction serving the proposed Microsoft office development within the business park can accommodate the projected levels of traffic associated with the proposed office and data centre development.

The relative Level of Service within this junction is again identified as A within the above PICADY9 assessments representing "all most free flow urban traffic conditions", as set out within the Highway Capacity Manual.

11.7 MITIGATION MEASURES

Construction Phase

The contractor will be required to provide wheel cleaning facilities, as well as regular cleaning of the access roads.

The temporary car parking for the construction phase will be finished to a standard to avoid mud spillage onto adjoining public roads.

Ongoing monitoring and control of construction traffic will be carried out and managed to avoid unnecessary trips during peak hours and as part of an agreed Construction Management Plan.

Operational Phase

Agree a Mobility Management Plan with the planning authority with a Mobility Management Co-ordinator appointed to advise staff and visitors of the most sustainable transport opportunities.

11.8 PREDICTED IMPACTS

The existing roads and traffic situation on the surrounding road network have been identified. The level of impact the proposed development is likely to have on the adjacent road network has also been assessed and it has been identified how the traffic associated with the proposed development can be accommodated within this road network.

Capacity assessments have been carried out on which indicate that under the forecast traffic conditions, assuming that the proposed development would be completed at 2022 there will be sufficient practical reserve capacity at these junctions to accommodate the traffic associated with this development proposal.

From the above it is conclusive that the proposed and existing junction arrangements to access the application site can operate satisfactorily in accommodating the levels and types of traffic likely to be generated by the development in terms of traffic capacity.

11.9 'DO NOTHING' SCENARIO

Should the development not progress the existing road network will operate within capacity and will remain capable of accommodating trips generated by land use development in this area

11.10 WORST CASE SCENARIO

The worst case traffic situation has been assessed within this TIA which identified the adjacent road network has ample capacity to accommodate existing, proposed and future land use development on road links and junctions in this area

11.11 MONITORING & REINSTATEMENT

The existing and proposed access arrangements have been designed to current road design standards and can be constructed under the relevant design standards which would be agreed with the Transportation Department within South Dublin County Council.

The ongoing Mobility Management Plan (MMP) to be agreed with the planning authority will have an appointed Mobility Management Co-ordinator to oversee and monitor the MMP with ongoing reviews and updates made to it as necessary to further promote sustainable travel.

11.12 DIFFICULTIES IN COMPILING INFORMATION

None encountered.

11.13 REFERENCES

- Traffic and Transport Assessment Guidelines' National Roads Authority (May 2014)
- Guidelines for Traffic Impact Assessments' The Institution of Highways and Transportation.
- The Design Manual for Urban Roads and Streets.
- South Dublin County Council Development Plan 2016 to 2020.

12 MATERIAL ASSETS

12.1INTRODUCTION

The Draft EIA Report Guidelines 2017 state that material assets refer to built services and infrastructure, roads and traffic as well as waste management.

Separate chapters of this EIAR deal with the impacts of the following material assets:

- Population and Human Health – Chapter 4
- Air Quality & Climate – Chapter 9
- Traffic & Transportation – Chapter 11
- Waste Management – Chapter 13
- Cultural Heritage – Chapter 14

This chapter evaluates the following material assets:

- Land Ownership
- Local Settlement;
- Utilities & Telecommunications;
- Water Services.

As several of these assets have been addressed in other chapters within this EIAR, they are not discussed in detail in this chapter but references are provided to other EIAR chapters as appropriate.

12.2RECEIVING ENVIRONMENT

Land Ownership

The subject site and area of application as described in Chapter 3 Description of Development is currently owned by South Dublin County Council. However, the applicant is in the process of purchasing the main site for the data centres and office administration building. The site to contain the temporary construction car park will remain in SDCC ownership.

Adjoining Settlements

The nearest significant settlement to the proposed development is Clondalkin Village c.3km to the east with Lucan, Tallaght and Rathcoole villages at further distances. There are a small number of occupied residential properties to the east and west along local roads greater than 500m from the proposal. Further details on the nature of local settlements are presented in Chapter 4 Population and Human Health.

Utilities & Telecommunications

There is an existing ESB 110 kV substation and 110kV/20kV transformer compound within the MS Data Centre campus.

A temporary MV substation will be established on site to serve the needs of contractors during the construction and commissioning phases. This temporary substation will be decommissioned once the permanent substation is completed.

The Business Park is also served by the Gas Networks Ireland network.

There are also existing excellent telecommunication networks within the Business Park with sufficient capacity.

Access &Transport

There are 3 main entrances into Grange Castle Business Park with the north eastern access from the R136 via a 3-arm at grade roundabout junction which connects with the north and southbound carriageways of the R136.

The R136 functions as a two-lane dual carriageway regional road within South Dublin Road County Council's road hierarchy. This road provides a link between the N4 to the north of the site and the N7 and the N81 to the south. The R136 in this area accommodates dedicated bus lanes in both directions. Cycle lanes and footpaths are also provided on both sides of this carriageway.

This north eastern access road serving the Grange Castle Business Park functions as a dual carriageway with two 7.0 metre wide lanes provided in both directions. A 1.5m cycle path and a 1.5m footpath are provided along the length of this carriageway. Street lighting, road furniture and road marking are also provided.

To the south of the Grange Castle Business Park are additional vehicular access to the business park via the R134 (Nangor Road). The south eastern access also takes the form of a 4-arm at grade roundabout junction. This roundabout junction connects the east and westbound carriageways of the R134, the access road serving the Grange Castle Golf Club as well as the access road serving the business park from the south. This business park access road is a single 9.0 metre wide carriageway with pedestrian footpaths and cycle ways and provides access to numerous business park units within the business park.

To the south west of the Grange Castle Business is a more recently upgraded access to the business park taking the form of a 4 arm traffic signal junction which connects with the upgraded Nangor Road and the Baldonnell Road.

The upgraded Nangor Road also connects with the R120 Lock Road which has also been upgraded to provide high capacity road links and junctions within this area. These new traffic signal junctions operate

with the Microprocessor Optimised Vehicle Actuated (MOVA) signal system. These new road links and junctions also contain new provisions for cyclists, pedestrians and public transport users.
Within The Grange Castle Business Park Site the existing Microsoft data centres are accessed from this business park internal spine route by means of a simple priority 'T' junction which is located some 50.0 metres to the south of a 4 arm 40.0metre ICD at grade roundabout junction which provides access to the Pfizer Pharmaceutical plant with western arm of this junction connecting with other internal road links within the Grange Castle Business Park.

The only permitted traffic movement out of the existing Microsoft site access arm of this junction is a left turn only. This site access contains a good standard of visibility into both the leading and non-leading traffic directions of the Grange Castle Business Park access road.

In addition, the junction geometry permits the inbound and outbound traffic movements of all classification of vehicles. Street lighting and shared pedestrian and cycle ways and footpaths which include tactile paving is located either side of this access.

The main application site is located some 3.5kms to the south of Adamstown rail station which served by both inter city and regional rail services operating the Dublin to Cork service and the Dublin, Kildare to Portlaoise rail service. During the morning and evening peak periods this station is served by 8 train services making the site an ideal location for accessing this site by rail who can use the cycle ways on the R120 and the R134 to access the proposed Microsoft application site.

In addition, the site is adjacent to several bus stops both within the Grange Castle Business Park and on the R134. The 7230 and 7714 bus stops are located on the business park estate road to the north of the Microsoft site. These stops are served by the Dublin Bus route 13 which connects this business park site with Harristown, Glasnevin, Drumcondra, Dublin City Centre, St James Hospital, Bluebell, Clondalkin and Deansrath.

This service operates every 30 minutes from 0530hrs to 2320hrs Monday to Friday and every 15 minutes at peak times. This service also operates on Saturday from 0600hrs to 2320hrs and on Sunday from 0700hrs to 2320hrs.

The 3413 and 3414 bus stops located on the R134 are less than 10 minutes' walk from the proposed Microsoft development site. These stops are served by the Dublin Bus Route 68 which provides a bus service from Greenogue Business Park to Dublin City Centre via Newcastle, Cherrywood Villa, Clondalkin and Camden Street.

This bus service operates every 30 minutes from 0625hrs to 2330hrs Monday to Friday and every 40 minutes on Saturday and every 90 minutes on Sunday.

Water Services
Surface Water Drainage
The proposed development will result in an increase in surface water runoff from the site. The proposed development will ultimately discharge to the River Griffeen to the west of the site.

The proposed drainage system has been designed in accordance with Greater Dublin Strategic Design System (GDSDS) specifications. Storm water runoff from roofs will be harvested for re use and to reduce demands on the public water supply infrastructure. Storm water runoff from hard paved surfaces will be collected and attenuated on site in a sub-surface water attenuation infrastructure prior to discharged at a controlled rate to the Griffeen River.

All roads, fuel supply areas and hard standings will drain through Class 1 full retention petrol interceptors and silt traps prior to controlled discharge at outfall manholes. All fuel storage will be in self-contained double bunded tanks.

Foul Water
The site of the proposed development is currently a Greenfield site. However, service and infrastructure have already been installed within the Business Park for foul water. The foul water is connected to the off-site South Dublin County Council sewer located on the western boundary of the site. Foul drainage is ultimately treated at the Dublin City Wastewater Treatment plant at Ringsend.

Water Supply
The proposed water main network will connect into an existing 300mm diameter water mains supply located on the western boundary of the site.

12.3CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

12.4POTENTIAL IMPACTS

Construction Phase

Power
During construction, contractors will require power for heating and lighting of the site and their onsite accommodation. In addition, some on site equipment/plant will require power. A construction compound and temporary power supply will be installed for the construction of the Proposed Development. The power requirements for the construction phase will be relatively minor and therefore the power demand for the construction phase will be imperceptible.

Telecommunications
Connection into the wider telecommunications network will be undertaken by a statutory telecommunications operator and the impact for the construction period will be imperceptible.

Water Supply
Welfare facilities (canteens, toilets etc.) will be required for the construction staff. This will be provided by a temporary connection into the existing live watermain. The demand during the construction phase

will not be significant enough to affect existing pressures. The impact for the construction period will be imperceptible.

Foul Drainage
Welfare facilities (canteens, toilets etc.) will be required for the construction compound and workers on site. Portable toilets will be provided onsite for construction staff. The impact for the construction period will be imperceptible.

Surface Water
Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and access roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

During the construction phase, 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.
- The use of concrete and cement

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Operational Phase

Power
The proposed development will have a maximum operational electrical demand of 60MW each. The power requirements for the proposed development will be provided via a connection to an existing substation on the site and the utility 110kv Substation (Corkagh). No additional external grid connections are required to facilitate the proposed development.

The proposed development will require the expansion of the existing customer yard within the substation to facilitate the addition of 3 No additional 110kv/20kV transformers.

As the development is located in what is noted as a constrained area in terms of electrical grid capacity a standby gas generation plant is planned to meet the requirements of the utilities flexible demand policy. The capacity of the plant will be 60MW. The gas plant which will be required to produce standby electricity for more sustained periods (circa 500 hours annual).

Diesel generators are also provided on site to provide further standby power in event of loss of the electrical supply.

Telecommunications
There is sufficient capacity available in the network to accommodate the development and there will be no potential impacts.

Surface Water
Without proper control measures, surface water can ingress into the surrounding environment. South Dublin County Council requires all new developments to adhere to the practice of Sustainable Urban Drainage Systems (SuDS) for the control of surface water on site. This is highlighted in the Greater Dublin Strategic Drainage Strategy.

There is a potential for leaks and spillages due to the vehicle movements and parking in the car park. Any accidental emissions of oil, petrol or diesel could cause contamination if the emissions enter the water environment.

Foul Water
The proposed development will lead to an increase in foul water discharge. Currently the South Dublin County Council public foul sewer system has sufficient capacity to cater for the proposed development.

Water Supply
The proposed development will result in an increased demand for water from the Irish Water supply system within the Business Park. Mitigation measures are being implemented to reduce the demand on potable water by implementing an industrial water management process utilising treated harvested rainwater. Application has been made to Irish water under application reference CDS20004546 and we are currently awaiting a response from Irish Water.

12.5POTENTIAL CUMULATIVE IMPACTS

Construction Phase

The construction of the data centres and Central Administrative building will cumulatively (with other developments in the area) have a neutral to imperceptible impact in relation to material assets during the construction period.

Operational Phase

The proposed development in combination with existing and planned developments in the area is well served by a comprehensive public water services network and impact on water supply and foul drainage capacity will not be adversely affected.

In relation to surface water, the development optimises SuDS measures to ensure a sustainable runoff rate to the Griffeen river and which takes into account existing and permitted developments in the vicinity which also rely on the same river system for controlled surface water runoff.

In relation to telecommunications there is sufficient capacity in the network to facilitate the proposed development along with existing and planned developments.

12.6MITIGATION MEASURES

Construction Phase

Water Services

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through the settlement ponds. The settlement ponds will be located between the area of construction and the nearest field drain. Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- A drainage plan will be drawn up and submitted for agreement. The drainage system and settlement ponds will be constructed as a first step before major site clearance activities occur.
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Silt traps will be placed in the existing drainage network around the site to minimise silt loss. These should be inspected and cleaned regularly.
- Weather conditions will be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal.

No concrete batching facility will be required at the site. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such wash waters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses.

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m).

If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented from entering watercourses by diverting runoff to the settlement ponds on site, and removing the material off-site as soon as possible to designated storage areas.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed substation is minimised. In particular, the Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Power & Telecommunications

No specific mitigation measures for the temporary power and telecommunications

Operational Phase

Water Services

Surface Water Drainage

Due to a variety of measures such as the design of the car park with hydrocarbon interceptors, the speed restrictions in place and the fact that no refuelling will be carried out on site, the likelihood of any spills entering the water environment from vehicles on site is negligible.

Foul Water

All foul water will be discharged to the main sewage system in the area (as described above). This increase in flow to the existing public foul sewer is not expected to have a negative effect on the foul drainage system in the area.

Water Supply

Rainwater Harvesting from all new roof areas excluding green roof zones will reduce the demands for potable water supply from the Irish water infrastructure. We are currently awaiting information from Irish Water in relation to a new connection application.

The water system will be metered to facilitate detection of leakage and the prevention of water loss. Dual & low flush toilets and water economy outlets and water saving measures will also be proposed.

Power & Telecommunications

A number of sustainability measures have been incorporated into the design of the Proposed Development including the installation of an array of photovoltaic panels on the roof and the use of direct drive EC fans for facilitating air supply and extract systems. These will feed back into the electrical supply for the building, serving lighting, office area general services and office IT equipment. The *Energy Statement* that accompanies this planning application also describes how waste heat associated with the facility could be utilised with a future district heating *scheme* developed by others.

12.7PREDICTED IMPACTS

Construction Phase

Temporary power and telecommunications will be made available for the construction period. Similar will be put in place for water supply and foul drainage. Surface water will be controlled in accordance with best practice as elaborated in Chapter 7.

The overall impact for power, telecommunications and water supply from the construction phase will be Neutral and Imperceptible.

Operational Phase

Water Services

In terms of predicted specific impacts the following points are of note:

- There is no likely impact on the geological heritage, sensitive groundwater receptors or groundwater supplies in the vicinity of the proposed development site.
- The removal of the 'protective' topsoil and subsoil cover across the development area at the site will leave the underlying bedrock more vulnerable to potential onsite contamination if not mitigated. This vulnerability category for the site (classed as "High to Extreme' by the GSI) will remain due to thin cover on site.
- Capping of significant areas of the site by hardstand/building following construction and installation of drainage will minimise the potential for contamination of the underlying locally important aquifer.
- There will be a loss of topsoil soil due to redevelopment. However, the area of redevelopment is small in the context of the overall region.

In summary, there are no likely significant impacts on the geological or hydrogeological environment associated with the proposed development of the site. It is not anticipated that any impacts will arise following the implementation of the mitigation measures discussed above.

The residual impact is considered to be neutral in terms of quality and of an imperceptible significance (short term and long term) as a result of this proposed development on the surrounding soils, geology and hydrogeological environment. Following the NRA criteria for rating the magnitude and significance of impacts on the geological and hydrogeological related attributes, the magnitude of impact is considered Negligible.

Telecommunications

No predicted impacts associated with telecommunications for the Proposed Development for the operational phase.

Power

The proposed development will be powered by a combination of electricity directly from the Grid (via the MS Campus substation which is to be extended as part of this application) and by electricity generated by a new gas generator compound (with gas skid) to be delivered as part of the development (with connection to the Gas Networks Ireland network within the Business Park).

It has been confirmed in discussions with Eirgrid and Gas Networks Ireland that there is sufficient capacity in both networks to facilitate the proposed development.

As per the Energy Statement a number of sustainability measures have been incorporated into the design of the Proposed Development including the installation of an array of photovoltaic panels on the roof. These will feed back into the electrical supply for the building, serving lighting, office area general services and office IT equipment.

The overall impact will be Neutral-Moderate and Long Term.

12.8'DO NOTHING' SCENARIO

Should the Data Centre Development not proceed there will be no change to the current material assets in the area.

12.9MONITORING & REINSTATEMENT

No monitoring required.

12.10 DIFFICULTIES IN COMPILING INFORMATION

No specific difficulties were encountered.

13 WASTE MANAGEMENT

13.1INTRODUCTION

This chapter addresses the issue of waste management for the permitted data centre development (DUB 14/15) as amended by the current planning application, during both the construction and operational phases of the project. Given the nature of the facility it is not anticipated that the facility will generate significant quantities of waste.

Prior to commencement of construction works a site specific Construction and Demolition Waste Management Plan (C&D WMP) for the construction phase of the development will be prepared and agreed with the planning authority.

An Operational Waste Management Plan (OWMP) will also be prepared for the operational phase of the proposed development to ensure that wastes generated are properly managed and recycled.

Implementation of both the C&D WMP and the OWMP will be in accordance with the Waste Management Plan for the Dublin Region which is expected to be reviewed in 2015. The most recent was completed in 2005-2010.

13.2METHODOLOGY

The assessment of the impacts of the proposed development arising from the consumption of resources and the generation of waste materials, was carried out taking into account the methodology specified in relevant guidance documents, along with an extensive document review to assist in identifying current and future requirements for waste management including national and regional waste policy, waste strategies, management plans, legislative requirements and relevant reports.

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate legislation includes:
    - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended
    - Waste Management (Collection Permit) Regulations (S.I No. 820 of 2007) as amended
    - Waste Management (Facility Permit and Registration) Regulations 2007, (S.I No. 821 of 2007) as amended
    - Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended
    - Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014) as amended
    - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)
    - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
    - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - European Union (Batteries and Accumulators) Regulations 2014(S.I. No. 283 of 2014) as amended
    - Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended
    - European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 191 of2015)
    - Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended
    - Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007) as amended
    - Waste Management (Movement of Hazardous Waste) Regulations, 1998 (S.I. No. 147 of 1998)
    - European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)
    - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015)
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended.

This Chapter is based on the proposed development and considers the following aspects:

- Legislative context;
- Demolition phase;
- Construction phase (including site preparation, excavation and levelling); and,
- Operational phase.

A desk study was carried out which included the following:

- Review of applicable policy and legislation which creates the legal framework for resource and waste management in Ireland;
- Description of the typical waste materials that will be generated during the demolition, construction and operational phases; and
- Identification of mitigation measures to prevent waste generation and promote management of waste in accordance with the waste hierarchy.

Estimates of waste generation during the demolition, construction and operational phases of the proposed development have been calculated. The waste types and estimated quantities are based on published data by the EPA in *National Waste Reports*, data recorded from similar previous developments, Irish and US EPA waste generation research, other available research sources and waste collection data from the current facilities on site.

Mitigation measures are proposed to minimise the effect of the proposed development on the environment during the construction and operational phases, to promote efficient waste segregation and to reduce the quantity of waste requiring disposal.

Legislation and Guidance
Waste management in Ireland is subject to EU, national and regional waste legislation which defines how waste materials must be managed, transported and treated. The overarching EU legislation is the Waste Framework Directive (2008/98/EC) which is transposed into national legislation in Ireland. The cornerstone of Irish waste legislation is the Waste Management Act 1996 (as amended).

In addition, the Irish government issues policy documents which outline measures aimed to improve waste management practices in Ireland and help the country to achieve EU targets in respect of recycling and disposal of waste. The most recent policy document *A Resource Opportunity – Waste Management Policy in Ireland* was published in 2012 and stresses the environmental and economic benefits of better waste management, particularly in relation to waste prevention.

The strategy for the management of waste from the construction and demolition phase is in line with the requirements of the *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* published in 2006. The guidance document *Construction and Demolition Waste Management: A handbook for Contractors and Site Managers* was also consulted in the preparation of this assessment.
There are currently no Irish guidelines on the assessment of operational waste generation and guidance is taken from industry guidelines, plans and reports, British Standards and other relevant studies and reports including BS 5906:2005 Waste Management in Buildings – Code of Practice, the Eastern-Midland Region Waste Management Plan 2015 – 2021, the EPA National Waste Database Reports 1998 – 2012 and the EPA National Waste Statistics Web Resource.

13.3RECEIVING ENVIRONMENT

The subject site is located at Grange castle Business Park, Co. Dublin. In terms of waste management, the receiving environment is largely defined by South Dublin County Council as the local authority responsible for setting and administering waste management activities in the area. This is governed by the requirements set out in the *Eastern-Midlands Region (EMR) Waste Management Plan 2015 – 2021.*

The waste management plan sets the following targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of *"70% preparing for reuse, recycling and other recovery of construction and demolition waste"* (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

The National Waste Statistics update published by the EPA in December 2017 identifies that Ireland's current progress against this C&D waste target is at 68% and our progress against 'Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass (includes metal and plastic estimates from household WEEE)' is at 45%. Both of these targets are required to be met by 12 December 2020 in accordance with the requirements of the Waste Framework Directive. The South Dublin County Council Development Plan 2016 – 2022 also sets policies and objectives for the area which reflect those set out in the regional waste management plan.

South Dublin County Council no longer operates any municipal waste landfill in the area. There are numerous wastes permitted and licensed facilities located in the Eastern-Midlands Waste Region for management of waste from the construction industry as well as municipal sources. These include soil recovery facilities, inert C&D waste facilities, hazardous waste treatment facilities, municipal waste landfills, material recovery facilities, waste transfer stations and two waste-to-energy facilities.

13.4CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

A Site Waste Management Plan and Construction Demolition Waste Management Plan (prepared by Winthrop Engineering) are included as Appendices 13.1 & 13.2 of Vol. II of the EIAR.

13.5POTENTIAL IMPACTS

Construction Phase
It is noted that the construction phase of the development of the data centres DUB09, DUB10, DUB12 & DUB13 (permitted under SD16A/0088) is nearing completion on the lands directly adjoining to the east of the current application site. A temporary construction car park and compound associated with that development is located on the former pitch and putt course which forms the eastern half of the main application site. There is also a temporary construction road and hard standing area in the western portion of the main site also associated with the current construction.

A significant proportion of soil excavation work has therefore been carried out, however further soil stripping and foundation work will be required.

Waste Management will form part of the overall Environmental Management Plan for the Construction Phase. This plan will be implemented by the Management Contractor for the entirety of the construction activities and will include specific detail relating to waste segregation and disposal as summarised below.

<u>Demolition of House & Outbuildings</u>

An existing vacant house and adjoining shed and garage (total floor area 291.2sq.m) will be demolished as part of the development. In addition to the normal waste generated (e.g. Concrete, bricks, tiles, ceramics, wood, glass and plastic) some asbestos may also be anticipated given the era in which the house was constructed.

Prior to demolition of the building's asbestos containing materials will be removed and disposed of by a competent contractor. Removal will form part of a construction project and will require careful coordination to be carried out safely.

Following removal of the asbestos containing materials a site clearance for reoccupation certificate must be obtained from a competent independent analyst prior to demolition of the structure in accordance with Regulation 15 (10) of the Safety Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010.

Excavated Materials

The proposed site slopes from east to west and so a combination of cut and fill work will make up the initial site development works in order to prepare an average working platform of approximately c.67.25m OD.

Site preparation, excavations and levelling works required to facilitate construction of foundations, access roads and the installation of services will generate c.45,000m3 of excavated material, as advised by Hanley Pepper Engineers. It is currently proposed that all excavated material will be reused on site where possible.

The importation of c.70,000m^3 of fill materials will be required for construction of foundations and other ground preparation works.

It is envisaged that all spoil generated during the site preparation excavation process mostly comprising topsoil and subsoil will, where feasible, be reused in the landscaping and levelling of the site during construction. (As a worst case scenario i.e. construction during a period of extended poor weather, a quantity may require removal for off-site disposal at suitably permitted/licensed facilities.)

Contractors will agree a method statement indicating the extent of the areas 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.

In the event that excess soils/stones not required and/or suitable for reuse on-site, will be removed off-site either as a waste or, where appropriate, as a by-product. Where the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27 of the *European Communities (Waste Directive) Regulations 201 l.* EPA agreement will be obtained before re-using the excess soils as a by-product. However, it is not currently anticipated that any excavated material will be removed offsite for reuse as a by-product.

If any excavated or surplus material requires removal from site and is deemed to be a waste, removal and reuse/recycling/recovery/disposal of the material will be carried out in accordance with the *Waste Management Act* (as amended), the *Waste Management (Collection Permit) Regulations 2007* (as amended) and the *Waste Management (Facility Permit & Registration) Regulations 2007* (as amended). The volume of waste requiring recovery/disposal will dictate whether a Certificate of Registration (GOR), permit or licence is required by the receiving facility.

Operators used to transport any waste off site for landfilling will need to hold valid Waste Collection Permits and the waste disposal facility must have a waste licence also.

Other Construction Wastes

The construction phase will result in the generation of surplus waste materials such as off-cuts from timber, tiles, insulation wiring, packaging and general waste. Packaging and oversupply of materials could also contribute to waste during these phases.

The majority of this waste will be reused and recycled if possible, with the remaining waste materials being disposed of by licensed waste contractors to an approved landfill site in accordance with the relevant national and EU legislation.

The main waste streams that will be generated by the construction activities at the site are:

- Stones and soil
- Concrete, brick, tiles and ceramics
- Steel
- Tar and tar products
- Plasterboard
- Metal
- Cardboard (packaging)
- Plastic (wrapping, packaging)
- Waste wood
- Paper
- Waste electrical and electronic components
- Batteries
- Wood Preservatives
- Liquid Fuels

Main C & D Waste Categories

The European Waste Codes (EWC) for typical waste materials expected to be generated during the construction of the proposed development are provided in Table 5.10.1.

Waste Material	**EWC**
Non – Hazardous	
Concrete, bricks, tiles, ceramics	17 01 02 17 01 03

Wood, glass and plastic	17 02 01 17 02 02 17 02 03
Bituminous mixtures, tar and tarred products	17 03 02
Iron and Steel	17 04 05
Metals (including their alloys)	17 04 07
Soil and stones	17 05 04
Gypsum-based construction material	17 08 02
Hazardous	
Electrical and Electronic Components	16 02
Batteries	16 06
Wood Preservatives	03 02
Liquid Fuels	13 07

Table 13.1: Typical Waste Types and EWC Codes

Staff Responsibility

Subcontractors will also be required to follow the site construction Waste Management Plan and will be advised of such at tender stage and pre-appointment meetings.

The regulation of this waste management and segregation will be overseen by the site agent and safety officers and all of the construction management team in general.

Operational Phase

The operation phase will generate a range of mostly non-hazardous wastes with some hazardous wastes. Segregation at the source will be practiced for waste generated on site (in accordance with the OWMP to be developed for the site).

Mitigation measures proposed to manage impacts arising from waste generated during operation of the proposed development are summarised below and will be described in more detail in the OWMP:

- On-site segregation of all waste materials into appropriate categories including:-
  - organic waste
  - cardboard and paper
  - plastic
  - packaging waste
  - glass
  - metals
  - mixed non-recyclables
  - empty plastic drums (containing residues of or contamination by dangerous substances)
  - landscaping waste
  - Non-hazardous WEEE
- All waste materials will be stored in bins or other suitable receptacles in a designated, easily accessible area of the site/buildings.
- All waste leaving site will be recycled, with the exception of those waste streams where appropriate recycling facilities are currently not available
- No damaged packaging will be accepted on site.
- Hazardous waste may be generated following the return of packaging (drums) from customers. If the returned drums are found to be unsuitable for re-use, they will be classed as a waste. If the packaging contains residues of or is contaminated by dangerous substances, it may be classed as a hazardous waste (depending on the volume and concentration of contaminants). Any waste classed as hazardous will be stored in a designated area and will be removed off site by a licensed hazardous waste contractor
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably licensed or permitted facilities
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

Table 13.2 below summarises the anticipated management strategy to be used for typical wastes to be generated at the data centre.

Waste Name	Hazard Y/N	On-site Storage/Treatment Method (anticipated)	Method of Treatment or disposal
Packaging Waste	N	Segregated bins/skips	Recycle
Office Waste	N	Segregated bins/skips	Recycle
General Non-Hazardous Waste	N	Segregated bins/skips (paper)	Recycle
Empty Containers	N	Segregated bins/skips	Disposal to landfill
Canteen Waste	N	Segregated bins for metal cans, waste plastics, cardboard, general waste	Compost food waste. Recycle dry paper, plastic and aluminium waste. Disposal of other general waste to landfill
Kitchen Waste	N	Segregated bins for general waste, waste plastic packaging, waste metal. Cardboard and waste vegetable oil	Compost food waste. Recycle dry paper, plastic and aluminium Waste. Disposal of other general
Non-hazardous WEEE	N	Segregated bins for waste electric and electronic equipment	Off-site recovery
Landscaping waste	N	Composting bins	Composting for re-use on site
UV & Fluorescent Tubes	Y	Specialised container in waste storage area	Off-site recovery

Waste Oil	Y	Oil drum in external waste storage area	Off-site recovery
(Wet) Batteries	Y	Specialised container in waste storage area	Return to supplier
(Dry) Batteries	Y	Specialised container in waste storage area	Off-site recovery

Table 13.2: Anticipated Waste Management Strategy for Typical Wastes Generated

13.6POTENTIAL CUMULATIVE IMPACTS

The generation of waste from the development at construction and operational phases is not expected to create an adverse impact in terms of waste management in combination with other adjoining developments in the area.

13.7MITIGATION MEASURES

Construction Phase

Mitigation measures proposed to manage impacts arising from waste generated during construction of the proposed development is summarised below and will be described in more detail in the C&D WMP to be agreed with the planning authority prior to commencement of development:

- Removal of asbestos from the existing house (if discovered) in accordance with standard practice.
- On site segregation of all waste materials into appropriate categories including:
  - Top-soil, subsoil, bedrock
  - Concrete, bricks, tile, ceramics, plasterboard
  - Asphalt, tar and tar products
  - Metals,
  - Dry Recyclables e.g. cardboard, plastic, timber
- All waste will be stored in skips or other suitable receptacles in a designated area of the site;
- Wherever possible, leftover materials (e.g. timber off cuts) and any suitable demolition materials will be reused on-site;
- Uncontaminated excavated material (top-soil, sub soil, etc.) will be re-used on site in preference to importation of clean fill, where possible;
- All waste leaving site will be recycled, with the exception of those waste streams where appropriate;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably permitted/licensed facilities.

Operational Phase

The waste generated during the operational phase will be primarily limited to the office area. The OWMP will enable the facility to contribute to the targets outlined in the *Waste Management Plan for the Dublin Region* such as a reduction in biodegradable waste sent to landfill by 65% and recycling of at least 35% of all municipal waste and to comply with the byelaws for commercial waste.

Mitigation measures proposed to manage impacts arising from waste generated during operation of the proposed development are summarised below and will be described in more detail in the OWMP:

- On-site segregation of all waste materials into appropriate categories including:-
  - organic waste
  - cardboard and paper
  - plastic
  - glass
  - metals
  - mixed non-recyclables;
- All waste materials will be stored in bins or other suitable receptacles in a designated, easily accessible area of the site;
- All waste leaving site will be recycled, with the exception of those waste streams where appropriate recycling facilities are currently not available;
- Any waste classed as hazardous will be stored in a designated area and will be removed off site by a licensed hazardous waste contractor;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably licensed or permitted facilities;
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

13.8PREDICTED IMPACTS

Construction Phase

There will be a short-term impact associated with the construction phase of the development. Due to the high level of recycling that will be achieved during the construction phase through the implementation of the C&D WMP, the impact will be short term and imperceptible.

Operational Phase

The mitigation measures, i.e. the implementation of the OWMP for the development will ensure the waste arising from the development is dealt with in compliance with the provisions the prevailing legislation and best practice and achieve optimum levels of waste reduction, re-use and recycling. The predicted impact of the operational phase will be long term and imperceptible.

13.9'DO NOTHING' SCENARIO

If the proposed development was not to go ahead there would be no additional construction or operational waste generation at the site until such time as an alternative development consistent with the land use zoning is granted permission and constructed.

13.10 MONITORING & REINSTATEMENT

Monitoring requirements for the development will be stipulated in the OWMP and the C&D WMP. This will include the requirement for recording of all waste materials leaving the site and maintenance of contractor waste collection permits and facility permits/licences on site.

13.11 DIFFICULTIES IN COMPILING INFORMATION

No significant difficulties encountered.

13.12 REFERENCES

Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate legislation includes:

- European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended
- Waste Management (Collection Permit) Regulations (S.I No. 820 of 2007) as amended
- Waste Management (Facility Permit and Registration) Regulations 2007, (S.I No. 821 of 2007) as amended
- Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended
- Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014) as amended
- Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)
- Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
- European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
- European Union (Batteries and Accumulators) Regulations 2014(S.I. No. 283 of 2014) as amended
- Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended
- European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 191 of2015)
- Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended
- Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007) as amended
- Waste Management (Movement of Hazardous Waste) Regulations, 1998 (S.I. No. 147 of 1998)
- European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)
- European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015)

Environmental Protection Act 1992 (No. 7 of 1992) as amended.
Litter Pollution Act 1997 (No. 12 of 1997) as amended.
Planning and Development Act 2000 (No. 30 of 2000) as amended.

14 CULTURAL HERITAGE (ARCHAEOLOGY)

14.1 INTRODUCTION

The following report was prepared by Reliqua archaeological consultants on behalf of Microsoft Operations Ireland Ltd. It evaluates the impact of the proposed amendments to the permitted Central Administration Building, Data Centre's DUB 14 & 15, temporary construction car park, and associated works on the archaeological, architectural and cultural heritage of the site.

14.2 METHODOLOGY

The extensive documentary research carried out for previous environmental statements and various archaeological monitoring, excavations, and geophysical investigations 2014-2018 was consulted. This includes include information drawn from:

a. Record of Monuments & Places (national Monuments Service), including documentary material and photographs.
b. Topographical Files in the National Museum, including information of any finds and artefacts found in the vicinity.
c. Secondary sources include published material on finds, artefacts, and monuments associated with the site, or its vicinity.
d. Cartographic Sources, including TCD Map Library, Ordnance Survey, and the National Archives.
e. Excavations Bulletin, including information on archaeological excavations carried out in the vicinity.
f. Preliminary reports of archaeological excavations and summary of findings DUB 06, 07, 08, 09, 10, 12 & 13: 2014-2016 Neil O'Flanagan et al, Licence No: 13E0471
g. Final report of excavations at DSF by Neil O'Flanagan & Liam Coen, Licence No:14E0453
h. Report of monitoring Ballybane Pitch & Putt course 2019 Licence 13E0471.
i. Report of geophysical survey, Joanna Leigh, Licence No: 19R0113 2019.

14.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A detailed description of the proposed amendments to the permitted DUB 14/15 data centres, central administrative building and temporary construction car parking development is outlined in Chapter 3 of this EIAR.

14.4 RECEIVING ENVIRONMENT

The main part of the development is bounded to the west by the Grangecastle Estate Road, to the south by the new Nangor Road (previously known as the Old Nangor Road), and to the east by already developed portions of the Microsoft campus. The temporary carpark is bounded to the south by the Grangecastle Business Park Road, to the North by the Grand Canal, to the east by the R136, and to the west by the open landscaped area of the Business Park, including a large attenuation pond.

The proposed development is situated almost entirely in the townland of Ballybane, (the temporary car park is situated in the townland of Kishogue). The Ballybane portion of the site is adjacent to the townland of Grange and the northern part was previously used as a Pitch and Putt course which was levelled in 2018 for the purposes of a temporary car park and haul road (Figure 14.1). The adjacent field was known as the triangular field, and its western boundary lies adjacent to the Griffeen River (Figures 14.2 & 14.3). To the south the triangular field is adjacent to the New Nangor Road, which prior to the recent improvements was believed to be the route of the ancient *Slighe Dhala* connecting Dublin to the province of Munster.

Figure 14.1 Levelling and laying with hard core of Ballybane Pitch & Putt Course

What was the Ballybane Pitch and Putt course portion has been lowered and is currently laid with hard core. The adjacent 'triangular' site is mainly comprised of a rough grassed that has been evidently been

disturbed in the recent past due to the uneven nature of the ground (Figure 14.2). A portion of it has been set aside as a cark park with hard core.

Figure 14.2 South eastern portion of 'triangle' area facing south.

Figure 14. 3 Excavation of haul road in 'triangle' area facing west.

Archaeological Features

A range of monument types have been excavated in the business park, and its environs (fig 1). The Grange Castle and associated features are the sole visible archaeological in the area. All other monuments described were visible only below the surface, although in the past, many of the monuments were visible above the ground, and contributed to the ritual and mythology, of the local inhabitants. Furthermore, the location of the monuments also contributed to the ownership of the lands, leading to family or tribal territories.

Neolithic

The Neolithic era is indicated by the presence of Neolithic houses, one excavated in 2001 in Kishogue Townland, and other in Ballybane, excavated in 2016. The Kishogue house was situated west of the temporary car park, and 800 metres from the proposed development, excavated in advance of the construction of a large attenuation pond. The house was roughly rectangular in shape measuring 6.05m in length by 4.5m in width and was constructed of oak posts and planking inserted into a foundation trench. Other domestic activity in the vicinity of the dwelling included a number of pits with inclusions of charcoal while artefacts recovered included scrapers, waste flint and a single sherd of Neolithic pottery. Radiocarbon analysis from the site returned dates of between 3941and 3659 BC (O'Donovan 2003)

Another Neolithic, and possible house, structure was excavated in advance of Data Centres DUB 12 & 13 in 2016 (O'Flanagan & Coen, 2016). The structure was identified by six irregularly spaced post-holes in a roughly hemispherical shape, with several other pits and post-holes scattered around them. The maximum internal dimensions may have been as large as 9.15 metres in diameter. Dating was achieved by the analysis of numerous sherds of early Neolithic pottery with clay derived from the Dublin Mountains to the south. The pottery is a carinated bowls type, found also in Dalkey Island, and Feltrim Hill, North Dublin, and is likely to date to 3850-3750 BC. It is associated with the earliest Neolithic settlements In Ireland. Burnt hazel nut shells were recovered suggesting hazel was used a food stuff. Flint implements were also recovered.

Bronze Age

The volume of Bronze Age remains indicate a substantial presence in the area during this era. The remains are primarily in the form of burnt mounds, and / or *Fulacht fiadh*, (cooking pits), used for heating water through placing heated stones in water-filled pits or troughs. Although they range in date from the Neolithic to the Iron Age they are most common in the Bronze Age (Waddell 1998 177). There were also several dry cooking pits present. Both burnt mounds and cooking pits are a particularly to be found in the vicinity of the Balldonnel Stream, and the Griffeen River.

Two burnt mounds were excavated north of the proposed development during July-August 2014 in advance of DUB 9 & 10 (O'Flanagan & O'Hora, 2016). The first mound included a series of pits, a probable well, several stakeholes and the shallow, scattered remains of the associated burnt mound material. The most significant findings were human bone fragments from the well, suggesting some form of ritual activity. The second site comprised the relatively shallow remains of a burnt mound that sealed much of a cluster of features. These included six pits, two probable troughs, a well with associated gulley, several postholes and a significant quantity of stakeholes, a large number of which were concentrated in one large cluster. Smaller cooking pits and burnt mound spreads were identified nearby in advance of DUB 12 & 13.

Other contemporary sites in the broader vicinity include three burnt mound sites recorded to the north during realignment work on the Griffeen River in 2004 and were situated c. 500m from Dub 9 & 10 in the townland of Grange (Tobin, 2004). A burnt mound to the east was located in the townland of Nangor and was excavated in a greenfield area located roughly 500m from Microsoft Campus (SMR no.: DU017-084) (Doyle, 2000a).

Excavations in advance of DUB 12 & 13 revealed a U-shaped enclosure comprising a curvilinear ditch and an elongated pit or short ditch, with a possible hearth. The cuts may represent slot trenches holding a line of posts or stakes and were of such a depth (0.32m – 0.44m) and width (0.7m – 0.94m) that they could have held load-bearing roof supports. The function of the structure may well be ceremonial due to its unusual shape and absence of any domestic features. Two pieces of worked flint came from the upper fill of the curvilinear ditch: a narrow blade and a possible pick or scraper. Flint and chert debitage was found in several of the fills of the ditch. Three sherds of prehistoric pottery came from the upper fill of the pit alongside several pieces of possible debitage. The pottery likely to be Bronze Age 1600-1400 BC.

East of the Microsoft complex, a Bronze Age ring barrow monument was excavated in advance of what is now the Pfizer pharmaceutical plant in the townland of Kilmahuddrick (DU 017-080---). Ring-barrows are generally characterised by a slightly raised, central circular mound surrounded by a fosse and external bank and the mound is generally no higher than the surrounding bank (Newman, 1997, p157). The ring-barrow at Kilmahuddrick consisted of an uninterrupted circular ditch cutting into natural subsoil and had an external diameter of 12.2m north-south by 12.4m east-west (Doyle 2005, p46). The interior of the enclosure as well as several of the ditch fills contained a number of cremated human bone deposits and the radiocarbon analysis produced a range of dates which show that the monument was first constructed in the Bronze Age but continued in use in to the Iron Age (ibid pp 43-75).

Two cremation pit cemeteries were excavated in 2015-16 in prior to the construction of the DSF date centre in Nangor Townland. The pits contained some of the residue of a ritual burning of human remains of such intensity as to whiten the fragment the bones. They are generally dated to the Middle bronze Age and Late Bronze Age (c.1500-500BC),

Iron Age

Features in the wider vicinity which may have an Iron Age date include a bowl furnace and probable charcoal clamp which were discovered during the monitoring of the adjacent link road forming the northern boundary of Microsoft complex. (McLoughlin 2013), Finds from the Iron Age are elusive so the discovery of an iron clamp in the business park provides evidence for prolonged human settlement throughout the ages.

Medieval

The most imposing early medieval monuments comprised a north south alignment of three enclosures in the DUB 6, 7 & 8 site, excavated in 2015-15 (O'Flanagan & O'Hora 2016). The included a large double ditched penannular enclosure, a D-shaped enclosure attached to the it, and a circular domestic structure at the southern end. A burial of a male and female was skeletons of two bodies buried in the enclosures have been dated to 8-10th century AD.

The largest of the three enclosures (known as Sites 3 & 4) consisted of a large sub-circular double-ditched enclosure. The external diameter of the outer enclosure is c. 82m north-south by c. 89m east-west while the external diameter of the inner enclosure ditch is *c*. 48m east-west by *c*. 44m north-south. The inner ditch penetrated the ground, often through rock, to a depth of 1400mm. The outer ditch was more shallow, being dug to a depth of 900mm. The primary use of the enclosures was accompanied by ritual activities involving the animals as indicated by the deposition of an inverted ox skull resting on deliberately placed stones together with a human femur bone near the south-western terminal on the inner ditch, a cluster of cattle-jaw bones in the western side, and two quern stones in the northern end of a ditch shared by another later enclosure (known as Site 2). Iron blades were found throughout, used probably for animal slaughter and / or butchery.

The Site 2 enclosure consisted of a large D-shaped enclosure ditch which was deliberately attached on to the southern end of the outer enclosure ditch of site 3. It had an east-west external diameter of 32.2m by 40m north-south. Significant findings from this site included the double inhumation burial located in the southern end of the interior of the enclosure, comprising a male and female burial, dated by radiocarbon to the 8th-10th centuries AD. An articulated sheep or goat was buried at the base of a shallow pit in the north-western end.

The third enclosure, Site 1, was located c 10.5m to the south/south-east of site 2. Smaller in size, it had a north-south external diameter of 14.7m by 14.16m east-west. Sub circular in plan it consisted of two circular concentric ditches. The interior enclosure contained a boulder clay floor, postholes and stakeholes representing at least two structures, a kiln/hearth, a wattle fence, as well as a number of shallow pits. The base of two of the pits located in the south-western end of the interior were heavily oxidised indicating in-situ burning. Their fills were charcoal-rich with inclusions of burnt bone, probably representing hearths or a pyre. A further three intercutting pits in the north-western end, as well as a number of ditch fills, were charcoal rich with inclusions of burnt bone and these may represent the deliberate deposition cremated remains or possibly token deposits.

A north-west/south-east linear feature cutting into the northern part of the enclosure ditch and extending roughly 9.5m to the north-west, links the Site 1 & 2 enclosures. This physical linking of both sites may be the manifestation of one familial group or tribe associating themselves with another by interring high status individuals in a funerary monument that was attached to earlier ones. The alignment of enclosures is 180 m in length, and runs parallel to the current boundary between Nangor

And Ballybane townlands. It seems probable that the townland boundaries were at one stage determined by the presence of the enclosures.

This view is corroborated by the series of double ditched townland boundaries excavated in advance of the DSF Date centre in Nangor Townland, south of the Ballybane alignment, as they are roughly parallel to them (O'Flanagan & Hora 2016). More numerous remains of ditches and cuts to the west of the Nangor Castle, outside the Microsoft complex, indicated several phases of activity from the Medieval to the Modern era. The ditches suggest the enclosure of lands during the medieval era, containing fills with numerous sherds of pottery, almost all of which were manufactured In Ireland. They include Leinster Cooking Ware, and Dublin-type pottery. Other finds in the excavations included iron implements, nails, an armour piercing arrowhead, a buckle, a key, and an intact iron sickle. Pollen and seed analysis demonstrate that wheat was the predominant cultivated crop. Both Ballybane and Nangor formed part of the estate of the Dean of St Patrick's, whereas the smaller Ballybane & Aungierstown, south of the Old Nagor Road, formed part of its prebendary, the estate of the Chancellor of St Patrick's Cathedral. The latter townland differs also in that it lies within the parochial lands of Kilmactalway, and the Barony of Newcastle, in contrast to Ballybane and Nangor, which are both within the parish of Clondalkin, and the Barony of Uppercross.

The name of Ballybane is intriguing. While it appears to be a derivation of the Irish *Baile Ban*, or White Town, the lands were commonage in the aftermath of Anglo-Norman settlement, suggesting that they were set aside for pasture, and unfenced. There is no indication that there was a town, or small village there. Perhaps the name is derived from a settlement that existed in the early medieval era, possibly the large excavated medieval enclosures. reflected in the archaeological monuments uncovered during the excavations prior to Microsoft Data Centre Dub06. The series of connected enclosures, oriented north-south, suggest that the enclosures themselves formed some form of boundary, possibly a *ferta,* an ancient form of tribal boundary.

There is also the possibility that the townland name is derived from *bealach*, meaning route. it may be referring to the Old Nangor Road which cuts through area in an east west direction, forming the current southern boundary of Nangor and Ballybane townlands. The road is believed to reflect the route of the ancient *Slighe Dhala*, one of the five great roads of Ireland, stretching from Tipperary towards Dublin, including Clondalkin, culminating in Tara, County Meath. The road was also known as *Bealach Muighe Dhala* and this may explain the townland name. The 'bane' or *ban* may in fact refer to forest clearance, or open lands, which would certainly reflect the local landscape by the Early Medieval period.

At first glance the name Nangor, appears reminiscent of a French family name, associated with the Anglo-Norman invasion of 1169. However, it may have a more prosaic origin. Officials compiling the Ordnance Survey field names in the 1830's suggested that it is derived from the Irish *Neangar*, meaning nettles. The earliest reference to Nangor is in 1307 when it was noted that the tenements of 'Kilbryde and the Naungre' were held by Walter de Kekley from William, son of John de Gabarry, for a rent of 20 pounds. According to Dalton, Nangor belonged in the early 14th century to the De Verdon family, who had extensive landholdings in County Dublin.

While causing great hardship for many, the dissolution of the monasteries in the 16th century provided an opportunity for some. A Dean Bassenet of St Patricks appears to have contrived to enrich his own family by conveying the lands of Nangor, and the adjacent townland of Deansrath (also belonging to the deanery), to his family. He gave 'to his brother Ffnion Basenet, the Manor of Deans-rath, and the tithes of the same, for sixty one years'. This Finian Bassenet was described as being of the Naungre', i.e. he resided in the castle. A Christopher Basnenett had the villages of the nearby townland of Ballybane & Angertsown (possibly part of Nangor) demised to him, whereas the tithes of Nangor, Prestown (Priestown), and Ballybane were also demised to the same individual. The manoeuvrings of Dean Basenet were much criticised in a later period by Dean Jonathan Swift who referred to Dean Basenet as 'the Scoundrel of the same name, who surrendered the deanery to that beast, H.8'. [Henry viii]. The Bassenett family retired to Wales, the country of their origins, in the beginning of the 17th century with considerable amount of Irish spoils. Nangor was claimed by a Thomas Bathe of Dullardstown, Dublin, and apparently succeeded as in 1634 it belonged to one John Bathe, who died that year. The family lost control of the property some time later as it was described as being in the ownership of Richard Nottingham, from Limerick, in 1641, and again in 1670 when it encompassed some 80 'Plantation acres'. Its sparse population of 7 individuals were made of 5 English, and 2 Irish persons. A Mr Joseph Budden acquired Nangor Castle and its lands in 1703, who passed it to his son in law, Mr John Falkiner, who embarked upon the renovation of the castle, adding to it a large Queen Anne style residence. Falkiner served as High Sheriff of Dublin for a time, and his grandson, Mr Daniel Rogers, inherited the property upon his death. Falkiner's renovations survived at least until 1843 when surveyed by the Ordnance Survey and depicted in the 1st edition six inch map.

Ballybane however remained part of the estate of the Dean of St Patrick's Cathedral. 'Ballybaune', in the 17th century was a townland of some 101 plantation acres, belonging to the Dean, in both 1641, and in 1670. In 1659 it housed 18 loyal English individuals, and a mere 3 Irish.

In the 1830's, it was described a 'Church land', leased to a Mr Graydon of Newcastle,

> 'all grazing lands on which are taken Horses and Cows, from Dublin by the North, flatland and in winter subject to water, a road runs thro it E and W. The herdsman's house in the only dwelling in the townland.

Ballybane continued to be sparsely occupied in 1851, with Mr Graydon continuing to lease the land from the Kiernan family, and who then rented out a property to a William Leonard, possibly the herdsman, as there were only two dwellings there, adjacent to the Old Nangor Road. In 1911, the sole occupants of the townland were the 5 members of the Sheridan family. The occupancy of Ballybane & Aungierston was extinguished.

14.5 POTENTIAL IMPACTS

Construction Phase
Archaeological works have already taken place in advance of the proposed development. A large portion of the site, previously Ballybane Pitch and Putt course, was substantially lowered in groundworks in 2018. The works were monitored, and no archaeological remains came to light.

The triangular are was surveyed by geophysical methods in 2019. The findings indicate that it was heavily disturbed, probably during prior works associated with the Grangecastle Business Park.

The construction of the various components of the proposed development will result in the removal of the ground in almost the entire area of development, including the central administration building, Data Centre's DUB 14 & 15, and new sub-station. This will have the effect of disturbing any archaeological remains that may exist under the surface.

The construction of the temporary car park may have the effect of disturbing extant archaeological features below the surface.

The treatment of the ditch between the site and the Estate Road may disturb the historic townland boundary between Ballybane and Grange townlands.

Operational Phase
There is not likely to be any impact on archaeological during the operational phase.

14.6 POTENTIAL CUMULATIVE IMPACTS

The potential cumulative effects are likely to be limited to the construction phase of the proposed development only.

14.7 MITIGATION MEASURES

Construction Phase
It is not likely that archaeological test trenches will yield any substantial archaeological remains. The appropriate mitigation measures is therefore to monitor the works during construction phase.

Ground works for the temporary car park should be monitored by a licensable archaeologist.

Operational Phase
There will no requirement for mitigation measures during the operational phase.

14.8PREDICTED IMPACTS

Construction Phase.
Any archaeological features that emerge during monitoring will be excavated following appropriate consultation with National Monuments Service.

Operational Phase
There will be no impact on archaeological remains

14.9 'DO NOTHING' SCENARIO

Archaeological monuments may be disturbed or destroyed.

14.10 WORST CASE SCENARIO

Substantial archaeological remains will be removed without excavation or recording.

14.11 MONITORING & REINSTATEMENT

All ground works should be monitored by a licensable archaeologist.

14.12 DIFFICULTIES IN COMPILING INFORMATION

There have been no difficulties in compiling information.

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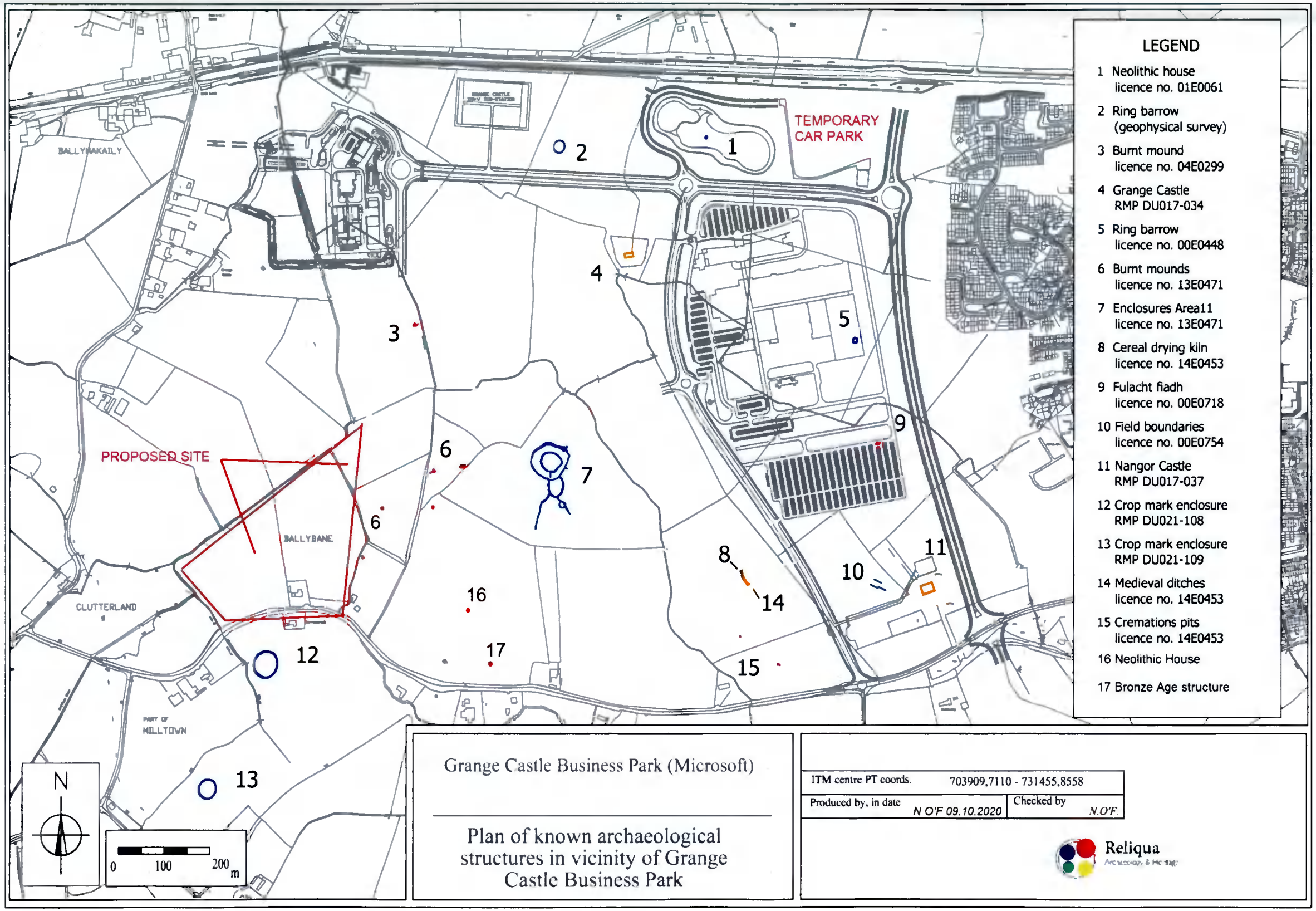

Figure 14.4: Plan of archaeological features in environs of proposed development

Figure 14.5: Downs Parish Survey extract 1656

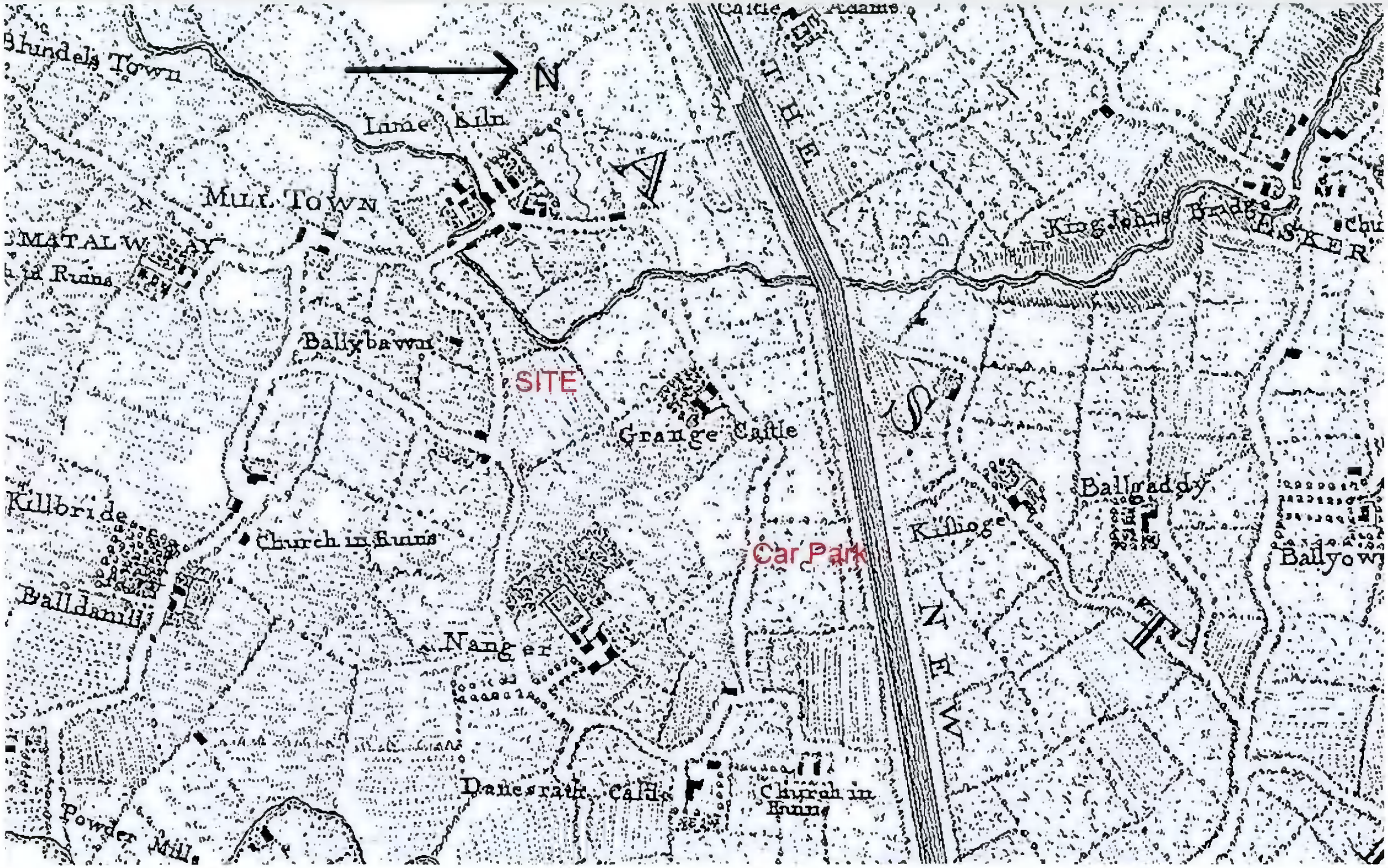

Figure 14.6: Rocque's Survey of Dublin 1756 extract

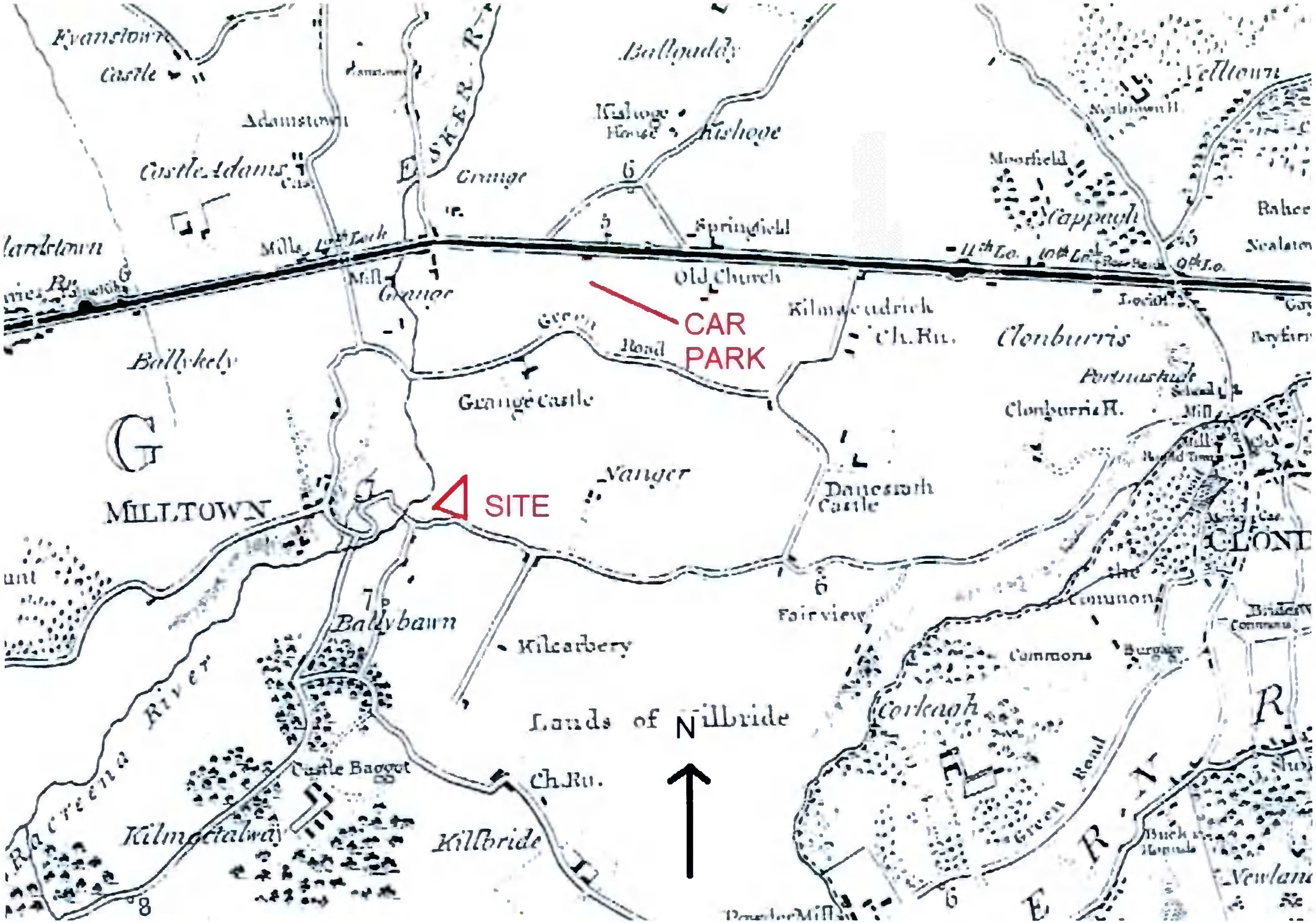

Figure 14.7: Taylors Map of Dublin extract 1816