Intended for
Vantage Data Centers DUB13 Limited

Date
March 2023

Project Number
1620014883

VANTAGE DUBLIN DATA CENTER

VOLUME 3: TECHNICAL APPENDICIES

RAMBOLL

Volume 3: Technical Appendices
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Technical Appendix 1.1: IEMA Quality Mark Checklist

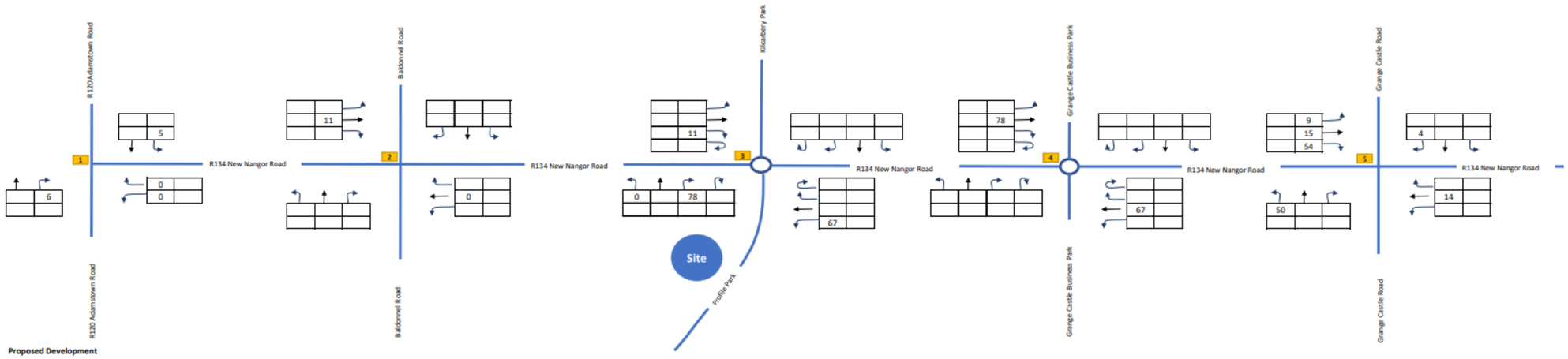
Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
EIA Commitment 1: Regulatory Compliance[1]	
a) Does the ES, in the light of the project being assessed, identify, describe and assess effects on:	√
- Human Beings	√
- Fauna & Flora	√
- Soil	√
- Water	√
- Air	√
- Climate	√
- Landscape	√
- Cultural Heritage	√
- Material Assets	√
b) Does the ES attempt to set out the interaction between the factors set out under criteria 1.a)?	√
c) Does the ES contain a clear section, or sections, providing a description of the project comprising information on the site, design and size of the project?	√
d) Does the ES contain a section, or sections, that describe the likely significant effects of the proposed project on the environment?	√
e) Does the ES contain a clear section, or sections, that provide a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects?	√
f) Does the ES contain a clear section, or sections, that provides the data required to identify and assess the main effects which the project is likely to have on the environment?	√
g) Does the ES contain a section, or sections, that outline the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects?	√
h) Has a Non-Technical Summary been produced containing an outline of the information mentioned in 1c) to 1h)?	√
EIA Commitment 4: EIA Context	
A) Scoping	
i) Has the ES clearly stated what effects will be addressed and how this decision was reached?	√
ii) Are the main environmental concerns and their locations, where relevant, clearly identified with an explanation of the risks posed from the project? Including relevant environmental issues beyond the boundary of the proposal?	√
iii) Does the ES identify the environmental issues that will not be assessed and explain why they are not being considered further?	√

[1] A number of the criteria under this Commitment cover similar issues to criteria set out in the other three Commitments, below. Where this occurs IEMA recognise that there will inevitably be some overlap between the criteria. However, the assessment of the criteria under this Commitment is focussed on the presence or absence of the issue, whereas the assessment of similar criteria, within the other three Commitments, will focus on the quality of the consideration of the issue in question.

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
iv) Is the sub-topic scope undertaken in relation to each of the topics included in the EIA appropriate and focussed	√
B) Alternatives, including iterative design	
i) Does the ES set out the main alternatives that were considered at different points during the development of the proposal?	√
ii) Are the main reasons for the selection of the proposal over distinct alternatives and design iterations easily identifiable?	√
iii) Does the ES clearly indicate how the EIA process, environmental issues and consultee responses influenced the iterative design process that led to the proposed project?	√
EIA Commitment 5: EIA Content	
A) Baseline	
i) Does the ES describe the current condition of those aspects of the environment that are likely to be significantly affected by the development?	√
ii) Is the sensitivity / importance of the baseline environment clearly evaluated?	√
iii) Are limitations in the baseline information identified and clearly set out?	√
B) Assessment	
i) Are the methods for establishing the magnitude of impacts on the receiving environment clearly defined?	√
ii) Does the ES set out a generic methodology for the assessment and evaluation of significance OR clearly explain and justify a specific method for each environmental issue?	√
iii) Does the assessment of significance consider the impact's deviation from the established baseline condition? (e.g. the sensitivity of the environment, the extent to which the impact is reversible, etc.).	√
iv) Does the ES identify the significance of impacts that would be anticipated to remain following the successful implementation of any mitigation set out in the ES?	√
vii) Does the ES give appropriate prominence to both positive and negative effects relative to their significance?	√
C) Environmental Management	
i) Does the ES describe the measures proposed to be implemented to avoid, reduce, and if possible, remedy significant adverse impacts of the proposed development?	√
ii) Is an indication of the effectiveness of the stated mitigation measures provided?	√
iii) Are details provided related to any management plans that the ES indicates should be implemented to deliver the mitigation measures and/or monitor the environmental impact of the project?	√
iv) Does the ES identify the general groups who will be responsible for the follow-up programme?	√

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
EIA Commitment 6: EIA Communication	
A) Consultation	
i) Does the description of any consultation include details of those who were contacted, including statutory and non-statutory consultees, and the public?	√
ii) Does the main text of the ES provide a summary of the main issues raised by consultees?	√
iii) Does the ES set out if any of the issues raised by consultees will not be dealt with in the ES?	√
If so is clear justification set out as to why the issue has been scoped out?	√
B) ES Quality	
i) Does the ES provide appropriate illustrations through the use of maps and/or diagrams? In particular this should cover:	
- the location of the site, site layout and boundary,	√
- operational appearance,	√
- main environmental receptors and	√
- impacts displayed in a visual format where appropriate.	√
ii) Is the area of proposed land clearly described and indicated on an appropriate map or diagram?	√
iii) Are the anticipated timescales of construction, operation and (where appropriate) decommissioning of the proposal clearly set out in the main text?	√
iv) Is the information in the ES presented in a manner in which a non-specialist would be able to logically identify information they were seeking?	√
v) Are technical terms kept to a minimum, with a glossary provided?	√
C) Non-Technical Summary (NTS)	
i) Does the NTS provide sufficient information for the non-specialist reader to understand the main environmental impacts of the proposal without reference to the main ES?	√
ii) Are maps and diagrams included in the NTS that, at a minimum, illustrate the location of the application site, the footprint of the proposed development, and the location of relevant key features?	√
iii) Is it clear that the NTS was made available as a separate, stand-alone document to facilitate a wider readership?	√

Technical Appendix 7.1: Traffic Flow and Distribution Diagrams



Proposed Development
Construction Stage
Trip Generation

		Arriv	Dep
Total Vehicles		78	78

Site	MW	Construction Movements
DUB11	56	440
DUB13	20	156

Trip Distribution:
Light construction vehicles have been distributed across the surrounding network in the same manner as the 2019 traffic surveys.
All heavy construction traffic travels to the site from the N7 National Road and from the M50 artirial motoriway via the R34 and R136 and departs along the same routes.

KEY

Client
Vantage Data Centers Dub11 Limited

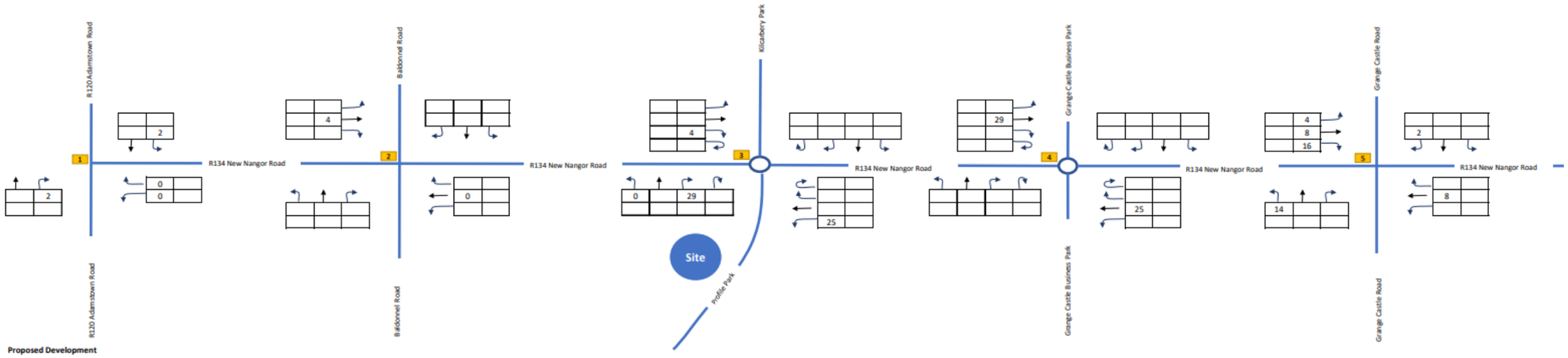
Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Proposed Development Construction Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	
Figure No. 1620014883/EIAR/7.312	Revision



Proposed Development
Operation Stage
Trip Generation

	Arriv	Dep
Total Vehicles	29	29

Trip Distribution:
Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

Site	MW	Operational Movements
DUB11	56	164
DUB13	20	58

KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

Project Number
1620014883

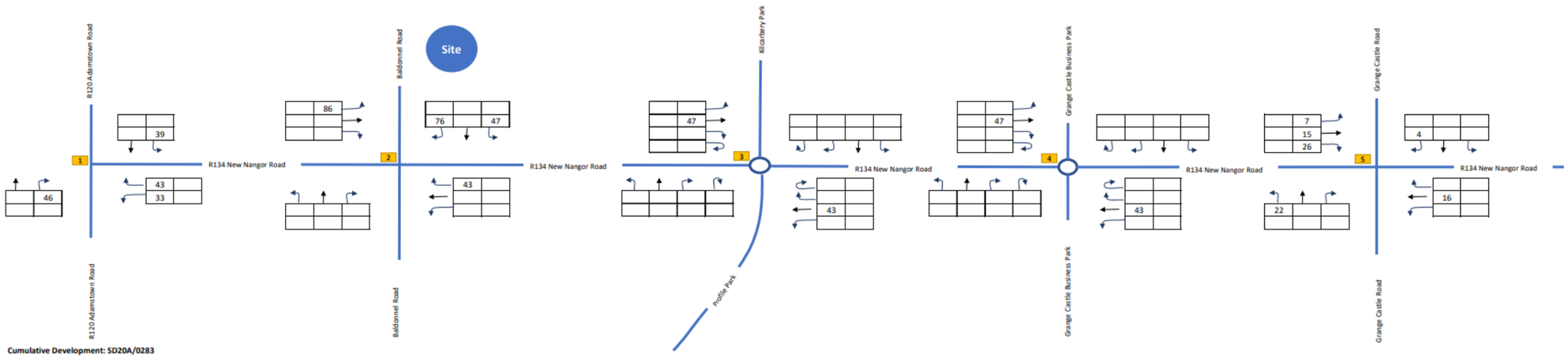
Figure Title
Proposed Development Operation Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	

Figure No.	Revision
1620014883/EIAR/7.313	

Technical Appendix 7.2: Accident Data



Cumulative Development: SD20A/0283

Operation Stage

Trip Generation

	Arriv	Dep
Total Vehicles	128	123

Trip Distribution:

Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

KEY

Client

Vantage Data Centers Dub11 Limited

Project Title

VDC DUB 13

Project Number

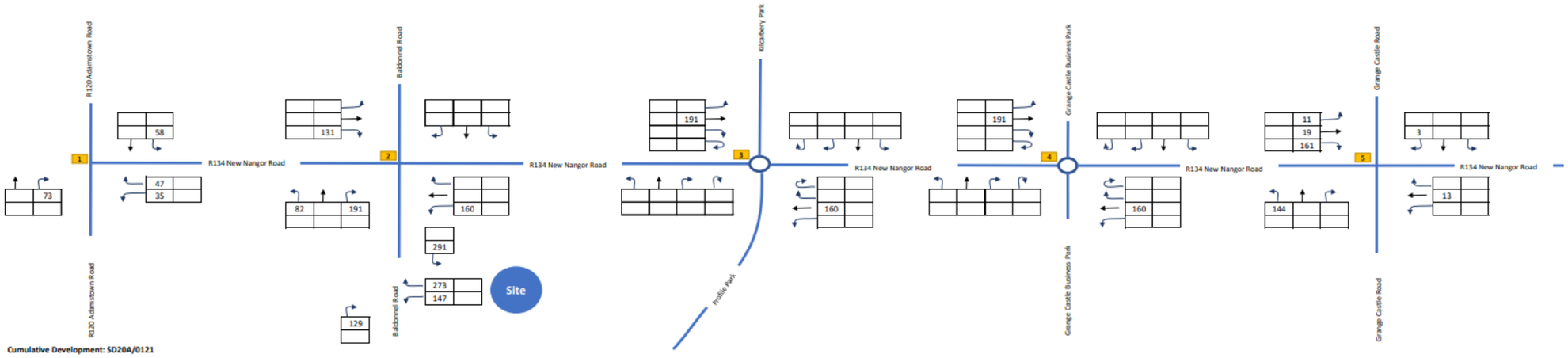
1620014883

Figure Title

Cumulative Scheme "SD20A/0283" Operation Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	
Figure No.	**Revision**
1620014883/EIAR/7.31	



Cumulative Development: SD20A/0121
Construction Stage
Trip Generation

		Arriv	Dep
Total Vehicles		420	420

SD20A/0121 (80,269sqm)
10 HGVs per hour and direction
up to 300 vehicles per direction for commuting
Working hours: 07:00-19:00
12 hours

Trip Distribution:
Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

KEY

Client
Vantage Data Centers Dub11 Limited

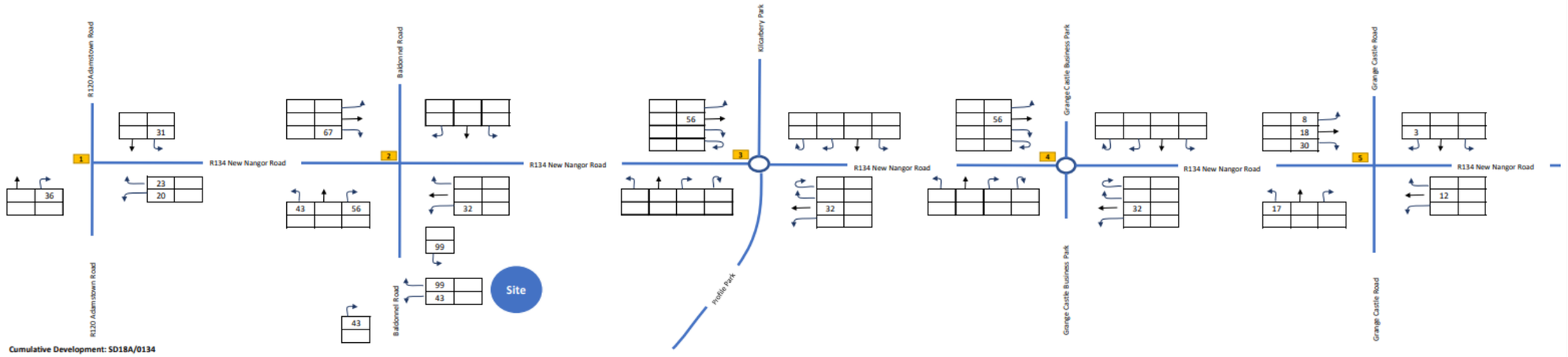
Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Cumulative Scheme "SD20A/0121" Construction Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	
Figure No.	**Revision**
1620014883/EIAR/7.32	



Cumulative Development: SD18A/0134
Operation Stage
Trip Generation

	Arriv	Dep
Total Vehicles	142	142

Trip Distribution:
Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

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Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

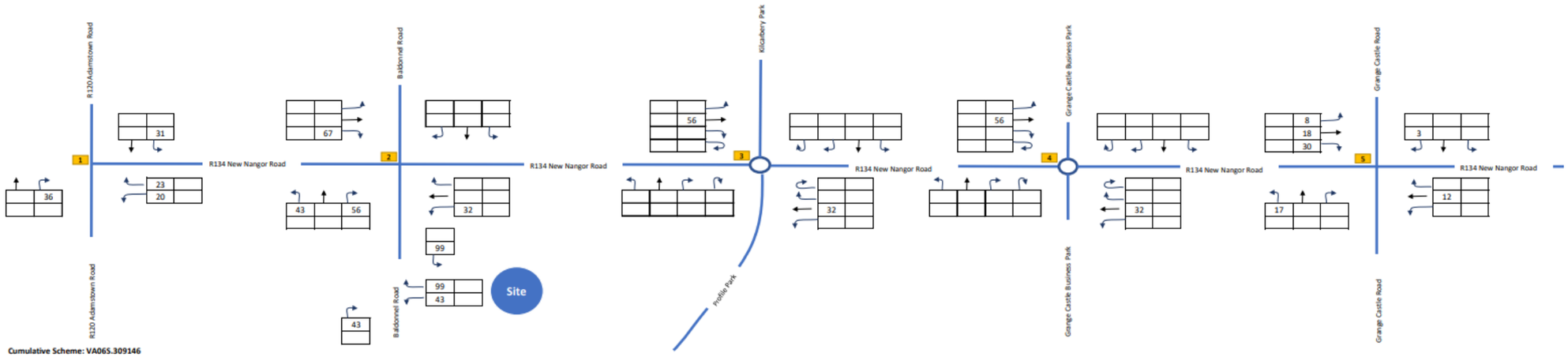
Project Number
1620014883

Figure Title
Cumulative Scheme "SD18A/0134" Operation Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	

Figure No.	Revision
1620014883/EIAR/7.33	



Cumulative Scheme: VA06S.309146
Operation Stage
Trip Generation

		Arriv	Dep
Total Vehicles		142	142

Trip Distribution:
Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

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Client
Vantage Data Centers Dub11 Limited

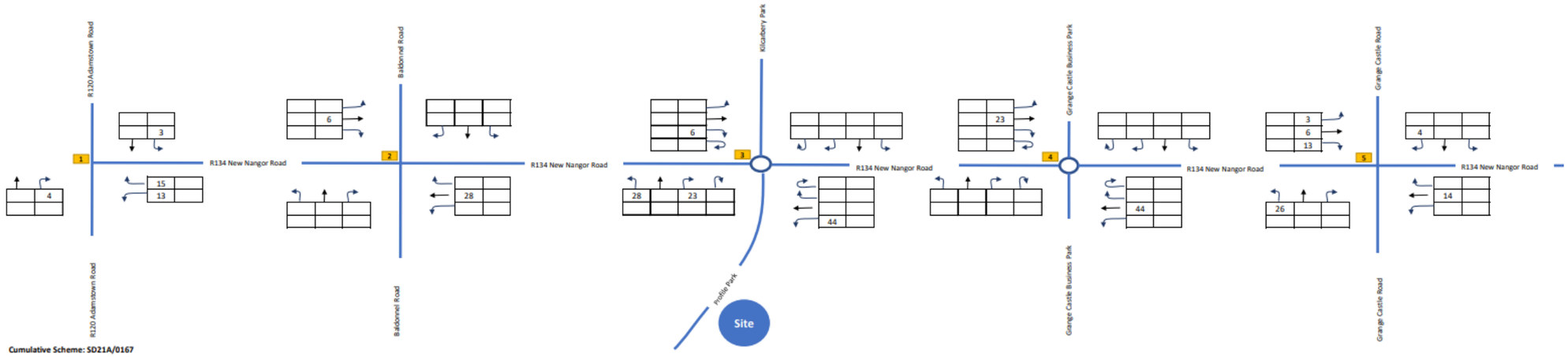
Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Cumulative Scheme "VA06S.309146" Operation Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	
Figure No.	**Revision**
1620014883/EIAR/7.34	



Cumulative Scheme: SD21A/0167
Construction Stage
Trip Generation

		Arriv	Dep
Total Vehicles		50	50

Trip Distribution:
Development traffic is distributed at Junction 3 based upon the survey data presented in SD21A/0167 EIAR and then distributed on the wider study area based upon the 2019 survey data presented in SD20A/0121 TIA

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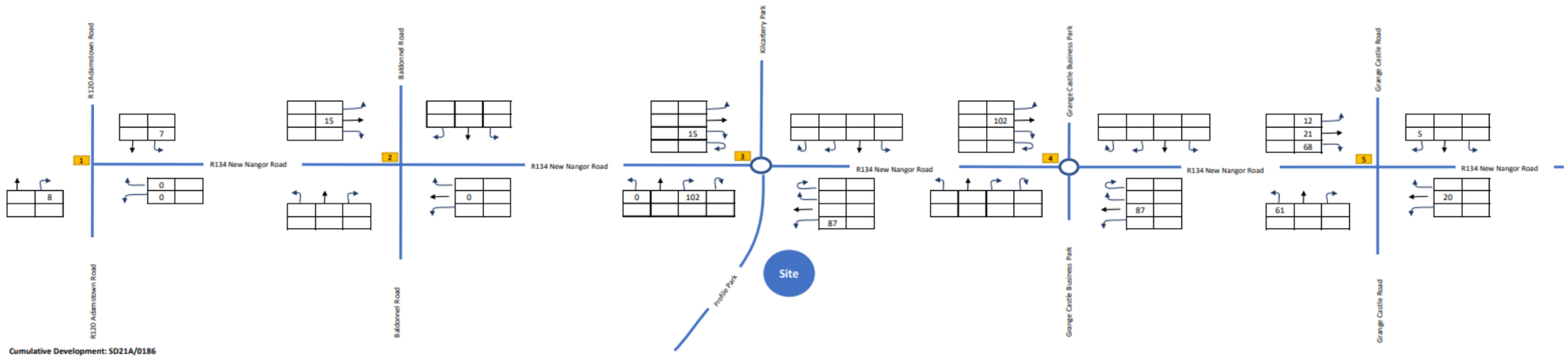
Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Cumulative Scheme "SD21A/0167" Construction Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	
Figure No.	**Revision**
1620014883/EIAR/7.35	



Cumulative Development: SD21A/0186
Construction Stage
Trip Generation

	Arriv	Dep
Total Vehicles	102	102

Trip Distribution:
Light construction vehicles have been distributed across the surrounding network in the same manner as the 2019 traffic surveys.
All heavy construction traffic travels to the site from the N7 National Road and from the M50 artirial motoriway via the R34 and R136 and departs along the same routes.

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Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

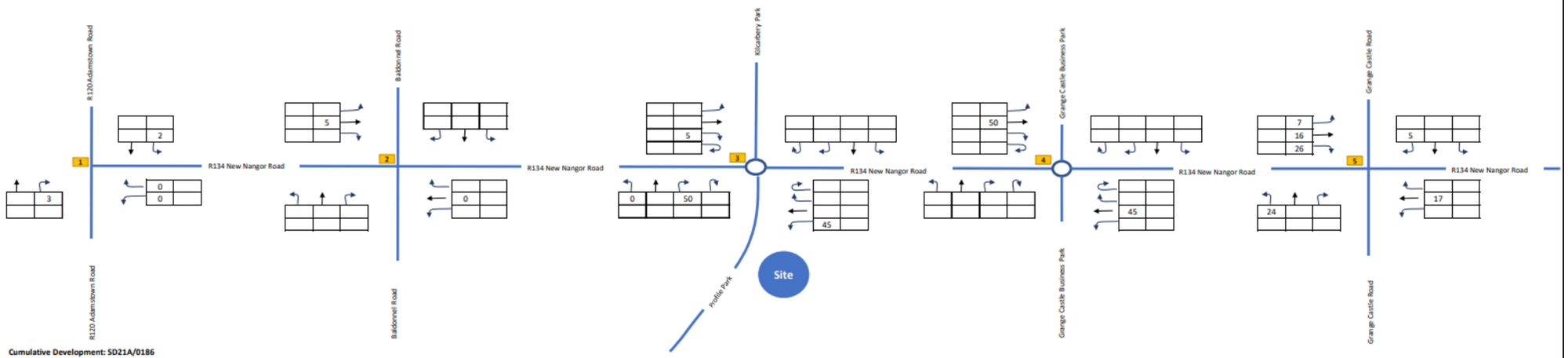
Project Number
1620014883

Figure Title
Cumulative Scheme "SD21A/0186" Construction Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	

Figure No.	Revision
1620014883/EIAR/7.36	



Cumulative Development: SD21A/0186
Operation Stage
Trip Generation

	Arriv	Dep
Total Vehicles	50	50

Trip Distribution:
Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Cumulative Scheme "SD21A/0186" Operation Stage Daily Traffic Flows

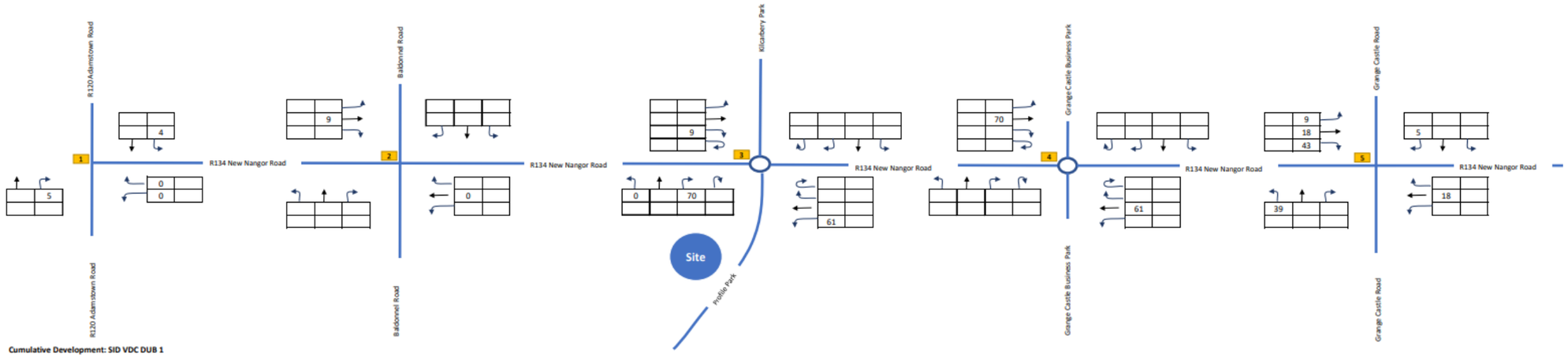
RAMBOLL

Date
26/09/2022

Prepared By

Figure No.
1620014883/EIAR/7.37

Revision



Cumulative Development: SID VDC DUB 1
Construction Stage
Trip Generation

	Arriv	Dep
Total Vehicles	70	70

Trip Distribution:
Light construction vehicles have been distributed across the surrounding network in the same manner as the 2019 traffic surveys.
All heavy construction traffic travels to the site from the N7 National Road and from the M50 artirial motoriway via the R34 and R136 and departs along the same routes.

KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Cumulative Scheme "SID VDC DUB 1" Construction Stage Daily Traffic Flows

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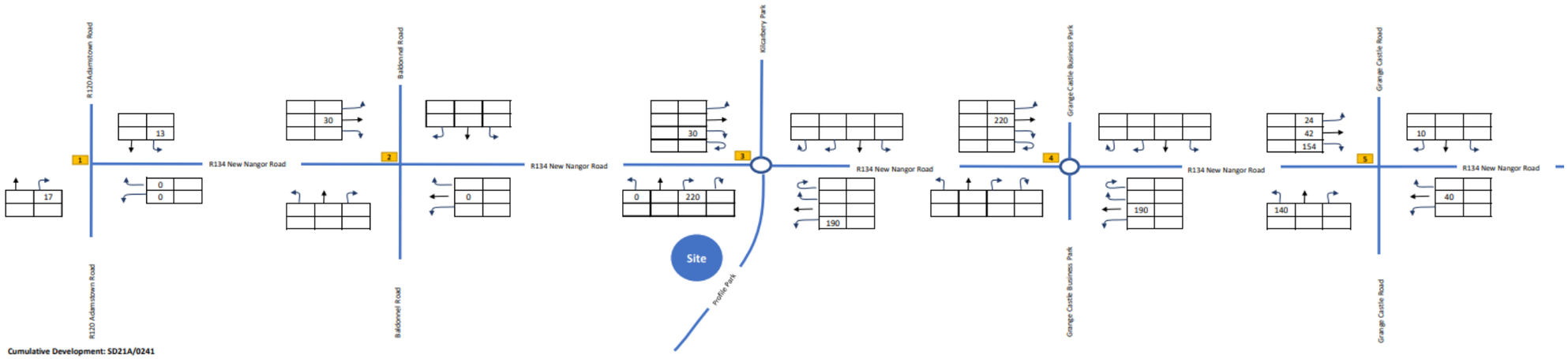
Date
26/09/2022

Prepared By

Figure No.
1620014883/EIAR/7.38

Revision



Cumulative Development: SD21A/0241
Construction Stage
Trip Generation

	Arriv	Dep
Total Vehicles	220	220

SD20A/0121 (80,269sqm)
10 HGVs per hour
up to 300 vehicles per direction for commuting

SD21A/0241 (41,105sqm)
5 HGVs per hour
157 vehicles per direction for commuting

Working hours: 07:00-19:00
12 hours

Trip Distribution:
Light construction vehicles have been distributed across the surrounding network in the same manner as the 2019 traffic surveys.
All heavy construction traffic travels to the site from the N7 National Road and from the M50 artirial motoriway via the R34 and R136 and departs along the same routes.

KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

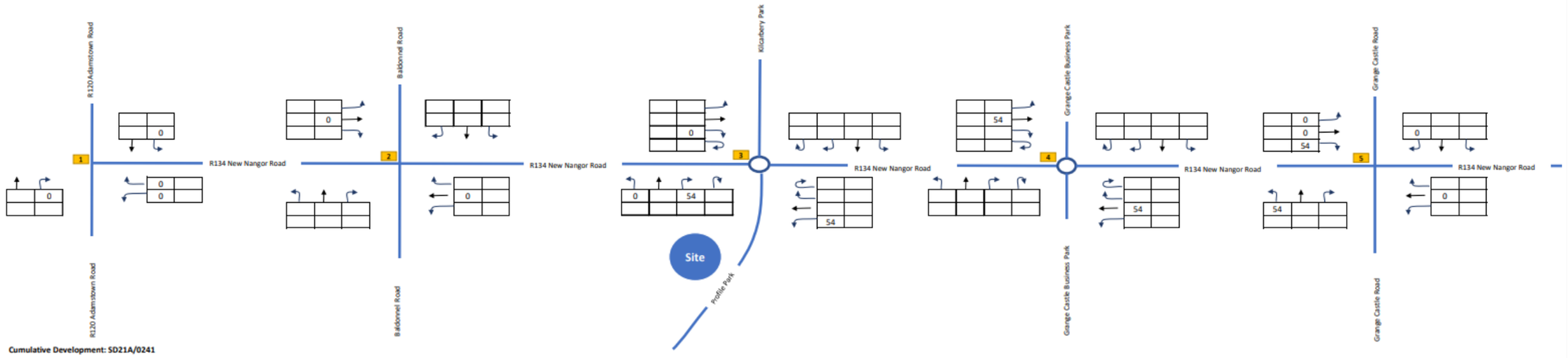
Project Number
1620014883

Figure Title
Cumulative Scheme "SD21A/0241" Construction Stage Daily Traffic Flows

RAMBOLL

Date	Prepared By
26/09/2022	

Figure No.	Revision
1620014883/EIAR/7.39	



Cumulative Development: SD21A/0241

Trip Generation

		Arriv	Dep
Total Vehicles		54	54

It should be noted that the multifuel generation plant will power DUB 11 directly up to approximately Q1 2025 using HVO as the fuel source and this would require an additional 54 HGV a day

Trip Distribution:

All Fuel HGVs travel to the site from the N7 National Road and from the M50 artirial motoriway via the R34 and R136 and departs along the same routes.

KEY

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Project Title

VDC DUB 13

Project Number

1620014883

Figure Title

Cumulative Scheme "SD21A/0241" Operation Stage HVO Daily Traffic Flows

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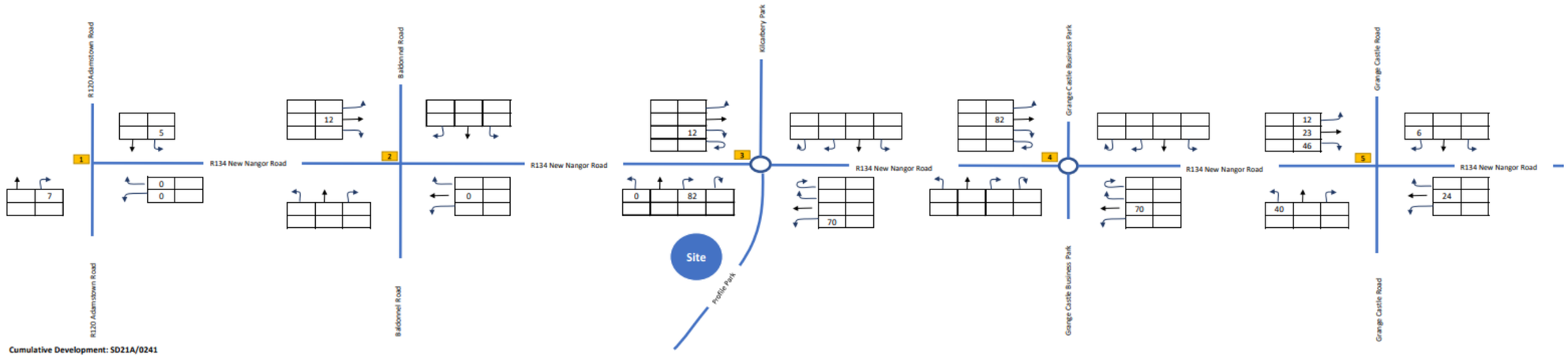
Date	Prepared By
26/09/2022	

Figure No.	Revision
1620014883/EIAR/7.310	



Cumulative Development: SD21A/0241
Operation Stage
Trip Generation

	Arriv	Dep
Total Vehicles	82	82

Trip Distribution:
Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Cumulative Scheme "SD21A/0241" Operation Stage Daily Traffic Flows

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Date	Prepared By
26/09/2022	
Figure No. 1620014883/EIAR/7.311	Revision

Technical Appendix 7.3: Cumulative Schemes Daily Traffic Flow Diagrams

Legend

Red Line Boundary

Accident Severity

- Fatal
- Severe
- Slight

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Accident Data (2021-2016)

RAMBOLL

Date	Prepared By
30/09/2022	NS
Figure No.	Revision
1620014883/EIAR/7.21	

DUB13_Accidents.pagx

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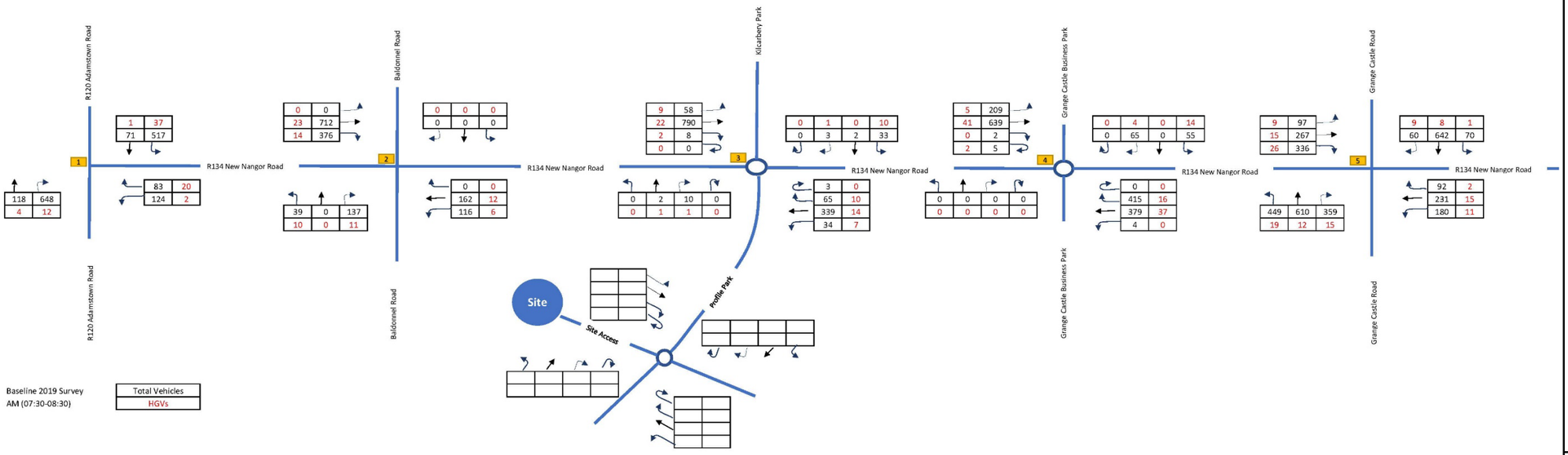
Coordinate System: TM65 Irish Grid. Projection: Transverse Mercator. Datum: TM65.

Technical Appendix 7.4: Proposed Development Trip Generation



KEY

Client
Vantage Data Centers Dub11 Limited

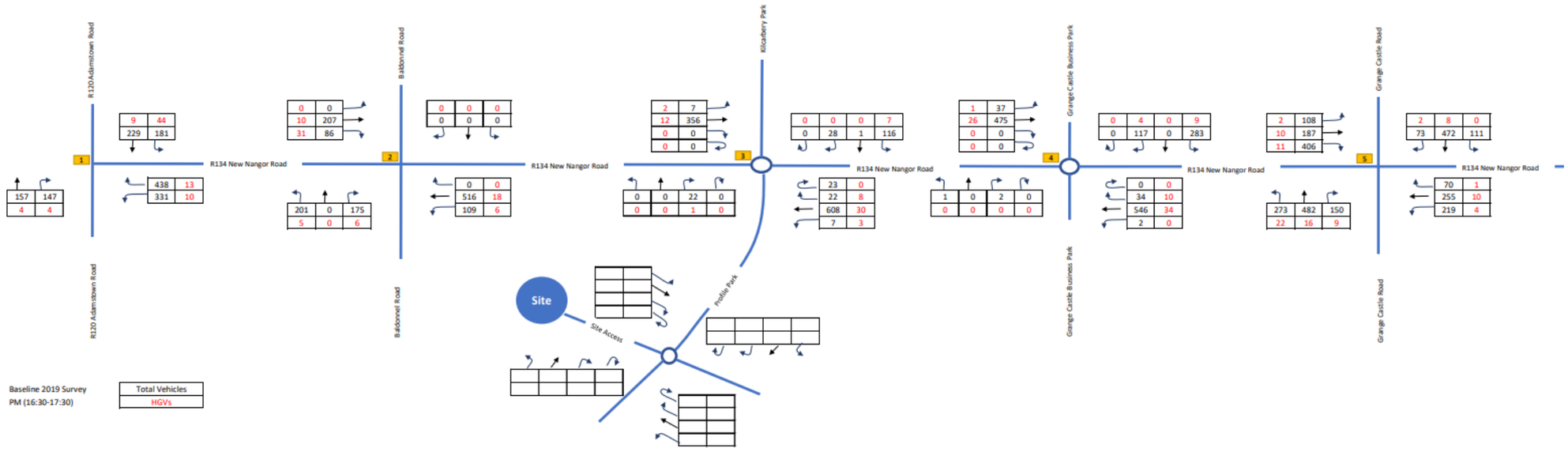
Project Title
VDC DUB 13

Project Number
1620014883

Figure Title
Baseline 2019 Traffic Flows AM Peak

RAMBOLL

Date	Prepared By
26/09/2022	
Figure No.	**Revision**
1620014883/EIAR/7.11	



KEY

Client

Vantage Data Centers Dub11 Limited

Project Title

VDC DUB 13

Project Number

1620014883

Figure Title

Baseline 2019 Traffic Flows PM Peak

RAMBOLL

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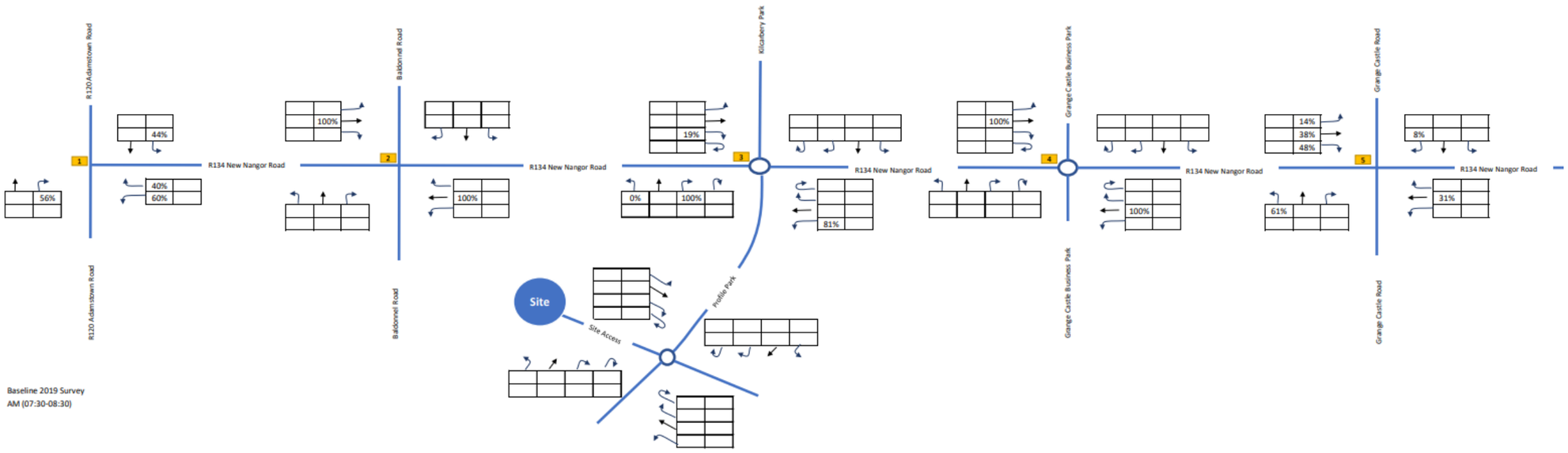
26/09/2022	
Figure No.	Revision
1620014883/EIAR/7.12	



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Client

Vantage Data Centers Dub11 Limited

Project Title

VDC DUB 13

Project Number

1620014883

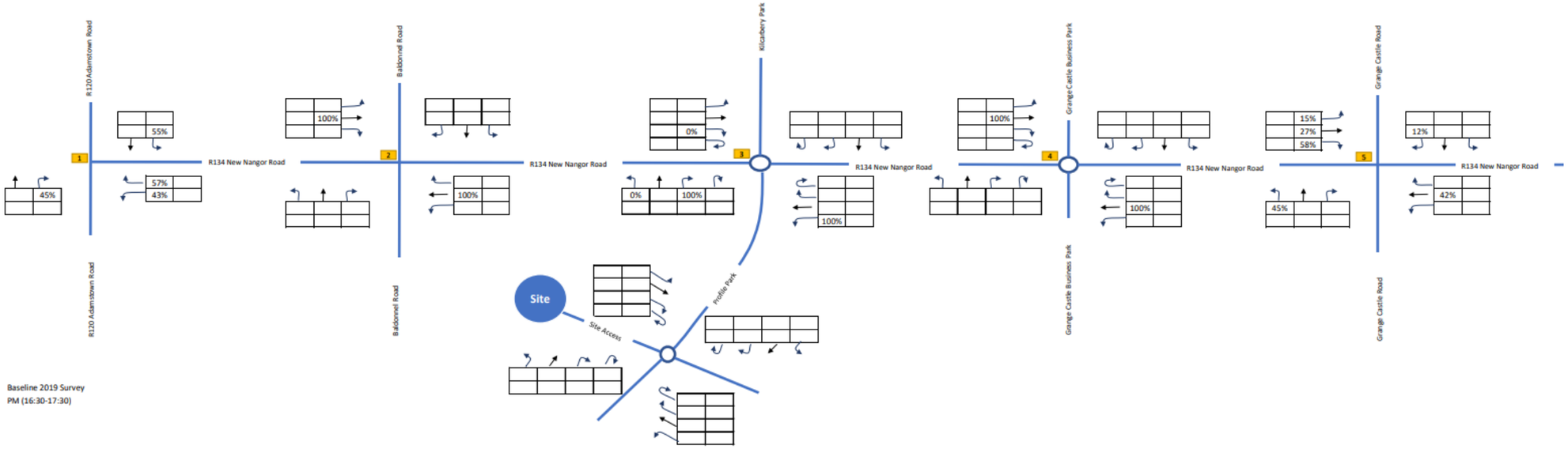
Figure Title

Baseline 2019 Trip Distribution AM Peak

RAMBOLL

Date	Prepared By
26/09/2022	

Figure No.	Revision
1620014883/EIAR/7.13	



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Vantage Data Centers Dub11 Limited

Project Title

VDC DUB 13

Project Number

1620014883

Figure Title

Baseline 2019 Trip Distribution PM Peak

RAMBOLL

Date	Prepared By
26/09/2022	
Figure No.	Revision
1620014883/EIAR/7.14	

Technical Appendix 8.1: Air ality etaile Metho ology Mo elling Approach an ata

1. DUST RISK ASSESSMENT METHODOLOGY

Table 1.1: Determining Dust Emission Magnitude

Large	Medium	Small
Demolition		
• total building volume >50,000 m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20 m above ground level	• total building volume 20,000m^3 – 50,000 m^3 • potentially dusty construction • demolition activities 10-20 m above ground level	• total building volume <20,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10 m above ground • during wetter months
Earthworks		
• total site area >10,000 m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8 m in height • total material moved >100,000 tonnes	• total site area 2,500 m^2 - 10,000 m^2 • moderately dusty soil type (e.g. silt) • 5-10 heavy earth moving vehicles active at any one time • formation of bunds 4 m – 8 m in height • total material moved 20,000 - 100,000 tonnes	• total site area <2,500 m^2 • soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • formation of bunds <4 m in height • total material moved <20,000 tonnes • earthworks during wetter months
Construction		
• total building volume >100,000 m^3 • piling • on-site concrete batching • sandblasting	• total building volume 25,000 m^3 - 100,000 m^3 • potentially dusty construction material (e.g. concrete) • piling • on-site concrete batching	• total building volume <25,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout		
• >50 HGV (>3.5t) movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100 m	• 10-50 HGV (>3.5t) movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 m – 100 m	• <10 HGV (>3.5t) movements in any one day • surface material with low potential for dust release • unpaved road length <50 m

Table 1.2: Determining Receptor Sensitivity

High	Medium	Low
Sensitivities of People to Dust Soiling Effects		
• users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property would not reasonably be expected to be present continuously or regularly for extended periods as part of the normal pattern of use of the land. • indicative examples include parks and places of work.	• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.
Sensitivities of People to the Health Effects of PM_{10}		
• locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• Locations where human exposure is transient. • indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of Receptors to Ecological Effects		

Table 1.2: Determining Receptor Sensitivity

• locations with an international or national designation *and* the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	• locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. • indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	• locations with a local designation where the features may be affected by dust deposition. • indicative example is a local Nature Reserve with dust sensitive features.

Table 1.3: Determining Sensitivity of the Area - Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 1.4: Determining Sensitivity of the Area – Human Health Impacts

	Annual Mean PM_{10} concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	>28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	>24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium		>1	High	Medium	Low	Low	Low
Low		>1	Medium	Low	Low	Low	Low

Table 1.5: Determining Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 1.6: Determining Risk of Dust Impacts - Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 1.7: Determining Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 1.8: Determining Risk of Dust Impacts –Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

2. MODEL INPUTS AND RESULTS PROCESSING TOOLS

2.1 ADMS 5

2.1.1 The predicted impacts on local air quality associated with point source emissions associated with the operation of the scheme was assessed using Cambridge Environmental Research Consultants (CERC) atmospheric dispersion modelling system for industrial installations (ADMS-5)[1]. ADMS 5 is used by several consultancies in the UK and across the world for air quality management and assessment studies of complex situations in large industrial areas.

2.1.2 The ADMS suite of models have been developed and validated by CERC. CERC was established in 1985 and has a leading position in environmental software development by encapsulating advanced scientific research into a number of computer models, providing user-friendly front-ends on PC based Windows platforms.

2.1.3 ADMS 5 model is an advanced dispersion model used to model the air quality impact of existing and proposed industrial installations. It was originally developed for regulatory authorities in the UK. Its many features include allowance for the impacts of buildings, complex terrain, coastlines and variations in surface roughness; dry and wet deposition; NOx chemistry schemes; short term releases (puffs); calculation of fluctuations of concentration on short timescales, odours and condensed plume visibility; and allowance for radioactive decay including γ-ray dose. It can predict long-term and short-term concentrations, as well as calculations of percentile concentrations. The science of ADMS 5 is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters.

2.1.4 The ADMS 5 model validation process includes comparisons against available measured data obtained from real world situations, field campaigns and wind tunnel experiments, with the results being published on CERC's model validation page[2]. Validation of the ADMS dispersion models has been performed using many experimental datasets that test different aspects of the models, for instance: ground/high level sources, passive and buoyant releases, buildings, complex terrain, chemistry, deposition and plume visibility. CERC is also involved in European programmes on model harmonisation, and their models were compared favourably against other EU and U.S. EPA systems. Further information in relation to this is available from the CERC web site at http://www.cerc.co.uk/environmental-software/modelvalidation.html.

2.2 Point Sources

2.2.1 The operation of the emergency generators has been assessed according to the methodology published by the UK Environmental Agency guidance[3,4]. The UK guidance is a conservative probabilistic approach which uses the emergency generators maximum hourly emissions to determine the number of hours that all the generators could operate simultaneously in any one year with a 1% chance of exceeding the 1-hour mean objective based on the worst modelled meteorological year.

2.2.2 Following the UK Environmental Agency methodology, the hourly emissions and the allowable operating hours for emergency operation were estimated from a statistical analysis of the likelihood of breaching the 1-hour objective for NO_2 concentrations by using the hypergeometric distribution function. The allowable operating hours were calculated for a 1% probability of exceeding the one-hour mean objective at the most impacted receptor location. In accordance with the emissions from specified generators guidance, in an emergency when the operating period is greater than one hour, the calculated probability has been multiplied by 2.5. For compliance with the annual mean objectives, the predicted concentrations were scaled to the total annual operating hours that the generators were determined to run for the 1% probability of exceeding the one-hour mean objective.

2.2.3 The likelihood of exceeding the 1-hour mean objective also considers the baseline pollutant concentrations in the vicinity of the site. For the short-term assessment, the background concentration is assumed to be twice the annual mean background concentration. As the dispersion modelling was undertaken for NOx emissions, for estimating the number of exceedances of the hourly mean NO_2 objective, the exceedance concentration in the model was set as follows:

- Model exceedance concentration = (200 – twice annual mean background)/0.35.

2.2.4 For this assessment, the conversion of NOx to NO_2 has been estimated using the worst-case assumptions set out in the UK Environment Agency guidance:

- For the assessment of long term (annual mean) impacts at receptors 70% of NOx is converted to NO_2; and
- For the assessment of short term (hourly mean) impacts at receptors 35% of NOx is converted to NO_2.

2.2.5 For the annual average the PC is added to the baseline concentrations (process environmental contribution- PEC) and for the short-term assessment, the baseline concentrations are assumed to be twice the annual mean determined from the roads modelling assessment.

2.2.6 The dispersion modelling has been undertaken with five years of hourly sequenced meteorology data for the years 2015 to 2019 inclusive, from Casement Aerodrome which is approximately 1 km to the south of the site. The Casement Aerodrome windroses are presented in Table 2.1.

2.2.7 To undertake the assessment the emergency generators were allocated their own flues which were combined in ADMS in triples or quadruples when adjacent, according to the plans configuration. The location and flues parameters used in the model are shown are shown in Technical Appendix 8.1 in the EIAR Volume 3.

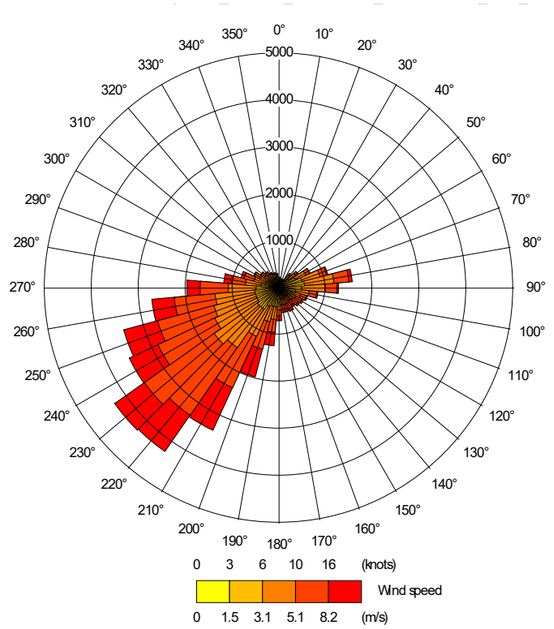
2.2.8 Further information on the model set up is provided in Table 2.1 and shown in Figure 2.1 and Figure 2.2.

[1] http://www.cerc.co.uk/environmental-software/ADMS-model.html

[2] http://www.cerc.co.uk/environmental-software/model-validation.html

[3] Guidance Specified generators: dispersion modelling assessment. Available at: https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment [Accessed on 04/08/2021]

[4] UK Environmental Agency. Guidance Specified generators: dispersion modelling assessment. Available at: https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf [Accessed on 04/08/2021]

Table 2.1: Roads Emissions Model Inputs	
Meteorological Data	2015-2019 Hourly meteorological data from Casement Aerodrome Station has been used in the model. The 2015-2019 combined wind rose is shown below. 
ADMS	ADMS5 version 5.2
Latitude	53.3
Surface Roughness	Topographic features, buildings or vegetation increase the ground's surface roughness which impact son the vertical mixing of a plume and changes the wind-speed profile at elevated heights due to mechanical turbulence generated as the air moves over the ground. Given the rural setting of the study area, a value of 0.3 m for Agricultural areas was used to represent the modelled area and the meteorological station site.
Minimum Monin-Obukhov length	The Minimum Monin-Obukhov provides a measure of the stability of the atmosphere and allows for the effect of heat production in cities, which is not represented by the meteorological data. The minimum standard value of 10 for small towns was used to represent the modelled area and the meteorological station site.

2.3 Terrain

2.3.1 The terrain in the vicinity of the site is flat with no slopes more than 10% and no large changes in surface roughness are expected. Following ADMS 5 manual recommendation, the terrain effects have not been included within the modelling.

2.4 Buildings

2.4.1 Tall buildings can have a substantial impact on the dispersion of pollutants from stacks, as a result of building downwash i.e., pollutants being drawn down in the wake of a building, giving rise to high concentrations close to the base of the buildings. Buildings within five times the stacks height have been considered in the assessment. The nearby buildings may also have an impact on the dispersion, and therefore these have also been included. The buildings set out in Table 2.2 and shown in Figure 2.1 and Figures 2.2 have been included within the ADMS 5 model.

Table 2.2: Scenario 1 and 2 Buildings Dimensions

Name	X (m)	Y (m)	Height (m)	Length (m) / Diameter (m)	Width (m)	Angle (Degrees)
DUB 11.1 & 11.2	703658	703658	14.2	85.4	127	67.0
DUB 12 A	703671	730668	14.2	83	62.0	78.0
DUB11 B	703653	730832	14.2	63.7	43.7	67.0
DUB12 B	703683	730632	14.2	74.1	13.0	258.0
DUB11.1 ChillerA	703642	730822	18.5	53.0	21.2	67
DUB11.1 ChillerB	703643	730797	18.5	22.7	36.4	157.0
DUB11 Elc Stor	703631	730766	19.1	9.3	123.1	67
Power Plant DUB 11	703582	730712	14	22.1	63.0	83.5
DUB11.2 ChillerA	703667	730761	18.5	53.0	21.2	67.0
DUB11.2 ChillerB	703668	730736	18.5	22.7	36.4	157.0
DUB12 Elc Stor	703645	730662	19.1	8.69	63.1	78.0
Kilcarbery Park	703773	730990	19	291.7	84.6	280.6
Kilcarbery BP A	703985	730951	12	26.5	87.0	93.1
Kilcarbery BP B	704023	730948	12	19.4	76.0	93.1
Google DC	703206	730497	12	138.5	123.6	115.1
AWS	702910	730677	12	258.3	68.2	104.5
Power Plant DUB 12	703578	730610	14	23.1	50.1	103.9
Dub 11.1 Lift Shaft	703622	730834	21.6	13.8	9.3	67.4

Table 2.2: Scenario 1 and 2 Buildings Dimensions						
DUB13	703815	730819	14.2	81.2	64.1	30.2
DUB13 Elc Stor	703800	730796	19.1	8.7	63.1	30.1
DU13 B	703850	730804	14.2	73.1	12.7	209.6
DUB13 Chiller	703820	730821	18.5	53.0	45.6	30.1

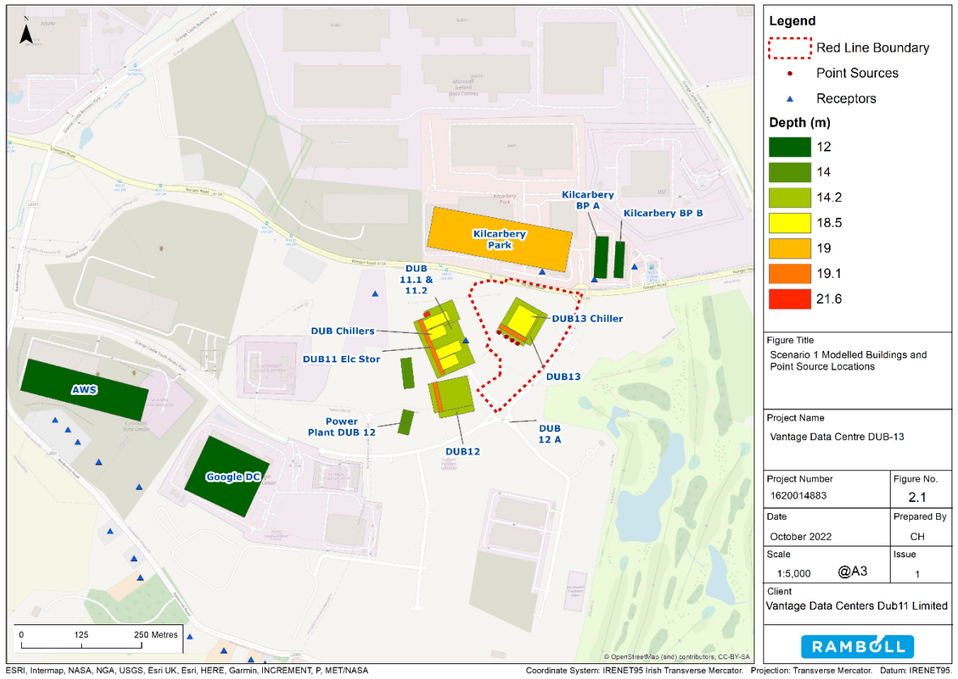


Figure 2.1: Scenario 1 Modelled Buildings and Point Source Locations

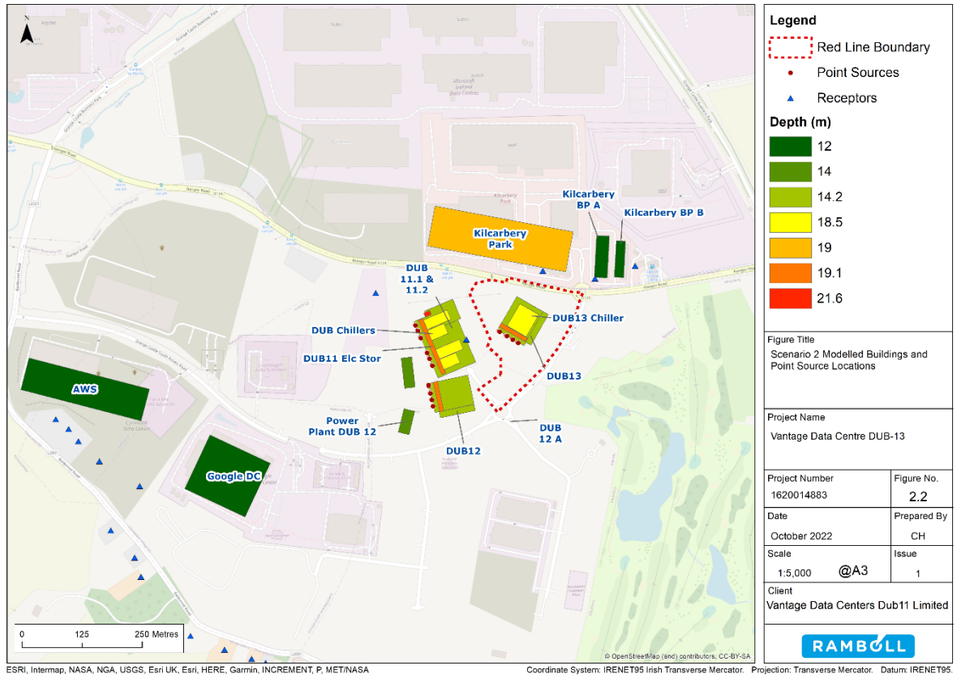


Figure 2-2: Scenario 2 Modelled Buildings and Point Source Locations

2.5 Grid

2.5.1 Concentrations were predicted at three grids. These consist of numerous receptors modelled at a height of 4.5m. The contour plots are centred at the coordinates 703610, 730726 with the spacing as defined in Table 2.3. Contours were modelled at 4.5m height. This was the height which modelled receptors experiences the highest concentration, and represent the second or top floor of a building. full receptor results are shown in Appendix 8.2 in Volume 3.

Table 2.3: Modelled Grids				
Outer Grid 5x5 km				
Ref	Start	Finish	No. points	Spacing (m)
x	708610	698610	21	500
y	735726	725726	21	500
z	4.5	4.5	1	
Middle Grid 3x3 km				
x	706610	700610	61	100
y	700610	727726	61	100
z	4.5	4.5	1	
Inner Grid 500x500m				
x	703110	704110	50	20
y	730226	731226	50	20

Table 2.3: Modelled Grids				
z	4.5	4.5	1	

2.6 Hypergeometric Distribution Function

2.6.1 A worked hypothetical example as provided in Environment Agency guidance[4] is presented below.

The applicant applies for an environmental permit to operate:

- an aggregated diesel specified generator site with a capacity of 40 MWth
- any time of the year for up to a maximum of 400 hours per year

Operations are expected to last up to 4 hours when needed.

Therefore, the operating envelope is all 8760 hours in the year. There are 400 operational hours within the operating envelope.

Dispersion modelling over the full year shows that the Predicted Environmental Concentration (PEC) exceeds the hourly mean limit value of 200mg/m^3 for 300 hours at a sensitive receptor over the worst modelled meteorological year.

This gives:

- 400 operational hours - the sample size denoted by 'N'
- an 8760 hour operating envelope - the population size denoted by 'M'
- 300 exceedance hours - or the number of failures in the population denoted by 'e'
- 8460 non-exceedance hours - the number of successes in the population denoted by 'K', where K = M - e = 8760 - 300 = 8460

The probability of randomly selecting 19 or more exceedance hours (failures) in 400 sample trials, is the same as selecting at most 'N' minus 19 non-exceedance hours (successes) in 400 sample trials (N - 19 = 400 - 19 = 381). So you can calculate the probability of an exceedance, 'P' by using the cumulative hypergeometric distribution.

$$P = \sum_{i=0}^{N-19} \frac{\binom{K}{i}\binom{M-K}{N-i}}{\binom{M}{N}}$$

Based on these data the cumulative hypergeometric distribution is 9.3%. As the continuous operations can be up to 4 hours, you multiply this probability by 2.5, giving a probability of exceedance of 23.25%. This indicates there is potential for an exceedance of the hourly standard.

The cumulative hypergeometric distribution calculates the probability to be less than 1.8% when there are 330 operational hours. Again multiplying this by the 2.5 factor gives a probability of 4.6%, indicating short term exceedances are unlikely.

Therefore we would propose to permit the generator and restrict the operational hours to 330 hours per year.

Technical Appendix 8.2: Air Quality Results

1. SCENARIO 1 DUB-13 EMERGENCY GENERATORS MODEL RESULTS

1.1 Scenario 1 DUB-13 Emergency Generators

Table 8.2.1: Scenario 1 DUB-13 Emergency Generators Maximum Annual Mean Concentrations for 62 hours Operation

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS	Number Exceeding Hours*	Probability Exceedance for 62h operation
R1 GF	1.5	0.36	0.89	17.4	17.8	44.4	85.4	0.0%
R1 TF	18	0.79	1.99	17.4	18.2	45.5	1446.0	1.0%
R2 GF	1.5	0.43	1.07	17.4	17.8	44.6	459.7	0.0%
R2 TF	12	0.59	1.49	17.4	18.0	45.0	785.8	0.0%
R3 GF	1.5	0.45	1.12	17.4	17.8	44.6	456.8	0.0%
R3 TF	4.5	0.45	1.14	17.4	17.9	44.6	470.9	0.0%
R4 GF	1.5	0.05	0.12	17.4	17.4	43.6	11.1	0.0%
R4 TF	4.5	0.05	0.12	17.4	17.4	43.6	12.1	0.0%
R5 GF	1.5	0.12	0.31	17.4	17.5	43.8	135.4	0.0%
R5 TF	12	0.21	0.53	17.4	17.6	44.0	236.2	0.0%
R6	1.5	0.10	0.24	17.4	17.5	43.7	0.0	0.0%
R7	1.5	0.11	0.28	17.4	17.5	43.8	0.0	0.0%
R8	1.5	0.11	0.28	17.4	17.5	43.8	0.0	0.0%
R9	1.5	0.01	0.02	17.4	17.4	43.5	0.0	0.0%
R10	1.5	0.01	0.02	17.4	17.4	43.5	0.0	0.0%
R11	1.5	0.01	0.02	17.4	17.4	43.5	0.0	0.0%
R12	1.5	0.01	0.03	17.4	17.4	43.5	0.0	0.0%
R13	1.5	0.01	0.03	17.4	17.4	43.5	0.0	0.0%
R14	1.5	0.01	0.03	17.4	17.4	43.5	0.0	0.0%
R15	1.5	0.02	0.04	17.4	17.4	43.5	0.0	0.0%
R16	1.5	0.02	0.05	17.4	17.4	43.6	0.0	0.0%
R17	1.5	0.02	0.06	17.4	17.4	43.6	0.0	0.0%
R18	1.5	0.03	0.07	17.4	17.4	43.6	0.0	0.0%
R19	1.5	0.04	0.10	17.4	17.4	43.6	0.0	0.0%
R20	1.5	0.04	0.11	17.4	17.4	43.6	0.0	0.0%
R21	1.5	0.04	0.11	17.4	17.4	43.6	0.0	0.0%
R22	1.5	0.04	0.11	17.4	17.4	43.6	0.0	0.0%
R23	1.5	0.04	0.10	17.4	17.4	43.6	0.0	0.0%
AQS		**40**					-	

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

2. SCENARIO 2 DUB-13 AND DUB-1 CAMPUS EMERGENCY GENERATORS MODEL RESULTS

2.1 Scenario 2 DUB11 and DUB12 Emergency Generators

Table 8.2.1: Scenario 2 DUB-13 and DUB-1 Campus Emergency Generators Maximum Annual Mean Concentrations for 29 hours Operation

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS	Number Exceeding Hours*	Probability Exceedance for 62h operation
R1 GF	1.5	0.58	1.45	17.4	18.0	45.0	2727.3	0.0%
R1 TF	18	0.89	2.22	17.4	18.3	45.7	3426.7	0.9%
R2 GF	1.5	0.56	1.39	17.4	18.0	44.9	1957.1	0.0%
R2 TF	12	0.66	1.64	17.4	18.1	45.1	2286.1	0.0%
R3 GF	1.5	0.51	1.28	17.4	17.9	44.8	1824.3	0.0%
R3 TF	4.5	0.52	1.29	17.4	17.9	44.8	1842.4	0.0%
R4 GF	1.5	0.08	0.21	17.4	17.5	43.7	241.3	0.0%
R4 TF	4.5	0.09	0.22	17.4	17.5	43.7	257.6	0.0%
R5 GF	1.5	0.44	1.10	17.4	17.8	44.6	732.2	0.0%
R5 TF	12	0.53	1.33	17.4	17.9	44.8	1214.6	0.0%
R6	1.5	0.14	0.34	17.4	17.5	43.8	0.0	0.0%
R7	1.5	0.15	0.38	17.4	17.6	43.9	0.0	0.0%
R8	1.5	0.15	0.38	17.4	17.6	43.9	0.0	0.0%
R9	1.5	0.02	0.05	17.4	17.4	43.5	47.3	0.0%
R10	1.5	0.02	0.04	17.4	17.4	43.5	37.2	0.0%
R11	1.5	0.01	0.03	17.4	17.4	43.5	35.2	0.0%
R12	1.5	0.02	0.04	17.4	17.4	43.5	36.2	0.0%
R13	1.5	0.02	0.04	17.4	17.4	43.5	42.2	0.0%
R14	1.5	0.02	0.05	17.4	17.4	43.6	40.2	0.0%
R15	1.5	0.03	0.06	17.4	17.4	43.6	39.7	0.0%
R16	1.5	0.04	0.10	17.4	17.4	43.6	76.3	0.0%
R17	1.5	0.05	0.12	17.4	17.4	43.6	96.6	0.0%
R18	1.5	0.06	0.14	17.4	17.5	43.6	112.9	0.0%
R19	1.5	0.08	0.20	17.4	17.5	43.7	228.0	0.0%
R20	1.5	0.09	0.22	17.4	17.5	43.7	249.4	0.0%
R21	1.5	0.09	0.22	17.4	17.5	43.7	242.3	0.0%
R22	1.5	0.09	0.21	17.4	17.5	43.7	228.0	0.0%
R23	1.5	0.08	0.20	17.4	17.5	43.7	187.3	0.0%
AQS		**40**					-	

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

Technical Appendix 9.1: Glossary of Noise and Vibration Terminology

1. TERMINOLOGY RELATING TO NOISE

Table 1.1: Noise Terminology

Term	Definition
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 ($_{s1}/_{s2}$). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the time period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index defined as the noise level exceeded for 90% of the time over the time period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS5969.
Rating Level ($L_{Ar,Tr}$)	To BS 4142:2014+A1:2019, the rating level is defined as the equivalent continuous A-weighted sound pressure level produced by the specific sound source over a given reference time interval, Tr plus any adjustment for the characteristic features of the sound (tonality, impulsivity, etc).
NSR	A Noise Sensitive Receiver is any receiver that is classed as being sensitive to noise sources, (residential properties, churches, music studios etc).
$R_w + C_{tr}$	Weighted Sound Reduction index (R_w) with low frequency sound correction factor (C_{tr}). $R_w + C_{tr}$ is used when increased control of low frequency sound sources is required such as amplified music, and traffic or aircraft noise

2. TERMINOLOGY RELATING TO VIBRATION

Table 2.1: Vibration Terminology

Term	Definition
VDV	Vibration Dose Value
Displacement, Acceleration and Velocity Root Mean Square (r.m.s.) and Peak Values Peak Particle Velocity (PPV)	Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values are used (i.e. the maximum displacement or maximum velocity) or r.m.s. / r.m.q. values (effectively an average value) are used. Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV), whilst human response to vibration is often described in terms of r.m.s. or r.m.q. acceleration.

Technical Appendix 9.2: Preliminary Construction Noise Assessment

1. PLANT ITEMS AND NOISE LEVELS USED IN THE ASSESSMENT

Table 1.1: Demolition and Construction Noise Plant and Sound Power Levels Used in Assessment

Activity	Plant	Sound Power Level L_{wA} dB	No. of plant	Overall L_{wA} dB	On-time (% of hour)	Reference
Site enabling works	Wheeled excavator	94	2	97	50	BS 5228 Table C4.no.10
	Dumper	111	2	114	20	BS 5228 Table C.2 ave no.s 30-31
	Loading lorries	106	2	109	10	BS 5228 Table C1. no.7
	Scaffold erection	108	1	108	20	BS 5228 Table C.2 ave no.s 26-28
	Generator	102	1	102	100	BS 5228 Table D.7 no.1
	Electric drills	104	2	107	10	BS 5228 Table C.4 no. 32
	Metal cutter	107	2	110	5	BS 5228 Table D.6 no.54
	Electric bolter	104	2	107	10	BS 5228 Table C.1 no.18
	Road sweeper	104	1	104	10	BS 5228 Table D.6 no.54
	Telescopic handler	102	1	102	20	BS 5228 Table C.4 no.45
Demolition	Dozer	106	1	106	20	BS 5228 Table C.8 no. 6
	Pneumatic breaker	116	2	119	50	BS 5228 Table D.2 ave 7-10
	Excavator (tracked)	110	2	113	50	BS 5228 Table D.3 ave no.s 34-40
	Dumper	101	2	104	33	BS 5228 Table D.7 ave no.s 81-92
	Generator	102	1	102	10	BS 5228 Table C.4 no. 32
Substructure	Excavator (tracked)	110	2	113	50	BS 5228 Table D.3 ave no.s 34-40
	Lorry mounted concrete pump	107	2	110	80	BS 5228 Table D.6 ave no.s 34 & 36
	Dumper	101	2	104	50	BS 5228 Table D.7 ave no.s 81-92
	Road sweeper	104	2	107	30	BS 5228 Table C.4 no.90
	Generator	102	1	102	10	BS 5228 Table C.4 no. 32
	Crane	97	1	97	100	BS 5228 Table C.3 ave no.s 28-30
Superstructure	Lorry mounted concrete pump	107	2	110	50	BS 5228 Table D.6 ave no.s 34 & 36
	Crane	106	1	106	50	BS 5228 Table C.4 no. 38
	Generator	102	1	102	100	BS 5228 Table C.4 no. 32
	Electric drills	104	2	107	30	BS 5228 Table D.6 no.54
	Metal cutter	107	2	110	20	BS 5228 Table C.1 no.18
	Electric bolter	104	2	107	20	BS 5228 Table D.6 no.54
	Hydraulic access platforms	95	2	98	70	BS 5228 Table C.4 no. 57
	Road sweeper	104	2	107	10	BS 5228 Table C.4 no.90
Internal works / Fit-out	Generator	102	1	102	100	BS 5228 Table C.4 no. 32
	Welding plant	102	2	105	30	BS 5228 Table C.3 no. 31
	Electric drills	104	3	109	10	BS 5228 Table D.6 no. 54
External works	Generator	102	1	102	100	BS 5228 Table C.4 no. 32
	Excavator (tracked)	110	2	113	50	BS 5228 Table D.3 ave no.s 34-40
	Road sweeper	104	2	107	10	BS 5228 Table C.4 no.90
	Dumper	101	2	104	33	BS 5228 Table D.7 ave no.s 81-92
	Cement mixer truck	105	2	108	10	BS 5228 Table C.4 ave no.s 18 & 20

Technical Appendix 10.1A: Engineering Planning Strategy

Technical Appendix 10.2: Site-Specific Flood Risk Assessment

KILGALLEN & PARTNERS
CONSULTING ENGINEERS

Vantage Data Centres Ltd.

Proposed Industrial Development, DUB13, Profile Park, Grangecastle, Co. Dublin

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Report on Site-Specific Flood Risk Assessment

Vantage Data Centres Ltd.	**Document Ref. No.**	**Kilgallen & Partners Consulting Engineers Well Road, Portlaoise Co. Laois**
	22050-R-SSFRA Issue PL1	

REVISION HISTORY

Client	Vantage Data Centres Ltd.
Project	Proposed Industrial Development, DUB13, Profile Park, Grangecastle, Co. Dublin
Title	Report on Site-Specific Flood Risk Assessment

Date	**Detail of Issue**	**Issue No.**	**Origin**	**Checked**	**Approved**
27/10/2022	Initial issue	PL1	CP	PB	PB

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1. INTRODUCTION

Vantage Data Centres Ltd. ['the Applicant'] intends to apply to South Dublin County Council for planning permission for an industrial development ['the proposed development'] on lands to the south of the New Nangor Road (R134), Dublin 22; and on land within the townlands of Ballybane and Kilbride within Profile Park, Clondalkin, Dublin 22 on an overall site of 3.79hectares ['the Site].

The Applicant appointed Kilgallen and Partners Consulting Engineers to :

- carry out a Site-Specific Flood Risk Assessment ['SSFRA'] for the proposed development in accordance with the 'Planning System and Flood Risk Management – Guidelines for Planning Authorities' ['the Guidelines'];
- prepare a report presenting the findings of the SSFRA to support the application for planning permission;

This is the report referred to above.

2. PROCESS FOR SITE-SPECIFIC FLOOD RISK ASSESSMENT

The initial stage of the SSFRA comprises an assessment of available flood risk data to identify flood risk indicators in the Study Area. If the Site is identified to be at risk of flooding, the SSFRA will proceed to a detailed assessment.

2.1 Potential Sources of Flood Risk

Potential flood risk mechanisms are summarised in Table 2-1.

Source	Mechanism
Fluvial:	Overtopping of Rivers and Streams
Pluvial:	The intensity of rainfall events is such that the ground cannot absorb rainfall run-off effectively or urban drainage systems cannot carry the run-off generated.
Groundwater:	Rising water table
Coastal:	Tidal levels and / or wave action
Infrastructure	Failure of flood protection or drainage infrastructure

Table 2-1 Flood Risk Mechanisms

As an inland site upstream of tidal influences and possible wave action, the Site is not subject to coastal flood risk and so this mechanism does not need to be considered further in this assessment.

The assessment will therefore consider the following mechanisms:

- Fluvial;
- Pluvial;
- Groundwater;
- Drainage Infrastructure *(considered under Section 9 – Residual Flood Risk)*

2.2 Flood Risk Indicators

Indicators of flood risk are identified using available data, most of which is historically derived. Typically, this data is not prescriptive in relation to flood return periods and neither predictive nor inclusive of climate change analysis.

Flood risk indicators include:

- Records available on the OPW's National Flood Risk Website. As part of the National Flood Risk Management Policy, the OPW developed the www.floodinfo.ie web-based data set, which contains

information concerning historical flood data and displays related mapped information and provides tools to search for and display information about selected flood events;
- PFRA & CFRAM mapping produced under the CFRAM programme;
- The Strategic Flood Risk Assessment carried out to inform the making of the Local Area Plan;
- Geological Survey of Ireland (GSI) mapping - Hydrogeological mapping maintained by the GSI and made available through its website www.gsi.ie;
- Ordnance Survey mapping - Ordnance Survey maps include areas which are marked as being "Liable to Floods". Generally, these areas are only shown identified indicatively and suggest historical flooding, usually recurrent. In addition, the maps indicate areas of wet or hummocky ground, bog, marsh, springs, rises and wells as well as surface water features including rivers, streams, bridges, weirs and dams;
- Topographical survey information;
- Records of previous floods from other sources;
- Flood Studies, Reports and Flood Relief Schemes carried out in the vicinity of the Study Area;
- Site Walkover.

2.3 Identification of the Presence and Extent of Fluvial Flood Risk

Where the initial process of examining flood risk indicators demonstrates the existence of a risk of fluvial flooding, the study progresses to the next stage, which is a detailed flood risk assessment. This is based on field measurements and hydrological modelling and enables mapping of the zones of Flood Risk within the Site to be established.

In accordance with the Guidelines, flood risk zones are categorized as follows:

Flood Zone A where the probability of flooding in any year is greater than 1% (i.e. Flood Zone in respect of a flood with a return period of 100years);

Flood Zone B where the probability of flooding in any year is between 0.1% and 1% (i.e. Flood Zone in respect of a flood with a return period of between 100years and 1,000years);

Flood Zone C where the probability of flooding in any year is less than 0.1% (i.e. Flood Zone in respect of a flood with a return period of greater than 1,000years).

2.4 Identification of the Presence and Extent of Pluvial Flood Risk

Where the initial process of examining flood risk indicators demonstrates the existence of a risk of pluvial flooding, the study progresses to the next stage, which is a detailed assessment to establish the extent of pluvial flood risk at the Site.

2.5 Identification of the Presence and Extent of Groundwater Flood Risk

Where the initial process of examining flood risk indicators demonstrates the existence of a risk of flooding from groundwater, the assessment progresses to the next stage, which is a detailed assessment to establish the extent of groundwater flood risk at the Site.

2.6 Assessment of Proposed Development

As described in the previous paragraphs, the first stages of the assessment process are concerned with identifying whether the Site is at risk of pluvial, fluvial or groundwater flooding and establishing the extent of any such flood risks.

The next steps in the assessment process are:

- Determination of the impact that any of the identified flood risks will have on the proposed Development;
- Determination of any impact that the Development itself might have in terms of increasing the level of flood risk elsewhere outside the Site;
- Identification of mitigation measures in respect of any such impacts and identification of any residual risks after those mitigation measures are put in place;
- Applying the Development Management Justification Test if appropriate;
- Providing a conclusion as to the appropriateness of the proposed development in terms of flood risk.

3. SITE DESCRIPTION

Figure 3-1 shows the Site in the context of its immediate surroundings and Figure 3-2 shows the main drainage features and site topography indicatively.

The Site is located in Profile Park Business Park. It is bounded:

- to the north by the R134 New Nangor Road;
- to the east by a distributor road ['the Park Road'] through Profile Park;
- to the west and south by unused agricultural lands which are the site for a recently approved industrial development (Pl Reg. Ref. No. SD21A/0241).

The Site is undeveloped and does not appear to be used for any purpose.

Main Drainage Features

The Baldonnell Stream ['the Stream'] crosses under the Park Road and enters the Site close to its southern boundary. The Baldonnell Stream flows through the Site for approximately 45m and then exits the Site at its west boundary. 190m downstream of the Site the Stream flows through a short 600mm dia. culvert. 300m downstream of the Site, the Stream discharges to a long twin-pipe culvert.

There is no evidence of pluvial drainage entering the Site.

The vegetation is suggestive of poorly draining upper soils but there is no evidence of standing groundwater.

Topography

The Site can be described as relatively flat, with a general shallow fall from northeast to southwest.

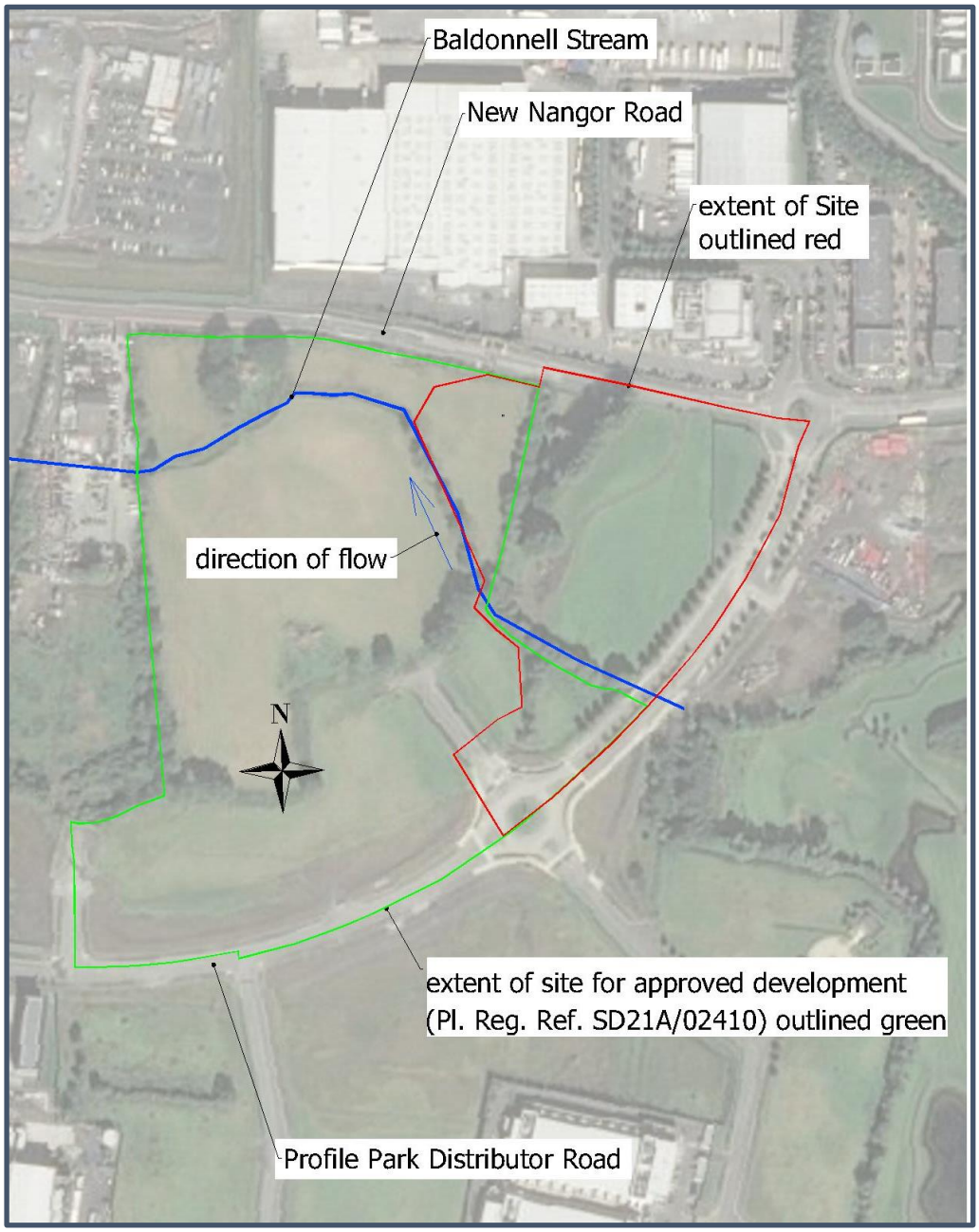


Figure 3-1 Site Context

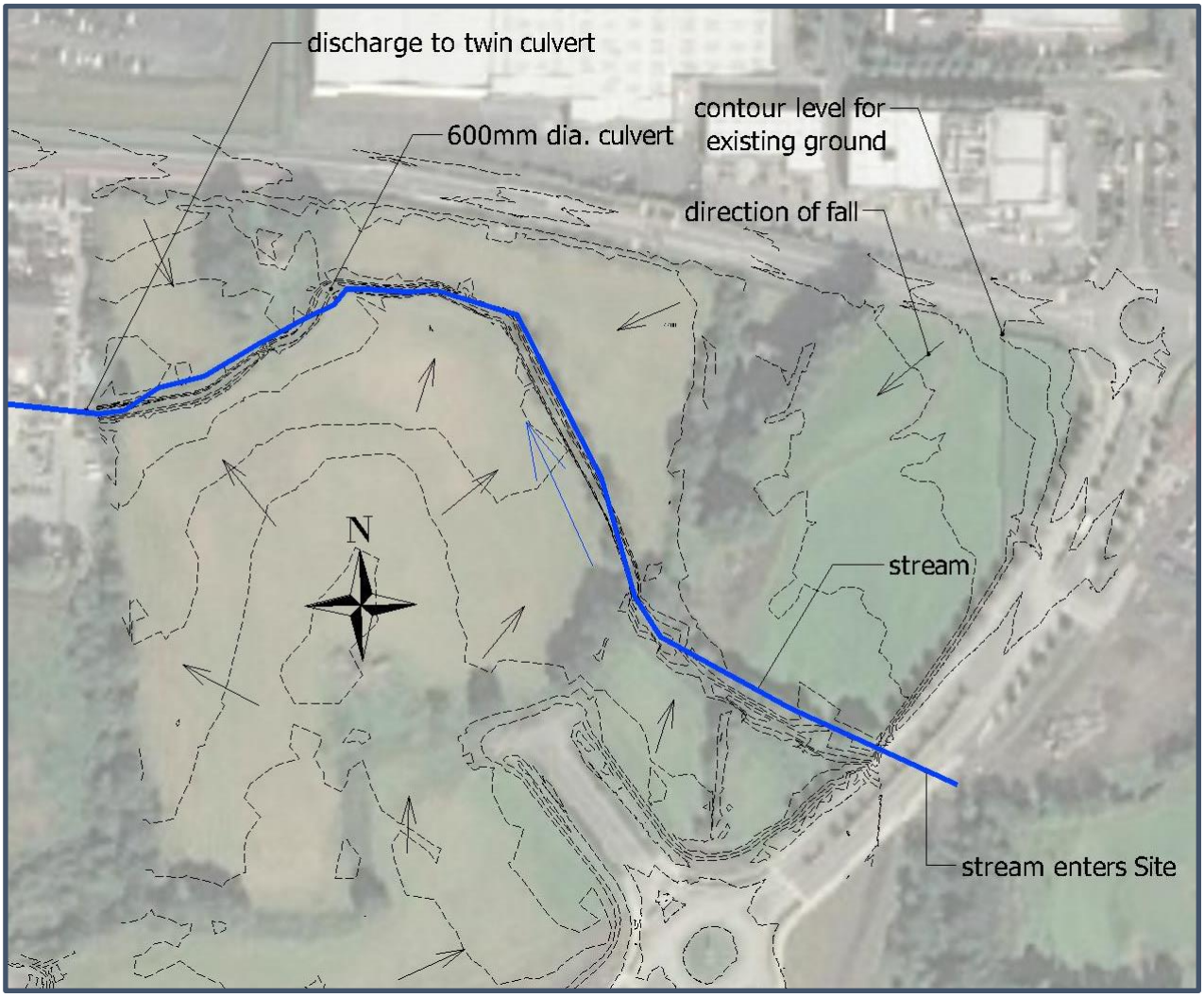


Figure 3-2 Site Topography / Main Drainage Features

4. PROPOSED DEVELOPMENT

4.1 Description

The proposed development comprises industrial buildings, parking areas, circulation roads, ancillary landscaping, drainage (including SUDS measures), services and ancillary Site works.

The development will consist of the demolition of the two storey dwelling (207.35sqm) and associated outbuildings and farm structures (348.36sqm); and the construction of 1 no. two storey data center with plant at roof level and associated ancillary development that will have a gross floor area of 12,893sqm that will consist of the following:

- 1 no. two storey data center (Building 13) with a gross floor area of 12,893sqm. It will include 13 no. emergency back-up generators of which 12 will be double stacked and one will be single stacked within a compound to the south-western side of the data center with associated flues that each will be 22.316m in height and 7 no. hot-air exhaust cooling vents that each will be 20.016m in height;
- the data center will include data storage rooms, associated electrical and mechanical plant rooms, loading bays, maintenance and storage spaces, office administration areas, and plant including PV panels at roof level as well as a separate house generator that will provide emergency power to the admin and ancillary spaces. Each generator will include a diesel tank and there will be a refuelling area to serve the proposed emergency generators;
- The data center will have a primary parapet height of 14.246m above ground level, with plant and screen around plus a plant room above at roof level. The plant room has an overall height of 21.571m;
- Construction of an internal road network and circulation areas, with a staff entrance off Falcon Avenue to the east, as well as a secondary vehicular access for service and delivery vehicles only across a new bridge over the Baldonnel Stream from the permitted entrance as granted under SDCC Planning Ref. SD21A/0241 from the south-west, both from within Profile Park that contains an access from the New Nangor Road (R134);
- Provision of 60 no. car parking spaces (to include 12 EV spaces and 3 disabled spaces), and 34 no. cycle parking spaces;
- Signage (5.7sqm) at first floor level at the northern end of the eastern elevation of the data center building; and
- Ancillary site development works, will include footpaths, attenuation ponds that will include an amendment to the permitted attenuation pond as granted to the north of the Baldonnel Stream under SDCC Planning Ref. SD21A/0241, as well as green walls and green roof. The installation and connection to the underground foul and storm water drainage network, and installation of utility ducts and cables, that will include the drilling and laying of ducts and cables under the internal road network within Profile Park. Other ancillary site development works will include hard and soft landscaping that will include an amendment to the permitted landscaping as granted under SDCC Planning Ref. SD21A/0241, lighting, fencing, signage, services road, entrance gates, and sprinkler tanks.

A schematic layout for the proposed development is shown in Figure 4-1. Relevant proposals for the development are shown on the schedule of documents contained in Appendix A.

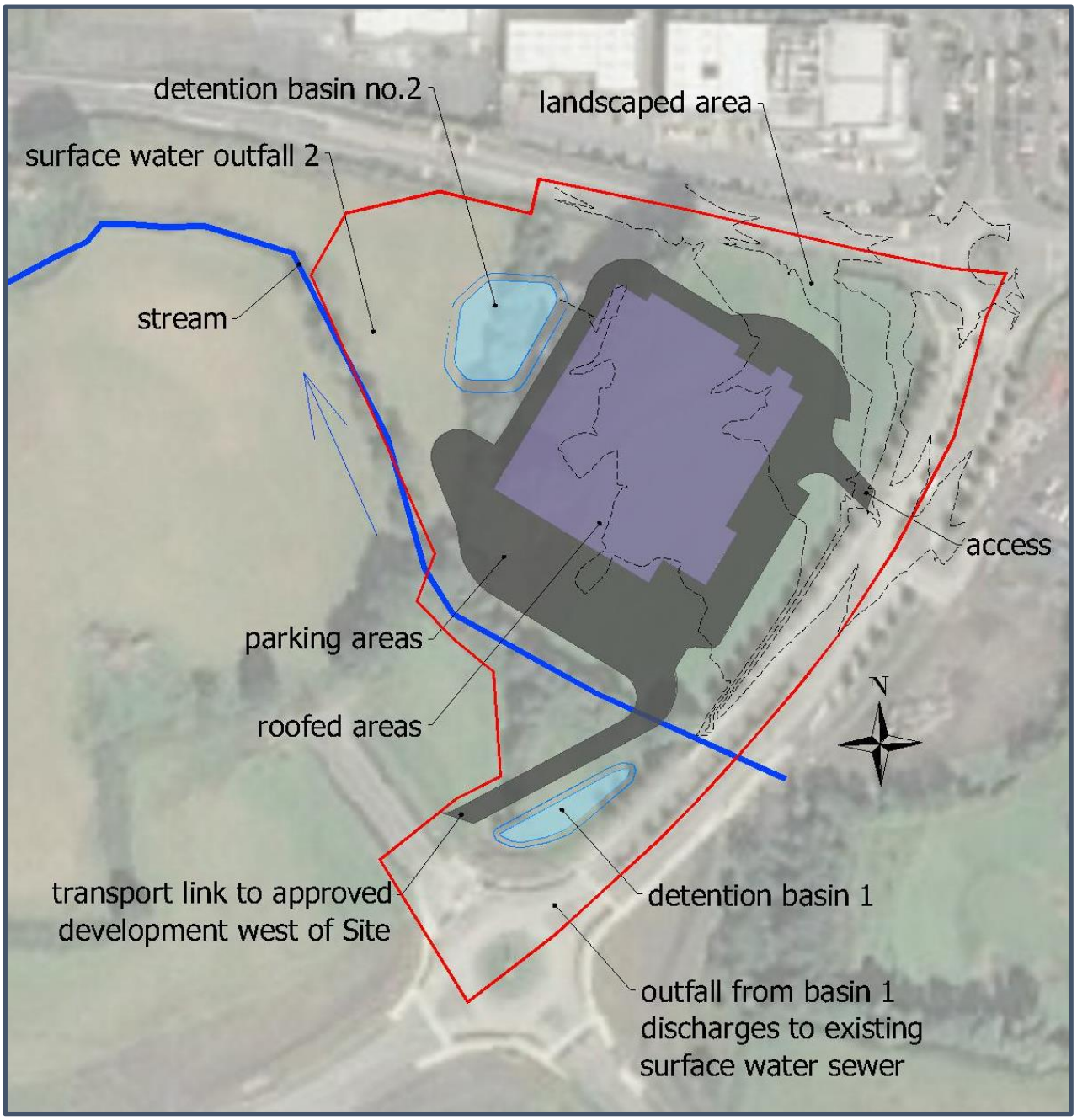


Figure 4-1 Schematic Layout of Proposed Development

4.2 Vulnerability

Table 3.1 of the Guidelines classifies different types of development in terms of their vulnerability to flooding. Figure 4-2 contains an extract from this table which shows industrial development classified as Less Vulnerable. The proposed development is an industrial development and so falls under this classification.

Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.

Figure 4-2 Classification of development type by vulnerability to flooding

Table 3.2 of the Guidelines provides a matrix of development vulnerability versus Flood Zone which illustrates the appropriateness of a development type for each Flood Zone. This table is reproduced in Figure 4-3 and shows the Guidelines regards Less Vulnerable development as being appropriate for Sites in Flood Zone B and requiring the Justification Test for Sites in Flood Zone A

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

Figure 4-3 Matrix of vulnerability versus Flood Zone

5. FLUVIAL FLOOD RISK – INITIAL ASSESSMENT

5.1 Flood Risk Indicators - Desktop

A number of datasets were interrogated for indicators of fluvial flood risk:

(i) SFRA

Mapping prepared as part of the Strategic Flood Risk Assessment for the South Dublin County Development Plan indicates the Site is not affected by either the 0.1% AEP and 1.0% AEP flood events. The only exception is at the southern corner where the existing Park Road is shown to be subject to flood risk. An extract from this mapping is shown in Figure 5-1.

Figure 5-1 Extract from SFRA showing fluvial flood risk at the Site

(ii) OPW National Flood Hazard Mapping Website

The OPW maintains the National Flood Hazard Mapping website (floodinfo.ie) which contains information about locations that may be at risk from flooding. The source of this information includes Local Authorities and other historic records such as newspaper articles and other documentation about reported floods.

The website does not have any records of flooding at this location.

(iii) CFRAM

Mapping prepared as part of the CFRAM programme indicates the Site is not affected by the 0.1% AEP flood event but not the 1.0% AEP event. As with SSFRA mapping, the only exception is at the southern corner where the existing Park Road is shown to be subject to flood risk. An extract from this mapping is shown in Figure 5-2.

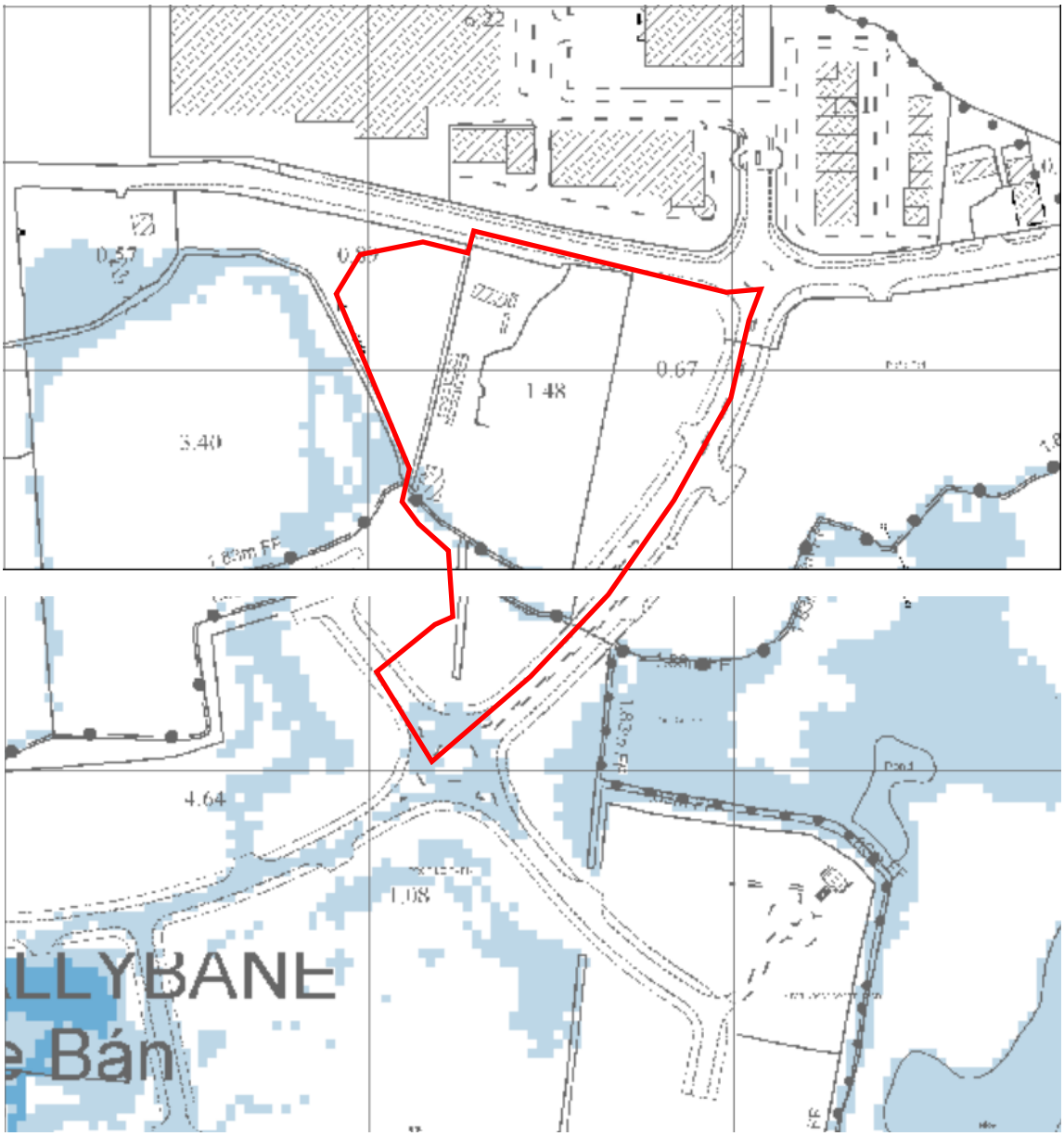


Figure 5-2 Extract from CFRAM mapping showing fluvial flood risk at the Site

(iv) Ordnance Survey Mapping

Figure 5-3 shows the historic 25" OS mapping for the Site and its immediate surroundings. There is no indication of flood risk at the Site.

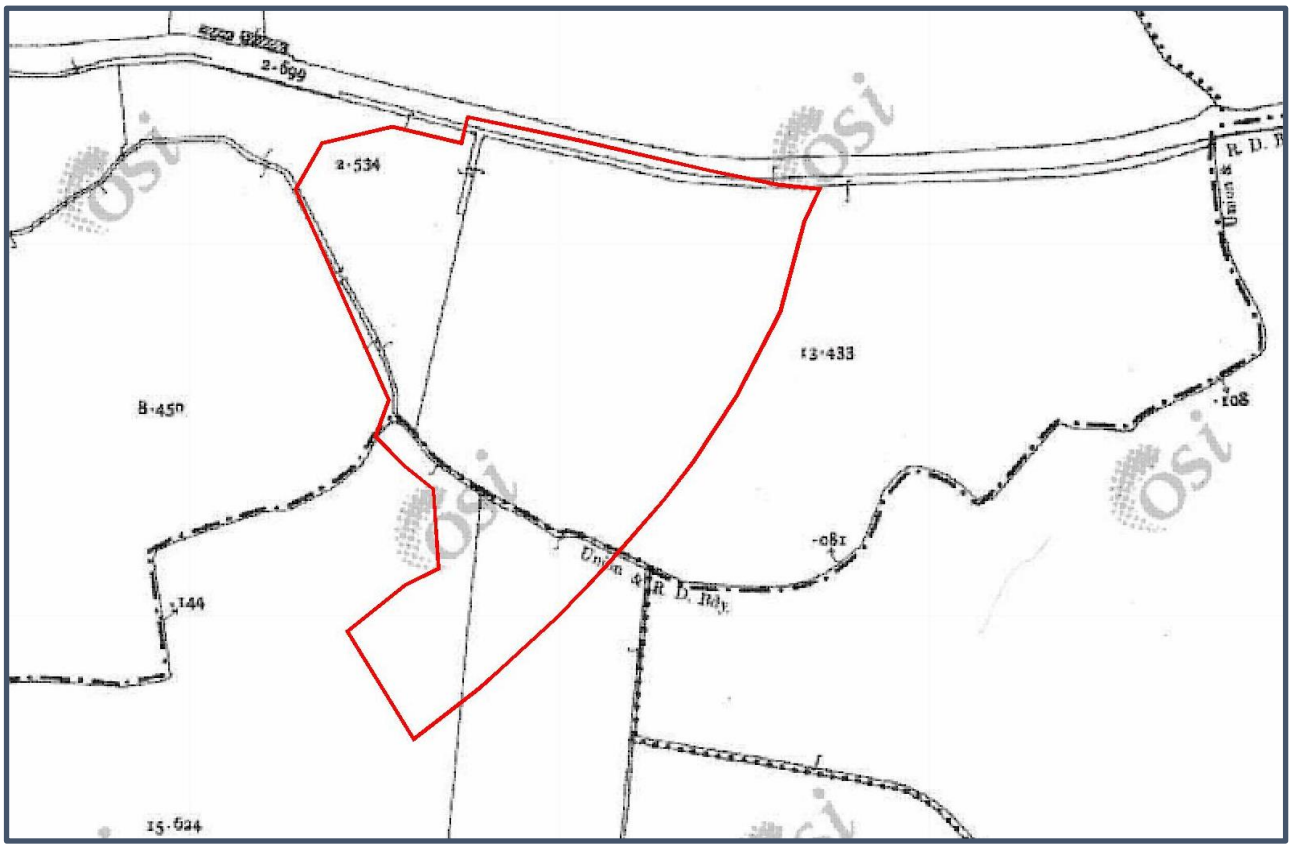


Figure 5-3 Historic OS Map

5.2 Flood Risk Indicators - Site Walkover

The Baldonnell Stream ['the Stream'] crosses under the Park Road through a twin-pipe culvert, each pipe 1400mm diameter, and enters the Site close to its southern boundary.

The Baldonnell Stream flows through the Site for approximately 45m and then exits the Site at its west boundary.

190m downstream of the Site the Stream flows through a short 600mm dia. culvert.

300m downstream of the Site, the Stream discharges to a long twin-pipe culvert. The inlet to this culvert is poorly constructed and hydraulically inefficient; it was observed that in addition to the pipes, the gaps between the pipes also provides a flow path for the stream to discharge to.

A visual assessment of the channel of the stream suggests the twin-pipe culvert will have a significantly lower hydraulic capacity than the channel.

Figure 5-4 View of Site at East Boundary from North

Figure 5-5 View of Site at West Boundary from North

Figure 5-6 View of Site at West Boundary from South

Figure 5-7 Upstream View of Culvert under Park Road

Figure 5-8 Typical View of Stream Channel through Site

Figure 5-7 Typical Section of Stream Channel downstream of Site

Figure 5-8 Inlet to twin-pipe culvert

5.3 Initial Assessment

The indicators described in Section 5.1 suggest the Site is not at significant risk from fluvial flooding. However, the Site Walkover suggests the Site may be at risk of flooding caused by inadequate hydraulic culvert capacity downstream of the Site.

Accordingly, it is the conclusion of this SSFRA that detailed assessment of fluvial flood risk is appropriate.

6. FLUVIAL FLOOD RISK – DETAILED ASSESSMENT

6.1 Estimating Peak Flood Flows

The catchment area for the stream, shown outlined blue on Figure 6-1, measures 1.0 km^2.

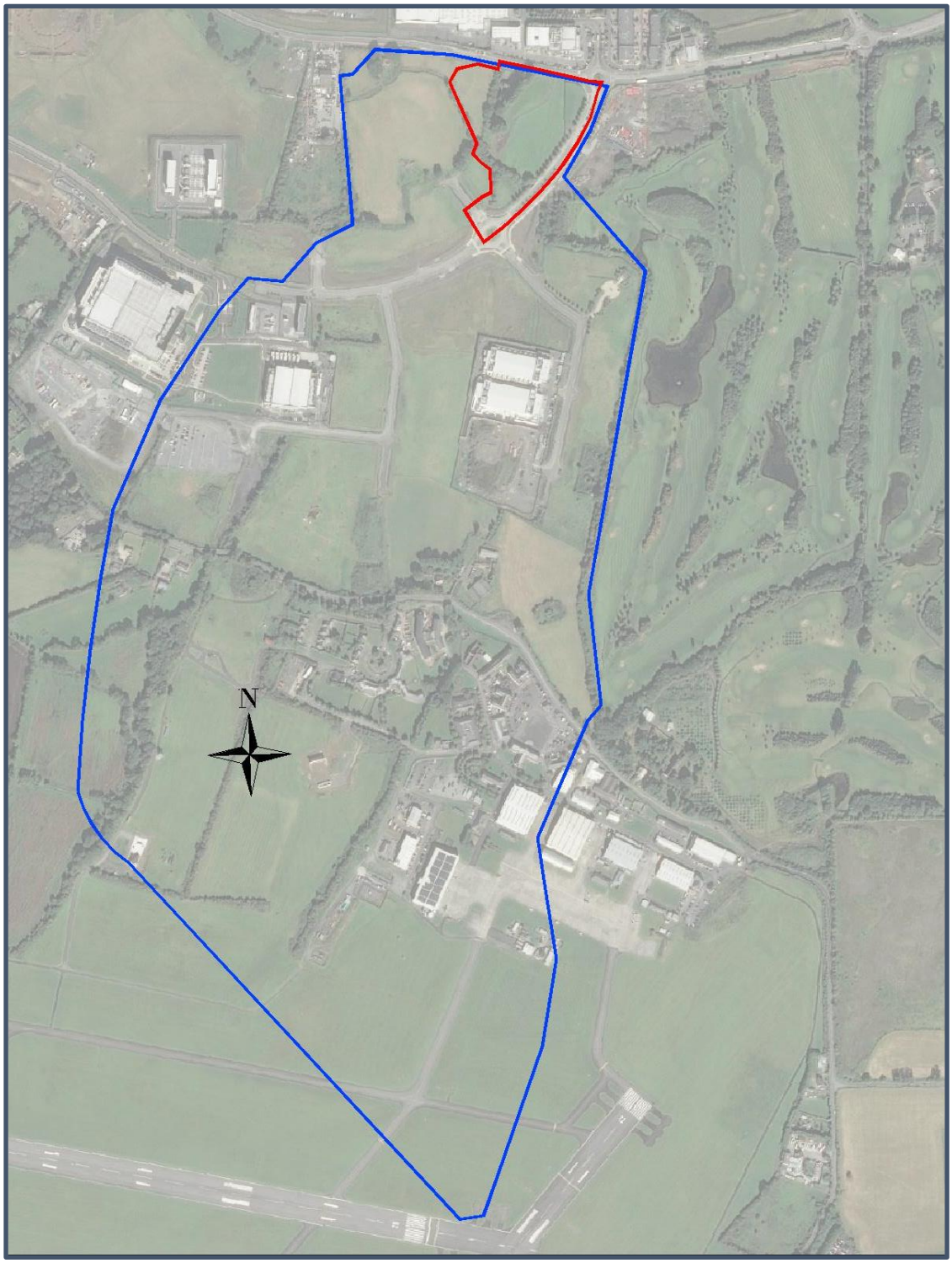


Figure 6-1 Catchment Area for Stream

The OPW provides a Web Portal for estimating peak flood flows in natural catchments (Flood Studies Update (FSU) Web Portal). While the use of this portal is generally considered best practice for the estimation of flood flows, the portal advises particular caution where peak flows are being estimated for catchments of less than 25km^2. Accordingly, peak flood flows were estimated using statistical methods for ungauged small catchments.

Table 6-1 shows a number of Physical Catchment Descriptors taken from the FSU portal that were used to estimate peak flood flows.

PCD	Value	
BFISOIL	0.5199	
SAAR	714.82	mm
FARL	1	
DRAIND	0.721	km/km^2
S1085	0.1	m/km
ARTDRAIN2	0	
ARTDRAIN2	0	
URBEXT	0.3589	

Table 6-1 Physical Catchment Descriptors from FSU Web Portal

Initially, various alternative statistical methods were used and the results of these are reproduced in Table 6-2 (details of these calculations are included in Appendix B). All flow estimates include a climate change factor of 20%.

Typically, peak flow estimates for the 1% AEP flood event are below 1.0m^3/s. The only exception is the flow estimate given by IH124 which is over three times the next greatest estimate and not consistent with the size of the catchment and the drainage infrastructure in the area. IH124 it generally considered to over-estimate peak flood flows *{WP4.2 Flood Estimation in Small and Urbanised Catchments – OPW 2012}*. Therefore, the IH124 flow estimate will not be used and instead the flow estimates used will be the next greatest; i.e. those given by the FEH-Statistical method.

Method	1% AEP	0.1% AEP
	m^3/s	m^3/s
IH124	2.79	3.69
FSU Update	0.47	0.64
FSU-3V	0.14	0.18
FSU_7V	0.37	0.51
FEH-Statistical	0.89	1.20

Table 6-2 Estimates for Peak Flood Flows

6.2 Pre-development Hydrological Model

A hydrological model was prepared to simulate flow patterns during the 1% and 0.1% AEP rainfall events. This model was developed using the River and Flood Analysis module of the industry standard package Infrastructure Ultimate Design Suite produced by Autodesk. The hydrological modelling within this module is itself based on the HEC-RAS modelling software produced by the US Army Corps of Engineers.

The module calculates flood risk zones for the catchment based on the peak flood flows and the following:

- a terrain model created using topographical survey data;
- dimensions of culverts and other drainage structures;
- appropriate values for the roughness coefficient 'Manning's n' as determined from visual inspection of the Site.

Culvert downstream of Site

As described above, the stream is culverted downstream of the Site. This culvert comprises two 600mm diameter pipes at its inlet. A CCTV survey of the culvert revealed that one of the pipes changes to 450mm diameter approximately 20m from the inlet. Furthermore, both pipes show significant blockages that greatly reduce the capacity of the culvert; the extent of these blockages was such that the survey could not be completed for the full length of the culvert.

In regard to this culvert, the hydraulic models assumes:

- the culvert comprises a 600mm dia. pipe and 450mm dia. pipe for its entire length;
- the culvert will be cleared of all obstructions and maintained free of debris / deposition throughout the operational life of the proposed development;
- the maximum depth of deposition in the culvert will be 100mm.

Pre-Development Fluvial Flood Risk Zones at the Development Site

The map in Figure 6-2 shows the existing fluvial flood risk zones determined using the hydrological model described above. Peak water levels are as follows:

- 1.0% AEP Flood Event 72.15 m;
- 0.1% AEP Flood Event 72.53 m.

The Site was found to be not affected by either 1% or 0.1% AEP flood risk zones.

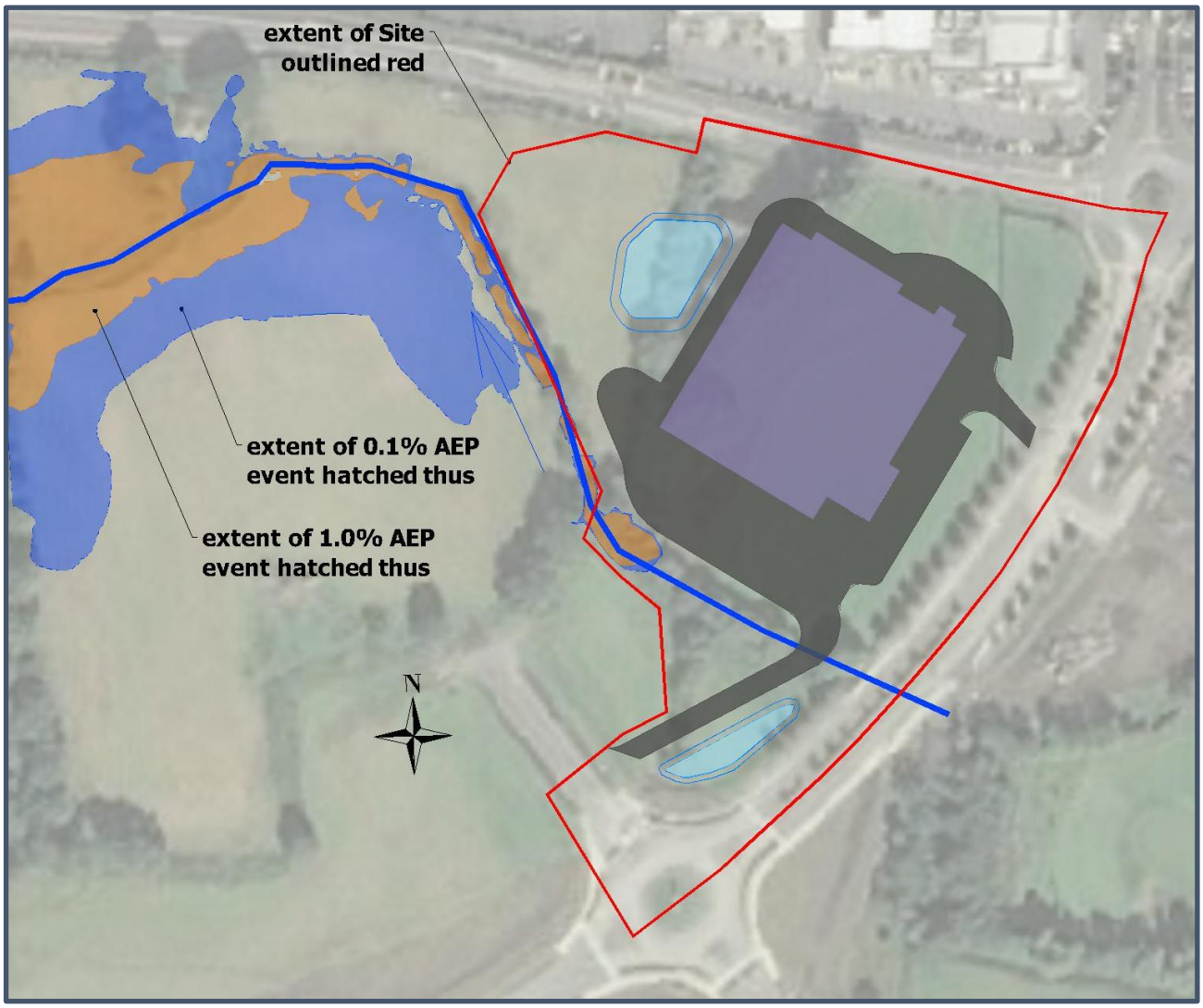


Figure 6-2 Fluvial flood risk zones - Pre-Development

6.3 Development Proposals - Surface Water Drainage

The surface water drainage system for the proposed development has been designed by Pinnacle Consulting Engineers who have provided design calculations demonstrating compliance with the Greater Dublin Strategic Drainage Study in the schedule of documents listed in Appendix A.

Full compliance with GDSDS ensures the drainage system ensures the flood regime in the receiving stream will not be affected, thus not giving rise to flood risk elsewhere.

6.4 Development Proposals - Road crossing of Baldonnell Stream

As described in Section 5.2, the Stream crosses under the Park Road through a twin-pipe culvert, each pipe 1400mm diameter. The proposed road crossing is 20m downstream from the Park Road culvert.

Figure 6-3 shows a box culvert to convey the Stream under the proposed crossing.

The internal dimensions of the box culvert are 1.4m in height and 3.5m in width and it thus has a significantly greater hydraulic capacity than that of the Park Road culvert.

To meet the requirements of the Office of Public Works (OPW) for granting Section 50 approval under the Arterial Drainage Act, culverts are typically required to have a minimum 300mm clearance between the 1% AEP water level and the soffit of the culvert. Figure 6-3 shows the box culvert will have 650mm clearance between the 1% AEP water level and the soffit level, thus comfortably exceeding OPW requirements.

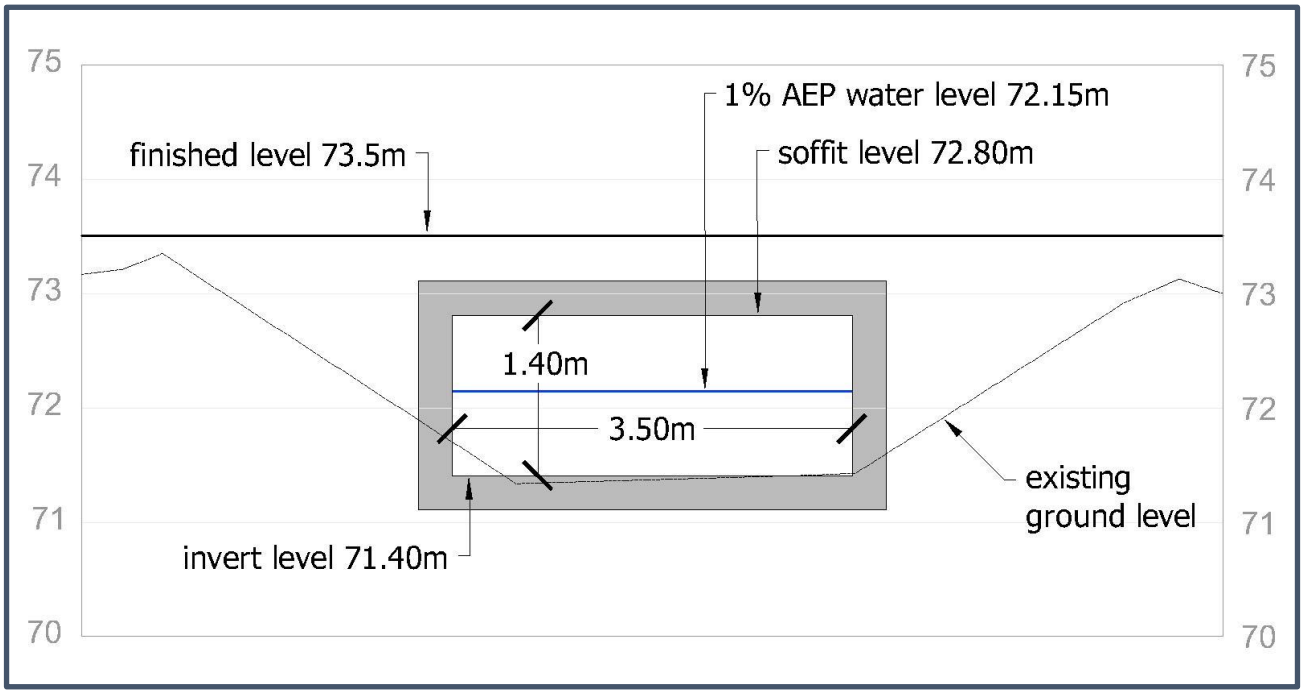


Figure 6-3 Fluvial flood risk zones - Pre-Development

6.5 Conclusion of Detailed Assessment of Fluvial Flood Risk

The proposed development will not be at risk of flooding from fluvial sources and will not give rise to fluvial flood risk elsewhere.

7. FLOOD RISK FROM GROUNDWATER

7.1 Flood Risk Indicators - Desktop

Various datasets were interrogated for indicators of flood risk from Ground Water. These comprise:

(i) *OPW National Flood Hazard Mapping*

Records from the National Flood Hazard Mapping website maintained by the OPW do not contain any evidence of flood events at the Site associated with fluctuations in groundwater level;

(ii) *Geological Survey of Ireland (GSI)*

The GSI maintains a web portal that provides data for Groundwater (https://www.gsi.ie), including groundwater flooding data.

The portal does not show any groundwater flooding at or in the vicinity of the Site.

The portal indicates the Site to be in an area of high groundwater vulnerability with subsoils of low permeability.

(iii) *Historical Ordnance Survey Mapping*

Historical OS maps shows a well immediately northwest of the Site. No other information is available for this well. There is no indication of springs at the Site.

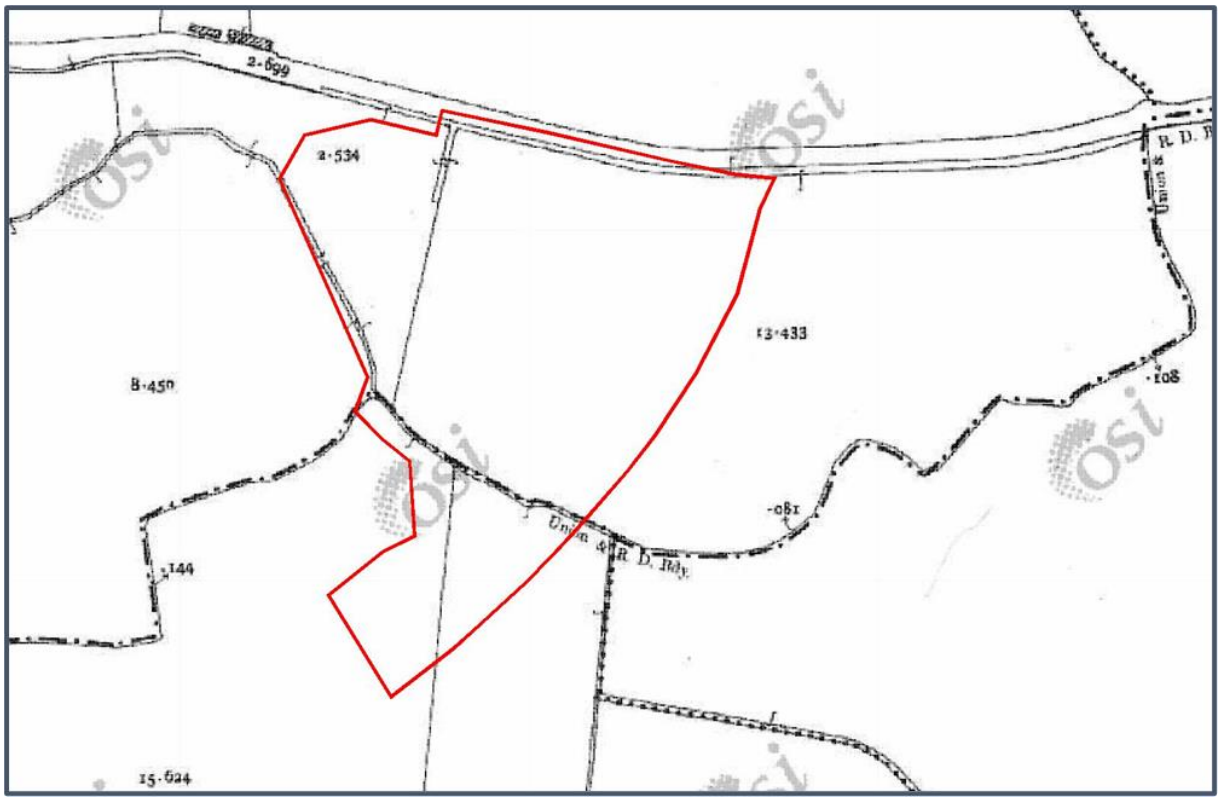


Figure 7-1 Historic OS Mapping

(iv) Ground Investigation

A ground investigation at the Site encountered groundwater generally between 1.0m and 2.0m blow existing ground level.

(v) Topography

The topography of the Site does not include localised low-lying areas that would give rise to groundwater ponding to a significant depth.

7.2 Flood Risk Indicators – Site Walkover

No evidence of flood risk from groundwater was observed during a Site walkover.

7.3 Initial Assessment

The ground investigation did encounter water-bearing strata relatively close to the surface however all indicators suggest the Site is not at risk from groundwater flooding. Detailed assessment of flood risk from this mechanism is not required.

8. PLUVIAL FLOOD RISK

8.1 Flood Risk Indicators - Desktop

A number of datasets were interrogated for indicators of pluvial flood risk:

(i) SFRA

The Strategic Flood Risk Assessment for the South Dublin County Council does not contain any information regarding pluvial flood risk at the Site.

(ii) OPW National Flood Hazard Mapping Website

The OPW maintains the National Flood Hazard Mapping website (floodinfo.ie) which contains information about locations that may be at risk from flooding. The source of this information includes Local Authorities and other historic records such as newspaper articles and other documentation about reported floods. This source does not register any previous flood events associated with pluvial flood risk at the Site.

(iii) CFRAM study programme undertaken by the OPW

Maps prepared for the CFRAM study programme do not show any pluvial flood risk at the Site.

(iv) Urban Drainage Systems

The Site is not affected by urban drainage systems that would give rise to overland flow across the Site.

8.2 Flood Risk Indicators – Site Walkover

No indicators of pluvial flood risk were observed during a site walkover

8.3 Surface water drainage system for the proposed development

The surface water drainage system for the proposed development has been designed by Pinnacle Consulting Engineers to comply with the Greater Dublin Strategic Drainage Study.

Full compliance with GDSDS ensures the drainage system will have sufficient capacity to accommodate rainfall events up to 1% AEP (including climate change) without causing pluvial flood risk within the development and without leading to an increase in pluvial flood risk elsewhere

8.4 Initial Assessment

Based on the indicators described in Section 8.1, on the site walkover described in Section 8.2 and the design of the surface water drainage system as described in Section 8.3, the initial assessment indicates the Site is not at risk from pluvial flooding and further assessment is not required.

9. RESIDUAL FLOOD RISK

Residual risk is the risk that remains after all mitigation measures to reduce the frequency of flooding have been taken.

9.1 Flood Risk Management Plan

The assessment to this point has found the proposed development is not at risk of flooding. However, all developments include some element of residual flood risk that must be addressed during their operational lives; for example the failure of building drainage due to lack of maintenance.

To address this residual risk, it is recommended that a Site-Specific Flood Risk Mitigation Plan prepared in accordance with the Guidelines is implemented throughout the operational life of the proposed development.

9.2 Blockage in culvert immediately downstream of the Site

As described already, the stream is culverted downstream of the Site. This culvert comprises two 600mm diameter pipes at its inlet. A CCTV survey of the culvert revealed that one of these pipes changes to 450mm diameter approximately 20m from the inlet. Furthermore, the CCTV survey found both pipes to have significant blockages that greatly reduce the overall capacity of the culvert; the extent of these blockages was such that the survey could not be completed for the full length of the culvert.

Therefore, the condition and size of the culvert downstream of the blockages is unknown and there is potential, for example in the event of culvert collapse, of the stream surcharging within the Site to a level exceeding that predicted by the hydrological models. To mitigate this risk, it is recommended that an overflow be constructed from the Site which would allow such excess to discharge to the stream immediately downstream of the Nangor Road. Subject to the capacity being available, this overflow could possibly discharge to existing surface water drainage in the Nangor Road but a dedicated surface water pipe might be required from the Site to a new outfall downstream of the Nangor Road.

The Flood Risk Mitigation Plan described in Section 9.1 must include should include a maintenance regime for all drainage features within the Site and for regular inspection of drainage features immediately upstream and downstream of the Site.

10. MINIMUM FINISHED LEVELS

In order to ensure that elements of development of the Site not compatible with water (i.e. roads, buildings etc.) are not at risk of flooding, the Guidelines recommend that floor levels and road levels be kept above the 1% AEP flood level with an appropriate allowance for freeboard.

A freeboard of 500mm is appropriate for floor levels and a freeboard of 250mm is appropriate for road levels.

The maximum water level during the 1% AEP flood event is 72.15m. The minimum floor level is 74.00m and the minimum parking level is 73.45m and so both meet the recommendations of the Guidelines.

11. DEVELOPMENT MANAGEMENT JUSTIFICATION TEST

A Development Management Justification Test was carried out in respect of the proposed development in accordance with Section 5.15 of the Flood Risk Management Guidelines and incorporating the findings of the subject FRA. Table 11.1 presents the results of this test which conclude that the proposed development satisfies the criteria of the Justification test.

1.1	*The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.*	
	Yes	
1.2	*The proposal has been subject to an appropriate flood risk assessment which demonstrates that :*	
	(i)	*the proposed development will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;*
		Yes
	(ii)	*the proposed development includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;*
		The proposed development includes proposals for treating and controlling surface water discharge which, will minimise flood risk to people, property, the economy and the environment as far as reasonably possible.
	(iii)	*the proposed development includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access;*
		The proposed development does not impact on any existing flood protection measures and will not prevent possible future flood risk management measures.
	(iv)	*the proposed development addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.*
		Yes.

Table 11.1 Justification Test

12. SUMMARY AND CONCLUSION

12.1 Summary

This report presents the findings of a Site-specific flood risk assessment (SSFRA) carried out by Kilgallen and Partners in regard to proposed development on lands to the south of the New Nangor Road (R134), Dublin 22 and on land within the townlands of Ballybane and Kilbride within Profile Park, Clondalkin, Dublin 22 on an overall site of 3.79hectares [‘the Site].

The SSFRA was carried out in accordance with the document *‘Planning System and Flood Risk Management – Guidelines for Planning Authorities’* [‘the Guidelines’].

Initial assessment

For an inland Site of this nature and for which there are no existing flood defence mechanisms that could affect flood risk at the Site, the potential flood risk mechanisms are Fluvial, Pluvial, Groundwater and failure of drainage infrastructure (assessed as a residual risk).

Initial assessment of existing flood risk indicators indicate the Site is not at risk from either Pluvial or Groundwater flooding. The designers of the surface water drainage system have confirmed the surface water drainage system for the proposed development is designed in accordance with the Greater Dublin Strategic Drainage Study and so will be sufficient to ensure surface water run-off from the proposed development will cause flood risk within the proposed development and will not give rise to flood risk elsewhere.

Initial assessment of flood risk indicators suggest the Site could be at risk from Fluvial Flooding during the 1.0% AEP and 0.1% AEP events. Accordingly, a detailed assessment of fluvial flood risk was carried out.

Detailed assessment of fluvial flood risk

The detailed assessment of fluvial flood risk confirmed the Site is not affected by Flood Risk Zone A (the 1% AEP flood event) and to a greater extent by Flood Risk Zone B (the 0.1% AEP flood event).

The surface water drainage system for the proposed development has been designed by Pinnacle Consulting Engineers in compliance with the Greater Dublin Strategic Drainage Study. Full compliance with GDSDS ensures the drainage system ensures the flood regime in the receiving stream will not be affected, thus not giving rise to flood risk elsewhere.

The proposed development includes a road crossing of the Park Road culvert. A box culvert with internal dimensions of 1.4m in height and 3.5m can installed at this crossing and would provide a significantly greater hydraulic capacity than that of the Park Road culvert and comfortably exceed OPW requirements for clearance between the soffit level of the culvert and the 1% AEP water level.

Finished levels for buildings and roads in the proposed development provide an appropriate freeboard above the 1% AEP water level in accordance with the Guidelines.

The detailed assessment of fluvial flood risk concluded the proposed development will not be at risk of flooding from fluvial sources and will not give rise to fluvial flood risk elsewhere.

Recommendations arising from assessment of residual flood risk

All developments include some element of residual flood risk that must be addressed during their operational life. To address this residual risk, it is recommended that a Site-Specific Flood Risk Mitigation Plan prepared in accordance with the Guidelines is implemented throughout the operational life of the proposed development. This plan should include a maintenance regime for all drainage features within the Site and for regular inspection of drainage features immediately upstream and downstream of the Site.

A CCTV survey of a culvert downstream of the Site revealed significant blockages that greatly reduce its capacity. The detailed fluvial flood risk assessment carried out for this report assumed the culvert is cleared of all obstructions and maintained free of debris / deposition throughout the operational life of the proposed development. However, the condition and size of the culvert downstream of the blockages is unknown and there is potential, for example in the event of culvert collapse, of the stream surcharging to the Site to a level exceeding that predicted by the hydraulic model. To mitigate this risk, it is recommended that an overflow be constructed from the Site which would allow such excess to discharge to the stream immediately downstream of the Nangor Road. Subject to the capacity being available, this overflow could possibly discharge to existing surface water drainage in the Nangor Road but a dedicated surface water pipe might be required from the Site to a new outfall downstream of the Nangor Road.

Justification Test

The proposed development was subject to and passed the Development Management Justification Test.

12.2 Conclusion

Assuming the implementation of the recommendations arising from this assessment, the proposed development is not at risk of flooding and will not increase flood risk elsewhere. The proposed development is therefore appropriate from a flood risk perspective.

Appendix A

Schedule of Relevant Planning Documents

PINNACLE CONSULTING ENGINEERS
DUB13-DR-SP-C124-V2-WS3-PIN-PROPOSED LEVELS & WATERMAIN LAYOUT
DUB13-DR-UG-C127-V2-WS3-PINPROPOSED DRAINAGE LAYOUT
DUB13-DR-SP-C130-V2-WS3-PIN-EXTERNAL WORKS LAYOUT
DUB13-RP-00-C001-V1-WS3-PIN

Appendix B

Estimation of Run-off from Stream Catchment

IH124 Estimation of Q_{100} and Q_{1000}			
$Q_{BAR\ RURAL} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$			
Characteristic	**Value**	**Unit**	**Source**
Area (A)	1.0	km^2	FSU
Average Annual Rainfall (SAAR)	715	mm	FSU
G1 % =	0	%	Fig I 4.18
G2 % =	0	%	Fig I 4.18
G3 % =	0	%	Fig I 4.18
G4 % =	0	%	Fig I 4.18
G5 % =	100	%	Fig I 4.18
Soil index (G) =	0.50	%	
$Q_{BAR\ RURAL}$ =	0.52	m3/sec	
CWI =	106.3		Fig I 6.62
CIND =	45.96		Eqn 7.2
NC =	0.75		Eqn 7.3
URBAN =	0.4		FSU
$Q_{BAR\ URBAN}$ / $Q_{BAR\ RURAL}$ =	1.367		Eqn 7.4
Q_{BAR} =	0.717	m3/sec	
Q_{100} / Q_{BAR} (Ireland)	1.96		FSR - Ireland
$Q_{1,000}$ / Q_{BAR} (Ireland)	2.6		FSR - Ireland
Q_{100} =	1.406	m3/sec	
$Q_{1,000}$ =	1.865	m3/sec	
Factorial Error Factor =	1.651		Page 37 IOH124
Climate Change Factor =	1.2		FRMG
Q_{100} =	**2.79**	**m3/sec**	
$Q_{1,000}$ =	**3.69**	**m3/sec**	

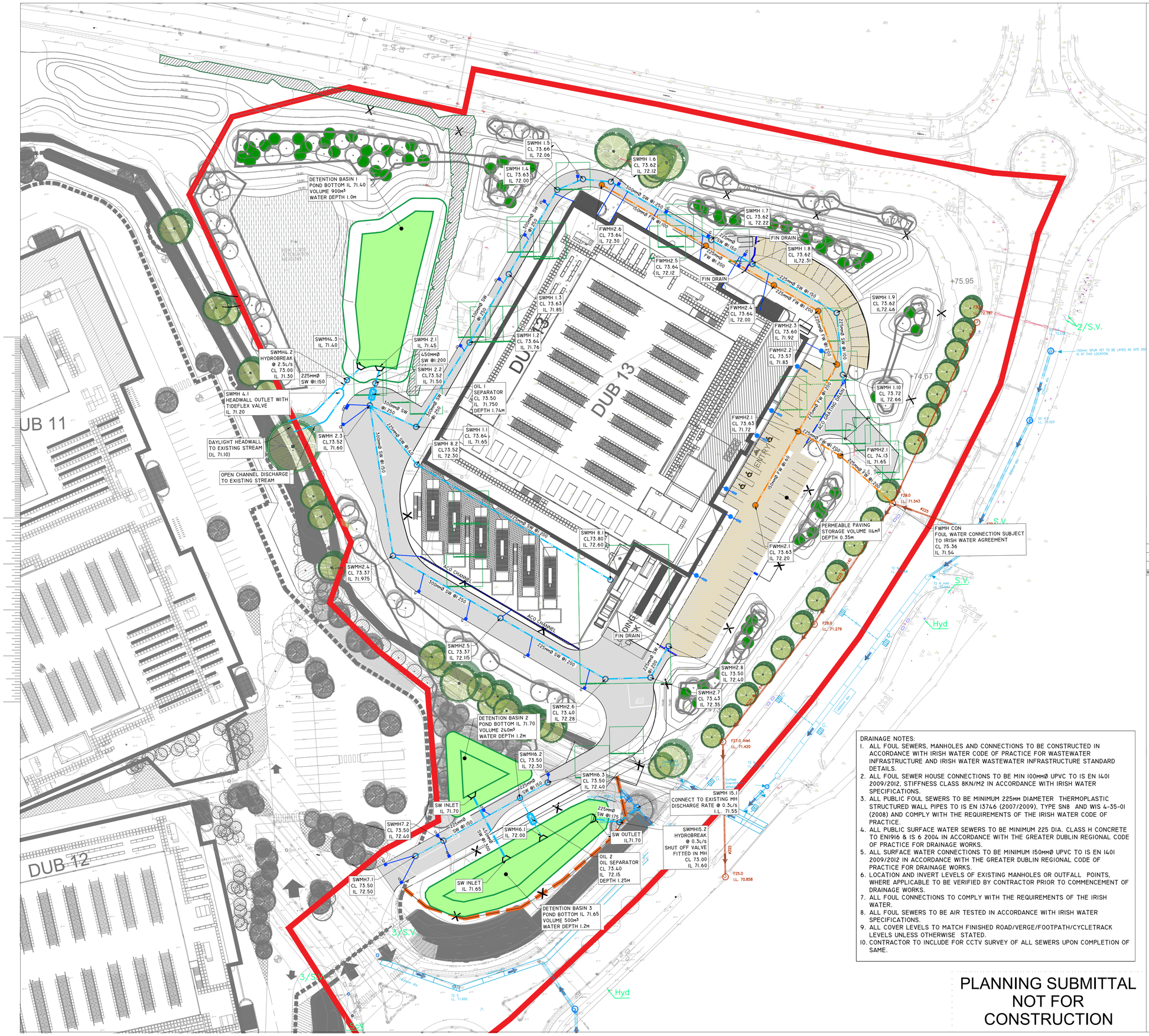
FSU Update estimation of Q_{100} & Q_{1000}			
Characteristic	**Value**	**Unit**	**Source**
Area	1.0	km^2	FSU Portal
SAAR	715	mm	FSU Portal
BFI_{soil}	0.520		FSU Portal
FARL	1.0		FSU Portal
S1085	0.10	m/km	FSU Portal
$QMED_{rural}$	0.09	m3/s	
URBEXT	0.36		FSU Portal
$QMED_{urban}$	0.14		
Climate Change Factor	1.2		OPW
Q_{100} / $QMED_{rural}$	2.77		FSU Portal
Q_{1000} / $QMED_{rural}$	3.74		FSU Portal
Q_{100}	**0.473**	**m3/sec**	
$Q_{1,000}$	**0.639**	**m3/sec**	

FSU-3V estimation of Q_{100} & Q_{1000}			
Characteristic	**Value**	**Unit**	**Source**
Area	1.0	km^2	FSU Portal
BFI_{soil}	0.520		FSU Portal
SAAR	715	mm	FSU Portal
QMED	0.041	m3/s	
Climate Change Factor	1.2		OPW
Q_{100} / QMED	2.77		
Q_{1000} / QMED	3.74		
Q_{100}	**0.136**	**m3/sec**	
$Q_{1,000}$	**0.183**	**m3/sec**	

FSU-7V estimation of Q_{100} & Q_{1000}			
Characteristic	**Value**	**Unit**	**Source**
Area	1.0	km^2	FSU Portal
BFI_{soil}	0.520		FSU Portal
SAAR	715	mm	FSU Portal
FARL	1.0		FSU Portal
DRAIND	0.72	km/km^2	
S1085	0.10	m/km	FSU Portal
ARTDRAIN	0.00		
$QMED_{rural}$	0.072	m3/s	
URBEXT	0.36		FSU Portal
$QMED_{urban}$	0.11		
Climate Change Factor	1.2		OPW
Q_{100} / $QMED_{rural}$	2.77		FSU Portal
Q_{1000} / $QMED_{rural}$	3.74		FSU Portal
Q_{100}	**0.375**	**m3/sec**	
$Q_{1,000}$	**0.506**	**m3/sec**	

FEH-Statistical estimation of Q_{100} & Q_{1000}			
Characteristic	**Value**	**Unit**	**Source**
Area	1.0	km^2	FSU Portal
SAAR	715	mm	FSU Portal
FARL	1.0		FSU Portal
BFI_{soil}	0.520		FSU Portal
QMED	0.27	m3/s	
Climate Change Factor	1.2		OPW
Q_{100} / QMED	2.77		FSU Portal
Q_{1000} / QMED	3.74		FSU Portal
Q_{100}	**0.885**	**m3/sec**	
$Q_{1,000}$	**1.195**	**m3/sec**	

Technical Appendix 10.3A: Foul and Surface Water Drainage Layout



Design originator:

BURNS McDONNELL

10 Bishops Square, London E1 6AO, United Kingdom

www.burnsmcd.com/locations/London

www.burnsmcd.com/services

GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

LEGEND

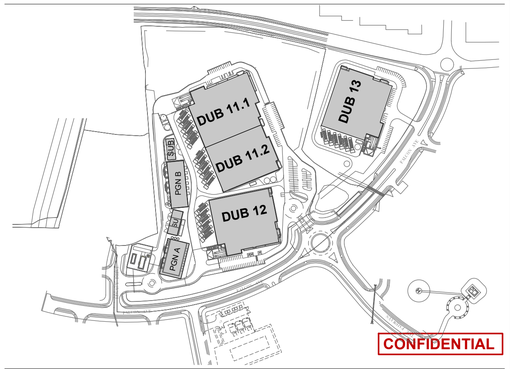
- PROPOSED PRIVATE SURFACE WATER SEWER
- PROPOSED PRIVATE FOUL SEWER
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PUBLIC FOUL SEWER
- EXISTING PUBLIC SURFACE WATER SEWER
- MANHOLE BACKDROP (BDI)
- DRAINAGE CHANNEL
- DRAINAGE RUN TO BE ABANDONED
- TX — INTERNAL FOUL GULLY PIPE
- G — ROAD GULLY
- RE — RODDING EYE
- SW DISTRIBUTION BOX (SWDB)
- SILT TRAP (ST)
- I500 SURFACE WATER SEWER
- RWP — RAINWATER DOWNPIPE
- SRWP — SIPHONIC RAINWATER DOWNPIPE
- 69.200 — PROPOSED LEVEL
- 69.200 — EXISTING TIE IN LEVEL
- +67.72 — EXISTING LEVEL
- SITE BOUNDARY
- ATTENUATION POND

DRAINAGE NOTES:

1. ALL FOUL SEWERS, MANHOLES AND CONNECTIONS TO BE CONSTRUCTED IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE AND IRISH WATER WASTEWATER INFRASTRUCTURE STANDARD DETAILS.
2. ALL FOUL SEWER HOUSE CONNECTIONS TO BE MIN 100MMØ UPVC TO IS EN 1401 2009/2012. STIFFNESS CLASS 8KN/M2 IN ACCORDANCE WITH IRISH WATER SPECIFICATIONS.
3. ALL PUBLIC FOUL SEWERS TO BE MINIMUM 225MM DIAMETER THERMOPLASTIC STRUCTURED WALL PIPES TO IS EN 13746 (2007/2009), TYPE SN8 AND WIS 4-35-01 (2008) AND COMPLY WITH THE REQUIREMENTS OF THE IRISH WATER CODE OF PRACTICE.
4. ALL PUBLIC SURFACE WATER SEWERS TO BE MINIMUM 225 DIA. CLASS H CONCRETE TO EN1916 & IS 6 2004 IN ACCORDANCE WITH THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS.
5. ALL SURFACE WATER CONNECTIONS TO BE MINIMUM 150MMØ UPVC TO IS EN 1401 2009/2012 IN ACCORDANCE WITH THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS.
6. LOCATION AND INVERT LEVELS OF EXISTING MANHOLES OR OUTFALL POINTS, WHERE APPLICABLE TO BE VERIFIED BY CONTRACTOR PRIOR TO COMMENCEMENT OF DRAINAGE WORKS.
7. ALL FOUL CONNECTIONS TO COMPLY WITH THE REQUIREMENTS OF THE IRISH WATER.
8. ALL FOUL SEWERS TO BE AIR TESTED IN ACCORDANCE WITH IRISH WATER SPECIFICATIONS.
9. ALL COVER LEVELS TO MATCH FINISHED ROAD/VERGE/FOOTPATH/CYCLETRACK LEVELS UNLESS OTHERWISE STATED.
10. CONTRACTOR TO INCLUDE FOR CCTV SURVEY OF ALL SEWERS UPON COMPLETION OF SAME.

PLANNING SUBMITTAL
NOT FOR
CONSTRUCTION

Rev.	Rev. Date	Drawn By	Checked By	Description
V4	13/03/2023	FJVR	SOR	SITE PLAN UPDATED
V3	08/02/2023	FJVR	SOR	SITE PLAN UPDATED
V2	09/09/2022	FJVR	SOR	ISSUED FOR PLANNING



CONFIDENTIAL

Client: VANTAGE DATA CENTERS

Architect: Hyphen
HYPHEN ARCHI IRELAND LTD
Unit G2, Aviemore House, Hill Street
Monaghan, H18 H928
Republic of Ireland

Mechanical/ Electrical/ Public Health/ Automation/ Telecoms/ Security /Fire Protection Engineer:
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BURNS & McDONNELL
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London E1 6AO
United Kingdom

Structure/ Civils Engineer:
..\X--Refs\pinnaclelogo.png
PINNACLE CONSULTING ENGINEERS
Alchemy, Bessemer Rd,
Welwyn Garden City, AL7 1HE
United Kingdom

BIM coordinator:	Approved by:	Checked by:	Drawn by:
-	JM	SOR	FJVR

Project address:

Profile Park, Dublin 22, Ireland
53° 19' 1.40"N 6° 26' 40.80"W
-

Drawing title:

PROPOSED DRAINAGE LAYOUT
-
-

Sheet number: 127

Format / Size:	Scale:	Status:	Date:	File Code:	Rev.
A1 594x841	1:500	ISSUED	09/09/2022	DUB13-DR-UG-C127-V2-WS4-PIN	V4

Technical Appendix 10.4N: Engineering Planning Report Letter of Conformity

PINNACLE
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Wednesday 01 March 23

Planning Department

South Dublin County Council

County Hall, Tallaght

Dublin 24

D24 A3XC

Ref: P2207053

RE: Vantage Data Centres Dub 11 Ltd., Construction of 1No. Two Storey Data Centre, Townlands of Ballybane & Kilbride within Profile Park, Clondalkin, Dublin 22

Planning Reg. Ref. No. SD22A/0420

Further to the Additional Information request pertaining to Items 4, 10, 13 & 14(a) in respect of the above development, as received from the Local Authority, dated 12th January 2023, we would respond as follows:-

Item 4: *The applicant is requested to submit a revised layout not less than 1:500 scale showing a footpath and cycle lane along the northern boundary to match the existing further west along the R134. The footpath and cycle lane shall be constructed to SDCC standards for public roads. The works on the public road will be undertaken by the applicant as part of the overall planning permission. The applicant is requested to secure the relevant letter of consent from SDCC.*

Response:

Refer to Pinnacle Consulting Engineers Drawing No. DUB13-DR-XX-C104-V1-WS3-PIN-C104 for details of the layout showing a footpath and cycle lane along the northern boundary to match the existing further west along the R134. The footpath and cycle lane will be constructed to SDCC standards for public roads.

Item 10: *The applicant is requested to demonstrate compliance with the SDCC SUDS Design Guide 2022, and Policies GI3, GI4, GI5, IE3, SM2, SM7, and sections 4.3.1, 12.7.6, 12.11.1, and 12.11.3. of the South Dublin County Development Plan 2022 - 2028 in relation to sustainable drainage systems.*

(B) In relation to SUDs, the applicant is requested to submit plans showing how surface water shall be attenuated to greenfield run off rates and showing what SuDS (Sustainable Drainage Systems)are proposed.

(C) SUDs Management - The applicant is requested to submit a comprehensive SUDS Management Plan to demonstrate that the proposed SUDS features have reduced the rate of runoff into the existing surface water drainage network. A maintenance plan should also be included as a demonstration of how the system will function following implementation.

(D) Natural SUDS features should be incorporated into the proposed drainage system for the development such as bio-retention/constructed tree pits, permeable paving, green roofs, filtration planting, filter strip etc. In addition, the applicant should demonstrate how the proposed natural SUDS features will be incorporated and work within the drainage design for the proposed development. The applicant is requested to refer to the recently published 'SDCC Sustainable Drainage Explanatory, Design and Evaluation Guide 2022' for acceptable SUDS tree pit details.

(E) The applicant is requested to submit a report to show surface water attenuation calculations for proposed development. Show on a report and drawing what surface water attenuation capacity each SuDS (Sustainable Drainage System) system has in m3 . Show in report what surface water attenuation capacity is required for proposed development. Show what different surface types, areas in m2 are proposed such as, green roofs, permeable paving, buildings, roads and their respective run off coefficients. Submit a drawing

Response:

(a) Compliance has been met as contained within the SDCC SUDS Design Guide 2022 and all relevant policies of the SDCC County Development Plan 2022 – 2028 pertaining to Sustainable Drainage, have been addressed as far as is practical and as demonstrated within this submission – refer below:-

- Policy G13 – Sustainable Water Management – This policy has been met and is covered off in the documentation as submitted by Ramboll / Neo Environmental and deals with the protection, enhancement, amenity & biodiversity value of existing watercourses, including for flood risk management & water quality etc. The integrity of riparian corridors along the edge of watercourses also forms part of this policy.

  Further to the above, SuDS elements have been addressed in the form of restricting the rate of discharge off the site via the introduction of flow control mechanisms, i.e. Hydrobrake manholes. Water quality has also been improved via the use of permeable paving and petrol / oil interceptors.

- Policy G14 – Sustainable Drainage Systems – Elements of this policy have been met in the form of restricting the overall run-off from the site to Green field run-off rates.

The surface water has been managed in the form of small sub-catchments, incorporating a treatment train discharge via an open channel which discharges into the existing watercourse.

- Policy G15 – Climate Resilience – This calls for the enhancement of the biodiversity and ecosystems. Another objective is for the provision of green roofs.

  Documentation as submitted by Ramboll / Neo Environmental provide information pertaining to this policy. Green roofs have not been considered in this instance, as it is an element that isn't normally associated with data centre developments.

- Policy IE3 – Surface Water & Groundwater – This calls for the management of surface water and enhancement of ground and surface water quality.

  Elements of this policy have been addressed by introducing detention basins, permeable paving, interceptors & flow restrictors. Responses to groundwater have also been addressed by submissions from Ramboll / Neo Environmental.

- Policy SM2 – Walking & Cycling – This deals with sustainable modes of travel, prioritizing walking and cycling facilities.

  Elements of the above have been dealt with under Item 4, as contained within this response.

- Policy SM7 – Car Parking & EV Charging – Elements of Objective 9 within this policy, have been complied by the introduction of permeable paving areas into the scheme, together with structural tree pits.

- 4.3.1 - Components of the GI Network – Responses to the majority of queries pertaining to the GI Network have been addressed in submissions by Kevin Fitzpatrick Landscape Architecture (KFLA) & Ramboll / Neo Environmental.

- 12.7.6 – Car Parking Design & Layout – This was addressed in the response under Policy SM7 above.

- 12.11.1 – Water Management:– (i) Flood Risk Assessment - an independent flood risk assessment has been carried out by Kilgallen & Partners in respect of this development; (ii) Surface Water – the surface water outflow has been calculated in accordance with greenfield run-off rates using the Qbar calculation (refer Appendix A); (iii) Sustainable Urban Drainage Systems (SuDS) – (a) in meeting SuDS requirements, the following have been installed - detention basins, permeable paving & tree pits, (b) the existing stream has been bridged over as opposed to being culverted and the outflow from Detention Basin 1 has been conveyed in an open channel prior to discharging into the existing stream; (iv) Groundwater – this has been addressed by Ramboll / Neo Environmental; (v) Rain Water Harvesting – this has not been proposed in this scheme.

- 12.11.3 – Waste Management – this item has been fully addressed in submissions by Ramboll / Neo Environmental.

(b) The proposed Drainage Layout, Dwg. No. DUB13-DR-UG-C127-V2-WS4 Rev. V2, issued as part of the planning pack, clearly identified the Hydrobrake manholes, i.e. SWMH5.1 & SWMH 4.2, with associated restricted outflow rates of 0.3l/s & 2.5l/s respectively. The total green field run-off rate was calculated and issued as part of the surface water calculations, as contained within Appendix B of the Engineering Planning Report. The total allowable outflow from the development, based on the Qbar calculation is 2.9l/s and we have restricted the total outflow from the development to 2.8l/s.

Further to the above, the Drainage Layout, Dwg. No. DUB13-DR-UG-C127-V2-WS4 Rev. V3, as submitted as part of this response, has been slightly modified to accommodate revisions to the overall site masterplan. This drawing clearly illustrates the 2 No. Hydrobrake manholes, i.e. SWMH15.1 & SWMH 4.2, with associated restricted outflow rates of 0.3l/s & 2.5l/s respectively. As mentioned in (a) above, the total outflow has been restricted in accordance with the calculated Greenfield run-off formula – this calculation has been included in Appendix A.

This drawing also indicates all SuDS elements as indicated below:-

Attenuation Storage Element	**Total Storage Volume**
3 No. Detention Basins	1,640m^3
Permeable Paving	114m^3
3 No. Structural Tree Pits	60m^3
All Elements Combined	1,814m^3

(c) Filtration through the permeable paving into the stone sub-base below provides for reduced peak flows to watercourses thereby reducing the risk of flooding downstream. In addition, the aggregate sub-base provides for enhanced water quality, prior to discharge. Other benefits include the following:-

- Permeable Paving is a ‘source control’ method. Water is managed and dealt with on-site without piping off to storage tanks or surface water treatment systems.
- The Water Framework Directive (Directive2000/60/EC) requires that surface water discharge is managed to ensure that risk of contamination or pollution are mitigated. Permeable Paving systems filter contaminants by microbial action. There is no requirement for additional filtering/polishing with Permeable Paving in normal use
- Separate attenuation tank systems are not required
- No need for gullies or channels or conventional drainage
- Recharges ground water
- Roofs, roads, and other non-permeable areas can be discharged into permeable paving (no gullies required)
- No ponding or surface water
- Collected water can potentially be re-used for non-potable purposes
- Improves water quality

Various manufacturers of permeable paving products have specific maintenance guidelines and a full maintenance regime is presented on supply of the product.

The hydrobrake mechanisms are provided within manholes in order to restrict the outflow to the rates specified. Most manufacturers of these products provide cleaning, maintenance and repair service teams and partners, providing specialist operations and maintenance (O&M) cover, keeping water management equipment and systems operating at peak performance, effectiveness and efficiency.

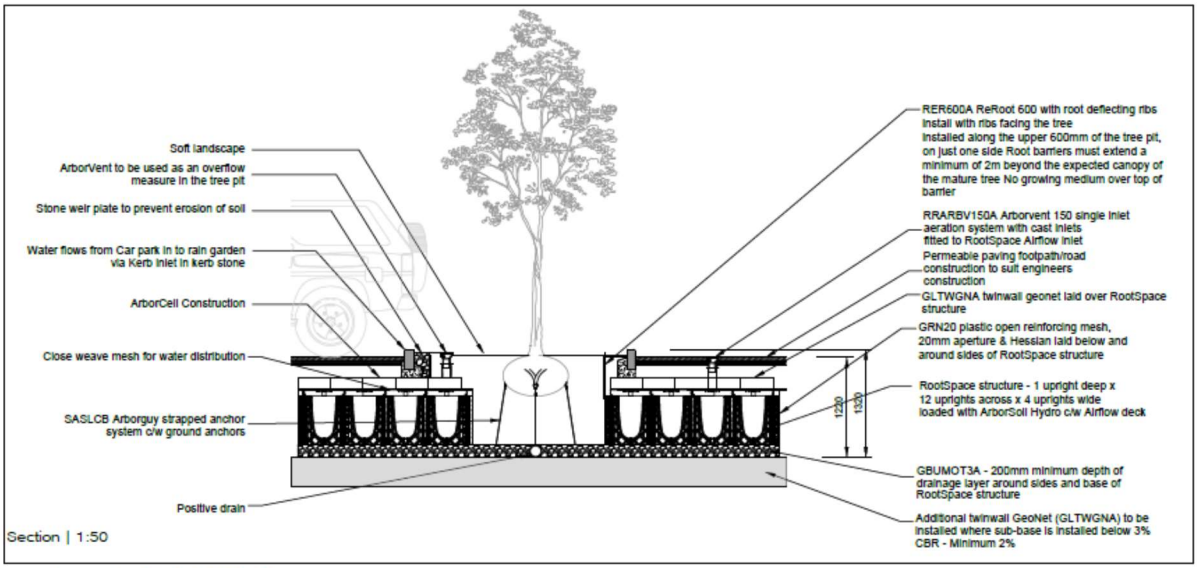
The maintenance of the detention basins and flood compensatory storage area will be in line with recommendations from the Landscape Architect (KFLA) on the scheme and / or recommendations by Parks Department.

(d) The SUDS elements which form part of this application are as follows:-

- 3 No. Surface water detention basins – the original application contained 2 No. Surface water detention basins
- Permeable paving – no change from the original application
- 3 No. Tree pits – new feature, these were not proposed under the original application
- Open swale / natural open channel (treatment train) linking Detention Basin 1 to the stream outfall – the original application contained a piped outfall from Detention Basin 1 into the stream
- Hydrobrake manholes restricting the outflow - no change from the original application
- Petrol / Oil Interceptors - no change from the original application

The proposed tree pits, as mentioned above, are detailed on Kevin Fitzpatrick Landscape Architecture Dwg. No. 0462 – 203 and these have been derived from the *'SDCC Sustainable Drainage Explanatory, Design and Evaluation Guide 2022'*.

An extract of same is included below:-



D Structural Tree Pit with SuDS Detail
1:50

(e) Refer to the External Works Layout, Dwg. No. DUB13-DR-SP-C130-V2-WS3 Rev. V3, as previously issued and since revised, in order to accommodate layout modifications, clearly details the various surface types in m^2 and their respective run-off co-efficients pertaining to this development.

The surface water attenuation capacities and respective storage elements are clearly notated on our Dwg. No. DUB13-DR-UG-C127-V2-WS4 Rev. V3, i.e. 3 No. Detention Basins, Permeable Paving & SuDS Tree Pits.

The overall attenuation volume for this development is ultimately derived from the green field Qbar run-off rate of 2.9l/s. In fact, attenuation on the site has now been over provided for, as the original submission catered for 970m^3 of storage in 2 No. detention basins + 114m^3 of storage within the permeable paving sub-base.

This has now been increased to 1,640m^3 of storage in 3 No. Detention Basins, the original 114m^3 of storage within the permeable paving sub-base and an additional circa 60m^3 of storage within the structural tree pit elements (3 No.). This has provided the overall site with an additional storage volume of attenuation of circa 730m^3.

Item 13: *(a) The sub catchment areas in the site do not add up to the total site area in surface water attenuation calculations submitted. Based on limited information submitted in terms of surface types and areas of same the surface water attenuation proposed of 970m3 or 1, 084m3 is undersized by approximately 2% to 11%. The applicant is requested to submit a report to show the areas in m2 of each surface type and their respective run off coefficients. Include the areas grasslands and explain why this has 0% runoff if that is the case. Note that the areas of all surface types should equal the total site area.*

(b) The applicant is requested to examine if any surface water pipes can be replaced with swales or filter drains at any location of the site. Submit a drawing showing what if any additional SuDS (Sustainable Drainage Systems) can be provided on site.

Response:-

(a) The area stated in the Qbar calculation of 1.43Ha, is the hard standing area of the site. This area is cross referenced to the areas of the various surface types as indicated in the extract below, as taken off the External Works Layout drawing - Dwg. No. DUB13-DR-SP-C130-V2-WS3 Rev. V3, as included in the submission.

KEY

	DESCRIPTION	AREA (m²)	CO-EFFICIENT
	PERMEABLE PAVING	759	0.6
	ROOF	6,384	1.0
	CONCRETE ROADS, GENERATOR YARDS, EXTERNALS CONCRETE SLABS	4,502	0.8
	ASPHALT ROAD	2,395	0.8
	WALKWAYS (CONCRETE)	394	0.8

The above area does not include for the existing road and walkways which fall under the redline boundary and it also excludes the landscaping areas as indicated on the layout.

Further to the above, the existing road (Falcon Avenue / Nangor Road) and walkways would never be considered as having to be attenuated under this development as they are entirely external, hence the area of same was not included. The landscaping berms and meadows contain tree and woodland planting and seeding elements, which cater for any rain water run-off falling on the berm elements themselves, due to their topography and shape and do not contribute run-off into any catchment areas feeding into the proposed surface water attenuation elements, hence the 0% co-efficient value.

Details of these landscaping elements are clearly detailed on Kevin Fitzpatrick Landscape Architecture Dwg. No. 0462 – 203. It should further be noted that the wet meadow area could not drain into the attenuation elements, as it is a depressed open area of the site, which is to be utilized as a flood compensatory storage area, as advised in the FRA produced by Kilgallen & Partners.

As stated in Item 10(e) above, even taking the worst case scenario of the attenuation being undersized by 11%, this would bring the total site attenuation requirement up to circa 1,203m^3. As we are now providing an overall volume of 1,814m^3, we would contend that we are in fact providing an over provision of attenuation in the amount of circa 611m^3.

As advised above, please refer to the External Works Layout, Dwg. No. DUB13-DR-SP-C130-V2-WS3 Rev. V3, for details pertaining to surface type areas and associated co-efficient percentages.

We have provided a detail explanation above, as to why all surface area types do not contribute to the total site area, particularly for the calculation of attenuation storage volumes.

(b) All of the proposed Suds features have been detailed in this response. As an additional element, the previously piped outfall from Detention Basin 1 into the stream, has been replaced by a natural open channel / open swale. This is further detailed under the response to Item 14.

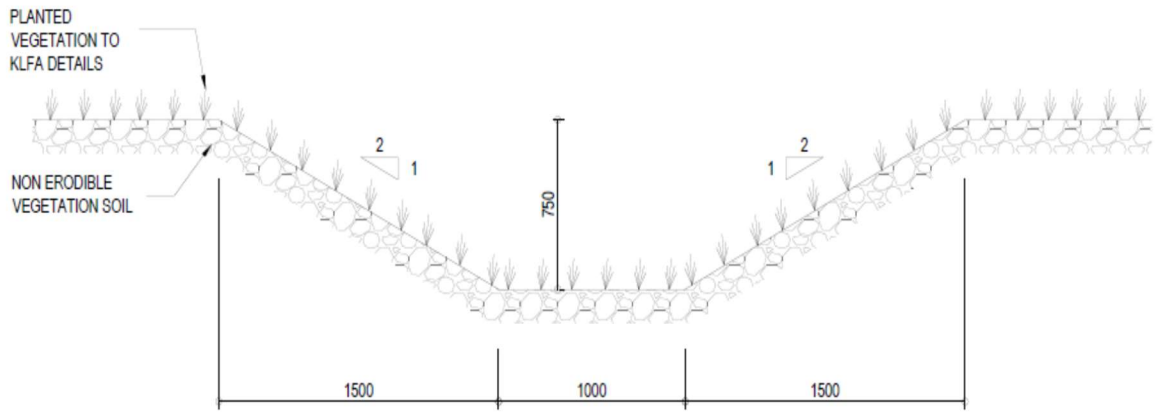
Item 14: *(a) where possible, the applicant is requested to replace proposed overflow pipe with an open swale or natural open channel.*

Response:-

The previously piped outfall from Detention Basin 1 into the stream, has been replaced by a natural open channel / open swale – refer Dwg. No. DUB13-DR-UG-C127-V2-WS4 Rev. V3.

Typical Bio Swale detail below.

PINNACLE
CONSULTING ENGINEERS



TYPICAL BIO SWALE DETAIL

Vdes = 0.7 m/s
Qdes = 0.94 m³/s

We trust that this adequately addresses the conditions as listed above.

Your sincerely

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PINNACLE
CONSULTING ENGINEERS

APPENDIX A

Surface Water Calculations

Qbar Calculation
Using IOH Report 124 for Sites < 25 km²

Catchment Name
DUB 13

[1]Q $_{bar}$= 0.00108 * (AREA)$^{0.89}$(SAAR)$^{1.17}$(SOIL)$^{2.17}$

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

SITE AREA =	1.43	Ha	Overall Redline Area
CATCHMENT AREA =	1.43	Ha (excl. Public Open Space)	Overall Catchment Area (Hectares) For catchments < 50 hectares in area, flow rates are linearly interpolated for smaller areas.
AREA =	0.014	km²	Area of the Catchment (km²)
SAAR =	754	mm	Standard Annual Average Rainfall (mm)
SOIL =	0.30		
$M5_{60}$	16.8	mm	
$M5_{2DAY}$	61.9	mm	
R=($M5_{60}$/$M5_{2d}$)	0.27		Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate .

Soil Type Expressed as a Percentage	Soil 1	Soil 2	Soil 3	Soil 4	Soil 5
	0	100	0	0	0
SOIL Value	0.15	0.30	0.40	0.45	0.50

Flood Return Event	[5]Growth Factor	Permitted Flow (l/s)
1	0.85	2.4
QBAR	1	2.9
10	1.67	4.8
30	2.1	6.0
50	2.33	6.6
100	2.6	7.4
200	2.85	8.1
1000	3.5	10.0

[4]QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	4.71 l/s

(With Allowance for the standard factorial error)

Pro-rata based on 50 Ha Site area to calculate Qbar

Q_{bar} =	0.00004	cumecs/Ha
Q_{bar} =	2.0	l/s/Ha

$Q_{bar[rural]}$ = 2.9 l/s

Catchment Characteristics			
DUB 13	Area (m²)	Runoff Coeff.	Effective Area (m²)
Roofs & Balconies - Type 1 (Draining to gullies)	-	1.00	0.0
Roofs - Type 2 (Draining to SUDS Soakaway features)	-	0.90	0.0
Green Roofs	-	0.85	0.0
Roads and Footpaths - Type 1 (Draining to gullies)	-	0.80	0.0
Roads and Footpaths - Type 2 (Draining to Suds features)	-	0.70	0.0
Paved Areas	-	0.80	0.0
Permeable Paving	-	0.70	0.0
Grass over Basement	-	0.70	0.0
Parks (contributing)	-	0.30	0.0
Public Open Space (non-contributing)	-	0.00	0.0

Include Public Open Space in Effective Catchment Area? no

Assumed open space area does not drain to surface water network

Effective Catchment Area **0.0** m²

Effective Catchment Runoff Coefficient **0.00**

Technical Appendix 11.1A: Ecological Impact Assessment Report

Appendix 11.1A: Ecological Impact Assessment

27/02/2023

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EXECUTIVE SUMMARY

1.1 An Ecological Impact Assessment (EcIA) has been undertaken on lands within Profile Park, Clondalkin, Dublin to assess the potential impacts from the Proposed Development on local ecology. Baseline information within the ecological assessment comprises of an initial desk-based assessment and a Fossitt habitat survey, which was extended to identify the presence or likely absence of protected species. These have been outlined within the relevant sections of this report.

1.2 The desk-based assessment identified six Special Areas of Conservation (SACs) and three Special Protection Areas (SPA) within the Zone of Influence of the Application Site boundary. These designated sites have been outlined and fully assessed within the supporting Appropriate Assessment (AA) report. Considering the limited hydrological connectivity, it was concluded that no potential significant effects will be incurred on any Natura 2000 site as a result of the Proposed Development.

1.3 Within 5km of the site boundary there are two Proposed Natural Heritage Areas (pNHAs).

1.4 A total of seven habitat types were noted during the Fossitt habitat survey undertaken in July 2022. The main habitat types recorded within the Application Site is Amenity Grassland (GA2). The lands directly under and adjacent to the Proposed Development are of low ecological value.

1.5 From the current survey findings and impact assessment conducted it is considered that the Proposed Development is unlikely to have significant impacts on local wildlife.

INTRODUCTION

Background

1.6 Neo Environmental Ltd has been appointed by Ramboll on behalf of Vantage Data Centres Dub 11 Limited (the "Applicant") to undertake an Ecological Impact Assessment for a data centre building and associated development (the "Proposed Development") on lands within Profile Park, Clondalkin, Dublin (the "Application Site").

Development Description

1.7 The development consists of the construction of one no. two storey data centres with a gross floor area of c. 12,893 sqm that will include office at first floor. The proposed data centre comprises of a two-storey data centre that will include 13 no. standby emergency generators with associate flues (each 25m in height) to be located to the west of the building. The data centre will be c. 14.23m to parapet height with the roof plant increasing the height to 18.5m overall. The data centre will be accessed from a new emergency and service vehicular access off Falcon Avenue as well as from the site of the already permitted data centres to the west. The data centre will be served by 60 car parking spaces that will be located generally to the east of the data centre, of which 3 no. spaces will be disabled spaces and 6 of these spaces will be provided for electrical charging vehicles. Covered bicycle parking provision will be provided within the site. The data centre will be enclosed by landscape berms and planting to the north and north-east.

Site Description

1.8 The site is located at Irish grid reference O 03911 30784, within Profile Park. Profile Park is located approximately 10 kilometres (km) to the south-west of Dublin city centre, within South Dublin County.

1.9 The site boundaries are defined by:

- New Nangor Road (R134) to the north;
- Falcon Avenue, Equinix and Grange Castle Golf Club to the east;
- Falcon Avenue to the south; and
- The consented Vantage data centre development (Planning Reference: SD21A/0241) to the west, currently agricultural fields.

1.10 The site is a triangular parcel of agricultural land, with a residential dwelling located in the north-west corner of the site, and an area of hardstanding within the south-west of the site.

The site covers a total area of 3.31 ha and lies at an elevation between approximately 74 and 75 m Above Ordnance Datum (m AOD).

1.11 The existing Baldonnell steam runs adjacent to the sites southern boundary and enters the southern section of the site, orientated in a north-west to south-east direction, flowing towards the east.

1.12 The site can currently be accessed from three access points, two from the north off New Nangor Road (R134), and one from Falcon Avenue on the eastern border, which leads to a roundabout on the R134 New Nangor Road.

1.13N1 It is noted that a 5m section of existing hedge located in the north-west of the site (no.H7-C2) was removed by a Contractor on an adjacent site, this has since been reinstated through remedial works on the site.

Scope of the Assessment

1.14 An Ecological Impact Assessment was completed at the Application Site. The aims of this report are to:

- Determine the main habitat types within and immediately adjacent to the Application Site in relation to the Proposed Development footprint;
- Identify any actual or potential habitat or species constraints pertinent to the development of the Application Site and to identify how the Proposed Development can avoid, mitigate and, if necessary, compensate for impacts on these actual or potential constraints;
- Assess the potential impacts of the Proposed Development during the construction, operation and decommissioning phases;
- Provide mitigation to reduce the impacts of the activities undertaken during the various phases of the Proposed Development; and
- Identify potential opportunities for the Proposed Development to enhance and add to the biodiversity resource within the site.

1.15 This allows for the identification of potential ecological impacts and the compilation of appropriate mitigation measures where applicable.

Statement of Authority

1.16 The assessment has been conducted by ecologists registered with the Chartered Institute of Ecology and Environmental Management (“CIEEM”). All work has been carried out in line with

the relevant professional guidance; CIEEM's Guidelines for Preliminary Ecological Appraisal[1] and the Environment, Heritage and Local Government's Guidance on Appropriate Assessments[2].

1.17 Dara Dunlop is a Qualifying Member of CIEEM with circa 4 years' experience in the ecology sector, including working for an ecological consultancy, undertaking a range of protected species surveys and extended phase 1 habitat surveys for industrial schemes, and land management of designated sites. Dara has authored a number of reports including Ecological Impact Assessments and Protected Species Reports for various developments.

1.18 Dylan Donoghue is an Ecologist in the process of receiving membership with the Chartered Institute of Ecology and Environmental management (CIEEM). Dylan has 2 years' experience in the Ecology Sector, including working for an ecological consultancy, undertaking bird and bat surveys.

1.19 Eiméar Rose Cunningham is an Ecologist and is a Qualifying Member of the Chartered Institute of Ecology and Environmental Management (CIEEM), with over 3 years' experience in the environmental/planning sector. She has experience of conducting habitat surveys as well as protected species surveys, including bats. In previous roles Eiméar Rose has experience of GIS map interpretation for large scale infrastructure projects. Furthermore, Eiméar Rose has experience in the completion of ecological report writing having co-authored a number of reports including Ecological Impact Assessments and Natura Impact Statements

[1] CIEEM, 2017. Guidelines for Preliminary Ecological Appraisal. Available at www.cieem.net

[2] Environment, Heritage and Local Government, 2009. Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities. Available at www.npws.ie

LEGISLATION AND PLANNING POLICY CONTEXT

European Legislation

1.20 European legislation relevant to the proposed development is outlined within **Table 1-1** below.

Table 1-1: Relevant European Legislation

Directive	Main Provisions
EU Habitats Directive 92/43/EEC	The EU Habitats Directive sets out the framework for the designation and protection of sites for nature conservation for species and habitats listed in Annex II, IV and V. The directive was adopted in 1992 as a response to the Bern Convention. "*The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance*" The protection of species outlined in the Habitats Directive is transposed into national legislation principally by 'EC (Natural Habitats) Regulations 1997 (amended)'[3].
The Birds Directive 2009/147/EC	European Union members meet their obligations for bird species under the Bern Convention and Bonn Convention, and more generally by the means of the EU Birds Directive. The Birds Directive sets out the criteria for Special Protection Areas including; a list of species requiring protection in Annex 1 of the Directive and mechanisms for protecting wild birds naturally occurring in Europe. This Directive is transposed into national legislation principally by the 'EC (Birds and Natural Habitats) Regulations 2011'[4]. The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. It sets broad objectives for a wide range of activities, although the precise legal mechanisms for their achievement are at the discretion of each Member State.

[3] Office of the Attorney General (1997), European Communities (Natural Habitats) Regulations 1997 (amended 1998, 2005), available at www.irishstatutebook.ie

[4] Office of the Attorney General (2011), European Communities (Birds and Natural Habitats) Regulations 2011, available at www.irishstatutebook.ie

Environmental Liability Directive 2004/35/EC	The Environmental Liability Directive aims to make those causing damage to the environment (water, land and nature) legally and financially responsible for that damage. The directive covers environmental damage caused by or resulting from occupational activities to species and natural habitats protected under the 1992 Habitats Directive and the 1979 Wild Birds Directive. Damage to protected species and natural habitats is "*any damage that has significant adverse effects on reaching or maintaining the favourable conservation status of such habitats or species*".
Bern Convention	The Bern Convention came into force in 1982, with the principal aims to ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase cooperation between contracting parties, and to regulate the exploitation of those species (including migratory species) listed in Appendix III.
Bonn Convention	The Bonn convention came into force in 1985. Contracting Parties work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species (listed in Appendix I of the Convention), concluding multilateral Agreements for the conservation and management of migratory species which require or would benefit from international cooperation (listed in Appendix II), and by undertaking cooperative research activities.

National Legislation

1.21 The principal national legislation governing the protection of wildlife and natural resources in Ireland is:

- The Wildlife Act 1976 (amended 2000)[5] - this is the principal legislation for the protection of wildlife in Ireland and outlines strict protection for species that have significant conservation value. The Act also provides a mechanism to give statutory protection to Natural Heritage Areas ("NHAs"). The amendment in 2000 broadens the scope of the Wildlife Acts to include most species, including the majority of fish and aquatic invertebrate species which were excluded from the 1976 Act.

[5] Office of the Attorney General (1976) Wildlife Act 1976 (amended 2000), available at www.irishstatutebook.ie

- EC (Birds and Natural Habitats) Regulations 2011 (amended 2015)[6] - transposes the EU directives into law. It protects species and priority habitats considered to be of European interest.
- Flora Protection Order 2015[7] - this Order makes it illegal to cut, uproot or damage a listed species in any way. It is illegal to alter, damage or interfere in any way with their habitats. This protection applies wherever the plants are found.
- The EC (Water Policy) Regulations 2003[8] – transposes the Water Framework Directive into national law.

1.22 The regulations contained within the above referenced legislation have all been taken into account during the production of this ecological report.

Planning and Development Act, 2000 (as amended)[9]

1.23 Relevant sections regarding ecology within the Planning and Development Act 2000 (amended 2006) are as follows:

First Schedule, Part IV Environment and Amenities

"5. (a) Preserving and protecting flora, fauna and ecological diversity.

(b) Preserving and protecting trees, shrubs, plants and flowers.

6. Protecting and preserving (either in situ or by record) places, caves, sites, features and other objects of archaeological, geological, historical, scientific or ecological interest."

Fifth Schedule

"19. Any condition relating to the protection of features of the landscape which are of major importance for wild fauna and flora.

20. Any condition relating to the preservation and protection of trees, shrubs, plants and flowers.

[6] Office of the Attorney General (2011) European Communities (Birds and Natural Habitats Regulations 2011 (amended 2015), available at www.irishstatutebook.ie

[7] Office of the Attorney General (2015) Flora Protection Order 2015, available at www.irishstatutebook.ie

[8] Office of the Attorney General (2003) European Communities (Water Policy) Regulations 2003, available at www.irishstatute book.ie

[9] Office of the Attorney General (2000) Planning and Development Act 2000, available at www.irishstatutebook.ie

21. Any condition relating to the preservation (either in situ or by record) of places, caves, sites, features or other objects of archaeological, geological, historical, scientific or ecological interest.

22. Any condition relating to the conservation and preservation of—

(a) one or more specific—

(i) (I) natural habitat types in Annex I of the Habitats Directive, or

(II) species in Annex II of the Habitats Directive which the site hosts,

contained in a European site selected by the Minister for Arts, Heritage, Gaeltacht and the Islands in accordance with Annex III (Stage 1) of that Directive,

(ii) species of bird or their habitat or other habitat contained in a European site specified in Article 4 of the Birds Directive, which formed the basis of the classification of that site,

or

(b) any other area prescribed for the purpose of section 10(2)(c).”

Part XIV

“212. – (1) A planning authority may develop or secure or facilitate the development of land and, in particular and without prejudice to the generality of the foregoing, may do one or more of the following:

(f) secure the preservation of any view or prospect, any protected structure or other structure, any architectural conservation area or natural physical feature, any trees or woodlands or any site of archaeological, geological, historical;

(g) secure the creation, management, restoration or preservation of any site of scientific or ecological interest, including any Nature Conservation Site.”

Planning Policy Statement 2015[10]

1.24 The aim of Planning Policy Statement 2015 is as follows:

“Planning legislation in Ireland seeks to ensure, in the interests of the common good, the proper planning and sustainable development of urban and rural areas.”

1.25 The Government outlined 10 key principles as a strategic guide in implementing the aim above. Relevant ecological principals outlined within this document include:

[10]Environment, Community and Local Government (2015), Planning Policy Statement 2015, available at www.environ.ie

"4. Planning must support the transition to a low carbon future and adapt to a changing climate taking full account of flood risk and facilitating, as appropriate, the use of renewable resources, particularly the development of alternative indigenous energy resources.

8. Planning will conserve and enhance the rich qualities of natural and cultural heritage of Ireland in a manner appropriate to their significance, from statutorily designated sites to sites of local importance, and including the conservation and management of landscape quality to the maximum extent possible, so that these intrinsic qualities of our country can be enjoyed for their collective contribution to the quality of life of this and future generations.

9. Planning will support the protection and enhancement of environmental quality in a manner consistent with the requirements of relevant national and European standards by guiding development towards optimal locations from the perspective of ensuring high standards of water and air quality, biodiversity and the minimisation of pollution risk."

South Dublin Development Plan 2022–2028 [11]

1.26 The Plan sets out an overall strategy for the proper planning and sustainable development of the County and consists of a written statement and accompanying plans and maps

1.27 Chapter 3 of the Plan refers to the county's natural heritage and contains a number of key policies (outlined below), which aim to protect and enhance biodiversity and designated sites within the county:

NCBH1: Objective 1: *To protect, conserve and enhance natural, built and cultural heritage features, seeking opportunities to identify, retain, protect, and incorporate heritage assets into plans and development.*

NCBH1 Objective 2: *To support the objectives and actions of the County Heritage Plan and the County Biodiversity Action Plan in the promotion and protection of natural, built and cultural heritage, and to take full cognisance of the County's Landscape Character Assessment and the County Geological Audit in the sustainable management of development.*

NCBH1 Objective 3: *To carry out an audit and assessment, based on an initial pilot study of the County's natural and built heritage assets including Council owned protected structures and archaeological features; to identify and safeguard these assets from the potential impacts of climate change; and to explore possible uses as part of climate change mitigation.*

NCBH2 Objective 1: *To support the implementation of the National Biodiversity Action Plan (2017- 2021) and the All-Ireland Pollinator Plan (2021-2025) and to support the adoption and implementation of the South Dublin County Biodiversity Action Plan (2020-2026) and Pollinator Action Plan (2021-2025) and any superseding plans.*

[11] Available from : https://www.sdcc.ie/en/devplan2022/adopted-plan/

NCBH2 Objective 2: To ensure the protection of designated sites in compliance with relevant EU Directives and applicable national legislation.

NCBH2 Objective 3: To protect and conserve the natural heritage of the County, and to conserve and manage EU and nationally designated sites and non-designated locally important areas which act as 'stepping stones' for the purposes of green infrastructure and Article 10 of the Habitats Directive.

NCBH2 Objective 4: To protect our rivers and in particular to avoid overdevelopment which could have an adverse effect on the biodiversity and ecosystems of the river.

NCBH3 Objective 1: To prevent development and activities that would adversely affect the integrity of any Natura 2000 site located within or adjacent to the County and promote the favourable conservation status of the habitats and species integral to these sites.

NCBH3 Objective 2: To ensure that plans, including land use plans, will only be adopted, if they either individually or in combination with existing and / or proposed plans or projects, will not have a significant adverse effect on a European Site, or where such a plan is likely or might have such a significant adverse effect (either alone or in combination), South Dublin County Council will, as required by law, carry out an appropriate assessment as per requirements of Article 6(3) of the Habitats Directive 92 / 43 / EEC of the 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, as transposed into Irish legislation. Only after having ascertained that the plan will not adversely affect the integrity of any European site, will South Dublin County Council adopt the plan, incorporating any necessary mitigation measures. A plan which could adversely affect the integrity of a European site may only be adopted in exceptional circumstances, as provided for in Article 6(4) of the Habitats Directive as transposed into Irish legislation.

NCBH3 Objective 3: To ensure that planning permission will only be granted for a development proposal that, either individually or in combination with existing and / or proposed plans or projects, will not have a significant adverse effect on a European Site, or where such a development proposal is likely or might have such a significant adverse effect (either alone or in combination), the planning authority will, as required by law, carry out an appropriate assessment as per requirements of Article 6(3) of the Habitats Directive 92 / 43 / EEC of the 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, as transposed into Irish legislation. Only after having ascertained that the development proposal will not adversely affect the integrity of any European site, will the planning authority agree to the development and impose appropriate mitigation measures in the form of planning conditions. A development proposal which could adversely affect the integrity of a European site may only be permitted in exceptional circumstances, as provided for in Article 6(4) of the Habitats Directive as transposed into Irish legislation.

NCBH4: Protect the ecological, visual, recreational, environmental and amenity value of the County's proposed Natural Heritage Areas and associated habitats and species.

NCBH5: Protect and promote the conservation of biodiversity outside of designated areas and ensure that species and habitats that are protected under the Wildlife Acts 1976 to 2018, the Birds Directive 1979 and the Habitats Directive 1992, the Flora (Protection) Order 2015, and wildlife corridors are adequately protected.

NCBH10: Protect against and prevent the introduction and spread of invasive species within the County and require landowners and developers to adhere to best practice guidance in relation to the control of invasive species.

NCB11: Review Tree Preservation Orders (TPO) within the County and maintain the conservation value of trees and groups of trees that are the subject of a Tree Preservation Order while also recognising the value of and protecting trees and hedgerows which are not subject to a TPO.

South Dublin County Council Draft Biodiversity Action Plan 2020-2026[12]

1.28 The preparation of this Biodiversity Action Plan is an objective of the South Dublin County Heritage Plan and the South Dublin County Council Development Plan 2022-2028. The South Dublin County Biodiversity Plan was prepared in the context of a range of national and international plans for biodiversity protection and enhancement

1.29 The National Biodiversity Plan lists a range of actions for biodiversity that aim to achieve this vision, arranged under a series of 7 Strategic Objectives. These objectives are:

- the mainstreaming of biodiversity issues across the decision-making in all sectors;
- the strengthening of the knowledge base for conservation, management and sustainable use of biodiversity;
- increasing public awareness and appreciation of biodiversity and ecosystem services;
- the conservation and restoration of biodiversity and ecosystem services in the wider countryside;
- the conservation and restoration of biodiversity and ecosystem services in the marine environment;
- the expansion and improved management of protected areas and species; and
- the strengthening of international governance for biodiversity and ecosystem services.

[12]https://consult.sdublincoco.ie/en/consultation/draft-biodiversity-action-plan-south-dublin-county-connecting-nature-2020-2026

Guidance Documents

BS 42020:2013 Biodiversity[13]

1.30 The British Standards Institute has published BS 42020:2013 Biodiversity. Code of practice for planning and development which offers a coherent methodology for biodiversity management. This document seeks to promote transparency and consistency in the quality and appropriateness of ecological information submitted with planning applications and applications for other regulatory approvals.

1.31 BS 42020:2013 cites CIEEM EcIA Guidelines as the acknowledged reference on ecological impact assessment. These guidelines provide recommendations on topics such as professional practice, proportionality, pre-application discussions, ecological surveys, adequacy of ecological information, reporting and monitoring.

CIEEM Guidelines

1.32 The Chartered Institute of Ecology and Environmental Management (CIEEM) have produced guidance on Ecological Impact Assessment[14] (EcIA) and Ecological Report Writing[15].

1.33 EcIA is a process of identifying, quantifying and evaluating potential effects from activities such as those related to development on habitats, species and ecosystems. This EcIA process follows the tasks set out in Table 1-2.

Table 1-2: EcIA Process

Task	Description
Scoping	Determining the matters to be addressed in the EcIA, including consultation to ensure the most effective input to defining the scope. Scoping is an ongoing process – the scope of the EcIA may be modified following further ecological survey/research and during impact assessment.
Establishing the baseline	Collecting information and describing the ecological conditions in the absence of the proposed project, to inform the assessment of impacts.
Important ecological features	Identifying important ecological features (habitats, species and ecosystems, including ecosystem function and processes) that may be affected, with reference to a geographical context in which they are considered important.

[13] BS 42020:2013 Biodiversity. Code of practice for planning and development
[14] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine.
[15] CIEEM (2017) Guidelines for Ecological Report Writing

Impact assessment	An assessment of whether important ecological features will be subject to impacts and characterisation of these impacts and their effects3. Assessment of the significance of the residual ecological effects of the project (those remaining after mitigation), including cumulative effects.
Avoidance, mitigation, compensation and enhancement	Incorporating measures to avoid, reduce and compensate negative ecological impacts and their effects, and the provision of ecological enhancements. Monitoring impacts and their effects. Evaluation of the success of proposed mitigation, compensation and enhancement measures.

1.34 The aims of their EcIA guidelines are to:

- promote good practice;
- promote a scientifically rigorous and transparent approach to EcIA;
- provide a common framework to EcIA in order to promote better communication and closer cooperation between ecologists involved in EcIA; and
- provide decision-makers with relevant information about the likely ecological effects of a project.

METHODOLOGY

Zone of Influence

1.35 The Zone of Influence (ZOI) is the area encompassing all predicted negative ecological effects from a proposed scheme and is informed by the habitats present within the site and the nature of the proposals. Due to the scale and nature of the proposal, it is considered that the ZOI will fall within the distances from the proposed solar farm outlined in **Table 1-3** below. These were therefore considered appropriate for gathering information for the desk study.

Table 1-3: Study areas for ecological features

ECOLOGICAL FEATURE	STUDY AREA
International/European statutory designations	15km, or wherever hydrological influence extends
National statutory designations	5km
Protected and Priority Species	2km
Fossitt habitat survey	50m

Desk Study

1.36 A desk-based assessment was undertaken to collate available ecological information for the Application Site and the surrounding area. This included a search of statutory designated sites within a 5km radius of the Proposed Development, including: Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar Sites, Nature Reserves (NRs), Wildfowl Sanctuaries, Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs). The descriptions of each of these sites was obtained utilising the National Parks and Wildlife Service (NPWS) website[16].

1.37 A data search was conducted though the National Biodiversity Data Centre (NBDC) to obtain information regarding protected/notable species within 2km of the Application Site boundary. The Application Site is located at Irish Grid Reference (IGR) O 03911 30784.

1.38 Additional information on the suitability of habitat in the surrounding area for bats was also obtained from the NBDC in the form of a habitat suitability map. The map provided enhanced information on the recorded distribution of bats and broad-scale geographic patterns of occurrence and local roosting habitat requirements for Irish bat species.

[16] NPWS website; available at: http://www.npws.ie/protected-sites.

Field Survey

Fossitt Habitat Survey

1.39 A Fossitt habitat survey was undertaken on the 20th of July 2022 by Eiméar Rose Cunningham. The Ecological Survey Area (ESA) covered all land within the Application Site and a 50m buffer around the entire site (where accessible).

1.40 Survey work was carried out in accordance with Fossitt habitat survey guidance[17]; habitats were mapped electronically in the field in order to produce a habitat map.

Species Scoping Survey

1.41 A species scoping survey was carried out to identify the presence of protected species, or the potential of the Application Site to support protected species. The aim of the survey was to provide an overview of the Application Site and to determine whether any further survey work was required.

1.42 No additional protected species surveys were undertaken at this time.

1.43 **Table 1-4** below outlines the relevant habitat and field signs that indicate the potential presence of protected or notable species within the ESA.

Table 1-4: Indicative Habitats and Field Signs of Protected Species

TAXON	INDICATIVE HABITAT(S)	FIELD SIGNS (IN ADDITION TO SIGHTINGS)
Bats	Roosts – trees, buildings, bridges, caves, etc. Foraging areas – e.g. parkland, water bodies, streams, wetlands, woodland edges and hedgerow. Commuting routes – linear features (e.g.) hedgerows, water courses, tree lines). See **Appendix C** for preferred foraging and commuting habitat for individual species.	In or on potential roost sites: droppings stuck to walls, urine spotting in roof spaces, oil from fur staining round roost entrances, feeding remains (e.g. moth wings under a feeding perch).
Badger *Meles meles*	Found in most rural and many urban habitats.	Excavations and tracks: sett entrances, latrines, hairs, well-worn paths, prints, scratch marks on trees.

[17] Fossitt (2000) A Guide to Habitats in Ireland

Taxon	Indicative Habitat(s)	Field Signs (In Addition to Sightings)
Otter *Lutra lutra*	Watercourses.	Holts (or dens), prints, spraints (droppings), slide marks into watercourses, feeding signs (e.g. fish bones).
Birds	Trees, scrub, hedgerow, field margins, grassland, buildings.	Nests, droppings below nest sites (especially in buildings of trees), tree holes.
Common lizard *Zootoca vivipara*	Rough grassland, log and rubble piles.	Sloughed skins.

Additional Surveys

1.44 Bat activity surveys were completed in August 2022 to determine the use of buildings on site by roosting bats. Two dusk emergence surveys; one of the shed in the southwest and one of the house in the northwest of the site were undertaken by Eiméar Rose Cunningham, Dylan Donoghue and Dara Dunlop on the 3rd August and the 30th August 2022. The results of 2022 bat survey is outlined in **Appendix B.**

1.45 No bats were observed emerging from either building within the Application Site, surveys indicate that the site is used by very low numbers of commuting bats.

Weather Conditions

1.46 **Table 1-5** describes the weather conditions at the time of survey giving air temperature (°C), wind speed (Beaufort force), cloud cover (percentage) and precipitation.

Table 1-5: Weather conditions at time of survey

Survey Date	Temperature (°C)	Wind Speed (Beaufort Scale)	Cloud-cover (oktas)	Precipitation
20/07/2022	17-19°c	3	7	None

Limitations

1.47 Results of the assessment undertaken by Neo Environmental are representative of the time that surveying was undertaken.

1.48 The absence of specific species records returned during the data search does not necessarily indicate absence of a species or habitat from an area, but rather that these have not been recorded or are perhaps under-recorded within the search area.

1.49 A Fossitt habitat survey does not aim to produce a full botanical or faunal species list or provide a full protected species survey, but enables competent ecologists to ascertain an understanding of the ecology of the site in order to:

- Identify broadly the nature conservation value of a site and preliminary assess the significance of any potential impacts on habitat/species recorded, and/or
- Confirm the need and extent of any additional specific ecological surveys that are required to identify the true nature conservation value of a site.

1.50 At the time of the initial survey, access was only permitted within the landownership boundary. The areas of land which formed the ESA which were not within the landownership boundary were viewed from field boundaries, with the use of binoculars, where needed. It is considered that the limited access to areas of land directly adjacent to the Proposed Development boundary has not unduly impacted upon the findings of the habitat or species scoping surveys.

Evaluation Methods

1.51 The evaluation of ecological receptors is based upon the CIEEM guidelines[18] (2018) which suggests that the value or potential value of an ecological resource or feature (for example a habitat type, species or ecosystems) should be determined within a geographical context (e.g. rare at a local level). Attributing a value to a receptor, which is also a designated site, is generally precise, as the designations themselves provide an indication of value.

Impact Assessment

1.52 The impact assessment process involves:

- identifying and characterising impacts and their effects
- incorporating measures to avoid and mitigate negative impacts and effects
- assessing the significance of any residual effects after mitigation
- identifying appropriate compensation measures to offset significant residual effects; and
- identifying opportunities for ecological enhancement.

[18] CIEEM (2018) Guidelines for the Ecological Impact Assessment in the UK and Ireland

1.53 The terms 'impact' and 'effect' are used commonly throughout ecological reports. Impact is defined as a change experienced by an ecological feature, while effect is defined as the outcome to an ecological feature from an impact. Impacts and effects can be positive, negative or neutral.

1.54 Assessment of potential impacts and effects needs to consider on-site, adjacent and more distant ecological features, including habitats, species and statutory and ecological designated sites.

1.55 This ecological impact assessment has been concluded by an experienced ecologist following CIEEM guidance[19].

[19] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine.

BASELINE CONDITIONS

Designated Sites

1.56 The Proposed Development does not lie within or directly adjacent to any statutory or non-statutory designated environmental sites.

1.57 Within the ZOI there are six Special Areas of Conservation (SACs) and three Special Protection Areas (SPA). Within 5km of the Application Site boundary there are two Proposed Natural Heritage Areas (pNHAs).

1.58 Each of these sites are outlined in **Table 1-6** below, and detailed within **Figure 1 of Appendix A**.

1.59 The site descriptions are derived from the original site citations available from NPWS[20].

Table 1-6: Designated Sites.

Site Code	Site Name	Qualifying/Notable Features	Distance (km) and Direction	Potential Connectivity with the Proposed Development Site
SAC				
001398	Rye Water Valley/Carton SAC	Petrifying springs with tufa formation (*Cratoneurion*) [7220] *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	5.88km northwest	None
001209	Glenasmole Valley SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (*	8.05km southeast	None

[20] http://www.npws.ie/protected-sites

		important orchid sites) [6210] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Petrifying springs with tufa formation (*Cratoneurion*) [7220]		
002122	Wicklow Mountains SAC	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110]	9.76km southeast	None

		Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] *Lutra lutra* (Otter) [1355]		
000397	Red Bog, Kildare SAC	Transition mires and quaking bogs [7140]	14.44km southwest	None
000210	South Dublin Bay SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310] Embryonic shifting dunes [2110]	15.21km east	Hydrological connectivity via the Baldonnell stream and the River Liffey
000206	North Dublin Bay SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	17.90km northeast	Hydrological connection via the Baldonnell stream and the River Liffey

		Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] *Petalophyllum ralfsii* (Petalwort) [1395]		
SPA				
004040	Wicklow Mountains SPA	Merlin (*Falco columbarius*) [A098] Peregrine (*Falco peregrinus*) [A103]	12.88km southeast	None
004024	South Dublin Bay and River Tolka Estuary SPA	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144]	14.81km east	Hydrological connectivity via the Baldonnell stream and the River Liffey (28km downstream)

		Dunlin (*Calidris alpina*) [A149] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194] Wetland and Waterbirds [A999]		
004006	North Bull Island SPA	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Oystercatcher (*Haematopus ostralegus*) [A130] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143]	19.71km east	Hydrological connectivity via the Baldonnell stream and the River Liffey

		Sanderling (*Calidris alba*) [A144] Dunlin (Calidris alpina) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Turnstone (*Arenaria interpres*) [A169] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]		
pNHA				
002104	Grand Canal pNHA	Canal system banked by hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland.	1.39km north	Hydrological connectivity via the Baldonnell stream
000128	Liffey Valley pNHA	River system	4.57km north	Hydrological connectivity via the Baldonnell stream

Habitats

1.60 A Fossitt habitat survey was undertaken in July 2022 which identified seven habitat types within the survey boundary; each of these is outlined in **Table 1-7** below. In addition, the habitat map is shown in **Figure 2 of Appendix A**.

Table 1-7: Habitat types on site

HABITAT TYPE	SPECIES PRESENT	OTHER OBSERVATIONS/ POTENTIAL FOR SPECIES
Building and Artificial Surfaces (BL3)	N/A	Two buildings were determined to have low bat roost potential.
Amenity Grassland (GA2)	Perennial ryegrass (*Lolium perenne*), creeping buttercup (*Ranunculus repens*), common nettle (*Urtica dioica*), daisy (*Bellis perennis*), ribwort plantain (*Plantago lanceolata*), white clover (*Trifolium repens*).	The majority of the site is comprised of amenity grassland. This habitat is generally considered to be of low ecological value.
Recolonising Bare Ground (ED3)	Rosebay Willowherb (*Chamerion angustifolium*), great willowherb (*Epilobium hirsutum*) and spear thistle (*Cirsium vulgare*).	This habitat is generally considered to be of low ecological value.
Scrub (WS1)	Bramble (*Rubus fruticosus*), spear thistle (*Cirsium vulgare*), cow parsley (*Anthriscus sylvestris*), perennial ryegrass (*Lolium perenne*).	A patch of scrub surrounds the building in the southwest of the application site. Provides some limited nesting opportunities for birds and
Depositing/Lowland rivers (FW2)	Brambles (*Rubus fruticosus*).	Watercourses are considered to be an important water source for local ecology at the site level.
Hedgerows (WL1)	Brambles (*Rubus fruticosus*), hawthorn (*Crataegus monogyna*), elder (*Sambucus nigra*), common nettle (*Urtica dioica*), European beech (*Fagus sylvatica*).	Providing bird nesting opportunities as well as foraging opportunities for many species.
Treelines (WL2)	European beech (*Fagus sylvatica*) Cypress (*Cupressus spp.*) and poplar (Populus spp.), hawthorn (*Crataegus monogyna*), bramble (*Rubus fruticosus*), horse chestnut (*Aesculus hippocastanum*), goat willow (*Salix caprea*), small leaved linden (*Tilia cordata*).	Providing bird nesting opportunities as well as foraging opportunities for many species.

Protected and Notable Species

Desk Study

1.61 The potential presence of protected species within the study area was assessed though a data search conducted through the NBDC. This identified records of invasive, rare, scarce and protected species within 2km of the Proposed Development location. The Application Site is located within the 2km grid squares: O03F. A database search was also carried out for adjacent grid squares to ensure a full assessment of the 2km radius, from Irish Grid Reference (IGR) O 03894 30791. These include 2km grid squares O03G, O03L, O03K, O02P and O02J.

1.62 Additional information on the suitability of habitat in the surrounding area for bats was also obtained from the NBDC in the form of a habitat suitability map. The map provided enhanced information on the recorded distribution of bats, and broad-scale geographic patterns of occurrence and local roosting habitat requirements for Irish bat species.

1.63 In addition, the Fossitt habitat survey included a species scoping survey in order to assess the potential of the site to support protected species.

1.64 Table 1-8 summarises the protected/notable species recorded within the search area, and their potential to be present within the Application Site.

Table 1-8: Summary of Biological Records

Species	Grids with Recordings of Species	Suitable Habitat or Field Signs Observed within Survey Area	Potential for species within Application Site
MAMMALS			
Eurasian Badger (*Meles meles*)	O02P	Yes, treelines, hedgerows and grassland habitats available	Yes
Western European hedgehog (*Erinaceus europaeus*)	O03K, O03F, O03G, O03L	Grassland and hedgerows offer some potential for commuting/foraging/ breeding	Yes
Brown long-eared bat (*Plecotus auritus*)	O03F, O03G, O03L	Yes, buildings on site offer low bat roosting	Yes

		potential, foraging potential along treeline	
Daubenton's bat (*Myotis daubentonii*)	O03F, O03G, O03L	Yes, buildings on site offer low bat roosting potential, foraging potential along treeline and stream	Yes
Leisler's bat (*Nyctalus leisleri*)	O03K, O03F, O03G, O03L, O02P	Yes, buildings on site offer low bat roosting potential, foraging potential along treeline and stream identified in flight	Yes
Pipistrelle (*Pipistrellus pipistrellus sensu lato*)	O03K, O03F, O03G, O03L, O02P	Trees unsuitable for roosting, however buildings on site offer low bat roosting potential, foraging potential along treeline and stream	Yes
Soprano pipistrelle (*Pipistrellus pygmaeus*)	O03K, O03F, O03G, O03L, O02P	Yes, buildings on site offer low bat roosting potential, foraging potential along treeline and stream	Yes
Pine Marten (*Martes martes*)	O03F	Yes, multiple habitats on site are suitable for species	Yes
European otter (*Lutra lutra*)	O03G, O02P	Yes, stream habitat available for foraging and commuting	Yes
American mink* (*Mustela vison*)	O03K, O02P	Yes, suitable habitat available in the form of a stream and treelines	Yes
Eurasian Pygmy Shrew	O03G	Yes, grassland and hedgerow habitats are	Yes

(*Sorex minutus*)		available	
Greater White-toothed Shrew (*Crocidura russula*)*	O02P	Yes, grassland habitat available	Yes
European Rabbit (*Oryctolagus cuniculus*)*	O03G, O02P	Yes, grassland and hedgerow habitats are available	Yes
Eastern grey squirrel* (*Sciurus carolinensis*)	O03K, O03G, O02P	Yes, potential habitat available in treelines present on site	Yes
BIRDS			
House martin (*Delichon urbicum*)	O02J, O03G	Yes, some nesting potential in buildings and structures, limited foraging potential	Yes
House sparrow (*Passer domesticus*)	O03K, O03G, O03L	Yes, some nesting potential in buildings and structures, limited foraging potential	Yes
Barn Swallow (*Hirundo rustica*)	O02J, O03K, O03G, O02P	Yes, some nesting potential in buildings and structures, limited foraging potential	Yes
Black-headed Gull (*Larus ridibundus*)	O03K, O03F	No, lacks suitable nesting and foraging potential such as wetland areas, such as bogs and marshes and will also use manmade lakes and arable fields	No
Great Black-backed Gull (*Larus marinus*)	O03F	No, lacks suitable habitat (coastal), well-vegetated rocky coastline with stacks and cliffs, flat-roofed buildings	No

Herring Gull (*Larus argentatus*)	O03F, O03L	No, lacks suitable habitat (coastal), well-vegetated rocky coastline with stacks and cliffs, flat-roofed buildings	No
Lesser Black-backed Gull (Larus fuscus)	O03F	No. lacks suitable habitat such as farmland, wetlands coastal areas, scavenges in rubbish tips and in urban areas	No
Common Coot (*Fulica atra*)	O03K, O03G, O03L, O02P	Yes, stream within the survey area offers suitable habitat	Yes
Common Pochard (*Aythya ferina*)	O03L	No, marsh and lake habitats are not available	No
Common Linnet (*Carduelis cannabina*)	O03L	Yes, dense hedgerow, scrub, and hawthorn bushes available	Yes
Great Cormorant (*Phalacrocorax carbo*)	O03K, O03F, O03L	No, prefer coastal habitats or inland lakes or estuaries	No
Common Kingfisher (*Alcedo atthis*)	O03F	Yes, stream within the survey area offers suitable habitat	Yes
Common Redshank *(Tringa totanus*)	O03F	No, prefer coastal habitats, marshy grassland, or inland lakes, estuaries or large rivers	No
Eurasian Tree Sparrow (*Passer montanus*)	O03K	Yes, can nest in cavities in buildings, especially under eaves or holes	Yes
Common Starling (*Sturnus vulgaris*)	O02J, O03K, O03G, O03L	Yes, some nesting potential in buildings	Yes

		and structures, limited foraging potential	
Northern Wheatear (*Oenanthe oenanthe*)	O02J	No, lacks suitable habitat such as rocky coasts, pasture with stone walls and bogs in uplands.	No
Yellowhammer (*Emberiza citrinella*)	O02J	Yes, but limited nesting and foraging potential	Yes
Little Grebe (*Tachybaptus ruficollis*)	O03K, O03F, O03L	Yes, breeding habitat available in the freshwater stream	Yes
Mallard (*Anas platyrhynchos*)	O03K, O03F, O03G, O03L	Yes, breeding habitat available in the freshwater stream	Yes
Mute swan (*Cygnus olor*)	O03K, O03F	No, the small stream in the survey area is not considered suitable habitat for the species	No
Peregrine Falcon (*Falco peregrinus*)	O03G	No, breed and winter on coastal and inland cliff areas and estuaries	No
Northern lapwing (*Vanellus vanellus*)	O03K, O03F, O03L	No, lacks suitable habitat such as agricultural cereal crop fields, meadows or wet grasslands	No
Sand Martin (*Riparia riparia*)	O03K, O02P	Yes, suitable habitat available in the freshwater stream	Yes
Tufted Duck (*Aythya fuligula*)	O03K, O03F, O03L	Yes, suitable habitat available in the freshwater stream	Yes
Common Swift (*Apus apus*)	O02P	Yes, can nest in cavities in buildings,	Yes

		especially under eaves or holes	
INVERTEBRATES			
Large red tailed bumblebee (*Bombus (Melanobombus) lapidarius*)	O02J, O02P	Grassland offers some limited potential	Yes
Trimmer's Mining Bee (*Andrena (Hoplandrena) trimmerana*)	O03G	No, habitats preferred are coastal landslips and cliffs and, inland, from heaths, open woodland, chalk grassland,	No
Iridescent pea mussel *(Pisidium pulchellum)*	O03G	Yes, stream habitat is suitable	Yes
Freshwater white-clawed crayfish (*Austropotamobius pallipes*)	O02P	Yes, stream habitat within the survey area	Yes
FLORA			
Butterfly-bush (*Buddleja davidii*)*	O02P	Yes, suitable habitat available	Yes
Indian Balsam (*Impatiens glandulifera*)*	O03K	Yes, suitable habitat available	Yes
Giant Hogweed (*Heracleum mantegazzianum*)	O02P	Yes, suitable habitat available	Yes
Japanese Knotweed (*Fallopia japonica*)*	O03K	Yes, suitable habitat available	Yes
Spanish Bluebell (*Hyacinthoides hispanica*)*	O03K	Yes, suitable habitat available	Yes
Three-cornered Garlic (*Allium triquetrum*)	O03K	Yes, suitable habitat available	Yes
HERPTILES			

Common frog (*Rana temporaria*)	O02J	Yes, watercourses within survey area	Yes

*indicates an invasive species

1.65 Table 1-9 below details the results of the NBDC Bat Suitability Index search undertaken for the Proposed Development. The index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats.

Table 1-9: Bat Suitability Index

SPECIES	INDEX SCORE
Brown long-eared bat (*Plecotus auritus*)	35
Common pipistrelle (*Pipistrellus pipistrellus*)	40
Daubenton's bat (*Myotis daubentonii*)	41
Leisler's bat (Nyctalus leisleri)	0
Lesser horseshoe bat (*Rhinolophus hipposideros*)	41
Nathusius's pipistrelle (*Pipistrellus nathusii*)	19
Natterer's bat (*Myotis nattereri*)	19
Soprano pipistrelle (*Pipistrellus pygmaeus*)	19
Whiskered bat (*Myotis mystacinus*)	26

Baseline Results

Bats

1.66 The bat suitability index is presented in Table 1-9. With the area scoring an overall suitability index score of 26.67, suggesting the area is relatively low suitability for bats. From the 2km grid square results, records of Brown Long-eared Bat (*Plecotus auritus*), Daubenton's bat (*Myotis daubentonii*), Lesser Noctule (*Nyctalus leisleri*) Pipistrelle (*Pipistrellus pipistrellus sensu lato*) and Soprano Pipistrelle (*Pipistrellus pygmaeus*) were found within 2km of the Application Site.

1.67 Two structures within the Application Site boundary were identified as being of low bat roosting suitability during the species scoping survey and as such further bat surveys were carried out due to their potential for use by roosting bats. The surveys covered a shed to the southwest of the site (see Target Note 1 in Figure 2, Appendix A) and a house to the northwest of the site (Target Note 2). The trees identified within the site, including horse chestnut and ash, among others, were considered unsuitable for bat roosting.

1.68 A bat emergence of the shed was carried out on the 2nd and a survey of the house was carried out on the 30th August 2022. No bats were seen emerging from either building, overall bat activity at the site was very low.

Badger

1.69 Records of badger were returned from one of the six grid squares assessed in the 2km desk study.

1.70 Habitats within the Application Site, such as hedgerows and the scrub areas, would provide suitable foraging habitat for badger. There were however no field signs or evidence of badgers within the Application Site during the Fossitt habitat survey.

Otter

1.71 Records of otter were returned for two of the grid squares checked within 2km of the Application Site (not covering the Application Site itself). The Baldonnell stream which flows along the southern boundary of the site is too narrow to support breeding and foraging otter, and the surrounding habitats (business parks, a golf course and a significant amount of residential housing and shopping centres) are not suitable to support commuting otter.

1.72 No sightings or field signs of otter were observed within the survey area.

Hedgehog

1.73 Records of hedgehog were returned from four of the 2km grid squares assessed, including the grid square that covers the Application Site.

1.74 No sightings or signs of hedgehog were observed within the study area although habitats within the ESA are expected to be suitable foraging areas for hedgehog. These habitats include scrub, hedgerow and amenity grassland.

Other Mammals

1.75 Records of eastern grey squirrel, American mink, brown rat, greater white-toothed shrew, and European rabbit, were returned from the 2km desk study, all of which are invasive species in Ireland. Suitable habitat is available for all species within the Application Site in the form of hedgerows, scrub, a treelines and amenity grassland.

1.76 There were no field signs or sightings of any of these species during the Fossitt habitat survey.

1.77 Recordings of pine marten were returned from one of the 2km grid squares assessed in the desk study and this was the 2km grid square that covered the Application Site.

1.78 There was no evidence or sightings of Pine Marten during the site visit, whilst the scrub within the application site offers suitable habitat for the species, it was present in a very small amount and was patchy and not continuous habitat.

1.79 Evidence of Eurasian pygmy shrew was returned from one of the 2km grid squares assessed in the desk study, not the grid square covering the Application Site. Habitats such as hedgerows and grassland offer suitable foraging habitat for the species.

1.80 There was no evidence or sightings of Eurasian pygmy shrew found during the survey of the site.

1.81 No other evidence of any additional mammal species was observed during the site visit.

Birds

1.82 Whilst no formal bird surveys were undertaken within the proposed ESA, the species scoping survey was completed to identify the presence of protected species, or the potential of the Application Site to support protected species. Any incidental observations of bird species during the walk over survey were recorded to provide information for the assessment of potential bird activity within the Application Site.

1.83 Sightings of swallow, swift, buzzard and magpie were recorded during the Fossitt habitat survey within the Application Site. Of which, swallow and swift are the only species of significant note as they have amber and red Birds of Conservation Concern in Ireland (BoCCI) status' respectively[21]. The site does offer suitable nesting and foraging habitat for bird species in the form of hedgerows, buildings treelines and scrub. Swallows were observed flying in and out of potential nesting sites within the residential home to the northwest of the site and the shed at the southwest of the Application Site .

Herptiles

1.84 Records of common frog were found within 2km of the Application Site boundary. The species is known to utilise stream freshwater habitats, such as the Baldonnell stream located south of the redline boundary of the site. However, no signs of this species were recorded during the survey.

Invertebrates

1.85 Of the notable species identified within the 2km grid square study, the Large Red Tailed Bumble Bee, Iridescent pea mussel and the Freshwater white-clawed crayfish were identified as being able to utilise habitat available within the Application Site.

[21] Birds of Conservation Concern in Ireland 4: 2020–2026: Gillian Gilbert, Andrew Stanbury & Lesley Lewis

Flora

1.86 None of the flora species recorded in the 2km data search were observed within the boundaries of the Application Site during the Fossitt habitat survey. Whilst there are recordings of invasive Japanese Knotweed, giant hogweed, butterfly bush and Indian balsam within the 2km study, these were not observed on site during the survey.

IMPACT ASSESSMENT

Best Practice Pollution Prevention Measures

1.87 Standard best practice pollution prevention measures will be adhered to, which will reduce the potential for impacts on ecology during the construction stage. As these are standard requirements, they are separate to mitigation measures (which are outlined later in this report). This is of particular importance with the proposed stream re-alignment.

1.88 Relevant measures include, but are not limited to:

Pollution Prevention

- Hydrocarbons, greases and hydraulic fluids will be stored in a secure compound area;
- All plant machinery will be properly serviced and maintained, thereby reducing risk of spillage or leakage;
- All waste produced from construction will be collected in skips, with the construction site kept tidy at all times;
- Excavated soil will be stored on site or removed by a licensed waste disposal unit;
- All materials and substances used for construction will be stored in a secure compound and all chemicals will be stored in secure containers to avoid potential contamination;
- Location of spill kit to be known by all construction workers and used in the event of spillage or leakage.

Waste Management

- Skips are to be used for site waste/debris at all times, and collected regularly or when full;
- All hydrocarbons and fluids are to be collected in leak-proof containers and removed from site for disposal or recycling;
- All waste from construction is to be stored within the site confines and then removed to a permitted waste facility.

Environmental Monitoring

- Contractor is to nominate member of staff as the environmental officer with the responsibility to ensure best practice measures are implemented and adhered to, with any incidents or non-compliance issues being reported to project team.

Designated Sites

1.89 Within 15km of the Application Site there are six Special Areas of Conservation (SACs) and three Special Protection Areas (SPAs). Within 5km of the Application Site boundary there are two potential Natural Heritage Areas (pNHAs).

1.90 There is hydrological connectivity between the Application Site and the South Dublin Bay SAC, the North Dublin Bay SAC, the South Dublin Bay and River Tolka Estuary SPA and the North Bull Island SPA. All of this connectivity is roughly 28km downstream via the Baldonnell stream which flows along the southern boundary of the Application Site and feeds into the River Liffey.

1.91 Given the distance between the sites and dilution that any potential contaminants would undergo from the proposed development site before they reach these designated sites, it is unlikely the development would have a significant negative impact on any of the species or habitats for which the above sites are designated.

1.92 Hydrological connectivity also exists between the proposed development site and both the Grand Canal pNHA and the Liffey Valley pNHA.

1.93 The majority of the qualifying bird species of the SPAs listed above prefer coastal or wetland habitats for foraging and/or breeding. Despite some habitats available on site being suitable for some of the species of the SPAs, the habitats within the site are in a less than ideal location, adjacent to a business park, main roads and multiple housing estates and retail centres. The bird species outlined within the SPAs above can obtain more favourable habitat closer to the SPAs in a more suitable location than the site in question, given the distance between the Application Site and the SPAs listed above.

1.94 It is considered that the survey area is unlikely to support any of the Annex II species or assemblages listed above. Narrow-mouthed whorl snail and Desmoulin's whorl snail are restricted to the marsh vegetation of the Rye Water Valley/Carton SAC. The Application site is not considered to offer suitable habitat for otter. The Baldonnell Stream is too narrow to support breeding and foraging otter, and the surrounding habitats (business parks, a golf course and a significant amount of residential housing and shopping centres) are not suitable to support otters commuting from the Wicklow Mountains SAC.

In the Absence of Mitigation

Natura 2000 Sites (SPAs and SACs)

1.95 The Dublin Bay is located approximately 15km from the Application Site. Hydrological connectivity exists between these the Application Site and four sites within the Dublin Bay; South Dublin Bay and River Tolka SPA, North Bull Island SPA, South Dublin Bay SAC and North Dublin Bay SAC.

1.96 The South Dublin Bay and River Tolka SPA and North Bull Island SPA are designated due to supporting assemblages of wetland and waterbirds. Due to a lack of suitable habitat within the site, it is considered highly unlikely that these species would be present on site.

1.97 The only opportunity for pollution arising from the Proposed Development to impact upon the designated site is through the contamination of the Baldonell stream. Given the drainage measures in place at the site, and the large distance between the Application Site and the Dublin Bay, the dilution factor will result in a **negligible** impact upon the qualifying features of the SPAs and SACs.

1.98 Therefore, **no significant effects** are predicted in the absence of mitigation.

Proposed Natural Heritage Areas (pNHAs)

2.1. The Grand Canal pNHA is located approximately 1.4km north of the Application Site. The Liffey Valley is located approximately 4.6km north. Both sites are hydrological connected via the Baldonnell stream.

1.99 As outlined above, there are no watercourses within the Application Site, and so the only pathway for contaminants would be through the contamination of surface waters. **Chapter 5: Demolition and Construction Environmental Management** outlines the procedures that will be implemented to prevent any spillages to the Balonnell stream.

1.100 With the implementation of these best practice procedures, **no significant effects** are predicted in the absence of mitigation.

Recommended Mitigation Measures

1.101 There will be no significant contamination of water in the absence of mitigation. Notwithstanding this, during the construction phase, standard best practice measures will be adhered to.

1.102 In order to prevent any spillages of fuels to the Baldonnel Stream, or groundwater, the following measures are proposed:

- Designation of a bunded refuelling areas on the site;
- Provision of spill kit facilities across the site;

- Where mobile fuel bowsers are used the following measures would be taken:
- Any flexible pipe, tap or valve would be fitted with a lock and would be secured when not in use;
- Pumps or valves would be fitted with a lock and would be secured when not in use;
- All bowsers to carry a spill kit;
- Operatives must have spill response training; and
- Drip trays used on any required mobile fuel units.
- In the case of drummed fuel or other potentially polluting substances which may be used during the demolition and construction stage the following procedures will be adopted:
- Secure storage of all containers that contain potential polluting substances in a dedicated internally bunded chemical storage cabinet unit or inside a concrete bunded area;
- Clear labelling of containers so that appropriate remedial measures can be taken in the event of a spillage;
- All drums to be quality approved and manufactured to a recognised standard;
- If drums are to be moved around the site, they would be secured and on spill pallets; and
- Drums to be loaded and unloaded by competent and trained personnel using appropriate equipment.

1.103 Potential pathways for contamination could be minimised as follows:

- Groundwater would be prevented from entering excavations by dewatering, if required;
- Surface water would be prevented from entering excavations by using cut-off ditches, covering the excavation, or captured within the groundwater pumping system;
- Potentially contaminating activities such as concrete preparation, vehicle washing and fuelling etc. are constrained to dedicated protected areas where contaminated water can be collected; and
- Contaminated water from excavations would be collected within a settlement tank or lagoon to enable treatment prior to release.

1.104 Any soil excavated should be retained on site and reused as fill material or landscaping. Excavation works will be carefully monitored by a suitably qualified person to ensure any potentially contaminated soil is identified and segregated from clean/inert soil.

1.105 Any stockpiles will be formed within the boundary of the site and there will be no direct link or pathway from this area to any surface water body.

Residual Effects

1.106 With best practice measures implemented during the construction of the Proposed Development there will be **no significant negative residual effects**.

Habitats

In the Absence of Mitigation

1.107 The construction of the Proposed Development will occur over land which has been identified as amenity grassland, buildings and artificial surfaces and recolonising bare ground. These habitats are considered to be of **low ecological value** and currently offer limited potential to support wildlife.

1.108 Other potential impacts during the construction phase include indirect loss or damage of habitats as a result of dust and other air- or water-borne pollution. As the construction phase will adhere to all relevant legislation and best practice construction and pollution prevention methods, this is expected to cause only **negligible** loss in a local context where these habitats are frequent. Overall habitat loss is **not considered to be significant** in terms of the Application Site's intrinsic habitat interest.

1.109 It is therefore considered that the loss of habitat under the Proposed Development footprint **will not be significant**.

Recommended Mitigation Measures

1.110 It is considered that no significant impacts will occur in the absence of mitigation, and therefore no mitigation measures are proposed.

Residual Effects

1.111 With best practice measures implemented during the construction of the Proposed Development there will be **no significant negative residual effects**.

Protected and Notable Species

In the Absence of Mitigation

1.112 Each section below details the potential impacts in the absence of mitigation for protected and notable species during the construction phase and the operational phase (expected to be >20 years) of the Proposed Development.

Bats

1.113 The Proposed Development will involve the removal of the house and outbuilding, classified as having low bat roost potential. Emergence surveys undertaken in 2022 found that there are no bats roosting within these dwellings. Therefore, in the absence of mitigation the loss in this habitat will not damage or destroy an existing roost, therefore the loss of this habitat will have a **negligible effect** on local bat populations.

1.114 The majority of the Application Site is comprised of amenity grassland; this habitat offers sub-optimal foraging habitat for bat species due to the limited number of prey species present. The loss of these habitats under the Proposed Development footprint **will not lead to a significant reduction in foraging habitat** for local bats.

1.111A Hedgerows and treelines provide suitable habitat for foraging and commuting bats. The removal of 79~~74~~ trees located in the treeline adjacent to the residential property is proposed. The loss of this amount of treeline **will not lead to a significant reduction in foraging habitat** for local bats, given the abundance of similar habitat in the surrounding landscape, and the poor quality of this habitat.

1.115 The site is currently subjected to high amounts of artificial light from neighbouring similar developments and streetlighting. The increased amount of artificial light has the potential to reduce the suitability of this habitat to commuting and foraging bats.

Badger

1.116 Habitats on site are suitable to support badger, however no badger setts, or evidence of badger was identified on site during the site surveys.

1.117 Given that badgers are a highly mobile species and new setts may be built prior to construction, there is the potential for the disturbance of badger during the construction phase of the Proposed Development. During the construction phase, the Proposed Development can cause undue stress in a number of ways. Installation of security fencing or hoarding can disrupt badger paths and cut off foraging areas within a clan's territory. Excavations can destroy badger setts, and any excavations lefts overnight can trap badgers.

1.118 The construction phase may have a minor temporary impact on commuting badger. This would result in an effect of **low** spatial and **short-term** temporal magnitude. Given the scale of the project it is considered likely that the Proposed Development will have a **negligible effect on the local badger population.**

Birds

1.119 Main impacts on bird species from developments include:

- Direct loss or deterioration of habitats.

- Indirect habitat loss as a result of displacement by disturbance.

1.120 The Proposed Development will occur on land that is currently of low ecological value and is subject to a level of disturbance from surrounding industrial developments. However, in the absence of mitigation there is **potential for significant effects** on breeding birds if construction works are undertaken between the months of March and August inclusive.

1.121 Swallows were observed flying in and out of potential nesting sites within the garage of the residential home and in the shed at the southwest of the site.

1.122 The construction phase may have a temporary adverse impact on breeding birds within and adjacent to the Application Site. This would result in an effect of **low** spatial and **medium-term** temporal magnitude. The effect may continue beyond a single bird generation but is expected to be sufficiently small for the local population to recover relatively soon. This effect would be **not significant** for the commoner species but could be **significant** for priority species and birds of conservation concern.

Mitigation Measures and Further Survey

Badger

1.122A All excavations are to be securely covered or closed off at the end of each working day to prevent the accidental trapping of badgers. Where this is not possible, a means of escape (for example a ramp) must be included to allow safe exit from the excavation. Checks of any open excavations should be performed by site staff prior to each day's works. The proposed security fencing will have mammal gates ~~or a gap of at least 10cm at the bottom~~ to allow free movement of badgers through the site.

1.124 With the implementation of these measures, **no significant effects** upon badger are predicted as a result of the Proposed Development.

Birds

1.125 As swallows were observed using the residential dwelling to the northwest of the site and the shed at the southwest of the site as nesting habitat, it is advised that no demolition of these buildings occur within their summer breeding season of April – October, after which they will fledge their nesting sites as the species are summer visitors. Checks of the building should be completed prior to demolition to ensure all swallows have migrated for the season. It is also recommended that appropriate replacement habitat be provided for these species following demolition.

1.126 If any trees or hedgerow are to be removed during the breeding season (March to August inclusive), potential significant impacts may occur on breeding birds in the absence of mitigation. This could include the loss of nests, eggs and/or young. It is therefore recommended

that pre-commencement breeding bird surveys should be carried out on any trees and hedgerows which may be removed.

Residual Effects

1.127 With the implementation of mitigation measures and further survey prior to and during the construction phase of the Proposed Development, it is considered that there will be **a negligible effect** upon protected or notable species.

CUMULATIVE EFFECTS

1.128 As well as singular effects, cumulative effects also need to be considered. Article 6 of the EU Habitats Directive and Regulation 15 of the European Communities (Natural Habitats) Regulations state that any plan or project that may, either alone or in combination with other plans or projects, significantly affect a designated site, should be the subject of an Appropriate Assessment.

1.129 Cumulative impacts can be an issue when multiple proposals each have a small impact on designated sites. If several proposals also have a small impact, the combined result can have a significant impact on a Natura site.

1.130 A search of the South Dublin County Council online planning portal was undertaken to identify any Projects or developments within 3km which could impact any ecological features, either alone or in combination with the Proposed Development. These developments are outlined in Table 1-10 below.

Table 1-10: Key Developments within 3km of the Proposed Development

Name	Planning Reference	Project Type	Approx. distance from the site
Microsoft - Grange Castle Business Park, Nangor Road, Clondalkin, Dublin 22	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. *Grant Permission – 29/03/2021* *Enabling works in progress*	400 m NW

UBC Properties - Townlands within Grange Castle South Business Park, Baldonnell, Dublin 22	SD20A/0121	The development will consist of the demolition of the existing two storey dwelling of Ballybane and associated farm buildings (565sq.m) and the 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. *Grant Permission – 09/09/2020* *Construction in progress*	850 m W
UBC Properties - Grange Castle South Business Park, Dublin 22	VA06S.308585	Clutterland 110kV GIS Substation building and 2 underground single circuit transmission lines. *Approved 07/05/21*	400 m W
Digital Reality Trust - Profile Park, Baldonnell, Dublin 22, D22 TY06	SD17A/0377	Revisions and alterations of the permitted development of a data processing facility under planning Ref: SD12A/0002 on a 3.85 hectare site. The revised application consists of alterations to the DUB14 (previously DUB12) data centre/warehouse structure, granted in the previous application. The alterations to the DUB14 (Previously DUB12) include: (i) 2 data halls 2137 sq.m (increase of 180sq.m), (ii) offices/reception 478sq.m (decrease of 190 sq.m), (iii)	400 m S

		support space/staff facilities and internal plant with a floor area of 953sq.m (increase of 84sq.m), (iv) external plant of 1,777sq.m (footprint increase of 35sq.m). Grant Permission – 15/12/2017 Constructed – site appears to be fully built out based on aerial imagery.	
Cyrus One - Grange Castle Business Park, Clondalkin, Dublin 22	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. *Grant Permission – 24/09/2018* *Site appears to be partially but not fully built out based on aerial imagery*	1000 m SW
Cyrus One Townlands within Grange Castle South Business Park, Baldonnel, Dublin 22	SD20A/0295 (amendment to SD18A/0134)	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	1000 m SW
Cyrus One - Grange Castle South Business	VA06S.309146	2 no. 110kV transmission lines and a 110kV Gas	900 m SW

Park, Baldonnel, Dublin 22.		Insulated Switchgear (GIS) substation *Grant Permission with Conditions - 19/07/2021*	
Centrica Business Solutions – Profile Park, Baldonnel, Dublin 22	SD21A/0167	Construction of a gas fired power plant with an electrical output of up to 125MW with associated balance of plant, equipment and buildings. *Grant Permission – 19/07/2022*	50 m S
quinix (Ireland) Ltd – Plot 100, Profile Park, Nangor Road, Clondalkin, Dublin 22	SD21A/0186	Construction of a three-storey (part four-storey) data centre known as 'DB8' to include data halls, electrical/plant rooms including internal generators, offices, lobbies, ancillary staff areas including break rooms and toilets, stores, stair/lift cores throughout and photovoltaic panels at roof level. *Grant Permission – 05/05/2022*	< 50 m E
Equinix (Ireland) Ltd	SD22A/0156	10 year permission on a site is bounded to the east and south by Grange Castle Golf Club, to the north by Nangor Road (R134) and to the west by an estate road known as Falcon Avenue) for modifications to the permitted data centre granted under SDCC Reg. Ref. SD21A/0186 comprising the following, reconfiguration and alterations to the data	< 50 m E

		centre building to include removal of front of house offices at third floor level, alterations to floor levels at second floor to provide consistency between front of house and data halls, parapet height increase of front of house to c.16.8m, provision of storage at second floor level in lieu of relocated internal generators to the external generator yard and associated elevational alterations; extension of loading dock at ground floor level by c.60sqm in area with minor height increase to c.5.3m; removal of 3 air plenums to the front (north) elevation and provision of screening to generator flues in lieu of omitted plenums; alterations at roof level to include removal of 2m high gantry screening; alterations to the permitted generator plant yard to the north of the data centre to include the removal of fuel tanks, reconfiguration of plant and generators, provision of 2 additional external generators (increase from 5 to 9 external generators), provision of 4 additional external plant rooms, provision of diesel pump tank cabinets and stepover, relocation of generator yard doors and enlarged generator yard to	

		accommodate the proposed modifications; increase in plant areas by c.77sq.m; reconfiguration of plant within the permitted chiller plant yard to the south of the data centre; removal of 1 sprinkler/water tank and removal of stairs and door to the side of the waste compound; reconfiguration of car parking and motorcycle spaces and removal of 1 accessible space. 64 total number of car parking spaces; the proposal also includes provision of on-site gas power generation compound (c.2,604sq.m in area) in the area previously reserved for a future data centre; the compound comprises 7 modular plant rooms (totalling c.180sq.m in area) in the area previously reserved for a future data centre; the compound comprises 7 modular plant rooms (totalling c.180sq.m in area), 10 gas fired generators and associated flues c.14.7m high, gas skid, associated modular plant, boundary treatment surrounding the compound c.6.5m high and 2 vehicular access points including general and emergency access; all associated site development works, services provision, drainage works, access,	

		landscaping and boundary treatment works; no buildings are proposed above the existing ESB and SDCC wayleaves to the west and north of the site; the overall Gross Floor Area of the development is reduced by c.44sq.m to c.9,795sq.m from previously permitted under SDCC Reg. Ref. SD21A/0186; the application is accompanied by a Natura Impact Statement. *Request Additional Information – 25/07/2022*	
Digital Netherlands VIII B.V	SD21A/0217	10 year permission for development consisting of removal of an existing unused waste water treatment facility on site and the erection of two data centre buildings, gas powered energy generation compound, and all other associated ancillary buildings and works; the two data centre buildings, DUB 15 and DUB 16, will comprise a total floor area of c. 33,577sq.m over two storeys; the first 2 storey data centre building (DUB15), located to the southwest of the site, will comprise 16,865sq.m data storage use, ancillary office use and associated electrical and mechanical plant rooms, loading bays, maintenance and storage	100 m S

		space; a second 2 storey data centre building (DUB16), located to the southeast of the site, will comprise 16,712sq.m data storage areas, ancillary office use and associated electrical and mechanical plant rooms, loading bays, maintenance and storage space; both data centre buildings will reach a height of 20m; emergency generators and associated emission flues and plant are proposed in compounds adjacent to each data centre building; gas powered energy generation is proposed to the north east corner of the site to provide electricity for the proposed development; the application proposes to re-route and widen an existing watercourse constructed following an earlier planning permission; it is proposed to reroute this watercourse along the eastern and southern boundary of the site; landscaping is proposed to the south of the site to screen the buildings; fencing and security gates are proposed around the site; new access roads within the site are proposed along with 71 car parking spaces and 26 cycle spaces, bin stores, site lighting, and all associated works including	

		underground foul and storm water drainage attenuation and utility cables and all other ancillary works; a Natura Impact Statement will be submitted to the planning authority with the application. *Grant Permission – 02/08/2022*	
Vantage Data Centers Dub 11 Limited Profile Park Business Park and partly within Grange Castle Business Park, Dublin 22.	ABP Ref: VA06S.312793	110kV Gas Insulated Switchgear (GIS) Substation compound and 110kV transmission lines along with associated and ancillary works *Due to be decided – 18/10/2022*	< 100 m SW

1.131 As the Proposed Development is situated within an industrial area, the majority of planning applications are for similar developments. Beyond 1km of the Application site, many sites to the north and east are residential in nature, with industrial and military areas also noted to the south.

1.132 It is considered that with the implementation of mitigation measures there will be no impact of the development upon any ecological feature. In conclusion, there is no potential for significant effects as a result of the Proposed Development upon any Natura 2000 site within the ZOI.

1.133 It is considered that the Proposed Development is comprised of land which is of low ecological significance. Therefore, the small cumulative loss in habitat will not be significant.

1.134 It has been concluded, that with measures included in Proposed Development and the implementation of best practice measures, that it is likely that there will **be no significant cumulative effects** to designated sites or any other ecological feature in combination with any other development.

CONCLUSION

1.135 To minimise potential impacts on local wildlife, ecological measures have been incorporated into the Proposed Development as part of the iterative design process (see Table 1-11 below). Standard best practice pollution prevention measures for the construction stage have also been outlined and considered as part of the impact assessment stage, prior to mitigation. These measures are also outlined within Table 1-11.

1.136 A total of seven habitat types were noted during the habitat survey undertaken in July 2022. The main impacts during the construction phase include the direct loss of habitat under the Proposed Development footprint and indirect loss of habitat due to disturbance and pollution.

1.137 The desk-based assessment identified six Special Areas of Conservation (SACs) and three Special Protection Area (SPA) within the study zone. These designated sites have been outlined and fully assessed within the supporting Appropriate Assessment (AA) report. There is a hydrological connection between the Application Site and designated sites within the Dublin Bay (South Dublin Bay and River Tolka SPA, North Bull Island SPA, South Dublin Bay SAC and North Dublin Bay SAC). There are two Proposed Natural Heritage Areas (pNHAs) located within 5km of the Application Site.

1.138 There will be no significant effect on any designated sites as a result of the Proposed Development.

1.139 It is considered that the short-term disturbance from the Proposed Development will not be significant on all ecological features if the recommended mitigation is implemented. With the implementation of the Biodiversity Management Plan, the potential of the site to support local wildlife will increase, resulting in long-term positive effects.

Table 1-11A: Integral design measures and standard best practice

Site/ Species	Potential Development Impacts	Phase of Development	Measures Implemented
Integral Design Measures			
Badger	Exclusion from foraging habitat	Operational	Security fencing to have mammal gates ~~10cm gap at base~~ to allow free movement of badger through the site.
Standard Best Practice Measures			
Aquatic environment	Pollution	Construction	Best practice pollution prevention measures implemented prior to and throughout the construction phase to prevent contaminants entering the aquatic environment.
Badger	Accidental trapping within excavations	Construction	All excavations should be securely covered, or a suitable means of escape provided at the end of each working day.
Mitigation Measures			
Badger	Disturbance / destruction of setts	Construction	Pre-construction badger survey
Breeding birds	Disturbance / destruction of nest (Only if works are undertaken between March and August)	Construction	Pre-construction breeding bird survey (Only if works are undertaken between **March and August**) No demolition of buildings within the swallow summer breeding season **April – October. Pre-demolition check of building for nesting birds.**

APPENDICES

Appendix A – Figures

- Figure 1 – Environmental Designations Map
- Figure 2 – Habitat Map

Appendix B – Bat Report

Technical Appendix 11.2A: Appropriate Assessment Screening Report

Appendix 11.2A: Appropriate Assessment Screening

27/02/2023

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1. EXECUTIVE SUMMARY

1.1. A Stage 1 Appropriate Assessment has been undertaken for a proposed for a data centre building and associated development, located within Profile Park, Clondalkin, Dublin. The aim of the Appropriate Assessment Screening is to assess the potential for connectivity between the Proposed Development and any Natura 2000 site within a 15km radius of the Application Site.

1.2. To provide a current baseline for the Application Site, an ecological site visit was undertaken in July 2022 by Eiméar Rose Cunningham. During this site visit habitats were assessed for their potential to support protected/notable species. No evidence of any qualifying species was observed within or adjacent to the Application Site during the site visit and habitats on site are considered to be sub-optimal.

1.3. Within the 15km Zone of Influence ("ZOI") surrounding the Site, there are nine Natura 2000 designated sites, comprising six Special Areas of Conservation ("SACs") and three Special Protection Areas ("SPAs").

1.4. Connectivity (potential pathways for impact) exists between the Application Site and four designated sites; the North Dublin Bay SAC, the South Dublin Bay and River Tolka Estuary SPA and the North Bull Island SPA. This connectivity is roughly 28km downstream via the Baldonnel stream.

1.5. The Proposed Development will not impact the Baldonnell stream. Given the distance (approximately 30km downstream) and dilution factors, it is not anticipated that the Proposed Development will cause any impact to the designated site or its qualifying features.

1.6. It is therefore considered that the next stage of the Appropriate Assessment is not required, and that the development **will not result in any significant effects for any Natura 2000 site**.

2. INTRODUCTION

Background

2.1. Neo Environmental Ltd has been appointed by Ramboll on behalf of Vantage Data Centers Dub 11 Limited (the "Applicant") to undertake an Appropriate Assessment (AA) Screening for a data centre building and associated development (the "Proposed Development") located on lands within Profile Park, Clondalkin, Dublin (the "Application Site").

2.2. The aim of this screening document is to determine whether a Natura Impact Statement (NIS) is required for the Proposed Development.

Site Description

2.3. The site is located at Irish grid reference O 03911 30784, within Profile Park. Profile Park is located approximately 10 kilometres (km) to the south-west of Dublin city centre, within South Dublin County.

2.4. The site boundaries are defined by:

- New Nangor Road (R134) to the north;
- Falcon Avenue, Equinix and Grange Castle Golf Club to the east;
- Falcon Avenue to the south; and
- The consented Vantage data centre development (planning reference SD21A/0241) to the west, currently agricultural fields.

2.5. The site is a triangular parcel of agricultural land, with a residential dwelling located in the north-west corner of the site, and an area of hardstanding within the south-west of the site. The site covers a total area of 3.31 ha and lies at an elevation between approximately 74 and 75 m Above Ordnance Datum (m AOD).

2.6. The existing Baldonnel steam runs adjacent to the sites southern boundary and enters the southern section of the site, orientated in a north-west to south-east direction, flowing towards the east.

2.7. The site can currently be accessed from three access points, two from the north off New Nangor Road (R134), and one from Falcon Avenue on the eastern border, which leads to a roundabout on the R134 New Nangor Road.

Development Description

2.8. The development consists of the construction of one no. two storey data centres with a gross floor area of c. 12,893 sqm that will include office at first floor. The proposed data centre comprises of a two-storey data centre that will include 13 no. standby emergency generators with associate flues (each 25m in height) to be located to the west of the building. The data centre will be c. 14.23m to parapet height with the roof plant increasing the height to 18.5m overall. The data centre will be accessed from a new emergency and service vehicular access off Falcon Avenue as well as from the site of the already permitted data centres to the west. The data centre will be served by 60 car parking spaces that will be located generally to the east of the data centre, of which 3 no. spaces will be disabled spaces and 6 of these spaces will be provided for electrical charging vehicles. Covered bicycle parking provision will be provided within the site. The data centre will be enclosed by landscape berms and planting to the north and north-east.

Statement of Authority

2.9. The assessment has been conducted by an ecologist registered with the Chartered Institute of Ecology and Environmental Management (CIEEM). All work has been carried out in line with the relevant professional guidance, namely CIEEM's Guidelines for Report Writing[1] and the Environment, Heritage and Local Government Guidance on Appropriate Assessments[2].

2.10. Dara Dunlop is a Qualifying Member of the Chartered Institute of Ecology and Environmental Management (CIEEM) with circa 3 years' experience in the ecology sector. This includes working for an ecological consultancy, undertaking a range of protected species surveys and extended phase 1 habitat surveys for residential schemes and land management of designated sites. Dara has co-authored a number of reports for various developments including Ecological Impact Assessments and Protected Species Reports.

2.11. Eiméar Rose Cunningham is an Ecologist and is a Qualifying Member of the Chartered Institute of Ecology and Environmental Management (CIEEM), with over 3 years' experience in the environmental/planning sector. She has experience of conducting habitat surveys as well as protected species surveys, including bats. In previous roles Eiméar Rose has experience of GIS map interpretation for large scale infrastructure projects. Furthermore, Eiméar Rose has experience in the completion of ecological report writing having co-authored a number of reports including Ecological Impact Assessments and Natura Impact Statements.

[1] CIEEM (2017) Guidelines for Ecological Report Writing. Available at www.cieem.net

[2] Environment, Heritage and Local Government (2009) Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities. Available at www.npws.ie

3. LEGISLATION & GUIDEANCE

REQUIREMENT FOR APPROPRIATE ASSESSMENT

- The requirement for Appropriate Assessment of plans or projects originates from Article 6 (3) and (4) of European Union (EU) Habitats Directive. This is implemented in Ireland through the European Communities (Natural Habitats) Regulations of 1997, and the European Communities (Birds and Natural Habitats) Regulations 2011 – 2015 (as amended).
- The wording of Article 6 (3) of the Directive is as follows:

  "Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."

- The aim of Stage 1, 'Screening' is to determine whether or not Stage 2 of the Appropriate Assessment is required, therefore to determine whether the Proposed Development is likely to have a significant, negative impact upon any Natura 2000 site. This is done by considering the type of development and the conservation objectives of any Natura 2000 sites which may be impacted.
- As outlined in the European Commission document 'Assessment of plans and projects significantly affecting Natura 2000 sites'[3], any project that is not directly connected with or necessary to the management of a Natura 2000 site, but likely to have a significant effect upon it, either individually or cumulatively will be subject to Appropriate Assessment.
- Where significant effects are uncertain or unknown at the screening stage an AA will be required, due to the need to apply the precautionary principle. Conversely, if a project will have impacts on a site, but these impacts will clearly not affect or undermine those conservation objectives, it is not considered that it will have a significant effect on the site concerned.
- As part of the assessment consideration is afforded to 'in combination' effects with other plans or projects on the integrity of Natura 2000 sites. Where adverse impacts are identified,

[3] European Commission. 2021. Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC.

mitigation measures can be proposed that would avoid reduce or remedy any such negative impacts and the plan or project should then be amended accordingly, thereby avoiding the need to proceed to Stage 3 'Alternative Solutions'.

- If the assessment cannot exclude significant impacts either alone or in combination with other plans or projects, then the process must proceed to Stage 2.
- The following legislation were used to inform the Article 6 assessments within this report:
  - Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, 1992[4];
  - Council Directive 2009/147/EC on the conservation of wild birds, 2009[5];
  - The Planning and Development Acts 2000 (as amended)[6];and
  - National Parks & Wildlife Service (NPWS), The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments, Unpublished Report, 2013[7].

Guidance

- The following guidance has been collated and reviewed to inform the Article 6 assessments within this report:
  - Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities, 2009 (as amended)[8];
  - Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10[9] & PSSP 2/10, 2008[10];
  - European Commission. 2021. Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC[11]
  - CIEEM, Guidelines for Ecological Report Writing, 2017[12].

[4] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043
[5] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147
[6] Available at: http://www.irishstatutebook.ie/eli/2017/act/20/enacted/en/html
[7] Available at: https://www.npws.ie/sites/default/files/publications/pdf/Article_17_Print_Vol_3_report_species_v1_1_0.pdf
[8] Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf
[9] Available at: https://www.npws.ie/sites/default/files/general/Circular%20NPW1-10%20%26%20PSSP2-10%20Final.pdf
[10] Available at: https://www.npws.ie/sites/default/files/general/circular-npws-02-08.pdf
[11] Available at: https://ec.europa.eu/environment/nature/natura2000/management/pdf/methodological-guidance_2021-10/EN.pdf
[12] CIEEM (2017) *Guidelines for Ecological Report Writing*

4. ASSESSMENT METHODOLOGY

Stages of Appropriate Assessment

- The Appropriate Assessment process comprises of four stages in order to identify whether proposals have the potential to significantly impact upon Natura 2000 designations. The stages are as follows:
  - Stage 1 Screening: To determine the likelihood of significant impacts;
  - Stage 2 Natura Impact Statement: To assess the impact of proposals on the integrity of the Natura 2000 site, considering the conservation objectives of the site and its ecological structure and function;
  - Stage 3 Assessment of alternatives: Where significant impacts are anticipated despite mitigation measures, the proposal should progress to Stage 3 or no longer proceed;
  - Stage 4 Assessment where no alternative exists and where adverse impacts remain: The final stage involves examining whether there are imperative reasons of overriding public interest for allowing the proposal to adversely impact upon a Natura 2000 site.

Study Zone Identification

- The 'Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities'[13] states that the AA Screening should include the following:
  - *"Any Natura 2000 sites within or adjacent to the plan or project area;*
  - *Any Natura 2000 sites within the likely zone of impact of the plan or project;*
  - *A distance of 15km […] currently recommended in the case of plans, [which] derives from UK guidance (Scott Wilson et. al., 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects; and*
  - *Natura 2000 sites that are more than 15km from the plan or project area depending on the likely impacts of the plan or project, and the sensitivities of the ecological receptors,*

[13] Department for Environment, Heritage and Local Government (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Available at: http://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf

bearing in mind the precautionary principle. In the case of sites with water dependent habitats or species, and a plan or project that could affect water quality or quantity, for example, it may be necessary to consider the full extent of the upstream and/or downstream catchment."

- It is considered that the Zone of Influence ('ZOI') for the Natura 2000 designated sites and their qualifying features will fall within a 15km radius of developments.

Desk Study

- Sources of material that were consulted as part of the desk study for the purposes of the assessment are as follows:
  - NPWS natural heritage database for Natura 2000 sites within the ZOI of the Application Site[14],
  - NPWS site synopses, Natura 2000 Data Form and conservation objectives relating to each site and aerial images, and
  - Environmental Protection Agency ('EPA') maps of river catchments, sub-catchments and flow directions.

Impact Assessment Process

- The assessment process involves:
  - Identifying and characterising Natura 2000 sites identified within the 15km zone of influence surrounding the Application Site and their qualifying features and addressing whether any of these designated sites have any connectivity with the Proposed Development. If any site is found to have no connectivity, then the designated site will be 'scoped out' (not considered further);
  - Assessing whether there will be any significant impacts to any of the Natura 2000 site, in regard to changes that result from the construction, operation and decommissioning phases of a project. Qualifying features of a Natura 2000 site that lie outside of the ZOI and not subject to any impacts from the Proposed Development will be 'scoped out' (not considered further);

[14] Environment, Heritage and Local Government (2009) Appropriate Assessment of Plan and Projects in Ireland. Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf

Environmental Protection Agency (EPA) maps available at: https://gis.epa.ie/EPAMaps/

- Identifying any significant impacts on the integrity of the Natura 2000 site from the development and 'in combination' with any other development within 5km; and
- Identifying the need for the Appropriate Assessment process to move to Stage 2: 'Natura Impact Statement'. If there are no impacts from the development, then the development may proceed.

5. BASELINE

5.1. In accordance with National Parks & Wildlife Service (NPWS) guidance, this stage of the AA has identified all Natura 2000 sites located within 15km of the development boundary. The potential effects associated with the Proposed Development have been identified. Those Natura 2000 sites which will not be significantly affected will be ruled out of any further assessment.

5.2. Effects can depend more on the nature of impacts, sensitivity of receptors and causal linkage, rather than actual distances. The assessment below considers connectivity, either ecological, ornithological or hydrological, that may exist between the Proposed Development and the designated sites.

ECOLOGICAL SITE VISIT

5.1. A habitat survey was undertaken which identified the following habitats

- Building and Artificial Surfaces (BL3);
- Amenity Grassland (GA2);
- Recolonising Bare Ground (ED3);
- Scrub (WS1);
- Depositing/Lowland rivers (FW2);
- Hedgerows (WL1), and
- Treelines (WL2).

5.2. The construction of the Proposed Development will occur primarily over land which has been identified as amenity grassland and recolonising bare ground. These habitats are considered to be of low ecological value and currently offer limited potential to support wildlife.

5.3. Habitats on site are suitable for supporting low numbers of common widespread species.

IDENTIFICATION OF NATURA 2000 SITES

5.4. There are nine Natura 2000 designated sites located within 15km of the Application Site, comprising six Special Areas of Conservation (SACs), and three Special Protection Areas (SPAs). The qualifying features of each have been outlined within **Table 5-1** below.

5.5. **Figure 1**, **Appendix A** of this report details the location of these sites in relation to the Application Site.

Table 5-1: Natura 2000 sites within 15km

Site Code	Site Name	Qualifying Features	Distance (km), Direction	Potential Connectivity with the Proposed Development Site
SAC				
001398	Rye Water Valley/Carton SAC	Petrifying springs with tufa formation (*Cratoneurion*) [7220] *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]	5.88km northwest	None
001209	Glenasmole Valley SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Petrifying springs with tufa formation (*Cratoneurion*) [7220]	8.05km southeast	None
002122	Wicklow Mountains SAC	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Natural dystrophic lakes and ponds [3160]	9.76km southeast	None

		Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] *Lutra lutra* (Otter) [1355]		
000397	Red Bog, Kildare SAC	Transition mires and quaking bogs [7140]	14.44km southwest	None
000210	South Dublin Bay SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310] Embryonic shifting dunes [2110]	15.21km east	Hydrological connectivity via the Baldonnell stream and the River Liffey
000206	North Dublin Bay SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310]	17.90km northeast	Hydrological connection via the Baldonnell stream and the River Liffey

		Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] *Petalophyllum ralfsii* (Petalwort) [1395]		
SPA				
004040	Wicklow Mountains SPA	Merlin (*Falco columbarius*) [A098] Peregrine (*Falco peregrinus*) [A103]	12.88km southeast	None
004024	South Dublin Bay and River Tolka Estuary SPA	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Roseate Tern (*Sterna dougallii*) [A192]	14.81km east	Hydrological connectivity via the Baldonnell stream and the River Liffey

		Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194] Wetland and Waterbirds [A999]		
004006	North Bull Island SPA	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Oystercatcher (*Haematopus ostralegus*) [A130] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Turnstone (*Arenaria interpres*) [A169] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]	19.71km east	Hydrological connectivity via the Baldonnell stream and the River Liffey

5.6. As shown in **Table 5-1**, the Application Site has a potential hydrological connection with four internationally designated sites.

5.7. The Baldonnell stream discharges into the River Liffey, approximately 7km from the Application Site. The River Liffey stretches approximately 28km before entering into the Dublin Bay. Therefore, it is considered that there is a hydrological connection between the Application Site and the designated sites within the Dublin Bay (South Dublin Bay and River Tolka SPA, North Bull Island SPA, South Dublin Bay SAC and North Dublin Bay SAC).

5.8. It is considered that the survey area is unlikely to support any of the Annex II species or assemblages listed above. Narrow-mouthed Whorl Snail and Desmoulin's whorl snail are restricted to the marsh vegetation of the Rye Water Valley/Carton SAC. The Application site is not considered to offer suitable habitat for otter, the Baldonnell Stream is too narrow to support breeding and foraging otter, and the surrounding habitats (business parks, a golf course and a significant amount of residential housing and shopping centres) are not suitable to support otters commuting from the Wicklow Mountains SAC.

5.9. The habitats are not suitable for supporting the qualifying bird species of the SPAs listed above. Merlin and Peregrine are associated with the upland habitats of the Wicklow Mountains SPA. Black-headed gulls (associated with Poulaphouca Reservoir SPA) nest in wetland habitats, but are not confined to wetlands, and will forage in domestic waste and fields of crop. As there is there is no food waste or crop associated within the Application Site it is considered there is no potential for gull species to scavenge within the site boundary. Greylag goose prefer coastal habitats or wetland habitats for foraging and/or breeding.

5.10. Given that no connectivity (potential pathway for impact) exists between the Application Site and the Natura 2000 designated sites, these sites have been scoped out of the impact assessment. No impacts upon these sites will result from the Proposed Development.

6. ASSESSMENT OF LIKELY EFFECTS

6.1. This section discusses and evaluates the likely impacts of the Proposed Development affecting the Natura 2000 sites within the Zone of Influence (ZOI) of the Application Site (i.e. where there is some ecological, ornithological or hydrological connection between the Application Site and the Natura 2000 site).

6.2. As outlined within Table 5-1 above, the Application Site has hydrological connectivity with the South Dublin Bay and River Tolka Estuary SPA, offering a pathway for impacts through the movement of contaminated waters.

6.3. Aquatic systems and the species/habitats which are dependent on these systems are sensitive to pollution and contamination of surface waters. Pollution can result from any of the following entering a body of surface or groundwater:

- Poisonous, noxious or polluting matter;
- Waste matter (including silt, cement, concrete, oil, petroleum spirit, chemicals, solvents, sewage and other polluting matter);
- Other harmful activities detrimentally affecting the status of a waterbody.

6.4. Table 6-1 below details common water pollutants and their effect on the aquatic environment and standard Best Practice Pollution Measures. (This table has been extracted from Ciria guidance[15]).

Table 6-1: Common water pollutants and their effects on the aquatic environment and standard prevention measures

[15] Ciria (2015) Environmental Good Practice on Site guide, fourth edition

Common Water Pollutants	Adverse Effect on Aquatic Environment	Standard Best Practice Pollution Prevention Measures
Silt	Reduces water quality, clogs fish gills, covers aquatic plants, impacts aquatic invertebrates, leads to a reduction in prey for species and leads to degradation of habitat	<u>Pollution Prevention</u> Hydrocarbons, greases and hydraulic fluids will be stored in a secure compound area; All plant machinery will be properly serviced and maintained thereby reducing risk of spillage or leakage; All waste produced from construction will be collected in skips with the construction site kept tidy at all times; Excavated soil will be stored on site or removed by a licensed waste disposal unit; All materials and substances used for construction will be stored in a secure compound and all chemicals to be stored in secure containers to avoid potential contamination; Location of spill kit to be known by all construction workers and implemented in the event of spillage or leakage. <u>Waste Management</u> Skips are to be used for site waste/debris at all times and collected regularly or when full; All hydrocarbons and fluids are to be collected in leak-proof containers and removed from site for disposal or recycling;
Bentonite (very fine silt)	Reduces water quality, clogs fish gills, covers aquatic plants, impacts aquatic invertebrates, leads to a reduction in prey for species and leads to degradation of habitat	
Cement or concrete wash water (highly alkaline)	Changes the chemical balance, is toxic to fish and other wildlife. This can lead to direct impacts for aquatic species (including otter), or indirect through loss of prey resources	
Detergent	Removes dissolved oxygen, can be toxic to fish and other wildlife present within the aquatic environment	

Hydrocarbons (e.g. oil, diesel)	Suffocates aquatic life, damaging to the wildlife (e.g. birds), and to water supplies including industrial abstractions	All waste from construction is to be stored within the site confines and removed to a permitted waste facility. Environmental Monitoring Contractor to nominate member of staff as the environmental officer with the responsibility to ensure best practice measures are implemented and adhered to, with any incidents or non-compliance issues being reported to project team.
Sewage	Reduces water quality, is toxic to aquatic wildlife, and damages water supplies	

Assessment of Likely Impacts Affecting Natura 2000 Designated sites in Dublin Bay

South Dublin Bay SAC

6.5. The South Dublin Bay SAC is located approximately 15km east, but connectivity is approximately 29km downstream of the Application Site. The site has been designated for a number of important Annex I habitats of the E.U. Habitats Directive, as detailed within **Table 5-1** above. The Application Site and the designated sites do not share any of the same habitats.

6.6. The only opportunity for pollution arising from the Proposed Development to impact upon the designated site is through the contamination of the Baldonell stream. Given the drainage measures in place at the site, and the large distance between the Application Site and the Dublin Bay, the dilution factor will result in a **negligible impact** upon the SAC and its qualifying species.

6.7. Notwithstanding this, during the construction phase, standard best practice measures will be adhered to.

6.8. **Chapter 5: Demolition and Construction Environmental Management** outlines the procedures that will be implemented to prevent any spillages to the Balonnell stream. In order to prevent any spillages of fuels to the Baldonnel Stream, or groundwater, the following measures are proposed:

- Designation of a bunded refuelling areas on the site;
- Provision of spill kit facilities across the site;
- Where mobile fuel bowsers are used the following measures would be taken:

- Any flexible pipe, tap or valve would be fitted with a lock and would be secured when not in use;
- Pumps or valves would be fitted with a lock and would be secured when not in use;
- All bowsers to carry a spill kit;
- Operatives must have spill response training; and
- Drip trays used on any required mobile fuel units.
- In the case of drummed fuel or other potentially polluting substances which may be used during the demolition and construction stage the following procedures will be adopted:
- Secure storage of all containers that contain potential polluting substances in a dedicated internally bunded chemical storage cabinet unit or inside a concrete bunded area;
- Clear labelling of containers so that appropriate remedial measures can be taken in the event of a spillage;
- All drums to be quality approved and manufactured to a recognised standard;
- If drums are to be moved around the site, they would be secured and on spill pallets; and
- Drums to be loaded and unloaded by competent and trained personnel using appropriate equipment.

6.9. Additional measures are outlined in Chapter 5. With the implementation of best practice measures, and considering the distance and dilution factors, **no significant effects** are predicted on qualifying habitats and species of South Dublin Bay SAC.

North Dublin Bay SAC

6.1. The North Dublin Bay SAC is located approximately 17.9km northeast but connectivity is over 30km downstream of the Application Site.

6.2. As outlined above in the assessment of the South Dublin Bay SAC, there is limited hydrological connectivity between the Proposed Development and Natura 2000 Sites within the Dublin Bay. Due to the drainage measures in place, and likely dispersion it is considered that potential effects are **negligible**. With best practice pollution measures in place, it is considered that there is no potential for significant effects.

6.3. Potential impacts from the Proposed Development will not be significant or have a detrimental effect on the qualifying features of any Natura 2000 designated sites with a hydrological connection.

6.4. Therefore, **no significant effects** are predicted on qualifying species of North Dublin Bay SAC.

South Dublin Bay and River Tolka Estuary SPA

6.5. Given the large distance between the Application Site and the SPA, the dilution factor will result in a **negligible** impact upon the SPA and its qualifying species.

6.6. Therefore, **no significant effects** are predicted on qualifying species of South Dublin Bay and River Tolka Estuary SPA.

North Bull Island SPA

6.1. Given the large distance between the Application Site and the SPA, the dilution factor will result in a **negligible** impact upon the SPA and its qualifying species.

6.2. Therefore, **no significant effects** are predicted on qualifying species of North Bull Island SPA.

7. CUMULATIVE IMPACTS

7.1. As well as singular effects, cumulative effects also need to be considered. Article 6 of the EU Habitats Directive and Regulation 15 of the European Communities (Natural Habitats) Regulations state that an AA should be performed for any plan or project that, either alone or in combination with other plans or projects, may significantly affect a Natura 2000 site.

7.2. Cumulative effects can be an issue when multiple proposals each have a low level of impact on Natura 2000 sites. If several proposals all have a small impact, the combined result can lead to a significant effect on the qualifying features of a Natura 2000 site.

7.3. However, the Proposed Development will have **negligible impacts** upon any Natura 2000 site. For the purposes of this assessment, it is therefore confirmed that **no likely significant cumulative effects** will occur upon any Natura 2000 sites as a result of the Proposed Development due to the

7.4. A search of the National Planning Application Database and the Dublin City Council online planning portal identified a large number of permitted plans or projects within 5km of the Proposed Development. However, as the Proposed Development will have no significant effects upon any Natura 2000 site, for the purposes of this this assessment it is therefore confirmed that **no likely cumulative effects will occur upon any Natura 2000 site as a result of the Proposed Development.**

8. CONCLUSION

8.1. According to NPWS (2009), the Appropriate Assessment Stage 1: Screening exercise can result in one of three conditions:

- An Appropriate Assessment is not required i.e., where the plan/proposal is associated with the management of the site;
- There is no potential for significant effects i.e., Appropriate Assessment is not required;
- Significant effects are certain, likely or uncertain i.e., the project must either proceed to Stage 2: Appropriate Assessment or be rejected.

8.2. The Proposed Development was screened for likely significant adverse effects upon any designated sites within its Zone of Influence. Within 15km of the Application Site there are nine designated sites, comprising six Special Areas of Conservation (SACs) and three Special Protection Areas (SPAs).

8.3. Potential connectivity (potential pathways for impact) exists between the Application Site and four designated sites; the North Dublin Bay SAC, the South Dublin Bay and River Tolka Estuary SPA and the North Bull Island SPA. This connectivity is roughly 28km downstream via the Baldonnel stream.

8.4. Given that the Proposed Development does not involve any instream works, and considering the distance and dilution factors, it has been concluded that the Proposed Development **will not lead to significant adverse impacts** upon any Natura 2000 sites. **No likely significant effect** is foreseen upon these Natura 2000 sites as a result of the proposals, either alone or in combination with any other development.

8.5. This screening report, based on the best available scientific information, finds that there is no reasonable scientific doubt that the development does not pose any risk of significant adverse effects on Natura 2000 sites, and that the development does not require progression to a Stage 2 AA. It is considered that the next stage of the AA is not required.

9. APPENDICES

Appendix A

- Figure 1: Natura 2000 Designated Sites

Technical Appendix 11.3A: Biodiversity Management Plan

Appendix 11.3A: Biodiversity Management Plan

27/02/2023

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EXECUTIVE SUMMARY

1.1. Objectives have been established to enhance and maintain the biodiversity of the land at a proposed data centre building and associated development on lands within Profile Park, Clondalkin, Dublin.

1.2. Measures include: native riparian planting along the Baldonnel stream and wetland wildflower (meadow) planting, the planting of species-rich hedgerows to provide a plentiful source of food and shelter for a range of fauna species. Other enhancement measures include development of a wildflower meadow mix, native woodland, medium to large deciduous trees and native conifer trees on site. This would be in addition to creating a herptile hibernaculum and adding bird and bat boxes to the site.

1.3. A Fossitt habitat survey of the site was conducted on the 20th of July 2022 by Eiméar Rose Cunningham to assess the current baseline of the Application Site. An Ecological Impact Assessment (EcIA) was then conducted to assess the local area and its ability to support a range of wildlife, as part of the full planning application.

1.4. The enhancements and management measures set out in this document have been developed in accordance with the findings of the above habitat survey. This will enable the Proposed Development to deliver biodiversity gain.

INTRODUCTION

Background

1.6. Neo Environmental Ltd has been appointed by Ramboll on behalf of Vantage Data Centres Dub 11 Limited (the "Applicant") to undertake a Biodiversity Management Plan for a data centre building and associated development (the "Proposed Development") on lands within Profile Park, Clondalkin, Dublin (the "Application Site").

Development Description

1.7. The development applied for consists of the construction of one no. two storey data centres with a gross floor area of c. 12,893 sqm that will include office at first floor.

1.8. The proposed data centre comprises of a two-storey data centre that will include 13 no. standby emergency generators with associate flues (each 25m in height) to be located to the west of the building.

1.9. The data centre will be c. 14.23m to parapet height with the roof plant increasing the height to 18.5m overall.

1.10. The data centre will be accessed from a new emergency and service vehicular access off Falcon Avenue as well as from the site of the already permitted data centres to the west.

1.11. The data centre will be served by 60 car parking spaces that will be located generally to the east of the data centre, of which 3 no. spaces will be disabled spaces and 6 of these spaces will be provided for electrical charging vehicles. Covered bicycle parking provision will be provided within the site.

1.12. The data centre will be enclosed by landscape berms and planting to the north and north-east.

Site Description

1.13. The Application Site is centred at Irish Grid Reference (IGR) O 03894 30791.

1.14. The Application Site is located Profile Park Business Park, Nangor Road, Clondalkin, County Dublin, Ireland. The surrounding area is mostly commercial in nature with retail/business parks, data centres and other commercial businesses in the vicinity of the proposed site. There is one residential property within the red line boundary of the proposed development site.

1.15. The site's immediate boundaries are defined by the following:

- The land is adjacent to Nangor Road which is situated north of the Application Site boundary.

- To the east of the site is the entrance to the business park as well as the Grange Castle Golf Club.
- To the south of the site are further green fields and commercial businesses within the business park, including Digital Reality Profile Park.
- Immediately to the south of the red line boundary of the site is the Baldonnel stream which flows west.
- To the west of the site is further green field and the continuation of the Baldonnel stream as well as Grange Castle Business Park and Bennet Construction.

1.16. Currently the site comprises mostly of amenity grassland with small areas of scrub, recolonising bare ground and buildings and other artificial surfaces. The site is bound by horse chestnut treeline to the south and bound by a combination of treeline and hedgerow elsewhere.

1.17. The wider context of the site is characterised by a mix of industrial and agricultural development with a fragmented mixture of commercial, industrial and residential uses.

OBJECTIVE OF THE BIODIVERSITY MANAGEMENT PLAN

1.18. The objective of this BMP is to minimise any potential negative impacts, arising from the Proposed Development, while increasing the habitat diversity. The enhancement of the land within the Application Site boundary will increase the sites capability of supporting wildlife.

1.19. This will be achieved by

- Creating and maintaining native riparian vegetation along Baldonnel stream;
- Creating and maintaining a wetland specific species-rich diverse grassland with a varied sward structure;
- Creating and maintaining a wildflower meadow;
- Creating and maintaining species-rich hedgerows;
- Planting and maintaining medium to large deciduous trees;
- Planting and maintaining coniferous trees;
- Creating and maintaining wildlife shelters for priority and locally important species; and
- Maximise the floral and faunal biodiversity of the created and retained habitats.

CURRENT CONSERVATION & BIODIVERSITY

National Conservation

Ireland's National Biodiversity Action Plan 2017 - 2021[1]

1.20. Ireland's 4th National Biodiversity Action Plan for the period 2023-2027 has been in development since October 2021. Is it currently in the public consultation phase. For the purpose of this report, the objectivise of the 2017-2021 plan has been considered.

1.21. The National Biodiversity Action Plan[2] sets out a vision and seven strategic objectives to halt the decline of biodiversity across Ireland.

"Objective 1 - Mainstream biodiversity into decision-making across all sectors.

[1] Department of Culture, Heritage, and the Gaeltach (2017) National Biodiversity Action Plan 2017-2021

[2] Department of Arts, Heritage and the Gaeltacht (2011) Actions for Biodiversity 2011 – 2016 Ireland's National Biodiversity Action Plan. Available at: http://www.npws.ie/sites/default/files/general/national-biodiversity-plan-english.pdf

Objective 2 - Strengthen the knowledge base for conservation, management, and sustainable use of biodiversity.

Objective 3 - Increase awareness and appreciation of biodiversity and ecosystem services.

Objective 4 - conserve and restore biodiversity and ecosystem services in the wider countryside.

Objective 5 - conserve and restore biodiversity and ecosystem services in the marine environment.

Objective 6 - Expand and improve management of protected areas and species.

Objective 7 - Strengthen international governance for biodiversity and ecosystem services."

1.22. This document outlines that special protection to sites of highest nature value and species most at risk, including designated sites should be afforded. However, effective conservation and sustainable use of biodiversity should also occur within the wider countryside, as this is where much of the biodiversity lies.

1.23. The primary threat to biodiversity both within and outside protected areas is from habitat degradation, fragmentation and loss due to changes in agricultural practices (such as intensification), commercial forestry, fisheries over exploitation, peat extraction, air and water pollution, invasive alien species, land clearance and development, tourism and recreational activities and climate change.

National Biodiversity Action Strategy 2022-2026[3]

1.24. The National Biodiversity Action Strategy was created by the Office of Public Works to identify strategic actions to help government delivery of the National Biodiversity Action Plan. The Plan outlines 48 strategic actions, each with an expected outcome and key performance indicators defined. These actions are divided into five strategic themes;

1. Strategic Theme 1 Planning for Nature
2. Strategic Theme 2 Natural Leaders
3. Strategic Theme 3 Working with Water and Wildlife
4. Strategic Theme 4 Diversity by Design
5. Strategic Theme 5 Natural Knowledge

[3] OPW (2022) Biodiversity Action Strategy 2022-2027

South Dublin Development Plan 2022–2028 [4]

1.25. The Plan sets out an overall strategy for the proper planning and sustainable development of the County and consists of a written statement and accompanying plans and maps

1.26. Chapter 3 of the Plan refers to the county's natural heritage and contains a number of key policies (outlined below), which aim to protect and enhance biodiversity and designated sites within the county:

NCBH1: Objective 1: To protect, conserve and enhance natural, built and cultural heritage features, seeking opportunities to identify, retain, protect, and incorporate heritage assets into plans and development.

NCBH1 Objective 2: To support the objectives and actions of the County Heritage Plan and the County Biodiversity Action Plan in the promotion and protection of natural, built and cultural heritage, and to take full cognisance of the County's Landscape Character Assessment and the County Geological Audit in the sustainable management of development.

NCBH1 Objective 3: To carry out an audit and assessment, based on an initial pilot study of the County's natural and built heritage assets including Council owned protected structures and archaeological features; to identify and safeguard these assets from the potential impacts of climate change; and to explore possible uses as part of climate change mitigation.

NCBH2 Objective 1: To support the implementation of the National Biodiversity Action Plan (2017- 2021) and the All-Ireland Pollinator Plan (2021-2025) and to support the adoption and implementation of the South Dublin County Biodiversity Action Plan (2020-2026) and Pollinator Action Plan (2021-2025) and any superseding plans.

NCBH2 Objective 2: To ensure the protection of designated sites in compliance with relevant EU Directives and applicable national legislation.

NCBH2 Objective 3: To protect and conserve the natural heritage of the County, and to conserve and manage EU and nationally designated sites and non-designated locally important areas which act as 'stepping stones' for the purposes of green infrastructure and Article 10 of the Habitats Directive.

NCBH2 Objective 4: To protect our rivers and in particular to avoid overdevelopment which could have an adverse effect on the biodiversity and ecosystems of the river.

NCBH3 Objective 1: To prevent development and activities that would adversely affect the integrity of any Natura 2000 site located within or adjacent to the County and promote the favourable conservation status of the habitats and species integral to these sites.

NCBH3 Objective 2: To ensure that plans, including land use plans, will only be adopted, if they either individually or in combination with existing and / or proposed plans or projects, will not

[4] Available from : https://www.sdcc.ie/en/devplan2022/adopted-plan/

have a significant adverse effect on a European Site, or where such a plan is likely or might have such a significant adverse effect (either alone or in combination), South Dublin County Council will, as required by law, carry out an appropriate assessment as per requirements of Article 6(3) of the Habitats Directive 92 / 43 / EEC of the 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, as transposed into Irish legislation. Only after having ascertained that the plan will not adversely affect the integrity of any European site, will South Dublin County Council adopt the plan, incorporating any necessary mitigation measures. A plan which could adversely affect the integrity of a European site may only be adopted in exceptional circumstances, as provided for in Article 6(4) of the Habitats Directive as transposed into Irish legislation.

NCBH3 Objective 3: To ensure that planning permission will only be granted for a development proposal that, either individually or in combination with existing and / or proposed plans or projects, will not have a significant adverse effect on a European Site, or where such a development proposal is likely or might have such a significant adverse effect (either alone or in combination), the planning authority will, as required by law, carry out an appropriate assessment as per requirements of Article 6(3) of the Habitats Directive 92 / 43 / EEC of the 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, as transposed into Irish legislation. Only after having ascertained that the development proposal will not adversely affect the integrity of any European site, will the planning authority agree to the development and impose appropriate mitigation measures in the form of planning conditions. A development proposal which could adversely affect the integrity of a European site may only be permitted in exceptional circumstances, as provided for in Article 6(4) of the Habitats Directive as transposed into Irish legislation.

NCBH4: Protect the ecological, visual, recreational, environmental and amenity value of the County's proposed Natural Heritage Areas and associated habitats and species.

NCBH5: Protect and promote the conservation of biodiversity outside of designated areas and ensure that species and habitats that are protected under the Wildlife Acts 1976 to 2018, the Birds Directive 1979 and the Habitats Directive 1992, the Flora (Protection) Order 2015, and wildlife corridors are adequately protected.

NCBH10: Protect against and prevent the introduction and spread of invasive species within the County and require landowners and developers to adhere to best practice guidance in relation to the control of invasive species.

NCB11: Review Tree Preservation Orders (TPO) within the County and maintain the conservation value of trees and groups of trees that are the subject of a Tree Preservation Order while also recognising the value of and protecting trees and hedgerows which are not subject to a TPO.

South Dublin County Council Draft Biodiversity Action Plan 2020-2026[5]

1.27. The preparation of this Biodiversity Action Plan is an objective of the South Dublin County Heritage Plan and the South Dublin County Council Development Plan 2022-2028. The South Dublin County Biodiversity Plan was prepared in the context of a range of national and international plans for biodiversity protection and enhancement

1.28. The National Biodiversity Plan lists a range of actions for biodiversity that aim to achieve this vision, arranged under a series of 7 Strategic Objectives. These objectives are:

- the mainstreaming of biodiversity issues across the decision-making in all sectors;
- the strengthening of the knowledge base for conservation, management and sustainable use of biodiversity;
- increasing public awareness and appreciation of biodiversity and ecosystem services;
- the conservation and restoration of biodiversity and ecosystem services in the wider countryside;
- the conservation and restoration of biodiversity and ecosystem services in the marine environment;
- the expansion and improved management of protected areas and species; and
- the strengthening of international governance for biodiversity and ecosystem services.

All Ireland Pollinator Plan 2021-2025[6]

1.29. On the 17th of September 2015, Ireland joined a small number of countries in Europe who have developed a strategy to address pollinator decline and protect pollination services. In March 2021, a new Plan was released.

1.30. This new Plan has six objectives and has identified 186 actions in order to achieve its objectives. The six objectives are as follows:

– Making farmland pollinator friendly. Working together with the farming community, increase awareness of pollinators and the resources they need in order to survive on farmland.

[5]https://consult.sdublincoco.ie/en/consultation/draft-biodiversity-action-plan-south-dublin-county-connecting-nature-2020-2026

[6] National Biodiversity Data Centre (2015) All Ireland Pollinator Plan 2021-2025. Available at: https://pollinators.ie/wp-content/uploads/2021/03/All-Ireland-Pollinator-Plan-2021-2025-WEB.pdf

- **Making public land pollinator friendly**. Working with Councils, Transport Authorities, Local Communities and others, to strengthen links between this plan and other initiatives and to increase shelter and food resources for pollinators.
- **Making private plan pollinator friendly**. Work together with the public and community groups to create networks of biodiversity-friendly habitat across the landscape.
- **All-Ireland honeybee strategy**. Working with beekeepers, achieve healthy, sustainable populations, and for honeybees to be part of a cohesive pollinator message that balances managed and wild pollinator populations.
- **Conserving rare pollinators**. Improving our knowledge on rare pollinators, and raising awareness through dedicated initiatives, achieve a Plan that protects as much wild pollinator diversity as possible.
- **Strategic coordination of the Plan**. Continually raising awareness; addressing gaps in knowledge through research, tracking where pollinators occur and how populations are changing, work from an evidence base that enables us to coordinate a dynamic plan that is targeted and effective.

1.31. The enhancements set out within this BMP will create areas of flower-rich habitat that will support Ireland's pollinator species, including bees and flies.

Local Conservation

1.32. The Proposed Development does not lie within or directly adjacent to any statutory or non-statutory designated environmental sites. Within 15km of the Application Site boundary there are nine Natura 2000 designated sites, six Special Areas of Conservation (SACs) and three Special Protection Areas (SPA)

1.33. Please refer to the supporting Appropriate Assessment (AA) Screening report (**Appendix 8.2**) for details of all Natura 2000 sites within 15km of the Application Boundary.

1.34. From the findings of the EcIA and AA it is considered that with the implementation of design, best practice and mitigation measures the Proposed Development will not significantly impact upon any of the designated and non-designated sites located within 15km of the Proposed Development.

HABITATS & SPECIES PRESENT

1.35. An extended habitat survey of the Proposed Development was undertaken in July 2022. The following habitat types were identified:

- Building and Artificial Surfaces (BL3)
- Amenity Grassland (GA2)
- Recolonising Bare Ground (ED3)
- Scrub (WS1)
- Depositing/Lowland rivers (FW2)
- Hedgerows (WL1)
- Treelines (WL2)

(Note: Fossitt classification within brackets).

Fauna

1.36. The potential presence of protected species within the study area was assessed though a data search conducted through the NBDC. This identified records of invasive, rare, scarce and protected species within 2km of the Proposed Development location.

1.37. The Application Site is located within the 1km grid squares O03F. A database search was also carried out for adjacent grid squares to ensure a full assessment of the 2km radius.

1.38. Additional information on the suitability of habitat in the surrounding area for bats was also obtained from the NBDC in the form of a habitat suitability map. The map provided enhanced information on the recorded distribution of bats and broad-scale geographic patterns of occurrence and local roosting habitat requirements for Irish bat species.

1.39. In addition, the extended habitat survey included a species scoping survey in order to assess the potential of the site to support protected species.

1.40. The Application Site and adjacent areas offer suitable habitat for badger, hedgehog, otter, shrew, squirrel, bat, bird and herptile species which are known to be present in the local area.

POTENTIAL IMPACTS

1.41. Potential impacts which could arise from a Development include:

- Potential habitat loss and fragmentation;
- Disturbance during construction and decommissioning; and
- Potential contamination of surface waters.

1.42. Each of these potential impacts have been considered below in relation to the Proposed Development.

Potential Habitat Loss and Fragmentation

1.43. The overall ground-level Proposed Development footprint take up 12,893m^2.

1.44. Currently the habitat present under the Proposed Development footprint is primarily amenity grassland, considered to be of low ecological value. As the surrounding landscape is of a similar nature, the loss of these small areas will not be significant and the alteration of this habitat will not result in fragmentation.

1.45. Post-construction, with the implementation of this BMP, existing habitats are to be enhanced, with new habitats created. This document sets out how the habitats including hedgerows, trees, wildflower meadow and wetland meadow within the Application Site will be sensitively managed to ensure the maximum potential of these habitats are maintained throughout the lifetime of the development.

1.46. It is therefore demonstrated that the Proposed Development will have a positive significant impact on local habitats and will indeed deliver biodiversity enhancements to the benefit of the site and wider area.

Disturbance During Construction and Operation

1.47. The construction and decommissioning phases of the Proposed Development have the greatest potential to impact upon local wildlife.

1.48A Measures will be implemented prior to construction and decommission work taking place to minimise any potential disturbance to wildlife. Mitigation measures recommended within the Ecological Impact Assessment (Appendix 8.1) include:

- Pre-construction bird surveys, if works commence between March and August inclusive;
- Pre-construction badger survey;
- Pre-construction otter survey;

- Securely covering all excavations at the end of each working day to prevent accidental trapping of badger, otter or other small mammals;
- Mammal gates will be installed at the base of security fence (every 10m, where possible) to allow the free movement of badger and other small mammals through the site.

1.49. With the creation of the wildflower meadow, wetland meadow, native hedgerow and native woodland/trees along with the introduction of hibernacula, bat and bird boxes and the enhancement of existing hedgerows and riparian habitat combined with sensitive management, the sites potential for supporting local wildlife could be greatly increased post-construction.

Potential Disturbance and Contamination of Surface Waters

1.50. The construction phase of a development has the potential for contamination of surface waters, if appropriate measures are not implemented.

1.51. A **Demolition and Construction Environmental Management Plan** (DCEMP) – **Chapter 5** of the accompanying **Environmental Impact Assessment Report** (EIAR) has been produced by Pinnacle Consulting Engineers. This DCEMP report outlines measures to be implemented during demolition and construction works to prevent contamination of the stream through contaminated surface waters.

1.52. The Baldonnel stream was assessed in the adjacent lands (in support of planning reference: **SD20A/0283**). Low species diversity of freshwater invertebrates were recorded, samples were dominated by freshwater shrimp and stone clingers.

1.53. Through following measures outlined in the DCEMP it is envisaged that no contaminants will enter the Baldonnel stream as a result of construction and demolition involved for the proposed development.

1.54A A bridge will be created to cross a small section of the Baldonnell stream. ~~is proposed to be culverted, via two pipes, under the road in the south of the site.~~ With the implementation of riparian planting and enhancements along the banks of the Baldonnel stream the Proposed Development will have a positive significant impact on local habitats (i.e. providing structure for invertebrate species, and thus, enhancing feeding for aquatic species such as frog) and will indeed deliver biodiversity enhancements to the benefit of the site and wider area.

MANAGEMENT & RECOMMENDATIONS

1.55. The following management recommendations have been made:

- to maintain and improve the biodiversity of species within the site;
- to enhance the quality of habitats present;
- increase the sites potential for supporting wildlife; and
- to avoid any potential negative impacts arising from the Proposed Development of the site.

1.56. It is proposed that the implementation of biodiversity and landscaping enhancements, will be undertaken early within the construction programme. This will enable habitats to establish before the operational phase of the development.

Recommended Management

1.57. Currently the amenity grassland of which the majority of the Application Site comprises offers limited benefit to wildlife. The potential of the site to support wildlife will be significantly increased by the habitat creation measures set out below.

Habitat Enhancement

1.58. Various options exist to enhance the biodiversity value of a site, including the creation of different habitats, such as: hedgerows, woodland, riparian zones, wildflower meadows and individual conifer and deciduous tree planting.

1.59. Habitats that will be created at the development site will include:

- Native woodland;
- Native hedgerow;
- Riparian zones;
- Wetland wildflower meadow;
- Standard wildflower meadow;
- Hibernaculum;
- Bird and bat boxes;
- Bee and beetle banks.

1.60. These habitats individually offer shelter and a food source for supporting a variety of wildlife. The mosaic of these new habitats combined with the existing hedgerows and existing trees, will support the existing wildlife within the site. They also have excellent potential to allow the biodiversity of the site to increase, by offering a wider range of habitats that benefit local wildlife.

General Considerations

Obligations

1.61. During each of the Proposed Development phases there are a number of legal obligations that should be considered by all those involved in site work:

- Ensure obligations of the European Communities (Birds and Natural Habitats) Regulations 2011 are met by all involved with the site.
- Ensure obligations of the Wildlife Act 1976 and Wildlife (Amendment) Act 2000 are met by all involved with the site.
- Ensure all relevant Health & Safety at Work Act obligations.

Good Ecological Practice

1.62. Whilst management practices should only be altered if there is a good ecological reason for doing so, they should not be rigidly adhered to if they are obviously detrimental.

Invasive Non-Native Species

1.63. During the extended habitat survey no field signs or evidence of invasive non-native species were observed.

MANAGEMENT OBJECTIVES AND ACTION PLAN

Table 1-1A: Recommended Management

Objective	Action Plan Task	Timescale	Notes
Creating a diversity of habitats within the site	Wetland wildflower mix to contain: Devils Bit (*Scabious Succisa pratensis*), Common Sorrel *(Rumex acetosa*), Cuckoo Flower (*Cardamine pratensis*), Cowslip (*Primula veris*), Fleabane* (*Erigeron*), Greater Trefoil* (Lotus *pedunculatus*), Hemp Agrimony (*Eupatorium cannabinum*), Lesser Knapweed (*Centaurea nigra*), Marsh Cinquefoil (*Comarum palustre*), Marsh Marigold (*Caltha palustris*), Meadow Buttercup (*Ranunculus acris*), Meadowsweet (*Filipendula ulmaria*), Meadow Rue (*Thalictrum*), Oxeye Daisy (*Leucanthemum vulgare*), Purple Loosestrife (*Lythrum salicaria*), Ragged Robin (*Lychnis flos-cuculi*) and Red Clover (*Trifolium pratense*) Standard Wildflower Meadow mix to contain: Perennials at 15% - Birdsfoot Trefoil (Lotus Corniculatus), Common Cat's Ear (Hypochaeris Radicata), Cowslip (Primula Veris), Field Scabious (Knautia Arvensis), Lady's Bedstraw (Galium Verum), Lesser knapweed (Centaurea Nigra)	Year 1 (early within the construction phase)	Wetland Wildflower mix and Standard Wildflower Meadow will also provide habitat for small mammals and larvae of pollinating insects, including butterflies and moths.

	Meadow Buttercup (Ranunculus Acris), Meadow Vetchling (Lathyrus pratensis), Musk Mallow (Malva Moschata), Ox Eye Daisy (Leucanthemum Vulgare), Ragged Robin (Lychnis Flos Cuculi), Red Campion (Silene Dioica), Ribwort Plantain (Planatago Lanceolata), Rough Hawkbit (Leontodon hispidus), Salad Burnet (Sanguisorba Minor), Self Heal (Prunella Vulgaris), Small Scabious (Scabiosa columbaria), Common Sorrel (Rumex Acetosa), White Campion (Silene Alba), Wild Carrot (Daucus carota), Upright Hedge Parsley (Torilis Japonica), Yarrow (Achillea millefolium), Yellow Rattle (Rhinanathus Minor) and Wild Clary (Salvia Verbenaca). Grass Species 85% - Browntop Bent (*Agrostis capillaris*), Crested Dogstail (*Cynosurus cristatus*), Sheeps Fescue (*Festuca ovina*), Chewings Fescue (*Festuca rubra subsp. Commutate*), Slender Creeping Red Fescue (*Festuca Rubra Litoralis*), Yellow Oat Grass (*Trisetum flavescens*), Sweet Vernal Grass (*Anthoxanthum odoratum*).		
Creating a diversity of habitats within the site	Riparian mix to contain: Fool's watercress (*Apium nodiflorum*), Marsh-marigold (*Caltha paulaustris*), Yellow iris (*Iris pseudacorus*), Water forget-me-not (*Myosotis scorioides*), Watermilfoil (*Myriophyllum spicatum*), Bur-reed	Year 1 (early within the construction phase)	Riparian mix will also provide an important source of food and shelter for aquatic species and support many terrestrial organisms, including bats and a wide range of bird species.

	(*Sparganium spp.*), Snow rush (*Luzula nivea*), Soft shield fern (*Polystichum setiferum*), Common fern (*Dryopteris filix-mas*) Riparian mix can be supplemented with species from Wetland Wildflower mix.		
Creating a diversity of habitats within the site	Tree planting mix to contain: Alder (*Alnus glutinosa*), Silver birch (*Betula pendula*), Scots pine (*Pinus sylvestris*) and Sessile Oak (*Quercus petraea*). Native woodland mix to contain: Alder (*Alnus glutinosa*), Silver birch (*Betula pendula*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*), Larch (*Larix decidua*), Scots pine (*Pinus sylvestris*), Bird Cherry (*Prunus padus*), Wild cherry (*Prunus avium*) and Sessile Oak (*Quercus petraea*).	Year 1 (early within the construction phase)	A patch of woodland/trees provides shelter and a source of food for a variety of species including birds, small mammals, amphibians, reptiles and butterflies. If the correct species are planted and maintained correctly, a woodland's potential can be maximised, providing food and shelter throughout the year.
To enhance the quality of habitats present & Creating a diversity of habitats within the site	Enhance existing hedgerow boundary Gap existing hedgerows and create new hedgerows with species such as blackthorn (*Prunus spinosa)*, hawthorn (*Crataegus monogyna)* and holly (*Ilex aquifolium*) as listed in **Table 1-4.** These corridors will allow the movement of small mammals and herptile species. To ensure a diverse hedgerow with a good structure it is important to plant and maintain	Year 1 (early within the construction phase)	A hedgerow provides shelter and a source of food for a variety of species including birds, small mammals, amphibians, reptiles and butterflies. If the correct species are planted and maintained correctly, a hedgerow's potential can be maximised, providing food and shelter throughout the year.

	ground flora along the hedgerow.		
Ensure fencing does not inhibit the movement of wildlife	To allow movement of badgers, small mammals and herptiles across the Proposed Development area the fence will have mammal gates (130mm high, 10mm wide) at base~~be above ground level, with at least a 10cm gap at the base~~, allowing access for these species where required.	Year 1 (during construction phase)	Although badgers will not pass through a 13cm gap, they will dig a depression into the ground at the required areas.
Creating a diversity of habitats within the site	Creation of hibernaculum, stone piles and log piles	Year 1	See Appendix A The hibernaculum comprise log, rock and stone piles, which are aimed at providing shelter for herptile species to hibernate. However, the hibernaculum and log pile may also be used by a variety of insects and small mammals.
Creating a diversity of habitats within the site	Creation of bat roosting habitat Bat boxes will be placed on a few of the mature trees within the site.	Year 1	The creation of roosting habitat, along with the creation of species-rich habitat that will encourage an abundance of invertebrate life (a potential food source) will be beneficial to local bats.
Creating a diversity of habitats within the site	Creation of bird nesting habitat Bird boxes will be placed on a few of the mature trees within the site.	Year 1	The creation of nesting habitat, along with the creation of species rich habitat that will encourage an abundance of invertebrate life (a potential food source) and the wild bird seed mix areas

			will be beneficial to local birds. Boxes installed should include a mixture of single hole, and open fronted bird boxes.
Creating a diversity of habitats within the site	Creation of invertebrate banks and insect hotels Several earth banks shall be created across the site to support invertebrates.	Year 1	See Appendix B Some banks should be left bare, and south facing for insects such as solitary bees, while others should be sown with grass for beetles etc.
Maintaining the hedgerows	Section of hedgerow to be cut	Each year between January and February	Cutting on a rotational basis, following standard advice[7], to ensure the optimal availability of berry and blossom for wildlife throughout the year, as a potential food source. Management will also ensure a good base is maintained within the hedgerow, to provide suitable habitat for a range of wildlife.

HABITAT CREATION

1.64. The existing groundcover (currently primarily amenity grassland) will be replaced by a mix of wetland meadow mix, wildflower meadow mix, native woodland and native hedgerow. Existing hedgerows will be enhanced, with new hedgerow created within the Proposed Development boundary. Native coniferous trees and medium or large deciduous trees have been proposed to give visual screening. A riparian planting mix has been proposed to be planted along the banks of the Baldonnel stream, southwest of the Application Site.

[7] Hedgelink UK, The Complete Hedge Good Management Guide, Available at www.hedgelink.org.uk

1.65. These habitats will be in place and managed for the duration of the Proposed Development.

Riparian Planting

1.66. A riparian planting mix (Table 1-2) has been proposed to be planted along the banks of the Baldonnel stream, southwest of the Application Site.

1.67. They are an important source of food and shelter for aquatic species and support many terrestrial organisms, including bats and a wide range of bird species.

Table 1-2: Native Riparian Planting Mix

SCIENTIFIC NAME	ENGLISH NAME
Apium nodiflorum	Fool's watercress
Caltha paulaustris	Marsh-marigold
Iris pseudacorus	Yellow iris
Myosotis scorioides	Water forget-me-not
Myriophyllum spicatum	Watermilfoil
Sparganium spp.	Bur-reed
Luzula nivea	Snow rush
Polystichum setiferum	Soft shield fern
Dryopteris filix-mas	Common fern

Management

1.68. Within the first year the main aim is to control weeds and to reduce competition from grasses. Where appropriate, this may include hand pulling of weeds.

1.69. After the wildflower mix has established, no specific management is required for the riparian strip

Wetland Wildflower Meadow

1.70. A wetland wildflower meadow has been proposed to be planted west of the proposed development footprint near the banks of a proposed attenuation area. These species will attract a wider range of species and create a diverse habitat which benefits invertebrates, bats, amphibians, and birds.

1.71. The species mixture is set out in Table 1-2 below.

Table 2-2: Wetland wildflower meadow mix

SCIENTIFIC NAME	ENGLISH NAME
Succisa pratensis	Devils Bit Scabious
Rumex acetosa	Common Sorrel
Cardamine pratensis	Cuckoo Flower
Primula veris	Cowslip
Erigeron	Fleabane*
Lotus pedunculatus	Greater Trefoil*
Eupatorium cannabinum	Hemp Agrimony
Centaurea nigra	Lesser Knapweed
Comarum palustre	Marsh Cinquefoil
Caltha palustris	Marsh Marigold
Ranunculus acris	Meadow Buttercup
Filipendula ulmaria	Meadowsweet
Thalictrum	Meadow Rue
Leucanthemum vulgare	Oxeye Daisy
Lythrum salicaria	Purple Loosestrife
Lychnis flos-cuculi	Ragged Robin
Trifolium pratense	Red Clover

Wildflower Meadow

1.72. The wildflower meadow, as shown within the landscape masterplan (by KFLA Architects) accompanying the application, is a species-rich grassland comprised of 85% grass species and 15% perennial species. This will create an insect-rich habitat and support a range of birds, mammals and invertebrates.

1.73. The species mixture is set out in Table 1-3 below.

Table 1-3: Wildflower meadow mix

SCIENTIFIC NAME	ENGLISH NAME
Lotus Corniculatus	Birdsfoot Trefoil
Hypochaeris Radicata	Common Cat's Ear
Primula Veris	Cowslip
Knautia Arvensis	Field Scabious
Galium Verum	Lady's Bedstraw
Centaurea Nigra	Lesser knapweed
Ranunculus Acris	Meadow Buttercup
Lathyrus pratensis	Meadow Vetchling
Malva Moschata	Musk Mallow
Leucanthemum Vulgare	Ox Eye Daisy
Lychnis Flos Cuculi	Ragged Robin

Silene Dioica	Red Campion
Planatago Lanceolata	Ribwort Plantain
Leontodon hispidus	Rough Hawkbit
Leontodon hispidus	Rough Hawkbit
Sanguisorba Minor	Salad Burnet
Prunella Vulgaris	Self Heal
Scabiosa columbaria	Small Scabious
Rumex Acetosa	Common Sorrel
Silene Alba	White Campion
Daucus carota	Wild Carrot
Torilis Japonica	Upright Hedge Parsley
Achillea millefolium	Yarrow
Rhinanathus Minor	Yellow Rattle
Salvia Verbenaca	Wild Clary
Agrostis capillaris	Browntop Bent
Cynosurus cristatus	Crested Dogstail
Festuca ovina	Sheeps Fescue
Festuca rubra subsp. Commutate	Chewings Fescue
Festuca Rubra Litoralis	Slender Creeping Red Fescue
Trisetum flavescens	Yellow Oat Grass
Anthoxanthum odoratum	Sweet Vernal Grass

Management

1.74. The wildflower mix will be sown in September or March/April, after the completion of the construction phase.

1.75. Within the first year the main aim is to control weeds and to reduce competition from grasses. The sward will be kept short in the first year until the end of June to reduce competition and then allowed to grow in July and August to permit any wildflowers to seed. All cuttings should be removed from site several days after cutting to avoid smothering the sward, but allowing any seeds to disperse.

1.76. After the wildflower mix has established, this area should only require one cutting in late summer (August – September), allowing flowering species to seed with an additional cut in October. Cuttings should be left on site for several days to disperse any seeds, then removed from site.

Hedgerow

1.77. Existing hedgerow boundaries will be enhanced in line with the arborist report. Native species hedgerow will also be created.

1.78. Enhancement and creation of native hedgerows will benefit a range of local species including BAP Priority Species such as badgers, herptiles, invertebrates and birds. If the correct species are planted and maintained correctly, a hedgerow's potential can be maximised, providing food and shelter throughout the year, as well as connecting corridors.

Table 1-4: Hedgerow Species Mix

SCIENTIFIC NAME	ENGLISH NAME
Crataegus monogyna	Common hawthorn
Corylus avellana	Hazel
Euonymus europaeus	European Spindleberry
Ilex aquifolium	Holly
Loinicera perclymenum	Common Honeysuckle
Prunus spinosa	Blackthorn
Rosa canina	Dog rose
Viburnum opulus	Guelder rose

1.79. It is also important to plant and maintain ground flora along the hedgerow to provide suitable commuting corridors for small mammals and herptiles.

Management

1.80. New hedgerows will be planted within the first available planting season (November – March).

1.81. Any pruning or cutting should be done outside of the breeding bird season (March to August inclusive) to minimise disturbance to nesting birds.

Native woodland/tree planting

1.82. Triple staggered rows of native trees have been proposed to screen the Proposed Development from the surrounding area, the mix of trees proposed can be seen in Table 1-5. A woodland planting mix (Table 1-6) has been proposed to enhance habitats around the perimeter and throughout the site. A tree planting mix

1.83. Planting trees will provide potential new habitat for roosting bats and birds, providing food and shelter for other BAP Priority Species.

Table 1-5: Tree planting mix

SCIENTIFIC NAME	ENGLISH NAME
Alnus glutinosa	Alder
Betula pendula	Silver birch
Corylus avellana	Hazel

Pinus sylvestris	Scots pine
Quercus petraea	Sessile Oak

1.84. Native woodland planting is proposed around the perimeter and throughout the site to create a biodiverse native habitat as shown within the landscape masterplan (by KFLA Architects).

Table 1-6: Woodland planting mix

SCIENTIFIC NAME	ENGLISH NAME
Alnus glutinosa	Alder
Betula pendula	Silver birch
Corylus avellana	Hazel
Crataegus monogyna	Hawthorn
Ilex aquifolium	Holly
Larix decidua	Larch
Pinus sylvestris	Scots pine
Prunus padus	Bird Cherry
Prunus avium	Wild cherry
Quercus petraea	Sessile Oak

Wildlife Shelters

1.85. The creation of wildlife shelters strategically placed throughout the Application Site, will provide shelter to a wide range of species.

Bat boxes

1.86. Providing bat boxes will increase opportunities for roosting bats within the local area. Bat boxes should be erected in suitable locations throughout the site. It can however take bats a long time to make use of artificial roosts, therefore a number of factors must be considered when installing a new bat box.

1.87. Microclimate within a new roost is a very important factor in terms of increasing the chance of successful uptake by bats. In line with Bat Conservation Trust guidelines[8] bat boxes should be draught-proof and made from a thermally stable material. They should be located where

[8] Bat Conservation Trust – Bat Box Information Pack – Available at: http://www.bats.org.uk/data/files/publications/Bat_Box_Information_Pack_FINAL.pdf

they will receive full/partial sunlight (southerly orientation). The boxes should also be positioned a minimum of 2m above the ground. Access points should also be clear of any obstructions.

1.88. To allow a choice of roosting, bat boxes should be installed in more than one aspect. Bat boxes located on a shady side will be cooler and may be suitable as a hibernation roost or used by male bats throughout the entire year.

1.89. There is a wide range of bat boxes currently available, some which are more suitable for certain species. A variety of bat boxes are recommended in Table 1-7. It is recommended that three of each box detailed below be installed on site.

Table 1-7: Details of Bat Boxes

BAT BOX	DETAILS	IMAGE
Schwegler 1FF[9]	Can be used as a summer roost or nursery site. Is open at the bottom and does not require cleaning.	
Schwegler 2F[10]	Standard box and most popular. Simple entrance role. Used as summer roosting space.	
Schwegler 1FD[11]	Specific for smaller bats such as common pipistrelle, nathusius pipistrlle, daubenton's bat and brown long-eared.	

Bird boxes

1.90. In order to enhance the site for nesting birds, a number of bird boxes shall be placed throughout the site. Several types of nest boxes will be installed at suitable locations to favour a variety of bird species.

1.91. Open-fronted boxes will provide enhanced nesting opportunities for species such as robins, pied wagtails and spotted flycatchers. Boxes with entrance holes are suitable for tits, wren and tree sparrows.

1.92. Bird boxes should be mounted so that they face between the south-east and north to avoid direct sunlight. They should be tilted forwards so that rain is directed away from the entrance.

1.93. A variety of bird boxes are recommended in the table below.

[9] Full specification available at: http://www.nhbs.com/title/158636/1ff-schwegler-bat-box-with-built-in-wooden-rear-panel

[10] Full specification available at: http://www.nhbs.com/title/158629

[11] Full specification available at: http://www.nhbs.com/title/177076/1fd-schwegler-bat-box

Table 1-8: Details of Bird Boxes

BIRD BOX	DETAILS	IMAGE
1B Schwegler Nest Box[12]	This nest box will attract a wide range of species and is available with different entrance hole sizes to prevent birds from competing with each other for the boxes. The 32mm entrance hole will attract Great, Blue, Marsh, Coal and Crested Tit, Redstart, Nuthatch, Collared and Pied Flycatcher, Wryneck, Tree and House Sparrow and bats. The 26mm entrance hole suits Blue, Marsh, Coal and Crested Tit and possibly Wren. All other species are prevented from using the nest box due to the smaller entrance hole.	
2H Schwegler Robin Box[13]	This traditional design has proved to be highly effective in attracting robins, as well as other small species such as black redstart, spotted flycatcher and wren.	

1.94. It is recommended that 1B Schwegler nest boxes (three 32mm and three 26mm holes) and 2H Schwegler robin boxes are installed.

Hibernacula

1.95. The hibernacula comprise of log, rock and stone piles and is aimed at providing shelter for reptile and amphibians to hibernate. It may also be used by a variety of insects and small mammals. The hibernacula will follow the instructions laid out within Appendix B below.

Management

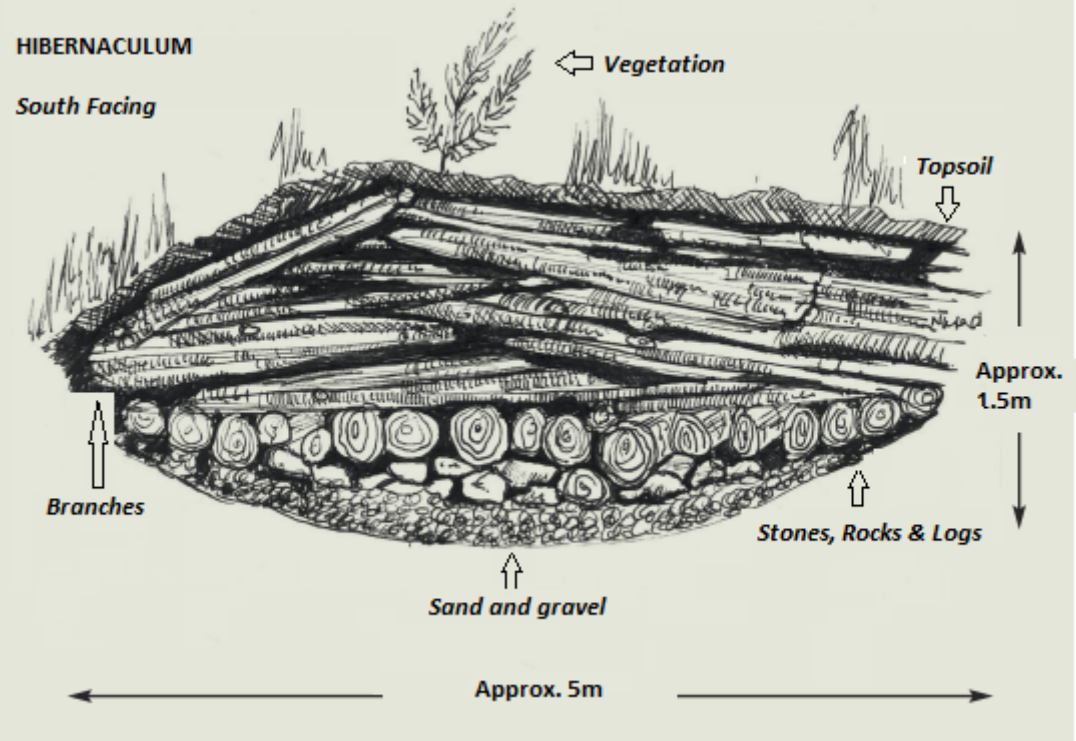
1.96. Final location and number of bird nest boxes and bat boxes to be determined on site by an ecologist.

[12] Full specification available at: http://www.nhbs.com/title/158587/1b-schwegler-nest-box
[13] Full specification available at: http://www.nhbs.com/title/161277/2h-schwegler-robin-box

APPENDICES

Appendix A - Hibernaculum Construction

1.97. The hibernaculum will follow the basic construction set out below, with the log and stone piles situated to the north of the hibernaculum.



- A 5m long east-west running ditch 1m deep and 1m wide will be dug.
- The base will be lined with sand and gravel.
- This will be followed with layers of stones, rocks and logs.
- Smaller branches will then be placed on top, and covered soil from the excavation will be placed over the pile, leaving gaps for access.
- The soil will be shaped into a mound.
- North facing side of the mound will be seeded / planted with species that will attract insects and will also provide extra shelter.
- South facing side will be maintained with a sparse vegetation cover to provide an area to bask.

- A log pile of approximately 2m by 1m will be placed to the north of the hibernaculum.

Appendix B – Invertebrate Bank Creation

Beetle Bank

- September is the best month to establish the grass sward that forms a beetle bank.
- Create a raised bank of about 0.4 metres.
- The grass mix should include up to 60% of tussock-forming species such as cocksfoot or Scots timothy grass. For the rest of the mix choose native species and include fescues.
- Up to three cuts may be needed in the first summer (when the sward reaches 10 cm in height) to encourage the grasses to tiller and to help control invasive annual weeds.
- Once established, the grass strips should be cut typically no more than once every three years.

Bee Bank

- Material (such as aggregate and sand) will be shaped into a mound with various slopes, hollows and angles that may be utilised and favoured by different species.
- Vertical banks created on bee banks take much longer to vegetate and this makes them attractive to many species. Over time a bee bank will be vegetated over through succession.
- Planting vegetation in an open structure in front of a bee bank will provide extra habitat for invertebrates that are attracted to the bee bank.
- These banks should be created close to flower-rich areas which will provide important foraging areas for pollinators.

Technical Appendix 12.1: Ground Investigation & Geotechnical Report

Intended for

Vantage Dublin Data Centers DUB11 Limited

Document type

Report

Date

October 2022

VANTAGE DUBLIN DATA CENTERS DUB-13 TECHNICAL APPENDIX 12.1: GEOTECHNICAL ASSESSMENT REPORT

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Project name	**Vantage DUB-13**
Project no.	**1620014883**
Recipient	**Vantage Data Centers DUB11 Limited**
Document type	**Report**
Document no.	
Version	**0.3**
Date	**2022/10/11**
Prepared by	**---**
Checked by	**---**
Approved by	**---**
Description	**-**

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Revision	Date	Prepared by	Checked by	Approved by	Description
0.3	20/10/2022	AG	SW	JF	Issue to Client

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APPENDICES

Appendix A
IGSL Factual Report

1. INTRODUCTION

On behalf of Vantage Data Centers (The Client), Ramboll UK Ltd (Ramboll) have completed a Phase II Site Investigation and Environmental Surveys to support the proposed development of a data centre located at the Profile Park Site, Kilcarbery (the 'site'), situated within the jurisdiction of South Dublin County Council (SDCC).

As part of the remit, Ramboll has been commissioned to undertake a high level geotechnical assessment of the site based on the findings of the 2022 IGSL Ltd ground investigation. This assessment summarises the findings and provides geotechnical recommendations with respect to design ground models, characteristic material parameters and where applicable outline recommendations in relation to the proposed development.

This assessment does not cover interpretation or recommendation with respect to potential ground and groundwater contamination at the site for which the reader should refer to the Ramboll Contaminated Land Interpretative Report (ref: 1620012232-CLIR-01).

1.1 Site

The site is located in Profile Park, approximately 10 kilometres (km) to the south-west of Dublin city centre, within South Dublin County, at Irish grid reference O 03911 30784 (Figure 1 in Appendix 1).

The site is a roughly rectangular parcel of agricultural land, with a residential dwelling located in the north-west corner of the site. The site covers a total area of 3.31 ha and at an elevation of between circa 74m and 75m Above Ordnance Datum (m AOD).

The site boundaries are defined by:

- New Nangor Road (R134) to the north;
- Falcon Avenue, Equinix and Grange Castle Golf Club to the east;
- Falcon Avenue to the south; and
- The consented Vantage data centre development (planning reference SD21A/0241) to the west which currently comprises agricultural fields.

The site consists predominantly of flat agricultural land, with a residential property present towards the north-west of the site and outbuildings in the south-east. A track is present providing entrance to the field from the northern site boundary and towards the outbuildings.

The site's surrounding context predominantly comprises Profile Park with an industrial development to the north, Grange Castle Golf Club to the east beyond which are residential properties. To the south comprises agricultural land and industrial development with the consented Vantage data centre development to the west, beyond which is Bolands Car Garage and further data centres. The existing Baldonnel stream runs adjacent to the southern boundary of the site and enters the southern section of the site, orientated in a north-west to south-east direction, flowing towards the east.

1.2 Proposed Development

At the time of writing the proposed development is understood to comprise the following:

- Demolition of the existing double-story dwelling and three outbuildings;
- • Erection of DUB-13 along with associated emergency generators and flues with a gross floor area of approximately 12,893 m2; and
- Provision of 60 car parking spaces and 26 bicycle parking spaces provision.

1.3 Limitations and Constraints

This report has been prepared solely for Vantage Data Centers and shall not be relied upon by any third party unless that party has been granted a contractual right to rely on this report for the purpose for which it was prepared.

Ramboll has endeavoured to assess all information provided to them but makes no guarantees or warranties for the completeness or accuracy of information relied upon derived from third party sources.

It should be noted that as the ground conditions encountered during the ground investigation are only a known detail at each exploratory hole location, the ground conditions detailed on sections between holes have been interpolated and therefore the actual nature of the ground may differ from the interpretation provided by Ramboll. In addition, groundwater levels will vary seasonally and with changes in weather and climate or possibly due to leakage from faulty water infrastructure.

2. GEOLOGY AND GROUND CONDITIONS

The online British Geological Survey Maps Portal shows the Geological Survey of Ireland 1:63,630 historical geological map Sheet 111, Maynooth (1901) to present the geology of the area. The historical sheet indicates that the site and surrounding area is underlain by solid geology of the Carboniferous Middle Limestone. The sheet records typical bedrock dip angles of between 20 and 30 degrees to the south.

Data from the current online Geological Survey of Ireland Interactive Map, indicates that the site is underlain by The Lucan Formation of the Carboniferous. The dominant lithology comprising dark grey to black, fine-grained, occasionally cherty, micritic limestones that weather to pale grey. The drift deposits at the site are envisaged to consist of Till derived from the limestone.

The Geological Survey of Ireland Interactive Map indicates that the site area is host to a 'locally important aquifer' where the bedrock is moderately productive only in local zones.

2.1 Historical Ground Investigation Data

No historical ground investigation data for the site is available.

2.2 Mining and Quarrying

According to the Geological Survey of Ireland there are no active quarries located in the immediate vicinity of the site.

3. GROUND INVESTIGATION

A ground investigation was undertaken by IGSL Ltd for the purpose of investigating and reporting on the ground and groundwater conditions at the site to assist with identifying geotechnical and geoenvironmental risks and hazards. All works completed are detailed in the below referenced factual report (presented in Appendix A) which should be read in conjunction with this interpretative report:

- IGSL Ltd, 2022. Data Center Project 3 Profile Park. Ground Investigation Report – Factual. Project No 24188 (September 2022).

The ground investigation works were undertaken in accordance with:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing;
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements;
- EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description;
- EN ISO 14688-2:2204 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles;
- EN ISO 14689-1:2004 Geotechnical Investigation and Testing – Identification & Classification of Rock, Part 1: Identification & Description;
- Engineers Ireland Specification for Ground Investigation, 2nd Edition, 2016;
- BS 5930:2015 Code of Practice for Ground Investigation; and
- BS 1377:1990, Parts 1 to 9.

The geotechnical element of the investigation was designed to provide site-specific information on:

- The presence, thickness, and composition of any recent and superficial deposits beneath the proposed development areas;
- Depth to and information on the solid geology to allow characterisation of the bedrock;
- The strength and stiffness of the underlying soils and bedrock;
- Chemical composition of soils for buried concrete design; and
- Determination of the existing groundwater levels.

The scope of ground investigation works undertaken at the site involved the following:

- 10 no. machine excavated trial pits to a maximum depth of 2.70 metres below ground level (mbgl);
- 6 no. cable percussive boreholes to a maximum depth of 2.10 mbgl with in situ testing;
- 6 no. rotary cored drillholes to a maximum depth of 11.0 mbgl;
- 10 no. plate load tests to determine in situ California Bearing Ratio;
- 10 no. dynamic cone penetrometer tests;
- Geophysical survey (in situ resistivity);
- Groundwater monitoring of 6 no. installations.

Groundwater monitoring standpipes were installed in all six of the rotary cored holes with groundwater levels monitored across the site post installation. In-situ testing comprising standard penetration tests were performed in the cable percussive boreholes to derive N values. The N values presented in the exploratory logs are uncorrected for energy ratio.

The following geotechnical laboratory tests were carried out on select samples obtained from the site.

- Moisture Content;
- Atterberg Limits (Liquid / Plastic Limits);
- Particle Size Distribution;
- Moisture Condition Value;
- Soil geochemical testing to BRE Test Suite D;
- Point Load Strength Index; and
- Uniaxial Compressive Strength testing.

Groundwater standpipes were installed in all six rotary holes with groundwater levels monitored across the site post installation.

4. GEOTECHNICAL FINDINGS

The ground conditions encountered during the 2022 IGSL Ltd investigation typically consisted of topsoil which was underlain by predominantly firm to very stiff cohesive soils (considered to be Till) which in turn were underlain by limestone bedrock (considered to be the Lucan Formation). Localised Made Ground were encountered on the western edge of the site, adjacent to the existing building structures, which was recorded as CI.804 stone fill. A summary of the ground conditions encountered is presented in Table 4.1. For detailed engineering descriptions please refer to the IGSL exploratory hole logs presented in Appendix 1.

Table 4-1: Summary of ground conditions encountered

Strata	Description	Depth to Base (mbgl)	Thickness (where proven) (metres)
Topsoil	Not available.	0.30 to 0.50	0.30 to 0.50
Localised Made Ground (TP06 and BH03)	Comprising Cl.804 stone fill.	0.30 to 0.50	0.30
Probable Till Deposits	Predominantly Firm becoming stiff or very stiff with depth, light brown or dark brown sandy SILT/ CLAY with some cobbles and occasional boulders. Gravel is angular	1.50 to 3.0	1.0 to 3.0
Weathered Rockhead	Possible weathered bedrock, recovered as grey sandy clayey angular GRAVEL with cobbles and occasional boulders.	1.90 to >3.50	0.30 to >3.50
Bedrock (Limestone)	Medium strong to very strong, thinly to thickly bedded, thinly laminated where fissile mudstone/shale, grey/dark grey/black, fine grained, LIMESTONE. Argillaceous limestone grading regularly (every approximately 0.10 to 0.50 m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present, slightly weathered where intact, very locally moderately weathered at fissile mudstone/shale zones. Many incipient zones throughout.	>10.0	Not Proven

4.1 Topsoil

Topsoil was encountered in all trial pits during the investigation and typically ranged in thickness from 0.3 metres to 0.5 metres. No topsoil was recorded within boreholes.

No in situ or geotechnical testing was performed on the topsoil given that the material will be stripped prior to construction.

4.2 Made Ground

Granular fill (described as Cl.804 stone) was encountered in TP06 and BH03 located in the vicinity of the western site boundary near/adjacent to the existing structures in the southwest of the site. At trial pit TP06, the fill was recorded underlying the topsoil to a depth of 0.5mbgl, whereas in BH03 the fill was recorded from ground level with a recorded thickness of 0.30 metres.

In Situ Testing
No in situ testing was undertaken within the Made Ground.

Geotechnical Laboratory Testing
No geotechnical laboratory testing was undertaken within the Made Ground.

4.3 Probable Till Deposits

Underlying the topsoil, cohesive soils interpreted to be Till were encountered site wide at depths ranging between 0.10 mbgl and 0.60 mbgl. The stratum varied in thickness from 1.30 metres to 3.0 metres. Given the engineering descriptions, particularly the cobble and boulder inclusions, the soils are considered to have been deposited in a glacial environment and have therefore been classified as Till deposits within this assessment. The base of the stratum was proven within both the trial pits and drillholes, whilst the cable percussive boreholes terminated in the stratum due to

the presence of cobbles and boulders. Where the base was proven, lateral variations in thickness and depth to base of the cohesive soils were recorded, with the depth to the base ranging between 1.50 mbgl in TP08 to 3.0 mbgl in RC06.

The Till deposits predominantly comprised fine grained soils with coarse grained secondary inclusions. Engineering descriptions from the 2022 IGSL investigation, recorded the stratum as being, firm increasing to stiff and very stiff with depth, brown, light or dark brown sandy gravelly clay or silt / clay with varying cobble and boulder content.

In situ Testing

A total of twelve penetration tests were performed at one metre intervals within the cohesive soils, recording uncorrected N values ranging from 15 (blows per 300mm penetration) to refusal (i.e. 50 blows for less than 300mm penetration). Test refusals were recorded at the base of the cable percussive boreholes and are considered to be either due to encountering either cobbles / boulders or due to the presence of the underlying limestone bedrock. Excluding the upper bound test refusals recorded at the base of the boreholes the mean N value was calculated to be 20, correlating to a soil of medium to high strength.

A total of ten plate load tests (PLT) using a 450mm diameter plate were carried out at each trial pit location at test depths of between 0.3 mbgl and 0.4 mbgl and are therefore considered to be at the interface between the topsoil and Till. Two load cycle tests were performed in accordance with BS 1377, Part 9. Results of the PLT's recorded CBR values ranging from 0.6% to 31.4%, with an average value of 5.3%. Low CBR values i.e. CBR values of less than 2.5%, were recorded in PT01, PT02, PT04, PT06 to PT08 and PT10. Modulus of subgrade reaction, k, values ranged from 11 MPa/m to 106 MPa/m.

Geotechnical Laboratory Testing

Various geotechnical laboratory tests were carried out on select samples which included natural moisture content, Atterberg Limit tests, particle size distribution, moisture condition value at natural moisture content (MCV) and thermal resistivity / conductivity. Due to the secondary granular content within the cohesive soils no high quality undisturbed samples were obtained during the investigation and therefore laboratory strength or consolidation testing has not been possible.

In addition to the geotechnical tests, geochemical tests were performed to determine the aggressive nature of the soils in relation to buried concrete design.

The geotechnical laboratory test results are summarised in Table 4-2.

Table 4-2: Summary of geotechnical test results - Possible Till Deposits

Test	Possible Superficial Deposits	
	Range of Results	Mean
Moisture Content (%)	14.6 to 26.7	17.7
Plasticity Index (%)	17 to 23	19
Liquid Limit (%)	33 to 41	37
Plastic Limit (%)	15 to 21	18
MCV	6.3 to 14.9	10.8
Bulk Density (Mg/m³)	1.55 to 2.05	1.74
Dry Density (Mg/m³)	1.34 to 1.69	1.47
Porosity	0.36 to 0.49	0.44
Thermal Conductivity, K (W/m.k)	0.80 to 1.33	1.07
Thermal Resistivity, R (m K/W)	0.77 to 1.25	0.97
Water Soluble Sulphate SO_4 (g/l)	<0.010	0.010
Total Sulphur %	0.048 to 0.095	0.07
pH	8.6 to 9.1	8.8

Results of the Atterberg Limit tests characterise the cohesive soils as being of intermediate plasticity, whilst modified plasticity index derived from the tests classifying the soils as typically being of low volume change potential, locally non-shrinkable.

4.4 Weathered Rock Deposits

Underlying the cohesive Till, a layer of coarse grained material considered to be weathered rockhead was encountered within both the machine excavated trial pits (with the exception of TP10) and rotary drillholes. The stratum was generally encountered site wide at depths ranging between 1.9 mbgl to 3.5 mbgl, with thickness varying from 0.30 metres to 1.0 metres. The base of the stratum was only proven within the rotary cored drillholes whilst the machine excavated trial pits were recorded as terminating within this stratum. Generally, the base of the weathered rock was at approximately 3.5 mbgl towards the southern edge of the site rising to circa 2.5mbgl within the north part of the site. Based on the findings of the 2022 IGSL investigation, the weathered rock deposits were recorded as being, grey sandy clayey angular gravel with occasional boulders.

In situ Testing

No in situ testing was undertaken within stratum.

Geotechnical Laboratory Testing

A limited number of geotechnical laboratory tests were carried out on select samples which included a single grading and thermal resistivity / conductivity. In addition to the geotechnical tests, geochemical tests were performed to determine the aggressive nature of the weathered rock materials in relation to buried concrete design. The geotechnical laboratory test results are summarised in Table 4-3

Table 4-3: Summary of geotechnical test results – Weathered Rock Deposits

Test	Weathered Rock Deposits
	Test Result
Moisture Content (%)	13.9
Bulk Density (Mg/m³)	1.69
Dry Density (Mg/m³)	1.48
Porosity	0.44
Thermal Conductivity, K (W/m.k)	1.06
Thermal Resistivity, R (m K/W)	0.95
Water Soluble Sulphate SO_4 (g/l)	<0.010
Total Sulphur %	0.054
pH	8.7

4.5 Limestone Bedrock

Bedrock comprising limestone with subordinate mudstone bedrock was encountered underlying either the Till or weathered bedrock deposits within the rotary drillholes. The depth to the top of the intact bedrock was typically recorded at a depth of circa 3.0m (RC01, RC02, RC04 and RC05) with the exception of RC03 at 3.5mbgl (69.82mOD) and RC06 where intact bedrock was recorded at a depth of 4.20mbgl (68.91mOD).

The IGSL rotary cored logs describe the bedrock as typically being, medium strong to very strong, thinly to thickly bedded and thinly laminated (where fissile mudstone/shale), grey, dark grey / black, fine grained, argillaceous limestone (grading every 0.10m to 0.50m into calci-siltite limestone with subordinate mudstone, local stylolites, pyrite present). Slightly weathered where intact, locally very moderately weathered at fissile mudstone/shale zones with many incipient zones throughout. Discontinuities are widely to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally moderately open, locally clay smeared, locally calcite-veined (1mm to 12mm thick). Subhorizontal and subvertical at 30° to 40° and locally 70°. Based on the description the bedrock is considered to be the Lucan Formation of the Carboniferous.

In situ Testing

No in situ testing was carried out within the limestone bedrock.

Geotechnical Laboratory Testing

Sub samples of the intact bedrock were subject to point load strength index tests and unconfined compressive strength (UCS) tests to derive the uniaxial compressive strength of the bedrock. A total of thirty diametral point load strength tests were undertaken at various depths with calculated values ranging from 8 MPa to 120 MPa with an average value of 69 MPa (based on a correlation K value of 20). In addition to the point load tests, six UCS tests were performed on core subsamples taken from the rock. The subsamples were taken at depths ranging from 4.3 mbgl to 8.8 mbgl and produced UCS results ranging from 28 MPa to 102 MPa. For further information on the test results the reader should refer to the IGSL factual report contained within Appendix A.

5. GROUNDWATER

No groundwater strikes were recorded during drilling, however seepages were encountered in BH01, BH03 and BH06 at 1.70m, 1.50m and 1.90mbgl respectively. Further seepages were recorded at circa 2.0m depth within trial pits TP06 to TP10 located within the southern section of the site.

Standpipes were installed in all rotary drillholes to allow groundwater levels to be monitored. The water levels were recorded 5 minutes after end of drilling. At the time of writing a single round of post fieldwork monitoring had been carried out on 31/08/22 which recorded groundwater at levels ranging from 70.99 mOD and 71.65 mOD. The results are presented in Table 5-1.

Table 5-1: Groundwater monitoring results

RC No.	Level (mOD)	Date of Reading	Depth of Reading (mbgl)	Level of Reading (mOD)
RC01	73.76	31/08/2022	2.77	70.99
RC02	74.20	31/08/2022	2.56	71.64
RC03	73.32	31/08/2022	2.03	71.29
RC04	73.52	31/08/2022	1.87	71.65
RC05	73.11	31/08/2022	1.67	71.44
RC06	73.11	31/08/2022	1.77	71.34

6. DERIVATION OF GEOTECHNICAL PARAMETERS

The data presented in this section is based upon the results of the 2022 IGSL investigation designed by Ramboll.

The characteristic values of geotechnical parameters and ground model recommendations provided have been selected for the purposes of permanent works design. If these parameters are to be adopted for any temporary works design the Temporary Works Designer should be satisfied that the parameter selected is appropriate for the load case being considered.

The derivation of characteristic values of geotechnical parameters is described for the soils that are expected to be encountered. Where direct measurement of parameters has not been carried out, established correlations with measured properties have been used to derive values for design.

Characteristic values are defined as a cautious estimate of the value affecting the occurrence of a limit state based on Clause 2.4.5.2, from BS EN 1997-1: 2004 (Eurocode 7). Characteristic values should be used with appropriate partial factors or to achieve appropriate factors of safety, as required.

Weight Density

Adopted characteristic weight density values for the superficial deposits have been based on laboratory test data and empirical values presented in Figure 1 and Figure 2 from BS 8002:2015.

Bedrock values have been derived from the laboratory tests performed as part of the 2022 IGSL Ltd Investigation.

Strength

Cohesive Soils – Undrained Strength Parameters

Characteristic undrained shear strength (c_u) for the over consolidated cohesive soils will be assessed from in situ testing and from material descriptions from boreholes, based on British Standard (BS) 5930:2015 and BS EN:1997 (2007).

For over consolidated cohesive soils, the characteristic undrained shear strength, c_u can be derived from SPT N values (where available) using the correlation recommended by Stroud and Butler (1975):

$c_u = f_1 \times N_{60}$ (kN/m^2)

Where:

N_{60} is the SPT N corrected for hammer energy;

f_1 is dependent on Plasticity Index as per Figure 3 reproduced by Tomlinson, 2001. Based on the data obtained during the 2022 investigation and the Till generally being of intermediate plasticity, an f_1 value of 4.4 has been adopted.

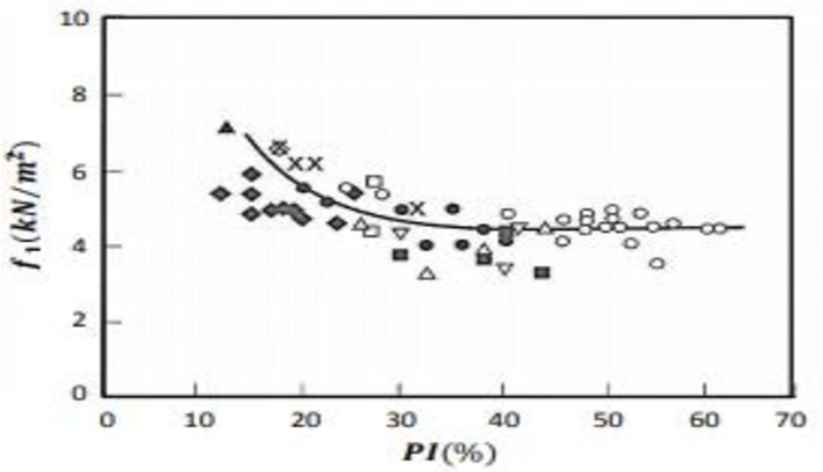


Figure 1: Relationship between plasticity index and undrained shear strength of fine grained soils, reproduced from Tomlinson, 2001

Data from the SPTs generally indicates to the cohesive soils being of medium to high strength with an increase in N values recorded at depth corresponding to an increase in granular content or grain size (i.e. presence of cobbles and boulders). Therefore when deriving the undrained shear strength upper bound values have been discounted and a characteristic SPT N value of 18 adopted.

Cohesive Soils - Effective Stress Strength Parameters

Effective stress (drained) strength parameters for cohesive soils are determined from interpretation of the relationship between ϕ' and PI proposed by Kenney (1959). A conservative value of ϕ' will be derived based on an upper bound value of PI.

The characteristic angle of internal friction determined for the Till based on plasticity index is 27°.

In the absence of effective stress strength tests undertaken on cohesive soils a drained cohesion (c') of 0 kN/m² has been recommended for design.

Stiffness and Compressibility

Cohesive Soils

Where determination of settlement of foundations on cohesive soils is required then stiffness will be assessed from SPT N values using the relationship described in CIRIA Report 143 (1995).

Stiffness based on Young's Modulus (E) has been assessed using:

For normally consolidated cohesive material (following Bowles):

- E_u = c_u x 250 (kN/m²) for undrained stiffness
- E' = E_u x 0.6 (kN/m²) for drained stiffness

For overconsolidated cohesive material (following Bowles):

- E_u = c_u x 750 (kN/m²) for undrained stiffness
- E' = E_u x 0.6 (kN/m²) for drained stiffness

The settlements calculated from soil modulus values interpreted following the guidance in CIRIA Report 143 are likely to represent conservative settlements.

Bedrock

The Hoek-Brown Classification for the Intact Modulus of the bedrock has been derived using the software RocLab. The values were derived using the UCS, GSI, mi and MR. For the intact rock a UCS of 53 MPa was adopted as the characteristic value based on the UCS and point load test data presented in the 2022 IGSL Ltd Report. In addition to the UCS value a mi value of 8 and an MR (modulus ratio) of 700 was used to derive the Intact Modulus.

6.1 Geotechnical Parameters

Table 6-1 provides a summary of the recommended characteristic values for the geotechnical soil parameters for the site.

Table 6-1: Recommended characteristic values for the geotechnical soil parameters

Stratum	Geotechnical Parameters					
	Bulk Density (kN/m²)	Undrained Shear Strength (kN/m²)	Angle of Shearing Resistance **(Φ´)**	Young's Modulus (MPa)		UCS (MN/m²)
				E_u	E'	
Till	19	75	27	56	34	-
Weathered Bedrock (granular soil)	19	-	36	-	18	-
Intact Limestone	26	-	26	-	37000	53

* Where 'z' is depth below top of stratum

7. RECOMMENDATIONS

The following section outlines the recommendations for the proposed development based on data obtained during the IGSL Ltd investigation. At the time of writing no structural loadings have been provided and therefore the following sections only provide outline recommendations.

7.1 Foundations

Due to the absence of design loadings for the structures, no specific recommendation as to the foundation type that should be adopted is provided, particularly given the type and number of structures requiring foundations. Any foundation design should be carried out in accordance with Eurocode 7 and the corresponding National Annex to obtain the appropriate partial factors.

When the design structural load takedown has been calculated, a detailed analysis into the suitability of shallow foundations should be undertaken. Should shallow spread foundations be deemed suitable these would typically be supported by either the cohesive Till deposits or granular soils where encountered at shallow depths. Given the variation in the geology, the design should consider differential settlements where foundations are in differing geology/strata. Where the foundations are required to support higher imposed loads, spread foundations should be founded on the underlying Lucan Formation, where a deepening of foundation excavations will be required. The commercial viability of founding in the limestone will need to be considered taking into account the depth of dig (circa 3.0m) and volume of material for disposal.

Based on the formation soils comprising medium strength cohesive soils with an undrained shear strength of 75kPa at a depth 1.0m, for a 1m square pad foundation the ultimate design bearing resistance, R, (under Design Approach 1, Combination 2) has been estimated to be 340 kPa using the method proposed in Annex D of Eurocode 7 Geotechnical Design, Part 1: General Rules (BS EN 1997-1:2004+A1:2013). In terms of Serviceability Limit State (SLS) allowing for total settlements to be in the order of 25mm to 30mm, then a safe gross bearing pressure of 150 kPa to 175 kPa is recommended. Where the founding stratum is weathered rock, it is recommended that these bearing pressures be adopted.

Modified plasticity values for the near surface cohesive soils indicate to these being shrinkable in nature and of low volume change potential. Where a shallow foundation solution is adopted guidance given in Chapter 4.2 of the NHBC Standards 2016 should be adhered to in relation to minimum founding depth, void dimensions (where applicable) and existing trees / new planting.

Where the structural loads cannot utilise the use of spread foundations, then the proposed structures should be supported by piled foundations. A piled foundation solution would involve a socketed pile into the limestone bedrock, typically up to 3.00 metres penetration into the rock (or a minimum of at least twice the socketed pile diameter), where the strength of the material would be adequate to support the structural loads.

The key risks associated with the piled foundation include, but are not limited to:

- Pile refusal on buried obstructions or hard strata;
- Variable soft/hard material causing flighting/affecting the integrity of the pile shaft through the infilled ground; and,
- Required penetration (rock socket) into the bedrock.

To reduce the risk of the above bored cast in place concrete piles would be the most suitable option, utilising a specialised hard rock cutter to penetrate the limestone bedrock layer. Driven piles are likely to be unsuitable for use within the Till given the presence of cobbles and boulders which have the potential to limit the depth of pile penetration, unless other plant was available on-site to remove the obstructions. In addition to this, driven piles would not be suitable for use in the limestone bedrock.

The piles will be supported by a combination of end bearing on the rock and shaft friction from the rock socket and overburden soils.

7.2 Floor Slabs

In areas of high strength homogeneous cohesive Till at near surface, ground bearing floor slabs are likely to perform satisfactorily subject to meeting any particular settlement criteria for the structure concerned. Estimations of the modulus of subgrade reaction, *K*, for the near surface soils have been derived from the in situ plate load tests with *K* values typically greater than 15 MPa/m with the exception of PT04, PT08 and PT10 which recorded a *K* value of 14, 11 and 13 MPa/m respectively were recorded. Liquid limit results of less than 50% were recorded as part of the Atterberg Limit tests and these results would correlate to a 'poor' subgrade classification and an assumed *K* value of 27MPa/m. Where a higher value of *K* is required, enhanced values can be achieved by the placement of a granular sub-base of minimum 150mm thickness.

Should floor slabs span material of variable composition then damaging differential settlement may occur and consideration to a suspended slab should be given.

7.3 Pavement Design

A total of ten plate load tests (PLT) using a 450mm diameter plate were carried out at test depths ranging from 0.4 mbgl to 0.6 mbgl and are therefore considered to be at the interface between the base of the topsoil and the upper zone of the Till deposits. Results of the PLT's recorded CBR values ranging from 0.6% to 31.4% with an average value of 5.3%. Localised zones of weaker soils (i.e a CBR value of less than 2.5%) were recorded at test location PT01, PT02, PT04, PT06 to PT08 and PT10.

In addition, a series of dynamic cone penetrometer (DCP) tests were also undertaken from ground level to a depth of 0.9 mbgl at each trial pit location (in accordance with the TRL recommended procedure) to estimate CBR values of the near surface soils. Results from the DCP tests recorded CBR values ranging between 15% and 55% with an average value of 27.8%.

Generally, the CBR values derived from in situ testing across the site were greater than 2.5%, however, localised weaker zones are likely to be encountered during construction. Where identified these localised zones will require improvement by means such as excavate and replace.

7.4 Buried Concrete

Chemical laboratory tests were undertaken on near surface samples of the Till deposits across the site, to determine the aggressivity of the ground against buried concrete. Characteristic values for the soil have been derived based on the size of the data set and guidance given in BRE Special Digest 1:2005 – Concrete in Aggressive Ground (3rd Edition).

The geochemical test results for the Till recorded pH values ranging from 8.6 to 9.1, with water soluble sulphate results <0.010 g/l.

The design ACEC class has been derived based on Table C1 Greenfield Site from the BRE Special Digest 1 and taking groundwater to be mobile. Considering the data set a characteristic value has been calculated based on the mean of the highest two results (where data set of five to nine tests). Findings from the IGSL investigation indicate to the near surface soils (Till) having an ACEC classification of AC-1.

7.5 Earthworks / Material Re-use

Any earthworks operations should be completed in accordance with a suitable earthworks specification. Where earthwork filling is required placement and compaction of fill should be designed to not negatively impact foundation construction, i.e. induce downdrag with respect to any future pile installation.

Data from the IGSL investigation indicates that site won Till material is likely to conform to a Class 2 general fill with the removal of any cobble or boulder inclusions. A single grading undertaken on the weathered bedrock indicates that the material comprised 37% fines and therefore based on this test result the material will also be classified as a Class 2 general fill, however further suitability testing should be undertaken on all soils to verify these classifications in areas where placement of fill are identified. MCV tests undertaken as part of the IGSL investigation produced a wide range of results ranging from 6.3 to 14.9. With the exception of a single test result from BH01 (which recorded 6.3), all other tests recorded MCV values greater than the minimum MCV value of 8 which is typically required for Class 2 soils to be used in earthworks. Considering the existing data set, site won soils are likely to be suitable for reuse, however localised improvement (potentially with the addition of lime) maybe required if all site won cohesive soils are to be reused.

7.6 Stability of Excavations

Information obtained during the investigation recorded the trial pits to be subject to seepages during excavation and therefore if a shallow foundation solution is adopted measures to deal with groundwater inflow may need to be implemented during excavation to maintain stability and prevent softening of cohesive formation soils.

Where excavations are required to a significant depth and it is not possible to batter excavation slopes, or if groundwater is encountered, temporary support; for example using trench sheeting or trench boxes should be considered. For temporary works the contractor should also make his own assessment as to the safety of excavations, particularly if/where man access is required.

8. GEOTECHNICAL RISK REGISTER

Risk	Description	Impact (1-5)	Probability (1-5)	Level of Risk	Mitigation
Unexpected/ unfavourable ground conditions	Risk of variable depth to rockhead across the site – variable length of piles if deep foundation solution adopted.	3	2	6	Ensure foundations are constructed to a sufficient depth to be stable in all possible geologies. Designer contacted immediately if ground conditions differ from what was anticipated. Use experienced site geotechnical personnel to provide advanced warning of potential problems.
Obstructions within the superficial deposits	Plant / equipment damaged during foundation installation	2	2	4	Design to be based on the ground investigation data. Utilise suitable foundation system (e.g. bored piles)
Encountering uncharted buried services	Risk of delay where uncharted services are encountered. Costs of repair, injury to personnel.	4	1	4	If, during foundation construction, an unexpected obstruction is discovered, cease immediately until it can be established what the obstruction is. CAT scanning must take place during foundation construction to mitigate this risk. Walkover surveys and stats searches will also lessen the likelihood of unknown services.
Unexpectedly high groundwater levels adversely affecting foundation/ formation levels	Groundwater encountered shallower than anticipated resulting in a decrease in working pile capacity/ reduction in FoS, or reduced bearing capacity for shallow foundations bearing on granular soils.	4	2	8	Utilise suitable foundation system (e.g. increase founding depth). Dependent upon site observations Designer contacted immediately if ground conditions differ from what was anticipated
Geological features, fissures, faults, dissolution features, etc which impact on design/ construction	Prescence of uplifted limestone rafts reduces shear strength of glacial deposits, resulting in lower FoS for foundations bearing capacity. Risk of dissolution features – online mapping indicates to Drogheda being in a area of medium risk in relation to subsidence	4	2	8	Use experienced site geotechnical personnel to provide advanced warning of potential problems. Contact designer in the event of encountering limestone void.

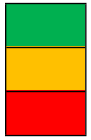
Risk	Description	Impact (1-5)	Probability (1-5)	Level of Risk	Mitigation
Pavement design	Risk of low strength formation soils.	3	2	6	In situ testing indicates that CBR greater than 2.5% can be anticipated across the site although localised weaker zones maybe encountered which will require improvement (probable excavate and replace with compact granular fill). Recommendation for further testing to be undertaken during construction to verify design CBR.
Contaminated ground/ groundwater	Environmental risks and / or H&S risk to operatives / public. Delay to programme while material is disposed of / remediated.	3	2	6	Refer to Ramboll Geo-environmental report
Shrink Swell effects from clays present.	Structural damage unlikely as laboratory test results indicates low volume change potential.	3	1	3	Foundations to be designed in accordance with NHBC guidelines Chapter 4.2 'Building near trees'. Where new planting is proposed Designer to consider choice of shrub/ sapling and adhere to guidance in Chapter 4.2.
Sulphates in ground attacking and weakening concrete buried structures	Reduction in strength of below ground concrete structures - potential failure of foundations.	3	2	6	Existing geochemical data indicates the near surface soils to be of AC-1 in accordance with Table C1 of BRE SD1. Concrete to be designed in accordance with guidelines given in BRE Special Digest1. Chemical data currently limited to near surface soils. Engineers descriptions record pyrite within bedrock - potential for sulphates within Lucan Formation and therefore further testing recommended should a deep foundation solution be adopted. Designer to be notified should contamination 'hot spots' been countered during construction which may require ACEC classification to be reassessed.

		Probability (P)				
		1	2	3	4	5
Impact (I)	1	1	2	3	4	5

	Impact	Probability
1	Very Low	Highly Unlikely
2	Low	Unlikely

	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

3	Medium	Possible
4	High	Likely
5	Very High	Highly Likely



LOW - Normal Risk (rectified through standard procedures)

MEDIUM - Requires Special Attention / Measures

HIGH - Unacceptable Risk

9. REFERENCES

BGS, Geological Survey of Ireland 1:63,630 geological map drift series Sheet 111, 1901

BRE Special Digest 1:2005 Concrete in Aggressive Ground 3rd Edition

Geological Survey of Ireland Interactive Map, 2022

BS 8004:2015 Code of Practice for Foundations

BS 5930:2015 Code of Practice for Ground Investigations

BS EN 1997-1:2004 Eurocode 7: Geotechnical design – Part 1: General Rules

BS EN 1997-1:2004 Eurocode 7: Geotechnical design – Part 2: Ground Investigation and Testing

IGSL Ltd Factual Report (ref: 24149)

CIRIA C143 The Standard Penetration Test (SPT): Methods and Use

CIRIA C504 Engineering in Glacial Tills

APPENDIX A
IGSL FACTUAL REPORT

IGSL Ltd

Data Centre Project 3
Profile Park

Ground Investigation Report
FACTUAL

Project No. 24188

September 2022

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DOCUMENT ISSUE REGISTER

Distribution	Report Status	Rev	Date of Issue	Prepared By:	Approved By:
Ramboll	DRAFT PDF by email	0	09-09-2022	John Lawler BSc MSc PGeo EurGeol FGS	Paul Quigley BEng CEng MICE MIEI FGS RoGEP Adviser
Ramboll	PDF by email	1	23-09-2022	John Lawler	Paul Quigley

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FOREWORD
The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards
The ground investigation works for this project (**Data Centre Project 3 – Profile Park**) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as Engineers Ireland Specification for Ground Investigation (2nd Ed, 2016), BS 5930 (2015+A1:2020) and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Principles for a classification
- EN ISO 14689-1:2017 Geotechnical Investigation and Testing – Identification, description & classification of rock

The Eurocode 7, Part 2 – Ground Investigation and Testing GI specification shall be read in conjunction with the Specification and Related Documents for Ground Investigation in Ireland, 2nd Edition, published by Engineers Ireland in 2016.

Reporting
No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations. The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

This report has been prepared for F1 Enzo Properties and Ramboll and the information should not be used without their prior written permission. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

Boring Procedures
Where required, 'shell and auger' or cable percussive boring technique is employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing meet with the recommendations set out in IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variation is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

In-Situ Testing
Where required, Standard Penetration Tests (SPT's) are conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is

available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Soil Sampling

Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Class 1 thin wall undisturbed tube samples (UT100) were obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

Table A – Details of Sample Quality Requirements

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible, drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are

subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2017 and IS EN ISO 14688-2:2017. Rock weathering classification conforms to IS EN ISO 14689-1:2017 along with discontinuities (bedding planes, joints, cleavages, faults etc) as classified in Section 6.4 of IS EN ISO 14689-1:2017 and Annex C of same. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Where peat has been encountered, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 and Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986.

Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

1. INTRODUCTION

IGSL has undertaken a programme of geotechnical ground investigation works at a greenfield site in the existing Profile Park. The Park is located on the western fringe of Dublin off the Nangor Road (R134), Dublin 22. It is host to a number of data centre buildings. The ground investigation (GI) works were conducted to inform the design for a proposed Data Centre, termed 'Data Centre 3'.

The site comprises former agricultural lands with some indication of there being a yardspace and some small-scale buildings having occupied the site. The predominantly grassland site is punctuated by a number of mature linear hedgerows. It is bound to the north by the Nangor Road, and beyond to Kilcarbery Park industrial estate. The expanse of Profile Park forms its boundary on all other sides with an internal estate road, Falcon Avenue, running along its southeastern aspect.

Figure 1 – Site Location Plan

Fig 1 reproduced from Google Earth Professional 4/2021

The investigation comprised rotary core drillholes, cable percussion boring, dynamic cone penetrometer testing, machine-dug trial pits and in situ plate bearing testing. A resistivity survey was undertaken by Minerex Geophysics Limited. The investigations were executed in accordance with BS 5930 Code of Practice for Site Investigations (2015+A1:2020) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing and supervised by an IGSL geotechnical engineer.

Geotechnical, chemical and environmental laboratory testing was scheduled on a range of soil samples. The geotechnical testing included moisture contents, Atterberg Limits, PSD gradings and

Moisture Condition Value [MCV] testing. Chemical testing was undertaken to BRE SD-1 on the soil samples. Environmental tests were undertaken on soil samples (WAC '*Rilta'* suite) to assess suitability for off-site disposal to landfill and/or Soil Recovery Facility.

Rock strength testing in the form of Point Load Strength Index [PLSI] and Uniaxial Compressive Strength [UCS] testing was performed on cores recovered from site.

This report presents the factual geotechnical data acquired from the 2022 investigation. The exploratory hole locations are plotted on the site plan in Appendix 11.

2. FIELDWORKS

2.1 General

The geotechnical investigations were carried out in July and August 2022 and comprised the following:

- Trial Pits (10 No.)
- Cable Percussion Boring (6 No.)
- Rotary Core Drillholes (6 No.)
- Dynamic Cone Penetrometer (10 No.)
- Plate Bearing Testing (10 No.)
- Resistivity Survey
- Groundwater Monitoring
- Surveying of Exploratory Hole Locations

2.2 Trial Pits

Trial pitting was undertaken at ten locations across the site. The trial pits were excavated, logged and sampled under the direction of an IGSL geotechnical engineer in accordance with BS 5930 (2015+A1:2020). Bulk disturbed samples (typically 20 to 30kg) were taken as the pits progressed. In each pit, a plate bearing test was conducted with a dynamic cone penetrometer performed in the surficial soils alongside.

The bulk samples were placed in heavy-duty polyethylene bags and sealed before being transported to Naas for laboratory testing. Environmental samples, collected in 60ml and 250ml glass jars as well as plastic tubs (500ml), were dispatched to the environmental laboratory (Chemtest UK). The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs together with pit photographs are presented in Appendix 1. The logs include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

2.3 Cable Percussion Boreholes

Cable percussion boring (200mm diameter) was undertaken at six locations using a Dando 2000 rig. The boreholes extended to depths of between 1.90m and 2.0m below ground level. Boring commenced through pre-dug services inspection pits. Each service pit was excavated only after undertaking careful CAT [Cable Avoidance Tool] survey and following consultation of all available utility plans. Disturbed bulk samples were recovered at 1m intervals or change of strata during boring and these are denoted 'B' on the engineering logs.

Standard Penetration Tests (SPT's) were performed in the boreholes and given the nature of the soils, a solid cone was used. It is noted that the SPT N-Values reported are the number of blows for 300mm increment penetration (e.g. BH01 at 1.0m where N=19). These exclude the seating blow values, which represent the initial 150mm depth of penetration. Where partial penetration was achieved during testing, the number of blows is shown for the actual penetration depth achieved (e.g. BH02 at 2.0m where N=50/75mm). In accordance with Eurocode 7, the SPT hammer has been calibrated and the energy ratio (Er) value is incorporated on the engineering logs. It is highlighted that the SPT N-Values reported on the engineering logs are uncorrected for energy ratio.

Descriptions of the soils encountered and samples recovered are presented on the borehole records in Appendix 2. Details of groundwater strikes and hard strata boring (i.e. chiselling) are also presented on the aforementioned records.

2.4 Rotary Core Drillholes

Rotary core drilling was carried out (holes denoted RC_) using a tracked Beretta T44 top-drive rig. At each location, symmetrex drilling was utilized within the superficial deposits with coring

techniques used in the underlying bedrock. The rotary drilling in bedrock produced 78mm diameter cores.

The cores were placed in 3m capacity timber boxes and logged by an IGSL engineering geologist. This included photography of the cores with a digital camera. Where rock core was recovered, a graphic fracture log is also presented alongside the mechanical indices. This illustrates the fracture state of the rock cores and allows easy identification of highly fractured / non-intact zones and discontinuity spacings. It should be noted that no correction for dip of the joints has been made and that the spacings shown are successive joint / core intersections within the core.

Groundwater monitoring standpipes were installed in all six coreholes. The standpipes consisted of 50mm diameter HDPE pipework with proprietary 1mm slots and incorporated a pea gravel filter pack and cement / bentonite grout seal. Protective headwork covers were concreted in place.

The core log records are presented in Appendix 3 and this includes engineering geological descriptions, details of the bedding / discontinuities and mechanical indices (TCR, SCR and RQD's) for each core run (to be included in a future version of this report). Core photographs are also presented in Appendix 3 and these illustrate the structure and fracture state of the bedrock.

2.5 Dynamic Cone Penetrometer Testing

In-situ dynamic cone penetrometer tests were carried out at each trial pit location in accordance with TRL recommended procedure* to estimate CBR values* of the indigenous subsurface deposits. Testing was carried out from ground level. The test results with CBR values are presented in Appendix 4 of this report.

**CBR values are estimated using the correlation derived by Kleyn and Van Heerden (1983), which is preferred by TRL.*

2.6 Plate Bearing Testing

Ten plate bearing tests were conducted at each of the trial pit locations at depths between 0.30m to 0.40m below ground level [bgl]. Plate testing was undertaken to evaluate the modulus of sub-grade reaction (Ks) and equivalent CBR value. A 450mm diameter plate was used for the tests with kentledge provided by a mechanical excavator. Two load cycle tests, in accordance with BS 1377, were performed and the load / settlement plots, Ks and equivalent CBR values are presented in Appendix 5 of the report.

2.7 Resistivity Survey

A resistivity survey was conducted by Minerex Geophysics Limited. It consisted of two different methods. The methodology employed used both Vertical Electrical Sounding (VES) and Soil Resistivity (SR) in the Wenner electrode configuration at a range of electrode spacing agreed with the client prior to the fieldwork. The increase in the electrode spacing leads to an increase in the depth - the VES permitting deeper soundings and Soil Resistivity Tests shallow. The Minerex report is presented in Appendix 6.

2.8 Groundwater Monitoring

Groundwater monitoring was undertaken following the fieldworks period. Groundwater levels were measured using an electric dipmeter with measurements taken from the wells installed in the coreholes on the project. The levels recorded are shown in Appendix 7.

2.9 Surveying of Exploratory Hole Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to Irish Transverse Mercator and ground levels (z) established to Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs with locations shown on the exploratory hole plan in Appendix 11.

3. LABORATORY TESTING

Geotechnical laboratory testing was performed at IGSL's INAB-accredited laboratory in accordance with the methods set out in BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute:1990. Soils testing on disturbed samples included moisture content, Atterberg Limits (Liquid / Plastic Limits), Particle Size Distribution, Moisture Condition Value and thermal resistivity testing. The results from testing on selected trial pit and borehole samples are presented in Appendix 8.

Soil chemical testing to BRE Test Suite D is presented in Appendix 9. It incorporates pH, water soluble, acid soluble sulphate, total sulphur in addition to magnesium, chloride and nitrate testing. Soil samples were also selected from trial pits and subject to the '*Rilta*' WAC Suite of testing. The results can be used to classify the material with regard to its potential for disposal to landfill. Both chemical and environmental results are presented in Appendix 9.

Rock strength testing on selected core specimens comprised Point Load Strength Index [PLSI] testing and Uniaxial Compressive Strength [UCS] testing. The tests were performed in accordance ISRM Suggested Methods for Rock Characterization, Testing and Monitoring and the results are presented in Appendix 10.

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2.0 BS 1377 (1990). Methods of Testing of Soils for Civil Engineering Purposes, BSI.

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8.0 Kleyn, E. & Van Heerden, M.J. (1983, July). Using DCP Soundings to Optimize Pavement Rehabilitation. Paper presented at the Annual Transportation Convention, Milner Park Showgrounds, Johannesburg.

9.0 Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

Appendix 1

Trial Pit Logs & Photographs

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,825.57 E 730,858.11 N
		DATE STARTED	19/07/2022
		DATE COMPLETED	19/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.70
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm grey sandy gravelly CLAY with occasional cobbles		0.40	73.30		180437	B	0.60-0.70		
1.0									
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)		1.70	72.00		180438	B	1.70-1.80		
2.0									
End of Trial Pit at 2.20m		2.20	71.50						
3.0									

Groundwater Conditions
Dry pit

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,872.43 E 730,847.06 N
		DATE STARTED	19/07/2022
		DATE COMPLETED	19/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	74.07
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
		0.40	73.67						
Firm brown sandy CLAY		0.60	73.47						
Firm grey sandy gravelly CLAY with occasional cobbles					180435	B	0.70-0.80		
1.0									
		1.80	72.27						
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)					180436	B	1.80-1.90		
2.0									
		2.20	71.87						
End of Trial Pit at 2.20m									
3.0									

Groundwater Conditions
Dry pit

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,800.44 E 730,827.39 N
		DATE STARTED	15/07/2022
		DATE COMPLETED	15/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.39
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Stiff greyish brown sandy gravelly CLAY with ocaassional cobbles		0.50	72.89		180428	B	0.60-0.70		
1.0									
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)		1.80	71.59		180429	B	2.00-2.10		
2.0									
End of Trial Pit at 2.60m		2.60	70.79						
3.0									

Groundwater Conditions
Dry pit

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,849.11 E 730,817.54 N
		DATE STARTED	18/07/2022
		DATE COMPLETED	18/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.72
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30	73.42						
Firm brown sandy CLAY		0.60	73.12		180432	B	0.50-0.60		
Firm grey sandy gravelly CLAY with occasional cobbles					180433	B	0.80-0.90		
1.0									
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock) Boulders at 1.80m		1.60	72.12		180434	B	1.60-17.00		
End of Trial Pit at 1.90m		1.90	71.82						
2.0									
3.0									

Groundwater Conditions
Dry pit

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP05**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,885.38 E 730,805.46 N
		DATE STARTED	18/07/2022
		DATE COMPLETED	18/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	74.04
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm greyish brown sandy gravelly CLAY with occasional boulders		0.50	73.54		180430	B	0.70-0.80		
1.0									
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)		1.90	72.14		180431	B	2.00-2.10		
2.0									
End of Trial Pit at 2.30m		2.30	71.74						
3.0									

Groundwater Conditions
Dry pit

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP06**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,777.23 E 730,780.74 N
		DATE STARTED	15/07/2022
		DATE COMPLETED	15/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.28
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	73.08						
MADE GROUND (granular fill)		0.50	72.78						
Firm brownish grey sandy gravelly CLAY with occasional boulders					180426	B	0.50-0.60		
1.0									
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)		1.80	71.48	1 (Slow)	180427	B	1.80-1.90		
2.0 End of Trial Pit at 2.10m		2.10	71.18						
3.0									

Groundwater Conditions
Slow ingress at 2.0m

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP07**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,816.50 E 730,771.47 N
		DATE STARTED	14/07/2022
		DATE COMPLETED	14/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.29
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
		0.40	72.89						
Firm brown sandy CLAY					180420	B	0.50-0.60		
		0.70	72.59						
Firm grey sandy gravelly CLAY									
1.0									
					180421	B	1.40-1.50		
		1.60	71.69						
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)				1 (Seepage)	180423	B	1.80-1.90		
		1.90	71.39						
End of Trial Pit at 1.90m									
2.0									
3.0									

Groundwater Conditions
Slow ingress at 1.80m

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP08**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,857.84 E 730,763.52 N
		DATE STARTED	15/07/2022
		DATE COMPLETED	15/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.49
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm brownish grey sandy gravelly CLAY with occasional cobbles		0.50	72.99		180424	B	0.70-0.80		
1.0									
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)		1.50	71.99		180425	B	1.70-1.80		
2.0 End of Trial Pit at 2.00m		2.00	71.49	1 (Slow)					
3.0									

Groundwater Conditions
Slow ingress at 2.0m

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP09**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,820.02 E 730,726.32 N
		DATE STARTED	14/07/2022
		DATE COMPLETED	14/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.12
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm grey sandy gravelly CLAY with occasional cobbles		0.40	72.72		180418	B	0.50-0.60		
1.0									
Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock)		1.60	71.52		180419	B	1.60-1.70		
End of Trial Pit at 1.80m		1.80	71.32	1 (Slow)					
2.0									
3.0									

Groundwater Conditions
Slow ingress at 1.80m

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**TRIAL PIT NO.**	**TP10**
		SHEET	Sheet 1 of 1
LOGGED BY	MB	**CO-ORDINATES**	703,759.48 E 730,692.48 N
		DATE STARTED	19/07/2022
		DATE COMPLETED	19/07/2022
CLIENT	F1 Enzo Properties	**GROUND LEVEL (m)**	73.08
ENGINEER	Ramboll	**EXCAVATION METHOD**	Hitachi 8.5

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm grey sandy gravelly CLAY with occasional cobbles		0.40	72.68		180439	B	0.50-0.60		
1.0									
Stiff to very stiff greyish black gravelly CLAY with cobbles and occasional boulders		1.40	71.68	1 (Slow)	180440	B	1.50-1.60		
2.0									
					180441	B	2.50-2.60		
End of Trial Pit at 2.70m		2.70	70.38						
3.0									

Groundwater Conditions
Slow ingress at 2.0m

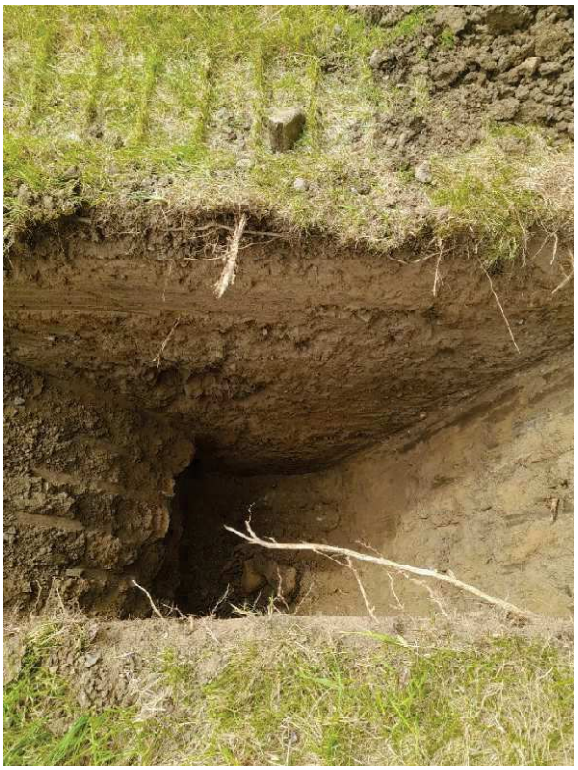
Stability
Slighty unstable

General Remarks

TP01 – 1 of 3

TP01 – 2 of 3

TP01 – 3 of 3



TP02 – 1 of 3

TP02 – 2 of 3

TP02 – 3 of 3

TP03 – 1 of 3

TP03 – 2 of 3

TP03 – 3 of 3

TP04 – 1 of 3

TP04 – 2 of 3

TP04 – 3 of 3

TP05 – 1 of 3

TP05 – 2 of 3

TP05 – 3 of 3

TP06 – 1 of 3

TP06 – 2 of 3

TP06 – 3 of 3

TP07 – 1 of 3

TP07 – 2 of 3

TP07 – 3 of 3

TP08 – 1 of 3

TP08 – 2 of 3

TP08 – 3 of 3

TP09 – 1 of 3

TP09 – 2 of 3

TP09 – 3 of 3

TP10 – 1 of 3

TP10 – 2 of 3

TP10 – 3 of 3

Appendix 2

Cable Percussion Borehole Logs

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**BOREHOLE NO.**	**BH01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,829.90 E 730,853.84 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	73.76	**BOREHOLE DEPTH (m)**	1.90
		DATE COMMENCED	18/07/2022
		DATE COMPLETED	18/07/2022
CLIENT	F1 Enzo Properties	**SPT HAMMER REF. NO.**	
ENGINEER	Ramboll	**ENERGY RATIO (%)**	
		BORED BY	W.Cahill
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	Firm dark brown sandy SILT/CLAY with some gravel and occasional cobbles									
1					AA171725	B	1.00		N = 19 (3, 4, 4, 4, 5, 6)	
			72.06	1.70						
	Very stiff dark brown sandy silty gravelly CLAY with cobbles		71.86	1.90					N = 50/75 mm (25, 50)	
2	Obstruction End of Borehole at 1.90 m									
3										
4										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.7	1.9	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.70	1.70	No	No	20	Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Location scanned using CAT [cable avoidance tool] with hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24188.GPJ IGSL.GDT 9/9/22

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**BOREHOLE NO.**	**BH02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,864.31 E 730,847.41 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	74.20	**BOREHOLE DEPTH (m)**	2.00
		DATE COMMENCED	18/07/2022
		DATE COMPLETED	18/07/2022
CLIENT	F1 Enzo Properties	**SPT HAMMER REF. NO.**	
ENGINEER	Ramboll	**ENERGY RATIO (%)**	
		BORED BY	W.Cahill
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	Stiff dark brown sandy SILT/CLAY with angular gravel									
1			73.10	1.10	AA171726	B	1.00		N = 22 (4, 4, 5, 5, 6, 6)	
	Stiff to very stiff dark brown sandy silty gravelly CLAY with angular cobbles									
2			72.20	2.00					N = 50/75 mm (25, 50)	
	Obstruction End of Borehole at 2.00 m									
3										
4										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.8	2	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

REMARKS Location scanned using CAT [cable avoidance tool] with hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**BOREHOLE NO.**	**BH03**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,784.97 E 730,779.34 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	73.32	**BOREHOLE DEPTH (m)**	1.90
		DATE COMMENCED	14/07/2022
		DATE COMPLETED	14/07/2022
CLIENT	F1 Enzo Properties	**SPT HAMMER REF. NO.**	
		BORED BY	W.Cahill
ENGINEER	Ramboll	**ENERGY RATIO (%)**	
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	MADE GROUND (Comprised of Cl.804 stone fill)		73.02	0.30						
	Light brown sandy SILT/CLAY with occasional gravel		72.62	0.70						
1	Stiff to very stiff dark brown sandy silty gravelly CLAY with some cobbles and occasional boulders				AA171722	B	1.00		N = 24 (4, 6, 6, 7, 5, 6)	
			71.42	1.90						
2	Obstruction End of Borehole at 1.90 m								N = 50/75 mm (25, 50)	
3										
4										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.7	1.9	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.50	1.50	No	No	20	Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Location scanned using CAT [cable avoidance tool] with hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

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GEOTECHNICAL BORING RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**BOREHOLE NO.**	**BH04**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,851.21 E 730,767.13 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	73.52	**BOREHOLE DEPTH (m)**	2.00
		DATE COMMENCED	14/07/2022
		DATE COMPLETED	14/07/2022
CLIENT	F1 Enzo Properties	**SPT HAMMER REF. NO.**	
ENGINEER	Ramboll	**ENERGY RATIO (%)**	
		BORED BY	W.Cahill
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	dark brown sandy SILT/CLAY with some gravel									
1					AA171721	B	1.00		N = 15 (3, 4, 4, 3, 4, 4)	
			72.02	1.50						
	Very stiff dark brown sandy silty gravelly CLAY with occasional cobbles									
2			71.52	2.00					N = 50/75 mm (25, 50)	
	Obstruction End of Borehole at 2.00 m									
3										
4										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.8	2	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Location scanned using CAT [cable avoidance tool] with hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24188.GPJ IGSL.GDT 9/9/22

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**BOREHOLE NO.**	**BH05**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,826.61 E 730,726.78 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	73.11	**BOREHOLE DEPTH (m)**	1.90
		DATE COMMENCED	13/07/2022
		DATE COMPLETED	13/07/2022
CLIENT	F1 Enzo Properties	**SPT HAMMER REF. NO.**	
		BORED BY	W.Cahill
ENGINEER	Ramboll	**ENERGY RATIO (%)**	
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	Stiff dark brown sandy SILT/CLAY with some gravel and occasional cobbles									
1					AA171723	B	1.00		N = 23 (4, 5, 5, 6, 5, 7)	
			71.41	1.70						
	Stiff to very stiff dark brown sandy gravelly silty CLAY with some cobbles and boulders		71.21	1.90					N = 50/75 mm (25, 50)	
2	Obstruction End of Borehole at 1.90 m									
3										
4										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
1.7	1.9	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Location scanned using CAT [cable avoidance tool] with hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24188.GPJ IGSL.GDT 9/9/22

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**BOREHOLE NO.**	**BH06**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,762.42 E 730,688.71 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (m AOD)	73.11	**BOREHOLE DEPTH (m)**	2.10
		DATE COMMENCED	15/07/2022
		DATE COMPLETED	15/07/2022
CLIENT	F1 Enzo Properties	**SPT HAMMER REF. NO.**	
		BORED BY	W.Cahill
ENGINEER	Ramboll	**ENERGY RATIO (%)**	
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	Firm light brown sandy SILT/CLAY with occasional gravel									
1			71.91	1.20	AA171726	B	1.00		N = 17 (4, 4, 3, 4, 4, 6)	
	Very stiff dark brown sandy silty gravelly CLAY with some cobbles									
2			71.01	2.10					N = 50/75 mm (25, 50)	
	Obstruction End of Borehole at 2.10 m									
3										
4										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
1.90	1.90	No	No	20	Seepage

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Location scanned using CAT [cable avoidance tool] with hand dug inspection pit carried out

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24188.GPJ IGSL.GDT 9/9/22

Appendix 3

Rotary Core Drillhole Logs & Photographs

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**DRILLHOLE NO**	**RC01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,829.90 E 730,853.84 N	**RIG TYPE**	BT-44
GROUND LEVEL (mOD)	73.76	**FLUSH**	Air/Mist
		DATE COMMENCED	10/08/2022
CLIENT	F1 Enzo Properties	**INCLINATION (deg)**	-90
		DATE COMPLETED	11/08/2022
ENGINEER	Ramboll	**CORE DIAMETER (mm)**	78
		DRILLED BY	IGSL - JK
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of CLAY	1.50	72.26		
	3.00				SYMMETRIX DRILLING: No recovery, observed by driller as returns of clayey GRAVEL	3.00	70.76		
3	4.50	100	50	18	Very strong to medium strong, thickly to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.10-0.50m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, very locally moderately weathered at fissile mudstone/shale zones at (3.59-3.64m, 6.42-6.45m & 7.31-7.35m). Many incipient fractures throughout. Discontinuities are widely to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally moderately open, locally clay smeared, locally calcite-veined (1-12mm thick). Dips are 30-40° & locally 70°.				
5	6.00	100	86	76					
6	7.50	100	81	67					
8	9.00	100	91	88					
9	10.00	100	91	61		10.00	63.76		

Fracture Spacing Log (mm): 0 – 250 – 500

Non-intact Zone: 609.999999999999 … 1070

REMARKS

Hole cased 0.00-3.00m.

End of Borehole at 10.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
11-08-22	10.00	3.00	8.80	Water level recorded 5 mins after end of drilling.

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
11-08-22	10.00	1.00	10.00	50mm SP

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**DRILLHOLE NO**	**RC02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,864.31 E 730,847.41 N	**RIG TYPE**	BT-44
GROUND LEVEL (mOD)	74.20	**FLUSH**	Air/Mist
		DATE COMMENCED	09/08/2022
CLIENT	F1 Enzo Properties	**INCLINATION (deg)**	-90
		DATE COMPLETED	10/08/2022
ENGINEER	Ramboll	**CORE DIAMETER (mm)**	78
		DRILLED BY	IGSL - JK
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of CLAY	1.50	72.70		
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of clayey GRAVEL	2.80	71.40		
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of ROCK	3.00	71.20		
3	3.00	100	62	48				Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.10-0.50m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, very locally moderately weathered at fissile mudstone/shale zones at (4.52-4.56m & 5.95-6.00m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally moderately open, locally clay/gravel-filled (at 3.23-3.39m), locally calcite-veined (1-10mm thick). Dips are 30-40° & locally 70°.				
4	4.50	100	66	59								
5	6.00	100	61	30								
6	7.50	100	65	47								
7	9.00	100	78	69								
8	10.00								10.00	64.20		
9												

REMARKS

Hole cased 0.00-3.00m.

End of Borehole at 10.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
10-08-22	10.00	3.00	8.80	Water level recorded 5 mins after end of drilling.

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
10-08-22	10.00	1.00	10.00	50mm SP

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 24188

CONTRACT Data Centre Projects 3 - Profile Park

DRILLHOLE NO RC03
SHEET Sheet 1 of 2

CO-ORDINATES 703,784.97 E
730,779.34 N
GROUND LEVEL (mOD) 73.32

RIG TYPE BT-44
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE COMMENCED 15/08/2022
DATE COMPLETED 16/08/2022

CLIENT F1 Enzo Properties
ENGINEER Ramboll

DRILLED BY IGSL - JK
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of clayey GRAVEL	3.00	70.32		
3	3.50							SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY	3.50	69.82		
4	4.50	100	8	0				Very strong to medium strong, thickly to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.10-0.50m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, very locally moderately weathered at fissile mudstone/shale zones at (5.50-5.64m & 7.05-7.10m). Many incipient fractures throughout.				
5	5.50	100	34	12								
6	6.50	100	53	22								
7	8.00	100	63	29								
8	9.50	100	85	74	330			Discontinuities are widely to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally moderately open, locally clay smeared, locally calcite-veined (1-70mm thick). Dips are subhorizontal, 30-40° & locally 70°.				

REMARKS

Hole cased 0.00-3.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
16-08-22	11.00	1.00	11.00	50mm SP

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 24188

CONTRACT Data Centre Projects 3 - Profile Park

DRILLHOLE NO RC03
SHEET Sheet 2 of 2

CO-ORDINATES 703,784.97 E
730,779.34 N
GROUND LEVEL (mOD) 73.32

RIG TYPE BT-44
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE COMMENCED 15/08/2022
DATE COMPLETED 16/08/2022

CLIENT F1 Enzo Properties
ENGINEER Ramboll

DRILLED BY IGSL - JK
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
10	11.00	100	90	68					11.00	62.32		
11								End of Borehole at 11.00 m				
12												
13												
14												
15												
16												
17												
18												
19												

REMARKS

Hole cased 0.00-3.50m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
16-08-22	11.00	3.50	3.10	Water level recorded 5 mins after end of drilling.

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
16-08-22	11.00	1.00	11.00	50mm SP

IGSL RC FI 10M 24188.GPJ IGSL.GDT 16/9/22

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 24188

CONTRACT Data Centre Projects 3 - Profile Park

DRILLHOLE NO RC04
SHEET Sheet 1 of 1

CO-ORDINATES 703,851.21 E
730,767.13 N
GROUND LEVEL (mOD) 73.52

RIG TYPE BT-44
FLUSH Air/Mist
INCLINATION (deg) -90
CORE DIAMETER (mm) 78

DATE COMMENCED 11/08/2022
DATE COMPLETED 12/08/2022

CLIENT F1 Enzo Properties
ENGINEER Ramboll

DRILLED BY IGSL - JK
LOGGED BY D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm)	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of CLAY	1.50	72.02		
1								SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY	2.40	71.12		
2								SYMMETRIX DRILLING: No recovery, observed by driller as returns of ROCK	3.00	70.52		
3	3.00	100	29	25				Very strong to medium strong, thickly to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.10-0.50m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, very locally moderately weathered at fissile mudstone/shale zones at (3.42-3.48m, 5.28-5.31m, 5.76-5.78m, 6.06-6.09m, 7.23-7.25m, 8.15-8.17m & 9.65-9.67m). Many incipient fractures throughout. Discontinuities are widely to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally moderately open, locally clay smeared, locally calcite-veined (1-10mm thick). Dips are 30-40° & locally subhorizontal & 70°.				
4	4.50	100	59	37								
5	6.00	100	74	53	370							
6	7.50	100	83	47								
7	9.00	100	82	71								
8	10.00								10.00	63.52		
9												
10												

REMARKS
Hole cased 0.00-3.00m.

End of Borehole at 10.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
12-08-22	10.00	3.00	8.40	Water level recorded 5 mins after end of drilling.

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
12-08-22	10.00	1.00	10.00	50mm SP

IGSL RC FI 10M 24188.GPJ IGSL.GDT 16/9/22

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**DRILLHOLE NO**	**RC05**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,826.61 E 730,726.78 N	**RIG TYPE**	BT-44
GROUND LEVEL (mOD)	73.11	**FLUSH**	Air/Mist
		DATE COMMENCED	12/08/2022
CLIENT	F1 Enzo Properties	**INCLINATION (deg)**	-90
ENGINEER	Ramboll	**CORE DIAMETER (mm)**	78
		DATE COMPLETED	15/08/2022
		DRILLED BY	IGSL - JK
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0					SYMMETRIX DRILLING: No recovery, observed by driller as returns of CLAY	1.50	71.61		
2					SYMMETRIX DRILLING: No recovery, observed by driller as returns of gravelly CLAY	2.70	70.41		
3	3.00				SYMMETRIX DRILLING: No recovery, observed by driller as returns of ROCK	3.00	70.11		
4	4.50	100	72	44	Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.10-0.50m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, very locally moderately weathered at fissile mudstone/shale zones at (3.44-3.51m, 5.37-5.40m, 5.53-5.56m, 5.96-6.00m, 6.23-6.28m, 6.72-6.75m & 9.15-9.19m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally moderately open, locally clay smeared, locally calcite-veined (1-7mm thick). Dips are 30-40° & 70°.				
5		100	44	7					
6	6.00								
7		100	67	47					
8	7.50								
9		100	81	61					
	9.00								
		100	81	61					
	10.00				End of Borehole at 10.00 m	10.00	63.11		

Fracture Spacing Log (mm): 0, 250, 500

Non-intact Zone

Legend

REMARKS

Hole cased 0.00-3.00m.

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike recorded

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
15-08-22	10.00	3.00	2.70	Water level recorded 5 mins after end of drilling.

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
15-08-22	10.00	1.00	10.00	50mm SP

GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER 24188

CONTRACT	Data Centre Projects 3 - Profile Park	**DRILLHOLE NO**	**RC06**
		SHEET	Sheet 1 of 1
CO-ORDINATES	703,762.42 E 730,688.71 N	**RIG TYPE**	BT-44
GROUND LEVEL (mOD)	73.11	**FLUSH**	Air/Mist
		DATE COMMENCED	08/08/2022
CLIENT	F1 Enzo Properties	**INCLINATION (deg)**	-90
		DATE COMPLETED	09/08/2022
ENGINEER	Ramboll	**CORE DIAMETER (mm)**	78
		DRILLED BY	IGSL - JK
		LOGGED BY	D.O'Shea

Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing Log (mm) 0 250 500	Non-intact Zone	Legend	Description	Depth (m)	Elevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX DRILLING: No recovery, observed by driller as returns of CLAY	3.00	70.11		
3								SYMMETRIX DRILLING: No recovery, observed by driller as returns of clayey GRAVEL	3.60	69.51		
								SYMMETRIX DRILLING: No recovery, observed by driller as returns of ROCK	4.20	68.91		
4	4.20	100	67	29				Very strong to medium strong, medium to thinly bedded (to thinly laminated where fissile mudstone/shale), grey/dark grey/black, fine-grained, LIMESTONE (argillaceous limestone grading regularly (every approx 0.10-0.50m) into calci-siltite limestone with subordinate MUDSTONE, local stylolites, pyrite present), slightly weathered where intact, very locally moderately weathered at fissile mudstone/shale zones at (5.42-5.47m, 7.00-7.05m, 8.05-8.12m, 8.58-8.60m & 8.68-8.72m). Many incipient fractures throughout. Discontinuities are medium to closely spaced, smooth to locally rough, planar to locally curviplanar. Apertures are tight to locally moderately open, locally clay smeared, locally calcite-veined (1-20mm thick). Dips are 30-40° & 70°.				
5	5.70	100	59	45								
6												
7	7.20	100	73	37								
8	8.70	100	75	51								
9												
10	10.00								10.00	63.11		

REMARKS

Hole cased 0.00-4.20m.

End of Borehole at 10.00 m

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
7.60	4.20	N/S			Slow

GROUNDWATER DETAILS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
09-08-22	10.00	4.20	2.90	Water level recorded 5 mins after end of drilling.

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
09-08-22	10.00	1.00	10.00	50mm SP

RC01 Box 1 of 3 – 3.00-6.00m

RC01 Box 2 of 3 – 6.00-9.00m

RC01 Box 3 of 3 – 9.00-10.00m

RC02 Box 1 of 3 – 3.00-6.00m

RC02 Box 2 of 3 – 6.00-9.00m

RC02 Box 3 of 3 – 9.00-10.00m

RC03 Box 1 of 3 – 3.50-6.50m

RC03 Box 2 of 3 – 6.50-9.50m

RC03 Box 3 of 3 – 9.50-11.00m

RC04 Box 1 of 3 – 3.00-6.00m

RC04 Box 2 of 3 – 6.00-9.00m

RC04 Box 3 of 3 – 9.00-10.00m

RC05 Box 1 of 3 – 3.00-6.00m

RC05 Box 2 of 3 – 6.00-9.00m

RC05 Box 3 of 3 – 9.00-10.00m

RC06 Box 1 of 2 – 4.20-7.20m

RC06 Box 2 of 2 – 7.20-10.00m

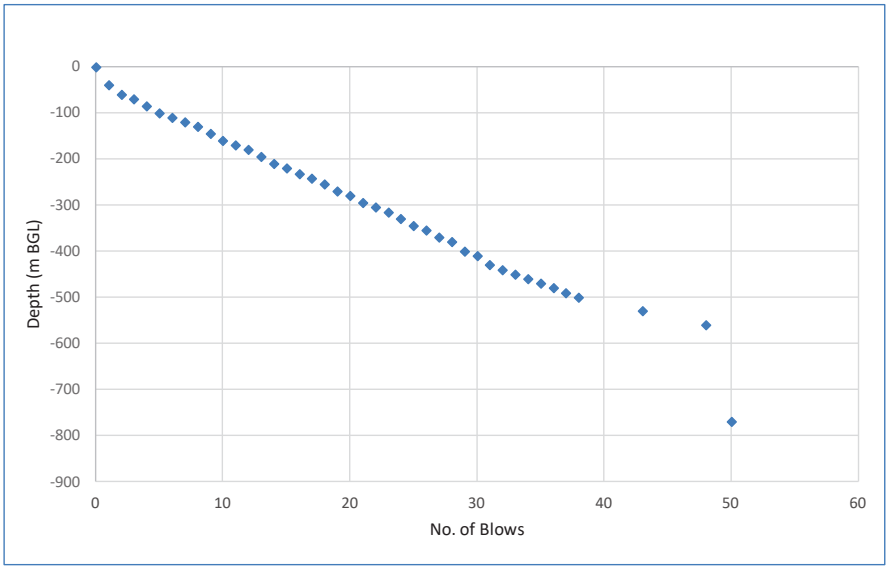
Appendix 4

Dynamic Cone Penetrometer Records

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	19/07/2022
Ref No.	24188	**Test No.**	1
Client	Ramboll	**DCP Zero Reading**	50 mm
Location	Profile Park, Dublin 22	**Start of Test at:**	0 m BGL
Direction		**Approximate Chainage**	
Soil Description	Firm grey brown sandy CLAY		

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	50	1	21	345			
1	1	90	1	22	355			
1	2	110	1	23	365			
1	3	120	1	24	380			
1	4	135	1	25	395			
1	5	150	1	26	405			
1	6	160	1	27	420			
1	7	170	1	28	430			
1	8	180	1	29	450			
1	9	195	1	30	460			
1	10	210	1	31	480			
1	11	220	1	32	490			
1	12	230	1	33	500			
1	13	245	1	34	510			
1	14	260	1	35	520			
1	15	270	1	36	530			
1	16	282	1	37	540			
1	17	292	1	38	550			
1	18	305	5	43	580			
1	19	320	5	48	610			
1	20	330	2	50	820			



	From	to	Penetration	mm / blow
Depth range (mm)	500	620	120	7.06
Blows	33	50	17	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

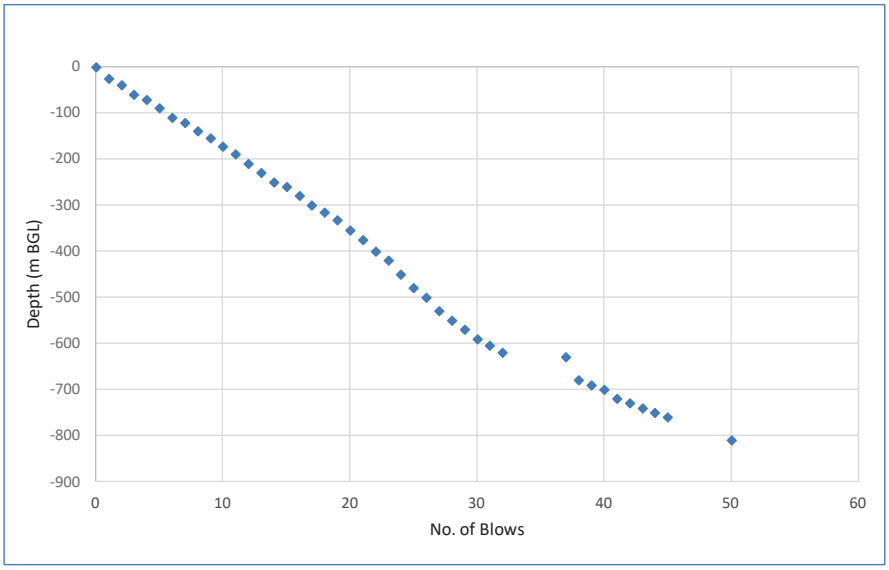
Log10(CBR) = 1.583

CBR = 38.273

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	19/07/2022
Ref No.	24188	**Test No.**	2
Client	Ramboll		
		DCP Zero Reading	50 mm
Location	Profile Park, Dublin 22		
Direction		**Start of Test at:**	0 m BGL
Soil Description	Firm grey brown sandy CLAY	**Approximate Chainage**	

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	50	1	21	425	5	50	860
1	1	75	1	22	450			
1	2	90	1	23	470			
1	3	110	1	24	500			
1	4	122	1	25	530			
1	5	140	1	26	550			
1	6	160	1	27	580			
1	7	172	1	28	600			
1	8	190	1	29	620			
1	9	205	1	30	640			
1	10	222	1	31	655			
1	11	240	1	32	670			
1	12	260	5	37	680			
1	13	280	1	38	730			
1	14	300	1	39	740			
1	15	310	1	40	750			
1	16	330	1	41	770			
1	17	350	1	42	780			
1	18	365	1	43	790			
1	19	382	1	44	800			
1	20	404	1	45	810			



	From	to	Penetration	mm / blow
Depth range (mm)	500	860	360	15.00
Blows	26	50	24	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

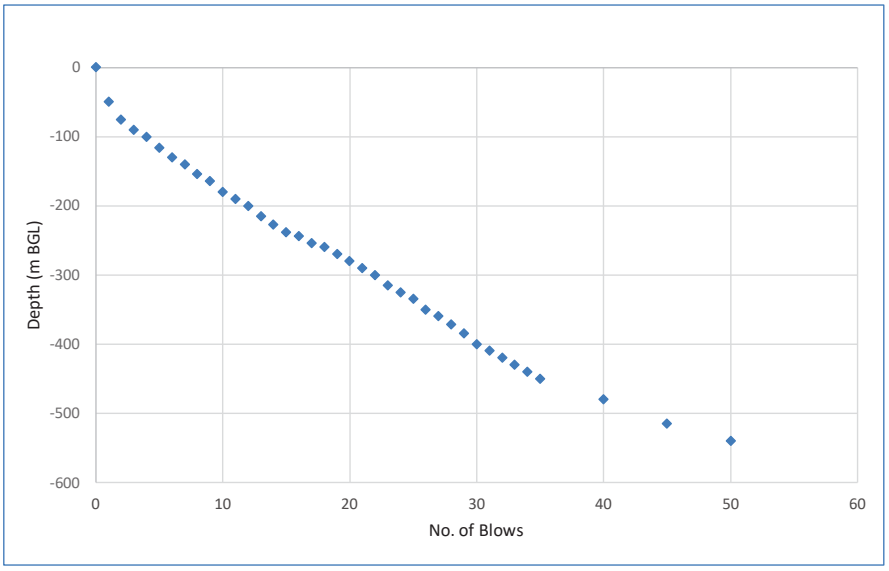
Log10(CBR) = 1.237

CBR = 17.253

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	15/07/2022 **Test No.** 3
Ref No.	24188		
Client	Ramboll	**DCP Zero Reading**	50 mm
Location	Profile Park, Dublin 22		
Direction		**Start of Test at:**	0 m BGL
Soil Description	stiff grey brown sandy CLAY	**Approximate Chainage**	

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	50	1	21	340			
1	1	100	1	22	350			
1	2	125	1	23	365			
1	3	140	1	24	375			
1	4	150	1	25	385			
1	5	166	1	26	400			
1	6	180	1	27	410			
1	7	190	1	28	422			
1	8	204	1	29	435			
1	9	214	1	30	450			
1	10	230	1	31	460			
1	11	240	1	32	470			
1	12	250	1	33	480			
1	13	265	1	34	490			
1	14	277	1	35	500			
1	15	288	5	40	530			
1	16	294	5	45	565			
1	17	304	5	50	590			
1	18	310						
1	19	320						
1	20	330						



	From	to	Penetration	mm / blow
Depth range (mm)	515	540	25	5.00
Blows	45	50	5	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

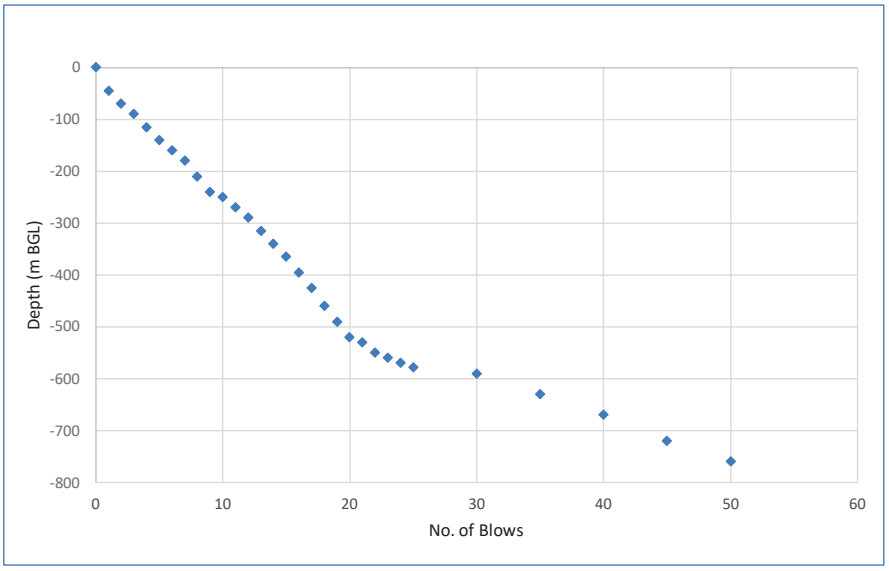
Log10(CBR) = 1.741

CBR = 55.105

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	18/07/2022
Ref No.	24188	**Test No.**	4
Client	Ramboll	**DCP Zero Reading**	50 mm
Location	Profile Park, Dublin 22	**Start of Test at:**	0 m BGL
Direction		**Approximate Chainage**	
Soil Description	Firm grey brown sandy CLAY		

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	50	1	21	580			
1	1	95	1	22	600			
1	2	120	1	23	610			
1	3	140	1	24	620			
1	4	165	1	25	628			
1	5	190	5	30	640			
1	6	210	5	35	680			
1	7	230	5	40	720			
1	8	260	5	45	770			
1	9	290	5	50	810			
1	10	300						
1	11	320						
1	12	340						
1	13	365						
1	14	390						
1	15	415						
1	16	445						
1	17	475						
1	18	510						
1	19	540						
1	20	570						



	From	to	Penetration	mm / blow
Depth range (mm)	520	810	290	9.67
Blows	20	50	30	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

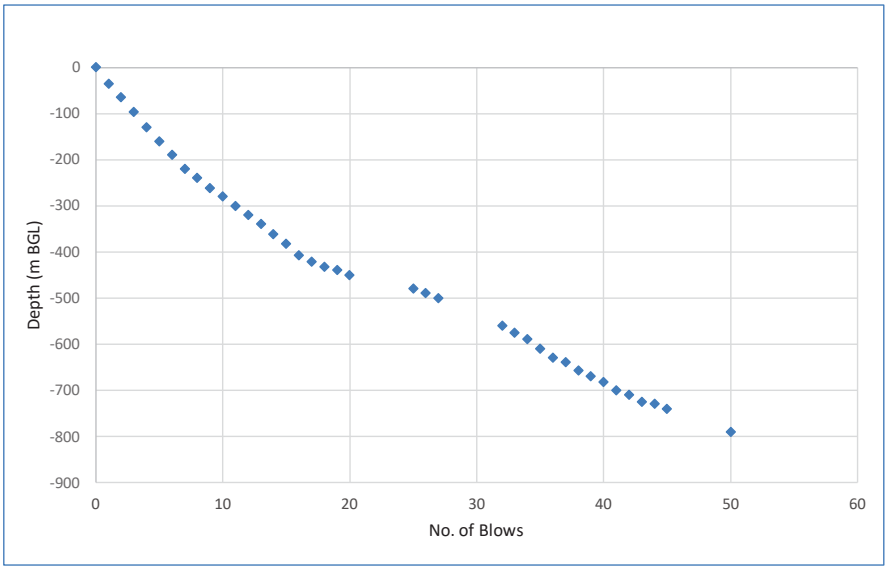
Log10(CBR) = 1.439

CBR = 27.451

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	18/07/2022
Ref No.	24188	**Test No.**	5
Client	Ramboll	**DCP Zero Reading**	50 mm
Location	Profile Park, Dublin 22	**Start of Test at:**	0 m BGL
Direction		**Approximate Chainage**	
Soil Description	Firm grey brown sandy CLAY		

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	50	5	25	530			
1	1	85	1	26	540			
1	2	115	1	27	550			
1	3	146	5	32	610			
1	4	180	1	33	625			
1	5	210	1	34	640			
1	6	240	1	35	660			
1	7	270	1	36	680			
1	8	290	1	37	690			
1	9	312	1	38	708			
1	10	330	1	39	720			
1	11	350	1	40	732			
1	12	370	1	41	750			
1	13	390	1	42	760			
1	14	412	1	43	776			
1	15	433	1	44	780			
1	16	458	1	45	790			
1	17	471	5	50	840			
1	18	483						
1	19	490						
1	20	500						



	From	to	Penetration	mm / blow
Depth range (mm)	500	682	182	14.00
Blows	27	40	13	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

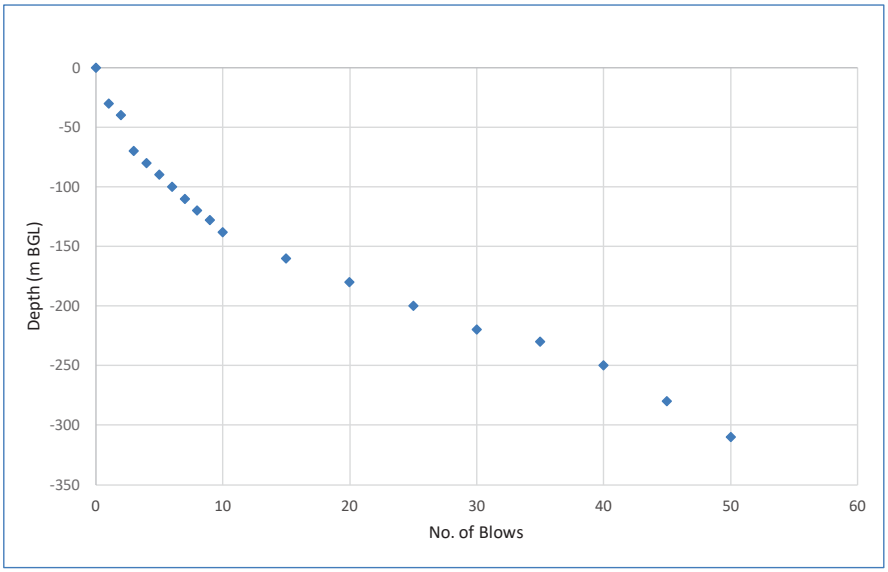
Log10(CBR) = 1.269

CBR = 18.558

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	15/07/2022 **Test No.** 6
Ref No.	24188		
Client	Ramboll	**DCP Zero Reading**	40 mm
Location	Profile Park, Dublin 22		
Direction		**Start of Test at:**	0 m BGL
Soil Description	Gravel (MADE GROUND)	**Approximate Chainage**	

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	40						
1	1	70						
1	2	80						
1	3	110						
1	4	120						
1	5	130						
1	6	140						
1	7	150						
1	8	160						
1	9	168						
1	10	178						
5	15	200						
5	20	220						
5	25	240						
5	30	260						
5	35	270						
5	40	290						
5	45	320						
5	50	350						



	Penetration	mm / blow
Depth range (mm)	178	16.18
Blows	11	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

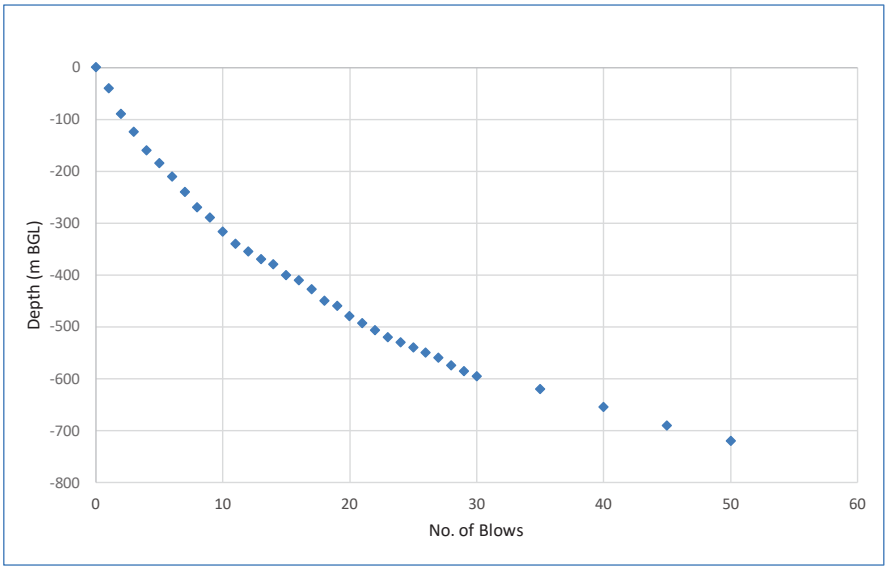
Log10(CBR) = 1.202

CBR = 15.924

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	14/07/2022 **Test No.** 7
Ref No.	24188		
Client	Ramboll	**DCP Zero Reading**	60 mm
Location	Profile Park, Dublin 22		
Direction		**Start of Test at:**	0 m BGL
Soil Description	Brown sandy Clay	**Approximate Chainage**	

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	60	1	21	553			
1	1	100	1	22	567			
1	2	150	1	23	580			
1	3	184	1	24	590			
1	4	220	1	25	600			
1	5	245	1	26	610			
1	6	270	1	27	620			
1	7	300	1	28	635			
1	8	330	1	29	645			
1	9	350	1	30	655			
1	10	377	5	35	680			
1	11	400	5	40	715			
1	12	415	5	45	750			
1	13	429	5	50	780			
1	14	440						
1	15	460						
1	16	470						
1	17	487						
1	18	510						
1	19	520						
1	20	540						



	From	to	Penetration	mm / blow
Depth range (mm)	507	780	273	9.75
Blows	22	50	28	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

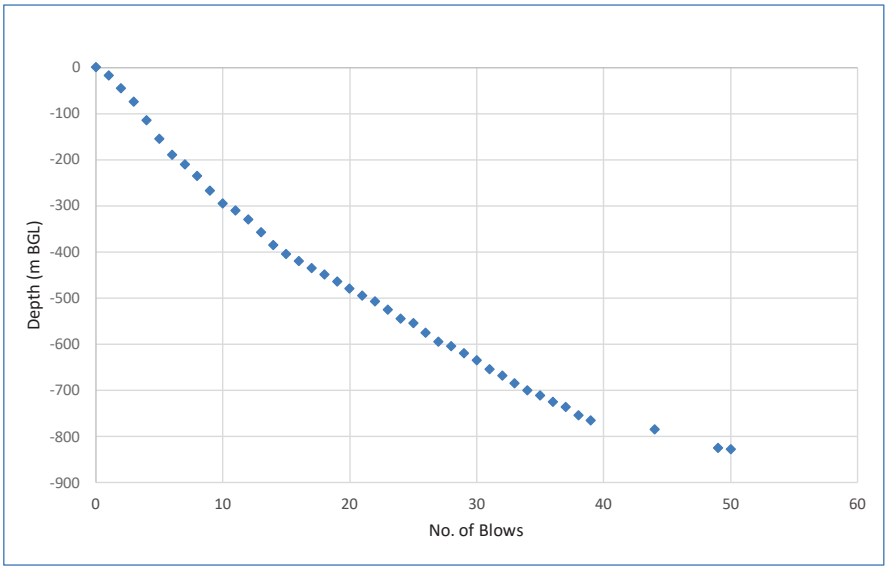
Log10(CBR) = 1.435

CBR = 27.203

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	15/07/2022 **Test No.** 8
Ref No.	24188		
Client	Ramboll	**DCP Zero Reading**	55 mm
Location	Profile Park, Dublin 22		
Direction		**Start of Test at:**	0 m BGL
Soil Description	Brown sandy Clay	**Approximate Chainage**	

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	55	1	21	550	1	50	883
1	1	73	1	22	562			
1	2	100	1	23	580			
1	3	130	1	24	600			
1	4	170	1	25	610			
1	5	210	1	26	630			
1	6	245	1	27	650			
1	7	265	1	28	660			
1	8	290	1	29	675			
1	9	322	1	30	690			
1	10	350	1	31	710			
1	11	365	1	32	723			
1	12	385	1	33	740			
1	13	412	1	34	755			
1	14	440	1	35	767			
1	15	460	1	36	780			
1	16	475	1	37	792			
1	17	490	1	38	810			
1	18	504	1	39	820			
1	19	520	5	44	840			
1	20	534	5	49	880			



	From	to	Penetration	mm / blow
Depth range (mm)	507	685	178	16.18
Blows	22	33	11	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

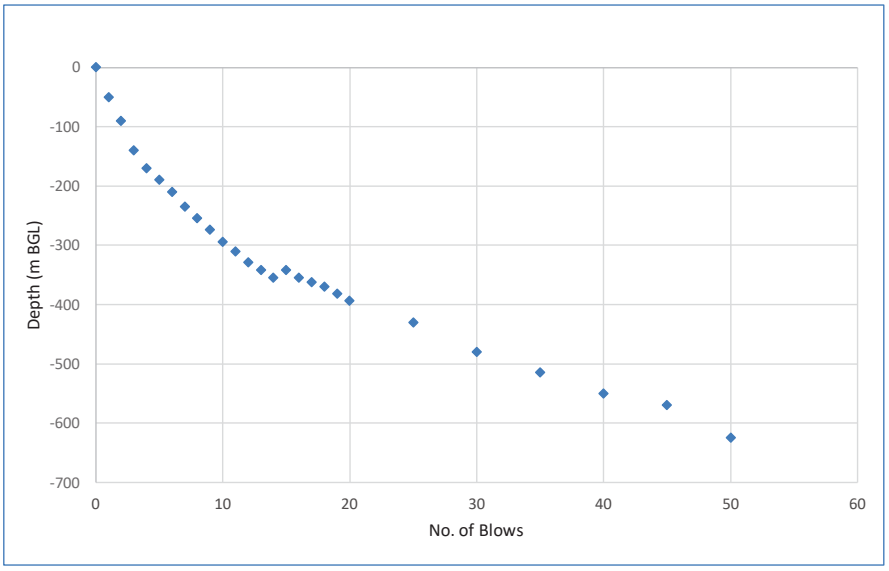
Log10(CBR) = 1.202

CBR = 15.924

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	14/07/2022
Ref No.	24188	**Test No.**	9
Client	Ramboll	**DCP Zero Reading**	40 mm
Location	Profile Park, Dublin 22	**Start of Test at:**	0 m BGL
Direction		**Approximate Chainage**	
Soil Description	Brown sandy Clay		

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	40	5	25	470			
1	1	90	5	30	520			
1	2	130	5	35	555			
1	3	180	5	40	590			
1	4	210	5	45	610			
1	5	230	5	50	665			
1	6	250						
1	7	275						
1	8	294						
1	9	314						
1	10	334						
1	11	350						
1	12	369						
1	13	382						
1	14	395						
1	15	382						
1	16	395						
1	17	402						
1	18	410						
1	19	422						
1	20	434						



	From	to	Penetration	mm / blow
Depth range (mm)	515	665	150	6.00
Blows	25	50	25	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

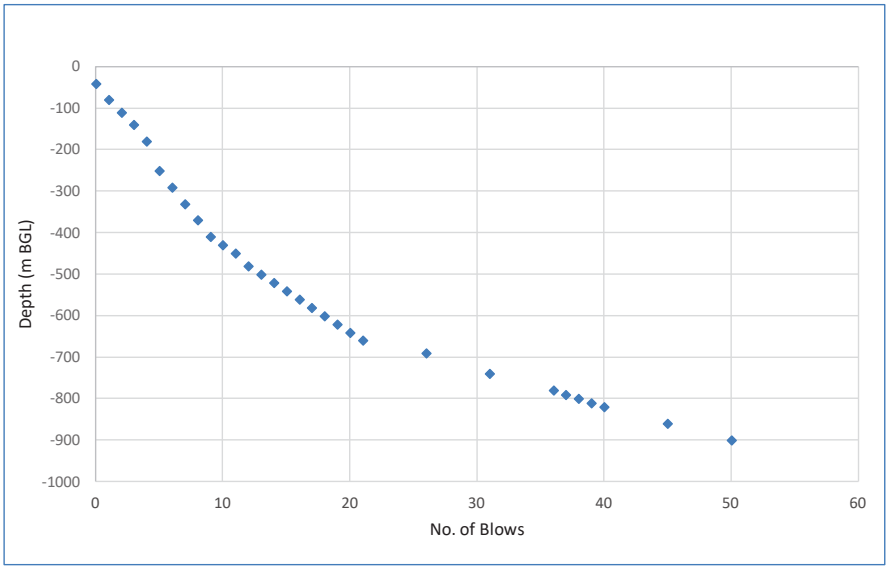
Log10(CBR) = 1.657

CBR = 45.446

Dynamic Cone Penetrometer

Contract	Profile Park	**Date:**	19/07/2022
Ref No.	24188	**Test No.**	10
Client	Ramboll		
		DCP Zero Reading	50 mm
Location	Profile Park, Dublin 22		
Direction		**Start of Test at:**	0 m BGL
Soil Description	Firm grey brown sandy CLAY	**Approximate Chainage**	

No of Blows	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*	*No of Blows*	*Total Blows*	*Reading mm*
0	0	90	1	21	710			
1	1	130	5	26	740			
1	2	160	5	31	790			
1	3	190	5	36	830			
1	4	230	1	37	840			
1	5	300	1	38	850			
1	6	340	1	39	860			
1	7	380	1	40	870			
1	8	420	5	45	910			
1	9	460	5	50	950			
1	10	480						
1	11	500						
1	12	530						
1	13	550						
1	14	570						
1	15	590						
1	16	610						
1	17	630						
1	18	650						
1	19	670						
1	20	690						



	From	to	Penetration	mm / blow
Depth range (mm)	500	600	100	12.50
Blows	11	19	8	

TRRL RN8: Log10 (CBR) = 2.48-1.057*Log10 (mm/blow)

Log10(CBR) = 1.321

CBR = 20.920

Appendix 5

Plate Bearing Test Records

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

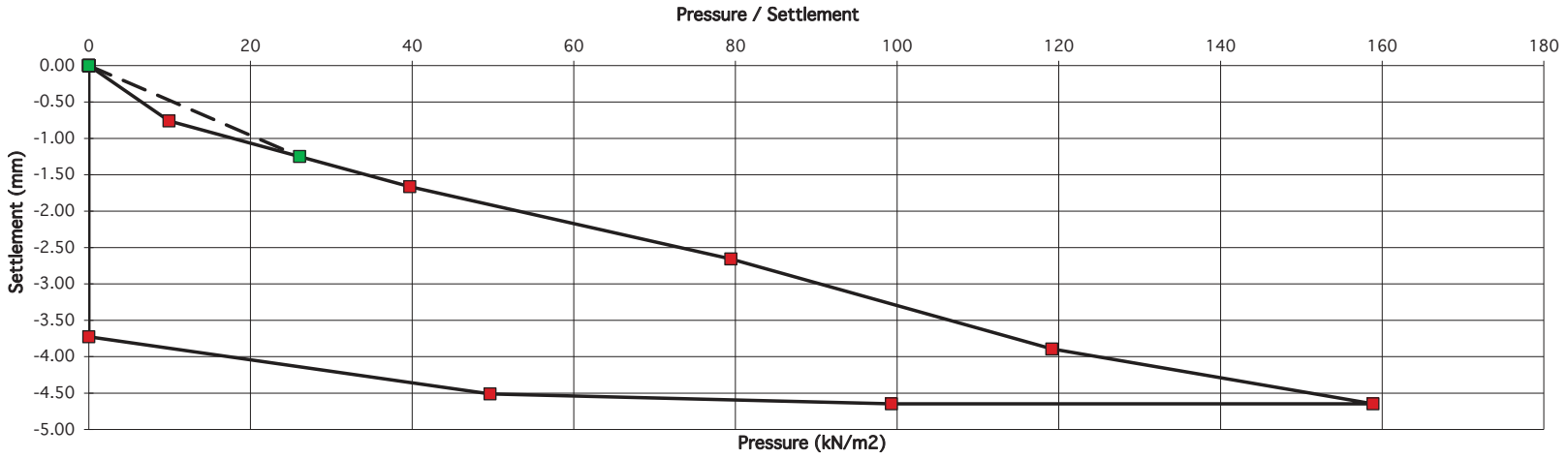
Reference No.	R136616
Contract	24188 Profile Park
Test No.	PT01 Load
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 21
Modulus of subgrade reaction = 13 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.9 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

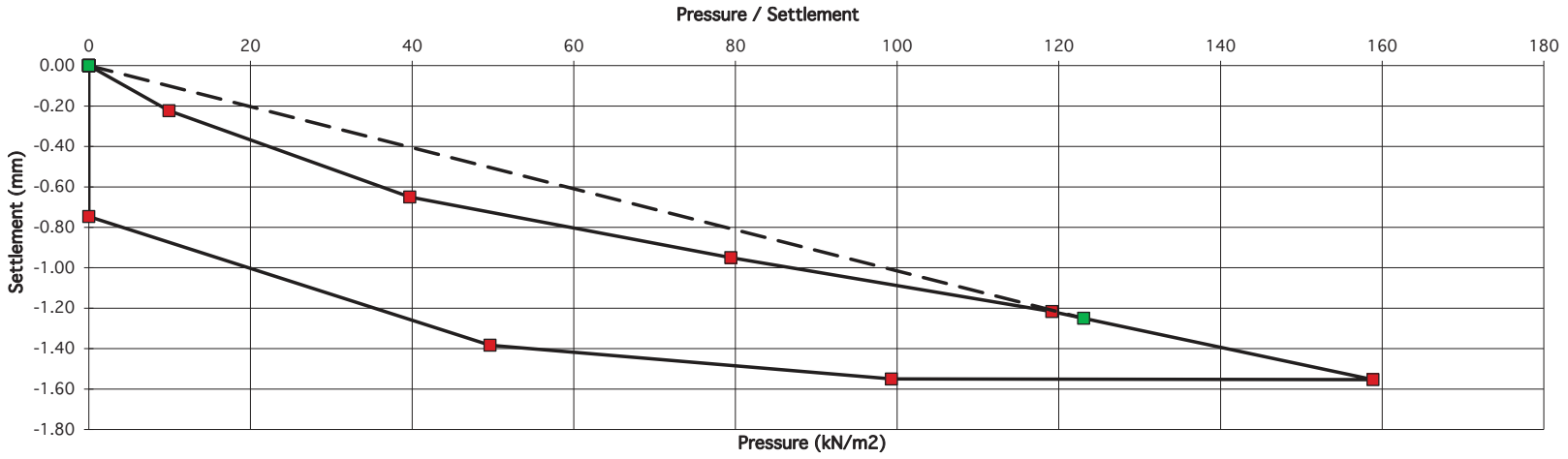
Reference No.	R136616
Contract	24188 Profile Park
Test No.	PT01 Reload
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 98
Modulus of subgrade reaction = 63 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 12.8 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

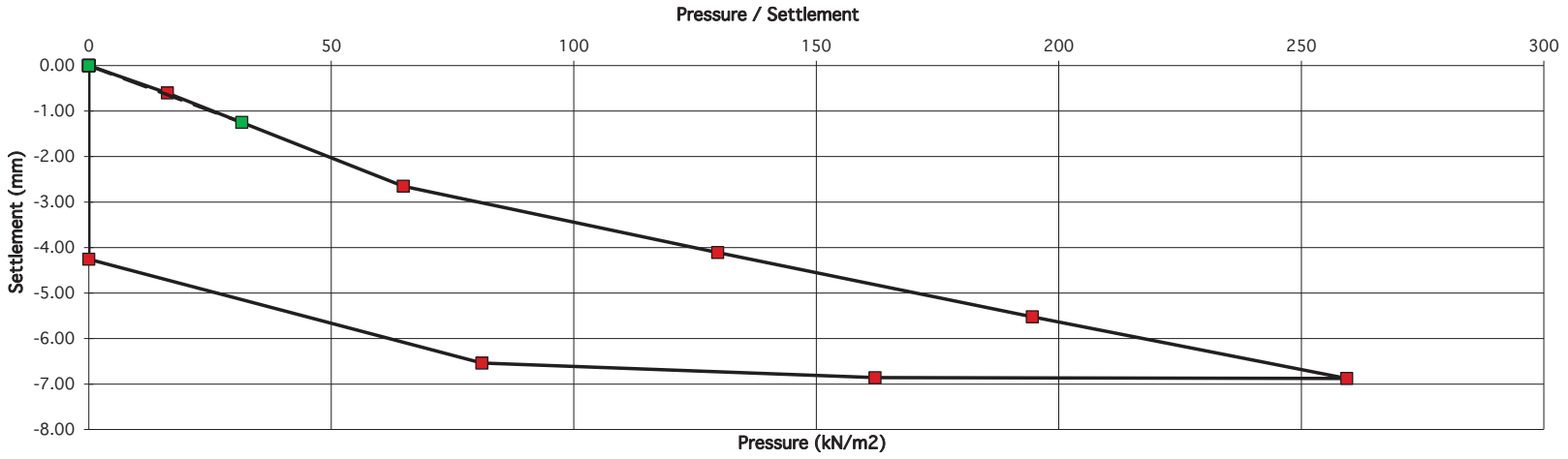
Reference No.	R136617
Contract	24188 Profile Park
Test No.	PT02 Load
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 25
Modulus of subgrade reaction = 16 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.2 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

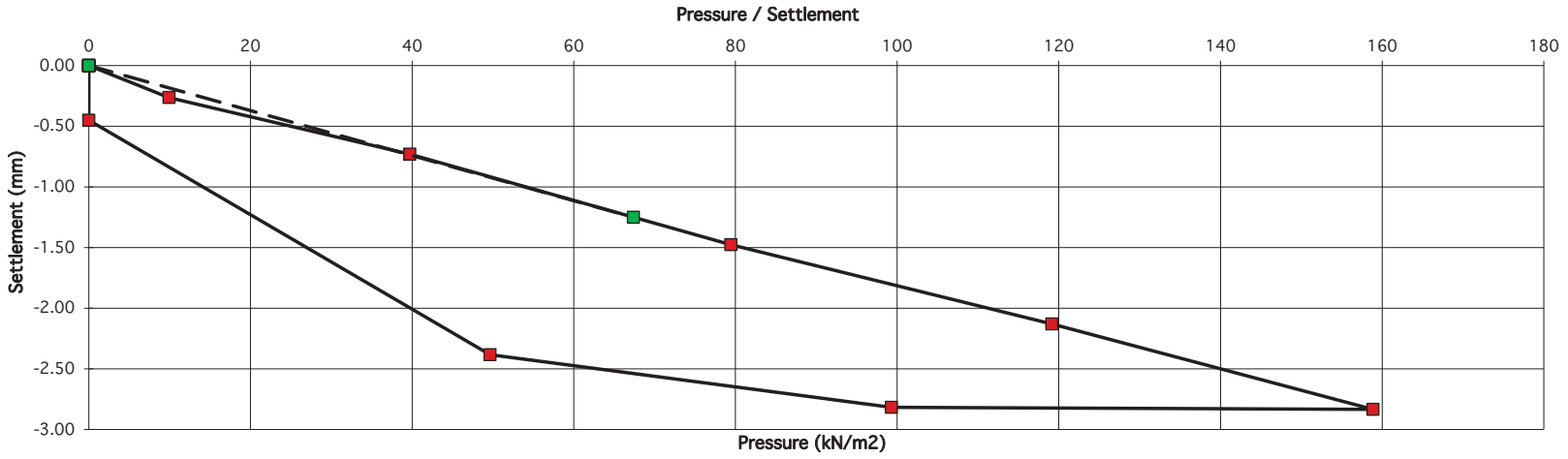
Reference No.	R136616
Contract	24188 Profile Park
Test No.	PT02 Reload
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 54
Modulus of subgrade reaction = 35 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

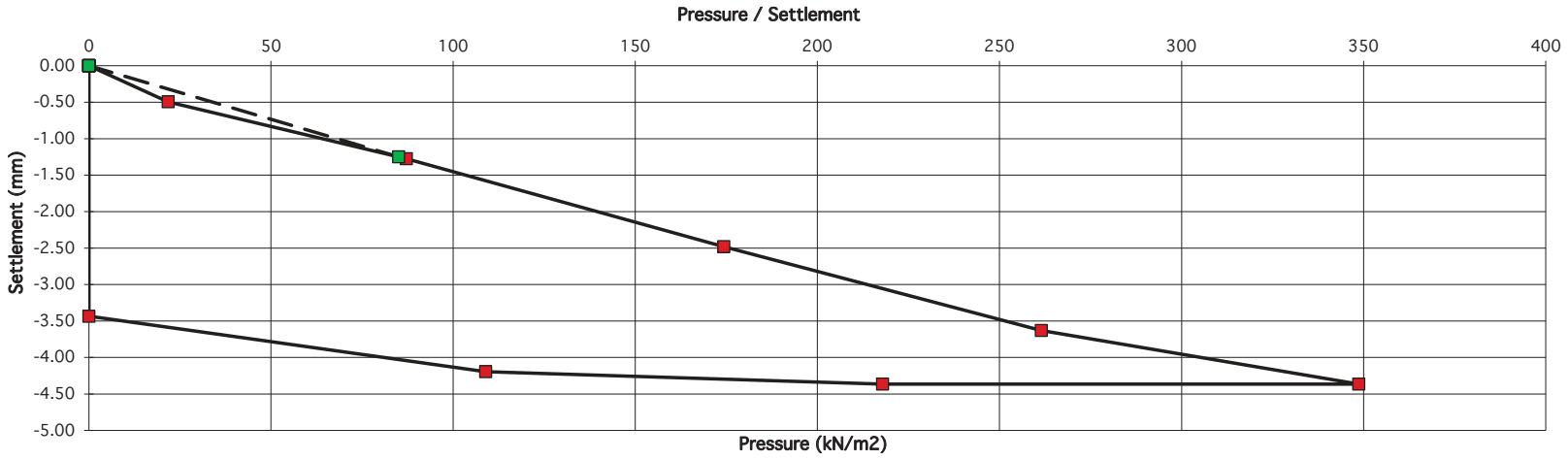
Reference No.	R136618
Contract	24188 Profile Park
Test No.	PT03 Load
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	15/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 68
Modulus of subgrade reaction = 44 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

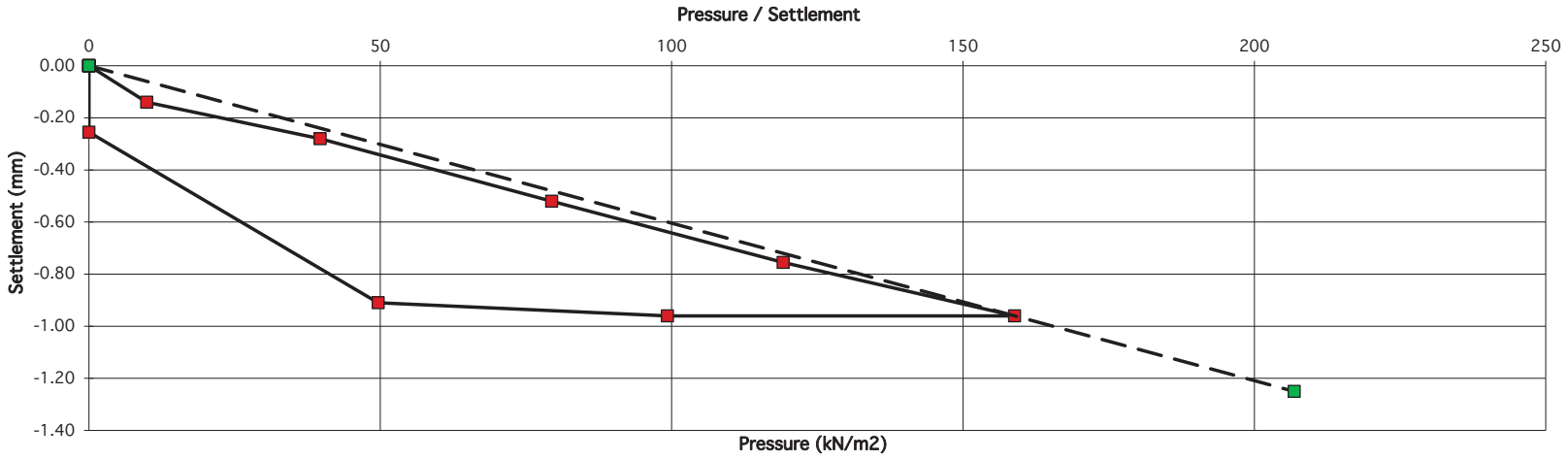
Reference No.	R136618
Contract	24188 Profile Park
Test No.	PT03 Reload
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 165
Modulus of subgrade reaction = 106 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 31.4 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

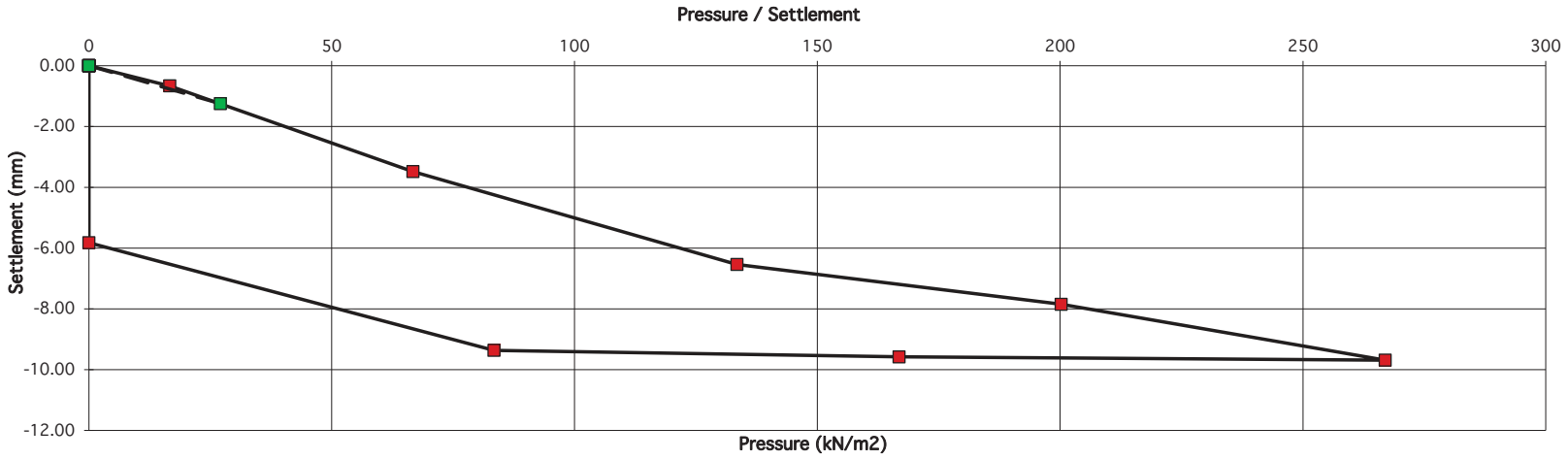
Reference No.	R136619
Contract	24188 Profile Park
Test No.	PT04 Load
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	18/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 22
Modulus of subgrade reaction = 14 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.9 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

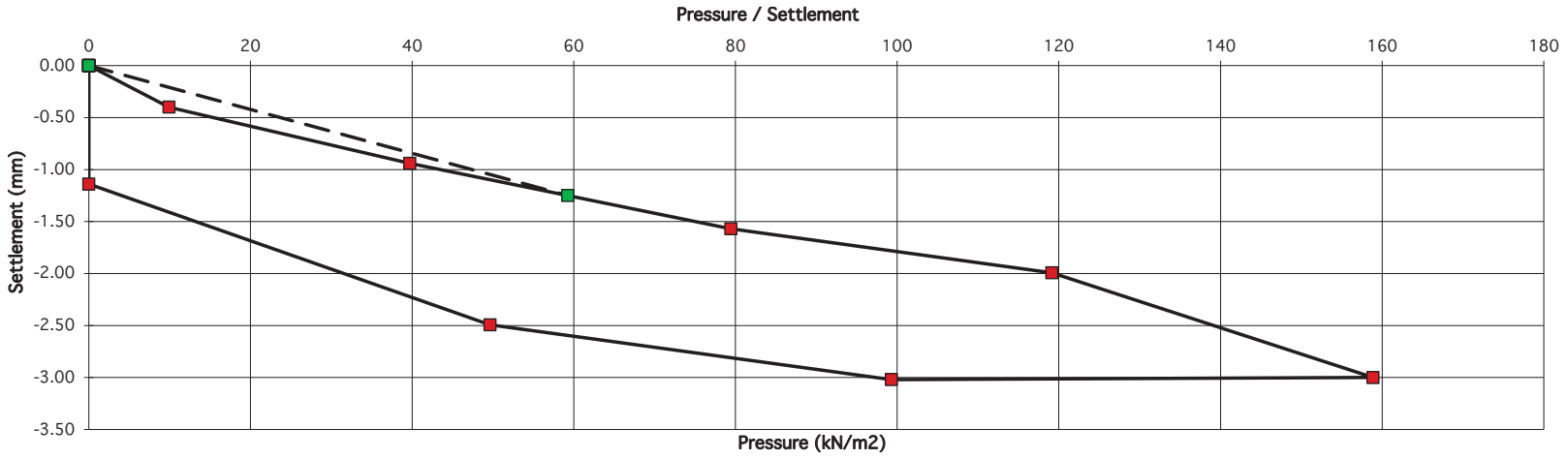
Reference No.	R136616
Contract	24188 Profile Park
Test No.	PT04 Reload
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 47
Modulus of subgrade reaction = 30 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.6 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

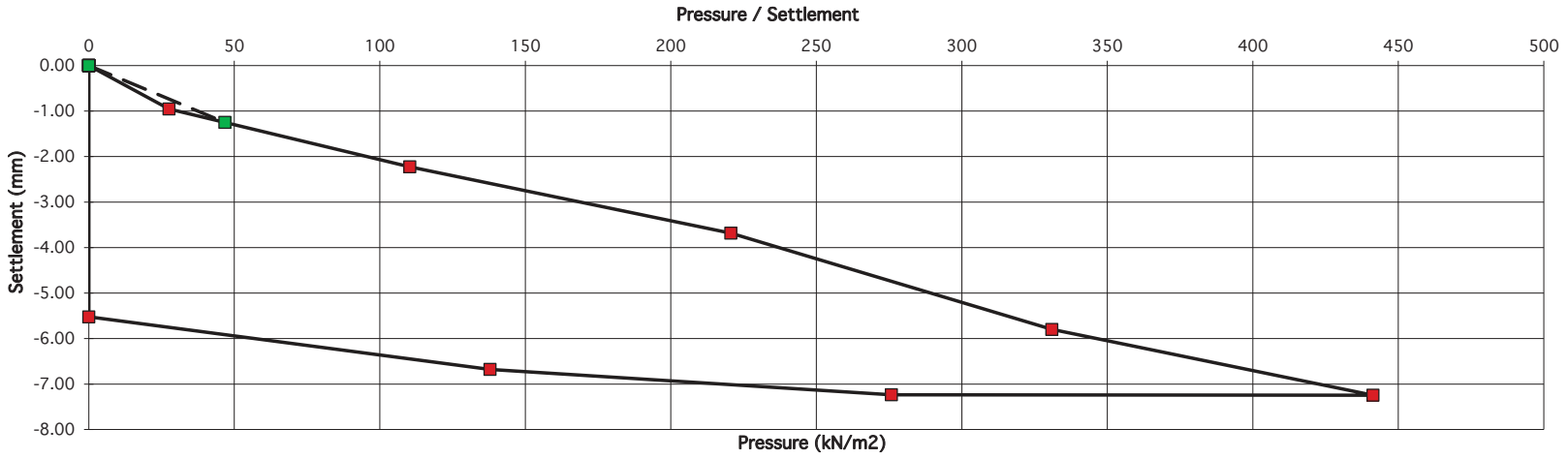
Reference No.	R136620
Contract	24188 Profile Park
Test No.	PT05 Load
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	18/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 37
Modulus of subgrade reaction = 24 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.4 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

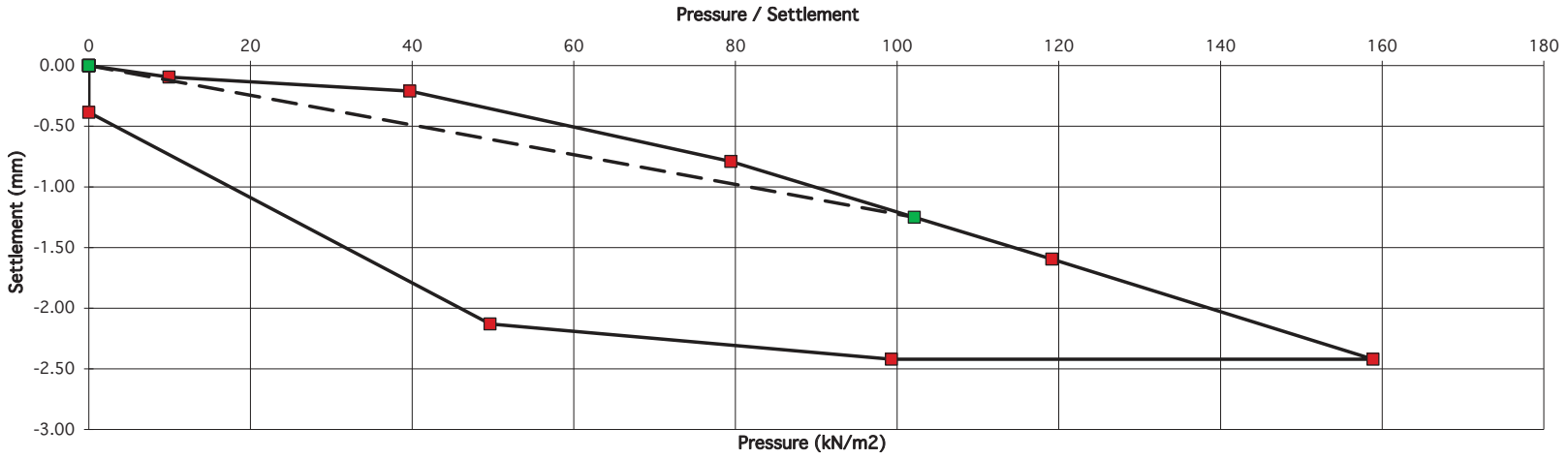
Reference No.	R136616
Contract	24188 Profile Park
Test No.	PT05 Reload
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 82
Modulus of subgrade reaction = 53 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 9.2 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

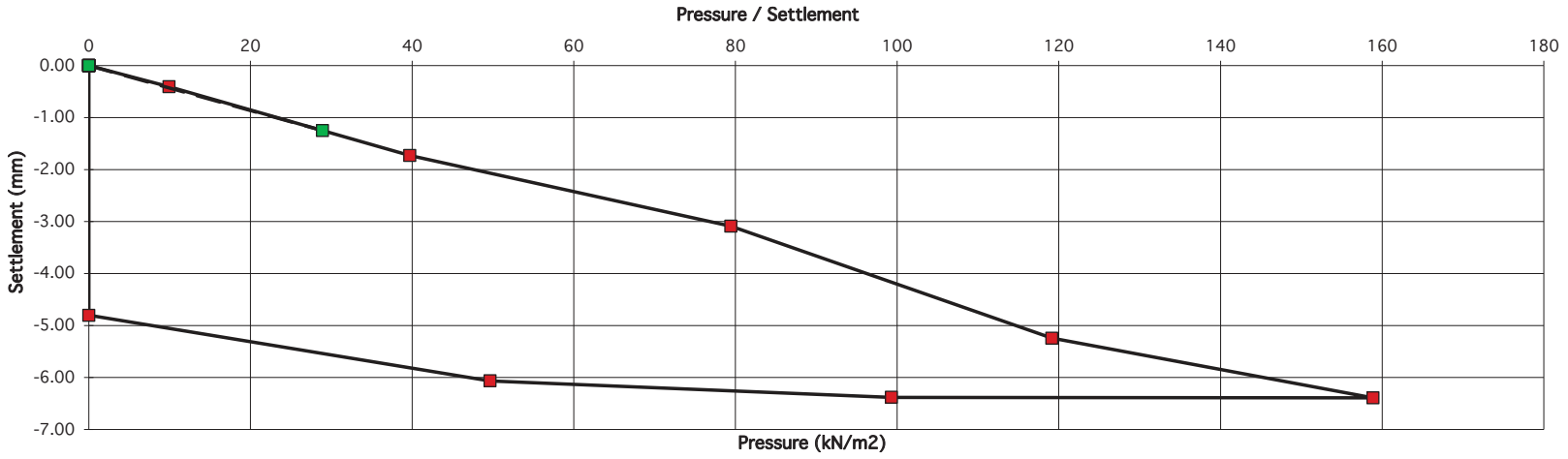
Reference No.	R136621
Contract	24188 Profile Park
Test No.	PT06 Load
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	15/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 23
Modulus of subgrade reaction = 15 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

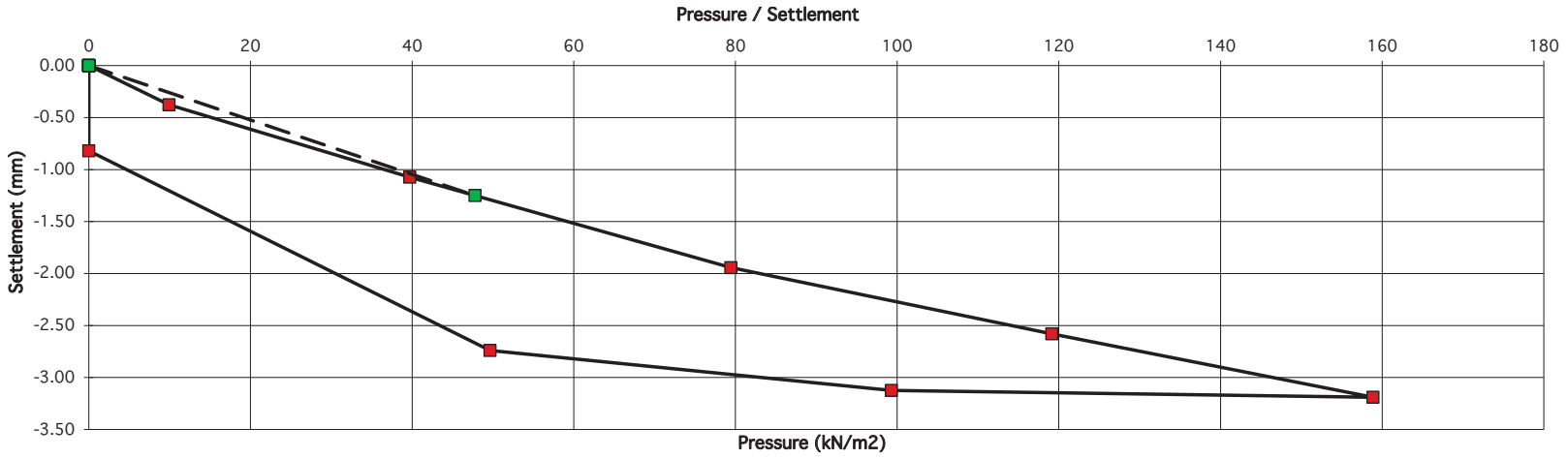
Reference No.	R136621
Contract	24188 Profile Park
Test No.	PT06 Reload
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 38
Modulus of subgrade reaction = 25 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

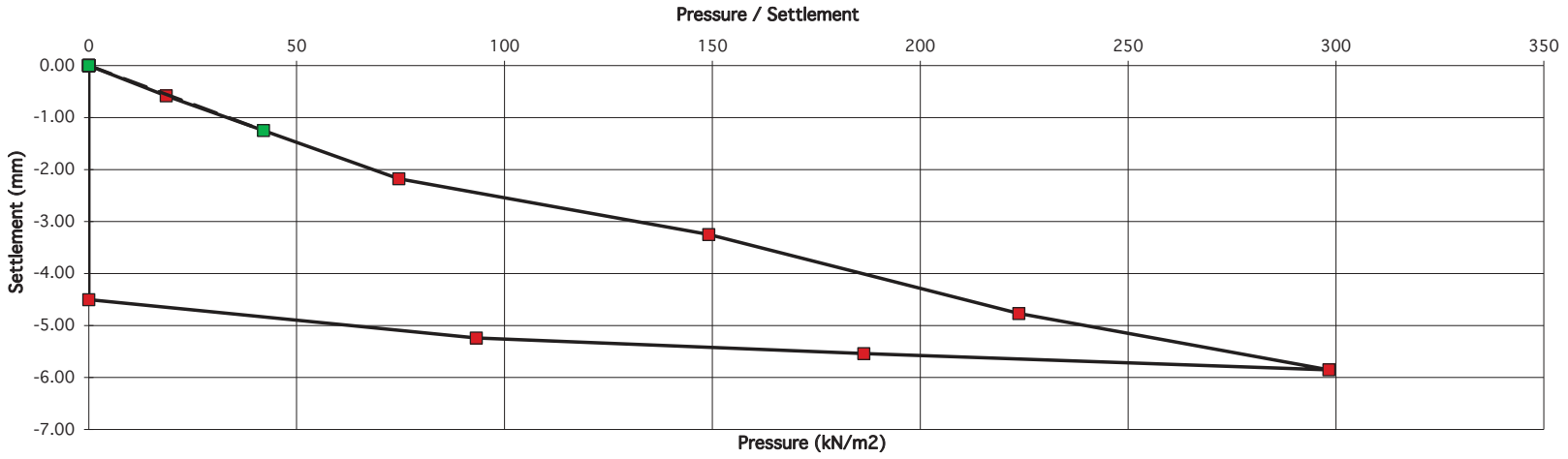
Reference No.	R136622
Contract	24188 Profile Park
Test No.	PT07 Load
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	14/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 34
Modulus of subgrade reaction = 22 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

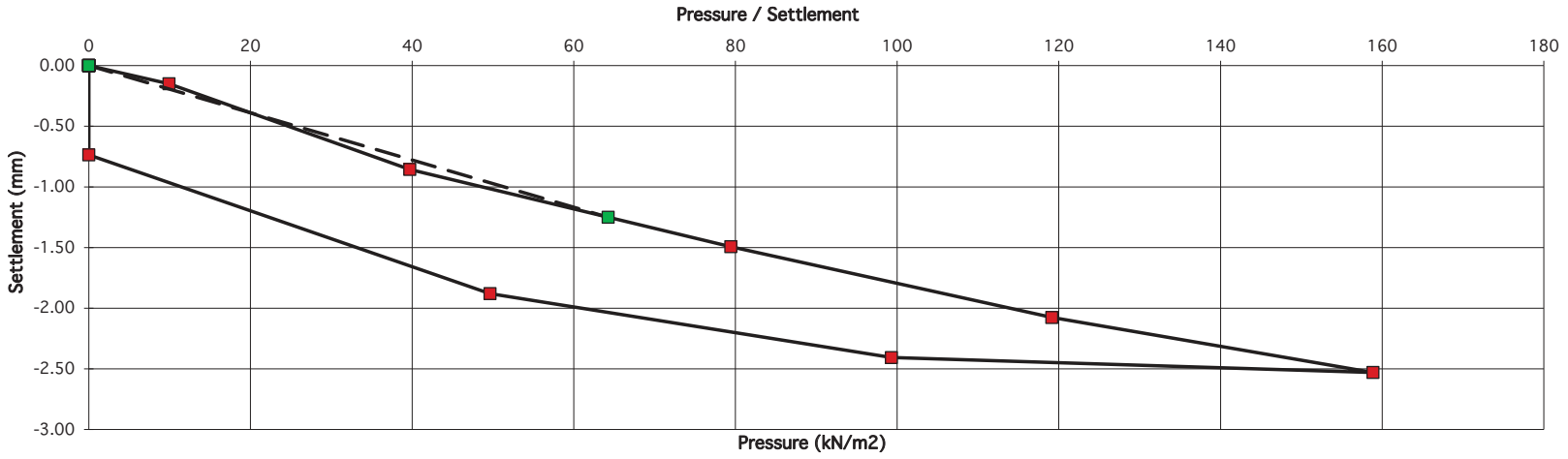
Reference No.	R136622
Contract	24188 Profile Park
Test No.	PT07 Reload
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	14/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 51
Modulus of subgrade reaction = 33 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

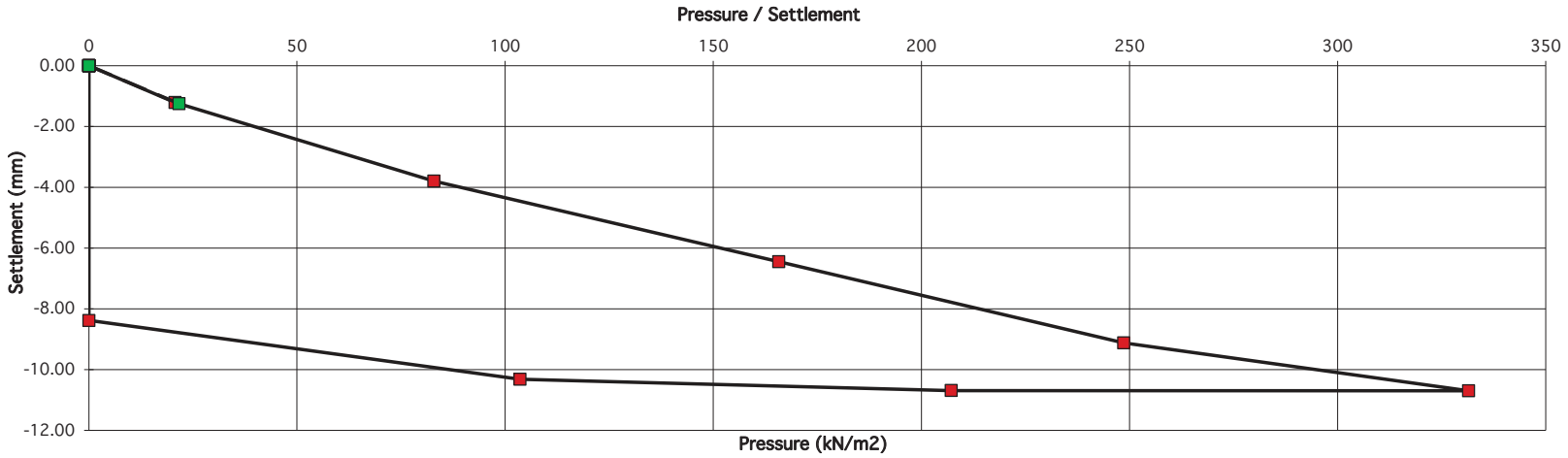
Reference No.	R136623
Contract	24188 Profile Park
Test No.	PT08 Load
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	15/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 17
Modulus of subgrade reaction = 11 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.6 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

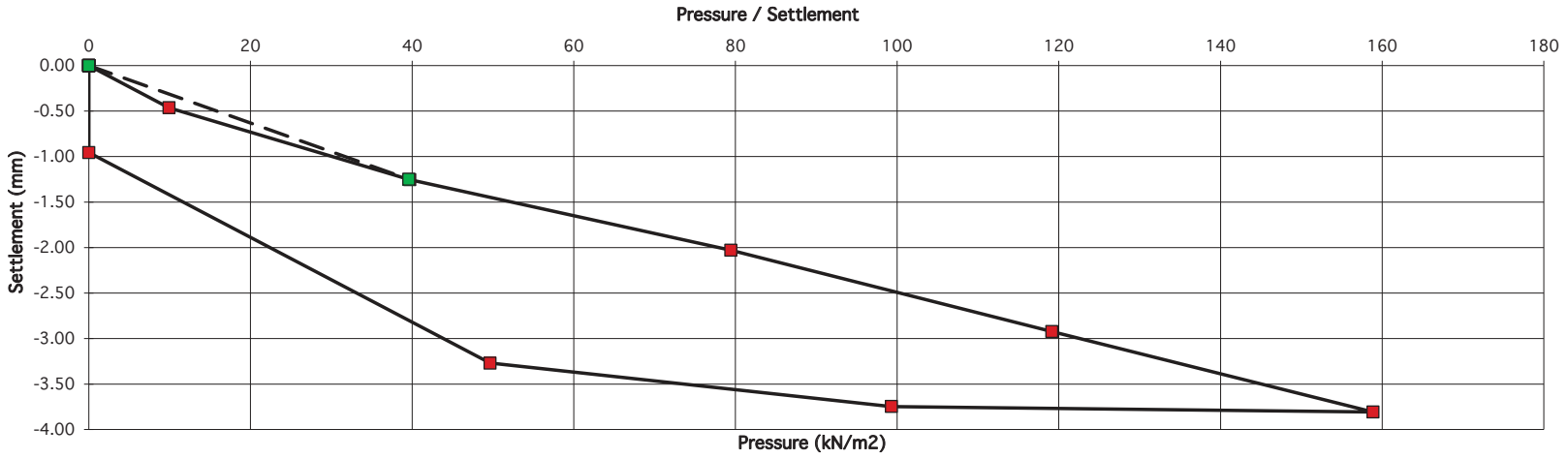
Reference No.	R136623
Contract	24188 Profile Park
Test No.	PT08 Reload
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	15/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 32
Modulus of subgrade reaction = 20 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.8 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

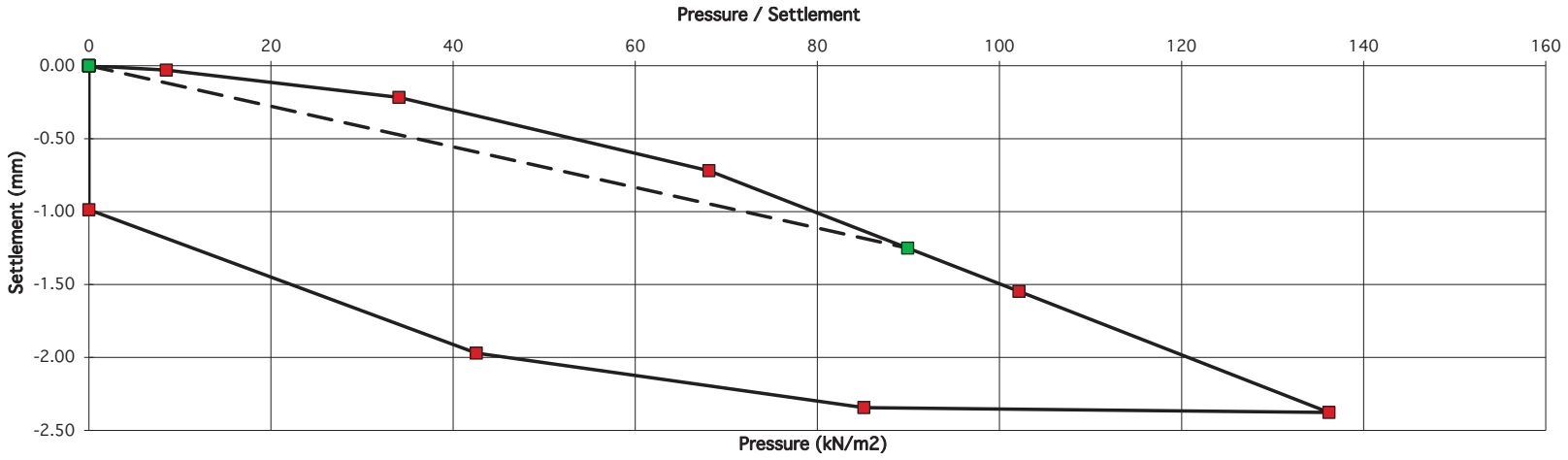
Reference No.	R136624
Contract	24188 Profile Park
Test No.	PT09 Load
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	14/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 72
Modulus of subgrade reaction = 46 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 7.4 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

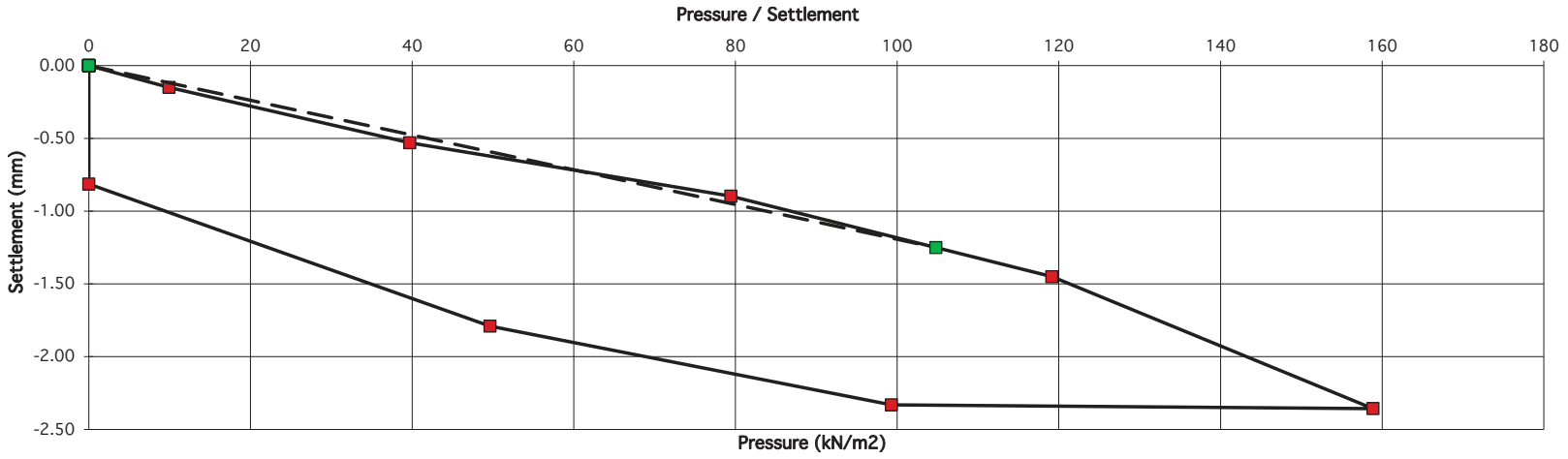
Reference No.	R136624
Contract	24188 Profile Park
Test No.	PT09 Reload
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	14/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 84
Modulus of subgrade reaction = 54 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 9.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

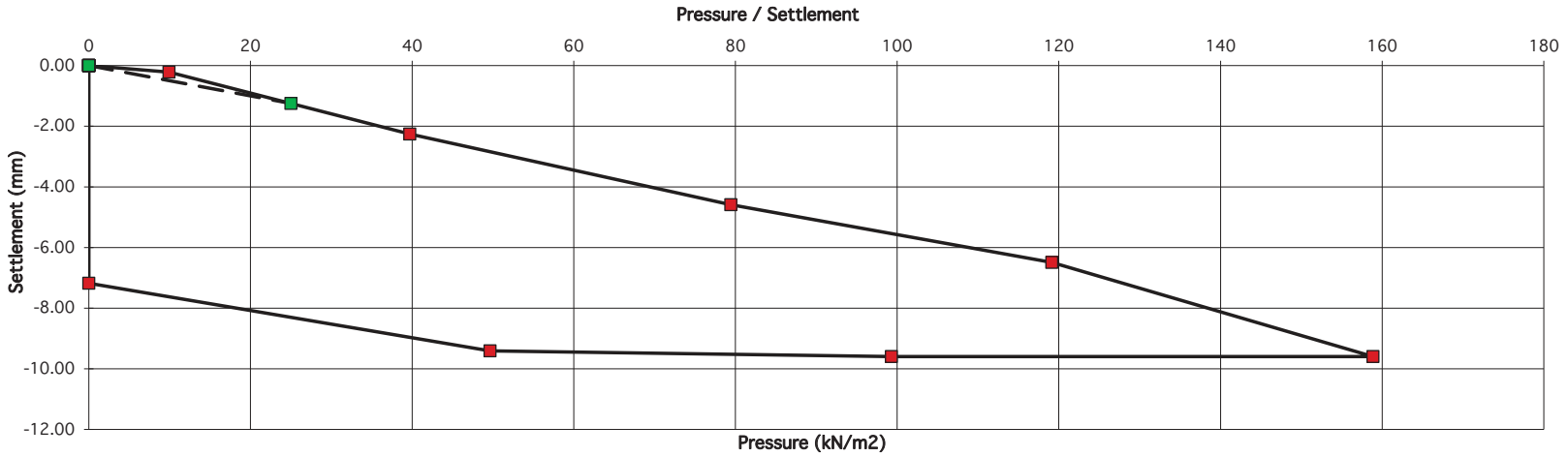
Reference No.	R136625
Contract	24188 Profile Park
Test No.	PT10 Load
Location	See site Drawing
Depth	0.4m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 20
Modulus of subgrade reaction = 13 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.8 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

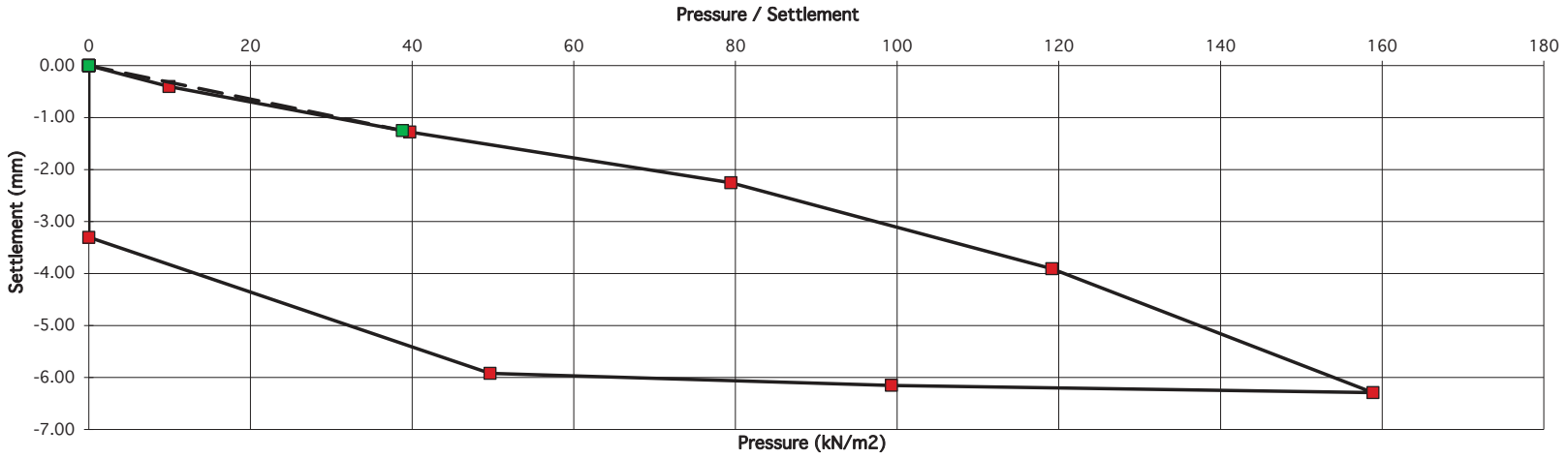
Reference No.	R136625
Contract	24188 Profile Park
Test No.	PT10 Reload
Location	See site Drawing
Depth	0.3m
Client	Ramboll
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	M. Brown
Authorised by	
Date	19/07/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Natural Soil - Sandy Clay

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 31
Modulus of subgrade reaction = 20 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.7 %

Appendix 6

Resistivity Survey

Profile Park Data Centre

Co. Dublin

Electrical Resistivity Testing

Report Status: Draft

MGX Project Number: 6631

MGX File Ref: 6631p-005.doc

29th of July 2022

Confidential Report To:

IGSL
Unit F
M7 Business Park
Newhall
Naas, Co. Kildare

Report submitted by:
Minerex Geophysics Limited

Unit F4, Maynooth Business Campus
Maynooth, Co. Kildare
Ireland
Tel.: 01-6510030
Fax.: 01-6510033
Email: info@mgx.ie

Issued by:

Hartmut Krahn (Senior Geophysicist)

Minerex
Geophysics Limited

Subsurface Geophysical Investigations

CONTENTS

1. INTRODUCTION 1

1.1 Background 1
1.2 Objectives 1
1.3 Site Description 1
1.4 Report 1

2. TESTING ON SITE 2

2.1 Methodology 2
2.2 Measurements 2
2.4 Site Work 3

3. RESULTS 4

4. REFERENCES 5

List of Tables, Maps and Figures:

Title	Pages	Document Reference
Table 1: VES Ground Resistivity Testing Results	4 x A4	6631p-Tab1.xls
Table 2: Soil Resistivity Testing Results	4 x A4	6631p-Tab2.xls
Map 1: Location Map	1 x A3	6631p_Map.dwg
Figure 1: Resistivity Testing using the Wenner Array	In Text	In Text

1. INTRODUCTION

1.1 Background

Minerex Geophysics Ltd. (MGX) carried out Resistivity Testing using the Wenner electrode configuration with two different methods for the Profile Park Data Centre in Kilcarbery. The survey was commissioned by IGSL who are the main ground investigation contractor for the project. Two deep vertical electrical sounding (VES) and 2 shallow soil resistivity (SR) tests were carried out. The coordinate system used on this site was Irish Transverse Mercator (ITM).

The test sequence was conducted as part of the overall ground investigation programme for the development of the data center. The purpose of the survey was to provide information to be used in the design and construction phases of the project.

These tests are conducted in order to increase the knowledge of the resistivity of the soil and rock and to assist with the design and installation of earthing systems and underground cabling systems. Soil resistivity depends on a number of factors like soil type, mineral content, temperature, moisture, salt content and compaction.

The methodology specified here encompasses onsite in–situ measurements and the presentation of the results, but does not include the design of the earthing or cabling system.

1.2 Objectives

The main objective of the geophysical survey was:

- To determine the electrical resistivity at a range of depths for each location

1.3 Site Description

The site is shown on Map 1 and the area consists of agricultural land.

1.4 Report

This report includes a location map of the resistivity testing locations and two tables of results. The client provided maps of the site and the digital versions were used as the background map in this report.

The indirect nature and the non-invasive survey methods must be taken into account when considering the results of this survey and Minerex Geophysics Limited, while using appropriate practice to execute the measurements and to present the data, give no guarantees in relation to the existing subsurface.

2. TESTING ON SITE

2.1 Methodology

The methodology consisted of using Vertical Electrical Sounding (VES) and Soil Resistivity (SR) in the Wenner electrode configuration at a range of electrode spacing agreed with the client prior to the fieldwork. The increase in the electrode spacing leads to an increase in the depth.

Two different electrical resistivity tests were used:

1 VES - Vertical Electrical Sounding – Deep

Objective: Determine the resistivity for ground, soil and rock to a depth around 50m below ground level (bgl) and also as two tests in two directions (check for anisotropy).

Purpose: This test is generally done to deliver values for the design of an earthing or grounding system

Test Method: Four probe array in Wenner electrode configuration with expanding electrode spacing

Spacings: 1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 40 and 50m

Directions: There are two tests done at each location in two orthogonal directions

Instrument: Tigre Resistivity Meter (high power)

Comment: This test includes the 'Soil Resistivity Test – Shallow' intrinsically

2 SR - Soil Resistivity Test – Shallow

Objective: Determine the shallow soil around 1 – 3m bgl. In one direction

Purpose: This test is generally done to deliver values for the design of the cable system

Test Method: Four probe array in Wenner electrode configuration with three electrode spacings

Spacings: 1, 2 and 3m

Directions: The test is done in one direction

Instrument: Tigre or Megger Resistivity Meter

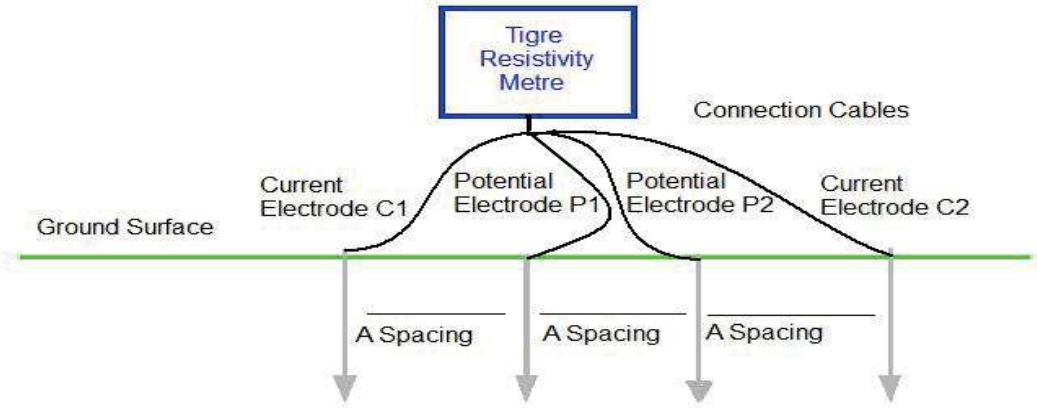
2.2 Measurements

Two Vertical Electrical Soundings were conducted at one location on the site.

All measurements were acquired in accordance with Minerex Geophysics Ltd. procedures, protocols, QC procedures and in compliance with appropriate IEEE and British Standards. The relevant IEEE standard is Std 81-2012 Part 1 – Guide to Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of Ground Systems (IEEE Std 81-2012) for the resistivity testing (IEEE Std81, 2012).

The Vertical Electrical Sounding (VES) and the soil resistivity (SR) was conducted using a Tigre Resistivity Meter with variable current input, a suite of four cables and four stainless steel electrodes. This 'four probe array' is called a Wenner Array as the spacing (A) between the four electrodes was the same for each measurement. At each electrode spacing, the test resistance in Ohms (Ω) was recorded in a detailed field sheet for later office-based computing of ground resistivities.

Figure 1: Resistivity Testing using the Wenner Array.



2.3 Testing Equipment

All equipment used was portable and intrinsically safe. The methods were non-destructive and non-intrusive. Only low voltage power requirements of 12 Volts or less were needed on site and were supplied by batteries. The following equipment was used:

- An ALLIED Tigre Resistivity Meter
- A suite of cables with 4 reels and distance marks for resistivity readings
- Stainless Steel Electrodes
- Measuring tapes
- Handheld GPS

Equipment checks and QC procedures were applied prior to the commencement of data acquisition.

2.4 Site Work

The data acquisition was carried out on the 27th of July 2022 in good weather conditions. Health and safety standards were adhered to at all times.

3. RESULTS

The recorded test resistance in Ω allows for the calculation of the resistivity value in Ωm for each individual electrode spacing.

The resistivity at a given electrode spacing was calculated using the following formula:

$\rho = 2*\pi*A*R$

Where;

ρ = Resistivity in Ωm

π = Pi = 3.141592

A = electrode spacing in m

R = Measured Resistance value in Ω

The survey results with electrode spacing, resistances and resistivities are displayed in Table 1 for the VES and in Table 2 for the SR.

The resistivity values recorded at given electrode spacing can be allocated to approximate depth values. For the Wenner array the average resistivity taken at a particular A-spacing is equal to the average resistivity for a depth range between the ground surface and the A-spacing. Therefore, the average resistivity value recorded in the last column of Table 1 and 2 corresponds to the depth range between 0m bgl and the value in the first column. The depth mentioned in this report is given for visualisation purpose but may change when using the resistivity values in the design of the earthing system.

4. REFERENCES

1. **IEEE Std81, 2012.** IEEE Std. 83-2012. IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potential of a Ground System. IEEE Power and Energy Society. The Institute of Electrical and Electronics Engineers Inc.

Table 1: VES Ground Resistivity Testing Results

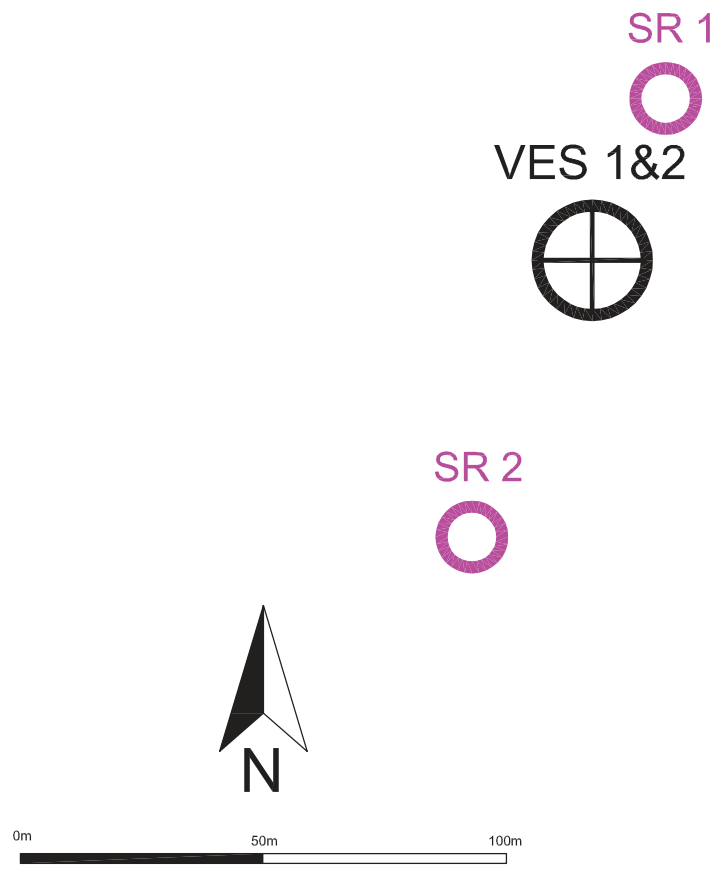
Location:	Direction:	**ITM** Coordinates East:	**ITM** Coordinates North:	Elevation:	Date:
VES 1	**N-S**	**703849**	**730812**	**73.67 mOD**	**27/07/2022**
Wenner Electrode Spacing a (m)	Inner Electrode P Distance to Centre (m)	Outer Electrode C Distance to Centre (m)	Total Distance (m)	Measured Resistance (Ω)	Apparent Resistivity (Ωm)
1	0.5	1.5	3	13.11	82
2	1	3	6	7.16	90
3	1.5	4.5	9	5.455	103
4	2	6	12	5.012	126
5	2.5	7.5	15	4.487	141
7	3.5	10.5	21	3.771	166
10	5	15	30	2.874	181
15	7.5	22.5	45	2.127	200
20	10	30	60	1.643	206
30	15	45	90	1.217	229
40	20	60	120	1.018	256
50	25	75	150	0.819	257

Table 1: VES Ground Resistivity Testing Results

Location:	Direction:	**ITM** Coordinates East:	**ITM** Coordinates North:	Elevation:	Date:
VES 2	**E-W**	**703849**	**730812**	**73.67 mOD**	**27/07/2022**
Wenner Electrode Spacing a (m)	Inner Electrode P Distance to Centre (m)	Outer Electrode C Distance to Centre (m)	Total Distance (m)	Measured Resistance (Ω)	Apparent Resistivity (Ωm)
1	0.5	1.5	3	12.1	76
2	1	3	6	7.341	92
3	1.5	4.5	9	5.748	108
4	2	6	12	5.062	127
5	2.5	7.5	15	4.528	142
7	3.5	10.5	21	3.791	167
10	5	15	30	3.005	189
15	7.5	22.5	45	1.996	188
20	10	30	60	1.744	219
30	15	45	90	1.452	274
40	20	60	120		Fence
50	25	75	150		Fence

Table 2: Soil Resistivity Testing Results

Test Name:	Elevation:	**ITM** Coordinates East:	**ITM** Coordinates North:	Date:	Instrument:
SR1	**74.12 mOD**	**703864**	**730845**	**27/07/2022**	**Tigre**
Wenner Electrode Spacing a (m)	Inner Electrode P Distance to Centre (m)	Outer Electrode C Distance to Centre (m)	Total Distance (m)	Measured Resistance (Ω)	Apparent Resistivity (Ωm)
1	0.5	1.5	3	10.38	65
2	1	3	6	5.657	71
3	1.5	4.5	9	4.507	85
Test Name:	Elevation:	**ITM** Coordinates East:	**ITM** Coordinates North:	Date:	Instrument:
SR2	**73.3 mOD**	**703825**	**730755**	**27/07/2022**	**Tigre**
Wenner Electrode Spacing a (m)	Inner Electrode P Distance to Centre (m)	Outer Electrode C Distance to Centre (m)	Total Distance (m)	Measured Resistance (Ω)	Apparent Resistivity (Ωm)
1	0.5	1.5	3	11.09	70
2	1	3	6	4.992	63
3	1.5	4.5	9	3.63	68



No background map received!

Minerex
Geophysics Limited
Unit F4, Maynooth Business Campus
Maynooth, Co. Kildare
Tel. (01) 6510030
Email: info@mgx.ie
Web: www.mgx.ie

CLIENT	IGSL
PROJECT	Profile Park Data Centre Electrical Resistivity Testing
TITLE	Map 1: Location Map

SCALE:	1:1000 @ A3
PROJECT:	6631
DRAWN:	HK
DATE:	29/07/2022
MGX FILE:	6631p_Map.dwg
STATUS:	Draft

LEGEND:

VES 1	Vertical Electrical Sounding In Wenner Electrode Configuration
SR 1	Soil Resistivity Testing in Wenner Electrode Configuration with A = 1, 2 and 3m

Appendix 7

Groundwater Monitoring Records

Project No.	24188	**GROUNDWATER MONITORING DATA SHEET**	*IGSL Ltd*

Project: Profile Park

Engineer:

Exploratory Hole No.	Hole Depth (m bgl)	Response Zone Top (m bgl)	Response Zone Base (m bgl)	Groundwater Level (m bgl) 31/08/2022	Groundwater Level (m bgl)	Groundwater Level (m bgl)	Comments
RC01	10.00	1.00	10.00	2.77			
RC02	10.00	1.00	10.00	2.56			
RC03	11.00	1.00	11.00	2.03			
RC04	10.00	1.00	10.00	1.87			
RC05	10.00	1.00	10.00	1.67			
RC06	10.00	1.00	10.00	1.77			

Remarks: Water levels measured using electric dipmeter
BH - denotes cable percussion borehole
RC - denotes rotary core drillhole

Appendix 8

Geotechnical Laboratory Results (Soil)

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3**

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No. **R137530** Contract No. 24188 (4) Contract Name: Profile Park - Date Centre Site 4

Customer Ramboll

Samples Received: 15/08/22 Date Tested: 15/08/22

BH/TP*	Sample No.	Depth* (m)	Lab. Ref	Sample Type*	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH01	AA171725	1.0	A22/4606	B	14	38	18	20	63	WS	4.4	C I	Brown sandy gravelly CLAY
BH02	AA171756	1.0	A22/4607	B	17	38	18	20	67	WS	4.4	C I	Brown slightly sandy, slightly gravelly, CLAY
BH03	AA171722	1.0	A22/4608	B	17	39	21	18	45	WS	4.4	C I	Brown sandy gravelly CLAY
BH04	AA171721	1.0	A22/4609	B	15	34	17	17	70	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
BH05	AA171723	1.0	A22/4610	B	10	41	18	23	34	WS	4.4	C I	Brown sandy gravelly CLAY
BH06	AA171728	1.0	A22/4611	B	20	39	18	21	69	WS	4.4	C I	Brown slightly sandy, slightly gravelly, CLAY
TP04	AA180433	0.8	A22/4616	B	10	37	20	17	48	WS	4.4	C I	Brown sandy gravelly CLAY
TP07	AA180421	1.4	A22/4620	B	15	36	19	17	57	WS	4.4	C I	Brown sandy gravelly CLAY
TP08	AA180424	0.7	A22/4621	B	11	36	17	19	63	WS	4.4	C I	Brown sandy gravelly CLAY
TP09	AA180418	0.5	A22/4622	B	13	37	17	20	62	WS	4.4	C I	Brown sandy gravelly CLAY
TP10	AA180439	0.5	A22/4623	B	12	39	18	21	64	WS	4.4	C I	Brown sandy gravelly CLAY
TP10	AA180441	2.5	A22/4624	B	12	33	15	18	62	WS	4.4	C L	Grey slightly sandy, gravelly, CLAY

Preparation: WS - Wet sieved
AR - As received
NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:
Results relate only to the specimen tested,in as received condition unless otherwise noted.
NOTE: **These clauses have been superceded by EN 17892-1 and EN17892-12.
Opinions and interpretations are outside the scope of accreditation. * denotes Customer supplied information.
This report shall not be reproduced except in fullwithout written approval from the Laboratory.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by: H Byrne

Date: 05/09/22

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	97	
28	97	
20	91	
14	88	
10	84	
6.3	80	
5	78	
3.35	75	
2	71	
1.18	68	SAND
0.6	64	
0.425	63	
0.3	61	
0.15	57	
0.063	53	SILT/CLAY
0.037	47	
0.026	43	
0.017	37	
0.010	30	
0.007	25	
0.005	20	
0.002	14	

Contract No. 24188 Report No. R138016
Contract Name : Profile Park - Data Centre Site 4
BH/TP* : BH02
Sample No.* AA171726 Lab. Sample No. A22/4607
Sample Type: B
Depth* (m) 1.00 Customer: Ramboll
Date Received 15/08/2022 Date Testing started 15/08/2022
Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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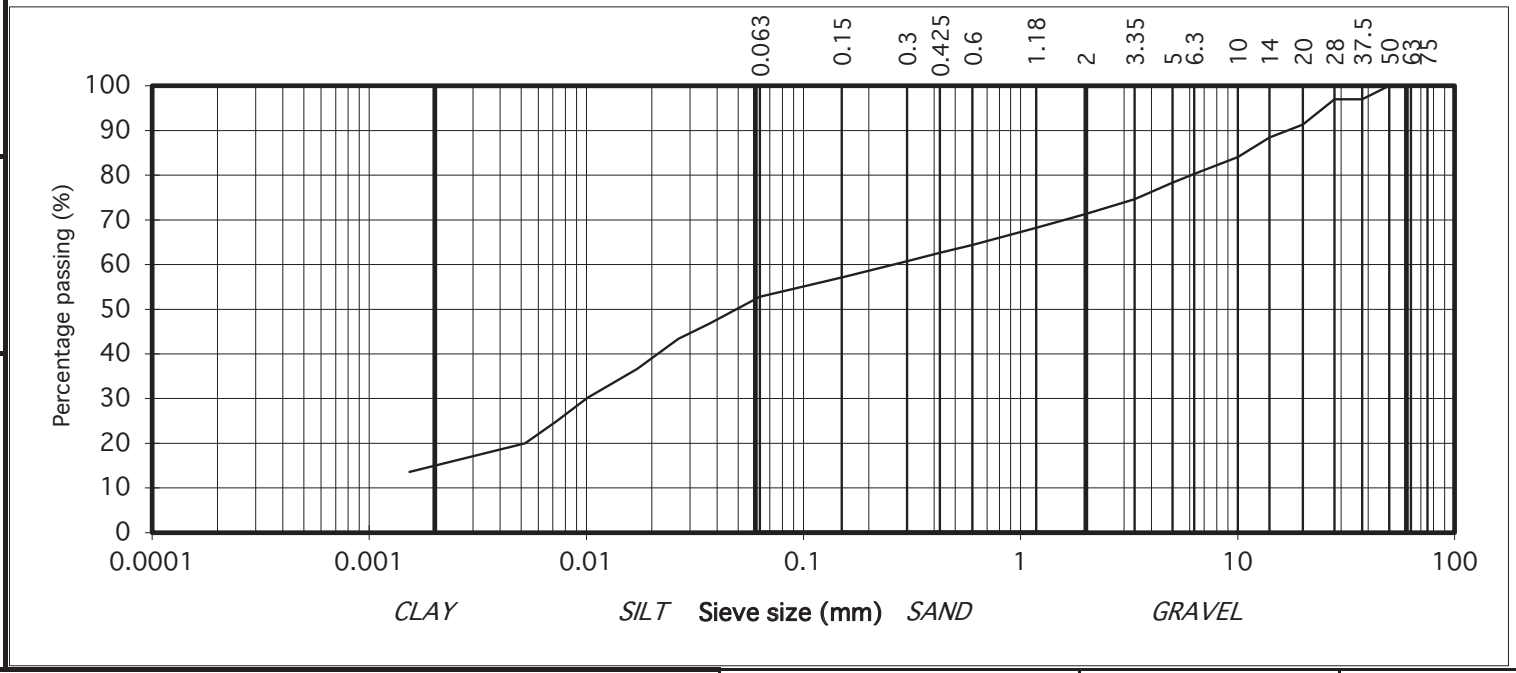

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	89	GRAVEL
37.5	86	
28	85	
20	80	
14	76	
10	73	
6.3	70	
5	68	
3.35	65	
2	63	
1.18	60	SAND
0.6	57	
0.425	56	
0.3	54	
0.15	51	
0.063	48	SILT/CLAY
0.037	43	
0.027	40	
0.017	35	
0.010	32	
0.007	28	
0.005	25	
0.002	17	

Contract No.	24188	Report No.	R138017	
Contract Name :	Profile Park - Data Centre Site 4			
BH/TP* :	BH04			
Sample No.*	AA171721	Lab. Sample No.		A22/4609
Sample Type:	B			
Depth* (m)	1.00	Customer:	Ramboll	
Date Received	15/08/2022	Date Testing started		15/08/2022
Description:	Brown slightly sandy, gravelly, CLAY			

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

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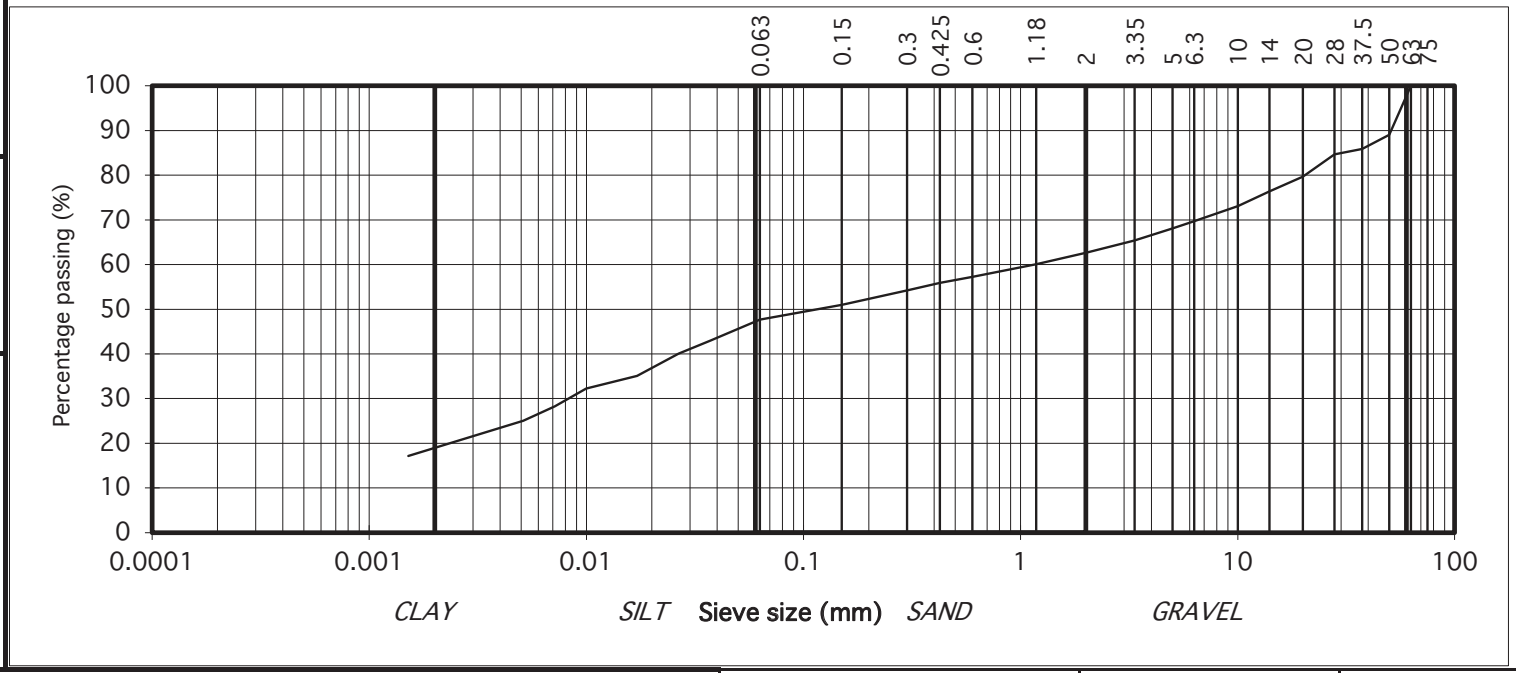

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TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	98	
28	96	
20	90	
14	86	
10	84	
6.3	82	
5	81	
3.35	80	
2	78	
1.18	76	SAND
0.6	73	
0.425	72	
0.3	70	
0.15	65	
0.063	59	SILT/CLAY
0.037	49	
0.027	43	
0.017	38	
0.010	31	
0.007	28	
0.005	24	
0.002	17	

Contract No. 24188 Report No. R138015
Contract Name : Profile Park - Data Centre Site 4
BH/TP* : BH06
Sample No.* AA171726 Lab. Sample No. A22/4611
Sample Type: B
Depth* (m) 1.00 Customer: Ramboll
Date Received 15/08/2022 Date Testing started 15/08/2022
Description: Brown slightly sandy, slightly gravelly, CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

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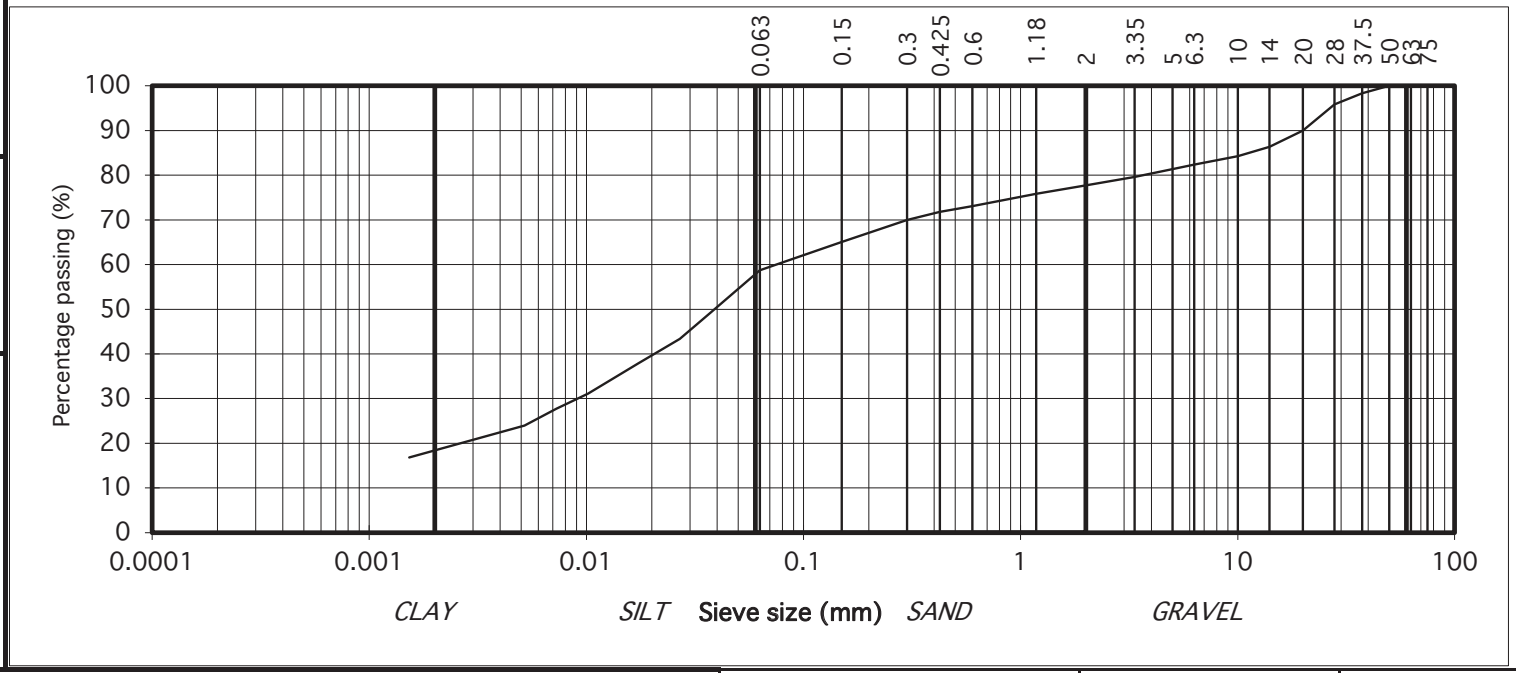

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TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	94	
20	77	
14	68	
10	52	
6.3	37	
5	34	
3.35	32	
2	29	
1.18	26	SAND
0.6	23	
0.425	22	
0.3	20	
0.15	19	
0.063	17	SILT/CLAY

Contract No. 24188 Report No. R138014
Contract Name : Profile Park - Data Centre Site 4
BH/TP* : TP03
Sample No.* AA180429 Lab. Sample No. A22/4614
Sample Type: B
Depth* (m) 2.00 Customer: Ramboll
Date Received 15/08/2022 Date Testing started 15/08/2022
Description: Grey/brown clayey/silty, sandy, GRAVEL

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

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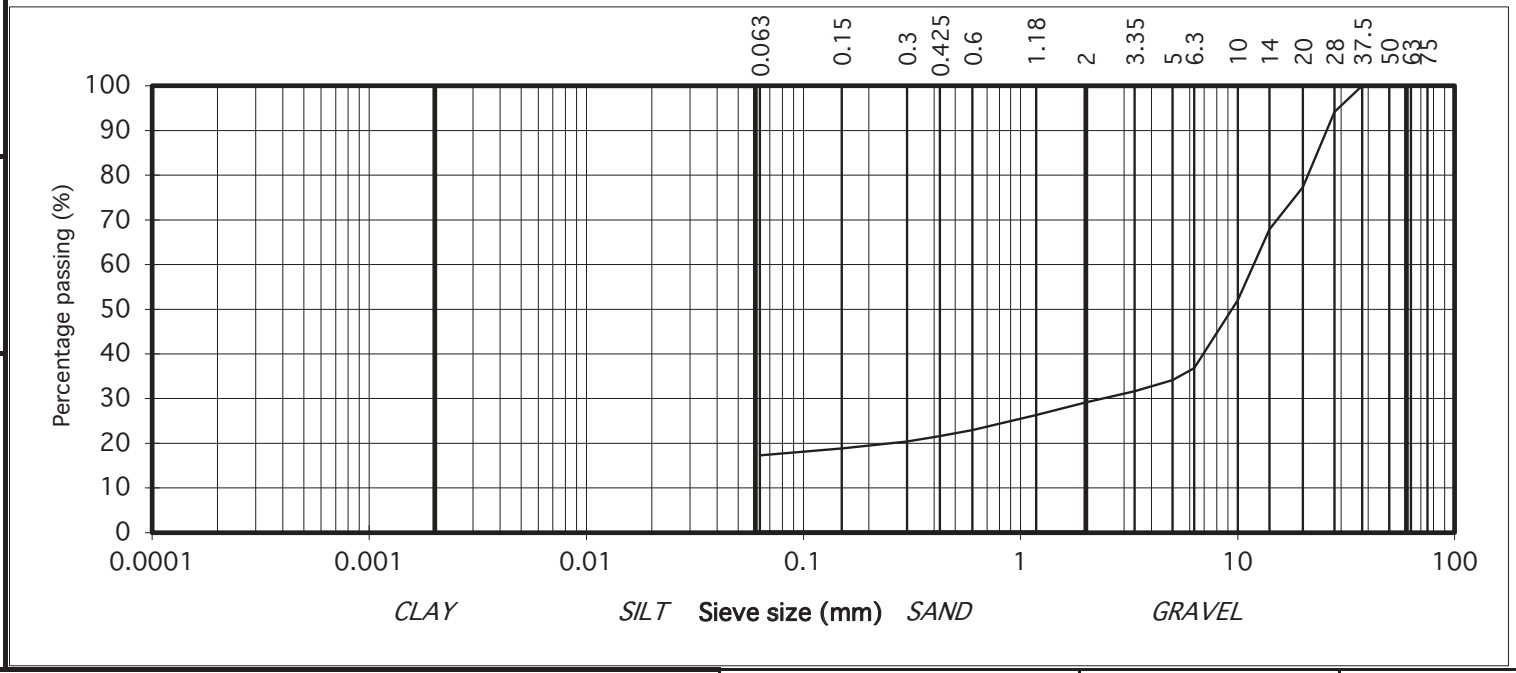

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TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	93	GRAVEL
37.5	89	
28	87	
20	80	
14	77	
10	73	
6.3	67	
5	65	
3.35	59	
2	54	
1.18	50	SAND
0.6	45	
0.425	44	
0.3	42	
0.15	39	
0.063	37	SILT/CLAY
0.037	33	
0.027	29	
0.017	26	
0.010	22	
0.007	19	
0.005	17	
0.002	12	

Contract No. 24188 Report No. R138018
Contract Name : Profile Park - Data Centre Site 4
BH/TP* : TP10
Sample No.* AA180441 Lab. Sample No. A22/4624
Sample Type: B
Depth* (m) 2.50 Customer: Ramboll
Date Received 15/08/2022 Date Testing started 15/08/2022
Description: Grey slightly sandy, gravelly, CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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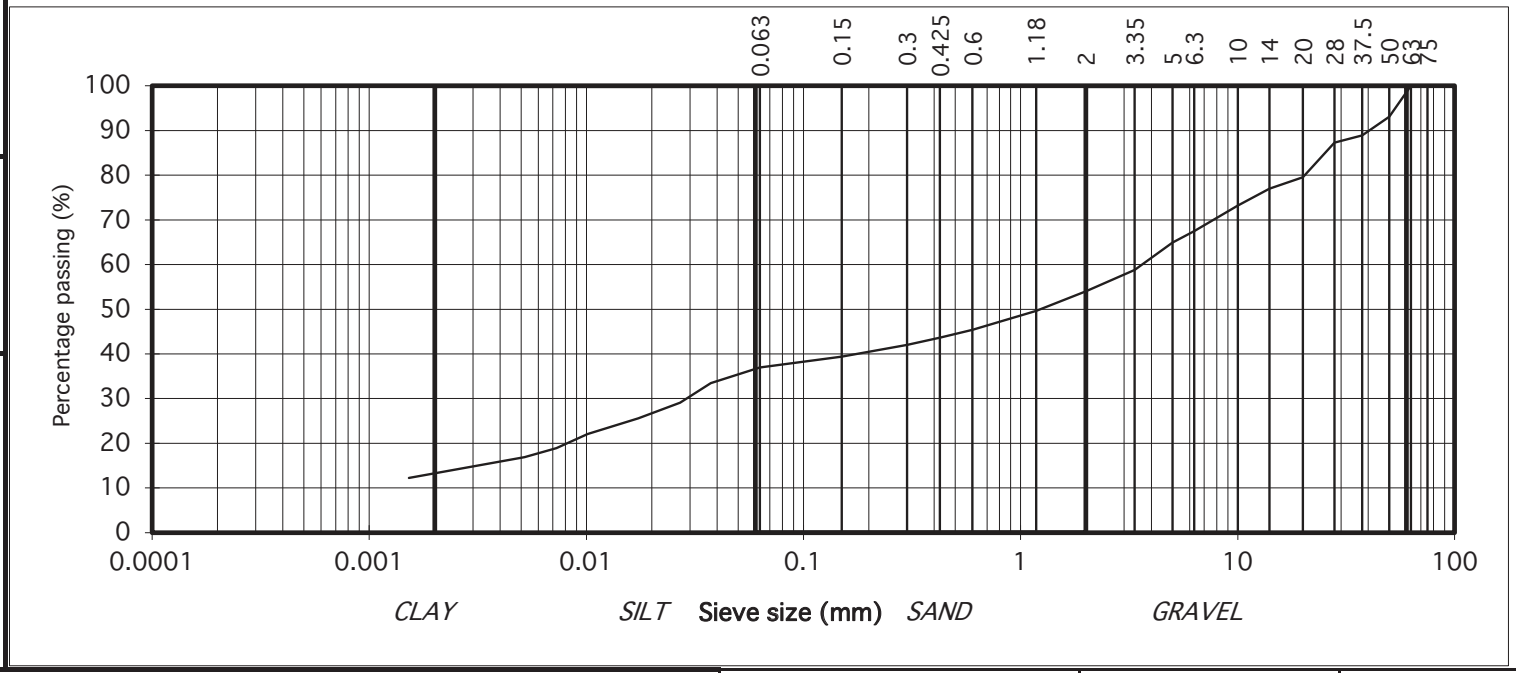

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138004**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	BH03
Sample No.*	AA171722
Depth* (m)	1.0m
Sample Type:	B
Lab Sample No.	A22/4608
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	17
% Particles > 20mm (By dry mass):	50
MCV:	9.4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138003**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	BH01
Sample No.*	AA171725
Depth* (m)	1.0m
Sample Type:	B
Lab Sample No.	A22/4606
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	16
% Particles > 20mm (By dry mass):	19
MCV:	6.3
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138005**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	BH05
Sample No.*	AA171723
Depth* (m)	1.0m
Sample Type:	B
Lab Sample No.	A22/4610
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	16
% Particles > 20mm (By dry mass):	22
MCV:	8.2
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138006**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP02
Sample No.*	AA180435
Depth* (m)	0.70
Sample Type:	B
Lab Sample No.	A22/4612
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	13
% Particles > 20mm (By dry mass):	13
MCV:	13
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138007**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP03
Sample No.*	AA180428
Depth* (m)	0.60
Sample Type:	B
Lab Sample No.	A22/4613
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	17
% Particles > 20mm (By dry mass):	12
MCV:	11
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138008**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP04
Sample No.*	AA180432
Depth* (m)	0.50
Sample Type:	B
Lab Sample No.	A22/4615
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	22
% Particles > 20mm (By dry mass):	1
MCV:	10.6
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138009**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP05
Sample No.*	AA180430
Depth* (m)	0.70
Sample Type:	B
Lab Sample No.	A22/4617
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	12
% Particles > 20mm (By dry mass):	13
MCV:	14.9
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138010**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP06
Sample No.*	AA180426
Depth* (m)	0.50
Sample Type:	B
Lab Sample No.	A22/4618
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	16
% Particles > 20mm (By dry mass):	12
MCV:	12
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138011**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP07
Sample No.*	AA180420
Depth* (m)	0.50
Sample Type:	B
Lab Sample No.	A22/4619
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	23/08/22
Sample Cert:	Not Provided
Moisture Content (%):	20
% Particles > 20mm (By dry mass):	0
MCV:	11
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138012**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP08
Sample No.*	AA180424
Depth* (m)	0.70
Sample Type:	B
Lab Sample No.	A22/4621
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	13
% Particles > 20mm (By dry mass):	8
MCV:	11.9
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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Test Report

Determination of Moisture Condition Value at Natural Moisture Content

Tested in accordance with BS1377:Part 4:1990, clause 5.4

Report No.	**R138013**
Contract No.	24188
Contract Name:	Profile Park Data Centre Site 4
Customer:	Ramboll
BH/TP*	TP10
Sample No.*	AA180439
Depth* (m)	0.50
Sample Type:	B
Lab Sample No.	A22/4623
Source* (if applicable)	N/A
Material Type* (if applicable):	B
Sample Received:	15/08/22
Date Tested:	24/08/22
Sample Cert:	Not Provided
Moisture Content (%):	12
% Particles > 20mm (By dry mass):	6
MCV:	10.4
Interpretation of Plot:	Steepest Straight Line
Description of Soil:	Brown sandy gravelly SILT/CLAY

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IGSL Ltd
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M7 Business Park
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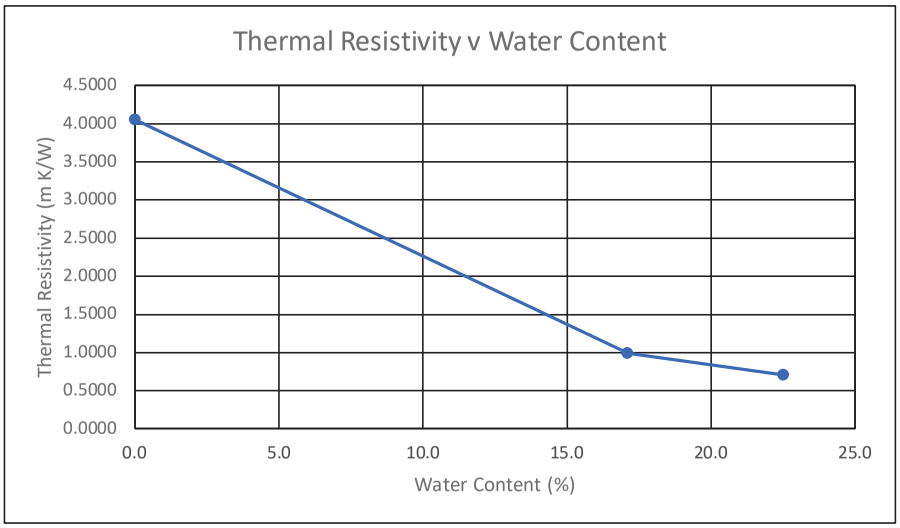
Test Report

Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe

Report No.	**R137284**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	171725
Location	BH01 1.0m
Soil description	Grey slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	11/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	17.1	1.57	1.34	1.0080	0.9920	0.49
Oven dried	0.0	1.34	1.34	0.2486	4.0511	0.49
Wetter than as received	22.5	1.82	1.48	1.4311	0.7058	0.44



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
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H Byrne (Laboratory Manager)

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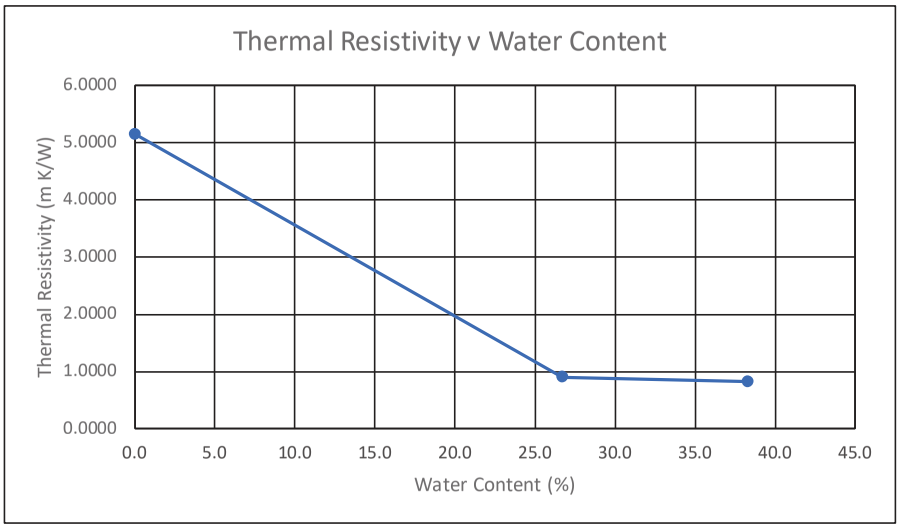
IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No.	**R137285**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	171722
Location	BH03 1.0m
Soil description	Greyish brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	11/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	26.7	1.84	1.45	1.1405	0.9049	0.45
Oven dried	0.0	1.37	1.37	0.1978	5.1415	0.48
Wetter than as received	38.3	1.69	1.22	1.2773	0.8208	0.54



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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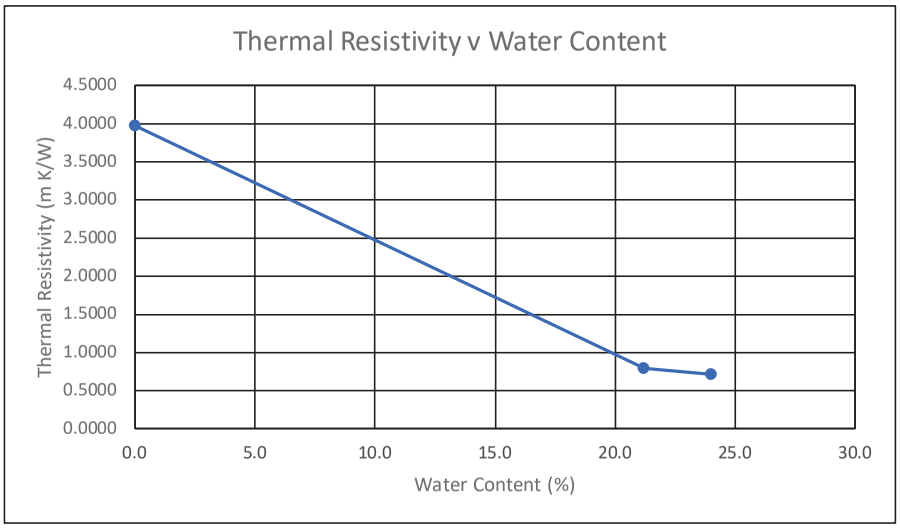
IGSL Ltd
Materials Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe

Report No.	**R137286**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	171724
Location	BH05 1.0m
Soil description	Greyish brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	11/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	21.2	2.05	1.69	1.3385	0.7931	0.36
Oven dried	0.0	1.52	1.52	0.2543	3.9729	0.42
Wetter than as received	24.0	1.75	1.41	1.4107	0.7139	0.47



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Materials Laboratory	Approved by	Date	Page
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IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No. **R137287**

Contract No. 24188

Contract Name: Profile Park Data Centre

Client: Ramboll

Sample No. 180437

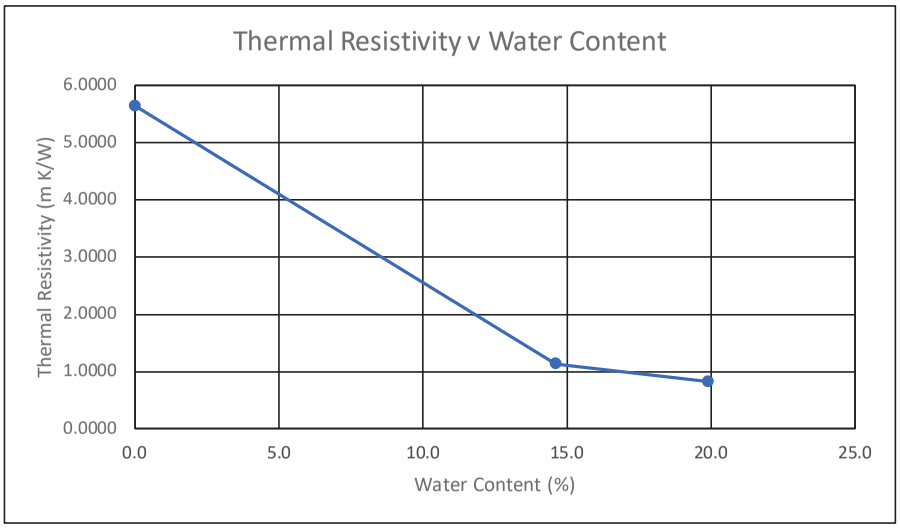
Location TP01 0.6m

Soil description Greyish brown slightly sandy slightly gravelly SILT/CLAY

Preparation <8mm material tamped into container at as received Water content oven dried, and wetter than as received

Date Tested: 09/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	14.6	1.56	1.36	0.8820	1.1377	0.49
Oven dried	0.0	1.32	1.32	0.1778	5.6423	0.50
Wetter than as received	19.9	1.62	1.35	1.2126	0.8274	0.49



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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IGSL Ltd
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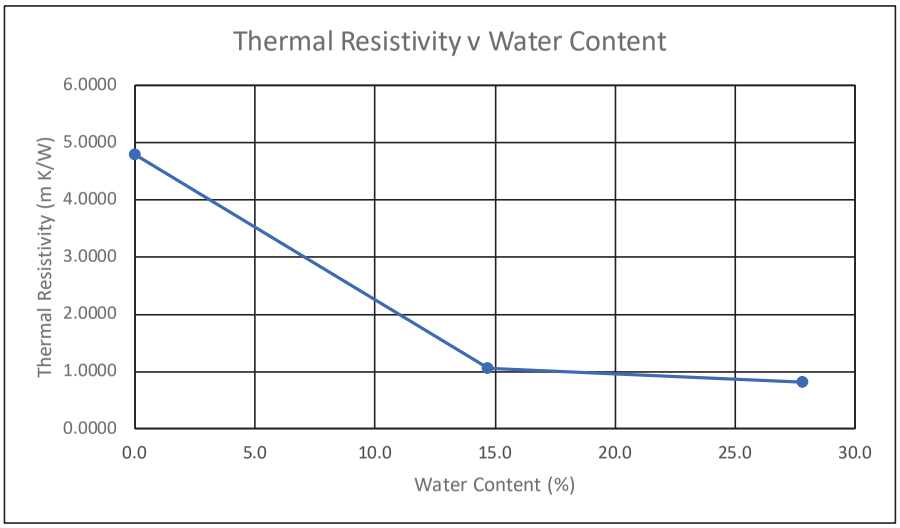
M7 Business Park
Naas
Co. Kildare

Test Report

Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe

Report No.	**R137288**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180435
Location	TP02 0.8m
Soil description	Brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	11/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	14.7	1.65	1.44	0.9508	1.0589	0.46
Oven dried	0.0	1.39	1.39	0.2092	4.7922	0.48
Wetter than as received	27.8	1.72	1.35	1.2433	0.8074	0.49



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Materials Laboratory	Approved by	Date	Page
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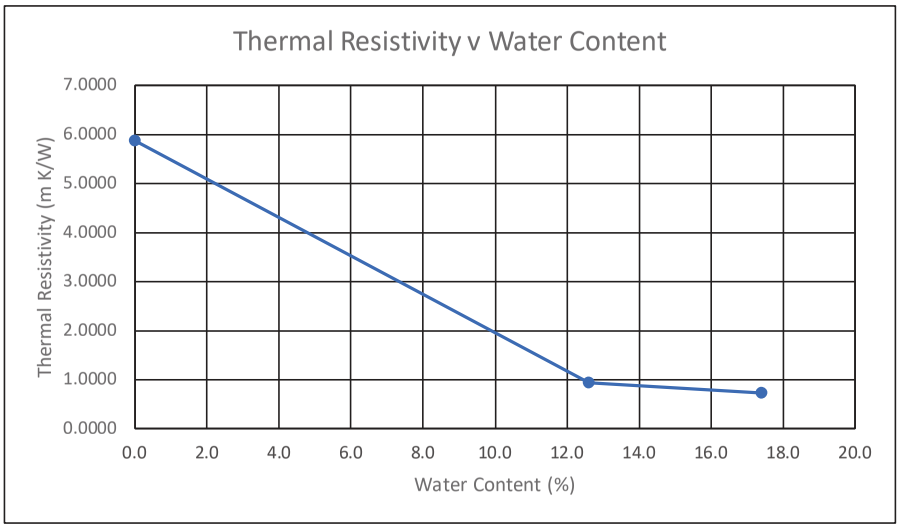
IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No.	**R137289**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180429
Location	TP03 2.0m
Soil description	Grey slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	09/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	12.6	1.81	1.61	1.0734	0.9358	0.39
Oven dried	0.0	1.53	1.53	0.1716	5.8714	0.42
Wetter than as received	17.4	2.14	1.83	1.4324	0.7227	0.31



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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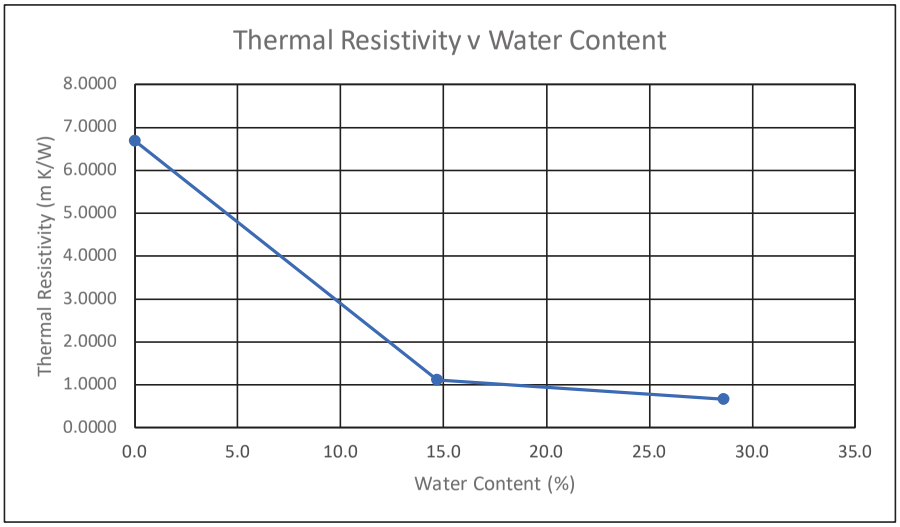
IGSL Ltd
Materials Laboratory
M7 Business Park
Naas
Co. Kildare

Test Report

Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe

Report No.	**R137290**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180423
Location	TP04 0.8m
Soil description	Greyish brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	09/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	14.7	1.69	1.47	0.9005	1.1167	0.44
Oven dried	0.0	1.35	1.35	0.1504	6.6750	0.49
Wetter than as received	28.6	2.02	1.57	1.5055	0.6647	0.41



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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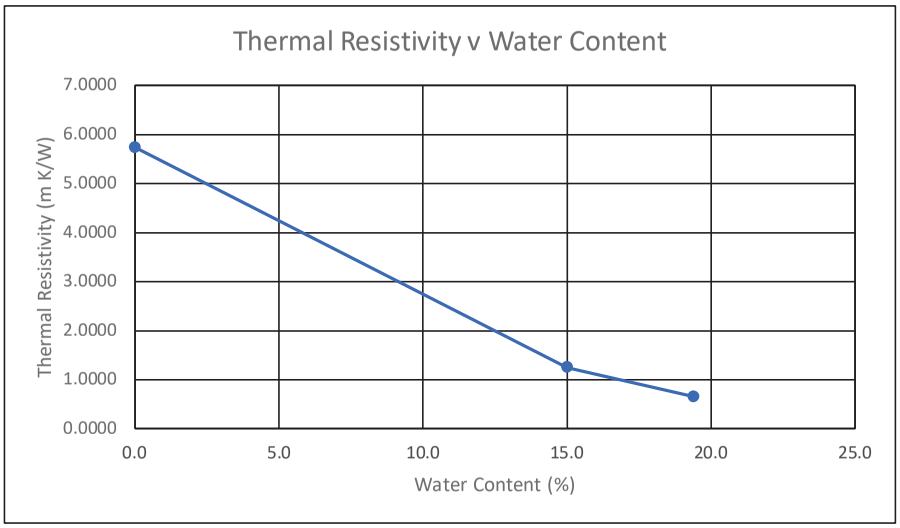
IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No.	**R137291**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180430
Location	TP05 0.7m
Soil description	Brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	09/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	15.0	1.55	1.34	0.8037	1.2526	0.49
Oven dried	0.0	1.42	1.42	0.1747	5.7375	0.47
Wetter than as received	19.4	1.98	1.66	1.5234	0.6586	0.37



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

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IGSL Materials Laboratory	Approved by	Date	Page
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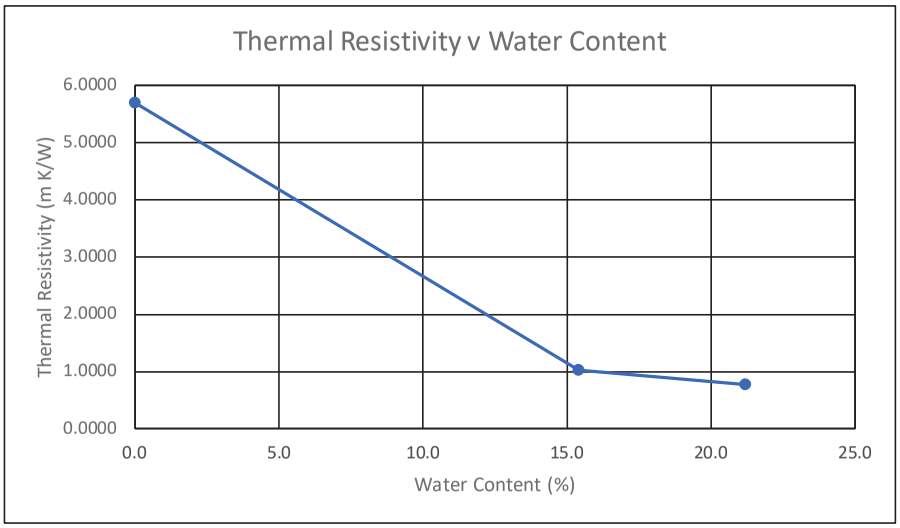
IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No.	**R137292**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180426
Location	TP06 0.5m
Soil description	Greyish brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	09/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	15.4	1.66	1.44	0.9823	1.0256	0.46
Oven dried	0.0	1.43	1.43	0.1768	5.6960	0.46
Wetter than as received	21.2	1.83	1.51	1.3255	0.7670	0.43



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

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IGSL Materials Laboratory	Approved by	Date	Page
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IGSL Ltd
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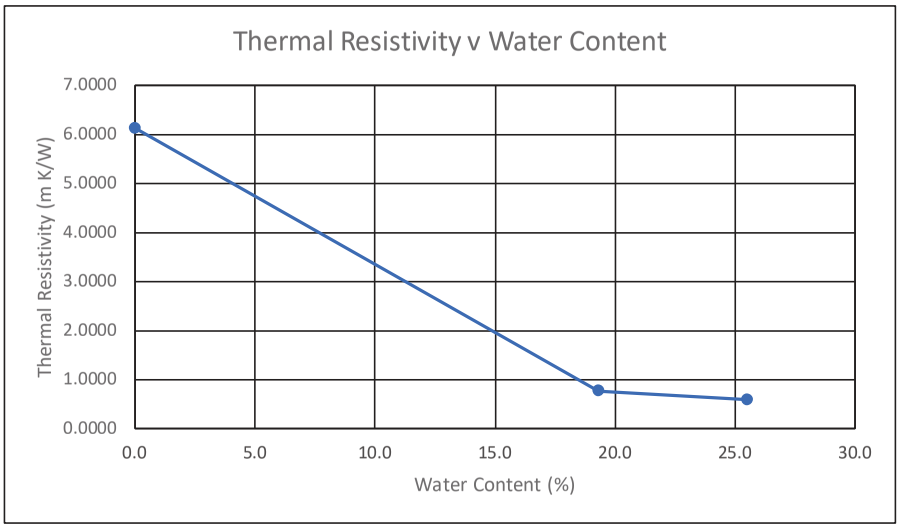
M7 Business Park
Naas
Co. Kildare

Test Report

Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe

Report No.	**R137293**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180422
Location	TP07 1.4m
Soil description	Brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	11/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	19.3	1.87	1.57	1.3003	0.7728	0.41
Oven dried	0.0	1.46	1.46	0.1656	6.1295	0.45
Wetter than as received	25.5	1.90	1.51	1.7019	0.5902	0.43



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

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IGSL Materials Laboratory	Approved by	Date	Page
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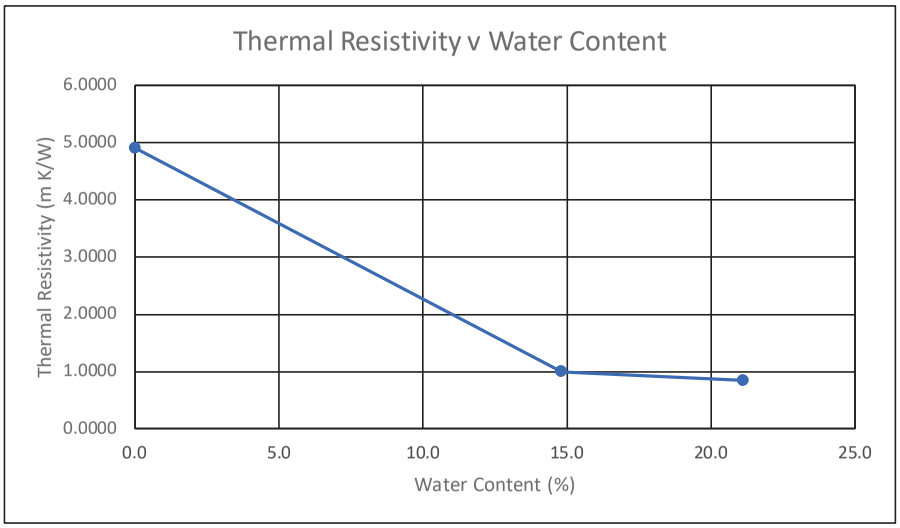
IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No.	**R137294**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180424
Location	TP08 0.7m
Soil description	Brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	11/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	14.8	1.63	1.42	1.0076	0.9973	0.47
Oven dried	0.0	1.53	1.53	0.2054	4.9015	0.42
Wetter than as received	21.1	1.96	1.62	1.2018	0.8488	0.39



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
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IGSL Materials Laboratory	Approved by	Date	Page
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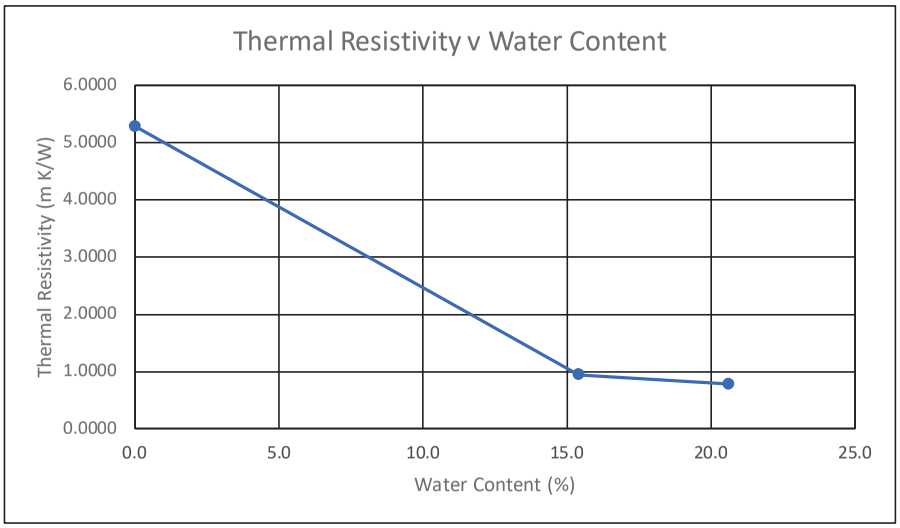
IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No.	**R137295**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180418
Location	TP09 0.5m
Soil description	Greyish brown slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	09/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	15.4	1.75	1.52	1.0672	0.9453	0.43
Oven dried	0.0	1.46	1.46	0.1902	5.2803	0.45
Wetter than as received	20.6	1.96	1.63	1.2804	0.7823	0.39



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

IGSL Materials Laboratory	Approved by	Date	Page
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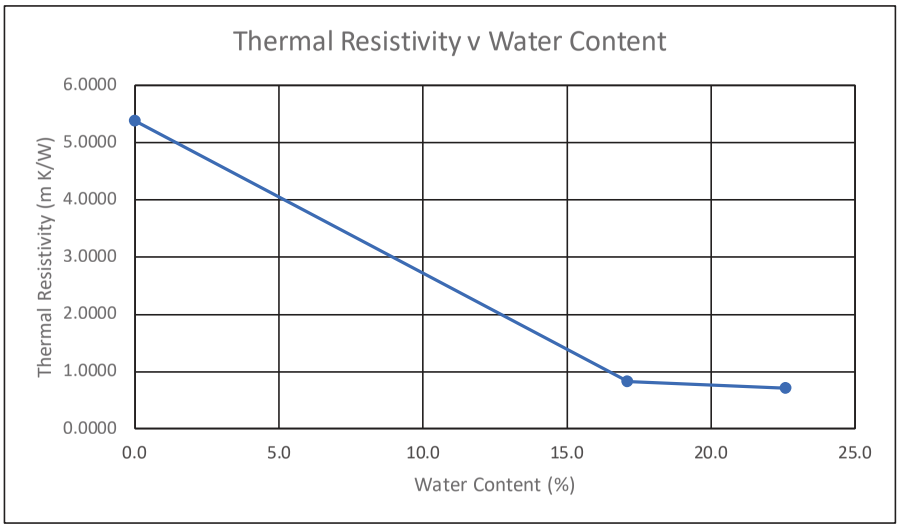
IGSL Ltd Materials Laboratory M7 Business Park Naas Co. Kildare	Test Report	
	Determination of Thermal Conductivity / Resistivity of Soil by Thermal Needle Probe	

Report No.	**R137296**
Contract No.	24188
Contract Name:	Profile Park Data Centre
Client:	Ramboll
Sample No.	180440
Location	TP10 1.5m
Soil description	Grey slightly sandy slightly gravelly SILT/CLAY
Preparation	<8mm material tamped into container at as received Water content oven dried, and wetter than as received
Date Tested:	09/08/2022

	Water Content %	Bulk density Mg/m^3	Dry density Mg/m^3	Thermal Conductivity K (W/m.k)*	Thermal Resistivity R (m K/W)*	Porosity
As received	17.1	1.95	1.66	1.2291	0.8267	0.37
Oven dried	0.0	1.50	1.50	0.1885	5.3727	0.43
Wetter than as received	22.6	1.90	1.55	1.4371	0.7031	0.42



Notes: Water content measured in accordance with ISO 17892-1:2014. Bulk density measured by linear measurement. Porosity calculated (voids ratio/1+voids ratio) with an assumed Particle Density of 2.65. Thermal measurements undertake using a TEMPOS and TR-3 probe (manufactured by METER Group). *Thermal test results are an average of 5 readings.

The result relates to the specimen tested.

Persons authorised to approve report
J Barrett (Quality Manager)
H Byrne (Laboratory Manager)

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Appendix 9

Chemical / Environmental Laboratory Results (Soil)

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	22-31072-1		
Initial Date of Issue:	23-Aug-2022		
Client	IGSL		
Client Address:	M7 Business Park Naas County Kildare Ireland		
Contact(s):	Darren Keogh		
Project	24188 - Profile Park - Data Centre Site 3 (Ramboll)		
Quotation No.:	Q20-19951	**Date Received:**	15-Aug-2022
Order No.:		**Date Instructed:**	15-Aug-2022
No. of Samples:	14		
Turnaround (Wkdays):	7	**Results Due:**	23-Aug-2022
Date Approved:	23-Aug-2022		

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Leachate

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL					**Chemtest Job No.:**	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951					**Chemtest Sample ID.:**	1487830	1487832	1487834	1487836	1487837	1487838	1487839	1487840	1487842
Order No.:					Client Sample Ref.:	AA171726	AA171721	AA171726	180428	180432	180431	180426	180420	180440
					Sample Location:	BH02	BH04	BH06	TP03	TP04	TP05	TP06	TP07	TP10
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	1.00	0.60	0.50	2.00	0.50	0.50	1.50
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**									
pH	U	1010	10:1		N/A	8.1	8.2	8.2	8.3	7.8	8.1	8.4	8.0	8.3
Ammonium	U	1220	10:1	mg/l	0.050	0.068	0.070	0.080	< 0.050	0.16	0.051	< 0.050	0.082	0.072
Ammonium	N	1220	10:1	mg/kg	0.10	0.73	0.76	0.87	0.54	1.6	0.54	0.47	0.87	0.80
Boron (Dissolved)	U	1455	10:1	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.16	< 0.01	< 0.01	< 0.01	< 0.01
Benzo[j]fluoranthene	N	1800	10:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

Results - Soil

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL					**Chemtest Job No.:**	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951					**Chemtest Sample ID.:**	1487829	1487830	1487831	1487832	1487833	1487834	1487835	1487836	1487837
Order No.:					Client Sample Ref.:	AA171725	AA171726	AA171722	AA171721	AA171723	AA171726	180436	180428	180432
					Sample Location:	BH01	BH02	BH03	BH04	BH05	BH06	TP02	TP03	TP04
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	1.00	1.00	1.00	1.00	1.80	0.60	0.50
					Asbestos Lab:		DURHAM		DURHAM		DURHAM		DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A		-		-		-		-	-	
Asbestos Identification	U	2192		N/A		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	
Moisture	N	2030	%	0.020	11	21	12	14	14	13	11	11	15	
pH (2.5:1)	N	2010		4.0	[A] 8.9		[A] 9.1		[A] 8.6		[A] 8.7			
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		[A] < 0.40		[A] < 0.40		[A] < 0.40		[A] < 0.40	[A] < 0.40	
Magnesium (Water Soluble)	N	2120	g/l	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010			
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010			
Total Sulphur	U	2175	%	0.010	[A] 0.048		[A] 0.095		[A] 0.073		[A] 0.054			
Sulphur (Elemental)	U	2180	mg/kg	1.0		[A] 1.4		[A] 1.1		[A] 1.6		[A] 1.0	[A] 1.3	
Chloride (Water Soluble)	U	2220	g/l	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010			
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010		< 0.010		< 0.010		< 0.010			
Cyanide (Total)	U	2300	mg/kg	0.50		[A] < 0.50		[A] < 0.50		[A] < 0.50		[A] < 0.50	[A] < 0.50	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		[A] 7.4		[A] 26		[A] 24		[A] 16	[A] 1.2	
Ammonium (Water Soluble)	U	2220	g/l	0.01	< 0.01		< 0.01		< 0.01		< 0.01			
Sulphate (Acid Soluble)	U	2430	%	0.010	[A] 0.020	[A] 0.026	[A] 0.014	[A] 0.026	[A] 0.017	[A] 0.018	[A] 0.031	[A] 0.019	[A] 0.019	
Arsenic	U	2455	mg/kg	0.5		6.8		7.2		14		7.0	12	
Barium	U	2455	mg/kg	0		41		36		92		17	92	
Cadmium	U	2455	mg/kg	0.10		1.2		1.6		0.61		0.16	3.2	
Chromium	U	2455	mg/kg	0.5		8.7		8.9		37		8.0	16	
Molybdenum	U	2455	mg/kg	0.5		2.5		3.3		3.1		1.3	3.2	
Antimony	N	2455	mg/kg	2.0		< 2.0		< 2.0		< 2.0		< 2.0	< 2.0	
Copper	U	2455	mg/kg	0.50		19		22		25		16	30	
Mercury	U	2455	mg/kg	0.05		0.05		< 0.05		0.05		< 0.05	0.05	
Nickel	U	2455	mg/kg	0.50		27		42		32		23	56	
Lead	U	2455	mg/kg	0.50		22		11		16		8.9	26	
Selenium	U	2455	mg/kg	0.25		0.57		0.49		1.0		0.45	1.2	
Zinc	U	2455	mg/kg	0.50		56		62		71		11	86	
Chromium (Trivalent)	N	2490	mg/kg	1.0		8.7		8.9		37		8.0	16	
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50		< 0.50		< 0.50		< 0.50	< 0.50	
Mineral Oil (TPH Calculation)	N	2670	mg/kg	10		< 10		< 10		< 10		< 10	< 10	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	

Results - Soil

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL					**Chemtest Job No.:**	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951					**Chemtest Sample ID.:**	1487829	1487830	1487831	1487832	1487833	1487834	1487835	1487836	1487837
Order No.:					Client Sample Ref.:	AA171725	AA171726	AA171722	AA171721	AA171723	AA171726	180436	180428	180432
					Sample Location:	BH01	BH02	BH03	BH04	BH05	BH06	TP02	TP03	TP04
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.00	1.00	1.00	1.00	1.00	1.00	1.80	0.60	0.50
					Asbestos Lab:		DURHAM		DURHAM		DURHAM		DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		[A] < 5.0		[A] < 5.0		[A] < 5.0		[A] < 5.0	[A] < 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		[A] < 5.0		[A] < 5.0		[A] < 5.0		[A] < 5.0	[A] < 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		[A] < 10		[A] < 10		[A] < 10		[A] < 10	[A] < 10	
Benzene	U	2760	µg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Toluene	U	2760	µg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Ethylbenzene	U	2760	µg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
m & p-Xylene	U	2760	µg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
o-Xylene	U	2760	µg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	
Naphthalene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Acenaphthylene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Acenaphthene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Fluorene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Phenanthrene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Anthracene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Fluoranthene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Pyrene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Benzo[a]anthracene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Chrysene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Benzo[b]fluoranthene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Benzo[k]fluoranthene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Benzo[a]pyrene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Benzo[g,h,i]perylene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Coronene	N	2800	mg/kg	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	
Total Of 17 PAH's	N	2800	mg/kg	0.20		[A] < 0.20		[A] < 0.20		[A] < 0.20		[A] < 0.20	[A] < 0.20	
PCB 28	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	
PCB 52	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	

Results - Soil

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL			**Chemtest Job No.:**		22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951			**Chemtest Sample ID.:**		1487829	1487830	1487831	1487832	1487833	1487834	1487835	1487836	1487837
Order No.:			Client Sample Ref.:		AA171725	AA171726	AA171722	AA171721	AA171723	AA171726	180436	180428	180432
			Sample Location:		BH01	BH02	BH03	BH04	BH05	BH06	TP02	TP03	TP04
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.00	1.00	1.00	1.00	1.00	1.00	1.80	0.60	0.50
			Asbestos Lab:			DURHAM		DURHAM		DURHAM		DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
PCB 90+101	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010
PCB 118	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010
PCB 153	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010
PCB 138	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010
PCB 180	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010
Total Phenols	U	2920	mg/kg	0.10		< 0.10		< 0.10		< 0.10		< 0.10	< 0.10

Results - Soil

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL			**Chemtest Job No.:**		22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951			**Chemtest Sample ID.:**		1487838	1487839	1487840	1487841	1487842
Order No.:			Client Sample Ref.:		180431	180426	180420	180418	180440
			Sample Location:		TP05	TP06	TP07	TP09	TP10
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		2.00	0.50	0.50	0.50	1.50
			Asbestos Lab:		DURHAM	DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
ACM Type	U	2192		N/A	-	-	-		-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected
Moisture	N	2030	%	0.020	16	8.9	14	9.3	9.2
pH (2.5:1)	N	2010		4.0				[A] 8.8	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	[A] < 0.40	[A] < 0.40	[A] < 0.40		[A] < 0.40
Magnesium (Water Soluble)	N	2120	g/l	0.010				[A] < 0.010	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010				[A] < 0.010	
Total Sulphur	U	2175	%	0.010				[A] 0.047	
Sulphur (Elemental)	U	2180	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] 1.5		[A] 1.3
Chloride (Water Soluble)	U	2220	g/l	0.010				[A] < 0.010	
Nitrate (Water Soluble)	N	2220	g/l	0.010				< 0.010	
Cyanide (Total)	U	2300	mg/kg	0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50		[A] < 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 7.0	[A] 39	[A] 1.4		[A] 0.65
Ammonium (Water Soluble)	U	2220	g/l	0.01				< 0.01	
Sulphate (Acid Soluble)	U	2430	%	0.010	[A] 0.014	[A] 0.017	[A] 0.021	[A] 0.021	[A] 0.010
Arsenic	U	2455	mg/kg	0.5	4.8	4.0	8.4		8.9
Barium	U	2455	mg/kg	0	14	16	39		21
Cadmium	U	2455	mg/kg	0.10	0.14	0.40	0.87		0.47
Chromium	U	2455	mg/kg	0.5	7.7	6.0	14		6.5
Molybdenum	U	2455	mg/kg	0.5	2.7	1.8	1.7		3.5
Antimony	N	2455	mg/kg	2.0	< 2.0	< 2.0	< 2.0		< 2.0
Copper	U	2455	mg/kg	0.50	15	13	16		18
Mercury	U	2455	mg/kg	0.05	< 0.05	< 0.05	< 0.05		0.60
Nickel	U	2455	mg/kg	0.50	32	20	28		24
Lead	U	2455	mg/kg	0.50	7.6	9.0	15		43
Selenium	U	2455	mg/kg	0.25	1.9	0.48	0.56		1.5
Zinc	U	2455	mg/kg	0.50	12	18	59		41
Chromium (Trivalent)	N	2490	mg/kg	1.0	7.7	6.0	14		6.5
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50		< 0.50
Mineral Oil (TPH Calculation)	N	2670	mg/kg	10	< 10	< 10	< 10		< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0

Results - Soil

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL			**Chemtest Job No.:**		22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951			**Chemtest Sample ID.:**		1487838	1487839	1487840	1487841	1487842
Order No.:			Client Sample Ref.:		180431	180426	180420	180418	180440
			Sample Location:		TP05	TP06	TP07	TP09	TP10
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		2.00	0.50	0.50	0.50	1.50
			Asbestos Lab:		DURHAM	DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10	[A] < 10	[A] < 10		[A] < 10
Benzene	U	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Toluene	U	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Ethylbenzene	U	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
m & p-Xylene	U	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
o-Xylene	U	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Naphthalene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Acenaphthylene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Acenaphthene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Fluorene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Phenanthrene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Anthracene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Pyrene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[a]anthracene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Chrysene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[b]fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[k]fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[a]pyrene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[g,h,i]perylene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Coronene	N	2800	mg/kg	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Total Of 17 PAH's	N	2800	mg/kg	0.20	[A] < 0.20	[A] < 0.20	[A] < 0.20		[A] < 0.20
PCB 28	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 52	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010

Results - Soil

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL			**Chemtest Job No.:**		22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951			**Chemtest Sample ID.:**		1487838	1487839	1487840	1487841	1487842
Order No.:			Client Sample Ref.:		180431	180426	180420	180418	180440
			Sample Location:		TP05	TP06	TP07	TP09	TP10
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		2.00	0.50	0.50	0.50	1.50
			Asbestos Lab:		DURHAM	DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
PCB 90+101	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 118	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 153	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 138	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 180	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10		< 0.10

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487830						
Sample Ref:	AA171726				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	BH02						
Top Depth(m):	1.00						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.32	3	5	6
Loss On Ignition	2610	U	%	2.4	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.036	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0007	0.0073	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	0.0007	0.0074	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0051	0.051	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	0.003	0.027	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.50	5.0	10	150	500
Sulphate	1220	U	1.8	18	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.2	72	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	21

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487832						
Sample Ref:	AA171721				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	BH04						
Top Depth(m):	1.00						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.52	3	5	6
Loss On Ignition	2610	U	%	2.4	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.055	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0004	0.0038	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	0.0005	0.0051	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0063	0.063	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	1.0	10	800	15000	25000
Fluoride	1220	U	0.32	3.2	10	150	500
Sulphate	1220	U	1.0	10	1000	20000	50000
Total Dissolved Solids	1020	N	62	620	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.6	86	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	14

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487834						
Sample Ref:	AA171726				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	BH06						
Top Depth(m):	1.00						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.63	3	5	6
Loss On Ignition	2610	U	%	2.7	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.093	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0003	0.0032	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	0.0008	0.0083	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0067	0.067	0.5	10	30
Nickel	1455	U	0.0005	0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.36	3.6	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	59	580	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.0	60	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487836						
Sample Ref:	180428				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP03						
Top Depth(m):	0.60						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.26	3	5	6
Loss On Ignition	2610	U	%	1.3	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.037	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0003	0.0028	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	0.0006	0.0056	0.5	10	70
Copper	1455	U	0.0007	0.0065	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0031	0.031	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	1.3	13	800	15000	25000
Fluoride	1220	U	0.39	3.9	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	60	600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.9	59	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487837						
Sample Ref:	180432				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP04						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 1.1	3	5	6
Loss On Ignition	2610	U	%	3.2	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0030	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0041	0.041	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	0.00014	0.0014	0.04	1	5
Chromium	1455	U	0.0042	0.042	0.5	10	70
Copper	1455	U	0.0089	0.089	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0015	0.015	0.5	10	30
Nickel	1455	U	0.0086	0.086	0.4	10	40
Lead	1455	U	0.0020	0.020	0.5	10	50
Antimony	1455	U	0.0006	0.0060	0.06	0.7	5
Selenium	1455	U	0.0007	0.0072	0.1	0.5	7
Zinc	1455	U	0.026	0.26	4	50	200
Chloride	1220	U	1.7	17	800	15000	25000
Fluoride	1220	U	0.17	1.7	10	150	500
Sulphate	1220	U	3.1	31	1000	20000	50000
Total Dissolved Solids	1020	N	60	600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	16	160	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	15

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487838						
Sample Ref:	180431				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP05						
Top Depth(m):	2.00						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.39	3	5	6
Loss On Ignition	2610	U	%	2.6	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.071	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0003	0.0031	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0050	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0044	0.044	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	0.0007	0.0073	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.33	3.3	10	150	500
Sulphate	1220	U	2.0	20	1000	20000	50000
Total Dissolved Solids	1020	N	58	580	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.6	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	16

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487839						
Sample Ref:	180426				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP06						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.40	3	5	6
Loss On Ignition	2610	U	%	1.1	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.8	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.053	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0003	0.0031	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0050	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0072	0.072	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	0.0006	0.0055	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	1.4	14	800	15000	25000
Fluoride	1220	U	0.36	3.6	10	150	500
Sulphate	1220	U	1.4	14	1000	20000	50000
Total Dissolved Solids	1020	N	54	540	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	15	150	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487840						
Sample Ref:	180420				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP07						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.99	3	5	6
Loss On Ignition	2610	U	%	2.3	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.012	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0038	0.038	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	0.00011	0.0011	0.04	1	5
Chromium	1455	U	0.0029	0.029	0.5	10	70
Copper	1455	U	0.0050	0.051	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0026	0.026	0.5	10	30
Nickel	1455	U	0.0061	0.061	0.4	10	40
Lead	1455	U	0.0021	0.021	0.5	10	50
Antimony	1455	U	0.0006	0.0063	0.06	0.7	5
Selenium	1455	U	0.0009	0.0086	0.1	0.5	7
Zinc	1455	U	0.016	0.16	4	50	200
Chloride	1220	U	1.8	18	800	15000	25000
Fluoride	1220	U	0.47	4.7	10	150	500
Sulphate	1220	U	2.0	20	1000	20000	50000
Total Dissolved Solids	1020	N	65	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	23	230	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	14

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	22-31072						
Chemtest Sample ID:	1487842						
Sample Ref:	180440				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP10						
Top Depth(m):	1.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.80	3	5	6
Loss On Ignition	2610	U	%	2.2	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.038	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0002	0.0021	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	0.0006	0.0056	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0079	0.079	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	0.0013	0.013	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.31	3.1	10	150	500
Sulphate	1220	U	1.0	10	1000	20000	50000
Total Dissolved Solids	1020	N	54	540	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.0	60	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.2

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1487829	AA171725		BH01		A	Amber Glass 250ml
1487829	AA171725		BH01		A	Plastic Tub 500g
1487830	AA171726		BH02		A	Amber Glass 250ml
1487830	AA171726		BH02		A	Plastic Tub 500g
1487831	AA171722		BH03		A	Amber Glass 250ml
1487831	AA171722		BH03		A	Plastic Tub 500g
1487832	AA171721		BH04		A	Amber Glass 250ml
1487832	AA171721		BH04		A	Plastic Tub 500g
1487833	AA171723		BH05		A	Amber Glass 250ml
1487833	AA171723		BH05		A	Plastic Tub 500g
1487834	AA171726		BH06		A	Amber Glass 250ml
1487834	AA171726		BH06		A	Plastic Tub 500g
1487835	180436		TP02		A	Amber Glass 250ml
1487835	180436		TP02		A	Plastic Tub 500g
1487836	180428		TP03		A	Amber Glass 250ml
1487836	180428		TP03		A	Plastic Tub 500g
1487837	180432		TP04		A	Amber Glass 250ml
1487837	180432		TP04		A	Plastic Tub 500g
1487838	180431		TP05		A	Amber Glass 250ml
1487838	180431		TP05		A	Plastic Tub 500g
1487839	180426		TP06		A	Amber Glass 250ml
1487839	180426		TP06		A	Plastic Tub 500g

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1487840	180420		TP07		A	Amber Glass 250ml
1487840	180420		TP07		A	Plastic Tub 500g
1487841	180418		TP09		A	Amber Glass 250ml
1487841	180418		TP09		A	Plastic Tub 500g
1487842	180440		TP10		A	Amber Glass 250ml
1487842	180440		TP10		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.

Test Methods

SOP	Title	Parameters included	Method summary
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix 10

Geotechnical Laboratory Test Results (Rock)

(Diametrial) POINT LOAD STRENGTH INDEX TEST DATA

Contract: Data Centre Projects 3 - Profile Park
Date of test: 12/09/2022

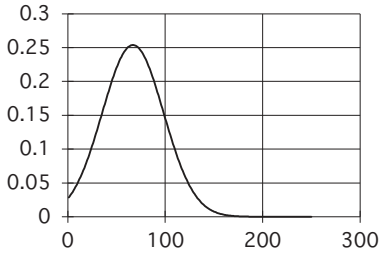
Sample Type: Core
Contract no. 24188

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC01	3.9	78	26.0	1.222	4.27	5.22	104	d	//
	5.5	78	14.0	1.222	2.30	2.81	56	d	//
	7.4	78	25.0	1.222	4.11	5.02	100	d	//
	8.5	78	30.0	1.222	4.93	6.02	120	d	//
	9.3	78	6.0	1.222	0.99	1.20	24	d	//
RC02	3.6	78	22.0	1.222	3.62	4.42	88	d	//
	5.9	78	21.0	1.222	3.45	4.22	84	d	//
	7.2	78	4.0	1.222	0.66	0.80	16	d	//
	8.9	78	12.0	1.222	1.97	2.41	48	d	//
	9.8	78	18.0	1.222	2.96	3.61	72	d	//
RC03	4.7	78	2.0	1.222	0.33	0.40	8	d	//
	5.4	78	26.0	1.222	4.27	5.22	104	d	//
	8.1	78	14.0	1.222	2.30	2.81	56	d	//
	9.4	78	20.0	1.222	3.29	4.02	80	d	//
	10.8	78	15.0	1.222	2.47	3.01	60	d	//
RC04	3.3	78	19.0	1.222	3.12	3.81	76	d	//
	4.7	78	8.0	1.222	1.31	1.61	32	d	//
	7.7	78	10.0	1.222	1.64	2.01	40	d	//
	8.9	78	20.0	1.222	3.29	4.02	80	d	//
	9.9	78	21.0	1.222	3.45	4.22	84	d	//
								d	//
								d	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	20	20
Minimum	0.40	8
Average	3.34	67
Maximum	6.02	120
Standard Dev.	1.57	31
Upper 95% Confidence Limit	6.42	128.48
Lower 95% Confidence Limit	0.26	5.24

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

(Diametrial) POINT LOAD STRENGTH INDEX TEST DATA

Contract: Data Centre Projects 3 - Profile Park
Date of test: 12/09/2022

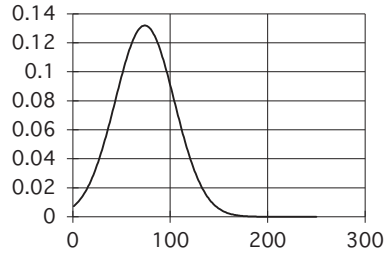
Sample Type: Core
Contract no. 24188

RC No.	Depth m	D (Diameter) mm	P (failure load) kN	F	Is (index strength) Mpa	Is(50) (index strength) Mpa	*UCS MPa	Type	Orienation
RC05	3.2	78	22.0	1.222	3.62	4.42	88	d	//
	4.8	78	18.0	1.222	2.96	3.61	72	d	//
	7.7	78	14.0	1.222	2.30	2.81	56	d	//
	8.9	78	20.0	1.222	3.29	4.02	80	d	//
	9.9	78	26.0	1.222	4.27	5.22	104	d	//
RC06	4.7	78	4.0	1.222	0.66	0.80	16	d	//
	5.7	78	22.0	1.222	3.62	4.42	88	d	//
	6.7	78	26.0	1.222	4.27	5.22	104	d	//
	8.4	78	8.0	1.222	1.31	1.61	32	d	//
	9.4	78	24.0	1.222	3.94	4.82	96	d	//

Statistical Summary Data	Is(50)	UCS*
Number of Samples Tested	10	10
Minimum	0.80	16
Average	3.69	74
Maximum	5.22	104
Standard Dev.	1.51	30
Upper 95% Confidence Limit	6.66	133.16
Lower 95% Confidence Limit	0.73	14.62

Comments:
*UCS taken as k x Point Load Is(50): k= 20

*UCS Normal Distribution Curve



Abbreviations	
i	irregular
a	axial
b	block
d	diametral

approx. orientation to planes of weakness/bedding

U	unknown
P	perpendicular
//	parallel

Uniaxial Compression Test Report Sheet | *I.G.S.L.*

Sample Identification

Contract Name:	Data Centre Projects 3 - Profile Park
Job Number:	24188
Hole No:	RC01
Depth (m):	4.70m

Sample Description

Colour:	Dark grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

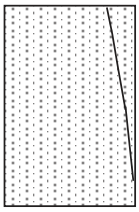
Sample Measurements

Length	200	
Diameter (Ø)	78.1	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	134	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength = $\frac{134000}{4788.19385}$

$= \frac{1000 \times P}{\prod \times (Ø/2)^2}$

= 27.97 (Mpa)

Bulk Density = 2.72 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet | *I.G.S.L.*

Sample Identification

Contract Name:	Data Centre Projects 3 - Profile Park
Job Number:	24188
Hole No:	RC02
Depth (m):	5.20m

Sample Description

Colour:	Dark grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

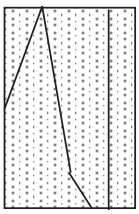
Sample Measurements

Length	199	
Diameter (Ø)	78	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	322	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{322000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 67.39 (Mpa)

Bulk Density = 2.69 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet

I.G.S.L.

Sample Identification

Contract Name:	Data Centre Projects 3 - Profile Park
Job Number:	24188
Hole No:	RC03
Depth (m):	8.80m

Sample Description

Colour:	Dark grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

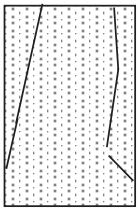
Sample Measurements

Length	199	
Diameter (Ø)	78	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	134	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{134000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 28.04 (Mpa)

Bulk Density $=$ 2.67 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet | *I.G.S.L.*

Sample Identification

Contract Name:	Data Centre Projects 3 - Profile Park
Job Number:	24188
Hole No:	RC04
Depth (m):	6.30m

Sample Description

Colour:	Dark grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

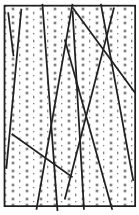
Sample Measurements

Length	203	
Diameter (Ø)	78	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	434	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{434000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

$=$ 90.83 (Mpa)

Bulk Density $=$ 2.65 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet | *I.G.S.L.*

Sample Identification

Contract Name:	Data Centre Projects 3 - Profile Park
Job Number:	24188
Hole No:	RC05
Depth (m):	4.30m

Sample Description

Colour:	Dark grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

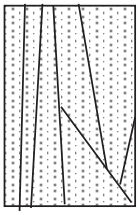
Sample Measurements

Length	202	
Diameter (Ø)	78	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	490	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength $= \dfrac{490000}{4775.94}$

$= \dfrac{1000 \times P}{\prod \times (Ø/2)^2}$

= 102.55 (Mpa)

Bulk Density = 2.68 (Mg/m^3)

Notes:

Uniaxial Compression Test Report Sheet | *I.G.S.L.*

Sample Identification

Contract Name:	Data Centre Projects 3 - Profile Park
Job Number:	24188
Hole No:	RC06
Depth (m):	5.80m

Sample Description

Colour:	Dark grey
Grain size:	Fine-grained
Weathering Grade:	Fresh
Rock Type:	LIMESTONE

Weathering Grade Criteria

I. Fresh:	Unchanged from original state
II. Slightly weathered:	Slight discolouration, slight weakening
III. Moderately weathered:	Considerable weakening, penetrative discolouration
IV. Highly weathered:	Considerable weakening, penetrative discolouration, breaks in hand

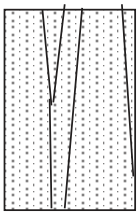
Sample Measurements

Length	188	
Diameter (Ø)	78	mm

Testing

Load Rate	4.3	kN/min
Load at Failure (P)	229	kN

Sketch of Failure Surfaces



Strength Calculations

Uniaxial Compressive Strength = $\frac{229000}{4775.94}$

= $\frac{1000 \times P}{\prod \times (Ø/2)^2}$

= 47.92 (Mpa)

Bulk Density = 2.64 (Mg/m^3)

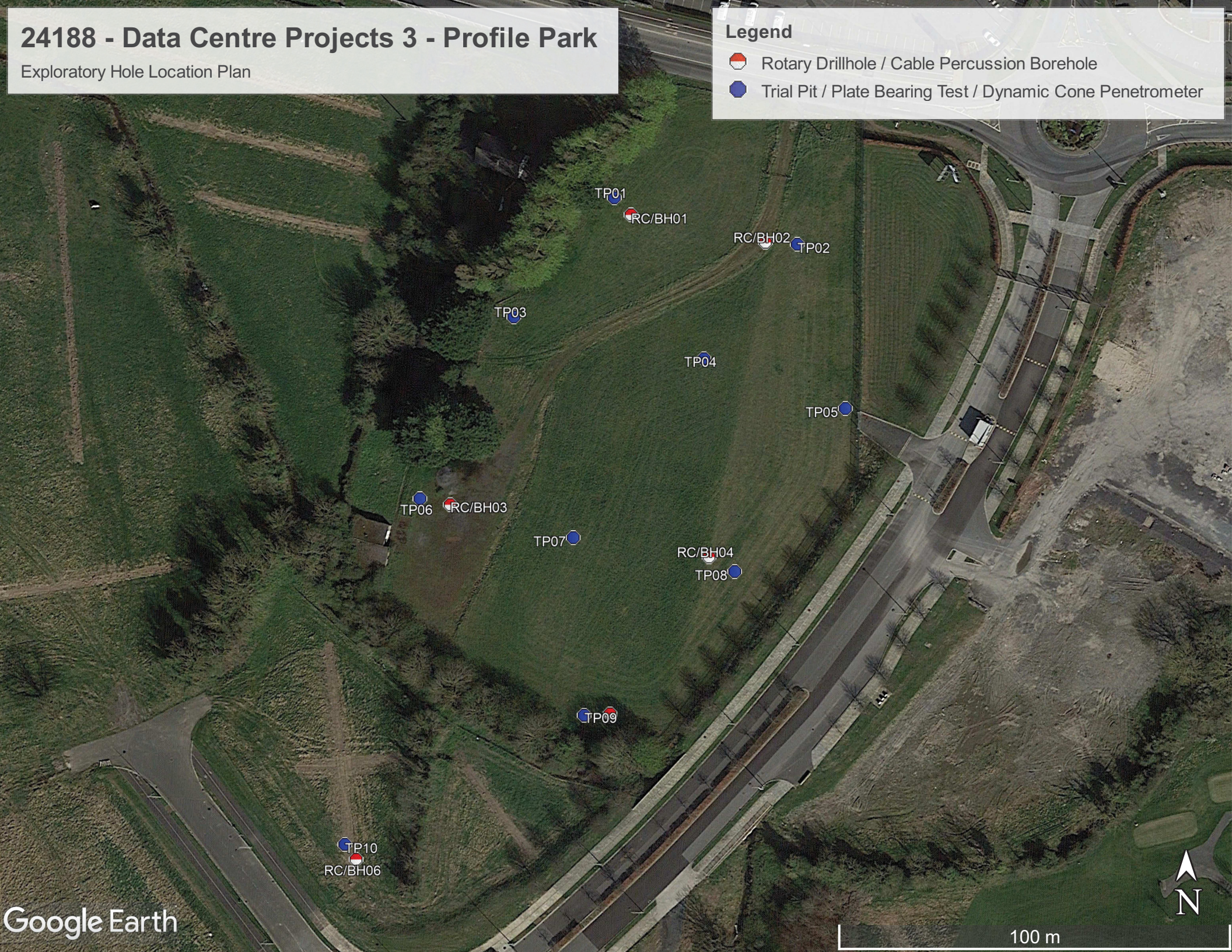
Notes:

Appendix 11

Exploratory Hole Location Plan

24188 - Data Centre Projects 3 - Profile Park

Exploratory Hole Location Plan



Technical Appendix 12.2: Contaminated Land Interpretative Report

Intended for
Vantage Data Centers DUB11 Limited
Date
September 2022

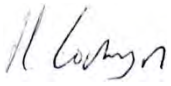
Project Number
1620014883

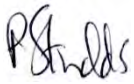
VANTAGE DUBLIN DATA CENTERS DUB13 CONTAMINATED LAND INTERPRETATIVE REPORT

RAMBOLL

VANTAGE DUBLIN DATA CENTERS DUB-13
CONTAMINATED LAND INTERPRETATIVE REPORT

Project Name	Vantage Dublin Data Centers DUB-13
Project No.	1620014883
Recipient	Vantage Data Centers DUB 11 Limited
Issue No.	P01
Document type	Report
Date	16/09/2022
Made by	Viktoriya Grygoryshchak
Checked by	Hazel Comyn
Approved by	Phil Studds
Document no.	1620014883-CLIR-01
Intended for purpose	For Information

Made by: 

Checked/Approved by: 

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Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
P01	14/10/2022	VG	HC	PS	Final issue

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Appendix 1
FIGURES AND DRAWINGS

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GENERIC QUANTITATIVE RISK ASSESSMENT SCREENING SHEETS

Appendix 3
HAZWASTEONLINE™ WASTE CLASSIFICATION

1. INTRODUCTION

1.1 Brief

Ramboll UK Limited (Ramboll) has been appointed by Vantage Data Centers DUB 11 Ltd (hereby referred to as Vantage, the Client) to support the proposed development of a data center (the 'proposed development') on the Profile Park Site, Kilcarbery (the 'site'), situated within the jurisdiction of South Dublin County Council (SDCC).

This report provides an assessment of risks associated with ground contamination. This report does not cover any issues other than those relating to contaminated land. For example, no geotechnical, ecological or archaeological studies are included in the scope of this report.

1.2 Previous Reports

An Environmental Impact Assessment Report (EIAR) has been prepared for Vantage - in accordance with the statutory procedures set out in the Planning and Development Act 2000 (as amended)[1] (the 'Act') and the Planning and Development Regulations 2001 (as amended)[2] (the 'Regulations') – to accompany an application (the 'application') seeking permission (also known as 'full permission') for a proposed data center (the 'proposed development') on the Profile Park Site, Kilcarbery (the 'site').

Geology and soils (and contamination) desk study information has been provided in Chapter 6 of the EIAR covering ground conditions and site history which allowed an initial indication of potential ground contamination risks at the site. A ground investigation was completed by IGSL Ltd. in September 2022 to provide data on ground conditions and quantify any ground contamination impacts in soils and groundwater/surface water at the site. This was provided to Ramboll in the following document: IGSL Ltd, 2022. Data Centre Project 3 Profile Park Ground Investigation Report Factual Project No 24188 (Draft).

This contaminated land risk assessment is based on the factual information provided by IGSL Ltd, 2022.

1.3 Proposed Development

In summary, the proposed development would comprise the following:

- Demolition of the existing double-story dwelling and three outbuildings/sheds;
- Erection of DUB-13 along with associated emergency generators and flues with a gross floor area of approximately 12,893 m^2;; and
- Provision of 60 car parking spaces and 26 bicycle parking spaces provision.

DUB-13 would comprise a two-storey data center of 12,893 m^2. The data storage facility would also include data storage rooms; associated electrical and mechanical plant rooms; loading bay; maintenance and storage space; office administration areas; plant at roof level; 13 double stacked standby generators with integral fuel tanks for emergency power to the data halls, admin and ancillary spaces with associated flues, each 22.3 m in height (95.95 m AOD) located to the south of the building; a house generator with integral fuel tanks that would provide emergency power to the admin and ancillary spaces; and a fuelling area to serve the proposed emergency generators.

1.4 Objectives

The objective of this report is to identify potential contaminated land risks and constraints associated with the ground conditions in the context of the proposed development, in accordance with current relevant legislation and guidance.

[1] Government of Ireland, 2000. Planning and Development Act 2000 (as amended). ISB. S.I. No. 30/2000.
[2] Government of Ireland, 2001-2019. Planning and Development Regulations 2001 (as amended). S.I. No. 600 of 2001. ISB.

1.5 Scope of Works

The scope of works includes:

- Review of the IGSL Ltd, 2022 report to provide a discussion of environmental ground conditions across the site;
- Interpretation of the IGSL Ltd, 2022 data to provide a Generic Quantitative Risk Assessment which provides an initial screen of potential ground contamination risks associated with the proposed development;
- Provide comment on soil waste management;
- Present a refined Conceptual Site Model (CSM) and qualitative risk assessment based on the findings of the ground investigations and data interpretation using the source-pathway-receptor methodology; and
- Present recommendations based on the findings of the ground investigation and the refined CSM.

1.6 General Limitations and Reliance

This report has been prepared by Ramboll exclusively for the intended use by the Client in accordance with the agreement between Ramboll and the Client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/ or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

The site investigation works were undertaken during a discrete period of time. The findings and conclusions presented in this report are accordingly factually limited by these circumstances and, unless stated otherwise in the report, are preliminary. The field investigations were restricted to a level of detail necessary to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant period of time has elapsed since the sampling took place. The interpretation of the geological and environmental quality conditions is based on extrapolation from point-source data in a heterogeneous environment. Accordingly, more detailed investigation may be appropriate dependent upon the client objectives.

2. SITE SETTING

2.1 Site details

The site is located at Irish grid reference O 03911 30784, within Profile Park, as shown in Figure 1 in Appendix 1. Geographically, the site is located in Profile Park, approximately 10 kilometres (km) to the south-west of Dublin city centre, within South Dublin County.

The site is a roughly rectangular parcel of agricultural land, with a residential dwelling located in the north-west corner of the site. The site covers a total area of 3.79 ha and lies at an elevation between approximately 74 and 75 m Above Ordnance Datum (m AOD).

The site boundaries are defined by:

- New Nangor Road (R134) to the north;
- Falcon Avenue, Equinix and Grange Castle Golf Club to the east;
- Falcon Avenue to the south; and
- The consented Vantage data centre development (planning reference SD21A/0241) to the west, currently agricultural fields.

The site consists of mostly flat agricultural land, with a residential property present towards the north-west of the site and outbuildings in the south-east. A track is present providing entrance to the field from the northern site boundary and towards the outbuildings.

The site's surrounding context predominantly comprises Profile Park and industrial development to the north, Grange Castle Golf Club to the east beyond which are residential properties, agricultural land and industrial development to the south and the consented Vantage data center development to the west, beyond which is Bolands Car Garage and further data centers (refer to Figure 2 in Appendix 1). The existing Baldonnel stream runs adjacent to the southern boundary of the site and enters the southern section of the site, orientated in a north-west to south-east direction, flowing towards the east.

The site can currently be accessed from three access points, two from the north off New Nangor Road (R134), and one from Falcon Avenue on the eastern border, which leads to a roundabout on the R134 New Nangor Road.

2.2 Potential sources of contamination

Due to the lack of development at the site and the historical agricultural use, the risk of contaminated soils being present onsite is considered low. There is a potential risk, albeit low, associated with migration of contaminants from the adjacent Bolands Garage, although it is noted that this land use is hydraulically down/cross gradient from the site.

A ground investigation was designed and completed to establish the presence of and quantify any ground contamination risks.

3. GROUND INVESTIGATION

3.1 Investigation Design

A ground investigation strategy was developed by Ramboll in consultation with the client and based on the findings of our previous Phase I ESA and proposed development design information. The investigation comprised of geotechnical and environmental ground investigation works. Ramboll appointed IGSL LTD, a Ramboll approved supplier, to undertake specific aspects of the intrusive investigation works.

The results of the geotechnical assessment are not discussed in this report.

3.2 Ground Investigation Activities

The ground investigation was undertaken by IGSL between July and August 2022. All works completed are detailed in the below referenced factual report which should be read in conjunction with this interpretative report:

- IGSL Ltd, 2022. Data Center Project 3 Profile Park. Ground Investigation Report – Factual. Project No 24188 (September 2022).

In summary the ground investigation works comprised:

- Trial pits (10 No.) advanced to between 1.8 m and 2.7 m below ground level (bgl);
- Cable percussive boreholes (6 No.) advanced to between 1.90 m and 2.0 mbgl with in-situ Standard Penetration Tests (SPTs);
- Rotary core drillholes (6 No.) all installed with groundwater monitoring wells;
- Plate load tests (10 No.);
- Geophysical survey (in-situ resistivity);
- Groundwater monitoring; and
- Surveying of exploratory locations.

Soil samples were submitted to Chemtest UK for laboratory testing of a range of determinands. No particular types of potential contaminants were identified from the current and historical use of the site, and therefore the 2022 ground investigation carried out by IGSL included a typical contaminated land chemical testing suite comprising of; heavy metals, total petroleum hydrocarbons (TPHs), asbestos, organic contaminants such as polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

All factual data including exploratory hole logs, and laboratory certificates are provided within the aforementioned IGSL Ltd, 2022.

Exploratory hole and sampling locations are shown on Figure 3, reproduced in Appendix 1.

4. GROUND CONDITIONS ENCOUNTERED

4.1 Ground Conditions

The ground conditions encountered on site during the ground investigation (IGSL Ltd, 2022) are described in Table 4.1 below.

Table 4.1: Summary of encountered ground conditions

Stratum	Typical Description	Range of Depth encountered (m bgl – below ground level)	Range of Thickness Encountered (m)
Topsoil	Topsoil	Ground level	0 – 0.50
Made Ground	Granular fill Encountered in TP06, BH03 (part of track leading to the outbuildings in the south-west of the site).	Ground level – 0.20	0 - 0.30
Glacial deposits	Firm to stiff brown and grey sandy and gravelly SILT/CLAY with occasional cobbles	0.30 – 0.50	1.00 – 1.40
Limestone	Grey sandy clayey angular GRAVEL with occasional boulders (possible weathered rock) Encountered in trial pits TP01 to TP10, with no known base.	1.50 – 1.90	Not proven

The ground conditions encountered across the site are generally comparable to the geology described on the GSI map for the area which indicates that the site is underlain by the undifferentiated Dublin Calp Limestone.

4.2 Groundwater

Groundwater strikes were noted as following as seepages or slow ingress in TP06 to TP10 between 1.80 m and 2.0 mbgl.

During IGSL's groundwater monitoring visit, the groundwater resting level was recorded to be between 1.67 m bgl (in RC05, south of the site) and 2.77 m bgl (RC01, north of the site).

4.3 Field Evidence of Contamination

No visual or olfactory observations of contamination noted in either soil or groundwater.

5. HUMAN HEALTH ASSESSMENT

The guidance document entitled 'Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites', published by the Environmental Protection Agency of the Republic of Ireland[3] has been referred to when assessing the results of the chemical analyses.

5.1 Assessment Approach

There are no statutory thresholds in Ireland for the assessment of soil contamination. For human health, the EPA recommends the use of GAC (generic assessment criteria), based on the UK Environment Agency Contaminated Land Exposure Assessment (CLEA) model, either produced by the UKEA itself or values generated using the CLEA model by reputable third-party organisations. Where GAC have not been published or if practitioners do not use human health GAC publications, values should be generated by appropriately qualified and experienced professionals using the CLEA model for consistency with the EPA approach.

Ramboll has derived GAC for the interpretation of soil and groundwater chemical analyses. The GAC are threshold-based screening criteria, below which a significant risk is not considered to be present. Contaminants at concentrations above the GAC do not infer an unacceptable risk; rather that further assessment is required to more fully understand potential contamination risks.

The Ramboll GAC for human health assessment are based on the generic scenarios outlined in the CLEA methodology and guidance documents, and include inhalation, ingestion, dermal contact of/with soil and dust and inhalation of volatiles as pathways for commercial and residential scenarios, as well as ingestion of homegrown produce for residential with gardens scenario. These have been calculated by use of CLEA Version 1.071.

Exceedances detected during the GAC screening are assessed further in the context of a qualitative source-pathway-receptor risk assessment presented in Section 7. This assessment has considered risk to human health in the context of the development of the Site for commercial / industrial purposes. As such, Ramboll has referred to GAC for commercial / industrial site use.

5.2 Results

The soil analytical results obtained during the ground investigations have been screened against the Ramboll GAC for commercial/industrial end use suitable for assessment of the proposed data centre use.

A total of nine soil samples were analysed for a range of metals PAHs, TPH and PCBs. The results have been screened against the appropriate GAC; the full screening sheets can be found in Appendix 2 showing all data and comparison to the GAC.

All measured concentrations were below the GAC indicating no significant risks to human health from soils for the proposed site use. PAHs, TPH and PCBs were also all laboratory below detection limits.

[3] Available at https://www.epa.ie/pubs/advice/waste/contaminatedland/contaminatedland/Guidance_on_the_Management_of_Contaminated_Land_and_Groundwater_at_EPA_Licensed_Sites_FINAL.pdf

6. WATER ENVIRONMENT ASSESSMENT

6.1 Assessment Approach

'Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites' indicates that values for screening of the impact on groundwater may come from several sources, including the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. no. 9 of 2010), the EPA's Groundwater Threshold Values (GTVs), the EPA's Interim Guideline Values (IGVs), and drinking water standards or relevant Environmental Quality Standards (EQSs), these latter for when considering a surface water receptor.

Concentrations of determinands (where detected in excess of laboratory reporting limits,) were assessed against the published quality standards for groundwater for initial screening purposes.

Exceedance of screening criteria does not infer that an unacceptable risk is present. In line with the risk-based approach taken in Ireland, the outcome of the screening is qualitatively assessed in the context of the conceptual Site model, to determine whether there is a viable (or potentially viable) source-pathway-receptor (S-P-R) linkage present between the contamination and a receptor.

If there is no S-P-R linkage (for example there is no pathway for the release to migrate, or a receptor is not present) then it can be inferred that the contamination does not pose a risk.

6.2 Water Analytical Results

Nine soil samples were analysed for leachable contaminants including pH, ammonium and metals. No groundwater samples were analysed.

The leachate concentrations are presented in comparison to the GAC protective of potable water supply and surface water environment in Appendix 2.

Nickel and lead were recorded marginally in exceedance of the bioavailable GAC in two samples. In order to calculate the bioavailable fraction from the measured concentrations, additional site specific parameters are needed which were not include in the analytical suite. However, typically the bioaccessible fraction would be less than half, which would suggest the nickel or lead impacts will not pose a significant risk to the water environment.

No significant risk to the water environment has been identified from the available data.

7. SOURCE-PATHWAY-RECEPTOR RISK ASSESSMENT

Sources:

- There are no potentially significant contaminative activities on-site;
- No significant visual or olfactory field evidence of contamination within soils or groundwater has been found on the site;
- Very low levels of soil contamination were recorded typical of a greenfield site at concentrations that do not present a significant risk to potential receptors have been found on-site;
- No asbestos was detected on site; and
- No significant potential off-site contamination sources have been identified.

In summary, no significant soil or groundwater impacts have been identified which may pose a risk to human health or the water environment based on the data available and the currently development proposals.

In the absence of any contamination sources, no further risk assessment is required.

8. SOIL WASTE MANAGEMENT

8.1 Methodology

The assessment has been undertaken using available soil chemical data and HazWasteOnline™, a web-based tool for classifying waste. The software utilises UK Environment Agency guidance and European regulations to classify samples in line with current requirements.

8.2 Soils Assessment

The analytical results for nine soil samples were entered into HazWasteOnline™ to provide a preliminary waste classification assessment. The HazWasteOnline™ output sheets are provided in Appendix 3.

All of the samples were classified as 'non-hazardous'.

8.3 Landfill Acceptance Criteria Testing

Nine soil samples were submitted for indicative laboratory Waste Acceptance Criteria (WAC) testing. The laboratory testing comprises generation of a leachate from the soil sample, which is subsequently analysed for a specific set of determinants against three landfill acceptance criteria. These are: Inert Waste Landfill, Stable Non-reactive Hazardous Waste (in non-hazardous landfill), and Hazardous Landfill.

The results of the WAC testing are presented in IGSL, 2022.

All nine samples analysed do not exceed the 'Inert Waste Landfill' criteria. Should this material be designated for off-site disposal to landfill, the HazWasteOnline™ classification report and laboratory WAC testing results should be passed for review by the receiving landfill.

8.4 Summary

Based on the information available, the soils on site will be classed as 'non-hazardous'.

Any material different from the encountered material during the ground investigation, and any material with visible contamination should be separated from the remaining soils.

The classification of waste reported above must be confirmed by the receiving landfill prior to disposal, under Duty of Care. Any material to be disposed of as hazardous or inert must have WAC analysis provided to confirm appropriate class of landfill (with the exception of clean natural strata).

WAC testing was completed on nine samples and indicated that these soils may be suitable for acceptance in an inert landfill.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

9.1.1 Soil and Groundwater Contamination

No significant ground contamination impacts have been identified which may pose a risk to human health or the water environment based on the data available and the current development proposals.

9.1.2 Soil Waste Management

Based on the information available, the Made Ground will be classed as 'non-hazardous'.

Any material different from the encountered material during the ground investigation, and any material with visible contamination should be separated from the remaining soils.

The classification of waste reported above must be confirmed by the receiving landfill prior to disposal, under Duty of Care. Any material to be disposed of as hazardous or inert must have WAC analysis provided to confirm appropriate class of landfill (with the exception of clean natural strata).

Any material to be disposed of as hazardous or inert waste must have WAC analysis provided to confirm appropriate class of landfill. WAC testing completed on 13 samples and indicated that the soil may be suitable for acceptance in an inert landfill.

9.2 Recommendations

Should the reuse of site won material be required, then best practice dictates that the reuse should be carried out in accordance with an appropriately designed Material Management Plan, typically using procedures given in the CL:AIRE, 2011 Definition of Waste: Code of Practice (DoWCoP).

To conform with DoWCoP, the following items will be required:

- Remedial statement/strategy including, *inter alia,* a methodology for the management of unsuspected contamination which may be encountered during works including for consultation with an appropriately qualified environmental consultant, stockpiling and additional chemical testing / assessment prior to re-use;
- Material management plan (earthworks strategy); and
- Production of a Validation Report.

An environmental watching brief by an appropriately qualified environmental consultant is recommended, in particular during the earthworks phases of development, with subsequent validation sampling in accordance with the methodology outlined within the Material Management Plan/Remediation Strategy. This will allow an independent verification report to be prepared which will be required after works are complete.

APPENDIX 1
FIGURES AND DRAWINGS

Figure 1: Site Location

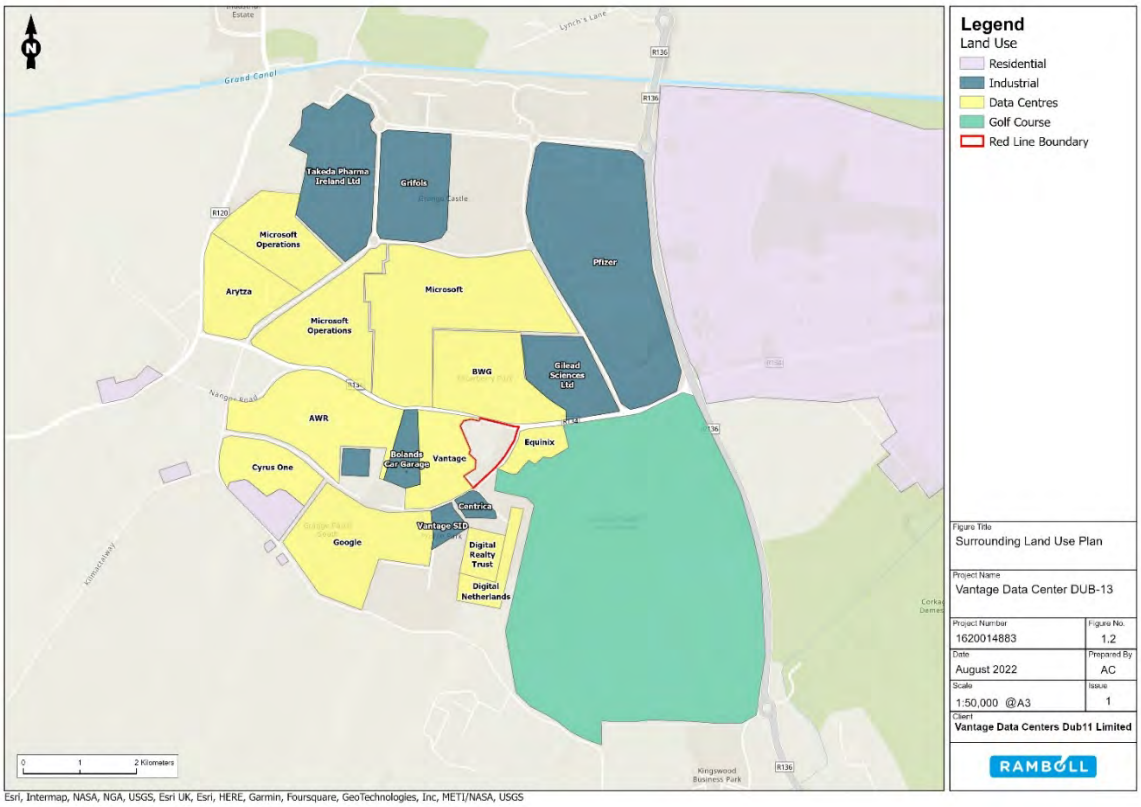


Figure 2: Surrounding Land Uses Plan

Figure 3: Exploratory Hole Location Plan

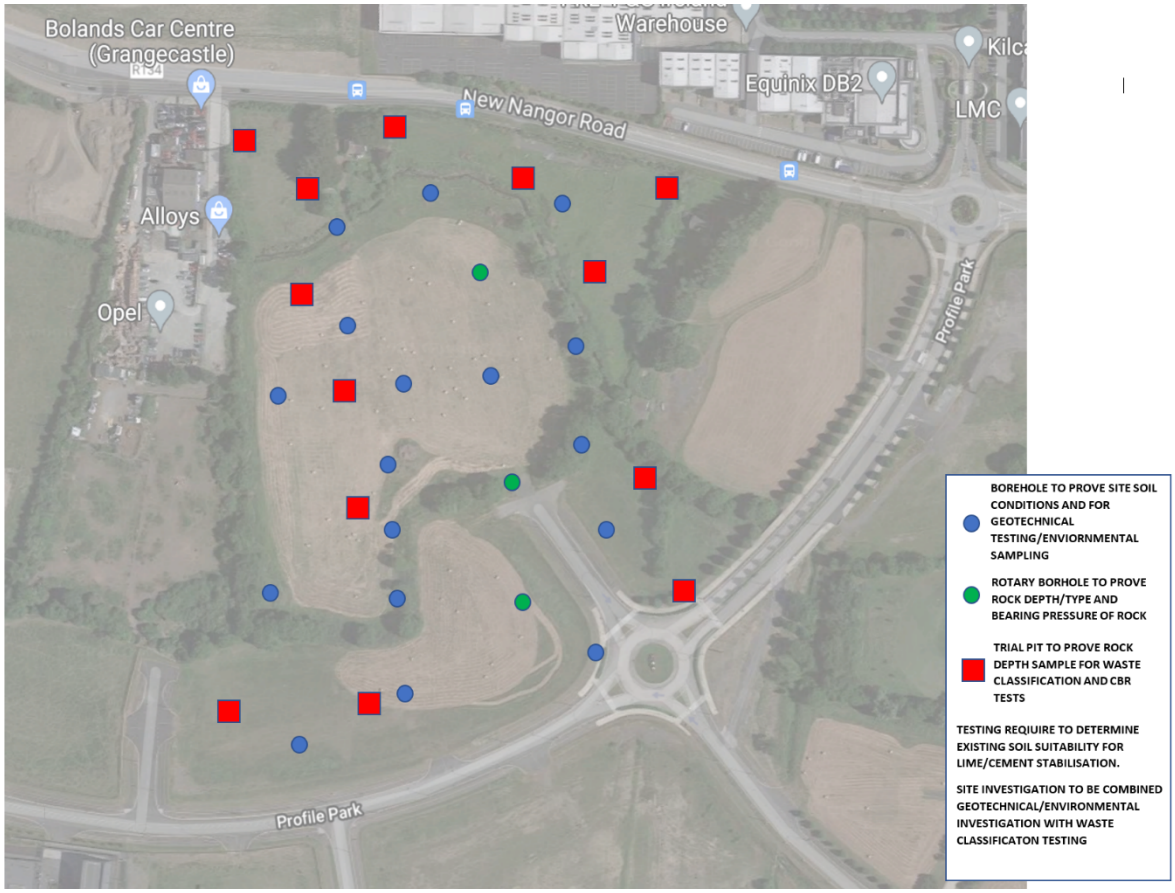
APPENDIX 2
GENERIC QUANTITATIVE RISK ASSESSMENT SCREENING SHEETS

APPENDIX 2
GROUND INVESTIGATION DESIGN SCOPE

From: James Mayer <james.m@iepinnacle.com>
Sent: 13 May 2021 21:06
To: paulquigley@igsl.ie
Subject: Profile Park, Grange Castle, Dublin

Hi Paul

We are looking at the above development for our client for an industrial project (refer site location plan below).



Refer attached for a site plan indicating trial pits, borehole and CBR test locations - could you provide us with a price and programme to undertake the site investigation works to include for the following:-

- 13 No trial Pits across the site as indicated on the attached plan
- 17 No boreholes (with ground water installations)
- 3 No Rotary Boreholes
- CBR test Across the site (trial Pits)
- Allowance should be made for geotechnical testing to confirm bearing pressures across the site to support 2 storey industrial building (up to 4500KN column loads), identification of various strata and testing of soils for reuse within ground works across the site (lime/cement stabilisation is being considered), but also an understanding of their natural properties for reuse
- Logging of ground water across the site
- Environmental sampling of soil and ground water from across the site
- Waste Classification of soil across the site
- Allow for 4No. Infiltration tests (locations to be confirmed)
- Interpretive Geotechnical and Environmental Report

Please could you provide your budget quote and programme on or before Wednesday 20th May, could you also provide a programme for start on site, initial reporting (boreholes and trial pit logs) and timescales for final report based on your current commitments.

Should you have any comments or queries, please do not hesitate to contact us.

Regards

James Mayer MEng MIEI
Director

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APPENDIX 3
GENERIC QUANTITATIVE RISK ASSESSMENT SCREENING SHEETS

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

					BH02	BH04	BH06	TP03	TP04	TP05	TP06	TP07	TP10
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Determinand	**Type**	**Units**	**DWS**	**EQS**	**1.00**	**1.00**	**1.00**	**0.60**	**0.50**	**2.00**	**0.50**	**0.50**	**1.50**
pH	10:1				8.1	8.2	8.2	8.3	7.8	8.1	8.4	8.0	8.3
Ammonium	10:1	mg/l	0.5	0.3	0.068	0.070	0.080	< 0.050	0.16	0.051	< 0.050	0.082	0.072
Arsenic	10:1	mg/l	0.01	0.0250	0.0007	0.0004	0.0003	0.0003	0.0041	0.0003	0.0003	0.0038	0.0002
Barium	10:1	mg/l			< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium	10:1	mg/l	0.005	0.00008- 0.00025	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.00014	< 0.00011	< 0.00011	0.00011	< 0.00011
Chromium	10:1	mg/l	0.05	0.03	< 0.0005	< 0.0005	< 0.0005	0.0006	0.0042	< 0.0005	< 0.0005	0.0029	< 0.0005
Copper	10:1	mg/l	2	0.0300	0.0007	0.0005	0.0008	0.0007	0.0089	< 0.0005	< 0.0005	0.0050	0.0006
Mercury	10:1	mg/l	0.001	0.001	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Molybdenum	10:1	mg/l			0.0051	0.0063	0.0067	0.0031	0.0015	0.0044	0.0072	0.0026	0.0079
Nickel	10:1	mg/l	0.02	0.004 (bio)	< 0.0005	< 0.0005	0.0005	< 0.0005	**0.0086**	< 0.0005	< 0.0005	**0.0061**	< 0.0005
Lead	10:1	mg/l	0.01	0.0012 (bio)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	**0.0020**	< 0.0005	< 0.0005	**0.0021**	< 0.0005
Antimony	10:1	mg/l			< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005	0.0006	< 0.0005
Selenium	10:1	mg/l			< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	0.0007	0.0006	0.0009	0.0013
Zinc	10:1	mg/l	5	0.100	0.003	< 0.003	< 0.003	< 0.003	0.026	< 0.003	< 0.003	0.016	< 0.003
Chloride	10:1	mg/l			< 1.0	1.0	< 1.0	1.3	1.7	< 1.0	1.4	1.8	< 1.0
Fluoride	10:1	mg/l			0.50	0.32	0.36	0.39	0.17	0.33	0.36	0.47	0.31
Sulphate	10:1	mg/l			1.8	1.0	< 1.0	< 1.0	3.1	2.0	1.4	2.0	1.0

DWS	https://www.epa.ie/publications/compliance--enforcement/drinking-water/advice--guidance/european-communities-drinking-water-no-2-regulations-2007.php
EQS	https://www.legislation.gov.uk/eudr/2008/105/annex/I
	https://www.rte.ie/documents/news/2017/08/water-quality-in-ireland-2010-2015.pdf
	WFD EU legislation

Project: 24188 - Profile Park - Data Centre Site 3 (Ramboll)

Client: IGSL				22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951				1487829	1487830	1487831	1487832	1487833	1487834	1487835	1487836	1487837	1487838	1487839	1487840	1487841	1487842
Order No.:				AA171725	AA171726	AA171722	AA171721	AA171723	AA171726	180436	180428	180432	180431	180426	180420	180418	180440
				BH01	BH02	BH03	BH04	BH05	BH06	TP02	TP03	TP04	TP05	TP06	TP07	TP09	TP10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				1.00	1.00	1.00	1.00	1.00	1.00	1.80	0.60	0.50	2.00	0.50	0.50	0.50	1.50
			GAC commercial /		DURHAM		DURHAM		DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		DURHAM
Determinand	**Units**	**LOD**	**industrial end use**														
ACM Type		N/A			-		-		-		-	-	-	-	-		-
Asbestos Identification		N/A	Presence?		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected
Moisture	%	0.020		11	21	12	14	14	13	11	11	15	16	8.9	14	9.3	9.2
pH (2.5:1)		4.0		[A] 8.9		[A] 9.1		[A] 8.6		[A] 8.7						[A] 8.8	
Boron (Hot Water Soluble)	mg/kg	0.40			[A] < 0.40		[A] < 0.40		[A] < 0.40		[A] < 0.40	[A] < 0.40	[A] < 0.40	[A] < 0.40	[A] < 0.40		[A] < 0.40
Magnesium (Water Soluble)	g/l	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010						[A] < 0.010	
Sulphate (2:1 Water Soluble) as SO4	g/l	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010						[A] < 0.010	
Total Sulphur	%	0.010		[A] 0.048		[A] 0.095		[A] 0.073		[A] 0.054						[A] 0.047	
Sulphur (Elemental)	mg/kg	1.0			[A] 1.4		[A] 1.1		[A] 1.6		[A] 1.0	[A] 1.3	[A] < 1.0	[A] < 1.0	[A] 1.5		[A] 1.3
Chloride (Water Soluble)	g/l	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010						[A] < 0.010	
Nitrate (Water Soluble)	g/l	0.010		< 0.010		< 0.010		< 0.010		< 0.010						< 0.010	
Cyanide (Total)	mg/kg	0.50			[A] < 0.50		[A] < 0.50		[A] < 0.50		[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50	[A] < 0.50		[A] < 0.50
Sulphide (Easily Liberatable)	mg/kg	0.50			[A] 7.4		[A] 26		[A] 24		[A] 16	[A] 1.2	[A] 7.0	[A] 39	[A] 1.4		[A] 0.65
Ammonium (Water Soluble)	g/l	0.01		< 0.01		< 0.01		< 0.01		< 0.01						< 0.01	
Sulphate (Acid Soluble)	%	0.010		[A] 0.020	[A] 0.026	[A] 0.014	[A] 0.026	[A] 0.017	[A] 0.018	[A] 0.031	[A] 0.019	[A] 0.019	[A] 0.014	[A] 0.017	[A] 0.021	[A] 0.021	[A] 0.010
Arsenic	mg/kg	0.5	640		6.8		7.2		14		7.0	12	4.8	4.0	8.4		8.9
Barium	mg/kg	0	22000		41		36		92		17	92	14	16	39		21
Cadmium	mg/kg	0.10	410		1.2		1.6		0.61		0.16	3.2	0.14	0.40	0.87		0.47
Chromium	mg/kg	0.5	8600		8.7		8.9		37		8.0	16	7.7	6.0	14		6.5
Molybdenum	mg/kg	0.5	18000		2.5		3.3		3.1		1.3	3.2	2.7	1.8	1.7		3.5
Antimony	mg/kg	2.0	7400		< 2.0		< 2.0		< 2.0		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0		< 2.0
Copper	mg/kg	0.50	68000		19		22		25		16	30	15	13	16		18
Mercury	mg/kg	0.05	1100		0.05		< 0.05		0.05		< 0.05	0.05	< 0.05	< 0.05	< 0.05		0.60
Nickel	mg/kg	0.50	980		27		42		32		23	56	32	20	28		24
Lead	mg/kg	0.50	2300		22		11		16		8.9	26	7.6	9.0	15		43
Selenium	mg/kg	0.25	12000		0.57		0.49		1.0		0.45	1.2	1.9	0.48	0.56		1.5
Zinc	mg/kg	0.50	730000		56		62		71		11	86	12	18	59		41
Chromium (Trivalent)	mg/kg	1.0			8.7		8.9		37		8.0	16	7.7	6.0	14		6.5
Chromium (Hexavalent)	mg/kg	0.50			< 0.50		< 0.50		< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		< 0.50
Mineral Oil (TPH Calculation)	mg/kg	10			< 10		< 10		< 10		< 10	< 10	< 10	< 10	< 10		< 10
Aliphatic TPH >C5-C6	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C6-C8	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C8-C10	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C10-C12	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C12-C16	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C16-C21	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C21-C35	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aliphatic TPH >C35-C44	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Total Aliphatic Hydrocarbons	mg/kg	5.0			[A] < 5.0		[A] < 5.0		[A] < 5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0
Aromatic TPH >C5-C7	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C7-C8	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C8-C10	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C10-C12	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C12-C16	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C16-C21	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C21-C35	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Aromatic TPH >C35-C44	mg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Total Aromatic Hydrocarbons	mg/kg	5.0			[A] < 5.0		[A] < 5.0		[A] < 5.0		[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0	[A] < 5.0		[A] < 5.0
Total Petroleum Hydrocarbons	mg/kg	10.0			[A] < 10		[A] < 10		[A] < 10		[A] < 10	[A] < 10	[A] < 10	[A] < 10	[A] < 10		[A] < 10
Benzene	µg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Toluene	µg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Ethylbenzene	µg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
m & p-Xylene	µg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
o-Xylene	µg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Methyl Tert-Butyl Ether	µg/kg	1.0			[A] < 1.0		[A] < 1.0		[A] < 1.0		[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0	[A] < 1.0		[A] < 1.0
Naphthalene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Acenaphthylene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Acenaphthene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010

Client: IGSL				22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072	22-31072
Quotation No.: Q20-19951				1487829	1487830	1487831	1487832	1487833	1487834	1487835	1487836	1487837	1487838	1487839	1487840	1487841	1487842
Order No.:				AA171725	AA171726	AA171722	AA171721	AA171723	AA171726	180436	180428	180432	180431	180426	180420	180418	180440
				BH01	BH02	BH03	BH04	BH05	BH06	TP02	TP03	TP04	TP05	TP06	TP07	TP09	TP10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				1.00	1.00	1.00	1.00	1.00	1.00	1.80	0.60	0.50	2.00	0.50	0.50	0.50	1.50
					DURHAM		DURHAM		DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM		DURHAM
Determinand	**Units**	**LOD**	**GAC commercial / industrial end use**														
Fluorene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Phenanthrene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Anthracene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Fluoranthene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Pyrene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[a]anthracene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Chrysene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[b]fluoranthene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[k]fluoranthene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[a]pyrene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Dibenz(a,h)Anthracene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Benzo[g,h,i]perylene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Coronene	mg/kg	0.010			[A] < 0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010		[A] < 0.010
Total Of 17 PAH's	mg/kg	0.20			[A] < 0.20		[A] < 0.20		[A] < 0.20		[A] < 0.20	[A] < 0.20	[A] < 0.20	[A] < 0.20	[A] < 0.20		[A] < 0.20
PCB 28	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 52	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 90+101	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 118	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 153	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 138	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
PCB 180	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
Total PCBs (7 congeners)	mg/kg	0.0010			[A] < 0.0010		[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010	[A] < 0.0010		[A] < 0.0010
Total Phenols	mg/kg	0.10			< 0.10		< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		< 0.10

APPENDIX 4
HAZWASTEONLINE™ WASTE CLASSIFICATION

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

T4Q0P-1DLW3-CZ5BK

Job name

Dub 13

Description/Comments

Project

Site

Classified by

Name:
Hazel Comyn
Date:
16 Sep 2022 07:59 GMT
Telephone:
0113 204 2880

Company:
Ramboll UK Ltd
1 Broad Gate
The Headrow
Leeds
LS1 8EQ

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: -

Course	Date
Hazardous Waste Classification	50% complete

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	BH02	1.00	Non Hazardous		2
2	BH04	1.00	Non Hazardous		4
3	BH06	1.00	Non Hazardous		6
4	TP03	0.60	Non Hazardous		8
5	TP04	0.50	Non Hazardous		10
6	TP05	2.00	Non Hazardous		12
7	TP06	0.50	Non Hazardous		14
8	TP07	0.50	Non Hazardous		16
9	TP10	1.50	Non Hazardous		18

Related documents

#	Name	Description
1	Ramboll Suite B, asbestos +barium	waste stream template used to create this Job

Report

Created by: Hazel Comyn

Created date: 16 Sep 2022 07:59 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	20
Appendix B: Rationale for selection of metal species	21
Appendix C: Version	21

Classification of sample: BH02

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
BH02
Sample Depth:
1.00 m
Moisture content:
21%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 21% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6.8 mg/kg	1.32	7.42 mg/kg	0.000742 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		41 mg/kg	1.516	51.38 mg/kg	0.00514 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.2 mg/kg	1.142	1.133 mg/kg	0.000113 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		8.7 mg/kg	1.462	10.509 mg/kg	0.00105 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		19 mg/kg	1.126	17.679 mg/kg	0.00177 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	22 mg/kg	1.56	28.36 mg/kg	0.00182 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.05 mg/kg	1.353	0.0559 mg/kg	0.00000559 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		27 mg/kg	2.976	66.413 mg/kg	0.00664 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.57 mg/kg	1.405	0.662 mg/kg	0.0000662 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		56 mg/kg	2.774	128.39 mg/kg	0.0128 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<**LOD**
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<**LOD**
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0304 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH04

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
BH04
Sample Depth:
1.00 m
Moisture content:
14%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7.2 mg/kg	1.32	8.339 mg/kg	0.000834 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		36 mg/kg	1.516	47.884 mg/kg	0.00479 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.6 mg/kg	1.142	1.603 mg/kg	0.00016 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		8.9 mg/kg	1.462	11.41 mg/kg	0.00114 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		22 mg/kg	1.126	21.728 mg/kg	0.00217 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	11 mg/kg	1.56	15.051 mg/kg	0.000965 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.05 mg/kg	1.353	<0.0677 mg/kg	<0.00000677 %		<**LOD**
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		42 mg/kg	2.976	109.652 mg/kg	0.011 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.49 mg/kg	1.405	0.604 mg/kg	0.0000604 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		62 mg/kg	2.774	150.875 mg/kg	0.0151 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<**LOD**
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<**LOD**
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0364 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: BH06

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
BH06
Sample Depth:
1.00 m
Moisture content:
13%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 13% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		14 mg/kg	1.32	16.358 mg/kg	0.00164 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		92 mg/kg	1.516	123.453 mg/kg	0.0123 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.61 mg/kg	1.142	0.617 mg/kg	0.0000617 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		37 mg/kg	1.462	47.856 mg/kg	0.00479 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		25 mg/kg	1.126	24.909 mg/kg	0.00249 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	16 mg/kg	1.56	22.086 mg/kg	0.00142 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.05 mg/kg	1.353	0.0599 mg/kg	0.00000599 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		32 mg/kg	2.976	84.284 mg/kg	0.00843 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1 mg/kg	1.405	1.243 mg/kg	0.000124 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		71 mg/kg	2.774	174.305 mg/kg	0.0174 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0489 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP03

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP03
Sample Depth:
0.60 m
Moisture content:
11%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 11% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		7 mg/kg	1.32	8.326 mg/kg	0.000833 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		17 mg/kg	1.516	23.223 mg/kg	0.00232 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.16 mg/kg	1.142	0.165 mg/kg	0.0000165 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		8 mg/kg	1.462	10.534 mg/kg	0.00105 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		16 mg/kg	1.126	16.229 mg/kg	0.00162 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	8.9 mg/kg	1.56	12.507 mg/kg	0.000802 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.05 mg/kg	1.353	<0.0677 mg/kg	<0.00000677 %		<LOD
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		23 mg/kg	2.976	61.67 mg/kg	0.00617 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.45 mg/kg	1.405	0.57 mg/kg	0.000057 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		11 mg/kg	2.774	27.492 mg/kg	0.00275 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0158 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP04

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP04
Sample Depth:
0.50 m
Moisture content:
15%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12 mg/kg	1.32	13.777 mg/kg	0.00138 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		92 mg/kg	1.516	121.306 mg/kg	0.0121 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		3.2 mg/kg	1.142	3.179 mg/kg	0.000318 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		16 mg/kg	1.462	20.335 mg/kg	0.00203 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		30 mg/kg	1.126	29.371 mg/kg	0.00294 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	26 mg/kg	1.56	35.265 mg/kg	0.00226 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.05 mg/kg	1.353	0.0588 mg/kg	0.00000588 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		56 mg/kg	2.976	144.931 mg/kg	0.0145 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1.2 mg/kg	1.405	1.466 mg/kg	0.000147 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		86 mg/kg	2.774	207.458 mg/kg	0.0207 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0567 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP05

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP05
Sample Depth:
2.00 m
Moisture content:
16%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 16% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4.8 mg/kg	1.32	5.463 mg/kg	0.000546 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		14 mg/kg	1.516	18.301 mg/kg	0.00183 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.14 mg/kg	1.142	0.138 mg/kg	0.0000138 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		7.7 mg/kg	1.462	9.702 mg/kg	0.00097 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		15 mg/kg	1.126	14.559 mg/kg	0.00146 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	7.6 mg/kg	1.56	10.219 mg/kg	0.000655 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.05 mg/kg	1.353	<0.0677 mg/kg	<0.00000677 %		<LOD
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		32 mg/kg	2.976	82.104 mg/kg	0.00821 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1.9 mg/kg	1.405	2.301 mg/kg	0.00023 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		12 mg/kg	2.774	28.698 mg/kg	0.00287 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.017 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP06

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP06
Sample Depth:
0.50 m
Moisture content:
8.9%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 8.9% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		4 mg/kg	1.32	4.85 mg/kg	0.000485 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		16 mg/kg	1.516	22.278 mg/kg	0.00223 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.4 mg/kg	1.142	0.42 mg/kg	0.000042 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		6 mg/kg	1.462	8.053 mg/kg	0.000805 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		13 mg/kg	1.126	13.44 mg/kg	0.00134 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	9 mg/kg	1.56	12.891 mg/kg	0.000826 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.05 mg/kg	1.353	<0.0677 mg/kg	<0.00000677 %		<LOD
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		20 mg/kg	2.976	54.661 mg/kg	0.00547 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.48 mg/kg	1.405	0.619 mg/kg	0.0000619 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		18 mg/kg	2.774	45.854 mg/kg	0.00459 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0161 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP07

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP07
Sample Depth:
0.50 m
Moisture content:
14%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		8.4 mg/kg	1.32	9.729 mg/kg	0.000973 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		39 mg/kg	1.516	51.874 mg/kg	0.00519 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.87 mg/kg	1.142	0.872 mg/kg	0.0000872 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		14 mg/kg	1.462	17.949 mg/kg	0.00179 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		16 mg/kg	1.126	15.802 mg/kg	0.00158 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	15 mg/kg	1.56	20.524 mg/kg	0.00132 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.05 mg/kg	1.353	<0.0677 mg/kg	<0.00000677 %		<LOD
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		28 mg/kg	2.976	73.101 mg/kg	0.00731 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				0.56 mg/kg	1.405	0.69 mg/kg	0.000069 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		59 mg/kg	2.774	143.574 mg/kg	0.0144 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
16		fluorene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7							
17		phenanthrene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8							
18		anthracene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7							
19		fluoranthene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0							
20		pyrene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0							
21		benzo[a]anthracene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3							
22		chrysene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9							
23		benzo[b]fluoranthene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2							
24		benzo[k]fluoranthene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9							
25		benzo[a]pyrene; benzo[def]chrysene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8							
26		indeno[123-cd]pyrene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5							
27		dibenz[a,h]anthracene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3							
28		benzo[ghi]perylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2							
29		asbestos				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5							
									Total:	0.0329 %	

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP10

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP10
Sample Depth:
1.50 m
Moisture content:
9.2%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 9.2% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		8.9 mg/kg	1.32	10.761 mg/kg	0.00108 %	✓	
2	barium { barium chloride }	056-004-00-8	233-788-1	10361-37-2		21 mg/kg	1.516	29.16 mg/kg	0.00292 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.47 mg/kg	1.142	0.492 mg/kg	0.0000492 %	✓	
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		6.5 mg/kg	1.462	8.7 mg/kg	0.00087 %	✓	
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		18 mg/kg	1.126	18.559 mg/kg	0.00186 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	43 mg/kg	1.56	61.421 mg/kg	0.00394 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.6 mg/kg	1.353	0.744 mg/kg	0.0000744 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		24 mg/kg	2.976	65.412 mg/kg	0.00654 %	✓	
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				1.5 mg/kg	1.405	1.93 mg/kg	0.000193 %	✓	
10	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		41 mg/kg	2.774	104.158 mg/kg	0.0104 %	✓	
11	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %		<LOD
12	TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<LOD
13	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
14	acenaphthylene		205-917-1	208-96-8		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
15	acenaphthene		201-469-6	83-32-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-695-5	86-73-7									
17		phenanthrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			201-581-5	85-01-8									
18		anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-371-1	120-12-7									
19		fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-912-4	206-44-0									
20		pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			204-927-3	129-00-0									
21		benzo[a]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
22		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
23		benzo[b]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
24		benzo[k]fluoranthene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
25		benzo[a]pyrene; benzo[def]chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
26		indeno[123-cd]pyrene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-893-2	193-39-5									
27		dibenz[a,h]anthracene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
28		benzo[ghi]perylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
			205-883-8	191-24-2									
29		asbestos				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.0281 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

- **chromium(III) oxide (worst case)** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds.

barium {barium chloride}

More likely species

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history.

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass.

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected.

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight.

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight.

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight.

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil.

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight.

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide].

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2022.255.5323.9951 (12 Sep 2022)
HazWasteOnline Database: 2022.255.5323.9951 (12 Sep 2022)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021