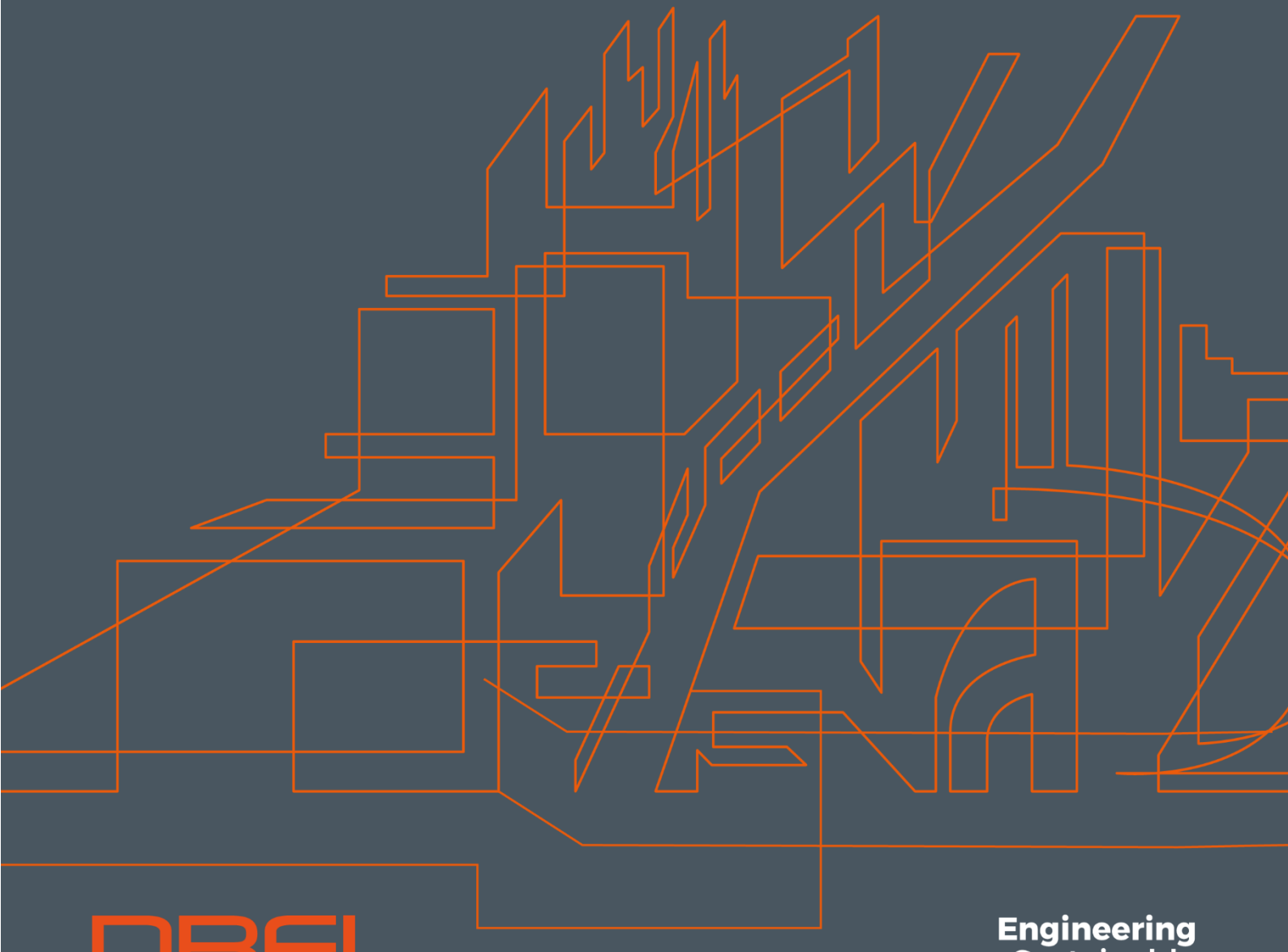
Proposed Residential-Led Mixed-Use Development, Sandford Road, Dublin 6

Site Specific Flood Risk Assessment

190226-X-X-X-XXX-RP-DBFL-CE-0003

December 2025



DBFL CONSULTING ENGINEERS

Engineering Sustainable Futures

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Document Title:	**Site Specific Flood Risk Assessment**		
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Contents

1 Introduction 4
1.1 Background 4
1.2 Objectives 5
1.3 Flood Risk Assessment Scope 5
1.4 Approach 5
1.5 Existing Site 6
1.6 Topography and Site Characteristics 7
2 Planning System & Flood Risk Management Guidelines 8
2.1 General 8
2.2 Sequential Approach 8
2.3 Flood Risk Assessment Stages 9
3 Stage 1 – Flood Risk Identification 10
3.1 General 10
3.2 Information Sources 10
3.2.1 OPW National Flood Hazard and Benefiting Lands Mapping 11
3.2.2 Dodder CFRAMS Study 11
3.2.3 Strategic Flood Risk Assessment for Dublin City Development Plan 2022 – 2028 12
3.2.4 Other Sources 12
3.3 Source – Pathway – Receptor Model 13
4 Stage 2 – Initial Flood Risk Assessment 15
4.1 Initial Fluvial Flood Risk Assessment 15
4.2 Initial Pluvial Flood Risk Assessment 16
4.3 Initial Groundwater Flood Risk Assessment 16
4.4 Flood Zone Category 16
5 Stage 3 – Detailed Flood Risk Assessment 17

5.1 General 17
5.2 Surface Water Management Measures and SuDS 17
5.3 Flood Exceedance 18
5.4 Impact on Adjacent Areas 19
5.5 Climate Change 19
5.6 Access and Egress for Emergency Services During Flood Events 19
5.7 Residual Risks 19
5.8 Mitigation Measures 20
5.8.1 Effectiveness of Mitigation Measures 20
6 Conclusion 21
Appendix A : Flood Hazard Information ..... A
Appendix B : GII Site Investigation Report Extracts ..... B

Figures

Figure 1-1 Site Location (Site Boundary Indicative Only) 6
Figure 1-2 Extract from EPA Online Mapping Service 7
Figure 2-1 Extract from The Planning System and Flood Risk Management Guidelines (Fig. 3.2 Sequential Approach Mechanism in the Planning Process) 8
Figure 3-1: Extract from Dodder CFRAMS Mapping (Source: floodinfo.ie) 12
Figure 5-1 Flood Exceedance (>1%AEP) Overland Flow Routes 18

Tables

Table 3-1: Information Sources Consulted 10
Table 3-2 Source-Pathway-Receptor Analysis 13

1 Introduction

1.1 Background

DBFL Consulting Engineers have been instructed to prepare a Site-Specific Flood Risk Assessment (SSFRA) to accompany a planning application for a Large-Scale Residential Development at a c. 4.26-hectare site at Milltown Park, Sandford Road, Dublin 6, D06 V9K7. Works are also proposed on Milltown Road and Sandford Road to facilitate access to the development including improvements to pedestrian facilities on an area of c. 0.16 hectares. The development's surface water drainage network shall discharge from the site via a proposed 300mm diameter pipe along Milltown Road through the junction of Milltown Road / Sandford Road prior to outfalling to the existing drainage network on Eglinton Road (approximately 200 metres from the Sandford Road / Eglinton Road junction), with these works incorporating an area of c. 0.32 hectares. The development site area, road works and drainage works areas will provide a total application site area of c. 4.74 hectares.

The development also includes the provision of: cultural/community space within Tabor House (4 No. storeys including lower ground floor level) and the Chapel (2 No. storeys including lower ground floor level and mezzanine level) (1,698 sq. m) with associated outdoor space (248 sq. m); a café/restaurant (179 sq. m) and a creche (375 sq. m) within Block F with associated outdoor creche play area; ancillary residents' amenities and facilities (324 sq. m) within Blocks B & C; and a single storey bin store and substation adjacent to Block F (101 sq. m).

The development also provides a new access from Milltown Road (which will be the principal vehicular entrance to the site) in addition to utilising and upgrading the existing access from Sandford Road as a secondary access principally for deliveries, emergencies and taxis; new pedestrian access points; pedestrian/bicycle connections through the site; 319 No. car parking spaces (288 No. at basement level and 31 No. at surface level); set down area for deliveries; bicycle parking; 22 No. motorcycle spaces; bin storage; boundary treatments; private balconies and terraces facing all directions; hard and soft landscaping including public open space and communal open space; green/blue roofs; PV panels; substations; lighting; plant; lift cores and overruns; and all other associated site works above and below ground.

This SSFRA should be read in conjunction with DBFL's Infrastructure Design Report (190226-X-X-X-XXX-RP-DBFL-CE-0002).

1.2 Objectives

The objectives of this report are to inform the planning authority in relation to flood risk associated with the site.

The report will assess the site in accordance with the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices (Office of Public Works, November 2009).

This flood risk assessment will outline the following:

- Information to allow an informed decision by the planning authority in relation to flood risk.
- The site's flood zone category.
- Appropriate flood risk mitigation and management measures for any residual flood risk.

1.3 Flood Risk Assessment Scope

This SSFRA relates only to the proposed development lands at Milltown Road, Sandford Road, Dublin 6 and its immediate surroundings, including Eglinton Road, where the drainage outfall is proposed.

This SSFRA uses information obtained from various sources in order to carry out an assessment of flood risk for the existing land and proposed development. Note, information sources are outlined in Table 3-1 of this report.

1.4 Approach

Section 2.0 of this SSFRA considers "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices as they relate to the site.

Flood risk identification is presented in Section 3.0, an initial flood risk assessment is carried out in Section 4.0, while a more detailed flood risk assessment is presented in Section 5.0.

Conclusions and recommendations are outlined in Section 6.0.

1.5 Existing Site

The subject site is located at the corner of Sandford Road and Milltown Road (refer to Figure 1-1 below). The site is currently occupied by vacant buildings, two of which are to be retained within the proposed development (The Chapel and Tabor House). The subject site includes the extent of Eglinton Road that will be impacted during the reconstruction of the existing surface water sewer that serves as the outfall for the overall development.

Sandford Road is located along the site's north-eastern boundary and Milltown Road is located along the site's south-eastern boundary. Existing residential developments are located to the north-west and west of the site while lands in the ownership of the Jesuit Order are located to the south of the site.

Figure 1-1 Site Location (Site Boundary Indicative Only)

1.6 Topography and Site Characteristics

The site generally falls from south to north at a gradient of approx. 1:45. Surface gradients become flatter (approx. 1:100) on approach to the existing site access off Sandford Road.

Existing surface gradients across the site have been a key factor in regard to design of roads levels, finished floor levels, surface water drainage and foul drainage.

A topographical survey of the site is provided as a background on DBFL's 'Road Layout' and 'Site Services Layout' drawings (ref. nos. 190226-X-04-Z00-DTM-DR-DBFL-CE-1201and 190226-X-05-Z00-DTM-DR-DBFL-CE-1301).

The closest river network as identified on the EPA's map viewer is the Dodder River located approximately 500m east of the site (refer to Figure 1-2 below).

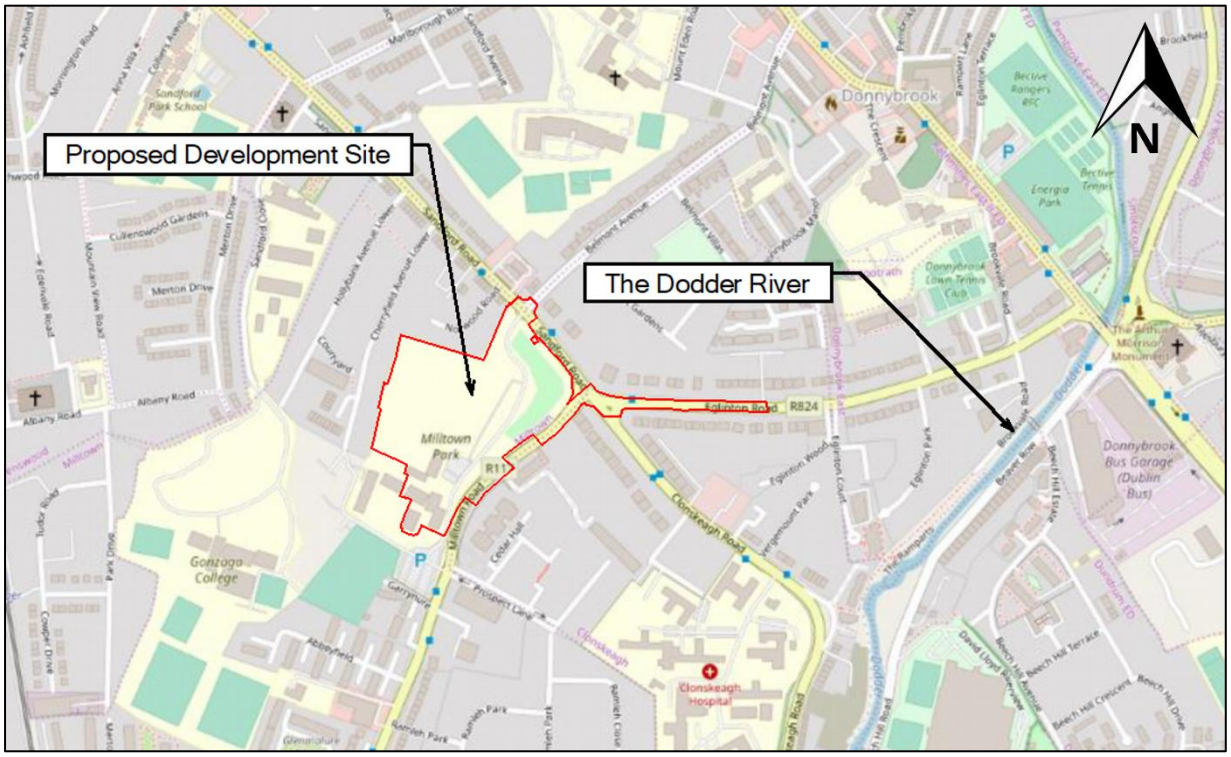


Figure 1-2 Extract from EPA Online Mapping Service

2 Planning System & Flood Risk Management Guidelines

2.1 General

"The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices outline the requirements for a Site-Specific Flood Risk Assessment.

Table 3.1 of the guidelines classify "dwelling houses" as a "highly vulnerable development".

Table 3.2 of the guidelines indicates that a "highly vulnerable development" is classified as "appropriate" once located in Flood Zone C i.e. where probability of flooding from rivers is low (less than 0.1% AEP).

If a "highly vulnerable development" is to be located in Flood Zone A or Flood Zone B, a Justification Test is required.

2.2 Sequential Approach

This SSFRA will initially use existing flood risk information to determine the flood zone category of the site i.e. to determine whether the development is considered appropriate or whether a justification test is required (see Figure 2-1 below).

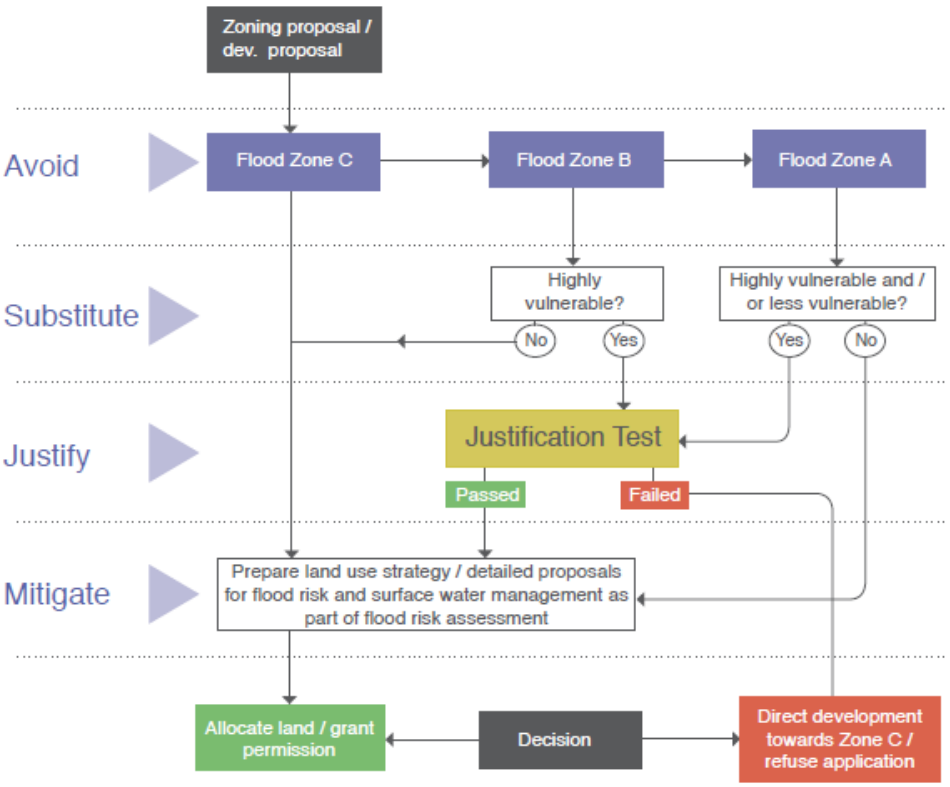


Figure 2-1 Extract from The Planning System and Flood Risk Management Guidelines (Fig. 3.2 Sequential Approach Mechanism in the Planning Process)

2.3 Flood Risk Assessment Stages

The stages of a Flood Risk Assessment are as follows:

- Stage 1 – Flood Risk Identification
- Stage 2 – Initial Flood Risk Assessment
- Stage 3 – Detailed Flood Risk Assessment

The following sections of this SSFRA follows this approach.

3 Stage 1 – Flood Risk Identification

3.1 General

The flood risk identification stage uses existing information to identify whether there may be any flooding or surface water management issues related to the site that may require further investigation.

3.2 Information Sources

Information sources consulted for the identification exercise are outlined in Table 3-1 below.

Table 3-1: Information Sources Consulted

Information Source	Comments
Predictive and historic flood maps, and Benefiting Lands Maps, such as those at http://www.floodinfo.ie	Information obtained (and reviewed) from www.floodinfo.ie (OPW website). e.g. flood reports and photographs of historic flood events
Expert advice from OPW who may be able to provide reports containing the results of detailed modelling and flood-mapping studies, including critical drainage areas, and information on historic flood events, including flooding from all sources;	Information obtained (and reviewed) from www.floodinfo.ie (OPW website).
Predictive flood maps produced by OPW	Floodinfo.ie provides access to Dodder CFRAM study Flood Maps –Fluvial Flood Extents and Fluvial Flood Depth Maps consulted.
Previous Strategic Flood Risk Assessments;	Strategic Flood Risk Assessment for Dublin City Development Plan 2022 - 2028 (JBA Consulting, July '22)
Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques;	A topographical survey of the site is provided as a background on DBFL's 'Road Layout' and 'Site Services Layout' drawings
Information on flood defence condition and performance;	No flood defences in the vicinity of the site

Alluvial deposit maps of the Geological Survey of Ireland (which would allow the potential for the implementation of source control and infiltration techniques, groundwater and overland flood risk to be assessed). These maps, while not providing full coverage, can indicate areas that have flooded in the past (the source of the alluvium) and may be particularly useful at the early stages of the FRA process where no other information is available;	GSI maps consulted.
Site Investigation	Ground Investigations were carried out by GII between January and October 2020.
Walkover survey to assess potential sources of flooding, likely routes for flood waters and the site's key features, including flood defences, and their condition;	Walkover survey carried out over a number of site visits.
'Liable to flood' markings on the old '6 Inch' maps;	Historic OSI maps consulted.

3.2.1 OPW National Flood Hazard and Benefiting Lands Mapping

OPW's Summary Local Area Report is included in Appendix A (Flood Hazard Information). This report is sourced from the OPW website (www.floodinfo.ie) and summarises all flood events within 2.5 km of the site. No flood events are noted in the immediate vicinity of the site.

3.2.2 Dodder CFRAMS Study

OPW's Dodder CFRAM Study (Fluvial Flood Extent) online mapping confirms that there is no fluvial flooding in the vicinity of the site or the extent of Eglinton Road impacted by the drainage outfall reconstruction. Figure 3-1 below shows the available flood map within the vicinity of the subject site. The subject site is situated northwest of the Dodder River.

This map is included in Appendix A (Flood Hazard Information).

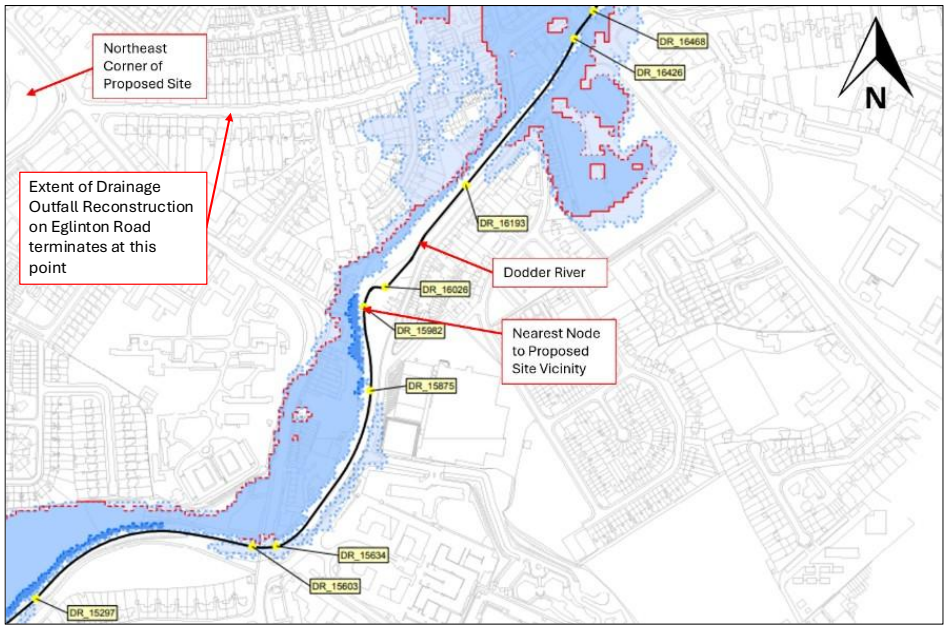


Figure 3-1: Extract from Dodder CFRAMS Mapping (Source: floodinfo.ie)

3.2.3 Strategic Flood Risk Assessment for Dublin City Development Plan 2022 – 2028

The Justification Test Table for Area 11 (River Dodder) within the Dublin City Development Plan 2022 – 2028 SFRA is included in Appendix A (Flood Hazard Information). It indicates the flood extent along the River Dodder between Donnybrook Bridge and Dundrum Road. No flooding is indicated in the vicinity of the site. The flood extents are in the immediate vicinity of the River Dodder and are consistent with those identified in the Dodder CFRAMS Study (Section 3.2.2 above).

3.2.4 Other Sources

Other information sources were consulted to determine if there was any additional flood risk to the site including:

- Topographical surveys of the area – the site is significantly elevated above the predicated 0.1% AEP fluvial flood event as shown on the Dodder CFRAMS Flood Extent Mapping.
- Soils data from the GSI – no alluvium deposits within the site boundary.
- Groundwater information from GSI – no groundwater wells or springs located within the site, underlying aquifer classified as locally important, groundwater vulnerability noted as low.

- Ground Investigations were carried out by Ground Investigations Ireland (GII) between January and June 2020. Standpipes were installed at 7 no. boreholes to determine the equilibrium groundwater level over time. Ground water measurements taken during the ground investigations in June 2020. A second phase of investigation was undertaken in October 2020. The results indicated ground water depths of 0.77m to 7.74m BGL.
- Walkover survey – there are no open drains within the site boundary.
- 6 inch OSI Map – no evidence of flooding or marsh areas shown within the site.

Review of the 'other sources' of information do not indicate evidence of flood risk to the site.

3.3 Source – Pathway – Receptor Model

A Source-Pathway-Receptor model was produced to summarise the possible sources of floodwater, the pathways by which flood water could reach receptors and the receptors that could be affected by potential flooding, see

Table 3-2 below.

It outlines effects of various potential sources, the performance and response of pathways and the consequences to the receptors in the context of the proposed development. These sources, pathways and receptors will be assessed further by the initial flood risk assessment stage.

Table 3-2 Source-Pathway-Receptor Analysis

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Fluvial	Overbank from Dodder River approx. 500m east of the site (refer to Figure 1.2)	People and Property (the proposed development).	Remote	Medium	Low
Surface Water (Pluvial)	Blockage and / or surcharging of the surface water drainage network	People and Property (the proposed development).	Possible	Medium	Medium
Human / Mechanical Error (Pluvial)	Failure of SuDS measures (e.g. Hydrobrake failure)	People and Property (the proposed development).	Possible	Medium	Medium

Groundwater	Rising groundwater levels within the site	People and Property (the proposed development).	Remote	Low	Low

4 Stage 2 – Initial Flood Risk Assessment

Flood risks identified during Stage 1 – Flood Risk Identification, are outlined in

Table 3-2 (Source Pathway Receptor Analysis) and noted below. These risks are assessed further in this section of the SSFRA.

- Low risk of fluvial flooding
- Medium risk of pluvial flooding (surface water and human / mechanical error)
- Low risk of groundwater flooding

The information sources identified in Section 3.2 are considered adequate for the purpose of an Initial Flood Risk Assessment for the site and no further technical studies are proposed.

4.1 Initial Fluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a low risk of fluvial flooding.

CFRAM Flood Extent Map

The Dodder CFRAM flood extents maps identify the location of the predicted 0.1% AEP fluvial flood events associated with watercourses in the areas (refer to Figure 3-1 and Appendix A).

No fluvial flooding is indicated in the vicinity of the site.

The closest modelled node to the site is located on the Dodder River (Node DR_15982), approximately 500m east of the site.

The location of the Dodder River in relation to the site is shown in Figure 1-2.

The location of this node is shown on CFRAM Drawing DR/EXT/UA/CURS/101 (refer to Appendix A).

- Node DR_15982, 10% AEP fluvial flood level +12.78m
- Node DR_15982, 1% AEP fluvial flood level +12.96m
- Node DR_15982, 0.1% AEP fluvial flood level +14.51m
- Lowest FFL +18.60m

The lowest proposed FFL (+18.60m) is 4.09m above the predicted 0.1% AEP fluvial flood event and 5.64 m above the predicted 1.0% AEP fluvial flood event associated with Node DR_15982.

4.2 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a medium risk of pluvial flooding relating to the proposed surface water drainage network and human / mechanical error. This risk can be mitigated by designing the surface water network in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) including attenuation of the 1:100 year storm event and implementation of SuDS methodologies.

Proper operation and maintenance of the drainage system should also be implemented to reduce the risk of human or mechanical error causing pluvial flood risk from blockages, fuel / oil interceptor operation problems etc.

4.3 Initial Groundwater Flood Risk Assessment

No groundwater wells, springs or marsh areas are located within the site (based on review of information available on the GSI and OSI websites and a walkover survey of the site).

11 no. Trial Pits and 16 no. Boreholes were excavated with 3 no. Infiltration Tests carried out and 7 no. Groundwater Monitoring Wells installed by GII at the site between January and October 2020 (Refer to Appendix B).

Standpipes were installed at 7 no. boreholes locations to determine the equilibrium groundwater level over time. Ground water measurements taken in June 2020 and October 2020 indicated groundwater depths of 0.77m to 7.74m BGL.

All SuDS features and attenuation storage areas located in levels of high groundwater levels will be lined to prevent groundwater ingress into the surface water network, therefore the possibility of groundwater flooding is remote.

4.4 Flood Zone Category

On completion of Stage 2 – Initial Flood Risk Assessment, the site is considered to be located in Flood Zone C as defined by the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices. The proposed residential-led mixed-use residential development is therefore considered appropriate as it is located in a Flood Zone C area.

5 Stage 3 – Detailed Flood Risk Assessment

5.1 General

As the Initial Flood Risk Assessment considers the site to be located in Flood Zone C and the proposed development is considered appropriate, the Detailed Flood Risk Assessment Stage will only consider pluvial flood risk in relation to the following;

- Proposed Surface Water Management Measures and SuDS.
- Flood Exceedance.
- Impact on Adjacent Areas.
- Climate Change.
- Access and Egress During Flood Events.
- Residual Risks.
- Effectiveness of Flood Mitigation Measures.

5.2 Surface Water Management Measures and SuDS

An existing 225mm diameter surface water drain is located approximately 80m from the eastern corner of the site at Eglinton Road and will provide a suitable surface water outfall for the proposed development. However, in order to achieve the required drainage invert levels on site, approximately 160m of the existing drainage network along Eglinton Road will need to be replaced with a 300mm pipe running at a flatter gradient (also refer to DBFL Infrastructure Design Report, 190226-X-X-X-XXX-RP-DBFL-CE-0002, Section 3.0 Surface Water Drainage).

Proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) and DCC's Sustainable Drainage Design and Evaluation Guide. Surface water discharge rates from the proposed surface water drainage network will be controlled by a Hydrobrake type flow control device and associated attenuation systems (blue / green systems at roof / podium level and a combination of attenuation basins at ground level and below ground Stormtech Chambers. Surface water discharge will also pass via a full retention fuel / oil separator (sized in accordance with permitted discharge from the site).

SuDs will also be incorporated into the design strategy to reduce run-off volumes and improve runoff water quality. Refer to DBFL Infrastructure Design Report, 190226-X-X-X-XXX-RP-DBFL-CE-

0002, Section 3.0 Surface Water Drainage for a full description of proposed SUDS methodologies and attenuation strategy.

5.3 Flood Exceedance

For storms greater than the 1% AEP pluvial event, the development's drainage network design will be exceeded and areas with low ground levels may begin to flood.

Proposed site levels fall towards the site's northern and eastern boundaries. Overland flow is therefore directed towards the open space areas and public roads located north and east of the site (refer to Figure 5-1).

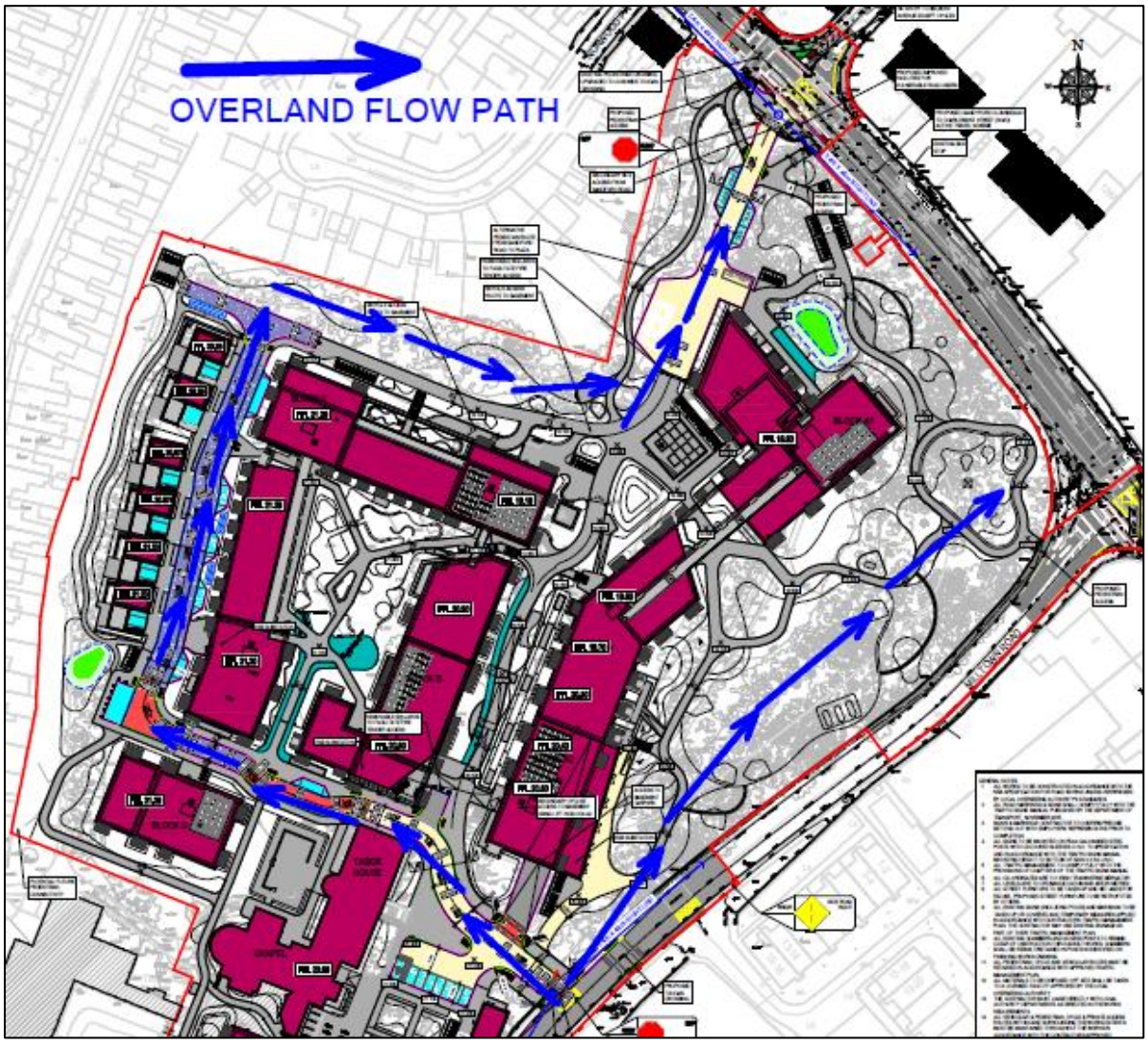


Figure 5-1 Flood Exceedance (>1%AEP) Overland Flow Routes

5.4 Impact on Adjacent Areas

Adjacent areas will not be impacted by the development up to the 1% AEP flood event. Storms greater that the 1% AEP (exceeding the design capacity of the site's drainage system) may result in overland flow being directed towards public roads located north and east of the site.

5.5 Climate Change

The potential impact of climate change has been allowed for as follows;

- Pluvial flood risk - attenuation storage design allows for a 20% increase in rainfall intensities, as recommended by the GDSDS.
- Pluvial flood risk – surface water network design allows for a 20% increase in flows, as recommended by the GDSDS.

5.6 Access and Egress for Emergency Services During Flood Events

Access and egress to the site is provided via proposed entrances off Milltown Road and Sandford Road which are both located in Flood Zone C as defined by the OPW guidelines.

As such, the site can be safely accessed during storms up to the 1% AEP event.

5.7 Residual Risks

Remaining residual flood risks, following the detailed assessment include the following;

1. Pluvial flooding from the private drainage system related to a pipe blockage, flood exceedance or mechanical failure.
2. Pluvial flooding from the development's drainage system for storms in excess of the 1% AEP storm event.

5.8 Mitigation Measures

Proposed mitigation measures to address residual flood risks are summarized below;

- Proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.
- During storm events exceeding the 1% AEP design capacity of the attenuation system, possible overland flow routing towards public roads located north and east of the site should not be blocked. At these locations, the site's boundaries should be permeable to facilitate flood routing onto Sandford Road and Milltown Road.

5.8.1 Effectiveness of Mitigation Measures

It is considered that the flood risk mitigation measures if implemented are sufficient to provide a suitable level of protection to the proposed development. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur.

Should extreme pluvial flooding occur that exceeds the development's attenuation capacity (i.e. greater than 1% AEP), overland flow routes directed towards adjacent public roads are provided in order to protect the proposed development.

6 Conclusion

The Site-Specific Flood Risk Assessment for proposed development at Sandford Road has been undertaken in accordance with the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices.

Following the Flood Risk Assessment, it has been determined that the site is located in Flood Zone C as defined by the Guidelines.

It is concluded that:

- The proposed residential-led mixed-use development and its associated development works are appropriate for the site's flood zone category.
- The sequential approach outlined in Planning System and Flood Risk Management Guidelines has been adhered to and that the 'Avoid' principal has been achieved.

In conclusion the proposed development is considered to have the required level of flood protection up to and including the 100-year return event.

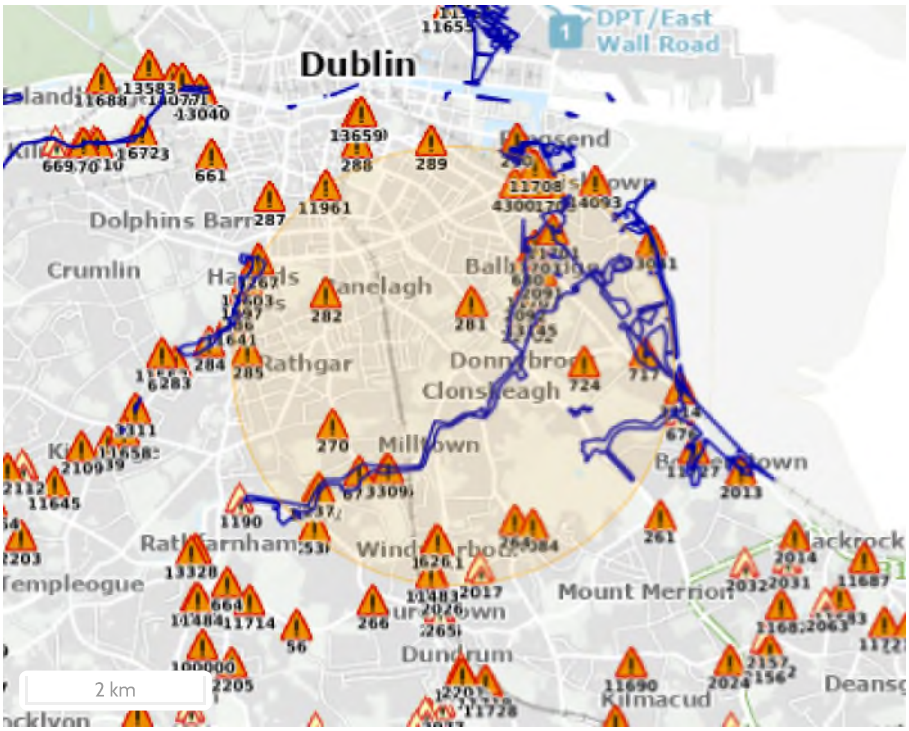
Overland flow paths have been identified for pluvial flooding exceeding the capacity of the proposed surface water drainage network.

Appendix A : Flood Hazard Information

Past Flood Event Local Area Summary Report

Report Produced: **17/11/2025 16:08**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

54 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Larchfield Estate Recurring (ID-2017)	n/a	Exact Point
	Additional Information: Reports (5) Press Archive (0)		
2.	Dodder Oct 1987 (ID-680)	20/10/1987	Approximate Point
	Additional Information: Reports (3) Press Archive (0)		
3.	Poddle August 1986 (ID-32)	24/08/1986	Area
	Additional Information: Reports (9) Press Archive (1)		
4.	Nutley Elm Park Streams June 1963 (ID-118)	10/06/1963	Area
	Additional Information: Reports (14) Press Archive (20)		
5.	Dodder August 1986 (ID-1)	25/08/1986	Area
	Additional Information: Reports (21) Press Archive (18)		
6.	Dodder Ballsbridge Sept 1931 (ID-2091)	02/09/1931	Approximate Point
	Additional Information: Reports (8) Press Archive (7)		

	Name (Flood_ID)	Start Date	Event Location
7.	Dodder Anglesea Road Dec 1958 (ID-2092) **Additional Information:** Reports (7) Press Archive (0)	18/12/1958	Approximate Point
8.	Bath Avenue June 1963 (ID-4300) **Additional Information:** Reports (4) Press Archive (0)	10/06/1963	Exact Point
9.	Dodder Classon's Bridge Nov 2000 (ID-3309) **Additional Information:** Reports (1) Press Archive (0)	05/11/2000	Approximate Point
10.	Slang River 24th Oct 2011 Frankfort (ID-11483) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Approximate Point
11.	Little Dargle Sept 1931 (ID-53) **Additional Information:** Reports (4) Press Archive (0)	02/09/1931	Approximate Point
12.	Dodder Sept 1931 (ID-237) **Additional Information:** Reports (9) Press Archive (3)	02/09/1931	Approximate Point
13.	Little Dargle Dec 1956 (ID-259) **Additional Information:** Reports (3) Press Archive (0)	25/12/1956	Approximate Point
14.	Roebuck June 1963 (ID-264) **Additional Information:** Reports (4) Press Archive (2)	10/06/1963	Exact Point
15.	Rathgar June 1963 (ID-270) **Additional Information:** Reports (4) Press Archive (2)	10/06/1963	Exact Point
16.	Dodder Donnybrook June 1963 (ID-281) **Additional Information:** Reports (4) Press Archive (3)	10/06/1963	Exact Point
17.	Rathmines Lower June 1963 (ID-282) **Additional Information:** Reports (4) Press Archive (2)	10/06/1963	Exact Point
18.	Harold's Cross June 1963 (ID-285) **Additional Information:** Reports (4) Press Archive (2)	10/06/1963	Exact Point
19.	Flooding at Roebuck Road on 21/08/2021 (ID-14084) **Additional Information:** Reports (0) Press Archive (0)	21/08/2021	Approximate Point
20.	Dundrum River Sept 1957 (ID-626) **Additional Information:** Reports (1) Press Archive (0)	23/09/1957	Exact Point
21.	Dodder August 1905 (ID-657) **Additional Information:** Reports (5) Press Archive (4)	24/08/1905	Approximate Point
22.	Dodder August 1946 (ID-658) **Additional Information:** Reports (7) Press Archive (2)	10/08/1946	Approximate Point
23.	Dodder October 1886 (ID-659) **Additional Information:** Reports (4) Press Archive (2)	16/10/1886	Approximate Point
24.	Dodder August 1912 (ID-660) **Additional Information:** Reports (5) Press Archive (0)	26/08/1912	Approximate Point

	Name (Flood_ID)	Start Date	Event Location
25.	Dodder Dartry Cottages Nov 2000 (ID-673) Additional Information: Reports (3) Press Archive (0)	05/11/2000	Approximate Point
26.	Booterstown/Ailesbury Park November 1965 (ID-717) Additional Information: Reports (1) Press Archive (0)	17/11/1965	Approximate Point
27.	Nutley Stream June 1989 (ID-724) Additional Information: Reports (1) Press Archive (0)	13/06/1989	Exact Point
28.	Dodder Sept 1957 (ID-731) Additional Information: Reports (5) Press Archive (0)	23/09/1957	Approximate Point
29.	Dodder November 1968 (ID-1231) Additional Information: Reports (2) Press Archive (0)	01/11/1968	Approximate Point
30.	Dodder 24th Oct 2011 Waldron's Br (ID-11482) Additional Information: Reports (1) Press Archive (0)	23/10/2011	Approximate Point
31.	Dodder Oct 1880 (ID-1228) Additional Information: Reports (2) Press Archive (0)	27/10/1880	Approximate Point
32.	Dodder October 1891 (ID-1229) Additional Information: Reports (3) Press Archive (0)	19/10/1891	Approximate Point
33.	Dodder November 1898 (ID-1230) Additional Information: Reports (2) Press Archive (0)	23/11/1898	Approximate Point
34.	Dodder November 1901 (ID-1232) Additional Information: Reports (2) Press Archive (0)	10/11/1901	Approximate Point
35.	Dodder November 1915 (ID-1233) Additional Information: Reports (3) Press Archive (0)	11/11/1915	Approximate Point
36.	Dodder September 1883 (ID-1234) Additional Information: Reports (2) Press Archive (0)	03/09/1883	Approximate Point
37.	Dodder December 1956 (ID-1235) Additional Information: Reports (2) Press Archive (0)	29/12/1956	Approximate Point
38.	Dodder Orwell Gardens Nov 1965 (ID-3342) Additional Information: Reports (10) Press Archive (0)	17/11/1965	Approximate Point
39.	Flooding at Ballsbridge on 14/11/2014 (ID-13145) Additional Information: Reports (0) Press Archive (0)	14/11/2014	Approximate Point
40.	Dublin City Tidal Feb 2002 (ID-456) Additional Information: Reports (45) Press Archive (27)	01/02/2002	Area
41.	Flooding at Bath Avenue, Sandymount, Dublin 4 on 24th Oct 2011 (ID-11706) Additional Information: Reports (1) Press Archive (0)	23/10/2011	Exact Point
42.	Flooding at Anglesea Road, Ballsbridge, Dublin 4 on 24th Oct 2011 (ID-11702) Additional Information: Reports (1) Press Archive (0)	23/10/2011	Exact Point

	Name (Flood_ID)	Start Date	Event Location
43.	Flooding at Herbert Cottages, Ballsbridge, Dublin 4 on 24th Oct 2011 (ID-11703) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Exact Point
44.	Flooding at Milltown, Dublin 6 on 24th Oct 2011 (ID-11705) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Exact Point
45.	Flooding at RDS, Ballsbridge, Dublin 4 on 24th Oct 2011 (ID-11707) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Exact Point
46.	Flooding at Havelock Square, Sandymount, Dublin 4 on 24th Oct 2011 (ID-11725) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Exact Point
47.	Little Dargle Feb 1958 (ID-60) **Additional Information:** Reports (2) Press Archive (0)	10/02/1958	Approximate Point
48.	Dodder Lr Dodder Road Orwell Gardens Dec 1958 (ID-77) **Additional Information:** Reports (7) Press Archive (0)	18/12/1958	Approximate Point
49.	Dodder Anglesea Road Nov 1965 (ID-238) **Additional Information:** Reports (11) Press Archive (10)	17/11/1965	Approximate Point
50.	Dodder Dec 2003 (ID-349) **Additional Information:** Reports (1) Press Archive (0)	02/12/2003	Approximate Point
51.	Flooding at Railway Cottages, Ballsbridge, Dublin 4 on 24th Oct 2011 (ID-11701) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Exact Point
52.	Slang Frankfort August 1986 (ID-1267) **Additional Information:** Reports (1) Press Archive (0)	24/08/1986	Approximate Point
53.	Flooding at ESB Sportsco, Ringsend, Dublin 4 on 24th Oct 2011 (ID-11708) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Exact Point
54.	Flooding at Dundrum, Dublin 14 on 24th Oct 2011 (ID-11711) **Additional Information:** Reports (1) Press Archive (0)	23/10/2011	Exact Point

N

DR_16945

DR_16797

10% Flow = 139.325 m^3/s
1% Flow = 219.669 m^3/s
0.1% Flow = 465.989 m^3/s

DR_16634

DR_16468

DR_16426

DR_16193

DR_16026

DR_15982

DR_15875

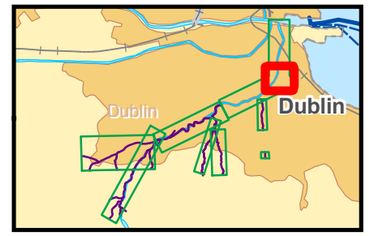
DR_15634

DR_15603

DR_15297

Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
LDI-15297	18.41	18.44	18.95
LDI-15634	15.54	15.60	18.35
LDI-15603	15.61	15.69	18.73
LDI-15875	13.12	13.25	14.61
LDI-15982	12.78	12.96	14.51
LDI-16026	8.87	9.62	11.95
LDI-16193	8.43	9.18	11.64
LDI-16434	7.84	8.30	10.56
LDI-16426	7.67	8.35	10.93
LDI-16634	7.10	7.68	9.86
LDI-16797	6.75	7.37	10.08
LDI-16945	6.34	6.95	9.90

Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- OS_2975 — Node Label (refer to table)
- Flow reporting location
- 10% Flow = 1.20, 1% Flow = 1.56, 0.1% Flow = 2.17 — Peak flow during design flood extent

USER NOTE:

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:

Dublin City; South Dublin County Council; Dún Laoghaire-Rathdown County Council; OPW

Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

PRESENT DAY DODDER

Map Type: FLOOD EXTENT

Source: FLUVIAL FLOODING

Map Area: URBAN AREA

Scenario: CURRENT

Drawn By : A.A.B **Date :** 26 November 2010

Checked By : A.J. **Date :** 26 November 2010

Approved By : A.G.B **Date :** 26 November 2010

Figure No. :

DR/EXT/UA/CURS/101

Map Series : Page 8 of 12

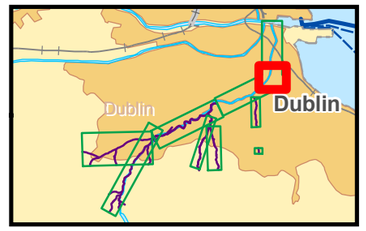
Drawing Scale : 1: 5,000 **Plot Scale : 1:1 @ A3**

0 0.1 0.2
Kilometers

RPS Consulting Engineers
ELMWOOD HOUSE
74 BOUCHER ROAD
BELFAST BT12 6RZ
TEL : 028 9066 7914
FAX : 028 9066 8286
www.rpsgroup.com/Ireland

N

Location Plan:



Legend:

Depth Grid [m]

- 0 - 0.25 m
- 0.25 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.5 - 2.00 m
- > 2.00 m
- River Centreline

USER NOTE:

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:

Dublin City Baile Átha Cliath · South Dublin County Council · Dún Laoghaire-Rathdown County Council Comhairle Contae Dhún Laoghaire-Rath an Dúin · OPW

Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

DODDER

Map Type:	DEPTH
Return Period:	0.1% AEP EVENT
Source:	FLUVIAL FLOODING
Map Area:	URBAN AREA
Scenario:	CURRENT

Drawn By :	A.A.B	Date :	26 November 2010
Checked By :	A.J.	Date :	26 November 2010
Approved By :	A.G.B	Date :	26 November 2010

Figure No. :

DR/EXT/UA/DEP/1000/101A

Map Series : Page 8 of 12

Drawing Scale : 1: 5,000 Plot Scale : 1:1 @ A3

0 0.1 0.2
Kilometers

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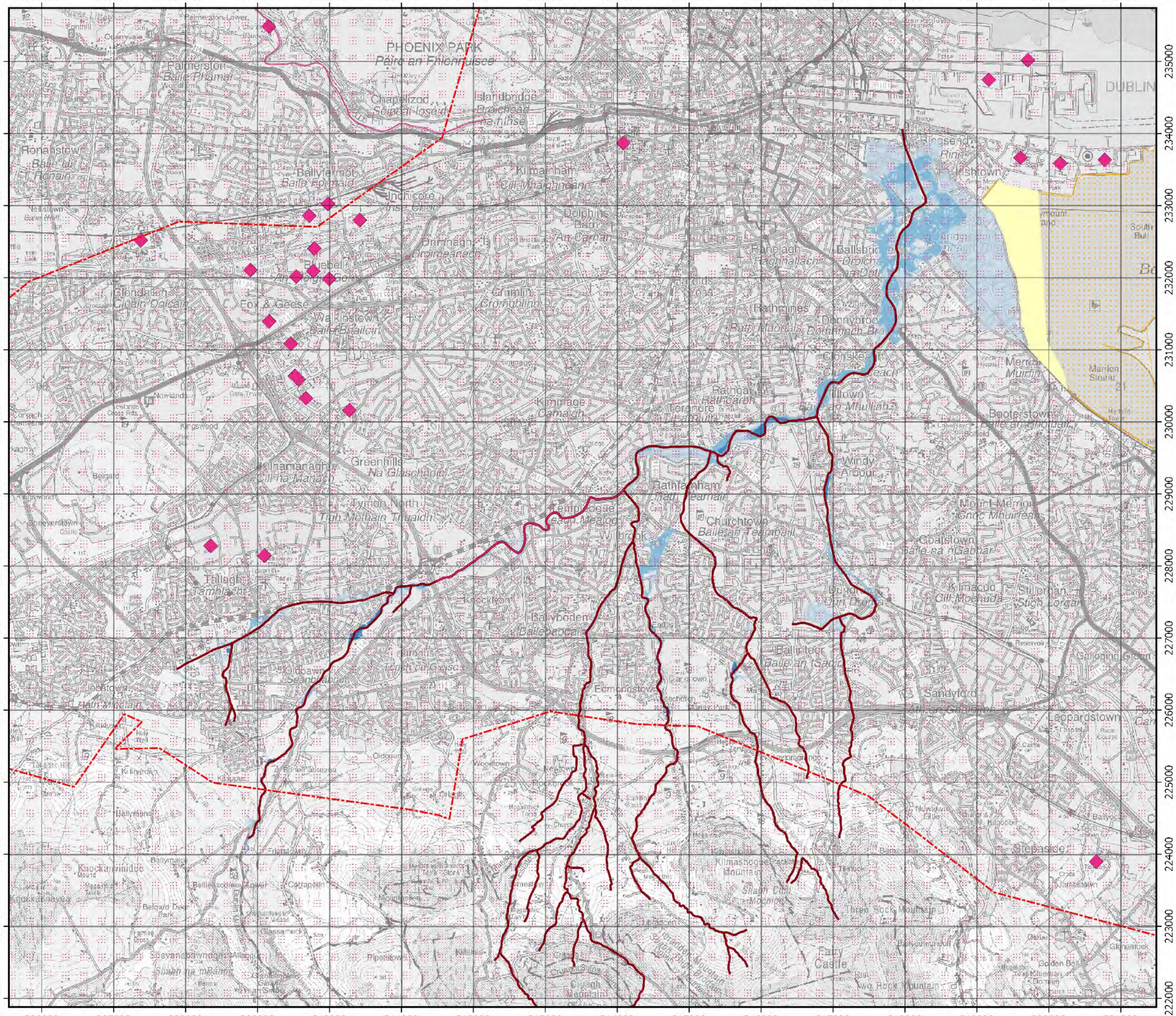


309000 312000 315000 318000 321000

234000

231000

228000

225000

PHOENIX PARK
Páirc an Fhionnuisce
DUBLIN HARBO
Sandymount Strand
South Bull
DUB
Baile Átha
Merrion Strand
Palmerston
Baile Phálmaí
Ballybrack
Cloch an Chaisil
Clondalkin
Cluain Dolcáin
Ballyfermot
Baile Formaid
Newlands
Kingswood
Greenhills
Na Glaschnoic
Tymon North
Tigh Mothain Thuaidh
Templeogue
Teach Meallóg
Willbrook
Rathfarnham
Rath Fearnáin
Churchtown
Baile an Teampaill
Windy Arbour
Mount Merrion
Cnoc Mhuirfean
Goatstown
Baile na nGabhar
Blackrock
Tallaght
Tamhlacht
Knocklyon
Ballyboden
Baile Bodáin
Firhouse
Teach na Giúise
Oldbawn
Seanbhaile
Jobstown
Rath Mionáin
Edmondstown
Ballinteer
Baile an tSaoir
Dundrum
Dún Droma
Kilmacud
Cill Mochuda
Stillorgan
Stigh Lorgan
Sandyford
Áth an Ghaimh
Leopardstown
Foxrock
Carraig an Sí
Galloping Green
Deansgrange
Granseo
Kilnamanagh
Cill na Manach
Kilnardan
Ballymana
Ballyroan
Ballymace
Friarstown
Knockanvinidee
Ballinascorney Upper
Corrageen
Bolgarc Door
Kilmashogue Mountain
Slaigh Cinn Mochóg
Three Rock Mountain
Sleepaside
Carrickmines
Carraig Mhaí
Ballyogan
Newtown Little
Taylorsgrange
Rockbrook
Newtown
Woodtown
Orlagh
Olcoun
Kilnipper
Killinardan
Holy Well
Megalithic Tomb
Standing Stone
Church
Castle
Reservoir
Race Course
Golf Course
Marlay Park
Clarkstown
Willsbrook
Ballyullen
Jamestown
Mountpelier
Bolgarc
Belgard
Quarryvale
Rivermount Park
Sweet Little Fanhill
Bull Wall
North Bank Lighthouse
Toll Bridge
Poolbeg
Ringsend
Irishtown
Merrion Gates
Marlello Tower
St Vincent's Hospital
Mater Hospital
Trinity College
Dublin Castle
Mary's Hospital
Phibsborough
Glasnevin
Finglas
Ballymun
Whitechurch
Loughlinstown
Cabinteely
Dalkey
Killiney
Shankill
Bray
DUBLIN
Baile Átha Cliath
KILDARE
WICKLOW
Location Plan:

LEGEND

- 10% AEP Pluvial
- 1% AEP Pluvial
- 0.5% AEP Pluvial

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

OPW
The Office of Public Works

The Office Of Public Works
Jonathan Swift Street
Trim
Co. Meath

Comhairle Cathrach Bhaile Átha Cliath
Dublin City Council

Dublin City Council
Civic Offices
Wood Quay
Dublin 8

Project:

DUBLIN PLUVIAL STUDY (FloodResilienCity)

Map: **DUBLIN CITY - PLUVIAL FLOOD EXTENT MAP**

Map Type:	EXTENT - 180min Rainfall	
Source:	PLUVIAL	
Map Area:	URBAN	
Scenario:	CURRENT	
Drawn by:	IH	Date: Aug - 2016
Checked by:	MC	Date: Aug - 2016
Approved by:	JM	Date: Aug - 2016

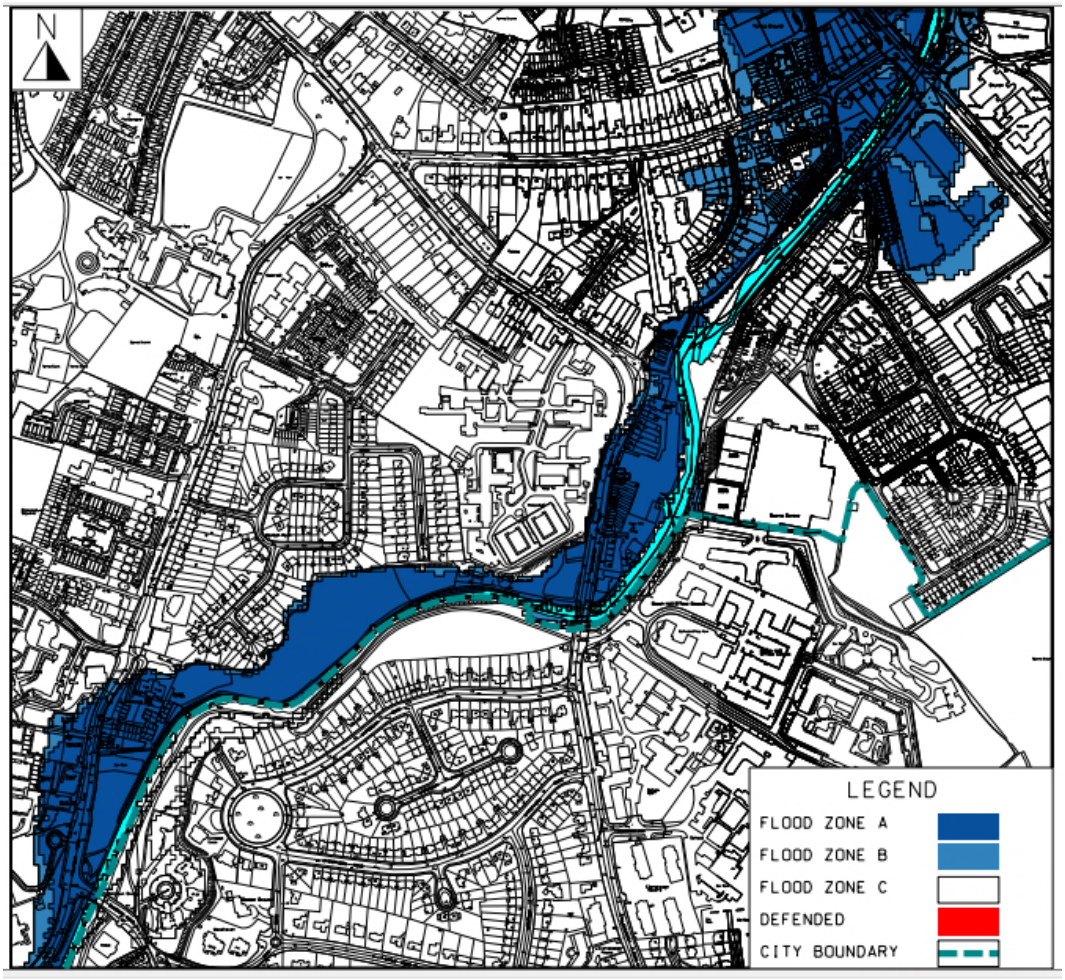
Map No.:
E09DCC_EXPCD_F0_03

Revision: F0

Map Scale: 1:50,000 Plot Scale: 1:1 @ A3

1000 0 1000 2000 3000 4000 Meters

Area: 11. Dodder: Donnybrook Bridge – Dundrum Road



For Land Use Zoning Maps Overlaid with Flood Zones see Dublin City Council Development Plan 2022 - 2028, Flood Map H.

Area Description	This area on the Dodder river goes from Donnybrook (Anglesea) Bridge to Clonskeagh Bridge to Dundrum Road Bridge. To the southeast it includes Beaver Row and Beech Hill Road (in Dun Laoghaire-Rathdown County Council). To the northwest it includes the rear of the lower part of Eglington Road, Dunbar, Brookvale Road, two Smurfit Weirs, Ashton's Pub and the Smurfit Site. Upstream of Clonskeagh Bridge it includes Clonskeagh House, Scully's Field, Strand Terrace in Milltown. The southern floodplains are in Dun Laoghaire-Rathdown County Council's area and it should be consulted on any proposed development in or adjacent to its area. The area has only fluvial and pluvial rainfall influences. Development in this area is a mixture of low to high density commercial and residential with infill development of both.

Area: 11. Dodder: Donnybrook Bridge – Dundrum Road	
SDRAs within this Area	N/A
Benefitting from Defences (flood relief scheme works)	Defences up to the first Smurfit Weir are under construction.
Sensitivity to Climate Change	An increase of 20% on top of the estimated 100-year fluvial level is planned to be catered for by storage upstream of where the Tallaght Stream joins the River Dodder. A 30% increase in fluvial flows should be used when assessing the viability of any critical development/ infrastructure.
Residual Risk	As no existing defences are utilised this is not currently applicable, but assessment of residual risks will be required when new flood defences are in place.
Historical Flooding	The SFRA flood maps are consistent with previous flooding of this section of the River Dodder in 1986 and 2011.
Surface Water	All surface water in this area needs to be carefully managed and provision made for significant rainfall events during high river flows. Should development be permitted, best practice with regard to surface water management should be implemented across the development area, to limit surface water run-off to current values. Separation of surface water and foul sewage flows should be carried out where possible. All developments shall have regard to the Pluvial Flood Maps in their Site Specific Flood Risk Assessment, see FloodResilienCity Project**,** Volume 2 City Wide Pluvial Flood Risk Assessment at http://www.dublincity.ie/main-menu-services-water-waste-and-environment-drains-sewers-and-waste-water/flood-prevention-plans.
Commentary on Flood Risk: The flood extents indicate flow paths generally coming directly out of the river channel. These can be compounded with local pluvial flooding if heavy rainfall coincides with high river flows. Backing up of the local combined and surface water network can occur when heavy rainfall coincides with high river flows. Some fluvial flood routes are modelled to leave upstream of the Lower Smurfit Weir and carry on down Beaver Row flooding Simmonscourt Terrace before draining slowly back into the river. Pluvial flooding in the past has exacerbated this flooding. Another flood route is from Strand Terrace through Scully's Field and down	

Area: 11. Dodder: Donnybrook Bridge – Dundrum Road
to Clonskeagh House, across the Clonskeagh Road into the Smurfit site and back into the river. Any development to alter these flood routes needs to be carefully planned. These flood maps were produced based on the OPW CFRAM Dodder Pilot Study and checked against historic flooding in the area. A new flood study for this site started in 2020 and remains ongoing.
Development Options: The main flood cells in this area are located in parkland and in small residential developments. No new development should be allowed in these green areas unless they are water compatible. All existing embankments and walls should be evaluated for new developments behind them. Residential development (mainly infill) with a small amount of commercial would be a natural extension of existing development in this area. However, any development could reasonably be accommodated within the extents of Flood Zone C and should not need to extend into Flood Zone A or B unless defended. Some development may require to await future flood defence works in this area.
Justification Test for Development Plans **1. Part 1 of the Justification Test is covered under Section 3.2.1 in the main body of the SFRA report.** **2. The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:** **(i) Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement.** **Answer: Yes:** This area is an established residential suburb of Dublin City. This stretch of the Dodder goes from Donnybrook (Anglesea) Bridge to Clonskeagh Bridge to Dundrum Road Bridge. To the southeast, it includes Beaver Row and Beech Hill Road (in Dun Laoghaire Rathdown County Council's area). To the northwest, it includes the rear of lower part of Eglington Road, Dunbar, Brookvale Road, two Smurfit Weirs, Ashton's Pub and the Smurfit Site. Upstream of Clonskeagh Bridge it includes the Clonskeagh House, Scully's field, Strand Terrace in Milltown. This area is essential to facilitate the expansion of the city. **(ii) Comprises significant previously developed and/or under-utilised lands.** **Answer: Yes:** The River along this stretch primarily flows through built-up established residential suburbs. Sites would generally consist of brownfield sites.

Area: 11. Dodder: Donnybrook Bridge – Dundrum Road

(iii) Is within or adjoining the core of an established or designated urban settlement.

Answer: Yes: The lands form part of the established / designated urban settlement of Dublin City.

(iv) Will be essential in achieving compact and sustainable urban growth.

Answer: Yes: (see response to (iii) above).

(v) There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.

Answer: There are no suitable alternative lands for the particular uses or development type in areas at lower risk of flooding, within or adjoining the urban settlement.

3. Specific Flood Risk Assessment

- Some areas within Flood Zone A and B are open space, providing a river corridor along the Dodder. These lands should be retained as they will provide moderation of flows to currently developed areas.
- Larger scale development or regeneration should be configured to avoid development within Flood Zone A and B, thus reconnecting the floodplain and minimising downstream flows.
- Development within Flood Zone A and B should be limited to small residential/ commercial extensions or changes of use. Surface water and overland flows have been identified as being important in this area, so should be fully assessed in any site specific flood risk assessment.
- Liaison with Dun Laoghaire-Rathdown County Council is required for any proposed development which may have cause a change in flood risk in its area.

Conclusion: The subject area passes Part 1 and 2 of the Justification Test for Development Plans and although Part 3 has found that new development should be located in Flood Zone C and avoid Flood Zone A and B, in situations where the applicant can demonstrate compliance with the Development Management Justification Test in Box 5.1 of the Flood Risk Management Guidelines, applications will be considered on their merits, having regard to the mitigation and management measures which the development can put in place.

Appendix B : GII Site Investigation Report Extracts

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Ground Investigations Ireland

Sandford Park Milltown

DBFL

Ground Investigation Report

October 2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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DOCUMENT CONTROL SHEET

Project Title	Sandford Park Milltown
Engineer	DBFL
Client	DBFL
Project No	9338-12-19
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Draft	M Sutton	A McDonnell	A McDonnell	Dublin	22 April 2020
B	Final	M Sutton	A McDonnell	A McDonnell	Dublin	19 June 2020
C	Final	M Sutton	A McDonnell	A McDonnell	Dublin	29 October 2020

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

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CONTENTS

1.0 Preamble 5
2.0 Overview 5
2.1. Background 5
2.2. Purpose and Scope 5
3.0 Subsurface Exploration 6
3.1. General 6
3.2. Trial Pits / Foundation Pits 6
3.3. Soakaway Testing 6
3.4. Window Sampling 6
3.5. Dynamic Probing 7
3.6. Cable Percussion Boreholes 7
3.7. Rotary Boreholes 7
3.8. Surveying 8
3.9. Groundwater/Gas Monitoring Installations 8
3.10. Insitu Plate Bearing Test 8
3.1. TRL Dynamic Cone Penetrometer 8
3.2. Laboratory Testing 9
4.0 Ground Conditions 9
4.1. General 9
4.2. Insitu Strength Testing 10
4.3. Groundwater 10
4.4. Laboratory Testing 11
4.4.1. Geotechnical Laboratory Testing 11
4.4.1. Chemical Laboratory Testing 11
4.4.1. Environmental Laboratory Testing 11

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5.0 Recommendations & Conclusions 12
5.1. General 12
5.2. Foundations 12
5.3. External Pavements 13
5.4. Excavations 13
5.5. Soakaway Design 14

APPENDICES

Appendix 1	**Site Location Plan**
Appendix 2	**Foundation and Trial Pit Records**
Appendix 3	**Soakaway Records**
Appendix 4	**Plate Load and TRL Probe Test Records**
Appendix 5	**Dynamic Probe Records**
Appendix 6	**Window Sample Records**
Appendix 7	**Borehole Records**
Appendix 8	**Laboratory Testing**
Appendix 9	**Groundwater Monitoring**

1.0 Preamble

On the instructions of DBFL Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between January and June 2020 at the site of the proposed residential development in Milltown Park in Milltown, Dublin 6, Co. Dublin. A second phase of investigation was undertaken in October 2020.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development including apartments and town houses with associated services, access roads and car parking at the site. The site is currently the grounds of Millfield Park and is partly greenfield with a portion on the eastern side of the site occupied by a car park and existing access road. The proposed construction is envisaged to consist of conventional or piles foundations and pavement make up with some local excavations for services and plant. A basement is proposed as part of the proposed scheme beneath the apartments at the centre of the site which will require excavation of approximately 4m BGL.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken, including both phases of this investigation for this project included the following:

- Visit project site to observe existing conditions
- Carry out 11 No. Trial / Foundation Inspection Pits to determine existing foundation details
- Carry out 3 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 14 No. Window Sample Boreholes to recover soil samples
- Carry out 13 No. Dynamic Probes to determine soil strength/density characteristics
- Carry out 16 No. Cable Percussion boreholes to a maximum depth of 8m BGL
- Carry out 5 No. Rotary Core follow on boreholes to a maximum depth of 20m BGL
- Carry out 9 No. Plate Load tests to determine CBR Value
- Carry out 1 No TRL probe to determine CBR Value
- Installation of 7 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits / Foundation Pits

The trial pits were excavated using a JCB 3CX or 3T excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and the exposed foundations were logged and sketched prior to backfilling and reinstatement. The logs and sketches are provided in Appendix 2 of this Report.

3.3. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 3 of this Report.

3.4. Window Sampling

The window sampling was carried out at the locations shown in the location plan in Appendix 1 using a Tecopsa SPT Tec 10 percussion drilling rig. The window sampling consists of a 1m long steel tube with a cutting edge and an internal plastic liner which is mechanically driven into the ground utilising a 50kg weight falling a height of 500mm. Upon completion of the 1m sample, the tube is withdrawn and the plastic liner removed and sealed for logging and sub sampling by a Geotechnical Engineer/Engineering Geologist. The tube is replaced in the borehole and a subsequent 1m sample can be recovered. Occasionally outer casing or a reduced diameter tube is utilised to enable the window sample to progress in difficult drilling conditions. Geotechnical or environmental soil samples can be recovered from each of the liners following logging. The window sample records are provided in Appendix 6 of this Report.

3.5. Dynamic Probing

The dynamic probe tests (DPH) were carried out at the locations shown in the location plan in Appendix 1 in accordance with B.S. 1377: Part 9 1990. The test consists of mechanically driving a cone with a 50kg weight in 100mm intervals and monitoring the number of blows required. An equivalent Standard Penetration Test (SPT) 'N' value may be calculated by dividing the total number of blows over a 300mm drive length by 1.5. The dynamic probe logs are provided in Appendix 5 of this Report.

3.6. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 7 of this Report.

3.7. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.
The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or

liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 7 of this Report.

3.8. Surveying

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations will be included on the exploratory hole logs in the appendices of the final Report. Where levels are not shown on the logs coordinates were taken from GIS.

3.9. Groundwater/Gas Monitoring Installations

Groundwater and or Gas Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.10. Insitu Plate Bearing Test

The plate bearing tests were carried out using a 305mm or 450mm diameter plate at the locations shown on the site plan in Appendix 1. The plate was loaded in increments using a hydraulic jack and an excavator to provide a reaction and the displacement was monitored in accordance with BS1377 Part 9 using independently mounted digital strain gauges. The constrained modulus and equivalent CBR are calculated in accordance with HD29/75 and are provided on the test reports in Appendix 4 of this Report.

3.1. TRL Dynamic Cone Penetrometer

The TRL DCP tests were carried out at locations where plate load tests were not possible, to determine a CBR design value for the design of external pavements. The testing was carried out below the Topsoil or existing pavement at the depths detailed on the test report. The test consists of dropping a 10kg weight on

an anvil to drive a small diameter cone and recording the blows for a given penetration. The results of the DCP testing is included in Appendix 4 of this Report.

3.2. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Environmental & Chemical testing as required by the specification, including the Rilta Suite pH and sulphate testing was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.
Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer tests were carried out in NMTL's Geotechnical Laboratory in Carlow.
The results of the laboratory testing are included in Appendix 8 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

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

- Topsoil/Surfacing
- Made Ground
- Cohesive Deposits
- Granular Deposits (Rarely Encountered)
- Bedrock

TOPSOIL/SURFACING: Topsoil was encountered in the majority of the exploratory holes and was typically present to a depth of between 0.20 and 0.40m BGL with a maximum depth of 0.7m BGL encountered in TP05. Tarmac surfacing was present in WS04, WS12, BH05 and BH11 typically to a depth of between 0.08m and 0.10mBGL. Concrete was encountered in BH08 to a depth on 0.10m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil/Surfacing in some investigation locations and were present to a depth of between 0.5m and 1.0m BGL. These deposits were described generally as *brown slightly sandy slightly gravelly CLAY with occasional cobbles* or *grey sandy angular Gravel.* In some locations the made ground contained *occasional fragments of mortar, red brick, and charcoal.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Topsoil or Made Ground and were described typically as *brown slightly sandy slightly gravelly CLAY with occasional cobbles* overlying a *stiff or very stiff dark grey /black slightly sandy slightly gravelly CLAY with occasional cobbles*. A brown *very stiff slightly sandy slightly gravelly CLAY* was also encountered in some boreholes below the dark grey/black clay. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was very stiff below 2.2m BGL in the majority of the exploratory holes with some extending to 2.6m BGL before very stiff deposits were encountered.

GRANULAR DEPOSITS: Granular deposits were encountered in BH16 within the cohesive deposits and were typically described as G*rey brown slightly clayey sandy sub angular sub rounded fine to coarse GRAVEL with occasional cobbles.*
Based on the SPT N values the deposits are typically medium dense. A significant groundwater strike was noted in the borehole on encountering the granular deposits.

BEDROCK: The rotary core boreholes recovered weak to strong grey/dark grey fine to medium grained LIMESTONE w calcite veining. In some locations the beds of stiff brown clay were encountered which have been interpreted as residual weathered mudstone. This is typical of the Calp Formation, which is noted on the geological mapping to the east of the proposed site.
The depth to rock varies from 9.0m BGL in BH11 to a maximum of 18.45m BGL in BH03. In BH03 there was poor recovery and where cobbles of limestone where recovered that presumed to be rock. Generally rock was encountered at higher levels in the eastern area of the site. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD vary in the borehole across the site, with some core recovered as non-intact and some hole encountering clay bands within the limestone, however generally both indices show an increase with depth.

4.2. Insitu Strength Testing

The correlated DPH blow counts indicate that the overburden deposits are typically soft to depths of between 0.7 and 1.6m BGL and become firm to stiff and stiff to very stiff with depth. Generally stiff soils were encountered from between depths of 1.2 and 2.4m BGL at the dynamic probe locations.

4.3. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH02, BH03, BH07, BH09, BH11 BH14 and BH16 to allow the equilibrium groundwater level to be determined. The groundwater monitoring will be included in Appendix 9 of the final Report.

4.4. Laboratory Testing

4.4.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low to intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 20% and 30% generally with fines contents of 40% to 60%.

4.4.1. Chemical Laboratory Testing

The pH and sulphate testing carried out indicate that pH results are near neutral and that the water soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

4.4.1. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

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

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

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. The waste classification report is included under the cover of a sperate report by Ground Investigations Ireland.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

An allowable bearing capacity of 200 kN/m^2 is recommended for conventional strip or pad foundations on the stiff or very stiff dark grey/back cohesive deposits encountered at a depth of between 2.0m and 2.6m BGL on the northern part of the site.

On the western part of the site where the 3 storey structures are proposed in the locations of DP03 to DP06 and DP10 to DP12 a bearing capacity 100 kN/m^2 is achievable at depths of between 1.2m and 1.5m BGL.

For the area of the proposed basement a bearing capacity of 350 kN/m^2 would be achievable at 4 m below ground level in the very stiff dark grey Clay, however a settlement assessment should be carried out to ensure the structure can deal with the potential settlement, total and differential due to this increased loading.

In the area to the west on the existing building in the location of BH13, BH16, DP01 and DP02 where a 5 story building is proposed an allowable bearing capacity of 200 kN/m^2 is achievable between depths of 2.0 and 2.6mBGL for conventional strip or pad foundations on the stiff or very stiff dark grey/back cohesive deposits or medium dense granular deposits. It should be noted that the strata varied between holes in this area so foundation inspections should be undertaken and it is recommended that the foundations from the structure be placed on the same strata to avoid differential settlement.

For the area to the south of the existing building near to the location of BH13, BH14 and BH15 where a 7 story building is proposed, a bearing capacity of 200 kN/m^2 would be achievable at depths of between 2.4m to 2.7m BGL and below ground level in the very stiff dark grey Clay. A bearing capacity of 125 kN/m^2 is achievable on the firm to stiff brown clay at a depth of 2.0m BGL.

The possibility for variation in the depth of the made ground of soft ground in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

A ground bearing floor slab is recommended to be based on the firm to stiff cohesive deposits with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:2014 +A1:2016 and/or NRA SRW CL808 Type E granular stone fill. Where the depth of Made Ground/Soft deposits exceeds 0.9m then suspended floor slabs should be considered.

Due to the potential high loading anticipated from some of the proposed structures, piled foundations may be more economically advantageous. The type, size and depth of the pile foundations should be confirmed by a specialist piling contractor based on the loading from the proposed building.

The pH and sulphate testing completed on samples recovered from the exploratory holes indicates the pH results are near neutral and the sulphate results are low, when compared to the guideline values from BRE Special Digest 1:2005. No special precautions are required for concrete foundations to prevent sulphate attack. The samples tested were below the limits of DS1 in the BRE Special Digest 1:2005.

5.3. External Pavements

The proposed pavements are recommended to be designed in accordance with the CBR test results included in the Appendixes of this Report. The low CBR test results indicate that a capping layer or a sufficient depth of crushed stone fill may be required. Plate bearing tests are recommended at the time of construction to verify the design assumptions for the proposed pavement make up and to verify adequate compaction has been achieved.
The use of a geogrid and separation membrane may improve the performance of the proposed pavement and enable a more economical pavement design to be achieved, a specialist supplier is recommended to advise of the required strength, depth and type of geotextile for the proposed design.

5.4. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.
Excavations in the Made Ground, or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.
Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.
The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations. An assessment by a specialist dewatering contractor is recommended to determine the most cost effective approach to the proposed excavation.

Excavations in the upper cohesive deposits are expected to be excavatable with conventional excavation equipment.

Any waste material to be removed off site should be disposed of to a suitably licenced landfill.
The environmental testing completed during the ground investigation is reported under the cover of a separate GII Waste Classification/Subsoil Assessment Report.

5.5. Soakaway Design

At the locations of SA01, SA02 and SA03 the water level dropped too slowly to allow calculation of ‘f’ the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client:

Project Title:
Sandford Park

Drawing Title:
Figure 1 Site Location

GII Project Reference:
9338-12-19

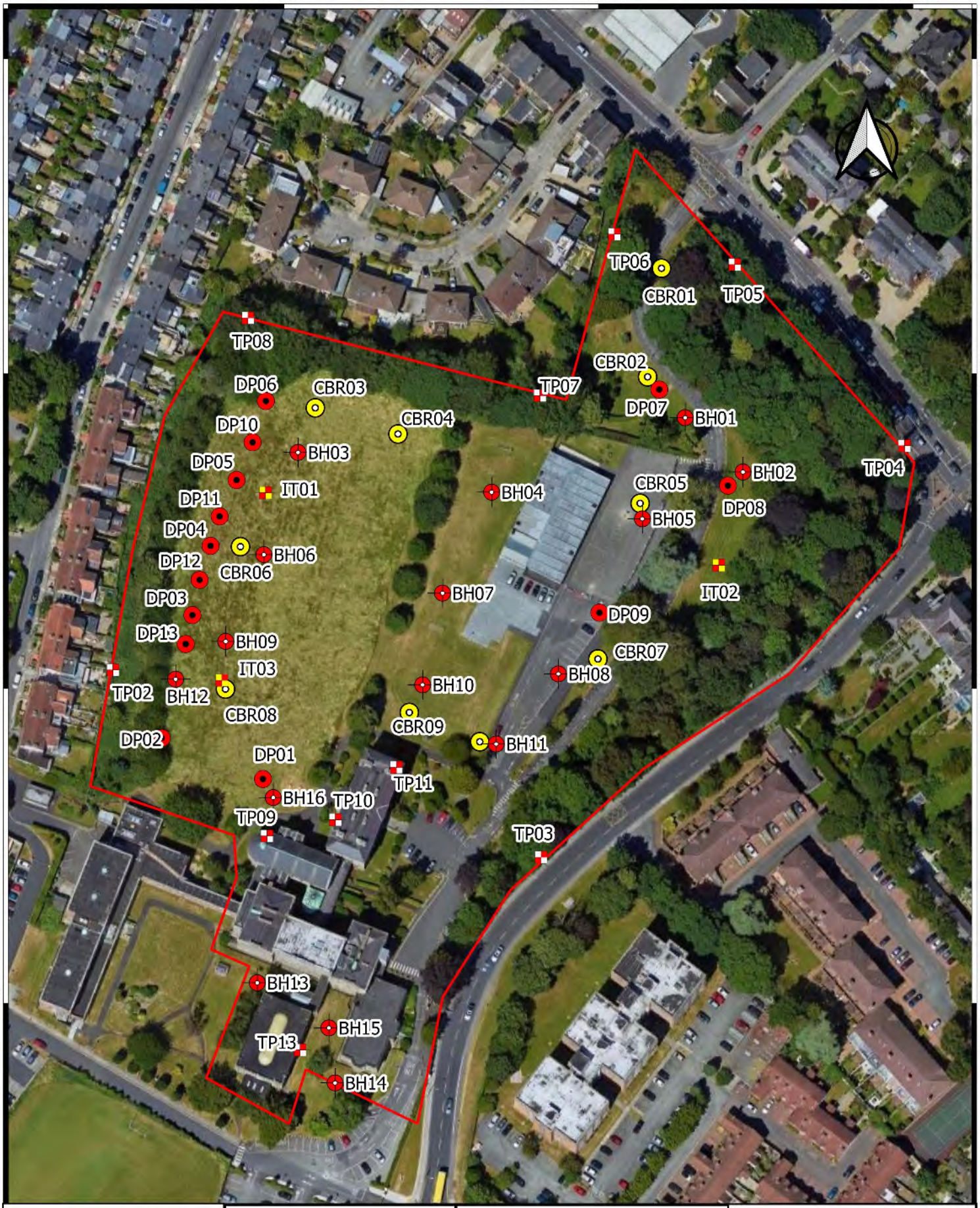
0 20 40 60 80 m

Drawn By:
NM

Date:
18/06/2020

Site Location

Indicative Site Boundary



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Hazelhatch Road,
Newcastle, Co. Dublin
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Client:

Project Title:
Sandford Park

Drawing Title:
Figure 2: GI Locations

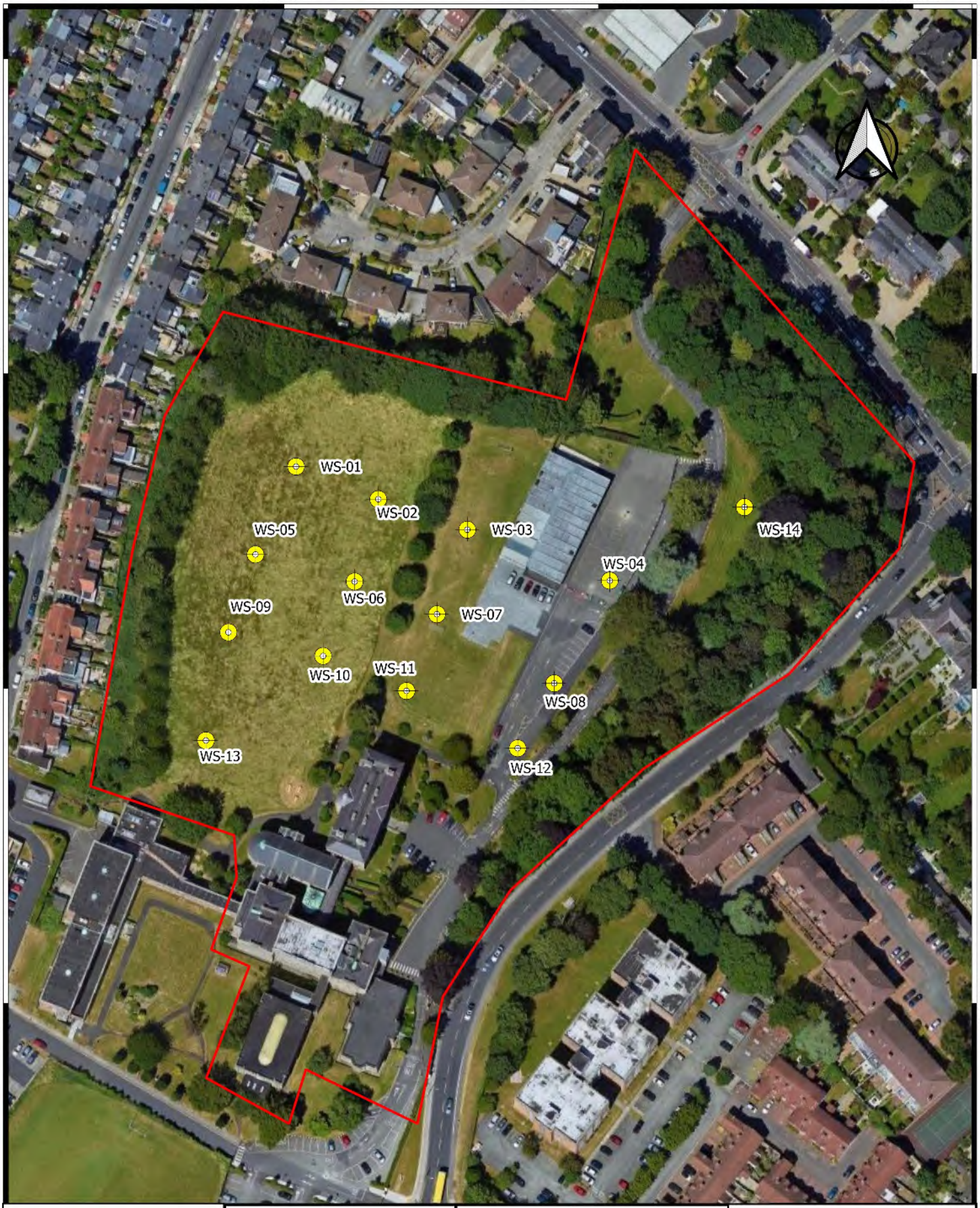
GII Project Reference:
9338-12-19

0 20 40 60 m

Drawn By:
NM

Date:
23/10/2020

- Indicative Site Boundary
- Borehole
- CBR
- Dynamic Probe
- Trial Pit
- Window Sample
- Soakaway



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
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Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client:

Project Title:
Sandford Park

Drawing Title:
Figure 3: WS Locations

GII Project Reference:
9338-12-19

0 20 40 60 m

Drawn By:
NM

Date:
23/10/2020

- Indicative Site Boundary
- Borehole
- CBR
- Dynamic Probe
- Trial Pit
- Window Sample
- Soakaway

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Sandford Park Milltown			**Trial Pit Number** TP02
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 1.2m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 716845.6 E 731205.5 N	**Dates** 17/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	TOPSOIL.		
					(0.55) 0.75	Firm light brown slightly sandy slightly gravelly CLAY.		
					(0.30) 1.05	Firm to stiff brown slightly sandy slightly gravelly CLAY with occasional sub-angular cobbles.		
						Complete at 1.05m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.05m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.TP02

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Trial Pit Number** TP03
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 1.4m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 716981.8 E 731146 N	**Dates** 17/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	MADE GROUND: Topsoil with roots plastic redbrick and concrete fragments.		
					0.30	MADE GROUND: Brown slightly sandy slightly gravelly CLAY with root concrete and fragments.		
					(0.90)			
					1.20	Complete at 1.20m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.20m BGL due to a concrete protection and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.TP03

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Site Sandford Park Milltown			**Trial Pit Number** TP04
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 1.5m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 717097.4 E 731276.8 N	**Dates** 17/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	TOPSOIL with roots.		
					(0.50) 0.70	Firm dark brown slightly sandy slightly gravelly CLAY with root fragments.		
					(0.70) 1.40	Firm to stiff light brown slightly sandy slightly gravelly CLAY.		
						Complete at 1.40m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.40m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.TP04

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Trial Pit Number** TP05
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 1.5m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 717043.4 E 731334.3 N	**Dates** 17/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.70)	TOPSOIL with roots.		
					0.70	Firm to stiff brown slightly sandy slightly gravelly CLAY.		
					(0.80)			
					1.50	Complete at 1.50m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.50m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.TP05

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Site Sandford Park Milltown			**Trial Pit Number** TP06
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 1.2m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 717005.1 E 731344 N	**Dates** 17/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25) 0.25	TOPSOIL with small concrete and plastic fragments.		
					(0.75)	Firm dark brown slightly sandy slightly gravelly CLAY.		
					1.00	Complete at 1.00m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.0m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.TP06

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Site Sandford Park Milltown			**Trial Pit Number** TP07
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 1.3m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 716981.4 E 731292.7 N	**Dates** 17/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	TOPSOIL.		
					0.25	Firm to stiff light brown slightly sandy slightly gravelly CLAY.		
					(0.90)			
					1.15	Complete at 1.15m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.15m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.TP07

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Trial Pit Number** TP08
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 1.5m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 716888.6 E 731317.4 N	**Dates** 17/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND: Topsoil with roots plastic redbrick and concrete fragments.		
					0.40			
					(0.30)	Firm light brown grey slightly sandy slightly gravelly CLAY.		
					0.70			
					(0.50)	Firm to stiff light brown slightly sandy slightly gravelly CLAY.		
					1.20	Complete at 1.20m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.20m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.TP08

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Trial Pit Number** TP09
Machine : 3T 360 **Method :** Trial Pit	**Dimensions** 0.6m W x 2.0m L	**Ground Level (mOD)** 20.90	**Client** DBFL	**Job Number** 9338-12-19
	Location (dGPS) 716894.6 E 731152.8 N	**Dates** 27/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Topsoil		
				20.75	0.15	Firm to stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subangular cobbles. Gravel is angular to subrounded fine to coarse.		
					(0.45)			
0.50	B			20.30	0.60	Stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subanugular cobbles and boulders. Gravel is angular to subrounded fine to coarse.		
1.00	B				(0.80)			
				19.50	1.40	Complete at 1.40m		

Plan

Remarks

Groundwater encountered at 1.40m
Trial pit stable.
Trial pit terminated at 1.40m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	PC	9338-12-19.TP09

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Site Sandford Park Milltown			**Trial Pit Number** TP10
Machine : 3T 360 **Method :** Trial Pit	**Dimensions** 0.6m W x 1.1m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location (Handheld GPS) 716916.4 E 731157.9 N	**Dates** 27/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	Topsoil		
					(0.25) 0.40	MADE GROUND: Brown slightly gravelly sandy Clay with occassional fragments of metal and red brick.		
					(0.40) 0.80	Firm to stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subangular cobbles. Gravel is angular to subrounded fine to coarse.		
1.20	B				(0.40) 1.20	Stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subanugular cobbles and boulders. Gravel is angular to subrounded fine to coarse. Complete at 1.20m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.20m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	PC	9338-12-19.TP10

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Site Sandford Park Milltown			**Trial Pit Number** TP11
Machine : 3T 360 **Method :** Trial Pit	**Dimensions** 0.6m W x 1.6m L	**Ground Level (mOD)** 20.81	**Client** DBFL	**Job Number** 9338-12-19
	Location (dGPS) 716935.8 E 731174.6 N	**Dates** 27/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Topsoil		
				20.66	0.15			
					(0.15)	MADE GROUND: Brown slightly gravelly sandy Clay with occassional fragments of red brick.		
				20.51	0.30			
0.80	B				(0.70)	Stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subanugular cobbles and boulders. Gravel is angular to subrounded fine to coarse.		
				19.81	1.00			
						Complete at 1.00m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.00m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	PC	9338-12-19.TP11

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Site Sandford Park Milltown			**Trial Pit Number** TP13
Machine : 3T 360 **Method :** Trial Pit	**Dimensions** 0.6m W x 1.0m L	**Ground Level (mOD)** 21.95	**Client** DBFL	**Job Number** 9338-12-19
	Location (dGPS) 716905.1 E 731084.8 N	**Dates** 27/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Topsoil		
				21.80	0.15	MADE GROUND: Brown slightly gravelly sandy Clay with rootlets and occassional fragments of glass and red brick.		
					(0.45)			
0.50	B			21.35	0.60	Stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subanugular cobbles. Gravel is angular to subrounded fine to coarse. Possible madeground.		
					(0.70)			
1.00	B			20.65	1.30	Complete at 1.30m		

Plan

Remarks

Groundwater not encountered during excavation.
Trial pit stable.
Trial pit terminated at 1.30m BGL on exposing the foundation and backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	PC	9338-12-19.TP13

APPENDIX 3 – Soakaway Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
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D22 YD52

Tel: 01 601 5175 / 5176
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Web: www.gii.ie

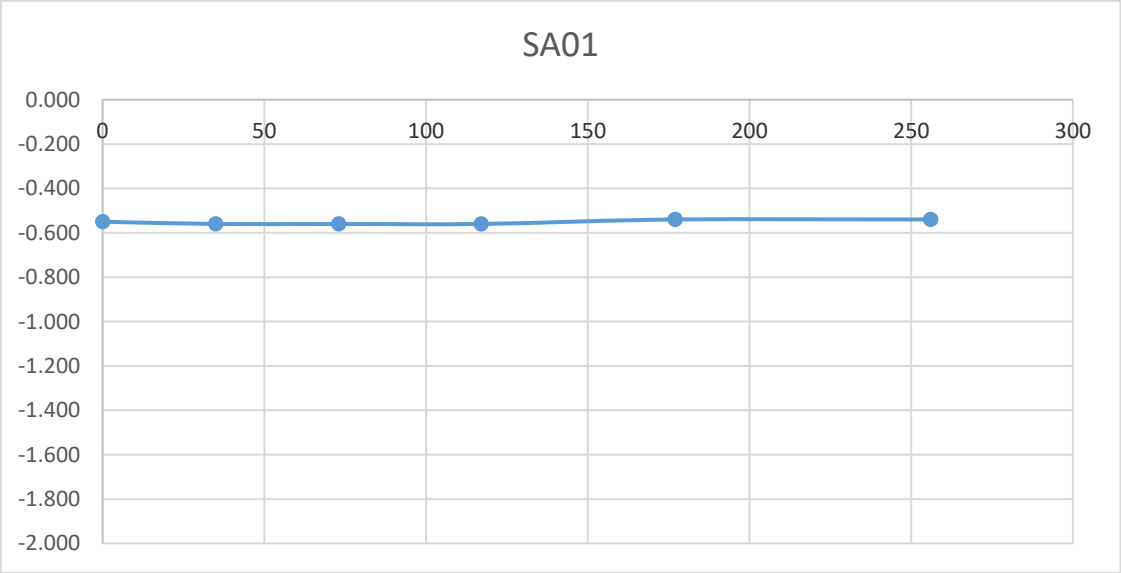
SA01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.5m x 0.60m 2.5m (L x W x D)

Date	Time	Water level (m bgl)
16/01/2020	0	-0.550
16/01/2020	35	-0.560
16/01/2020	73	-0.560
16/01/2020	117	-0.560
16/01/2020	177	-0.540
16/01/2020	256	-0.540

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.55	2.500	1.950	1.0375	2.0125



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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Tel: 01 601 5175 / 5176
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Web: www.gii.ie

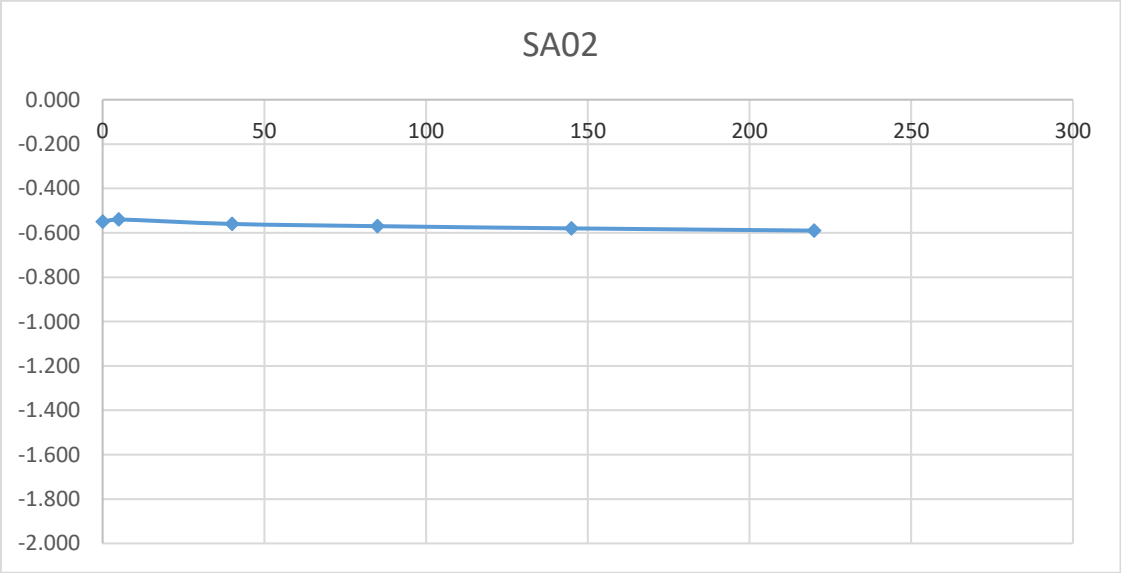
SA02

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.5m x 0.60m 2.5m (L x W x D)

Date	Time	Water level (m bgl)
16/01/2020	0	-0.550
16/01/2020	5	-0.540
16/01/2020	40	-0.560
16/01/2020	85	-0.570
16/01/2020	145	-0.580
16/01/2020	220	-0.590

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.55	2.500	1.950	1.0375	2.0125



GROUND INVESTIGATIONS IRELAND
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Tel: 01 601 5175 / 5176
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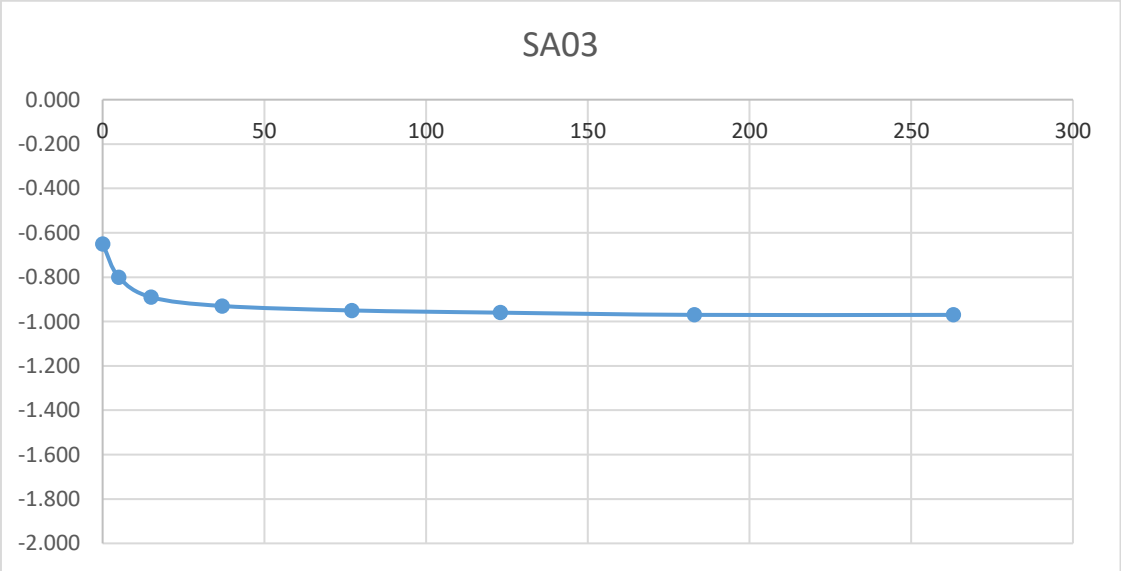
SA03

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.6m x 0.60m 2.60m (L x W x D)

Date	Time	Water level (m bgl)
16/01/2020	0	-0.650
16/01/2020	5	-0.800
16/01/2020	15	-0.890
16/01/2020	37	-0.930
16/01/2020	77	-0.950
16/01/2020	123	-0.960
16/01/2020	183	-0.970
16/01/2020	263	-0.970

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.65	2.600	1.950	1.1375	2.1125



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Site Sandford Park Milltown			**Trial Pit Number** SA01
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 2.5m L	**Ground Level (mOD)** 20.09	**Client** DBFL	**Job Number** 9338-12-19
	Location 716894.1 E 731261.8 N	**Dates** 16/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL.		
				19.89	0.20	POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly Clay.		
					(0.25)			
				19.64	0.45	Firm light brown slightly sandy slightly gravelly CLAY.		
					(1.85)			
				17.79	2.30	Firm to stiff brown grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles and boulders		
					(0.20)			
				17.59	2.50	Complete at 2.50m		

Plan

Remarks

Groundwater not encountered during excvation.
Trial pit stable.
Trial pit terminated at 2.50m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.SA01

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www.gii.ie

Site Sandford Park Milltown			**Trial Pit Number** SA02
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 2.5m L	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 9338-12-19
	Location 717038.2 E 731238.8 N	**Dates** 16/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL.		
					0.20			
					(0.20)	Soft to firm brown grey mottled sandy very gravelly CLAY with occasional sub-angular cobbles.		
					0.40			
					(0.80)	Brown grey sandy very clayey fine to coarse sub-angular to sub-rounded GRAVEL.		
					1.20			
					(0.90)	Firm brown slightly sandy slightly gravelly CLAY with occasional sub-angular to sub-rounded cobbles.		
					2.10			
					(0.40)	Stiff dark grey black slightly sandy slightly gravelly CLAY.		
					2.50	Complete at 2.50m		

Plan

Remarks

No groundwater encountered.
Trial pit spalling at 0.50m BGL.
Trial pit terminated at 2.50m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.SA02

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Site Sandford Park Milltown			**Trial Pit Number** SA03
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 0.6m W x 2.6m L	**Ground Level (mOD)** 21.18	**Client** DBFL	**Job Number** 9338-12-19
	Location 716880.2 E 731202.2 N	**Dates** 16/01/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	TOPSOIL.		
				20.98	0.20	POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly Clay.		
					(0.20)			
				20.78	0.40	Firm light brown slightly sandy slightly gravelly CLAY.		
					(0.30)			
				20.48	0.70	Firm to stiff brown grey slightly sandy gravelly CLAY with occasional sub-angular cobbles.		
					(1.10)			
				19.38	1.80	Stiff to very stiff brown grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles.		
					(0.80)			
			Water strike(1) at 2.50m.	18.58	2.60	Complete at 2.60m		▽1

Plan

Remarks

Slow ingress of groundwater encountered at 2.5m BGL.
Trial pit stable.
Trial pit terminated at 2.60m BGL and backfilled upon completion of soakaway.

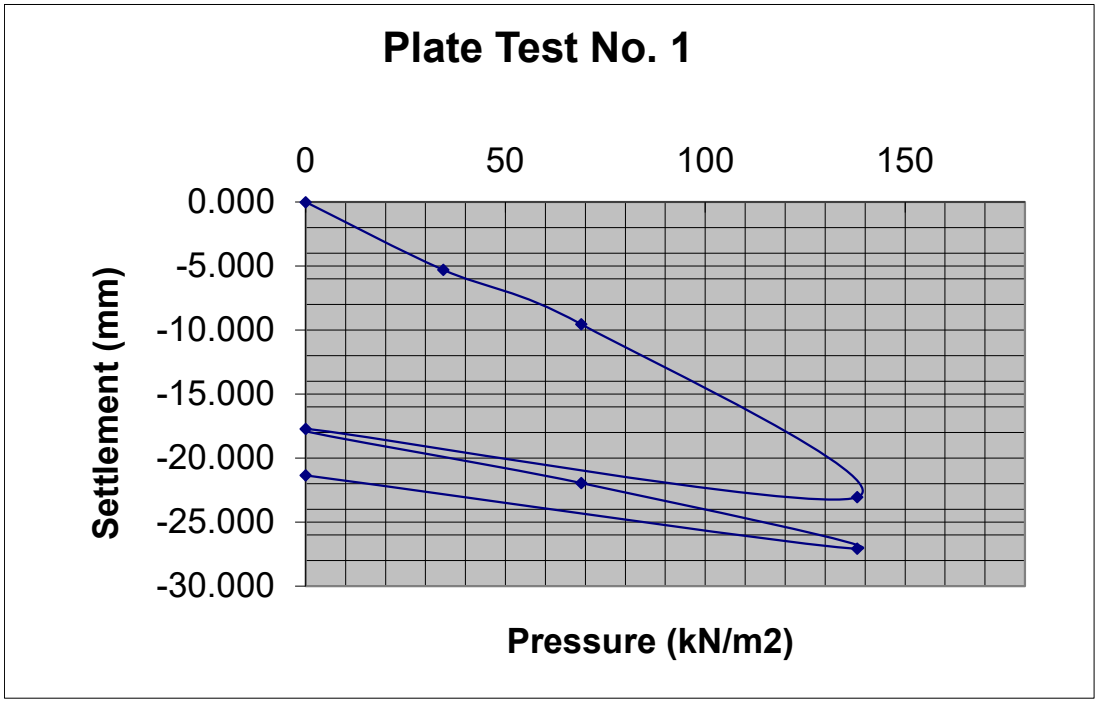
Scale (approx)	Logged By	Figure No.
1:25	NM	9338-12-19.SA03

APPENDIX 4 – Plate Load Test and TRL Probe Records

Applied Load	Gauge settlement
0	**0.000**
34.5	-5.3
69	-9.535
138	-23.05
0	-17.715
69	-21.95
138	-27.07
0	-21.335

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick and mortar fragments.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.40m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR01	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **4.89 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **11.01 MN/m2/m**

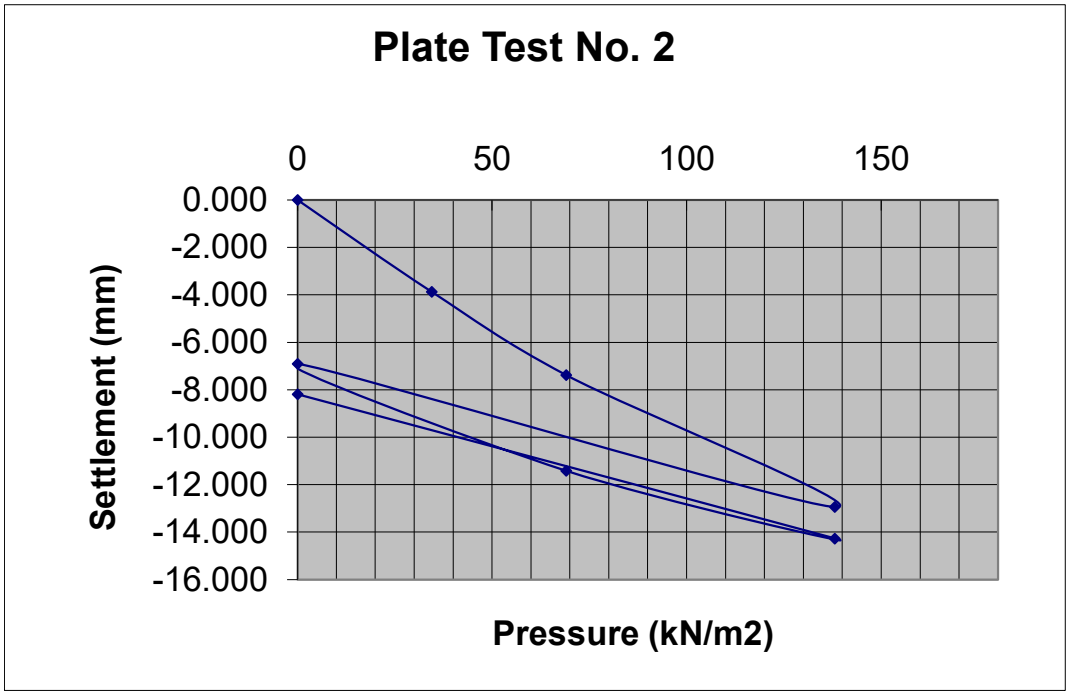
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.15 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **0.62 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-3.87
69	-7.38
138	-12.93
0	-6.9
69	-11.415
138	-14.265
0	-8.19

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick fragments.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.40m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR02	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **6.32 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **10.33 MN/m2/m**

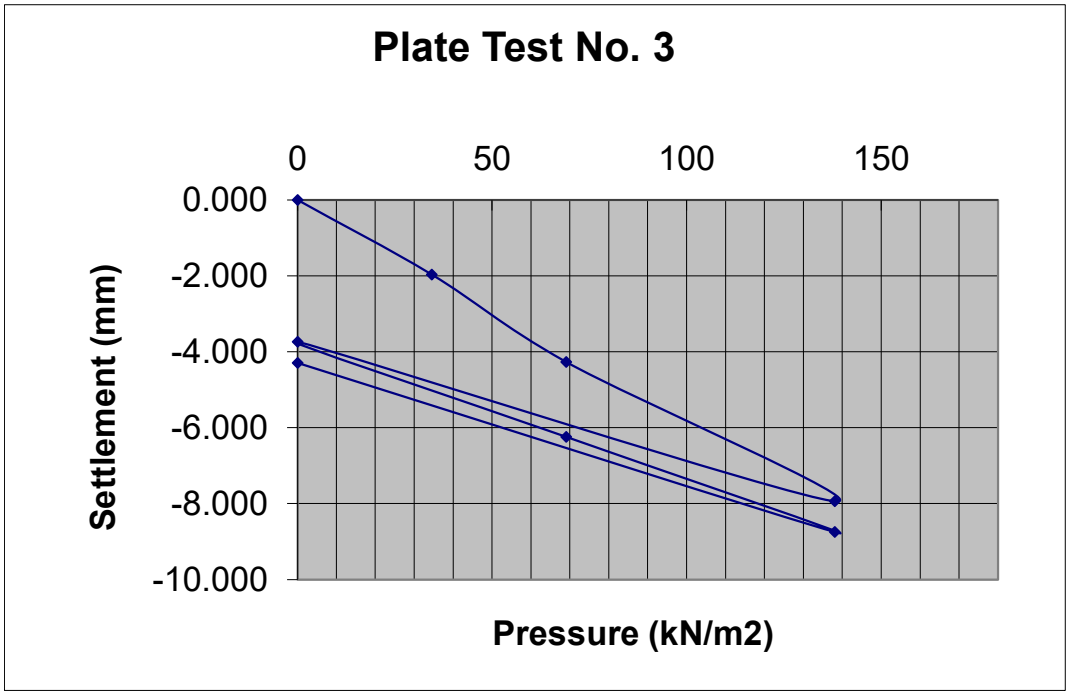
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.24 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **0.55 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-1.96
69	-4.265
138	-7.93
0	-3.73
69	-6.24
138	-8.745
0	-4.29

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.40m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR03	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **10.93 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **18.58 MN/m2/m**

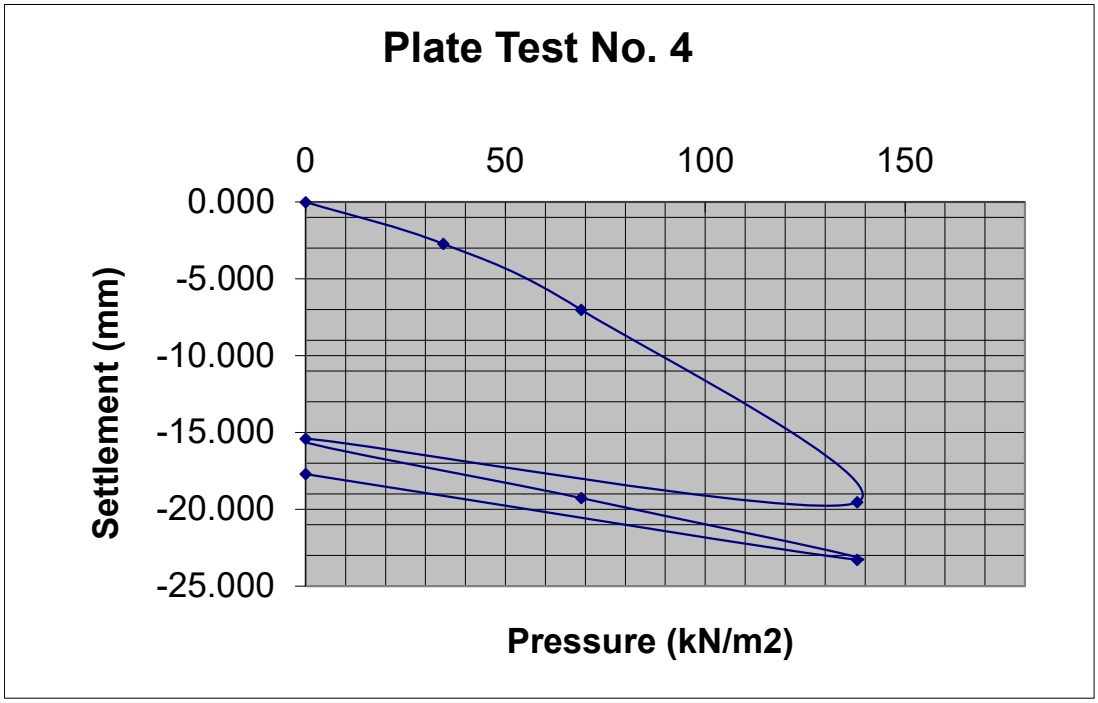
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.61 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.53 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-2.71
69	-7.01
138	-19.54
0	-15.41
69	-19.275
138	-23.28
0	-17.7

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets
CONTRACT NO.	9338-12-19		
DATE	20/01/2020		
CLIENT	DBFL	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR04	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **6.65 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **12.06 MN/m2/m**

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.26 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **0.72 %**

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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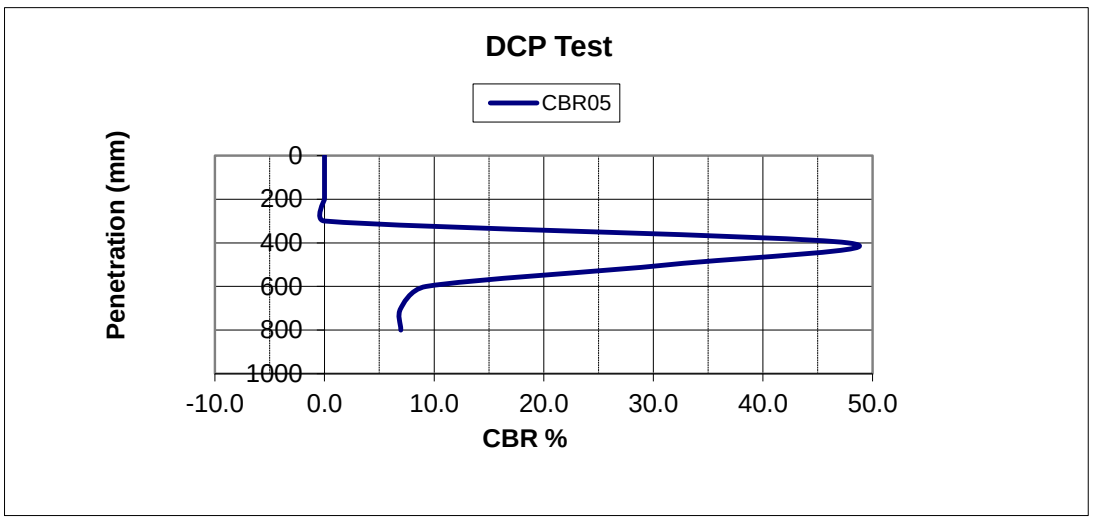
Job Name	Sandford Park Milltown	**Test Type**	Dynamic Cone Penetration Test
Job No.	9338-12-19	**Test Reference**	CBR05
Client	DBFL	**By**	N Morgan
		Date	21/01/2020
Initial Depth	0.3		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	-	-	0.0
200	-	-	0.0
300	-	-	0.0
400	18	5.6	47.7
500	13	7.7	31.5
600	5	20.0	9.3
700	4	25.0	7.0
800	4	25.0	7.0
900	4	25.0	7.0
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

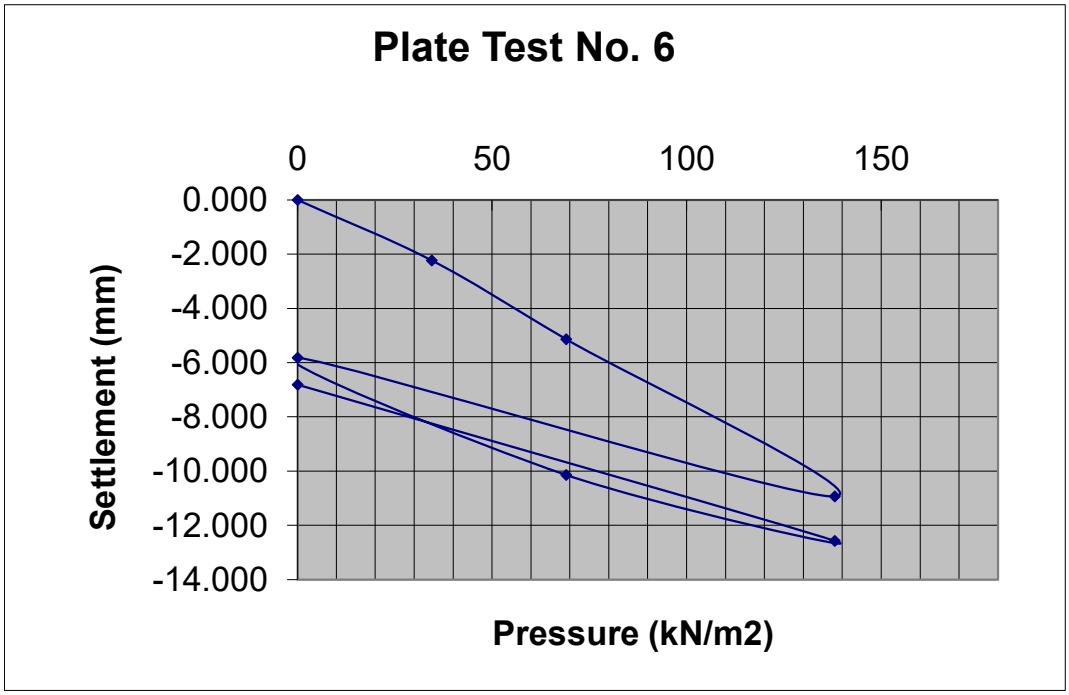
Reference **Kleyn and Van Heerden (60^{o} Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



Applied Load	Gauge settlement
0	**0.000**
34.5	-2.225
69	-5.135
138	-10.93
0	-5.815
69	-10.14
138	-12.565
0	-6.81

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	Possible MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.40m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR06	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **9.08 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **10.78 MN/m2/m**

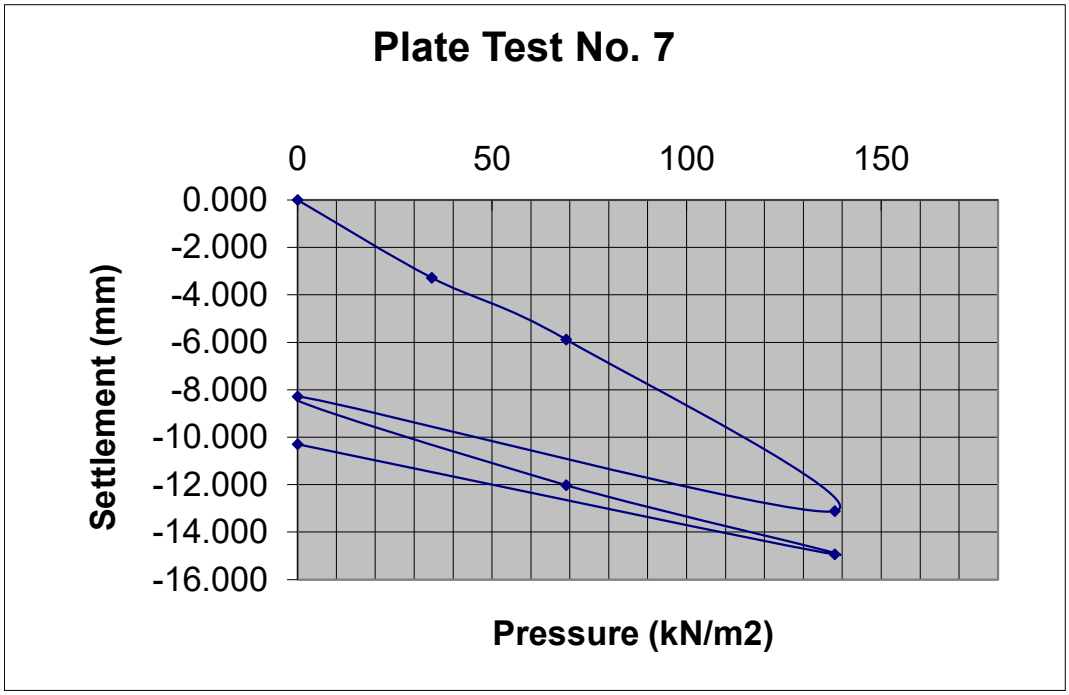
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.44 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **0.59 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-3.275
69	-5.88
138	-13.11
0	-8.275
69	-12.015
138	-14.935
0	-10.29

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets redbrick mortar and bone fragments.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.45m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR07	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **7.93 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **12.47 MN/m2/m**

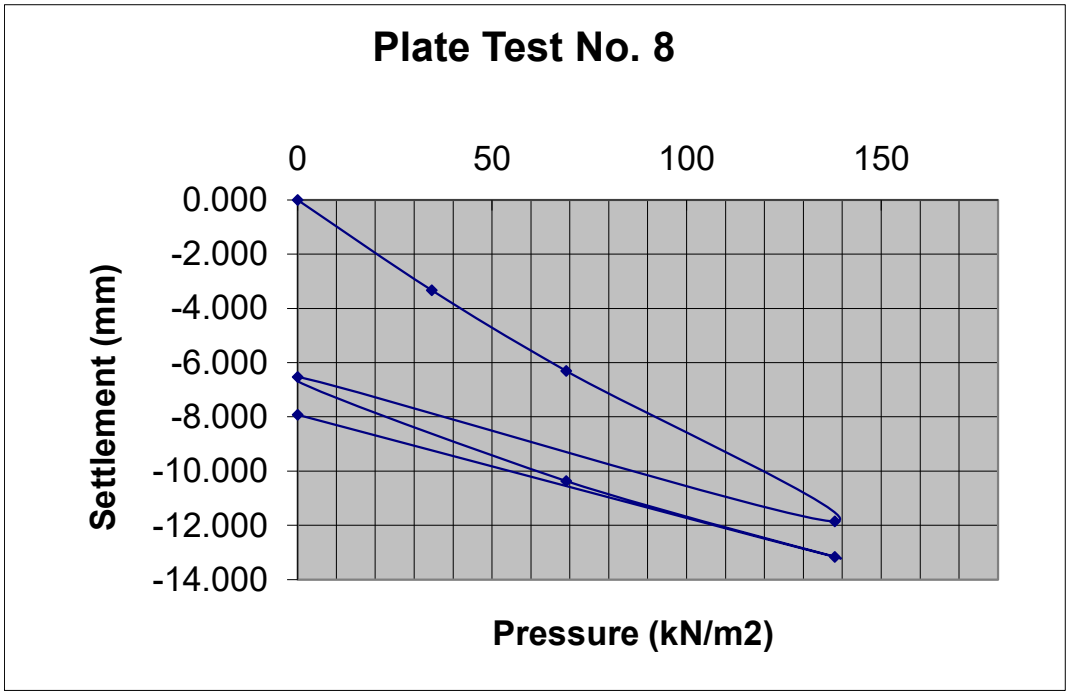
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.35 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **0.76 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-3.33
69	-6.305
138	-11.85
0	-6.52
69	-10.36
138	-13.16
0	-7.92

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.40m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR08	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **7.39 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **12.14 MN/m2/m**

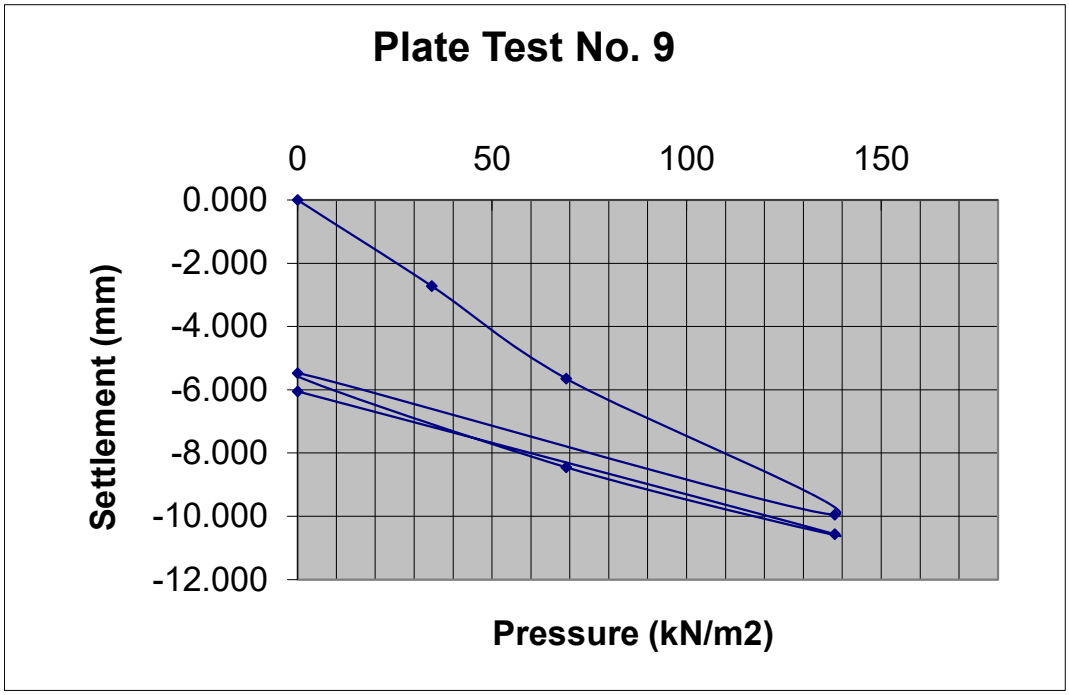
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.31 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **0.73 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-2.715
69	-5.64
138	-9.94
0	-5.47
69	-8.445
138	-10.56
0	-6.045

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick and plastic fragments.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR09	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **8.27 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **15.67 MN/m2/m**

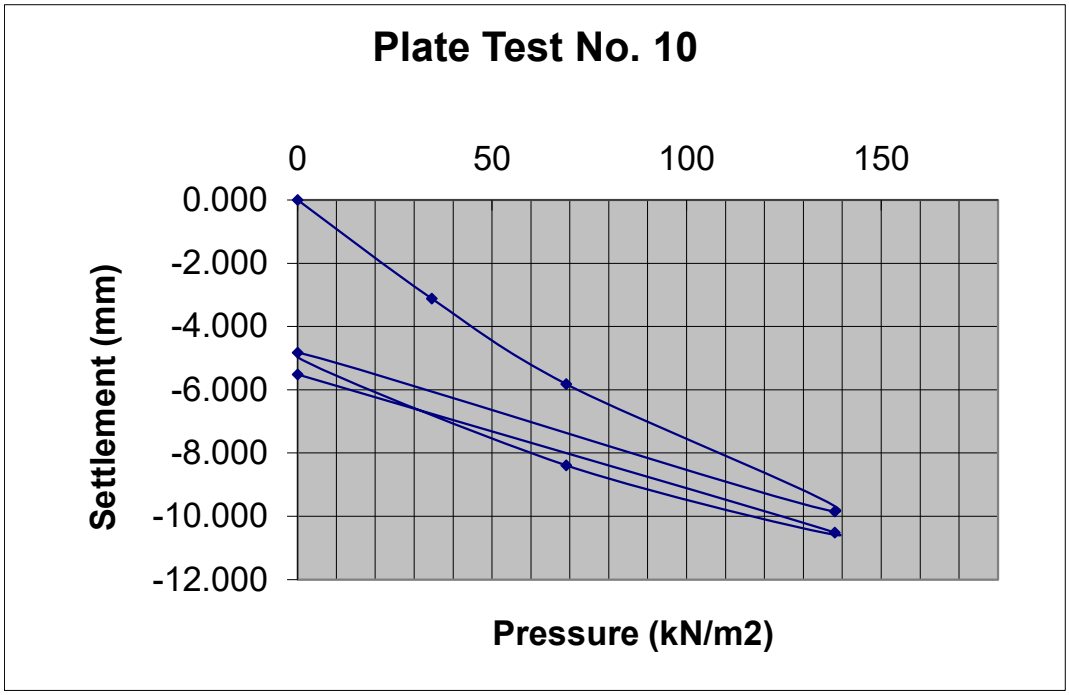
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.38 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **1.14 %**

Applied Load	Gauge settlement
0	**0.000**
34.5	-3.11
69	-5.82
138	-9.84
0	-4.82
69	-8.385
138	-10.515
0	-5.51

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

LOCATION	Sandford Park Milltown	**MATERIAL**	MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick and plastic fragments.
CONTRACT NO.	9338-12-19		
DATE	21/01/2020		
CLIENT	DBFL	**DEPTH**	0.30m
PLATE DIAMETER	457mm	**NOTES**	
TEST NO.	CBR10	**SAMPLES**	



Modulus of subgrade reaction, K (Initial) = **8.01 MN/m2/m**

Modulus of subgrade reaction, K (Reload) = **13.08 MN/m2/m**

Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 = **0.36 %**

Equivalent CBR(reload)in accordance with HD25/94 volume7 section2 = **0.83 %**

APPENDIX 7 – Borehole Records

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Borehole Number** BH01
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 5.70m	**Ground Level (mOD)** 18.33	**Client** DBFL	**Job Number** 9338-12-19
	Location (dGPS) 717027.6 E 731285.9 N	**Dates** 04/03/2020-05/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					18.03	(0.30) 0.30	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.		
0.50	B				17.53	(0.50) 0.80	Soft light brown slightly sandy slightly gravelly CLAY.		
1.00-1.45 1.00	SPT(C) N=11 B			1,2/2,3,3,3			Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
2.00-2.45 2.00	SPT(C) N=19 B			2,3/4,5,5,5		(1.70)			
3.00-3.45 3.00	SPT(C) N=40 B			3,5/7,9,11,13	15.83	2.50	Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
4.00-4.45 4.00	SPT(C) N=39 B			5,6/7,9,9,14		(3.20)			
5.00-5.38 5.00	SPT(C) 50/225 B			6,9/13,17,19,1					
					12.63	5.70	Refusal at 5.70m		

Remarks
No groundwater encountered during drilling
Borehole backfilled on complertion.
Borehole terminated at 5.70m BGL due to obstruction, possible boulder or rock
Chiselling from 5.70m to 5.70m for 1 hour.

Scale (approx)	Logged By
1:50	PM

Figure No. 9338-12-19.BH01

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Borehole Number** BH02
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 7.00m	**Ground Level (mOD)** 18.40	**Client** DBFL	**Job Number** 9338-12-19
	Location (dGPS) 717045.9 E 731268.6 N	**Dates** 06/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	Dark brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets.			
					18.10	0.30				
0.50	B					(0.80)	Soft light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
1.00-1.45 1.00	SPT(C) N=14 B			1,2/3,3,4,4	17.30	1.10				
						(1.20)	Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
2.00-2.45 2.00	SPT(C) N=18 B			2,3/4,5,4,5	16.10	2.30				
3.00-3.45 3.00	SPT(C) N=33 B			4,6/7,8,9,9			Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
4.00-4.40 4.00	SPT(C) 50/250 B			6,8/11,15,17,7						
						(4.70)				
5.00-5.40 5.00	SPT(C) 50/250 B			7,10/13,15,17,5						
6.00-6.30 6.00	SPT(C) 50/150 B			8,10/17,21,12						
7.00-7.00 7.00	SPT(C) 25*/0 50/0 B			25/50	11.40	7.00	Refusal at 7.00m			

Remarks
No groundwater encountered during drilling
Slotted pipe with pea gravel surround from 7.0m BGL to 1.0m BGL, plain pipe with bentonite seal from 1.0m BGL to GL, finished with an upright cover
Borehole terminated at 7.00m BGL due to obstruction, possible boulder or rock
Chiselling from 7.00m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:50	PM

Figure No. 9338-12-19.BH02

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Borehole Number** BH03
Machine : Dando 2000, Beretta T44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 7.20m 63mm cased to 20.00m	**Ground Level (mOD)** 19.67	**Client** DBFL	**Job Number** 9338-12-19
	Location 716904.5 E 731274.9 N	**Dates** 06/03/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					19.37	(0.30) 0.30	Dark brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets.			
0.50	B					(0.60)	Soft light brown slightly sandy slightly gravelly CLAY.			
1.00 1.00-1.45	B SPT(C) N=13			1,2/3,2,4,4	18.77 18.47	0.90 (0.30) 1.20	Soft light brown mottled orange grey slightly sandy slightly gravelly CLAY.			
2.00 2.00-2.45	B SPT(C) N=22			7,4/5,6,6,5		(1.10)	Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Some yellow and grey mottling.			
3.00 3.00-3.31	B SPT(C) 50/160			7,12/18,25,7	17.37	2.30	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
4.00 4.00-4.45	B SPT(C) N=39			7,10/8,9,11,11						
5.00 5.00-5.45	B SPT(C) N=47			6,8/10,12,12,13		(4.20)				
6.00 6.00-6.45	B SPT(C) N=50			6,9/10,11,14,15						
7.00 7.00-7.22	B SPT(C) 50/70			10,20/50	13.17 12.67	6.50 (0.50) 7.00	Very stiff brown slightly sandy gravelly CLAY.			
7.00	TCR: 75	SCR	RQD	FI			Very stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
8.20-8.28 8.20	SPT(C) 25*/75 50/0			22,3/50						
	TCR: 93	SCR	RQD	FI		(4.20)				
9.70-9.78 9.70	SPT(C) 25*/75 50/0			22,3/50						

Remarks
No groundwater encountered during cable percusion drilling.
Cable percussion to 7.00m BGL with Rotary core follow on to 20.00m BGL.
Slotted pipe installed from 8.5m BGL to 3m BGL with pea grval filter zone from 8.5m BGL to 1.0m BGL and bentonite seal from 1.0m BGL to GL, finished with an upright cover
Chiselling from 7.20m to 7.20m for 1 hour.

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH03

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Site Sandford Park Milltown			**Borehole Number** BH03
Machine : Dando 2000, Beretta T44 **Flush :** Water **Core Dia :** 63 mm **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 7.20m 63mm cased to 20.00m	**Ground Level (mOD)** 19.67	**Client** DBFL	**Job Number** 9338-12-19
	Location 716904.5 E 731274.9 N	**Dates** 06/03/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	93				26/50 SPT(C) 26*/75 50/0						
11.20-11.28 11.20						8.47	11.20	Very stiff brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse.			
	67						(2.20)				
12.70-12.70 12.70					25/50 SPT(C) 25*/0 50/0						
	73					6.27	13.40	Very stiff grey slightly sandy gravelly CLAY with many subangular to subrounded cobbles and boulders. Gravel is subangular to subrounded fine to coarse.			
14.20-14.20 14.20					25/50 SPT(C) 25*/0 50/0						
	73						(3.80)				
15.70-15.78 15.70					22,3/50 SPT(C) 25*/75 50/0						
	100										
17.20-17.28 17.20					21,4/50 SPT(C) 25*/75 50/0	2.47	17.20	Poor recovery. Recovery consists of slightly clayey slightly gravelly clayey subangular to subrounded COBBLES of limestone.			
	33						(1.25)				
						1.22	18.45	Poor recovery. Recovery consists of COBBLES of limestone. Presumed rock.			
18.70											
	62						(1.55)				
20.00						-0.33	20.00				

Remarks

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH03

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Borehole Number** BH04
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 7.30m	**Ground Level (mOD)** 19.44	**Client** DBFL	**Job Number** 9338-12-19
	Location 716966.1 E 731262.2 N	**Dates** 10/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					19.24	(0.20) 0.20	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.		
0.50	B					(0.70)	Soft to firm light brown mottled grey slightly sandy slightly gravelly CLAY.		
1.00-1.45 1.00	SPT(C) N=8 B			1,1/2,1,2,3	18.54	0.90			
						(0.50)	Soft to firm light brown slightly sandy slightly gravelly CLAY.		
					18.04	1.40			
2.00-2.02 2.00	SPT(C) 25*/20 50/0 B			25/50		(1.10)	Firm to stiff light brown slightly sandy slightly gravelly CLAY.		
					16.94	2.50			
3.00-3.45 3.00	SPT(C) N=47 B			6,8/11,12,13,11			Very stiff, dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
4.00-4.45 4.00	SPT(C) N=50 B			6,8/11,13,14,12					
						(4.40)			
5.00-5.43 5.00	SPT(C) 50/275 B			7,8/10,15,16,9					
6.00-6.37 6.00	SPT(C) 50/215 B			9,10/14,16,20					
					12.54	6.90			
7.00-7.35 7.00	SPT(C) 50/195 B			10,10/15,20,15		(0.40)	Very stiff greyish brown slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
					12.14	7.30	Refusal at 7.30m		

Remarks
No groundwater encountered during drilling
Borehole backfilled on complertion.
Borehole terminated at 7.30m BGL due to obstruction, possible boulder or rock
Chiselling from 2.50m to 2.62m for 0.75 hours. Chiselling from 7.30m to 7.30m for 1 hour.

Scale (approx)	Logged By
1:50	PM

Figure No. 9338-12-19.BH04

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Site Sandford Park Milltown			**Borehole Number** BH05
Machine : Dando 2000, Beretta T44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 5.30m 63mm cased to 16.50m	**Ground Level (mOD)** 18.75	**Client** DBFL	**Job Number** 9338-12-19
	Location 717014 E 731253.8 N	**Dates** 03/03/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					18.65	0.10	MADE GROUND: Tarmacadam		
						(0.40)	MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional fragments of red brick cloth fibres and tarmacadam.		
0.50	B				18.25	0.50			
1.00 1.00-1.45	B SPT(C) N=12			1,2/3,3,3,3		(1.70)	Firm light brown slightly sandy slightly gravelly CLAY. Some orange mottling.		
2.00 2.00-2.45	B SPT(C) N=37			2,4/5,7,12,13	16.55	2.20	Very stiff dark grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse.		
3.00 3.00-3.45	B SPT(C) N=51			5,7/11,11,14,15 Water strike(1) at 3.10m, rose to 2.60m in 20 mins, sealed at NOm.				▼1	▽1
4.00 4.00-4.45	B SPT(C) N=55			5,7/10,13,15,17		(4.50)			
5.00 5.00-5.30	B SPT(C) 50/150			7,15/20,30					
5.30	TCR: 25	SCR	RQD	FI					
6.70-6.85 6.70	TCR: 100	SCR	RQD	FI	12.05	6.70	Very stiff brown slightly sandy slightly gravelly CLAY with some subangular to subrounded cobbles and boulders. Gravel is subanugular to subrounded fine to coarse.		
8.20-8.28 8.20	TCR: 100	SCR	RQD	FI					
9.70-9.78 9.70				14,22/50 SPT(C) 50/0 22,3/50 SPT(C) 25*/75 50/0 22,3/50 SPT(C) 25*/75 50/0					

Remarks
Groundwater encountered at 3.10m BGL.
Borehole backfilled on completion.
Cable percussion to 5.30m BGL with Rotary core follow on to 16.50m BGL.
Chiselling from 5.30m to 5.30m for 1 hour.

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH05

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Site Sandford Park Milltown			**Borehole Number** BH05
Machine : Dando 2000, Beretta T44 **Flush :** Water **Core Dia :** 63 mm **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 5.30m 63mm cased to 16.50m	**Ground Level (mOD)** 18.75	**Client** DBFL	**Job Number** 9338-12-19
	Location 717014 E 731253.8 N	**Dates** 03/03/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	93						(6.60)			
11.20-11.28 11.20	73				22,3/50 SPT(C) 25*/75 50/0					
12.70-13.15 12.70					8,9/10,12,12,11 SPT(C) N=45					
13.30	50	22	22			5.45	13.30	Weak- medium strong fine grained grey LIMESTONE distinctly weathered with calcite veining and occasional beds of stiff brown Clay. (possible residual mudstone) One set of fractures. F1: 0-10 degrees. Very closely-closely spaced undulating smooth occasionally open with brown staining and clay smearing.		
14.20	87	59	52	7			(3.20)			
15.40 15.70	81	23	16	N.I.				From 15.40 to 16.50 Non Intact.		
16.50						2.25	16.50	Complete at 16.50m		

Remarks

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH05

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Site Sandford Park Milltown			**Borehole Number** BH06
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 8.00m	**Ground Level (mOD)** 20.32	**Client** DBFL	**Job Number** 9338-12-19
	Location 716893.6 E 731242.4 N	**Dates** 11/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					20.12	(0.20) 0.20	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.		
						(0.40)	Soft light brown slightly sandy slightly gravelly CLAY with some grey mottling.		
0.50	B				19.72	0.60	Firm light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
1.00-1.45 1.00	SPT(C) N=10 B			1,1/2,2,3,3		(1.60)			
2.00-2.45 2.00	SPT(C) N=19 B			2,2/3,4,5,7	18.12	2.20	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
3.00-3.42 3.00	SPT(C) 50/265 B			10,10/10,15,15,10					
4.00-4.39 4.00	SPT(C) 50/235 B			11,12/13,14,16,7		(4.80)			
5.00-5.38 5.00	SPT(C) 50/230 B			10,12/12,16,17,5					
6.00-6.35 6.00	SPT(C) 50/200 B			11,13/17,19,14					
7.00-7.33 7.00	SPT(C) 50/180 B			12,14/16,22,12	13.32	7.00	Very stiff light brown slightly sandy slightly gravelly CLAY.		
						(1.00)			
8.00-8.28 8.00	SPT(C) 50/125 B			16,19/25,25	12.32	8.00	Complete at 8.00m		

Remarks
No groundwater encountered during drilling
Borehole terminated at 8.00m BGL

Scale (approx)	Logged By
1:50	PM

Figure No. 9338-12-19.BH06

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Site Sandford Park Milltown			**Borehole Number** BH07
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 8.00m	**Ground Level (mOD)** 20.00	**Client** DBFL	**Job Number** 9338-12-19
	Location 716950.4 E 731230.1 N	**Dates** 12/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.50	B					(1.00)	MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional fragments of concrete and red brick.			
1.00-1.45 1.00	SPT(C) N=5 B			1,1/1,2,1,1	19.00	1.00 (0.40)	POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
2.00-2.45 2.00	SPT(C) N=27 B			1,2/4,6,8,9	18.60	1.40 (1.00)	Firm to Stiff light brown slightly sandy slightly gravelly CLAY.			
3.00-3.45 3.00	SPT(C) N=44 B			5,7/10,11,11,12	17.60	2.40	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
4.00-4.44 4.00	SPT(C) 50/285 B			8,8/11,14,15,10						
5.00-5.43 5.00	SPT(C) 50/275 B			9,11/11,13,17,9		(4.80)				
6.00-6.37 6.00	SPT(C) 50/220 B			11,14/15,16,19						
7.00-7.37 7.00	SPT(C) 50/220 B			12,12/14,16,20	12.80	7.20 (0.80)	Very stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
8.00-8.31 8.00	SPT(C) 50/155 B			14,17/20,25,5	12.00	8.00	Complete at 8.00m			

Remarks
No groundwater encountered during drilling
Slotted pipe with pea gravel surround from 8.0m BGL to 1.0m BGL, plain pipe with bentonite seal from 1.0m BGL to GL, finished with an upright cover
Borehole terminated at 8.00m BGL

Scale (approx)	Logged By
1:50	PM

Figure No. 9338-12-19.BH07

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Site Sandford Park Milltown			**Borehole Number** BH08
Machine : Dando 2000, Beretta T44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 8.00m 96mm cased to 13.70m	**Ground Level (mOD)** 19.76	**Client** DBFL	**Job Number** 9338-12-19
	Location 716987.3 E 731204.4 N	**Dates** 13/03/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					19.66	0.10	CONCRETE.		
						(0.40)			
0.50	B				19.26	0.50	MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional fragments of red brick and concrete.		
1.00	B					(0.80)	Soft light brown very sandy slightly gravelly CLAY.		
1.00-1.45	SPT(C) N=5			1,1/1,1,1,2					
					18.46	1.30	Soft to firm brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
2.00	B					(1.30)			
2.00-2.45	SPT(C) N=9			1,1/1,2,3,3					
					17.16	2.60	Very stiff dark grey slightly sandy slightly gravelly CLAY with rare subangular to subrounded cobbles.		
3.00	B								
3.00-3.45	SPT(C) N=38			5,5/8,9,10,11					
4.00	B								
4.00-4.45	SPT(C) N=41			4,5/8,10,11,12					
5.00	B					(4.60)			
5.00-5.45	SPT(C) N=41			5,6/7,9,11,14					
6.00	B								
6.00-6.45	SPT(C) N=47			8,9/10,11,13,13					
7.00	B								
7.00-7.37	SPT(C) 55/220			11,14/16,17,22	12.56	7.20	Very stiff dark brown very sandy very gravelly CLAY. Gravel is subangular to subrounded fine to coarse.		
						(0.80)			
8.00	B			14,20/27,23					
8.00-8.25	SPT(C) 50/95				11.76	8.00	Very stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders. Gravel is subangular to subrounded fine to coarse.		
8.00	TCR 100	SCR	RQD	FI					
8.20						(1.70)			
	63								
9.70-9.78				12,13/50 SPT(C) 25*/75	10.06	9.70	Medium strong- strong fine grained grey LIMESTONE partially- distinctly weathered with calcite veining.		
9.70				50/0					

Remarks
No groundwater encountered during drilling
Cable percussion to 8.00m BGL with Rotary core follow on to 13.70m BGL.
Borehole backfilled on completion.

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH08

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Borehole Number** BH08
Machine : Dando 2000, Beretta T44 **Flush :** Water **Core Dia :** 96 mm **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 8.00m 96mm cased to 13.70m	**Ground Level (mOD)** 19.76	**Client** DBFL	**Job Number** 9338-12-19
	Location 716987.3 E 731204.4 N	**Dates** 13/03/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100	67	60					Two sets of fractures. F1: 0-10 degrees. Very closely-closely spaced undulating smooth occasionally open with clay smearing. F2: 30-45 degrees. Very closely-closely spaced undulating smooth closed.		
11.20	100	59	59	9			(4.00)			
12.50	100	75	68							
13.70						6.06	13.70	Complete at 13.70m		

Remarks

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH08

Ground Investigations Ireland Ltd
www.gii.ie

Site Sandford Park Milltown			**Borehole Number** BH09
Machine : Dando 2000, Beretta T44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 8.00m 63mm cased to 18.70m	**Ground Level (mOD)** 20.84	**Client** DBFL	**Job Number** 9338-12-19
	Location 716881.5 E 731214.8 N	**Dates** 17/03/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.30)	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.			
					20.54	0.30				
0.50	B					(0.60)	Soft light brown slightly sandy slightly gravelly CLAY.			
1.00	B				19.94	0.90				
1.00-1.45	SPT(C) N=10			1,1/2,3,3,2			Firm light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
						(1.50)				
2.00	B									
2.00-2.45	SPT(C) N=11			1,2/3,3,3,2						
					18.44	2.40	Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
3.00	B									
3.00-3.45	SPT(C) N=28			2,3/5,7,7,9						
4.00	B									
4.00-4.45	SPT(C) N=38			5,7/7,9,11,11						
5.00	B									
5.00-5.45	SPT(C) N=43			7,7/8,10,12,13		(5.20)				
6.00	B									
6.00-6.44	SPT(C) 50/285			10,12/12,14,14,10						
7.00	B									
7.00-7.34	SPT(C) 50/190			12,14/16,23,11						
				12,17/24,26	13.24	7.60	Very stiff light brown slightly sandy slightly gravelly CLAY with rare subangular to subrounded cobbles.			
8.00	TCR / SCR	RQD	FI	B		(0.40)				
8.00-8.28				SPT(C) 50/125	12.84	8.00				
8.00	100						Very stiff slightly sandy slightly gravelly CLAY with occsional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse.			
8.20										
	100					(2.50)				
				12,22/50						
9.70-9.85				SPT(C) 50/0						
9.70										

Remarks
No groundwater encountered durig cable percussion drilling
Cable percussion drilling to 8.00m BGL with rotary follow on to 18.70m BGL.
Slotted pipe installed from 9.5 BGL to 3.0m BGL with pea gravel filter zone from 9.5m BGL to 1.0m BGL and bentonite seal from 1.0m BGL to GL, finished with an upright cover

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH09

Ground Investigations Ireland Ltd
www.gii.ie

Site Sandford Park Milltown			**Borehole Number** BH09
Machine : Dando 2000, Beretta T44 **Flush :** Water **Core Dia :** 63 mm **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 8.00m 63mm cased to 18.70m	**Ground Level (mOD)** 20.84	**Client** DBFL	**Job Number** 9338-12-19
	Location 716881.5 E 731214.8 N	**Dates** 17/03/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	100					10.34	10.50	Very stiff brown slightly sandy slightly gravelly CLAY with somel subangular to subrounded cobbles and boulders.			
11.20-11.28 11.20					19,6/50 SPT(C) 25*/75 50/0		(2.50)				
	83										
12.70						7.84	13.00	No recovery. Driller notes possible rock at 13.00m.			
	27						(1.20)				
14.20						6.64	14.20	Possible weathered rock recovered as slightly sandy gravelly CLAY with subangular to subrounded cobbles of limestone.			
	77						(1.50)				
15.70						5.14	15.70	Medium strong- strong fine grained grey LIMESTONE partially to distinctly weathered, with closely to medium spaced thin beds of stiff brown Clay (possible residual mudstone). One set of fractures. F1: 0-10 degrees. Very closely-closely spaced undulating smooth occasionally open with brown staining and clay smearing.			
	93	51	51				(3.00)				
17.20											
	80	32	32								
18.70						2.14	18.70	Complete at 18.70m			

Remarks

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH09

Ground Investigations Ireland Ltd
www.gii.ie

Site Sandford Park Milltown			**Borehole Number** BH10
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 7.20m	**Ground Level (mOD)** 20.35	**Client** DBFL	**Job Number** 9338-12-19
	Location 716944.1 E 731201 N	**Dates** 17/03/2020-18/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					20.15	(0.20) 0.20	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.		
0.50	B					(1.00)	Soft light brown slightly sandy slightly gravelly CLAY. Mottled grey.		
1.00-1.45 1.00	SPT(C) N=11 B			1,1/2,3,3,3	19.15	1.20	Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
2.00-2.45 2.00	SPT(C) N=21 B			2,3/4,5,5,7		(1.30)			
3.00-3.45 3.00	SPT(C) N=44 B			5,7/9,10,12,13	17.85	2.50	Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
4.00-4.44 4.00	SPT(C) 50/285 B			7,9/11,14,16,9 Water strike(1) at 4.30m, rose to 4.20m in 20 mins.		(4.70)			▼1 ▽1
5.00-5.40 5.00	SPT(C) 44/245 B			7,10/10,10,17,7					
6.00-6.37 6.00	SPT(C) 50/215 B			9,11/14,17,19					
7.00-7.17 7.00	SPT(C) 50/20 B			12,14/50	13.15	7.20	Refusal at 7.20m		

Remarks
Groundwater encountered at 4.30m.
Borehole backfilled on completion
Borehole terminated at 7.20m BGL due to obstruction, possible boulder or rock

Scale (approx)	Logged By
1:50	PM

Figure No. 9338-12-19.BH10

Ground Investigations Ireland Ltd
www.gii.ie

Site Sandford Park Milltown			**Borehole Number** BH11
Machine : Dando 2000, Beretta T44 **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 8.00m 96mm cased to 13.00m	**Ground Level (mOD)** 20.45	**Client** DBFL	**Job Number** 9338-12-19
	Location 716967.5 E 731182.2 N	**Dates** 18/03/2020	**Project Contractor** GII	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					20.35	0.10	MADE GROUND: Tarmacadam			
						(0.40)	MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles			
0.50	B				19.95	0.50				
1.00	B				19.75	(0.20) 0.70	Soft light brown slightly sandy slightly gravelly CLAY with rare subangular to subrounded cobbles.			
1.00-1.45	SPT(C) N=6			1,1/1,2,1,2		(0.50)				
					19.25	1.20	Soft light brown mottled grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
2.00	B					(1.20)	Firm light brown slightly sandy slightly gravelly CLAY.			
2.00-2.45	SPT(C) N=12			1,1/2,3,3,4						
					18.05	2.40	Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
3.00	B									
3.00-3.45	SPT(C) N=48			7,9/10,12,12,14						
4.00	B									
4.00-4.45	SPT(C) N=49			7,10/10,12,14,13						
						(4.70)				
5.00	B									
5.00-5.44	SPT(C) 50/285			8,9/11,12,13,14						
6.00	B									
6.00-6.40	SPT(C) 50/245			8,10/12,14,14,10						
7.00	B			10,11/14,16,20						
7.00-7.37	SPT(C) 50/220				13.35	7.10	Very stiff light brown slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles.			
7.00	TCR 33	SCR -	RQD	FI		(0.90)				
8.00-8.34	B			12,14/17,20,15						
8.00	SPT(C) 52/190				12.45	8.00	Very stiff brown slightly sandy slightly gravelly CLAY with some subangular to subrounded cobbles and boulders.			
8.20						(1.00)				
9.00	TCR 87	SCR 18	RQD 9	FI	11.45	9.00	Medium strong-strong grey fine grained LIMESTONE partially weathered with calcite veining. Two sets of fractures. F1: 0-10 degrees. Very closely- closely spaced undulating smooth closed. F2 35-45 degrees. Closely- medium spaced undulating smooth closed.			
9.70										

Remarks
No groundwater encountered during cable percussive drilling
Cable percussion to 8.00m BGL with Rotary core follow on to 13.00m BGL.
Slotted pipe installed from 7.0m BGL to 3m BGL with pea gravel filter zone from 7.0m BGL to 1.0m BGL and bentonite seal from 1.0m BGL to GL, finished with a flush cover.

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH11

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Borehole Number** BH11
Machine : Dando 2000, Beretta T44 **Flush :** Water **Core Dia :** 96 mm **Method :** Cable Percussion with Rotary follow on	**Casing Diameter** 200mm cased to 8.00m 96mm cased to 13.00m	**Ground Level (mOD)** 20.45	**Client** DBFL	**Job Number** 9338-12-19
	Location 716967.5 E 731182.2 N	**Dates** 18/03/2020	**Project Contractor** GII	**Sheet** 2/2

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	93	89	87	8			(4.00)				
11.20	100	67	36								
12.70	100	67	67								
13.00						7.45	13.00	Complete at 13.00m			

Remarks

Scale (approx)	Logged By
1:50	PM, CB

Figure No. 9338-12-19.BH11

Ground Investigations Ireland Ltd
www.gii.ie

Site Sandford Park Milltown			**Borehole Number** BH12
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 8.00m	**Ground Level (mOD)** 21.41	**Client** DBFL	**Job Number** 9338-12-19
	Location 716865.6 E 731202.8 N	**Dates** 19/03/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.		
					21.11	0.30			
0.50	B					(0.70)	POSSIBLE MADE GROUND: light brown sandy gravelly CLAY.		
1.00-1.45 1.00	SPT(C) N=6 B			1,1/1,1,2,2	20.41	1.00			
						(0.90)	Soft light brown mottled grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
2.00-2.45 2.00	SPT(C) N=10 B			2,2/2,3,3,2	19.51	1.90			
						(0.70)	Firm light brown slightly sandy slightly gravelly CLAY.		
3.00-3.45 3.00	SPT(C) N=25 B			2,3/4,5,7,9	18.81	2.60			
4.00-4.45 4.00	SPT(C) N=30 B			3,4/5,7,9,9			Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		
5.00-5.45 5.00	SPT(C) N=35 B			6,6/7,8,9,11		(5.40)			
6.00-6.45 6.00	SPT(C) N=46 B			7,10/10,11,12,13					
7.00-7.40 7.00	SPT(C) 50/245 B			10,12/14,14,15,7					
8.00-8.37 8.00	SPT(C) 50/220 B			10,14/16,17,17	13.41	8.00	Complete at 8.00m		

Remarks
No groundwater encountered durig drillling
Borehole backfilled on completion.
Borehole complete at 8.00m BGL

Scale (approx)	Logged By
1:50	PM

Figure No. 9338-12-19.BH12

Ground Investigations Ireland Ltd
www.gii.ie

Site Sandford Park Milltown			**Borehole Number** BH13
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 3.70m	**Ground Level (mOD)** 22.64	**Client** DBFL	**Job Number** 9338-12-19
	Location 716891.5 E 731106.3 N	**Dates** 05/10/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets		
					22.34	0.30			
0.50	B						Soft to firm brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional rootlets. Gravel is subangular to subrounded fine to coarse		
1.00-1.45 1.00	SPT(C) N=7 B			1,2/2,1,2,2		(1.70)			
					20.64	2.00			
2.00-2.45 2.00	SPT(C) N=14 B			2,2/3,3,4,4		(0.60)	Firm to stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse		
					20.04	2.60			
3.00-3.45 3.00	SPT(C) N=39 B			4,6/7,9,10,13		(1.10)	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse		
					18.94	3.70			
3.70	B						Obstruction: presumed boulder		
							Complete at 3.70m		

Remarks
Borehole terminated at 3.70m BGL due to an obstruction on a presumed boulder
No groundwater encountered during drilling
Borehole backfilled upon completion
Chiselling from 3.70m to 3.70m for 1 hour.

Scale (approx)	Logged By
1:50	PC

Figure No. 9338-12-19.BH13

Ground Investigations Ireland Ltd
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Site	Borehole Number
Sandford Park Milltown	BH14

Machine	Casing Diameter	Ground Level (mOD)	Client	Job Number
Dando 2000	200mm cased to 3.50m	22.96	DBFL	9338-12-19
Method : Cable Percussion	**Location** 716916.3 E 731074.5 N	**Dates** 05/10/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.40)	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets			
					22.56	0.40				
0.50	B						Firm brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse			
1.00-1.45 1.00	SPT(C) N=11 B			2,2/2,3,3,3		(1.60)				
2.00-2.45 2.00	SPT(C) N=15 B			2,3/3,3,4,5	20.96	2.00				
						(0.70)	Firm to stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse			
					20.26	2.70				
3.00-3.45 3.00	SPT(C) N=36 B			4,5/6,8,10,12		(0.80)	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse		▼1	
3.50	B			Water strike(1) at 3.50m, rose to 3.00m in 20 mins.	19.46	3.50	Obstruction: presumed boulder		▽1	
							Complete at 3.50m			

Remarks
Borehole terminated at 3.50m BGL due to an obstruction on a presumed boulder
Groundwater encountered at 3.50m BGL
Slotted pipe with pea gravel surround from 3.50m BGL to 1.00m BGL, plain pipe with bentonite seal from 1.00m BGL to GL, finished with a flush cover
Chiselling from 3.50m to 3.50m for 1 hour.

Scale (approx)	Logged By
1:50	PC

Figure No. 9338-12-19.BH14

Ground Investigations Ireland Ltd
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Site Sandford Park Milltown			**Borehole Number** BH15
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 9.50m	**Ground Level (mOD)** 22.71	**Client** DBFL	**Job Number** 9338-12-19
	Location 716914.3 E 731092 N	**Dates** 06/10/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets		
					22.41	0.30			
0.50	B					(0.60)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional rootlets and occasional fragments of concrete and red brick		
					21.81	0.90			
1.00-1.45 1.00	SPT(C) N=13 B			2,2/3,3,3,4			Firm to stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse		
						(1.10)			
					20.71	2.00			
2.00-2.45 2.00 2.00	SPT(C) N=17 B EN			2,3/3,4,5,5		(0.40)	Stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse		
					20.31	2.40			
							Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse		
3.00-3.45 3.00 3.00	SPT(C) N=32 B EN			3,5/6,8,9,9					
4.00-4.45 4.00	SPT(C) N=39 B			3,6/7,10,11,11					
5.00-5.42 5.00	SPT(C) 50/270 B			5,8/11,15,17,7					
						(6.70)			
6.00-6.39 6.00	SPT(C) 50/240 B			4,7/12,15,19,4					
7.00-7.38 7.00	SPT(C) 50/225 B			5,9/13,15,22					
8.00-8.36 8.00	SPT(C) 50/210 B			6,10/14,17,19					
9.00-9.38 9.00	SPT(C) 50/225 B			5,9/12,18,20	13.61	9.10			
						(0.40)	Very stiff brown slightly sandy gravelly CLAY with some angular to subrounded cobbles. Gravel is angular to subrounded fine to coarse		
9.50	B				13.21	9.50	Obstruction: presumed boulder		
							Complete at 9.50m		

Remarks
Borehole terminated at 9.50m BGL due to an obstruction on a presumed boulder
No groundwater encountered during drilling
Borehole backfilled upon completion
Chiselling from 9.40m to 9.50m for 1 hour.

Scale (approx)	Logged By
1:50	PC

Figure No. 9338-12-19.BH15

Ground Investigations Ireland Ltd
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Site	Borehole Number
Sandford Park Milltown	BH16

Machine	Casing Diameter	Ground Level (mOD)	Client	Job Number
DANDO 2000	200mm cased to 5.70m	21.38	DBFL	9338-12-19
Method : Cable Percussion	**Location** 716896.6 E 731165.2 N	**Dates** 07/10/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.40)	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets			
					20.98	0.40				
0.50	B						Firm brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional rootlets			
1.00-1.45	SPT(C) N=12			2,2/3,3,3,3		(1.40)				
1.00	B								▼1	
				Water strike(1) at 1.80m, rose to 1.30m in 20 mins.	19.58	1.80			▽1	
2.00	B						Medium dense greyish brown slightly clayey sandy subangular to subrounded fine to coarse GRAVEL with occasional angular to subrounded cobbles			
2.00-2.45	SPT(C) N=15			2,3/4,3,4,4						
3.00-3.45	SPT(C) N=16			3,4/3,3,5,5		(2.70)				
3.00	B									
4.00-4.17	SPT(C) 25*/95 50/75			19,6/50						
4.00	B									
					16.88	4.50	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse			
5.00-5.45	SPT(C) N=41			4,3/7,9,12,13		(1.20)				
5.00	B									
					15.68	5.70	Obstruction: presumed boulder			
5.70	B						Complete at 5.70m			

Remarks
Borehole terminated at 5.70m BGL due to an obstruction on a presumed boulder
Groundwater encountered at 1.80m BGL
Slotted pipe with pea gravel surround from 5.70m BGL to 1.00m BGL, plain pipe with bentonite seal from 1.00m BGL to GL, finished with a raised cover
Chiselling from 4.30m to 4.40m for 0.10 hours. Chiselling from 5.70m to 5.70m for 1 hour.

Scale (approx)	Logged By
1:50	PC

Figure No. 9338-12-19.BH16

APPENDIX 9 – Groundwater Monitoring

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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GROUNDWATER MONITORING

Sandford Park Miltown

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
BH02	04/06/2020	17:15	1.31	
BH02	09/06/2020	16:15	1.37	
BH03	05/06/2020	14:58	7.00	
BH03	09/06/2020	15:50	7.25	
BH07	05/06/2020	14:37	1.47	
BH07	09/06/2020	16:06	1.50	
BH09	05/06/2020	15:20	7.50	
BH09	09/06/2020	15:25	7.74	
BH11	05/06/2020	15:55	1.40	
BH11	09/06/2020	16:11	1.50	

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
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GROUNDWATER MONITORING

Sandford Park Miltown

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
BH02	23/10/2020	09:05	0.77	
BH03	23/10/2020	08:50	6.30	
BH07	23/10/2020	08:52	1.37	
BH09	23/10/2020	08:47	6.69	
BH11	23/10/2020	09:00	1.10	
BH14	23/10/2020	08:35	1.43	
BH16	23/10/2020	08:45	1.22	

ENVIRONMENT ISO 14001:2015 NSAI Certified

HEALTH & SAFETY ISO 45001:2018 NSAI Certified

QUALITY I.S. EN ISO 9001:2015 NSAI Certified

Engineering Sustainable Futures

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