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KILDARE COUNTY COUNCIL

MAYNOOTH FIRE STATION

ENGINEERING SERVICES REPORT

Maynooth Fire Station

Engineering Services Report

Document Control Sheet	
Document Reference	TR01
Report Status	Draft for Review
Report Date	August 2022
Current Revision	D01
Client:	Kildare County Council
Client Address:	Head Office Aras Chill Dara, Devoy Park, Naas, Co. Kildare W91 X77
Project Number	11421

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Revision	Description	Author:	Date	Reviewed By:	Date	Authorised by:	Date
D01	For Review	PF	24/08/2022	MC	24/08/2022	MC	24/08/2022
TOBIN Consulting Engineers							

ENVIRONMENT I.S. EN ISO 14001:2015 NSAI Certified

HEALTH & SAFETY I.S. ISO 45001:2018 NSAI Certified

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

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1.0 INTRODUCTION

1.1 APPOINTMENT

TOBIN Consulting Engineers have been appointed by Kildare County Council to provide Civil and Structural Consultancy Services for their proposed new Fire Station along the Mullen Park Road in Maynooth, Co Kildare.

1.2 ADMINISTRATIVE JURISDICTION

The Site is located within the administrative jurisdiction of Kildare County Council, whose offices are located in Naas, Co. Kildare.

Figure 1-1: Site Location Drawing, 11421-2000

1.3 PROPOSED DEVELOPMENT

The proposed development at the site will consist of the following:

- A new one storey Fire Station with a four storey tower.
- New car parking layout with permeable surfacing to allow infiltration into the ground.
- Associated infrastructural services to service the development.
- Upgrading of the existing site entrance.

Figure 1-2: Proposed Site Layout Drawing, 11421-2002

1.4 SITE LOCATION

The Site is located in the South East of Maynooth along the Mullen Park Road. To the west of the site is a supermarket, to the east is a new residential housing estate and to the North is an existing residential estate.

1.5 PROPOSAL

The purpose of this report is to address the proposed service infrastructural requirements for the development. In the coming sections the Potable Water, Wastewater and Surface Water proposals will be detailed, and the designed layouts showcased.

The design principles adopted will be those of best engineering practices and standards used and will be from the most recent applicable publications

2.0 SITE INVESTIGATION

Site Investigation Ltd were commissioned by TOBIN Consulting Engineers on behalf of the applicant to carry out Site Investigation Works consisting of the following (refer to Appendix F for the SI results):

- 4 Mo. Cable percussive boreholes;
- 1 No. Rotary core borehole;
- 4 No. trial pits with 2 no. Soakaway tests;
- 4 no. California Bearing ration tests;
- 8 No. Dynamic probes.

The trial holes and bore holes revealed made ground across the site, to a depth between 0.60mbgl – 0.70mbgl. The made ground consisted of grey brown sandy gravelly silty clay with medium cobble content with some timber, concrete, plastic pipe and telecom cable fragments. Beneath the made ground a brown (slightly) sandy (slightly) gravelly silty CLAY .

No groundwater ingresses were recorded in any of the boreholes during the fieldworks.

The water level in both soakaway tests did not fall sufficiently enough to complete the tests.

3.0 ROADS & TRAFFIC

3.1 ACCESS & LAYOUT

The site will be accessed from Mullen Park Road with minimum work required to the existing roadway. The site will have two access points, one for general vehicular traffic and one for fire tenders. Cycle tracks and footpaths which will be interrupted at the access points will have tactile pavers and dished curbs. Safe paths from the parking area to the building will be provided and the site will also have bicycle parking areas.

A swept path analysis has been run to analyse the movements of cars and fire tenders in and out of the site. Figure 8-1 below shows the fire engine tracking

Figure 3-1: Fire Engine Swepth Path Analysis, 11421-2035

3.2 TRAFFIC

Annual average daily traffic counts have been estimated for Griffin Rath Road as part of the part 8 planning application for the Maynooth Eastern Ring Road. A snapshot of the predicted traffic volumes from the planning application is shown below.

Table 1: Traffic Counts

Road Link	Do Minimum 2036		Do Something 2036	
	AADT	% HGV	AADT	% HGV
R405 (west of R405/Griffin Rath Junction)	11,637	3	9324	2
R157 North of R148	20181	7	23616	16
Griffin Rath Road	12400	4	16800	21
M4 Motorway	75,000	8	75,000	8
MERR	--	--	22775	16

Maynooth Fire Station is crewed under the retained fire service model. This means that the crew are generally not present in the station and only respond to the station on receipt of a pager alert to attend for a fire call incident. The crew complement at Maynooth is currently 10, which means that the expected impact on the traffic count would be not greater than 10 vehicles arriving, generally across a 2 or 3 minute time window. This would shortly thereafter be followed by the departure of the fire appliance and perhaps 1 or 2 other support vehicles. The traffic movement at the end of a fire call would be these movements in reverse order.

Maynooth fire station generally services approximately 300 fire calls per annum, and an analysis of the month, day, and time of these call from 1 January 2016 to 24th June 2022 is attached for information. This data shows October as the busiest month, Friday as the busiest day, and 17:00 to 17:59 as the busiest hour.

In addition to fire calls, structured training takes place each Monday evening from 18:00 to 20:00. The traffic movements associated with these events are the 10 vehicles traveling into station beforehand and those vehicles departing afterwards. The arrival and departure of vehicles to these training nights are more casual and may not necessarily take place within the short time window as previously described for fire calls.

4.0 POTABLE WATER SUPPLY

4.1 INTRODUCTION

Irish Water's records indicate the presence of an existing 150mm uPVC watermain within the Mullen Park Road. The record map received showed the watermain stopped at a sluice valve outside the site, however during a site walk it was noticed the watermain had been extended as part of the new residential development to the East of the site.

Figure 4-1: Existing Watermain Infrastructure

For further information please see infrastructural record maps in Appendix C.

4.2 PROPOSAL

It is proposed to service the site with a new 100mm internal diameter HDPE watermain, which will connect to the existing 150mm uPVC located in the Mullen Park Road.

The new 100mm pipe will be fitted with a water meter at the entrance o the site and a Hydrant within the new car park. The design is subject to approval by Irish Water after a connection application has been made.

Figure 4-2: Proposed Watermain Drawing, 11421-2020

A Pre-Connection Application was made to Irish Water on the 04/05/2022. A Confirmation of Feasibility (COF) was received from Irish Water on the 08/06/2022 and can be seen in Appendix D. The COF confirmed the development is "*Feasible without any infrastructure upgrade*".

5.0 WASTEWATER INFRASTRUCTURE

5.1 INTRODUCTION

Irish Water's records indicate an existing 300mm diameter foul pipe located in the Mullen Park Road. There is also a rising main discharging into the 300mm diameter foul pipe just west of the proposed site.

Figure 5-1: Existing Foul Infrastructure

5.2 PROPOSAL

It is proposed to discharge waste generated from the development into the existing 300mm Diameter pipe through a 150mm diameter gravity pipe.

The wastewater layout has been designed in accordance with Irish Water's latest standard details and code of practice. The Design is subject to approval by Irish Water after a Connection Application has been made.

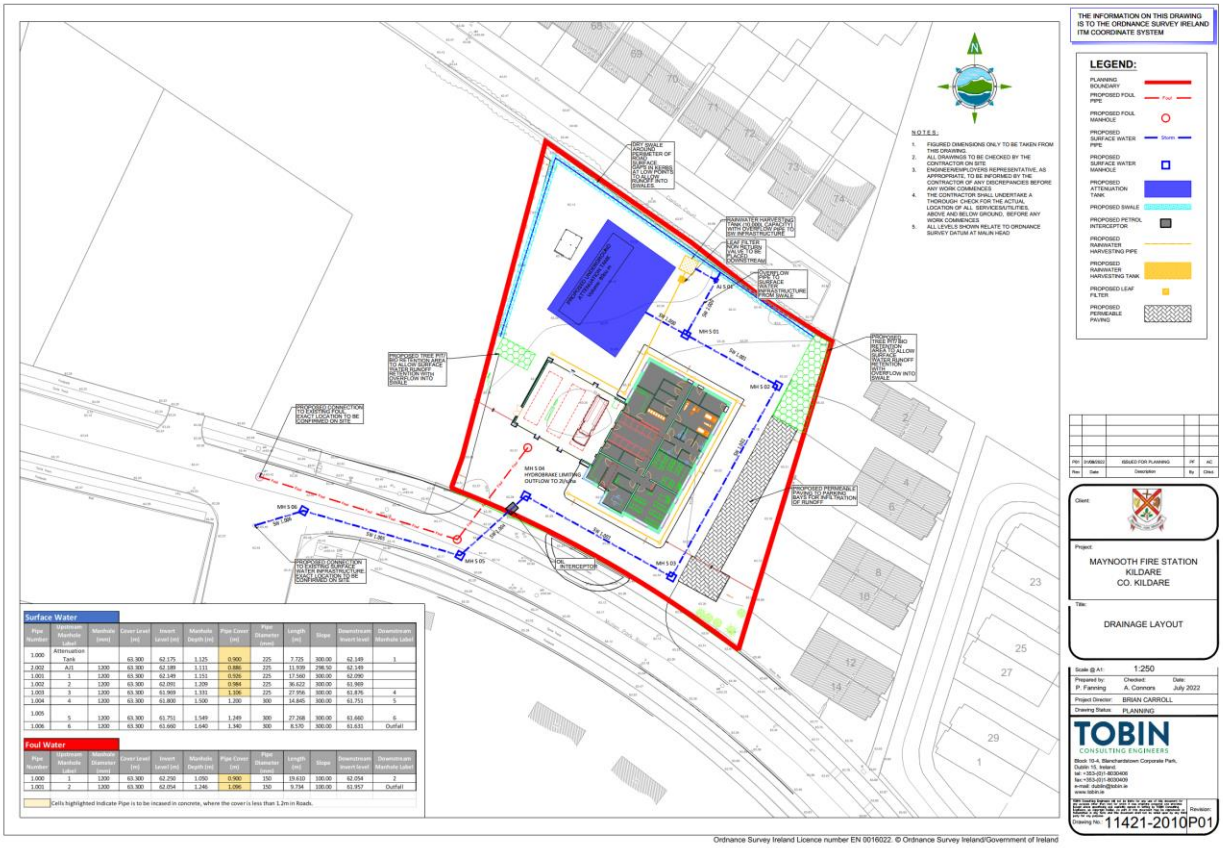


Figure 5-2: Proposed Foul Layout Drawing, 11421-2010

A Pre-Connection Application was made to Irish Water on the 04/05/2022. A Confirmation of Feasibility (COF) was received from Irish Water on the 08/06/2022 and can be seen in Appendix D. The COF confirmed the development is "*Feasible without any infrastructure upgrade*"..

6.0 SURFACE WATER INFRASTRUCTURE

6.1 INTRODUCTION

Kildare County Councils records did not show any existing surface water infrastructure along the Mullen Park Road. However during a site walk it was noticed the Mullen Park Road has a number of Road Gullies discharging to a shallow surface water pipe. There was also a surface water manhole located outside the existing commercial premises South West of the development. This manhole had a 450mm Diameter pipe present within it and a depth of 1.5m was measured to the invert.

Figure 6-1: Existing Surface Water Infrastructure

6.2 DESIGN PRINCIPLES

The proposed Surface Water Drainage strategy was developed after discussions with Kildare County Council.

The design and management of the Surface Water for the proposed development will comply with the policies and guidelines outlined in the following.

- The Greater Dublin Strategic Drainage Study (GDSDS).
- Kildare County Council Development Plan

- Recommendations for Site Development Works for Housing Areas published by the Department of the Environment.
- Greater Dublin Regional Code of Practice for Drainage Works.
- The SuDs Manual (2015).

The key design principles of the Surface Water drainage are as follows.

1. The flow from the development to the existing Surface Water Infrastructure is designed to equal the natural greenfield runoff in accordance with the GDSDS and sustainable drainage best practice.
2. There are no additional or increased flows for the developed site compared to the existing greenfield condition.
3. The site will have an Attenuation Area designed to store volumes from the 30 year and 100-year storm events on site in accordance with SuDs best practise. (As space is limited, the volume of water from the storm events will be stored in underground tanks).
4. The design of the attenuation system includes an allowance for 30% climate change.

6.3 PROPOSAL

A new surface water drainage system incorporating SuDs features will collect runoff from the proposed development. Attenuated surface water will discharge to the existing 450mm Diameter pipe within Mullen Park Road. He surface water drainage has been designed in accordance with the "Greater Dublin Regional Code of Practice for Drainage Works" (Draft version 6.0) and the Kildare County Council Development Plan.

Surface water drainage for the proposed development is designed using the recommendations of the GDSDS, EN752 and BS8301:1985, with the following parameters applied:

- Return period for pipe network 2 years,
- Time of entry 4 minutes
- Pipe Friction (Ks) 0.6 mm
- Minimum Velocity 0.75 m/s
- M5 – 2D = 56.2
- M5-60 = 15.7 mm
- Ratio r (M5-60/M5-2D) = 0.279
- Climate Change 30% for rainfall intensities.

The surface water drainage network has been designed and simulated for a range of storm events (including 1 in 1, 1 in 30 and 1 in 100-year storm events) using the Network module of MicroDrainage. Refer to Appendix A for MicroDrainage results.

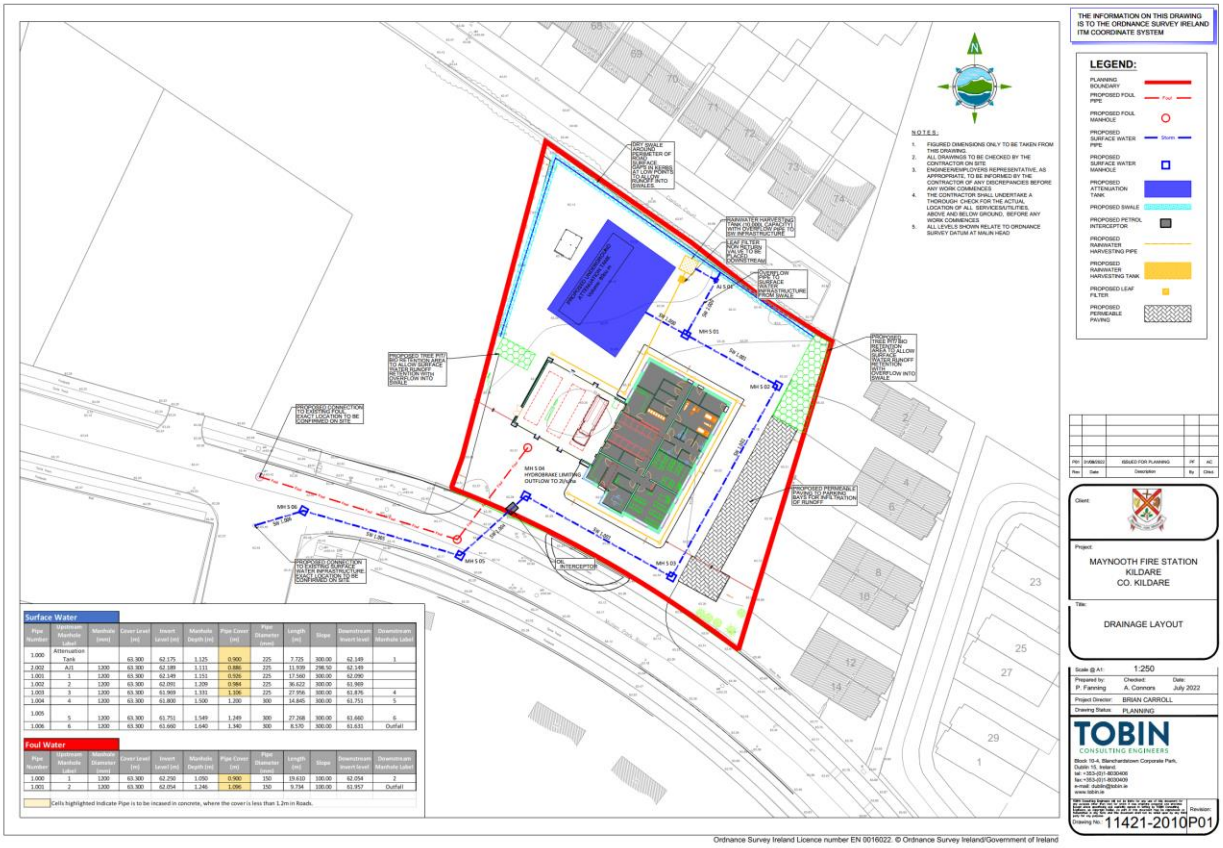


Figure 6-2: Proposed Surface Water Layout Drawing, 11421-2010

It is proposed to collect surface runoff through the use of rainwater harvesting, swales, permeable paving and tree pits. Runoff will be directed to the swales, permeable paving and tree pits through the use of gravity falls on the finished surface. Once collected within the swales, permeable paving and tree pits the water will be allowed to infiltrate in the ground. When the rate of rainfall is greater than the rate of infiltration the excess water will be directed towards the underground pipe network through perforated pipes and gullies.

Runoff from the proposed building will be directed towards a rainwater 10,000l underground harvesting tank. The tank will be fitted with an overflow pipe to discharge any excess water collected to the underground pipe network.

6.3.1 Attenuation

It is proposed to attenuate runoff from the proposed development to Greenfield Runoff or Q_{bar} as per the recommendations of the GDSDS. Q_{bar} is estimated at 0.74l/s using the *Institute of Hydrology* equation.

$$Q_{bar[rural]} = 0.00108\ x\ AREA^{0.89} x SAAR^{1.17} x\ SPR^{\ 2.17}$$

Were.

$Q_{bar[rural]}$ = is the mean annual flood flow from a rural catchment

$AREA$ = the area of the catchment in ha. = 50ha

$SAAR$ = is the standard average annual rainfall = 900

SPR = Standard Percentage Runoff coefficient for the soil category, where SPR values for the 5 soil types are as follows; Soil 1 = 0.1; Soil 2 = 0.3; Soil 3 =0.37; Soil 4 = 0.47; Soil 5 = 0.53

A SPR value of 0.30 (Soil Type 2) has been applied for the subject site.

$$Q_{bar[rural]} = 0.00108\ x\ 50^{0.89} x 722^{1.17} x\ 0.30^{2.17}$$

$$Q_{bar[rural]} = 122.27 l/s\ for\ 50ha\ or\ \ 0.74/s\ for\ an\ area\ of\ 0.301ha$$

As per the Greater Dublin Regional Code of Practice the minimum discharge rate which can be achieved is 2.0l/s. As 0.90l/s is less than 2.0l/s, the discharge from the site will be set at 2/0l/s.

6.3.2 Surface Water Storage

Surface water storage volumes have been calculated using the *Source Control* module of the *Microdrainage* software. The total volume of storage required to store runoff from a 1%AEP storm event has been calculated as 82cu.m, refer to Appendix A for Source Control results.

6.3.3 SuDs (Sustainable Urban Drainage Systems)

A number of SuDs features have been proposed into the surface water drainage system in accordance with the GDSDs. SuDs are incorporated to attenuate runoff and volumes; reduce pollutant concentrations in surface water and to replicate the natural characteristics of surface water run off for the site in its pre-developed state.

The following SuDs features are proposed:

6.3.3.1 Permeable Paving

It is proposed to install permeable paving within the car parking areas of the site. The water once permeated into the pavement will be allowed to infiltrate into the ground, when the rate of rainfall surpasses the infiltration rate into the ground the excess water will be directed through falls into the underground pipe network. The inclusion of the permeable paving will slow the surface water run off at source, treat the surface water runoff and provide storage. Refer to figure 4-3 below.

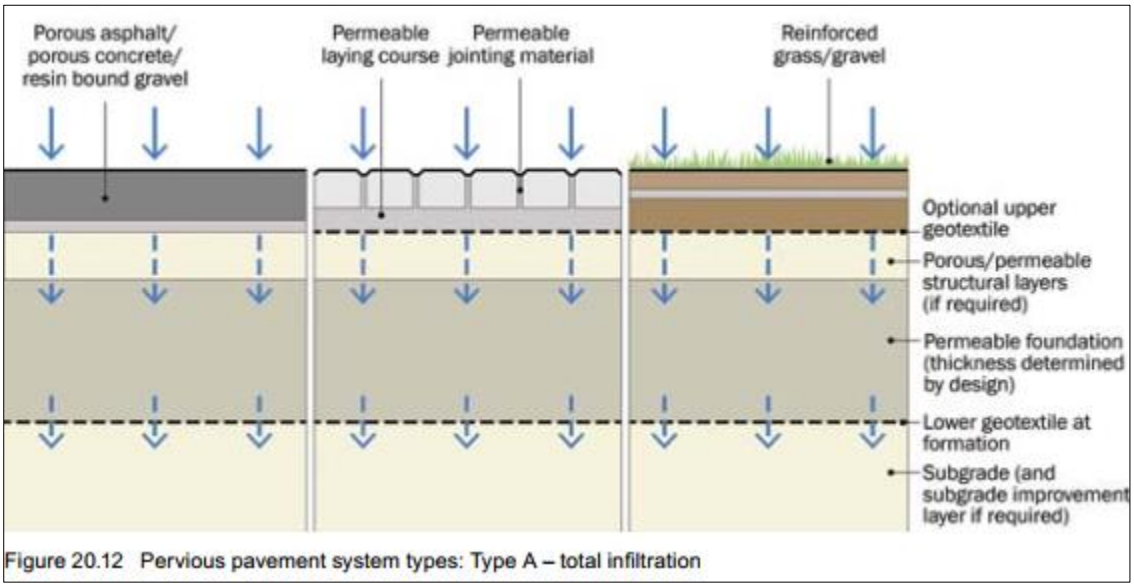


Figure 6-3: Typical Cross Section of infiltration permeable paving (Extract from CIRA SuDs Manual)

6.3.3.2 Dry Swale/Bioretention area

The dry swale is a vegetated conveyance channel, designed to include a filter bed of prepared soil that overlays an underdrain system. This underdrain provides additional treatment and conveyance capacity beneath the base of the swale/bioretention and prevents water logging. Refer to figure 4-4 below. Surface Water will be directed to the dry sale from the car parking and footways through falls and an opening in the kerb line.

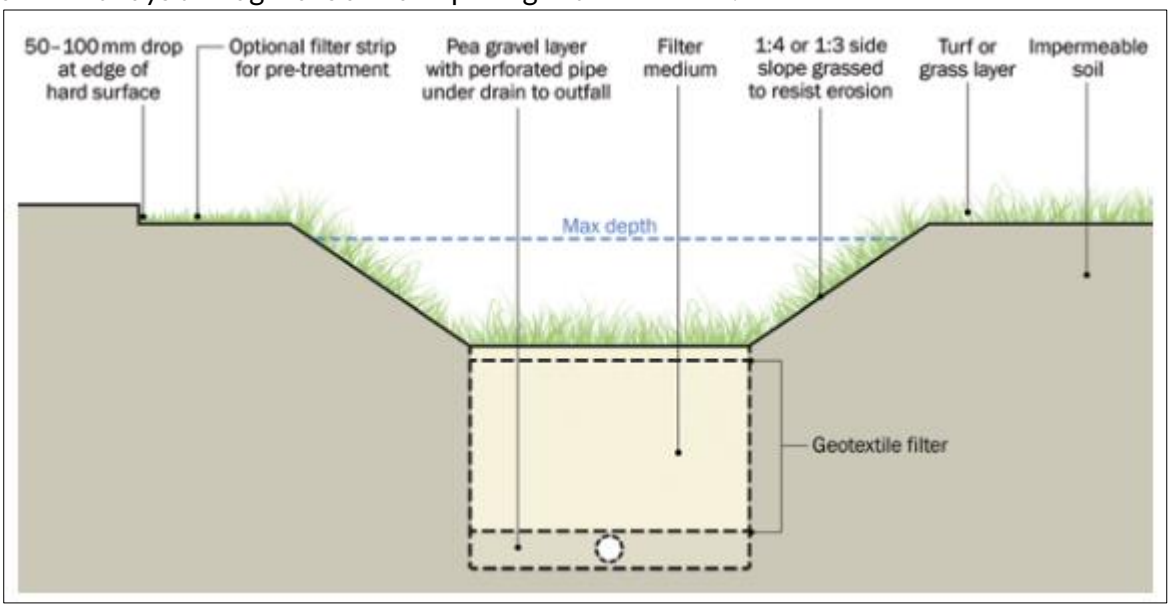


Figure 6-4: Typical Cross Section of dry swale/bioretention area (Extract from CIRA SuDs Manual)

6.3.3.3 Petrol Interceptor

It is proposed to flow all the surface water collected through a petrol interceptor before discharging to the existing surface water infrastructure, to ensure a certain level of treatment is provided to the surface water.

6.3.3.4 Hydrobrake

The rate of discharge from the proposed development will be controlled using a Hydrobrake. The total rate of discharged was determined using the QBAR greenfield run off method. The total rate of discharge was calculated at 0.74l/s but as per the Greater Dublin Regional Code of Practice the discharge rate will be limited to 2.0l/s.

6.3.3.5 Attenuation Tank

Surface water runoff from the site will be collected and directed towards the Hydrobrake in manhole S04, once the flow entering the infrastructure exceeds the Hydrobrake Flow Capacity, water will begin to flood the infrastructure and begin to fill the Attenuation Tank located at the north of the site. The surface water infrastructure will cater for the storage of a 1 in 100-year storm event and has been sized to store the required volume if the infiltration SuDs measures were to fail.

6.3.3.6 Rainwater Harvesting

It is proposed to collect the runoff from roof area and to discharge it into a separate 10,000l underground tank. This water will then be used for greywater purposes within the building and for training practices. The collection of this runoff will reduce the developments demand on treated water and reduce the required underground attenuation tank. A leaf filter and non

return valve will be provided to prevent blockages within the pipe work and backflow. An overflow pipe will also be provided discharging the water into the attenuation tank.

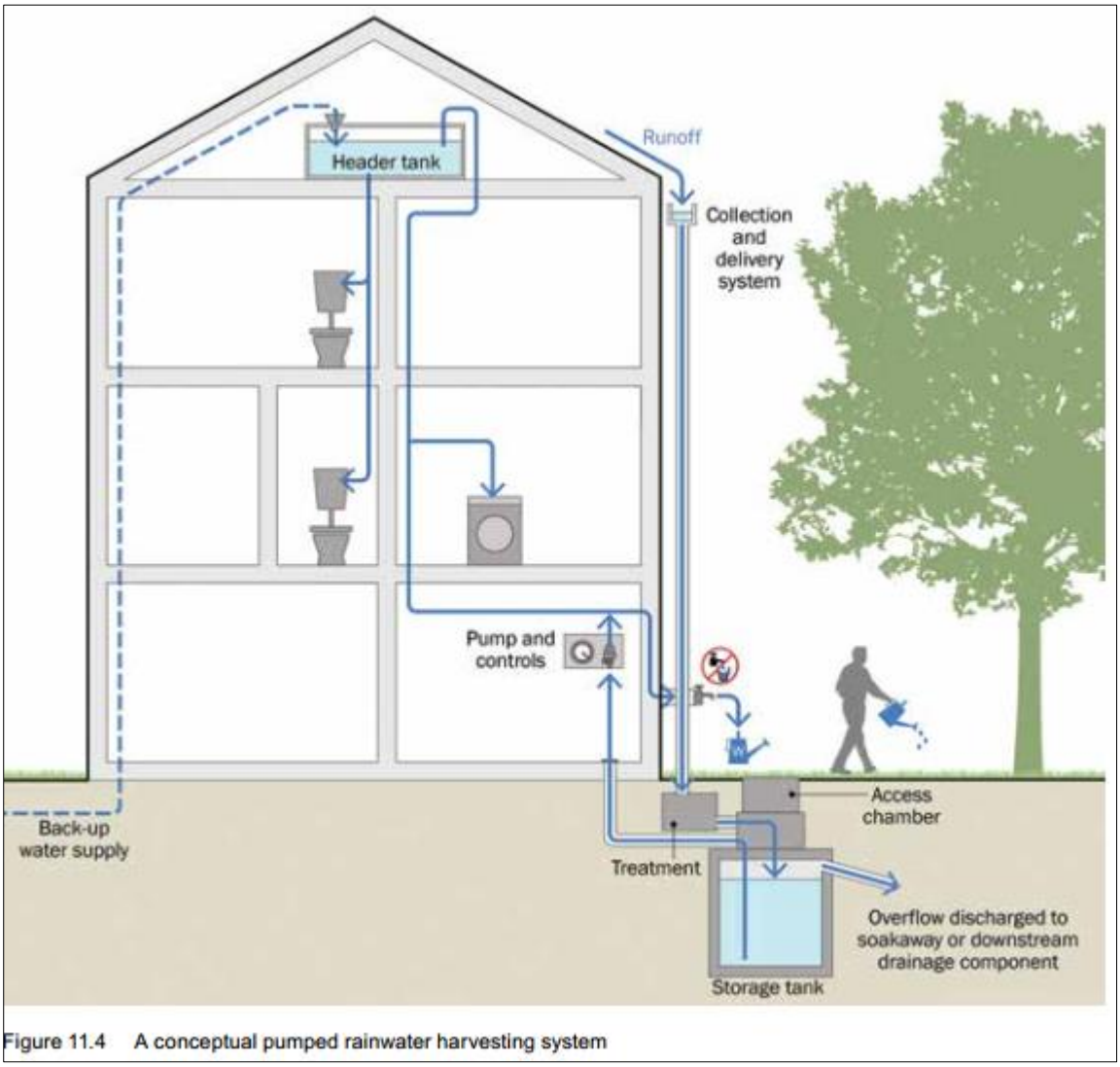


Figure 6-5: Typical Pumped RWH System (Extract from CIRIA SuDs Manual)

6.3.4 Treatment Train

Through the SuDs measures described above, the surface water management (treatment train) approach has been incorporated into the development in accordance with the GDSDS. This will assure the surface water runoff quantity and quality issues are addressed.

In accordance with the GDSDS, the following four objectives of the treatment train provide an integrated and balanced approach to help mitigate the changes in surface water runoff flows that occur as land is urbanised and to help mitigate the impacts of surface water quality on receiving systems:

1. **Pollution Prevention**: spill prevention (protection provided by Petrol Interceptor), recycling, public awareness, and participation.
2. **Source Control**: conveyance and infiltration of runoff (provided by the proposed surface water network, Attenuation Tank, Dry Swale, Hydrobrake, Petrol Interceptor, tree pits and Permeable Paving).

3. **Site Control:** reduction in volume and rate of surface water runoff, with some additional treatment provided (provided by Attenuation Tank, Dry Swale, Hydrobrake, Rainwater Harvesting, Petrol Interceptor, tree pits and Permeable Paving).
4. **Regional Control:** Interception of runoff downstream of all source and on-site controls to provide follow-up flow management and water quality treatment (provided by the Existing Surface Water infrastructure).

The above measures ensure a suitable treatment train is provided in accordance with GDSDS.

7.0 FLOOD RISK ASSESMENT

To establish if there is a risk of flooding to the proposed development and its location a desktop-based Flood Risk study was carried out. As part of the flood risk assessment, several informative reports, studies, and records were researched to determine the risk of flooding to the site.

7.1 SITE FLOOD HISTORY & FLOOD DATA

7.1.1 Sources of information

TOBIN Consulting Engineers reviewed information collected from the below sources to identify any existing flood risk to the site and proposed development.

- Historic flood maps and reports from the OPW www.floodinfo.ie
- CFRAMS Study
- Maynooth Local Area Plan 2013-2019 (updated LAP could not be found)

7.1.2 Historic Flooding

A past flood summary can be viewed in Appendix E. This was generated on the website www.floodinfo.ie and lists out the flood events which happened within 2.5km of our proposed site.

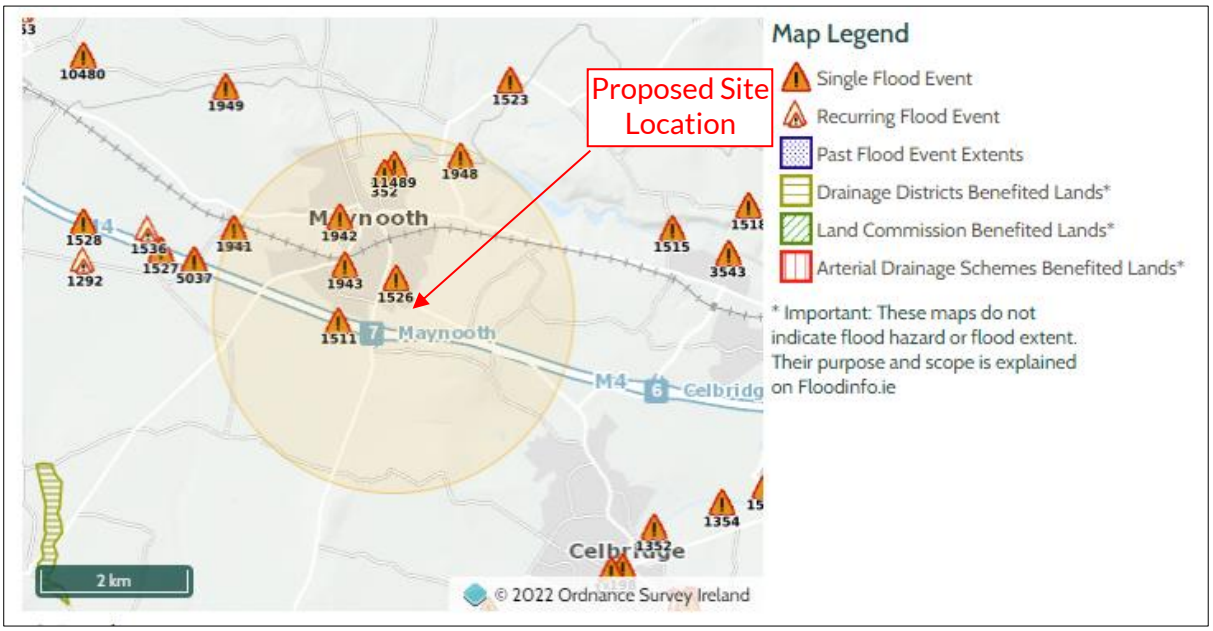


Figure 7-1: Past Flood Events within 2.5km of Site

All of the events mentioned in the report were determined to be a sufficient distance away they would not affect the proposed site.

7.1.3 CFRAMS

The proposed site was located outside the flood risk area in the national Catchment Flood Risk Assessment and Management (CFRAM) study.

7.1.4 Coastal Flood Risk

The subject site is approximately 24km inland, on existing ground at an elevation of approximately 63.25mOD. On this basis, it is estimated that the risk of coastal flooding to the proposed development is minimal.

7.1.5 Groundwater Flood Risk

Based on the map by the Geological Survey Ireland (GSI), see figure 5-2 below, the bedrock in the area consists of limestone and shale.

The makeup of soil in the Maynooth Area is shown in figure 5-3. The town area itself is shown as urban/ made ground, with the subject site located where the soil changes from urban/ made ground to Mineral Poorly Drained.

With reference to figure 5-4, there are no recorded karst features in the Maynooth Area.

Based on the mapping by the GSI there is not evidence to suggest there is any groundwater flooding issues at the proposed site.

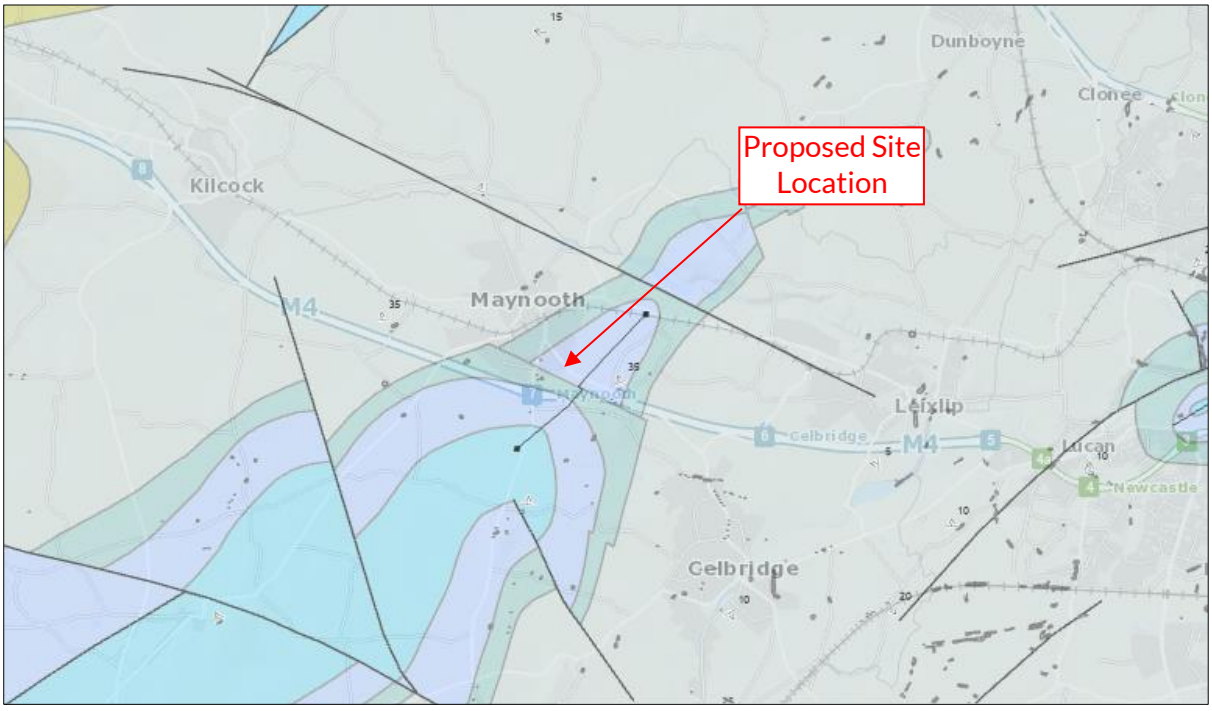


Figure 7-2: Bedrock Geology in the Maynooth Area

Figure 7-3: Soil Mapping (Teagasc)

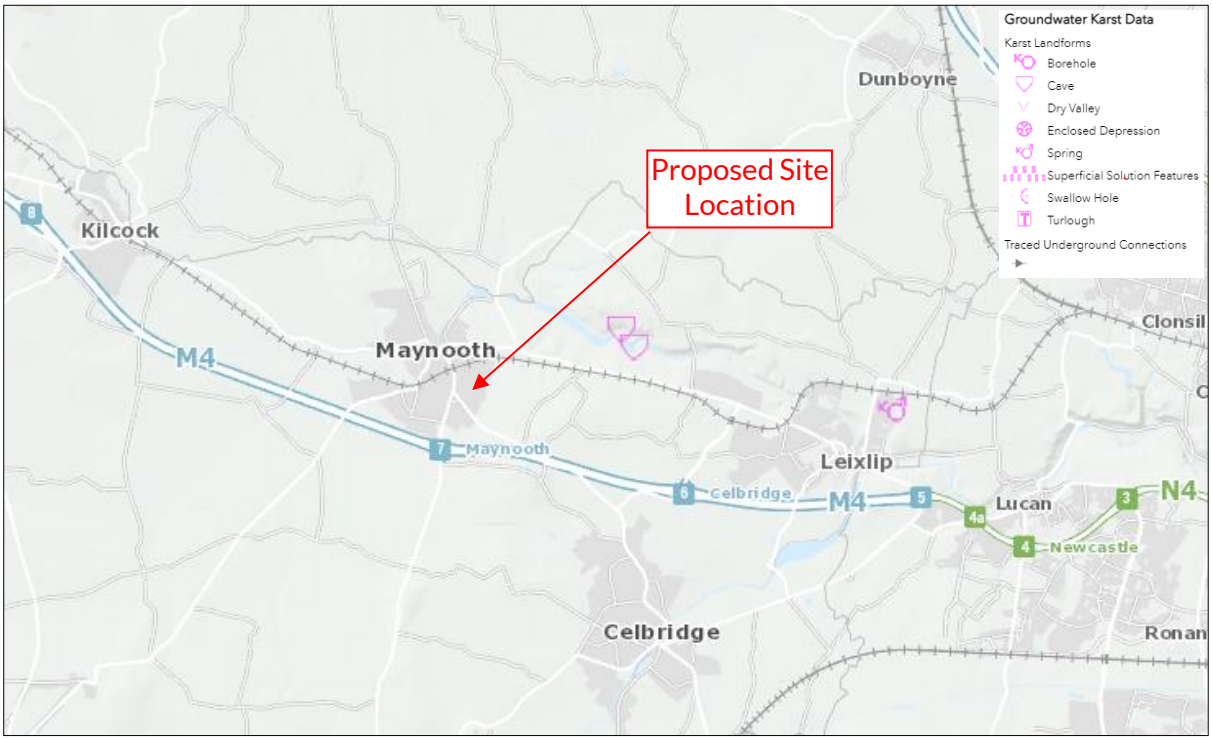


Figure 7-4: Karst Mapping (GSI)

7.1.6 Impact of Development elsewhere

It is predicted that the proposed development is not at risk from flooding during the 1,000 year mid range future scenario. Therefore, the development will not affect floodplain storage or obstruct the flow path of any existing watercourses.

Surface water arising onsite will be managed by an onsite surface water drainage system and onsite storage. On this basis, it is predicted that the proposed development will not contribute towards flood risk elsewhere in the area.

8.0 CONCLUSION

There is sufficient capacity within the Potable Water infrastructure.

There is sufficient capacity within the Wastewater infrastructure.

The Surface Water collection will be slowed at source through SuDS features, with all the surface water being directed into a piped system before being discharged to the existing Surface Water Infrastructure via a Hydrobrake.

Appendix A – Source Control Results

5 Year Storm

30 year Storm

100 year Storm

Summary of Results for 5 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	61.875	0.000	1.0	0.0	O K
30 min Summer	61.875	0.000	1.4	0.0	O K
60 min Summer	61.875	0.000	1.8	0.0	O K
120 min Summer	61.899	0.024	1.9	1.9	O K
180 min Summer	61.944	0.069	1.9	5.5	O K
240 min Summer	61.972	0.097	1.9	7.7	O K
360 min Summer	62.014	0.139	1.9	11.1	O K
480 min Summer	62.028	0.153	1.9	12.2	O K
600 min Summer	62.050	0.175	1.9	14.0	O K
720 min Summer	62.076	0.201	1.9	16.1	O K
960 min Summer	62.079	0.204	1.9	16.4	O K
1440 min Summer	62.033	0.158	1.9	12.7	O K
2160 min Summer	61.984	0.109	1.9	8.7	O K
2880 min Summer	61.920	0.045	1.9	3.6	O K
4320 min Summer	61.875	0.000	1.9	0.0	O K
5760 min Summer	61.875	0.000	1.7	0.0	O K
7200 min Summer	61.875	0.000	1.5	0.0	O K
8640 min Summer	61.875	0.000	1.4	0.0	O K
10080 min Summer	61.875	0.000	1.3	0.0	O K
15 min Winter	61.875	0.000	1.1	0.0	O K
30 min Winter	61.875	0.000	1.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	46.918	0.0	19.9	0
30 min Summer	31.864	0.0	27.4	0
60 min Summer	20.904	0.0	38.2	0
120 min Summer	13.447	0.0	48.8	122
180 min Summer	10.333	0.0	56.3	174
240 min Summer	8.559	0.0	61.7	274
360 min Summer	6.553	0.0	71.0	386
480 min Summer	5.418	0.0	77.0	478
600 min Summer	4.673	0.0	83.6	562
720 min Summer	4.141	0.0	89.9	652
960 min Summer	3.420	0.0	99.1	794
1440 min Summer	2.611	0.0	112.7	1030
2160 min Summer	1.993	0.0	132.6	1412
2880 min Summer	1.645	0.0	146.1	1764
4320 min Summer	1.255	0.0	166.8	0
5760 min Summer	1.036	0.0	184.9	0
7200 min Summer	0.893	0.0	199.0	0
8640 min Summer	0.790	0.0	211.3	0
10080 min Summer	0.713	0.0	221.8	0
15 min Winter	46.918	0.0	22.4	0
30 min Winter	31.864	0.0	30.9	0

Summary of Results for 5 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	61.875	0.000	1.9	0.0	O K
120 min Winter	61.969	0.094	1.9	7.6	O K
180 min Winter	62.014	0.139	1.9	11.1	O K
240 min Winter	62.065	0.190	1.9	15.2	O K
360 min Winter	62.098	0.223	1.9	17.9	O K
480 min Winter	62.134	0.259	1.9	20.7	O K
600 min Winter	62.149	0.274	1.9	22.0	O K
720 min Winter	62.164	0.289	1.9	23.1	O K
960 min Winter	62.158	0.283	1.9	22.7	O K
1440 min Winter	62.082	0.207	1.9	16.6	O K
2160 min Winter	61.946	0.071	1.9	5.7	O K
2880 min Winter	61.877	0.002	1.9	0.2	O K
4320 min Winter	61.875	0.000	1.7	0.0	O K
5760 min Winter	61.875	0.000	1.4	0.0	O K
7200 min Winter	61.875	0.000	1.2	0.0	O K
8640 min Winter	61.875	0.000	1.1	0.0	O K
10080 min Winter	61.875	0.000	1.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	20.904	0.0	42.8	84
120 min Winter	13.447	0.0	15.2	122
180 min Winter	10.333	0.0	61.9	230
240 min Winter	8.559	0.0	69.1	304
360 min Winter	6.553	0.0	77.8	428
480 min Winter	5.418	0.0	86.5	522
600 min Winter	4.673	0.0	93.9	616
720 min Winter	4.141	0.0	101.0	706
960 min Winter	3.420	0.0	111.8	856
1440 min Winter	2.611	0.0	127.4	1152
2160 min Winter	1.993	0.0	148.6	1344
2880 min Winter	1.645	0.0	164.0	1772
4320 min Winter	1.255	0.0	187.0	0
5760 min Winter	1.036	0.0	207.1	0
7200 min Winter	0.893	0.0	222.9	0
8640 min Winter	0.790	0.0	236.7	0
10080 min Winter	0.713	0.0	248.6	0

Model Details

Storage is Online Cover Level (m) 63.300

Tank or Pond Structure

Invert Level (m) 61.875

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	1.000	80.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	61.500
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

Summary of Results for 30 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	61.875	0.000	1.6	0.0	O K
30 min Summer	61.893	0.018	1.9	1.5	O K
60 min Summer	61.998	0.123	1.9	9.8	O K
120 min Summer	62.176	0.301	1.9	24.1	O K
180 min Summer	62.247	0.372	1.9	29.7	O K
240 min Summer	62.267	0.392	1.9	31.3	O K
360 min Summer	62.343	0.468	1.9	37.4	O K
480 min Summer	62.364	0.489	1.9	39.1	O K
600 min Summer	62.399	0.524	1.9	41.9	O K
720 min Summer	62.359	0.484	1.9	38.7	O K
960 min Summer	62.409	0.534	1.9	42.7	O K
1440 min Summer	62.382	0.507	1.9	40.6	O K
2160 min Summer	62.308	0.433	1.9	34.6	O K
2880 min Summer	62.272	0.397	1.9	31.8	O K
4320 min Summer	62.134	0.259	1.9	20.8	O K
5760 min Summer	61.949	0.074	1.9	5.9	O K
7200 min Summer	61.877	0.002	1.9	0.1	O K
8640 min Summer	61.875	0.000	1.8	0.0	O K
10080 min Summer	61.875	0.000	1.7	0.0	O K
15 min Winter	61.875	0.000	1.8	0.0	O K
30 min Winter	61.944	0.069	1.9	5.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	68.911	0.0	29.8	0
30 min Summer	47.332	0.0	41.3	61
60 min Summer	30.924	0.0	14.2	68
120 min Summer	19.669	0.0	31.9	126
180 min Summer	14.988	0.0	41.7	184
240 min Summer	12.334	0.0	86.4	298
360 min Summer	9.351	0.0	101.3	398
480 min Summer	7.674	0.0	110.2	496
600 min Summer	6.580	0.0	120.1	558
720 min Summer	5.801	0.0	122.6	644
960 min Summer	4.754	0.0	138.5	750
1440 min Summer	3.590	0.0	156.0	1042
2160 min Summer	2.710	0.0	178.0	1344
2880 min Summer	2.218	0.0	196.3	1908
4320 min Summer	1.672	0.0	221.2	2756
5760 min Summer	1.367	0.0	243.5	3352
7200 min Summer	1.169	0.0	260.7	3904
8640 min Summer	1.029	0.0	275.1	0
10080 min Summer	0.923	0.0	287.4	0
15 min Winter	68.911	0.0	33.5	0
30 min Winter	47.332	0.0	45.3	69

Summary of Results for 30 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	62.097	0.222	1.9	17.8	O K
120 min Winter	62.256	0.381	1.9	30.4	O K
180 min Winter	62.331	0.456	1.9	36.4	O K
240 min Winter	62.388	0.513	1.9	41.1	O K
360 min Winter	62.449	0.574	1.9	45.9	O K
480 min Winter	62.473	0.598	2.0	47.8	O K
600 min Winter	62.518	0.643	2.0	51.4	O K
720 min Winter	62.505	0.630	2.0	50.4	O K
960 min Winter	62.494	0.619	2.0	49.5	O K
1440 min Winter	62.451	0.576	2.0	46.1	O K
2160 min Winter	62.358	0.483	1.9	38.7	O K
2880 min Winter	62.273	0.398	1.9	31.9	O K
4320 min Winter	61.959	0.084	1.9	6.8	O K
5760 min Winter	61.875	0.000	1.9	0.0	O K
7200 min Winter	61.875	0.000	1.6	0.0	O K
8640 min Winter	61.875	0.000	1.5	0.0	O K
10080 min Winter	61.875	0.000	1.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	30.924	0.0	22.0	68
120 min Winter	19.669	0.0	38.7	124
180 min Winter	14.988	0.0	49.1	180
240 min Winter	12.334	0.0	97.4	272
360 min Winter	9.351	0.0	111.5	346
480 min Winter	7.674	0.0	122.5	432
600 min Winter	6.580	0.0	134.1	472
720 min Winter	5.801	0.0	140.2	552
960 min Winter	4.754	0.0	153.1	708
1440 min Winter	3.590	0.0	174.2	1012
2160 min Winter	2.710	0.0	200.3	1584
2880 min Winter	2.218	0.0	220.9	2048
4320 min Winter	1.672	0.0	249.1	2760
5760 min Winter	1.367	0.0	273.3	0
7200 min Winter	1.169	0.0	292.1	0
8640 min Winter	1.029	0.0	308.2	0
10080 min Winter	0.923	0.0	322.2	0

Model Details

Storage is Online Cover Level (m) 63.300

Tank or Pond Structure

Invert Level (m) 61.875

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	1.000	80.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	61.500
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	61.875	0.000	1.9	0.0	O K
30 min Summer	62.017	0.142	1.9	11.4	O K
60 min Summer	62.147	0.272	1.9	21.7	O K
120 min Summer	62.379	0.504	1.9	40.3	O K
180 min Summer	62.394	0.519	1.9	41.5	O K
240 min Summer	62.542	0.667	2.0	53.3	O K
360 min Summer	62.647	0.772	2.1	61.8	O K
480 min Summer	62.652	0.777	2.1	62.2	O K
600 min Summer	62.692	0.817	2.2	65.3	O K
720 min Summer	62.658	0.783	2.1	62.6	O K
960 min Summer	62.697	0.822	2.2	65.8	O K
1440 min Summer	62.654	0.779	2.1	62.3	O K
2160 min Summer	62.611	0.736	2.1	58.9	O K
2880 min Summer	62.509	0.634	2.0	50.7	O K
4320 min Summer	62.379	0.504	1.9	40.3	O K
5760 min Summer	62.252	0.377	1.9	30.2	O K
7200 min Summer	62.082	0.207	1.9	16.6	O K
8640 min Summer	61.922	0.047	1.9	3.8	O K
10080 min Summer	61.876	0.001	1.9	0.1	O K
15 min Winter	61.919	0.044	1.9	3.5	O K
30 min Winter	62.105	0.230	1.9	18.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	89.222	0.0	1.5	25
30 min Summer	61.749	0.0	13.9	40
60 min Summer	40.231	0.0	26.1	70
120 min Summer	25.397	0.0	88.3	160
180 min Summer	19.243	0.0	54.8	186
240 min Summer	15.766	0.0	72.1	242
360 min Summer	11.874	0.0	130.3	348
480 min Summer	9.696	0.0	139.7	404
600 min Summer	8.281	0.0	151.0	458
720 min Summer	7.277	0.0	155.5	532
960 min Summer	5.932	0.0	172.3	666
1440 min Summer	4.445	0.0	192.2	938
2160 min Summer	3.331	0.0	221.0	1360
2880 min Summer	2.712	0.0	238.2	1764
4320 min Summer	2.027	0.0	269.6	2720
5760 min Summer	1.647	0.0	292.6	3536
7200 min Summer	1.402	0.0	311.8	4352
8640 min Summer	1.228	0.0	328.3	4600
10080 min Summer	1.099	0.0	342.1	5344
15 min Winter	89.222	0.0	5.1	26
30 min Winter	61.749	0.0	20.7	40

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	62.307	0.432	1.9	34.6	O K
120 min Winter	62.548	0.673	2.0	53.8	O K
180 min Winter	62.639	0.764	2.1	61.1	O K
240 min Winter	62.681	0.806	2.2	64.5	O K
360 min Winter	62.772	0.897	2.2	71.8	O K
480 min Winter	62.821	0.946	2.3	75.6	O K
600 min Winter	62.799	0.924	2.2	73.9	O K
720 min Winter	62.837	0.962	2.3	77.0	O K
960 min Winter	62.823	0.948	2.3	75.9	O K
1440 min Winter	62.800	0.925	2.2	74.0	O K
2160 min Winter	62.677	0.802	2.1	64.2	O K
2880 min Winter	62.546	0.671	2.0	53.7	O K
4320 min Winter	62.327	0.452	1.9	36.2	O K
5760 min Winter	62.018	0.143	1.9	11.4	O K
7200 min Winter	61.875	0.000	1.9	0.0	O K
8640 min Winter	61.875	0.000	1.7	0.0	O K
10080 min Winter	61.875	0.000	1.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	40.231	0.0	78.2	112
120 min Winter	25.397	0.0	63.4	124
180 min Winter	19.243	0.0	114.8	180
240 min Winter	15.766	0.0	84.1	238
360 min Winter	11.874	0.0	141.4	350
480 min Winter	9.696	0.0	116.9	450
600 min Winter	8.281	0.0	163.6	490
720 min Winter	7.277	0.0	175.5	558
960 min Winter	5.932	0.0	190.3	718
1440 min Winter	4.445	0.0	216.9	1024
2160 min Winter	3.331	0.0	246.6	1460
2880 min Winter	2.712	0.0	268.0	1880
4320 min Winter	2.027	0.0	301.5	2928
5760 min Winter	1.647	0.0	328.2	3720
7200 min Winter	1.402	0.0	350.2	0
8640 min Winter	1.228	0.0	368.1	0
10080 min Winter	1.099	0.0	383.4	0

Model Details

Storage is Online Cover Level (m) 63.300

Tank or Pond Structure

Invert Level (m) 61.875

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	1.000	80.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	61.500
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

Appendix B – MicroDrainage Simulation Results

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes GDSDS Manhole Sizes IW Foul

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	15.200	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.279	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	30	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.098	4-8	0.119	8-12	0.014	12-16	0.016

Total Area Contributing (ha) = 0.247

Total Pipe Volume (m³) = 26.032

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	63.300	1.125	Open Manhole	1200	1.000	62.175	225				
2	63.400	0.200	Junction		2.000	63.200	150				
3	63.400	0.304	Junction		2.001	63.096	150	2.000	63.096	150	
4	63.400	0.200	Junction		3.000	63.200	150				
5	63.400	0.591	Junction		2.002	62.809	225	2.001	62.984	150	
								3.000	63.137	150	153
6	63.300	1.151	Open Manhole	1200	1.001	62.149	225	1.000	62.149	225	
								2.002	62.769	225	620
7	63.300	1.209	Open Manhole	1200	1.002	62.091	225	1.001	62.091	225	
8	63.300	1.331	Open Manhole	1200	1.003	61.969	225	1.002	61.969	225	
9	63.300	1.500	Open Manhole	1200	1.004	61.800	300	1.003	61.875	225	
10	63.300	1.549	Open Manhole	1200	1.005	61.751	300	1.004	61.751	300	
11	63.300	1.640	Open Manhole	1200	1.006	61.660	300	1.005	61.660	300	
	63.300	1.668	Open Manhole	450		OUTFALL		1.006	61.632	300	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	63.300	62.175	0.900	Open Manhole	1200
2.000	3 \=/	150	2	63.400	63.200	0.150	Junction	
2.001	3 \=/	150	3	63.400	63.096	0.254	Junction	
3.000	3 \=/	150	4	63.400	63.200	0.150	Junction	
2.002	o	225	5	63.400	62.809	0.366	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	7.725	300.0	6	63.300	62.149	0.926	Open Manhole	1200
2.000	31.284	300.8	3	63.400	63.096	0.254	Junction	
2.001	33.643	300.4	5	63.400	62.984	0.366	Junction	
3.000	18.982	301.3	5	63.400	63.137	0.213	Junction	
2.002	11.939	298.5	6	63.300	62.769	0.306	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.001	o	225	6	63.300	62.149	0.926	Open Manhole	1200
1.002	o	225	7	63.300	62.091	0.984	Open Manhole	1200
1.003	o	225	8	63.300	61.969	1.106	Open Manhole	1200
1.004	o	300	9	63.300	61.800	1.200	Open Manhole	1200
1.005	o	300	10	63.300	61.751	1.249	Open Manhole	1200
1.006	o	300	11	63.300	61.660	1.340	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.001	17.560	300.0	7	63.300	62.091	0.984	Open Manhole	1200
1.002	36.622	300.0	8	63.300	61.969	1.106	Open Manhole	1200
1.003	27.956	300.0	9	63.300	61.875	1.200	Open Manhole	1200
1.004	14.845	300.0	10	63.300	61.751	1.249	Open Manhole	1200
1.005	27.268	300.0	11	63.300	61.660	1.340	Open Manhole	1200
1.006	8.570	300.0		63.300	61.632	1.368	Open Manhole	450

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		63.300	61.632	61.410	450	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	30.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	15.200	Cv (Summer)	0.750
Return Period (years)	5	Ratio R	0.279	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 9, DS/PN: 1.004, Volume (m³): 2.8

Unit Reference	MD-SHE-0067-2000-1000-2000	Sump Available	Yes
Design Head (m)	1.000	Diameter (mm)	67
Design Flow (l/s)	2.0	Invert Level (m)	61.800
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	0.600	1.6	1.600	2.5	2.600	3.1	5.000	4.2	7.500	5.1
0.200	1.9	0.800	1.8	1.800	2.6	3.000	3.3	5.500	4.4	8.000	5.2
0.300	1.9	1.000	2.0	2.000	2.7	3.500	3.5	6.000	4.6	8.500	5.4
0.400	1.9	1.200	2.2	2.200	2.9	4.000	3.8	6.500	4.7	9.000	5.5
0.500	1.8	1.400	2.3	2.400	3.0	4.500	4.0	7.000	4.9	9.500	5.7

Storage Structures for Storm

Tank or Pond Manhole: 1, DS/PN: 1.000

Invert Level (m) 62.175

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	1.000	80.0	1.001	0.0

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	30.000	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm)	15.200	Cv (Summer)	0.750
Region	Scotland and Ireland	Ratio R	0.279	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	2.5 Second Increment (Extended)	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	360 Winter	100	+0%	1/120 Winter				63.224	0.824	0.000	0.15		3.7	FLOOD RISK

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Level Exceeded
1.000	1	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
2.000	2	15 Winter	100	+0%					63.295	-0.105	0.000	0.17		7.3
2.001	3	360 Winter	100	+0%					63.223	-0.177	0.000	0.02		2.0
3.000	4	15 Winter	100	+0%					63.260	-0.140	0.000	0.07		2.9
2.002	5	360 Winter	100	+0%	100/120 Winter				63.223	0.189	0.000	0.08		2.5
1.001	6	360 Winter	100	+0%	1/15 Summer				63.223	0.849	0.000	0.13		3.5
1.002	7	360 Winter	100	+0%	1/15 Summer				63.223	0.907	0.000	0.11		3.2
1.003	8	15 Summer	100	+0%	1/15 Summer				63.231	1.037	0.000	0.25		7.1
1.004	9	15 Summer	100	+0%	1/15 Summer				63.278	1.177	0.000	0.04		2.3
1.005	10	600 Winter	100	+0%					61.790	-0.261	0.000	0.04		2.3
1.006	11	480 Winter	100	+0%					61.702	-0.258	0.000	0.05		2.3

PN	US/MH Name	Status	Level Exceeded
2.000	2	FLOOD RISK*	
2.001	3	FLOOD RISK*	
3.000	4	FLOOD RISK*	
2.002	5	FLOOD RISK*	
1.001	6	FLOOD RISK	
1.002	7	FLOOD RISK	
1.003	8	FLOOD RISK	
1.004	9	FLOOD RISK	
1.005	10	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
1.006	11	OK	

Appendix C – Existing Service Infrastructure Maps

Foul Map

Surface Water Map

Potable Water Map

11429 - Toppins Field- Sewer.Water Overlay

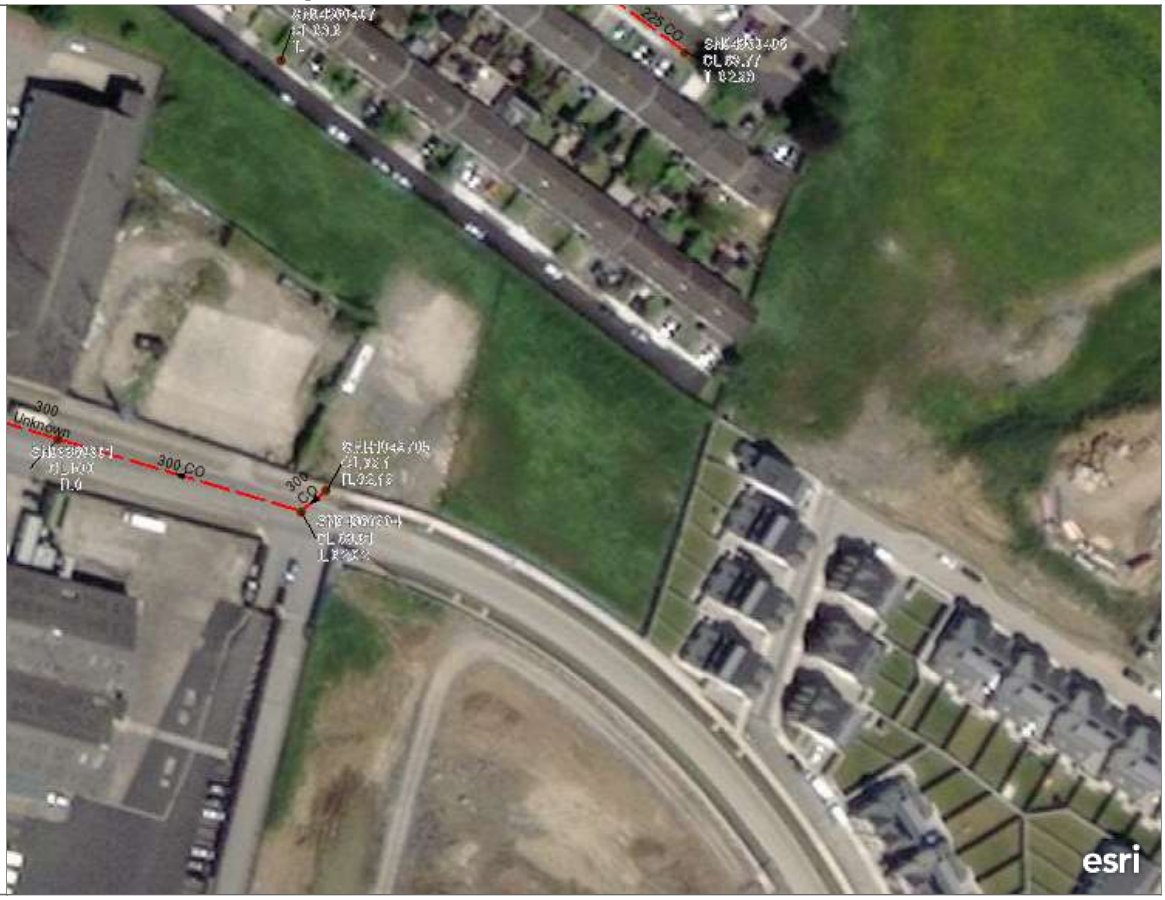
SewerStormWaterNetwork

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Sewer Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Sewer Clean Outs
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Network Structures
- Waste Water Treatment plant



40m

11429 - Toppins Field- Sewer.Water Overlay

StormWaterNetwork

Storm Manholes

- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Storm Discharge Points

- Outfall
- Overflow
- Soakaway
- Other; Unknown

Surface Water Mains

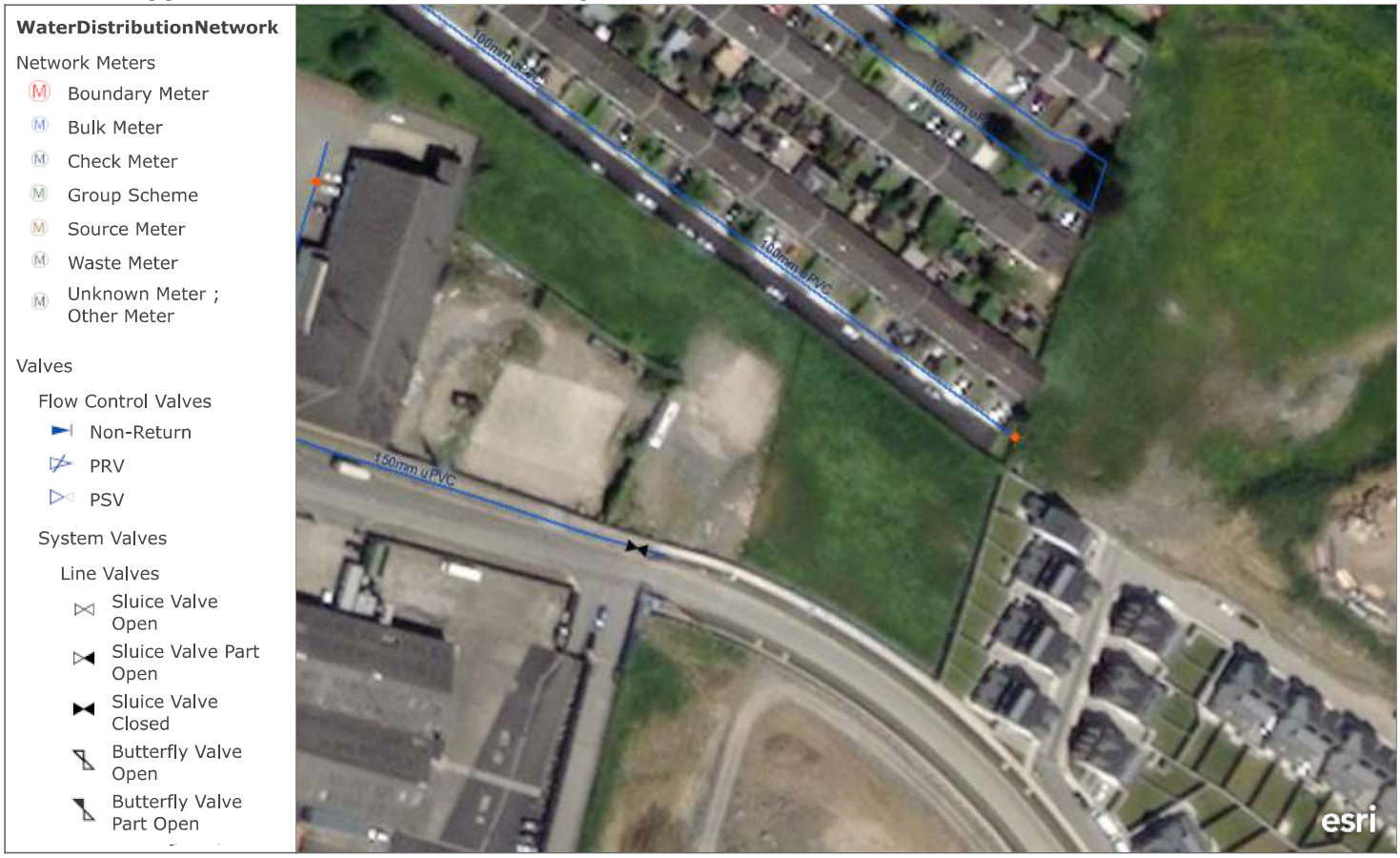
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Storm Inlets

40m

Maxar, Microsoft | OS, Esri, HERE, Garmin, GeoTechnologies, Inc.

11429 - Toppins Field- Sewer.Water Overlay



Maxar, Microsoft | OS, Esri, HERE, Garmin, GeoTechnologies, Inc.

Appendix D – Irish Water Confirmation of Feasibility

Aoife O'Sullivan

Block 10-4
Blanchardstown Corporate Park
Dublin
D15X98N

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

8 June 2022

Re: CDS22003271 pre-connection enquiry - Subject to contract | Contract denied

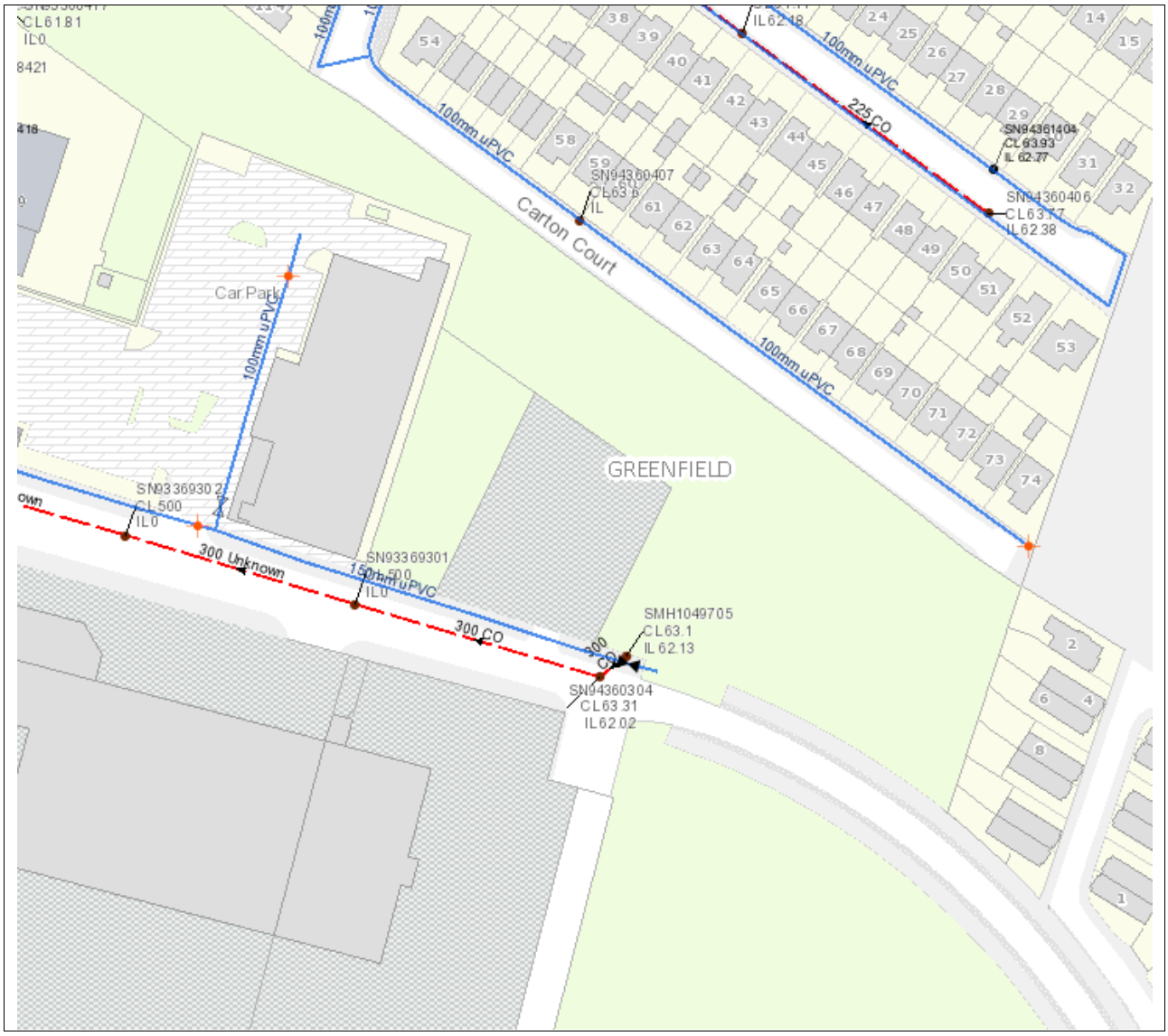
Connection for Business Connection of 1 unit(s) at Straffan Road, Greenfield, Maynooth, Kildare

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Straffan Road, Greenfield, Maynooth, Kildare (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

The map included below outlines the current Irish Water infrastructure adjacent to your site:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

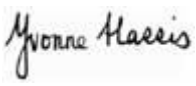
General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**

2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at hiips://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at hiips://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Tinus van der Walt from the design team at twalt@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

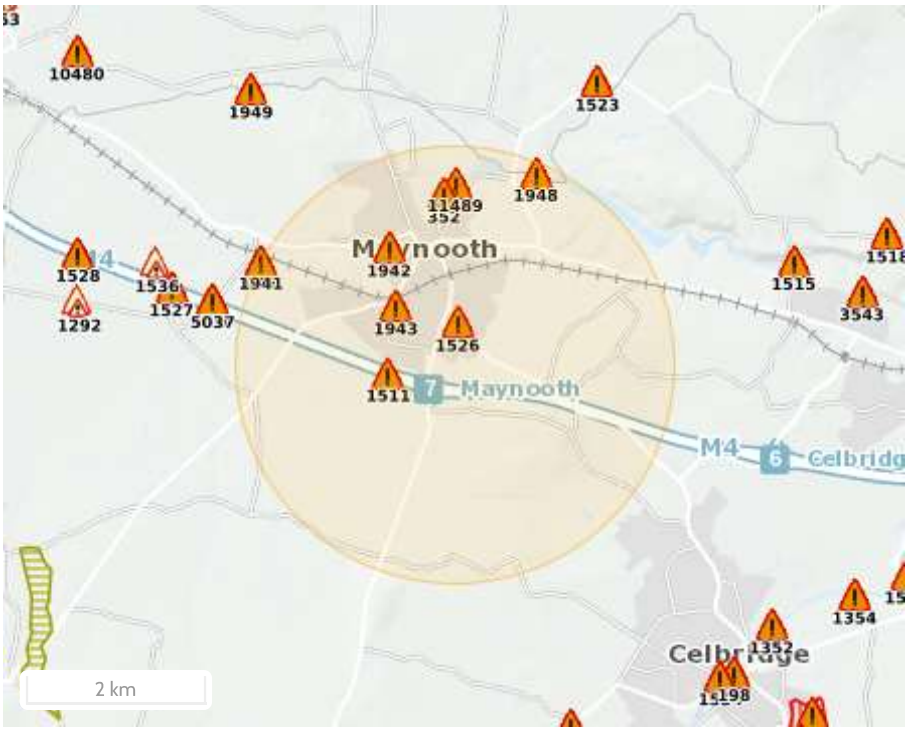
Head of Customer Operations

Appendix E – Past Flood Events Report

Past Flood Event Local Area Summary Report

Report Produced: **30/8/2022 10:03**

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

10 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Lyreen Maynooth Canal Culvert Nov 2000 (ID-1941)	05/11/2000	Exact Point
	Additional Information: Reports (3) Press Archive (0)		
2.	Lyreen Maynooth College Nov 2000 (ID-1942)	05/11/2000	Approximate Point
	Additional Information: Reports (1) Press Archive (5)		
3.	Meadowbrook Estate Parson St Maynooth Nov 2000 (ID-1943)	05/11/2000	Approximate Point
	Additional Information: Reports (4) Press Archive (0)		
4.	Ryewater Maynooth Carton Nov 2000 (ID-1948)	05/11/2000	Approximate Point
	Additional Information: Reports (2) Press Archive (6)		
5.	Lyreen Maynooth Jackson's Bridge area June 1993 (ID-476)	09/06/1993	Approximate Point
	Additional Information: Reports (3) Press Archive (0)		
6.	Lyreen Maynooth University June 1993 (ID-3539)	31/05/1993	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

	Name (Flood_ID)	Start Date	Event Location
7.	Lyreen River 24th Oct 2011 Maynooth (ID-11489)	23/10/2011	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
8.	Lyreen Maynooth Nov 2002 (ID-352)	15/11/2002	Approximate Point
	Additional Information: Reports (6) Press Archive (5)		
9.	Meadowbrook Greenfield M4 Nov 2000 (ID-1511)	05/11/2000	Approximate Point
	Additional Information: Reports (5) Press Archive (2)		
10.	Laurence Avenue, Maynooth Nov 2002 (ID-1526)	14/11/2002	Approximate Point
	Additional Information: Reports (2) Press Archive (0)		

Appendix F – Site Investigations Results

S.I. Ltd Contract No: 5994

Client:	Kildare County Council
Engineer:	Tobin Consulting Engineers
Contractor:	Site Investigations Ltd

Maynooth Fire Station,
Maynooth, Co. Kildare
Site Investigation Report

Prepared by:

Letch

.....

Stephen Letch

Issue Date:	24/06/2022
Status	Final
Revision	1

Appendix 1

Cable Percussive Borehole Logs

Contract No: 5994	**Cable Percussion Borehole Log**				Borehole No: **BH01**
Contract:	Maynooth Fire Station	Easting:	693991.954	Date Started:	31/05/2022
Location:	Maynooth, Co. Kildare	Northing:	736387.194	Date Completed:	02/03/2021
Client:	Kildare County Council	Elevation:	63.34	Drilled By:	J. O'Toole
Engineer:	Tobin Consulting Engineers	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.			63.14					
	0.20	MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic, timber and concrete fragments.		63.0						
0.5						0.50	B	JOT02		
	0.70	Brown slightly sandy slightly gravelly silty CLAY with low cobble content.			62.64					
				62.5						
1.0						1.00	B	JOT03		
						1.00	C	50 (3,18/50 for 105mm)		
	1.25	Obstruction - possible boulders.			62.09					
	1.35	End of Borehole at 1.35m		62.0	61.99	1.35	C	50 (25 for 5mm/50 for 5mm)		
1.5										
				61.5						
2.0										
				61.0						
2.5										
				60.5						
3.0										
				60.0						
3.5										
				59.5						
4.0										
				59.0						
4.5										
				58.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
1.25	1.35	01:30				31/05	1.35	Dry				0.00	1.35	Arisings	Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5994	**Cable Percussion Borehole Log**			Borehole No: **BH02**
Contract:	Maynooth Fire Station	Easting:	693986.702	Date Started: 31/05/2022
Location:	Maynooth, Co. Kildare	Northing:	736374.180	Date Completed: 03/03/2021
Client:	Kildare County Council	Elevation:	63.38	Drilled By: J. O'Toole
Engineer:	Tobin Consulting Engineers	Borehole Diameter:	200mm	Status: FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.			63.18					
	0.20	MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic, timber and concrete fragments.		63.0		0.50	B	JOT04		
0.5	0.60	Brown slightly sandy gravelly silty CLAY with low cobble content.			62.78					
				62.5		1.00	B	JOT05		
1.0						1.00	C	50 (9,15/50 for 90mm)		
	1.25	Obstruction - boulders.			62.13					
	1.35	End of Borehole at 1.35m		62.0	62.03	1.35	C	50 (25 for 5mm/50 for 5mm)		
1.5										
				61.5						
2.0										
				61.0						
2.5										
				60.5						
3.0										
				60.0						
3.5										
				59.5						
4.0										
				59.0						
4.5										
				58.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
1.25	1.35	01:30				31/05	1.35	Dry				0.00	1.35	Arisings	Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5994	**Cable Percussion Borehole Log**				Borehole No: **BH03**
Contract:	Maynooth Fire Station	Easting:	694017.345	Date Started:	30/05/2022
Location:	Maynooth, Co. Kildare	Northing:	736374.408	Date Completed:	04/03/2021
Client:	Kildare County Council	Elevation:	63.33	Drilled By:	J. O'Toole
Engineer:	Tobin Consulting Engineers	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
0.5	0.20	TOPSOIL.		63.0	63.13					
	0.60	MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic, timber and concrete fragments.			62.73	0.70	B	JOT01		
	0.80	Brown slightly sandy gravelly silty CLAY with low cobble content.		62.5	62.53					
1.0	0.90	Obstruction - possible boulders.			62.43	0.90	C	50 (25 for 5mm/50 for 10mm)		
1.5		End of Borehole at 0.90m		62.0						
2.0				61.5						
2.5				61.0						
3.0				60.5						
3.5				60.0						
4.0				59.5						
4.5				59.0						
				58.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
0.80	0.90	01:30				30/05	0.90	Dry				0.00	0.90	Arisings	Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 5994	**Cable Percussion Borehole Log**				Borehole No: **BH04**
Contract:	Maynooth Fire Station	Easting:	694008.037	Date Started:	01/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736356.332	Date Completed:	01/06/2022
Client:	Kildare County Council	Elevation:	63.44	Drilled By:	J. O'Toole
Engineer:	Tobin Consulting Engineers	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
		TOPSOIL.			63.24					
	0.20	MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic, timber and concrete fragments.		63.0		0.50	B	JOT06		
0.5	0.60	Brown slightly sandy gravelly silty CLAY with low cobble content.			62.84					
				62.5		1.00	B	JOT07		
1.0						1.00	C	50 (6,14/50 for 40mm)		
	1.20	Obstruction - possible boulders.			62.24					
	1.30	End of Borehole at 1.30m			62.14	1.30	C	50 (25 for 5mm/50 for 5mm)		
1.5				62.0						
2.0				61.5						
2.5				61.0						
3.0				60.5						
3.5				60.0						
4.0				59.5						
4.5				59.0						
				58.5						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
1.20	1.30	01:30				01/06	1.30	Dry				0.00	1.30	Arisings	Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Appendix 2

Rotary Corehole Log and Photograph

Contract No: 5994	**Rotary Corehole Log**				Corehole No: **RC02**
Contract:	Maynooth Fire Station	Easting:	693986.702	Date Started:	08/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736374.180	Date Completed:	08/06/2022
Client:	Kildare County Council	Elevation:	63.38	Drilled By:	MEDL
Engineer:	Tobin Consulting Engineers	Rig Type:	Sondeq	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples	Rock Indices TCR/%	SCR/%	RQD/%	FI/m	Backfill
0.5		Cable percussive borehole completed - see CP log.		63.0							
1.0				62.5							
1.5	1.35	Open hole drilling - driller reports returns of sandy gravelly CLAY with cobbles and boulders.		62.0	62.03						
2.0				61.5							
2.5	2.30	Moderately strong light grey massive LIMESTONE with occasional calcite veins. Fresh to slightly weathered. *Discontinuities - rough, undulating, tight to open, sub-horizontal, occasionally sub-vertical dip, clean with occasional brown staining.*		61.0	61.08	2.30 - 3.30	96	82	51	7	
3.0				60.5							
3.5				60.0		3.30 - 4.30	95	77	46		
4.0				59.5						11	
4.5				59.0		4.30 - 5.30	93	84	32		
5.0				58.5							
5.5	5.30	End of Corehole at 5.30m		58.0	58.08						
				57.5							

Installation: From:	To:	Pipe Type:	Backfill: From:	To:	Type:	Remarks:
			0.00	5.30	Bentonite	Cable percussive borehole previously completed. Corehole completed adjacent to borehole.

RC02 Box 1 of 1

Appendix 3

Trial Pit Logs and Photographs

Contract No: 5994	**Trial Pit Log**				Trial Pit No: **TP01**
Contract:	Maynooth Fire Station	Easting:	693983.942	Date:	25/05/2022
Location:	Maynooth, Co. Kildare	Northing:	736366.956	Excavator:	JCB 3CX
Client:	Kildare County Council	Elevation:	63.29	Logged By:	M. Kaliski
Engineer:	Tobin Consulting Engineers	Dimensions (LxWxD) (m):	6.50 x 0.60 x 1.70	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
		TOPSOIL.							
	0.10	MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic pipe and timber fragments.			63.19				
0.5				63.0		0.50	ES	MK05	
	0.60	Stiff brown slightly sandy gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of limestone. Cobbles are angular to subangular of limestone.			62.69				
				62.5					
1.0						1.00	B	MK06	
				62.0					
1.5									
	1.70	Obstruction - possible boulders.			61.59				
		Pit terminated at 1.70m		61.5					
2.0									
				61.0					
2.5									
				60.5					

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstruction - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5994	**Trial Pit Log**				Trial Pit No: **TP02**
Contract:	Maynooth Fire Station	Easting:	694007.291	Date:	25/05/2022
Location:	Maynooth, Co. Kildare	Northing:	736395.659	Excavator:	JCB 3CX
Client:	Kildare County Council	Elevation:	63.24	Logged By:	M. Kaliski
Engineer:	Tobin Consulting Engineers	Dimensions (LxWxD) (m):	5.10 x 0.60 x 1.80	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
	0.10	TOPSOIL.			63.14				
		MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic fragments.		63.0					
0.5						0.50	ES	MK03	
	0.70	Stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of limestone. Cobbles are angular to subangular of limestone.		62.5	62.54				
1.0						1.00	B	MK04	
				62.0					
1.5									
	1.80	Obstruction - possible boulders.		61.5	61.44				
		Pit terminated at 1.80m							
2.0									
				61.0					
2.5									
				60.5					

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstruction - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5994	**Trial Pit Log**				Trial Pit No: **TP03**
Contract:	Maynooth Fire Station	Easting:	694032.944	Date:	25/05/2022
Location:	Maynooth, Co. Kildare	Northing:	736371.616	Excavator:	JCB 3CX
Client:	Kildare County Council	Elevation:	63.34	Logged By:	M. Kaliski
Engineer:	Tobin Consulting Engineers	Dimensions (LxWxD) (m):	4.40 x 0.60 x 1.50	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
	0.10	TOPSOIL.			63.24				
		MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some concrete fragments.		63.0					
0.5						0.50	ES	MK01	
	0.60	Stiff brown slightly sandy gravelly silty CLAY with high cobble and low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of limestone. Cobbles and boulders are angular to subangular of limestone (up to 300mm diameter).			62.74				
				62.5					
1.0						1.00	B	MK02	
				62.0					
1.5	1.50	Obstruction - possible boulders.			61.84				
		Pit terminated at 1.50m							
				61.5					
2.0									
				61.0					
2.5									
				60.5					

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstruction - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Contract No: 5994	**Trial Pit Log**				Trial Pit No: **TP04**
Contract:	Maynooth Fire Station	Easting:	694021.704	Date:	25/05/2022
Location:	Maynooth, Co. Kildare	Northing:	736347.331	Excavator:	JCB 3CX
Client:	Kildare County Council	Elevation:	63.27	Logged By:	M. Kaliski
Engineer:	Tobin Consulting Engineers	Dimensions (LxWxD) (m):	4.50 x 0.60 x 1.20	Status:	FINAL

Level (mbgl) Scale:	Depth	Stratum Description	Legend	Level (mOD) Scale:	Depth:	Samples / Field Tests Depth	Type	Result	Water Strike
	0.10	TOPSOIL.			63.17				
		MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic pipe and telecom cable fragments.		63.0					
0.5						0.50	ES	MK07	
	0.70				62.57				
		Stiff brown slightly sandy gravelly silty CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of limestone. Cobbles are angular to subangular of limestone.		62.5					
1.0						1.00	B	MK08	
	1.20	Obstruction - possible boulders.			62.07				
		Pit terminated at 1.20m		62.0					
1.5									
				61.5					
2.0									
				61.0					
2.5									
				60.5					

Termination:	Pit Wall Stability:	Groundwater Rate:	Remarks:	Key:
Obstruction - possible boulders.	Pit walls stable.	Dry	-	B = Bulk disturbed D = Small disturbed CBR = Undisturbed CBR ES = Environmental

Appendix 4

Soakaway Test Results

SOAKAWAY TEST

Project Reference:	5994
Contract name:	Maynooth Fire Station
Location:	Maynooth, Co. Kildare
Test No:	TP02
Date:	25/05/2022

Ground Conditions

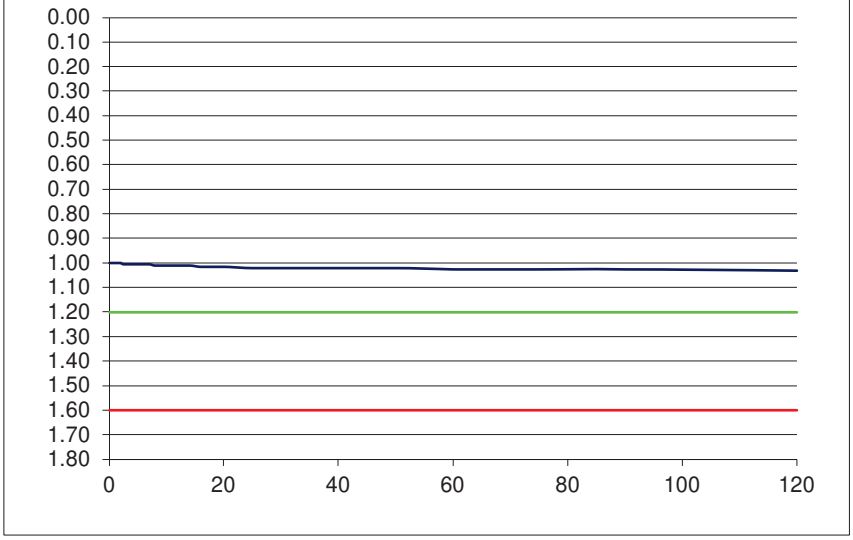
From	To	
0.00	0.10	TOPSOIL.
0.10	0.70	MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic fragments.
0.70	1.80	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content.

Remarks:

Obstruction at 1.80mbgl - pit terminated and test completed.

Elapsed Time (mins)	Fall of Water (m)
0	1.00
0.5	1.00
1	1.00
1.5	1.00
2	1.00
2.5	1.01
3	1.01
3.5	1.01
4	1.01
4.5	1.01
5	1.01
6	1.01
7	1.01
8	1.01
9	1.01
10	1.01
12	1.01
14	1.01
16	1.02
18	1.02
20	1.02
25	1.02
30	1.02
40	1.02
50	1.02
60	1.03
75	1.03
90	1.03
120	1.03

Pit Dimensions (m)		
Length (m)	5.10	m
Width (m)	0.60	m
Depth	1.80	m
Water		
Start Depth of Water	1.00	m
Depth of Water	0.80	m
75% Full	1.20	m
25% Full	1.60	m
75%-25%	0.40	m
Volume of water (75%-25%)	**1.22**	m3
Area of Drainage	**20.52**	m2
Area of Drainage (75%-25%)	**7.62**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** m/min or **Fail** m/s

SOAKAWAY TEST

Project Reference:	5994
Contract name:	Maynooth Fire Station
Location:	Maynooth, Co. Kildare
Test No:	TP04
Date:	25/05/2022

Ground Conditions

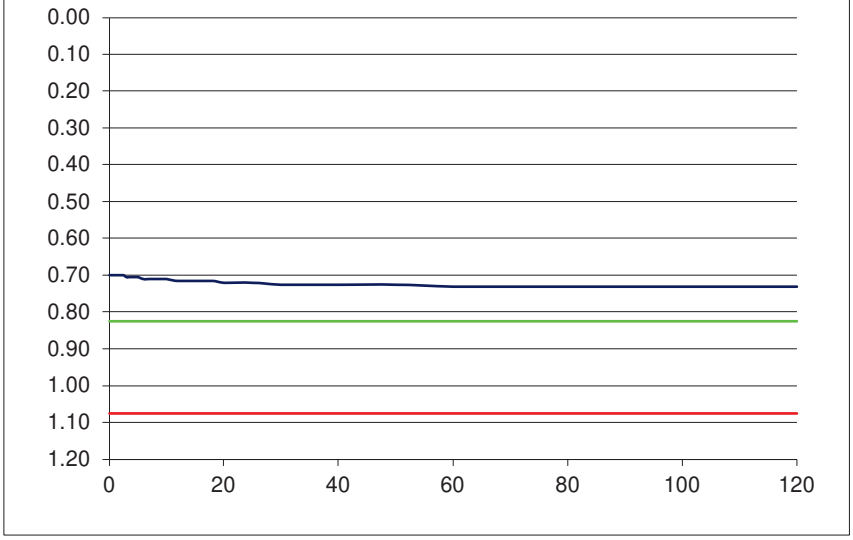
From	To	
0.00	0.10	TOPSOIL.
0.10	0.70	MADE GROUND: grey brown sandy gravelly silty clay with medium cobble content and some plastic pipe and telecom cable fragments.
0.70	1.20	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content.

Remarks:

Obstruction at 1.20mbgl - pit terminated and test completed.

Elapsed Time (mins)	Fall of Water (m)
0	0.70
0.5	0.70
1	0.70
1.5	0.70
2	0.70
2.5	0.70
3	0.71
3.5	0.71
4	0.71
4.5	0.71
5	0.71
6	0.71
7	0.71
8	0.71
9	0.71
10	0.71
12	0.72
14	0.72
16	0.72
18	0.72
20	0.72
25	0.72
30	0.73
40	0.73
50	0.73
60	0.73
75	0.73
90	0.73
120	0.73

Pit Dimensions (m)		
Length (m)	4.50	m
Width (m)	0.60	m
Depth	1.20	m
Water		
Start Depth of Water	0.70	m
Depth of Water	0.50	m
75% Full	0.83	m
25% Full	1.08	m
75%-25%	0.25	m
Volume of water (75%-25%)	**0.68**	m3
Area of Drainage	**12.24**	m2
Area of Drainage (75%-25%)	**5.25**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** **m/min** or **Fail** **m/s**

Appendix 5

California Bearing Ratio Tests

California Bearing Ratio (CBR) In accordance with BS1377: Part 4: Method 7

Client	Kildare County Council
Site	Maynooth Fire Station
S.I. File No	5994 / 22
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email info@siteinvestigations.ie
Report Date	17th June 2022

CBR No	Depth (mBGL)	Sample No	Sample Type	Lab Ref	Moisture Content (%)	CBR Value (%)	Location / Remarks
CBR01	0.50	MK20	CBR	22/784	12.3	7.7	
CBR02	0.50	MK21	CBR	22/785	14.1	6.3	
CBR03	0.50	MK22	CBR	22/786	13.6	5.5	
CBR04	0.50	MK23	CBR	22/787	16.0	4.8	

Printed 24/06/2022

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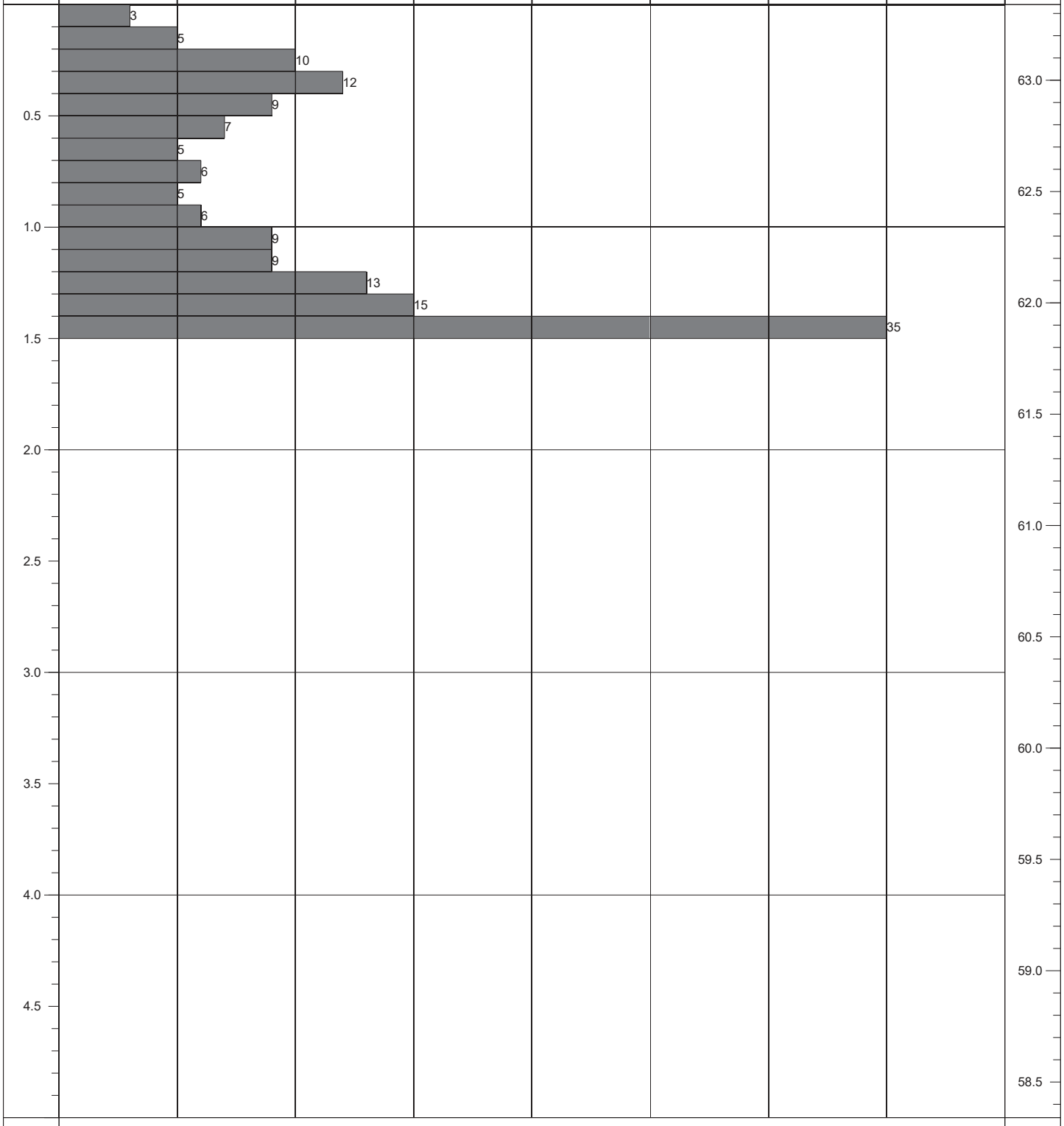
Appendix 6

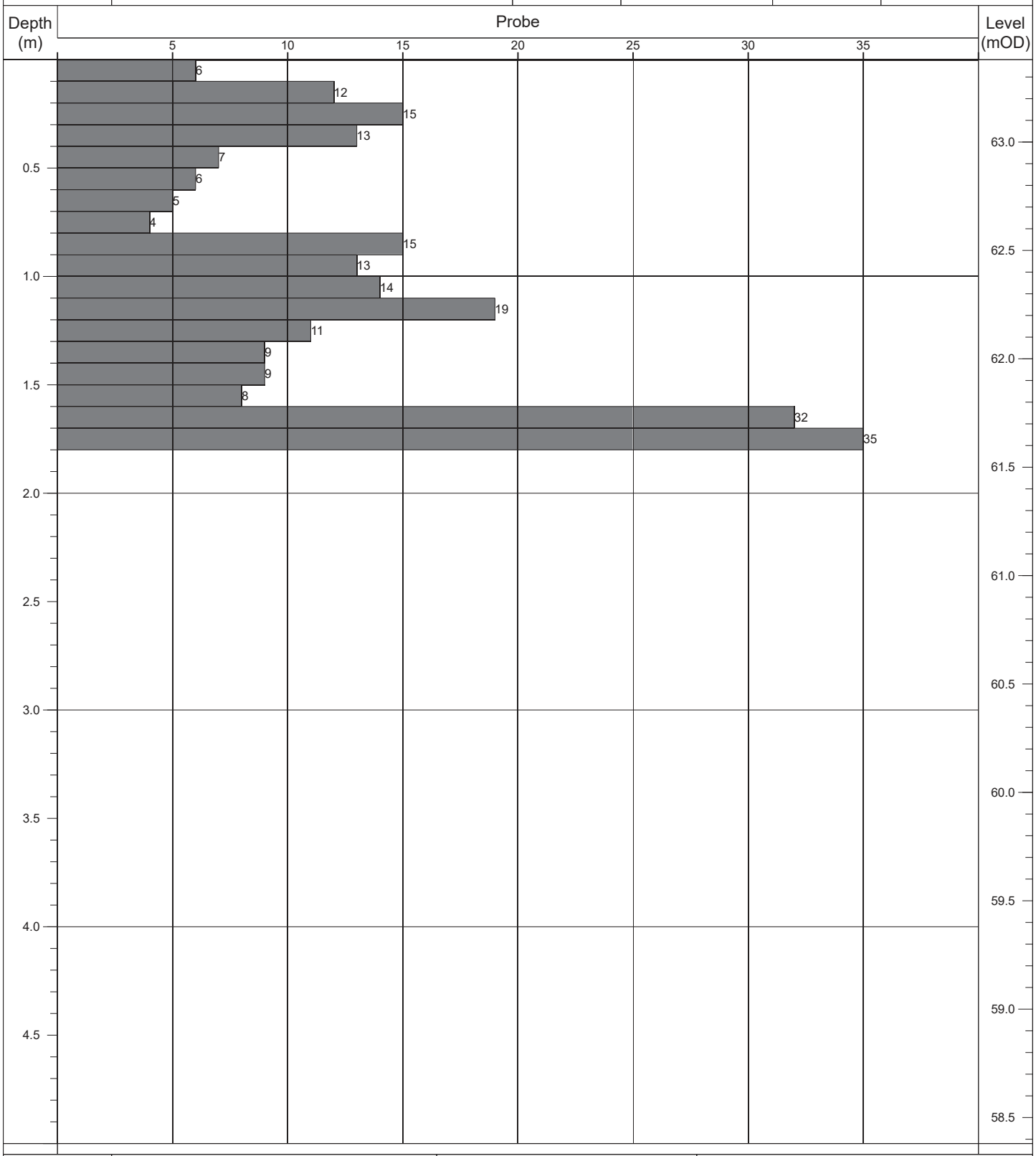
Dynamic Probe Logs

Contract No: 5994	Dynamic Probe Log				Probe No: **DPBH01**
Contract:	Maynooth Fire Station	Easting:	693991.954	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736387.194	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.34	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



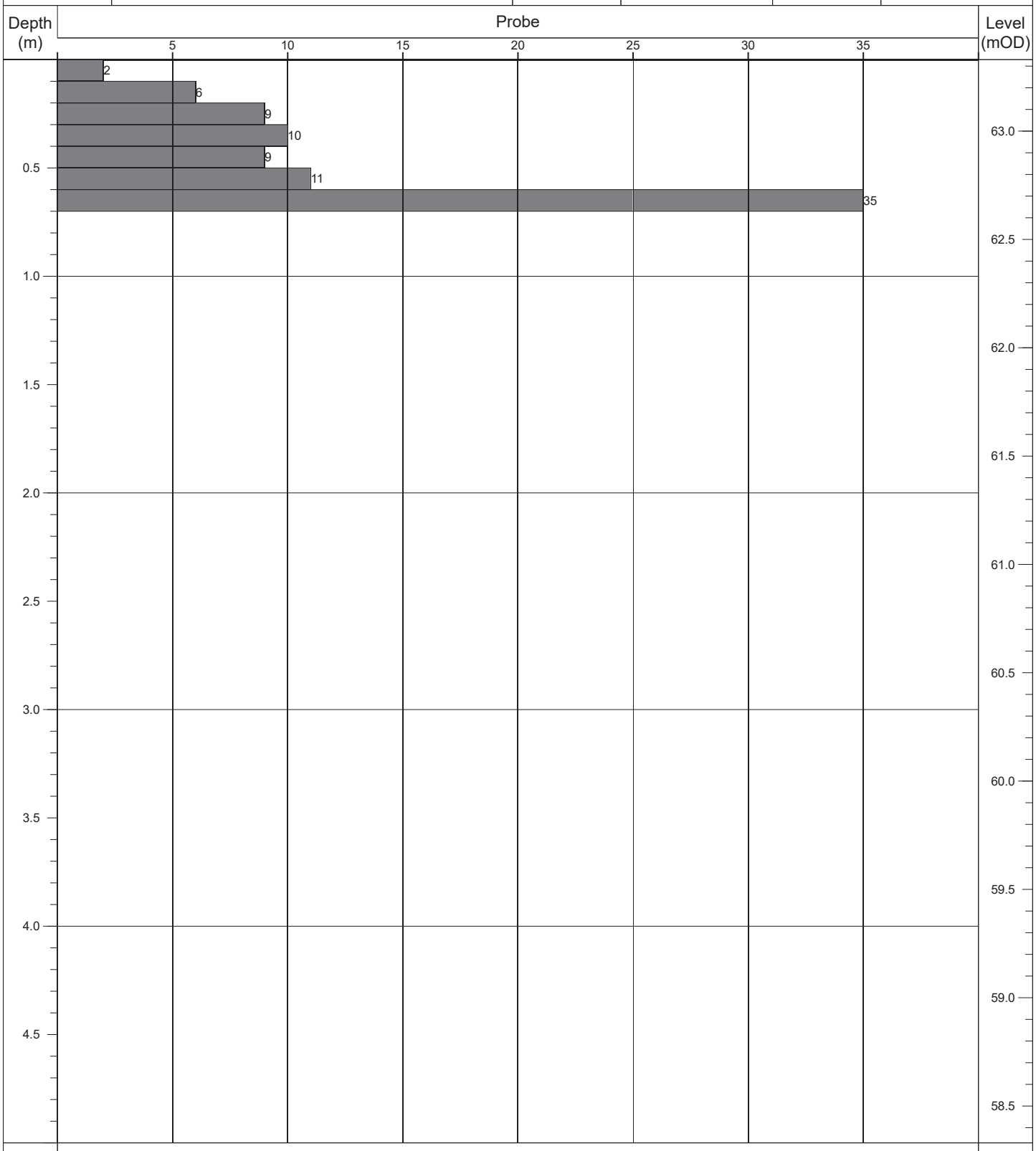
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to BH01.
1.50m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Contract No: 5994	Dynamic Probe Log				Probe No: **DPBH02**
Contract:	Maynooth Fire Station	Easting:	693986.702	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736374.180	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.38	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



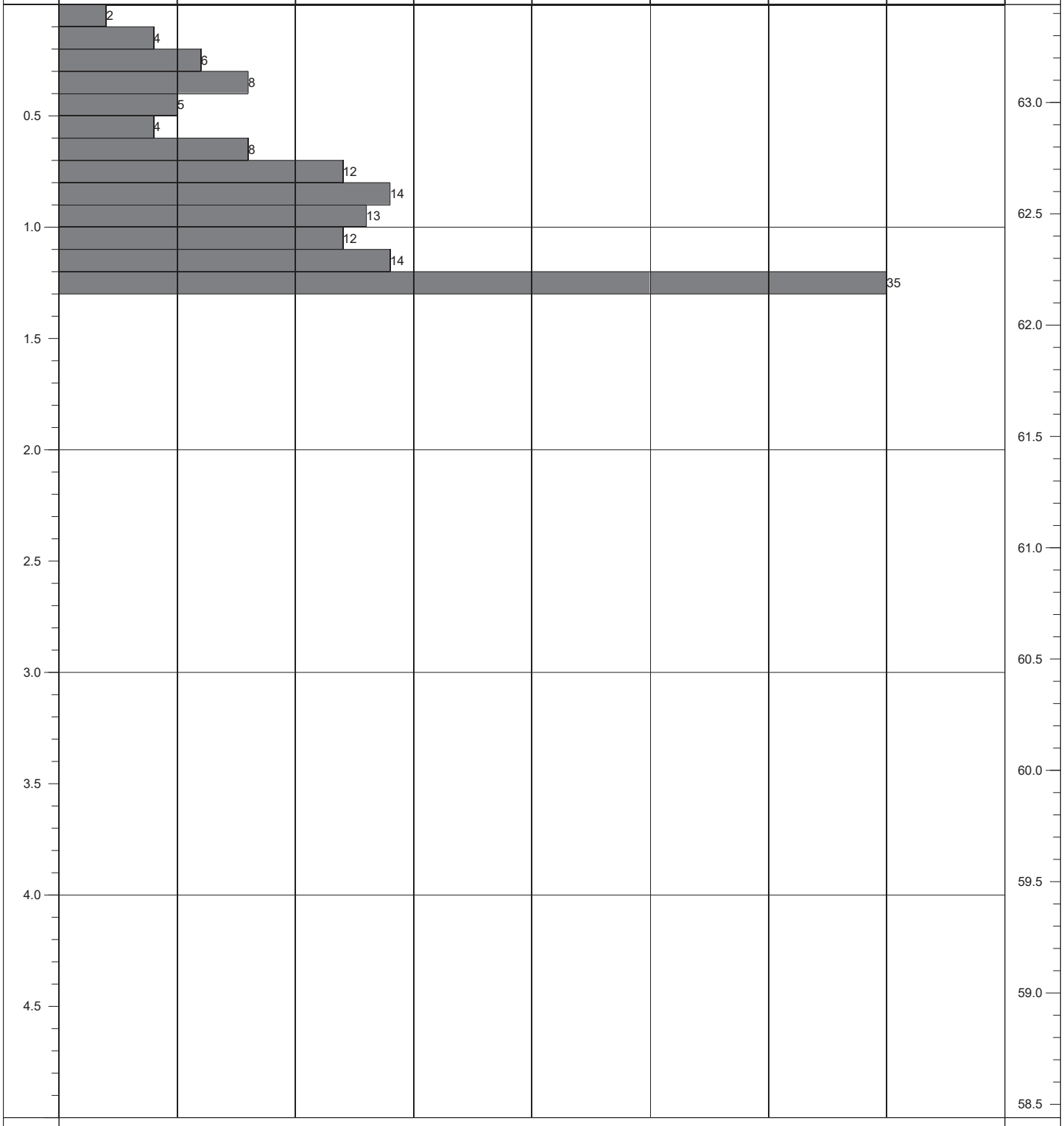
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to BH02.
1.80m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Contract No: 5994	Dynamic Probe Log				Probe No: **DPBH03**
Contract:	Maynooth Fire Station	Easting:	694017.345	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736374.408	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.33	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



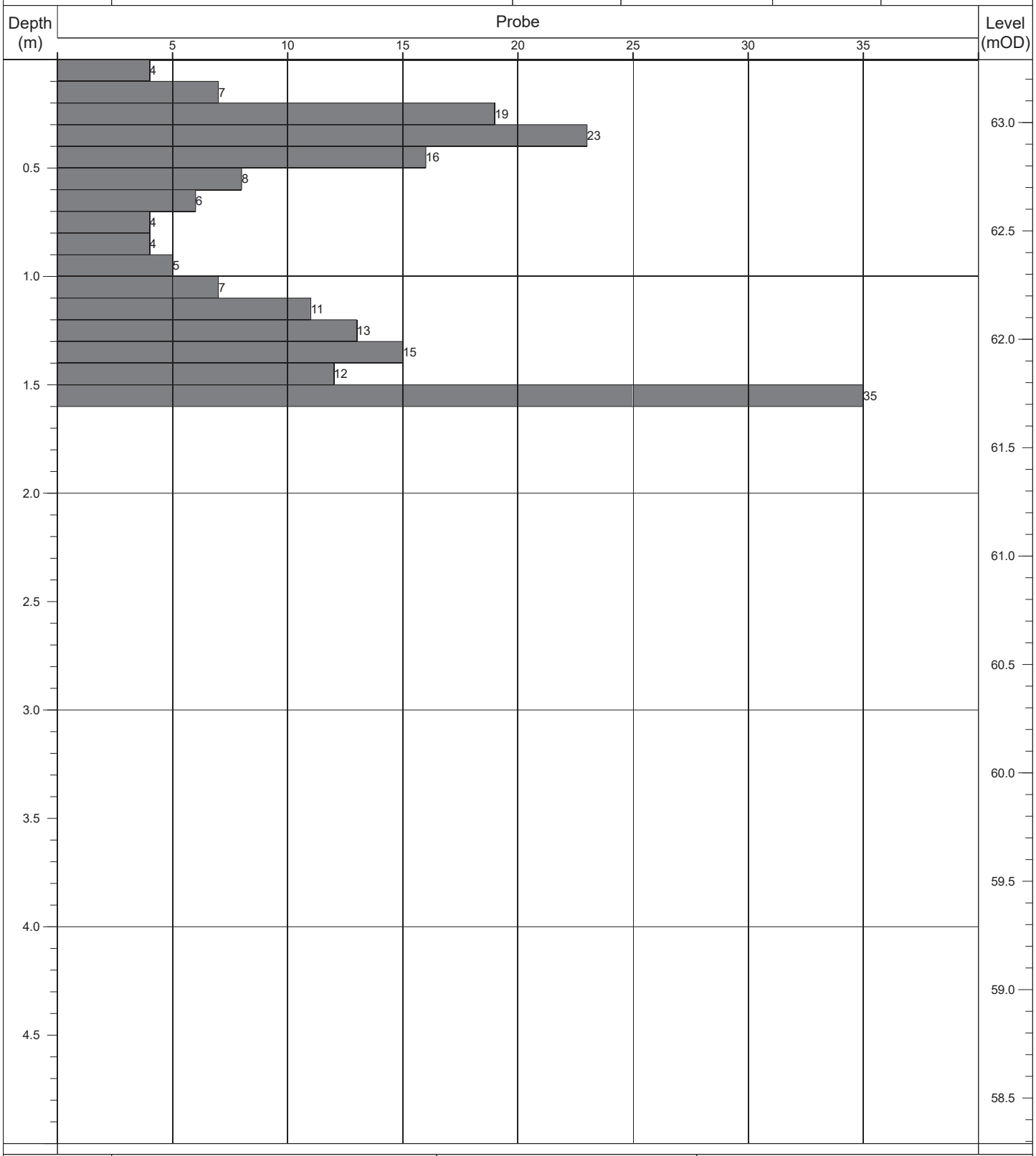
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to BH03.
0.70m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Contract No: 5994	Dynamic Probe Log				Probe No: **DPBH04**
Contract:	Maynooth Fire Station	Easting:	694008.037	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736356.332	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.44	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



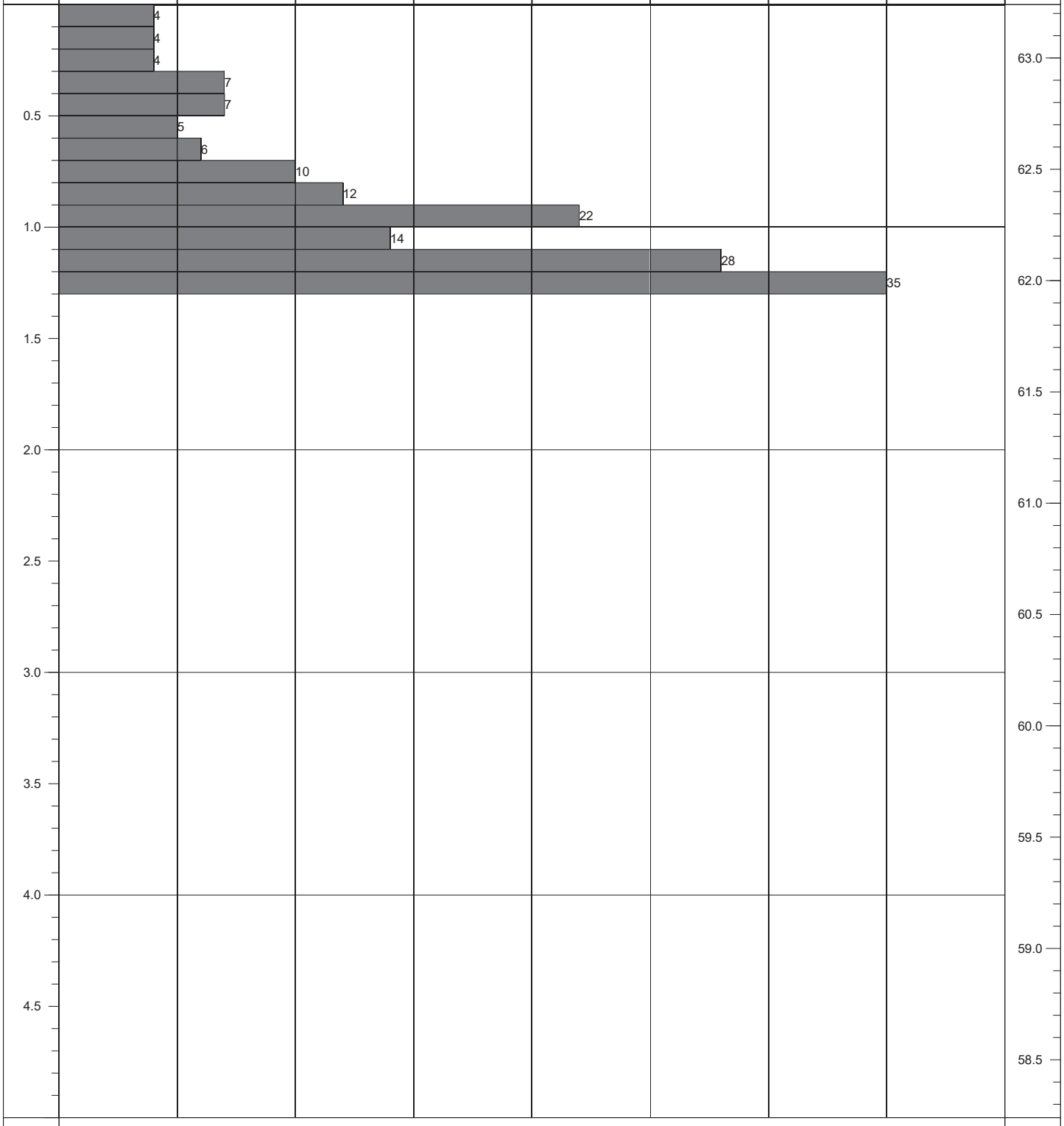
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to BH04.
1.30m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Contract No: 5994	Dynamic Probe Log				Probe No: DPTP01
Contract:	Maynooth Fire Station	Easting:	693983.942	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736366.956	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.29	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



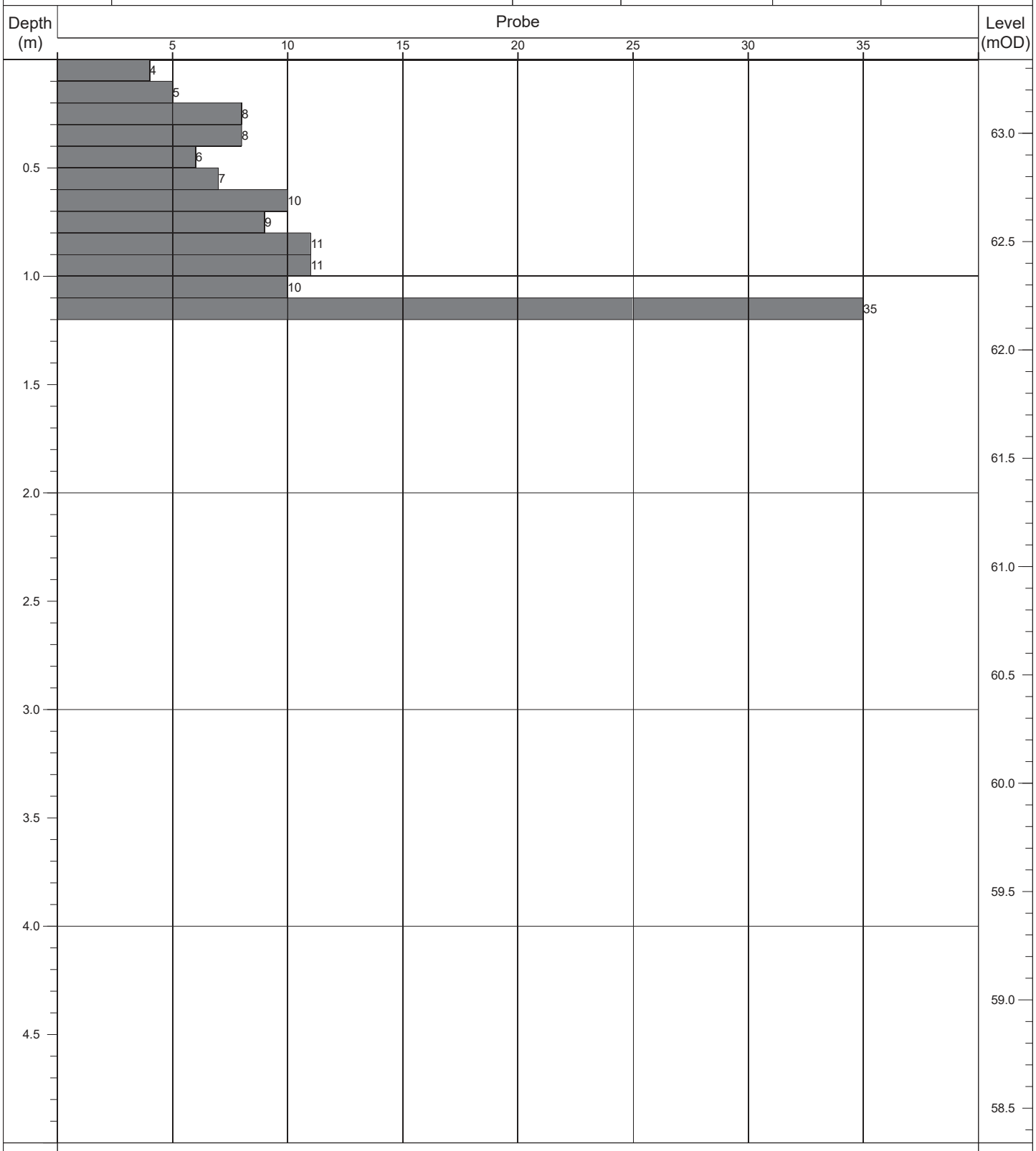
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to TP01.
1.60m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Contract No: 5994	Dynamic Probe Log				Probe No: DPTP02
Contract:	Maynooth Fire Station	Easting:	694007.291	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736395.659	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.24	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



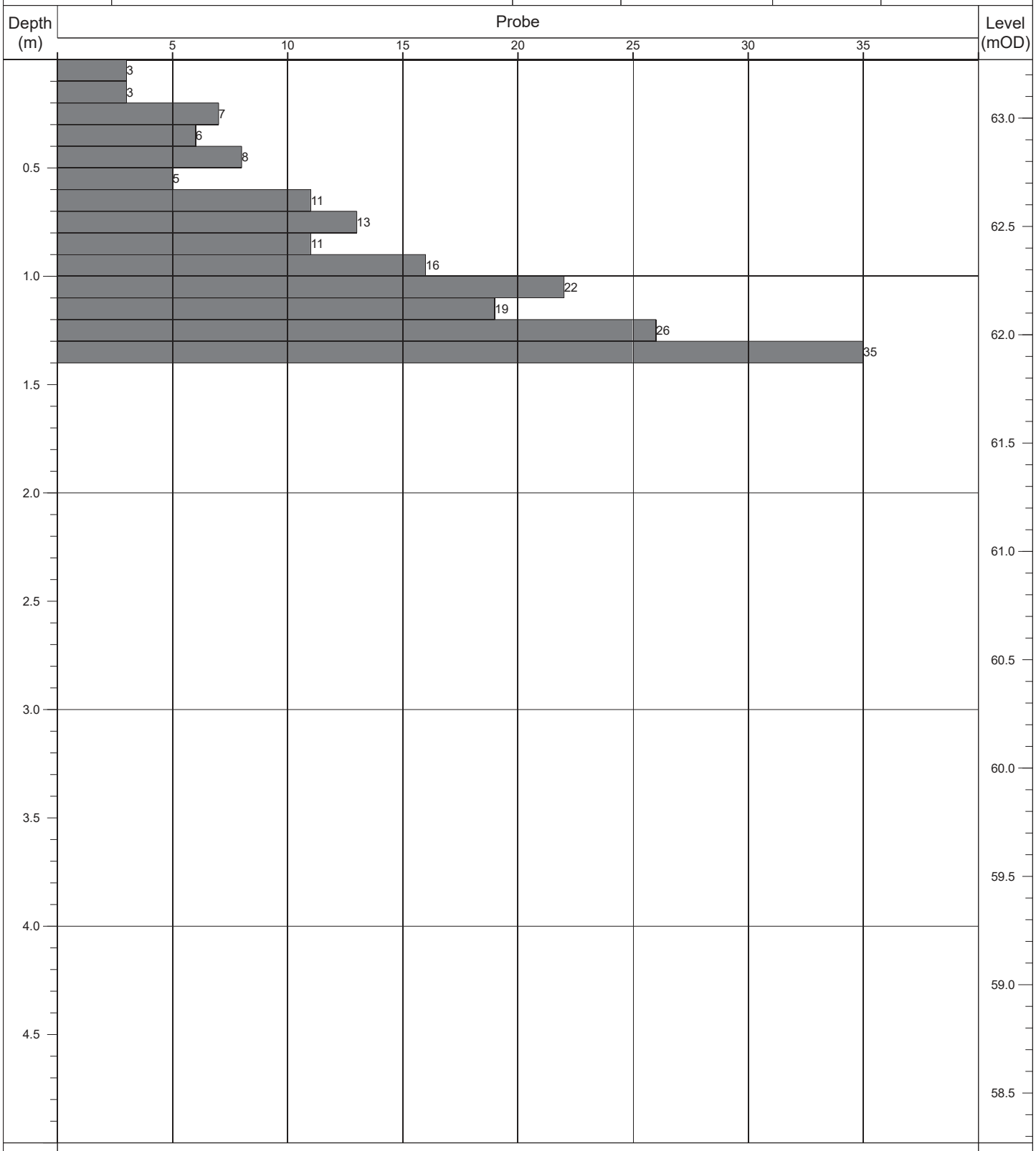
Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to TP02.
1.30m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Contract No: 5994	Dynamic Probe Log				Probe No: DPTP03
Contract:	Maynooth Fire Station	Easting:	694032.944	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736371.616	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.34	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to TP03.
1.20m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Contract No: 5994	Dynamic Probe Log				Probe No: DPTP04
Contract:	Maynooth Fire Station	Easting:	694021.704	Date Started:	24/06/2022
Location:	Maynooth, Co. Kildare	Northing:	736347.331	Logged By:	D. Clarke
Client:	Kildare County Council	Elevation:	63.27	Scale:	1:25
Engineer:	Tobin Consulting Engineers	Rig Type:	Competitor 130	Sheet No:	Sheet 1 of 1



Termination:		Probe Details:			Remarks:
Depth:	Reason:	Type:	Mass	Drop:	Completed adjacent to TP04.
1.40m	Obstruction - possible boulders or weathered bedrock.	DPH	50kg	500mm	

Appendix 7

Geotechnical Laboratory Test Results

Classification Tests
In accordance with BS 1377: Part 2

Client	Kildare County Council
Site	Maynooth Fire Station
S.I. File No	5994 / 22
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	17th June 2022

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Min. Dry Density Mg/m^3	Bulk Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
BH01	1.00	JOT03	22/776	B	16.2	36	20	16			50.0		CL
BH02	1.00	JOT05	22/777	B	17.1	32	18	14			27.1		CL
BH03	0.70	JOT01	22/778	B	18.6	38	20	18			44.5		CI
BH04	1.00	JOT07	22/779	B	11.9	36	20	16			48.7		CI
TP01	1.00	MK06	22/780	B	16.5	33	18	15			45.3		CL
TP02	1.00	MK04	22/781	B	16.1	37	21	16			63.8		CI
TP03	1.00	MK02	22/782	B	9.7	34	19	15			56.5		CL
TP04	1.00	MK08	22/783	B	11.3	37	21	16			46.0		CL

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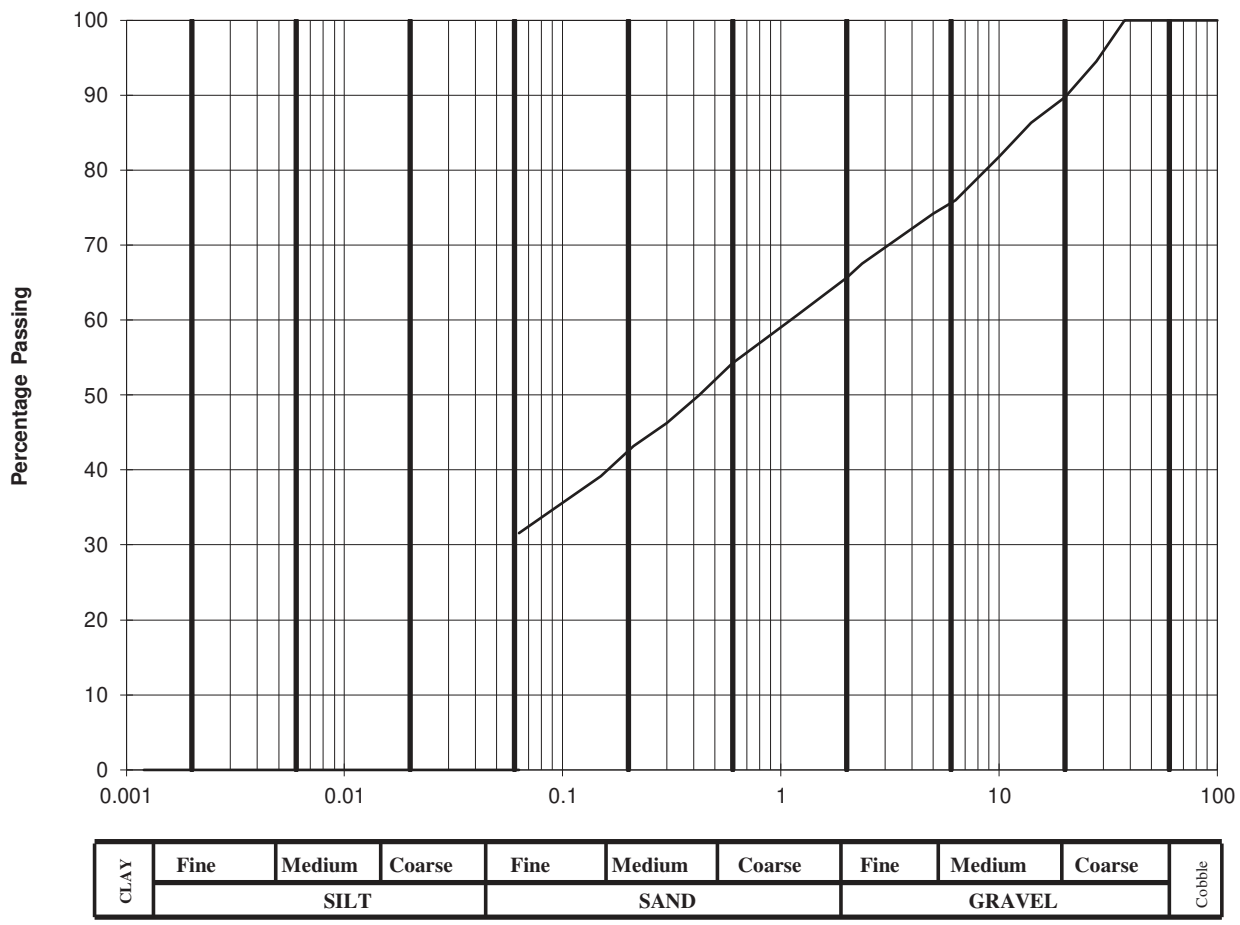
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	94.5		
20	89.7		
14	86.3		
10	81.8		
6.3	76		
5.0	74.2		
2.36	67.5		
2.00	65.6		
1.18	60.6		
0.600	54.2		
0.425	50		
0.300	46.3		
0.212	43.2		
0.150	39.2		
0.063	32		

Cobbles, %	0
Gravel, %	34
Sand, %	34
Clay / Silt, %	32



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/776
Sample No :	JOT03

Hole ID :	BH 01
Depth, m :	1.00

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

File No: 5502
Printed 24/06/2022

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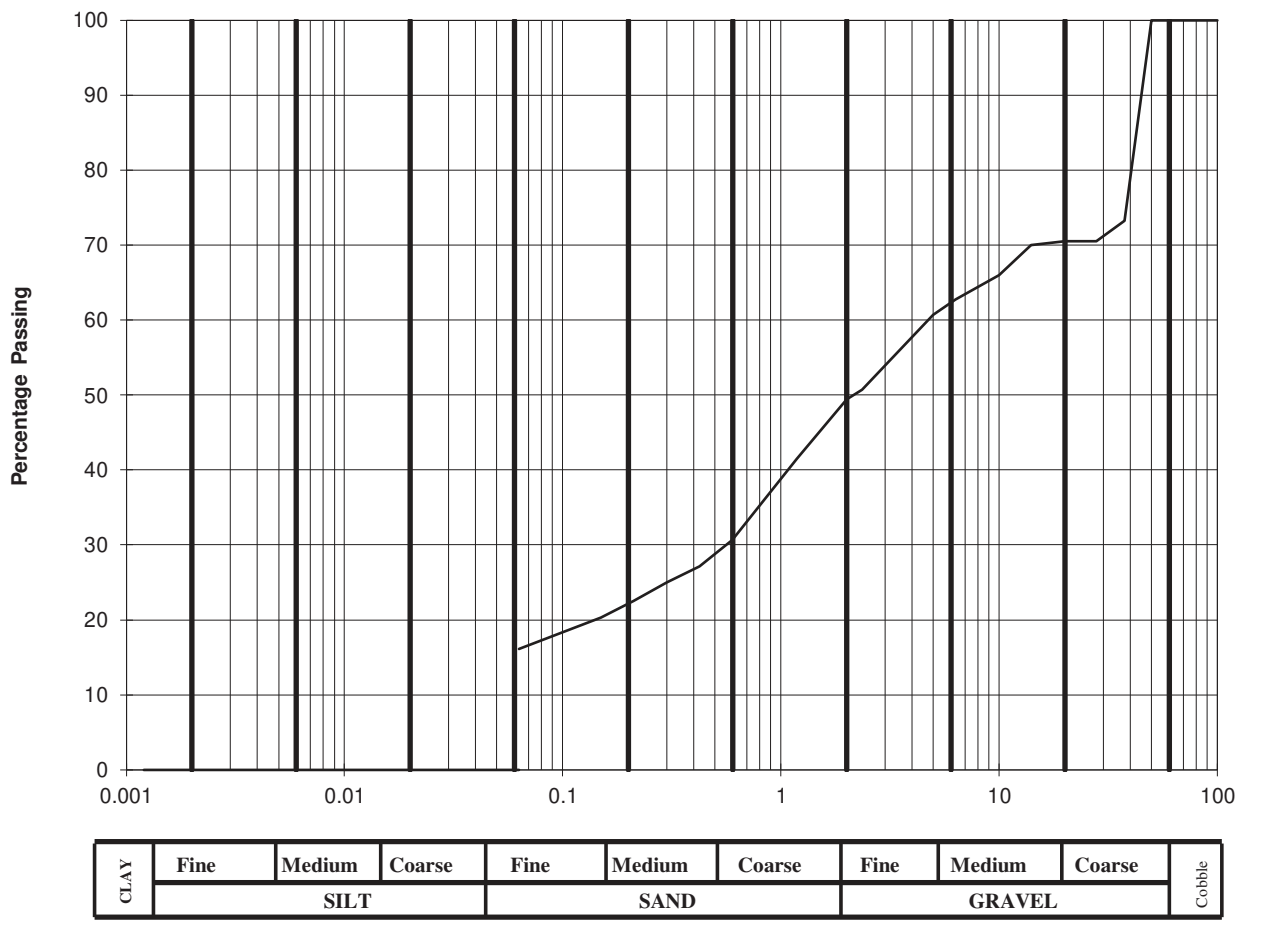
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	73.2		
28	70.5		
20	70.5		
14	70		
10	66		
6.3	62.7		
5.0	60.7		
2.36	50.7		
2.00	49.4		
1.18	41.5		
0.600	30.6		
0.425	27.1		
0.300	25		
0.212	22.5		
0.150	20.3		
0.063	16		

Cobbles, %	0
Gravel, %	51
Sand, %	33
Clay / Silt, %	16



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/777
Sample No :	JOT05

Hole ID :	BH 02
Depth, m :	1.00

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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_____Paddy McGonagle
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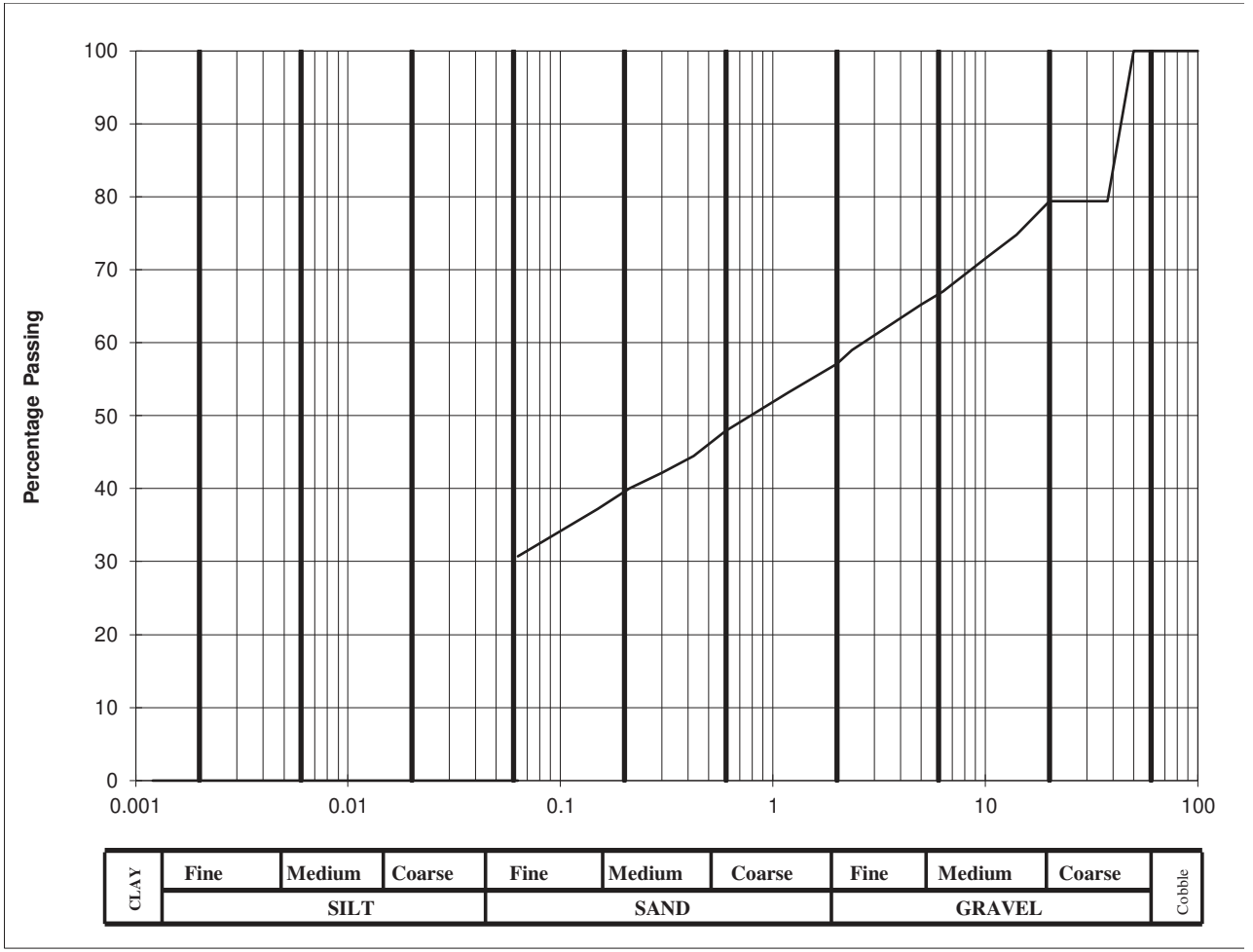
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	79.4		
28	79.4		
20	79.4		
14	74.8		
10	71.5		
6.3	67		
5.0	65.2		
2.36	59		
2.00	57.1		
1.18	53.2		
0.600	47.9		
0.425	44.5		
0.300	42.2		
0.212	40		
0.150	37.2		
0.063	31		

Cobbles, %	0
Gravel, %	43
Sand, %	26
Clay / Silt, %	31



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/778
Sample No :	JOT01

Hole ID :	BH 03
Depth, m :	0.70

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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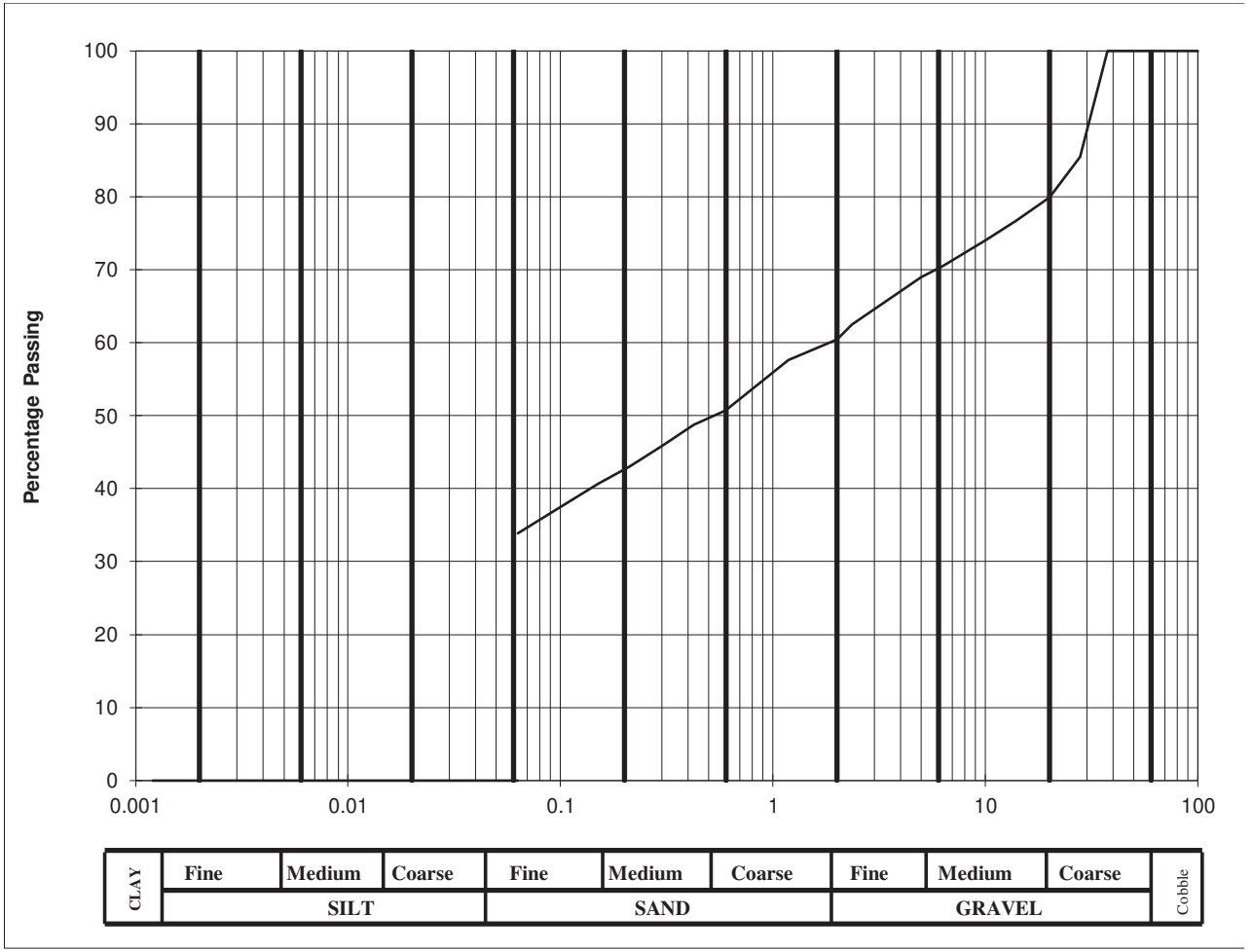
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	85.4		
20	79.9		
14	76.7		
10	74		
6.3	70.5		
5.0	69		
2.36	62.5		
2.00	60.4		
1.18	57.6		
0.600	50.7		
0.425	48.7		
0.300	45.8		
0.212	43		
0.150	40.6		
0.063	34		

Cobbles, %	0
Gravel, %	40
Sand, %	26
Clay / Silt, %	34



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/779
Sample No :	JOT07

Hole ID :	BH 04
Depth, m :	1.00

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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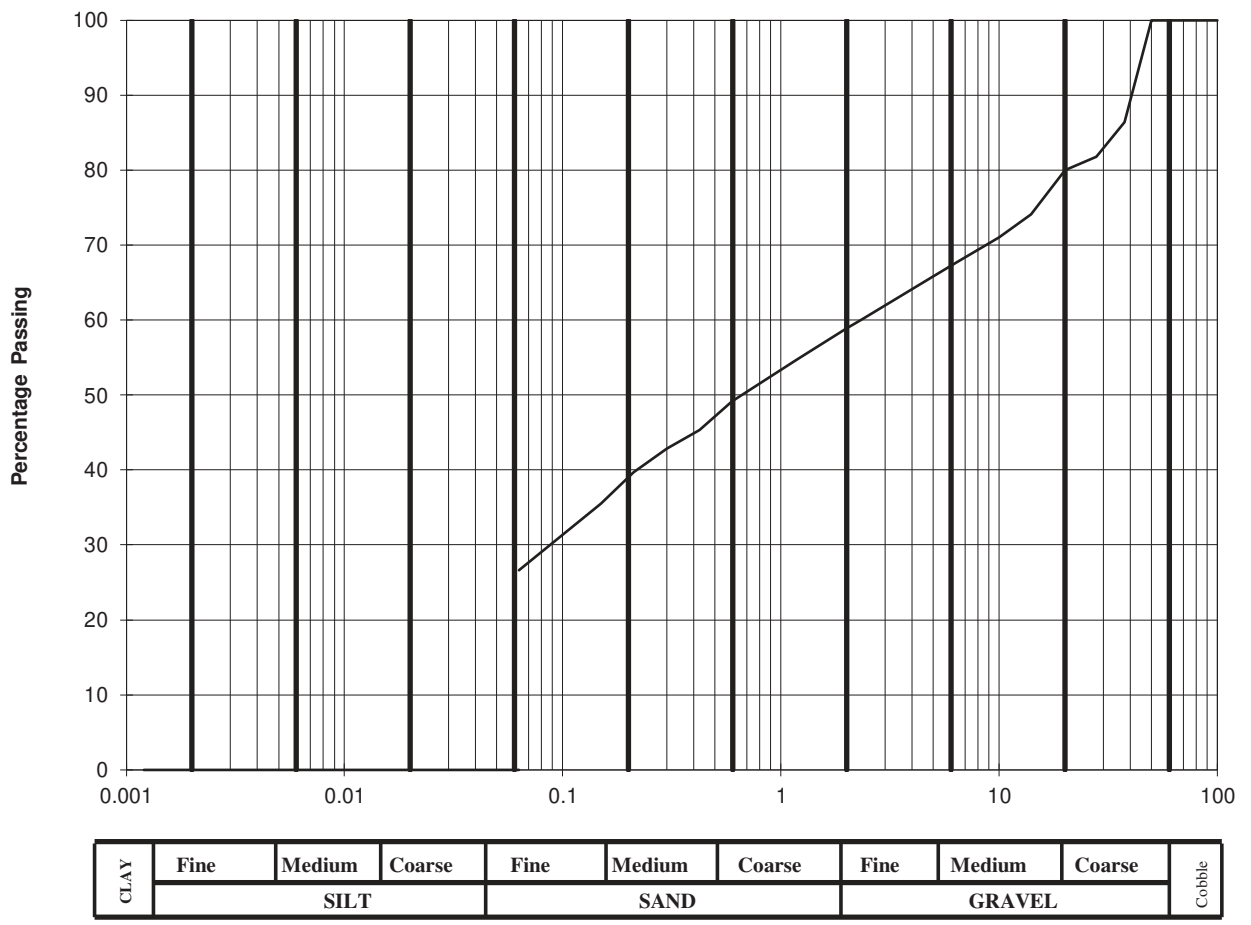
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	86.4		
28	81.8		
20	80		
14	74.1		
10	71		
6.3	67.6		
5.0	65.8		
2.36	60.1		
2.00	58.9		
1.18	54.7		
0.600	49.2		
0.425	45.3		
0.300	42.8		
0.212	39.7		
0.150	35.5		
0.063	27		

Cobbles, %	0
Gravel, %	41
Sand, %	32
Clay / Silt, %	27



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/780
Sample No :	MK06

Hole ID :	TP 01
Depth, m :	1.00

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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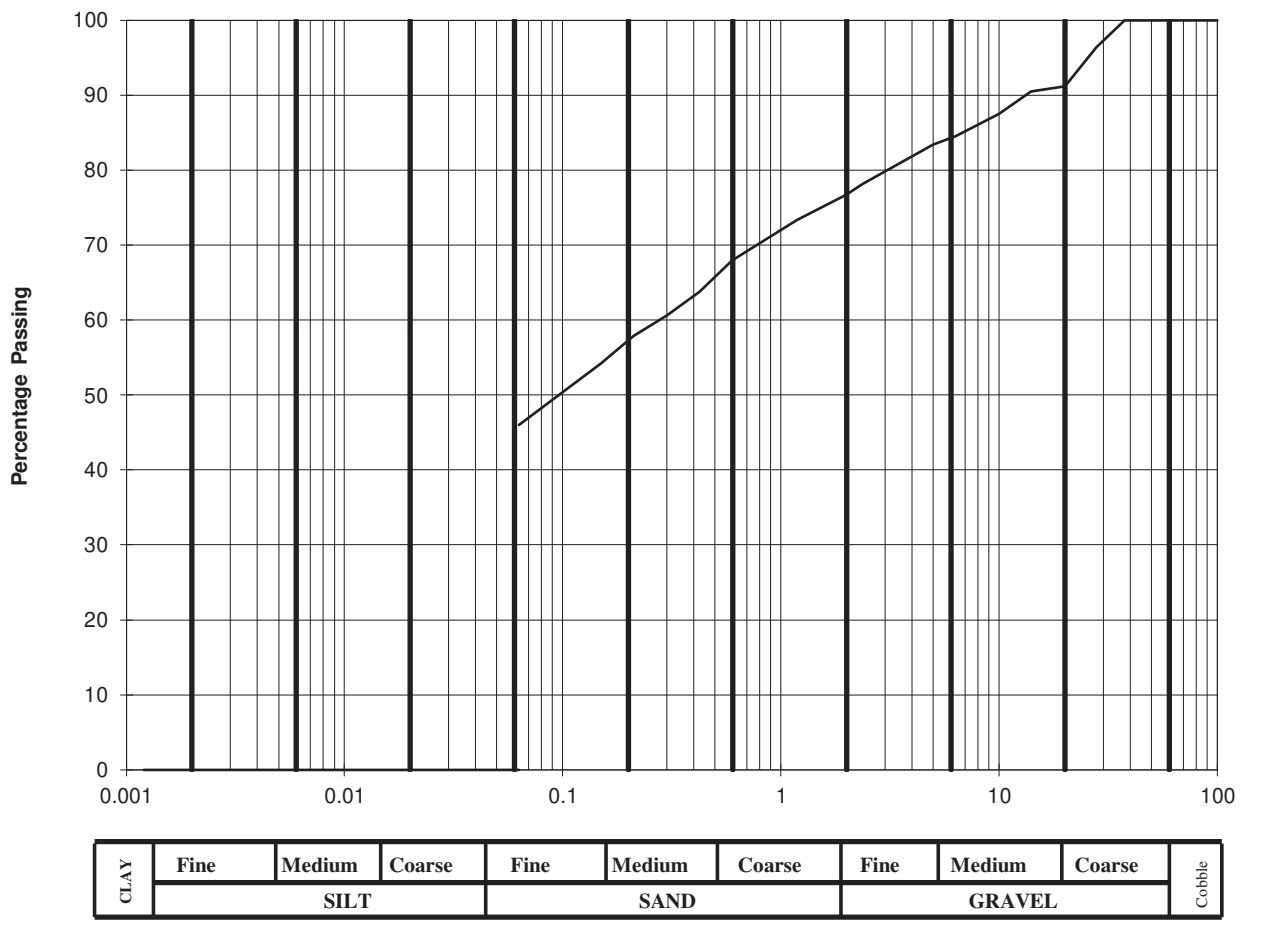
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	96.4		
20	91.2		
14	90.5		
10	87.5		
6.3	84.5		
5.0	83.4		
2.36	78.1		
2.00	76.7		
1.18	73.3		
0.600	67.9		
0.425	63.8		
0.300	60.6		
0.212	57.9		
0.150	54.2		
0.063	46		

Cobbles, %	0
Gravel, %	23
Sand, %	31
Clay / Silt, %	46



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/781
Sample No :	MK04

Hole ID :	TP 02
Depth, m :	1.00

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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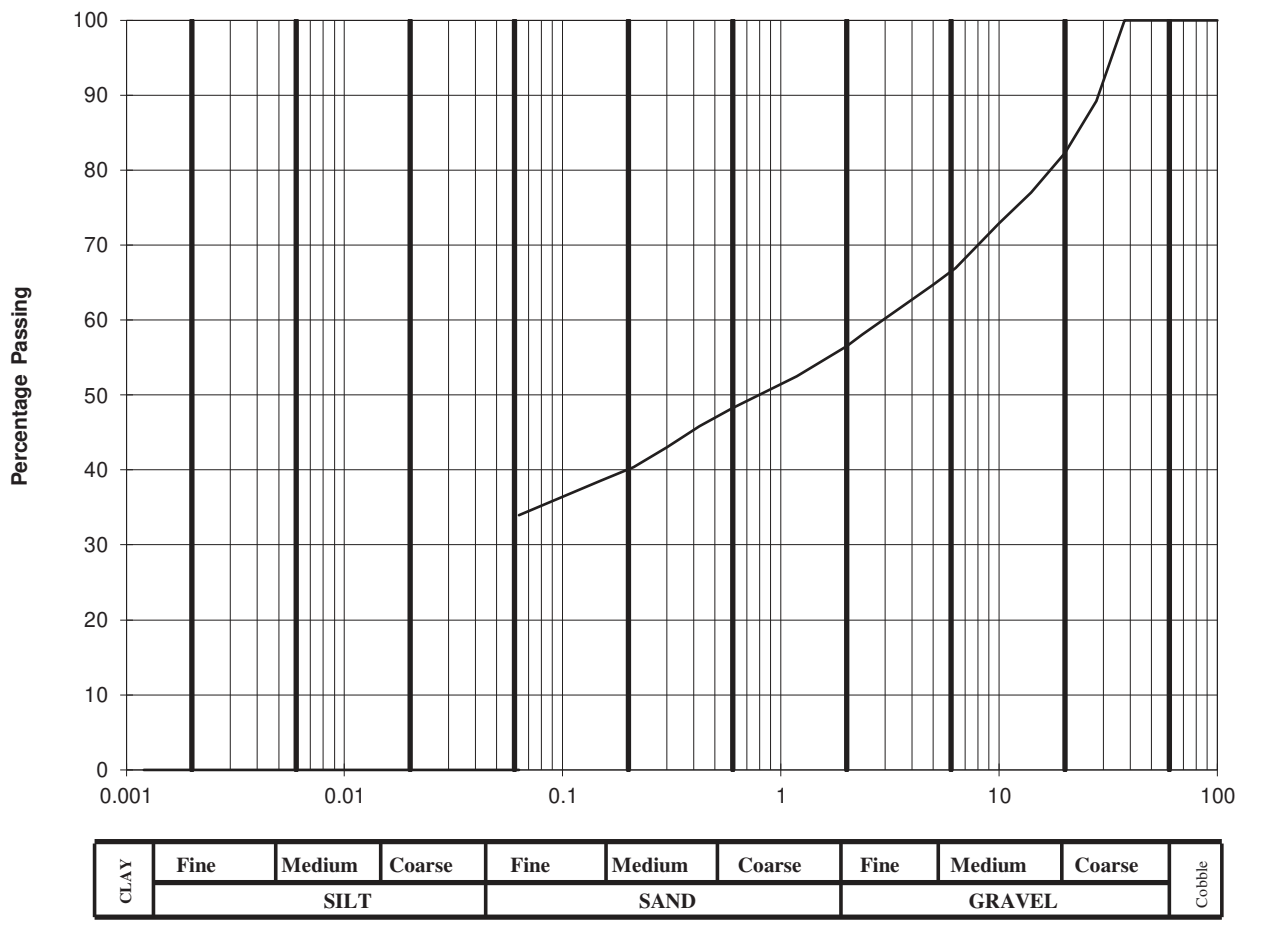
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	89.2		
20	82.3		
14	77		
10	72.9		
6.3	66.9		
5.0	64.7		
2.36	58		
2.00	56.5		
1.18	52.5		
0.600	48.2		
0.425	45.8		
0.300	43		
0.212	40.4		
0.150	38.6		
0.063	34		

Cobbles, %	0
Gravel, %	44
Sand, %	23
Clay / Silt, %	34



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/782
Sample No :	MK02

Hole ID :	TP 03
Depth, m :	1.00

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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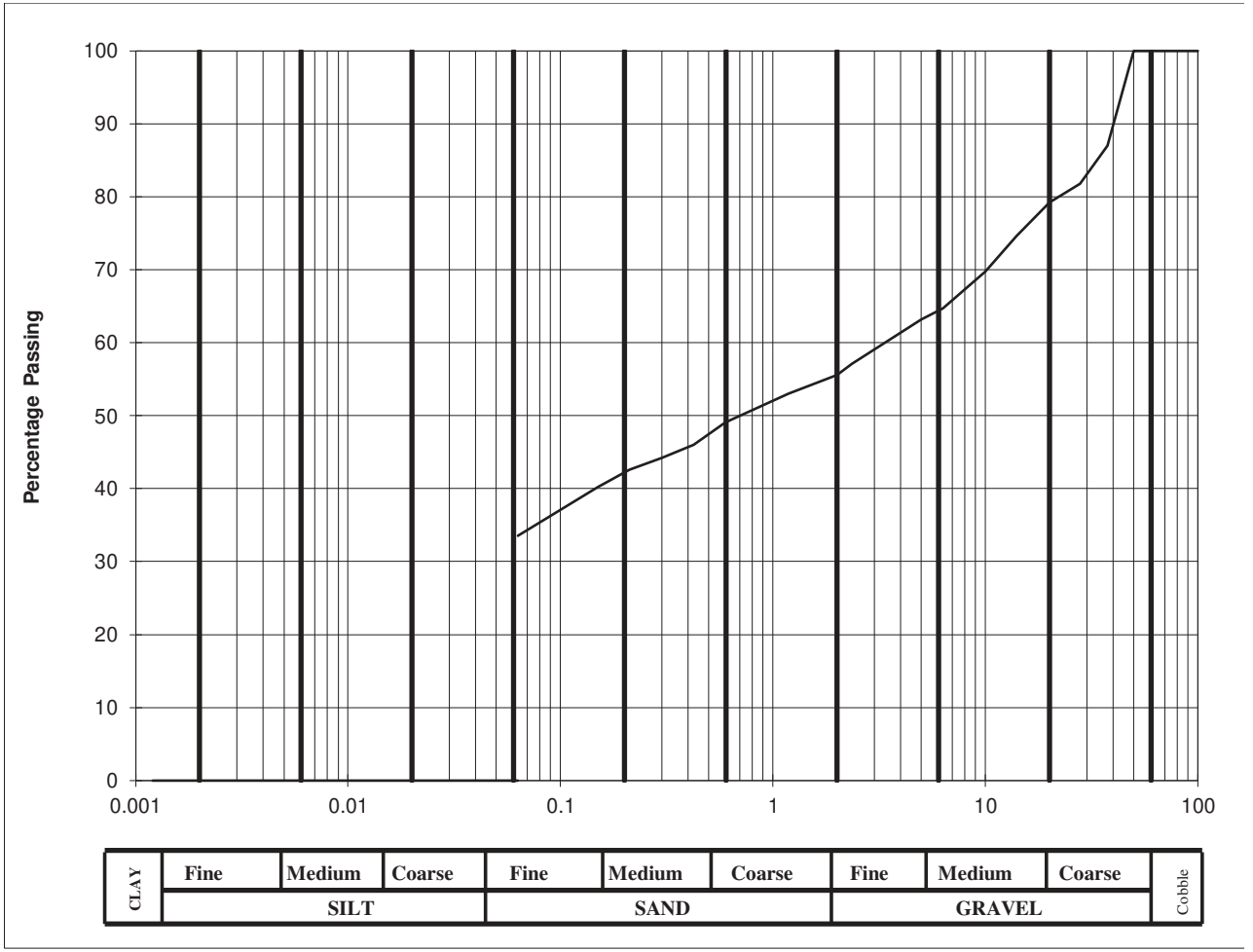
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	87		
28	81.8		
20	79.2		
14	74.6		
10	69.7		
6.3	64.7		
5.0	63.2		
2.36	57.1		
2.00	55.6		
1.18	53		
0.600	49.1		
0.425	46		
0.300	44.2		
0.212	42.6		
0.150	40.2		
0.063	34		

Cobbles, %	0
Gravel, %	44
Sand, %	22
Clay / Silt, %	34



Client :	Kildare County Council
Project :	Maynooth Fire Station

Lab. No :	22/783
Sample No :	MK08

Hole ID :	TP 04
Depth, m :	1.00

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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_____Paddy McGonagle
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Chemical Testing
In accordance with BS 1377: Part 3

Client	Kildare County Council
Site	Maynooth Fire Station
S.I. File No	5994 / 22
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	17th June 2022

Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) g/L	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) %	Loss on Ignition (Organic Content) %	Chloride ion Content (water:soil ratio 2:1) %	% passing 2mm	Remarks
BH01	1.00	JOT03	22/776	8.23	0.122	0.080			65.6	
BH02	1.00	JOT05	22/777	8.11	0.119	0.059			49.4	
BH03	0.70	JOT01	22/778	8.22	0.122	0.069			57.1	
BH04	1.00	JOT07	22/779	8.19	0.122	0.073			60.4	

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