RECEIVED: 16/10/2025

APPENDIX 7-3

GEO-ENVIRONMENTAL INTERPRETIVE REPORT, MKO 2025

Planning and Environmental Consultants

RECEIVED: 16/10/2025

Geo-environmental Interpretive Report

Proposed Large-Scale Residential Development at Knocknacarra, Galway

RECEIVED: 16/10/2025

DOCUMENT DETAILS

Client:	**Kingston Stables Ltd**
Project Title:	**Proposed Large-Scale Residential Development at Knocknacarra, Galway**
Project Number:	**240142-i**
Document Title:	**Geo-environmental Interpretive Report**
Document File Name:	**GIR D4 - 2025.10.13 - 240142**

Prepared By:

MKO
Tuam Road
Galway
Ireland
H91 VW84

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	02/10/2025	BA/MV/FZ	EOS
02	Final	13/10/2025	BA/MV/FZ	EOS

RECEIVED: 16/10/2025

Table of Contents

1. INTRODUCTION 1
1.1 Project Background 1
1.2 Purpose of this Report 1
1.3 Scope and Methodology 1
1.3.1 Information Sources and Standards 3
1.4 Statement of Authority 3
2. SITE CONTEXT 5
2.1 Site Location and Description 5
2.2 Topography 5
2.3 Soils and Geology 5
2.4 Hydrological Setting and Site Drainage 5
2.4.1 Water Framework Directive Status and Risk Assessment 7
2.4.2 Designated Sites 7
2.5 Flood Risk 7
2.6 Hydrogeology 8
2.6.1 Aquifer Type Classification 8
2.6.2 Groundwater Recharge 8
2.6.3 Groundwater Vulnerability 8
2.7 Abstractions and Water Supply 8
2.8 Surface Water Quality 9
2.9 Site History and Land Use 9
2.9.1 Historical Maps 9
3. PREVIOUS INVESTIGATIONS 10
3.1 Summary of Causeway 2019 Investigation 10
3.1.1 Soil 10
3.2 Summary of Flood Risk Assessment 10
4. CURRENT ADDITIONAL GROUND INVESTIGATION 11
4.1 Fieldwork 11
4.2 Monitoring and Sampling 11
4.2.1 Groundwater 11
4.2.1.1 Groundwater Sampling 13
4.2.2 Ground Gas 13
4.3 Laboratory Testing 13
5. GROUND AND GROUNDWATER CONDITIONS 18
5.1 Ground Model 19
5.1.1 Topsoil 19
5.1.2 Made Ground 19
5.1.3 Possible Made Ground 19
5.1.4 Recent Deposits 19
5.1.5 Glacial Till 19
5.1.6 Bedrock (Granite) 19
5.2 Ground Contamination 20
5.2.1 Groundwater Depth 20
5.2.2 Groundwater Quality 23
5.2.2.1 Groundwater Field Parameters 23
5.2.2.2 Chemical Tests 24
5.2.3 Ground Gas 28
5.3 Waste Assessment and Classification 31
5.3.1 Waste Classification Report 31

RECEIVED: 16/10/2025

5.3.2 Overview of Methodology 31
5.3.3 Waste Acceptance Criteria 32

6. CONTAMINATION ASSESSMENT 33

6.1 Introduction 33
6.2 Risks to Human Health 33
6.2.1 Risks from Made Ground 33
6.2.1.1 Residential without Private Gardens Land Use Scenario 33
6.2.1.2 Residential with Private Gardens Land Use Scenario 33
6.2.2 Risks from Natural Ground 33
6.2.2.1 Residential without Private Gardens Land Use Scenario 33
6.2.2.2 Residential with Private Gardens Land Use Scenario 33
6.3 Asbestos 34
6.4 Risks to Plant Growth 34
6.5 Risks to Controlled Waters 34
6.5.1 Surface Water Monitoring 35
6.6 Ground Gas Assessment 35

7. REFINED RISK ASSESSMENT 38

7.1 Introduction 38
7.2 Risks to Human Health 39
7.3 Risks to Vegetation and Plants 39
7.4 Risks to Controlled Waters 39
7.5 Risks to Buildings and Structures 39

8. GEOENVIRONMENTAL RECOMMENDATIONS 41

8.1 Contamination and Remediation 41
8.2 Gas protection measures 41
8.3 Underground services 41
8.4 Material Management and Waste Classification 41
8.4.1 Re-use, Recycling and Recovery 41
8.4.2 Waste Recovery/Disposal 42
8.4.3 Asbestos 43
8.5 Health and Safety 45

BIBLIOGRAPHY 46

TABLE OF TABLES

Table 4-1 Sample Location, Depth and Rationale 13
Table 5-1 Summary of Ground Conditions (Causeway 2025 Investigations) 18
Table 5-2 Summary of Groundwater Depth 21
Table 5-3 Groundwater quality monitoring 23
Table 5-4 Summary of groundwater result 24
Table 5-5 Summary of worst-case ground gas monitoring records in all boreholes 28
Table 5-6 Waste Acceptance Criteria 31
Table 6-1 Soil Risks to Vegetation and Plants 34
Table 6-2 Modified Wilson and Card Classification (CIRIA Report 659) 35
Table 6-3 Summary of worst-case ground gas monitoring records in boreholes 36
Table 7-1 Semi-quantitative risk assessment 38
Table 8-1 Summary of Waste Acceptance Criteria Testing 42

TABLE OF FIGURES

Figure 1-1 Site Location 2
Figure 2-1 Bedrock Geology Map 6
Figure 4-1 Exploratory Hole Location Plan 12
Figure 7-1 Conceptual Site Model 40
Figure 8-1 Landfill Waste Disposal Plan 44

RECEIVED: 16/10/2025

RECEIVED: 16/10/2025

1. INTRODUCTION

1.1 Project Background

This Geo-environmental Interpretive Report (GIR) has been prepared by MKO on behalf of Kingston Stables Ltd., who intend to apply to Galway City Council (GCC) pursuant to the provisions of the Planning and Development (Amendment) (Large-scale Residential Development (LRD)) Act 2021 for permission in respect of a large-scale residential development located at Knocknacarra, Co. Galway. The location of the site is outlined in Figure 1-1 below.

The Proposed Project involves the construction of more than 500 residential units and covers an overall area of 8.74 ha. The Proposed Project will consist of a mix of residential units, open spaces, creche and all other site related infrastructure.

1.2 Purpose of this Report

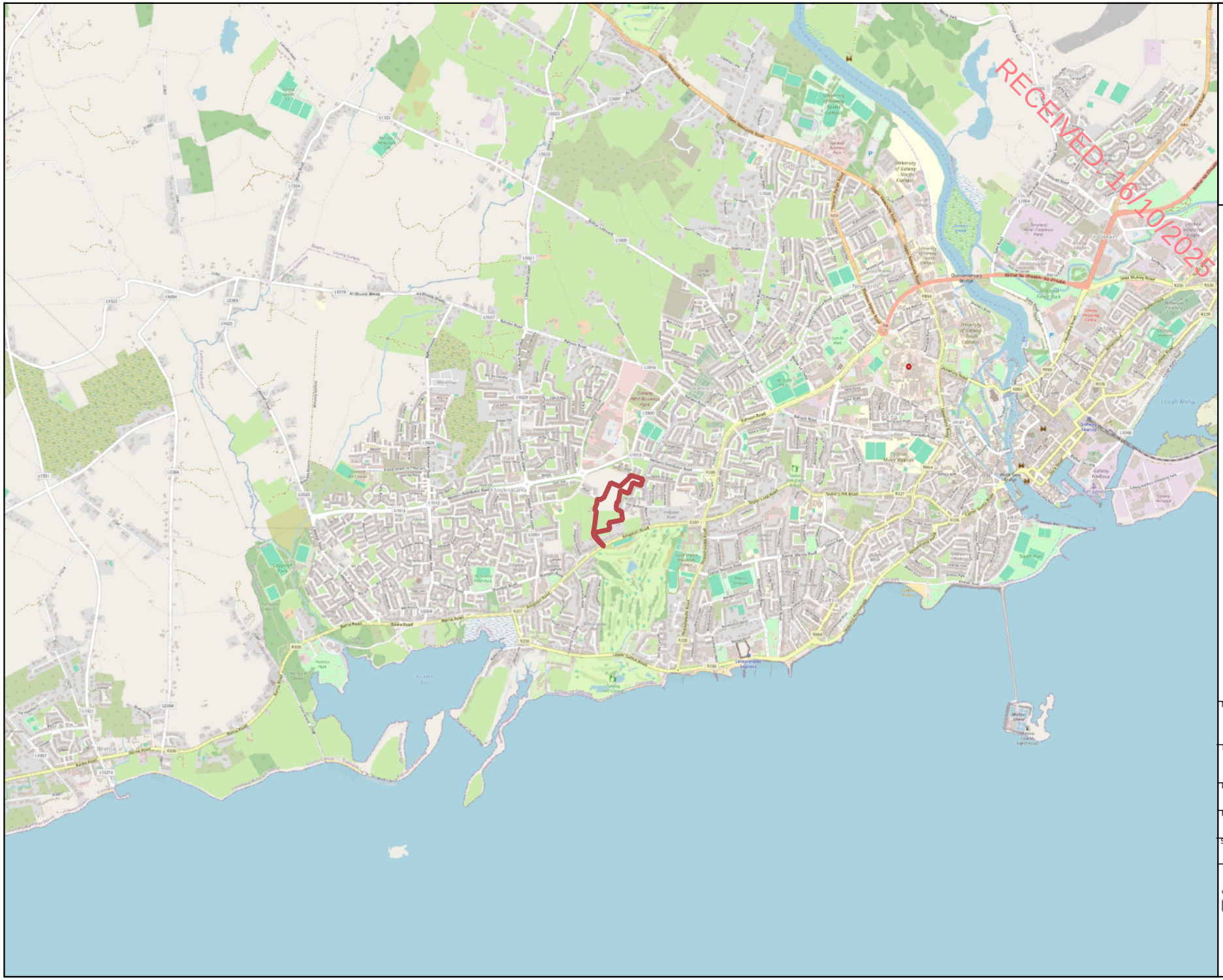
This GIR presents the findings and interpretations derived from the geological and hydrogeological site investigations, environmental monitoring, and environmental sampling which have been completed by Causeway Geotech Ltd. and MKO.

This report describes the geo-environmental investigative work completed at the site thus far and presents the findings of the assessment and recommendations.

1.3 Scope and Methodology

This assessment has been informed by the following works which have been undertaken at the Proposed Project site:

- A desk study and initial site visit which was undertaken by Béibhinn Anders (MKO) in June 2024. Proposed trial pit locations and groundwater well locations were assessed and selected.
- Two site investigations were completed by Causeway Geotech. The first site investigation was completed between 30th April and 14th May 2019. The second site investigation was completed between May – June 2025. These investigations comprised:
    - Trial Pitting,
    - Logging of subsoils,
    - Logging of bedrock,
    - Drilling and installation of groundwater monitoring wells,
    - Drilling and installation of gas monitoring wells,
    - Geotechnical testing,
    - Environmental testing (soil),
    - Two rounds of groundwater level monitoring,
    - Two rounds of groundwater sampling,
    - 3 no. rounds of ground gas sampling.



RECEIVED: 16/10/2025

Map Legend

Site Boundary

Microsoft product screen shots reprinted with permission from Microsoft Corporation

© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517

N

Drawing Title

Site Location

Project Title

King Knocknacarra, Galway

Drawn By	Checked By
FZ	EOS
Project No.	Drawing No.
240142	Figure 1-1
Scale	Date
1:35,000	25.09.25

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

RECEIVED: 16/10/2025

1.3.1 Information Sources and Standards

This report has been compiled with regard to relevant data and guidance, and informed by the following resources:

- Bedrock 1:100,000 Digital Geological Map 2018. Geological Survey of Ireland (GSI 2018);
- Causeway Geotech, (2019). *Kingston Lands, Galway Ground Investigation Report.*
- Causeway Geotech (2025). *Kingston, Galway – Ground Investigation.*
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).
- Environmental Protection Agency (EPA) database (www.epa.ie).
- Geological Survey of Ireland (GSI) - Geology Database (www.gsi.ie).
- Geological Survey of Ireland (GSI) - Groundwater Database (www.gsi.ie).
- Office of Public Works (OPW) Flood Maps (www.floodinfo.ie).
- Teagasc Soil Map (http://gis.teagasc.ie/soils/map.php).
- Tailte Éireann– Discovery Series and 1:50,000 maps.
- Tailte Éireann – aerial photographs.
- Tobin (2025). *Civil design report.*

1.4 Statement of Authority

This GIR has been prepared by Bebhin Anders, Morgan Valvik, and Fangfei Zhang and reviewed by Eoin O'Sullivan, all of MKO.

Bébhinn Anders is an environmental geologist with MKO with 2 years of experience in the industry sector. Bébhinn holds BA (Hons) in Earth and Ocean Science and a PhD in Sedimentary provenance and geochemistry. Prior to taking up her position with MKO in February 2024, Bébhinn worked as a project geologist with CDM Smith Ireland and held previous roles with University of Galway as a research assistant and as a teaching assistant over a 7-year period. Bébhinn is an environmental geologist with specialist knowledge in sedimentary analysis, geochemistry especially Pb-Pb feldspar and U-Pb dating, site investigations, remediation and monitoring of contaminated lands, groundwater and surface water monitoring, soil characterisation, and knowledge in geo-heritage and historic mine sites. Bébhinn's key strengths and areas of expertise are in environmental monitoring, site investigations, organisation, and data management. Since joining MKO Bébhinn has been involved as an environmental geologist on a range of environmental groundwater and surface water monitoring projects, remediation projects and geoheritage monitoring projects of historic mine sites. Within MKO Bébhinn works as part of a large multi-disciplinary team that focus on hydrogeology, environmental, surface and groundwater monitoring, site investigations and remediation of contaminated lands. Bébhinn is a Member-in-Training with the IGI (Institute of Geologists Ireland).

Morgan is an Environmental Scientist at MKO, having joined the company in September 2023. Morgan holds an MSc in Environmental Science from Trinity College Dublin. Prior to joining MKO, she worked as a Graduate Environmental Scientist for AKRF Inc. where she conducted site assessments and remedial oversight related to brownfield sites and landfills in the United States. Morgan's key strengths and areas of expertise are in report writing and EIAR management and coordination. Since joining MKO, Morgan has been involved in the preparation of Environmental Impact Assessment Screening Reports, Construction and Environmental Management Plans, and Environmental Reports for a wide range of projects. Morgan is a graduate member of the Chartered Institution of Water and Environmental Management.

Fangfei Zhang is a Graduate Environmental Scientist with MKO. She holds an MSc(Hons) in Environmental Science from Trinity College Dublin and a BEng(Hons) in Environmental Engineering from Shenzhen University, taking up her position with MKO in September 2025. She has experience in wastewater treatment, environmental monitoring, and sustainability-focused engineering design, and brings skills in data analysis (R, GIS, CAD) and stakeholder engagement.

Eoin is an experienced geo-environmental scientist and has over fifteen years' experience in the project management of large-scale infrastructural projects and brownfield developments which includes all

aspects of geo-environmental and geotechnical investigation. Eoin holds an MSc in Environmental Engineering and is a Chartered Member of the Chartered Institute of Water and Environmental Management (CWEM) and Chartered Environmentalist (CEnv) with the Society of Environment.

RECEIVED: 16/10/2025

RECEIVED: 16/10/2025

2. SITE CONTEXT

2.1 Site Location and Description

The proposed site is located south of the Western Distributor Road, Knocknacarra, Galway approximately 3 kilometres (km) west of Galway City Centre. The surrounding area is characterised by the established residential suburb of Knocknacarra. The lands to the north are the location of the Gateway Retail Park which is the primary district retail centre serving the surrounding area. St. John the Apostle, Knocknacarra National School is situated west of the subject site, on School Road. While another primary school, Gaelscoil Mhic Amhlaigh, is found north of the subject site, adjoining the Gateway Retail Park (See Figure 1-1).

The EIAR Study Area encompasses an overall area of 8.74 ha and covers the entire Proposed Project area. The application site is bounded by the Western Distributor Road, School Road, and Kingston Road. The southern part of the site is currently utilised for low-intensity agricultural purposes, while the remainder predominantly comprises brownfield scrubland and stockpiles of predominantly construction material with scattered small trees throughout.

2.2 Topography

The Proposed Project site is located at an approximate elevation of 25 m above Ordnance Datum (m OD). The site's topography is generally flat. Lands to the northeast and east drain towards the site and south Galway Bay.

2.3 Soils and Geology

The national Teagasc Soils map indicates that natural soils at the Proposed Project site (i.e. the 'Site') are composed of fine loamy drift with limestones in the northern part of the Site and classified the southern section of the Site as urban. The GSI Subsoils map indicates the quaternary sediments consist of granite till with rock at or near surface. The GSI has indicated subsoils are poorly drained and designated a moderate subsoil permeability in the area of the Site as bedrock is close to, or at surface.

The GSI Bedrock Geology map (scale 1:100,000) indicates that the site is underlain by the Murvey Granite composed of pink non-porphyritic syenogranite. The northwestern corner of the Site is underlain by the Errisbeg Townland Granite composed of pink/grey megacrystic monzogranite. Local or regional structural features have not been mapped by the GSI in the general study area.

Bedrock outcrops are noted in some areas across the Site and local area. A bedrock geology map is included in Figure 2-1 below.

2.4 Hydrological Setting and Site Drainage

The Site is located within the Galway Bay North Catchment, specifically the Knock(Furbo)_SC_010 Subcatchment. The EPA has mapped the Knocknacarragh_010 waterbody (EPA Code: 31K16, Order 2) to flow westwards along the northern and northwestern boundary of the Site before the waterbody flows south-westwards to Galway Bay approximately 900 m southwest of the Site. The general surface water flow direction is south-westwards.

There is an absence of notable surface level drainage features at the Site indicating that the Knocknacarragh_010 is culverted or underground.

RECEIVED: 16/10/2025

N

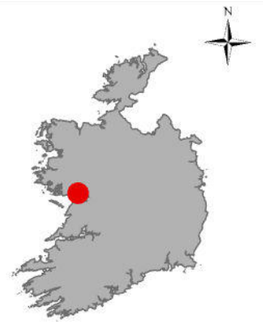
Map Legend

- EIAR Site Boundary
- Faults

Bedrock Geology (GSI)

- Burren Formation
- Visean Limestones (undifferentiated
- Porphyritic-Megacrystic Granite
- Errisbeg Townland Granite
- Murvey Granite
- Quartz porphyry and Felsite
- Fine-grained foliated granite
- Metagabbro & orthogneiss suite

Spatial Reference
Datum: IRENET95
Projection: Transverse Mercator



SITE LOCATION - NOT TO SCALE

Drawing Title: **Bedrock Geology Map**

Project Title: **King Knocknacarra**

Project No.	Drawing No.	Scale
240142	Figure 2-1	1:25,000
Drawn By: MNR	Checked By: MK	Date: 11/04/2025

MKO
Email: info@mkoireland.ie/ Website: www.mkoireland.ie

0 1,000 2,000 m

728000 727000 726000 725000 724000 723000 722000

523000 524000 525000 526000 527000 528000 529000 530000 531000

RECEIVED: 16/10/2025

2.4.1 Water Framework Directive Status and Risk Assessment

The Knocknacarragh River is part of the EPA-designated Knocknacarragh_010 waterbody which is part of the Knock[Furbo]_SC_010 subcatchment. Based on the latest available Water Framework Directive (WFD) status classification for the period 2016 to 2021, Knocknacarragh_010 waterbody is classified by EPA as being at "Poor" ecological status; thus, not meeting its default Good Status objective. This assessment is based on modelling with a low confidence status as no monitoring has been done on this waterbody. There is a plan to monitor in the future.

2.4.2 Designated Sites

The closest Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and proposed Natural Heritage Areas (pNHAs) to the Site are the Galway Bay Complex SAC and the Inner Galway Bay SPA, and Galway Bay Complex which broadly all overlap and are approximately 850m south of the Proposed Project site. The Knocknacarragh_010, drains into Galway Bay and has a hydraulic connection of the Site to these areas.

Inner Galway Bay is an SPA under the E.U. Birds Directive, of special conservation interest for 21 no. species of bird. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The Galway Bay Complex is an SAC selected for 17 no. habitats and/or species listed on Annex I / II of the E.U. Habitats Directive.

The nearest NHA (Natural Heritage Area) are the Moyculln Bogs NHA which are approximately 2 km to the northwest, with areas also further to the east. This NHA is located upgradient from the Site and could potentially be hydrogeologically linked to the Site.

The Corrib River (Corrib_020) is a designated drinking water and salmonid river approximately 2.8 km to the east of the Site, drains into Galway Bay. The River Corrib in the Corrib_SC_010 sub catchment which is not hydrologically connected to the Site.

The Lough Corrib SAC and Lough Corrib SPA are situated approximately 3 km to the north and northeast of the Site. The Lough Corrib SAC and SPA are in the Corrib_SC_010 sub catchment which is not hydrologically connected to the Site.

The Spiddal Groundwater Body (GWB) is a designated drinking water protected area, but all GWBs in Ireland are considered the same on account of groundwater as a possible source of public or private water supply.

2.5 Flood Risk

There is no recorded evidence of flooding in the area and there is no national fluvial (river), pluvial (rain) or groundwater probability status assigned to the site area by the Office of Public Works (OPW) or GSI. A high probability of fluvial (river) has been assigned to the headwaters of the Innplot River 1.8 km north of site. Recurring coastal flood events are noted approximately 1 – 1.5 km south and southeast of the site along the Salthill Promenade and adjacent lands from Blackrock to Salthill.

RECEIVED: 16/10/2025

2.6 Hydrogeology

2.6.1 Aquifer Type Classification

The site is underlain by a poor aquifer bedrock which is generally unproductive except for local zones (Pl), the Spiddal groundwater body (GWB). The overall, chemical and quantitative status of the Spiddal GWB (IE_WE_G_0004) ranging from 2016 – 2021 is classified as good.

2.6.2 Groundwater Recharge

The GSI suggests a recharge maximum capacity of 100 mm/yr. The GSI suggests capping recharge to bedrock at 160 to 180 mm/yr across the site. The average effective rainfall across the site is 709 mm/yr as not all of the available can be physically accommodated by the poorly permeable bedrock aquifer. In such instances, the remainder of the recharge i.e. 354 mm/year, will in principle be 'rejected', adding to flow via shallow pathways, including enhanced runoff.

2.6.3 Groundwater Vulnerability

Groundwater vulnerability at the northwest of the Site is mapped by GSI as 'E' Extreme Vulnerability with a small area in the west marked as 'X' Which indicates rock at or near surface. The southern part of the Site is marked as 'H', which indicates High Vulnerability.

2.7 Abstractions and Water Supply

The area is served by the Galway West Water Supply Scheme which abstracts water from the River Corrib approximately 2.9 km to the northeast. There are no public water supply abstractions at or near the Site.

The National Federation of Group Water Schemes (NFGWS) database confirms there are no GWS in the area, the closest being over 15 km north of the Site (Luimnagh).

The site is not located within a delineated zone of contribution or source protection zone (SPZ). The nearest SPZs are greater than 20 km to the northeast and southwest.

Although the mains public water supply does serve houses in the wider area, it is not known to what extent all single dwellings and farms in the immediate vicinity are connected. Some properties may still rely on private wells for their water needs. Based on the precautionary principle, it is assumed that all local dwellings and farms use private wells.

The GSI database of wells confirms the presence of wells in the area, even if their current status and precise locations have not been surveyed. Within a 5 km zone, one of the wells is in Low Spring yield class, one is unknown, and two are in good GSI yield class. A brief summary is presented in Table 2-1.

Table 2-1 Summary of the Wells Near Site.

Well Unique ID	GSI Well Name	Distance between Well and Site (kilometer)	GSI Yield Class
IE_GSI_GW_Well_7917	1121NEW003	2.8	Low Spring
IE_GSI_GW_Well_7919	1121NEW005	3.8	Good
IE_GSI_GW_Well_7951	1121NEW006	4.5	Good
IE_GSI_GW_Well_7606	1121NEW027	5	Unknown

RECEIVED: 16/10/2025

2.8 Surface Water Quality

There are no relevant EPA Q-rating or water quality stations that inform about potential water quality impacts from the Site.

Baseline water samples were collected by MKO from the Knocknacarragh Stream at 3 no. locations, two upstream locations and one downstream location where the Knocknacarragh Stream enters Rusheen Bay. The water sampling results are presented in Appendix 1 and is further discussed in Section 8.3.6 of the EIAR Chapter 8 Hydrology & Hydrogeology, and Section 6.5.1 below.

2.9 Site History and Land Use

The southern part of the site is greenfield and currently utilised for low-intensity agricultural purposes, while the norther part predominantly comprises brownfield scrubland with scattered small trees throughout and stockpiles mainly comprising gravel, cobbles and boulders. Stone walls and treelines are also present within the boundary of the site. There is an existing dwelling in the centre of the site along with some agricultural buildings. The surrounding area is urban in character, and the site is surrounded by a number of residential estates and commercial and industrial buildings.

2.9.1 Historical Maps

The 6-inch OSI maps surveyed between 1829 – 1842 map Kingstown House at the centre of the Site with surrounding farmland. A Christian Brothers Burial Ground is marked in the southeast of the Site, however no remains were visible during the Site walkover.

RECEIVED: 16/10/2025

3. PREVIOUS INVESTIGATIONS

3.1 Summary of Causeway 2019 Investigation

A summary of the findings of the Causeway 2019 investigation with respect to ground conditions is presented below.

3.1.1 Soil

Causeway undertook a ground investigation between the 30th April and the 14th May 2019 which comprised the excavation of three boreholes (BH) by dynamic sampling methods, eleven boreholes by dynamic sampling methods and rotary follow-on drilling, one borehole by rotary drilling methods, twelve machine dug trial pits, and indirect California Bearing Ratio (CBR) tests at eight locations. Selected samples were carefully described and their descriptions incorporated into the borehole logs. Environmental laboratory testing of soils for a range of determinants was also undertaken.

The ground types encountered during the investigation of the site included (in approximate stratigraphic order):

- Topsoil, which was encountered in 100-200mm thickness in boreholes BH02-BH02, BH04-BH08, and BH12 and 400-500mm in BH09-BH11.
- Made ground (fill) which was encountered in most of the exploratory holes, particularly in the west of the site where fill was found to extend to depths of 3.70-3.90m.
- Recent deposits (peat) were encountered in boreholes BH02 at 2.30-2.50 mbgl BH03B at 1.20-2.00m and 3.80-4.10 mbgl; BH04 at 0.90-1.80 mbgl; BH08 at 3.70-4.00 mbgl; and BH09 at 0.00-0.50 mbgl.
- Fluvioglacial deposits: typically medium dense to dense sands and gravels with localised pockets of sandy gravelly clays interspersed throughout encountered across much of the site.
- Bedrock (Granite): Rockhead was encountered at depths ranging from 2.00m in boreholes BH06 and BH11 to 5.40 mbgl in boreholes BH03B and BH08.

Groundwater was encountered during boring through soil as a water strike at 1.80m in borehole BH09. Groundwater was also encountered at 0.10m and 2.50m in nearby trial pit TP09. Groundwater strikes were not observed in any of the other exploratory hole locations.

The Causeway 2019 report provides a number of recommendations for construction based on the ground conditions. The Causeway 2019 site investigation assessment and conclusions can be found in Appendix 2.

3.2 Summary of Flood Risk Assessment

A Site-Specific Flood Risk Assessment (SSFRA) was prepared by Tobin's for the Proposed Project. The assessment determined that the site is located within Flood Zone C and concluded that the Proposed Project is appropriate for this flood zone classification.

This report is included as Appendix 3.

RECEIVED: 16/10/2025

4. CURRENT ADDITIONAL GROUND INVESTIGATION

4.1 Fieldwork

An additional ground investigation, undertaken by Causeway, was completed between May and June 2025 and comprised twenty-one light cable percussion boreholes, five rotary drilled boreholes, standpipe installation's in fifteen boreholes, thirty-three machine-dug trial pits, fifteen sampling locations, eighteen machine-dug soakaway pits, in-situ testing (including: Standard Penetration Tests, eighteen infiltration tests, and indirect CBR (Dynamic Cone Penetrometer (DCP)) tests at forty-two locations.

Prior to the undertaking of ground investigation works, an initial site walkover was completed by Béhinn Anders (MKO) in June 2024. Proposed trial pit locations and groundwater well locations were assessed and selected. No surface water was observed during the site visit.

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R10 Global Positioning System (GPS) employing Virtual Reference Station (VRS) and real time kinetic (RTK) techniques

The investigation was undertaken generally in accordance with the requirements set out within the relevant testing standards as presented in the Causeway 2025 report. A site layout and exploratory hole location plan is presented as Figure 4-1, and a record of the borehole logs outlining the material encountered, samples and field testing undertaken for each exploratory hole is presented in Appendix 4.

4.2 Monitoring and Sampling

Following completion of site works, three rounds of groundwater and ground gas monitoring were conducted. The monitoring records are included in Appendix 5. The methodologies employed are described in the following sections.

4.2.1 Groundwater

A calibrated YSI PRO PLUS (Multi-Probe System) was used to determine field parameters (temperature, pH, oxidation-reduction potential (ORP), specific electrical conductivity, dissolved oxygen (DO [mg/L and % saturation]) for groundwater.

For groundwater monitoring, the YSI probes were placed in a flow-through cell to prevent contact between the groundwater and air.

Physico-chemical parameters were recorded at initial-5-3-3 minute intervals. The sample was collected after stabilisation of these field parameters. Stabilisation was achieved after all parameters fell within established limits for three successive readings; i.e., temperature ± 3 %, or ±1 °C, pH ± 10 % or ±0.1 and specific conductivity ±3 %.

Additionally, groundwater levels were monitored on two events following the groundwater well installation.

Map Legend

- Site Boundary

Log location

- Borehole Location
- Trial Pit Location
- Sampling Location

Microsoft product screen shots reprinted with permission from Microsoft Corporation
© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517

Drawing Title

Exploratory Hole Location

Project Title

King Knocknacarra, Galway

Drawn By	Checked By
FZ	EOS
Project No.	Drawing No.
240142	Figure 4-1
Scale	Date
1:3,000	25.09.25

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

RECEIVED: 16/10/2025

4.2.1.1 Groundwater Sampling

Groundwater was sampled using the active low-flow purge and sample technique. A portable low-flow GeoPump Peristaltic Pump is used to carry out low-flow sampling. After purging and stabilization of the field parameters, the sample was collected.

Samples for metal analyses were filtered in the field using a 0.45 micron membrane filter before preservation.

4.2.2 Ground Gas

Following completion of site works, three rounds of ground gas monitoring were conducted. Ground gas measurements were carried out using a Gas Analyser (GA)5000 gas meter.

4.3 Laboratory Testing

A total of 78 soil samples were analysed during the 2025 Causeway Site Investigation which comprised soil classification and soil chemistry. Laboratory testing of soils samples was carried out in accordance with British Standard (BS) 1377, Methods of test for soils for civil engineering purposes; Part 1 (BSI, 2016), and Part 2 (BSI, 2022).

The number of samples tested, as well as their location, depth and rationale are summarised in Table 4-1.

Table 4-1 Sample Location, Depth and Rationale

Sample ID	Depth (mbgl)	Testing	Rationale
BH01	0 – 7.7	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH02	0 – 3.8	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH03	0 – 3.00	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH04	0 – 1.7	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH05	1.3 – 1.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH06	0 – 3.0	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH07	0 – 2.8	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH08	0 – 1.7	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH09	0 – 1.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH10	0 – 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.

RECEIVED: 16/10/2025

Sample ID	Depth (mbgl)	Testing	Rationale
BH11	0 – 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH12	0 - 1.3	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH13	0 - 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH14	0 - 1.2	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH15	0 - 1.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH16	0 - 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH17	0 - 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH18	0 - 3.0	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH19	0 - 6.30	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH19A	0 – 0.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH20	0 – 0.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH23	0 – 3.0	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH24	0 – 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH25	0 – 0.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH25A	0 – 2.3	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
BH27	0 – 2.0	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
Trial Pit (TP)01	0 – 2.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP02	0 – 2.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.

RECEIVED: 16/10/2025

Sample ID	Depth (mbgl)	Testing	Rationale
TP03	0 – 2.85	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP04	0 – 2.9	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP05	0 – 2.0	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP06	0 – 2.7	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP07	0 – 3.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP08	0 – 1.3	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP09	0 – 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP10	0 – 1.0	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP10A	0 – 0.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP11	0 – 4.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP12	0 – 2.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP13	0 – 0.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP13A	0 – 2.3	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP14	0 – 0.9	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP15	0 – 3.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP16	0 – 1.9	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP17	0 – 2.3	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP18	0 – 2.15	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.

RECEIVED: 16/10/2025

Sample ID	Depth (mbgl)	Testing	Rationale
TP19	0 – 1.9	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
TP20	0 – 1.65	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP01	0 – 2.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP02	0 – 1.8	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP03	0 – 1.8	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP04	0 – 2.7	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP05	0 – 1.05	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP06	0 – 2.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP07	0 – 3.35	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP08	0 – 2.45	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP09	0 – 1.9	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP010	0 – 3.1	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
ETP011	0 – 2.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
Sampling Location (SL)01	0 – 0.85	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL02	0 – 1.2	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL03	0 – 1.15	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL04	0 – 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL05	0 – 1.4	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.

RECEIVED: 16/10/2025

Sample ID	Depth (mbgl)	Testing	Rationale
SL06	0 -1.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL07	0 – 2.35	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL08	0 – 2.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL09	0 – 2.2	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL10	0 – 2.1	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL11	0 – 2.3	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL12	0 – 2.5	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL13	0 – 1.8	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL14	0 – 2.8	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.
SL15	0 – 2.6	Soil suite, Asbestos screen and ID, WAC[1].	To test for presence of contamination within Made Ground.

Notes
1 WAC = Waste Acceptance Criteria

The soil analysis included the following determinants:

- Heavy metals including; antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc;
- Benzene, toluene, ethylbenzene, xylenes (BTEX) compounds;
- Total Petroleum Hydrocarbons (TPHCWG) and Polycyclic aromatic hydrocarbons (PAHs);
- Polychlorinated biphenyl (PCBs);
- Total monohydric phenols;
- Total Organic Carbon;
- Inorganics;
- Natural Moisture Content; and
- pH determination.

Groundwater samples from boreholes BH01, BH02, BH08, BH25A, BH26 and BH19 were analysed for a similar suite of contaminants. Samples of Made Ground that were scheduled for laboratory analysis were screened for asbestos. Laboratory testing results are presented in Appendix 5.

5. GROUND AND GROUNDWATER CONDITIONS

RECEIVED: 26/10/2025

The ground conditions encountered during the additional site investigation broadly corresponded to published geology and the findings of previous ground investigations conducted on the site and are presented in Table 5-1 below. It includes: twenty-six boreholes (BH01-BH20, BH23-BH26, BH19A, and BH25A), thirty-three trial pits (TP01-TP10, TP10A, TP11-TP13, TP13A, TP14-TP20, and ETP01-ETP11) and fifteen sampling locations (SL01-SL15) which were aimed primarily at sampling stockpiled material.

Table 5-1 Summary of Ground Conditions (Causeway 2025 Investigations)

Stratum	Depth to Top of Stratum (mbgl)	Typical Thickness (m)
Topsoil	0.0	0.05 to 0.5
Made Ground (reworked sandy gravelly clay fill typically encountered) Brown, grey, black sandy gravelly sandy clay, sandy gravelly clay, gravelly silty sand, sandy gravelly silt, gravelly sandy silt, sandy silty gravel, clay, or sandy clayey gravel, subrounded to subangular with occasional cobbles. Sand is fine to coarse. Gravel is subrounded fine to coarse of various lithologies, predominantly granite. It is majorly found in all logs except [BH07, BH08, BH09, BH13, TP02, TP03, TP09, ETP02, ETP06, SL06].	0.0	0.2 to 3
Possible made ground Brown gravelly sandy clay with low cobble content or grey cobbles Found in [BH06, BH11, BH12, ETP05].	0.0 to 1.2	0.25 to 1.8
Recent deposits Firm black amorphous peat Found in [BH07, TP02, TP03, TP05, TP09, ETP02, SL04, SL06, SL13].	0.0 to 0.9	0.4 to 1.7
Glacial Till Medium dense sands and gravels interspersed with firm to stiff sandy gravelly silt or clay frequently with low cobble content, becoming very stiff with increasing depth. It is majorly found in all logs except [BH05, BH06, BH19, BH19A, BH20, TP10A, SL01, SL02, SL03, SL04, SL05, SL07, SL08, SL09, SL11, SL12, SL13, SL14, SL15].	0.0 to 3.9	0.1 to 3.8
Bedrock (granite)	0.7 to 3.3	0.6 to 5.6

Stratum	Depth to Top of Stratum (mbgl)	Typical Thickness (m)
Found in [BH01, BH19, BH25A].		

RECEIVED: 16/10/2025

A more detailed account of the ground conditions encountered during the Causeway 2025 Investigations is provided below, along with consideration of the results of in-situ testing.

5.1 Ground Model

5.1.1 Topsoil

A layer of topsoil was encountered in 0.05m to 0.5m thickness across the site with fine roots. The typical thickness is between 0.05m to 0.5m.

5.1.2 Made Ground

Made Ground was encountered at surface across much of the site. It generally extended from 0.2 mbgl up to 3 mbgl, with a general thickness between 0.2m to 3m. The deposits consisted of reworked sandy gravelly clay fill (reworked topsoil). The single SPT-N value recorded in the granular Made Ground in Borehole BH05 was 50, which correspond to a material that is dense. The single SPT-N value recorded in the cohesive Made Ground in borehole BH03 was 5 which corresponds to a material that is firm.

5.1.3 Possible Made Ground

Possible Made Ground was encountered in boreholes BH06, BH11, BH12, ETP05 and comprised of brown gravelly sandy clay with low cobble content or cobbles. The SPT-N values recorded in the granular Possible Made Ground were between 37 and 50, which correspond to a material that is dense.

5.1.4 Recent Deposits

Firm, organic-rich sediments were encountered as the near-surface materials at several locations. These layers were generally present from around 0.0 to 1.8 mbgl, with thicknesses between 0.4m and 1.7m. The deposits comprised black amorphous peat, usually with roots on top layer. The single SPT-N value recorded in the cohesive peat was in borehole BH07 was 3, which corresponds to a material that is soft.

5.1.5 Glacial Till

Beneath the superficial layers, glacial till was encountered across the site. It generally extended from 0.2 mbgl up to 4.5 mbgl. Thickness was variable, 0.1m to 3.8m, overlying bedrock. This typically consisted of medium dense sandy gravels interspersed with firm to stiff sandy gravelly silt or clay, often with cobbles, and occasional boulders. The SPT-N values recorded in the granular Glacial Till were between 5 and 50, which correspond to a material that is loose to dense. The SPT-N values recorded in the cohesive Glacial Till were all 50 which corresponds to a material that is hard.

5.1.6 Bedrock (Granite)

Bedrock was encountered in rotary drilled boreholes BH01, BH19 and BH25A, with weathered granite on top, strong slightly weathered granite beneath. These layers were generally present from 0.7 to 7.7 mbgl, subjected to the length of logs. Thicknesses were between 0.4m and 1.7m. Described in the logs as strong, coarse-grained, pink speckled dark grey.

RECEIVED: 16/10/2025

5.2 Ground Contamination

No visual or olfactory evidence of contamination was encountered during drilling.

5.2.1 Groundwater Depth

Due to the nature of the drilling process, groundwater strikes were not recorded in the boreholes during drilling. Water strikes were encountered in 20 no. of the trial pits at depths ranging from 0.6m to 4m.

A groundwater monitoring standpipe was installed in boreholes BH01-BH03, BH06-BH09, BH15-BH16, BH18-BH19, BH19A, BH23, BH25A, and BH26. The results of subsequent groundwater monitoring. The groundwater levels in the monitoring standpipes were measured by Causeway. There will be continued monitoring of the standpipes to give an indication of the seasonal variation in groundwater level. A summary of the groundwater levels is presented in Table 5-2.

RECEIVED: 16/10/2025

Table 5-2 Summary of Groundwater Depth

Borehole No.	Response Zone	Depth to groundwater (mbgl) 13/06/2025		Depth to groundwater (mbgl) 02/07/2025		Depth to groundwater (mbgl) 23/07/2025	
		Depth to top of water	Depth to bottom of BH	Depth to top of water	Depth to bottom of BH	Depth to top of water	Depth to bottom of BH
BH01	Natural (Granite Bedrock)	3.30	7.70	3.10	7.70	2.82	7.70
BH02	Natural (Glacial Till / Possible Weathered Bedrock)	3.20	3.60	3.19	3.60	2.81	3.60
BH03	Made Ground / Natural (Glacial Till / Possible Weathered Bedrock)	1.01	3.00	1.02	3.00	0.74	3.00
BH06	Made Ground/Possible Made Ground	2.57	3.00	2.73	3.00	2.75	3.00
BH07	Natural (Peat / Glacial Till over weathered bedrock)	0.43	2.80	0.37	2.80	0.13	2.8
BH08	Natural (Glacial Till / Possible Weathered Bedrock)	Dry	1.66	Dry	1.66	1.53	1.66
BH09	Natural (Glacial Till / Possible Weathered Bedrock)	Dry	1.53	Dry	1.51	1.50	1.51

RECEIVED: 16/10/2025

Borehole No.	Response Zone	Depth to groundwater (mbgl) 13/06/2025		Depth to groundwater (mbgl) 02/07/2025		Depth to groundwater (mbgl) 28/07/2025	
		Depth to top of water	Depth to bottom of BH	Depth to top of water	Depth to bottom of BH	Depth to top of water	Depth to bottom of BH
BH15	Natural (Glacial Till / Possible Weathered Bedrock)	1.46	1.49	Not Available	Not Available	Not Available	Not Available
BH19	Natural (Granite Bedrock)	1.42	6.19	1.31	6.10	1.11	6.10
BH23	Made Ground / Natural (Glacial Till over weathered bedrock).	2.64	2.68	Not Available	Not Available	Not Available	Not Available
BH25A	Natural (Granite Bedrock)	1.80	6.38	Not Available	Not Available	Not Available	Not Available
BH26	Made Ground / Natural – (Glacial Till over weathered bedrock)	2.01	2.04	Not Available	Not Available	Not Available	Not Available

Note: It should be noted that some data was unavailable due to access issues – this is noted above, where relevant. Furthermore, if borehole results were dry across all monitoring periods, it is not included above.

An analysis of the groundwater monitoring data indicates a relatively high-water table in parts of the site. The shallowest water levels occur in permeable sediments and Made Ground, suggesting these zones respond quickly to precipitation and surface infiltration.

RECEIVED: 16/10/2025

5.2.2 Groundwater Quality

5.2.2.1 Groundwater Field Parameters

Groundwater monitoring was undertaken by MKO in 2 no. rounds – during a dry event on June 17th and following a rainfall event on July 21st. This data is summarised in Table 5-3 below.

Table 5-3 Groundwater quality monitoring

Round 1 (Dry event) 17/06/2025							
Site Location	BH01	BH02	BH08	BH19	BH20	BH25A	BH26
Temperature (C)	12.6	Dry	Dry	12.6	Dry	12.5	Dry
Dissolved Oxygen (%)	0.7	Dry	Dry	0.6	Dry	1.8	Dry
Dissolved Oxygen (mgl)	0.08	Dry	Dry	0.06	Dry	0.19	Dry
Conductivity (µscm)	1940	Dry	Dry	793	Dry	1151	Dry
pH	6.99	Dry	Dry	6.68	Dry	6.98	Dry
ORP (mV)	52.5	Dry	Dry	49.8	Dry	72.5	Dry
Round 2 (after Rainfall event) 21/07/2025							
Site Location	BH01	BH02	BH08	BH19	BH20	BH25A	BH26
Temperature (C)	13.4	13.9	13.8	14.6	Dry	14.3	15.6
Dissolved Oxygen (%)	5.40	84.5	87.6	2.90	Dry	17.2	74.5
Dissolved Oxygen (mgl)	0.56	8.71	9.04	0.30	Dry	1.76	7.40
Conductivity (µscm)	621	425	427	780	Dry	578	954
pH	6.90	6.30	6.22	6.42	Dry	6.80	6.81
ORP (mV)	-158	-93.7	-98.7	-127	Dry	-123	-73.1

As set out in Table 5-3 above, BH01, BH19, BH25 contained water during both sampling rounds (i.e. the dry event and after the rainfall event). This aligns with their response zones being installed in granitic bedrock, which provides a sustained groundwater source. Across both monitoring rounds, these boreholes had consistently low dissolved oxygen levels which is indicative of slow-moving, poorly oxygenated bedrock groundwater.

In contrast, BH02, BH08, and BH26, only yielded water following the rainfall event. The monitoring records show high dissolved oxygen which aligns with the direct influence of the rainwater and indicates that it is responds more rapidly to recharge.

Across all samples, the conductivity is considered to be moderate. Across all boreholes, after the rainfall event, negative ORPs were recorded – indicating a reducing environment. All of the pH values recorded were slightly acidic. Meanwhile, BH20 remained dry in both rounds which indicates that it is likely above the water table or poorly connected.

RECEIVED: 16/10/2025

5.2.2.2 Chemical Tests

Chemical test results from groundwater samples collected during the monitoring visit are presented in Appendix 5. The results have been compared against Annual Average Environmental Quality Standards (AA-EQS)[1,2,3,4] and Groundwater Threshold Values (GTV)[5,6,7,8,9]. In the absence of specific AA-EQS and GTV values, EPA interim guideline values (IGV)[10] have been used. The main findings of the monitoring are summarised in Table 5-4 below and further details are provided in Section 6.5

Table 5-4 Summary of groundwater result

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances
Dissolved Arsenic	7.50	25	9	0	0
Dissolved Barium	100.00	nc[11]	9	0	0
Dissolved Boron	750.00	nc	9	0	0
Dissolved Cadmium	3.75	0.008	9	1	1
Dissolved Calcium	200.00	nc	9	0	0
Total Dissolved Chromium	37.50	3.4	9	0	0
Dissolved Copper	1500.00	5 or 30	9	0	0
Total Dissolved Iron	200.00	nc	9	3	0
Dissolved Lead	7.50	1.2	9	0	1

[1] *European Communities Environmental Objectives (Surface Water) Regulations 2009. S.I. No. 272 of 2009*
[2] *European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015. S.I. No. 386 of 2015*
[3] *European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. S.I. No. 77 of 2019*
[4] *European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2025. (S.I. No. 50 of 2025).*
[5] *European Communities Environmental Objectives (Groundwater) Regulations 2010. S.I. No. 9 of 2010*
[6] *European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016. S.I. No. 366 of 2016*
[7] *European Communities Environmental Objectives (Groundwater) Regulations 2010. S.I. No. 9 of 2010*
[8] *European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016. S.I. No. 366 of 2016*
[9] *European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2025 (S.I. No. 51 of 2025).*
[10] *Environment Protection Agency (2003). Towards Setting Guideline Values for the Protection of Groundwater in Ireland. Interim Report*
[11] *nc indicates that no criteria is available.*

RECEIVED: 16/10/2025

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances
Dissolved Magnesium	50.00	nc	9	0	0
Dissolved Manganese	50.00	nc	9	6	0
Dissolved Mercury	0.75	0.05	9	0	0
Dissolved Nickel	15.00	4	9	0	3
Dissolved Potassium	5.00	nc	9	5	0
Dissolved Selenium	nc	nc	9	0	0
Dissolved Sodium	150.00	nc	9	0	0
Dissolved Zinc	75.00	8 or 50 or 100	9	0	0
Naphthalene	1.00	2	9	0	0
Anthracene	10000.00	0.1	9	0	0
Fluoranthene	nc	0.0063	9	0	2
Benzo(bk)fluoranthene	0.50	nc	9	0	0
Benzo(a)pyrene	0.01	0.00017	9	0	0
Indeno(123cd)pyrene	0.05	nc	9	0	0
Dibenzo(ah)anthracene	nc	nc	9	0	0
Benzo(ghi)perylene	0.05	nc	9	0	0
PAH 16 Total	0.08	nc	9	0	0
Benzo(b)fluoranthene	0.50	nc	9	0	0
Benzo(k)fluoranthene	0.05	nc	9	0	0
Dichlorodifluoromethane	nc	nc	9	0	0
Methyl Tertiary Butyl Ether	10.00	nc	9	0	0
Chloromethane	nc	nc	9	0	0
Vinyl Chloride	0.38	nc	9	0	0
Bromomethane	nc	nc	9	0	0

RECEIVED: 16/10/2025

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances
Chloroethane	nc	nc	9	0	0
Trichlorofluoromethane	nc	nc	9	0	0
1,1-Dichloroethene (1,1 DCE)	30	nc	9	0	0
Dichloromethane (DCM)	15.00	20	9	0	0
Chloroform	12.00	2.5	9	0	1
1,1,1-Trichloroethane	500.00	nc	9	0	0
Carbon tetrachloride	2	nc	9	0	0
1,2-Dichloroethane	2.25	10	9	0	0
Benzene	0.75	10	9	0	0
Trichloroethene (TCE)	7.50	nc	9	0	0
Toluene	525.00	10	9	0	0
Tetrachloroethene (PCE)	7.50	nc	9	0	0
Chlorobenzene	1.00	1.5	9	0	0
Ethylbenzene	10.00	nc	9	0	0
m/p-Xylene	10.00	10	9	0	0
o-Xylene	10.00	10	9	0	0
1,2,4-Trichlorobenzene	0.40	0.4	9	0	0
Hexachlorobutadiene	0.10	0.1	9	0	0
1,2,3-Trichlorobenzene	nc	0.4	9	0	0
Benzene	nc	10	9	0	0
Pentachlorophenol	nc	0.4	9	0	0
Phenol	nc	8	9	0	0
Bis(2-ethylhexyl) phthalate	nc	1.3	9	0	0
1,2,4-Trichlorobenzene	nc	0.4	9	0	0

RECEIVED: 16/10/2025

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances
Hexachlorobenzene	nc	0.01	9	0	0
Hexachlorobutadiene	nc	0.1	9	0	0
>C5-C6	10.00	nc	9	0	0
>C6-C8	10.00	nc	9	0	0
>C8-C10	10.00	nc	9	0	0
>C10-C12	10.00	nc	9	3	0
>C12-C16	10.00	nc	9	4	0
>C16-C21	10.00	nc	9	3	0
>C21-C35	10.00	nc	9	0	0
Total aliphatics C5-35	10.00	nc	9	4	0
>C5-EC7	10.00	nc	9	0	0
>EC7-EC8	10.00	nc	9	0	0
>EC8-EC10	10.00	nc	9	0	0
>EC10-EC12	10.00	nc	9	0	0
>EC12-EC16	10.00	nc	9	0	0
>EC16-EC21	10.00	nc	9	0	0
>EC21-EC35	10.00	nc	9	0	0
Total aromatics C5-35	10.00	nc	9	0	0
Total aliphatics and aromatics(C5-35)	7.50	nc	9	4	0
Phenol	nc	8	6	0	0
Sulphate as SO4	187.50	nc	9	0	0
Chloride	187.50	nc	9	0	0
Ortho Phosphate as P	0.04	0.035	9	0	0
Total Oxidised Nitrogen as N	nc	nc	9	0	0

RECEIVED: 16/10/2025

Test	GTV / IGV (µg/l)	AA-EQS Inland surface waters (µg/l)	No. of Samples	No. of GTV Exceedances	No. of AA-EQS Exceedances
Free Cyanide	0.04	10	9	0	0
Total Cyanide	0.04	10	9	0	0
Ammoniacal Nitrogen as N	0.07	0.065	9	6	6
Hexavalent Chromium	7.50	3.4	9	0	0
Electrical Conductivity @25C	1875.00	nc	9	0	0
pH	≥ 6.5 and ≤ 9.5	4.5< pH < 9.0	9	0	0

5.2.3 Ground Gas

The atmospheric pressure and local pressure system recorded during 3 no. ground gas monitoring visit on the June 13th , July 2nd and July 23rd was 1012-1023 and rising. The main findings of the monitoring are summarised in Table 5-5 below and further details are provided in Section 6.6:

RECEIVED: 16/10/2025

Table 5-5 Summary of worst-case ground gas monitoring records in all boreholes

Borehole No.	Response Zone	Flow (l/hr)			O_2 (min %)			CO_2 (max %)			CH_4 (max %)		
Date		13/06/2025	02/07/2025	23/07/2025	13/06/2025	02/07/2025	23/07/2025	13/06/2025	02/07/2025	23/07/2025	13/06/2025	02/07/2025	23/07/2025
BH01	Bedrock	0.1	0.5	0.3	20.3	16.5	19.5	0.2	3.8	0.7	0.1	<0.1	0.1
BH02	Glacial Till	0.36	0.3	0.3	17.4	17.9	19.5	3.0	0.3	2.1	<0.1	<0.1	<0.1
BH03	Made Ground/ Glacial Till	0.36	0.4	0.31	17.4	16.9	17.7	0.2	3.4	3.4	<0.1	<0.1	0.1
BH06	Made Ground/Possible Made Ground	0.3	0.4	0.2	17.8	20.1	18.7	1.9	0.9	2.0	<0.1	<0.1	<0.1
BH07	Made Ground/ Glacial Till	0.4	5.95	1 -RT	20.5	20.9	1 -RT	0.1	<0.1	1 -RT	<0.1	<0.1	1 -RT
BH08	Glacial Till	0.3	0.2	0.4	13.3	11.7	8.3	6.4	6.7	8.6	<0.1	<0.1	<0.1
BH09	Glacial Till	0.4	0.1	0.1	14.5	15.0	18.7	5.2	4.3	10.3	<0.1	<0.1	0.1
BH15	Glacial Till	0.4	1 -NR	1 -NR	18.3	1 -NR	21.6	3.0	1 -NR	1 -NR	<0.1	1 -NR	1 -NR
BH16	Glacial Till	0.36	0.44	0.4	13.7	14.0	19.1	4.4	4.3	1.2	<0.1	1 -NR	<0.1

RECEIVED: 16/10/2025

Borehole No.	Response Zone	Flow (l/hr)			O_2 (min %)			CO_2 (max %)			CH_4 (max %)		
Date		13/06/2025	02/07/2025	23/07/2025	13/06/2025	02/07/2025	23/07/2025	13/06/2025	02/07/2025	23/07/2025	13/06/2025	02/07/2025	23/07/2025
BH18	Made Ground/ Glacial Till	0.4	0.3	0.4	16.3	18.3	16.3	3.5	2.5	3.6	<0.1	0.1	<0.1
BH19	Bedrock	0.4	0.3	0.3	20.2	13.0	20.2	0.1	5.6	0.8	<0.1	0.1	<0.1
BH19A	Made Ground	0.11	0.3	0.4	17.3	16.0	14.9	3.8	4.9	5.9	<0.1	0.1	<0.1
BH23	Glacial Till	0.3	1 -NR	1 -NR	16.9	1 -NR	1 -NR	3.1	1 -NR	1 -NR	<0.1	1 -NR	1 -NR
BH25A	Bedrock	0.4	1 -NR	1 -NR	17.5	1 -NR	1 -NR	2.6	1 -NR	1 -NR	<0.1	1 -NR	1 -NR
BH26	Made Ground/ Glacial Till	0.06	1 -NR	1 -NR	19.0	1 -NR	1 -NR	1.4	1 -NR	1 -NR	<0.1	1 -NR	1 -NR

Notes

1 -NR = None recorded. No access due to landowner permission denied.

1 -RT = None recorded. No data due to readings terminate

RECEIVED: 16/10/2025

5.3 Waste Assessment and Classification

Laboratory analysis was carried out on soil/waste samples from 27 representative trial pits, boreholes and soil locations targeting a broad coverage and areas where contaminants were present (indicated by the 2019 Causeway Site Investigation).

There were no detections of Asbestos, polycyclic aromatic hydrocarbons (PAHs) total, polychlorinated biphenyls (PCBs) total, benzene, toluene, ethylbenzene, and xylenes (BTEX) or methyl tertiary-butyl ether (MTBE).

5.3.1 Waste Classification Report

In accordance with the Environmental Protection Agency (2019) guidance document '*Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-hazardous*', and the guidance in UK Environmental Agency's *Technical Guidance WM3*, the soil data was assessed using HazWasteOnline to classify the samples as 'hazardous' or 'non-hazardous'. The complete HazWasteOnline *Waste Classification Report* is included in Appendix 6.

Initially, all samples were flagged as 'potentially hazardous' due to low levels of Cr(III) detected across the samples. While there is no specific WM3 threshold for Cr(III), Cr(VI)—a hazardous form of chromium—was evaluated against the worst-case scenario of metal chromates. The HazWasteOnline system automatically calculates whether:

1. The metal exceeds the HP 7 threshold for chromates.
2. Cr(VI) makes up more than 90% of the metal concentration.
3. Cr(VI) exceeds the hazardous threshold for chromates.

In all cases, the HazWasteOnline system determined this to be 'No'. This indicates that there isn't enough Cr(VI) or metal to form hazardous metal chromates, and the samples do not meet hazardous thresholds. Therefore, all the samples were classified as 'non-hazardous'.

5.3.2 Overview of Methodology

The samples were analysed for waste acceptance criteria (WAC) in accordance with the European Communities Council Decision (ECCD) 2003/33/EC. Both the solid soil and the soil eluate (i.e. Committee for Standardization (CEN) leaching test 10:1 liquid to solid) and exceedances when compared to the ECCD 2003/33/EC for waste acceptance criteria are presented in Table 5-6. These are expressed as % for Solids and mg/kg for eluates.

Total organic carbon (%) and loss on ignition (%) were above the hazardous waste acceptance criteria in 20 samples and above the inert waste acceptance criteria in 15 samples. Total organic carbon was above the stable non-reactive waste acceptance criteria in one sample.

Molybdenum was elevated above the inert waste acceptance criteria in 4 samples. Dissolved organic Carbon was above the inert waste acceptance criteria in one sample.

Table 5-6 Waste Acceptance Criteria

ID	Depth	Total Organic Carbon	Loss On Ignition	Dissolved Organic Carbon	Molybdenum as Mo
		Solid		Leachate	
Units	m	%		mg/kg	
BH07	1	39	72	-	-
ETP02	0.5	45	82	-	-
ETP03	0.5	21	67	-	0.6
ETP04	1	13	37	-	-

RECEIVED: 16/10/2025

ID	Depth	Total Organic Carbon	Loss On Ignition	Dissolved Organic Carbon	Molybdenum as Mo
ETP07	0.5	13	24	-	-
ETP07	1	12	26	-	-
SL03	1.15	7.1	14	-	-
SL04	1.4	33	86	-	-
SL06	0.8	26	57	-	-
SL07	2	5.1	11	-	-
SL09	1	9.2	18	-	-
SL09	2	6.9	16	-	-
SL13	1.8	20	6.1	-	1.5
TP02	0.5	36	70	-	-
TP03	0.5	41	79	-	-
TP04	1	19	83	-	-
TP04	0.5	25	75	-	-
TP09	0.5	21	50	-	-
TP10a	0.4	7.6	17	620	-
TP16	0.5	8.7	15	-	-

	Inert Waste	SNRHW	Hazardous Waste
Waste	3%	5%	6%
Leachate Molybdenum	0.5 mg/kg	10 mg/kg	30 mg/kg
Leachate Dissolved organic Carbon	500 mg/kg	800 mg/kg	1000 mg/kg

The complete laboratory certificates of analysis are attached in Appendix 6.

5.3.3 Waste Acceptance Criteria

A total of 78 samples were analysed by Normec DETS. Laboratory testing included asbestos, moisture content, metals suite, inorganics (pH, cyanide, total organic carbon, sulphide, sulphur (free), sulphate as SO_4, petroleum hydrocarbons including BTEX and MTBE, PAHs, PCBs and phenols. Laboratory data is provided in Appendix 6.

The soil laboratory test results were assessed to evaluate whether the material should be classified as 'hazardous' or 'non-hazardous', in accordance with the Environmental Protection Agency (2019) guidance document; '*Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-hazardous*', and in accordance with the guidance in UK Environmental Agency's (2015, as updated) *Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste.*

Of the 78 samples taken, 20 are classified as hazardous under the waste classification criteria; 15 samples are classified as inert waste. Samples which fall in neither of these two groups are not discussed further. This is outlined in Table 8-1 and further discussed in Section 8.4.2 below.

RECEIVED: 16/10/2025

6. CONTAMINATION ASSESSMENT

6.1 Introduction

This section evaluates risks to potential receptors at the site from identified chemical contamination. Potential receptors identified include future site occupants, construction workers, building & structures, vegetation & plants and controlled waters. MKO's approach and rationale to assessment criteria adoption for this site is presented in Appendix 7.

6.2 Risks to Human Health

MKO have screened the soil chemical results from the ground investigation against Generic Assessment Criteria (GAC) derived by LQM/CIEH (Suitable 4 Use Levels) for the Proposed Development's end use scenarios – Residential (without Private Gardens) and Residential (with Private Gardens). It is noted that the Soil Guideline Value (SGV) for lead has been withdrawn and that the Category 4 Screening Level (C4SL) for lead will be used in its place.

For the purposes of this assessment, the soil chemical results from have been screened against GACs. The results of the assessment are set out in Appendix 7.

As part of the 2025 ground investigation, forty Made Ground samples and thirty-eight Natural Ground samples were tested by DETS on behalf of MKO for a range of parameters including heavy metals, Total Petroleum Hydrocarbons, Benzene, Toluene, Ethylbenzene, Xylenes and polycyclic aromatic hydrocarbons. An asbestos screen was also carried out on the seventy-eight total samples.

6.2.1 Risks from Made Ground

6.2.1.1 Residential without Private Gardens Land Use Scenario

As can be observed from Appendix 7 the measured concentrations for the determinants analysed in the Made Ground are below the assessment criteria therefore are not considered to present an unacceptable risk to human health based on a residential (without private gardens) land use scenario.

6.2.1.2 Residential with Private Gardens Land Use Scenario

As can be observed from Appendix 7 the measured concentrations for the determinants analysed in the Made Ground are below the assessment criteria therefore are not considered to present an unacceptable risk to human health based on a residential (with private gardens) land use scenario.

6.2.2 Risks from Natural Ground

6.2.2.1 Residential without Private Gardens Land Use Scenario

As can be observed from Appendix 7, the measured concentrations for the determinants analysed in the Natural Ground are below the assessment criteria and therefore are not considered to present an unacceptable risk to human health based on a residential (without private gardens) land use scenario.

6.2.2.2 Residential with Private Gardens Land Use Scenario

As can be observed from Appendix 7 the measured concentrations for the determinants analysed in the Natural Ground are below the assessment criteria therefore are not considered to present an unacceptable risk to human health based on a residential (with private gardens) land use scenario.

RECEIVED: 16/10/2025

6.3 Asbestos

There was no asbestos containing material identified in the samples tested as part of the 2025 ground investigation.

6.4 Risks to Plant Growth

The risks to plant growth (i.e. phytotoxicity) have also been assessed for specific contaminants where the limits for phytotoxic effect proposed by BS3882:2015[12] are significantly lower than the health GAC. The results of the assessment are presented in Table 6-1 below.

Table 6-1 Soil Risks to Vegetation and Plants

Determinant	Assessment Criteria	Measured Range (mg/kg)	Concentration > Assessment Criteria (Y/N)
Copper	135	<0.2 to 160	Y
Zinc	200	1 to 96	N
Nickel	75	0.4 to 16	N

As can be observed in Table 6-1, the concentrations of copper in the Made Ground soil material are above those prescribed by BS3882:2015 and therefore pose a risk to vegetation and plant growth. The concentration of zinc and nickel are below the criteria and therefore do not pose a risk to vegetation and plant growth.

6.5 Risks to Controlled Waters

Chemical test results from groundwater samples collected during the monitoring visit are presented in Appendix 5. The results have been compared against Annual Average Environmental Quality Standards (AA-EQS)[13,14,15,16] and Groundwater Threshold Values (GTV)[17,18,19,20,21]. In the absence of specific AA-EQS and GTV values, EPA interim guideline values (IGV)[22] have been used. Table 5-4 summarises analysis from standpipes generally in the response zones of the Made Ground and Natural strata.

As can be observed from Table 5-4 the contamination concentrations measured in groundwater are below the EQS with the exception of cadmium (in borehole BH25A), iron (in boreholes BH01 and BH19), lead (in borehole BH25A), nickel (in boreholes BH01, BH19, and BH25A), fluoranthene (In boreholes BH01 and BH25A), chloroform (in borehole BH01), and ammoniacal nitrogen (in BH01, BH19, and BH25A).

As can also be observed from Table 5-4, there was one exceedance of the GTV/IGV thresholds for cadmium (in BH25A); 3 no. exceedances of iron (in boreholes BH01 and BH19); 6 no. exceedances of manganese (in boreholes BH01, BH25A, and BH19); 5 no. exceedances of potassium in boreholes

[12] *BSI (2015). Specification for Topsoil BS3882:2015. BSI Standards Publication*
[13] *European Communities Environmental Objectives (Surface Water) Regulations 2009. S.I. No. 272 of 2009*
[14] *European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015. S.I. No. 386 of 2015*
[15] *European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. S.I. No. 77 of 2019*
[16] *European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2025. (S.I. No. 50 of 2025).*
[17] *European Communities Environmental Objectives (Groundwater) Regulations 2010. S.I. No. 9 of 2010*
[18] *European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016. S.I. No. 366 of 2016*
[19] *European Communities Environmental Objectives (Groundwater) Regulations 2010. S.I. No. 9 of 2010*
[20] *European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016. S.I. No. 366 of 2016*
[21] *European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2025 (S.I. No. 51 of 2025).*
[22] *Environment Protection Agency (2003). Towards Setting Guideline Values for the Protection of Groundwater in Ireland. Interim Report*

RECEIVED: 16/10/2025

BH01, BH19, and BH25A; as well as 4 no exceedances of total aliphatics C5-35 and total aliphatics and aromatics(C5-35) in boreholes BH01, BH19, and BH25A.

Whilst it is noted that there were recorded exceedances of the EQS and GTV/IGV for cadmium, iron, nickel, lead, aliphatics/aromatics, manganese, fluoranthene, and potassium, in three of the six boreholes, the site investigation data would indicate that contamination beneath the site occurs in a series of discrete hotspots which may be impacting directly upon groundwater locally and is not indicative of site-wide contamination. Iron and potassium exceedances are consistent with natural weathering of the local granitic bedrock and the reducing groundwater chemistry observed across the subject boreholes. Furthermore, the exceedances of manganese in more than half the samples may may be caused by natural enrichment from the granite bedrock rather than contamination. The elevated ammoniacal nitrogen are likely to be indicative of background concentrations found in the regional groundwater and not attributable to site concentrations.

6.5.1 Surface Water Monitoring

Baseline water samples were collected by MKO from the Knocknacarragh Stream at 3 no. locations -two upstream locations and one downstream location where the Knocknacarragh Stream enters Rusheen Bay. The water sampling results are presented in Appendix 1 and are also discussed in Section 8.3.6 of the EIAR Chapter 8 Hydrology & Hydrogeology.

There was one recorded EQS exceedance of total dissolved iron in SW01, which is upstream of the site. Based on monitoring results, there is no perceptible deterioration in water quality downstream of the site. The surface water findings are consistent with the groundwater monitoring results, which show that contamination within the site occurs as isolated hotspots with low potential for off-site migration The available data indicate that groundwater beneath the site is not measurably impacting surface water quality in the Knocknacarragh Stream.

6.6 Ground Gas Assessment

A summary of the maximum recorded ground gas concentrations and flow rates are presented below in Table 6-3. Table 6-3 also presents the calculated gas screening value (GSV) and the associated Risk classification and Characteristic Situation[23] to CIRIA 665[24] based on the results of monitoring undertaken on the 13th June, 2nd and 23rd July 2025. The GSV for each borehole is based on the product of the greater of the methane (CH_4) or carbon dioxide (CO_2) concentration measured and the flow rate recorded in each borehole during the monitoring visits. The corresponding risk categories are outlined within Table 6-2 below.

Table 6-2 Modified Wilson and Card Classification (CIRIA Report 659)

Characteristic Situation	Risk Classification	Gas Screening Value (l/hr)		Typical Source Generation
		Lower boundary	Upper Boundary	
1	Very low risk	0	<0.07	Natural soils with low organic content. "Typical" made-up ground.
2	Low risk	0.07	<0.7	Natural soil, high peat/organic content.
3	Moderate risk	0.7	<3.5	Old landfill, inert waste, flood mineworking.

[23] *Wilson et. al. (2006/2007). Characteristic situations, CIRIA 149*
[24] *Wilson et. al. (2007). Assessing risks posed by hazardous ground gases to building, CIRIA C665*

RECEIVED: 16/10/2025

Characteristic Situation	Risk Classification	Gas Screening Value (l/hr)		Typical Source Generation
		Lower boundary	Upper Boundary	
4	Moderate to high risk	3.5	<15	Mineworking susceptible to flooding, completed landfill.
5	High risk	15	<70	Unflooded, inactive mineworking with shallow working near surface.
6	Very high risk	>70	N.A	Recent landfill site.

Table 6-3 Summary of worst-case ground gas monitoring records in boreholes

Borehole	Response Zone	Flow (l/hr)		O_2 (min %)	CO_2 (max %)	CH_4 (max %)	CO_2 Gas screening value (GSV)	CH_4 Gas screening value (GSV)	Classification CIRIA
		CO_2	CH_4						
BH01	Bedrock	0.5	0.5	16.5	3.8	0.1	0.019	0.0005	Characteristic Situation 1
BH02	Glacial Till	0.36	0.3	17.4	3	<0.1	0.0108	0.0003	Characteristic Situation 1
BH03	Made Ground/ Glacial Till	0.4	0.4	16.9	3.4	0.1	0.0136	0.0004	Characteristic Situation 1
BH06	Made Ground/Possible Made Ground	0.2	0.4	17.8	2	<0.1	0.004	0.0004	Characteristic Situation 1
BH07	Made Ground/ Glacial Till	0.4	5.95	20.5	0.1	<0.1	0.0004	0.00595	Characteristic Situation 1
BH08	Glacial Till	0.4	0.2	8.3	8.6	<0.1	0.0344	0.0002	Characteristic Situation 1
BH09	Glacial Till	0.1	0.1	14.5	10.3	0.1	0.0103	0.0001	Characteristic Situation 1
BH15	Glacial Till	0.4	0.4	18.3	3	<0.1	0.012	0.0004	Characteristic Situation 1
BH16	Glacial Till	0.36	0.36	13.7	4.4	<0.1	0.01584	0.00036	Characteristic Situation 1
BH18	Made Ground/ Glacial Till	0.4	0.3	16.3	3.6	0.1	0.0144	0.0003	Characteristic Situation 1

Borehole	Response Zone	Flow (l/hr)		O_2 (min %)	CO_2 (max %)	CH_4 (max %)	CO_2 Gas screening value (GSV)	CH_4 Gas screening value (GSV)	Classification CIRIA
		CO_2	CH_4						
BH19	Bedrock	0.3	0.3	13	5.6	0.1	0.0168	0.0003	Characteristic Situation 1
BH19A	Made Ground	0.4	0.3	14.9	5.9	0.1	0.0236	0.0003	Characteristic Situation 1
BH23	Glacial Till	0.3	0.3	16.9	3.1	<0.1	0.0093	0.0003	Characteristic Situation 1
BH25A	Bedrock	0.4	0.4	17.5	2.6	<0.1	0.0104	0.0004	Characteristic Situation 1
BH26	Made Ground/ Glacial Till	0.06	0.06	19	1.4	<0.1	0.00084	0.00006	Characteristic Situation 1

RECEIVED: 16/10/2025

Although all of the boreholes monitored fall within Characteristic Situation 1, CIRIA guidance (C665) recommends that site characterisation of ground gas risk is calculated from the maximum concentrations and flow rates across the site as a whole, taking into consideration the conceptual site model.

The maximum recorded gas concentrations (volume gas/volume air) across the site were recorded as 0.1 v/v% for methane and 5.9 v/v% for carbon dioxide. The maximum flow rate recorded in the monitoring wells was recorded as 6.5 litres/hour (l/hr). The GSV would therefore be 0.0065 l/h for methane and 0.384 l/h for carbon dioxide. Therefore, on the basis of the maximum GSV calculated with the maximum flow rate, the site is classified as characteristic situation 2.

RECEIVED: 16/10/2025

7. REFINED RISK ASSESSMENT

7.1 Introduction

Further semi-quantitative risk assessment has been undertaken based on the findings of the 2019 and 2025 intrusive investigations and subsequent assessment to evaluate the potential pollutant linkages identified at the site in accordance with the EPA's (2025) *Land Contamination Risk Management*[25]. An assessment of the risks based on the pollutant linkages identified at the site is outlined in Table 7-1 below. A graphical representation of the conceptual site model is included as Figure 7-1.

Table 7-1 Semi-quantitative risk assessment

Source/Medium	Receptor	Potential Exposure Route	Risk Rating
Organic/inorganic contaminants (including PAHs, hydrocarbons, metals, asbestos, etc.) within underlying soils/Made Ground	Future site occupants	Direct ingestion of soil & dust, inhalation of particulates & vapours, and dermal contact	Low – where soil is exposed Negligible/Low – beneath buildings and hard standing.
	Construction workers	Direct ingestion of soil & dust, inhalation of particulates	Low to medium - elevated concentrations of TOC/LOI and isolated molybdenum/DOC in soil.
	Vegetation & Plants	Root uptake	Low (due to copper concentrations identified in the Made Ground).
	Building & Structures	Direct contact with water supply pipes and underground concrete structures	Low to medium –. elevated TOC/DOC within underlying soils/Made Ground.
Explosive / asphyxiating gases from underlying soils/Made Ground, if present	Internal building spaces and current/ future occupiers	Migration of gases/vapour through the surface and via permeable soils	Low - based on the results of the ground gas monitoring.
Organic/inorganic contaminants within underlying soils/Made Ground	Local surface water bodies	Lateral migration of contaminants	Low to medium – due to concentrations of metals, TPH, PAH.
	Groundwater	Lateral migration of contaminants Vertical migration of contaminants	Low to medium – due to concentrations of metals, TPH, PAH

[25] *https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm*

Source/Medium	Receptor	Potential Exposure Route	Risk Rating
Off-site sources	Ground and groundwater conditions beneath the study site	Lateral migration of contaminants. Vertical migration of contaminants.	Low to medium – due to concentrations of metals, TPH, PAH

RECEIVED: 16/10/2025

7.2 Risks to Human Health

The measured concentrations for the determinants analysed in the samples are below the assessment criteria and therefore are not considered to present an unacceptable risk to human health based on residential (without private gardens) and residential (with private gardens) land use scenarios.

Based on the gas monitoring conducted on site, a low risk to future users is associated with the concentrations of methane and carbon dioxide recorded.

The risk to construction workers from contaminants in the soil is considered to be low. It is considered that the risk posed to construction workers can be minimised by the use of appropriate health, safety and welfare provisions. These include but are not limited to good site hygiene and the use of appropriate personal protective equipment (PPE).

7.3 Risks to Vegetation and Plants

The risk to vegetation and plants is considered to be low based on the concentrations of phytotoxic contaminants at the site. The risk to vegetation and plants can be mitigated by the use of capping layers in communal landscaping and importation of clean topsoil and growth medium.

7.4 Risks to Controlled Waters

A low to medium risk is considered for controlled waters as elevated concentrations of contaminants were encountered in isolated groundwater samples from the granite bedrock taking into consideration the isolated nature of the recorded exceedances. As discussed in Section 6.5, there were recorded exceedances of the EQS and GTV in three of the six boreholes which indicates that contamination beneath the site occurs in a series of discrete hotspots which may be impacting directly upon groundwater found in the granite bedrock and is not indicative of site-wide contamination.

7.5 Risks to Buildings and Structures

The contaminants encountered beneath the site may pose a risk to underground services, particularly water supply pipes. This risk can be mitigated through the use of appropriate pipework material.

Sources:

S1. Made Ground
S2. Off-site sources

Pathways:

P1. Ingestion & inhalation
P2. Direct dermal contact
P3. Direct contact with underground infrastructure/ pipework
P4. Migration of contaminants through permeable soils and groundwater
P5. Root uptake

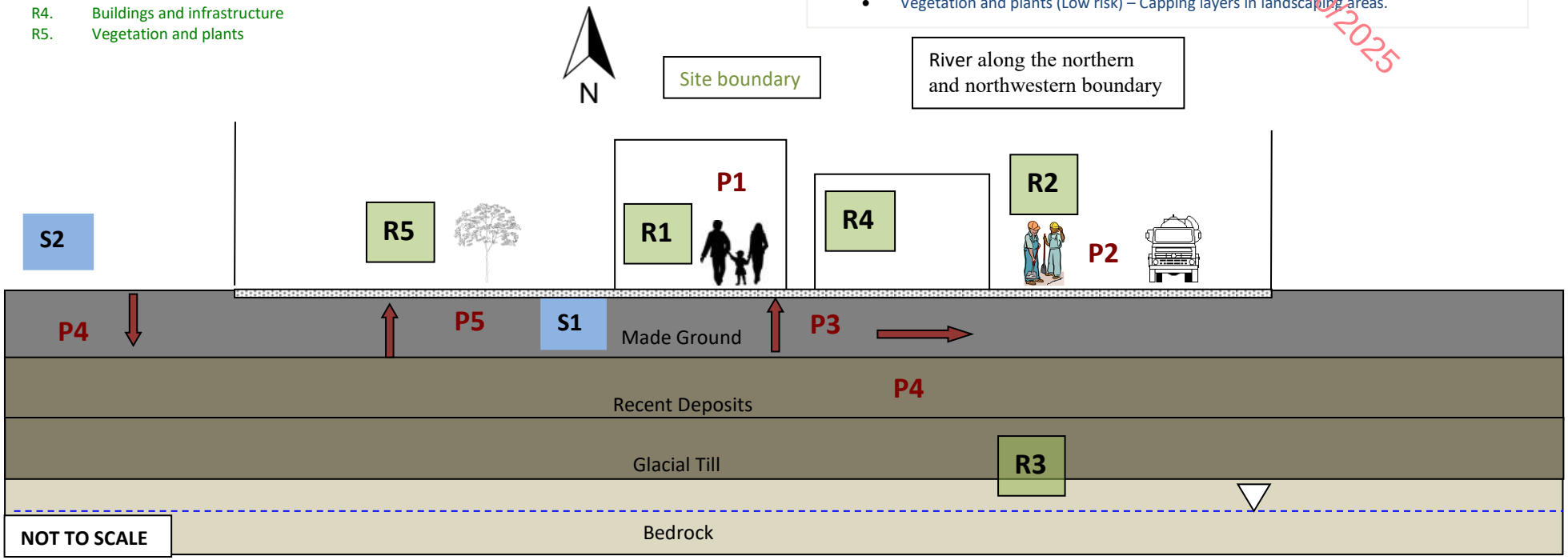
Receptors:

R1. Future occupants
R2. Construction workers
R3. Groundwater/Surface water
R4. Buildings and infrastructure
R5. Vegetation and plants

Risk to receptors and mitigation measures:

- Future occupants (negligible/low risk) – Barrier layers comprising buildings, hard cover or capping in landscaping areas will prevent contact with underlying Made Ground.
- Construction workers (Low to Medium risk) – Appropriate health and safety procedures during demolition and construction and appropriate PPE.
- Buildings and infrastructure (Low to Medium risk) – Appropriate material for service pipes.
- Groundwater/Surface Water (Low Medium risk) – Dewatering and disposal off-site..
- Vegetation and plants (Low risk) – Capping layers in landscaping areas.

RECEIVED: 16/10/2025



MKO	Project: **Western Distributor Road, Knocknacarra, Galway**	Project No: **240142**
	Title: **Conceptual Site Model**	**Figure 7-1**

RECEIVED: 16/10/2025

8. GEOENVIRONMENTAL RECOMMENDATIONS

8.1 Contamination and Remediation

Based on Residential (without private gardens) and Residential (with private gardens) end use scenarios, the result of the samples undertaken to date correlates to low risk, indicating that no protection measures are required for future developments at the site.

Should groundwater be encountered during earthworks or piling operations, dewatering measures may be necessary. Contaminated groundwater may need to be disposed off-site to a licensed waste disposal facility or it may be passed through a three-stage interceptor and discharged to foul sewer under a discharge license from the local authority.

8.2 Gas protection measures

The result of the gas monitoring undertaken to date correlates to a Characteristic 2 Situation.

Based on the data quality check section of NHBC (2023)[26] report, monitoring data should be obtained at least once during falling atmospheric pressure to represent the worst-case conditions. Also, the response zones shouldn't span multiple strata, without access restrictions. Due to limitations in the current dataset (e.g. the absence of readings under falling barometric pressure conditions, monitoring wells spanning multiple strata and the data limitation due to restricted site access), the data cannot be considered fully compliant with guidance. It is therefore recommended that further ground gas monitoring be undertaken to obtain a qualified dataset.

According to CIRIA Report 659[24], ground gas mitigation can be achieved either by constructing a reinforced concrete cast in situ floor slab—whether suspended, non-suspended, or raft foundation—incorporating at least a 1200 g damp proof membrane (DPM) together with underfloor ventilation; or alternatively by using a beam and block system or pre-cast concrete floor, combined with a 2000 g DPM or reinforced gas membrane, and underfloor ventilation..

8.3 Underground services

In accordance with current UKWIR guidance, the use of barrier pipes for water supply may be required in some areas of the site, to prevent possible permeation of contaminants into drinking water supplies.

8.4 Material Management and Waste Classification

It may be prudent to undertake further soil sampling at the site in advance of individual phases of development, in order to fully delineate the areas for waste management planning purposes and to reduce disposal costs.

8.4.1 Re-use, Recycling and Recovery

In order to minimise the volumes of soils for off-site disposal/recovery, it is prudent to consider material management options prior to waste disposal/recovery. The on-site re-use of uncontaminated excavated materials is excluded from the provisions of the Waste Management Acts when it meets the following criteria:

[26] *NHBC (2023). Hazardous Ground Gas – An Essential Guide for Housebuilders. Milton Keynes: National House Building Council.*

- The material must be uncontaminated.
- The material must not comprise of bricks rubble or other man-made substances or objects.
- It must have been excavated as part of the construction activities and be used on the site from which it was excavated for the purposes of construction.
- The holder of the material must be able to demonstrate that the material will definitely be used. Intention of use is not considered satisfactory.

RECEIVED: 16/10/2025

8.4.2 Waste Recovery/Disposal

Where offsite recovery or disposal is required, the available laboratory results indicates that of the 78 samples taken, 20 are classified as hazardous under the waste classification criteria (see Figure 8-1). 15 samples are classified as inert waste. (i.e. inert or non-hazardous) for waste recovery/disposal purposes.

The results of the Waste Acceptance Criteria (WAC) testing and waste characterisation (as per the HazWasteOnline classifications) is presented in Table 8-1 and Section 5.3.3.

Table 8-1 Summary of Waste Acceptance Criteria Testing

Sample Location	Depth (mbgl)	Stratum	Characterisation[1]	Landfill Type[2] based on WAC Results
ETP04	1	Made Ground	Not-hazardous	Hazardous Waste
TP10a	0.4	Made Ground	Not-hazardous	Hazardous Waste
ETP03	0.5	Made Ground	Not-hazardous	Hazardous Waste
TP04	1	Made Ground	Not-hazardous	Hazardous Waste
TP05	0.5	Natural	Not-hazardous	Inert Waste
TP09	0.5	Natural	Not-hazardous	Hazardous Waste
TP08	0.5	Made Ground	Not-hazardous	Inert Waste
BH08	1	Natural	Not-hazardous	Inert Waste
ETP02	0.5	Natural	Not-hazardous	Hazardous Waste
ETP02	1	Natural	Not-hazardous	Inert Waste
ETP08	0.5	Natural	Not-hazardous	Inert Waste
TP02	0.5	Natural	Not-hazardous	Hazardous Waste
TP03	0.5	Natural	Not-hazardous	Hazardous Waste
TP03	1	Natural	Not-hazardous	Inert Waste
TP16	0.5	Made Ground	Not-hazardous	Hazardous Waste
TP17	0.5	Natural	Not-hazardous	Inert Waste
BH05	1	Made Ground	Not-hazardous	Inert Waste
BH07	1	Natural	Not-hazardous	Hazardous Waste

Sample Location	Depth (mbgl)	Stratum	Characterisation[1]	Landfill Type[2] based on WAC Results
ETP07	0.5	Made Ground	Not-hazardous	Hazardous Waste
ETP07	1	Made Ground	Hazardous	Hazardous Waste
SL01	0.85	Made Ground	Not-hazardous	Inert Waste
SL02	1.2	Made Ground	Not-hazardous	Inert Waste
SL03	1.15	Made Ground	Not-hazardous	Hazardous Waste
SL04	1.4	Natural	Not-hazardous	Hazardous Waste
SL05	1.4	Made Ground	Not-hazardous	Inert Waste
SL06	0.8	Natural	Not-hazardous	Hazardous Waste
SL07	1	Made Ground	Not-hazardous	Inert Waste
SL07	2	Made Ground	Not-hazardous	Hazardous Waste
SL08	2	Made Ground	Not-hazardous	Inert Waste
SL09	1	Made Ground	Not-hazardous	Hazardous Waste
SL09	2	Made Ground	Not-hazardous	Hazardous Waste
SL12	2	Made Ground	Not-hazardous	Inert Waste
SL13	1.8	Made Ground	Not-hazardous	Hazardous Waste
SL15	1	Made Ground	Not-hazardous	Inert Waste
TP04	0.5	Made Ground	Not-hazardous	Hazardous Waste

RECEIVED: 16/10/2025

Notes
1. Not hazardous i.e., inert or non-hazardous
2. Non-hazardous i.e. waste which is not classified as hazardous waste.

Please note that acceptance at an inert landfill would be subject to confirmation by the selected permitted facility.

It may also be possible to dispose of the non-hazardous material to a licensed soil waste recovery facility, where disposal does not incur landfill tax. This should be discussed with a suitable facility.

All material intended for off-site disposal should be transported and disposed in accordance with the Waste Management Act 1996 and Environmental Protection Agency Act, 1992.

8.4.3 Asbestos

The result of the monitoring undertaken to date indicates that there are no asbestos-containing materials present on site – indicating that no asbestos protection measures are required for future developments at the site.

Map Legend

- Hazardous Waste Location
- Inert Waste Location
- Site Boundary

Microsoft product screen shots reprinted with permission from Microsoft Corporation
© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517

N

Drawing Title
Waste Classification

Project Title
King Knocknacarra, Galway

Drawn By	Checked By
FZ	EOS
Project No.	Drawing No.
240142	Figure 8-1
Scale	Date
1:3,000	03.10.25

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

RECEIVED: 16/10/2025

8.5 Health and Safety

All site works should be undertaken in accordance with the guidelines prepared by the Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended)[27]. Works should also be carried out in accordance with the Construction and Environmental Management Plan. During the construction of the Proposed Development, precautions should be taken to minimise exposure of workers and the general public to potentially harmful substances. Attention should also be paid to restricting possible off-site nuisance such as dust and odour emissions. Such precautions should include, but not be limited to:

1. *Personal hygiene, washing and changing procedures.*
2. *Adequate personal protective equipment, including, but not limited to, disposable overalls, gloves and particulate filter masks/vapour respirators, where required.*
3. *Measures to avoid surface water ponding and positive collection and disposal of onsite run-off.*
4. *Regular cleaning of site roads, access roads and the public highway including dust suppressions methods (e.g. water spraying), if necessary.*
5. *Waste haulage vehicles should be covered when leaving the site to minimise the release of airborne particulates.*

[27] *Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021 (S.I. No. 528 of 2021)*

BIBLIOGRAPHY

RECEIVED: 26/10/2025

BSI (2015). Specification for Topsoil. BS 3882:2015. London: BSI Standards Publication.

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

Council of the European Communities (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive). Official Journal of the European Communities, L206, 7–50.Environment Agency (2020). Land contamination risk management (LCRM). Last updated 12 June 2025. GOV.UK. Available at: https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

Environmental Protection Agency (2003). Towards Setting Guideline Values for the Protection of Groundwater in Ireland: Interim Report. Wexford: EPA.

European Communities (2009). Environmental Objectives (Surface Water) Regulations 2009. S.I. No. 272 of 2009. Dublin: Stationery Office.

European Communities (2010). Environmental Objectives (Groundwater) Regulations 2010. S.I. No. 9 of 2010. Dublin: Stationery Office.

European Union (2015). Environmental Objectives (Surface Waters) (Amendment) Regulations 2015. S.I. No. 386 of 2015. Dublin: Stationery Office.

European Union (2016). Environmental Objectives (Groundwater) (Amendment) Regulations 2016. S.I. No. 366 of 2016. Dublin: Stationery Office.

European Union (2019). Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. S.I. No. 77 of 2019. Dublin: Stationery Office.

European Union (2025). Environmental Objectives (Surface Waters) (Amendment) Regulations 2025. S.I. No. 50 of 2025. Dublin: Stationery Office.

European Union (2025). Environmental Objectives (Groundwater) (Amendment) Regulations 2025. S.I. No. 51 of 2025. Dublin: Stationery Office.

Government of Ireland (2021). Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021. S.I. No. 528 of 2021. Dublin: Stationery Office.

NHBC (2023). Hazardous Ground Gas – An Essential Guide for Housebuilders. Milton Keynes: National House Building Council.

SI (2015). Specification for Topsoil. BS 3882:2015. London: BSI Standards Publication.

UK Water Industry Research (UKWIR) (2010). Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites. London: UKWIR.

Wilson, S., Card, G., Haines, S. & Lunny, R. (2006/2007). Characteristic situations for assessing risks from hazardous ground gases to buildings. CIRIA Report C149. London: CIRIA.

Wilson, S., Card, G. & Haines, S. (2007). Assessing risks posed by hazardous ground gases to buildings. CIRIA Report C665. London: CIRIA.

RECEIVED: 16/10/2025

APPENDIX 1

SURFACE WATER SCREENING

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	XX	Detection		

										Round	Groundwater Round 1			Groundwater Round 2					
										Sample ID	BH25	BH19	BH01	BH01	BH26	BH25	BH08	BH19	BH02
										Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
										Sampled Date	17/06/2025	17/06/2025	17/06/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025
Test	**Method**	**Units**	**LOD**	**GTV / IGV**	**No. of GTV / IGV Exceedances**	**Minimum (result above detection limit)**	**Mean**	**Maximum**	**No. of Samples**		x	x	x	x	x	x	x	x	x
Physicochemical																			
Apparent Colour	TM35/PM0	mg/l PtCo	<15	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
BOD (Settled)	TM58/PM0	mg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
COD (Settled)	TM57/PM0	mg/l	<7	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Oxygen	TM58/PM0	mg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Organic Carbon	TM60/PM0	mg/l	<2	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Suspended Solids	TM37/PM0	mg/l	<10	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Turbidity	TM34/PM0	NTU	<0.1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
pH	TM73/PM0	pH units	<0.01	≥ 6.5 and ≤ 9.5	0	6.5	7.2	7.81	9		**7.81**	**7.77**	**7.77**	**7.17**	**7.04**	**7.04**	**7.03**	**6.8**	**6.5**
Electrical Conductivity @25C	TM76/PM0	µS/cm	<2	1875	0	405	715	961	9		**961**	**755**	**876**	**669**	**949**	**670**	**444**	**705**	**405**
Total Alkalinity as CaCO3	TM75/PM0	mg/l	<1	nc	0	86	196	292	9		**214**	**156**	**212**	**230**	**292**	**238**	**86**	**226**	**108**
Nutrients																			
Ortho Phosphate as P	TM38/PM0	mg/l	<0.03	0.035	0	0.03	0.03	0.03	9		<0.03	<0.03	<0.03	<0.03	**0.03**	<0.03	<0.03	<0.03	<0.03
Ammoniacal Nitrogen as N	TM38/PM0	mg/l	<0.03	0.065	6	0.03	1.0	3.23	9		1.06	1.27	3.23	1.41	**0.06**	0.19	<0.03	1.09	**0.03**
Total Oxidised Nitrogen as N	TM38/PM0	mg/l	<0.2	nc	0	1.3	3.3	5.6	9		**1.3**	<0.2	<0.2	<0.2	**5**	**3**	**5.6**	<0.2	**1.7**
Nitrate as N	TM38/PM0	mg/l	<0.05	37.5	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Nitrite as N	TM38/PM0	mg/l	<0.006	0.375	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Ions, Anions and Inorganics																			
Fluoride	TM173/PM0	mg/l	<0.3	1	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Chloride	TM38/PM0	mg/l	<0.3	187.5	0	46.3	81	125	9		**125**	**109.8**	**108.2**	**59.8**	**95.3**	**48.5**	**55.8**	**79.5**	**46.3**
Free Cyanide	TM89/PM0	mg/l	<0.01	0.0375	0	0	-	0	9		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Cyanide	TM89/PM0	mg/l	<0.01	0.0375	0	0.02	0.02	0.02	9		<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	<0.01	<0.01	<0.01
Sulphate as SO4	TM38/PM0	mg/l	<0.5	187.5	0	14.9	31	53.6	9		**53.6**	**34.1**	**43.2**	**21.4**	**48.1**	**20**	**14.9**	**21.8**	**19.9**
Sulphide	TM107/PM0	mg/l	<0.01	187.5	0	0	-	0	9		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thiocyanate	TM107/PM0	mg/l	<0.02	nc	0	0	-	0	9		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Metals																			
Dissolved Aluminium	TM30/PM14	µg/l	<1.5	150	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Antimony	TM30/PM14	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Dissolved Arsenic	TM30/PM14	µg/l	<2.5	7.5	0	3.1	4.2	4.8	9		**4.8**	<2.5	**4.7**	**3.1**	<2.5	<2.5	<2.5	<2.5	<2.5
Dissolved Barium	TM30/PM14	µg/l	<3	100	0	3	23	91	9		**3**	**59**	**18**	**6**	**4**	**14**	**8**	**91**	**3**
Dissolved Beryllium	TM30/PM14	µg/l	<0.5	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Boron	TM30/PM14	µg/l	<12	750	0	22	86	186	9		**186**	**61**	**144**	**81**	**152**	**37**	**22**	**44**	**45**
Dissolved Cadmium	TM30/PM14	µg/l	<0.5	3.75	1	20.3	20	20.3	9		<0.5	<0.5	<0.5	<0.5	<0.5	20.3	<0.5	<0.5	<0.5
Dissolved Calcium	TM30/PM14	mg/l	<0.2	200	0	44.1	64	134.2	9		**52.4**	**51.4**	**46.3**	**69.1**	**134.2**	**84.8**	**49.2**	**45**	**44.1**
Dissolved Cobalt	TM30/PM14	µg/l	<0.1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Dissolved Chromium	TM30/PM14	µg/l	<1.5	37.5	0	0	-	0	9		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Hexavalent Chromium	TM38/PM0	mg/l	<0.006	7.5	0	0	-	0	9		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Dissolved Copper	TM30/PM14	µg/l	<7	1500	0	0	-	0	9		<7	<7	<7	<7	<7	<7	<7	<7	<7
Total Dissolved Iron	TM30/PM14	µg/l	<20	200	3	22	356	1579	9		**97**	**186**	223	352	<20	<20	**36**	1579	**22**
Dissolved Lead	TM30/PM14	µg/l	<5	7.5	0	6	6.0	6	9		<5	<5	<5	<5	<5	**6**	<5	<5	<5
Dissolved Magnesium	TM30/PM14	mg/l	<0.1	50	0	3.8	10	17.8	9		**17.8**	**14.4**	**12**	**7.6**	**15**	**5**	**3.8**	**11.8**	**4.8**
Dissolved Manganese	TM30/PM14	µg/l	<2	50	6	7	881	3715	9		100	1247	264	517	**38**	1997	**7**	3715	**44**
Dissolved Mercury	TM30/PM14	µg/l	<1	0.75	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Molybdenum	TM30/PM14	µg/l	<0.2	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Nickel	TM30/PM14	µg/l	<2	15	0	2	4.5	6	9		**4**	**6**	**5**	**2**	<2	**4**	<2	**6**	<2
Dissolved Phosphorus	TM30/PM14	µg/l	<0.7	0.035	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Potassium	TM30/PM14	mg/l	<0.1	5	5	1.4	6.0	11.5	9		11.1	6.6	11.5	7.9	**4.9**	**2.5**	**1.4**	5.5	**2.3**
Dissolved Selenium	TM30/PM14	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Dissolved Sodium	TM30/PM14	mg/l	<0.1	150	0	18.6	47	76	9		**68.6**	**59.1**	**58.3**	**52.2**	**42.1**	**22.6**	**18.6**	**76**	**21.2**
Dissolved Thallium	TM30/PM14	µg/l	<0.9	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Vanadium	TM30/PM14	µg/l	<0.6	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Zinc	TM30/PM14	µg/l	<3	75	0	5	12	53	9		**5**	**12**	**6**	**7**	**5**	**53**	**5**	**12**	**6**
PAHs																			
Naphthalene	TM4/PM30	µg/l	<0.1	1	0	0	-	0	9		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluorene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Phenanthrene	TM4/PM30	µg/l	<0.005	nc	0	0.005	0.01	0.02	9		**0.02**	**0.008**	**0.017**	**0.006**	**0.005**	**0.006**	<0.005	<0.005	<0.005
Anthracene	TM4/PM30	µg/l	<0.005	10000	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	TM4/PM30	µg/l	<0.005	nc	0	0.005	0.008	0.012	9		**0.012**	**0.005**	**0.01**	<0.005	**0.005**	<0.005	<0.005	<0.005	<0.005
Pyrene	TM4/PM30	µg/l	<0.005	nc	0	0.005	0.007	0.011	9		**0.011**	**0.005**	**0.007**	<0.005	**0.005**	<0.005	<0.005	<0.005	**0.005**
Benzo(a)anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chrysene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(bk)fluoranthene	TM4/PM30	µg/l	<0.008	0.5	0	0	-	0	9		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(b)fluoranthene	TM4/PM30	µg/l	<0.008	0.5	0	0	-	0	9		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(k)fluoranthene	TM4/PM30	µg/l	<0.008	0.05	0	0	-	0	9		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(a)pyrene	TM4/PM30	µg/l	<0.005	0.0075	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Indeno(123cd)pyrene	TM4/PM30	µg/l	<0.005	0.05	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dibenzo(ah)anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(ghi)perylene	TM4/PM30	µg/l	<0.005	0.05	0	0	-	0	9		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
PAH 16 Total	TM4/PM30	µg/l	<0.173	0.075	0	0	-	0	9		<0.173	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173

RECEIVED: 16/10/2025

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	XX	Detection		

										Groundwater Round 1			Groundwater Round 2					
Round																		
Sample ID										BH25	BH19	BH01	BH01	BH26	BH25	BH08	BH19	BH02
Sample Type										Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sampled Date										17/06/2025	17/06/2025	17/06/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025
Test	**Method**	**Units**	**LOD**	**GTV / IGV**	**No. of GTV / IGV Exceedances**	**Minimum (result above detection limit)**	**Mean**	**Maximum**	**No. of Samples**	x	x	x	x	x	x	x	x	x
VOCs																		
Benzene	TM15/PM10	µg/l	<0.5	0.75	0	0	-	0	9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromochloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromodichloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromoform	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromomethane	TM15/PM10	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
n-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
sec-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
tert-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Carbon tetrachloride	TM15/PM10	µg/l	<2	2	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	TM15/PM10	µg/l	<2	1	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloroethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloroform	TM15/PM10	µg/l	<2	12	0	3	3.0	3	9	<2	<2	**3**	<2	<2	<2	<2	<2	<2
Chloromethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
2-Chlorotoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
4-Chlorotoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,2-Dibromo-3-chloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dibromomethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dibromoethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dichlorodifluoromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichloroethane	TM15/PM10	µg/l	<2	2.25	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethene (1,1 DCE)	TM15/PM10	µg/l	<3	30	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
cis-1-2-Dichloroethene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
trans-1-2-Dichloroethene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Dichloromethane (DCM)	TM15/PM10	µg/l	<3	15	0	4	4.5	5	9	<3	<3	<3	<3	<3	<3	**4**	**5**	<3
1,2-Dichloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,3-Dichloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
2,2-Dichloropropane	TM15/PM10	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloropropene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
cis-1-3-Dichloropropene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
trans-1-3-Dichloropropene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	TM15/PM10	µg/l	<1	10	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Isopropylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
4-Isopropyltoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Propylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Styrene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,1,2-Tetrachloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2,2-Tetrachloroethane	TM15/PM10	µg/l	<4	nc	0	0	-	0	9	<4	<4	<4	<4	<4	<4	<4	<4	<4
Tetrachloroethene (PCE)	TM15/PM10	µg/l	<3	7.5	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Toluene	TM15/PM10	µg/l	<5	525	0	0	-	0	9	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3-Trichlorobenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,4-Trichlorobenzene	TM16/PM30	µg/l	<1	0.4	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	TM15/PM10	µg/l	<2	500	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2-Trichloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Trichloroethene (TCE)	TM15/PM10	µg/l	<3	7.5	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Trichlorofluoromethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,3-Trichloropropane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,4-Trimethylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,3,5-Trimethylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Vinyl Chloride	TM15/PM10	µg/l	<0.1	0.375	0	0	-	0	9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-Xylene	TM15/PM10	µg/l	<2	10	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
o-Xylene	TM15/PM10	µg/l	<1	10	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl Tertiary Butyl Ether	TM15/PM10	µg/l	<0.1	10	0	0	-	0	9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorocyclopentadiene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenols																		
4-Chloro-3-methylphenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorophenol	TM16/PM30	µg/l	<1	200	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Methylphenol	TM16/PM30	µg/l	<0.5	0.5	0	0	-	0	9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dimethylphenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Methylphenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Nitrophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Nitrophenol	TM16/PM30	µg/l	<10	nc	0	0	-	0	9	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	TM16/PM30	µg/l	<1	2	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenol	TM26/PM0	mg/l	<0.01	nc	0	0	-	0	6	nt	nt	nt	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4,6-Trichlorophenol	TM16/PM30	µg/l	<1	200	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,5-Trichlorophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

RECEIVED: 16/10/2025

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	XX	Detection		

RECEIVED: 16/10/2025

Test	Method	Units	LOD	GTV / IGV	No. of GTV / IGV Exceedances	Minimum (result above detection limit)	Mean	Maximum	No. of Samples	Round	Groundwater Round 1			Groundwater Round 2					
										Sample ID	BH25	BH19	BH01	BH01	BH26	BH25	BH08	BH19	BH02
										Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
										Sampled Date	17/06/2025	17/06/2025	17/06/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025
											x	x	x	x	x	x	x	x	x
Other SVOCs																			
2-Chloronaphthalene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Nitroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-Dinitrotoluene	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
3-Nitroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Bromophenylphenylether	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chloroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chlorophenylphenylether	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Nitroaniline	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azobenzene	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Butylbenzyl phthalate	TM16/PM30	µg/l	<1	5	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Bis(2-chloroethoxy)methane	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Bis(2-ethylhexyl) phthalate	TM16/PM30	µg/l	<5	6	0	0	-	0	9		<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbazole	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diethyl phthalate	TM16/PM30	µg/l	<1	5	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Dimethyl phthalate	TM16/PM30	µg/l	<1	5	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Di-n-butyl phthalate	TM16/PM30	µg/l	<1.5	5	0	0	-	0	9		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Di-n-Octyl phthalate	TM16/PM30	µg/l	<1	5	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachloroethane	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Isophorone	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene	TM16/PM30	µg/l	<1	10	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
N-nitrosodi-n-propylamine	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Methylnaphthalene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH CWG																			
>C5-C6	TM36/PM12	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>C6-C8	TM36/PM12	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>C8-C10	TM36/PM12	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>C10-C12	TM5/PM16/PM30	µg/l	<5	10	3	42	58	75	9		75	42	57	<5	<5	<5	<5	<5	<5
>C12-C16	TM5/PM16/PM30	µg/l	<10	10	4	80	1,608	2350	9		2350	2220	1780	80	<10	<10	<10	<10	<10
>C16-C21	TM5/PM16/PM30	µg/l	<10	10	3	30	30	30	9		30	30	30	<10	<10	<10	<10	<10	<10
>C21-C35	TM5/PM16/PM30	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aliphatics C5-35	TM36/PM12/PM16/I	µg/l	<10	10	4	80	1,674	2455	9		2455	2292	1867	80	<10	<10	<10	<10	<10
>C5-EC7	TM36/PM12	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC7-EC8	TM36/PM12	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC8-EC10	TM36/PM12	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC10-EC12	TM5/PM16/PM30	µg/l	<5	10	0	0	-	0	9		<5	<5	<5	<5	<5	<5	<5	<5	<5
>EC12-EC16	TM5/PM16/PM30	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC16-EC21	TM5/PM16/PM30	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC21-EC35	TM5/PM16/PM30	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aromatics C5-35	TM36/PM12/PM16/I	µg/l	<10	10	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aliphatics and aromatics(C5-35)	TM36/PM12/PM16/I	µg/l	<10	7.5	4	80	1,674	2455	9		2455	2292	1867	80	<10	<10	<10	<10	<10

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	**XX**	Detection		

										Groundwater Round 1			Groundwater Round 2					
									Round									
									Sample ID	BH25	BH19	BH01	BH01	BH26	BH25	BH08	BH19	BH02
									Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
									Sampled Date	17/06/2025	17/06/2025	17/06/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025
Test	**Method**	**Units**	**LOD**	**DWS**	**No. of DWS Exceedances**	**Minimum (result above detection limit)**	**Mean**	**Maximum**	**No. of Samples**	x	x	x	x	x	x	x	x	x
Physicochemical																		
Apparent Colour	TM35/PM0	mg/l PtCo	<15	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
BOD (Settled)	TM58/PM0	mg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
COD (Settled)	TM57/PM0	mg/l	<7	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Oxygen	TM58/PM0	mg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Organic Carbon	TM60/PM0	mg/l	<2	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Suspended Solids	TM37/PM0	mg/l	<10	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Turbidity	TM34/PM0	NTU	<0.1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
pH	TM73/PM0	pH units	<0.01	> 6.5 and < 9.5	0	6.5	7.2	7.81	9	**7.81**	**7.77**	**7.77**	**7.17**	**7.04**	**7.04**	**7.03**	**6.8**	**6.5**
Electrical Conductivity @25C	TM76/PM0	µS/cm	<2	2500	0	405	715	961	9	**961**	**755**	**876**	**669**	**949**	**670**	**444**	**705**	**405**
Total Alkalinity as CaCO3	TM75/PM0	mg/l	<1	nc	0	86	196	292	9	**214**	**156**	**212**	**230**	**292**	**238**	**86**	**226**	**108**
Nutrients																		
Ortho Phosphate as P	TM38/PM0	mg/l	<0.03	nc	0	0.03	0.03	0.03	9	<0.03	<0.03	<0.03	<0.03	**0.03**	<0.03	<0.03	<0.03	<0.03
Ammoniacal Nitrogen as N	TM38/PM0	mg/l	<0.03	0.5	5	0.03	1.0	3.23	9	1.06	1.27	3.23	1.41	**0.06**	**0.19**	<0.03	1.09	**0.03**
Total Oxidised Nitrogen as N	TM38/PM0	mg/l	<0.2	50.5	0	1.3	3.3	5.6	9	**1.3**	<0.2	<0.2	<0.2	**5**	**3**	**5.6**	<0.2	**1.7**
Nitrate as N	TM38/PM0	mg/l	<0.05	50	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Nitrite as N	TM38/PM0	mg/l	<0.006	0.5	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Ions, Anions and Inorganics																		
Fluoride	TM173/PM0	mg/l	<0.3	1.5	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Chloride	TM38/PM0	mg/l	<0.3	250	0	46.3	81	125	9	**125**	**109.8**	**108.2**	**59.8**	**95.3**	**48.5**	**55.8**	**79.5**	**46.3**
Free Cyanide	TM89/PM0	mg/l	<0.01	0.05	0	0	-	0	9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Cyanide	TM89/PM0	mg/l	<0.01	0.05	0	0.02	0.02	0.02	9	<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	<0.01	<0.01	<0.01
Sulphate as SO4	TM38/PM0	mg/l	<0.5	250	0	14.9	31	53.6	9	**53.6**	**34.1**	**43.2**	**21.4**	**48.1**	**20**	**14.9**	**21.8**	**19.9**
Sulphide	TM107/PM0	mg/l	<0.01	250	0	0	-	0	9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thiocyanate	TM107/PM0	mg/l	<0.02	nc	0	0	-	0	9	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Metals																		
Dissolved Aluminium	TM30/PM14	µg/l	<1.5	200	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Antimony	TM30/PM14	µg/l	<2	10	0	0	-	0	9	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dissolved Arsenic	TM30/PM14	µg/l	<2.5	10	0	3.1	4.2	4.8	9	**4.8**	<2.5	**4.7**	**3.1**	<2.5	<2.5	<2.5	<2.5	<2.5
Dissolved Barium	TM30/PM14	µg/l	<3	nc	0	3	23	91	9	**3**	**59**	**18**	**6**	**4**	**14**	**8**	**91**	**3**
Dissolved Beryllium	TM30/PM14	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Boron	TM30/PM14	µg/l	<12	1500	0	22	86	186	9	**186**	**61**	**144**	**81**	**152**	**37**	**22**	**44**	**45**
Dissolved Cadmium	TM30/PM14	µg/l	<0.5	5	1	20.3	20	20.3	9	<0.5	<0.5	<0.5	<0.5	<0.5	20.3	<0.5	<0.5	<0.5
Dissolved Calcium	TM30/PM14	mg/l	<0.2	nc	0	44.1	64	134.2	9	**52.4**	**51.4**	**46.3**	**69.1**	**134.2**	**84.8**	**49.2**	**45**	**44.1**
Dissolved Cobalt	TM30/PM14	µg/l	<0.1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Dissolved Chromium	TM30/PM14	µg/l	<1.5	25	0	0	-	0	9	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Hexavalent Chromium	TM38/PM0	mg/l	<0.006	nc	0	0	-	0	9	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Dissolved Copper	TM30/PM14	µg/l	<7	2000	0	0	-	0	9	<7	<7	<7	<7	<7	<7	<7	<7	<7
Total Dissolved Iron	TM30/PM14	µg/l	<20	200	3	22	356	1579	9	**97**	**186**	223	352	<20	<20	**36**	1579	**22**
Dissolved Lead	TM30/PM14	µg/l	<5	5	1	6	6.0	6	9	<5	<5	<5	<5	<5	6	<5	<5	<5
Dissolved Magnesium	TM30/PM14	mg/l	<0.1	nc	0	3.8	10	17.8	9	**17.8**	**14.4**	**12**	**7.6**	**15**	**5**	**3.8**	**11.8**	**4.8**
Dissolved Manganese	TM30/PM14	µg/l	<2	50	6	7	881	3715	9	100	1247	264	517	**38**	1997	**7**	3715	**44**
Dissolved Mercury	TM30/PM14	µg/l	<1	1	0	0	-	0	9	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Molybdenum	TM30/PM14	µg/l	<0.2	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Nickel	TM30/PM14	µg/l	<2	20	0	2	4.5	6	9	**4**	**6**	**5**	**2**	<2	**4**	<2	**6**	<2
Dissolved Phosphorus	TM30/PM14	µg/l	<0.7	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Potassium	TM30/PM14	mg/l	<0.1	nc	0	1.4	6.0	11.5	9	**11.1**	**6.6**	**11.5**	**7.9**	**4.9**	**2.5**	**1.4**	**5.5**	**2.3**
Dissolved Selenium	TM30/PM14	µg/l	<3	20	0	0	-	0	9	<3	<3	<3	<3	<3	<3	<3	<3	<3
Dissolved Sodium	TM30/PM14	mg/l	<0.1	200	0	18.6	47	76	9	**68.6**	**59.1**	**58.3**	**52.2**	**42.1**	**22.6**	**18.6**	**76**	**21.2**
Dissolved Thallium	TM30/PM14	µg/l	<0.9	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Vanadium	TM30/PM14	µg/l	<0.6	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt	nt	nt	nt
Dissolved Zinc	TM30/PM14	µg/l	<3	nc	0	5	12	53	9	**5**	**12**	**6**	**7**	**5**	**53**	**5**	**12**	**6**
PAHs																		
Naphthalene	TM4/PM30	µg/l	<0.1	nc	0	0	-	0	9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluorene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Phenanthrene	TM4/PM30	µg/l	<0.005	nc	0	0.005	0.01	0.02	9	**0.02**	**0.008**	**0.017**	**0.006**	**0.005**	**0.006**	<0.005	<0.005	<0.005
Anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	TM4/PM30	µg/l	<0.005	nc	0	0.005	0.008	0.012	9	**0.012**	**0.005**	**0.01**	<0.005	**0.005**	<0.005	<0.005	<0.005	<0.005
Pyrene	TM4/PM30	µg/l	<0.005	nc	0	0.005	0.007	0.011	9	**0.011**	**0.005**	**0.007**	<0.005	**0.005**	<0.005	<0.005	<0.005	**0.005**
Benzo(a)anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chrysene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(bk)fluoranthene	TM4/PM30	µg/l	<0.008	nc	0	0	-	0	9	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(b)fluoranthene	TM4/PM30	µg/l	<0.008	nc	0	0	-	0	9	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(k)fluoranthene	TM4/PM30	µg/l	<0.008	nc	0	0	-	0	9	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(a)pyrene	TM4/PM30	µg/l	<0.005	0.01	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Indeno(123cd)pyrene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dibenzo(ah)anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(ghi)perylene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
PAH 16 Total	TM4/PM30	µg/l	<0.173	0.1	0	0	-	0	9	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173

RECEIVED: 16/10/2025

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	XX	Detection		

RECEIVED: 16/10/2025

Test	Method	Units	LOD	DWS	No. of DWS Exceedances	Minimum (result above detection limit)	Mean	Maximum	No. of Samples	Round	Groundwater Round 1			Groundwater Round 2					
										Sample ID	BH25	BH19	BH01	BH01	BH26	BH25	BH08	BH19	BH02
										Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
										Sampled Date	17/06/2025	17/06/2025	17/06/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025
											x	x	x	x	x	x	x	x	x
VOCs																			
Benzene	TM15/PM10	µg/l	<0.5	1	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromochloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromodichloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromoform	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromomethane	TM15/PM10	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
n-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
sec-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
tert-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Carbon tetrachloride	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloroethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloroform	TM15/PM10	µg/l	<2	nc	0	3	3.0	3	9		<2	<2	**3**	<2	<2	<2	<2	<2	<2
Chloromethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
2-Chlorotoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
4-Chlorotoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
1,2-Dibromo-3-chloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Dibromomethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dibromoethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Dichlorodifluoromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichloroethane	TM15/PM10	µg/l	<2	3	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethene (1,1 DCE)	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
cis-1-2-Dichloroethene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
trans-1-2-Dichloroethene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Dichloromethane (DCM)	TM15/PM10	µg/l	<3	nc	0	4	4.5	5	9		<3	<3	<3	<3	<3	<3	**4**	**5**	<3
1,2-Dichloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
1,3-Dichloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
2,2-Dichloropropane	TM15/PM10	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloropropene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
cis-1-3-Dichloropropene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
trans-1-3-Dichloropropene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	TM15/PM10	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Isopropylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
4-Isopropyltoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Propylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Styrene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,1,2-Tetrachloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2,2-Tetrachloroethane	TM15/PM10	µg/l	<4	nc	0	0	-	0	9		<4	<4	<4	<4	<4	<4	<4	<4	<4
Tetrachloroethene (PCE)	TM15/PM10	µg/l	<3	10	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Toluene	TM15/PM10	µg/l	<5	nc	0	0	-	0	9		<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2,3-Trichlorobenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,4-Trichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2-Trichloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
Trichloroethene (TCE)	TM15/PM10	µg/l	<3	10	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Trichlorofluoromethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,3-Trichloropropane	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,4-Trimethylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
1,3,5-Trimethylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	9		<3	<3	<3	<3	<3	<3	<3	<3	<3
Vinyl Chloride	TM15/PM10	µg/l	<0.1	0.5	0	0	-	0	9		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-Xylene	TM15/PM10	µg/l	<2	nc	0	0	-	0	9		<2	<2	<2	<2	<2	<2	<2	<2	<2
o-Xylene	TM15/PM10	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl Tertiary Butyl Ether	TM15/PM10	µg/l	<0.1	nc	0	0	-	0	9		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorocyclopentadiene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenols																			
4-Chloro-3-methylphenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorophenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Methylphenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dimethylphenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Methylphenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Nitrophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Nitrophenol	TM16/PM30	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenol	TM26/PM0	mg/l	<0.01	nc	0	0	-	0	6		nt	nt	nt	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4,6-Trichlorophenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,5-Trichlorophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	XX	Detection		

RECEIVED: 16/10/2025

										Round	Groundwater Round 1			Groundwater Round 2					
										Sample ID	BH25	BH19	BH01	BH01	BH26	BH25	BH08	BH19	BH02
										Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
										Sampled Date	17/06/2025	17/06/2025	17/06/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025	21/07/2025
Test	**Method**	**Units**	**LOD**	**DWS**	**No. of DWS Exceedances**	**Minimum (result above detection limit)**	**Mean**	**Maximum**	**No. of Samples**		x	x	x	x	x	x	x	x	x
Other SVOCs																			
2-Chloronaphthalene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Nitroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-Dinitrotoluene	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
3-Nitroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Bromophenylphenylether	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chloroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chlorophenylphenylether	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Nitroaniline	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azobenzene	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Butylbenzyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Bis(2-chloroethoxy)methane	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Bis(2-ethylhexyl) phthalate	TM16/PM30	µg/l	<5	nc	0	0	-	0	9		<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbazole	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diethyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Dimethyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Di-n-butyl phthalate	TM16/PM30	µg/l	<1.5	nc	0	0	-	0	9		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Di-n-Octyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachloroethane	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
Isophorone	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
N-nitrosodi-n-propylamine	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	9		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Methylnaphthalene	TM16/PM30	µg/l	<1	nc	0	0	-	0	9		<1	<1	<1	<1	<1	<1	<1	<1	<1
TPH CWG																			
>C5-C6	TM36/PM12	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>C6-C8	TM36/PM12	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>C8-C10	TM36/PM12	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>C10-C12	TM5/PM16/PM30	µg/l	<5	nc	0	42	58	75	9		**75**	**42**	**57**	<5	<5	<5	<5	<5	<5
>C12-C16	TM5/PM16/PM30	µg/l	<10	nc	0	80	1,608	2350	9		**2350**	**2220**	**1780**	**80**	<10	<10	<10	<10	<10
>C16-C21	TM5/PM16/PM30	µg/l	<10	nc	0	30	30	30	9		**30**	**30**	**30**	<10	<10	<10	<10	<10	<10
>C21-C35	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aliphatics C5-35	TM36/PM12/PM16/I	µg/l	<10	nc	0	80	1,674	2455	9		**2455**	**2292**	**1867**	**80**	<10	<10	<10	<10	<10
>C5-EC7	TM36/PM12	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC7-EC8	TM36/PM12	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC8-EC10	TM36/PM12	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC10-EC12	TM5/PM16/PM30	µg/l	<5	nc	0	0	-	0	9		<5	<5	<5	<5	<5	<5	<5	<5	<5
>EC12-EC16	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC16-EC21	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC21-EC35	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aromatics C5-35	TM36/PM12/PM16/I	µg/l	<10	nc	0	0	-	0	9		<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aliphatics and aromatics(C5-35)	TM36/PM12/PM16/I	µg/l	<10	nc	0	80	1,674	2455	9		**2455**	**2292**	**1867**	**80**	<10	<10	<10	<10	<10

RECEIVED: 16/10/2025

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	XX	Detection		

Test	Method	Units	LOD	MAC-EQS	No. of MAC-EQS Exceedances	Minimum (result above detection limit)	Mean	Maximum	No. of Samples	Surface Water Round 1			Surface Water Round 2		
Round										Surface Water Round 1			Surface Water Round 2		
Sample ID										SW01	SW02	SW03	SW01	SW02	SW03
Sample Type										Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Sampled Date										17/09/2025	17/09/2025	17/09/2025	29/09/2025	29/09/2025	29/09/2025
Physicochemical															
Apparent Colour	TM35/PM0	mg/l PtCo	<15	nc	0	37	120	346	6	**174**	**45**	**66**	**37**	**346**	**54**
BOD (Settled)	TM58/PM0	mg/l	<1	nc	0	0	-	0	6	<3	<1	<2	<1	<1	<1
COD (Settled)	TM57/PM0	mg/l	<7	nc	0	15	22	31	6	**31**	**15**	**27**	**20**	<7	**16**
Dissolved Oxygen	TM58/PM0	mg/l	<1	nc	0	8	9.3	10	6	**9**	**10**	**10**	**8**	**9**	**10**
Total Organic Carbon	TM60/PM0	mg/l	<2	nc	0	3	6.5	11	6	**11**	**4**	**7**	**9**	**3**	**5**
Total Suspended Solids	TM37/PM0	mg/l	<10	nc	0	12	46	113	6	**12**	<10	<10	**12**	**113**	<10
Turbidity	TM34/PM0	NTU	<0.1	nc	0	1.9	8.8	29.8	6	**13.2**	**2.9**	**2.3**	**1.9**	**29.8**	**2.7**
pH	TM73/PM0	pH units	<0.01	> 6.5 and < 9.5	0	6.34	7.2	8.18	6	**7.07**	**6.34**	**7.33**	**7.01**	**7.21**	**8.18**
Electrical Conductivity @25C	TM76/PM0	µS/cm	<2	2500	0	126	278	524	6	**314**	**265**	**524**	**126**	**165**	**274**
Total Alkalinity as CaCO3	TM75/PM0	mg/l	<1	nc	0	40	91	152	6	**82**	**64**	**152**	**40**	**60**	**150**
Nutrients															
Ortho Phosphate as P	TM38/PM0	mg/l	<0.03	nc	0	0.04	0.04	0.04	6	<0.03	<0.03	<0.03	<0.03	<0.03	**0.04**
Ammoniacal Nitrogen as N	TM38/PM0	mg/l	<0.03	0.5	0	0.03	0.12	0.25	6	<0.03	<0.03	**0.09**	**0.03**	<0.03	**0.25**
Total Oxidised Nitrogen as N	TM38/PM0	mg/l	<0.2	50.5	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Nitrate as N	TM38/PM0	mg/l	<0.05	50	0	0.08	0.97	1.92	6	**0.21**	**0.92**	**1.92**	**1.07**	**0.08**	**1.64**
Nitrite as N	TM38/PM0	mg/l	<0.006	0.5	0	0.048	0.05	0.048	6	<0.006	<0.006	<0.006	<0.006	<0.006	**0.048**
Ions, Anions and Inorganics															
Fluoride	TM173/PM0	mg/l	<0.3	1.5	0	0	-	0	6	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chloride	TM38/PM0	mg/l	<0.3	250	0	34.9	37	41	6	**38.6**	**37.1**	**35.3**	**34.9**	**41**	**37.2**
Free Cyanide	TM89/PM0	mg/l	<0.01	0.05	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Total Cyanide	TM89/PM0	mg/l	<0.01	0.05	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Sulphate as SO4	TM38/PM0	mg/l	<0.5	250	0	12	27	52	6	**15.2**	**12.7**	**50.6**	**16.8**	**12**	**52**
Sulphide	TM107/PM0	mg/l	<0.01	250	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Thiocyanate	TM107/PM0	mg/l	<0.02	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Metals															
Dissolved Aluminium	TM30/PM14	µg/l	<1.5	200	0	19.6	37	56.4	6	**51.1**	**38.7**	**56.4**	**33.1**	**23.1**	**19.6**
Dissolved Antimony	TM30/PM14	µg/l	<2	10	0	0	-	0	6	<2	<2	<2	<2	<2	<2
Dissolved Arsenic	TM30/PM14	µg/l	<2.5	10	0	1.5	2.0	2.5	6	<0.9	<0.9	**1.5**	<0.9	**2.5**	<0.9
Dissolved Barium	TM30/PM14	µg/l	<3	nc	0	9.2	25	41.3	6	**22.8**	**12.1**	**39.2**	**22.6**	**9.2**	**41.3**
Dissolved Beryllium	TM30/PM14	µg/l	<0.5	nc	0	0	-	0	6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved Boron	TM30/PM14	µg/l	<12	1500	0	15	17	21	6	<12	<12	<12	**15**	**16**	**21**
Dissolved Cadmium	TM30/PM14	µg/l	<0.5	5	0	0	-	0	6	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Dissolved Calcium	TM30/PM14	mg/l	<0.2	nc	0	21.2	44	79.7	6	**33.2**	**26**	**73.4**	**30.5**	**21.2**	**79.7**
Dissolved Cobalt	TM30/PM14	µg/l	<0.1	nc	0	0	-	0	6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Dissolved Chromium	TM30/PM14	µg/l	<1.5	25	0	0.4	0.40	0.4	6	<0.2	<0.2	**0.4**	<0.2	<0.2	<0.2
Hexavalent Chromium	TM38/PM0	mg/l	<0.006	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Dissolved Copper	TM30/PM14	µg/l	<7	2000	0	3	6.3	9	6	**3**	<3	**9**	<3	<3	**7**
Total Dissolved Iron	TM30/PM14	µg/l	<20	200	1	9.2	81	224.6	6	224.6	**24.7**	**50**	**155.3**	**9.2**	**23.9**
Dissolved Lead	TM30/PM14	µg/l	<5	5	0	0	-	0	6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Dissolved Magnesium	TM30/PM14	mg/l	<0.1	nc	0	2.8	3.4	4.4	6	**3**	**3**	**4.2**	**3**	**2.8**	**4.4**
Dissolved Manganese	TM30/PM14	µg/l	<2	50	0	3	8.7	15.5	6	**10.1**	**15.5**	**8.8**	**10.6**	**3**	**4.2**
Dissolved Mercury	TM30/PM14	µg/l	<1	1	0	0	-	0	6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved Molybdenum	TM30/PM14	µg/l	<0.2	nc	0	0.2	2.4	6.4	6	**1.1**	**0.4**	**6.4**	**1**	**0.2**	**5.2**
Dissolved Nickel	TM30/PM14	µg/l	<2	20	0	0.5	0.60	0.7	6	<0.2	<0.2	**0.7**	<0.2	<0.2	**0.5**
Dissolved Phosphorus	TM30/PM14	µg/l	<0.7	nc	0	6	23	63.3	6	**21.8**	**7.2**	**31.1**	**8.6**	**6**	**63.3**
Dissolved Potassium	TM30/PM14	mg/l	<0.1	nc	0	2	3.4	5.3	6	**2.4**	**3.2**	**5.3**	**2**	**2.4**	**5**
Dissolved Selenium	TM30/PM14	µg/l	<3	20	0	0	-	0	6	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Dissolved Sodium	TM30/PM14	mg/l	<0.1	200	0	16	18	19.8	6	**17**	**16**	**18.5**	**18**	**16.5**	**19.8**
Dissolved Thallium	TM30/PM14	µg/l	<0.9	nc	0	0	-	0	6	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Dissolved Vanadium	TM30/PM14	µg/l	<0.6	nc	0	0.7	0.80	0.9	6	**0.7**	**0.9**	**0.8**	<0.6	<0.6	<0.6
Dissolved Zinc	TM30/PM14	µg/l	<3	nc	0	4	4.3	5	6	<3	<3	**5**	<3	**4**	**4**
PAHs															
Naphthalene	TM4/PM30	µg/l	<0.1	nc	0	0	-	0	6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Acenaphthene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluorene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Phenanthrene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Fluoranthene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Pyrene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(a)anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chrysene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(bk)fluoranthene	TM4/PM30	µg/l	<0.008	nc	0	0	-	0	6	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(b)fluoranthene	TM4/PM30	µg/l	<0.008	nc	0	0	-	0	6	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(k)fluoranthene	TM4/PM30	µg/l	<0.008	nc	0	0	-	0	6	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Benzo(a)pyrene	TM4/PM30	µg/l	<0.005	0.01	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Indeno(123cd)pyrene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dibenzo(ah)anthracene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzo(ghi)perylene	TM4/PM30	µg/l	<0.005	nc	0	0	-	0	6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
PAH 16 Total	TM4/PM30	µg/l	<0.173	0.1	0	0	-	0	6	<0.173	<0.173	<0.173	<0.173	<0.173	<0.173

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	XX	Detection		

RECEIVED: 16/10/2025

Test	Method	Units	LOD	MAC-EQS	No. of MAC-EQS Exceedances	Minimum (result above detection limit)	Mean	Maximum	No. of Samples	Round	Surface Water Round 1			Surface Water Round 2		
										Sample ID	SW01	SW02	SW03	SW01	SW02	SW03
										Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
										Sampled Date	17/09/2025	17/09/2025	17/09/2025	29/09/2025	29/09/2025	29/09/2025
VOCs																
Benzene	TM15/PM10	µg/l	<0.5	1	0	0	-	0	6		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Bromochloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Bromodichloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Bromoform	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Bromomethane	TM15/PM10	µg/l	<1	nc	0	0	-	0	6		<1	<1	<1	<1	<1	<1
n-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
sec-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
tert-Butylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Carbon tetrachloride	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Chlorobenzene	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Chloroethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Chloroform	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Chloromethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
2-Chlorotoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
4-Chlorotoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,3-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,4-Dichlorobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Dibromochloromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
1,2-Dibromo-3-chloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Dibromomethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,2-Dibromoethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Dichlorodifluoromethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
1,1-Dichloroethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,2-Dichloroethane	TM15/PM10	µg/l	<2	3	0	0	-	0	6		<2	<2	<2	<2	<2	<2
1,1-Dichloroethene (1,1 DCE)	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
cis-1-2-Dichloroethene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
trans-1-2-Dichloroethene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Dichloromethane (DCM)	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,2-Dichloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
1,3-Dichloropropane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
2,2-Dichloropropane	TM15/PM10	µg/l	<1	nc	0	0	-	0	6		<1	<1	<1	<1	<1	<1
1,1-Dichloropropene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
cis-1-3-Dichloropropene	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
trans-1-3-Dichloropropene	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Ethylbenzene	TM15/PM10	µg/l	<1	nc	0	0	-	0	6		<1	<1	<1	<1	<1	<1
Isopropylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
4-Isopropyltoluene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Propylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Styrene	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
1,1,1,2-Tetrachloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
1,1,2,2-Tetrachloroethane	TM15/PM10	µg/l	<4	nc	0	0	-	0	6		<4	<4	<4	<4	<4	<4
Tetrachloroethene (PCE)	TM15/PM10	µg/l	<3	10	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Toluene	TM15/PM10	µg/l	<5	nc	0	0	-	0	6		<5	<5	<5	<5	<5	<5
1,2,3-Trichlorobenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,2,4-Trichlorobenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,1,1-Trichloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
1,1,2-Trichloroethane	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
Trichloroethene (TCE)	TM15/PM10	µg/l	<3	10	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Trichlorofluoromethane	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,2,3-Trichloropropane	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,2,4-Trimethylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
1,3,5-Trimethylbenzene	TM15/PM10	µg/l	<3	nc	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Vinyl Chloride	TM15/PM10	µg/l	<0.1	0.5	0	0	-	0	6		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
m/p-Xylene	TM15/PM10	µg/l	<2	nc	0	0	-	0	6		<2	<2	<2	<2	<2	<2
o-Xylene	TM15/PM10	µg/l	<1	nc	0	0	-	0	6		<1	<1	<1	<1	<1	<1
Methyl Tertiary Butyl Ether	TM15/PM10	µg/l	<0.1	nc	0	0	-	0	6		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	0		nt	nt	nt	nt	nt	nt
Hexachlorobutadiene	TM15/PM10	µg/l	<3	0.1	0	0	-	0	6		<3	<3	<3	<3	<3	<3
Hexachlorocyclopentadiene	TM16/PM30	µg/l	<1	0.1	0	0	-	0	0		nt	nt	nt	nt	nt	nt
Phenols																
4-Chloro-3-methylphenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
2-Chlorophenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
2-Methylphenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
2,4-Dichlorophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
2,4-Dimethylphenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
4-Methylphenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
2-Nitrophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
4-Nitrophenol	TM16/PM30	µg/l	<10	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
Pentachlorophenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
Phenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
Phenol	TM26/PM0	mg/l	<0.01	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
2,4,6-Trichlorophenol	TM16/PM30	µg/l	<1	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt
2,4,5-Trichlorophenol	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0		nt	nt	nt	nt	nt	nt

Notes:					
nt	not tested	<XX	Below LOD	XX	> screen value
nc	no criteria	**XX**	Detection		

Round	Surface Water Round 1			Surface Water Round 2		
Sample ID	SW01	SW02	SW03	SW01	SW02	SW03
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
Sampled Date	17/09/2025	17/09/2025	17/09/2025	29/09/2025	29/09/2025	29/09/2025

Test	Method	Units	LOD	MAC-EQS	No. of MAC-EQS Exceedances	Minimum (result above detection limit)	Mean	Maximum	No. of Samples						
Other SVOCs															
2-Chloronaphthalene	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
2-Nitroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
2,4-Dinitrotoluene	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
2,6-Dinitrotoluene	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
3-Nitroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
4-Bromophenylphenylether	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
4-Chloroaniline	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
4-Chlorophenylphenylether	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
4-Nitroaniline	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Azobenzene	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Butylbenzyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Bis(2-chloroethoxy)methane	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Bis(2-chloroethyl)ether	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Bis(2-ethylhexyl) phthalate	TM16/PM30	µg/l	<5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Carbazole	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Dibenzofuran	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Diethyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Dimethyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Di-n-butyl phthalate	TM16/PM30	µg/l	<1.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Di-n-Octyl phthalate	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Hexachloroethane	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Isophorone	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
Nitrobenzene	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
N-nitrosodi-n-propylamine	TM16/PM30	µg/l	<0.5	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
2-Methylnaphthalene	TM16/PM30	µg/l	<1	nc	0	0	-	0	0	nt	nt	nt	nt	nt	nt
TPH CWG															
>C5-C6	TM36/PM12	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>C6-C8	TM36/PM12	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>C8-C10	TM36/PM12	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>C10-C12	TM5/PM16/PM30	µg/l	<5	nc	0	0	-	0	6	<5	<5	<5	<5	<5	<5
>C12-C16	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>C16-C21	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>C21-C35	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
Total aliphatics C5-35	TM36/PM12/PM16/I	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>C5-EC7	TM36/PM12	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>EC7-EC8	TM36/PM12	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>EC8-EC10	TM36/PM12	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>EC10-EC12	TM5/PM16/PM30	µg/l	<5	nc	0	0	-	0	6	<5	<5	<5	<5	<5	<5
>EC12-EC16	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>EC16-EC21	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
>EC21-EC35	TM5/PM16/PM30	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
Total aromatics C5-35	TM36/PM12/PM16/I	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10
Total aliphatics and aromatics(C5-35)	TM36/PM12/PM16/I	µg/l	<10	nc	0	0	-	0	6	<10	<10	<10	<10	<10	<10

RECEIVED: 16/10/2025

RECEIVED: 16/10/2025

APPENDIX 2

CAUSEWAY 2019 SITE INVESTIGATION ASSESSMENT

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

Kingston, Galway – Ground Investigation

Client:	Lioncor Developments Limited
Client's Representative:	Tobin Consulting Engineers
Report No.:	19-0472
Date:	June 2019
Status:	Final for Issue

Causeway Geotech Ltd
8 Drumahiskey Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7QL

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

Registered in Northern Ireland. Company Number: NI610766
Approved: ISO 9001 • ISO 14001 • OHSAS 18001

RECEIVED: 16/10/2025

CONTENTS

Document Control Sheet

Note on: Methods of describing soils and rocks & abbreviations used on exploratory hole logs

1 AUTHORITY 5

2 SCOPE 5

3 DESCRIPTION OF SITE 5

4 SITE OPERATIONS 6
4.1 Summary of site works 6
4.2 Boreholes 6
4.3 Trial Pits 7
4.4 Indirect CBR tests 7
4.5 Surveying 8

5 LABORATORY WORK 8
5.1 Geotechnical laboratory testing of soils 8
5.2 Geotechnical laboratory testing of rock 8
5.3 Environmental laboratory testing of soils 9

6 GROUND CONDITIONS 9
6.1 General geology of the area 9
6.2 Ground types encountered during investigation of the site 9
6.3 Groundwater 10

7 DISCUSSION 11
7.1 Proposed construction 11
7.2 Recommendations for construction 11
7.2.1 Summary 11
7.2.2 Soil strength parameters 11
7.2.3 Foundations and ground floor construction 11
7.2.4 Floor slabs 14
7.2.5 Excavations for services 14
7.2.6 Soil aggressivity 14
7.2.7 Access roads, car parks and hard standing 15

8 REFERENCES 17

RECEIVED: 16/10/2025

APPENDICES

Appendix A	Site and exploratory hole location plans
Appendix B	Borehole logs
Appendix C	Core photographs
Appendix D	Trial pit logs
Appendix E	Trial pit photographs
Appendix F	Indirect in-situ CBR test results
Appendix G	Geotechnical laboratory test results
Appendix H	Environmental laboratory test results
Appendix I	SPT hammer energy measurement report

RECEIVED: 16/10/2025

Document Control Sheet

Report No.:		19-0472			
Project Title:		Kingston, Galway – Ground Investigation			
Client:		Lioncor Developments Limited			
Client's Representative:		Tobin Consulting Engineers			
Revision:	A01	**Status:**	Final for Issue	**Issue Date:**	14 June 2019
Prepared by:		**Reviewed by:**		**Approved by:**	
Carin Cornwall BSc MSc PhD		Paul McNamara BEng MICE		Darren O'Mahony BSc MSc MIEI	

The works were conducted in accordance with:

UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)

British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

RECEIVED: 16/10/2025

METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler)
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler)
P	Nominal 100mm diameter undisturbed piston sample
B	Bulk disturbed sample
LB	Large bulk disturbed sample
D	Small disturbed sample
C	Core sub-sample (displayed in the Field Records column on the logs)
L	Liner sample from dynamic sampled borehole
W	Water sample
ES / EW	Soil sample for environmental testing / Water sample for environmental testing
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained)
SPT (c)	Standard penetration test using 60 degree solid cone
x,x/x,x,x,x	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length. The length achieved is stated (mm) for any test increment less than 75mm
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm)
N=X/Z	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (mm)
V VR	Shear vane test (borehole) Hand vane test (trial pit) Shear strength stated in kPa V: undisturbed vane shear strength VR: remoulded vane shear strength
dd/mm/yy: 1.0 dd/mm/yy: dry	Date & water level at the borehole depth at the end of shift and the start of the following shift
▽	Water strike: initial depth of strike
▼	Water strike: depth water rose to
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum).

RECEIVED: 16/10/2025

Kingston, Galway

1 AUTHORITY

On the instructions of Tobin Consulting Engineers, ("the Client's Representative"), acting on the behalf of Lioncor Developments Limited ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of proposed residential and commercial blocks.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results. A discussion on the recommendations for construction is also provided.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client's Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included boreholes, trial pits, DCPs, soil and rock core sampling, environmental sampling, in-situ and laboratory testing, and the preparation of a report on the findings including recommendations for construction.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted within an undeveloped area adjacent to the western distributor road. The site is bordered by residential developments to the north, east and west and fields to the south and southwest.

RECEIVED: 16/10/2025

4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 30 April and 14 May 2019, comprised:

- three boreholes by dynamic (windowless) sampling methods
- eleven boreholes by dynamic (windowless) sampling methods and rotary follow-on drilling
- one borehole by rotary drilling methods only
- twelve machine dug trial pits
- indirect CBR tests at eight locations.

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

4.2 Boreholes

A total of fifteen boreholes were put down in a minimum diameter of 150mm through soil and rock strata to their completion depths by a combination of methods, including light percussion boring using a Dando Terrier rig and rotary drilling by a Comacchio 205 rotary drilling rig.

Boreholes BH01 and BH01A were put down by light percussion boring techniques but met shallow refusal before a third borehole (BH01B) was advanced deeper. Eleven boreholes (BH01B, BH02, and BH04-BH12) were put down by a combination of light percussion boring and rotary follow-on drilling techniques with core recovery in bedrock. Rotary drilling at borehole BH03A was put down a short distance away from BH03 because the rotary rig was not able to access the location of the percussive borehole.

Hand dug inspection pits were carried out between ground level and 1.20m depth to ensure boreholes were put down at locations clear of services or subsurface obstructions. Where the percussion borehole had not been advanced onto bedrock, rotary percussive methods were employed to advance the borehole to completion/bedrock.

Standard penetration tests were carried out in accordance with BS EN 22476-3: 2005 at standard depth intervals throughout the overburden using the split spoon sampler ($SPT_{(s)}$). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N-values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix I.

Disturbed (bulk and small bag) samples were taken within the encountered strata.

RECEIVED: 16/10/2025

Where coring was carried out within bedrock strata, Geobor S Coring was used. The core was extracted in up to 1.5m lengths using a SK6L core barrel, which produced core of nominal 102mm diameter, and was placed in single channel wooden core boxes.

The core was subsequently photographed and examined by a qualified and experienced Engineering Geologist, thus enabling the production of an engineering log in accordance with *BS 5930: 2015: Code of practice for ground investigations*.

Appendix B presents the draft borehole logs, with core photographs soon to be presented in Appendix C.

4.3 Trial Pits

Twelve trial pits (TP01–TP12) were excavated using a 6t tracked excavator fitted with a 600mm wide bucket, to depths up to 3.20m.

Disturbed bulk bag samples were taken at standard depth intervals and at change of strata. Environmental samples were taken at regular depths across the site.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix D presents the draft trial pit logs with photographs of the pits and arising provided in Appendix E.

4.4 Indirect CBR tests

An indirect CBR test was conducted at eight locations (TP01, TP02, TP05, TP06, TP08, TP10-TP12) using a Dynamic Cone Penetrometer (DCP). The equipment was developed in conjunction with the UK Transport Research Laboratory, is used widely throughout the world, and is referred to in the UK Highway Agency Interim Advice Note 73/06.

The test results are presented in Appendix F in the form of plots of the variation with depth of the penetration per blow. Straight lines have been fitted to the plots and the CBR for each depth range estimated using the following relationship, which is derived from Kleyn & Van Heerden (1983):

$$\text{Log CBR} = 2.48 - 1.057 \text{ Log (mm/blow)}$$

The frequently elevated CBR values are a consequence of the coarse-grained content of the penetrated soils and are often not representative of the soil matrix.

RECEIVED: 16/10/2025

4.5 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described and their descriptions incorporated into the borehole logs.

5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **soil chemistry:** pH and water soluble sulphate content

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: *BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990).*

The test results are presented in Appendix G.

5.2 Geotechnical laboratory testing of rock

Laboratory testing of rock sub-samples comprised:

- point load index

Test	Test carried out in accordance with
Point load index	ISRM Suggested Methods (1985) Suggested method for determining point-load strength. Int. J. Rock Mech. Min. Sci. Geomech. Abstr. 22, pp. 53–60

The test results are presented in Appendix G.

RECEIVED: 16/10/2025

5.3 Environmental laboratory testing of soils

Environmental testing, as specified by the Client's Representative was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out for a range of determinants, including:

- Metals
- Speciated total petroleum hydrocarbons (TPH)
- Speciated polycyclic aromatic hydrocarbons (PAH)
- Cyanides
- Asbestos screen
- pH.

Waste acceptance criteria (WAC) testing was carried out on selected samples.

Results of environmental laboratory testing are presented in Appendix H.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise Till derived from granite. These deposits are underlain by granite of the Murvey Granite and Errisbeg Townland Granite which may contain Quartz Porphyry and Felsite dykes.

6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Topsoil:** encountered in 100-200mm thickness in boreholes BH02-BH03, BH04-BH08, and BH12 and 400-500mm in borehole BH09-BH11.

- **Made Ground (fill):** reworked sandy clayey gravel fill with high cobble content encountered in most of the exploratory holes, particularly in the west of the site (e.g. BH01B, BH08 and BH12) where fill was found to extent to depths of 3.70-3.90m.

- **Recent deposits (peat):** Peat layers were encountered in boreholes BH02 at 2.30-2.50m; BH03B at 1.20-2.00m and 3.80-4.10m; BH04 at 0.90-1.80m; BH08 at 3.70-4.00m; and BH09 at 0.00- 0.50m

RECEIVED: 16/10/2025

- **Fluvioglacial deposits:** typically medium dense to dense sands and gravels with localised pockets of sandy gravelly clays interspersed throughout encountered across much of the site.

- **Bedrock (Granite):** Rockhead was encountered at depths ranging from 2.00m in boreholes BH06 and BH11 to 5.40m in boreholes BH03B and BH08.

6.3 Groundwater

Groundwater was encountered during percussion boring through soil as a water strike at 1.80m in borehole BH09. Groundwater was also encountered at 0.10m and 2.50m in nearby trial pit TP09. Groundwater strikes were not observed in any of the other exploratory hole locations.

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

Although groundwater was not noted during drilling in many locations, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any groundwater strikes and the possibility of encountering groundwater during excavation works should not be ruled out. Seasonal variation in groundwater levels should also be factored into design considerations.

It should also be noted that any groundwater strikes within bedrock may have been masked by the fluid used as the drilling flush medium.

RECEIVED: 16/10/2025

7 DISCUSSION

7.1 Proposed construction

It is proposed to construct a number of mixed residential and commercial blocks.

No further details were available to Causeway Geotech at the time of preparing this report and any designs based on the recommendations or conclusions within this report should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory holes. Causeway Geotech were commissioned to provide a geotechnical report, and it is outwith our remit to advise on structure design.

7.2 Recommendations for construction

7.2.1 Summary

Based on the presence of significant depths of made ground (often underlain by peat) across much of the site, the implementation of shallow foundation methods is likely to be problematic. It follows that the most practicable solution for installing safe working foundations across the site will be by a "deep" foundation method, such as piling to transfer loadings to depth. In parts of the eastern side of the side, the implementation of trench fill foundations may be considered suitable.

7.2.2 Soil strength parameters

When estimating the shear strength of fine soils (silt/clay), reference is made to the results of Standard Penetration Tests (SPT's) carried out within the boreholes. The undrained shear strength of fine soils can be estimated using the correlation developed by Stroud & Butler:

$$C_u = f_1 \times N$$

where f_1 is typically in the range 4 to 6. A median f_1 value of 5 is adopted for this report.

For granular soils (sand/gravel), a graphical relationship between SPT "N" value and angle of shearing resistance, φ, has been developed by Peck, Hanson and Thorburn. This is published in *Foundation Design and Construction* (Tomlinson, 2001) and is referenced in this report when deriving angles of shearing resistance for the gravel soils.

7.2.3 Foundations and ground floor construction

Foundations should transfer loading to below any Made Ground or subsoil. The recommended foundation construction and allowable bearing pressure (ABP) at the borehole locations are presented in Table 1.

RECEIVED: 16/10/2025

Table 1: Construction recommendations

Borehole	Depth below EGL* to suitable bearing stratum	Estimated ABP (kPa)	Strata description	Foundation type	Ground floor construction	Groundwater
BH01	4.30m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH02	4.70m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH03B	5.40m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH04	3.00m	300	Dense Gravel	Trench fill	Suspended	Not encountered
	4.40m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH05	2.00m	200	Dense Gravel	Trench fill	Suspended	Not encountered
	4.00m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH06	1.20m	250	Medium dense Gravel	Trench fill	Ground bearing	Not encountered
	2.00m	>500	Weathered Granite	Trench fill	Suspended	Not encountered
BH07	1.20m	300	Dense Gravel	Trench fill	Ground bearing	Not encountered
	4.60m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH08	5.10m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH09	1.80m	250	Medium dense Gravel	Trench fill	Suspended	Encountered at 1.80m
	3.90m	>500	Weathered Granite	Piled	Suspended	
BH10	3.40m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH11	2.10m	>500	Weathered Granite	Piled	Suspended	Not encountered
BH12	5.50m	>500	Weathered Granite	Piled	Suspended	Not encountered

*Existing Ground Level

RECEIVED: 16/10/2025

Based on the findings of the site investigation, spread foundations (trench fill) are only considered suitable in some areas at the north eastern part of the site. At these locations (e.g. boreholes BH04-BH07 and BH09) allowable bearing pressures on the fluvioglacial deposits were estimated at between 200kPa and 300kPa.

The base of foundation excavations should be thoroughly inspected; any soft soils should be removed with the resultant void backfilled with ST1 concrete. A consistent bearing stratum should be provided for any building unit to limit differential settlements.

Given the predominance of granular strata, and the findings of the trial pit excavations (some of which were found to be unstable), excavations for foundations are not likely to be stable. Where space allows, instability can be minimised by battering the side slopes at 2 vertical to 1 horizontal and by limiting the duration that the excavation is open. Groundwater control, where required, will be possible by pumping from sumps formed in the base of excavations.

Across much of the site, particularly in the western area, made ground was found to extend to depths of up to 3.90m, and was often underlain by a layer of peat. Piling to transfer loadings to depth is therefore suggested to be the most practicable and applicable foundation option.

Driven piles are the preferred pile type – of precast concrete or steel/ductile iron. The piles should be driven to a predetermined set – each pile will, therefore, be effectively proof tested by the installation method.

If the surrounding land use precludes the use of hard drive piles, due to environmental restrictions with respect to noise and vibration, low vibration driven piles, continuous flight auger (CFA) or continuous helical displacement (CHD) piles will be required.

Piles will acquire capacity from shaft friction through the fluvioglacial deposits, and end bearing on the weathered igneous bedrock.

Where site levels are to be raised, piles should be designed to resist additional loading that will arise due to negative skin friction along the pile length passing through Made Ground and soft soils.

The detailed design of piles should be undertaken in conjunction with specialist piling contractors. Their proposals should include the means to verify that the required load capacity has been achieved: for example, dynamic pile tests and/or static load tests.

Where pile foundation solution is adopted, floor slabs should be supported by ground beams spanning between piles caps supported by piles.

RECEIVED: 16/10/2025

7.2.4 Floor slabs

Floor slabs should not bear directly onto Made Ground or soft soils. Therefore, the use of ground bearing floor slabs is only appropriate following the removal of any surface Made Ground and soft clay layers and their replacement using well-graded well-compacted granular fill. However, a suspended floor slab should be adopted where the difference in levels of the proposed floor and the base of Made Ground/soft soils is greater than 600mm.

Therefore, given the depth to the base of Made Ground, a suspended floor slab may be required over parts of the site. The use of intermediate lines of support stub walls would reduce the spans required for flooring units.

7.2.5 Excavations for services

For the installation of services ducts/trenches, it is suggested that open trenching will be the most practicable construction method. Generally speaking, the ground conditions should render the use of open trenching by backhoe excavator possible, with some trench support required for the granular stratas.

Where working in open trenches, it is thought that trench support systems, by way of a trench box (or possibly sheet piles), will be required to maintain trench stability and safe working conditions. Groundwater control at these locations should be possible by means of sump pumping.

To preclude the eventuality of differential settlements in pipes, they should be laid on a consistent stratum of appropriate allowable bearing capacity and protected with appropriate fill cover.

Where ducts and chambers must be installed in areas where localised soft spots are encountered, the use of geogrid reinforcement along the base of the very soft/soft soil (e.g. peat) below the trench base is recommended. This will stiffen the base of the trench and help control longitudinal differential settlement.

Backfilling of trenches may be completed by using compacted Cl 804 granular fill and reinstated as appropriate.

7.2.6 Soil aggressivity

An assessment of the Aggressive Chemical Environment for Concrete (ACEC) was undertaken through reference to the Building Research Establishment (BRE) Special Digest 1 (2017).

As noted by BRE Special Digest 1, sulphates in the soil and groundwater are the chemical agents most likely to attack concrete. The extent to which sulphates affect concrete is linked to their concentrations, the type of ground, the presence of groundwater, the type of concrete and the form of construction in which concrete is used.

RECEIVED: 16/10/2025

BRE Special Digest 1 identifies four different categories of site which require specific procedures for investigation for aggressive ground conditions:

- Sites not subjected to previous industrial development and not perceived as containing pyrite;
- Sites not subjected to previous industrial development and perceived as containing pyrite;
- Brownfield sites not perceived as containing pyrite;
- Brownfield sites perceived as containing pyrite.

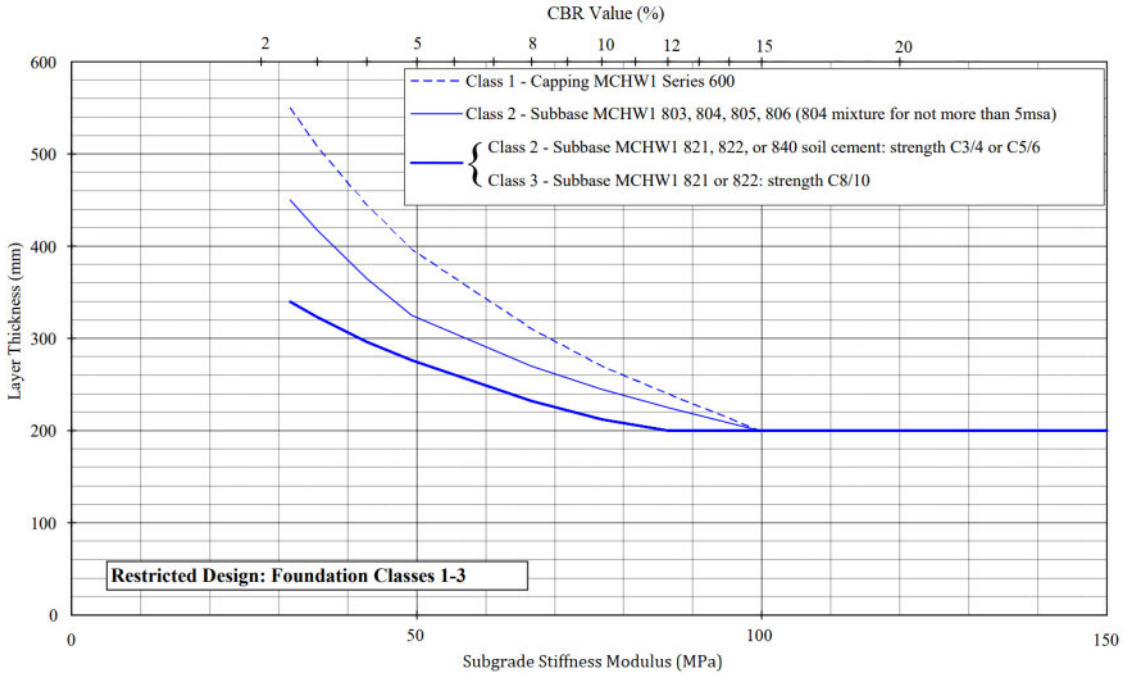
For the purposes of this report the site was classified as not having been subject to previous industrial development and not perceived as containing pyrite.

The results of chemical tests (pH and water soluble sulphate contents) on soil samples indicate Design Sulphate Class DS-1 and ACEC Class AC-1 – reference Table C1 of BRE Special Digest 1 (Building Research Establishment, 2005). The Special Digest does not require any measures to protect underground concrete elements greater that 140mm thick.

7.2.7 Access roads, car parks and hard standing

Based on a summary of the CBR tests undertaken at the site, it is envisaged that the upper made ground and glaciogluvial deposits would be suitable for the placement of road make up layers. Most areas across the site have CBR values in excess of 5% at a depth of 0.5mbgl.

Table 2.1 of volume 7 section2 of the Design Manual for Roads and Bridges (below), gives guidance on the average thickness of the pavement layers in relation to the CBR results. As can be seen, a CBR in excess of 5% requires a 400mm thick capping layer.



RECEIVED: 16/10/2025

Table 2.1 (DMRB Vol.7 Sec2) 2009

Some tests provided lower CBR values in certain areas of the site. The above plot should be used to determine the thicknesses of any capping or sub-base layers that may need to be placed in these areas.

It is recommended that further testing be undertaken during the course of construction works at intervals as set out in the Earthworks Specification, and should any areas indicate lower than expected value, the above plot should be used to determine the thicknesses of any capping or sub-base layers that may need to be placed in these areas.

The use of geosynthetics in the construction of paved areas, will be beneficial, particularly in areas of Made Ground. These could include a geosynthetic (e.g., a geogrid) at subgrade level with further benefit gained by incorporating further layer(s) within the capping/sub-base layer. Road design should be undertaken by a specialist earthworks contractor/designer.

RECEIVED: 16/10/2025

8 REFERENCES

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930: 2015: Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS EN ISO 14689-1:2018: Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

BS EN ISO 22476-3:2005+A1:2011: Geotechnical investigation and testing. Field testing. Standard penetration test.

Building Research Establishment (2005) BRE Special Digest 1, Concrete in aggressive ground.

Contaminated Land Report (CLR) 11, (2009) Model Procedures for the Management of Land Contamination, The Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency.

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX A

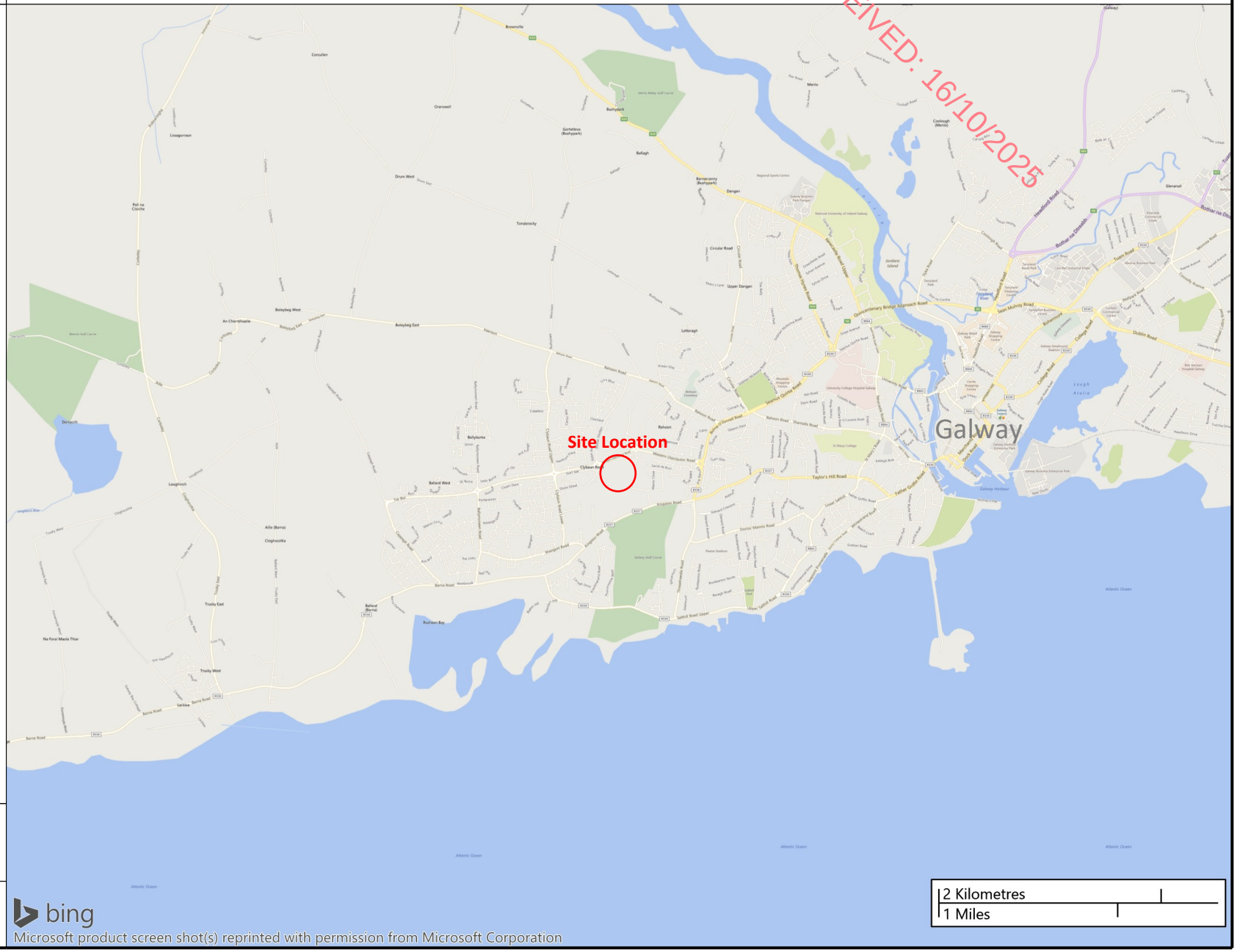
SITE AND EXPLORATORY HOLE LOCATION PLANS

CAUSEWAY GEOTECH

Project No.:	19-0472	**Client:**	Lioncor Developments Limited
Project Name:	Kingston, Galway	**Client's Representative:**	Tobin Consulting Engineers

RECEIVED: 16/10/2025

Legend Key



Title:
Site Location Plan

Last Revised:	**Scale:**
07/06/2019	1:50000

CAUSEWAY GEOTECH

Project No.:	19-0472	**Client:**	Lioncor Developments Limited
Project Name:	Kingston, Galway	**Client's Representative:**	Tobin Consulting Engineers

RECEIVED: 16/10/2025

Legend Key

- Locations By Type - CP
- Locations By Type - CP+RC
- Locations By Type - RC
- Locations By Type - TP

Title:
Exploratory Hole Location Plan

Last Revised:	**Scale:**
07/06/2019	1:2000

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX B

BOREHOLE LOGS

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	0.40

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH01

Coordinates: 126617.42 E 224918.75 N

Client: Lioncor Developments Limited

Client's Representative: Tobin Consulting Engineers

Ground Level: 22.34 mOD

Dates: 30/04/2019 - 30/04/2019

Sheet 1 of 1

Scale: 1:50

Driller: JL

Logger: MFG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.40)		MADE GROUND: Grey sandy slightly clayey subangular fine to coarse GRAVEL with high cobble content. Sand is fine to coarse.		
					21.94	0.40		End of Borehole at 0.40m		

Remarks

Hand dug inspection pit excavated.

Four attempts at borehole refused at 0.40m. Moved to 5th location at BH01A.

Terminated at refusal on cobbles.

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	1.20

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH01A

Coordinates: 126613.08 E, 224916.14 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Driller: JL

Ground Level: 22.12 mOD

Dates: 30/04/2019 - 30/04/2019

Logger: MFG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.90)		MADE GROUND: Grey sandy slightly clayey subangular fine to coarse GRAVEL with high cobble content. Sand is fine to coarse.		
					21.22	0.90 (0.30)		MADE GROUND: Yellowish grey sandy subangular fine to coarse GRAVEL with high cobble content. Sand is fine to coarse.		
					20.92	1.20		End of Borehole at 1.20m		

Remarks

Hand dug inspection pit excavated.

5th and 6th attempts at borehole refused at 1.20m. Moved to BH01B.

Terminated at refusal on cobbles.

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	2.00
Rotary Drilling	Comacchio 205	2.00	5.30
Rotary Coring	Comacchio 205	5.30	8.30

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH01B

Coordinates: 126607.50 E, 224913.82 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 22.06 mOD

Dates: 30/04/2019 - 30/04/2019

Driller: JL+RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 0.90	B1					(0.90)		MADE GROUND: Grey sandy subangular fine to coarse GRAVEL with high cobble content and bands of peaty clay throughout.		
					21.16	0.90				
1.00 - 2.00	B2							MADE GROUND: Dense yellowish grey sandy subangular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse.		
1.20	D3									
1.20 - 1.65	SPT (S) N=35		Dry	N=35 (14,11/14,8,8,5)		(1.40)				
2.00	D4									
2.00 - 2.32	SPT (S)		Dry	N=50 (11,13/50 for 165mm)						
					19.76	2.30		Dark brown sandy gravelly silty CLAY (Driller's description)		
						(0.50)				
					19.26	2.80		Light grey sandy GRAVEL / Possible destructured GRANITE (Driller's description)		
						(1.50)				
					17.76	4.30		Weathered GRANITE (Driller's description)		
						(1.00)				
			3		16.76	5.30		Medium strong light pink and white speckled black GRANITE. Partially weathered: closer fracture spacing discolouration on joint surfaces. Discontinuities: 1. 10 to 20 degree joints, closely spaced (40/150/900) undulating, rough, pale green and patchy black staining on joint surfaces. 2. 35 to 45 degree joints, medium spaced (60/250/600) planar, rough, pale green, yellowish orange and patchy black staining on joint surface.		
	100 80 55		20							
6.30										
	100 80 60		11			(3.00)				
			16							
7.30										
	100 100 90		2							
8.30					13.76	8.30		End of Borehole at 8.30m		
	TCR SCR RQD		FI							

Remarks
Hand dug inspection pit excavated.

Core Barrel	Water Strikes				Chiselling Details		
SK6L	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Flush Type	Water Added		Casing Details	
Polymer	From (m)	To (m)	To (m)	Diam (mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	2.00
Rotary Drilling	Comacchio 205	2.00	5.30
Rotary Coring	Comacchio 205	5.30	8.30

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH02

Coordinates: 126743.33 E, 224942.19 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Driller: JL+RS

Ground Level: 26.34 mOD

Dates: 01/05/2019 - 01/05/2019

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.20 - 1.00	B1				26.14	(0.20) 0.20		TOPSOIL		
						(0.80)		MADE GROUND: Brown gravelly slightly clayey fine to coarse SAND with low cobble content. Gravel is subangular fine to coarse.		
1.00 - 1.80	B2				25.34	1.00		MADE GROUND: Loose grey slightly gravelly very silty fine to coarse SAND. Gravel is subangular fine.		
1.20	D4									
1.20 - 1.65	SPT (S) N=9		Dry	N=9 (1,1/2,2,2,3)		(0.80)				
1.80 - 2.00	B3				24.54	1.80		MADE GROUND: Dense grey slightly sandy subangular fine to coarse GRAVEL with occasional thin lenses of light brown sandy clay. Sand is fine to coarse.		
2.00	D5					(0.50)				
2.00 - 2.28	SPT (S)		Dry	N=50 (25 for 85mm/50 for 190mm)	24.04	2.30		PEAT (Driller's description)		
					23.84	(0.20) 2.50		Light brownish grey gravelly very silty SAND/possible destructured GRANITE (Driller's description)		
						(2.20)				
					21.64	4.70		GRANITE (Driller's description)		
						(0.60)				
	100	100	65	8	21.04	5.30		Medium strong pink and white speckled white speckled black GRANITE. Partially weathered: discolouration on joint surfaces. Discontinuities: 1. 20 to 30 degree joints, closely spaced (30/80/150) undulating, rough, pale green and patchy black and reddish orange staining.		
						(0.90)				
6.30					20.14	6.20		Strong pink, white and green speckled black GRANITE. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 5 to 25 degree joints, closely spaced (20/130/220) undulating, rough, patchy orange, black and green staining with light brown patchy silt deposits on joint surfaces.		
	100	100	95	6		(1.50)				
7.30										
	100	85	85	5	18.64	7.70		Medium strong white and green saussuritic GRANITE. Partially weathered: pervasive discolouration. Discontinuities: 1. 0 to 15 degree joints, closely spaced (30/130/300) undulating, rough, strong dark green and patchy black and brown staining on joint surfaces.		
						(0.60)				
8.30					18.04	8.30		End of Borehole at 8.30m		
	TCR	SCR	RQD	FI						

Remarks
Hand dug inspection pit excavated.

Core Barrel	Water Strikes				Chiselling Details		
SK6L	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Flush Type	Water Added		Casing Details	
Polymer	From (m)	To (m)	To (m)	Diam (mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	1.20

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH03

Coordinates: 126685.34 E, 224848.29 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 26.29 mOD

Dates: 10/05/2019 - 10/05/2019

Driller: JL

Logger: MFG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.20)		TOPSOIL		
0.20 - 1.20	B1				26.09	0.20		MADE GROUND: Grey slightly sandy angular fine to coarse GRAVEL with medium cobble content. Sand is fine to coarse.		
						(1.00)				
1.20	D2				25.09	1.20		End of Borehole at 1.20m		
1.20 - 1.52	SPT (S)		Dry	N=50 (25 for 110mm/50 for 205mm)						

Remarks
Hand dug inspection pit excavated.

Water Strikes				Chiselling Details		
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Rotary Drilling	Comacchio 205	0.00	5.40
Rotary Coring	Comacchio 205	5.40	8.40

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH03B

Coordinates: 126667.65 E, 224850.62 N

Client: Lioncor Developments Limited

Client's Representative: Tobin Consulting Engineers

Ground Level: 26.81 mOD

Date(s): 03/06/2019 - 03/06/2019

Sheet 1 of 1

Scale: 1:50

Driller: RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
							(1.10)		MADE GROUND: Hardcore fill (Driller's description)		
						25.71	1.10				
						25.61	(0.10) 1.20		MADE GROUND: GRAVEL (Driller's description)		
							(0.80)		MADE GROUND: Reworked PEAT and GRAVEL (Driller's description)		
						24.81	2.00				
							(0.60)		MADE GROUND: BOULDER (Driller's description)		
						24.21	2.60				
							(1.20)		MADE GROUND: GRAVEL (Driller's description)		
						23.01	3.80				
							(0.30)		PEAT (Driller's description)		
						22.71	4.10				
							(0.30)		BOULDER (Driller's description)		
						22.41	4.40				
							(1.00)		Light grey gravelly silty SAND/Possible destructured GRANITE (Driller's description)		
	100	100	90	5		21.41	5.40		Medium strong light pink and white speckled black GRANITE. Partially weathered: discolouration on joint surfaces. Discontinuities: 1. 5 to 15 degree joints, medium spaced (10/280/750) undulating, rough, pale green and pacthy black staining on joint surfaces. 2. 45 degree to 60 degree joints, medium spaced (10/300/500) slightly undulating, rough, patchy brownish orange, pale green, and black staining on joint surfaces.		
6.40	100	100	50	12			(2.30)				
7.40				2							
	100	100	90	6		19.11	7.70		Medium strong pale pinkish white speckled black GRANITE. Partially weathered: discolouration on joint surfaces. Discontinuities: 1. 5 to 15 degree joints, closely spaced (30/130/300) undulating, rough, pal green, yellowish brown and black staining on joint surface.		
				2			(0.70)				
8.40						18.41	8.40		End of Borehole at 8.40m		
	TCR	SCR	RQD	FI							

Remarks

Casing Details		Water Strikes			
To (m)	Diam (mm)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Core Barrel: SK6L

Flush Type: Polymer

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	3.00
Rotary Drilling	Comacchio 205	3.00	4.70
Rotary Coring	Comacchio 205	4.70	7.70

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH04

Coordinates: 126800.10 E, 224897.81 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 27.56 mOD

Dates: 02/05/2019 - 02/05/2019

Driller: JL+RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.10 - 0.90	B4				27.46	(0.10) 0.10		TOPSOIL		
						(0.80)		MADE GROUND: Grey slightly sandy subangular fine to coarse GRAVEL with high cobble content. Sand is fine to coarse.		
1.00 - 1.80	B5				26.66	0.90		Spongy dark brown fibrous PEAT		
1.20	D1									
1.20 - 1.65	SPT (S) N=5		Dry	N=5 (0,1/1,2,1,1)		(0.90)				
					25.76	1.80		Medium dense orangish grey slightly sandy subangular fine to medium GRAVEL with low cobble content. Sand is fine to coarse.		
2.00	D2									
2.00 - 3.00	B6									
2.00 - 2.45	SPT (S) N=12		Dry	N=12 (3,3/3,3,3,3)		(1.20)				
3.00	D3				24.56	3.00		Dense grey sandy subangular fine to coarse GRAVEL. (Possibly destructured granite.)		
3.00 - 3.28	SPT (S)		Dry	N=47 (9,11/47 for 130mm)		(1.40)				
					23.16	4.40		Weathered GRANITE (Driller's description)		
						(0.30)				
	100 100	44	10		22.86	4.70		Strong pale green saussuritic GRANITE with very narrow black veins. Partially weathered: pervasive discolouration. Discontinuities: 1. 0 to 10 degree joints, closely spaced (20/190/450) slightly undulating, rough, strong patchy orange, green and black staining on joint surfaces. 2. 25 to 35 degree joints medium spaced (180/550/750) slightly undulating, rough, strong patchy ornage, green and black staining on joint surfaces.		
5.70										
	100 100	55	6			(3.00)				
			17							
6.70	100 100	90	5							
7.70					19.86	7.70		End of Borehole at 7.70m		
	TCR SCR	RQD	FI							

Remarks
Hand dug inspection pit excavated.

Core Barrel
SK6L

Flush Type
Polymer

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	2.00
Rotary Drilling	Comacchio 205	2.00	4.90
Rotary Coring	Comacchio 205	4.90	7.90

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH05

Coordinates: 126849.31 E, 224906.11 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 27.09 mOD

Dates: 02/05/2019 - 02/05/2019

Driller: JL+RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.20 - 1.10	B1				26.89	(0.20) 0.20		TOPSOIL		
						(0.90)		MADE GROUND: Medium dense dark orangish brown sandy slightly clayey subangular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.		
1.10 - 2.00	B2				25.99	1.10				
1.20	D3							Medium dense yellowish grey sandy subangular to subrounded fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.		
1.20 - 1.65	SPT (S) N=20		Dry	N=20 (7,7/6,5,4,5)		(0.90)				
2.00	D4				25.09	2.00				
2.00 - 2.22	SPT (S)		Dry	N=50 (25 for 80mm/50 for 135mm)				Dense grey slightly sandy subangular fine to coarse GRAVEL with high boulder content. Sand is fine to coarse.		
						(2.00)				
					23.09	4.00		Weathered GRANITE (Driller's description)		
						(0.90)				
					22.19	4.90		Medium strong green and pale yellowish green speckled black saussuritic GRANITE. Partially weathered: closer fracture spacing, pervasive discolouration. Discontinuities: 1. 5 to 15 degree joints closely spaced (120/170/230) undulating, rough, strong green staining on joint surfaces.		
	100 100 90		7			(0.55)				
					21.64	5.45				
5.90	100 100 100		4					Medium strong pale green and pale pinkish white speckled black GRANITE. Partially weathered: closer fracture spacing, discolouration on joint surfaces. Discontinuities: 1. 15 to 25 degree joints medium spaced (20/210/440) undulating, rough, pale green, greenish yellow and patchy black staining on joint surfaces. 2. 60 to 70 degree joints at 5.45m to 5.60m and 6.35m to 6.45m, undulating, rough, pale green, greenish yellow and patchy black staining on joint surfaces.		
						(2.45)				
6.90	100 100 88		9							
7.90					19.19	7.90		End of Borehole at 7.90m		
	TCR SCR RQD		FI							

Remarks
Hand dug inspection pit excavated.

Core Barrel
SK6L

Flush Type
Polymer

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	2.00
Rotary Drilling	Comacchio 205	2.00	2.40
Rotary Coring	Comacchio 205	2.40	5.40

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH06

Coordinates: 126979.75 E, 224867.54 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Driller: JL+RS

Ground Level: 33.95 mOD

Dates: 01/05/2019 - 01/05/2019

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	TCR	SCR	RQD	FI	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.20 - 0.70	B1								33.75	(0.20) 0.20		TOPSOIL		
										(0.50)		Soft dark brown peaty slightly sandy gravelly SILT with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse.		
0.70 - 2.00	B2								33.25	0.70		Medium dense greyish yellow fine to coarse SAND and subangular fine to coarse GRAVEL with medium cobble content.		
1.20	D3													
1.20 - 1.65	SPT (S) N=25						Dry	N=25 (9,7/7,6,1,11)		(1.30)				
2.00	D4								31.95	2.00 (0.40)		GRANITE (Driller's description)		
2.00 - 2.34		100	100	85	5 >20			N=50 (11,12/50 for 190mm)	31.55	2.40		Medium strong pale pink and white speckled medium grained GRANITE with very narrow green veins. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 10 to 20 degree joints closely spaced (30/180/700) undulating, rough, strong green and patchy black, orange and yellow staining with patchy white and light brown silt deposits on joint surfaces. 2. 50 to 65 degree joints medium spaced (400/590/800) planar, rough, strong green and patchy black, orange and yellow staining with patchy white and light brown silt deposits on joint surfaces. 3. >80 degree joint at 2.55m to 2.80m, undulating, rough, strong green and patchy black staining with patchy white silt deposits on joint surfaces. *2.70m to 2.90m: Zone of dark green weak saussuritic granite*		
3.40		100	100	100	5					(3.00)				
4.40		100	100	95	3 10							*5.20m to 5.40m: Coarse grained pink and white granite.*		
5.40									28.55	5.40		End of Borehole at 5.40m		

Remarks
Hand dug inspection pit excavated.

Core Barrel
SK6L

Flush Type
Polymer

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	1.75
Rotary Drilling	Comacchio 205	1.75	4.70
Rotary Coring	Comacchio 205	4.70	6.70

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH07

Coordinates: 126885.72 E, 224830.69 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 27.18 mOD

Dates: 02/05/2019 - 02/05/2019

Driller: JL+RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.20 - 0.50	B1				26.98	(0.20) 0.20		TOPSOIL		
						(0.30)		Possible MADE GROUND: Greyish brown gravelly fine to coarse SAND. Gravel is subangular fine to coarse.		
0.50 - 0.90	B2				26.68	0.50		Soft grey slightly gravelly very sandy SILT. Sand is fine to coarse. Gravel is subangular fine to medium.		
						(0.40)				
0.90 - 1.50	B3				26.28	0.90		Dense grey slightly gravelly fine to coarse SAND. Gravel is subangular fine to medium.		
1.20	D5					(0.60)				
1.20 - 1.65	SPT (S) N=37		Dry	N=37 (3,4/7,6,6,18)	25.68	1.50		Dense greyish orange slightly sandy slightly silty angular fine to coarse GRAVEL. Sand is fine to coarse.		
1.50 - 1.75	B4									
1.75	D6									
1.75 - 1.97	SPT (S)		Dry	N=50 (25 for 105mm/50 for 115mm)		(1.00)				
					24.68	2.50		Light grey sandy GRAVEL / Possible destructured GRANITE (Driller's description)		
						(2.10)				
					22.58	4.60		Medium strong purplish pink speckled black fine grained GRANITE. Partially weathered: discolouration on joint surfaces. Discontinuities: 1. 25 to 35 degree joints, closely s[paced (10/130/200) slightly undulating, rough, strong black and orange and patchy yellow and green staining on joint surfaces.		
	100 85 70		20 20							
5.70						(2.10)				
	100 90 85		20 6							
6.70					20.48	6.70		End of Borehole at 6.70m		
	TCR SCR RQD		FI							

Remarks
Hand dug inspection pit excavated.

Core Barrel
SK6L

Flush Type
Polymer

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	1.20
Rotary Drilling	Comacchio 205	1.20	5.50
Rotary Coring	Comacchio 205	5.50	8.50

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH08

Coordinates: 126774.87 E, 224862.37 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 26.89 mOD

Dates: 10/05/2019 - 10/05/2019

Driller: JL+RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.20 - 1.20	B1				26.68	(0.20) 0.20		TOPSOIL		
						(1.00)		MADE GROUND: Dense grey slightly sandy subangular fine to medium GRAVEL with medium cobble content. Sand is fine to coarse.		
1.20					25.68	1.20				
1.20 - 1.54	D2 SPT (S)		Dry	N=50 (25 for 115mm/50 for 220mm)		(0.80)		MADE GROUND: GRAVEL (Driller's description)		
					24.88	2.00				
						(1.70)		MADE GROUND: Sandy GRAVEL (Driller's description)		
					23.18	3.70				
						(0.30)		PEAT (Driller's description)		
					22.88	4.00				
						(0.20)		SAND (Driller's description)		
					22.68	4.20		GRAVEL/possible destructured GRANITE (Driller's description)		
						(0.90)				
					21.78	5.10				
						(0.30)		Weathered GRANITE (Driller's description)		
					21.48	5.40				
	100 70 70		7			(0.90)		Medium strong very pale pinkish white speckled black GRANITE. Partially weathered: closer fracture spacing, discolouration on joint surfaces. Discontinuities: 1. 50 to 70 degree joints, closely spacing (100/190/300) undulating, rough, strong brownish orange and green staining on joint surfaces.		
					20.58	6.30				
6.50	100 100 85		7					Strong pale pink and white speckled black GRANITE. Partially weathered: closer fracture spacing, discolouration on joint surfaces. Discontinuities: 1. 0 to 10 degree joints closely spaced (100/180/550) undulating, rough, pale green, yellowish green and patchy black staining on joint surfaces. 2. 45 degree to 60 degree joints at 6.95m to 7.05m and 7.75m to 7.90m, slightly undulating, rough, pale green, yellowish green and patchy black staining on joint surfaces.		
7.50	100 100 100		3			(2.20)				
8.50					18.39	8.50		End of Borehole at 8.50m		
	TCR SCR RQD		FI							

Remarks
Hand dug inspection pit excavated.

Core Barrel
SK6L

Flush Type
Polymer

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	2.70
Rotary Drilling	Comacchio 205	2.70	3.90
Rotary Coring	Comacchio 205	3.90	6.90

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH09

Coordinates: 126835.00 E 224775.53 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 23.48 mOD

Dates: 09/05/2019 - 09/05/2019

Driller: JL+RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.50)		Peaty TOPSOIL		
0.50 - 1.00	B1				22.98	0.50		MADE GROUND: Grey slightly silty slightly gravelly fine SAND. Gravel is subrounded fine.		
						(0.50)				
1.00 - 1.80	B2				22.48	1.00		Soft grey slightly gravelly sandy silty CLAY. Sand is fine to coarse. Gravel is subrounded fine.		
1.20	D4									
1.20 - 1.65	SPT (S) N=7		Dry	N=7 (2,2/1,1,2,3)		(0.80)				
1.80 - 2.00	B3			Water strike at 1.80m	21.68	1.80		Medium dense grey slightly sandy subangular fine to coarse GRAVEL. Sand is fine to coarse.	▼	
2.00	D5					(0.90)				
2.00 - 2.45	SPT (S) N=25		1.20	N=25 (3,8/4,2,5,14)					▼	
2.45	D6				20.78	2.70		Light grey sandy silty GRAVEL / Possible destructured GRANITE (Driller's description)		
2.45 - 2.71	SPT (S)		1.20	N=50 (25 for 79mm/50 for 180mm) Water strike at 2.50m		(1.20)				
	100 90 60			7	19.58	3.90		Medium strong pink and white speckled black medium grained GRANITE with narrow dark green veins. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 0 to 10 degree medium spaced (180/400/600) undulating, rough, strong green and patchy orangish yellow and greenish yellow staining with patchy white silt deposits on joint surfaces. 2. 40 to 50 degree joints, medium spaced (130/350/650) planar, rough, strong green and patchy orangish yellow ad greenish yellow staining with patchy white silt deposits on joint surfaces. 3. 65 to 75 degree joints, widely spaced (350/850/1050) slightly undulating, rough, strong green and black patchy orangish yellow staining with patchy white silt deposits on joint surfaces.		
4.90	100 95 80					(3.00)				
5.90	100 100 90			5						
6.90					16.58	6.90		End of Borehole at 6.90m		
	TCR SCR RQD		FI							

Remarks
Hand dug inspection pit excavated.

Core Barrel
SK6L

Flush Type
Polymer

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
1.80 2.50	1.80 2.50		

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)

Chiselling Details

From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion Rotary Coring	Dando Terrier Comacchio 205	0.00 3.40	3.40 5.00

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH10

Coordinates: 126740.88 E, 224740.11 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Driller: JL+RS

Ground Level: 23.52 mOD

Dates: 09/05/2019 - 09/05/2019

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.50)		Peaty TOPSOIL		
0.50 - 1.00	B1				23.02	0.50		Possible MADE GROUND: Soft dark grey slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is subrounded fine to coarse.		
						(0.50)				
1.00 - 2.00	B2				22.52	1.00		Medium dense grey slightly silty sandy subangular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium.		
1.20	D4									
1.20 - 1.65	SPT (S) N=16		Dry	N=16 (4,5/4,3,3,6)		(1.00)				
2.00	D5				21.52	2.00		Firm grey sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular fine to medium.		
2.00 - 3.00	B3									
2.00 - 2.45	SPT (S) N=11		1.80	N=11 (2,0/3,3,3,2)		(1.40)				
3.00	D6									
3.00 - 3.44	SPT (S)		1.30	N=50 (9,11/50 for 295mm)						
	100 100 70		8		20.12	3.40		Weak to medium strong reddish pink, white and pale green speckled black coarse grained GRANITE. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 35 to 45 degree joints, closely spaced (30/150/200) slightly undulating, rough, strong black and green staining, patchy orange and greenish yellow staining with patchy white silt deposits on joint surfaces.		
4.40						(1.60)				
	100 100 100									
5.00					18.52	5.00		End of Borehole at 5.00m		
	TCR SCR RQD FI									

Remarks
Hand dug inspection pit excavated.

Core Barrel	Water Strikes				Chiselling Details		
SK6L	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Flush Type	Water Added		Casing Details	
Polymer	From (m)	To (m)	To (m)	Diam (mm)

CAUSEWAY GEOTECH

Project No.:	Project Name:	Borehole No.:
19-0472	Kingston, Galway	BH11
Coordinates:	**Client:**	Sheet 1 of 1
126795.45 E	Lioncor Developments Limited	
224695.08 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:50
Ground Level: 24.87 mOD	**Dates:** 09/05/2019 - 09/05/2019	**Driller:** JL+RS
		Logger: MFG+CC

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	2.10
Rotary Coring	Comacchio 205	2.10	5.10

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	TCR	SCR	RQD	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
									(0.40)		Peaty TOPSOIL		
0.40 - 1.00	B1							24.47	0.40		Medium dense orangish brown gravelly slightly silty fine to coarse SAND. Gravel is subrounded fine.		
1.00 - 1.70	B2								(1.30)				
1.20	D4												
1.20 - 1.65	SPT (S) N=22					Dry	N=22 (4,4/6,5,6,5)						
1.70 - 2.00	B3							23.17	1.70		Dense yellow orange sandy angular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse.		
2.00	D5								(0.40)				
2.00 - 2.45		100	95	95		4	N=50 (5,10/11,12,13,14)	22.77	2.10		Medium strong pink and white speckled black medium grained GRANITE. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 35 to 45 degree joints closely spaced (40/180/260) planar, rough, strong black and green staining, patchy yellowish orange, brownish yellow and white staining with patchy light brown silt deposits. 2. 65 degree joint at 3.60m to 3.70m, planar, rough, strong black and green staining with patchy light brown silt deposits on joint surfaces.		
						8							
3.10		100	100	100		6			(3.00)				
4.10		100	95	95		7							
5.10								19.77	5.10		End of Borehole at 5.10m		

Remarks
Hand dug inspection pit excavated.

Core Barrel	Water Strikes				Chiselling Details		
SK6L	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)

Flush Type	Water Added		Casing Details	
Polymer	From (m)	To (m)	To (m)	Diam (mm)

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Light Percussion	Dando Terrier	0.00	3.00
Rotary Drilling	Comacchio 205	3.00	5.50
Rotary Coring	Comacchio 205	5.50	8.50

Project No.: 19-0472

Project Name: Kingston, Galway

Borehole No.: BH12

Coordinates: 126703.46 E, 224699.86 N

Client: Lioncor Developments Limited

Sheet 1 of 1

Client's Representative: Tobin Consulting Engineers

Scale: 1:50

Ground Level: 26.72 mOD

Dates: 09/05/2019 - 09/05/2019

Driller: JL+RS

Logger: MFG+CC

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.20)		TOPSOIL		
0.20 - 1.00	B1				26.52	0.20		MADE GROUND: Very soft dark brown peaty slightly gravelly SILT with rootlets throughout.		
1.00 - 2.00	B2									
1.20	D5									
1.20 - 1.65	SPT (S) N=2		Dry	N=2 (0,0/0,0,1,1)		(2.70)				
1.90 - 3.00	D7									
2.00	D6									
2.00 - 2.90	B3									
2.00 - 2.45	SPT (S) N=12		Dry	N=12 (0,0/0,0,6,6)						
2.90 - 3.00	B4				23.82	2.90		MADE GROUND: Dense grey slightly sandy angular fine to medium GRAVEL. Sand is fine to coarse.		
3.00 - 3.44	SPT (S)		Dry	N=50 (2,6/50 for 290mm)		(1.00)				
					22.82	3.90		PEAT (Driller's description)		
						(0.70)				
					22.12	4.60		Light grey GRAVEL / Possible destructured GRANITE (Driller's description)		
						(0.90)				
	100 80	37	>20 8		21.22	5.50 (1.00)		Medium strong pink and white speckled black coarse grained GRANITE. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 20 to 35 degree joints, closely spaced (10/60/120) slightly undulating, rough, strong green and black staining with patchy white silt deposits on joint surfaces		
6.50					20.22	6.50		Strong reddish pink speckled black fine grained GRANITE. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 15 to 30 degree joints, closely spaced (40/150/290) slightly undulating, rough, strong patchy green ad black staining with patchy films of white silt deposits on joint surfaces.		
	100 100	87	5			(0.90)				
7.50					19.32	7.40		Medium strong pale pink and white fine grained GRANITE. Partially weathered: silt deposits and discolouration on joint surfaces. Discontinuities: 1. 20 to 35 degree joints, closely spaced (40/120/230) undulating, rough, strong patchy green, black and orange staining with patchy films of white silt deposits on joint surfaces.		
	100 100	75	5 15 6			(1.10)				
8.50					18.22	8.50		End of Borehole at 8.50m		
	TCR	SCR	RQD	FI						

Remarks
Hand dug inspection pit excavated.

Core Barrel
SK6L

Flush Type
Polymer

Water Strikes			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Water Added		Casing Details	
From (m)	To (m)	To (m)	Diam (mm)

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX C

CORE PHOTOGRAPHS

RECEIVED: 16/10/2025

Borehole BH01B (5.30-8.20m)

Borehole BH02 (5.30-8.30m)

RECEIVED: 16/10/2025

Borehole BH03B (5.40-8.40m)

Borehole BH04 (4.70-7.70m)

RECEIVED: 16/10/2025

Borehole BH05 (4.90-7.90m)

Borehole BH06 (2.30-5.40m)

RECEIVED: 16/10/2025

Borehole BH07 (4.70-6.70m)

Borehole BH08 (5.50-8.50m)

Borehole BH09 (3.90-6.90m)

Borehole BH10 (3.40-5.00m)

Borehole BH11 (2.10-5.10)

Borehole BH12 (5.50-8.50m)

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX D

TRIAL PIT LOGS

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP01
Co-ordinates: 126609.14 E 224902.24 N	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	**Client's Representative:** Tobin Consulting Engineers		**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 21.70 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			21.65	(0.05) 0.05		Grass roots and vegetation	
0.40	B2					MADE GROUND: Dark greyish brown sandy very gravelly slightly silty angular to subangular COBBLES. Sand is fine to coarse. Gravel is angular to subangular fine to coarse.	
0.40	ES1			(0.85)			
			20.80	0.90			
1.00	B3					MADE GROUND: Stiff dark greyish brown slightly organic slightly sandy very gravelly clayey SILT with medium to high cobble and boulder content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are angular to subangular.	
				(1.10)			
			19.70	2.00		Firm dark brown fibrous PEAT	
2.20	B4			(0.50)			
			19.20	2.50		Very weak light brownish grey GRANITE excavated as slightly silty gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse.	
				(0.20)			
			19.00	2.70		End of trial pit at 2.70m	

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 2.70

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP02
Co-ordinates: 126744.62 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224956.89 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 24.59 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.60)		Grass roots and TOPSOIL	
0.40	B2		23.99	0.60		Possible MADE GROUND: Light orangish brown very gravelly fine to coarse SAND with medium cobble and boulder content. Gravel is angular to subangular fine to coarse. Cobbles and boulders are angular to subangular.	
0.90	B3			(0.60)			
0.90	ES1		23.39	1.20		End of trial pit at 1.20m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks
No groundwater encounetred

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 1.20

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP03
Co-ordinates: 126671.80 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224834.81 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 22.14 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			22.09	(0.05) 0.05		Grass roots and TOPSOIL	
						End of trial pit at 0.05m	

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability:

Width: 0.80
Length: 0.05

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP04
Co-ordinates: 126752.18 E 224900.22 N	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	**Client's Representative:** Tobin Consulting Engineers		**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 27.44 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.50	B1			(0.65)		MADE GROUND: Dark greyish brown sandy slightly silty angular to subrounded fine to coarse GRAVEL with high cobble content. Sand is fine to coarse. Cobbles are angular to subangular.	
			26.79	0.65		End of trial pit at 0.65m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 0.65

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP05
Co-ordinates: 126845.84 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224912.63 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 27.37 mOD	**Date:** 14/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			27.36	(0.01)		Grass roots and vegetation	
						MADE GROUND: Brown slightly gravelly fine to coarse SAND with low cobble content. Gravel is subangular to subrounded fine to coarse. Cobbles are angular to subrounded.	
				(1.19)			
1.00	B2						
1.00	ES1						
			26.17	1.20		Brown slightly silty slightly gravelly fine to medium SAND with high cobble content. Gravel is subangular to subrounded fine to coarse. Cobbles are rounded to subrounded.	
1.40	B3						
				(0.80)			
			25.37	2.00		Brownish grey very sandy slightly silty subangular to subrounded fine to coarse GRAVEL with high cobble and boulder content. Sand is fine to coarse. Cobbles and boulders are rounded to subrounded.	
2.20	B4						
				(1.20)			
			24.17	3.20		End of trial pit at 3.20m	

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 3.20

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP06
Co-ordinates: 126965.76 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224869.99 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 32.50 mOD	**Date:** 14/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		Grass roots and TOPSOIL	
			32.20	0.30		Light orangish brown sandy silty subangular to subrounded fine to coarse GRAVEL with low cobble and boulder content. Sand is fine to coarse. Cobbles and boulders are angular to subangular.	
0.60 0.60	B2 ES1			(1.10)			
			31.10	1.40		End of trial pit at 1.40m	

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 1.40

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP07
Co-ordinates: 126878.51 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224836.07 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 26.04 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			25.94	(0.10) 0.10		Grass roots and TOPSOIL	
0.60	B2			(0.60)		Possible MADE GROUND: Very stiff orangish brown slightly sandy gravelly clayey SILT with medium to high cobble content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse. Cobbles are angular to subangular.	
0.60	ES1		25.34	0.70		Light greyish cream very gravelly fine to coarse SAND with medium cobble content. Gravel is subangular to subrounded fine to coarse. Cobbles are angular to subangular.	
1.20	B3			(1.10)			
			24.24	1.80		End of trial pit at 1.80m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability: Unstable

Width: 0.80

Length: 1.80

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP08
Co-ordinates: 126767.86 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224836.01 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 26.75 mOD	**Date:** 14/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.30	ES1			(1.20)		MADE GROUND: Grey slightly silty slightly sandy gravelly angular to subangular COBBLES and BOULDERS. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.	
			25.55	1.20		End of trial pit at 1.20m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability: Unstable

Width: 0.80

Length: 1.20

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP09
Co-ordinates: 126820.04 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224760.04 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 23.63 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
		Small seepage from 0.70m to 0.70m	23.53	(0.10) 0.10		Grass roots and TOPSOIL	
				(0.60)		MADE GROUND: Light brown slightly silty angular to subangular COBBLE and BOULDERS. (Possible old land drain)	
0.90	B3		22.93	0.70		Grey very silty fine to coarse SAND	
0.90	ES1			(1.20)			
			21.73	1.90		Firm grey slightly sandy CLAY. Sand is fine.	
2.40	B4						
2.40	ES2	Small seepage from 2.50m to 2.70m		(1.30)			
			20.43	3.20		End of trial pit at 3.20m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks

Terminated at scheduled depth

Water Strikes:

Struck at (m):	Remarks:
0.10	Small seepage from 0.70m to 0.70m
2.50	Small seepage from 2.50m to 2.70m

Stability: Unstable

Width: 0.80

Length: 3.20

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP10
Co-ordinates: 126717.86 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224774.08 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 25.92 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			25.91	(0.01)		Grass roots and vegetation	
0.40	B2					MADE GROUND: Dark brown slightly silty very gravelly fine to coarse SAND with medium cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles ad boulders are subangular to subrounded.	
0.40	ES1			(1.19)			
			24.72	1.20		Possible MADE GROUND: Dark brown slightly clayey silty very gravelly fine to coarse SAND with medium cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Cobbles and boulders are angular to subangular.	
1.40	B3			(0.40)			
			24.32	1.60		End of trial pit at 1.60m	

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 1.60

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP11
Co-ordinates: 126780.63 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224677.06 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 29.52 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			29.47	(0.05) 0.05		Grass roots and TOPSOIL	
				(0.80)		Very stiff dark brownish black slightly sandy gravelly SILT with medium cobble and boulder content. Sand is fine to coarse. Gravel is angular to subangular. Cobbles and boulders are angular to subangular.	
0.80	B3		28.67	0.85			
0.80	ES1					Dark reddish brown very silty sandy gravelly angular to subangular COBBLES and BOULDERS. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse,	
1.00	B4			(0.35)			
1.00	ES2		28.32	1.20		End of trial pit at 1.20m	

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 1.20

CAUSEWAY GEOTECH

Project No.: 19-0472	**Project Name:** Kingston, Galway		**Trial Pit No.:** TP12
Co-ordinates: 126691.89 E	**Client:** Lioncor Developments Limited		Sheet 1 of 1
Method: Trial Pitting	224682.40 N	**Client's Representative:** Tobin Consulting Engineers	**Scale:** 1:25
Plant: 6T Tracked Excavator	**Ground Level:** 25.12 mOD	**Date:** 13/05/2019	**Logger:** FG

RECEIVED: 16/10/2025

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			25.07	(0.05) 0.05		Grass roots and TOPSOIL	
0.60 0.60	B3 ES1			(1.15)		MADE GROUND: Dark greyish black slightly organic gravelly sandy clayey SILT with medium cobble and boulder content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse.	
			23.92	1.20		Possible MADE GROUND: Light brown very sandy silty subangular to subrounded fine to coarse GRAVEL with low to medium cobble and boulder content. Sand is fine to coarse. Cobbles an boulders are angular to subangular.	
1.60 1.60	B4 ES2			(0.60)			
			23.32	1.80		End of trial pit at 1.80m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks
No groundwater encountered

Terminated on large boulders or possible bedrock

Water Strikes:

Struck at (m):	Remarks:

Stability: Stable

Width: 0.80

Length: 1.80

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX E

TRIAL PIT PHOTOGRAPHS

Trial Pit TP01

Trial Pit TP01

Trial Pit TP02

Trial Pit TP02

Trial Pit TP03

Trial Pit TP04

Trial Pit TP04

RECEIVED: 16/10/2025

Trial Pit TP05

Trial Pit TP05

Trial Pit TP06

Trial Pit TP06

CAUSEWAY GEOTECH

Trial Pit TP07

Trial Pit TP07

Trial Pit TP08

Trial Pit TP08

Trial Pit TP09

Trial Pit TP09

Trial Pit TP10

Trial Pit TP10

Trial Pit TP11

Trial Pit TP11

Trial Pit TP12

CAUSEWAY GEOTECH

Trial Pit TP12

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX F

INDIRECT IN-SITU CBR TEST RESULTS

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP01

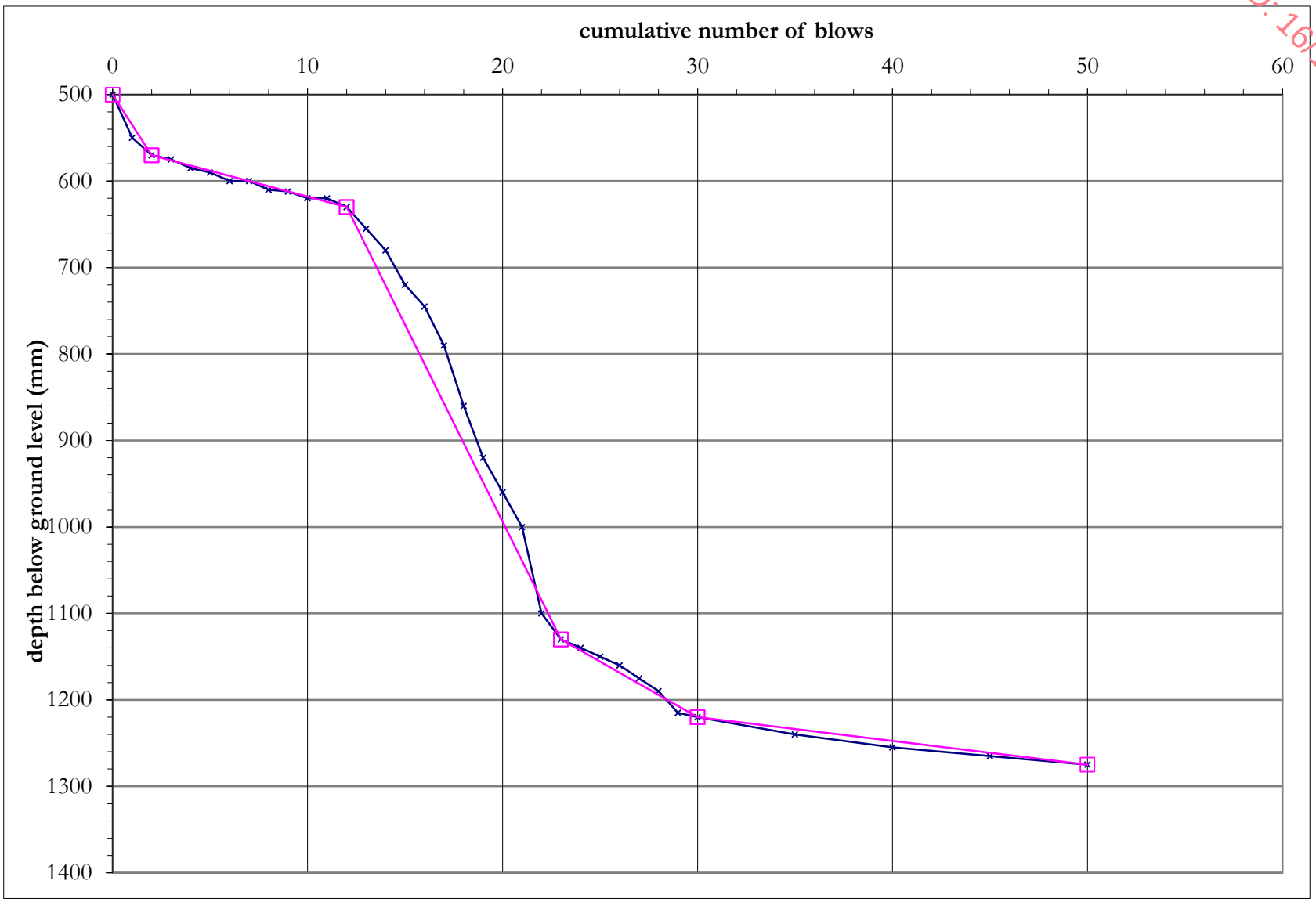
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 16-May-19



depth from to (mm)	mm/blow	CBR (%)
500	35	7
570		
570	6	45
630		
630	45	5.3
1130		
1130	13	20
1220		
1220	2.8	>100
1275		

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP02

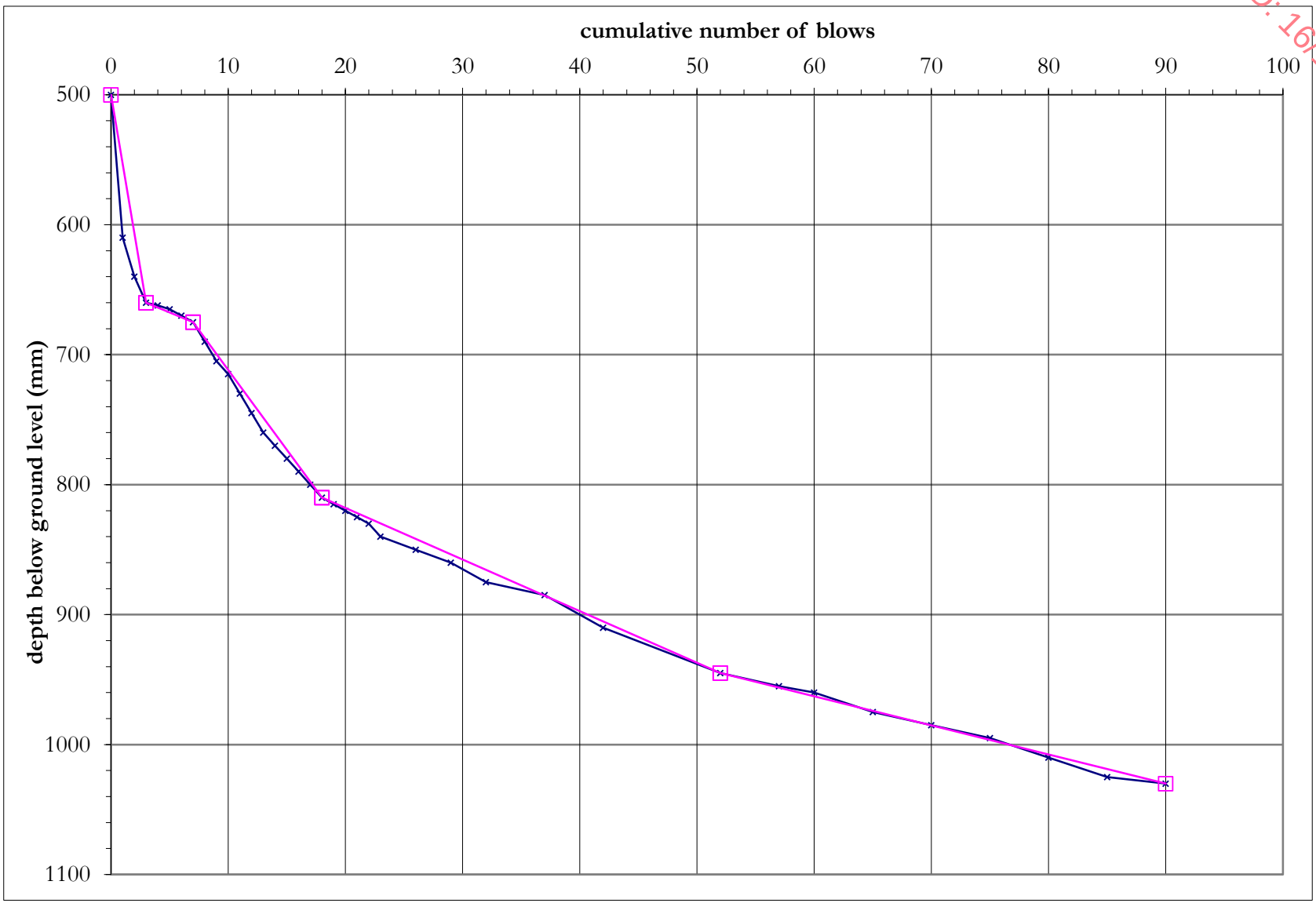
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 16-May-19



depth from to (mm)	mm/blow	CBR (%)
500	53	4.5
660		
660	3.8	75
675		
675	12	21
810		
810	4	70
945		
945	2.2	>100
1030		

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP05

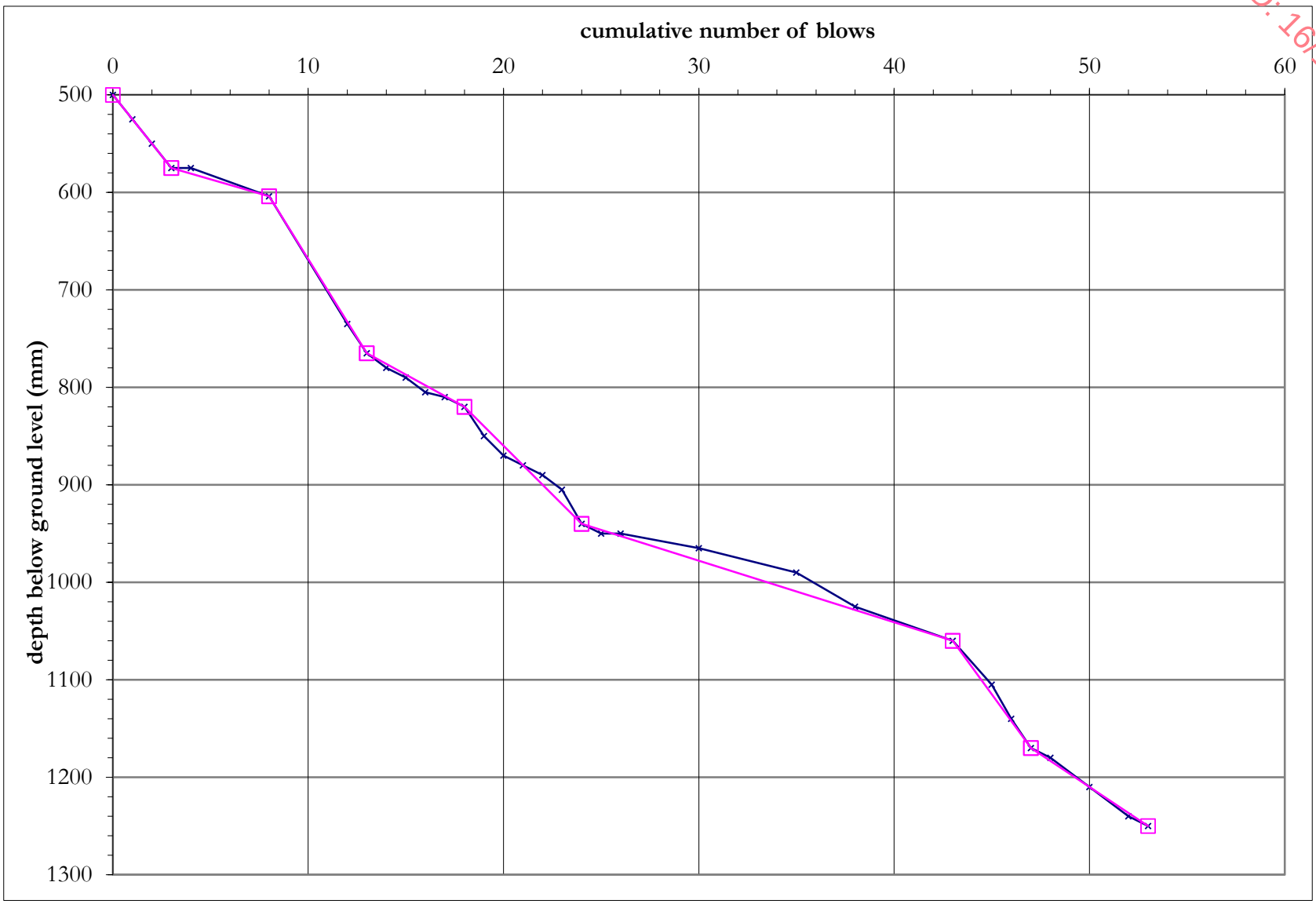
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 16-May-19



depth from to (mm)	mm/blow	CBR (%)
500	25	10
575		
575	5.8	47
604		
604	32	7.7
765		
765	11	24
820		
820	20	13
940		
940	6.3	43
1060		
1060	28	9.1
1170		
1170	13	20
1250		

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP06

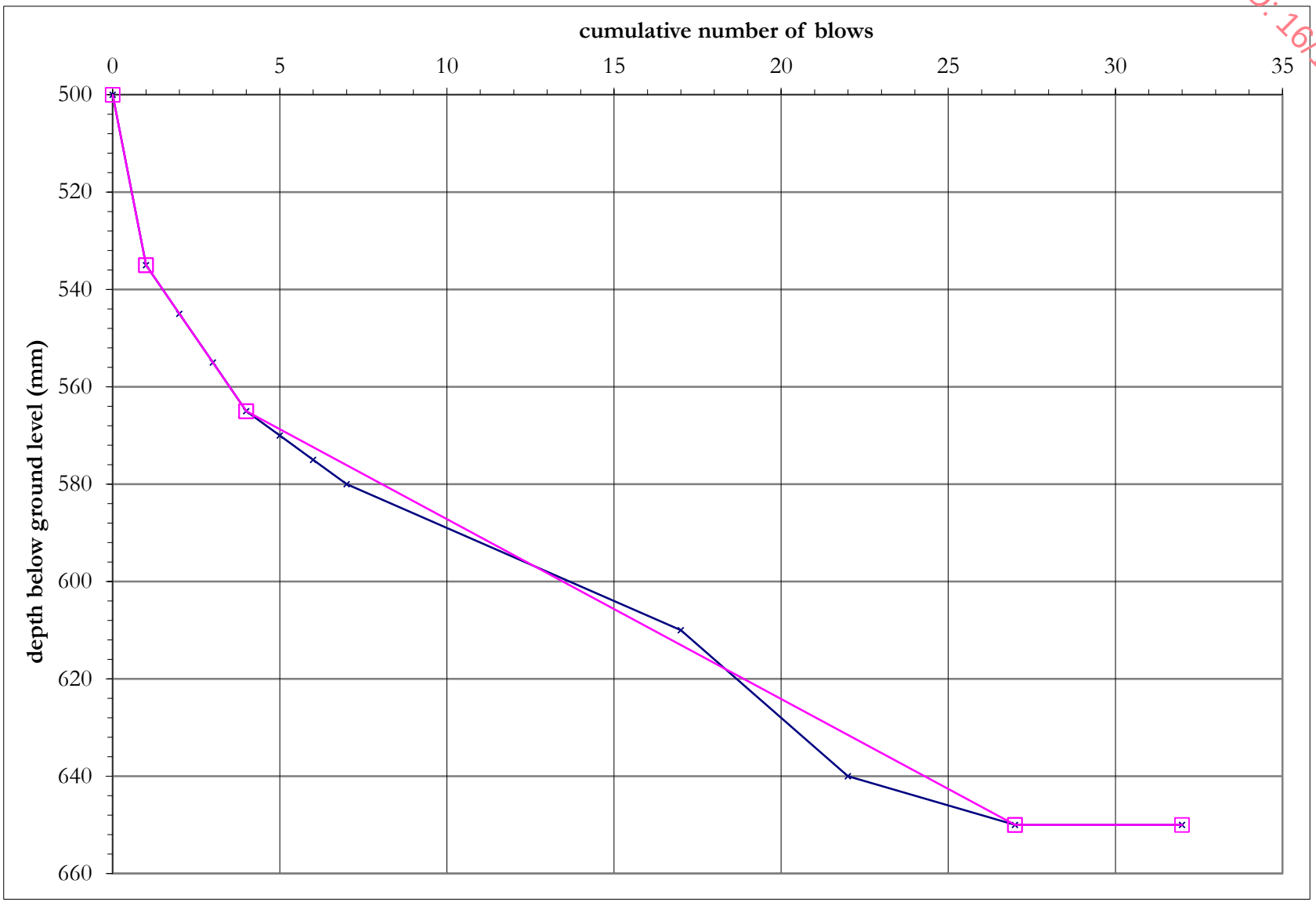
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 14-May-19



depth from to (mm)	mm/blow	CBR (%)
500	35	7
535		
535	10	26
565		
565	3.7	76
650		
650	0	>100
650		

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP08

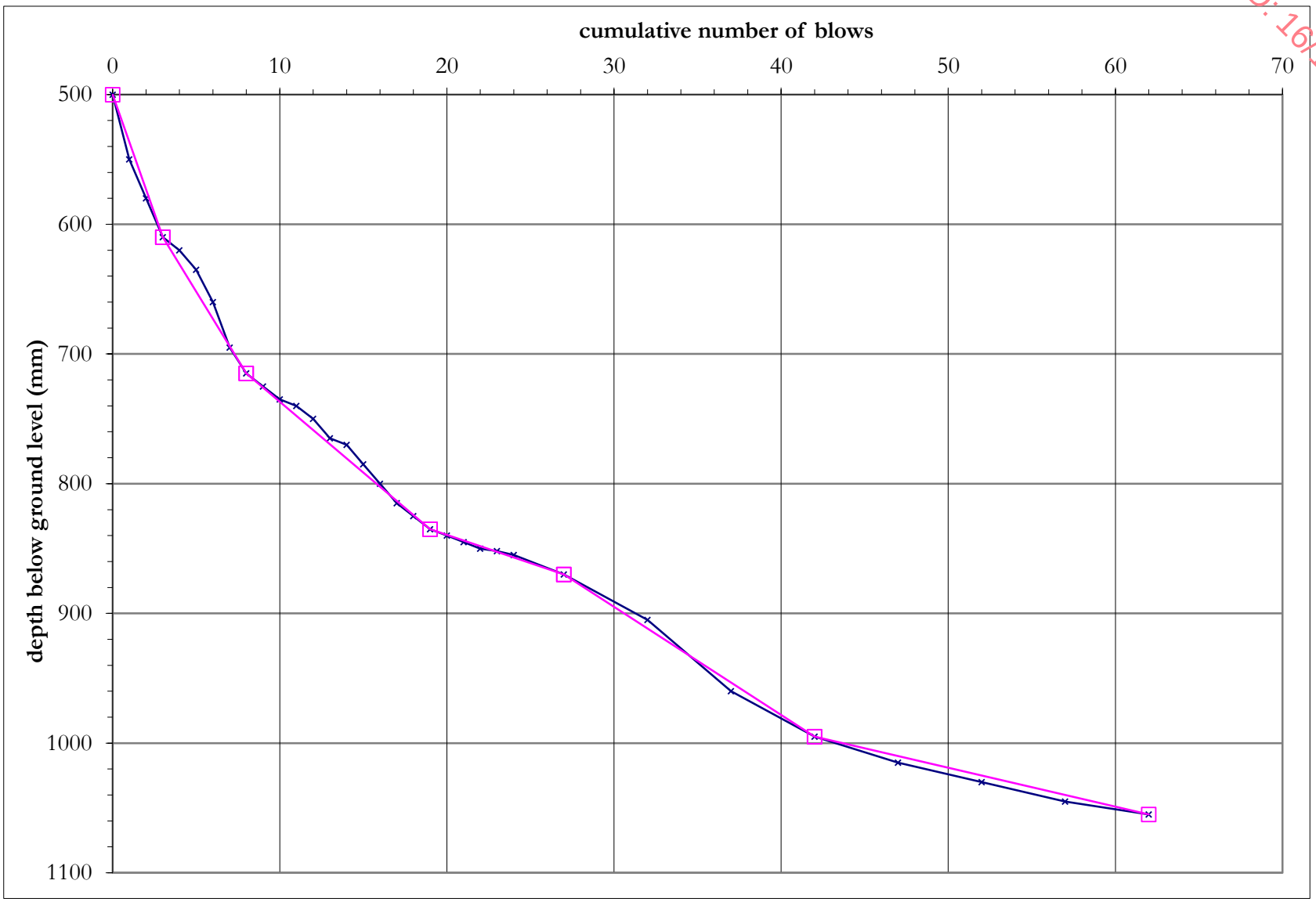
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 14-May-19



depth from to (mm)	mm/blow	CBR (%)
500	37	6.7
610		
610	21	12
715		
715	11	24
835		
835	4.4	63
870		
870	8.3	32
995		
995	3	95
1055		

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP10

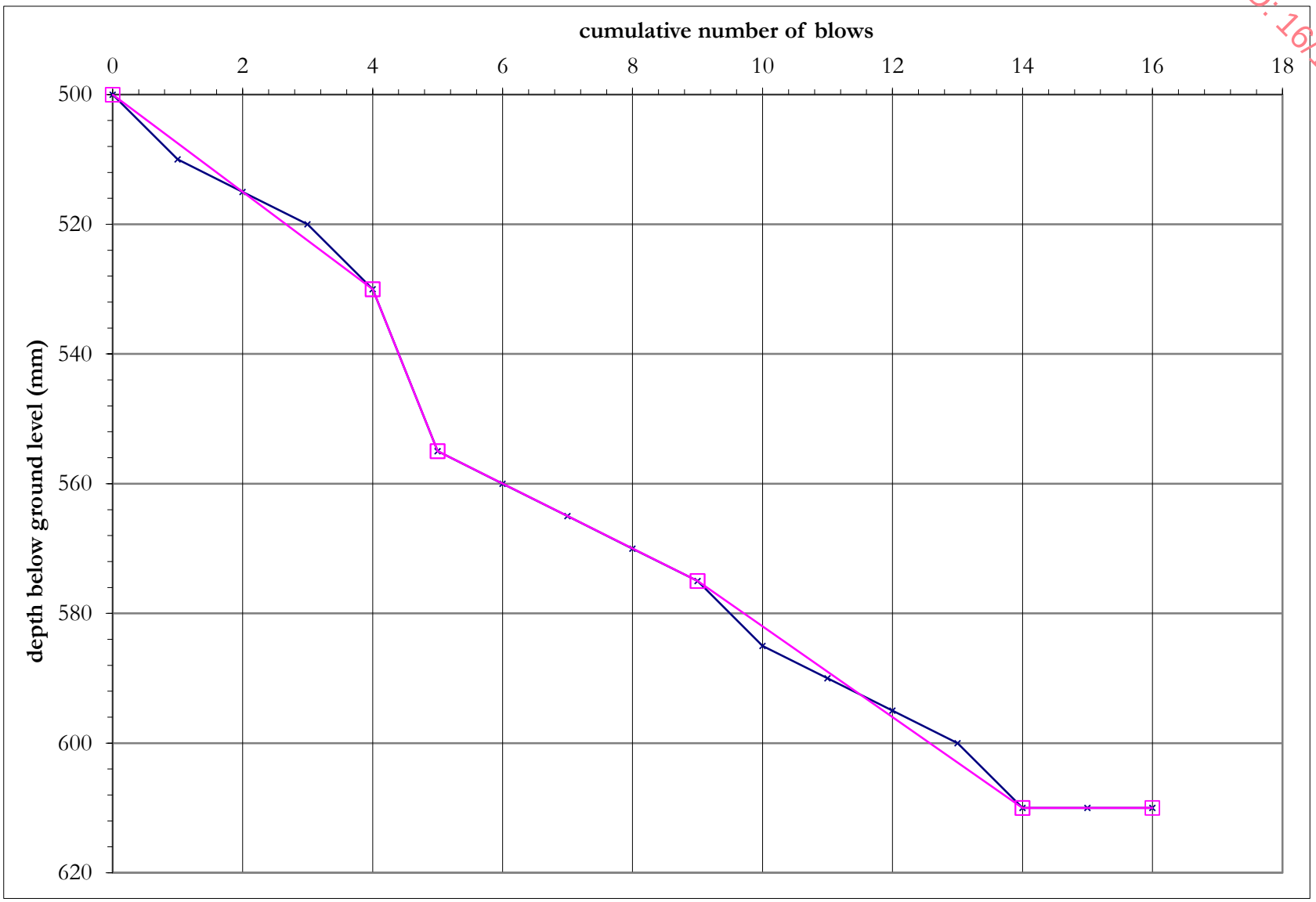
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 13-May-19



depth from (mm)	to (mm)	mm/blow	CBR (%)
500	530	7.5	36
530	555	25	10
555	575	5	55
575	610	7	39
610	610	0	>100

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP11

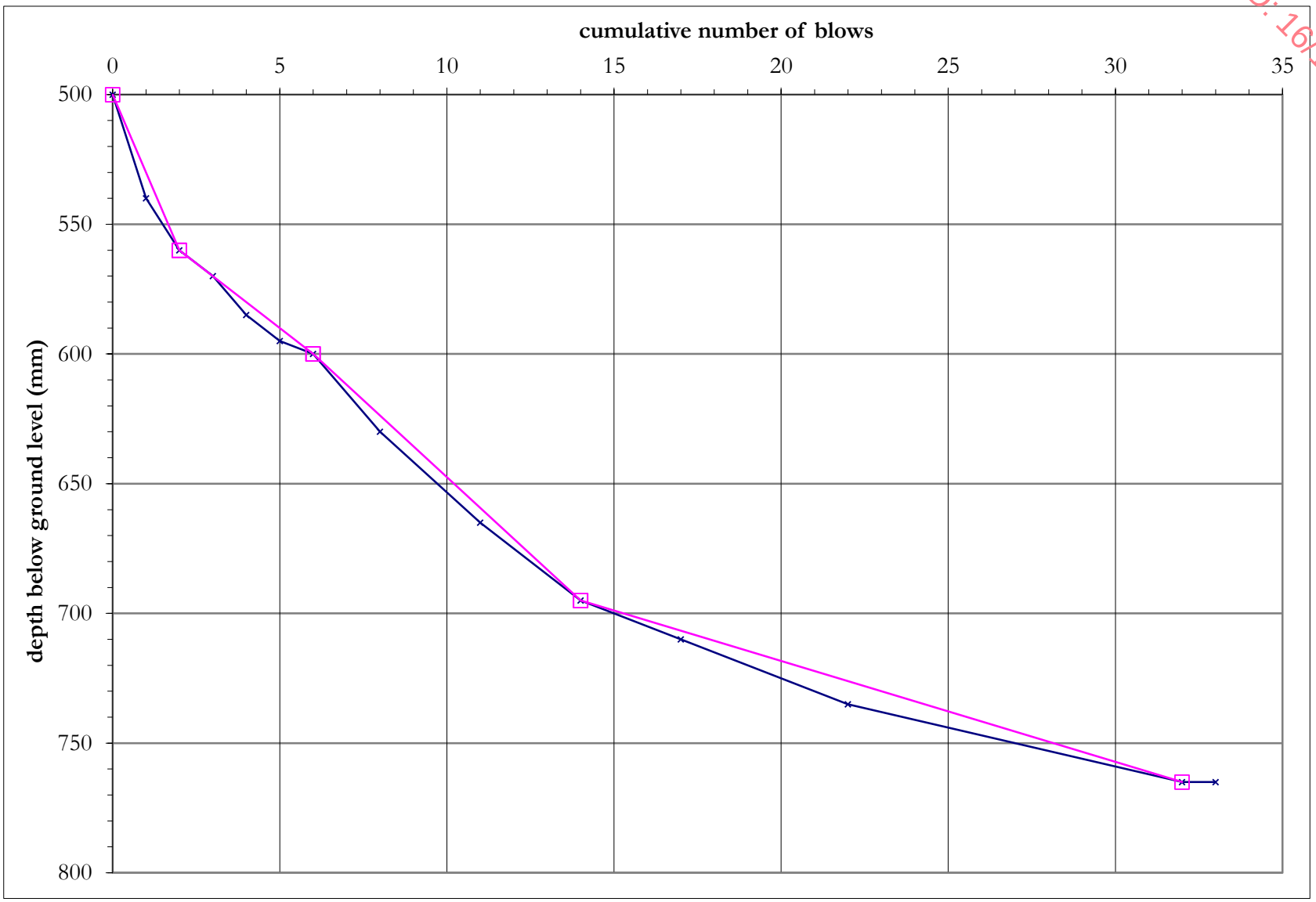
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 13-May-19



depth from to (mm)	mm/blow	CBR (%)
500	30	8.3
560		
560	10	26
600		
600	12	22
695		
695	3.9	72
765		

Causeway Geotech Ltd

Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Kingston Galway

Test Number: TP12

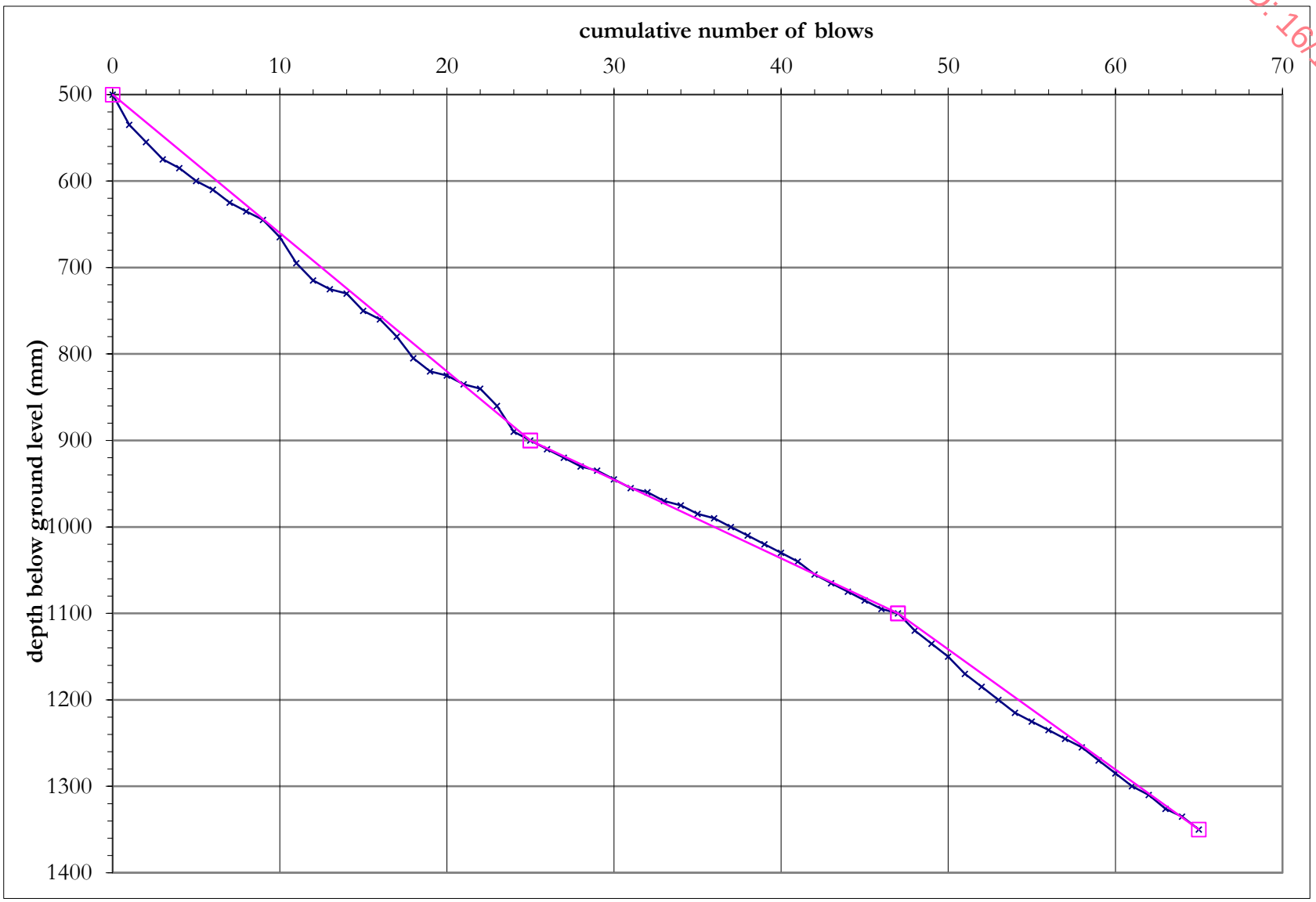
CBR estimated using TRL Road Note 8:

Log CBR = 2.48-1.057 Log (mm/blow)

RECEIVED: 16/10/2025

Project No: 19-0472

Date: 13-May-19



depth from to (mm)	mm/blow	CBR (%)
500 900	16	16
900 1100	9.1	29
1100 1350	14	19

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX G

GEOTECHNICAL LABORATORY TEST RESULTS

CAUSEWAY GEOTECH

10122

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

RECEIVED: 16/10/2025

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

Project Name:	Kingston, Galway –Ground Investigation
Project No.:	19-0472
Client:	Lioncor Developments Limited
Engineer:	Tobin Consulting Engineers
Date:	08/06/19

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s).

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Approved Signatory

Stephen Watson
Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

CAUSEWAY GEOTECH

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

10122

RECEIVED: 16/10/2025

Project Name: Kingston, Galway –Ground Investigation

Report Reference: Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report.

Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: Cl 3.2	14
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: Cl 4.4, 5.3 & 5.4	9
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: Cl 9.2	13
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: Cl 9.5	6

SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL – Subcontracted to Pro Soils Limited *(UKAS 2183)*	pH Value of Soil		3
SOIL – Subcontracted to Chemtest Ltd *(UKAS 2183)*	Sulphate Content water extract		3
SOIL – Subcontracted to Chemtest Ltd *(UKAS 2183)*	Organic Matter Content		2

Summary of Classification Test Results

CAUSEWAY GEOTECH

Project No.	Project Name
19-0472	Kingston, Galway

RECEIVED: 16/10/2025

Hole No.	Sample				Soil Description	Density bulk / dry Mg/m3		w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
	Ref	Top	Base	Type										
BH01B	2	1.00		B	Brown slightly gravelly silty fine to coarse SAND.			6.3						
BH02	2	1.00		B	Brown slightly gravelly silty fine to coarse SAND.			15.0						
BH04	5	1.00		B	Dark brown slightly gravelly fibrous PEAT.			126.0						
BH05	2	1.10		B	Brown slightly sandy subangular fine to coarse GRAVEL with some cobbles.			5.1						
BH06	1	0.20		B	Brown sandy gravelly clayey SILT.			12.0	42	66 -1pt	43	23		MH
BH07	2	0.50		B	Grey sandy slightly gravelly SILT.			14.0	72	22 -1pt	18	4		ML
BH09	2	1.00		B	Grey sandy slightly gravelly silty CLAY.			14.0	94	20 -1pt	13	7		CL
BH10	3	2.00		B	Greyish brown sandy gravelly silty CLAY.			6.9	40	21 -1pt	10	11		CL
BH11	2	1.00		B	Brown slightly gravelly silty fine to coarse SAND.			9.7						
BH12	2	1.00		B	Dark brown sandy slightly gravelly SILT with large pockets of organic matter throughout.			107.0	72	205 -1pt	108	97		ME
TP01	3	1.00		B	Brown gravelly slightly silty fine to coarse SAND.			18.0	37	63 -1pt	NP			
TP07	2	0.60		B	Brown sandy gravelly SILT with medium cobble content.			12.0	45	37 -1pt	31	6		MI

All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 4

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed: 06/08/2019 00:00

Approved By: Stephen.Watson

UKAS TESTING 10122

Summary of Classification Test Results

CAUSEWAY GEOTECH

Project No.	Project Name
19-0472	Kingston, Galway

RECEIVED: 16/10/2025

Hole No.	Sample Ref	Top	Base	Type	Soil Description	Density bulk Mg/m3	Density dry Mg/m3	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m3	Casagrande Classification
TP09	4	2.40		B	Brown slightly sandy silty CLAY.			19.0	100	26 -1pt	15	11		CL
TP11	3	0.80		B	Brown sandy gravelly clayey SILT.			8.3	41	76 -1pt	64	12		MV

All tests performed in accordance with BS1377:1990 unless specified otherwise

LAB 01R Version 4

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed: 06/08/2019 00:00

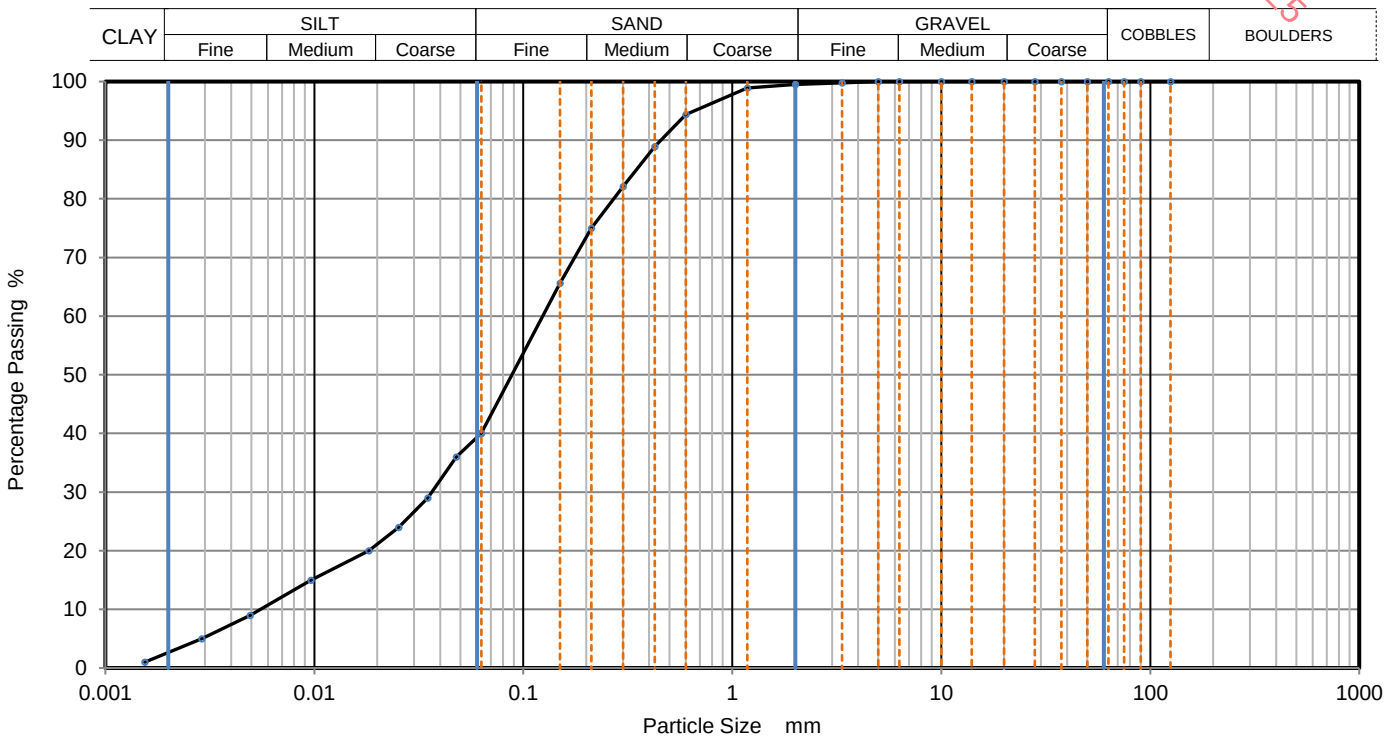
Approved By: Stephen.Watson

UKAS TESTING 10122

PARTICLE SIZE DISTRIBUTION

				Job Ref	**19-0472**
				Borehole/Pit No.	BH02
Site Name	Kingston, Galway			Sample No.	2
Soil Description	Brown slightly gravelly silty fine to coarse SAND.			Depth, m	1.00
Specimen Reference	4	Specimen Depth	1 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus201905171

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0629	40
90	100	0.0478	36
75	100	0.0349	29
63	100	0.0253	24
50	100	0.0182	20
37.5	100	0.0096	15
28	100	0.0049	9
20	100	0.0029	5
14	100	0.0015	1
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	94	Particle density	(assumed)
0.425	89	2.65	Mg/m3
0.3	82		
0.212	75		
0.15	66		
0.063	40		

Dry Mass of sample, g	202

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	60
Silt	37
Clay	3

Grading Analysis		
D100	mm	
D60	mm	0.124
D30	mm	0.036
D10	mm	0.00536
Uniformity Coefficient		23
Curvature Coefficient		2

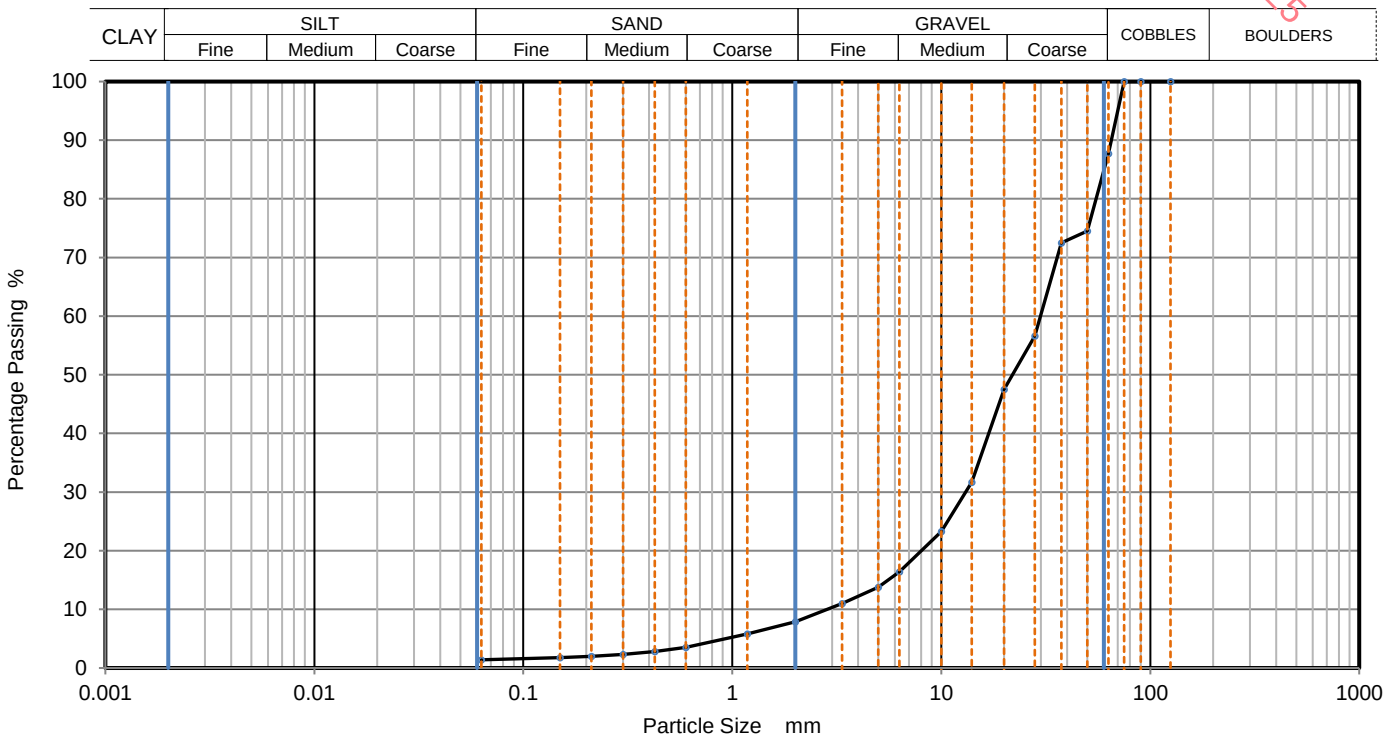
Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**19-0472**
				Borehole/Pit No.	BH05
Site Name	Kingston, Galway			Sample No.	2
Soil Description	Brown slightly sandy subangular fine to coarse GRAVEL with some cobbles.			Depth, m	1.10
Specimen Reference	4	Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus201905173

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	88		
50	75		
37.5	73		
28	57		
20	48		
14	32		
10	23		
6.3	16		
5	14		
3.35	11		
2	8		
1.18	6		
0.6	4		
0.425	3		
0.3	2		
0.212	2		
0.15	2		
0.063	1		

Dry Mass of sample, g	3995

Sample Proportions	% dry mass
Cobbles	12
Gravel	80
Sand	7
Fines <0.063mm	1

Grading Analysis		
D100	mm	
D60	mm	29.8
D30	mm	13.1
D10	mm	2.83
Uniformity Coefficient		11
Curvature Coefficient		2

Remarks

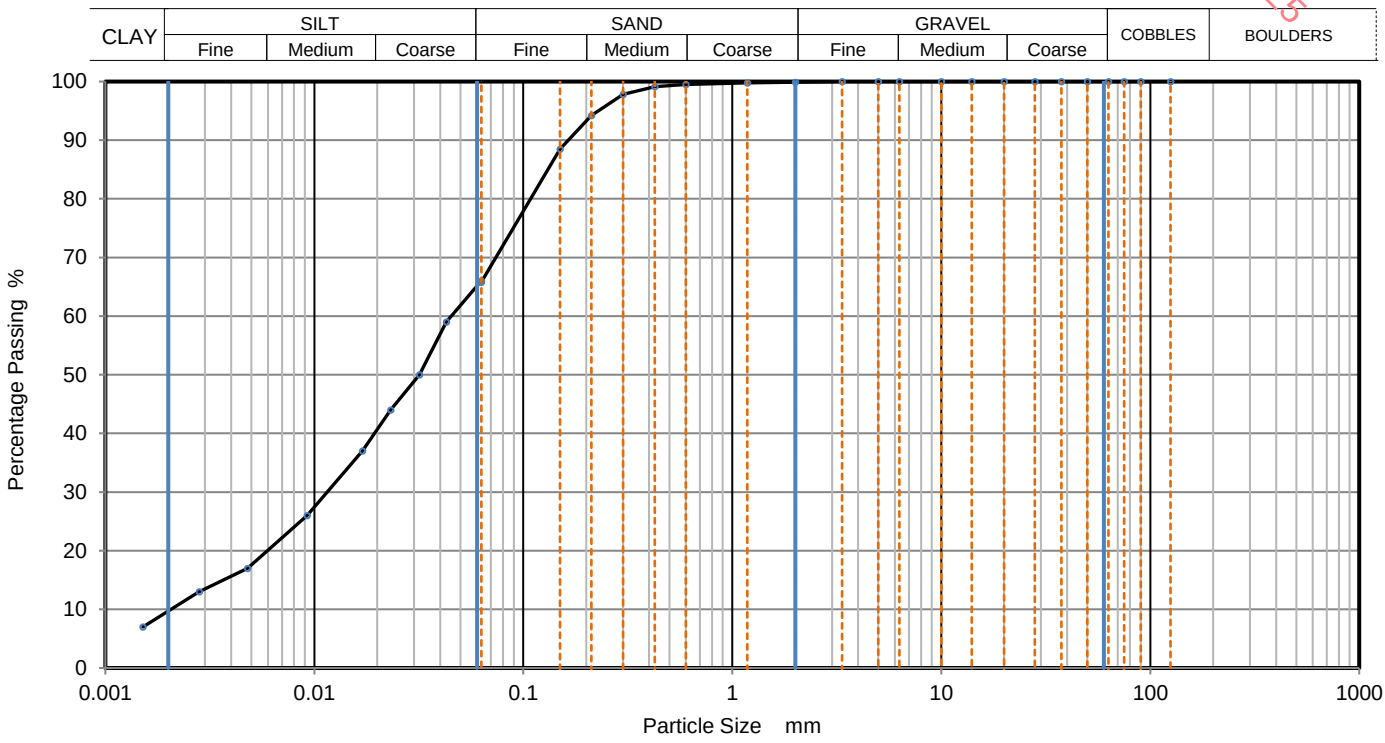
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

UKAS TESTING 10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**19-0472**
				Borehole/Pit No.	BH09
Site Name	Kingston, Galway			Sample No.	2
Soil Description	Grey sandy slightly gravelly silty CLAY.			Depth, m	1.00
Specimen Reference	5	Specimen Depth	1 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus201905176

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	66
90	100	0.0429	59
75	100	0.0318	50
63	100	0.0232	44
50	100	0.0170	37
37.5	100	0.0092	26
28	100	0.0048	17
20	100	0.0028	13
14	100	0.0015	7
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	99	2.65	Mg/m3
0.3	98		
0.212	94		
0.15	89		
0.063	66		

Dry Mass of sample, g	214

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	34
Silt	56
Clay	10

Grading Analysis		
D100	mm	
D60	mm	0.0461
D30	mm	0.0116
D10	mm	0.00206
Uniformity Coefficient		22
Curvature Coefficient		1.4

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

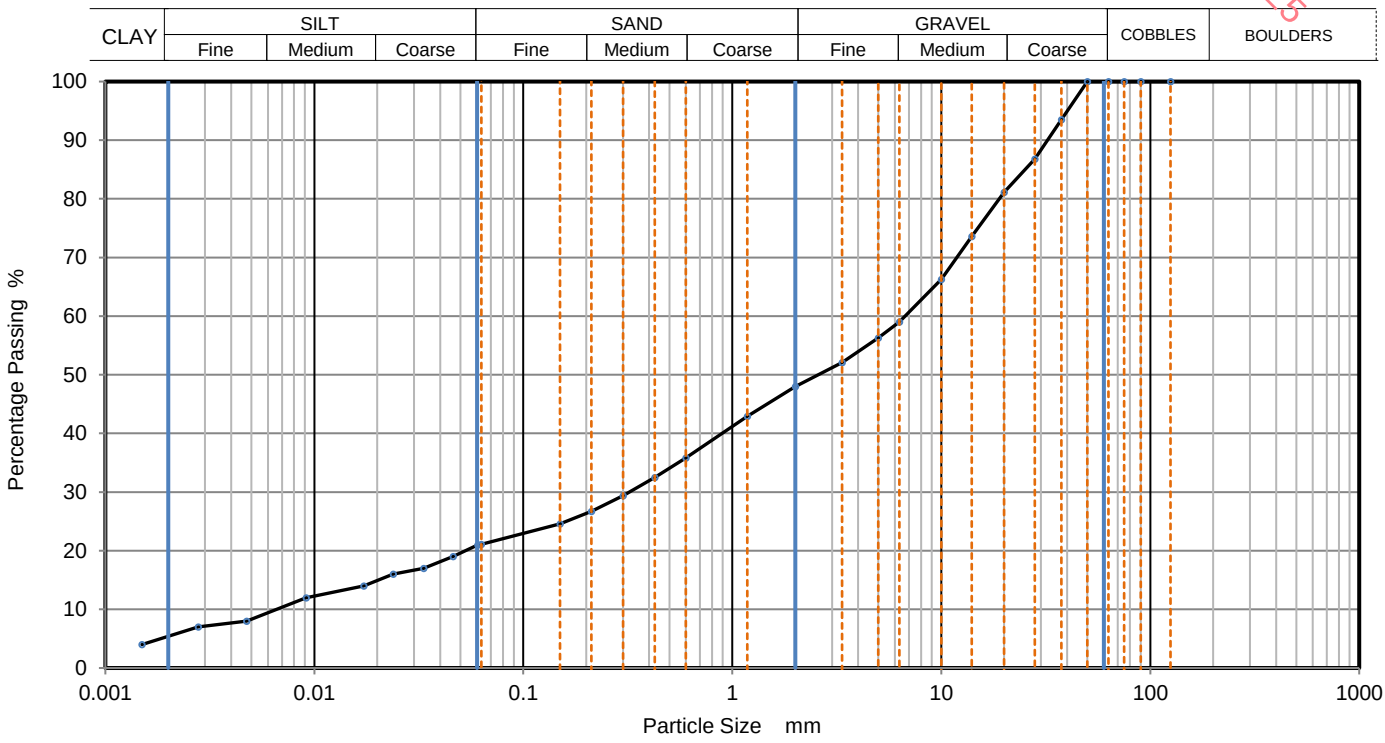
Approved
Stephen.Watson

LAB 05R Version 4

UKAS TESTING
10122

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION			Job Ref	19-0472
				Borehole/Pit No.	BH10
Site Name	Kingston, Galway			Sample No.	3
Soil Description	Greyish brown sandy gravelly silty CLAY.			Depth, m	2.00
Specimen Reference	5	Specimen Depth	2 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus201905177

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0606	21
90	100	0.0461	19
75	100	0.0333	17
63	100	0.0239	16
50	100	0.0172	14
37.5	94	0.0091	12
28	87	0.0047	8
20	81	0.0028	7
14	74	0.0015	4
10	66		
6.3	59		
5	56		
3.35	52		
2	48		
1.18	43		
0.6	36	Particle density	(assumed)
0.425	33	2.65	Mg/m3
0.3	29		
0.212	27		
0.15	25		
0.063	21		

Dry Mass of sample, g	5672

Sample Proportions	% dry mass
Cobbles	0
Gravel	52
Sand	27
Silt	16
Clay	5

Grading Analysis		
D100	mm	
D60	mm	6.69
D30	mm	0.322
D10	mm	0.00628
Uniformity Coefficient		1100
Curvature Coefficient		2.5

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

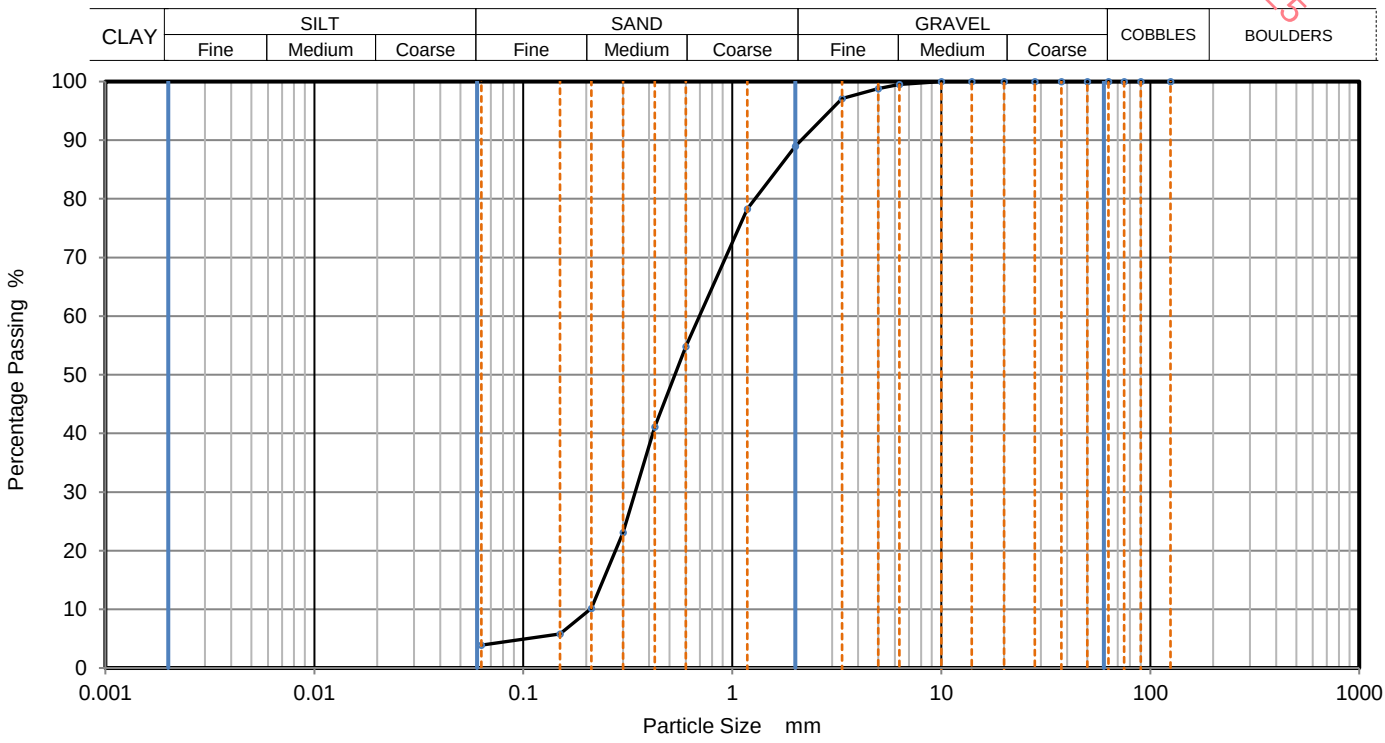
Approved
Stephen.Watson

UKAS TESTING 10122

PARTICLE SIZE DISTRIBUTION

CAUSEWAY GEOTECH				Job Ref	**19-0472**
				Borehole/Pit No.	BH11
Site Name	Kingston, Galway			Sample No.	2
Soil Description	Brown slightly gravelly silty fine to coarse SAND.			Depth, m	1.00
Specimen Reference	4	Specimen Depth	m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus201905178

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	97		
2	89		
1.18	78		
0.6	55		
0.425	41		
0.3	23		
0.212	10		
0.15	6		
0.063	4		

Dry Mass of sample, g	210

Sample Proportions	% dry mass
Cobbles	0
Gravel	11
Sand	85
Fines <0.063mm	4

Grading Analysis		
D100	mm	
D60	mm	0.696
D30	mm	0.343
D10	mm	0.209
Uniformity Coefficient		3.3
Curvature Coefficient		0.81

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

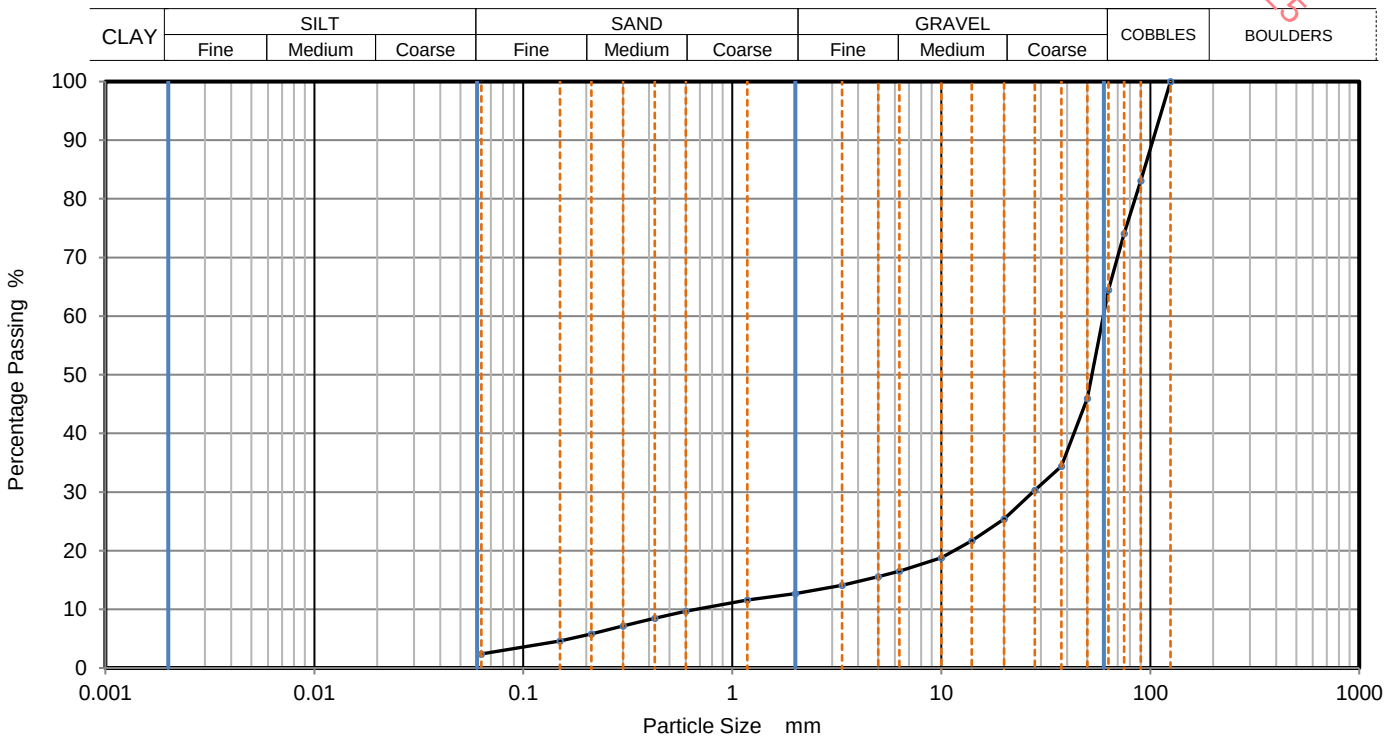
Approved
Stephen.Watson

LAB 05R Version 4

UKAS TESTING
10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**19-0472**
				Borehole/Pit No.	TP01
Site Name	Kingston, Galway			Sample No.	2
Soil Description	Brown slightly sandy subangular fine to coarse GRAVEL with medium cobble content.			Depth, m	0.40
Specimen Reference	2	Specimen Depth	0.4 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2019051710

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	83		
75	74		
63	65		
50	46		
37.5	34		
28	30		
20	25		
14	22		
10	19		
6.3	17		
5	16		
3.35	14		
2	13		
1.18	12		
0.6	10		
0.425	9		
0.3	7		
0.212	6		
0.15	5		
0.063	2		

Dry Mass of sample, g	20320

Sample Proportions	% dry mass
Cobbles	36
Gravel	52
Sand	10
Fines <0.063mm	2

Grading Analysis		
D100	mm	125
D60	mm	59.6
D30	mm	27.5
D10	mm	0.677
Uniformity Coefficient		88
Curvature Coefficient		19

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

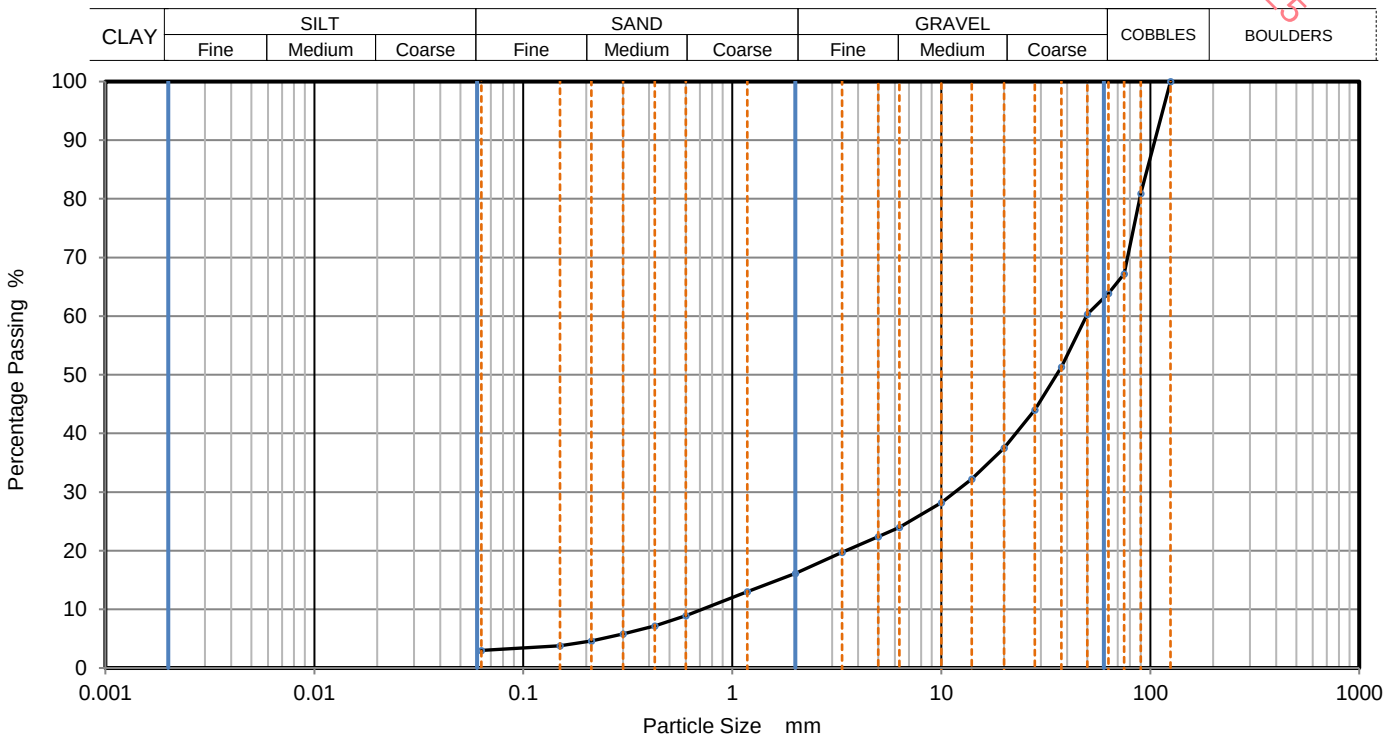
Approved
Stephen.Watson

UKAS TESTING 10122

PARTICLE SIZE DISTRIBUTION

CAUSEWAY GEOTECH				Job Ref	**19-0472**
				Borehole/Pit No.	TP04
Site Name	Kingston, Galway			Sample No.	1
Soil Description	Brown slightly sandy slightly silty subangular fine to coarse GRAVEL with medium cobble content.			Depth, m	0.50
Specimen Reference	2	Specimen Depth	0.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2019051712

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	81		
75	67		
63	64		
50	60		
37.5	51		
28	44		
20	38		
14	32		
10	28		
6.3	24		
5	22		
3.35	20		
2	16		
1.18	13		
0.6	9		
0.425	7		
0.3	6		
0.212	5		
0.15	4		
0.063	3		

Dry Mass of sample, g	24974

Sample Proportions	% dry mass
Cobbles	36
Gravel	48
Sand	13
Fines <0.063mm	3

Grading Analysis		
D100	mm	125
D60	mm	49.6
D30	mm	11.6
D10	mm	0.715
Uniformity Coefficient		69
Curvature Coefficient		3.8

Remarks

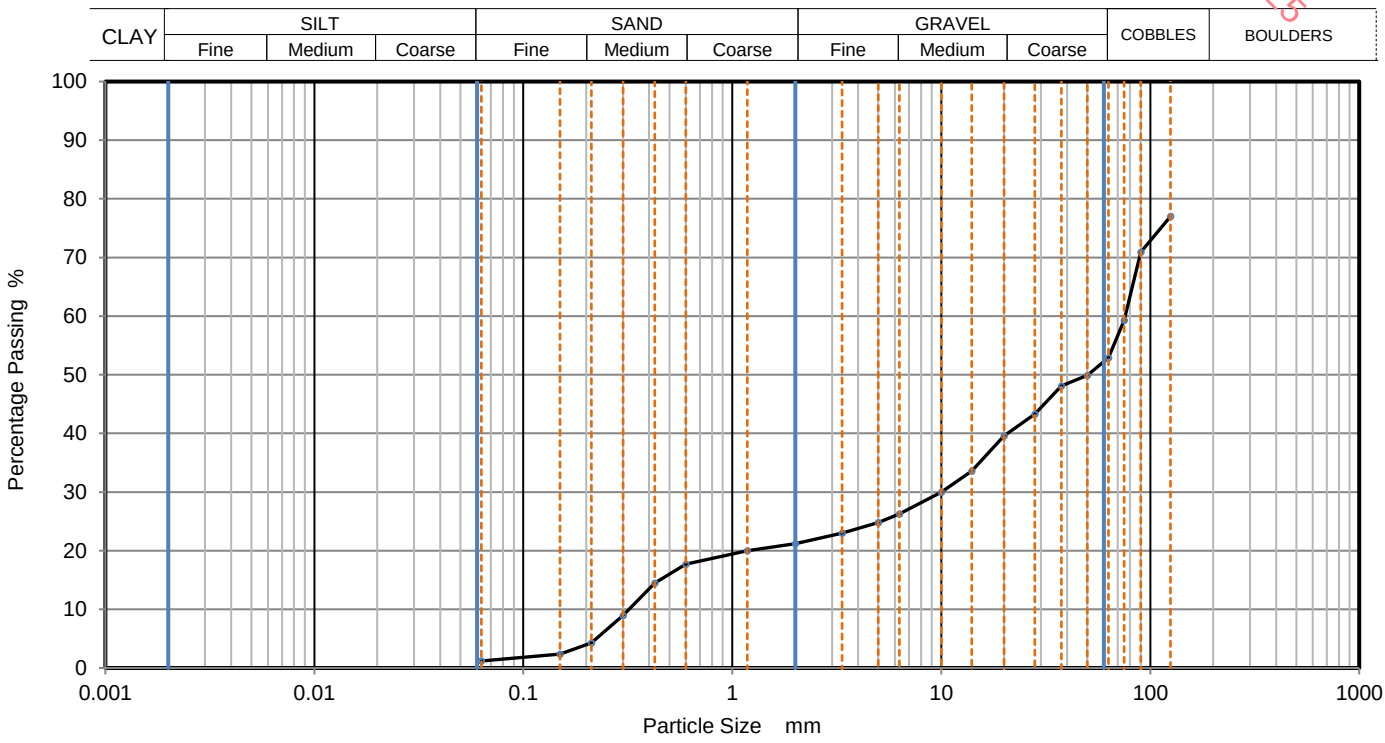
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

UKAS TESTING 10122

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**19-0472**
				Borehole/Pit No.	TP05
Site Name	Kingston, Galway			Sample No.	4
Soil Description	Greyish brown sandy subangular fine to coarse GRAVEL with medium to high cobble content.			Depth, m	2.20
Specimen Reference	2	Specimen Depth	2.2 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2019051713

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	77		
90	71		
75	59		
63	53		
50	50		
37.5	48		
28	43		
20	40		
14	34		
10	30		
6.3	26		
5	25		
3.35	23		
2	21		
1.18	20		
0.6	18		
0.425	15		
0.3	9		
0.212	4		
0.15	2		
0.063	1		

Dry Mass of sample, g	24588

Sample Proportions	% dry mass
Cobbles	47
Gravel	32
Sand	20
Fines <0.063mm	1

Grading Analysis		
D100	mm	
D60	mm	75.9
D30	mm	10
D10	mm	0.319
Uniformity Coefficient		240
Curvature Coefficient		4.1

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

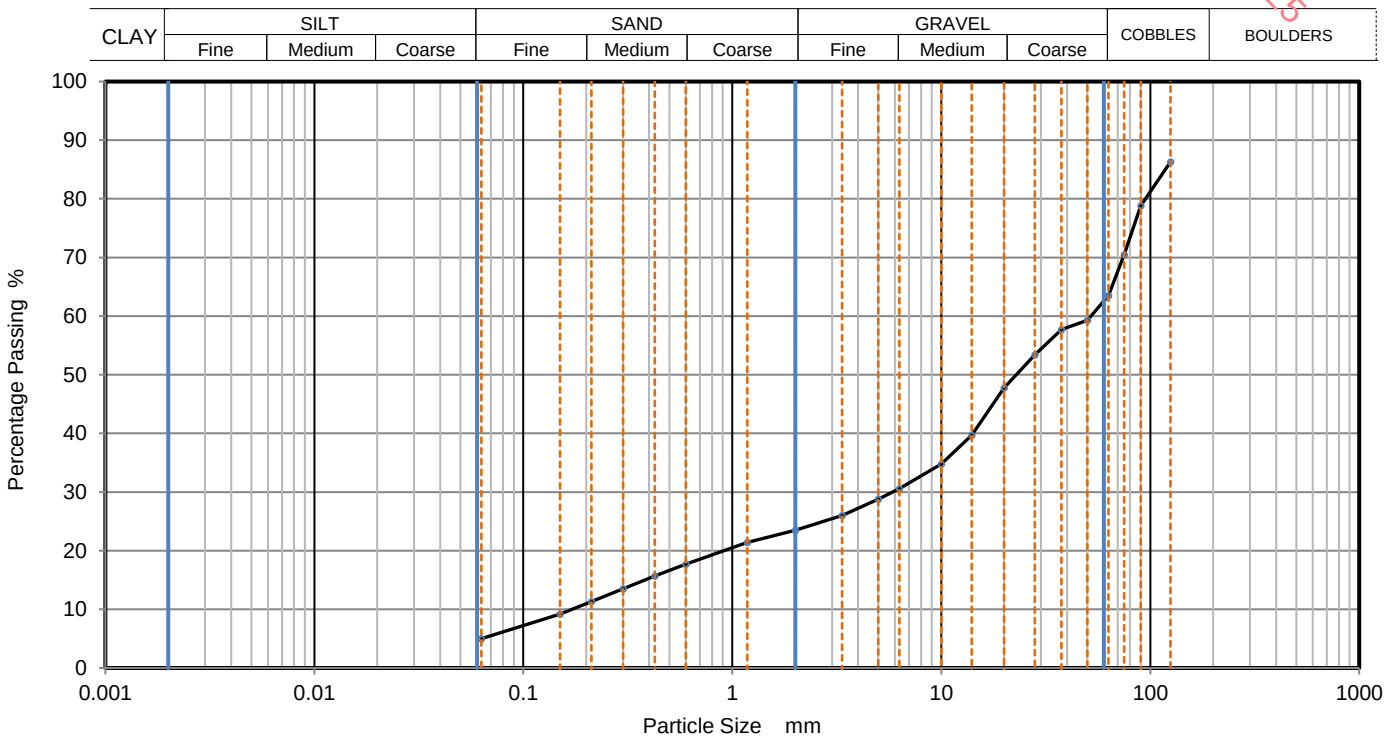
Approved
Stephen.Watson

UKAS TESTING 10122

PARTICLE SIZE DISTRIBUTION

				Job Ref	**19-0472**
				Borehole/Pit No.	TP06
Site Name	Kingston, Galway			Sample No.	2
Soil Description	Greyish brown slightly sandy subangular fine to coarse GRAVEL with medium cobble content.			Depth, m	0.60
Specimen Reference	2	Specimen Depth	0.6 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2019051714

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	86		
90	79		
75	71		
63	64		
50	59		
37.5	58		
28	53		
20	48		
14	40		
10	35		
6.3	31		
5	29		
3.35	26		
2	24		
1.18	21		
0.6	18		
0.425	16		
0.3	14		
0.212	11		
0.15	9		
0.063	5		

Dry Mass of sample, g: 20350

Sample Proportions	% dry mass
Cobbles	37
Gravel	40
Sand	19
Fines <0.063mm	5

Grading Analysis		
D100	mm	
D60	mm	52
D30	mm	5.84
D10	mm	0.171
Uniformity Coefficient		300
Curvature Coefficient		3.8

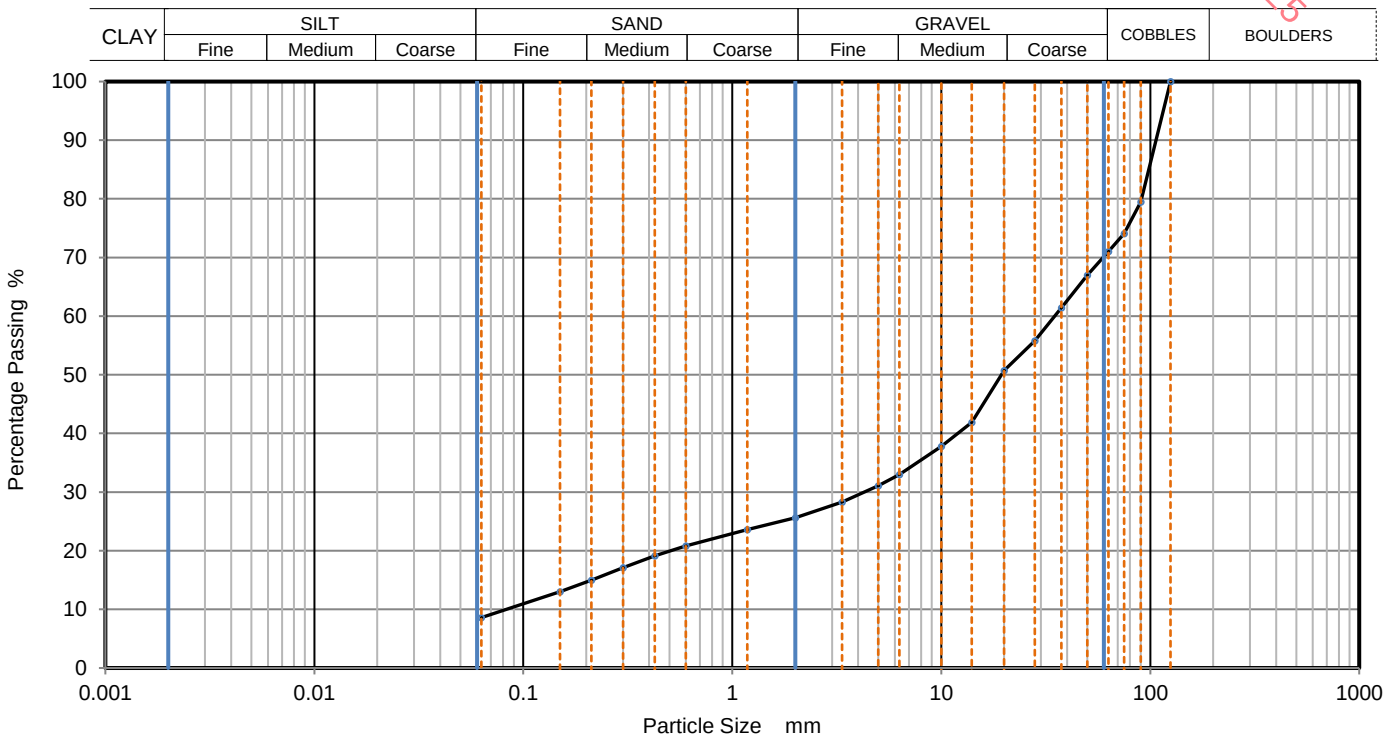
Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION			Job Ref	19-0472
				Borehole/Pit No.	TP07
Site Name	Kingston, Galway			Sample No.	2
Soil Description	Brown sandy gravelly SILT with medium cobble content.			Depth, m	0.60
Specimen Reference	5	Specimen Depth	0.6 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clause 9.2			KeyLAB ID	Caus2019051715

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	80		
75	74		
63	71		
50	67		
37.5	61		
28	56		
20	51		
14	42		
10	38		
6.3	33		
5	31		
3.35	28		
2	26		
1.18	24		
0.6	21		
0.425	19		
0.3	17		
0.212	15		
0.15	13		
0.063	9		

Dry Mass of sample, g	14535

Sample Proportions	% dry mass
Cobbles	29
Gravel	45
Sand	17
Fines <0.063mm	9

Grading Analysis		
D100	mm	125
D60	mm	34.9
D30	mm	4.28
D10	mm	0.0833
Uniformity Coefficient		420
Curvature Coefficient		6.3

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

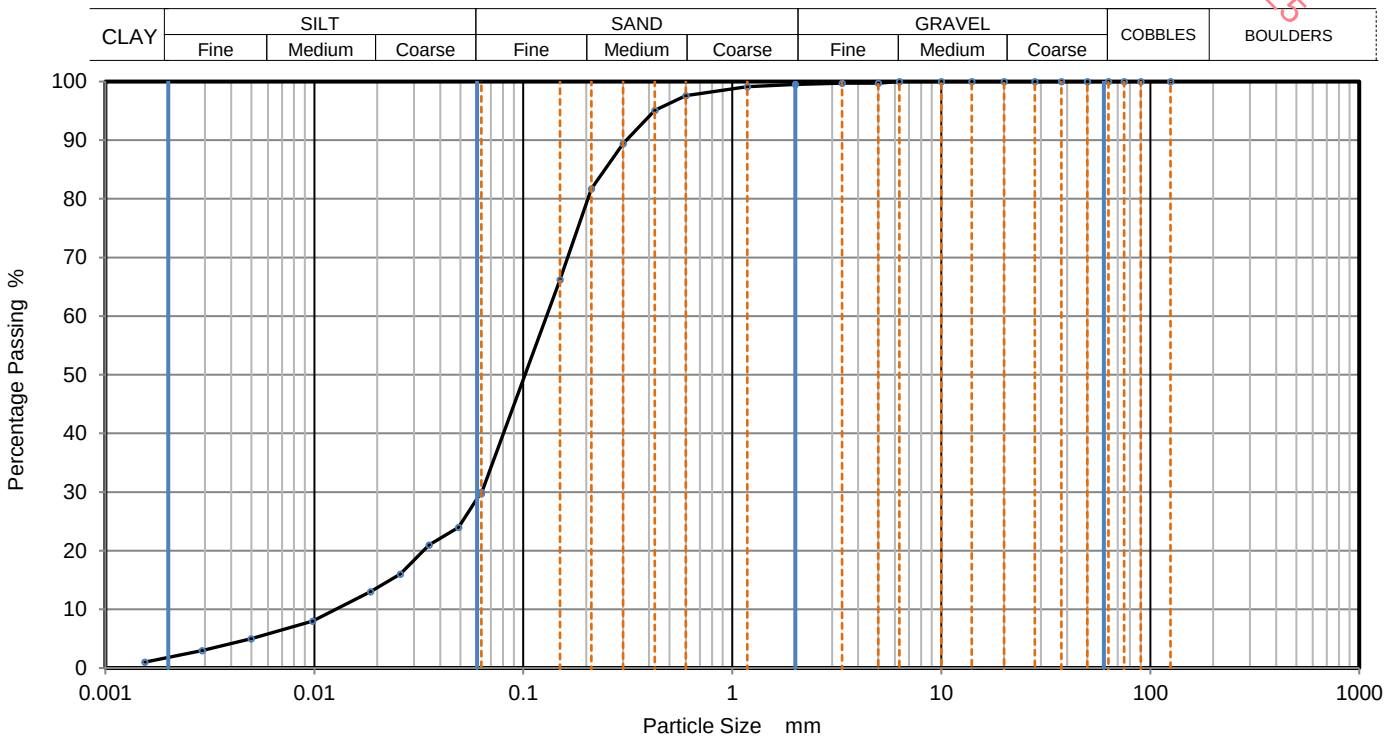
Approved
Stephen.Watson

UKAS TESTING 10122

PARTICLE SIZE DISTRIBUTION

				Job Ref	**19-0472**
				Borehole/Pit No.	TP09
Site Name	Kingston, Galway			Sample No.	3
Soil Description	Greyish brown silty fine to coarse SAND.			Depth, m	0.90
Specimen Reference	2	Specimen Depth	0.9 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2019051716

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	30
90	100	0.0491	24
75	100	0.0354	21
63	100	0.0258	16
50	100	0.0185	13
37.5	100	0.0098	8
28	100	0.0050	5
20	100	0.0029	3
14	100	0.0015	1
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	98	Particle density	(assumed)
0.425	95	2.65	Mg/m3
0.3	89		
0.212	82		
0.15	66		
0.063	30		

Dry Mass of sample, g: 216

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	70
Silt	28
Clay	2

Grading Analysis		
D100	mm	
D60	mm	0.129
D30	mm	0.0634
D10	mm	0.0123
Uniformity Coefficient		11
Curvature Coefficient		2.5

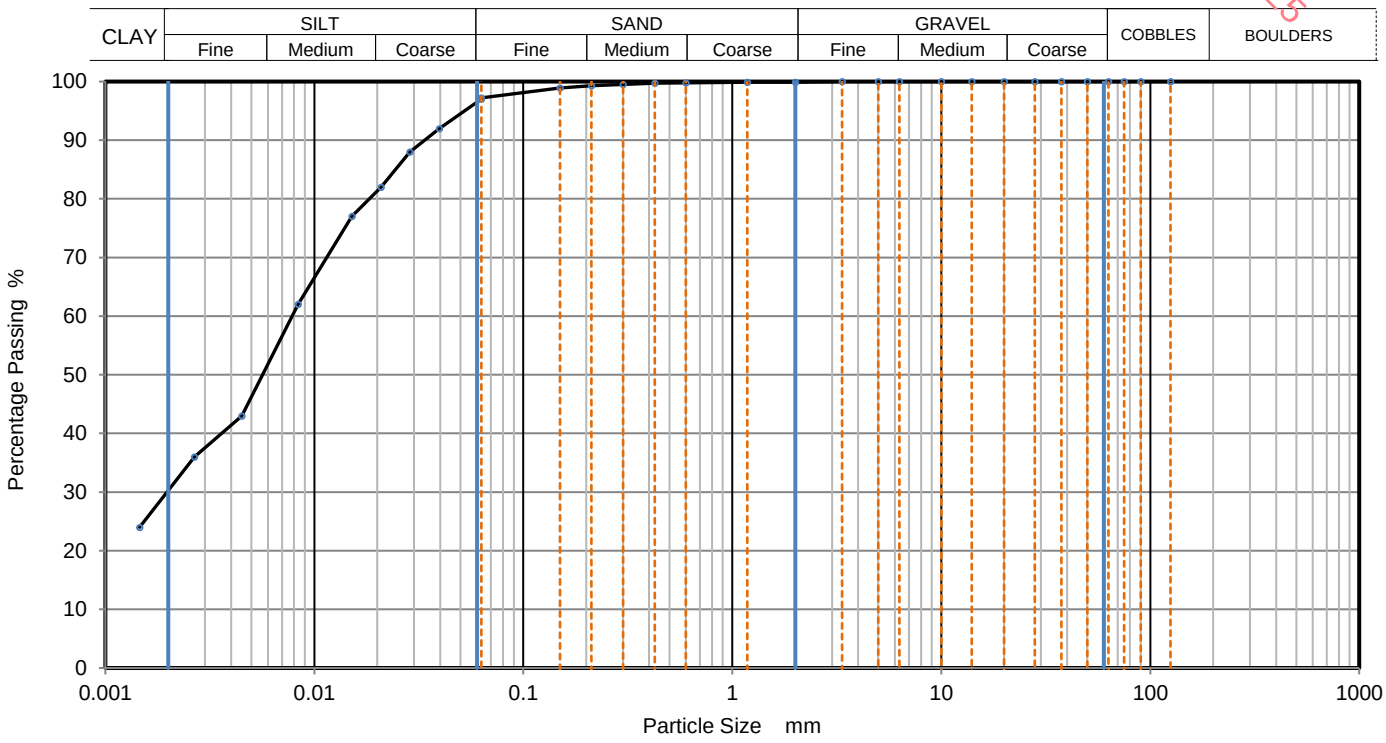
Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

CAUSEWAY GEOTECH	**PARTICLE SIZE DISTRIBUTION**			Job Ref	**19-0472**
				Borehole/Pit No.	TP09
Site Name	Kingston, Galway			Sample No.	4
Soil Description	Brown slightly sandy silty CLAY.			Depth, m	2.40
Specimen Reference	5	Specimen Depth	2.4 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2019051717

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	97
90	100	0.0396	92
75	100	0.0286	88
63	100	0.0208	82
50	100	0.0151	77
37.5	100	0.0084	62
28	100	0.0045	43
20	100	0.0027	36
14	100	0.0015	24
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density	(assumed)
0.425	100	2.65	Mg/m3
0.3	100		
0.212	99		
0.15	99		
0.063	97		

Dry Mass of sample, g	210

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	3
Silt	67
Clay	30

Grading Analysis		
D100	mm	
D60	mm	0.00791
D30	mm	0.00198
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

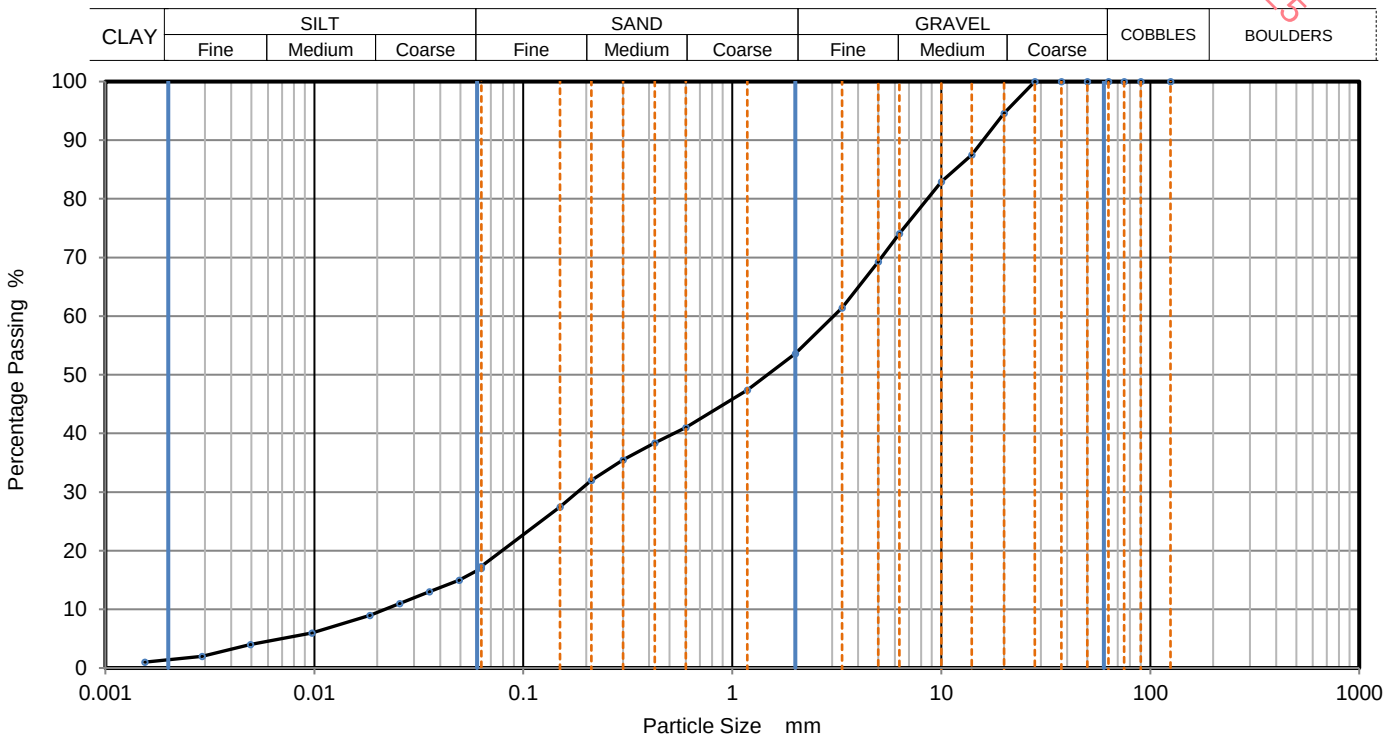
Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

UKAS TESTING 10122

CAUSEWAY GEOTECH	PARTICLE SIZE DISTRIBUTION			Job Ref	19-0472
				Borehole/Pit No.	TP12
Site Name	Kingston, Galway			Sample No.	4
Soil Description	Greyish brown gravelly silty fine to coarse SAND.			Depth, m	1.60
Specimen Reference	2	Specimen Depth	1.5 m	Sample Type	B
Test Method	BS1377:Part 2:1990, clauses 9.2 and 9.5			KeyLAB ID	Caus2019051719

RECEIVED: 16/10/2025



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	17
90	100	0.0494	15
75	100	0.0356	13
63	100	0.0256	11
50	100	0.0184	9
37.5	100	0.0097	6
28	100	0.0050	4
20	95	0.0029	2
14	88	0.0015	1
10	83		
6.3	74		
5	69		
3.35	61		
2	54		
1.18	47		
0.6	41	Particle density	(assumed)
0.425	38	2.65	Mg/m3
0.3	36		
0.212	32		
0.15	28		
0.063	17		

Dry Mass of sample, g	2331

Sample Proportions	% dry mass
Cobbles	0
Gravel	46
Sand	36
Silt	16
Clay	1

Grading Analysis		
D100	mm	
D60	mm	3.06
D30	mm	0.182
D10	mm	0.0216
Uniformity Coefficient		140
Curvature Coefficient		0.5

Remarks

Preparation and testing in accordance with BS1377-2 :1990 unless noted below

Approved
Stephen.Watson

UKAS TESTING 10122

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

RECEIVED: 16/10/2025

UKAS TESTING
2183

Final Report

Report No.:	19-18433-1
Initial Date of Issue:	07-Jun-2019
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Carin Cornwall Colm Hurley Darren O'Mahony Gabriella Horan Joe Gervin John Cameron Lucy Newland Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Sean Ross Stephen Franey Stephen McCracken Stephen Watson Stuart Abraham
Project	19-0472 Kingston, Galway

Quotation No.:		**Date Received:**	31-May-2019
Order No.:		**Date Instructed:**	31-May-2019
No. of Samples:	5		
Turnaround (Wkdays):	5	**Results Due:**	06-Jun-2019
Date Approved:	07-Jun-2019		

Approved By:

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

RECEIVED: 16/10/2025

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 19-0472 Kingston, Galway

Client: Causeway Geotech Ltd		**Chemtest Job No.:**			19-18433	19-18433	19-18433	19-18433	19-18433
Quotation No.:		**Chemtest Sample ID.:**			835523	835524	835525	835526	835527
Order No.:		Client Sample Ref.:			2	5	2	5	2
		Sample Location:			BH01B	BH04	BH05	BH10	BH12
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			1.00	1.00	1.10	2.00	1.00
		Date Sampled:			30-May-2019	30-May-2019	30-May-2019	30-May-2019	30-May-2019
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	3.6	20	5.2	6.4	48
pH	U	2010		N/A	8.7		8.3	9.0	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.010		< 0.010	< 0.010	
Organic Matter	U	2625	%	0.40		3.3			33

RECEIVED: 16/10/2025

Chemtest
The right chemistry to deliver results

Report Information

RECEIVED: 16/10/2025

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

CAUSEWAY GEOTECH

10122

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

RECEIVED: 16/10/2025

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

Project Name:	Kingston, Galway –Ground Investigation
Project No.:	19-0472
Client:	Lioncor Developments Limited
Engineer:	Tobin Consulting Engineers
Date:	14/06/19

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s).

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Approved Signatory

Stephen Watson
Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

CAUSEWAY GEOTECH

+44 (0)28 2766 6640
info@causewaygeotech.com
www.causewaygeotech.com

10122

RECEIVED: 16/10/2025

Project Name: Kingston, Galway –Ground Investigation

Report Reference: Schedule 2

The table below details the tests carried out, the specifications used, and the number of tests included in this report.

Tests marked with* in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
ROCK	Point load index	ISRM Commission on Testing Methods. Suggested Method for Determining Point Load Strength 1985	12

CAUSEWAY GEOTECH

Point Load Strength Index Tests
Summary of Results

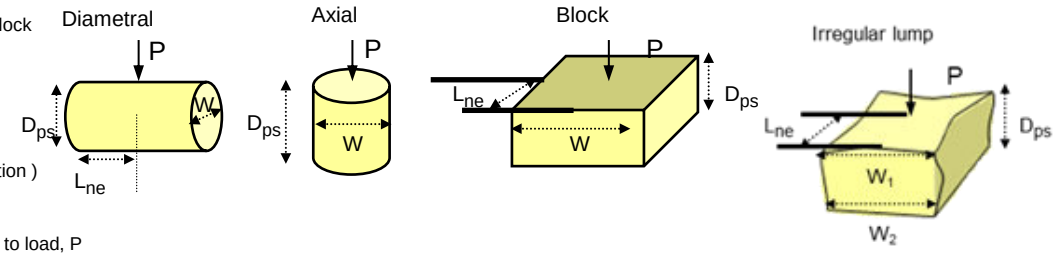
Project No.: 19-0472

Project Name: Kingston, Galway

RECEIVED: 16/10/2025

Borehole No.	Sample			Specimen		Rock Type	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
	Depth	Ref.	Type	Ref.	Depth		Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)	
	m				m					mm	mm	mm	mm	kN	mm	MPa	MPa	
BH01B	5.30		C	1	5.30	GRANITE	D	U	YES	69.4	78.9	78.9	76.0	17.0	77.4	2.8	3.5	
BH02	6.40		C	2	6.40	GRANITE	D	U	NO	92.2	79.1	79.1	76.0	44.6	77.5	7.4	9.0	
BH03A	5.40		C	3	5.40	GRANITE	D	U	NO	90.8	83.8	83.8	82.0	25.7	82.9	3.7	4.7	
BH04	6.00		C	4	6.00	GRANITE	D	U	YES	57.2	79.2	79.2	74.0	61.7	76.6	10.5	12.8	
BH05	4.90		C	5	4.90	GRANITE	D	U	NO	87.3	83.8	83.8	81.0	22.5	82.4	3.3	4.2	
BH06	5.00		C	6	5.00	GRANITE	D	U	YES	73.6	84.0	84.0	81.0	19.1	82.5	2.8	3.5	
BH07	5.80		C	7	5.80	GRANITE	D	U	YES	82.4	83.9	83.9	81.0	11.4	82.4	1.7	2.1	
BH08	8.10		C	8	8.10	GRANITE	D	U	NO	55.6	83.7	83.7	82.0	47.6	82.8	6.9	8.7	
BH09	5.90		C	9	5.90	GRANITE	D	U	NO	60.5	84.0	84.0	81.0	30.5	82.5	4.5	5.6	
BH10	3.80		C	10	3.80	GRANITE	D	U	YES	62.7	83.9	83.9	81.0	6.1	82.4	0.9	1.1	
BH11	3.30		C	11	3.30	GRANITE	D	U	YES	62.2	84.1	84.1	81.0	9.7	82.5	1.4	1.8	
BH12	6.50		C	12	6.50	GRANITE	D	U	YES	80.9	83.9	83.9	79.0	51.8	81.4	7.8	9.7	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Test performed in accordance with ISRM Suggested Methods : 2007, unless noted otherwise

Detailed legend for test and dimensions, based on ISRM, is shown above.

Size factor, F = (De/50)0.45 for all tests.

LAB 17R Version 4

Date Printed: 14/06/2019

Approved By: Stephen.Watson

UKAS TESTING
10122

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX H

ENVIRONMENTAL LABORATORY TEST RESULTS

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

RECEIVED: 16/10/2025

Final Report

Report No.:	19-16635-1
Initial Date of Issue:	23-May-2019
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Carin Cornwall Colm Hurley Darren O'Mahony Gabriella Horan John Cameron Lucy Newland Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Sean Ross Stephen Franey Stephen McCracken Stephen Watson Stuart Abraham
Project	19-0472 Kingston Galway

Quotation No.:		**Date Received:**	16-May-2019
Order No.:		**Date Instructed:**	16-May-2019
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	22-May-2019
Date Approved:	23-May-2019		

Approved By:

Details: Robert Monk, Technical Manager

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

RECEIVED: 16/10/2025

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 19-0472 Kingston Galway

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		19-16635	19-16635	19-16635
Quotation No.:			**Chemtest Sample ID.:**		827612	827617	827624
			Sample Location:		TP01	TP07	TP12
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.4	0.6	0.6
			Date Sampled:		13-May-2019	13-May-2019	13-May-2019
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	8.6	8.3	24
pH	U	2010		N/A	8.1	7.6	7.7
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	0.019
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	0.50
Thiocyanate	U	2300	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	2.9	1.7	0.91
Sulphate (Total)	U	2430	%	0.010	0.063	0.021	0.30
Arsenic	U	2450	mg/kg	1.0	5.3	6.3	12
Cadmium	U	2450	mg/kg	0.10	0.10	< 0.10	0.27
Chromium	U	2450	mg/kg	1.0	6.9	8.1	17
Copper	U	2450	mg/kg	0.50	17	17	24
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	5.2	7.8	5.3
Lead	U	2450	mg/kg	0.50	18	25	49
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	0.79
Zinc	U	2450	mg/kg	0.50	22	32	51
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	2.2	< 0.40	11
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	1.8
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	74
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	76
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

RECEIVED: 16/10/2025

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 19-0472 Kingston Galway

RECEIVED: 16/10/2025

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		19-16635	19-16635	19-16635
Quotation No.:			**Chemtest Sample ID.:**		827612	827617	827624
			Sample Location:		TP01	TP07	TP12
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.4	0.6	0.6
			Date Sampled:		13-May-2019	13-May-2019	13-May-2019
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	50
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	2.4
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	52
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	130
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Phenols	U	2920	mg/kg	0.30	< 0.30	1.4	< 0.30

Chemtest
The right chemistry to deliver results

Report Information

RECEIVED: 16/10/2025

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

RECEIVED: 16/10/2025

UKAS TESTING
2183

Final Report

Report No.:	19-16652-1
Initial Date of Issue:	24-May-2019
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Carin Cornwall Colm Hurley Darren O'Mahony Gabriella Horan John Cameron Lucy Newland Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Sean Ross Stephen Franey Stephen McCracken Stephen Watson Stuart Abraham
Project	19-0472 Kingston Galway

Quotation No.:		**Date Received:**	16-May-2019
Order No.:		**Date Instructed:**	16-May-2019
No. of Samples:	3		
Turnaround (Wkdays):	7	**Results Due:**	24-May-2019
Date Approved:	24-May-2019		

Approved By:

Details: Martin Dyer, Laboratory Manager

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

RECEIVED: 16/10/2025

Results - 2 Stage WAC

RECEIVED 16/10/2025

Project: 19-0472 Kingston Galway

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	19-16652								
Chemtest Sample ID:	827657								
Sample Ref:									
Sample ID:									
Sample Location:	TP01								
Top Depth(m):	0.4								
Bottom Depth(m):									
Sampling Date:	13-May-2019								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%			2.0	3	5	6
Loss On Ignition	2610	U	%			2.7	--	--	10
Total BTEX	2760	U	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			< 2.0	100	--	--
pH	2010	U				8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0050	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.011	0.0079	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	0.0010	0.0013	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.0022	0.0026	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0082	0.0033	< 0.050	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	0.0042	< 0.010	0.038	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0010	< 0.0010	< 0.010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.0010	< 0.50	< 0.50	4	50	200
Chloride	1220	U	4.4	1.7	< 10	20	800	15000	25000
Fluoride	1220	U	0.29	0.28	< 1.0	2.8	10	150	500
Sulphate	1220	U	5.2	< 1.0	10	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	170	98	340	1000	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	18	20	< 50	190	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	13

Leachate Test Information	
Leachant volume 1st extract/l	0.323
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.181

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

RECEIVED 16/10/2025

Project: 19-0472 Kingston Galway

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	19-16652								
Chemtest Sample ID:	827658								
Sample Ref:									
Sample ID:									
Sample Location:	TP07								
Top Depth(m):	0.6								
Bottom Depth(m):									
Sampling Date:	13-May-2019								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%			0.30	3	5	6
Loss On Ignition	2610	U	%			2.4	--	--	10
Total BTEX	2760	U	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			< 2.0	100	--	--
pH	2010	U				7.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0050	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.0047	0.0068	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	0.0028	0.0032	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.0068	0.0084	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0018	< 0.0010	< 0.050	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.012	0.024	0.024	0.23	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0010	< 0.0010	< 0.010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0011	0.0016	< 0.50	< 0.50	4	50	200
Chloride	1220	U	5.9	2.1	12	23	800	15000	25000
Fluoride	1220	U	0.16	0.20	< 1.0	2.0	10	150	500
Sulphate	1220	U	4.7	2.9	< 10	30	1000	20000	50000
Total Dissolved Solids	1020	N	47	29	93	300	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	20	27	< 50	260	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	13

Leachate Test Information	
Leachant volume 1st extract/l	0.324
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.117

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

RECEIVED 16/10/2025

Project: 19-0472 Kingston Galway

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	19-16652								
Chemtest Sample ID:	827659								
Sample Ref:									
Sample ID:									
Sample Location:	TP12								
Top Depth(m):	0.6								
Bottom Depth(m):									
Sampling Date:	13-May-2019								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%			9.4	3	5	6
Loss On Ignition	2610	U	%			18	--	--	10
Total BTEX	2760	U	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			< 2.0	100	--	--
pH	2010	U				7.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0040	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.0098	0.0073	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.0019	0.0016	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.015	0.0075	< 0.050	0.084	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.0012	0.0052	< 0.010	0.047	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0034	< 0.0010	< 0.50	< 0.50	4	50	200
Chloride	1220	U	3.1	1.2	< 10	14	800	15000	25000
Fluoride	1220	U	0.17	0.18	< 1.0	1.8	10	150	500
Sulphate	1220	U	8.5	< 1.0	17	10	1000	20000	50000
Total Dissolved Solids	1020	N	160	110	320	1200	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	29	24	56	250	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	17

Leachate Test Information	
Leachant volume 1st extract/l	0.315
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.215

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
The right chemistry to deliver results

Report Information

RECEIVED: 16/10/2025

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

CAUSEWAY GEOTECH

RECEIVED: 16/10/2025

APPENDIX I

SPT HAMMER ENERGY MEASUREMENT REPORT

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

RECEIVED: 16/10/2025

Neil Burrows
Southern Testing Laboratories
Unit 11
Charlwoods Road
East Grinstead
RH19 2HU

SPT Hammer Ref:	0193
Test Date:	23/02/2019
Report Date:	26/02/2019
File Name:	0193.spt
Test Operator:	NPB

Instrumented Rod Data

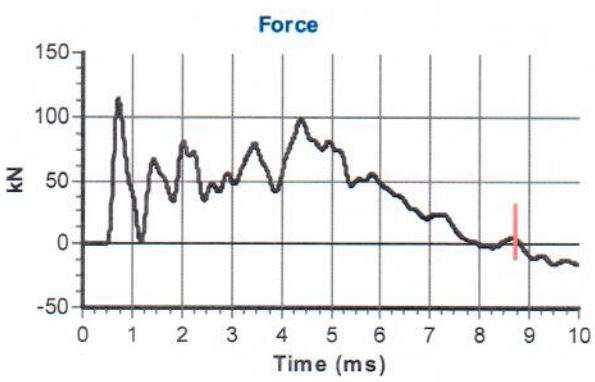
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	6458
Accelerometer No.2:	9607

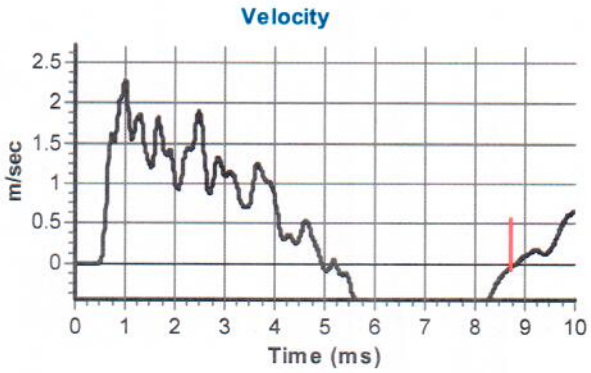
SPT Hammer Information

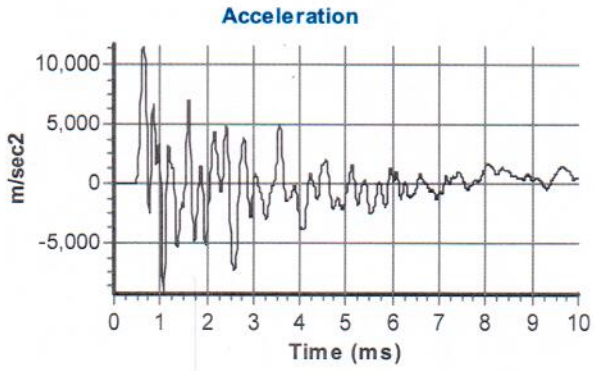
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

Comments / Location

CAUSEWAY







Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	296

Energy Ratio E_r (%): **63**

The recommended calibration interval is 12 months

Signed: N P Burrows

Title: Field Operations Manager

SPTMAN ver.1.92 All rights reserved, Testconsult ©2010

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

RECEIVED: 16/10/2025

Neil Burrows
Southern Testing Laboratories
Unit 11
Charlwoods Road
East Grinstead
RH19 2HU

SPT Hammer Ref:	0267
Test Date:	23/02/2019
Report Date:	26/02/2019
File Name:	0267.spt
Test Operator:	NPB

Instrumented Rod Data

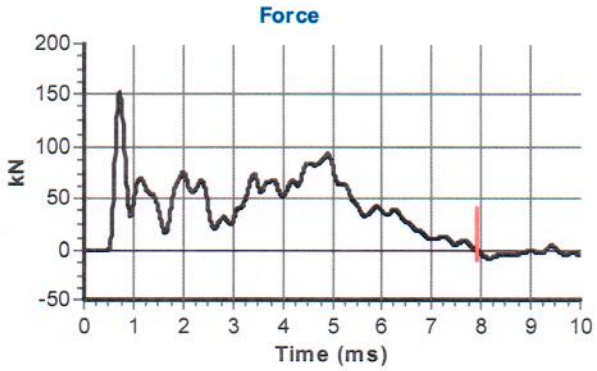
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.0
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	6458
Accelerometer No.2:	9607

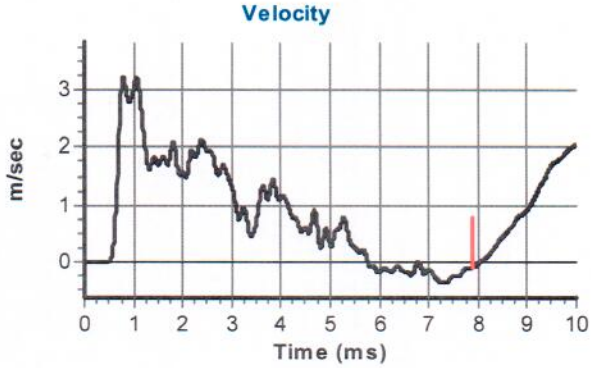
SPT Hammer Information

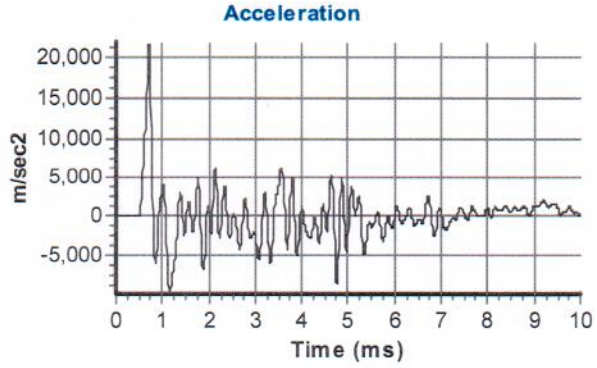
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

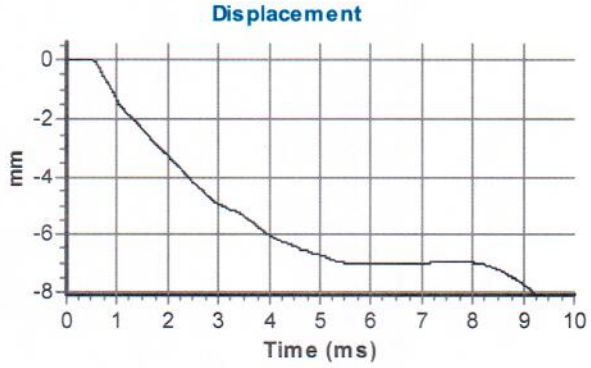
Comments / Location

CAUSEWAY









Calculations

Area of Rod A (mm2):	905
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	407

Energy Ratio E_r (%): **86**

Signed: N P Burrows

Title: Field Operations Manager

The recommended calibration interval is 12 months

SPTMAN ver.1.92 All rights reserved, Testconsult ©2010

RECEIVED: 16/10/2025

APPENDIX 3

SITE-SPECIFIC FLOOD RISK ASSESSMENT

TOBIN

RECEIVED: 16/10/2025

Kingston Stables Ltd.

Residential Development at Kingston, Knocknacarra, Co. Galway

Flood Risk Assessment

BUILT ON KNOWLEDGE

Document Control Sheet	
Document Reference	Stage 2 – Flood Risk Assessment
Client:	Kingston Stables Ltd.
Project Reference	11893

RECEIVED: 16/10/2025

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
A	Draft Issue	FOC	27/03/2024	KD	02/04/2024	ST	05/04/2024
B	Second Issue	FOC	27/01/2024	KD	27/01/2024	ST	27/01/2024
C	Planning Issue	FOC/KD	05/02/2025	KD	05/02/2025	AT	05/02/2025
D	Planning issue	FOC	02/07/2025	AT	02/07/2025	AT	02/07/2025
E	Planning Issue	FOC	23/09/2025	AT	23/09/2025	AT	23/09/2025

Disclaimer
This Document is Copyright of Patrick J Tobin & Co. Ltd. trading as TOBIN. This document and its contents have been prepared for the sole use of our client. No liability is accepted by TOBIN for the use of this report, or its contents for any other use than for which it was prepared.

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
ACEI ASSOCIATION OF CONSULTING ENGINEERS OF IRELAND
ENGINEERS IRELAND CPD ACCREDITED EMPLOYER

Table of Contents

RECEIVED: 16/10/2025

1. Introduction 1
1.1 Project Background 1
1.2 Development Description 2
2. Flood Risk Management Guidance 4
2.1 The Planning System and Flood Risk Management Guidelines 4
2.2 The Flood Risk Management Climate Adaption Plan 6
2.3 Galway City Development Plan (2023 – 2029) 7
2.4 Galway City SFRA (2023 – 2029) 9
3. Initial Flood Risk Assessment 10
3.1 Past Flood Events 10
3.2 OPW Preliminary Flood Risk Assessment (PFRA) Study 11
3.3 National Coastal Flood Hazard Mapping (NCFHM) 13
3.4 Catchment Flood Risk Assessment and Management Study 14
3.5 OPW Drainage Districts and Arterial Drainage Schemes 15
3.6 Geological Survey Ireland Mapping 16
4. Site Visit Findings 18
5. Detaled Flood Risk Assesment 20
5.1 Fluvial Flooding 20
5.2 Coastal Flooding 20
5.3 Pluvial Flooding 20
5.4 Groundwater Flooding 20
5.5 The Justification Test 20
6. Conclusions 21

Appendices

Appendix A Topographic Survey

List of Tables

Table 2.1: Decision Matrix for Determining the Appropriateness of a Development 4
Table 2.2: Climate Change Adaptation Allowances for Future Flood Risk Scenarios 6

Table 3-1: ICWWS Modelled Extreme Water Levels 14

RECEIVED: 16/10/2025

List of Figures

Figure 1-1: Site Location 2
Figure 2-1: Criteria of the Justification Test 5
Figure 2-2: Galway City Development Plan Map A - Land Use Zoning 8
Figure 2-3: Galway City SFRA Flood Zone Mapping 9
Figure 3-1: Past Flood Events 10
Figure 3-2: Indicative Flood Mapping [extract from PFRA Map 209 & 226] 11
Figure 3-3: PFRA Fluvial Flood Extents 12
Figure 3-4: National Coastal Extreme Water Level Estimation Point W7 Location 13
Figure 3-5 Arterial Drainage 15
Figure 3-6: GSI Mapping of Groundwater Flooding 16
Figure 3-7: GSI Mapping of Karst Features 17
Figure 4-1: View of subject site watercourse location facing northeast 18
Figure 4-2: View of subject site watercourse location facing south east 19

1. INTRODUCTION

RECEIVED: 16/10/2025

1.1 PROJECT BACKGROUND

TOBIN were appointed by Kingston Stables Ltd. to undertake a Flood Risk Assessment (FRA) for a proposed residential development at Kingston, Knocknacarra, Co. Galway.

The Planning System and Flood Risk Management (PSFRM) Guidelines categorise types of development into three vulnerability classes based on their sensitivity to flooding. As per Table 2.11 for the classification of vulnerability of different types of development in the PSFRM Guidelines, "residential properties and ESB substations" are categorized as "highly vulnerable" development and as such are considered appropriate in Flood Zone C (Less frequently than the 0.1% AEP event), 'childcare facilities' . are considered appropriate in Flood Zone B (Between the 0.1% and 1% AEP event)

The subject site is bounded to the south of the site by Kingston Road. Residential properties bound the site to the east, greenfield to the west, Galway Golf Club to the south, and Commercial and residential properties to the North. The western distributor road is just north of the subject site.

There are large areas of dense vegetation located on the northern half of the subject site. The subject site is hilly, with multiple raised areas noted. There is an existing drain in the northern half of the subject site.

There is one hydraulic feature of particular interest to the subject site. The Knocknacarra culvert flows just northwest of the subject site. The culvert was installed to redirect a river which historically to flow through the subject site from north to south.

The purpose of this Stage 2 FRA report is to identify, quantify, and communicate the risks of flooding, if any, to the proposed development.

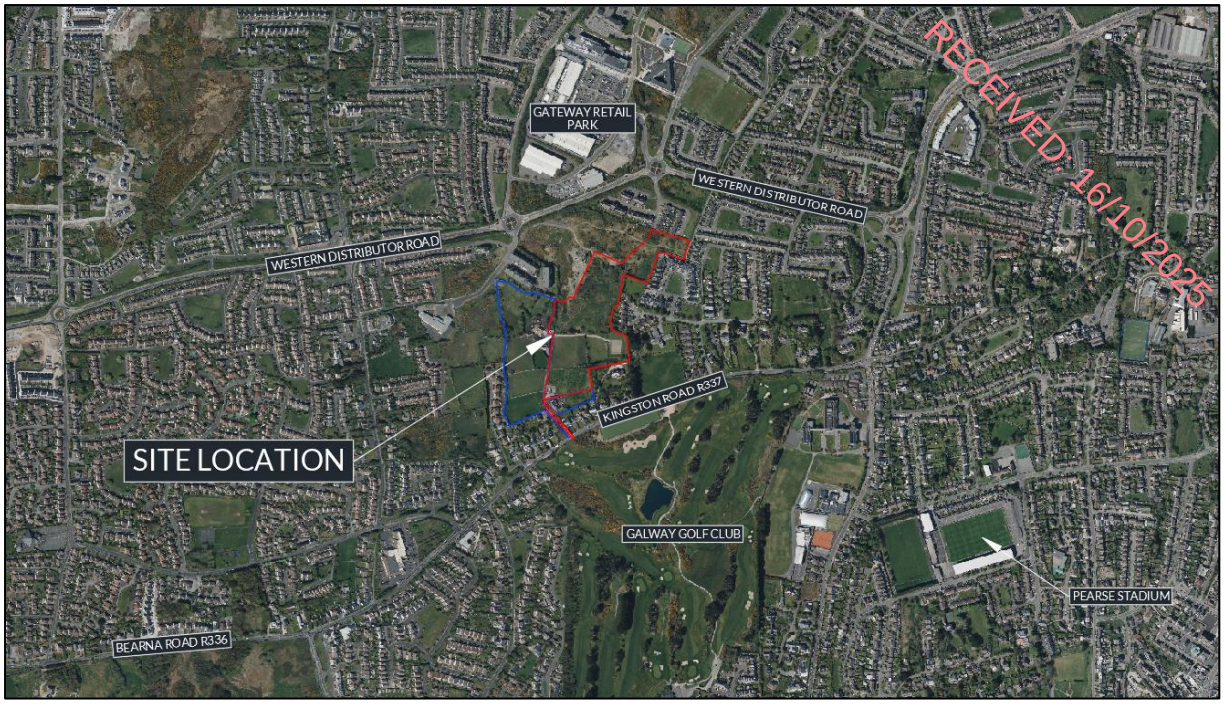


Figure 1-11: Site Location

1.2 DEVELOPMENT DESCRIPTION

Planning permission is sought by Kingston Stables Ltd for development of a Large-Scale Residential Development (LRD) for a 10-year planning permission, on a site which extends to 5.37 ha on lands located at Knocknacarra, Galway.

The proposed development will consist of the following:

1. Provision of 362 no. residential units in 4 no. development areas with a mix of apartment and house types on a site area of 5.37 ha. The buildings range between 2 no. and 6 no. storeys in height. The development will comprise the following:
    - 4 no. 2-bed townhouses;
    - 40 no. 3-bed townhouses;
    - 21 no. 4-bed townhouses;
    - 15 no. 1-bedroom duplex apartments;
    - 46 no. 2-bedroon duplex apartments;
    - 15 no. 2-bedroom duplex houses;
    - 46 no. 3-bedroom duplex houses;
    - 114 no. 1-bedroom apartments;
    - 56 no. 2-bedroon apartments;
    - 5 no. 3-bedroom apartments.
2. Demolition of existing structures (333.8 sqm);
3. Vehicular access to the proposed development from a permitted road (Planning Reference 24/60370 refers);
4. The provision of new active travel cycle and pedestrian access from Millers Lane;
5. Upgrades to the existing access at Kingston Road
6. The provision of a childcare facility (440 sq.m.);
7. The provision of public open space;
8. The provision of 665 no. bicycle parking spaces;