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PROPOSED FACILITY CENTRE FOR WATER BASED ACITIVITIES
KILLINEY BEACH,
DUBLIN

PLANNING SUBMISSION

DRAINAGE DESIGN REPORT

Prepared by GK, Consulting Engineers

Date: May 2024

DOCUMENT REVIEW SHEET
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Project Preparation and Contact Person

06/03/2024

…… ……

Liam Gleeson – lgeeson@gkce.ie Date

CONTENTS

1. INTRODUCTION

GK Consulting Engineers have undertaken a detailed assessment of proposed foul, surface water drainage & water supply infrastructure, associated with the proposed water-based facility centre located at Killiney Beach, Co. Dublin. The site is accessed by vehicle from Strathmore road under the rail bridge.

The site is located on the beachfront on a raised grass landing above the tidal zone and protected from coastal actions by a gabion revetment. The site boundaries extend from the Killiney Waste Water Pump Station (WWPS) to the Northern end of the grass embankment at Scalpwilliam Bay Beach. The area for the proposed works is located at the northern site boundary and is bounded by a public parking lot to the south, embankment and rail line to the west, coastal zones to the east and north.

The proposed development includes the construction of a water-based facility centre and associated civil works.

Figure 1: Proposed Site Location .

1.1 DRAINAGE PROPOSALS

- A new foul sewer is laid to a 1/80 fall, connecting to the existing Local Authority Waste Water Pumpstation from which circa 110m south of the proposed.
- Attenuation is not required for the site. Storm runoff is directed into the Bay via gravity to an existing public 225MM surface water in the Killiney Beach Parking lot.
- A new 25mm (OD) service pipe and boundary box is proposed to connect to the existing 100mm HDPE in the Killiney Beach Parking lot.

2. EXISTING SITE SERVICES LOCAL AUTHORITY NETWORKS

Referring to Dublin County Council utility maps (Appendix A), the existing site is serviced as follows:

Foul Sewer
There is no existing foul sewer serving the site. The Killiney WWPS is located circa 110m south from the new site

Surface water
There is an existing 225mm uPVC surface water that runs from Strathmore Road down below the rail bridge into the Killiney Beach Parking adjacent to the site.

Watermain
There is an existing 100mm HDPE water main that runs to the Killiney Beach Parking adjacent to the surface water line.

3. PERCOLATION TEST

A percolation test is not required for this site. No infiltration suds systems are proposed at ground level. Strom runoff is directed into the bay via a existing public 225MM surface water sewer in the Killiney Beach Parking lot.

4. FOUL DESIGN

4.1 FOUL SEWER DESIGN

The foul drainage layout is indicated on Site Layout Drawing C100 and C101. The proposed sewer discharges by gravity via a new 225mm diameter uPVC to the Killiney WWPS, circa 110m from the site. A fall of 1/80 is achievable.

The site drainage will be designed to Dun-laoghaire Rathdown requirements. The individual pipe materials and gradients are chosen to ensure self-cleaning velocities (i.e. between approximately 0.75 and 1.8 m/sec) at flows greater than approximately 1/8 of the pipe bore. The uPVC pipe grade is ULTRARIB solid wall SN8 classification.

4.2 ESTIMATION OF FOUL WATER FLOWS

The proposed foul effluent is estimated as follows, calculated in accordance with the Irish Water Code of Practice for Wastewater Infrastructure. There are approximately 100,000 visitors every year to Killiney Beach.

Staff / Visitors

Classify Water sports centre as "Amenity Site" in accordance with CoP

Assume 500 visitors at 10l/person/day = 5000l/day

Assume 10 staff at 90l/person/day = 900l/day

Infiltration

Assume 10% = 680l/day

Total Dry Weather Flow = 6580l/day

Peak Flow

(4.5 x Total Dry Weather Flow + Infiltration) = 29610l/day

= 0.34l/s

Design Flow

Peak Flow + Surface Water Allowance = 0.45l/s

The estimation of the Foul Water flow is determined by the IS EN 752 discharge unit method.

IS EN 752 Discharge Units (DU):

Type of Appliance	No. of	DU	Value
Wash Basin	5	0.3	1.5
Shower without plug	10	0.4	4
Shower with plug	0	1.3	0
Single Urinal with Cistern	0	0.4	0
Slab Urinal	0	0.2	0
Bath	0	1.3	0
Kitchen Sink	0	1.3	0
Dishwasher	0	0.2	0
Washing Machine (6kg)	0	0.6	0
Washing Machine (12kg)	0	1.2	0
WC	5	1.7	8.5
			14 Discharge Units

From table C1 of IS EN 752, the frequency factor, kcu, is 0.5.

Usage of appliances	K
Intermittent use, e.g. in dwelling, guesthouse, office	0,5
Frequent use, e.g. in hospital, school, restaurant, hotel	0,7
Congested use, e.g. in toilets and/or showers open to public	1,0
Special use, e.g. laboratory	1,2

Therefore, the wastewater design flow is: Q = 1 x √14 = **3.75 l/s**

The foul pipe network for the site is designed for **3.75 l/s** based on the discharge unit method. This is within the capacity of the receiving public sewer system.

The onsite network will utilise 225mm diameter uPVC pipes at a minimum fall of 1:80 to satisfy level constraints. Chosen diameter allowable pipe flows are as follows:

- Allowable foul flow at 75 % of proportional depth for 225mm diameter pipes at min. gradient of 1:80 = 46 l/s

Pipe sizes, gradients, invert and cover levels and connection to public sewers are shown on drawing C100 and C101 Site Drainage Layout.

All connections will be in accordance with the requirements of Irish Water and the recommendations of IW Code of Practice for wastewater infrastructure. Additional capacity allowance for proposed future connections.

5. SURFACE WATER DESIGN

The Site Drainage Layout Drawing No. C100 and C101 shows the proposed surface water drainage layout. The flat roof area is circa 150m2. ACO channels surround the entrance to the facility. All surface runoff from hardstanding areas is discharged into the existing public surface water at Killiney Beach Parking. This network outfalls directly into the bay.

Attenuation is not required.

The surface water design methodology is in accordance with the criteria below:

- The pipe network is designed for a rainfall intensity of 50mm/hr, EN752 or 1in 2year return period;
- Allowance for 20% Climate change;
- Attenuation storage in accordance with SUDS & Dublin City Council requirements;
- Design for interception of the first 5mm of all rainfall events;
- Designed based on Wallingford method outlined in the CIRIA Report R156 (1996) and SuDS Manual C753

5.1. EXISTING SITE DATA

Average annual rainfall data obtained from Met Eireann for the area is shown in the figure below.

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 326020, Northing: 224834,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.6,	4.1,	5.0,	5.6,	6.0,	7.5,	9.1,	10.2,	11.8,	13.2,	14.2,	15.9,	17.2,	18.2,	N/A ,
10 mins	3.5,	5.0,	5.8,	6.9,	7.7,	8.4,	10.4,	12.7,	14.3,	16.4,	18.3,	19.8,	22.1,	23.9,	25.4,	N/A ,
15 mins	4.1,	5.9,	6.8,	8.2,	9.1,	9.8,	12.2,	15.0,	16.8,	19.3,	21.6,	23.3,	26.0,	28.2,	29.9,	N/A ,
30 mins	5.4,	7.6,	8.7,	10.4,	11.6,	12.4,	15.3,	18.6,	20.7,	23.7,	26.3,	28.4,	31.5,	33.9,	35.9,	N/A ,
1 hours	7.1,	9.8,	11.2,	13.3,	14.6,	15.7,	19.2,	23.0,	25.5,	29.0,	32.1,	34.5,	38.1,	40.9,	43.2,	N/A ,
2 hours	9.4,	12.7,	14.4,	16.9,	18.6,	19.8,	24.0,	28.5,	31.5,	35.6,	39.1,	41.9,	46.1,	49.3,	51.9,	N/A ,
3 hours	11.0,	14.7,	16.6,	19.5,	21.3,	22.8,	27.3,	32.4,	35.6,	40.1,	44.0,	47.0,	51.5,	55.0,	57.8,	N/A ,
4 hours	12.3,	16.4,	18.5,	21.5,	23.5,	25.1,	30.0,	35.4,	38.8,	43.6,	47.8,	50.9,	55.8,	59.4,	62.5,	N/A ,
6 hours	14.4,	19.0,	21.4,	24.8,	27.0,	28.8,	34.2,	40.1,	43.9,	49.1,	53.7,	57.1,	62.3,	66.3,	69.6,	N/A ,
9 hours	16.9,	22.1,	24.8,	28.6,	31.1,	33.0,	39.0,	45.5,	49.7,	55.4,	60.3,	64.0,	69.7,	74.0,	77.5,	N/A ,
12 hours	19.0,	24.6,	27.5,	31.6,	34.3,	36.3,	42.8,	49.8,	54.2,	60.3,	65.5,	69.5,	75.5,	80.0,	83.7,	N/A ,
18 hours	22.3,	28.6,	31.8,	36.4,	39.4,	41.7,	48.8,	56.5,	61.3,	67.9,	73.6,	77.9,	84.4,	89.3,	93.3,	N/A ,
24 hours	24.9,	31.8,	35.3,	40.3,	43.5,	45.9,	53.6,	61.8,	66.9,	73.9,	80.0,	84.5,	91.3,	96.5,	100.7,	114.9,
2 days	31.7,	39.6,	43.5,	49.0,	52.6,	55.3,	63.7,	72.5,	78.0,	85.4,	91.7,	96.5,	103.6,	108.9,	113.2,	127.7,
3 days	37.1,	45.8,	50.1,	56.1,	60.0,	62.9,	71.8,	81.2,	87.0,	94.8,	101.4,	106.4,	113.8,	119.3,	123.7,	138.7,
4 days	42.0,	51.3,	55.9,	62.4,	66.5,	69.5,	79.0,	88.8,	94.9,	103.0,	109.9,	115.0,	122.7,	128.4,	132.9,	148.3,
6 days	50.5,	61.0,	66.1,	73.2,	77.7,	81.1,	91.4,	102.0,	108.5,	117.3,	124.6,	130.1,	138.1,	144.1,	149.0,	165.0,
8 days	58.1,	69.6,	75.1,	82.8,	87.6,	91.2,	102.2,	113.6,	120.5,	129.7,	137.4,	143.2,	151.6,	157.9,	163.0,	179.7,
10 days	65.1,	77.4,	83.3,	91.5,	96.7,	100.5,	112.1,	124.1,	131.3,	141.0,	149.1,	155.0,	163.9,	170.4,	175.6,	192.9,
12 days	71.6,	84.8,	91.0,	99.7,	105.1,	109.1,	121.3,	133.8,	141.4,	151.4,	159.8,	166.0,	175.1,	181.9,	187.3,	205.1,
16 days	83.9,	98.4,	105.3,	114.7,	120.6,	125.0,	138.2,	151.6,	159.8,	170.5,	179.5,	186.1,	195.7,	202.9,	208.6,	227.4,
20 days	95.3,	111.0,	118.5,	128.6,	134.9,	139.6,	153.7,	168.0,	176.6,	188.0,	197.4,	204.3,	214.5,	222.0,	227.9,	247.5,
25 days	108.8,	125.9,	133.9,	144.8,	151.6,	156.7,	171.7,	186.9,	196.1,	208.1,	218.0,	225.4,	236.0,	243.9,	250.2,	270.7,

5.2. SURFACE WATER PIPE NETWORK DESIGN

The system is designed in accordance with EN752 British Standard Code of Practice for drain & sewer systems outside buildings. Two methods are compared with the greater used for the design.

METHOD 1 (Wallingford Rational Method)

Impermeable area drained to surface water sewer	200	m2
Time of concentration=time of entry+ (length of drain / full bore velocity of flow)		
Time of entry for a two-year return period is 4 to 7 mins		
For flat catchments we take the longer of 7mins :	420	seconds
Full bore velocity for 150 mm diameter:	1	m/s
Total drain length	50	m
Therefore time of concentration =	470	seconds
	8	minutes
Referring to published MET office rainfall depth data		
Closest storm duration for a two-year return period	10	minutes
Rainfall at closest storm duration	5.8	mm/above peric
Converted rainfall per hour	34.8	mm/hr
Q=Ap*I*Cv*Cr*2.78	**2.0**	l/s
Where:		
Cv=1.3		
Cr=0.8		

METHOD 2 (Design for rainfall intensity of 50mm/hr)

Outfall Flow = [(200x50/1000) / (60x60)] x1000 = 2.8 l/s

The surface water pipe network is therefore designed to cater for an outfall of 7.4 l/s, per the requirements of EN752

The proposed surface water network utilises 150mm uPVC pipes at a minimum fall of 1:100. The capacity of which based on a roughness value of Ks=0.6mm at full bore is 17.7 l/s

6. WATER SUPPLY

Information obtained from Irish Water & Dunlaoghaire Rathdown County Council indicates the presence of a 100mm Ø water main pipe running into the existing carpark. It is intended that a new connection will be made to this pipe.

6.1. WATER DEMAND

The Centre for water-based activities is equivalent to an Amenity Site (as outlined in the Irish Water Code of Practice for Wastewater Infrastructure)

Visitors

Required water demand requirements - 10 litres per use

Expected maximum number of visitors per day - circa 500 persons per day

Water demand per day - 500 persons/day x 10 litres/use = 5000 l/day

Average water demand over 10 hour period (8a.m - 6p.m) - 5000 litres/day / (10 hrs x 60 min x 60 sec) = 0.13 l/s

Working Staff

Working staff are equivalent to Industrial full-time day staff (as outlined in the Irish Water

Code of Practice for Wastewater Infrastructure)

Required water demand requirements - 90 litres per person per day

Expected maximum number of staff - 10 persons

Total water demand per day - 10 persons x 90 litres/person/day = 900l/day

Average water demand over 10 hour period (8a.m - 6p.m) - 900 litres/day / (10 hrs x 60 min x 60 sec) = 0.025 l/sec

Total Daily Water Demand: 5900 l/day = 0.16 l/sec (over a 10 hour working period)

Total Peak Water Demand 5 x 0.16 l/sec = 0.82 l/sec (Irish Water Code of Practice for Water Infrastructure)

6.2. WATER SUPPLY NETWORK

A new connection from the plant room to the public main is proposed. An individual 80mm (OD) service connection & boundary box in accordance with Irish Water Guidelines are proposed. The connection will be made in accordance with the requirements of Irish Water. Details are provided on drawing C100.

7. FLOOD RISK ASSESSMENT

Guidelines for planning titled "The Planning System and Flood Risk Management" were published by the Department of Environment, Heritage and Local Government in 2009. This document identifies different flooding zones, appropriate development in these zones and how to conduct a flood risk assessment (FRA).

The guidelines include definitions of Flood zones A, B and C as described below. It should be noted that these do not account for flood defences as these can be breached or overtopped in extreme events, or in the case of demountable defences, not installed correctly.

Zone A: This is a zone where likelihood of flooding is greatest, with a risk greater than 1% (1 in 100 year) for fluvial and 0.5% (1 in 200 year) for coastal flooding.

Zone B: In this zone the likelihood of fluvial flooding is between 1% and 0.1% (1 in 100 year to 1 in 1000 year) and between 0.5% and 0.1% (1 in 200 year to 1 in 1000 year)for coastal flooding.

Zone C: In this zone the likelihood of flooding is less than 0.1% (1 in 1000 year) for both fluvial and coastal flooding. Such sites are suitable for all development from a flooding perspective.

Once a flood zone has been identified, the guidelines set out the types of development that are appropriate for each zone. Exemptions to the restrictions are provided for through the use of the justification test, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated. Many towns and urban centres lie within flood risk zones and the avoidance of all future development in these areas would not be sustainable.

The guidelines set out a three stage approach to carrying out a FRA:

1. Flood Risk Identification:

2. Initial Flood Risk Assessment

3. Detailed Flood Risk Assessment

7.1. Flood Risk Identification – Stage 1

Stage 1 identifies whether there are any flooding or surface water management issues related to the site, i.e. it identifies whether a flood risk assessment is required. Based on information on the OPW floodinfo.ie website, the location of the proposed development is not at risk from river flooding events, in any of the low- medium- or high probability cases. Similarly, while there have been a limited number of reported flooding

Historic Flood Events.

Historical flood events have been researched with reference to an online Office of Public Works database, www.floodinfo.ie. A summary report generated from www.floodinfo.ie is contained within Appendix B. The site has no records of coastal or fluvial flooding events. The site is marked with a red X for all figures.

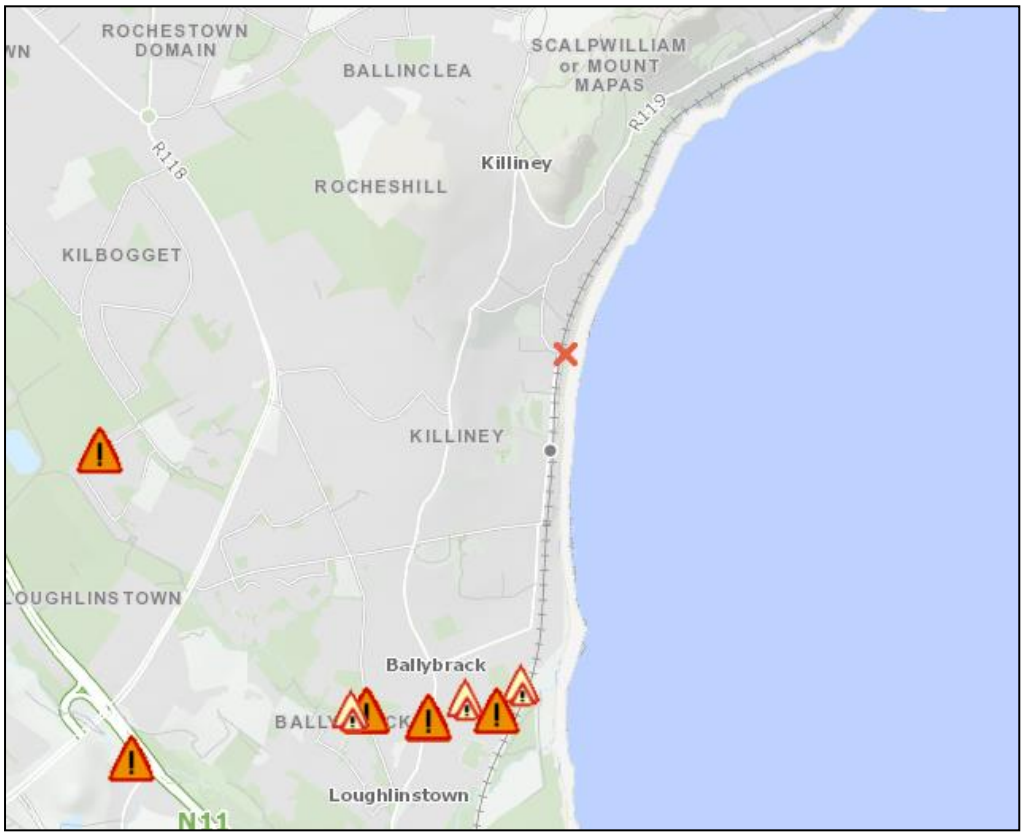


Figure 2: Historic flood events (Source: floodmaps.ie)

Coastal Flooding Risk

The site is located on an elevated platform and protected by gabion walls. Detailed coastal flooding maps at this location are not available however a coarse flood extent map (IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE II) shows the site is possibly located within the extents of the of the 0.5 and .1% AEP event. Modelled water levels for the 0.1% AEP at point 4 south of the site (see appendix B) show a water level of 3.11 mOD Malin. With the proposed site level of 7.0 mOD Malin, the site is above the flood zone but is however still exposed to coastal spray from wave impact into the gabion wall.

Figure 3: South East coast flood extent map

A Killiney Sports Facility Coastal Wave Overtopping Assessment by has been carried out JBA Consulting. This report recommends the defence wave crest level should be between 7 and 7.19mOD.

8. CONSTRUCTION MANAGEMENT PLAN

General

This section has been included to outline the intended strategy for the management of the construction works on site. Once appointed, the contractor will prepare a more detailed Construction Management Plan. In advance of the works commencing. This may be updated throughout the construction phase, as required.

Construction Programme and Phasing

Subject to a successful grant of planning, it is intended that the works would commence in 2025. The proposed development is anticipated to be constructed over a 12-15 month period.

The anticipated construction sequence for the building is as follows:

1 Clearance of existing vegetation on site

2 Set up site perimeter and contractor's site compound

3 Localised re-grading of the ground to facilitate access for construction machinery

4 Excavations for new building foundations

5 Construction of building foundations and rising walls to ground level, with back-filling

below ground floor level, as required

6 Construction of remainder of the new building superstructure and connect all services

7 Installation of finishes and internal elements to new building

8 External landscaping and construction of hard-standing areas

8.1. Site Establishment

Excavations

Based on SI reports & previous records from utility providers, there appears to be a considerable amount of underground services towards the northeast of the site. Prior to excavation, the Contractor shall accurately locate and verify all existing services.

It is proposed that excavations are generally battered-back to a 45 degree angle with trench boxes shall be used for deeper excavations.

It is not proposed that any significant de-watering will be required on site. However, localised pumping from deeper excavations for foundations may be required.

Fencing

Temporary fencing around the site will be required to maintain site security during the

construction phase. It is envisaged that this will be Heras fencing or solid timber hoarding 2m high.

Site Access And Contractor's Compound

It is envisaged that a temporary entrance to the site will be made at the location of the existing carpark.

It is indicatively proposed that the contractor's compound and storage area could be located in the southern corners of the site. However, given the extremely restricted conditions of the side, it is likely that the site compound may need to be relocated a number of times as works progress.

It is proposed that the contractor would make a temporary connection to the Irish Water mains water supply to serve the compound during the construction works. As there is a foul sewer MH adjacent to the site area, the contractor shall manage the temporary disposal of wastewater through the connection to the existing sewer line.

Temporary access routes and hard-standing areas will be required to provide trafficable routes around the site.

The appointed contractor will determine the exact location for site access points, compound location and on-site temporary roads to suit their construction programme and methodology.

Appendix A

CONFIRMATION OF FEASIBILITY

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

Liam Gleeson

GK Engineers Ltd
Unit 11
Millbank Business Park
Lower Lucan Road
Lucan
Dublin
K78R261

24 April 2024

Our Ref: CDS24002798 Pre-Connection Enquiry
Killiney, Beach, Dun Laoghaire

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Business Connection of 1 unit(s) at Killiney, Beach, Dun Laoghaire, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible Subject to upgrades

- There is no Uisce Éireann watermain adjacent to the site (please see Section B – Details of Uisce Éireann's Network(s)). In order to connect the proposed Development, Uisce Éireann network has to be extended for approximately 25m from the 160mm HPPE via the train underpass. The Developer will be required to fund the extension works. The fee will be calculated at a connection application stage.

- **Wastewater Connection** - Feasible without infrastructure upgrade by Uisce Éireann

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

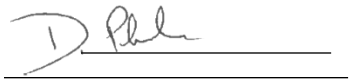
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie

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Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Appendix B

GROUND INVESTIGATIONS IRELAND
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Ground Investigations Ireland

Killiney Beach

Dun Laoghaire-Rathdown County Council

Ground Investigation Report

December 2023

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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DOCUMENT CONTROL SHEET

Project Title	Killiney Beach
Engineer	GK Consulting Engineers
Client	Dun Laoghaire-Rathdown County Council
Project No	12178-08-22
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	S Graydon	J Cashen	C Finnerty	Dublin	14 December 2023
B	Final	S Graydon	J Cashen	C Finnerty	Dublin	20 December 2023

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

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CONTENTS

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APPENDICES

1.0 Preamble

On the instructions of GK Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd. (GII) between November and December 2023, at the site of the proposed canoe storage and toilet facility at Killiney Beach, County Dublin.

2.0 Overview

2.1. Background

It is proposed to construct a new multi-purpose canoe storage and toilet facility with associated services at the proposed site. At the time of the site investigation the site was parkland with the DART railway line and a pedestrian footpath to the west and Killiney Beach to the east. The site is situated beside the Killiney Beach car park in Killiney, South County Dublin.

2.2. Purpose and Scope

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

- Visit project site to observe existing conditions
- Carry out 2 No. Trial Pits to a maximum depth of 2.50m BGL
- Carry out 1 No. Slit Trench to locate existing services
- Carry out 1 No. Soakaway test to determine a soil infiltration value to BRE Digest 365
- Carry out 1 No. Percussion borehole to a maximum depth of 2.90m BGL
- Carry out 1 No. Rotary Core Borehole to a maximum depth of 10.00m BGL
- Installation of 1 No. Groundwater monitoring well
- Geochemical Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing were undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015+A1:2020.

3.2. Trial Pits

The trial pits were excavated using a 3.5T tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered, and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Slit Trenching

The slit trench was excavated using a 3.5T tracked excavator at the location shown in the exploratory hole location plan in Appendix 1. The location was checked using a CAT scan to minimise the potential for encountering services during the excavation. The soil was slowly stripped using a spotter on the trench to alert the driver if any services were seen, to avoid damage to any underlying services. The slit trench was sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered, and the characteristics of the strata encountered and are presented on the slit trench record which is provided in Appendix 3 of this Report.

3.4. Soakaway Testing

The soakaway test was carried out in a selected trial pit at the location shown in the exploratory hole location plan in Appendix 1. This pit was carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pit was allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pit was logged prior to completing the soakaway test and backfilled with arising's upon completion. The soakaway test result is provided in Appendix 4 of this Report.

3.5. Percussion Borehole

The percussion borehole was carried out at the location shown in the location plan in Appendix 1 using a Tecopsa SPT Tec 10 percussion drilling rig. The percussion sampling consists of a 1m long steel tube with a cutting edge and an internal plastic liner which is mechanically driven into the ground utilising a 63.5kg weight falling a height of 760mm. Upon completion of the 1m sample, the tube is withdrawn and the plastic liner removed and sealed for logging and sub sampling by a Geotechnical Engineer/Engineering Geologist. The tube is replaced in the borehole and a subsequent 1m sample can be recovered. Occasionally outer casing or a reduced diameter tube is utilised to enable the window sample to progress in difficult drilling conditions. Geotechnical or environmental soil samples can be recovered from each of the liners following logging. Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole record. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a weight of 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid

60º cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The percussion borehole record is provided in Appendix 5 of this Report.

3.6. Rotary Borehole

The rotary coring was carried out by a track mounted T44 Beretta rig at the location shown on the location plan in Appendix 1. The rotary borehole was completed from the ground surface.
The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole log and core photographs are provided to allow assessment of the core recovered. The rotary borehole log is provided in Appendix 6 of this Report.

3.7. Surveying

The exploratory hole locations have been recorded using a KQGeo M8 GNSS System which records the coordinates and elevation of the locations to ITM as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.8. Groundwater Monitoring Installation

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

3.9. Laboratory Testing

Samples were selected from the exploratory holes for chemical testing to assist in the classification of soils and to provide information for the proposed design.
Chemical testing as required by the specification, including pH and sulphate testing was carried out by Element Materials Technology Laboratory in the United Kingdom (UK).
The results of the laboratory testing are included in Appendix 7 of this Report.

4.0 Ground Conditions

4.1. General

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

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

- Topsoil
- Made Ground
- Granular Deposits

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.10m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil and were present to a depth of up to 3.50m BGL. These deposits were described generally as *brown slightly sandy slightly gravelly Clay with cobbles and boulders* and contained *rare fragments of concrete, red brick, metal, and plastic.* Relatively large pieces (~0.7m) of concrete were also observed within the trial pits.

GRANULAR DEPOSITS: Granular deposits were encountered below the Made Ground deposits and were typically described as either brownish g*rey slightly clayey gravelly fine to coarse SAND with cobbles* or g*rey slightly clayey sandy subangular to subrounded fine to coarse GRAVEL with cobbles.* The secondary sand/gravel and fines constituents varied across the site and with depth, while low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content was also present, where noted on the exploratory hole logs. Based on the SPT N values the deposits are dense.

4.2. Groundwater

Water strikes were not able to be accurately identified during the rotary core drilling as water is added as part of the drilling process. Therefore, no remarks on groundwater are included on the rotary core log. At all other locations, no groundwater was encountered however it should be noted out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and

groundwater levels would be expected to vary with the time of year, rainfall, nearby construction, and other factors. For this reason, a standpipe was installed in RC01 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 8 of this Report.

4.3. Laboratory Testing

4.3.1. Chemical Laboratory Testing

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

The results from the completed laboratory testing are included in Appendix 7 of this report.

5.0 Recommendations & Conclusions

5.1. General

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

5.2. Foundations

An allowable bearing capacity of 150 kN/m^2 is recommended for conventional strip or pad foundations on the dense granular deposits at a depth of 3.50m BGL. Lean mix trench fill may be utilised to build up the foundation level and achieve the recommended allowable bearing capacity. Due to the depth of the made ground, a suspended floor slab should be considered.

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

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

5.3. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry. Excavations in the Made Ground will require to be appropriately battered or the sides supported due to the low strength of these deposits.
Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and may require dewatering. The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations.

5.4. Soakaway Design

At the location of SA01 the water level dropped too slowly to allow calculation of ‘f’ the soil infiltration rate. This location is therefore not recommended as suitable for soakaway design and construction.

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

APPENDIX 1 - Figures

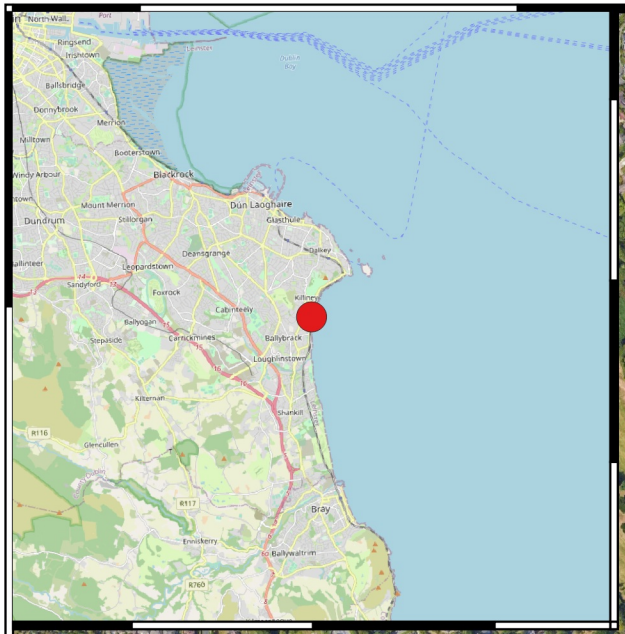
724500E 725000E 725500E 726000E 726500E

725500N

725000N

724500N

724000N



732000N

726000N

720000N

720000E 726000E 732000E

N

L7

Site Location

Indicative Site Boundary

Client:

Dún Laoghaire-Rathdown
County Council Comhairle Contae
Dhún Laoghaire-Ráth an Dúin

Project Code:

12178-08-22

Project Title:

Killiney Beach Site Investigation

Drawing Title:

Figure 1 - Site Location

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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

0 75 150 225 300 375 450 m

Drawn By:	Date:
SG	06-12-2023

Legend

- Rotary Borehole
- Percussive Borehole
- Soakaway
- Trial Pit
- Slit Trench
- Indicative Site Boundary

Client:

Dún Laoghaire-Rathdown
County Council Comhairle Contae
Dhún Laoghaire-Ráth an Dúin

Project Code:

12178-08-22

Project Title:

Killiney Beach Site Investiation

Drawing Title:

Figure 2 - GI Locations

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

0 3.5 7 10.5 14 m

Drawn By:	Date:
SG	14-12-2023

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Killiney Beach			**Trial Pit Number** SA01
Machine : 3.5T Excavator **Method :** Trial Pit	**Dimensions** 1.20m x 0.70m x 1.50m (L x W x D)	**Ground Level (mOD)** 7.12	**Client** Dun Laoghaire-Rathdown County Council	**Job Number** 12178-08-22
	Location (dGPS) 725947.2 E 724790.7 N	**Dates** 22/11/2023	**Engineer** GK Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				7.02	(0.10) 0.10	TOPSOIL		
					(0.50)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional fragments of plastic, wire and concrete		
				6.52	0.60			
					(0.30)	MADE GROUND: Brown and grey slightly sandy slightly gravelly Clay with rare fragments of yellow brick		
				6.22	0.90			
					(0.60)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with low cobble content		
				5.62	1.50	Complete at 1.50m		

Plan

Remarks

No groundwater encountered
Trial pit stable
Soakaway carried out in trial pit
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	SB	12178-08-22.SA01

Ground Investigations Ireland Ltd
www.gii.ie

Site Killiney Beach			**Trial Pit Number** TP01
Machine : 3.5T Excavator **Method :** Trial Pit	**Dimensions** 2.10m x 0.70m x 2.50m (L x W x D)	**Ground Level (mOD)** 6.82	**Client** Dun Laoghaire-Rathdown County Council	**Job Number** 12178-08-22
	Location (dGPS) 725951.7 E 724791.1 N	**Dates** 22/11/2023	**Engineer** GK Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				6.72	(0.10) 0.10	TOPSOIL		
						MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional fragments of concrete, red brick, yellow brick, metal, wire and ceramic		
0.50	B				(1.10)			
				5.62	1.20	MADE GROUND: Brown sandy slightly gravelly Clay with rare fragments of concrete and yellow brick		
1.50 1.50	B T				(0.50)			
				5.12	1.70	MADE GROUND: Brown slightly sandy slightly gravelly Clay with rare fragments of ceramic and yellow brick		
				4.82	(0.30) 2.00	MADE GROUND: Brownish grey slightly sandy slightly gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse		
					(0.50)			
				4.32	2.50	Complete at 2.50m		
2.50 2.50	B T							

Plan

Remarks

No groundwater encountered
Trial pit stable
Trial pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	SB	12178-08-22.TP01

Killiney Beach– Trial Pit Photographs

TP01

TP01

Killiney Beach– Trial Pit Photographs

TP01

TP01

Killiney Beach– Trial Pit Photographs

SA01

SA01

Killiney Beach– Trial Pit Photographs

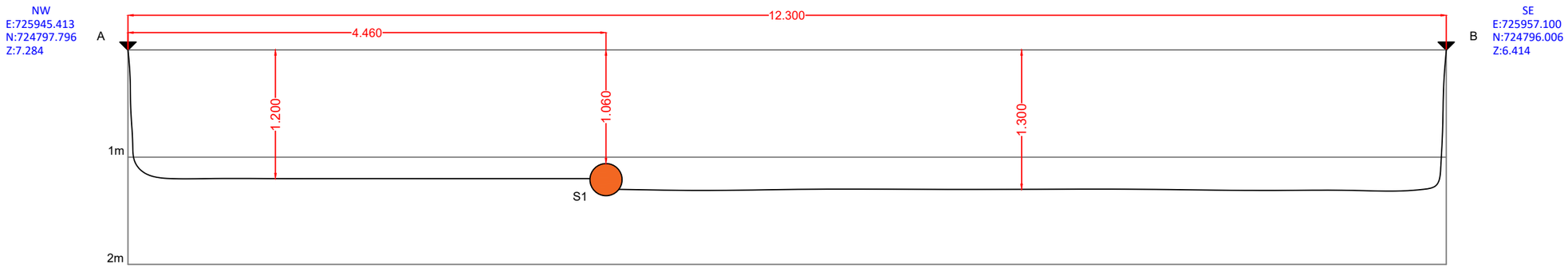
SA01

SA01

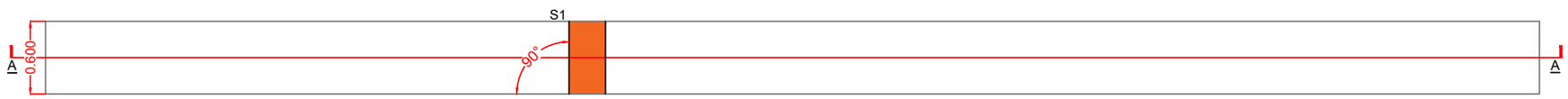
APPENDIX 3 – Slit Trench Records

ST-01

SECTION A-A



PLAN VIEW



Service No	ø (m)	Colour - Material	Utility	Angle to trench	Coordinates		Level
					East	North	
S1	0.300	Orange - Ribbed PVC	Storm	90°	725949.961	724796.945	5.903

Surface from/to (m)		Surface type
0.00	12.30	-

Sample depth (m)	Sample type

From (m)	To (m)	Description
0.00	1.30	MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional fragments of concrete, metal, plastic, red brick.

Groundwater	Y/N	Depth	Notes
	N		

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Geotechnical & Environmental

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PROJECT:	12178-08-22 - Killiney Beach
DRAWING No.:	ST-01
DATE:	22/11/2023
CLIENT:	GK Consulting Engineers
SCALE:	NTS

Version:	Date:	Drawn By:	Checked By:
1	04/12/2023	J.S.	S.B.

Killiney Beach – Slit Trench Photographs

Slit trench overview

ST1a

Killiney Beach – Slit Trench Photographs

ST1b

ST1c

Killiney Beach – Slit Trench Photographs

ST1d

ST1e

Killiney Beach – Slit Trench Photographs

ST1f

ST1g

Killiney Beach – Slit Trench Photographs

ST1h

ST1i

Killiney Beach – Slit Trench Photographs

ST1j

ST1k

Killiney Beach – Slit Trench Photographs

Service 1

APPENDIX 4 – Soakaway Testing Result

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

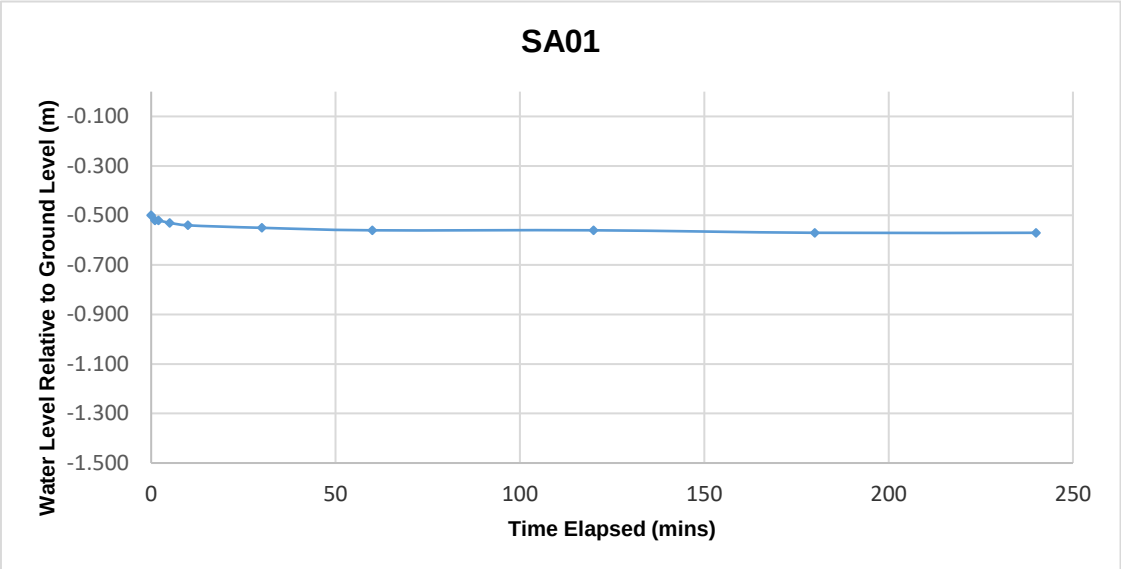
SA01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 1.20m x 0.70m x 1.50m (L x W x D)

Date	Time	Water level (m bgl)
22/11/2023	0	-0.500
22/11/2023	1	-0.520
22/11/2023	2	-0.520
22/11/2023	5	-0.530
22/11/2023	10	-0.540
22/11/2023	30	-0.550
22/11/2023	60	-0.560
22/11/2023	120	-0.560
22/11/2023	180	-0.570
22/11/2023	240	-0.570

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.50	1.500	1.000	0.75	1.25



APPENDIX 5 - Percussion Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site	Number
Killiney Beach	BH01

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Tech-10 Percussion Borehole	88mm to 2.00m 68mm to 2.90m	7.03	Dun Laoghaire-Rathdown County Council	12178-08-22
	Location (dGPS) 725947.6 E 724786.8 N	**Dates** 22/11/2023	**Engineer** GK Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	B			6.93	0.10	TOPSOIL		
					(0.90)	MADE GROUND: Dark brown slightly sandy slightly gravelly Clay with rare fragments of concrete and red brick		
1.00-1.45 1.00-2.00	SPT(C) N=10 B		2,2/2,2,3,3	6.03	1.00	MADE GROUND: Brown slightly sandy slightly gravelly Clay with low cobble content and rare fragments of concrete and red brick		
2.00-2.45 2.00-2.90	SPT(C) N=6 B		4,2/2,1,1,2		(1.90)			
2.90-3.03	SPT(C) 25*/75 50/50		24,1/50	4.13	2.90	Complete at 2.90m		

Remarks
0.00m - 1.00m BGL: 100% recovery
1.00m - 2.00m BGL: 60% recovery
2.00m - 2.90m BGL: 55% recovery
Refusal at 2.90m BGL
No groundwater encountered
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	SB

Figure No.
12178-08-22.TP01

Killiney Beach – Percussion Borehole Photograph

BH01

APPENDIX 6 – Rotary Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Killiney Beach			**Borehole Number** RC01
Machine : Beretta T-41 **Flush :** Water **Core Dia :** 63.5 mm **Method :** Rotary Cored	**Casing Diameter** 96mm cased to 10.00m	**Ground Level (mOD)** 6.95	**Client** Dun Laoghaire-Rathdown County Council	**Job Number** 12178-08-22
	Location (dGPS) 725949.3 E 724785.7 N	**Dates** 21/11/2023-22/11/2023	**Engineer** GK Consulting Engineers	**Sheet** 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	36						(1.50)	Recovery consists of MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional fragments of red brick and concrete. Drillers note: Clay Fill			
1.40 1.40-1.85	92				6,7/9,9,11,11 SPT(C) N=40	5.45	1.50 (0.50)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional fragments of red brick and concrete			
2.00 2.00-2.45	25				5,7/9,9,12,13 SPT(C) N=43	4.95	2.00 (1.50)	Recovery consists of MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional fragments of red brick and concrete. Drillers note: Clay Fill			
3.50 3.50-3.95	29				4,6/8,7,8,7 SPT(C) N=30	3.45	3.50 (1.50)	Recovery consists of brownish grey slightly clayey slightly gravelly fine to coarse SAND. Drillers note: coarse Sand and Gravel (Dense)			
5.00 5.00-5.45	48				5,5/12,10,9,19 SPT(C) N=50	1.95	5.00 (1.50)	Recovery consists of white, brown and grey subrounded COBBLES and BOULDERS with much subangular to rounded fine to coarse Gravel. Drillers note: Cobbles with gravel (Dense)			
6.50 6.50-6.95	15				8,9/8,12,13,13 SPT(C) N=46	0.45	6.50 (1.50)	Recovery consists of grey slightly sandy subangular to rounded fine to coarse GRAVEL with low cobble content. Drillers note: Gravel (Dense)			
8.00 8.00-8.38	10				8,8/13,14,19,4 SPT(C) 50/230	-1.05	8.00 (1.50)	Recovery consists of greyish brown slightly clayey gravelly fine to coarse SAND. Drillers note: Sand (Dense)			
9.50 9.50-9.84	0				7,9/11,19,20 SPT(C) 50/190	-2.55	9.50 (0.50)	No Recovery. Drillers note: Sand (Dense)			
10.00						-3.05	10.00				

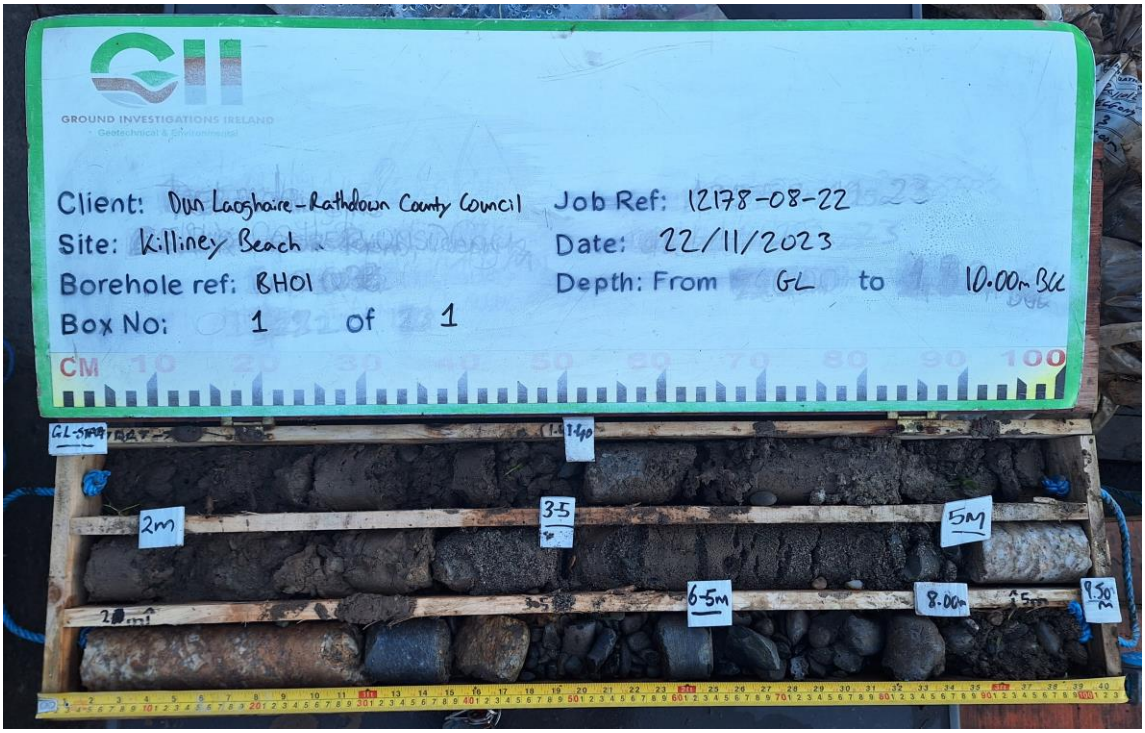
Remarks
50mm standpipe installed: Slotted pipe with gravel filter from 10.00m to 1.00m BGL. Plain pipe with bentonite seal from 1.00m BGL to GL. Complete with flush cover
Borehole complete at 10.00m BGL

Scale (approx)	Logged By
1:50	SB

Figure No. 12178-08-22.RC01

Killiney Beach – Rotary Core Photographs

RC01



APPENDIX 7 – Laboratory Testing

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Deeside
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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland
D22 K5P8

Attention :	James Cashen
Date :	18th December, 2023
Your reference :	12178-08-22
Our reference :	Test Report 23/20725 Batch 1
Location :	Killiney Beach
Date samples received :	7th December, 2023
Status :	Final Report
Issue :	202312181158

Two samples were received for analysis on 7th December, 2023 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 1.593 kg of CO2

Scope 1&2&3 emissions - 3.764 kg of CO2

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 12178-08-22
Location: Killiney Beach
Contact: James Cashen
EMT Job No: 23/20725

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2									LOD/LOR	Units	Method No.
Sample ID	TP01	TP01											
Depth	1.50	2.50											
COC No / misc													
Containers	T	T											
Sample Date	22/11/2023	22/11/2023											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	07/12/2023	07/12/2023											
Sulphate as SO4 (2:1 Ext) #	0.0368	0.1133									<0.0015	g/l	TM38/PM20
pH #	8.76	7.87									<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Notification of Deviating Samples

Client Name: Ground Investigations Ireland
Reference: 12178-08-22
Location: Killiney Beach
Contact: James Cashen

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/20725						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/20725

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/20725

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

APPENDIX 8 – Groundwater Monitoring

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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D22 YD52

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

GROUNDWATER MONITORING

Killiney Beach

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
RC01	20/12/2023	16:00:00	6.41	