
S.I. Ltd Contract No: 5648

Client: Glenveagh Properties PLC
Engineer: Barrett Mahony
Contractor: Site Investigations Ltd

Howth Road,
Howth, Co. Dublin
Site Investigation Report

Prepared by:

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Stephen Letch

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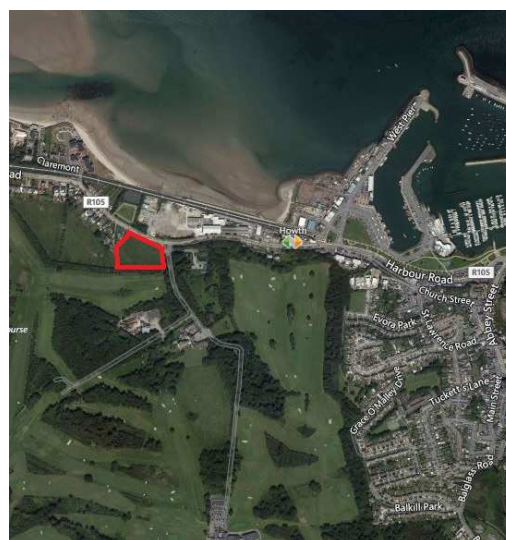
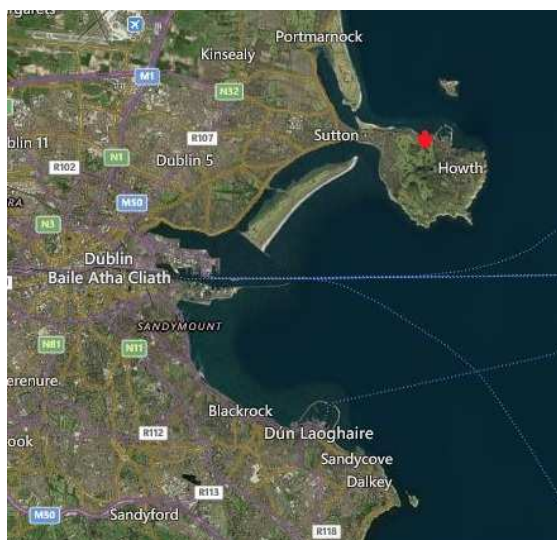
1. Introduction

On the instructions of Barrett Mahony, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Howth Road, Howth, Co. Dublin. The investigation was for a new residential development of the site and was completed on behalf of the Client, Glenveagh Properties PLC. The investigation was started in October and completed in November 2019.

This report presents the factual geotechnical data obtained from the field and laboratory testing with interpretation of the ground conditions discussed.

2. Site Location

The site was located to the West of Howth on the Howth Road and was accessed through Deer Park Golf Course. Howth is located to the East of Dublin city and forms a peninsula into the Irish Sea. The first map below shows the location of the site in relation to the city centre and the second map shows the location of the site in Howth.



3. Fieldwork

The fieldworks comprised a programme of cable percussive boreholes and soakaway tests. All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design. Laboratory testing has been performed on representative soil samples recovered from the boreholes and these were completed in accordance of BS1377: 1990. The fieldworks comprised of the following:

- 7 No. cable percussive boreholes
- 7 No. soakaway tests

3.1. Cable Percussive Boreholes

Cable percussion boring was undertaken at 7 No. locations using a Dando 150 rig and constructed 200mm diameter boreholes. The borehole depths were consistent in depth from 6.60mbgl (BH06) to 7.30mbgl (BH03). It was not possible to collect undisturbed samples due to the granular soils encountered so bulk disturbed samples were recovered at regular intervals.

To test the strength of the stratum, Standard Penetration Tests (SPT's) were performed at 1.00m intervals in accordance with BS 1377 (1990). In soils with high gravel and cobble content it is appropriate to use a solid cone (60°) (CPT) instead of the split spoon and this was used throughout the testing. The test is completed over 450mm and the cone is driven 150mm into the stratum to ensure that the test is conducted over an undisturbed zone. The cone is then driven the remaining 300mm and the blows recorded to report the N-Value. The report shows the N-Value with the 75mm incremental blows listed in brackets (e.g. BH01 at 1.20mbgl where N=6-(2,3/1,1,2,2)). Where refusal of 50 blows across the test zone was encountered was achieved during testing, the penetration depth is also reported (e.g. BH01 at 3.00mbgl where N=50-(25 for 125mm/50 for 35mm)).

The logs are presented in Appendix 1.

3.2. Soakaway Tests

Close to the borehole locations, 7 No. soakaway tests were completed and the tests carried out in accordance with BRE Special Digest 365. The soakaway pits were excavated using a wheeled excavator and were logged by a SIL geotechnical engineer. The soakaway test is used to identify possible areas for storm water drainage. The pit was filled with water and the level of the groundwater was recorded over time. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration.

The soakaway logs and photographs are presented in Appendix 2.

3.3. Surveying

Following completion of all the fieldworks, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with a site plan in Appendix 4.

4. Laboratory Testing

Geotechnical laboratory testing was completed on representative soil samples in accordance with BS 1377 (1990). Testing included:

- 10 No. pH and sulphate content

The laboratory test results are presented in Appendix 3.

5. Ground Conditions

5.1. Overburden

The site ground conditions in the boreholes are consistent with cohesive soils dominating the site with light brown sandy slightly gravelly silty CLAY encountered at most locations. The SPT N-values are generally 10 or greater at 1.20mbgl, although BH01 and BH06 did record values of 6 and 5 respectively. The values also increased with depth across the site.

5.2. Groundwater

Groundwater details in the boreholes during the fieldworks are noted on the logs in Appendix 1. Groundwater was recorded in all of the boreholes ranging from 4.20mbgl to 4.70mbgl and the levels rose slightly after 20 minutes.

6.0. Recommendations and Conclusions

Please note the following caveats:

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 the exploratory hole locations or below the final level of excavation, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for adjacent unexpected conditions that have not been revealed by the exploratory holes. It is further recommended that all bearing surfaces when excavated should be inspected by a suitably qualified Engineer to verify the information given in this report.

Excavated surfaces in clay strata should be kept dry to avoid softening prior to foundation placement. Foundations should always be taken to a minimum depth of 0.50mBGL to avoid the effects of frost action and possible seasonal shrinkage/swelling.

If it is intended that on-site materials are to be used as fill, then the necessary laboratory testing should be specified by the Client to confirm the suitability. Also, relevant lab testing should be specified where stability of side slopes to excavations is a concern, or where contamination may be an issue.

6.1. Shallow Foundations

Due to the unknown depth of foundation and no longer-term groundwater information, this analysis assumes the groundwater will not influence the construction or performance of these foundations.

The boreholes recorded cohesive CLAY soils at 1.20mbgl with SPT test results generally over 10 but values as low as 5 was recorded. Using a correlation proposed by Stroud and Butler between SPT N-values and plasticity indices, the SPT N-value can be used to calculate the undrained shear strength. No Atterberg limit tests were completed as part of the investigation but these soils have low to intermediate plasticity indices and therefore, the correlation of $C_u=6N$ has been chosen. The undrained shear strength can be used to calculate the ultimate bearing capacity, and finally, a factor of safety of 3 is applied to get the allowable bearing capacity.

The table below shows the undrained shear strength, ultimate bearing capacity and allowable bearing capacity at 1.00mbgl and 2.00mbgl at each location.

Borehole No:	1.20mbgl				2.00mbgl			
	SPT	C_u	ULS	ABC	SPT	C_u	ULS	ABC
BH01	6	36	205	70	9	54	310	105
BH02	10	60	330	110	11	66	375	125
BH03	10	60	330	110	24	144	770	255
BH04	10	60	330	110	8	48	280	95
BH05	12	72	390	130	23	138	740	245
BH06	5	30	175	60	14	84	465	155
BH07	15	90	480	160	29	174	925	310

All values are kN/m².

The following assumptions were made as part of these analyses. If any of these assumptions are not in accordance with detailed design or observations made during construction these recommendations should be re-evaluated.

- Foundations are to be constructed on a level formation of uniform material type (described above).
- The bulk unit weight of the material in this stratum has a minimum density of 19kN/m³.
- All bearing capacity calculations allow for a settlement of 25mm.

The soakaway pits indicate that excavations in the cohesive soils should be stable for a short while at least. However, if granular soils or granular lenses are encountered then the likelihood of pit wall instability increases, and regular inspection of temporary excavations should be completed during construction to ensure that all slopes are stable. Temporary support should be used on any excavation that will be left open for an extended period.

6.2. Groundwater

The caveats below relating to interpretation of groundwater levels should be noted:

There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.

Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.

Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of groundwater monitoring using any constructed standpipes is required to provide more accurate information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall, nearby construction and tides.

Pumping tests would be required to determine likely seepage rates and persistence into excavations taken below the groundwater level. Deep trial pits also aid estimation of seepage rates.

As discussed previously, groundwater was encountered in all the borehole locations at depths between 4.20mbgl to 4.70mbgl. There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. However, based on this information at the exploratory hole locations to date, it is considered likely that any seepages into excavations of the CLAY will be slow. If granular soils are encountered in shallow excavations, then the possibility of water ingressing into an excavation increase.

If groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

6.3. Aggressive Ground Conditions

The chemical test results in Appendix 3 indicate a general pH value between 8.04 and 8.34, which is close to neutral and below the level of 9, therefore no special precautions are required.

The maximum value obtained for water soluble sulphate was 126mg/l as SO₃. The BRE Special Digest 1:2005 – ‘Concrete in Aggressive Ground’ guidelines require SO₄ values and after

conversion ($SO_4 = SO_3 \times 1.2$), the maximum value of 151mg/l shows Class 1 conditions and no special precautions are required.

Appendix 1
Cable Percussive Borehole Logs

Contract No: 5648		Cable Percussion Borehole Log							Borehole No: BH02										
Contract:		Howth Road			Easting:		727620.170		Date Started:		01/11/2019								
Location:		Howth, Co. Dublin			Northing:		739330.711		Date Completed:		01/11/2019								
Client:		Glenveagh Properties PLC			Elevation:		7.38		Drilled By:		J. O'Toole								
Engineer:		Barrett Mahony			Borehole Diameter:		200mm		Status:		FINAL								
Depth (m)		Stratum Description			Legend	Level (mOD)		Samples and Insitu Tests				Water Strike	Backfill						
Scale	Depth					Scale	Depth	Depth	Type	Result									
0.20	0.20	TOPSOIL.				7.18													
0.5	0.5	Brown sandy slightly gravelly silty CLAY with low cobble content.				7.0	0.50	B	JOT08										
1.0	1.20	Soft becoming firm brown sandy slightly gravelly silty CLAY with low cobble content.				6.5													
1.5	1.20					6.18	1.20	C	N=10 (1,1/2,2,3,3)										
2.0	2.0					5.5	2.00	B	JOT09										
2.5	2.50	Stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.				5.0	2.00	C	N=11 (1,2/2,2,3,4)										
3.0	2.50					4.88													
3.5	3.50	Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.				4.5	3.00	B	JOT10										
4.0	3.50					4.0	3.00	C	N=22 (2,4/4,5,6,7)										
4.5	3.50					3.88													
5.0	4.0					3.5	4.00	B	JOT11										
5.5	4.5					3.0	4.00	C	N=44 (5,7/10,10,12,12)										
6.0	5.0					2.5	5.00	B	JOT12										
6.5	5.5					2.0	5.00	C	N=36 (4,6/7,9,9,11)										
7.0	6.0					1.5	6.00	B	JOT13										
7.5	6.5					1.0	6.00	C	N=44 (3,7/9,12,11,12)										
8.0	7.0					0.5	7.00	B	JOT14										
8.5	7.10	Obstruction - possible boulders.				0.28	7.00	C	50 (25 for 100mm/50 for 5mm)										
9.0	7.20	Borehole terminated due to obstruction. End of Borehole at 7.20m				0.18	7.20	C	50 (25 for 5mm/50 for 0mm)										
9.5						-0.5													
						-1.0													
						-1.5													
						-2.0													
						-2.5													
		Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:		Legend: B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
		From: 4.70 To: 7.10	To: 4.80 To: 7.20	Time: 00:45 01:00	Strike: 4.70 Rose: 4.60 Depth Sealed: 5.60	Date: 01/11	Hole Depth: 7.20	Water Depth: Dry	From:	To:	Pipe:	From: 0.00 To: 7.20	Type: Arisings	Hand dug inspection pit to 1.20mbgl.					

Contract No: 5648	Cable Percussion Borehole Log				Borehole No: BH06
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Contract:	Howth Road	Easting:	727649.255	Date Started:	05/11/2019
Location:	Howth, Co. Dublin	Northing:	739275.640	Date Completed:	06/11/2019
Client:	Glenveagh Properties PLC	Elevation:	9.88	Drilled By:	J. O'Toole
Engineer:	Barrett Mahony	Borehole Diameter:	200mm	Status:	FINAL

Depth (m)		Stratum Description	Legend	Level (mOD)		Samples and Insitu Tests			Water Strike	Backfill
Scale	Depth			Scale	Depth	Depth	Type	Result		
	0.20	TOPSOIL.			9.68					
		Brown sandy slightly gravelly silty CLAY.			9.5					
	0.70	Soft becoming firm brown sandy slightly gravelly silty CLAY with low cobble content.			9.18					
						1.00	B	JOT22		
						1.20	C	N=5 (1,1/1,1,1,2)		
						2.00	B	JOT23		
						2.00	C	N=14 (2,3/3,3,4,4)		
	2.50	Stiff becoming very stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.			7.38					
						3.00	B	JOT24		
						3.00	C	N=23 (2,4/5,5,6,7)		
						4.00	B	JOT25		
						4.00	C	N=31 (4,5/7,7,9,8)		
	4.40	Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.			5.48					
						5.00	B	JOT26		
						5.00	C	50 (25 for 125mm/50 for 15mm)		
						6.00	B	JOT27		
						6.00	C	N=50 (10,11/50 for 235mm)		
	6.50	Obstruction - possible boulders.			3.38	6.50	B	JOT28		
	6.60	Borehole terminated due to obstruction. End of Borehole at 6.60m			3.28	6.60	C	50 (25 for 5mm/50 for 0mm)		

	Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:		Legend: B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
	From:	To:	Time:	Strike:	Rose:	Depth Sealed:	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	Hand dug inspection pit to 1.20mbgl.		
	5.20	5.30	00:45	4.20	4.00	5.20	05/11	3.00	Dry				0.00	6.60	Arisings			
6.50	6.50	01:00				06/11	3.00	Dry										

Contract No: 5648		Cable Percussion Borehole Log							Borehole No: BH07				
Contract:		Howth Road			Easting:		727551.320		Date Started:		08/11/2019		
Location:		Howth, Co. Dublin			Northing:		739274.500		Date Completed:		08/11/2019		
Client:		Glenveagh Properties PLC			Elevation:		10.64		Drilled By:		J. O'Toole		
Engineer:		Barrett Mahony			Borehole Diameter:		200mm		Status:		FINAL		
Depth (m)		Stratum Description			Legend	Level (mOD)		Samples and Insitu Tests				Water Strike	Backfill
Scale	Depth					Scale	Depth	Depth	Type	Result			
	0.20	TOPSOIL.				10.5	10.44						
	0.5	Brown sandy slightly gravelly silty CLAY.											
	0.60	Firm brown sandy slightly gravelly silty CLAY with low cobble content.				10.0	10.04						
	1.0					9.5		1.00	B	JOT36			
	1.5					1.20	C	N=15 (2,2/3,4,4,4)					
	1.80	Stiff dark brown sandy slightly gravelly silty CLAY with low cobble content.				9.0	8.84						
	2.0					8.5		2.00	B	JOT37			
	2.5					2.00	C	N=29 (2,4/7,7,7,8)					
	2.90	Stiff grey sandy slightly gravelly silty CLAY with low cobble content.				8.0	7.74						
	3.0					7.5		3.00	B	JOT38			
	3.5					3.00	C	N=39 (4,6/7,9,11,12)					
	4.0					7.0		4.00	B	JOT39			
	4.5					4.00	C	N=37 (4,6/7,8,10,12)					
	4.60	Very stiff black sandy slightly gravelly silty CLAY with low cobble and boulder content.				6.0	6.04						
	5.0					5.5		5.00	B	JOT40			
	5.5					5.00	C	47 (10,14/47 for 200mm)					
	6.0					5.0		6.00	B	JOT41			
	6.5					6.00	C	50 (25 for 125mm/50 for 25mm)					
	7.0	Obstruction - possible boulders. Borehole terminated due to obstruction. End of Borehole at 7.10m				4.0		7.00	B	JOT42			
	7.10					3.54	C	50 (25 for 50mm/50 for 20mm) 50 (25 for 5mm/50 for 0mm)					



Chiselling:			Water Strikes:			Water Details:			Installation:			Backfill:			Remarks:	Legend: B: Bulk D: Disturbed U: Undisturbed ES: Environmental W: Water C: Cone SPT S: Split spoon SPT
From:	To:	Time:	Strike:	Rose:	Depth Sealed:	Date:	Hole Depth:	Water Depth:	From:	To:	Pipe:	From:	To:	Type:	Hand dug inspection pit to 1.20mbgl.	
5.40	5.50	00:45	4.20	4.10	5.50	08/11	7.10	Dry				0.00	7.10	Arising		

Appendix 2
Soakaway Test Results and Photographs

SOAKAWAY TEST

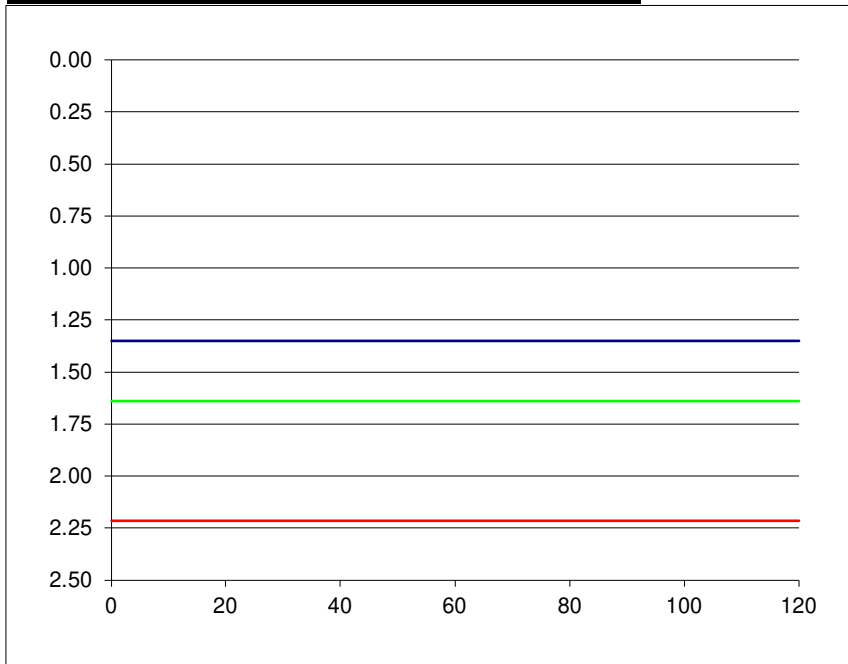


Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA01
Date:	08/10/2019

Ground Conditions		
From	To	
0.00	0.30	TOPSOIL.
0.30	0.70	Firm brown slightly sandy gravelly silty CLAY with low cobble content.
0.70	2.50	Firm becoming stiff grey brown slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.35
0.5	1.35
1	1.35
1.5	1.35
2	1.35
2.5	1.35
3	1.35
3.5	1.35
4	1.35
4.5	1.35
5	1.35
6	1.35
7	1.35
8	1.35
9	1.35
10	1.35
12	1.35
14	1.35
16	1.35
18	1.35
20	1.35
25	1.35
30	1.35
40	1.35
50	1.35
60	1.35
75	1.35
90	1.35
120	1.35

Pit Dimensions (m)	
Length (m)	2.60 m
Width (m)	0.90 m
Depth	2.50 m
Water	
Start Depth of Water	1.35 m
Depth of Water	1.15 m
75% Full	1.64 m
25% Full	2.21 m
75%-25%	0.58 m
Volume of water (75%-25%)	1.35 m ³
Area of Drainage	19.84 m ²
Area of Drainage (75%-25%)	6.37 m ²
Time	
75% Full	N/A min
25% Full	N/A min
Time 75% to 25%	N/A min
Time 75% to 25% (sec)	N/A sec



f = Fail or Fail
m/min m/s

SOAKAWAY TEST



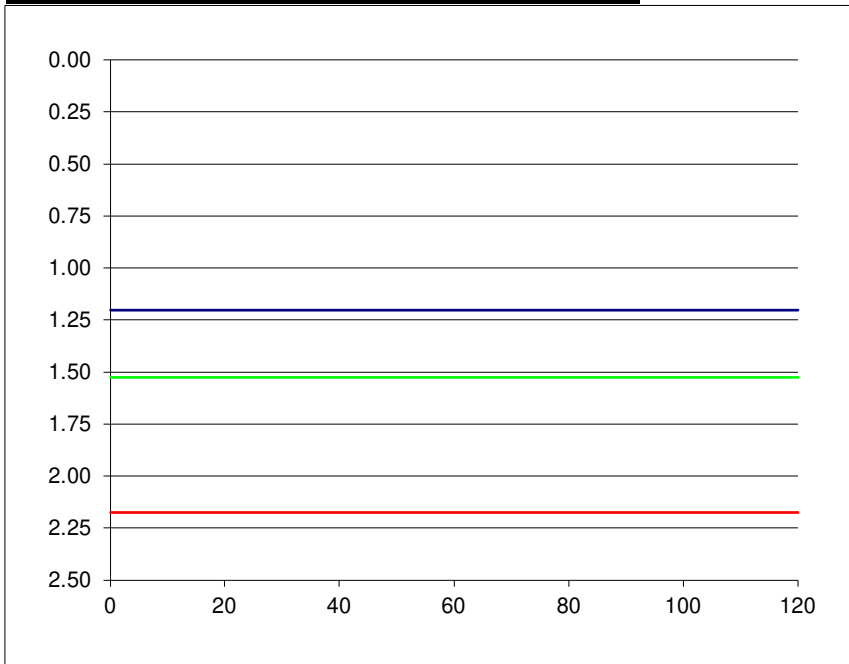
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA02
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.80	Firm light brown sandy slightly gravelly silty CLAY with low cobble content.
0.80	2.50	Firm grey brown slightly sandy gravelly silty CLAY with high cobble and medium boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.20
0.5	1.20
1	1.20
1.5	1.20
2	1.20
2.5	1.20
3	1.20
3.5	1.20
4	1.20
4.5	1.20
5	1.20
6	1.20
7	1.20
8	1.20
9	1.20
10	1.20
12	1.20
14	1.20
16	1.20
18	1.20
20	1.20
25	1.20
30	1.20
40	1.20
50	1.20
60	1.20
75	1.20
90	1.20
120	1.20

Pit Dimensions (m)	
Length (m)	2.50 m
Width (m)	0.90 m
Depth	2.50 m
Water	
Start Depth of Water	1.20 m
Depth of Water	1.30 m
75% Full	1.53 m
25% Full	2.18 m
75%-25%	0.65 m
Volume of water (75%-25%)	1.46 m ³
Area of Drainage	19.25 m ²
Area of Drainage (75%-25%)	6.67 m ²
Time	
75% Full	N/A min
25% Full	N/A min
Time 75% to 25%	N/A min
Time 75% to 25% (sec)	N/A sec



f = **Fail** or
m/min

Fail
m/s

SOAKAWAY TEST



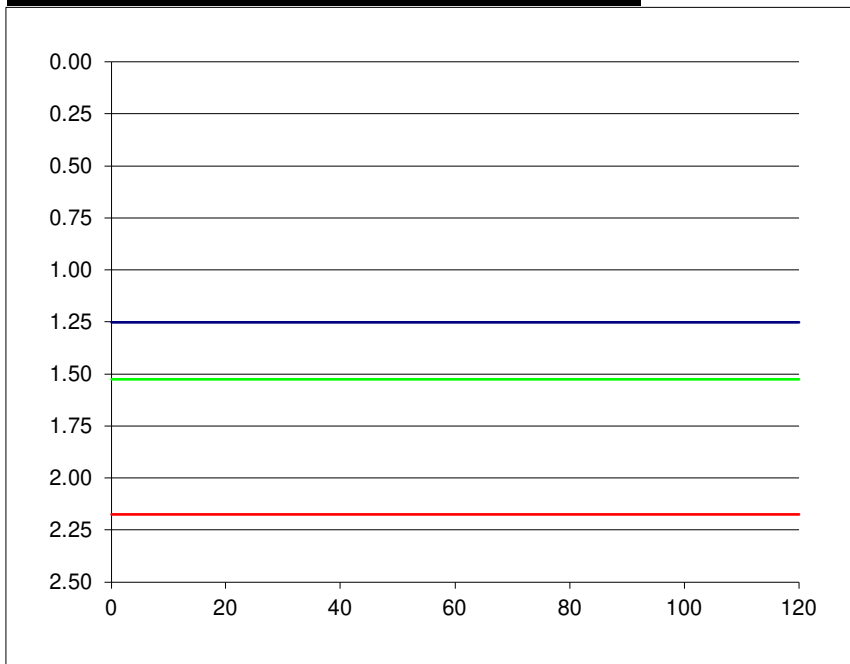
Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA03
Date:	08/10/2019

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	0.90	Grey brown silty sandy GRAVEL with high cobble content.
0.90	1.80	Firm light brown sandy slightly gravelly silty CLAY with medium cobble content.
1.80	2.50	Firm light brown grey slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.25
0.5	1.25
1	1.25
1.5	1.25
2	1.25
2.5	1.25
3	1.25
3.5	1.25
4	1.25
4.5	1.25
5	1.25
6	1.25
7	1.25
8	1.25
9	1.25
10	1.25
12	1.25
14	1.25
16	1.25
18	1.25
20	1.25
25	1.25
30	1.25
40	1.25
50	1.25
60	1.25
75	1.25
90	1.25
120	1.25

Pit Dimensions (m)	
Length (m)	2.40 m
Width (m)	0.90 m
Depth	2.50 m
Water	
Start Depth of Water	1.20 m
Depth of Water	1.30 m
75% Full	1.53 m
25% Full	2.18 m
75%-25%	0.65 m
Volume of water (75%-25%)	1.40 m ³
Area of Drainage	18.66 m ²
Area of Drainage (75%-25%)	6.45 m ²
Time	
75% Full	N/A min
25% Full	N/A min
Time 75% to 25%	N/A min
Time 75% to 25% (sec)	N/A sec



f = **Fail** or
m/min

Fail
m/s

SOAKAWAY TEST

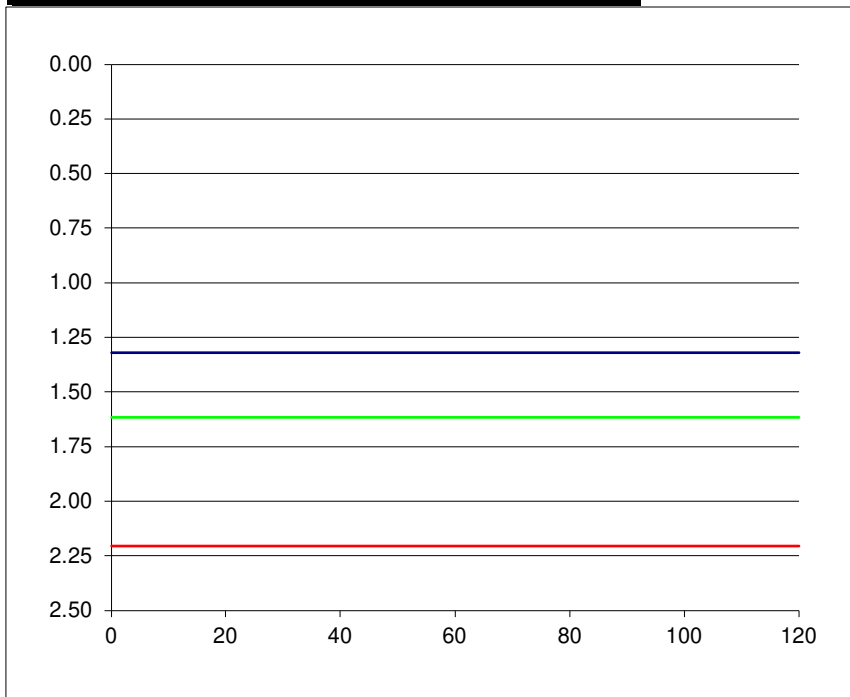


Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA04
Date:	08/10/2019

Ground Conditions		
From	To	
0.00	0.30	TOPSOIL.
0.30	1.10	Firm light brown sandy slightly gravelly silty CLAY with low cobble content.
1.10	2.50	Firm brown grey slightly sandy gravelly silty CLAY with medium cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.32
0.5	1.32
1	1.32
1.5	1.32
2	1.32
2.5	1.32
3	1.32
3.5	1.32
4	1.32
4.5	1.32
5	1.32
6	1.32
7	1.32
8	1.32
9	1.32
10	1.32
12	1.32
14	1.32
16	1.32
18	1.32
20	1.32
25	1.32
30	1.32
40	1.32
50	1.32
60	1.32
75	1.32
90	1.32
120	1.32

Pit Dimensions (m)	
Length (m)	2.30 m
Width (m)	0.90 m
Depth	2.50 m
Water	
Start Depth of Water	1.32 m
Depth of Water	1.18 m
75% Full	1.62 m
25% Full	2.21 m
75%-25%	0.59 m
Volume of water (75%-25%)	1.22 m ³
Area of Drainage	18.07 m ²
Area of Drainage (75%-25%)	5.85 m ²
Time	
75% Full	N/A min
25% Full	N/A min
Time 75% to 25%	N/A min
Time 75% to 25% (sec)	N/A sec



f = Fail m/min or Fail m/s

SOAKAWAY TEST

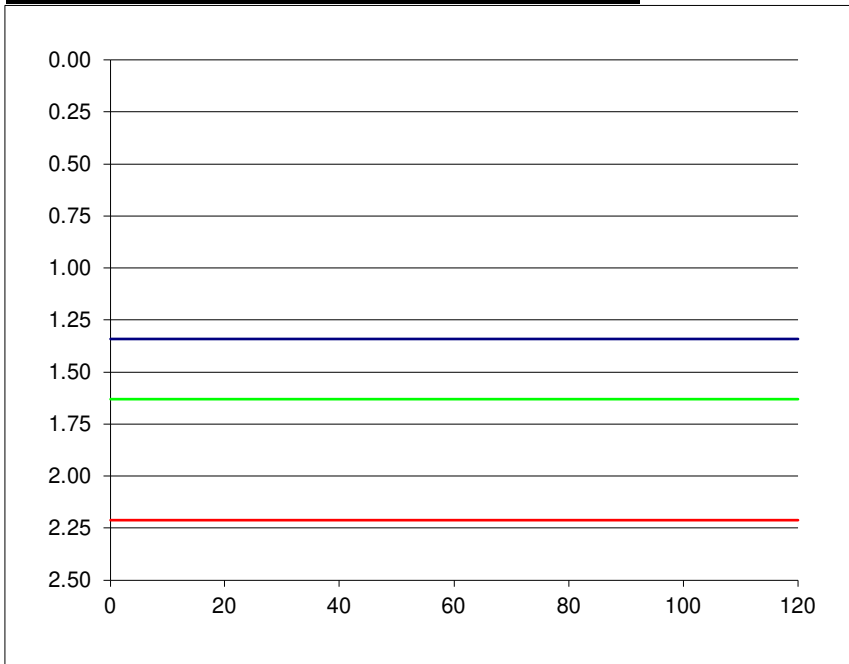


Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA05
Date:	08/10/2019

Ground Conditions		
From	To	
0.00	0.30	TOPSOIL.
0.30	0.80	Firm light brown slightly sandy gravelly silty CLAY with low cobble content.
0.80	2.50	Firm becoming stiff brown grey slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.34
0.5	1.34
1	1.34
1.5	1.34
2	1.34
2.5	1.34
3	1.34
3.5	1.34
4	1.34
4.5	1.34
5	1.34
6	1.34
7	1.34
8	1.34
9	1.34
10	1.34
12	1.34
14	1.34
16	1.34
18	1.34
20	1.34
25	1.34
30	1.34
40	1.34
50	1.34
60	1.34
75	1.34
90	1.34
120	1.34

Pit Dimensions (m)	
Length (m)	2.60 m
Width (m)	0.90 m
Depth	2.50 m
Water	
Start Depth of Water	1.34 m
Depth of Water	1.16 m
75% Full	1.63 m
25% Full	2.21 m
75%-25%	0.58 m
Volume of water (75%-25%)	1.36 m ³
Area of Drainage	19.84 m ²
Area of Drainage (75%-25%)	6.40 m ²
Time	
75% Full	N/A min
25% Full	N/A min
Time 75% to 25%	N/A min
Time 75% to 25% (sec)	N/A sec



f = Fail /min or Fail /s

SOAKAWAY TEST

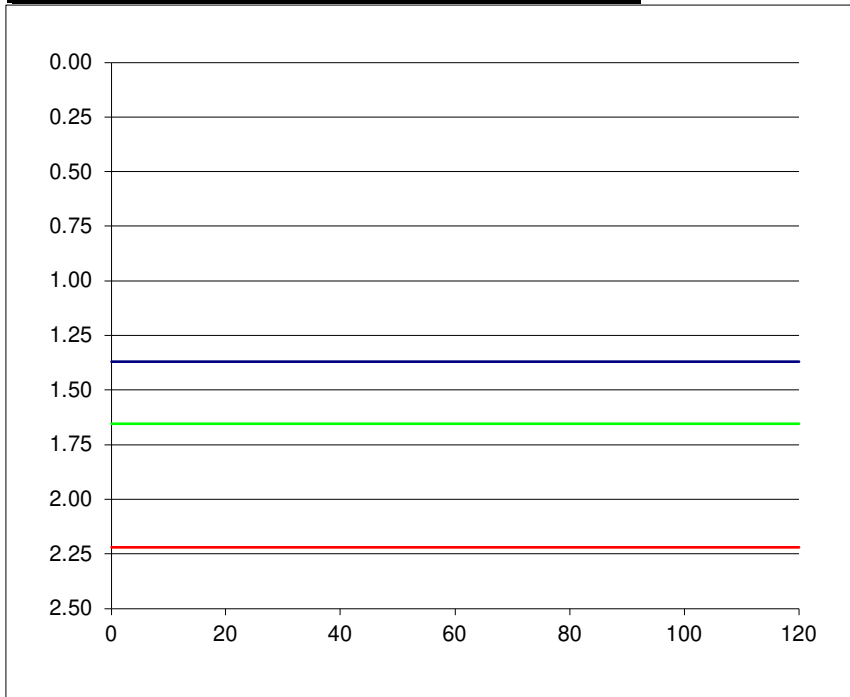


Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA06
Date:	08/10/2019

Ground Conditions		
From	To	
0.00	0.30	TOPSOIL.
0.30	1.90	Firm brown slightly sandy gravelly silty CLAY with low cobble content.
1.90	2.50	Stiff grey brown slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.37
0.5	1.37
1	1.37
1.5	1.37
2	1.37
2.5	1.37
3	1.37
3.5	1.37
4	1.37
4.5	1.37
5	1.37
6	1.37
7	1.37
8	1.37
9	1.37
10	1.37
12	1.37
14	1.37
16	1.37
18	1.37
20	1.37
25	1.37
30	1.37
40	1.37
50	1.37
60	1.37
75	1.37
90	1.37
120	1.37

Pit Dimensions (m)	
Length (m)	2.70 m
Width (m)	0.90 m
Depth	2.50 m
Water	
Start Depth of Water	1.37 m
Depth of Water	1.13 m
75% Full	1.65 m
25% Full	2.22 m
75%-25%	0.57 m
Volume of water (75%-25%)	1.37 m ³
Area of Drainage	20.43 m ²
Area of Drainage (75%-25%)	6.498 m ²
Time	
75% Full	N/A min
25% Full	N/A min
Time 75% to 25%	N/A min
Time 75% to 25% (sec)	N/A sec



f = Fail m/min or Fail m/s

SOAKAWAY TEST

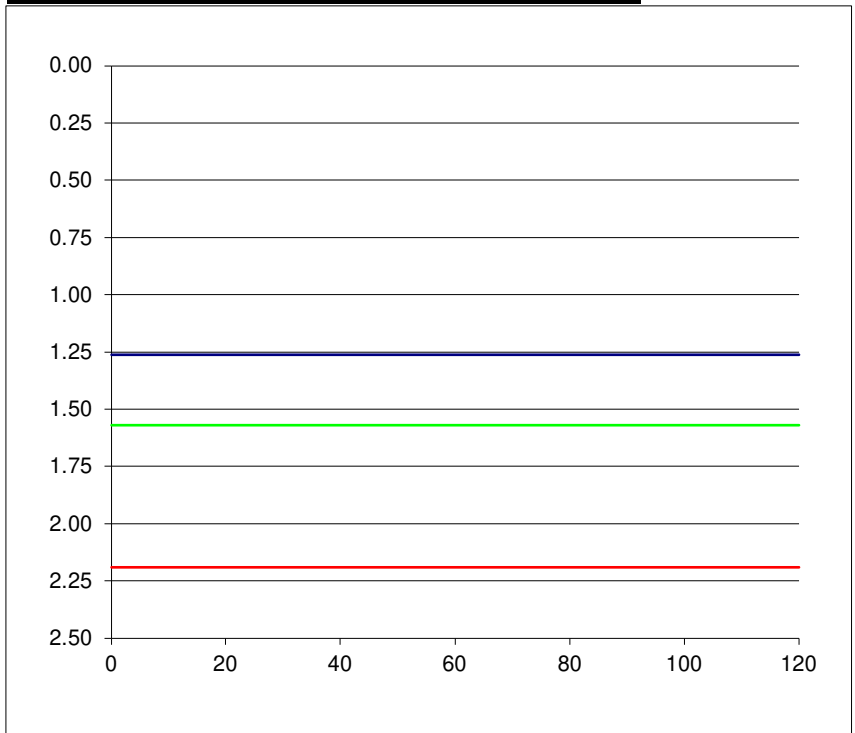


Project Reference:	5648
Contract name:	Howth Road
Location:	Howth, Co. Dublin
Test No:	SA07
Date:	08/10/2019

Ground Conditions		
From	To	Description
0.00	0.30	TOPSOIL.
0.30	2.50	Firm brown grey slightly sandy gravelly silty CLAY with high cobble content.

Elapsed Time (mins)	Fall of Water (m)
0	1.26
0.5	1.26
1	1.26
1.5	1.26
2	1.26
2.5	1.26
3	1.26
3.5	1.26
4	1.26
4.5	1.26
5	1.26
6	1.26
7	1.26
8	1.26
9	1.26
10	1.26
12	1.26
14	1.26
16	1.26
18	1.26
20	1.26
25	1.26
30	1.26
40	1.26
50	1.26
60	1.26
75	1.26
90	1.26
120	1.26

Pit Dimensions (m)	
Length (m)	2.20 m
Width (m)	0.90 m
Depth	2.50 m
Water	
Start Depth of Water	1.26 m
Depth of Water	1.24 m
75% Full	1.57 m
25% Full	2.19 m
75%-25%	0.62 m
Volume of water (75%-25%)	1.23 m ³
Area of Drainage	17.48 m ²
Area of Drainage (75%-25%)	5.82 m ²
Time	
75% Full	N/A min
25% Full	N/A min
Time 75% to 25%	N/A min
Time 75% to 25% (sec)	N/A sec



f = Fail m/min or Fail m/s

SA01 Pit



SA01 Sidewall



SA01 Spoil



SA02 Pit



SA02 Sidewall



SA02 Spoil



SA03 Pit



SA03 Sidewall



SA03 Spoil



SA04 Pit



SA04 Sidewall



SA04 Spoil



SA05 Pit



SA05 Sidewall



SA05 Spoil



SA06 Pit



SA06 Sidewall



SA06 Spoil



SA07 Pit



SA07 Sidewall



SA07 Spoil



Appendix 3
Geotechnical Laboratory Test Results

Chemical Testing
In accordance with BS 1377: Part 3

Client	Glenveagh Properties Ltd.
Site	Howth Road
S.I. File No	5648 / 19
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	26th November 2019

Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO ₃) g/L	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO ₃) %	Loss on Ignition (Organic Content) %	Chloride ion Content (water:soil ratio 2:1) %	% passing 2mm	Remarks
BH01	1.00	JOT01	19/1463	8.16	0.123	0.093			75.9	
BH01	2.00	JOT02	19/1464	8.13	0.124	0.085			68.3	
BH02	0.50	JOT08	19/1465	8.12	0.123	0.099			80.6	
BH03	1.00	JOT15	19/1466	8.04	0.122	0.094			77.3	
BH04	1.00	JOT43	19/1467	8.13	0.122	0.108			88.6	
BH04	2.00	JOT44	19/1468	8.34	0.120	0.095			79.2	
BH05	1.00	JOT29	19/1469	8.13	0.122	0.100			81.9	
BH06	1.00	JOT22	19/1470	8.16	0.120	0.100			83.2	
BH06	2.00	JOT23	19/1471	8.10	0.126	0.094			74.7	
BH07	1.00	JOT36	19/1472	8.19	0.123	0.090			73.2	

Appendix 4

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Boreholes					
BH01	727569.693	739346.250	7.58	327646.524	239321.181
BH02	727620.170	739330.711	7.38	327697.012	239305.639
BH03	727650.112	739302.186	8.59	327726.960	239277.108
BH04	727562.272	739302.844	9.70	327639.102	239277.766
BH05	727596.769	739273.657	10.50	327673.606	239248.573
BH06	727649.255	739275.640	9.88	327726.104	239250.556
BH07	727551.320	739274.500	10.64	327628.148	239249.415
Soakaway Tests					
SA01	727556.891	739349.071	7.68	327633.719	239324.003
SA02	727616.585	739323.768	8.19	327693.426	239298.695
SA03	727646.652	739302.093	8.83	327723.500	239277.015
SA04	727554.380	739306.570	9.78	327631.208	239281.492
SA05	727596.427	739268.765	10.65	327673.264	239243.680
SA06	727656.970	739273.897	10.13	327733.820	239248.813
SA07	727560.565	739278.538	10.67	327637.395	239253.454



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 The Grange
 12th Lock Road
 Lucan
 Co. Dublin
 T: 01 6108768
 e: info@siteinvestigations.ie

Contract No:	5648	Client:	Glenveagh Properties PLC
Contract Name:	Howth Road	Engineer:	Barrett Mahony
Location:	Howth, Co. Dublin	Scale:	1:1000
Title:	Site Plan	Drawn By:	SL

Legend Key
 ● Locations By Type - CP
 ■ Locations By Type - IP