

SOIL TESTING REPORT FOR
RESIDENTIAL DEVELOPMENT AT
GLENCAIRN, MURPHYSTOWN WAY,
DUBLIN 18

MAY 2018



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Dublin 18

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TABLE OF CONTENTS

1.0	INTRODUCTION.....	4
2.0	INFILTRATION TESTS.....	5
2.1	SUDS INFILTRATION TESTS:	6
3.0	SUMMARY OF INFILTRATION TEST RESULTS	8
4.0	SOIL CLASSIFICATION TEST.....	9
4.1	A – DRAINAGE GROUP.....	10
4.2	B – DEPTH TO 'IMPERMEABLE' LAYERS.....	10
4.3	C – PERMEABILITY GROUP (ABOVE IMPERMEABLE LAYERS OR TO 80CM)	10
4.4	D – SLOPE	11
4.5	SUMMARY OF SOIL CLASSIFICATION RESULTS	11

1.0 INTRODUCTION

This report relates to the proposed residential development at Glencairn, Murphystown Way, Dublin 18 off the Ballyogan Road. A site investigation was undertaken by IGSL in 2017 (provided under separate cover) which has been used to inform the drainage design. Information utilised included the following:

- Determination of SOIL value for runoff calculations based on the Flood Studies Report (FSR) – Hydrological Studies, Institute of Hydrology, Wallingford, 1993.
- Presence of saturated ground
- Classification of soil

The proposed development seeks to demolish an existing house on site and provide for the construction of 341 no. residential units, a childcare facility, open space and all associated site and infrastructural works on a site of c. 9.59 hectares.



Figure 1 – Site Location, Glencairn, Murphystown Road, Dublin 18 (Extract Google Maps)

In addition to the site investigation carried out by IGSL, DBFL visited the subject site on a number of occasions in Winter 2017/2018. Areas of ponding of surface water were witnessed on areas on the surface within the site and the ground was waterlogged to an appreciable extent within the site.

The assessment of soil infiltration was undertaken by excavating trial pits based on the requirements of BRE Digest 365 and CIRIA SuDS Manual C753. The FSR (Winter Rain Acceptance) SOIL value determined will be used to calculate the pre-development characteristics of the in-situ soil and the corresponding greenfield run-off of the site.

2.0 INFILTRATION TESTS

Three infiltration tests were undertaken by IGSL in general accordance with BRE document 365 (Soakaway Design) and CIRIA SuDS Manual C753 at a number of positions within the proposed residential development.

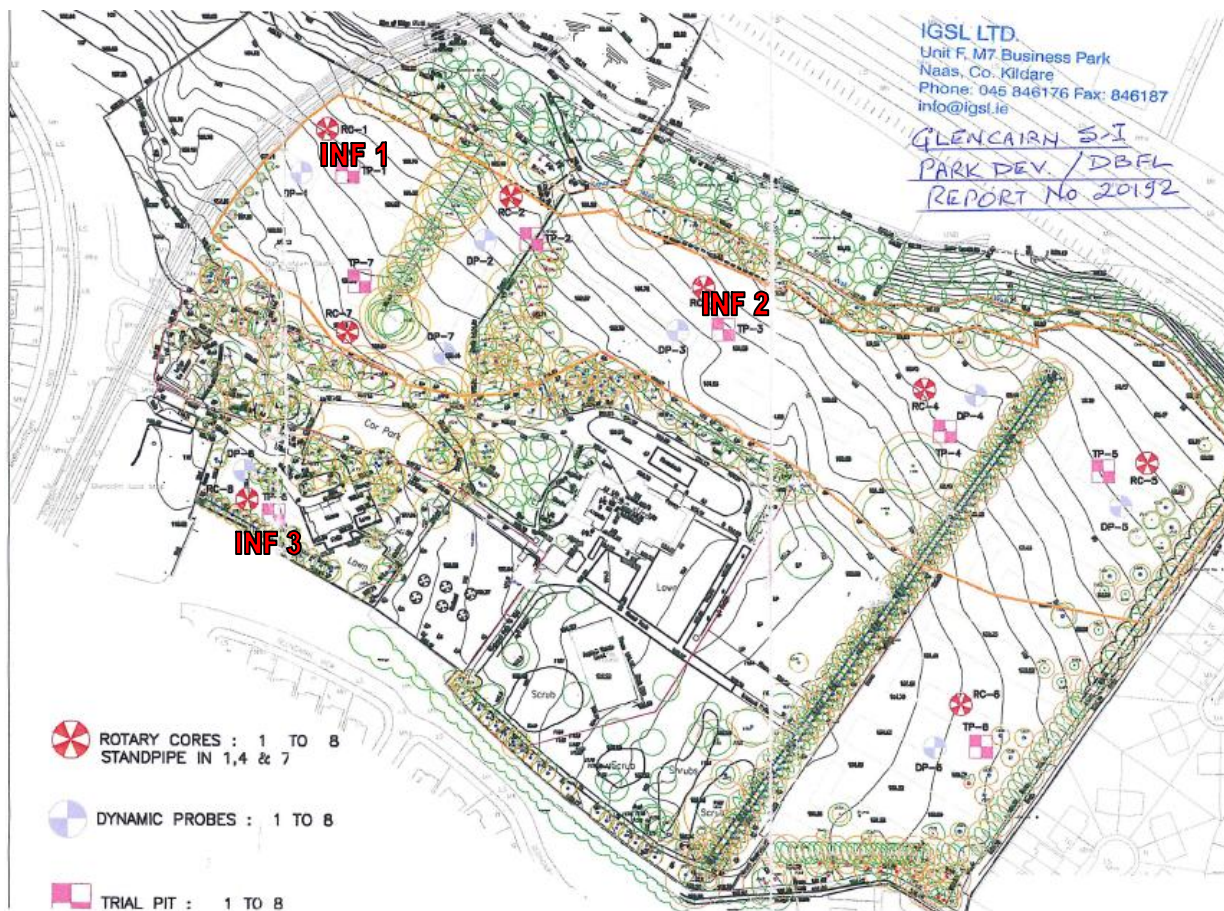


Figure 1 – Infiltration Test locations

A photographic record of each trial pit was undertaken which logged the depth of water and the time lapsed from the beginning of the test. This was used to determine infiltration rates.

2.1 SuDS Infiltration Tests:

Dimensions of the pit: 0.75m (d) x 1.8m (l) x 1.4m (w)



Figure 2 –Infiltration Test Pit - INF 1



Figure 4 – Infiltration Test Pit - INF 2



Figure 5 – Infiltration Test Pit - INF 3

Summary of test results are as follows:-

Test No.	Trial Pit No.	Infiltration Rate f (m/min)	Infiltration Rate f (mm/hr)
INF 1	TP01	0.00013	7.8
INF 2	TP03	0.00018	10.8
INF 3	TP06	0.00002	1.2

Table 1 – Infiltration Tests Results

3.0 Summary of Infiltration Test Results

The average infiltration rate for the three pits is $((7.8+10.8+1.2)/3) = 6.6\text{mm/hr}$ and will be used as a SuDS infiltration rate throughout the site.

In conclusion, the infiltration tests undertaken throughout the site show that the site would not be suitable for infiltration systems for attenuation purposes. However, the values determined can be used to calculate interception volumes that can be achieved through infiltration.

4.0 SOIL CLASSIFICATION TEST

The SOIL value for the site will be classified using the 'Winter Rain Acceptance' table 4.5 from the Flood Studies Report (FSR) – Hydrological Studies, Institute of Hydrology, Wallingford, 1993. Table 4.4 from the FSR explains how to classify the SOIL factors. These two tables are shown below:

Water regime class	Depth to impermeable horizon(cm)	Slope Classes									
		< 2°			2-8°			> 8°			
		Permeability class (above impermeable horizon)									
		Rapid	Medium	Slow	Rapid	Medium	Slow	Rapid	Medium	Slow	
1	> 80	1			1			2	1	2	3
	80-40	1			2			3			4
	< 40	-			-			-			
2	> 80	2	3			-			-		
	80-40	-			4			-			
	< 40	3	-			-			-		
3	> 80	-			5			-			
	80-40	-			5			-			
	< 40	-			-			-			

Winter Rain Acceptance Class		Winter Run-off Potential	
1	Very high	1	Very Low
2	High	2	Low
3	Moderate	3	Moderate
4	Low	4	High
5	Very low	5	Very high

Figure 6 – 'Table 4.5'-Winter Rain Acceptance from the Flood Studies Report

Property	Classes
A Drainage group	1 Rarely waterlogged within 60 cm at any time (well and moderately well drained)
	2 Commonly waterlogged within 60 cm during winter (imperfect and poor)
	3 Commonly waterlogged within 60 cm during winter and summer (very poorly drained)
B Depth to 'impermeable' layers	1 >80 cm
	2 80-40 cm
	3 <40 cm
C Permeability group (above 'impermeable' layers or to 80 cm)	1 Rapid
	2 Medium
	3 Slow
D Slope	1 0-2°
	2 2-8°
	3 >8°

Figure 7 – 'Table 4.4'-Classification of Soil Factors from the Flood Studies Report

From the IGSL site investigation report it was concluded that the general depth to topsoil is approximately 300mm. Below the topsoil is a soft to firm brown gravelly clay to approximately 1m below ground. From 1m to 2m deep lies a layer of well graded sandy slightly clayey gravel granite. Solid granite bedrock was determined at an average depth of 2.0m, deepening to 3.0m in isolated areas.

4.1 A – Drainage Group

From site visit, the site is defined as commonly waterlogged within 60cm during winter (imperfect and poor).

SOIL is in Drainage Group 2.

4.2 B – Depth to 'Impermeable' Layers

An impermeable layer is defined in the UK Institute of Hydrology Report No. 126 (1995) as "a layer with hydraulic conductivity of less than 0.1m per day". As shown in the infiltration tests carried out previously, the maximum hydraulic conductivity of the soil is 259mm per day. Therefore, the clay cannot be defined as 'impermeable'. The depth to the impermeable layer is greater than 80cm therefore, this is in Group 1.

4.3 C – Permeability Group (above impermeable layers or to 80cm)

The Handbook of Soils for Landscape Architects by Robert F. Keeler (published by Oxford University Press, New York, 2000), Table 6.1, categorises soil permeability from slow to rapid permeability. The table is shown below:

Table 6.1 Soil Permeability Class Related to Flow of Water through a Saturated Soil

Permeability Class	Rate of Flow (inches per hour)
Very slow	Less than 0.06
Slow	0.06–0.2
Moderately slow	0.2–0.6
Moderate	0.6–2.0
Moderately rapid	2.0–6.0
Rapid	6.0–20.0
Very rapid	More than 20

Figure 8 - Soil Permeability Class

As indicated in the infiltration tests, the average permeability of the soil above the impermeable layers is 5mm per hour (0.197 inches per hour). This can be defined as Slow Permeability, therefore, this is in Group 3.

4.4 D – Slope

Approximately 58% of the site has a nominal slope at 1:19 or above (3.0 degrees). This is between 2 and 8 degrees therefore, this is in Slope Class 2. The remaining 42% of the site has a slope less than 2.0 degrees and therefore this is in Slope Class 1.

4.5 Summary of SOIL Classification Results

Each of the soil type options from above were inputted into Table 4.5. See below.

Table 4.5 The classification of soils by winter rain acceptance rate from soil survey data.

Drainage class Group	Depth to impermeable layer (cm)	Slope classes								
		0 - 2°			2 - 8°			>8°		
		Permeability rates above impermeable layers								
		Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)
1	>80				1			1	2	3
	40 - 80	1				2		3		4
	<40	—	—	—	—	—	—	—	—	—
2	>80									
	40 - 80	2		3			4			
	<40	3								
3	>80									
	40 - 80					5				
	<40									

Winter rain acceptance indices: 1, very high; 2, high; 3, moderate; 4, low; 5, very low. Upland peat and peaty soils are in Class 5. Urban areas are unclassified.

Figure 9: Winter Rainfall Acceptance Table – SOIL Type 3

Table 4.5 The classification of soils by winter rain acceptance rate from soil survey data.

Drainage class Group	Depth to impermeable layer (cm)	Slope classes										
		0 - 2°			2 - 8°			>8°				
		Permeability rates above impermeable layers										
		Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)		
1	>80	1			1			1			2	3
	40 - 80	1			2			3			4	
	<40	—	—	—	—	—	—	—	—	—	—	
2	>80	2			3			4			—	
	40 - 80	2			3			4			—	
	<40	3			—			—			—	
3	>80	—			—			—			—	
	40 - 80	—			—			—			—	
	<40	—			—			—			—	

Winter rain acceptance indices: 1, very high; 2, high; 3, moderate; 4, low; 5, very low. Upland peat and peaty soils are in Class 5. Urban areas are unclassified.

Figure 10: Winter Rainfall Acceptance Table – SOIL Type 4

The soil has been classified as 58% Class 4 and 42% Class 3 according to the Winter Rain Acceptance Table of the FSR.

APPENDIX A
IGSL Infiltration Testing Charts

Soakaway Design f -value from field tests IGSL

Contract: Glencairn House SI Contract No. 20192
 Test No. SA1
 Engineer DBFL
 Date: 30/06/2017

Summary of ground conditions			
from	to	Description	Ground water
0.00	0.20	TOPSOIL	DRY
0.20	1.10	MADE GROUND (brown/grey sandy gravelly clay, granite cobbles and boulders, timber, red brick)	
1.10	1.50	Dense, light greyish brown, slightly clayey slightly sandy fine to coarse rounded GRAVEL with granite cobbles and boulders (weathered rock)	

Notes: SA1 done beside TP1 location

Field Data

Depth to Water (m)	Elapsed Time (min)
0.840	0.00
0.840	1.00
0.840	2.00
0.840	3.00
0.840	4.00
0.845	5.00
0.845	6.00
0.845	7.00
0.845	8.00
0.845	9.00
0.845	10.00
0.850	12.00
0.850	14.00
0.850	16.00
0.855	18.00
0.855	20.00
0.855	25.00
0.860	30.00
0.865	40.00
0.870	50.00
0.875	60.00
0.880	70.00
0.885	80.00
0.890	90.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	2.00	m

Initial depth to Water =	0.84	m
Final depth to water =	0.89	m
Elapsed time (mins)=	90.00	

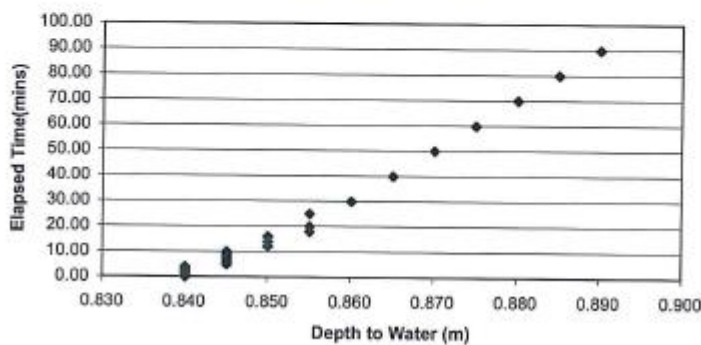


Base area=	1	m ²
*Av. side area of permeable stratum over test p	3.175	m ²
Total Exposed area =	4.175	m ²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f = 0.00013 m/min or 2.21779E-06 m/sec

Depth of water vs Elapsed Time (mins)





Soakaway Design f-value from field tests IGSL

Contract: Glencairn House SI Contract No. 20192
 Test No. SA3
 Engineer DBFL
 Date: 30/06/2017

Summary of ground conditions			Ground water
from	to	Description	
0.00	0.30	TOPSOIL	DRY
0.30	1.00	Soft to firm, brown, slightly sandy gravelly CLAY with some subangular to subrounded granite cobbles and boulders	
1.00	1.50	Very dense, light brown, slightly clayey slightly sandy fine to coarse rounded to subrounded GRAVEL with granite cobbles (weathered rock)	

Notes: SA3 done beside TP3 location

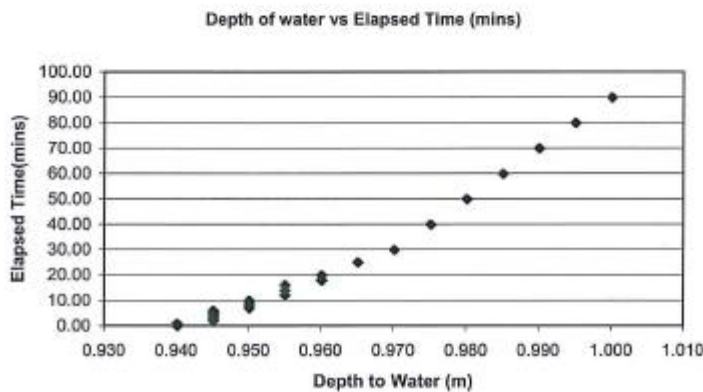
Field Data

Depth to Water (m)	Elapsed Time (min)
0.940	0.00
0.940	1.00
0.945	2.00
0.945	3.00
0.945	4.00
0.945	5.00
0.945	6.00
0.950	7.00
0.950	8.00
0.950	9.00
0.950	10.00
0.955	12.00
0.955	14.00
0.955	16.00
0.960	18.00
0.960	20.00
0.965	25.00
0.970	30.00
0.975	40.00
0.980	50.00
0.985	60.00
0.990	70.00
0.995	80.00
1.000	90.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	2.00	m
Initial depth to Water =	0.94	m
Final depth to water =	1.00	m
Elapsed time (mins)=	90.00	
Top of permeable soil	0.94	m
Base of permeable soil	1.00	m
Base area=	1	m ²
*Av. side area of permeable stratum over test p	2.65	m ²
Total Exposed area =	3.65	m ²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time
f = 0.00018 m/min or 3.04414E-06 m/sec





Soakaway Design f-value from field tests IGSL

Contract: Glencairn House SI Contract No. 20192
 Test No. SA6
 Engineer DBFL
 Date: 30/06/2017

Summary of ground conditions

from	to	Description	Ground water
0.00	0.25	TOPSOIL	DRY
0.25	1.50	Soft to firm, brown, slightly sandy gravelly CLAY with occasional small cobbles	

Notes: SA6 done beside TP6 location

Field Data

Depth to Water (m)	Elapsed Time (min)
0.800	0.00
0.800	1.00
0.800	2.00
0.800	3.00
0.800	4.00
0.800	5.00
0.800	6.00
0.800	7.00
0.800	8.00
0.800	9.00
0.800	10.00
0.805	12.00
0.805	14.00
0.805	16.00
0.805	18.00
0.805	20.00
0.810	25.00
0.810	30.00
0.810	40.00
0.810	50.00
0.810	60.00
0.810	70.00
0.810	80.00
0.810	90.00

Field Test

Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.50	m
Initial depth to Water =	0.80	m
Final depth to water =	0.81	m
Elapsed time (mins) =	90.00	
Top of permeable soil		m
Base of permeable soil		m

Movement Stop at 0.81m

Base area =	0.75	m ²
*Av. side area of permeable stratum over test pit =	2.78	m ²
Total Exposed area =	3.53	m ²

Infiltration rate (f) = Volume of water used/unit exposed area / unit time
f = 2.4E-05 m/min or 3.93453E-07 m/sec

Depth of water vs Elapsed Time (mins)

