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PROJECT: **CASTLECOMER HOUSING SCHEME**

PROJECT NO. **16.134**

DOCUMENT TITLE: **CIVIL ENGINEERING INFRASTRUCTURE REPORT FOR PLANNING**

DOCUMENT NO: **16.134-IR-01**

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CIVIL ENGINEERING INFRASTRUCTURE REPORT FOR PLANNING

C O N T E N T S:

1.0 INTRODUCTION

1.1 General Description

The proposed development is a new residential estate consisting of 28no. dwellings, with associated roads, footpaths and car parking, located at Donaguile, Castlecomer, Co. Kilkenny. The total site area is 1.14ha.

Currently the site is a brownfield occupied by 2no. dwellings. These are to be demolished prior to the commencement of the new developments construction.

1.2 Scope of this Report

This report describes the proposed civil engineering infrastructure for the development and how it connects to the public infrastructure serving the area. In particular, foul, surface water drainage and water supply aspects are considered. This report should be read in conjunction with the BMCE drawings submitted with the Planning Application.

2.0 SURFACE WATER DRAINAGE SYSTEM

2.1 Existing Surface Water Infrastructure

Currently the site is a brownfield site with no existing surface water drainage network. Run-off generated on site due to rainfall discharges directly to the soil via infiltration. There is an existing 150mm combined sewer located on Barrack Street to the south of the site.

2.2 Proposed Surface Water Drainage System

The proposed development will maintain all surface water generated on site. No additional flow will be discharged to the existing sewer in the area. Rainfall falling on hardstanding surfaces will be collected in a new gravity network located beneath the new access road from which it will discharge to the soil via soakaway devices.

Due to the topography of the site and the variation of soil permeability across the site two separate surface water drainage networks and soakaways are required. These will be located to the west and east of the site.

All car parking spaces will be finished in permeable paving designed to allow full infiltration of surface water in these areas.

2.3 Compliance with the Principles of Sustainable Urban Drainage Systems

In order to both reduce and attenuate the flow, the proposed development will be designed in accordance with the principles of Sustainable Urban Drainage Systems (SUDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off characteristics of the greenfield site. The criteria provide a consistent approach to addressing both rate and volume of run-off as well as ensuring the environment is protected from pollution that is washed off roads and buildings.

The requirements of SUDS are typically addressed by provision of the following:

- Interception storage
- Treatment storage (not required if interception storage is provided)
- Attenuation storage
- Long term storage (not required if growth factors are not applied to Qbar when designing attenuation storage)

In the case of the subject site interception and attenuation storage will be provided in the form of two soakaway devices as mentioned above in Section 2.2. Growth factors will not be applied to the allowable discharge for the 100 year event. This means that both treatment storage and long term storage (neither of which would be practical on this site) are not required. Section 2.3.1 that follow describe how interception and attenuation storage have been provided for the subject site.

2.3.1 **Interception Storage**

According to the CIRIA SuDS Manual C753 interception storage where provided should ensure that the first 5-10mm of rainfall is intercepted on site and does not find its way to the site drainage system. The overall site area of the site 1.14ha.

$$\underline{\text{Required Interception Storage}} = 0.01 \times 1.14 \times 10^4 = 57m^3$$

In the context of the subject site interception storage will be provided in the form of two soakaways. The first soakaway will be located under the grassed area to the west of the site and will serve 9no. dwellings with the associated footpaths and road. The soil infiltration rate in this area of the site is 0.0017m/minute, as calculated by IGSL Limited in their Geotechnical Report (refer to extract in Appendix II). A soakaway with a maximum volume of $54m^3$ has been designed for the 100 year storm to provide adequate storage for this portion of the site.

A second soakaway will be located under the green area to the east of the site near the entrance and will cater for 19no. dwellings and associated footpaths and road. The infiltration rate in this area is 0.00048m/minute (refer Appendix II). This soakaway will provide $189m^3$ of storage and has been designed for a 100 return period.

$$\underline{\text{Provided Interception storage}} = 54m^3 + 189m^3 = 243m^3$$

Adequate interception storage is provided in the form of 2no. soakaways to meet the criteria set in the Ciria SuDS Manuel C753.

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3.0 FOUL DRAINAGE SYSTEM

3.1 Existing Foul Sewer Infrastructure

The existing site is served by 150mm combined sewer located under Barrack Street to the south of the site.

3.2 Proposed Foul Sewer System

The proposed development will be served by a new foul sewer to be laid beneath the new access road. This site will discharge to the existing combined sewer on Barrack Street.

The Occupancy of the site is:

Dwelling	Quantity	Total Occupancy
3 Bed/4 Person House	8	32
2 Bed/ 4 person House	5	20
3 Bed/ 6 Person House	4	24
4 Bed/ 7 Person House	2	14
1 Bed/ 2 person Apartment	8	16
2 Bed/ 3 Person Apartment	6	18
Total	**33**	**124**

Foul Effluent:

Waste Water Load = 225 l/person/day

Daily water Demand = 225 l/person/day x 124 ppl = 27,900 l/day

Peak Flow = $\frac{27{,}900 \text{ l/day} \times 6}{24 \times 60 \times 60}$ = 1.94 l/s

Foul Sewer Network Pipe Sizes

The foul sewer which runs along Barrack Street is a 300 mm diameter foul pipe at 1:150 minimum fall. This pipe will have a capacity = 11.48/s, which is sufficient for the foul flow from the site.

4.0 WATER SUPPLY

4.1 Existing Water Supply Infrastructure

The site is currently served by an existing 100mm asbestos watermain located on Barrack Street.

4.2 Proposed Water Supply System

The proposed site will be served by a new 100mm HDPE watermain which will connect into the existing watermain on Barrack Street.

The water demand for the development is 27,900 l/day. Fire hydrants will be provided on the new line at a maximum distance of 46 meters from any dwelling in accordance with the 'Recommendations for Site Development Works for Housing Areas'. 24 hours storage will be provided within each house.

APPENDIX I

Soakaway Design for 100 Year Storm

Summary of Results for 100 year Return Period (+10%)

Half Drain Time : 408 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	159.455	0.455	0.9	20.5	O K
30 min Summer	159.610	0.610	1.0	27.5	O K
60 min Summer	159.755	0.755	1.0	34.0	O K
120 min Summer	159.887	0.887	1.1	39.9	O K
180 min Summer	159.946	0.946	1.1	42.6	O K
240 min Summer	159.975	0.975	1.1	43.9	O K
360 min Summer	159.991	0.991	1.1	44.6	O K
480 min Summer	159.991	0.991	1.1	44.6	O K
600 min Summer	159.985	0.985	1.1	44.3	O K
720 min Summer	159.975	0.975	1.1	43.9	O K
960 min Summer	159.950	0.950	1.1	42.7	O K
1440 min Summer	159.894	0.894	1.1	40.3	O K
2160 min Summer	159.809	0.809	1.1	36.4	O K
2880 min Summer	159.725	0.725	1.0	32.6	O K
4320 min Summer	159.572	0.572	1.0	25.7	O K
5760 min Summer	159.444	0.444	0.9	20.0	O K
7200 min Summer	159.339	0.339	0.9	15.3	O K
8640 min Summer	159.254	0.254	0.8	11.4	O K
10080 min Summer	159.185	0.185	0.8	8.3	O K
15 min Winter	159.511	0.511	0.9	23.0	O K
30 min Winter	159.687	0.687	1.0	30.9	O K
60 min Winter	159.853	0.853	1.1	38.4	O K
120 min Winter	160.009	1.009	1.1	45.4	O K
180 min Winter	160.083	1.083	1.2	48.7	O K
240 min Winter	160.123	1.123	1.2	50.5	O K
360 min Winter	160.152	1.152	1.2	51.8	O K
480 min Winter	160.148	1.148	1.2	51.7	O K
600 min Winter	160.141	1.141	1.2	51.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	83.260	0.0	19
30 min Summer	56.717	0.0	33
60 min Summer	36.261	0.0	62
120 min Summer	22.587	0.0	122
180 min Summer	16.980	0.0	182
240 min Summer	13.846	0.0	240
360 min Summer	10.354	0.0	316
480 min Summer	8.414	0.0	380
600 min Summer	7.159	0.0	444
720 min Summer	6.272	0.0	512
960 min Summer	5.089	0.0	652
1440 min Summer	3.789	0.0	924
2160 min Summer	2.820	0.0	1340
2880 min Summer	2.285	0.0	1732
4320 min Summer	1.697	0.0	2508
5760 min Summer	1.373	0.0	3232
7200 min Summer	1.164	0.0	3968
8640 min Summer	1.018	0.0	4672
10080 min Summer	0.908	0.0	5352
15 min Winter	83.260	0.0	18
30 min Winter	56.717	0.0	33
60 min Winter	36.261	0.0	62
120 min Winter	22.587	0.0	120
180 min Winter	16.980	0.0	178
240 min Winter	13.846	0.0	234
360 min Winter	10.354	0.0	342
480 min Winter	8.414	0.0	402
600 min Winter	7.159	0.0	470

Summary of Results for 100 year Return Period (+10%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
720 min Winter	160.127	1.127	1.2	50.7	O K
960 min Winter	160.088	1.088	1.2	48.9	O K
1440 min Winter	159.998	0.998	1.1	44.9	O K
2160 min Winter	159.860	0.860	1.1	38.7	O K
2880 min Winter	159.731	0.731	1.0	32.9	O K
4320 min Winter	159.510	0.510	0.9	22.9	O K
5760 min Winter	159.335	0.335	0.9	15.1	O K
7200 min Winter	159.200	0.200	0.8	9.0	O K
8640 min Winter	159.101	0.101	0.8	4.6	O K
10080 min Winter	159.050	0.050	0.7	2.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
720 min Winter	6.272	0.0	548
960 min Winter	5.089	0.0	702
1440 min Winter	3.789	0.0	1008
2160 min Winter	2.820	0.0	1444
2880 min Winter	2.285	0.0	1848
4320 min Winter	1.697	0.0	2640
5760 min Winter	1.373	0.0	3400
7200 min Winter	1.164	0.0	4104
8640 min Winter	1.018	0.0	4672
10080 min Winter	0.908	0.0	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.800	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+10

Time Area Diagram

Total Area (ha) 0.136

Time (mins) From:	To:	Area (ha)
0	4	0.136

Model Details

Storage is Online Cover Level (m) 161.000

Cellular Storage Structure

Invert Level (m)	159.000
Infiltration Coefficient Base (m/hr)	0.10200
Infiltration Coefficient Side (m/hr)	0.10200
Safety Factor	2.0
Porosity	0.90

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	50.0	50.0	1.100	50.0	83.0
0.100	50.0	53.0	1.200	50.0	86.0
0.200	50.0	56.0	1.300	0.0	86.0
0.300	50.0	59.0	1.400	0.0	86.0
0.400	50.0	62.0	1.500	0.0	86.0
0.500	50.0	65.0	1.600	0.0	86.0
0.600	50.0	68.0	1.700	0.0	86.0
0.700	50.0	71.0	1.800	0.0	86.0
0.800	50.0	74.0	1.900	0.0	86.0
0.900	50.0	77.0	2.000	0.0	86.0
1.000	50.0	80.0			

Summary of Results for 100 year Return Period (+10%)

Half Drain Time : 1627 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	153.963	0.313	0.8	49.3	O K
30 min Summer	154.074	0.424	0.8	66.8	O K
60 min Summer	154.186	0.536	0.8	84.5	O K
120 min Summer	154.305	0.655	0.9	103.2	O K
180 min Summer	154.376	0.726	0.9	114.3	O K
240 min Summer	154.426	0.776	0.9	122.2	O K
360 min Summer	154.493	0.843	0.9	132.8	O K
480 min Summer	154.536	0.886	0.9	139.6	O K
600 min Summer	154.566	0.916	0.9	144.2	O K
720 min Summer	154.586	0.936	0.9	147.3	O K
960 min Summer	154.607	0.957	0.9	150.8	O K
1440 min Summer	154.613	0.963	0.9	151.7	O K
2160 min Summer	154.603	0.953	0.9	150.1	O K
2880 min Summer	154.584	0.934	0.9	147.1	O K
4320 min Summer	154.540	0.890	0.9	140.2	O K
5760 min Summer	154.493	0.843	0.9	132.8	O K
7200 min Summer	154.445	0.795	0.9	125.2	O K
8640 min Summer	154.396	0.746	0.9	117.6	O K
10080 min Summer	154.349	0.699	0.9	110.1	O K
15 min Winter	154.001	0.351	0.8	55.3	O K
30 min Winter	154.126	0.476	0.8	74.9	O K
60 min Winter	154.252	0.602	0.9	94.9	O K
120 min Winter	154.388	0.738	0.9	116.2	O K
180 min Winter	154.469	0.819	0.9	129.0	O K
240 min Winter	154.527	0.877	0.9	138.1	O K
360 min Winter	154.606	0.956	0.9	150.6	O K
480 min Winter	154.659	1.009	1.0	158.9	O K
600 min Winter	154.696	1.046	1.0	164.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	83.260	0.0	19
30 min Summer	56.717	0.0	34
60 min Summer	36.261	0.0	64
120 min Summer	22.587	0.0	124
180 min Summer	16.980	0.0	184
240 min Summer	13.846	0.0	242
360 min Summer	10.354	0.0	362
480 min Summer	8.414	0.0	482
600 min Summer	7.159	0.0	602
720 min Summer	6.272	0.0	722
960 min Summer	5.089	0.0	960
1440 min Summer	3.789	0.0	1284
2160 min Summer	2.820	0.0	1664
2880 min Summer	2.285	0.0	2048
4320 min Summer	1.697	0.0	2896
5760 min Summer	1.373	0.0	3696
7200 min Summer	1.164	0.0	4544
8640 min Summer	1.018	0.0	5360
10080 min Summer	0.908	0.0	6152
15 min Winter	83.260	0.0	19
30 min Winter	56.717	0.0	33
60 min Winter	36.261	0.0	64
120 min Winter	22.587	0.0	122
180 min Winter	16.980	0.0	180
240 min Winter	13.846	0.0	240
360 min Winter	10.354	0.0	356
480 min Winter	8.414	0.0	474
600 min Winter	7.159	0.0	590

Summary of Results for 100 year Return Period (+10%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
720 min Winter	154.723	1.073	1.0	168.9	O K
960 min Winter	154.756	1.106	1.0	174.2	O K
1440 min Winter	154.777	1.127	1.0	177.5	O K
2160 min Winter	154.760	1.110	1.0	174.8	O K
2880 min Winter	154.735	1.085	1.0	170.9	O K
4320 min Winter	154.668	1.018	1.0	160.3	O K
5760 min Winter	154.592	0.942	0.9	148.4	O K
7200 min Winter	154.515	0.865	0.9	136.2	O K
8640 min Winter	154.439	0.789	0.9	124.2	O K
10080 min Winter	154.365	0.715	0.9	112.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
720 min Winter	6.272	0.0	704
960 min Winter	5.089	0.0	932
1440 min Winter	3.789	0.0	1370
2160 min Winter	2.820	0.0	1752
2880 min Winter	2.285	0.0	2192
4320 min Winter	1.697	0.0	3116
5760 min Winter	1.373	0.0	4032
7200 min Winter	1.164	0.0	4904
8640 min Winter	1.018	0.0	5784
10080 min Winter	0.908	0.0	6560

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.800	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+10

Time Area Diagram

Total Area (ha) 0.320

Time (mins) From:	To:	Area (ha)
0	4	0.320

Model Details

Storage is Online Cover Level (m) 155.350

Cellular Storage Structure

Invert Level (m)	153.650
Infiltration Coefficient Base (m/hr)	0.02880
Infiltration Coefficient Side (m/hr)	0.02880
Safety Factor	2.0
Porosity	0.90

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	175.0	175.0	0.900	175.0	232.6
0.100	175.0	181.4	1.000	175.0	239.0
0.200	175.0	187.8	1.100	175.0	245.4
0.300	175.0	194.3	1.200	175.0	251.8
0.400	175.0	200.6	1.300	0.0	251.8
0.500	175.0	207.0	1.400	0.0	251.8
0.600	175.0	213.4	1.500	0.0	251.8
0.700	175.0	219.8	1.600	0.0	251.8
0.800	175.0	226.2	1.700	0.0	251.8

APPENDIX II

Extract from IGSL Limited Geotechnical Report

e. Percolation

The percolation characteristics of the sub soil was determined at two locations in accordance with the requirements of BRE Digest 365. Results are presented in Appendix V.

Trial holes were excavated to a depth of 2.00 metres, the stratification consisting of top/soil and fill overlying clayey gravelly SAND.

The trial excavations were initially soaked and then filled with water and the dissipation of this water over time was recorded. Tests were then repeated and the infiltration rate was calculated based on the second cycle of tests.

The infiltration rates calculated for both tests are as follows:

Test No. SA01 **Infiltration Rate 0.0017 metres/minute**

Test No. SA02 **Infiltration Rate 0.00048 metres/minute**

III Testing

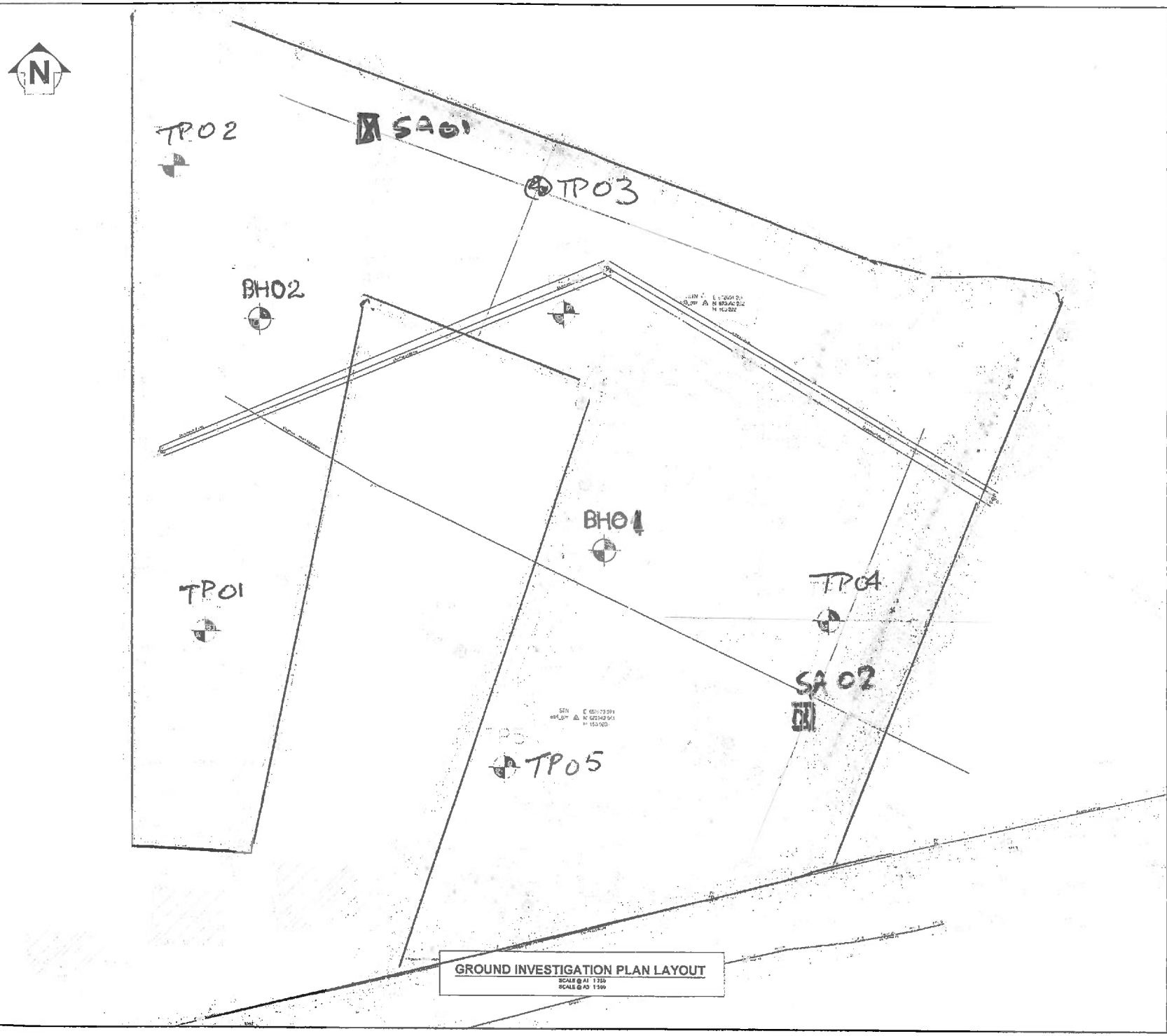
***(a) In-Situ* :**

Standard penetration tests were carried out at approximate 1.00 metre intervals in the geotechnical boreholes to measure relative in-situ soil strength. N values are noted in the right hand column of the boring records, representing the blow count required to drive the standard sampler 300mm into the soil, following initial seating blows.

The results are summarised as follows:

Stratum	Range of N values	Comment
Sandy GRAVEL (Gravelly SAND)	11 to 29	Medium Dense to Dense
Gravelly CLAY	28 to 51	Stiff to Hard

Tests carried out during the course of rotary drilling also confirm the very stiff to hard consistency of the gravelly clay.



GROUND INVESTIGATION PLAN LAYOUT

SCALE @ A1 1:250
SCALE @ A3 1:500

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS & ARCHITECTS DRAWINGS FIGURED DIMENSIONS ONLY MUST BE USED TO BE USED WHERE A CONFLICT OF INFORMATION EXISTS OR IF IN ANY DOUBT - ASK.
2. CONSULTANTS TO BE INFORMED IMMEDIATELY OF ANY DISCREPANCIES BEFORE WORK PROCEEDS

LEGEND

BH — BOREHOLE LOCATION

TRIAL PIT LOCATION

ISSUE	DATE	DESCRIPTION	DRN	CHK	P.E.
P1	18.08.16	ISSUED FOR INFORMATION			

ISSUE STATUS: ☒ PRELIMINARY (P1, P2 etc.) ☐ PLANNING (P1 / P2 / P3 etc.) ☐ TENDER (T1, T2 etc.) ☐ FOR CONSTRUCTION (C1, etc.)

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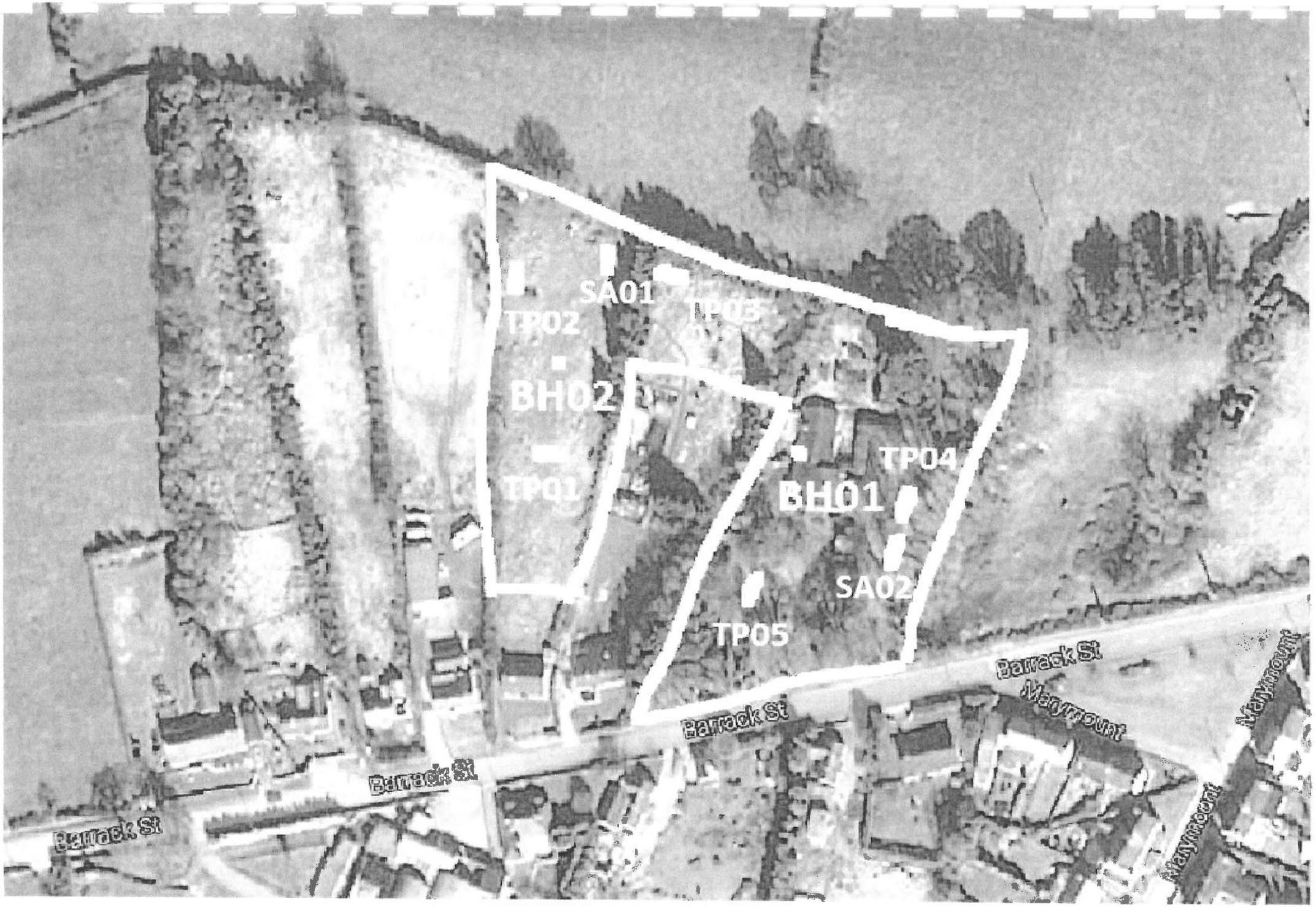
The Institution of Structural Engineers

CLIENT: KILKENNY COUNTY COUNCIL

PROJECT TITLE: HOUSING DEVELOPMENT AT DONAGUILE, CASTLECOMER, CO. KILKENNY

DRAWING TITLE: GROUND INVESTIGATION PLAN LAYOUT: BOREHOLE AND TRIAL PIT INDICATIVE LOCATIONS

PROJECT No.	DRAWING No.	ISSUE	STATUS
16134	C1050	P1	PRELIMINARY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