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Sustainable Urban Drainage Hydrogeological Assessment

PRESENTED TO

Romeville Development Ltd.
Proposed Residential Development at Stoney Hill Road, Rathcoole, Dublin 24

April 2023

Environmental Consultancy Services

Document Control Sheet

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1 INTRODUCTION

Enviroguide Consulting (hereby referred to as EGC) was appointed by Romeville Developments Limited (hereby referred to as the Client) to prepare a hydrogeological assessment for the proposed residential development at Stoney Hill Road, Rathcoole, Dublin 24 (hereby referred to as the Proposed Development / site).

The Client has applied to South Dublin County Council (SDCC) for Planning Permission (Planning Reference: SD22A/0347) for the Proposed Development comprising of a residential development of 42No. dwellings, in curtilage surface car parking spaces, public open spaces in an eastern park and a western park (including proposed play equipment), an additional large parkland to the south of the Site comprising the first phase of a linear park, private domestic gardens, a new vehicular, pedestrian and cycle entrance from Stoney Hill Road, an internal road network including footpaths / cycleways, 3No. refuse/bin stores, public lighting, landscaping boundary treatments, drainage and engineering works and all other associated and ancillary development works. The Proposed Development is shown in Figure 1-1.

A Request for Further Information (RFI) was issued by SDCC on the 11th September 2022 in relation to the Planning Application for the Proposed Development (Planning Reference SD22A/0347).

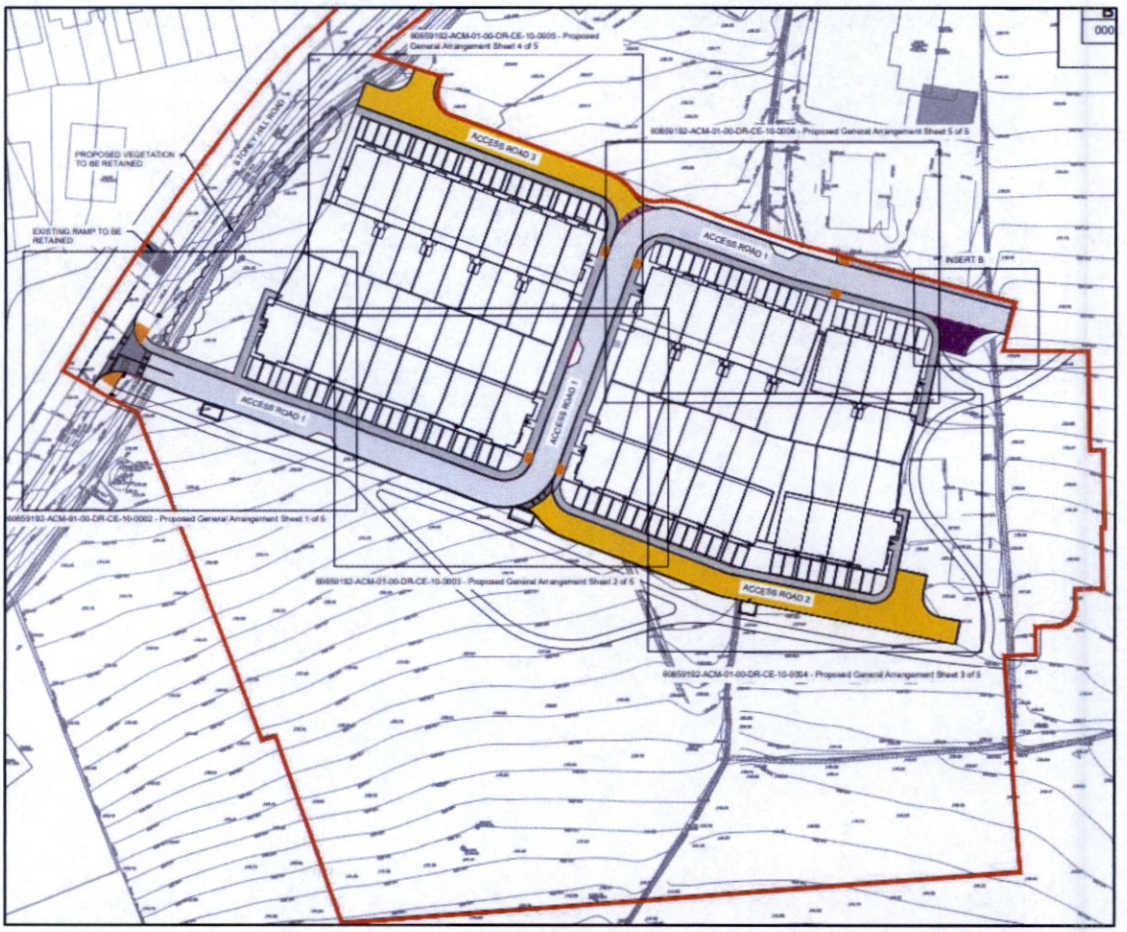

Figure 1-1: Proposed General Arrangement (AECOM Drawing No: 60659192-ACM-01-00-DR-CE-10-0001, refer to Appendix A for full redline and drawing)

1.1 Project Objective

The overall objective of the hydrogeological assessment was to prepare a response to address the issues raised in Item 4 (iv, a) of the RFI which states:

Item 4 (iv, a):

'Additional natural SUDS features should be incorporated into the proposed drainage system for the development such as bio-retention/ construction tree pits, permeable paving, green roofs filtration planning, filter stripe etc. In addition, should provide the following:

a. *Demonstrate how the proposed SUDS scheme has been designed to incorporate and adhere to the natural route of groundwater through and out of the site.'*

1.2 Scope of Works

The scope of works undertaken to meet the project objective included:

- A desktop study of the publicly available hydrogeological information available for the site and information pertaining to the Proposed Development provided by the Client, the Engineers (AECOM) and specifically the proposed SuDS (Sustainable Drainage Systems) features.
- A site walkover survey to identify and establish the general hydrogeological site setting and receiving environment at the site. The site walkover survey was undertaken by EGC on 16th of March 2023.
- Develop a Hydrogeological Conceptual Site Model (CSM) for the site.
- Assessment of the SuDS scheme for the Proposed Development and how this incorporates the natural route of groundwater through the site.
- Prepare the RFI response in the form of this report.

1.3 Quality Assurance and Competence

This report was written by Sam Marchant BSc, MSc., Hydrogeologist with EGC who has experience in carrying out hydrological and hydrogeological assessments. The chapter was reviewed by Claire Clifford BSc., MSc., PGeo., EurGeol who is Technical Director of the Contaminated Land and Hydrogeology Division of Enviroguide Consulting and is a Professional Geologist with the Institute of Geologists of Ireland and has extensive experience in preparing environmental assessments for a range of project types and geological and hydrogeological site settings.

2 HYDROGEOLOGICAL SITE SETTING (BASELINE CONDITION)

2.1 Site Location

The site is located at Stoney Hill Road, Rathcoole, Dublin 24. The current land use is mixed-use including residential to the east, grazing of animals to the south, road (Stoney Hill Road) to the northwest and disturbed ground in the centre of the site. The aerial photograph of the site is shown in Figure 2-1.

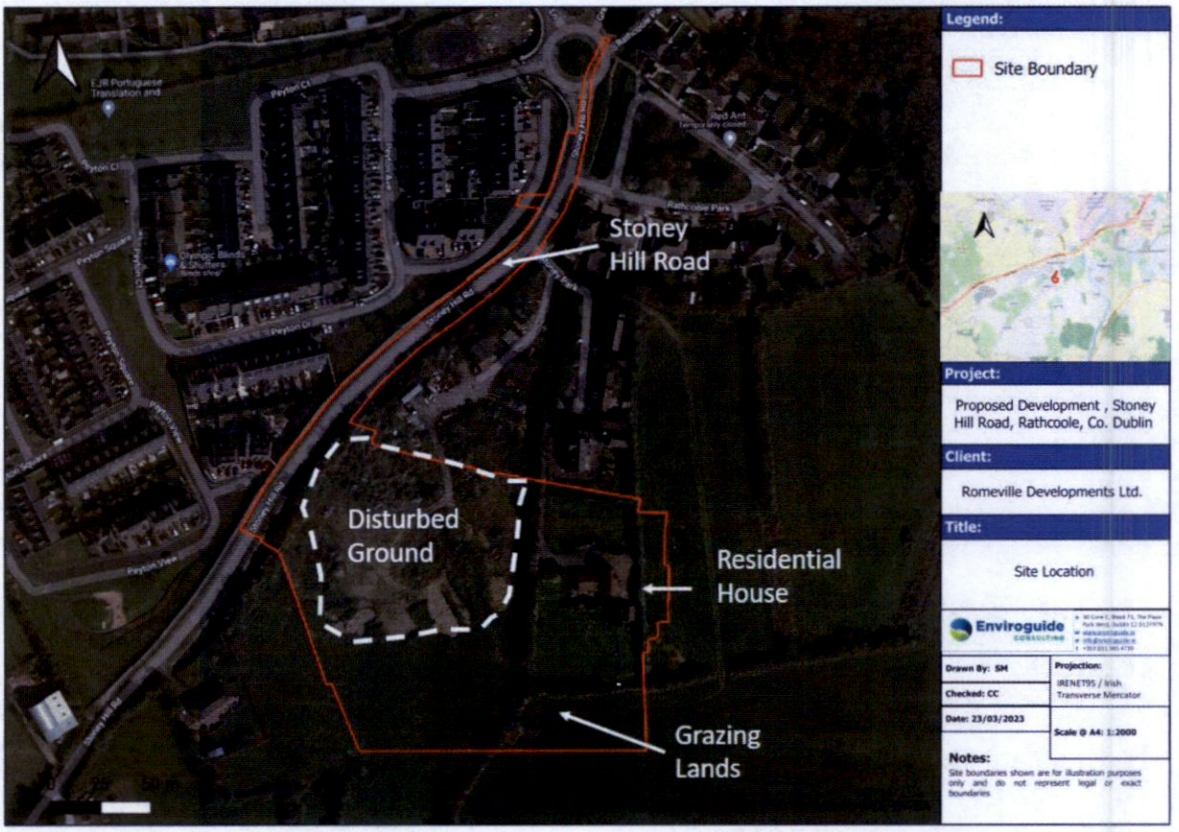

Figure 2-1: Site Aerial Photograph and Location Map

2.2 Site History

Historical mapping and serial photography available from the Ordnance Survey of Ireland website (OSI, 2023) and Google Earth (Google Earth, 2023) were reviewed with particular focus on hydrological or hydrogeological features. The key observations onsite and offsite are summarised in Table 2-1.

Table 2-1: Review of Site History

Date	Information Source	Site Description
1839-1842	**OSI map 6inch**	**Onsite:** The site is undeveloped. **Offsite:** The area is mainly undeveloped except for occasional housing developments. Rathcoole town is identified approximately 0.5km to the north of the site. An unnamed road is identified to the northwest of the site (which is

Date	Information Source	Site Description
		now referred to as Stoney Hill Road). An undetermined building is identified to the north of the site.
1909	**OSI map 25inch**	**Onsite:** The site remains undeveloped. **Offsite:** There are two (2No.) wells mapped approximately 0.1km north of the site. There is also a well mapped approximately 0.25km to the northeast of the site and along the western boundary of where the Rathcoole Woodland exists today (there is north arrow pointed towards the well). There are drainage channels located approximately 0.21km and 0.29km east of the site, with arrows indicating the flow is to the north toward where the Rathcoole Woodland exists today. There is a spring mapped approximately 0.25km to the north of the site.
1911-1941	**OSI Cassini map 6inch**	**Onsite:** The site remains undeveloped. **Offsite:** The site boundaries have changed. 'Rises' are present to the northwest (where the Greenoge Stream and Rathcreedan Stream are now mapped) and to the east of the site. There is an arrow presumed to indicate flow running through the fields to the northeast of site where the Rathcoole Woodlands exists today. The spring identified on the previous map is no longer present.
1995	**OSI Aerial photography**	**Onsite:** A new building has been constructed to the southeast of the site. **Offsite:** The building to the north has been expanded and an additional building is identified. The surrounding lands use is predominately agricultural to the south and east. The field to the northeast of site where the Rathcoole Woodlands exists today appears to be tillage lands. Housing developments have expanded south from the Rathcoole townland towards the site.
1999-2003	**OSI Aerial photography**	**Onsite:** Evidence of ground disturbance is identified behind the house to the east of the site (appears to be a pathway). **Offsite:** Evidence of ground disturbance behind the house located to the north of the site.
2004-2006	**OSI Aerial Photography**	**Onsite:** The field boundary has changed and now comprises a triangular shape extending from the house to the north (i.e., part of the site is a garden to the house to the north). **Offsite:** Forestry has been planted on the now Rathcoole Woodlands.
2005-2012	**OSI Aerial photography**	**Onsite:** No significant changes. **Offsite:** Housing estate development is present to the north of Stoney Hill Road.
2013-2018	**OSI Aerial photography**	**Onsite:** No significant changes. **Offsite**: Vegetation in the Rathcoole Woodlands has expanded.
2022	**Google Maps Photography / Site Walk Over**	**Onsite:** Ground disturbance and stockpiling of materials is evident across the site. Hummocky ground and water pooling present. No evidence of overland flow noted during site walkover. **Offsite:** Rathcoole Woodlands has further expanded. Within the woodland, a spring was identified during the site walkover; the ground was highly saturated and drainage channels and the river were identified running through the woodland.

2.3 Topography

The site topography is sloping from the south to the northwest. The ground is hummocky with stockpiles of mixed materials. The ground slopes from approximately 142 meters above ordnance datum (mOD) along the southern boundary to approximately 129mOD to the northwest of the site prior to reaching Stoney Hill Road. The annotated screengrab from the topographic survey with 20m contours is shown in Figure 2-2. The topographic survey was provided by AECOM in AutoCAD format (AECOM 2023. X-Topo 2D ITM).

Regionally the Dublin Mountains are located to the south of the site and the ground is sloping towards the River Liffey to the north and northeast. The EPA 20m contours are shown in Figure 2-3.

Figure 2-2: Screengrab from Topographical Survey with Annotated Spot Heights and Approximate Redline Boundary (AECOM 2023. X-Topo 2D ITM)

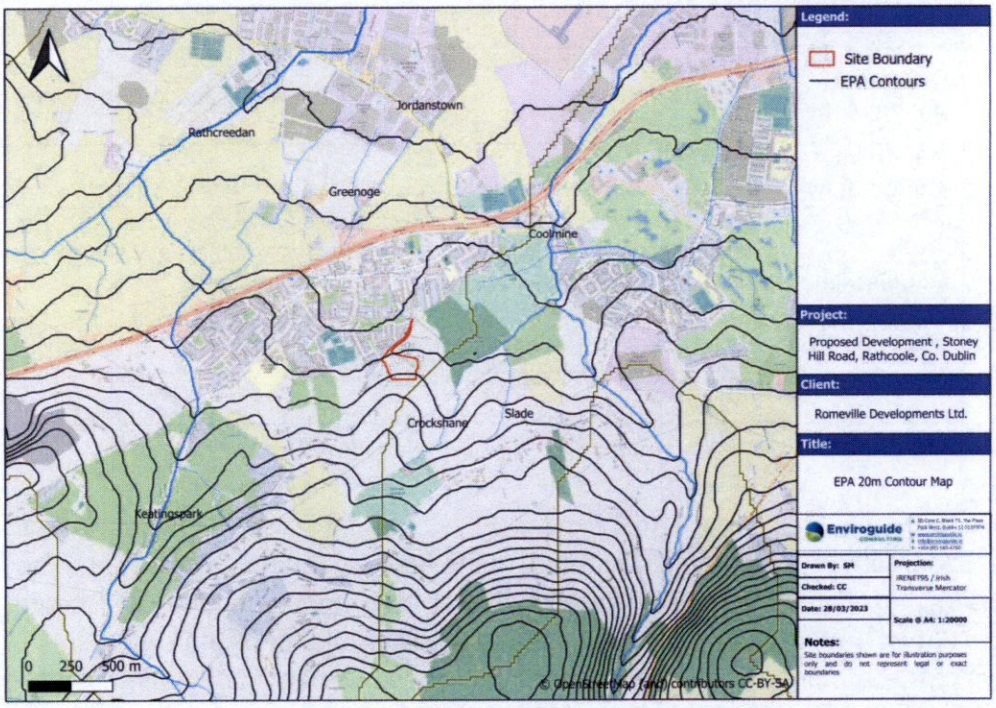

Figure 2-3: Regional Topographic Map

2.4 Rainfall

Monthly rainfall data available for 1km x 1km grids (for the period 1981 to 2010) was sourced from Met Éireann (Walsh, 2012) and is presented in Table 2-2.

Table 2-2: Long term mean monthly rainfall data (mm) (Walsh, 2012)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
75	58	59	61	65	67	61	79	71	93	85	88	863
Note: 1km x 1km Irish Grid Coordinates selected for the site = X (Easting): 302000, Y (Northing): 226000												

The closest synoptic meteorological station to the site, Casement, is located approximately 2.8km north of the site. A summary of the long-term average Potential Evapotranspiration (PE) at Casement station (Met Éireann, 2023) is presented in Table 2-3.

Table 2-3: Long term average PE (Met Éireann, 2023)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
15.8	22.1	34.6	52.2	71.4	80.5	81.2	68.4	47.6	27.9	17.7	13.1	530.5

2.5 Soil and Quaternary Sediments

The soils underlying the site are mapped by Teagasc (Teagasc, 2023) as 'till derived chiefly from lower Palaeozoic rocks' (Code: TLPSsS) with a parent material description of 'sandstone and shale till (Lower Palaeozoic)'. The soils fall within the category of 'deep well drained mineral (mainly acidic)' soils.

The subsoils underlying the majority of the site are mapped by the GSI (GSI, 2023a) as 'Till derived from Lower Palaeozoic sandstones and shales'. The subsoils underlying the Stoney Hill Road are mapped as 'till derived from limestones' (GSI, 2023a). 'Alluvium' and 'gravels derived from limestones' are mapped underlying sections of the Camac River and Tootenhill River (part of Liffey_170 WFD sub-catchment) (GSI, 2023a). The quaternary sediments map is shown in Figure 2.4.

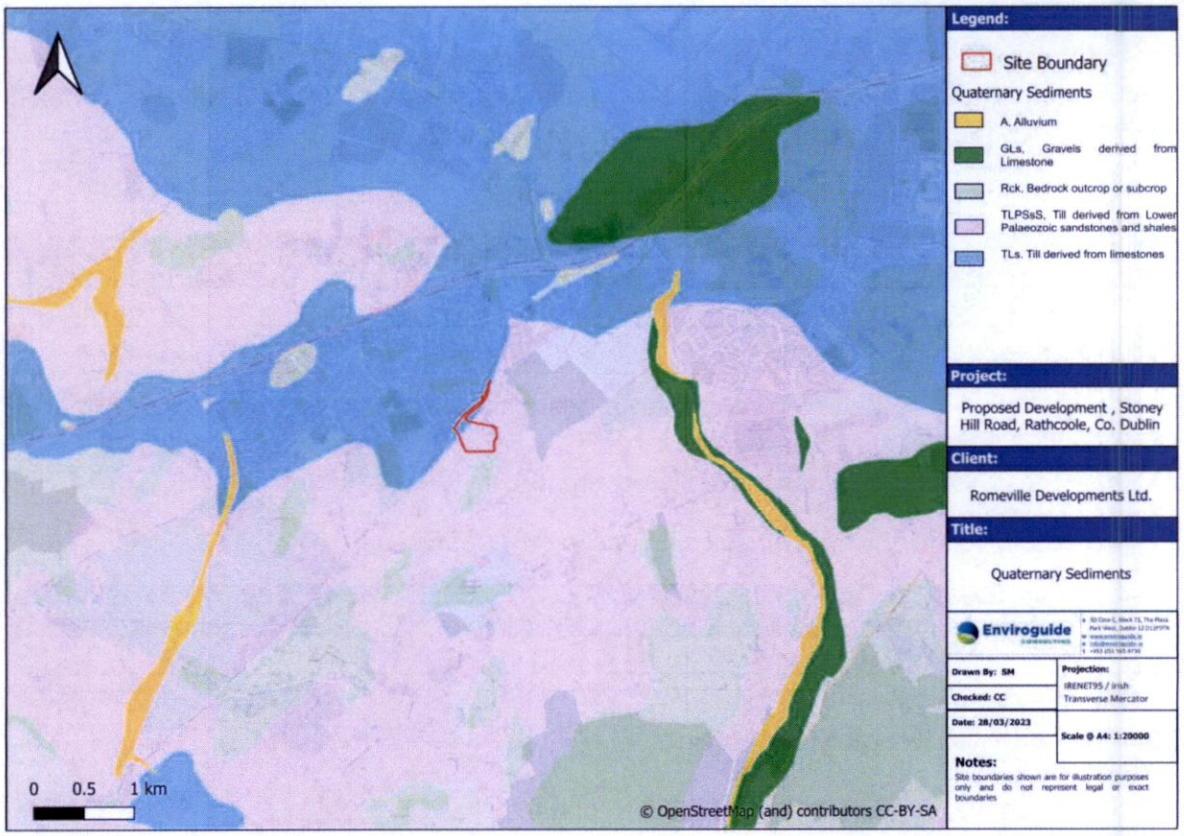

Figure 2-4: Quaternary Sediments

2.5.1 Quaternary Geomorphology

The quaternary geomorphology map shows several features within a 2km radius (GSI, 2023a). The Camac River to the east of the site is mapped as a meltwater channel (GSI, 2023a) forming a glaciofluvial terrace landform. Hammocking Sand and gravel deposits are mapped further north along the Camac River. Crag-and-Tail subglacial lineation are present to the southwest of the site orientated in a southwest to northeast direction.

2.6 Geology

The bedrock underlying the majority of the site is mapped by the GSI (GSI, 2023a) as the 'Tipperkevin' formation. The 'Carrighill formation' is underlying Stoney Hill Road to the northwest of the site (GSI, 2023a). A southwest / northeast trending fault is mapped at the southeast corner of the site. The 'Glen ding' formation is located to the east of the fault (GSI, 202a3). The GSI (GSI, 2023a) provide the following description of the bedrock units:

- The Tipperkevin formation is comprised of 'greywacke and shales'.
- The Carrighill formation is comprised of 'calcareous greywacke siltstone and shale'.
- The Glen Ding formation is comprised of 'chloritic, feldspathic greywacke'.

All three formations are of geological age of Palaeozoic, Silurian period.

There is no additional information available on the fault running through the site. The fault runs through the site to the Rathcoole woodland and beyond to meet an east / west trending fault.

The east/ west trending fault is significant in length extending to Dublin Bay. The east / west fault separates the Visean limestone and calcareous shales which form the central basin of Ireland from the Silurian deposits of the Wicklow and Dublin mountains.

There are no mapped karst features at or within a 2km radius of the site. The bedrock map is shown in Figure 2.5.

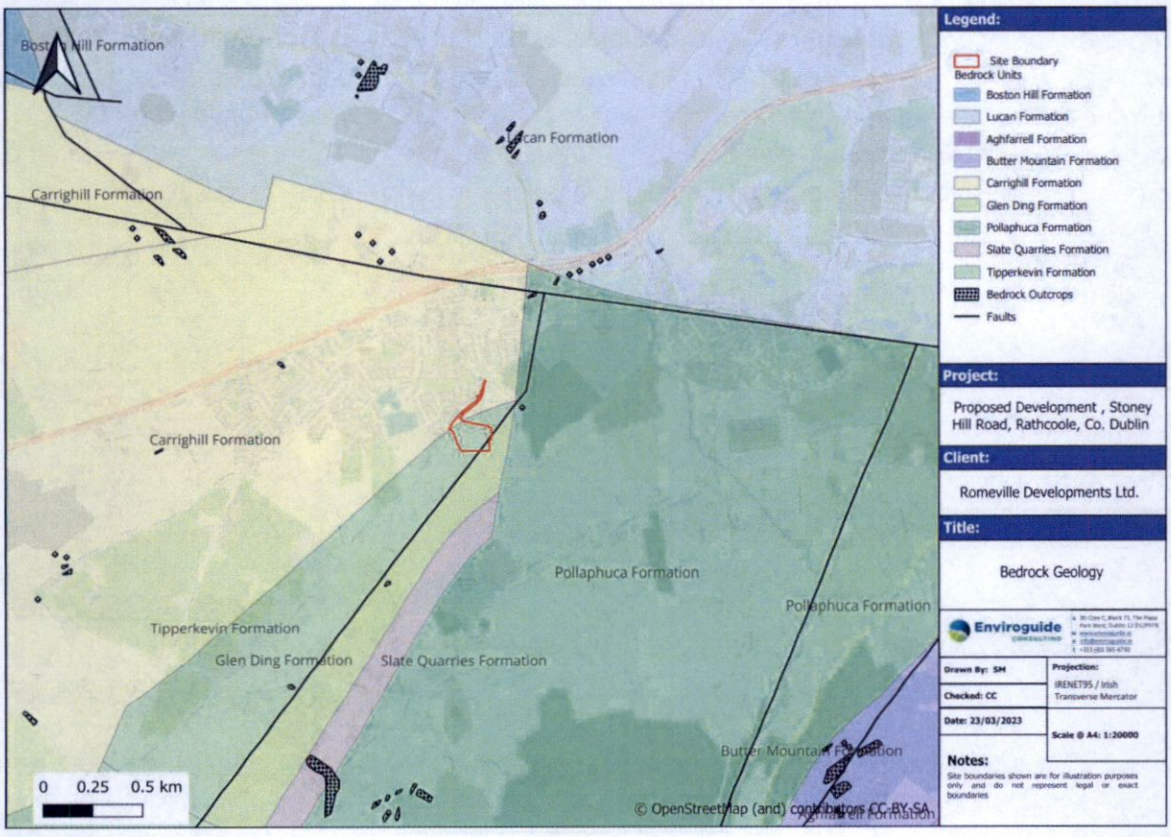

Figure 2-5: Bedrock Geology Map

2.7 Hydrogeology

2.7.1 Regional Hydrogeology

2.7.2 Recharge

The GSI (GSI, 2023a) groundwater recharge map provides an estimate of the average amount of rainwater that percolates down through the subsoils to the water table over a year. The map accounts for rainfall that percolates diffusely through soils and subsoils, it does not consider water that enters aquifers at points (e.g., at sinkholes) or along linear features (e.g., along sinking streams/rivers). Groundwater recharge amounts are estimated by considering soil drainage, subsoil permeability, thickness and type, the ability of the aquifer to accept the recharge, and rainfall.

The GSI (GSI, 2023a) map the effective rainfall for the site as '416' mm/yr. A recharge cap of 100mm/year is applied (GSI, 2023a). The average recharge range for the site is between 51 and 100 mm/year (GSI, 2023a). The 'rock at or near Surface or Karst' mapped directly south of the site also has a recharge cap of 100mm/year applied (GSI, 2023a) which indicates the

recharge cap is due to the limited capacity within the aquifer to accept recharge rather than the subsoil permeability.

The permeability of most of the soils beneath the site are listed as 'not mapped' (GSI, 2023a). The soils along the Stoney Hill Road are mapped as having a 'moderate' permeability.

2.7.3 Aquifer Classification

The bedrock aquifer beneath the site is classified by the GSI (GSI, 2023a) as a 'PI-Poor Aquifer – Bedrock which is generally Unproductive except for Local Zones'. The aquifer is surrounded by PU aquifers on either side which are classified as 'Pu-Poor Aquifer- Bedrock which is generally unproductive'. The aquifer beneath Stoney Hill Road is mapped within the PU aquifer classification. Poor aquifers have limited capacity to receive recharge.

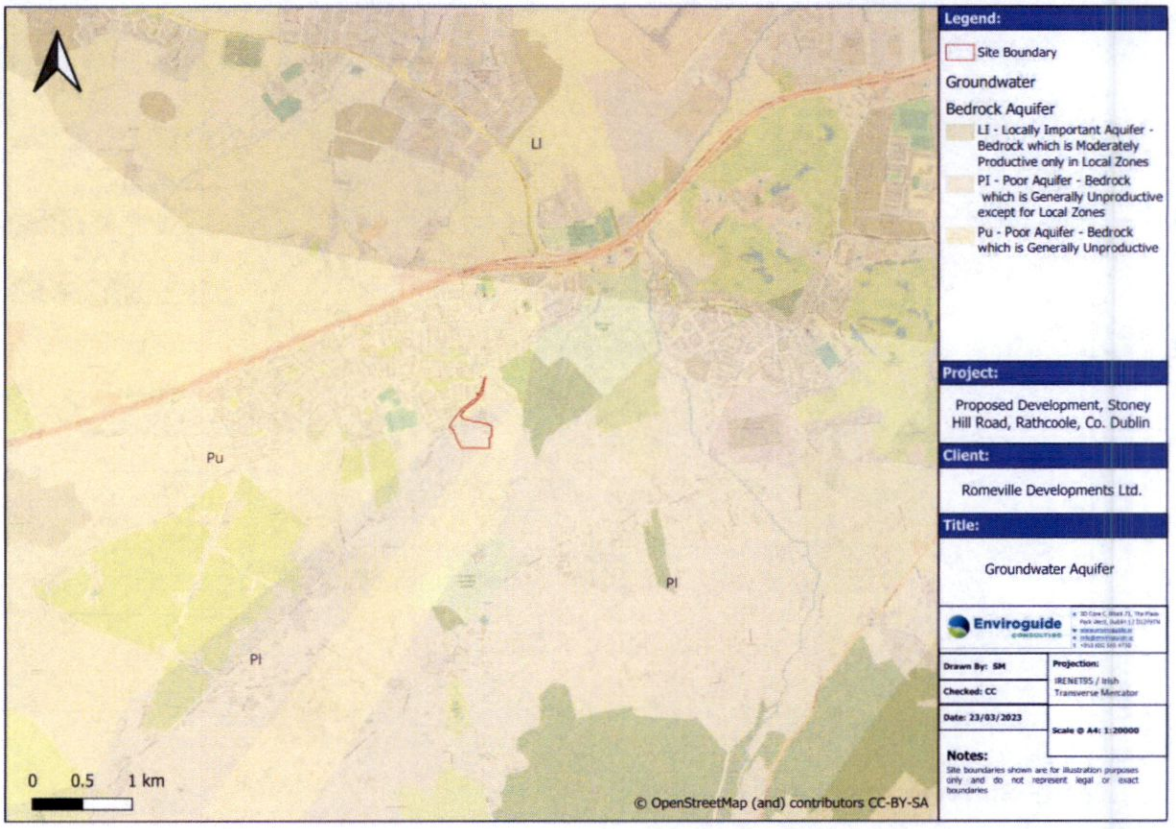

Figure 2-6: Bedrock Geology Map

2.7.4 Aquifer Vulnerability

The vulnerability rating, and methods for determination, are presented in the Groundwater Protection Schemes publication (DEHLG/EPA/GSI, 1999) and summarised in Table 2-4. The publications state that '*as all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area:*

- *the subsoils that overlie the groundwater.*
- *the type of recharge - whether point or diffuse; and*
- *the thickness of the unsaturated zone through which the contaminant moves.*

Table 2-4: Vulnerability Mapping Criteria (DEHLG/EPA/GSI, 1999)

Subsoil Thickness	Hydrogeological Requirements				
	Diffuse Recharge			Point Recharge	Unsaturated Zone
	Subsoil Permeability & Type			(Swallow holes, losing streams)	(sand & gravel aquifers *only*)
	High permeability (sand & gravel)	Moderate permeability (sandy subsoil)	Low permeability (clayey subsoil, clay, peat)		
0-3m	Extreme	Extreme	Extreme	Extreme (30m radius)	Extreme
3-5m	High	High	High	N/A	High
5-10m	High	High	Moderate	N/A	High
>10m	High	Moderate	Low	N/A	High
Notes: (i) N/A = not applicable (ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method.					

The GSI (GSI, 2023a) has assigned a groundwater vulnerability rating of 'extreme' for the majority of the site. The groundwater vulnerability rating along Stoney Hill Road is 'High'. Based on the low permeability of the subsoils encountered during the ground investigation (refer to Section 2.7.7), bedrock beneath the south of the site is expected to be between 0 meters below ground level (mbGL) and 3mbGL (trial pitting proved the depth to bedrock is greater than 2mbGL). The depth to bedrock to the north of the site is expected between 3mbGL and 5mbGL.

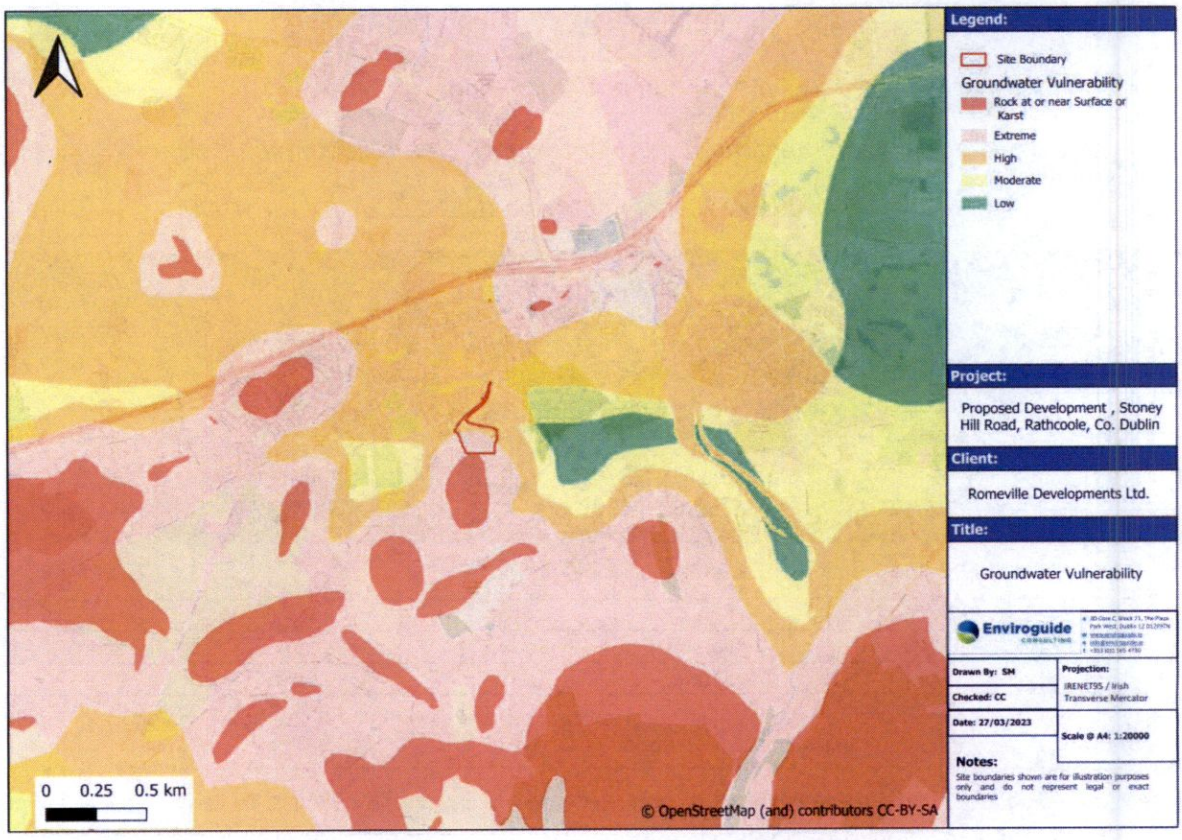

Figure 2-7: Groundwater Vulnerability

2.7.5 Groundwater Body

The EPA (EPA, 2023) maps the groundwater body (GWB) beneath the site as the Kilcullen GWB (EU Code: IE_SH_G_110). The Kilcullen GWB comprises a large area across Wicklow, Kildare and Dublin covering 642m^2. The GWB is made up of three distinct hydrogeological settings (the granites that are classified as poor aquifers (Pl); the Ordovician metasediments which are classified as locally important aquifers (Ll); and the Lower Paleozoic rocks (i.e. Silurian rocks) which are classified as poor (Pl and Pu) aquifers) (GSI, 2023a). The aquifer beneath the site falls into the latter category.

The topographic flow will influence the hydraulic gradient in the aquifer which will determine the velocity and volume of groundwater flow. The Kilcullen GWB Report (GSI, 2023b) notes how most of the groundwater flow in this aquifer will take place in the upper 3m of the bedrock aquifer (within the weathered zone), with lateral flow towards discharge points such as rivers and springs.

The Kilcullen GWB Report (GSI, 2023b) notes that the dominant recharge process in this area will be diffuse recharge from water percolating through the overlying tills and into the aquifer, with high rates of potential recharge expected in the hill areas where there are thin subsoils and high rainfall. A large portion of potential recharge will be rejected because the rocks are poor aquifers and do not have high enough storativity to accept all the water, an indication of this process than be seen in very high drainage density in the areas.

The discharge mechanisms in the GWB will be via springs at the break of slopes located at the foot of hills (GSI, 2023b). Discharge via baseflow to rivers and streams will also occur.

Regional groundwater flow paths are not considered to develop, as the rocks do not have sufficient transmissivity to transport water long distances. Typical groundwater flow paths will be in the order of a couple of hundred meters, with discharge likely to the closest surface water features (GSI, 2023b).

2.7.6 Wells and Springs

A review of the GSI wells and springs database (GSI, 2023a) has indicated there are three features within a 2km radius of the site:

- St. Bridget's Well (GSI name: 2921NWW007): a spring located approximately 0.63km northwest of the site.
- St. Patricks Well (GSI name: 2921NWW005): a spring located approximately 2km east of the site.
- St. Catherines Well (GSI Name: 292NWW008): a spring located approximately 1.15km southwest of the site.

The location of the springs are shown in Figure 2-8.

There are no groundwater source protection areas or drinking water rivers mapped within a 2km radius of the site. The closest supply is the source protection area for the Kilteel Public Supply located approximately 4.2km south of the site.

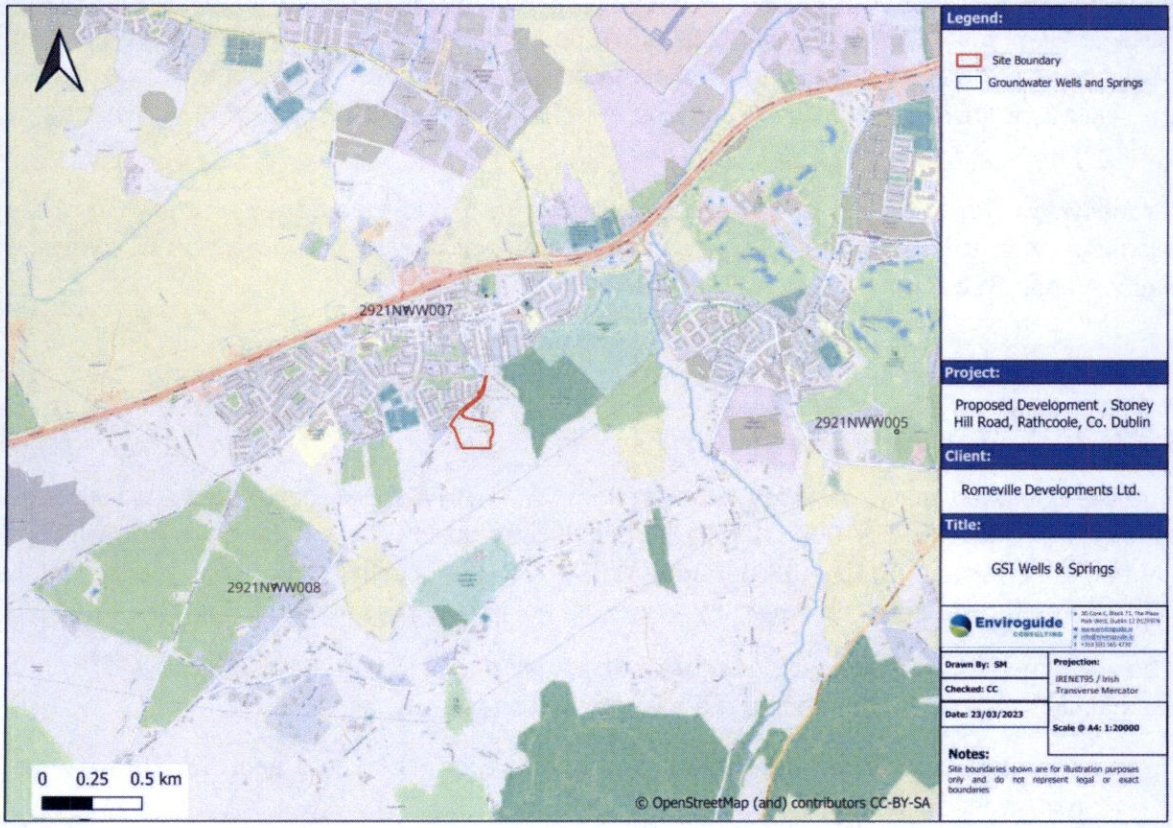

Figure 2-8: Water use

2.7.7 Site Investigation Results

A ground investigation was complete by IGSL in June 2022 (refer to Appendix B). The investigation comprised the excavation of six (6No.) trial pits to a maximum depth of 2mbgl. Infiltration and plate bearing tests were also undertaken. The ground conditions beneath the site generally comprise topsoil overlying CLAY. Made ground was noted in trial pit TP01 to a depth of 0.4mbGL. The clay beneath the site generally comprised of:

1. Firm to stiff brown gravelly CLAY with low cobble content or
2. Whiteish grey CLAY (crumbles into a white powder).

All trial pits were dry and stable on completion.

Groundwater was not encountered during the ground investigation works and thus the depth to bedrock beneath the site is considered to be greater than 2mbGL. A review of the GSI geotechnical database (GSI, 2023a) indicate a well approximately 0.05km southeast of the site which was drilled as part of the Liffey Aqueduct site investigation (Site Investigation Ireland, 1981). The well was drilled to 4.5mbGL, and bedrock was not encountered. The borehole is located within an area classified as having 'high' groundwater vulnerability (GSI, 2023a).

2.7.8 Ground Water Flow

The bedrock beneath the site is classified as a poor aquifer (Pl) and groundwater flow occurs predominantly through a limited and poorly connected network of fractures, fissures and joints (GSI, 2017). Most of the flow will occur within upper 3m of the bedrock (GSI, 2023b), in the shallow weathered zone, due to the limited capacity of the aquifer to accept recharge. Due to the limited storativity, groundwater may be rejected (resulting in discharge features such as springs).

Groundwater flow direction at the site is expected to mimic topography and flow from the recharge zone to the south of the site to the northwest toward the Greenoge Stream and Rathcreedan Stream.

2.8 Hydrology

2.8.1 Catchment and Water Bodies

The site is located within the Liffey_SC_09 (Code: 09_15) WFD Sub-catchment and within the Liffey_170 (Code: IE_EA_09L012100) WFD river sub-basin. The catchment divide with the Camac_020 (Code: IE_EA_09C020250) WFD river sub basin is mapped approximately 0.03km southeast of the site boundary at the closest point and is shown in Figure 2-9 below.

The EPA mapped surface water bodies within the River Liffey sub-basin (Liffey_170) and potentially hydraulically connected are summarised as follows:

- The Greenoge Stream (Segment Code: 069_1587) is located approximately 0.72km northwest of the site.
- The Rathcreedan Stream (Segment Code: 09_598) is located approximately 1.0km northwest of the site.

- The Jordanstown Stream (Segment Code: 09_590) is located approximately 0.95km north of the site.
- The Greenoge Stream, Rathcreedan Stream and Jordanstown Stream flow in a northerly direction and at Greenoge Logistics Park these streams are culverted below ground and directed to the Grifeen River (Segment Code: 09-1852)
- The Tootenhill River (Segment Code: 09_1165) is located approximately 1.1km west of the site. The Tootenhill River flows in a northerly direction and discharges into the Grifeen River (Segment Code: 09-1852)
- The Grifeen River flows in a northly direction prior to entering the main Liffey River channel. The river Liffey flows in an easterly direction discharging to the Liffey Estuary Upper Transitional waterbody and eventually discharging at Dublin Bay coastal waterbody.

The Crockshane Stream (Segment Code: 09_435) (which is part of Camac_020 WFD sub-catchment) is located approximately 0.28km to the east of the site. There is a catchment divide between the site and the Crockshane Stream and is therefore not considered to be hydraulically connected with the Site.

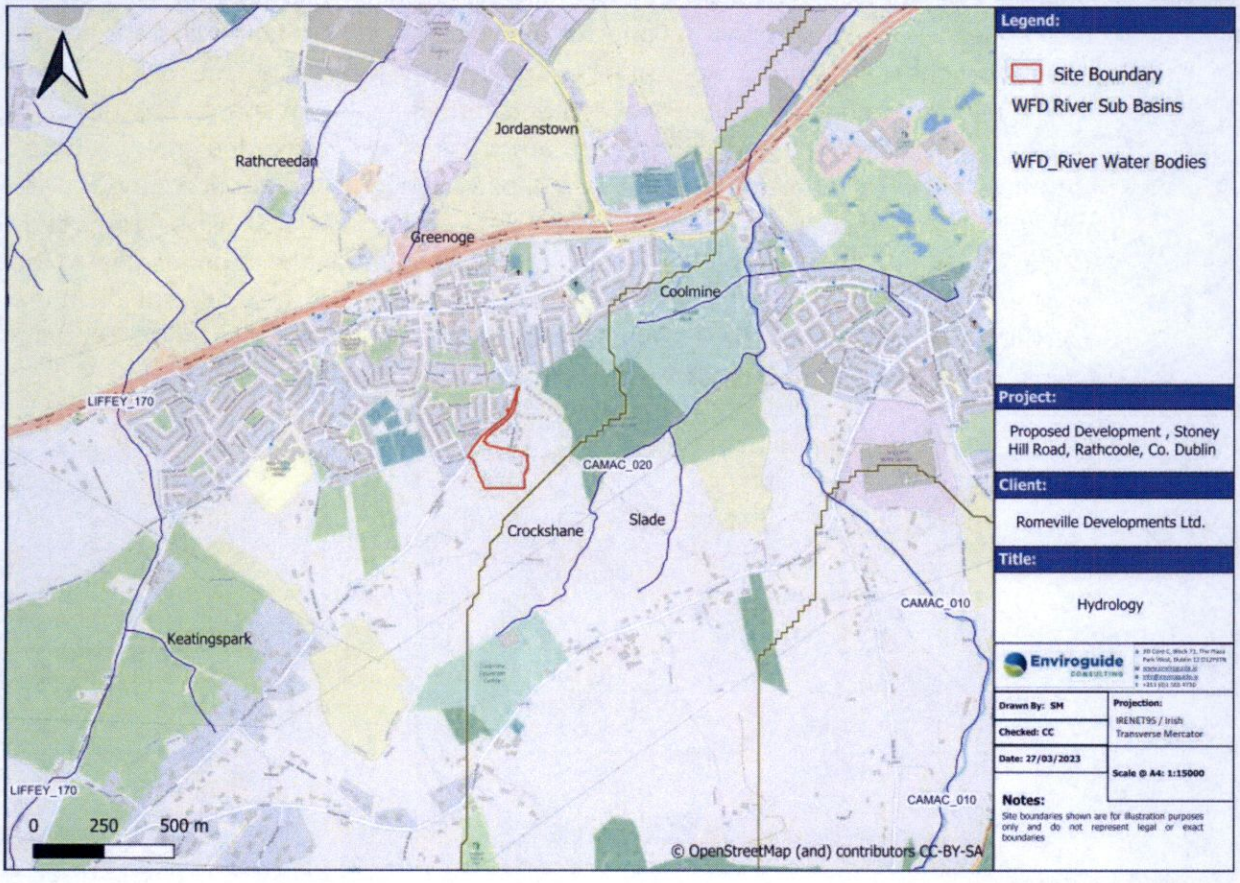

Figure 2-9: Hydrology and WFD Water Bodies

2.9 Site Drainage

2.9.1 Surface Water

In additional to the EPA mapped water bodies rivers, the following hydrological observations were made during the site walkover survey completed by EGC on the 16th March 2023:

- There were no surface water flows or streams identified within the site boundary. At the time of the site walkover survey there were no drainage ditches identified at the site. The ground was saturated following heavy rainfall with localised pooling on the ground surface at isolated areas of the site. There was no overland flow observed during the wet conditions at the site indicating that some infiltration to ground occurs at the site. The overland flow catchment associated with the site extends to the south of the site which has been considered in the design for site drainage (AECOM, 2022). Currently surface water flow or overland at the site will follow topography and flow to the north towards the Stoney Hill Road and ultimately the Greenoge Stream.
- Drainage channels were identified in the Rathcoole Woodland which are not mapped by the EPA as waterbodies however are recorded on the OSI maps (refer to Figure 2-10). A spring seepage was noted on the bank of a drainage channel along the western boundary of Rathcoole Woodland which may represent a local shallow groundwater discharge where topography is flatter or associated with the fault, different aquifer (classifications) and bedrock types mapped within the area (refer to section 2.6). Based on the inferred groundwater flow direction and surface water (overland) flow direction these drainage channels and spring seep are cross-gradient from the site. It is noted that the area of Rathcoole Woodland where these drainage channels and springs were noted is to the west of the mapped boundary of the Camac_020 (River Waterbody Code: IE_EA_09C020250) WFD river sub-basin, however as these drains flow to the east and ultimately discharge to the Camac River drainage network are therefore considered to be within the Camac sub-basin and not the Liffey sub-basin and therefore within a different sub-basin or catchment than the site.

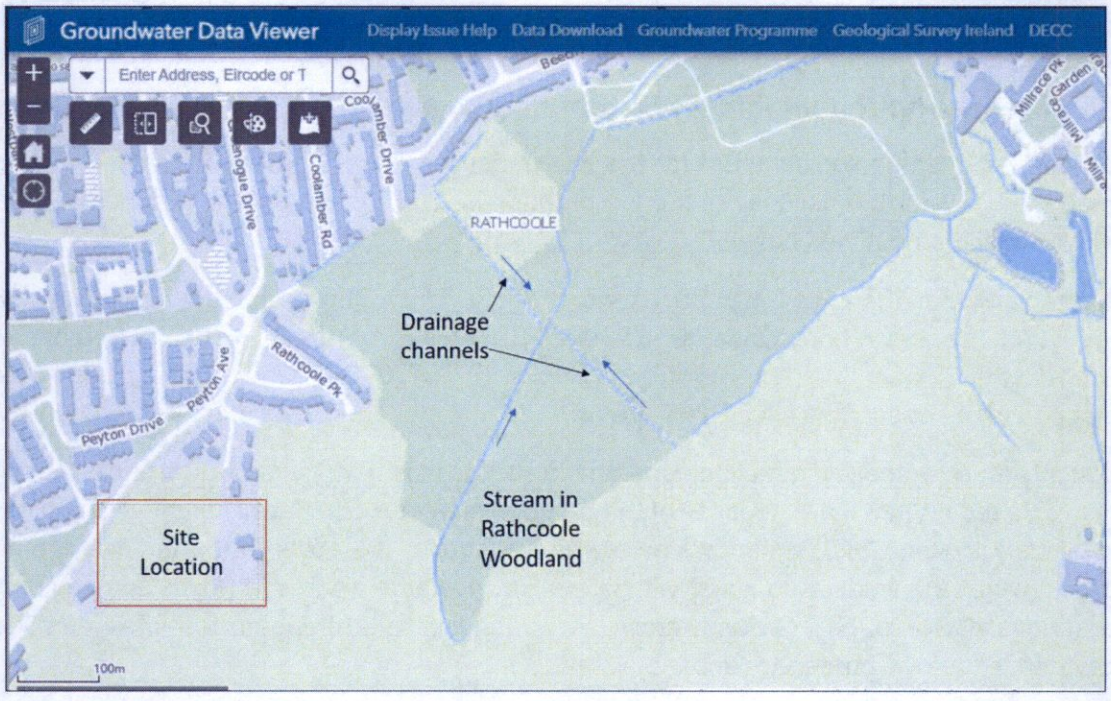

Figure 2-10: OSI 'Map Genie Standard' annotated screengrab from the OSI Website (OSI, 2023)

2.9.2 Surface Water Infrastructure

A review of the existing surface water drainage network indicate there are a number of surface water sewers in the vicinity of the site, there are no surface water drains mapped within the site boundary (AECOM, 2022). The existing mains surface water drainage includes:

- 300mm diameter concrete sewer along the Stoney Hill Road discharging into a 375mm diameter concrete surface water sewer.
- 375mm diameter concrete surface water sewer along Stoney Hill Road discharging into a 525mm concrete surface water sewer.
- 225mm diameter concrete surface water sewer discharging into the 375mm diameter surface water sewer.

The SDCC drainage maps are provided in Appendix C.

3 HYDROGEOLOGICAL CONCEPTUAL SITE MODEL

3.1 Baseline Hydrogeological Conceptual Site Model

The baseline hydrogeological CSM for the site under the current pre-development scenario formed the basis for the assessment of the proposed SuDS measures and groundwater flow through the site as outlined below.

The site is within the Liffey_SC_09 (Code: 09_15) WFD Sub-catchment and within the Liffey_170 (River Waterbody Code: IE_EA_09L012100) WFD river sub basin. The catchment divide with the Camac_020 (River Waterbody Code: IE_EA_09C020250) WFD river sub basin is mapped to the east of the site. There are no surface water courses within the site boundary.

The local groundwater flow direction beneath the site is to the northwest towards the Greenoge Stream. Based on the characteristics of the bedrock aquifer (poor classification - Pl), which is part of the Kilcullen GWB, groundwater flow in the aquifer will occur in the upper 3m of the bedrock (within the weathered zone) with lateral flow towards discharge points such as rivers and springs (GSI, 2023b). Groundwater was not encountered beneath the site in trial pits excavated in the overburden to 2mbGL.

Most of the rainfall to the site will flow overland due to the topographic slope and where there are lower permeability clay subsoils with flow to the northeast towards Stoney Hill Road and eventually to the Greenoge Stream (which eventually enters the River Liffey via the Grifeen River). As the permeability of soils are variable at the site, infiltration will occur where more permeable soils are located.

Limited recharge to groundwater will occur where soils are more permeable, and permeability is variable at the site. There is limited potential for the aquifer to receive recharge and due to the low storativity of the aquifer groundwater will discharge at the closest surface water courses or as springs.

3.2 Proposed Site Drainage

Surface water runoff from the Proposed Development will be collected in a newly constructed surface water drainage network designed in accordance with the requirements of 'Greater Dublin Strategic Drainage Study (GDSDS) Volume 2 -New Developments' and 'Ciria C753-The SuDS Manual' (AECOM, 2022). It is proposed to discharge the surface water runoff from the Proposed Development by gravity via a new 225mm diameter surface water outfall discharging to the existing SDCC 300mm diameter surface water sewer on Stoney Hill Road (AECOM, 2022). Surface water from the Proposed Development will ultimately outfall from the SDCC sewer to the Greenoge Stream. The Proposed Drainage layout is provided in AECOM Drawing 'Proposed Drainage Layout' (DWG No. 606591912-ACM-01-00-DR-CE-10-0501), the proposed SuDs layout is provided in AECOM Drawing 'Proposed SuDs Layout' (DWG No. 60659192-ACM-01-00-DR-CE-10-0520), both are provided in Appendix A.

The surface water drainage design (AECOM, 2022) incorporates the following SuDS measures to treat and attenuate the surface water prior to discharge from the site. The design takes account of the current CSM for the site including the flow of surface water and groundwater through the site.

The SuDs measures proposed for the surface water drainage along with the final design is presented in Table 3-1. In addition to the SuDs measures, the proposed attenuation tank will provide the storage volume required (AECOM, 2022).

Table 3-1: SuDs Measures and Proposed Depths

SuDs Feature	Depth below proposed ground level (m)
Permeable Paving	0.35
Porous Asphalt	0.275
Grasscrete	0.3
Filter Drains	0.75
Rainwater butts	Above ground
Tree pits	As deep as tree roots
Ponds	0.6
Swales	0.35
Petrol Interceptor	4.5

The SuDS measures including permeable paving and filter drains will allow partial infiltration to groundwater. The design incorporates the use of the ponds and swales to attenuate the upstream overland flow (AECOM, 2023). Based on the location and proposed invert level of certain SuDS features (i.e., the ponds and petrol interceptor) there is a potential that groundwater may be encountered, and this has been considered in the overall SuDS design proposal. Details of how the topography, the catchment and the SuDS measures will be integrated with the existing site conditions will be further developed as part of the detailed design.

3.3 Existing Groundwater Flow and SuDS Measures

Groundwater Flows

Permeable paving, porous asphalt, grasscrete and filter drains will allow partial infiltration and therefore the current variable infiltration via soil to ground will be maintained and the implementation of SuDS measures will not impact on recharge to the underlying aquifer.

Applying the precautionary principle in the absence of groundwater level data, it has been assumed as part of the design considerations that shallow groundwater may be encountered in some areas of the site where SUDS features will be installed and incorporated in the design.

Where shallow groundwater is encountered and intersected by subsurface SuDS or drainage infrastructure there is a potential to impact the natural groundwater flow across the site. These potential impacts include localised groundwater mounding and diversion of groundwater flow around the subsurface feature (structure). This may also result in an increased hydrostatic pressure on the upgradient of the subsurface feature with the potential for buoyancy issues for subsurface structures. Therefore, appropriate standard design measures including groundwater drainage and impermeable materials will be incorporated into the final design, in particular for the ponds and petrol interceptor, which will allow groundwater flow around the subsurface features to be maintained and also prevent ingress of groundwater into the structure.

The attenuation tank design will also include appropriate groundwater drainage to maintain groundwater flow through and out of that part of the site. Groundwater will not be intercepted or collected within the surface water drainage or SuDS measures.

Therefore, the natural route of groundwater flow through and out of the site will be maintained with no overall impact on the groundwater flow regime within the Kilcullen GWB and associated downgradient receptors.

Surface Water Flows

Currently, surface water flow through and out of the site will ultimately discharge to the Greenoge Stream. Surface water and overland flow onto the site will be intercepted in the swales and ponds to the south of the site which will be discharged to the main storm water drainage network. All surface water from the site will be attenuated and treated prior to discharge to the SDCC surface water sewer. Therefore, there is no overall impact on surface water discharges from the site to the receiving water environment.

4 CONCLUSIONS

EGC prepared a hydrogeological assessment for the Proposed Development at Stoney Hill Road, Rathcoole, Dublin 24 to determine if the proposed drainage and SuDS measures for the site incorporates the natural flow of groundwater through the site and to specifically address Item 4 (iv, a) of the RFI from SDCC dated 11th September 2022 (Planning Reference SD22A/0347) stating:

'Additional natural SUDS features should be incorporated into the proposed drainage system for the development such as bio-retention/ construction tree pits, permeable paving, green roofs filtration planning, filter stripe etc. In addition, should provide the following:

> *Demonstrate how the proposed SUDS scheme has been designed to incorporate and adhere to the natural route of groundwater through and out of the site.'*

Based on the results of the assessment taking account of information made available by the Client for the Proposed Development the following can be concluded.

The baseline hydrogeological CSM for the site is summarised as follows:

- The site is located with the Liffey_170 (River Waterbody Code: IE_EA_09L012100) WFD river sub basin. The Camac River and the catchment divide with the Camac_020 (River Waterbody Code: IE_EA_09C020250) WFD river sub basin are mapped to the east and southeast of the site boundary respectively. There are no EPA mapped or other surface water courses (i.e., drainage ditches, streams) at the site.
- The site is located within the Kilcullen GWB and the bedrock aquifers beneath the site are mapped as poor aquifers (Pu and Pl) with limited capacity to accept recharge (capped at 100mm/year) and groundwater flow is within the upper 3m of the bedrock aquifer (within the weathered zone). There is not groundwater level data for the site.
- Rainfall and surface water runoff at the site will disperse as overland flow or recharge to groundwater. Due to the limited capacity for groundwater recharge to the bedrock aquifer and variable soil infiltration rates, overland flow and groundwater flow in the upper weathered bedrock are the predominant mechanisms for water movement across the site. Overland and groundwater flows at the site mimic topography and flow to the northwest towards the Greenoge Stream.

The drainage design and SUDS have been designed in accordance with GDSDS and SuDS principles and therefore takes account of the existing groundwater flow regime at the site.

Permeable paving, Porous Asphalt, Grasscrete and filter drains will allow partial infiltration to ground and therefore the current variable infiltration via soil to ground will be maintained with no change in the recharge to the underlying aquifer.

As a precautionary measure, in the absence of site-specific groundwater level data it has been assumed that groundwater will be intersected by subsurface SuDS measures with a potential impact on the flow of groundwater through the site. Therefore, appropriate standard design measures including groundwater drainage and impermeable materials will be incorporated in ponds and petrol interceptor which will maintain the natural route of groundwater flow.

There will be no overall negative impact on the existing groundwater flow regime at the site hydraulically connected downgradient receptors associated with the proposed drainage and

SuDS measures which incorporate standard design measures to ensure the natural flow of groundwater through the site is maintained through the site.

5 REFERENCES

AECOM, 2022. Proposed Residential Development in Stoney Hill Road, Rathcoole, Co. Dublin Infrastructure Report.

AECOM, 2023. Item No.4 and Item No.9 Request for Information Letter Response dated 27th February 2023.

Construction Industry Research and Information Association, 2015. The SuDs Manual. (CIRIA-C753).

Environmental Protection Agency, 2023. EPA Envision Maps. https://gis.epa.ie/EPAMaps/. Consulted on 28/03/2023.

Google Earth Pro, 2023. Consulted on: 28/03/2023.

Geological Society of Ireland, 2023. GSI web mapping. https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228. Consulted on 28/03/2023 (GSI, 2023a)

Geological Survey Ireland, 2023. Groundwater Body Report: Kilcullen GWB: Summary of Initial Characterisation] (GSI, 2023b)

Geological Survey Ireland, 2017. Groundwater Programme, A description of Irish Aquifer Categories.

Misstear, Bruce, Banks, David & Clark, Lewis (2017) Water Wells and Boreholes, Second edition.

Met Eireann, 2023. Meteorloical databases, Casement Aerodrone Station Weather Data. Available at: Met Éireann - The Irish Meteorological Service. Consulted on: 29/03/2023.

Met Éireann, 2012. Séamus Walsh, 'Long-term climate averages for Ireland 1981 - 2010', [IE_RR_8110_V1] (Walsh, 2012).

Ordnance Survey Ireland, 2023. Irish Townland and Historical Map Viewer. Available at: https://osi.maps.arcgis.com/apps/webappviewer/index.html?id=bc56a1cf08844a2aa2609aa92e89497e. Consulted on: 28/03/2023.

Site Investigations Ireland (1981) Tallagh Pipelines, Addendum to Report No. S.379.

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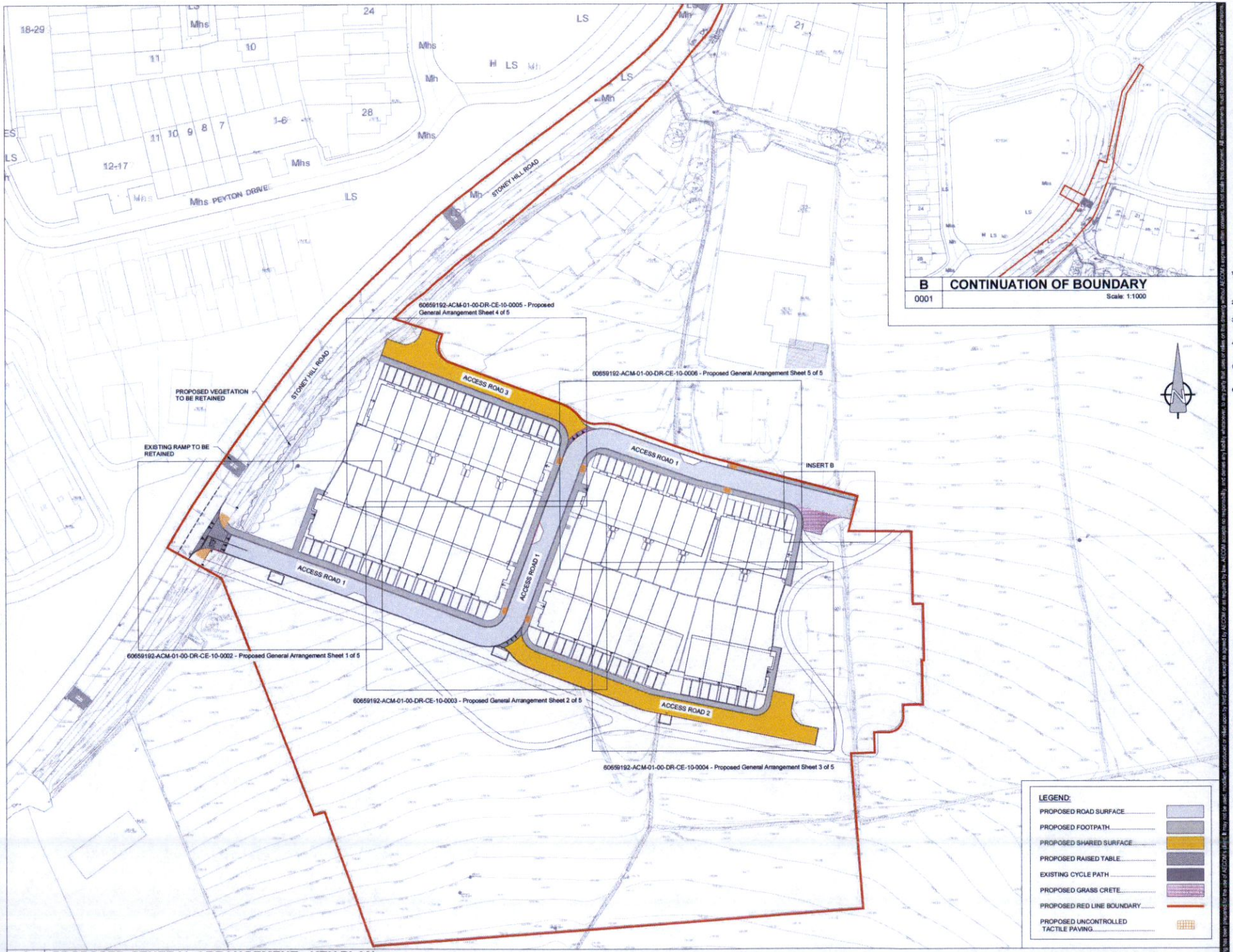
Environmental Consultancy Services

Appendix A



B	CONTINUATION OF BOUNDARY
0001	Scale: 1:1000

A	PROPOSED GENERAL ARRANGEMENT - KEY PLAN
0001	Scale: 1:500

AECOM

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT AT LANDS AT STONEY HILL ROAD, RATHCOOLE, Co. DUBLIN

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5. FOR TYPICAL INTERNAL ROAD & TYPICAL HOMEZONE / SHARED SURFACE CROSS SECTIONS PLEASE REFER TO DRAWINGS 60659192-ACM-01-00-DR-CE-10-0104.
6. THE FOLLOWING TOPOGRAPHICAL SURVEY WAS PROVIDED BY STANLEY RESIDENTIAL, DATED 29TH APRIL

AECOM
PLANNING

ISSUE/REVISION

I/R	DATE	DESCRIPTION
1	03.02.2023	RFI ISSUE
0	19.08.2022	PLANNING ISSUE

PROJECT NUMBER
60659192

SHEET TITLE
PROPOSED
GENERAL ARRANGEMENT
KEY PLAN

SHEET NUMBER
60659192-ACM-01-00-DR-CE-10-0001

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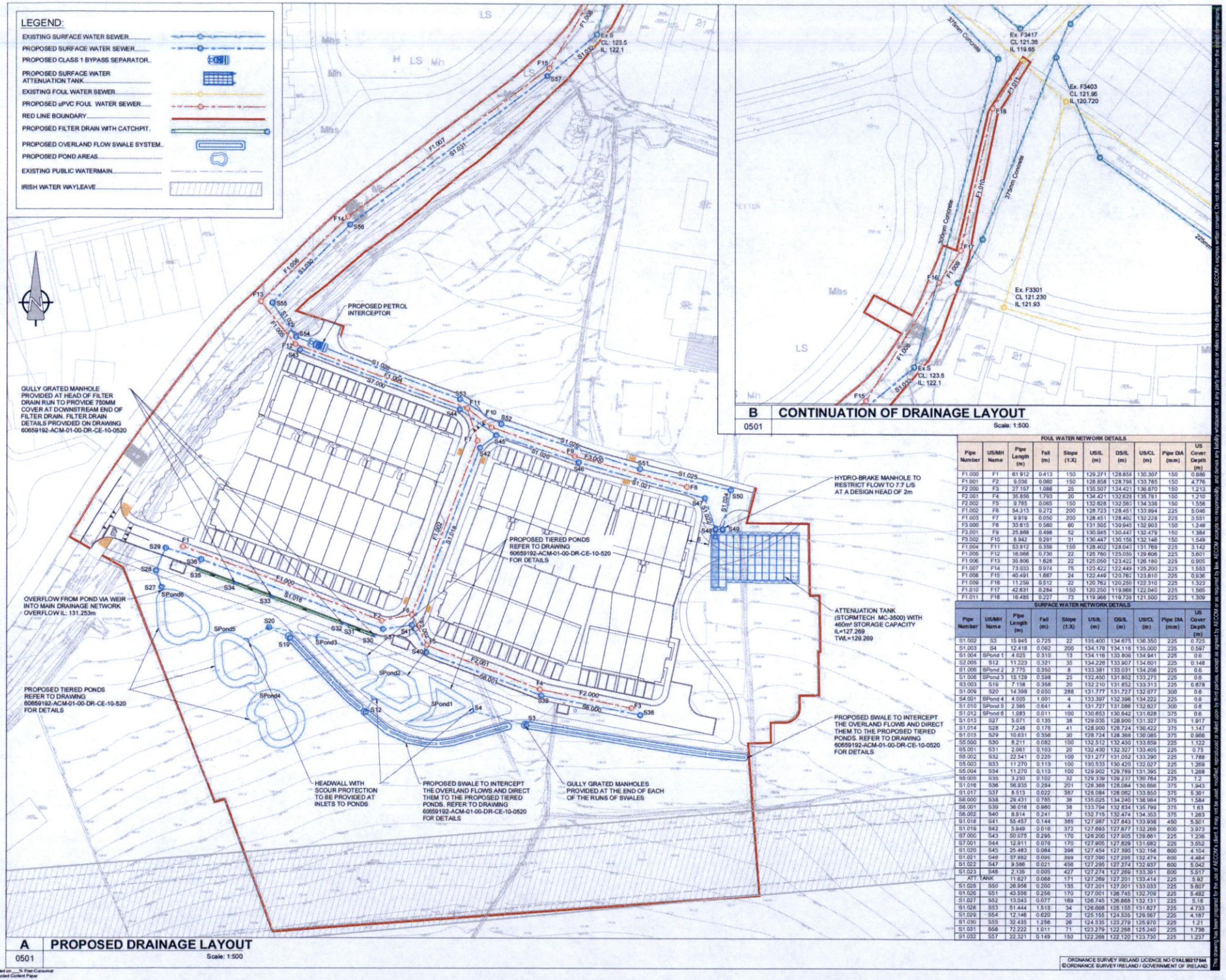

A PROPOSED DRAINAGE LAYOUT

0501 Scale: 1:500

B CONTINUATION OF DRAINAGE LAYOUT

0501 Scale: 1:500

FOUL WATER NETWORK DETAILS

Pipe Number	US/MH Name	Pipe Length (m)	Fall (m)	Slope (1:X)	US/IL (m)	DS/IL (m)	US/CL (m)	Pipe DIA (mm)	US Cover Depth (m)
F1.000	F1	61.912	0.413	150	129.271	128.858	130.307	150	0.886
F1.001	F2	9.036	0.060	150	128.858	128.798	133.765	150	4.776
F2.000	F3	27.157	1.086	25	135.507	134.421	136.870	150	1.213
F2.001	F4	35.856	1.793	20	134.421	132.628	135.781	150	1.210
F2.002	F5	9.765	0.065	150	132.628	132.563	134.338	150	1.558
F1.002	F6	54.313	0.272	200	128.723	128.451	133.994	225	5.046
F1.003	F7	9.919	0.050	200	128.451	128.402	132.228	225	3.551
F3.000	F8	33.815	0.560	60	131.505	130.945	132.903	150	1.248
F3.001	F9	25.868	0.498	52	130.945	130.447	132.479	150	1.384
F3.002	F10	8.942	0.291	31	130.447	130.156	132.146	150	1.549
F1.004	F11	53.812	0.359	150	128.402	128.043	131.769	225	3.142
F1.005	F12	16.066	0.730	22	125.780	125.050	129.606	225	3.601
F1.006	F13	35.806	1.626	22	125.050	123.422	126.180	225	0.905
F1.007	F14	73.033	0.974	75	123.422	122.449	125.200	225	1.553
F1.008	F15	40.491	1.687	24	122.449	120.762	123.610	225	0.936
F1.009	F16	11.259	0.512	22	120.762	120.250	122.310	225	1.323
F1.010	F17	42.831	0.284	150	120.250	119.966	122.040	225	1.565
F1.011	F18	16.485	0.227	73	119.966	119.739	121.500	225	1.309

SURFACE WATER NETWORK DETAILS

Pipe Number	US/MH Name	Pipe Length (m)	Fall (m)	Slope (1:X)	US/IL (m)	DS/IL (m)	US/CL (m)	Pipe DIA (mm)	US Cover Depth (m)
S1.002	S3	15.945	0.725	22	135.400	134.675	136.350	225	0.725
S1.003	S4	12.418	0.062	200	134.178	134.116	135.000	225	0.597
S1.004	SPond 1	4.025	0.310	13	134.116	133.806	134.941	225	0.6
S2.005	S12	11.223	0.321	35	134.228	133.907	134.601	225	0.148
S1.005	SPond 2	2.775	0.350	8	133.381	133.031	134.206	225	0.6
S1.006	SPond 3	15.129	0.598	25	132.450	131.852	133.275	225	0.8
S3.003	S19	7.158	0.358	20	132.210	131.852	133.313	225	0.878
S1.009	S20	14.399	0.050	288	131.777	131.727	132.677	300	0.6
S4.001	SPond 4	4.005	1.001	4	133.397	132.396	134.222	225	0.6
S1.010	SPond 5	2.565	0.641	4	131.727	131.086	132.627	300	0.6
S1.012	SPond 6	1.083	0.011	100	130.653	130.642	131.628	375	0.6
S1.013	S27	5.071	0.135	38	129.035	128.900	131.327	375	1.917
S1.014	S28	7.248	0.176	41	128.900	128.724	130.422	375	1.147
S1.015	S29	10.631	0.356	30	128.724	128.368	130.085	375	0.986
S5.000	S30	8.211	0.082	100	132.512	132.430	133.859	225	1.122
S5.001	S31	2.061	0.103	20	132.430	132.327	133.405	225	0.75
S5.002	S32	22.541	0.225	100	131.277	131.052	133.290	225	1.788
S5.003	S33	11.270	0.113	100	130.533	130.420	132.027	225	1.269
S5.004	S34	11.270	0.113	100	129.902	129.789	131.395	225	1.268
S5.005	S35	3.200	0.107	32	129.339	129.237	130.764	225	1.2
S1.016	S36	56.935	0.284	201	128.368	128.084	130.686	375	1.943
S1.017	S37	8.513	0.022	387	128.084	128.062	133.850	375	5.301
S6.000	S38	29.431	0.785	38	135.025	134.240	138.984	375	1.584
S6.001	S39	96.016	0.960	38	133.794	132.834	135.799	375	1.63
S6.002	S40	8.814	0.241	37	132.715	132.474	134.353	375	1.263
S1.018	S41	55.457	0.144	385	127.987	127.843	133.938	450	5.501
S1.019	S42	5.849	0.016	372	127.693	127.677	132.266	600	3.973
S7.000	S43	50.075	0.295	170	128.200	127.905	128.861	225	1.236
S7.001	S44	12.911	0.078	170	127.905	127.826	131.682	225	3.552
S1.020	S45	25.483	0.064	398	127.454	127.390	132.158	600	4.104
S1.021	S46	37.882	0.095	399	127.390	127.295	132.474	600	4.484
S1.022	S47	9.586	0.021	456	127.295	127.274	132.937	600	5.042
S1.023	S48	2.135	0.005	427	127.274	127.269	133.391	600	5.517
ATT	TANK	11.627	0.068	171	127.269	127.201	133.414	225	5.92
S1.025	S50	26.956	0.200	135	127.201	127.001	133.033	225	5.607
S1.026	S51	43.556	0.256	170	127.001	126.745	132.709	225	5.482
S1.027	S52	13.043	0.077	169	126.745	126.668	132.131	225	5.16
S1.028	S53	51.444	1.513	34	126.668	125.155	131.627	225	4.733
S1.029	S54	12.146	0.620	20	125.155	124.535	129.567	225	4.187
S1.030	S55	32.435	1.256	26	124.535	123.279	125.970	225	1.21
S1.031	S56	72.222	1.011	71	123.279	122.268	125.240	225	1.736
S1.032	S57	22.321	0.149	150	122.268	122.120	123.730	225	1.237

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3. ALL DIMENSIONS TO BE CHECKED BY THE CONTRACTOR ON SITE PRIOR TO COMMENCEMENT OF WORKS.
4. AECOM LIMITED TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF WORKS ON SITE.
5. DIMENSIONS OF ALL BOUNDARIES AND ADJOINING ROADS TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF WORKS.
6. DO NOT SCALE. ALL MEASUREMENTS AND COORDINATES TO BE CHECKED ON SITE.
7. EXISTING SERVICES SHOWN ON DRAWINGS ARE BASED ON PUBLIC RECORDS AVAILABLE AT THE DATE OF THIS PLANNING APPLICATION. RECORDS COULD BE INACCURATE, THEREFORE SHOULD BE VERIFIED VIA GPR AND MANHOLE SURVEY.
8. THE TOPOGRAPHICAL SURVEY WAS PROVIDED BY STANLEY RESIDENTIAL DATED 25TH APRIL.
9. THE LOCATION & DEPTH OF SERVICES TO BE CHECKED ON SITE PRIOR TO COMMENCING ANY WORKS.
10. MANHOLE COVERS AND FRAMES IN PUBLICLY ACCESSIBLE AREAS SHALL BE HEAVY DUTY CAST IRON, CLASS D400, DOUBLE SEALED AND LOCKABLE TYPE COMPLYING WITH BS EN 124-2:2015.
11. GULLY GRATINGS & FRAMES SHALL COMPLY WITH BS EN 124-2 2015.
12. EXISTING INVERT LEVELS TO BE VERIFIED ON SITE BEFORE COMMENCING CONSTRUCTION.
13. SURFACE WATER & FOUL SEWER PIPES LESS THAN 1.2m BELOW THE ROAD SURFACE OR LESS THAN 0.9m IN NON-TRAFFICKED FOOTPATHS AND LANDSCAPE AREAS (WITH AN ABSOLUTE MINIMUM DEPTH OF COVER ABOVE THE EXTERNAL CROWN OF THE PIPE Ø700mm) SHALL BE PROTECTED FROM DAMAGE BY PROVIDING MINIMUM 150mm THICK CONCRETE C19/20 HAUNCH IN ACCORDANCE WITH IS EN 12620.
14. ATTENUATION PROPOSALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY.
15. RAINWATER BUTTS TO BE INSTALLED AT THE BACK OF EACH PROPOSED DWELLING.
16. CCTV SURVEY TO BE CONDUCTED PRIOR TO COMMENCEMENT OF ANY WORKS TO DETERMINE THE CONDITION AND VERIFY LEVELS OF THE EXISTING FOUL AND SURFACE WATER PIPES/ MANHOLES. ANY SUB-STANDARD OR DEFECTIVE ELEMENTS OF THE EXISTING PIPES/MANHOLES TO BE REPORTED AND CORRECTED.
17. ALL SURFACE WATER DRAINAGE DETAILS TO BE IN ACCORDANCE WITH THE GREATER DUBLIN STRATEGIC DRAINAGE STUDY AND THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS.
18. ALL FOUL WATER DETAILS TO BE IN ACCORDANCE WITH THE IRISH WATER INFRASTRUCTURE STANDARD DETAILS AND CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE.
19. PROPOSED PIPEWORKS WITH COVER TO GROUND BETWEEN 750mm AND 1.2m TO BE CONCRETE SURROUNDED.
20. FOR PROPOSED SUDS SYSTEMS LAYOUT PLEASE REFER TO DRAWING 60659192-ACM-01-00-DR-CE-10-0520.

AECOM PLANNING

ISSUE/REVISION

I/R	DATE	DESCRIPTION
1	14.04.2023	RFI RESPONSE
0	19.08.2022	PLANNING ISSUE

PROJECT NUMBER
60659192

SHEET TITLE
PROPOSED DRAINAGE LAYOUT

SHEET NUMBER
60659192-ACM-01-00-DR-CE-10-0501

ISO A1 594mm x 841mm
Approved: LS
Checked: JC
Drawn By: KM
Project Management Initials:
Last saved by: JAMIE.CULLEN(2023-02-22) Last Plotted: 2023-04-14
Filename: \\NA.AECOMNET.COM\IRSHEMEA\DUBLIN-EDBL2\LEGACY\EDBL2FP001\DATA\DCS\PROJECTS\C\60659192_STONEYHILL\IW90_CAD_GIS\604_CE\01_WIP\02_SHEETS\60659192-ACM-01-00-DR-CE-10-0501.DWG
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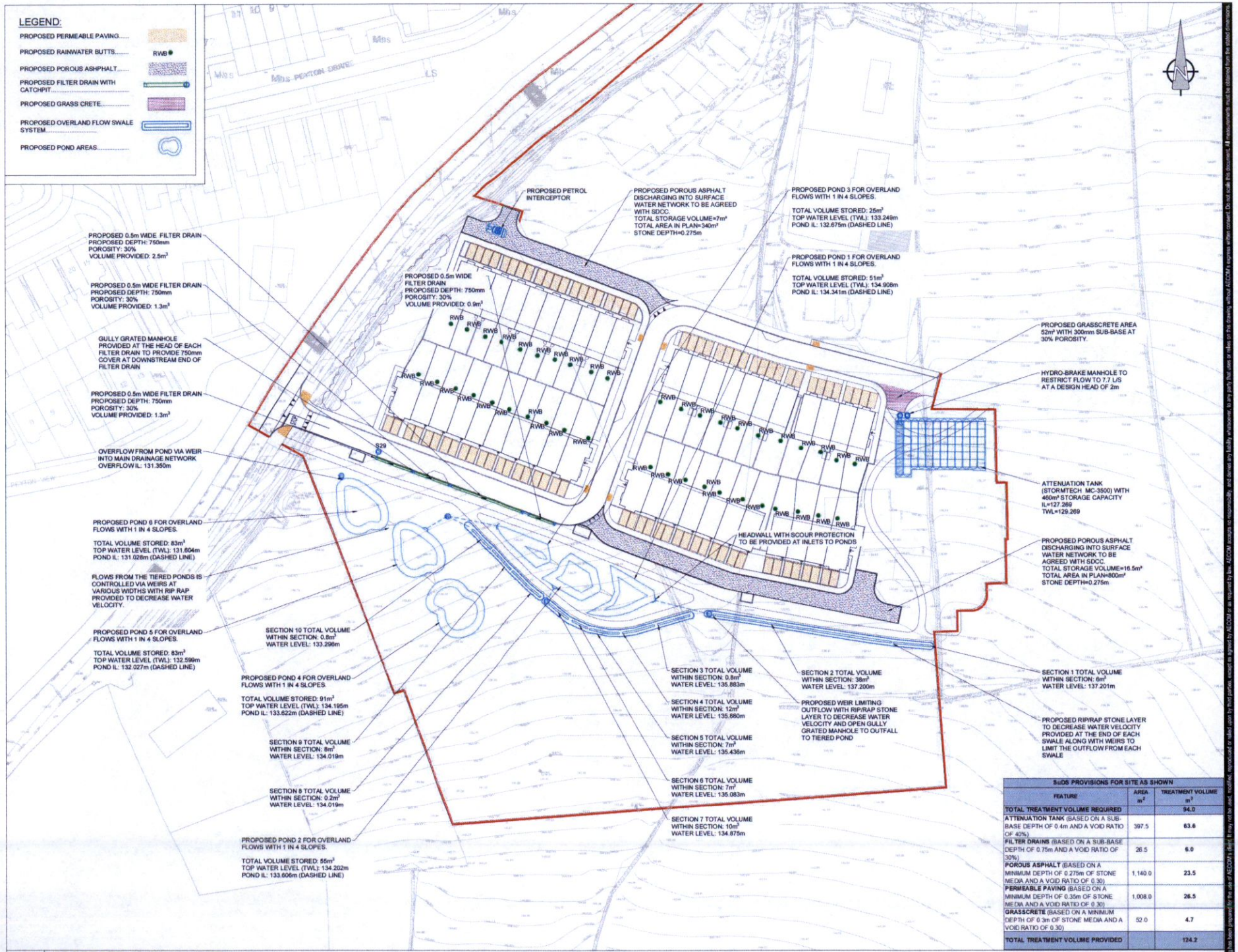

SuDS PROVISIONS FOR SITE AS SHOWN

FEATURE	AREA m²	TREATMENT VOLUME m³
TOTAL TREATMENT VOLUME REQUIRED		**94.0**
ATTENUATION TANK (BASED ON A SUB-BASE DEPTH OF 0.4m AND A VOID RATIO OF 40%)	397.5	**63.6**
FILTER DRAINS (BASED ON A SUB-BASE DEPTH OF 0.75m AND A VOID RATIO OF 30%)	26.5	**6.0**
POROUS ASPHALT (BASED ON A MINIMUM DEPTH OF 0.275m OF STONE MEDIA AND A VOID RATIO OF 0.30)	1,140.0	**23.5**
PERMEABLE PAVING (BASED ON A MINIMUM DEPTH OF 0.35m OF STONE MEDIA AND A VOID RATIO OF 0.30)	1,008.0	**26.5**
GRASSCRETE (BASED ON A MINIMUM DEPTH OF 0.3m OF STONE MEDIA AND A VOID RATIO OF 0.30)	52.0	**4.7**
TOTAL TREATMENT VOLUME PROVIDED		**124.2**

A **PROPOSED SUDS LAYOUT**

0520 Scale: 1:500

AECOM

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT AT LANDS AT STONEY HILL ROAD, RATHCOOLE, Co. DUBLIN

CLIENT
ROMEVILLE DEVELOPMENTS LTD.

CONSULTANT
AECOM
4th Floor Adelphi Plaza,
George's Street Upper,
Dun Laoghaire,
Co Dublin
Tel:+353 (0)1 696 6220
www.aecom.com

NOTES
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS, ANY DISCREPANCIES, ERRORS OR OMISSIONS TO BE BROUGHT TO THE ATTENTION OF THE DESIGNER.
2. ALL DIMENSIONS TO BE CHECKED BY THE CONTRACTOR ON SITE PRIOR TO COMMENCEMENT OF WORKS.
3. AECOM LIMITED TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF WORKS ON SITE.
4. DIMENSIONS OF ALL BOUNDARIES AND ADJOINING ROADS TO BE CHECKED ON SITE PRIOR TO COMMENCEMENT OF WORKS.
5. DO NOT SCALE. ALL MEASUREMENTS AND COORDINATES TO BE CHECKED ON SITE.
6. THE LOCATION & DEPTH OF SERVICES TO BE CHECKED ON SITE PRIOR TO COMMENCING ANY WORKS.
7. MANHOLE COVERS AND FRAMES IN PUBLICLY ACCESSIBLE AREAS SHALL BE HEAVY DUTY CAST IRON, CLASS D400, DOUBLE SEALED AND LOCKABLE TYPE COMPLYING WITH BS EN 124-2:2015.
8. SURFACE WATER & FOUL SEWER PIPES LESS THAN 1.2m BELOW THE ROAD SURFACE OR LESS THAN 0.9m IN NON-TRAFFICKED FOOTPATHS AND LANDSCAPE AREAS (WITH AN ABSOLUTE MINIMUM DEPTH OF COVER ABOVE THE EXTERNAL CROWN OF THE PIPE Ø750mm) SHALL BE PROTECTED FROM DAMAGE BY PROVIDING MINIMUM 150mm THICK CONCRETE C16/20 HAUNCH IN ACCORDANCE WITH IS EN 1290.
9. ATTENUATION PROPOSALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY.
10. ALL SURFACE WATER DRAINAGE DETAILS TO BE IN ACCORDANCE WITH THE GREATER DUBLIN STRATEGIC DRAINAGE STUDY AND THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS.
11. RAINWATER BUTTS TO BE INSTALLED AT THE BACK OF EACH PROPOSED DWELLING.
12. PROPOSED SUDS SYSTEMS HAVE BEEN DESIGNED IN ACCORDANCE WITH C753, C768 AND SOUTH DUBLIN COUNTY COUNCIL'S SUDS CHECKLIST.
13. DRAWING TO BE READ IN CONJUCTION WITH AECOM LANDSCAPE ARCHITECT DRAWINGS.
14. DRAWING TO BE READ IN CONJUNCTION WITH AECOM DRAINAGE DRAWINGS 60659192-ACM-01-00-DR-CE-10-0501
15. FOR DETAILS OF PROPOSED SUDS SYSTEMS PLEASE REFER TO AECOM DRAWING 60659192-ACM-01-00-DR-CE-10-0521

AECOM
PLANNING

ISSUE/REVISION

I/R	DATE	DESCRIPTION
1	14.04.2023	RFI REPONSE
0	19.08.2022	PLANNING ISSUE

PROJECT NUMBER
60659192

SHEET TITLE
PROPOSED SUDS LAYOUT

SHEET NUMBER
60659192-ACM-01-00-DR-CE-10-0520

ISO A1 594mm x 841mm
Approved: LS
Checked: JC
Project Management Initials: Drawn By: KM
Last saved by: JAMIE.GULLEN (2023-02-22) Last Plotted: 2023-04-14
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Enviroguide CONSULTING

Appendix B

IGSL Limited

AECOM

Rathcoole Residential

Geotechnical Report

Report No. 24101

June 2022

Report

M7 Business Park
Naas
Co. Kildare
Ireland

T: +353 (45) 846176
E: info @igsl.ie
W: www.igsl.ie

Project: Rathcoole Residential

Project No. 24101

Revision	Date	Title		
Rev 0	06/2022	Ground Investigation Report		
	Copies	Document Format	Prepared By	Reviewed By
		PDF	Brian Green Chartered Engineer	David Green Chartered Engineer
	To	Aecom		
Revision	**Date**	**Title**		
Rev 1				
	Copies	Document Format	Prepared By	Reviewed By
	To			
Revision	**Date**	**Title**		
	Copies	Document Format	Prepared By	Reviewed By
	To			
Revision	**Date**	**Title**		
	Copies	Document Format	Prepared By	Reviewed By
	To			

TABLE OF CONTENTS

FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930 (1999), BS 1377 (Parts 1 to 9) and Engineers Ireland Specification & Related Documents for Ground Investigation in Ireland (2006). A new National Annex for use in the Republic of Ireland is currently in circulation for comment and will be adopted in the near future. In the meantime, the following Irish (IS) and European Standards or Norms are referenced:

- IS EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- IS EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- IS EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- IS EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- IS EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

Reporting

Recommendations made and opinions expressed in this report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points.

This report has been prepared for AECOM Consulting Engineers and the information should not be used without prior written permission. The recommendations developed in this report specifically relate to the proposed development. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

In-Situ Testing

Standard penetration tests were conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Groundwater
The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging
Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Retention of Samples
Samples shall be retained for a period of 60 days following approval of the final factual report, as detailed in the Scope of Works.

1.0 Introduction

Prior to the commencement of the Stoney Hill Phase 1 Residential Scheme, information was required regarding the general sub-soil conditions and, more specifically, factors relating to pavement design and soil infiltration. This report contains the results of the fieldworks as specified by the consulting engineers. No interpretation of this information was required.

The fieldworks entailed the following elements.

* Trial pits were excavated in six locations to ascertain the sub-soil stratification at the infiltration test locations.

* Infiltration tests were performed at the selected locations.

* Plate Bearing Tests were performed at an additional six locational

2.0 Ground Conditions

2.1 Trial Pits

Trial pits were excavated in six locations as shown on the site plan enclosed in Appendix 4 while the descriptions and depths of the various soils encountered are shown on the trial pit records enclosed in Appendix 1.

TP01, TP02 and TP03 were excavated to a depth of 0.5 metres to provide an indication of the sub-soil conditions in areas where the use of permeable pavement is being considered. These pits revealed made ground overlying firm brown sandy gravelly clay in which the pits were terminated.

TP04, TP05 and TP06 were excavated to the proposed soakaway depth of 2.0 metres.

TP04 revealed firm to stiff brown gravelly clay, becoming stiff from 1.10 metres to the terminal depth of 2.0 metres.

TP05 and TP06 encountered firm white/grey friable clay from 1.2 metres to 2.0 metres.

All pits remained dry during the course of excavation operations.

2.2 Infiltration Tests

The infiltration tests were performed in accordance with BRE Digest 365 'Soakaway Design'.

To obtain a measure of the infiltration rate of the sub-soils, water is poured into the test pit, and records taken of the fall in water level against time. This procedure is repeated twice more to ensure saturation of the sub-soils. Normally the results for the final stage of testing, following the saturation periods, are used for soakaway design purposes. The

infiltration rate is the volume of water dispersed per unit exposed area per unit of time, and is generally expressed as metres/minute or metres/second.

The records for the monitored stages, following the initial saturation stages, are enclosed in Appendix 2. The results are summarised in Table1. The infiltration rates are very low, with no measurable infiltration in IFT02.

Location	Infiltration f-value (m/min)
IFT01	0.00022
IFT02	0.000000
IFT03	0.00008
IFT04	0.000091
IFT05	0.00015
IFT06	0.00012

Table 1

2.3 Plate Bearing Tests

Plate bearing tests were performed in six locations to obtain a measure of the CBR values. A 450 mm diameter plate was used, and the test was performed at a depth of 0.35 metres below existing ground level. The test was performed in accordance with BS 1377 Part 9: 1990. "In-situ Tests". The incremental loading test (4.1.6.4.2) was used.

The maximum applied load was estimated on the basis of obtaining an accumulative displacement of at least 1.25 mm. The load was then applied in five approximately equal increments to the design load. To measure recovery the load was removed in three increments. A second phase of loading and unloading was performed to assess the benefits of further compaction.

The settlement under each increment was measured against time until movement had effectively ceased and the results are presented as graphs of applied pressure against settlement. Calculation of Modulus of Sub-grade Reaction (k) and CBR values are in accordance with NRA HD25-26/10 Volume7: Pavement Design and Maintenance.

The test records from the initial and reload stages are presented in Table 2

Location	Depth (m bgl)	CBR %	
		First Cycle	Second Cycle
PT01	0.35	3.0	5.1
PT02	0.35	2.9	6.2
PT03	0.35	8.0	13.9
PT04	0.35	0.7	0.7
PT05	0.35	2.0	3.5
PT06	0.35	2.4	3.3

Table 2

Appendix 1 Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 24101

CONTRACT	Rathcoole housing scheme	TRIAL PIT NO.	TP01
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	CO-ORDINATES	
		DATE STARTED	28/05/2022
		DATE COMPLETED	28/05/2022
CLIENT	Stanley Developments	GROUND LEVEL (m)	
ENGINEER	Aecom	EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 MADE GROUND - Firm to stiff brown gravelly clay with abundant waster material									
Firm to stiff brown gravelly CLAY.		0.40							
End of Trial Pit at 0.50m		0.50							

1.0
2.0
3.0
4.0

Groundwater Conditions
DRY

Stability
Stable

General Remarks
CAT Scanned location for services.

IGSL TP LOG 24101.GPJ IGSL.GDT 1/6/22

TRIAL PIT RECORD

REPORT NUMBER 24101

CONTRACT	Rathcoole housing scheme	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	
		DATE STARTED	28/05/2022
		DATE COMPLETED	28/05/2022
CLIENT	Stanley Developments	**GROUND LEVEL (m)**	
ENGINEER	Aecom	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20							
Firm brown slightly sandy gravelly CLAY with low cobble content.		0.60							
End of Trial Pit at 0.60m									
1.0									
2.0									
3.0									
4.0									

Groundwater Conditions
DRY

Stability
Stable

General Remarks
CAT Scanned location for services.

TRIAL PIT RECORD

REPORT NUMBER 24101

CONTRACT	Rathcoole housing scheme	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	
		DATE STARTED	28/05/2022
		DATE COMPLETED	28/05/2022
CLIENT	Stanley Developments	**GROUND LEVEL (m)**	
ENGINEER	Aecom	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20							
Firm brown slightly sandy gravelly CLAY with low cobble content.		0.50							
End of Trial Pit at 0.50m									

1.0 2.0 3.0 4.0

Groundwater Conditions
DRY

Stability
Stable

General Remarks
CAT Scanned location for services.

IGSL TP LOG 24101.GPJ IGSL.GDT 1/6/22

TRIAL PIT RECORD

REPORT NUMBER 24101

CONTRACT	Rathcoole housing scheme	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	
		DATE STARTED	28/05/2022
		DATE COMPLETED	28/05/2022
CLIENT	Stanley Developments	**GROUND LEVEL (m)**	
ENGINEER	Aecom	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.10							
Firm brown slightly sandy gravelly CLAY		0.40							
Firm to stiff brown gravelly CLAY with low cobble content.		1.10							
1.0 Stiff brown very gravelly CLAY with medium cobble content.		2.00							
2.0 End of Trial Pit at 2.00m									
3.0									
4.0									

Groundwater Conditions
DRY

Stability
Stable

General Remarks
CAT Scanned location for services.

IGSL TP LOG 24101.GPJ IGSL.GDT 1/6/22

TRIAL PIT RECORD

REPORT NUMBER 24101

CONTRACT	Rathcoole housing scheme	TRIAL PIT NO.	TP05
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	CO-ORDINATES	
		DATE STARTED	28/05/2022
		DATE COMPLETED	28/05/2022
CLIENT	Stanley Developments	GROUND LEVEL (m)	
ENGINEER	Aecom	EXCAVATION METHOD	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.10							
Firm brown slightly sandy gravelly CLAY with low cobble content.		0.60							
Firm to stiff brown gravelly CLAY with low cobble content.		1.20							
Firm whiteish grey CLAY.		1.90							
End of Trial Pit at 1.90m									

1.0
2.0
3.0
4.0

Groundwater Conditions
DRY

Stability
Stable

General Remarks
CAT Scanned location for services.

IGSL TP LOG 24101.GPJ IGSL.GDT 1/6/22

TRIAL PIT RECORD

REPORT NUMBER 24101

CONTRACT	Rathcoole housing scheme	**TRIAL PIT NO.**	**TP06**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	
		DATE STARTED	28/05/2022
		DATE COMPLETED	28/05/2022
CLIENT	Stanley Developments	**GROUND LEVEL (m)**	
ENGINEER	Aecom	**EXCAVATION METHOD**	JCB

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.10							
Firm brown slightly sandy gravelly CLAY with low cobble content.		0.60							
Firm to stiff brown gravelly CLAY with low cobble content.		1.20							
Firm whiteish grey slightly gravelly CLAY (crumbles into white powder)					AA118026	B	1.50-2.00		
End of Trial Pit at 2.00m		2.00							

1.0 2.0 3.0 4.0

Groundwater Conditions
DRY

Stability
Stable

General Remarks
CAT Scanned location for services.

IGSL TP LOG 24101.GPJ IGSL.GDT 1/6/22

Appendix 2 Infiltration Test Results

Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathcoole Housing Contract No. 24101
Test No. IFT1
Client Stanley Developments
Date: 28/05/2022

Summary of ground conditions

from	to	Description	Ground water
0.00	0.40	MADE GROUND - Firm to stiff brown gravelly clay with abundant waster material	None encountered
		(timber, rope, metal and plastic).	
0.40	0.50	Firm to stiff brown gravelly CLAY.	

Notes:

Field Data

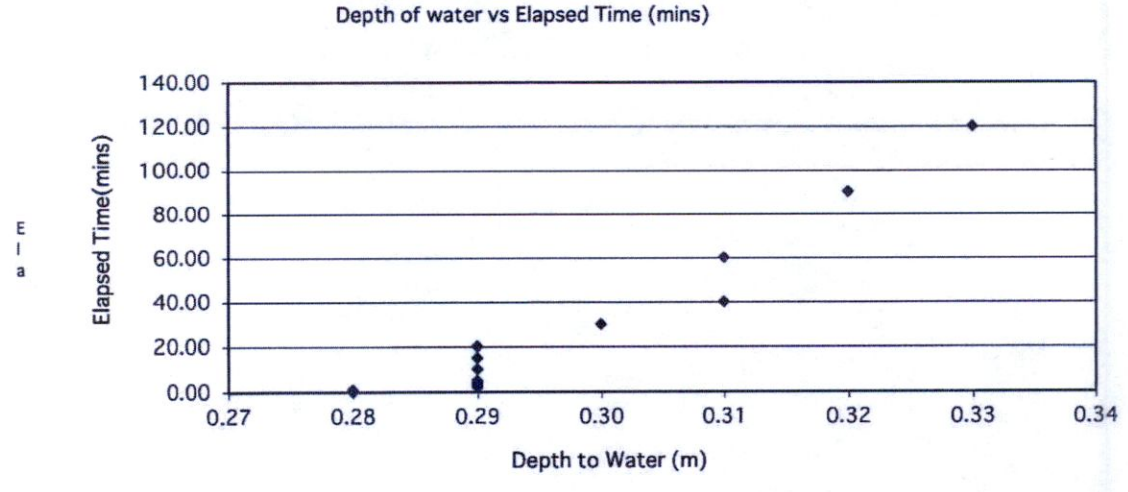
Depth to Water (m)	Elapsed Time (min)
0.28	0.00
0.28	1.00
0.29	2.00
0.29	3.00
0.29	4.00
0.29	5.00
0.29	10.00
0.29	15.00
0.29	20.00
0.30	30.00
0.31	40.00
0.31	60.00
0.32	90.00
0.33	120.00

Field Test

Depth of Pit (D)	0.50	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	0.28	m
Final depth to water =	0.33	m
Elapsed time (mins)=	120.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	0.819	m2
Total Exposed area =	1.719	m2

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

f= 0.00022 m/min or 3.63583E-06 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathcoole Housing Contract No. 24101
Test No. IFT2
Client Stanley Developments
Date: 28/05/2022

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	None encountered
0.20	0.60	Firm brown slightly sandy gravelly CLAY with low cobble content.	

Notes:

Field Data

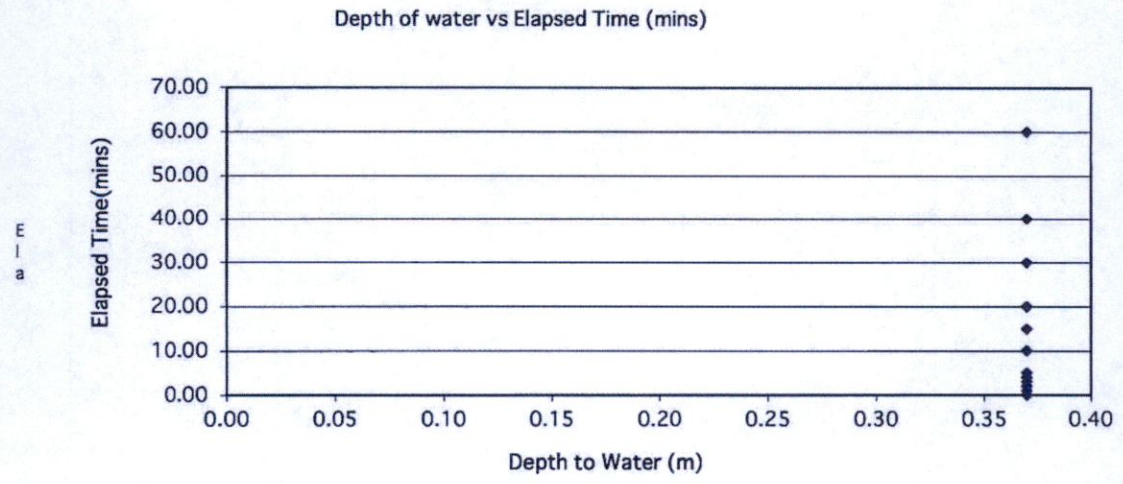
Depth to Water (m)	Elapsed Time (min)
0.37	0.00
0.37	1.00
0.37	2.00
0.37	3.00
0.37	4.00
0.37	5.00
0.37	10.00
0.37	15.00
0.37	20.00
0.37	30.00
0.37	40.00
0.37	60.00

Field Test

Depth of Pit (D)	0.60	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.80	m
Initial depth to Water =	0.37	m
Final depth to water =	0.37	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.72	m2
*Av. side area of permeable stratum over test period=	1.012	m2
Total Exposed area =	1.732	m2

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

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathcoole Housing Contract No. 24101
Test No. IFT3
Client Stanley Developments
Date: 28/05/2022

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	None encountered
0.20	0.50	Firm brown slightly sandy gravelly CLAY with low cobble content.	

Notes:

Field Data

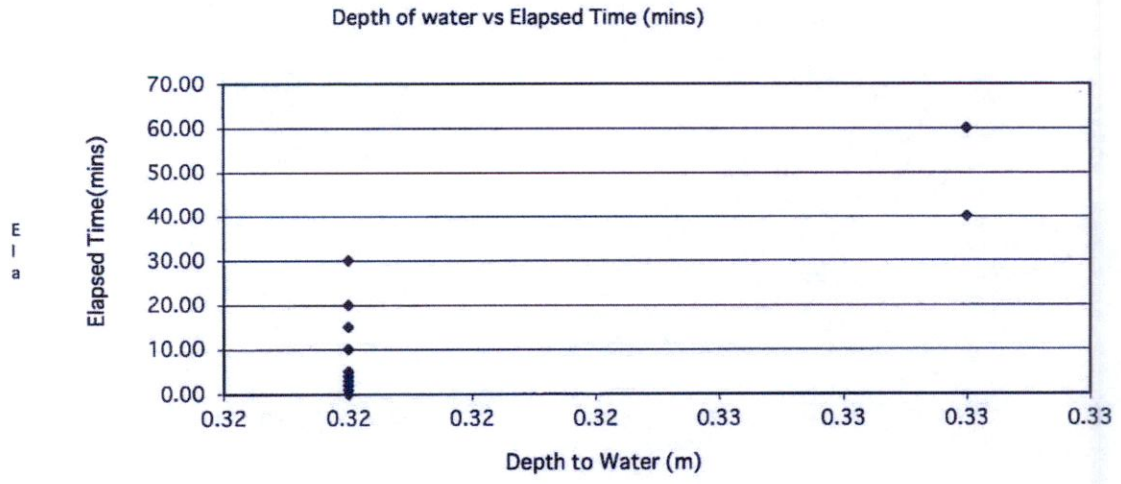
Depth to Water (m)	Elapsed Time (min)
0.32	0.00
0.32	1.00
0.32	2.00
0.32	3.00
0.32	4.00
0.32	5.00
0.32	10.00
0.32	15.00
0.32	20.00
0.32	30.00
0.33	40.00
0.33	60.00

Field Test

Depth of Pit (D)	0.50	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.70	m
Initial depth to Water =	0.32	m
Final depth to water =	0.33	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.68	m2
*Av. side area of permeable stratum over test period=	0.735	m2
Total Exposed area =	1.415	m2

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

f= 8E-05 m/min or 1.3349E-06 m/sec



Soakaway Design f -value from field tests

(F2C) IGSL

Contract: Rathcoole Housing
Contract No. 24101
Test No. IFT4
Client Stanley Developments
Date: 28/05/2022

Summary of ground conditions

from	to	Description	Ground water
0.00	0.10	TOPSOIL	None encountered
0.10	0.40	Firm brown slightly sandy gravelly CLAY	
0.40	1.10	Firm to stiff brown gravelly CLAY. (slightly unstable)	
1.10	2.00	Stiff brown very gravelly CLAY with medium cobble content	

Notes:

Field Data

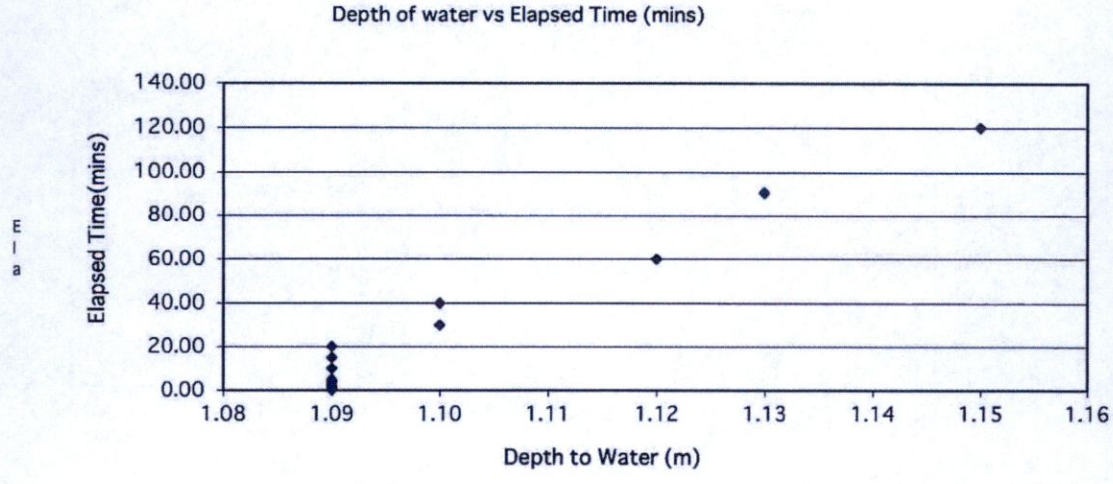
Depth to Water (m)	Elapsed Time (min)
1.09	0.00
1.09	1.00
1.09	2.00
1.09	3.00
1.09	4.00
1.09	5.00
1.09	10.00
1.09	15.00
1.09	20.00
1.10	30.00
1.10	40.00
1.12	60.00
1.13	90.00
1.15	120.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.80	m
Initial depth to Water =	1.09	m
Final depth to water =	1.15	m
Elapsed time (mins)=	120.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	4.048	m2
Total Exposed area =	4.948	m2

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

f= 9.1E-05 m/min or 1.51576E-06 m/sec



Soakaway Design f -value from field tests

(F2C) IGSL

Contract: Rathcoole Housing
Contract No. 24101
Test No. IFT5
Client Stanley Developments
Date: 28/05/2022

Summary of ground conditions

from	to	Description	Ground water
0.00	0.10	TOPSOIL	None encountered
0.10	0.60	Firm brown slightly sandy gravelly CLAY with low cobble content.	
0.60	1.20	Firm to stiff brown gravelly CLAY with low cobble content.	
1.20	1.90	Firm whiteish grey CLAY.	

Notes:

Field Data

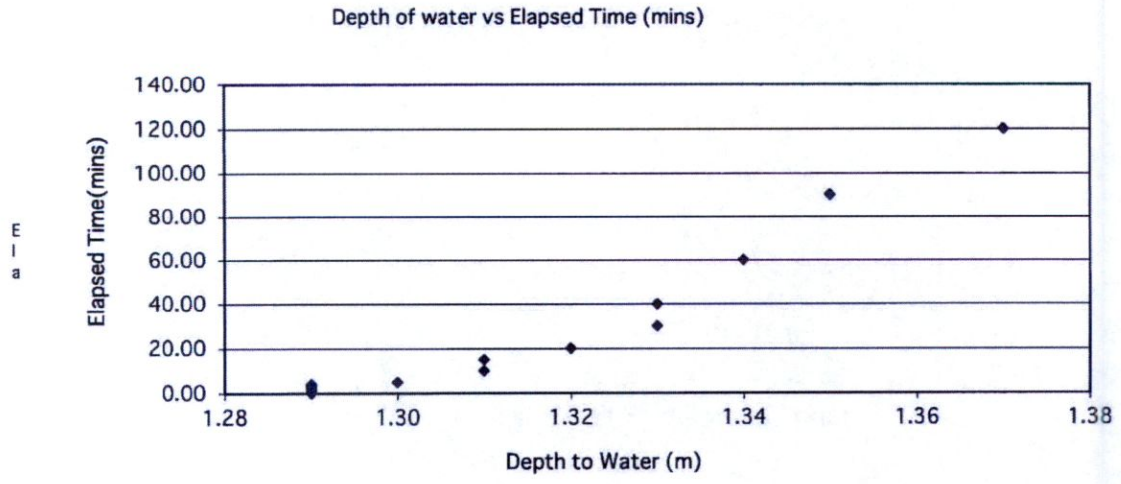
Depth to Water (m)	Elapsed Time (min)
1.29	0.00
1.29	1.00
1.29	2.00
1.29	3.00
1.29	4.00
1.30	5.00
1.31	10.00
1.31	15.00
1.32	20.00
1.33	30.00
1.33	40.00
1.34	60.00
1.35	90.00
1.37	120.00

Field Test

Depth of Pit (D)	1.90	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.70	m
Initial depth to Water =	1.29	m
Final depth to water =	1.37	m
Elapsed time (mins)=	120.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.68	m2
*Av. side area of permeable stratum over test period=	2.394	m2
Total Exposed area =	3.074	m2

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

f= 0.00015 m/min or 2.45789E-06 m/sec



Soakaway Design f -value from field tests (F2C) IGSL

Contract: Rathcoole Housing Contract No. 24101
Test No. IFT6
Client Stanley Developments
Date: 28/05/2022

Summary of ground conditions

from	to	Description	Ground water
0.00	0.10	TOPSOIL	None encountered
0.10	0.60	Firm brown slightly sandy gravelly CLAY with low cobble content.	
0.60	1.20	Firm to stiff brown gravelly CLAY with low cobble content.	
1.20	2.00	Firm whiteish grey CLAY (crumbles into white powder, sample at 1.5-2 m AA118026)	

Notes:

Field Data

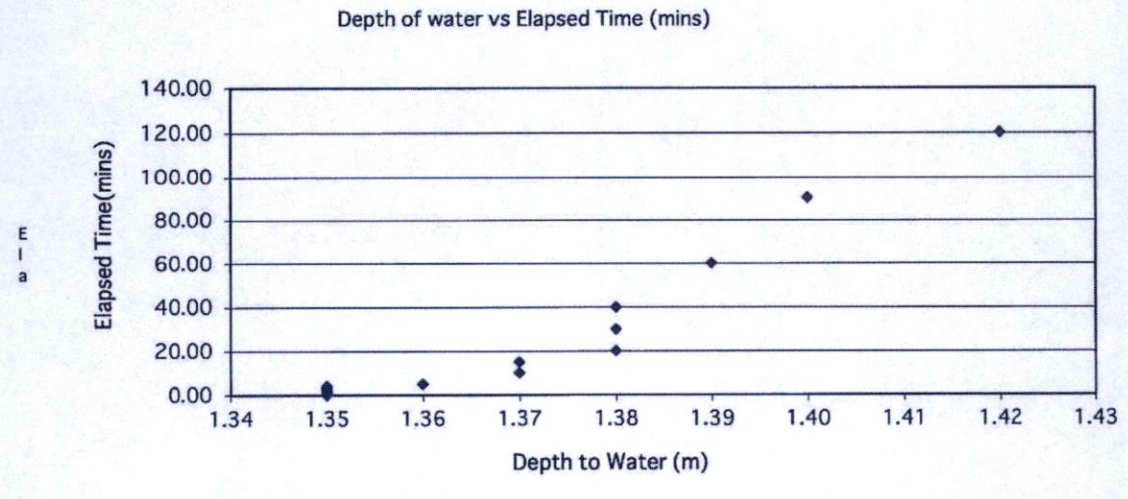
Depth to Water (m)	Elapsed Time (min)
1.35	0.00
1.35	1.00
1.35	2.00
1.35	3.00
1.35	4.00
1.36	5.00
1.37	10.00
1.37	15.00
1.38	20.00
1.38	30.00
1.38	40.00
1.39	60.00
1.40	90.00
1.42	120.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.40	m
Length of Pit (L)	1.70	m
Initial depth to Water =	1.35	m
Final depth to water =	1.42	m
Elapsed time (mins)=	120.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.68	m2
*Av. side area of permeable stratum over test period=	2.583	m2
Total Exposed area =	3.263	m2

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

f= 0.00012 m/min or 2.02608E-06 m/sec



Appendix 3 Plate Bearing Test Results

PLATE TEST REPORT SHEET (F3.1)

Reference No.	R134809
Contract	Rathcoole housing scheme
Test No.	PT1 Load
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

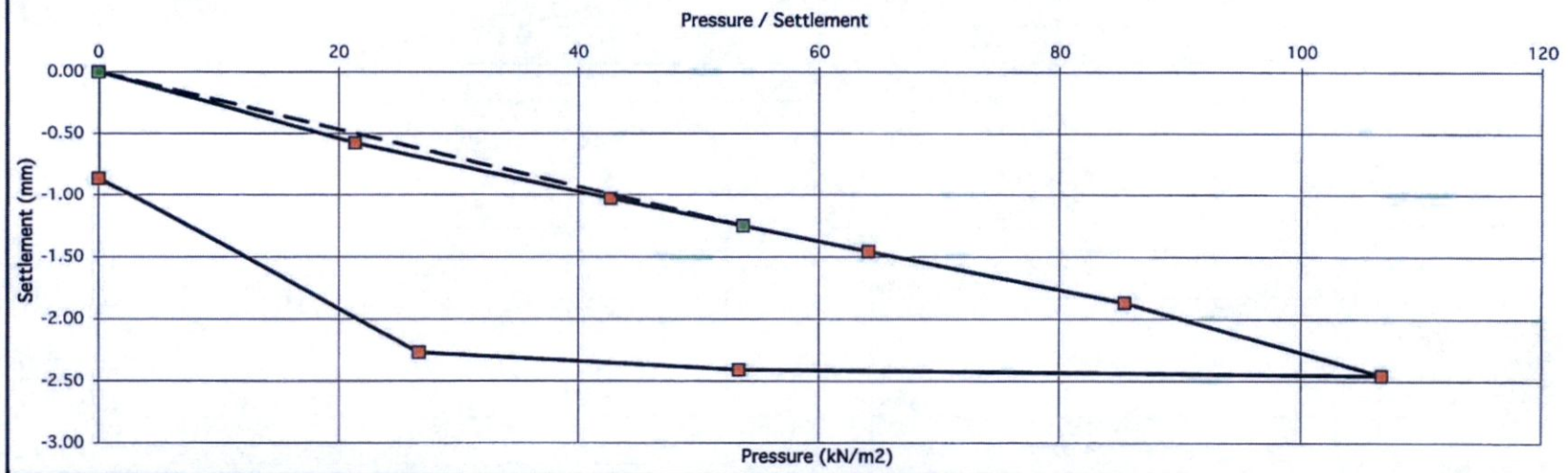
Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl

Applied Pressure/Settlement Curve



Gradient at 1.25 mm settlement intersection = 43
Modulus of subgrade reaction = 28 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.0 %

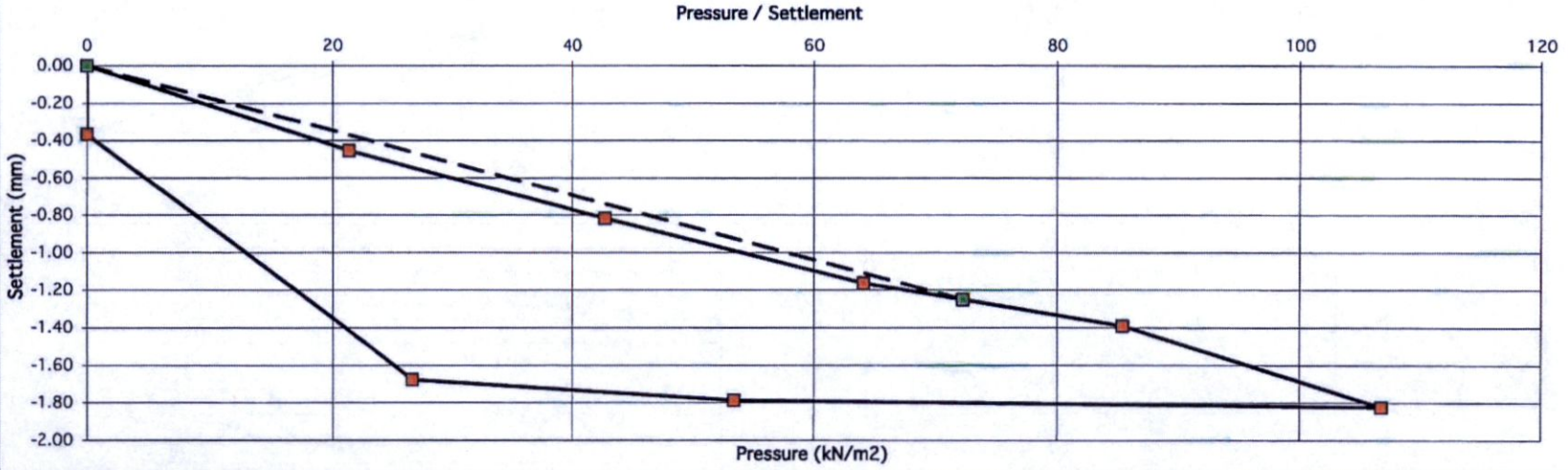
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R134809
Contract	Rathcoole housing scheme
Test No.	PT1 Reload
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)
Brown gravelly clay

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 58
Modulus of subgrade reaction = 37 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 5.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

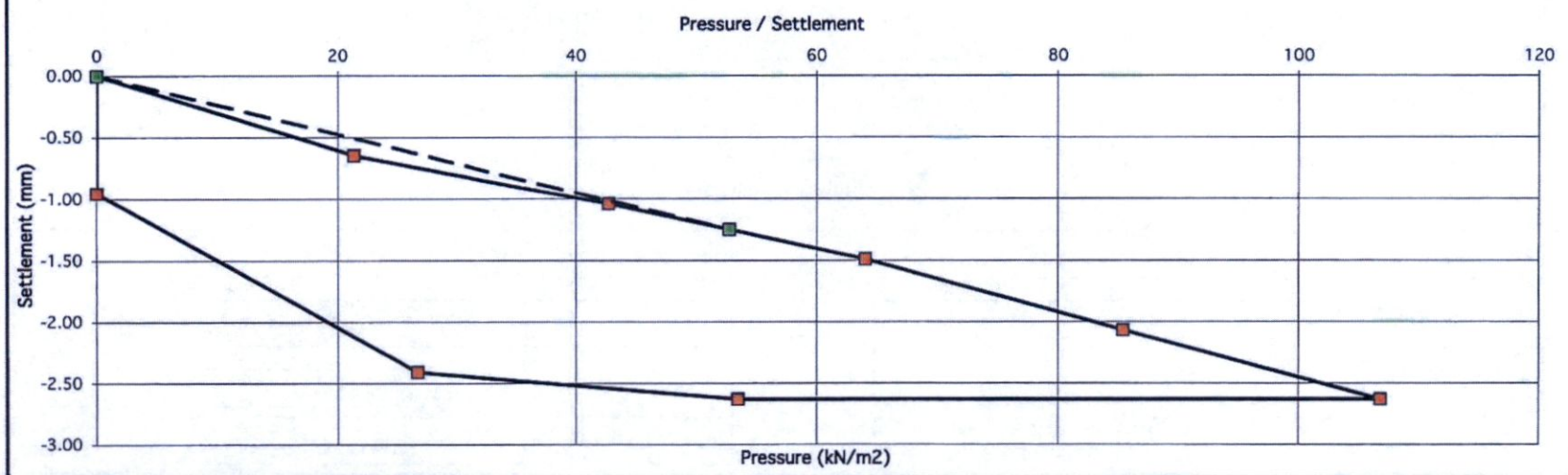
Reference No.	R134810
Contract	Rathcoole housing scheme
Test No.	PT2 Load
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 42
Modulus of subgrade reaction = 27 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.9 %

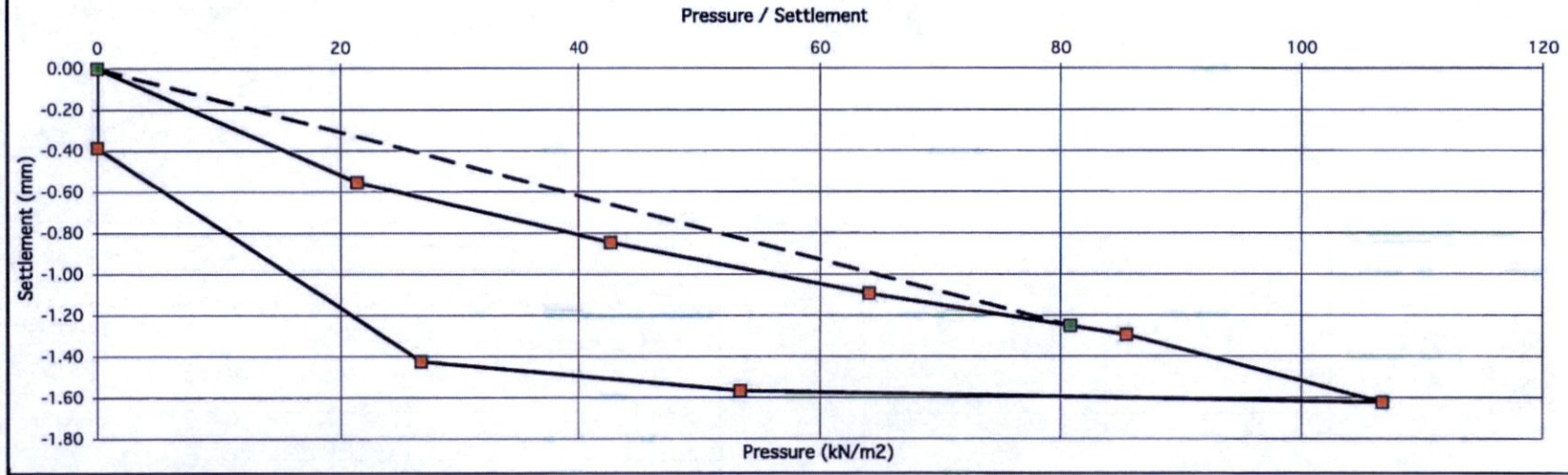
PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

Reference No.	R134810
Contract	Rathcoole housing scheme
Test No.	PT2 Reload
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)
Brown gravelly clay

Sample Ref No. N/A
Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 65
Modulus of subgrade reaction = 42 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 6.2 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

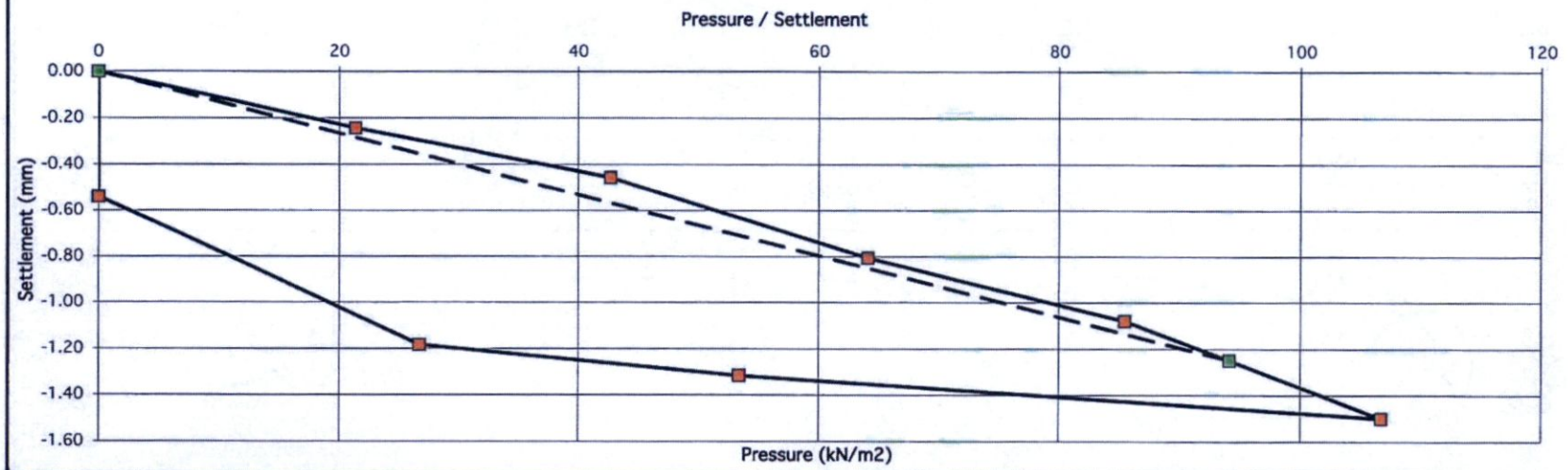
Reference No.	R134811
Contract	Rathcoole housing scheme
Test No.	PT3 Load
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test (natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 75

Modulus of subgrade reaction = 48 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 8.0 %

PLATE TEST REPORT SHEET (F3.1)

Reference No.	R134811
Contract	Rathcoole housing scheme
Test No.	PT3 Reload
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

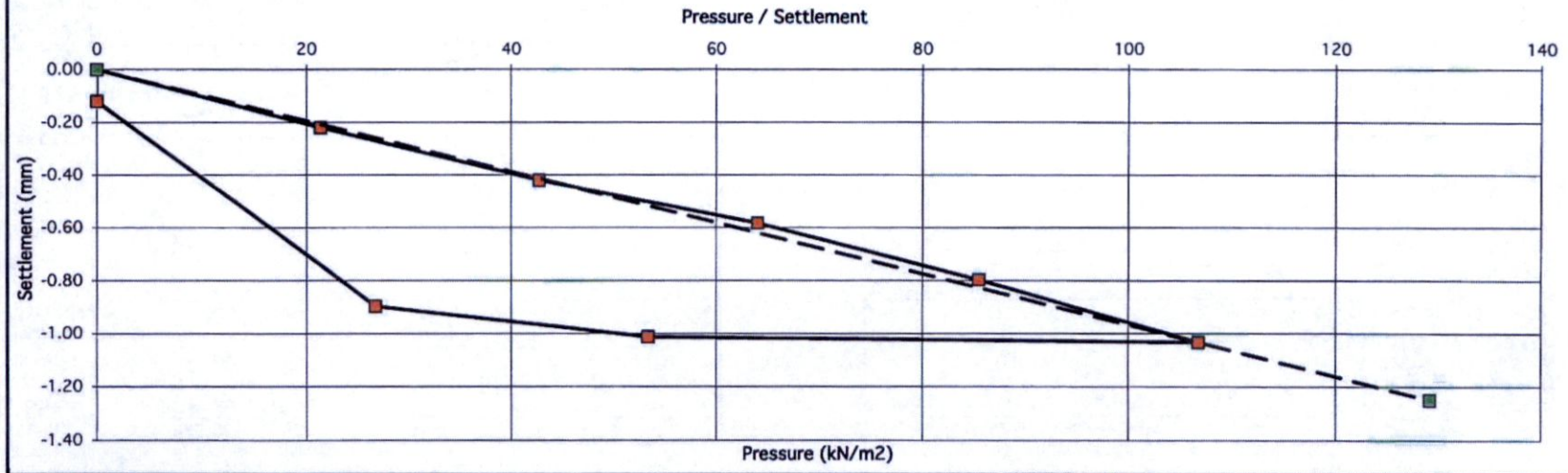
Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 103
Modulus of subgrade reaction = 66 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 13.9 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

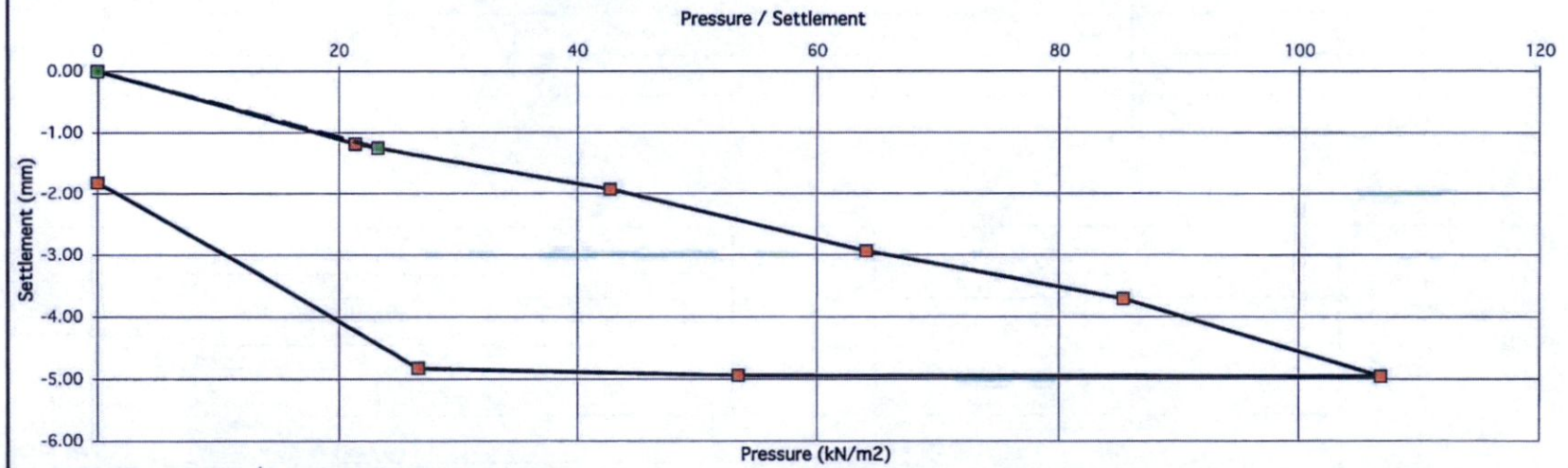
Reference No.	R134812
Contract	Rathcoole housing scheme
Test No.	PT4 Load
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 19
Modulus of subgrade reaction = 12 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

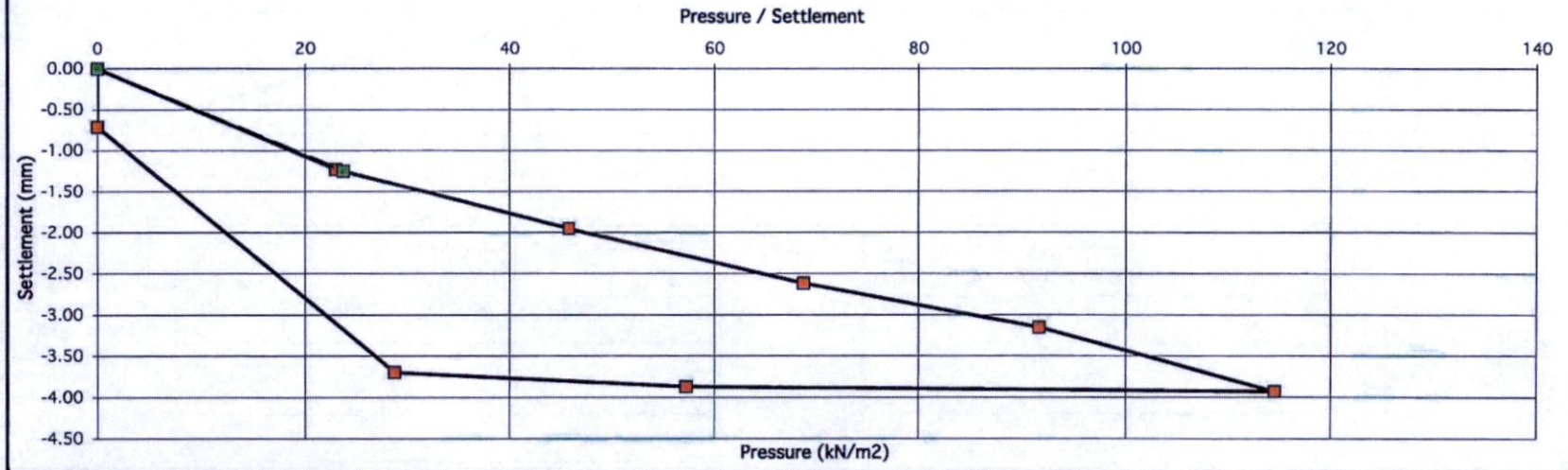
Reference No.	R134812
Contract	Rathcoole housing scheme
Test No.	PT4 Reload
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 19
Modulus of subgrade reaction = 12 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.7 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

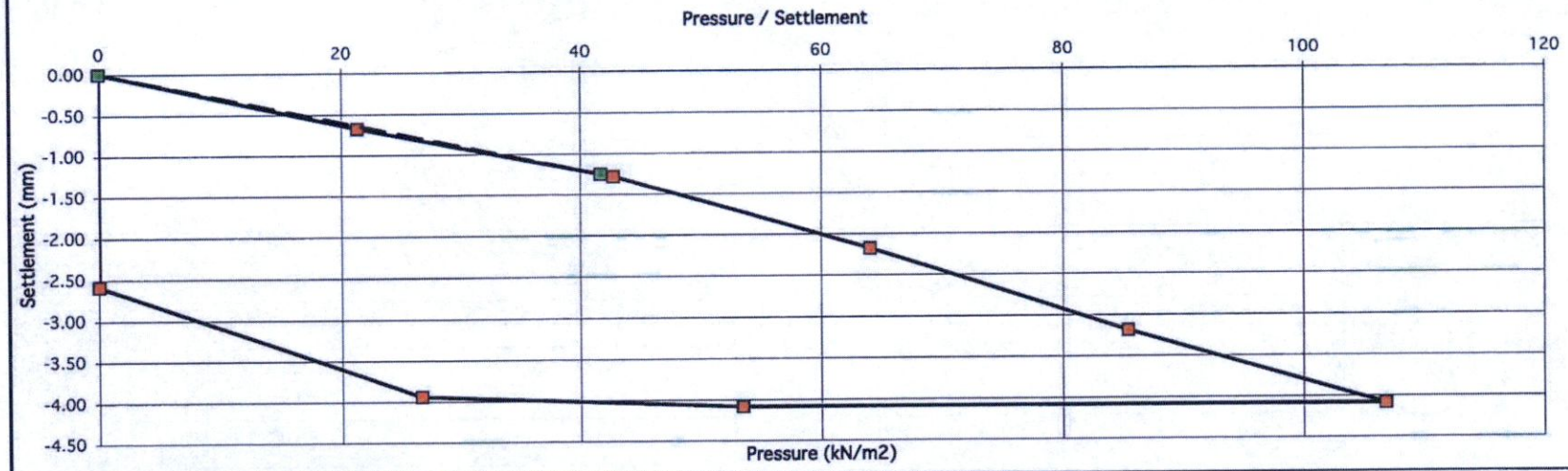
Reference No.	R134813
Contract	Rathcoole housing scheme
Test No.	PT5 Load
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 33
Modulus of subgrade reaction = 21 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

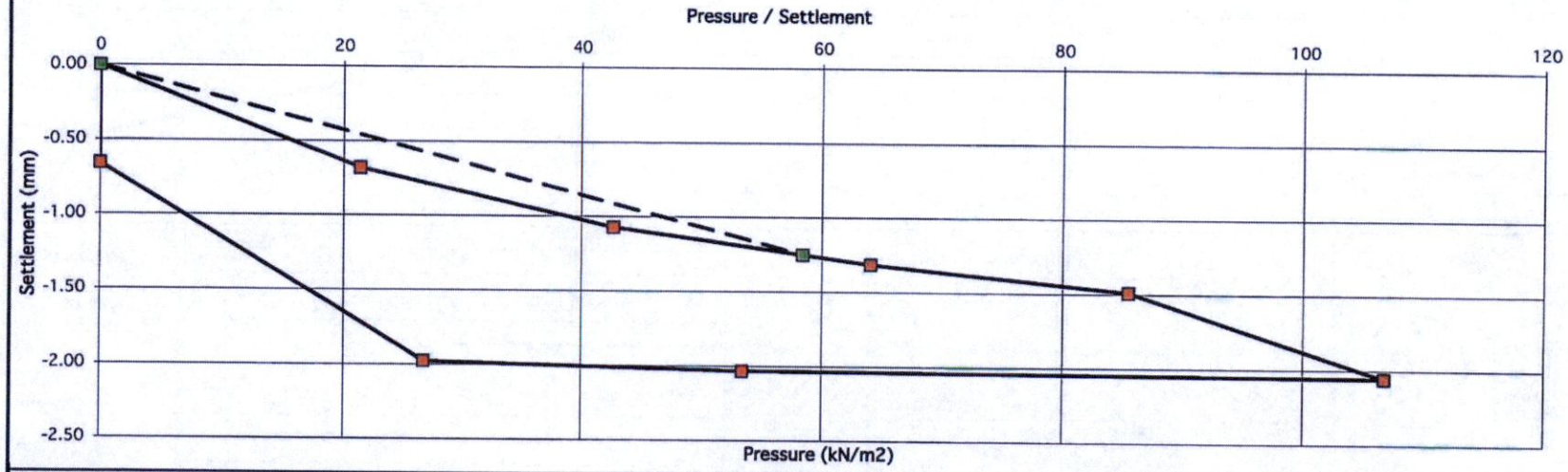
Reference No.	R134814
Contract	Rathcoole housing scheme
Test No.	PT5 Reload
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 47

Modulus of subgrade reaction = 30 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

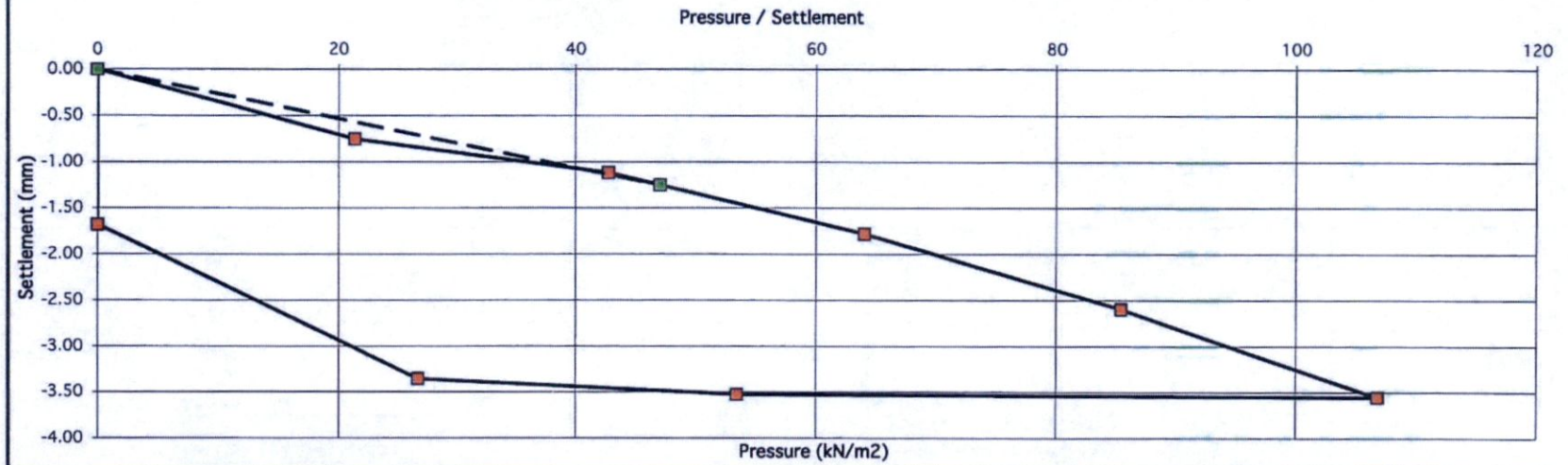
Reference No.	R134814
Contract	Rathcoole housing scheme
Test No.	PT6 Load
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 38
Modulus of subgrade reaction = 24 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.4 %

PLATE TEST REPORT SHEET (F3.1)

Reference No.	R134814
Contract	Rathcoole housing scheme
Test No.	PT6 Reload
Location	See site Map
Depth	350 mm
Client	Aecom
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	S.Hannon
Authorised by	H. Byrne
Date	27/05/2022

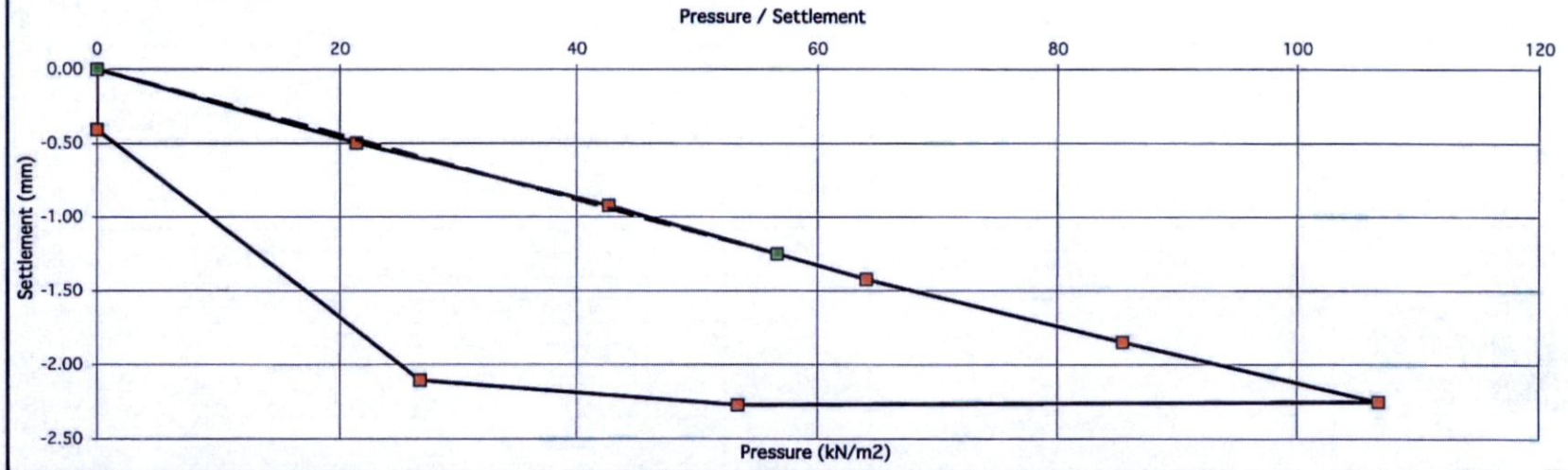
Applied Pressure/Settlement Curve

Description of soil under test
(natural soil, placed fill, sub-base)

Brown gravelly clay

Sample Ref No. N/A

Depth 0.00 m bgl



Gradient at 1.25 mm settlement intersection = 45
Modulus of subgrade reaction = 29 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.3 %

Appendix 4 Site Plan

Test	Coordinates	
	North	East
IFT 1	226245	302231
IFT 2	226239	302155
IFT 3	226199	302221
IFT 4	226221	302200
IFT 5	226194	302277
IFT 6	226213	302293
CBR 1	226260	302179
CBR 2	226237	302226
CBR 3	226218	302293
CBR 4	226208	302131
CBR 5	226182	302206
CBR 6	226159	302276

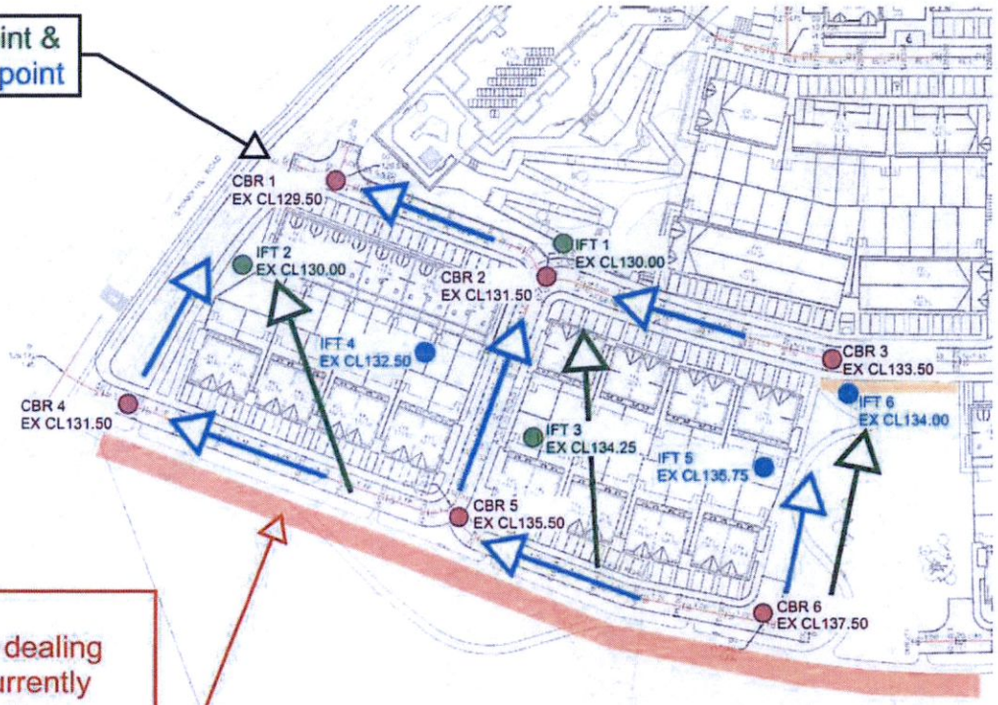
Natural low point &
Proposed low point

Natural overland flow direction

Proposed flow exceedance route

Potential Storage Swale

Upstream Overland
Flow Storage Swale



Key Item to Note

The SHD application did not proposed a strategy for dealing with the overland flow coming from the south, that currently drains across the land and likely infiltrates to a degree.

We have seen on a few recent projects, particularly with Wicklow County Council, the requirement to provide an upstream catchment analysis and overland flow strategy that includes attenuation, to deal with these flows to ensure that the development does not create issues elsewhere. For example, in the case, the flows ending up out on Stoney Hill Road.

INFILTRATION TEST
AT 0.5m BGL (3 no.)

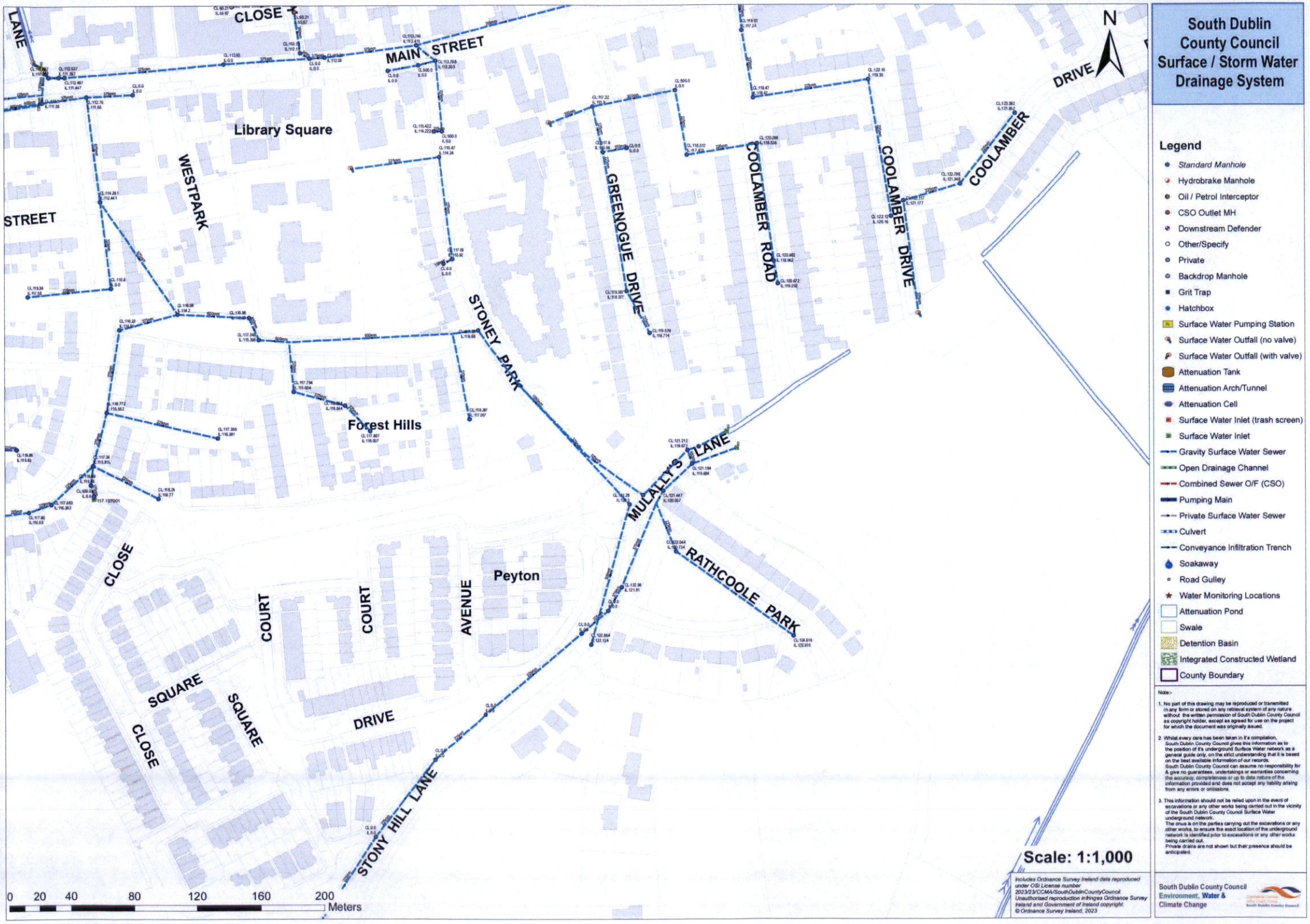
INFILTRATION TEST
AT 2m BGL (3 no.)

CBR TEST (6 no.)

Project:	Stoney Hill Phase 1 Residential Scheme, Rathcoole
Code:	60659192
Title:	MU-CE-0001 - Infiltration and CBR Test Locations [01]
Date:	09/03/2022
Scale:	Not to Scale
Drawn:	LShaughnessy
Status:	For Information
File Path:	L:\Legacy\ledbt2fp001\DATA\DCS\Projects\C\60659192_StoneyhillII\300_Communications\330_External\302_OUT\11_PDF Mark-ups

AECOM

Appendix C


South Dublin County Council Surface / Storm Water Drainage System
N
Legend
Standard Manhole
Hydrobrake Manhole
Oil / Petrol Interceptor
CSO Outlet MH
Downstream Defender
Other/Specify
Private
Backdrop Manhole
Grit Trap
Hatchbox
Surface Water Pumping Station
Surface Water Outfall (no valve)
Surface Water Outfall (with valve)
Attenuation Tank
Attenuation Arch/Tunnel
Attenuation Cell
Surface Water Inlet (trash screen)
Surface Water Inlet
Gravity Surface Water Sewer
Open Drainage Channel
Combined Sewer O/F (CSO)
Pumping Main
Private Surface Water Sewer
Culvert
Conveyance Infiltration Trench
Soakaway
Road Gulley
Water Monitoring Locations
Attenuation Pond
Swale
Detention Basin
Integrated Constructed Wetland
County Boundary
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Scale: 1:1,000
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South Dublin County Council
Environment, Water & Climate Change
Library Square
Forest Hills
Peyton
MAIN STREET
WESTPARK
STONEY PARK
GREENOGUE DRIVE
COOLAMBER ROAD
COOLAMBER DRIVE
COOLAMBER
MULALLY'S LANE
RATHCOOLE PARK
STONY HILL LANE
CLOSE
COURT
AVENUE
SQUARE
DRIVE
STREET
LANE
0 20 40 80 120 160 200 Meters

South Dublin County Council Surface / Storm Water Drainage System

Legend

- *Standard Manhole*
- Hydrobrake Manhole
- Oil / Petrol Interceptor
- CSO Outlet MH
- Downstream Defender
- Other/Specify
- Private
- Backdrop Manhole
- Grit Trap
- Hatchbox
- Surface Water Pumping Station
- Surface Water Outfall (no valve)
- Surface Water Outfall (with valve)
- Attenuation Tank
- Attenuation Arch/Tunnel
- Attenuation Cell
- Surface Water Inlet (trash screen)
- Surface Water Inlet
- Gravity Surface Water Sewer
- Open Drainage Channel
- Combined Sewer O/F (CSO)
- Pumping Main
- Private Surface Water Sewer
- Culvert
- Conveyance Infiltration Trench
- Soakaway
- Road Gulley
- Water Monitoring Locations
- Attenuation Pond
- Swale
- Detention Basin
- Integrated Constructed Wetland
- County Boundary

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2. Whilst every care has been taken in it's compilation, South Dublin County Council gives this information as to the position of it's underground Surface Water network as a general guide only, on the strict understanding that it is based on the best available information of our records. South Dublin County Council can assume no responsibility for & give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability arising from any errors or omissions.

3. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the South Dublin County Council Surface Water underground network.
The onus is on the parties carrying out the excavations or any other works, to ensure the exact location of the underground network is identified prior to excavations or any other works being carried out.
Private drains are not shown but their presence should be anticipated.

South Dublin County Council
Environment, Water & Climate Change