

Project Name	Care home, Central Avenue, Gravesend		
Project Number	22 026	Note reference	22 026/JAB/PD10 REV A
Date	13th April 2023	Prepared by	J. Bowkett
Subject	Surface Water Discharge – Planning Condition 10 Discharge		

INTRODUCTION

A planning application 20220207 has been made to construct a 62 Bed Care Home for the proposed development at Central Avenue, Gravesend. The site has been previously developed with a public house centre with associated parking. All existing structures are to be demolished.

This document is intended to provide sufficient information to allow the discharge of planning condition 10.

The planning condition required the following:

'Where infiltration is to be used to manage the surface water from the development hereby permitted, it will only be allowed within those parts of the site where information is submitted to demonstrate to the Local Planning Authority's satisfaction that there is no resultant unacceptable risk to controlled waters and/or ground stability. The development shall only then be carried out in accordance with the approved details.

Reason: To protect vulnerable groundwater resources and ensure compliance with the National Planning Policy Framework (NPPF), 2021.'

GROUND WATER VULNERABILITY

A review of the ground water vulnerability mapping indicated that the site is located within a source protection zone.

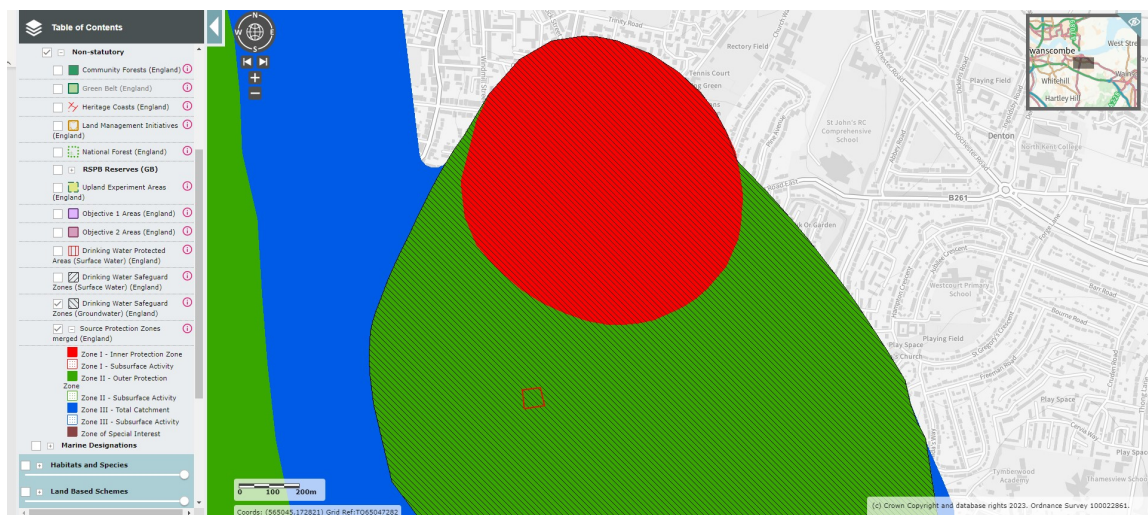


Figure 1 – Source Protection Zones (Site Extents in Red within Source Protection Zone II)

The site is within a Zone II outer protection area and is indicated to be within a drinking water Safeguard area.

A further review of the Hydrology of the site indicated that the site is located within a Principal Aquifer Area for the bed rock.

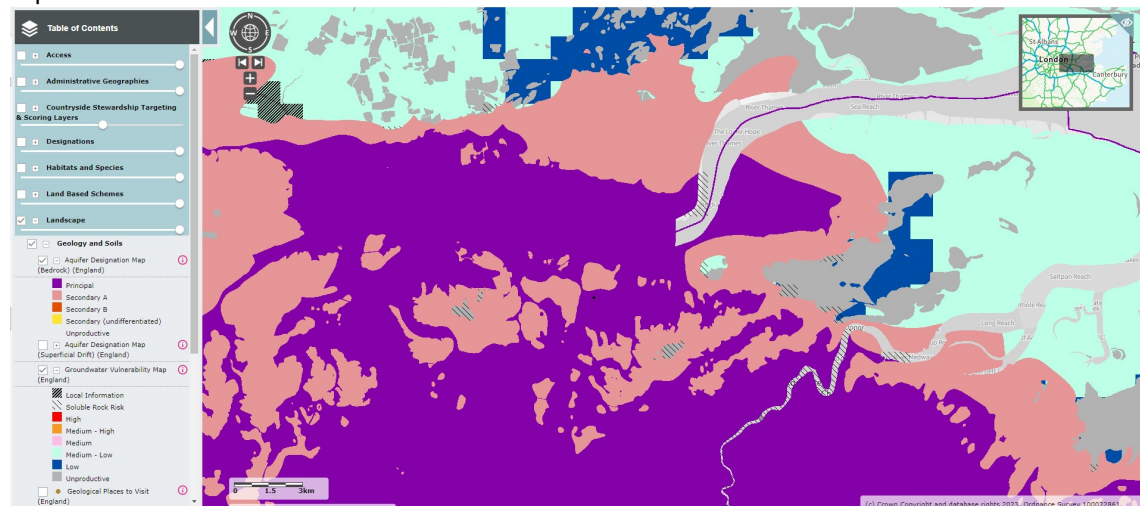


Figure 2 – Aquifer Designation Map (Bedrock) (Site Extends In Black within principal Aquifer)

The site is also located within a high ground water vulnerability area, with an additional note that the site is located within an area where there is a soluble Rock Risk. This is due to the underlying Chalk Strata within the Area.

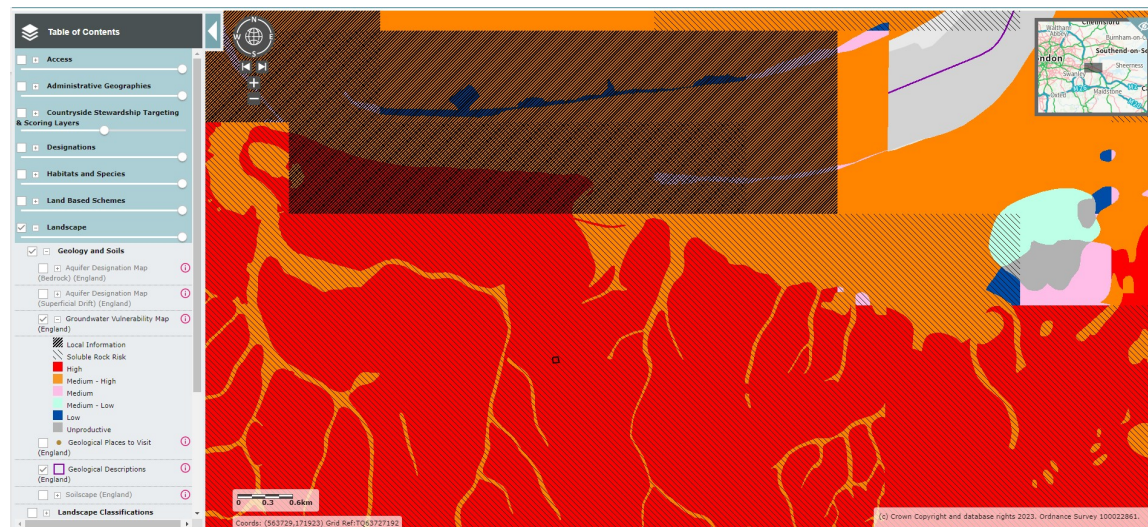


Figure 3 – Ground Water Vulnerability Map (Site Extends in Black within High Area)

In summary this site is in a Sensitive area with regards to the ground water and appropriate treatments should be provided for the discharge of surface water to the underlying ground.

ENVIROMENT AGENCY CONSULTATION

The Environment Agency have been contacted with regards to the discharge of Surface water from roof area and parking/access road to a deep bore soakaway. They have issued a pre-application advice letter.

SURFACE WATER DISCHARGE



Which concludes the flowing:

Application reference number	EPR/GP3120ST/A001
Summary and advice	Please find below a summary of our discussions and advice based on information provided within the online pre-application form and correspondence with your contact James Bowkett: You have requested advice about whether you need to apply for a discharge permit for your site 'Ascot Arms'. • You propose to discharge surface water runoff from roofs and hardstanding to ground via a borehole. • The surface water runoff will be treated by SuDS methods including a permeable paving system and infiltration/collection trench. • The maximum daily discharge volume will be around 160 m³/day (160 m³ for 1 in 100 + 40%). • Based on your site plan, the discharge point will be located near to national grid reference TQ 64912 72426. Based on the information that you have provided us within your pre-application form and correspondence, we can provide the following advice: Advice from our local Groundwater Team As part of this pre-application request, I have consulted with our local Area Groundwater Team who have advised that the proposed discharge does not require an environmental permit, so long as the following advice is implemented: The consultant/developer must <u>not</u> allow direct discharges to groundwater and there <u>must</u> be an unsaturated zone beneath the base of the proposed borehole and the highest seasonal groundwater table at all times. Provided that the operator can ensure the above advice is followed,

	which might mean making the borehole shallower, the Groundwater Team would not object here. Please note – the operator should also have regard to the Environment Agency's Groundwater Protection Position Statements: https://www.gov.uk/government/publications/groundwater-protection-position-statements, Section G. They should also look more generally at the pages on groundwater protection: https://www.gov.uk/government/collections/groundwater-protection. Discharges to boreholes are not our preferred method of surface water disposal, as they bypass the shallow soil layers where natural attenuation of pollutants occurs. If a borehole is proposed for the discharge of <u>clean</u> surface water, it must not discharge directly to groundwater. Direct discharges are <u>not</u> allowed. The borehole should be constructed as shallow as possible when required infiltration rates are reached. The surface water system should include pollution prevention measures, especially if draining roads. Such measures can include treatment methods such as oil interceptors, downstream defenders, etc., which must be maintained as per the manufacturer's guidance. Please be aware that the proposed site is located within groundwater Safeguard Zone and a Source Protection Zone 2. As such the groundwater is of high vulnerability. If you cannot meet our Groundwater Team's advice If you are unable to meet the above advice, provided by our Groundwater Team, then you will need to apply for an environmental permit, as outlined in the below sections.
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It is considered that the conditions of the EA Groundwater Team can be met and that a Permit to Discharge is not required. The full document is contained within **Appendix C**.

The following Guidance have been met with the following considerations.

1. *'The consultant/ developer must not allow direct discharge to ground water and there must be an unsaturated zone beneath the base of the proposed borehole and the highest seasonal ground water level.'*

The current proposal is for surface water discharge to a deep bore soakaway. The current Scheme drawing is contained within **Appendix A**.

Following further site investigation the proposed deep bore soakaways are to be taken to a depth of 16m as a requirement of the design.

During the investigation works no water strikes were made the investigation states that ground water levels may vary due to seasonal conditions and antecedent weather conditions.

The SI report is contained within **Appendix B**.

However, the borehole works were completed in early February when the water table would be near its peak. It is also noted from Environment Agency Report Water Situation: January 2023 Summary that

‘The wettest hydrological area was Kent in south-east England which received 159% of LTA rainfall for January’

‘At the end of January, groundwater levels increased at all but 4 of the reported indicator sites as wet soils and above average rainfall in many areas helped aquifers continue their seasonal recharge’

The full report can be found at: <https://www.gov.uk/government/publications/water-situation-national-monthly-reports-for-england-2023/water-situation-january-2023-summary#rainfall>

We therefore consider that the water table would have been at or near its peak level during the investigation works.

2. ‘The operator should also have regard to the Environment Agency’s Groundwater Protection Position Statements: <https://www.gov.uk/government/publications/groundwater-protection-position-statement>, Section G.’

The full section G is contained within **Appendix C**.

The document has been reviewed and the relevant section in relation to this scheme is G13.

In relation to G13 – sustainable drainage systems.

- The system is suitably designed
- It meets the current standards for sustainable drainage systems
- A SuDs management treatment has been provided and justification is contained within this document.

The discharge is within a SPZ2 and the final statement does not apply.

We therefore consider that this requirement has been met.

3. ‘They should look more generally at the pages on ground water protection: <https://www.gov.uk/government/collections/groundwater-protection>,’

These documents have been considered and the scheme proposed adheres to the principals and requirements of these documents.

4. ‘Discharge to boreholes are not our preferred method of surface water disposal, as they bypass the shallow soil layers where natural attenuation of pollutants occurs.’

As noted shallow soakaways were considered, however due to the poor permeability of the upper strata is unsuitable. This is the only remaining option to soakaway within the site.

5. *'If a borehole is proposed for the discharge of clean surface water, it must not discharge directly to ground water. Direct discharges are not allowed. The borehole should be constructed as shallow as possible when required infiltration rates are reached.'*

This has been done and as noted above the ground water depth is in excess of 20m. The borehole is 16m deep which is the minimum required to soakaway.

6. *'The surface water system should include pollution prevention measures, especially if draining roads. Such measures can include treatment methods such as oil interceptors, downstream defender etc, which must be maintained as per the manufacturer's guidance,*
This has been considered and suitable SuDs treatments have been provided as outlined within this report.

7. *'Please be aware that the proposed site is located within ground water safeguard Zone and a Source Protection Zone 2. As such ground water is highly vulnerable.'*

This requirement has been considered and the contamination risk is considered to be low and has been managed by the proposed SuDs strategy.

ARC have followed and checked the requirements and consider that a permit is not required to discharge the surface water into the deep bore soakaway.

SURFACE WATER DISCHARGE



SuDS WATER QUALITY ASSESSMENT

The proposed scheme involves some SuDS items to manage any potential contamination from the site entering the ground water.

With respect to Table 26.2 of the CIRIA SuDS Manual, the two principal areas of the site are considered as noted in the table .

Land Use	Pollution Hazard Level
Residential Roofs	VERY LOW
Low Traffic Roads and non-residential car parking with infrequent change (eg offices) < 300 traffic movements / day	LOW

Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

Extract of table 26.2 from The SuDS Manual (CIRIA Report C753)

Indicative SuDS mitigation indices for discharges to groundwater			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.8 ⁴	0.8	0.8
Proprietary treatment systems ^{5, 6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

Extract of table 26.4 from The SuDS Manual (CIRIA Report C753)

The water quality assessment have been completed using the above pollution indices and migration indices and direct by The SuDS Manual (CIRIA Report C753)

RESIDENTIAL ROOF AREAS

HAZARD INDEX	Total SS	Metals	Hydrocarbons
ROOF	0.2	0.2	0.05
TOTAL HAZARD INDEX	0.2	0.2	0.05
MITIGATION MEANS			
A SOIL WITH GOOD CONTAMINATION ATTENUATION POTENTIAL	0.4	0.3	0.3

- Mitigation index scores are higher than hazard index scores.
- Proposed means of SuDS to catchment areas is appropriate.

Further to this it should be noted that the Environment Agency will allow a discharge of clean roof Water into a Deep bore Soakaway without an Environmental permit, even with a Source Protection Zone 1. The site is located within a Source Protection Zone 2.

SURFACE WATER DISCHARGE



LOW TRAFFIC ROADS

HAZARD INDEX	Total SS	Metals	Hydrocarbons
EXTERNALS	0.5	0.4	0.4
TOTAL HAZARD INDEX	0.5	0.4	0.4
MITIGATION MEANS			
CONSTRUCTED PERMEABLE PAVING	0.7	0.6	0.7

- Mitigation index scores are higher than hazard index scores.
- Proposed means of SuDS to catchment areas is appropriate.

The discharge of the surface water from the Low Traffic Roads is subject to an Environment Agency Permit. They have been contacted in relation to the use and requirement of a deep bore soakaway and the relevant advice and documentation will be adhered to.

Given the time it takes for an the Environment Agency Permit to discharge to the ground we intend to include this within the Verification report for the drainage which is a requirement of Planning Condition 9, prior to occupation of the building.

CONTAMINATION ASSESSMENT CONTROLLED WATERS

The original Ground Investigation completed by asl in April 2022 to assess the risks to controlled waters from the recorded concentrations in soil. The following is taken directly from that report:

8 CONTAMINATION ASSESSMENT – CONTROLLED WATERS

8.1 Introduction

To assess the potential risk to controlled waters from the recorded concentrations in soils, the use of leachability is generally used to determine contaminant mobility within the ground with the results of these tests compared to the determinants respective environmental quality standards (EQS) or other applicable standards such as UK drinking water standards (DWS). As groundwater has been identified as potentially at risk, the DWS is used in this assessment where available. For organic determinants, the use of leachability is not considered reliable. These determinants are assessed using half the inert WAC criteria. Exceedances of these criterion are considered to require further assessment.

8.2 Summary of Results - Soils

Table 3 presents a summary of the screening criteria compared with the recorded concentrations of determinants at the site. Only those determinants recorded in excess of their relevant laboratory detection limits are assessed here.

The chemical test results are presented in full in Appendix III.

Table 3 Summary of Soils Data with Respect to Controlled Waters (Tier 1)

Determinant	Max Conc. (mg/l)	Tier 1 Value (mg/l)	No. of Exceedances
Arsenic	0.0043	0.01	0 (3)
Beryllium	0.0002	0.004	0 (3)
Boron	0.038	1	0 (3)
Chromium	0.0016	0.05	0 (3)
Copper	0.047	2	0 (3)
Lead	0.0046	0.01	0 (3)
Nickel	0.0083	0.02	0 (3)
Vanadium	0.0071	0.06	0 (3)
Zinc	0.016	5	0 (3)
TPH (C10-C40)	28	250	0 (5)
PAH total	18.4	50	0 (5)

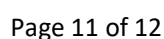
Notes 1. Numbers in brackets denote the number of tests undertaken.
2. Organic determinant concentrations in mg/kg.

None of the contaminants of concern summarised in Table 3 are recorded in excess of their relevant screening criteria.

Based on the findings of this contamination assessment, no further assessment of the potential risk to controlled waters from contamination present in soil is considered necessary. No remediation of soil to be protective of controlled waters is considered necessary.

Figure 4 - Extract From asl Geotechnical Report April 2022

It is therefore considered that no further works are required in relation to contamination of the existing site soil.



SITE TOPOGRAPHY

The site is reasonably flat within the vicinity of the proposed deep bore soakaways. There are no existing or proposed embankments or earth retaining structures which could be effected by the introduction of a soakaway.

DISSOLUTION OF CHALK

The ground Investigation produced by asl has a statement related to the dissolution risk.

6.11 Ground Dissolution Risk

The site is located in an area indicated to have a very significant soluble rock risk with a 'high possibility' of occurrence, however there are no recorded natural cavities in the vicinity of the site. Further to this, the environmental database search indicates the site to be at 'very low' risk from ground dissolution stability hazards.

Based on the findings of the Desk Study Report, the potential risk from ground dissolution at the site is considered to be very low.

It is considered that the findings of the current intrusive investigation have confirmed the findings of the Desk Study Report with competent chalk materials encountered at shallow depth across the site. However, it is recommended that where less competent chalk or any other anomalous ground is encountered during the development works the materials are inspected by a suitably qualified geotechnical engineer to assess whether the materials pose a constraint to the development works.

Figure 6 - asl - Dissolution of Chalk Statement

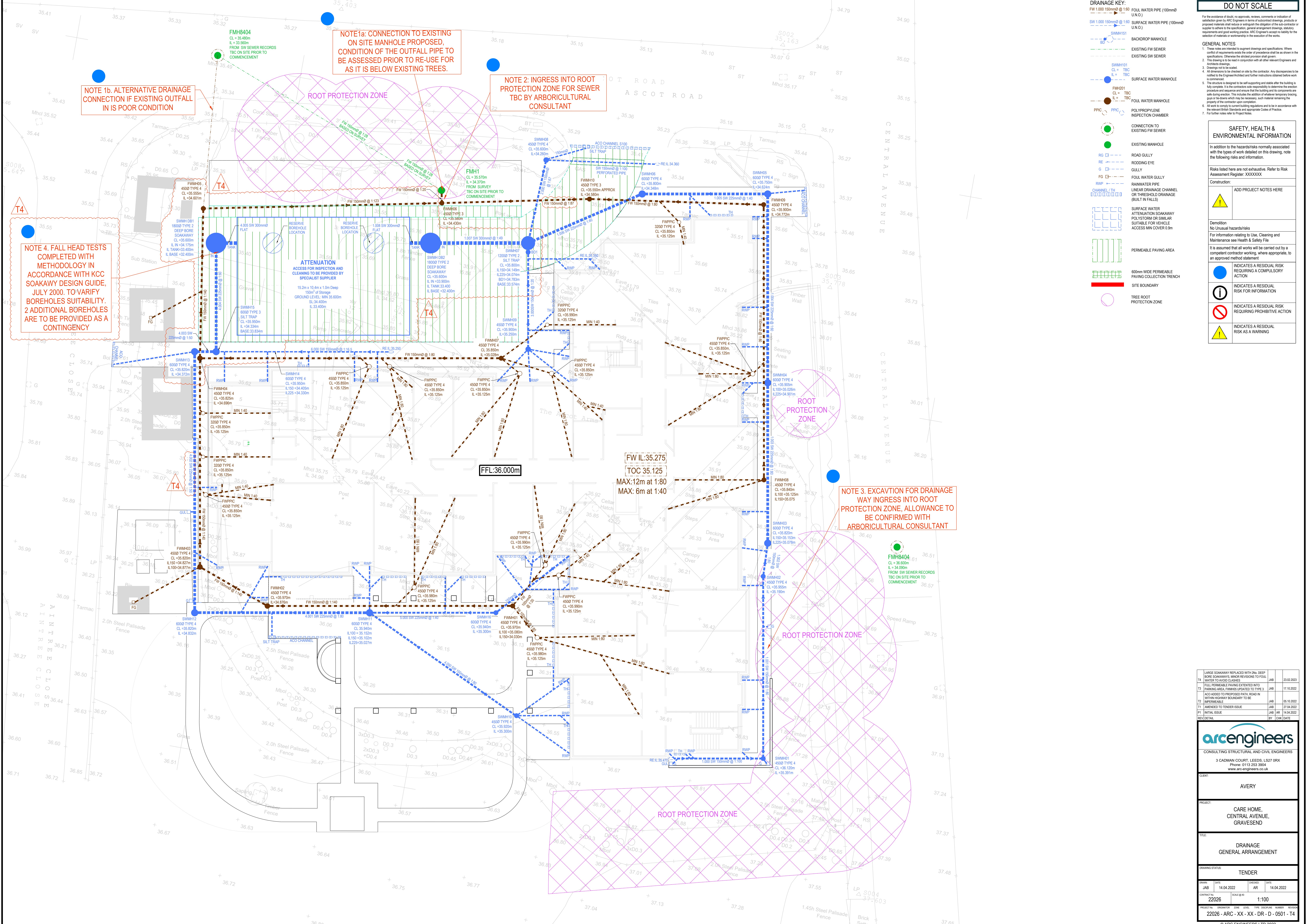
Additional site investigation works have been completed by GES and the following statement have been made.

'We can confirm that GES did not find anything in our supplementary ground investigation works (Report ref 12992, dated February 2023) which would contradict the findings of the earlier phase of investigations carried out by ASL with respect to the risk of ground dissolution.'

Figure 7 – GES – Dissolution of Chalk Statement

It is therefore considered that the risk of ground dissolution on the site is Low.

APPENDIX A – PROPOSED DRAINAGE PLAN



- DRAINAGE KEY:**
- FW 1,000 150mm @ 1:80 FOUL WATER PIPE (100mm U.N.O.)
 - SW 1,000 150mm @ 1:80 SURFACE WATER PIPE (100mm U.N.O.)
 - SWMH151 BACKDROP MANHOLE
 - SWMH01 CL = TBC EXISTING FW SEWER
 - SWMH01 CL = TBC EXISTING SW SEWER
 - FMH201 CL = TBC SURFACE WATER MANHOLE
 - FMH201 CL = TBC FOUL WATER MANHOLE
 - PPIC POLYPROPYLENE INSPECTION CHAMBER
 - CONNECTION TO EXISTING FW SEWER
 - EXISTING MANHOLE
 - ROAD GULLY
 - RODDING EYE
 - GULLY
 - FOUL WATER GULLY
 - RAINWATER PIPE
 - LINEAR DRAINAGE CHANNEL OR THRESHOLD DRAINAGE (BUILT IN FALLS)
 - SURFACE WATER ATTENUATION SOAKAWAY POLYSTYROM OR SIMILAR SUITABLE FOR VEHICLE ACCESS MIN COVER 0.8m
 - PERMEABLE PAVING AREA
 - 600mm WIDE PERMEABLE PAVING COLLECTION TRENCH
 - SITE BOUNDARY
 - TREE ROOT PROTECTION ZONE

DO NOT SCALE

For the avoidance of doubt, no approvals, reviews, comments or indication of satisfaction given by ARCC Engineers in terms of submittal drawings, production or proposed materials shall reduce or extinguish the obligation of the sub-contractor or supplier to adhere to the specification, general arrangement drawings, statutory requirements and good working practice. ARCC Engineer's accept no liability for the selection of materials or workmanship in the execution of the works.

GENERAL NOTES

- These notes are intended to augment drawings and specifications. Where conflict of requirements exists the order of precedence shall be as shown in the specifications. Otherwise the actual provision shall govern.
- This drawing is to be used in conjunction with all other relevant Engineering and Architects drawings.
- Drawings not to be scaled.
- All dimensions to be checked on site by the contractor. Any discrepancies to be notified to the Engineer/Architect and further instructions obtained before work is commenced.
- The structure is designed to be self supporting and stable after the building is fully completed. It is the contractor's sole responsibility to determine the erection procedure and sequence and ensure that the building and its components are safe during erection. This includes the addition of whatever temporary bracing, girders or tie-downs which may be necessary. Joint material remaining the property of the contractor upon completion.
- All work comply to current building regulations and to be in accordance with the relevant British Standards and appropriate Codes of Practice.
- For further notes refer to Project Notes.

SAFETY, HEALTH & ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following risks and information:

Risks listed here are not exhaustive. Refer to Risk Assessment Register: XXXXXXX

Construction:

- ADD PROJECT NOTES HERE

Demolition

No Unusual hazards/risks

For information relating to Use, Cleaning and Maintenance see Health & Safety File

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

- INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION
- INDICATES A RESIDUAL RISK FOR INFORMATION
- INDICATES A RESIDUAL RISK REQUIRING PROHIBITIVE ACTION
- INDICATES A RESIDUAL RISK AS A WARNING

LARGE SOAKAWAY REPLACED WITH 2x DEEP BORE SOAKAWAYS, MINOR REVISIONS TO FOUL WATER TO AVOID CLASHES

FULL PERMEABLE PAVING EXTENDED INTO PARKING AREA, FWMH01 UPDATED TO TYPE 3

ACC ADDED TO PROPOSED PAVEMENT ROAD IN WITHIN HIGHWAY BOUNDARY TO BE IMPERMEABLE

AMENDED TO TENDER ISSUE

INITIAL ISSUE

REV	DETAIL	DATE	BY	CHK	DATE
14			JAB		23.02.2023
13			JAB		17.10.2022
12			JAB		05.10.2022
11			JAB		27.04.2022
P1			JAB		14.04.2022

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CLIENT: AVERY

PROJECT: CARE HOME, CENTRAL AVENUE, GRAVESEND

TITLE: DRAINAGE GENERAL ARRANGEMENT

DRAWING STATUS: TENDER

DATE	DATE	DATE	DATE
JAB	14.04.2022	AR	14.04.2022

CONTRACT NO.	SCALE	NO.
22026	1:100	

PROJECT NO.	ORGANISATION	ZONE	LEVEL	TYPE	DISCIPLINE	NUMBER	REVISION
22026	ARC	XX	XX	DR	D	0501	14

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APPENDIX B – ADDITIONAL SI REPORT WITH BOREHOLES



Ground and Environmental Services Limited

**Unit 2 Montpelier Business Park
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Kent
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01233 646237**

**New Care Home
Central Avenue
Gravesend
DA12 5AW**

**Report on Supplementary Ground Investigation
On Behalf of Jenner (Contractors) Ltd**



Document Reference: 12992

February 2023

air quality assessment contaminated land ecology environmental audits noise assessment
environmental impact assessments flood risk assessments geotechnical engineering ground investigation
hydrogeology noxious weeds remediation design risk assessments waste management

Site: New Care Home, Central Avenue, Gravesend, DA12 5AW

Document Reference No: 12992

Quality Management

Prepared by:	PJ/CSS
Reviewed by:	KM
Authorised by:	KM
Date	February 2023
Revision	0

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3. Trial Pit Logs and DG365 Test Results
4. In situ CBR Test Results and Dynamic Cone Penetrometer Test Results
5. Laboratory Test Results

1 INTRODUCTION

Ground and Environmental Services Ltd (GES) was commissioned by the Jenner (Contractors) Ltd (The Client) to undertake a Supplementary Ground Investigation on a proposed redevelopment site at Central Avenue, Gravesend, Kent, DA12 5AW.

It was understood that the proposed redevelopment of the site will comprise the demolition of a former public house and the construction of a new care home.

The objectives of the supplementary ground investigation were to provide provide guideline recommendations with regard to a piled foundation solution and ground floor slab design. Parameters for use in the design of the surface water drainage and pavements has also been presented.

The scope of the supplementary ground investigation works was provided by The Client.

This report specifically excludes comment or advice with regards to contaminated land or pollution related issues with regards to the development.

2 SITE LOCATION AND LAYOUT

The site is located at the junction of Central Avenue and Ascot Road approximately 1.8km to the south of Gravesend town centre and is centred on approximate National Grid Reference TQ649724.

The site comprises a relatively flat lying rectangular shaped piece of land approximately 65m by 60m in plan. The northern and eastern areas of the site were dominated by the former Ascot Arms Public House with a tarmac parking areas to the north of the pub and a hardcore parking area to the north west of the structure. An electrical substation is located in the north-western corner of the site.

To the south of the public house were areas of soft landscaping which were mainly laid to grass.

3 GEOLOGICAL SETTING

Reference to the British Geological Survey geological mapping of the area indicates that the geology underlying the site comprises chalk of the Lewes Nodular Chalk Formation, Newhaven Chalk Formation and Seaford Chalk Formation (undifferentiated). No superficial deposits are shown on site.

The geological memoir for the area described this stratum is as follows:

Lewes Nodular Chalk Formation

Composed of hard to very hard nodular chalks and hardgrounds (which resist scratching by finger-nail) with interbedded soft to medium hard chalks (some grainy) and marls; some

griotte chawks. The softer chawks become more abundant towards the top. Nodular chawks are typically lumpy and iron-stained (usually marking sponges). Brash is rough and flaggy or rubbly, and tends to be dirty. First regular seams of nodular flint, some large, commence near the base and continue throughout.

Seaford Chalk Formation

Firm white chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large.

Newhaven Chalk Formation

Composed of soft to medium hard, smooth white chawks with numerous marl seams and flint bands, including abundant Zoophycos flints (notably at levels near the base). The formation is known to contain distinct phosphatic chawks of limited lateral extent. Equivalent beds, the Margate Chalk of north Kent, are marl-free and contain little flint.

4 INTRUSIVE INVESTIGATION

4.1 FIELDWORK

The site works were carried out between the 27th January and the 7th February 2023 and comprised the following:

- Cable Percussion Drilling;
- Falling Head Testing;
- DG365 Soakage Testing
- In situ CBR and Dynamic Cone Penetrometer Testing

The positions of the above works on the site are indicated on Figure 1, Exploratory Hole Location Plan.

Cable Percussion Drilling

Two boreholes, BH1 and BH2, were excavated using cable percussion boring methods to depths of 20 m below existing ground level.

During boring, temporary steel casing (150mm diameter) was used to support the sides of the bores. Disturbed (D) soil samples were recovered at regular intervals for description and subsequent laboratory testing purposes.

In addition in situ Standard Penetration tests were carried out at regular intervals using the SPT split spoon attachment.

New Care Home, Central Avenue, Gravesend Report on Supplementary Ground Investigation



Upon completion the boreholes were backfilled with arisings and surface coverings made safe.

Borehole logs are presented in Appendix 1.

Falling Head Testing

Falling head soakage testing was undertaken in boreholes BH1 and BH2 as they were progressed. The test involved recording the drop in water level with respect to time.

The field test data is summarised below in Section 7.4 below and the results presented in Appendix 2.

DG365 Soakage Tests

Two trial pits (SP1 and SP2) were excavated across the site, to depths of 2.95m and 3.25m below existing ground level respectively using a JCB 3CX excavator under the supervision of a Geo-Environmental Engineer from GES. The soils/materials encountered were logged on site.

Infiltration tests were carried out in both trial pit excavations. These tests were carried out in accordance with the methodology given in BRE DG365 'Soakaway design' and comprised discharging water into the excavations up to approximately 1 m bgl and monitoring the fall in water level against time.

The field test data is summarised below in Section 7.4 below and the results presented in Appendix 3.

Plate Load and Dynamic Cone Penetrometer Testing

In situ plate load tests were carried out using the 8.5T JCB 3CX as kentledge. A total of four plate load tests (CBR1 – CBR4) were undertaken at locations specified in order to obtain CBR parameters. The results from the plate load tests are presented in Appendix 4.

In addition, in areas inaccessible for the JCB3CX two dynamic cone penetrometer (DCP) tests (DCP1 and DCP2) were undertaken.

The dynamic cone penetrometer (DCP) uses an 8 kg hammer dropping through a height of 575 mm and a 60° cone having a maximum diameter of 20 mm. Penetration depth is recorded after every blow.

The DCP is a Penetrometer device used to provide a measure of in situ CBR. Blow count readings were converted to an equivalent CBR, which is displayed in the results tables are also presented in Appendix 4. The TRRL equation was used to calculate the equivalent CBR value from the DCP results.

4.2 GROUNDWATER

Groundwater was not encountered during the excavation of the boreholes.

It should be noted that the absence of groundwater is not necessarily indicative of the absence of a groundwater table in view of the short period the boreholes and trial pits remained open. Groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

5 LABORATORY TESTING

The following range of laboratory tests were scheduled, and the results are presented in Appendix 5.

- i.* Determination of Natural Moisture Content (1 no.).
- ii.* Determination of Atterberg limits (1 no.).
- iii.* Determination of Saturation Moisture content and Density of chalk (3 no.).
- iv.* Determination of pH (5 No.).
- v.* Determination of water soluble sulphate (5 No.).

In addition, two composite samples of arisings were prepared and submitted for analysis in accordance with the Environment Agency's waste acceptance criteria (WAC) for the off-site disposal of soils. The results of the WAC testing are also presented in Appendix 5.

6 GROUND CONDITIONS

6.1 GROUND PROFILE

The soils encountered during the investigation are described in the borehole and trial pit logs presented in Appendices 1 and 2.

This ground investigation found a surface layer of Made Ground/Topsoil over a discontinuous horizon of Head materials with chalk typical of the Lewes Nodular Chalk Formation found at depth.

Made Ground/Topsoil

Made Ground materials were encountered to depths ranging between 0.02m and 0.8m. The Made ground at the location of SP1 comprised of Type 1 material and was found to 0.2m. At the location of SP2 a thin layer of topsoil was found. In boreholes BH1 and BH2 the surface layer comprised silty sandy clayey topsoil.

Head Deposits

Underlying the Made Ground at the locations of BH1, and both trial pits were soils typical of Head Deposits. The Head Deposits comprised silty clay with a variable gravel component comprising of flint. The Head Deposits were not found at the location of borehole BH2 which found chalk directly beneath the Made Ground/Topsoil.

Where found the Head Deposits were proven to depths ranging between 1.95m and 2.4m.

Lewes Nodular Chalk Formation

Materials typical of the Lewes Nodular Chalk Formation were found beneath the Made Ground in BH2 and beneath the Head Deposits at other test locations.

The chalk materials comprised an upper layer of off white and light brown highly weathered chalk which was recovered as fine to coarse chalk gravel in a silt matrix with frequent flints. The highly weathered materials were found to depths ranging between 2.1m and 2.9m. Below which was partially weathered white chalk which was also recovered as fine to coarse chalk gravel. The partially weathered materials was differentiated from the highly weathered materials by colour. Scattered flints were observed throughout the stratum.

The chalk stratum was proven to a minimum depth of 20m during this ground investigation.

6.2 ENGINEERING PROPERTIES

The engineering properties of the principal strata, as discussed above, can be assessed based upon a combination of the in situ and laboratory test results. A summary of the engineering properties is given below.

Head Deposits

In situ SPT's recorded N values of 20 and 19 (stiff) at the location of BH1. See Figure 2, SPT v Depth Profile. Figure 3 provides a plot of corrected N₆₀ values against depth. The N₆₀ value taking into account an energy ratio (Er) of 70% for equipment used.

Tactile observations recorded firm to stiff soils.

Classification testing recorded a slightly gravelly very silty clay of low plasticity with a plasticity index of 12% measured – low shrink/swell potential.

Lewes Nodular Chalk Formation

In situ SPT's indicated this material to be very weak to weak with N values in the range 16 to 46. The SPT N values rose significantly below depths of 14.0m in BH1 and 13.0m in BH2.

Laboratory testing on disturbed chalk samples found that the chalk was of low to medium density with dry densities in the range 1.41 to 1.58 Mg/m³ and saturation moisture contents in the range 26.2 to 33.7% recorded.

6.3 FOUNDATION DESIGN PARAMETERS

Based upon visual observations, laboratory test results and in situ test results the following parameters are recommended for use in the design of piled foundations:

Stratum	In situ SPT range (See Figures 2 and 3)	Design SPT Range	Undrained Shear Strength	Effective angle of shearing resistance
Head Deposits	19 and 20		75 kN/m ²	
Chalk	16- 46	See Figures 2 and 3		
Groundwater was not found during this investigation				

7 ENGINEERING DESIGN

7.1 OUTLINE FOUNDATION DESIGN

The proposed development is understood to comprise the construction of a new care home.

Structural loads were unknown at the time of reporting however for preliminary foundation design purposes column loads of upto 400kN have been adopted.

In deliberation of suitable foundation options consideration was given to the geotechnical hazards and risks as presented below:

Geotechnical Hazard	Qualitative Risk & Consequences	Possible Risk Reduction Measures
Variations in stiffness of ground below foundation depth that could give rise to unacceptable total and differential settlement.	Medium Large span buildings would be particularly sensitive to differential settlement. Would result in cracking of superstructure if conventional brickwork or brick cladding is used.	Calculate likely magnitude of settlement and determine if within acceptable tolerances. Make foundations act as reinforced beams. Consider ground treatment to improve ground conditions or adopt deep foundation.
Existing underground structures such as service runs and old footings.	Very High Implication for foundation depth and economic feasibility of shallow foundations.	New foundations to be constructed in undisturbed ground or alternatively disturbed ground to be removed and replaced with suitable engineering fill. Consider a deep foundation solution.
Shrinkage/swelling of foundation soils due to action of tree roots.	Low Foundation movement and cracking of brickwork.	Follow requirements for low shrink/swell potential soils

Based upon the findings of an earlier phase of ground investigation carried out by others and on the understanding that the proposed building is to be located over the footprint of the existing public house, which includes a basement area, it is understood that a deep foundation solution (i.e. piles) is the preferred foundation solution. Piles should be founded within the Lewes Nodular Chalk Formation.

Piled Foundations in Chalk

The variation in ground conditions encountered across the site would typically lend itself to a deep foundation solution, such as piles, as this minimises the potential for total and differential settlements.

The choice of pile type at this site is very dependent upon the magnitude of noise and vibration generated by the piling equipment and installation technique. Driven piles are considered unsuitable as excessive noise and vibration will occur. Bored cast in situ or

continuous flight auger (CFA) piles are therefore the basic alternative options. Bored pile excavations would need to be supported by temporary casing during construction. The chosen method of piling would need to be capable of advancing through flint bands which were encountered within the chalk stratum and required chiselling tools to advance through.

CFA piles would not normally require casing through soils of the type found on this site. However, the piling contractor should be made aware of possible underground obstructions due to the previous development of the site and the presence of hard flint layers within the Chalk as noted above.

The suitability of this method of piling for use on this site should be checked with a piling contractor to ensure all factors have been taken into consideration. It should be noted that all pile types would require reinforcement.

Preliminary Design Criteria

The following discussion is based on the use of bored cast in situ or CFA piles and assumes the following criteria:

The design line relating SPT 'N₆₀' in chalk to depth is provided in Figure 3.

- Piles to terminate in the Lewes Nodular Chalk Formation with a minimum penetration of 3 m into the chalk and in chalk with an SPT 'N' greater than 25.
- Groundwater at a minimum of 20m below existing ground level.
- The end bearing stress that can be mobilised by the pile is dependent on the ability of the chosen method of installation to ensure a clean base. A factor of safety of 3.5 (CFA piles) on end-bearing resistance has been incorporated.
- A factor of safety of 1.5 has been used for shaft friction.
- Positive and negative skin friction effects from Made ground materials overlying the Lewes Nodular Chalk Formation have been ignored for preliminary design but should be accounted for in final design.
- Pile working loads may be obtained by summing the working end bearing stress and shaft resistance for the required pile lengths and pile diameters.
- The settlement of isolated piles designed on the above basis should be acceptably small and typically about 0.5% of the pile diameter. Settlement should be checked for piles installed in groups.

Predicted load capacity for CFA piles are given in the tables below and are based on the Construction Industry Research and Information (CIRIA) Reports C574,2000 and PR86,2003.

New Care Home, Central Avenue, Gravesend
Report on Supplementary Ground Investigation



CFA Piles: - Working end-bearing stress in Lewes Nodular Chalk Formation (incorporating a factor of safety of 3.5).				
Pile Toe Depth (m)	SPT 'N₆₀' value at Pile Toe (blows)	Pile Diameter (m)		
		0.3	0.45	0.6
		Working End Bearing Capacity (kN)		
15	36	145	327	582
16	37	149	336	598
17	38	153	345	614
CFA Piles - Working shaft friction in Lewes Nodular Chalk Formation (Factor of Safety, FOS, of 1.5)				
Shaft Length in Chalk (m)		Pile Diameter (m)		
		0.4	0.5	0.6
		Working Shaft Friction (kN)		
4-15		502	753	1005
4-16		580	870	1160
4-17		663	995	1327

Working Loads – combined

An example of working loads for a range of pile diameters is given in the table below. This combines the shaft friction and end bearing resistance generated within the chalk.

Pile Toe Depth (m)	Pile Diameter (mm)	Safe Working Load (kN) – Shaft friction and End bearing
15	300 CFA	648
	450 CFA	1081
16	300 CFA	730
	450 CFA	1207
17	300 CFA	817
	450 CFA	1341

NB: A requirement of pile design is that ground conditions should be known to a minimum of 5 x pile diameter or 5m below the toe of the pile. (Eurocode 7).

It should be noted that the above predictions are for preliminary design purposes only and final design should be carried out by the appointed specialist piling contractor. In addition as piles will be required to penetrate into the Chalk the Environment Agency would need to be consulted and a risk assessment maybe required

The final choice of pile type and installation method should take into consideration the following:

- The effects of noise and vibration during pile installation on nearby adjacent structures.
- flint bands.

7.2 GROUND FLOORS

Based upon the results of this ground investigation and that a piled foundation solution is likely to be utilised it is recommended that suspended ground floor slabs should be adopted.

7.3 TEMPORARY WORKS

Excavations in excess of 1.2m depth may be required in connection with the proposed development on this site. If there is a requirement for personnel to enter into excavations, then the need for trench side support should be considered for any depth of excavation and, therefore, appropriate equipment should be available on site prior to excavation proceeding. A site specific risk assessment should be carried out where man entry into excavations is required.

The base of foundation excavations should be inspected and any soft loose, organic or otherwise deleterious material at foundation level removed and replaced with lean mix concrete. The soils encountered will be liable to softening/loosening when exposed to surface water infiltration. In order to avoid deterioration of the prepared formation the base of foundations should be blinded with concrete as soon as practical after excavation and particularly if there is delay before placing foundation concrete.

7.4 ROADS/HARDSTANDING

The results of in situ DCP tests indicated CBR values in the range 6 to >100% although generally in the range 6 to 17% below a typical formation level of 0.45m.

The results of the in situ plate CBR tests recorded CBR values in the range 4.5 % to 6.7% at typical formation levels at or below 450mm. A CBR value of 14.0% was recorded in the CBR test carried out at ground level.

For preliminary design purposes a CBR value of 4.5% should be adopted. The soils encountered during this ground investigation are considered frost susceptible therefore road construction should have a minimum of thickness of 450 mm.

Following excavation to formation level the subgrade should be proof rolled and inspected by an engineer and any soft, loose or otherwise deleterious material either stabilised or removed and replaced with well compacted granular fill.

Clay soils at formation level will locally be moisture susceptible and liable to softening and swelling or heave when wet. Prepared surfaces should therefore be kept dry to prevent localised subgrade softening where cohesive soils are exposed.

7.5 SOAKAWAYS

The results from the DG365 soakage tests are presented in the table below:

Trial Pit ID	Test No	Test Depth (m)	Infiltration rate (m/s)	Comment
SP1	1	0.93-2.95	5.15×10^{-6}	Low Infiltration – rate based on extrapolation of test data
SP2	1	1.0-3.25	1.30×10^{-6}	Low Infiltration – rate based on extrapolation of test data

NB: Rates are unfactored

Based on these results the use of shallow chamber type soakaways discharging into the Lewes Nodular Chalk Formation would not be a viable option for disposal of surface water.

To assess the p[potential for adopting a deep bore soakaway option falling head testing was carried out in the boreholes as they were advance. The test results are tabulated below:

Borehole ID	Test No	Test Depth (m)	Infiltration rate – KCC Method l/m ² /min	Infiltration rate (m/s)	Comment
BH1	1	7.5-10	24.75	4.3×10^{-4}	Good Infiltration
BH2	1	9-11	57.5	1.7×10^{-3}	Good Infiltration
BH2	2	9-15	21.4	1.6×10^{-3}	Good Infiltration

Based on the results of the falling head tests the use of a deep bore soakaway solution would be feasible for this site.

Should soakaways be considered as part of the development then irrespective of other considerations they should be sited at least 10m away from any foundations. The Environment Agency and Local Authority must be consulted when planning soakaway installations.

7.6 CHEMICAL ATTACK ON BURIED CONCRETE

The results of the chemical testing indicated a concentration of water-soluble sulphate in the range 456 to 576mg/l as SO₄. pH values were slightly alkaline with a range between 8.0 and 8.3 pH units.

In accordance with BRE Special Digest 1 (SD1:2005) entitled 'Concrete in Aggressive Ground' a design sulphate class for the site of DS-2 is recommended. Using SD1 an ACEC (Aggressive Chemical Environment for Concrete) class of AC-2 is recommended.



7.7 WASTE DISPOSAL

Should an excess volume of soil be required to be disposed of off-site then a waste classification may be required.

For a waste classification to be undertaken, materials need to be subjected to chemical testing which would give an indication to the contaminants present and, therefore those most toxic to the environment in the waste.

Following the assessment of the waste as hazardous or non-hazardous waste acceptance criteria leachate testing allows the appropriate disposal pathway to a suitably licensed disposal facility to be further determined.

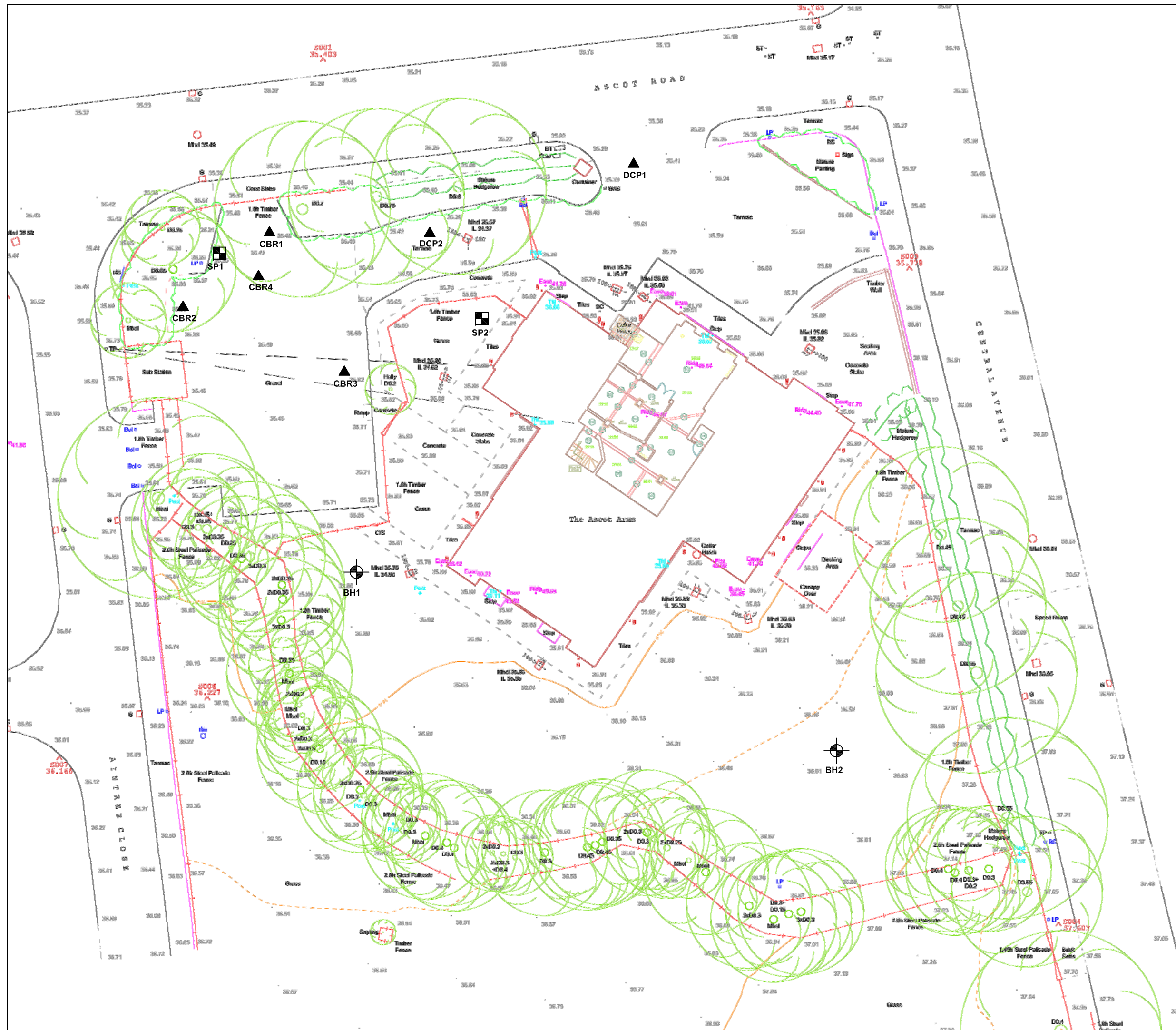
Waste acceptance criteria (WAC) leachate testing was carried out on two composite soil samples from the site. The results are attached at Appendix 5 and show that no leachable content in excess of the inert limit values was noted. No organic contamination was noted in the soils.

As a preliminary waste assessment and based on the results of materials tested to date, it is considered that any waste soils would be classed as non-hazardous and would be suitable for offsite disposal at a facility licensed to accept inert waste. The soils would be classed as EWC 17 05 04.

8 CONCLUSIONS AND RECOMMENDATIONS

Based on the site investigation, intrusive works and subsequent data assessment, the following conclusions and recommendations have been drawn in respect of the New Care Home site at Central Avenue, Gravesend, DA12 2BG.

- The ground investigation found, beneath a variable thickness of Made Ground/Topsoil, a discontinuous layer of Head Deposits and chalk typical of the Lewes Nodular Chalk Formation.
- Piled foundations into the Lewes Nodular Chalk Formation have been recommended. Preliminary safe working loads have been presented for a range of pile diameters and lengths.
- Suspended ground floor slabs were recommended
- A design CBR of 4.5% was recommended for pavements.
- The results of the DG365 testing indicated a shallow soakaway solution would not be a feasible option for the surface water drainage .
- Falling Head Testing in the boreholes indicated a good infiltration potential therefore deep bore soakaways are considered a viable option for this site. Soakaways would need to be sited a minimum of 10m from any structures.
- A design sulphate class for the site of DS-2 and an ACEC class of AC-2 is recommended
- The majority of any surplus subsoil material to be removed off site is likely to be classified as non-hazardous and may be acceptable at a facility licensed to accept inert waste.



KEY:

- WS - WINDOW SAMPLE
- BH - BOREHOLE
- (I) - INSTALLATION
- TP - TRIAL PIT
- HDTP - HAND DUG TRIAL PIT
- SP - SOAKAGE PIT
- ▲ DCP - DYNAMIC CONE PENETRATION
- DP - DYNAMIC PROBE
- HA - HAND AUGER
- PT - PERCOLATION TEST
- GM - GAS MONITORING STANDPIPE
- S - SAMPLE LOCATION

CLIENT:
JENNER CONTRACTORS

SITE ADDRESS:
NEW CARE HOME
CENTRAL AVENUE
GRAVESEND
DA12 5AW

DRAWING NO.:
FIGURE 1

DRAWING TITLE:
EXPLORATORY HOLE LOCATION PLAN

PROJECT NO.:
12992

DATE:
01/2023

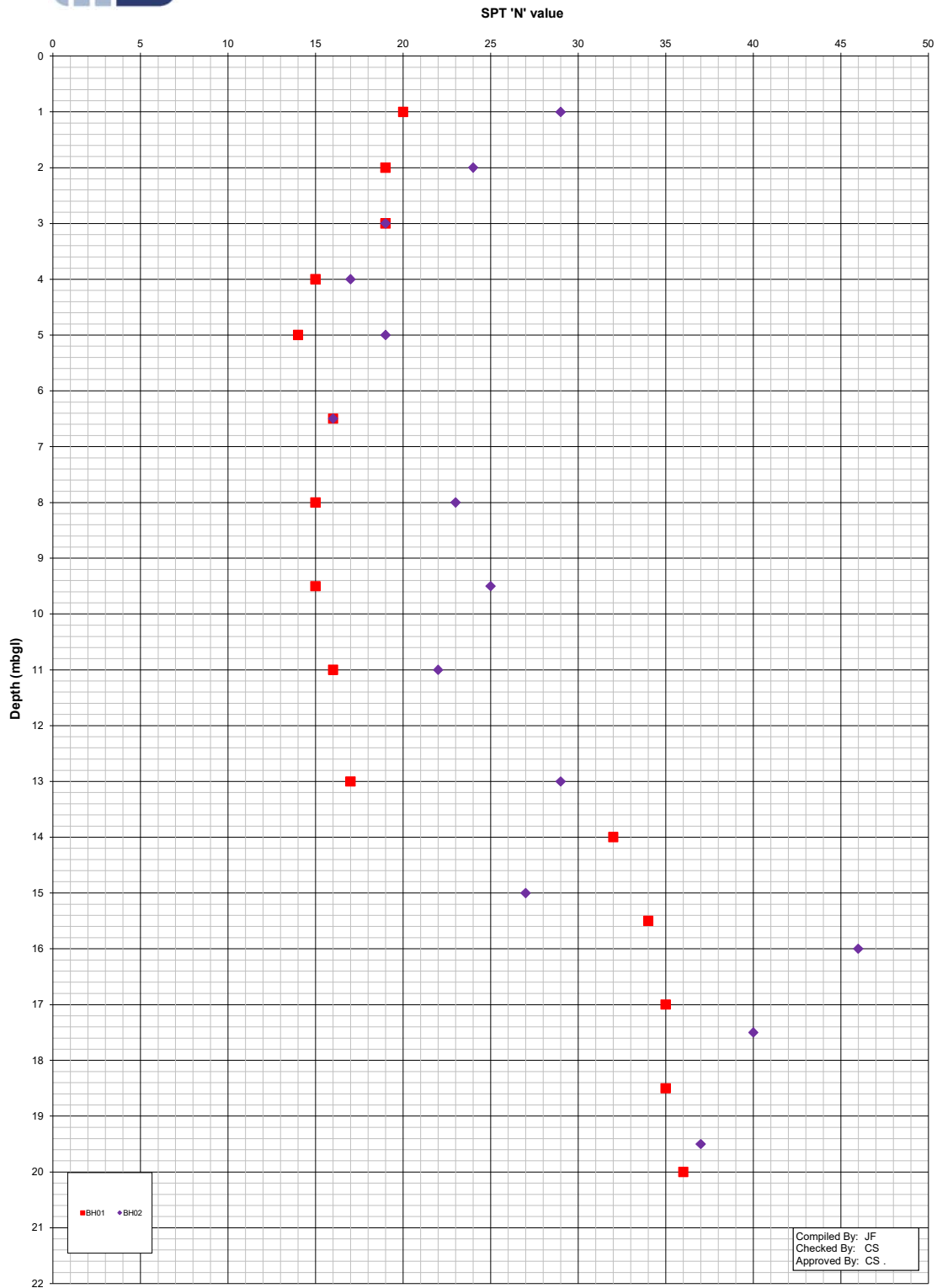
DRAWN:
PJ

REVISION:

GROUND AND ENVIRONMENTAL SERVICES (GES) LIMITED
UNIT 2
MONTPELIER BUSINESS PARK
DENCORA WAY
ASHFORD
KENT TN23 4FG
TEL: 01233 646 237

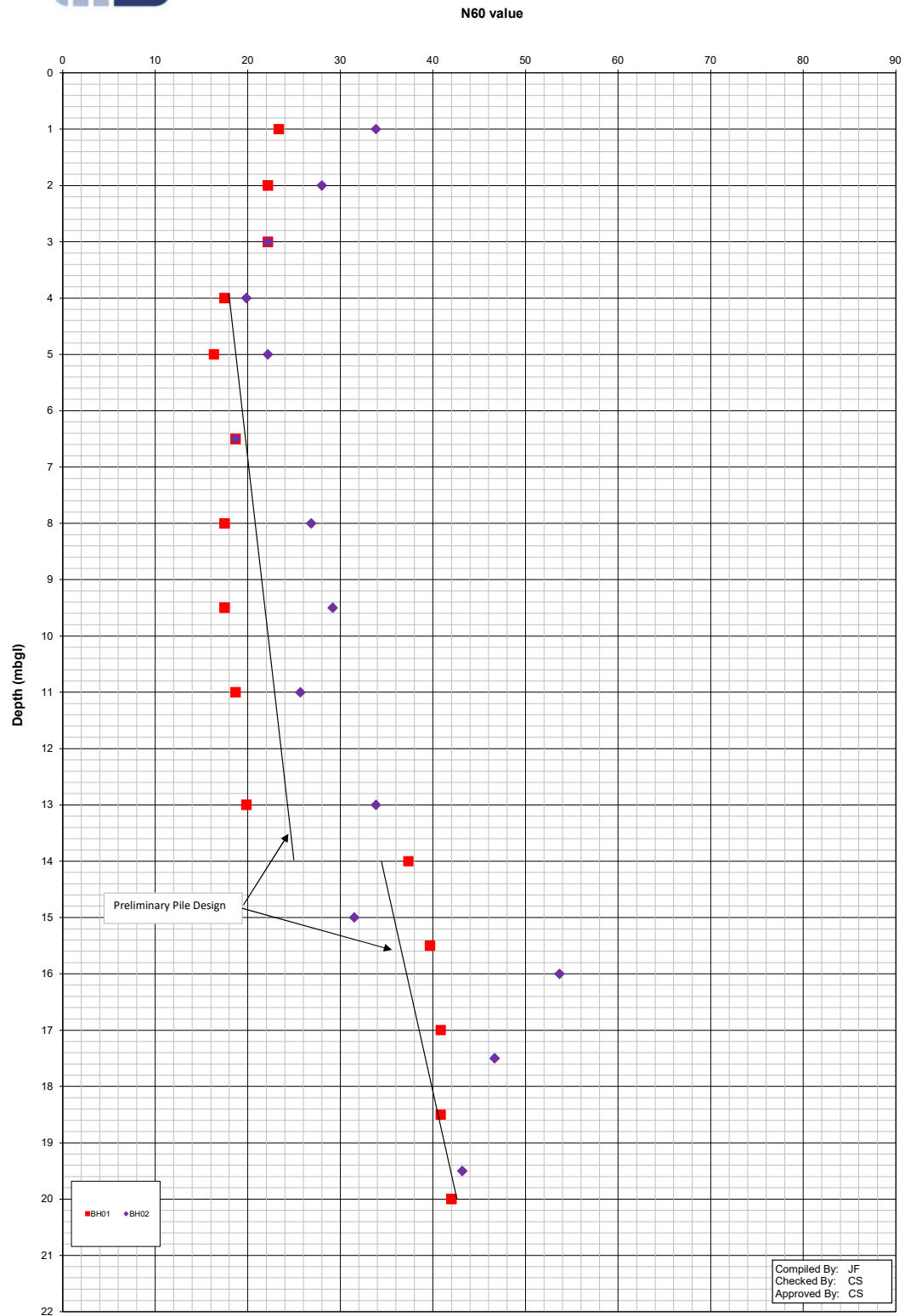


Figure 2: Former Ascot Arms, Central Avenue, Gravesend
SPT N-Depth Profile





**Figure 3: Former Ascot Arms, Central Avenue, Gravesend
N60-Depth Profile**





APPENDIX 1
BOREHOLE LOGS



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH1

Sheet: 1 of 3

Equipment & Methods. Dando 150 Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:01/02/2023 Date Completed:07/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
0.70		D		3,4/4,5,6,5	MADE GROUND: Grass over silty sandy clayey topsoil with frequent roots	-0.70		(0.70)		
1.00- 1.45		SS	SN=20		Stiff orange brown silty gravelly CLAY. Gravel is fine to coarse flint		0.70			
1.60		D		3,5/5,4,5,5				(1.50)		
2.00- 2.45		SS	SN=19							
2.60		D		4,5/4,5,5,5	Off white and light brown highly weathered CHALK. recovered as fine to coarse chalk gravel in a silt matrix	-2.20		2.20		
3.00- 3.45		SS	SN=19		White partially weathered CHALK. Recovered as fine to coarse chalk gravel in a comminuted silt matrix. Scattered flint throughout	-2.60		(0.40)		
3.70		D		2,4/5,4,4,3				2.60		
4.00- 4.45		SS	SN=15							
4.60		D		3,3/4,3,3,4						
5.00- 5.45		SS	SN=14							
6.00		D		2,4/5,4,4,3						
6.50- 6.95		SS	SN=16							
7.00		D		2,3/3,4,3,5						
8.00		SS	SN=15							
8.00- 8.45		D		2,2/3,4,4,4						
9.00		SS	SN=15							
9.50- 9.95		D		2,3/3,4,5,4						
10.00		SS	SN=16							
11.00		D		3,3/4,5,4,4						
11.00- 11.45		SS	SN=17							
12.00		D						(17.40)		

Remarks:

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Logged By:
DPR

Checked By:
CSS

Scale:
1:60

Approved By:

FIG No.
.1



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH1

Sheet: 2 of 3

Equipment & Methods. Dando 150 _Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:01/02/2023 Date Completed:07/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
12.00- 12.45		SS								
13.00		D								
14.00		D	SN=32	3,3/5,7,8,12						
14.00- 14.45		SS								
15.00		D								
15.50- 15.95		SS	SN=34	4,4/7,8,9,10						
16.00		D								
17.00		D	SN=35	4,6/6,8,9,12						
17.00- 17.45		SS								
18.00		D								
18.50- 18.95		SS	SN=35	4,7/7,9,9,10						
19.00		D								
20.00		D	SN=36	4,5/8,8,9,11						
20.00- 20.45		SS								
						-20.00		20.00		
						End of Borehole 20.00 m (Thickness of basal layer not proven)				
Remarks:						Logged By:		Checked By:		
						DPR		CSS		
						Scale: 1:60		Approved By:		
Notes: For explanation of symbols and abbreviations, see Key Sheet.						FIG No.		.2		



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH1

Sheet: 3 of 3

Equipment & Methods.

Dando 150
_Backfill: Arisings

Project Name: New Care Home

Project Location: Central Avenue, Gravesend, Kent

Client: Jenner (Contractors) Ltd

Job No:

12992

Co-ordinates:

E:

N:

Ground Level (m):

Date Started:01/02/2023

Date Completed:07/02/2023

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1-2-23	00:00	2.00		dry	end of shift
6-2-23	08:00	2.00		dry	start of shift
6-2-23	15:00	12.00	6.00	dry	end of shift
7-2-23	08:00	12.00	6.00	dry	start of shift
7-2-23	14:00	20.00	6.00	dry	end of borehole

Hole Diameter by Depth Table

Depth of Hole (m)	Diameter of Hole (mm)	Diameter of Casing (mm)	Depth of Casing (m)
20.00	150	150	9.00

Remarks:

Logged By:

DPR

Checked By:

CSS

Scale:
1:60

Approved By:

FIG No.

.3

Notes: For explanation of symbols and abbreviations, see Key Sheet.



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH2

Sheet: 1 of 3

Equipment & Methods. Dando 150 Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:30/01/2023 Date Completed:01/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
0.50		D			MADE GROUND: Grass over silty sandy clayey topsoil with frequent roots			(0.80)		
1.00- 1.45		SS	SN=29	4,6/7,7,7,8	Off white and light brown highly weathered CHALK. recovered as fine to coarse chalk gravel in a silt matrix	-0.80		0.80		
1.70		D								
2.00- 2.45		SS	SN=24	3,5/5,6,7,6				(2.10)		
2.60		D								
3.00- 3.45		SS	SN=19	4,6/5,4,5,5	...from 2.60 to 2.90 flints	-2.90		2.90		
3.50		D			White partially weathered CHALK. Recovered as fine to coarse chalk gravel in a comminuted silt matrix. Scattered flint throughout					
4.00- 4.45		SS	SN=17	3,4/5,4,4,4						
4.60		D								
5.00- 5.45		SS	SN=19	3,4/4,5,4,6						
6.00		D								
6.50- 6.95		SS	SN=16	3,3/4,3,4,5						
7.00		D								
8.00		D	SN=23	4,5/6,5,6,6						
8.00- 8.45		SS								
9.00		D								
9.50- 9.95		SS	SN=25	4,5/5,6,6,8	...from 9.10 to 9.50 flints					
10.00		D			...from 9.70 to 10.00 flints					
11.00		D	SN=22	3,5/5,6,6,5						
11.00- 11.45		SS						(17.10)		
Remarks:						Logged By:		Checked By:		
						DPR		CSS		
						Scale: 1:60		Approved By:		
Notes: For explanation of symbols and abbreviations, see Key Sheet.						FIG No.		.1		



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH2

Sheet: 2 of 3

Equipment & Methods. Dando 150 _Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:30/01/2023 Date Completed:01/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
13.00 13.00- 13.45		D SS	SN=29	3,5/6,7,7,9						
14.00		D								
15.00 15.00- 15.45		D SS	SN=27	4,5/5,6,7,9						
16.00 16.00- 16.45		D SS	SN=46	4,7/7,10,12,17						
17.00		D								
17.50- 17.95		SS	SN=40	5,6/8,9,10,13						
18.00		D								
19.00		D								
19.50- 19.95		SS	SN=37	3,7/8,8,9,12						
						-20.00		20.00		
						End of Borehole 20.00 m (Thickness of basal layer not proven)				
Remarks:							Logged By:		Checked By:	
							DPR		CSS	
							Scale: 1:60		Approved By:	
Notes: For explanation of symbols and abbreviations, see Key Sheet.							FIG No.		.2	



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH2

Sheet: 3 of 3

Equipment & Methods.

Dando 150
_Backfill: Arisings

Project Name: New Care Home

Project Location: Central Avenue, Gravesend, Kent

Client: Jenner (Contractors) Ltd

Job No:

12992

Co-ordinates:

E:

N:

Ground Level (m):

Date Started:30/01/2023

Date Completed:01/02/2023

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
30-1-23	00:00	6.50	1.50	dry	end of shift
31-1-23	08:00	6.50	1.50	dry	start of shift
31-1-23	16:00	15.00	9.00	dry	end of shift
1-2-23	09:00	15.00	9.00	dry	start of shift
1-2-23	13:00	20.00	9.00	dry	end of borehole

Hole Diameter by Depth Table

Depth of Hole (m)	Diameter of Hole (mm)	Diameter of Casing (mm)	Depth of Casing (m)
20.00	150	150	9.00

Chiselling Details

From (m)	To (m)	Time Taken (hhmm)	Chiselling Tool Used	Notes
2.60	2.90	00:15		flints
9.10	9.50	00:30		flints
9.70	10.00	00:15		flints

Remarks:

Logged By:

DPR

Checked By:

CSS

Scale:
1:60

Approved By:

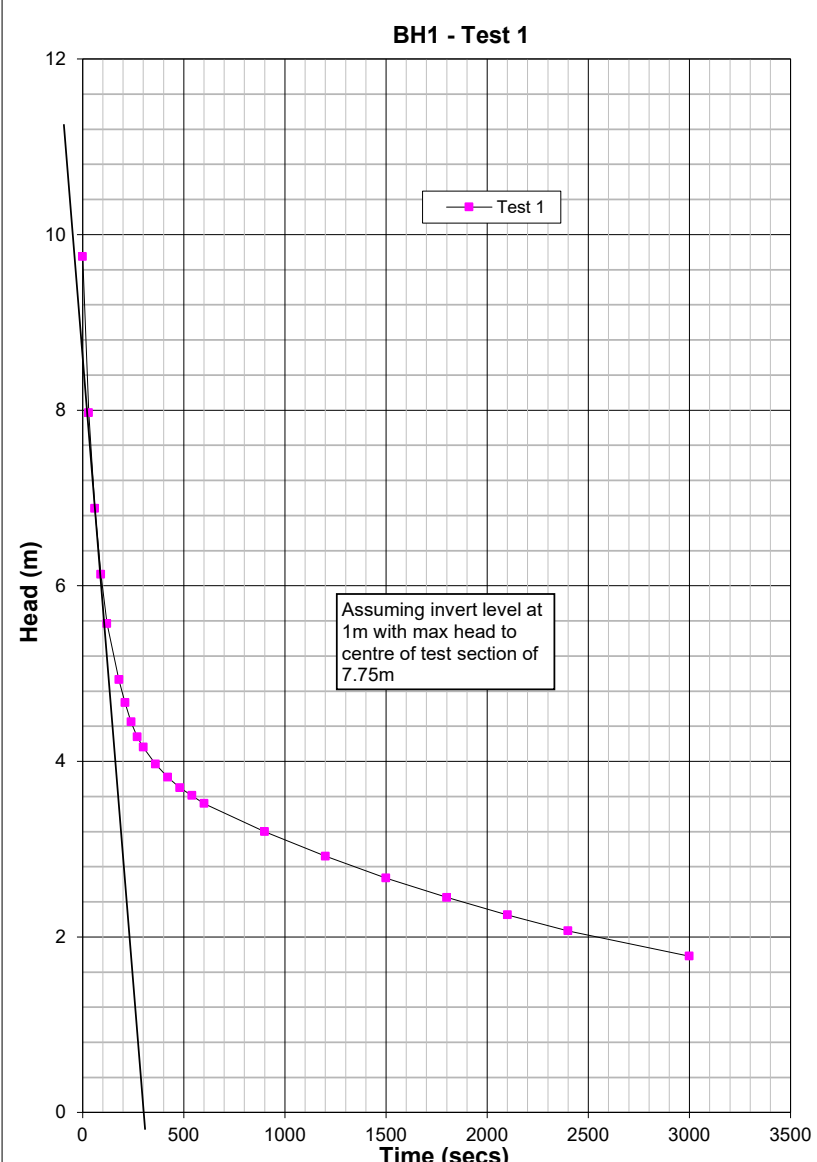
FIG No.

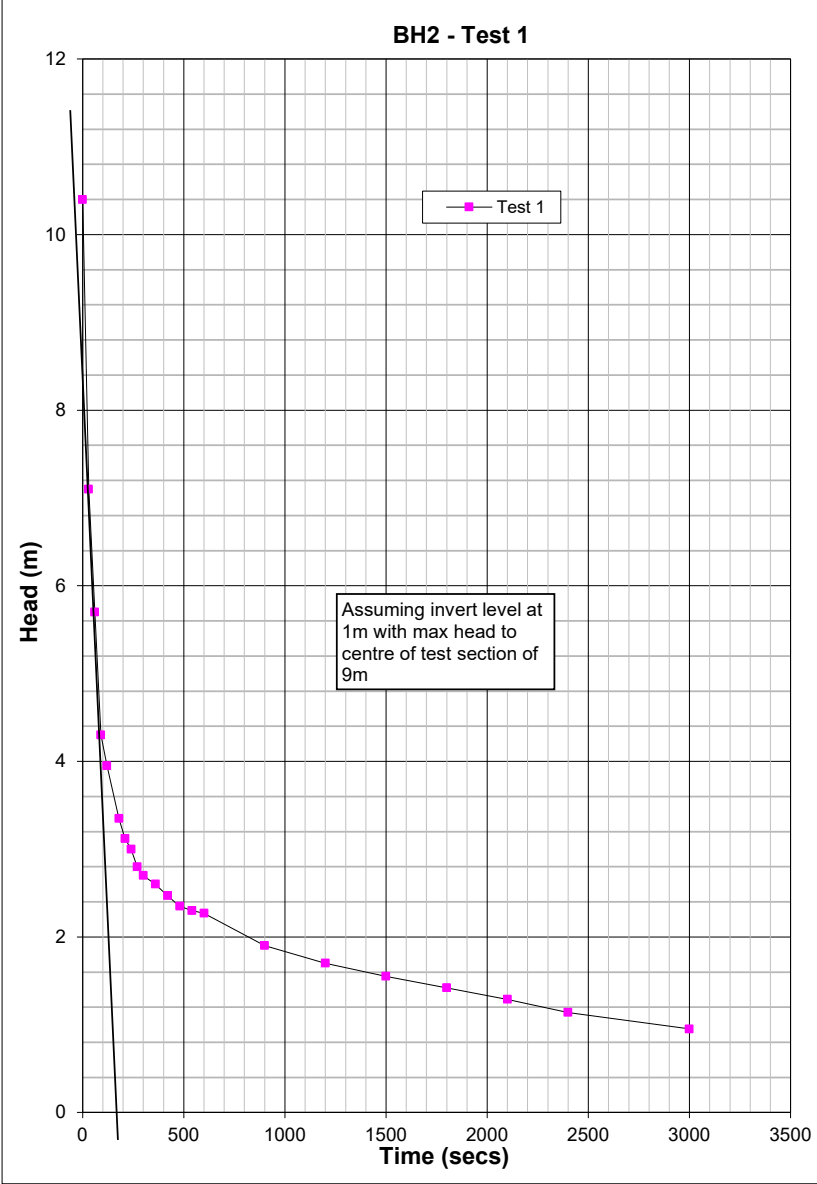
.3

Notes: For explanation of symbols and abbreviations, see Key Sheet.



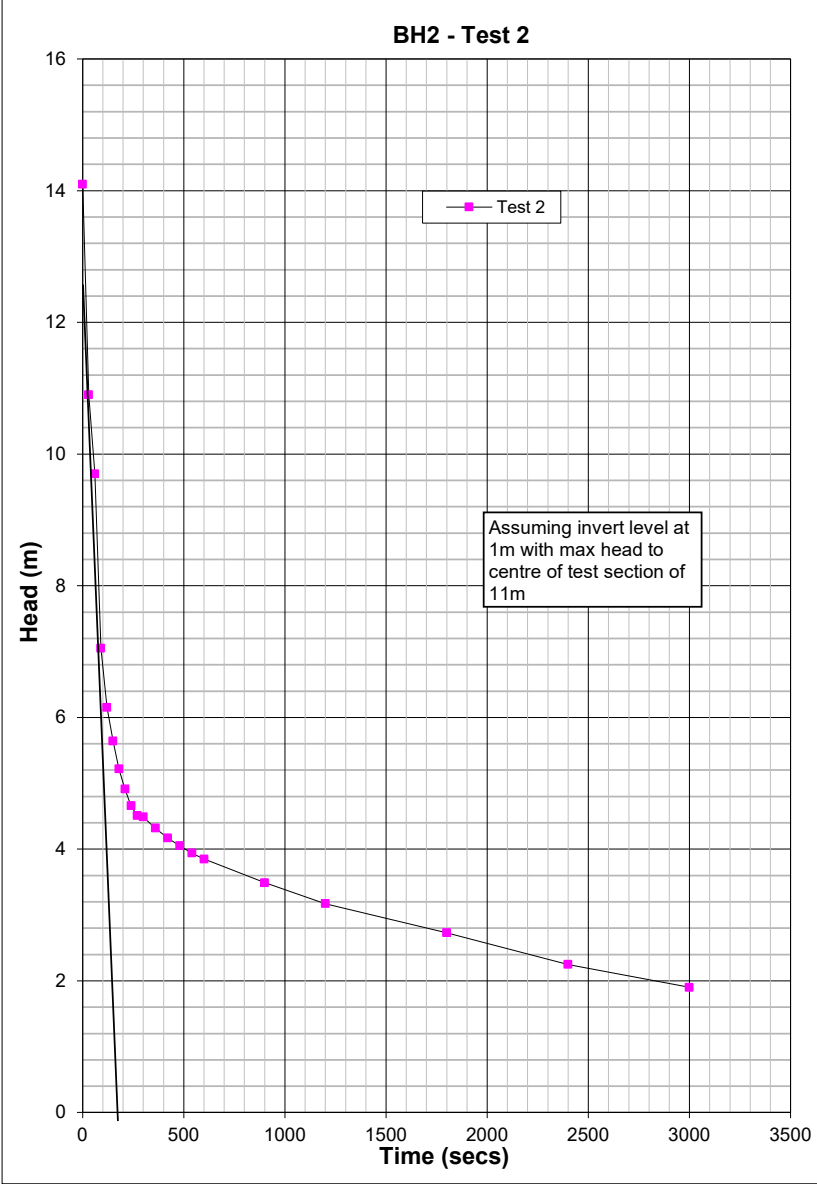
APPENDIX 2
FALLING HEAD TEST RESULTS

	New Care Home, Central Avenue, Gravesend	BH1																																																																					
Top section 7.5 m Bottom section 10 m	Centre section Diameter of test section 8.75 m 0.15 m	Diameter of Hole 0.15 m Length of test section 2.5 m																																																																					
Water Level dry m																																																																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Time (Seconds)</th> <th style="text-align: center;">Depth</th> <th style="text-align: center;">Head</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">0</td><td style="text-align: center;">0.25</td><td style="text-align: center;">9.75</td></tr> <tr><td style="text-align: center;">30</td><td style="text-align: center;">2.03</td><td style="text-align: center;">7.97</td></tr> <tr><td style="text-align: center;">60</td><td style="text-align: center;">3.12</td><td style="text-align: center;">6.88</td></tr> <tr><td style="text-align: center;">90</td><td style="text-align: center;">3.87</td><td style="text-align: center;">6.13</td></tr> <tr><td style="text-align: center;">120</td><td style="text-align: center;">4.43</td><td style="text-align: center;">5.57</td></tr> <tr><td style="text-align: center;">180</td><td style="text-align: center;">5.07</td><td style="text-align: center;">4.93</td></tr> <tr><td style="text-align: center;">210</td><td style="text-align: center;">5.33</td><td style="text-align: center;">4.67</td></tr> <tr><td style="text-align: center;">240</td><td style="text-align: center;">5.55</td><td style="text-align: center;">4.45</td></tr> <tr><td style="text-align: center;">270</td><td style="text-align: center;">5.72</td><td style="text-align: center;">4.28</td></tr> <tr><td style="text-align: center;">300</td><td style="text-align: center;">5.84</td><td style="text-align: center;">4.16</td></tr> <tr><td style="text-align: center;">360</td><td style="text-align: center;">6.03</td><td style="text-align: center;">3.97</td></tr> <tr><td style="text-align: center;">420</td><td style="text-align: center;">6.18</td><td style="text-align: center;">3.82</td></tr> <tr><td style="text-align: center;">480</td><td style="text-align: center;">6.3</td><td style="text-align: center;">3.7</td></tr> <tr><td style="text-align: center;">540</td><td style="text-align: center;">6.39</td><td style="text-align: center;">3.61</td></tr> <tr><td style="text-align: center;">600</td><td style="text-align: center;">6.48</td><td style="text-align: center;">3.52</td></tr> <tr><td style="text-align: center;">900</td><td style="text-align: center;">6.8</td><td style="text-align: center;">3.2</td></tr> <tr><td style="text-align: center;">1200</td><td style="text-align: center;">7.08</td><td style="text-align: center;">2.92</td></tr> <tr><td style="text-align: center;">1500</td><td style="text-align: center;">7.33</td><td style="text-align: center;">2.67</td></tr> <tr><td style="text-align: center;">1800</td><td style="text-align: center;">7.55</td><td style="text-align: center;">2.45</td></tr> <tr><td style="text-align: center;">2100</td><td style="text-align: center;">7.75</td><td style="text-align: center;">2.25</td></tr> <tr><td style="text-align: center;">2400</td><td style="text-align: center;">7.93</td><td style="text-align: center;">2.07</td></tr> <tr><td style="text-align: center;">3000</td><td style="text-align: center;">8.22</td><td style="text-align: center;">1.78</td></tr> </tbody> </table>	Time (Seconds)	Depth	Head	0	0.25	9.75	30	2.03	7.97	60	3.12	6.88	90	3.87	6.13	120	4.43	5.57	180	5.07	4.93	210	5.33	4.67	240	5.55	4.45	270	5.72	4.28	300	5.84	4.16	360	6.03	3.97	420	6.18	3.82	480	6.3	3.7	540	6.39	3.61	600	6.48	3.52	900	6.8	3.2	1200	7.08	2.92	1500	7.33	2.67	1800	7.55	2.45	2100	7.75	2.25	2400	7.93	2.07	3000	8.22	1.78	BH1 - Test 1 	
Time (Seconds)	Depth	Head																																																																					
0	0.25	9.75																																																																					
30	2.03	7.97																																																																					
60	3.12	6.88																																																																					
90	3.87	6.13																																																																					
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METHODOLOGY IN ACCORDANCE WITH KCC SOAKAWAY DESIGN GUIDE, JULY 2000.																																																																							
Soakage Rate:	$250 \cdot H_p \cdot d^2$	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Hp</td> <td style="text-align: center;">8.25</td> <td style="text-align: center;">m</td> <td style="text-align: center;">th</td> <td style="text-align: center;">5</td> <td style="text-align: center;">mins</td> </tr> </table>	Hp	8.25	m	th	5	mins																																																															
Hp	8.25	m	th	5	mins																																																																		
	$D \cdot L \cdot th$	Very good Infiltration - 1000L added to borehole in 280 seconds. Constant head at 0.25m for 40 seconds. Borehole collapsed to 9.35m during the test																																																																					
=	24.75																																																																						
		After BS5930:1999 $k(\text{approx}) = 4.3 \times 10^{-4} \text{ m/s}$ ESTIMATED																																																																					

		New Care Home, Central Avenue, Gravesend				BH2		
Top section Bottom section	9 11	m m	Centre section Diameter of test section	10 0.15	m m	Diameter of Hole Length of test section	0.15 2	m m
Water Level		dry m						
Time (Seconds)	Depth	Head						
0	0.6	10.4						
30	3.9	7.1						
60	5.3	5.7						
90	6.7	4.3						
120	7.05	3.95						
180	7.65	3.35						
210	7.88	3.12						
240	8	3						
270	8.2	2.8						
300	8.3	2.7						
360	8.4	2.6						
420	8.53	2.47						
480	8.65	2.35						
540	8.7	2.3						
600	8.73	2.27						
900	9.1	1.9						
1200	9.3	1.7						
1500	9.45	1.55						
1800	9.58	1.42						
2100	9.71	1.29						
2400	9.86	1.14						
3000	10.05	0.95						
			BH2 - Test 1					
								
			METHODOLOGY IN ACCORDANCE WITH KCC SOAKAWAY DESIGN GUIDE, JULY 2000.					
Soakage Rate:	$250 \cdot H_p \cdot d^2$		Hp	9.2	m	th	3	mins
	$D \cdot L \cdot th$		Very good Infiltration - 1000L added to borehole in 240 seconds. Constant head at 0.6m for 1 minute 10 seconds. Borehole collapsed to 10.2m during the test					
=	57.50	L/m ² /min	After BS5930:1999 k(approx) = 1.7×10^{-3} m/s ESTIMATED					

	New Care Home, Central Avenue, Gravesend					BH2		
Top section Bottom section	9 15	m m	Centre section Diameter of test section	12 0.15	m m	Diameter of Hole Length of test section	0.15 6	m m
Water Level		dry m						

Time (Seconds)	Depth	Head
0	0.9	14.1
30	4.1	10.9
60	5.3	9.7
90	7.95	7.05
120	8.85	6.15
150	9.36	5.64
180	9.78	5.22
210	10.09	4.91
240	10.34	4.66
270	10.49	4.51
300	10.51	4.49
360	10.68	4.32
420	10.83	4.17
480	10.95	4.05
540	11.06	3.94
600	11.15	3.85
900	11.51	3.49
1200	11.83	3.17
1800	12.27	2.73
2400	12.75	2.25
3000	13.1	1.9



BH2 - Test 2

METHODOLOGY IN ACCORDANCE WITH KCC SOAKAWAY DESIGN GUIDE, JULY 2000.							
Soakage Rate:	250*Hp*d^2	Hp	12	m	th	3.5	mins
	D*L*th	Very good Infiltration - 1000L added to borehole in 250 seconds. Borehole collapsed to 13.9m during the test					
=	21.43	L/m^2/min		After BS5930:1999 k(approx) = 1.6x10 ⁻³ m/s ESTIMATED			



APPENDIX 3

TRIAL PIT LOGS
AND DG365 TEST RESULTS



SOAKAWAY TESTING

Test in accordance with BRE 365 Guidelines

Project Reference Number: 12992 Client: Jenner Contractors

Site: New Care Home

Location: Central Avenue, Gravesend, DA12 5AW

SP 1 Test
1 / 1

Weather: Clear skies, sunny

Date of Test: 27-Jan-23

TRIAL PIT DIMENSIONS

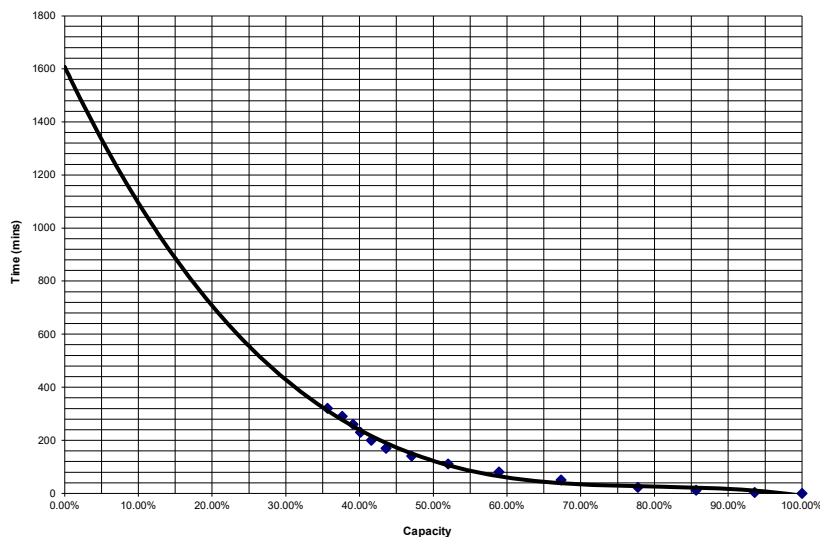
Width (m): 0.5 Length (m): 1.8

Depth (m): 2.95 Invert Depth (m): 0.93

Drainage time of test (mins): 321 (64% Drained)

SOAKAGE RESULTS

Depth	(%)	Time
0.93	100.00%	0
1.06	93.56%	4
1.22	85.64%	12
1.38	77.72%	23
1.59	67.33%	51
1.76	58.91%	81
1.9	51.98%	111
2	47.03%	141
2.07	43.56%	171
2.11	41.58%	201
2.14	40.10%	231
2.16	39.11%	261
2.19	37.62%	291
2.23	35.64%	321
2.95	0.00%	



INFILTRATION RATE

Depth (B.G.L.) (m)	Infiltration Rate (m/s)
0.93 - 2.95	5.15E-06

Departures from the specified test method: None

Remarks: low infiltration-rate based on extrapolation of test data

Authorised Signatory: C SPANTON Date: 1 / 02 / 2023



SOAKAWAY TESTING

Test in accordance with BRE 365 Guidelines

Project Reference Number: 12992 Client: Jenner Contractors

Site: New Care Home

Location: Central Avenue, Gravesend, DA12 5AW

SP 2 Test
1 / 1

Weather: Clear skies, sunny

Date of Test: 27-Jan-23

TRIAL PIT DIMENSIONS

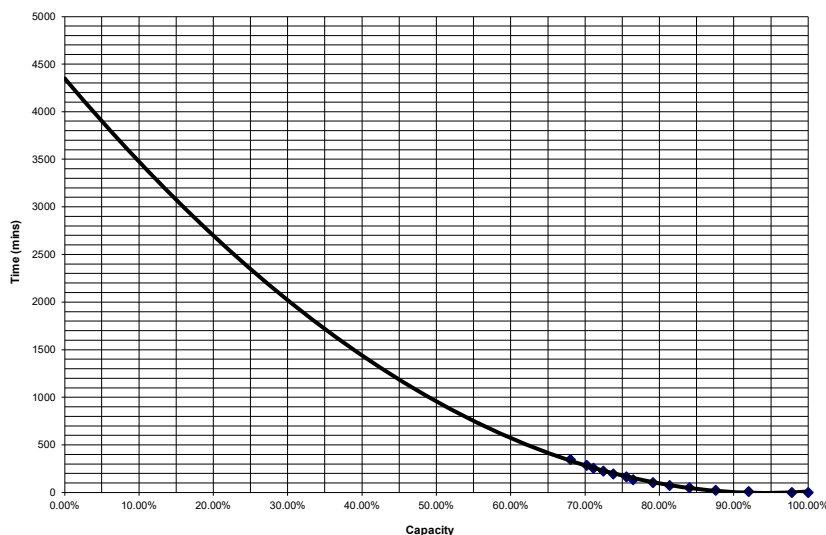
Width (m): 0.5 Length (m): 2

Depth (m): 3.25 Invert Depth (m): 1

Drainage time of test (mins): 346 (32% Drained)

SOAKAGE RESULTS

Depth	(%)	Time
1	100.00%	0
1.05	97.78%	1
1.18	92.00%	11
1.28	87.56%	26
1.36	84.00%	50
1.42	81.33%	76
1.47	79.11%	106
1.53	76.44%	136
1.55	75.56%	166
1.59	73.78%	196
1.62	72.44%	226
1.65	71.11%	256
1.67	70.22%	286
1.72	68.00%	346
3.25	0.00%	



INFILTRATION RATE

Depth (B.G.L.) (m)	Infiltration Rate (m/s)
1.00-3.25	1.30E-06

Departures from the specified test method: None

Low infiltration - rate based on extrapolation of test data

Remarks: _____

Authorised Signatory: C SPANTON Date: 1 / 02 / 2023



APPENDIX 4

PLATE LOAD AND DYNAMIC CONE PENETROMETER TEST RESULTS

TEST REPORT:	ESTIMATION OF CALIFORNIA BEARING RATIO		
	Design Manual for Roads and Bridges Vol. 7, Design and Maintenance: IAN 73/06, Revision 1 (2009)		
REFERENCE NUMBER :	MH23-12298-27-01-23-1	CLIENT :	Ground and Environmental Services Limited
CLIENT REF.:	CBR 3	ADDRESS :	Unit 2 Montpelier Busines Park, Dencora Way, Ashford
DATE TESTED :	27.01.2023		
TECHNICIAN :	R.Gaskin	SITE :	Land @ Central Avenue Gravesend
LOCATION :	CBR 3	MATERIAL :	Brown Sandy Clay With Masonry

TEST RESULTS

LOAD APPLIED TO PLATE	AVERAGE BEARING PRESSURE	GAUGE READING			GAUGE SETTLEMENT			AVERAGE SETTLEMENT
		1	2	3	1	2	3	
kN	kN/m ²	mm			mm			mm
0.0	0.0	20.30	19.43	18.92	0.00	0.00	0.00	0
5.3	32.0	20.08	19.03	18.62	0.22	0.40	0.30	0.31
8.3	50.3	19.80	18.60	18.27	0.50	0.83	0.65	0.66
10.5	64.0	19.50	18.20	17.88	0.80	1.23	1.04	1.02
12.0	73.2	19.17	17.78	17.49	1.13	1.65	1.43	1.40
13.5	82.3	18.83	17.36	17.10	1.47	2.07	1.82	1.79
15.0	91.5	18.58	16.92	16.71	1.72	2.51	2.21	2.15

EQUIPMENT DETAILS

Plate Diameter : 457 mm
Plate Area : 0.164 m²
Plate Correction : 0.63

AVERAGE BEARING PRESSURE

Average Bearing Pressure (P) at 1.25mm penetration

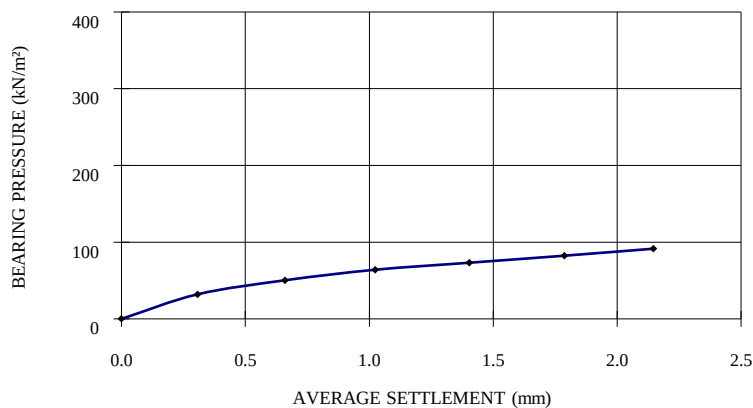
$$P = 69 \text{ kN / m}^2$$

ESTIMATED C.B.R VALUE

Estimated C.B.R at 1.25mm penetration

Estimated C.B.R.=4.5%

APPLIED LOAD vs SETTLEMENT RELATIONSHIP



Estimated C.B.R.=4.5%

REMARKS :

This test report shall not be reproduced, except in full , without the written approval of M&H Testing Limited. These results relate only to the items tested.



Checked and verified by:
Jon Champion
General Manager

27-Jan-23



M & H Testing Limited

"Adding Quality To Construction"

Southfield, Barnfield Road, Charing Heath, Ashford, Kent, TN27 0BP
Telephone: 01233 714051 Fax: 0700 601 9306



9873

TEST REPORT:	ESTIMATION OF CALIFORNIA BEARING RATIO		
	Design Manual for Roads and Bridges Vol. 7, Design and Maintenance: IAN 73/06, Revision 1 (2009)		
REFERENCE NUMBER :	MH23-12298-27-01-23-2	CLIENT :	Ground and Environmental Services Limited
CLIENT REF.:	CBR 2	ADDRESS :	Unit 2 Montpelier Busines Park, Dencora Way, Ashford
DATE TESTED :	27.01.2023		
TECHNICIAN :	R.Gaskin	SITE :	Land @ Central Avenue Gravesend
LOCATION :	CBR 2	MATERIAL :	Brown Sandy Clay With Masonry

TEST RESULTS

LOAD APPLIED TO PLATE	AVERAGE BEARING PRESSURE	GAUGE READING			GAUGE SETTLEMENT			AVERAGE SETTLEMENT
		1	2	3	1	2	3	
kN	kN/m ²	mm			mm			mm
0.0	0.0	20.61	19.33	18.92	0.00	0.00	0.00	0
9.0	54.9	20.30	18.92	18.59	0.31	0.41	0.33	0.35
12.0	73.2	19.93	18.52	18.25	0.68	0.81	0.67	0.72
13.5	82.3	19.58	18.19	17.83	1.03	1.14	1.09	1.09
15.0	91.5	19.18	17.89	17.44	1.43	1.44	1.48	1.45
16.5	100.6	18.75	17.58	17.02	1.86	1.75	1.90	1.84

EQUIPMENT DETAILS

Plate Diameter : 457 mm
Plate Area : 0.164 m²
Plate Correction : 0.63

AVERAGE BEARING PRESSURE

Average Bearing Pressure (P) at 1.25mm penetration

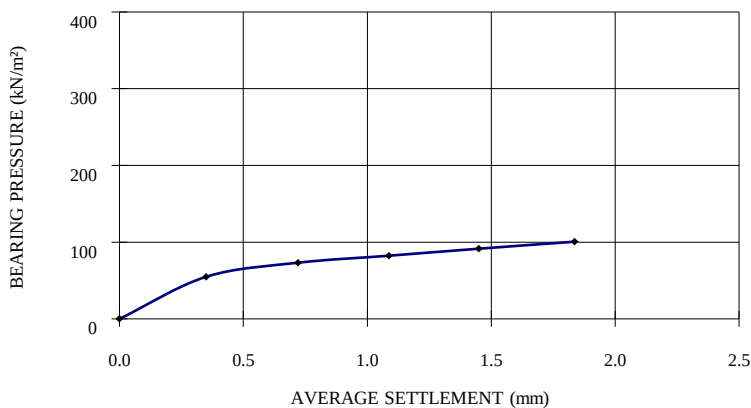
$$P = 86 \text{ kN / m}^2$$

ESTIMATED C.B.R VALUE

Estimated C.B.R at 1.25mm penetration

Estimated C.B.R.=6.7%

APPLIED LOAD vs SETTLEMENT RELATIONSHIP



Estimated C.B.R.=6.7%

REMARKS :

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Checked and verified by:
Jon Champion
General Manager

27-Jan-23

TEST REPORT:	ESTIMATION OF CALIFORNIA BEARING RATIO		
	Design Manual for Roads and Bridges Vol. 7, Design and Maintenance: IAN 73/06, Revision 1 (2009)		
REFERENCE NUMBER :	MH23-12298-27-01-23-3	CLIENT :	Ground and Environmental Services Limited
CLIENT REF.:	CBR 1	ADDRESS :	Unit 2 Montpelier Busines Park, Dencora Way, Ashford
DATE TESTED :	27.01.2023		
TECHNICIAN :	R.Gaskin	SITE :	Land @ Central Avenue Gravesend
LOCATION :	CBR 1	MATERIAL :	Brown Sandy Clay With Masonry

TEST RESULTS

LOAD APPLIED TO PLATE	AVERAGE BEARING PRESSURE	GAUGE READING			GAUGE SETTLEMENT			AVERAGE SETTLEMENT
		1	2	3	1	2	3	
kN	kN/m ²	mm			mm			mm
0.0	0.0	20.12	19.02	18.10	0.00	0.00	0.00	0
7.5	45.7	19.80	18.62	17.95	0.32	0.40	0.15	0.29
9.0	54.9	19.41	18.28	17.65	0.71	0.74	0.45	0.63
10.5	64.0	19.01	17.91	17.30	1.11	1.11	0.80	1.01
12.8	77.7	18.58	17.58	16.97	1.54	1.44	1.13	1.37
15.0	91.5	18.15	17.22	16.62	1.97	1.80	1.48	1.75

EQUIPMENT DETAILS

Plate Diameter : 457 mm
 Plate Area : 0.164 m²
 Plate Correction : 0.63

AVERAGE BEARING PRESSURE

Average Bearing Pressure (P) at 1.25mm penetration

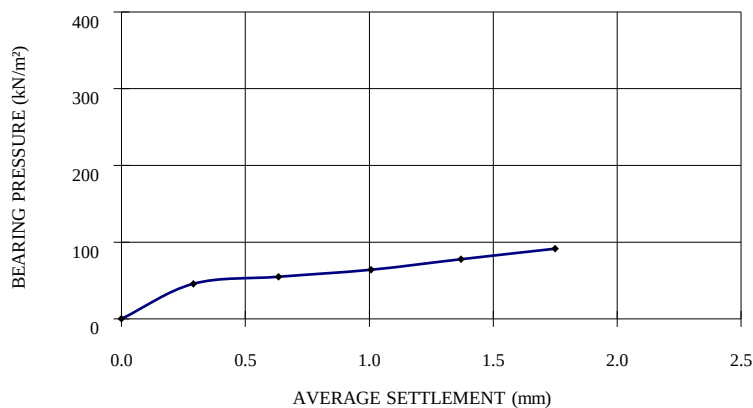
$$P = 73 \text{ kN / m}^2$$

ESTIMATED C.B.R VALUE

Estimated C.B.R at 1.25mm penetration

Estimated C.B.R.=5.0%

APPLIED LOAD vs SETTLEMENT RELATIONSHIP



Estimated C.B.R.=5.0%

REMARKS :

This test report shall not be reproduced, except in full , without the written approval of M&H Testing Limited. These results relate only to the items tested.

Handwritten signature

Checked and verified by:
 Jon Champion
 General Manager

27-Jan-23

TEST REPORT:	ESTIMATION OF CALIFORNIA BEARING RATIO		
	Design Manual for Roads and Bridges Vol. 7, Design and Maintenance: IAN 73/06, Revision 1 (2009)		
REFERENCE NUMBER :	MH23-12298-27-01-23-4	CLIENT :	Ground and Environmental Services Limited
CLIENT REF.:	CBR 4	ADDRESS :	Unit 2 Montpelier Busines Park, Dencora Way, Ashford
DATE TESTED :	27.01.2023		
TECHNICIAN :	R.Gaskin	SITE :	Land @ Central Avenue Gravesend
LOCATION :	CBR 4	MATERIAL :	Brown Sandy Clay With Masonry

TEST RESULTS

LOAD APPLIED TO PLATE	AVERAGE BEARING PRESSURE	GAUGE READING			GAUGE SETTLEMENT			AVERAGE SETTLEMENT
		1	2	3	1	2	3	
kN	kN/m ²	mm			mm			mm
0.0	0.0	21.08	19.57	18.61	0.00	0.00	0.00	0
12.8	77.7	20.71	19.19	18.33	0.37	0.38	0.28	0.34
15.8	96.0	20.35	18.79	18.00	0.73	0.78	0.61	0.71
19.5	118.9	20.00	18.42	17.67	1.08	1.15	0.94	1.06
24.0	146.3	19.64	18.03	17.33	1.44	1.54	1.28	1.42
27.8	169.2	19.28	17.60	16.94	1.80	1.97	1.67	1.81

EQUIPMENT DETAILS

Plate Diameter : 457 mm
Plate Area : 0.164 m²
Plate Correction : 0.63

AVERAGE BEARING PRESSURE

Average Bearing Pressure (P) at 1.25mm penetration

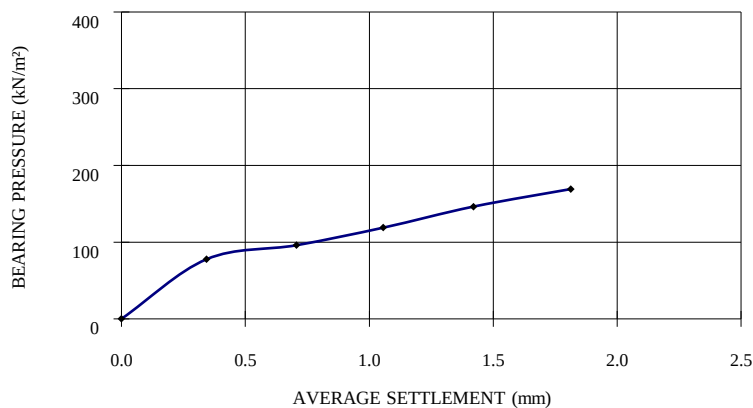
$$P = 134 \text{ kN / m}^2$$

ESTIMATED C.B.R VALUE

Estimated C.B.R at 1.25mm penetration

Estimated C.B.R.=14%

APPLIED LOAD vs SETTLEMENT RELATIONSHIP



Estimated C.B.R.=14%

REMARKS :

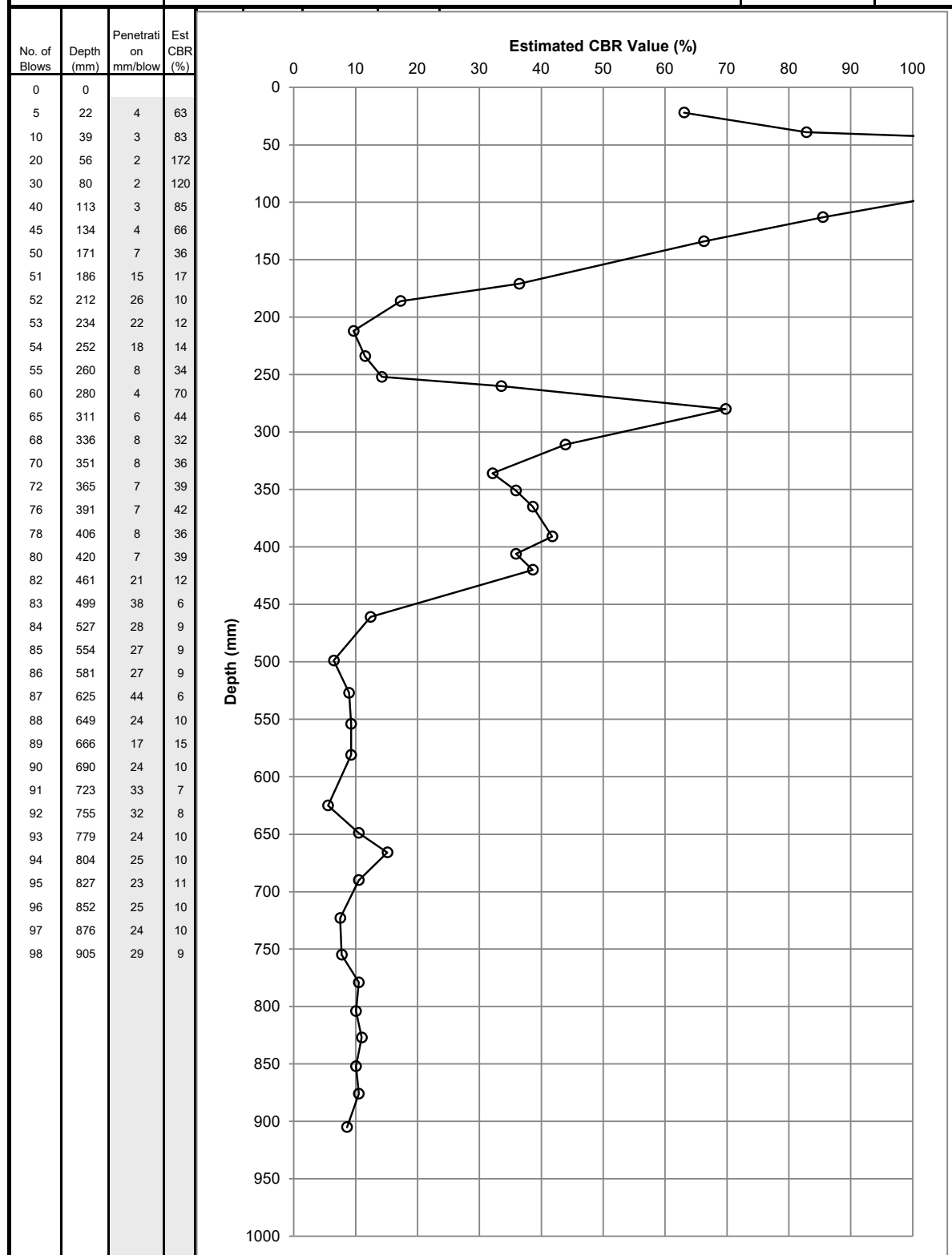
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Handwritten signature

Checked and verified by:
Jon Champion
General Manager

27-Jan-23

DYNAMIC CONE PENETROMETER TEST RESULTS		Test No	DCP1
		Date:	26-Jan
Project Name:	New Care Home, Central Avenue, Gravesend	Project No:	12992
Client Name:	Jenner Group	Zero Reading	48



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

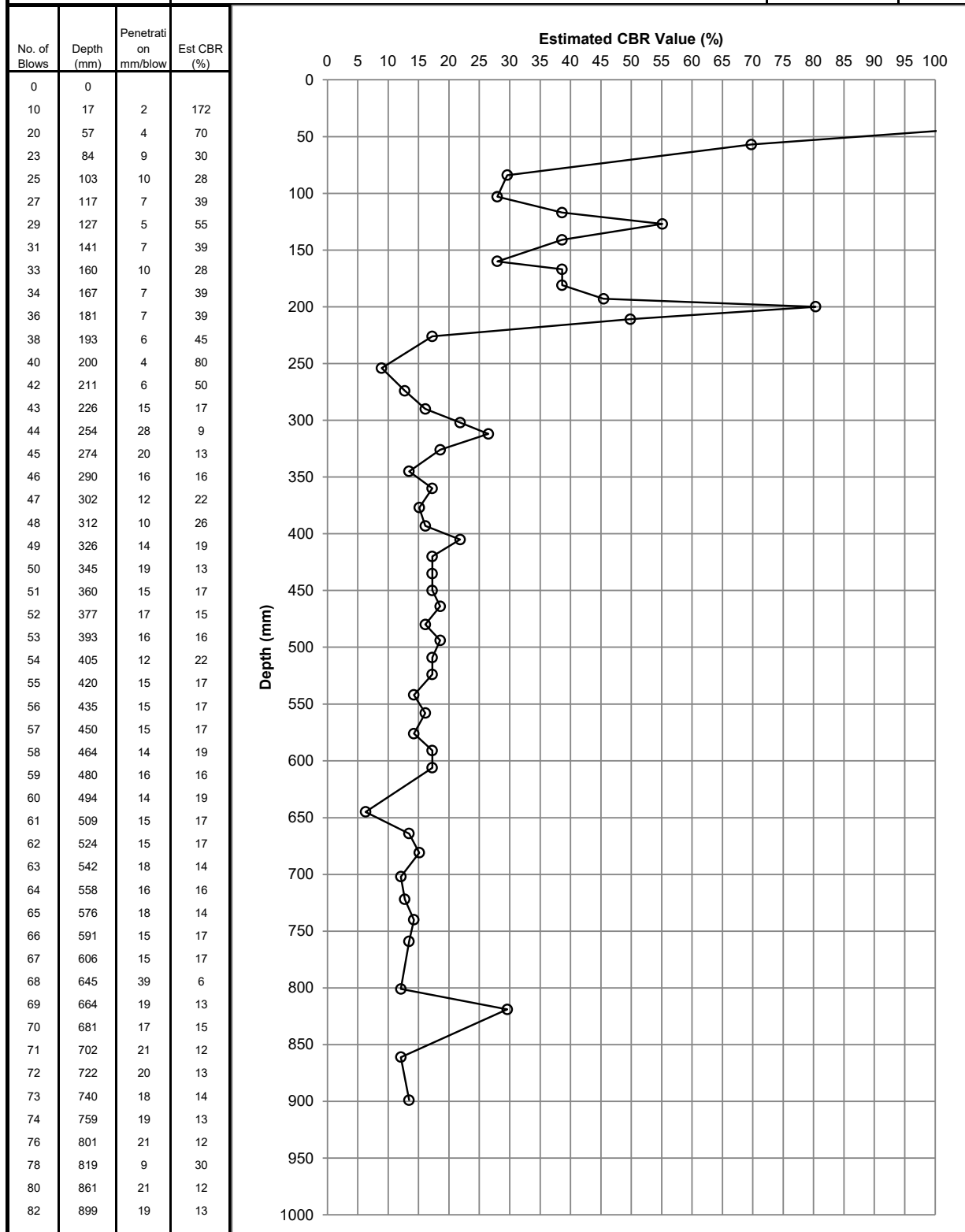
Tested By: JM

Approved By: CSS

Checked By: CSS



DYNAMIC CONE PENETROMETER TEST RESULTS		Test No	DCP2
		Date:	26-Jan
Project Name:	New Care Home, Central Avenue, Gravesend	Project No:	12992
Client Name:	Jenner Group	Zero Reading	48





APPENDIX 5
LABORATORY TEST RESULTS



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TN23 4FG

www.genvs.com
E: info@genvs.com
T: 01233 646237

Site: New Care Home, Gravesend

Project No: 12992

Client: Jenner (Contractors) Ltd

Date 21/02/2023

Date Received: 09/02/2023

Date Tested: 20/02/2023

Test Results

Location ID	Depth (m)	MC (%)	LL (%)	PL (%)	PI (%)	% passing 425 µm sieve	Classification	Sample type
BH 1	1.6	5.3	32	20	12	98	CL	D

Visual Descriptions

Location ID	Depth	Description
BH 1	1.6	Brown slightly gravelly very silty CLAY

Tested by: STP

Checked by: CSS

Approved by: CSS

Ground and Environmental Services Limited

Registered Office - Unit 2 Montpelier Business Park, Dencora Way, Ashford, Kent, TN23 4FG

Co Registration No: 7567478



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Site: New Care Home, Gravesend

Project No: 12992

Client: Jenner (Contractors) Ltd

Date: 21/02/2023

Date Received: 09/02/2023

Date Tested: 20/02/2023

Test Results

Location ID	Depth (m)	Saturation Moisture Content SMC (%)	Bulk Density (mg/m ³)	Dry Density (mg/m ³)	Sample type
BH01	10.0	33.2	1.89	1.42	D
SP 1	2.95	26.2	1.98	1.58	D
SP 2	3.25	33.7	1.85	1.41	D

Visual Descriptions

Location ID	Depth	Description
BH01	10.0	Off white gravel of CHALK
SP 1	2.95	Off white gravel of CHALK
SP 2	3.25	Off white gravel of CHALK

Tested by: STP

Checked by: CSS

Approved by: CSS



Craig Spanton
Ground & Environmental Services Ltd
Unit 2
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Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-01753

Site Reference: New Care Home, Gravesend

Project / Job Ref: 12992

Order No: GES/5081.12992

Sample Receipt Date: 10/02/2023

Sample Scheduled Date: 10/02/2023

Report Issue Number: 1

Reporting Date: 21/02/2023

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

For Topsoil and WAC analysis the expanded uncertainty measurement should be considered while evaluating results against compliance values.



DETS Ltd
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Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 23-01753	Date Sampled	09/02/23	09/02/23	09/02/23	09/02/23	09/02/23
Ground & Environmental Services Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: New Care Home, Gravesend	TP / BH No	BH1	BH1	BH2	BH2	BH2
Project / Job Ref: 12992	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/5081.12992	Depth (m)	3.70	7.00	2.60	4.60	10.00
Reporting Date: 21/02/2023	DETS Sample No	633578	633579	633580	633581	633582

Determinand	Unit	RL	Accreditation	(n)	(n)	(n)	(n)	(n)
pH	pH Units	N/a	MCERTS	8.0	8.1	8.2	8.2	8.3
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	562	515	456	469	576
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.06	0.05	0.05	0.05	0.06
Arsenic (As)	mg/kg	< 2	MCERTS					
Barium (Ba)	mg/kg	< 2.5	MCERTS					
Beryllium (Be)	mg/kg	< 0.5	MCERTS					
W/S Boron	mg/kg	< 1	NONE					
Cadmium (Cd)	mg/kg	< 0.2	MCERTS					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Copper (Cu)	mg/kg	< 4	MCERTS					
Lead (Pb)	mg/kg	< 3	MCERTS					
Mercury (Hg)	mg/kg	< 1	MCERTS					
Nickel (Ni)	mg/kg	< 3	MCERTS					
Selenium (Se)	mg/kg	< 2	MCERTS					
Vanadium (V)	mg/kg	< 1	MCERTS					
Zinc (Zn)	mg/kg	< 3	MCERTS					

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
 Subcontracted analysis (S)

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



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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 23-01753	Date Sampled	09/02/23	09/02/23			
Ground & Environmental Services Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: New Care Home, Gravesend	TP / BH No	WAC A	WAC B			
Project / Job Ref: 12992	Additional Refs	None Supplied	None Supplied			
Order No: GES/5081.12992	Depth (m)	None Supplied	None Supplied			
Reporting Date: 21/02/2023	DETS Sample No	633583	633584			

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS					
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS					
Total Sulphate as SO ₄	%	< 0.02	MCERTS					
Arsenic (As)	mg/kg	< 2	MCERTS	13	6			
Barium (Ba)	mg/kg	< 2.5	MCERTS	54	32			
Beryllium (Be)	mg/kg	< 0.5	MCERTS	1	0.5			
W/S Boron	mg/kg	< 1	NONE	< 1	< 1			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3	0.3			
Chromium (Cr)	mg/kg	< 2	MCERTS	23	15			
Copper (Cu)	mg/kg	< 4	MCERTS	14	10			
Lead (Pb)	mg/kg	< 3	MCERTS	31	9			
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	23	13			
Selenium (Se)	mg/kg	< 2	MCERTS	< 2	< 2			
Vanadium (V)	mg/kg	< 1	MCERTS	35	21			
Zinc (Zn)	mg/kg	< 3	MCERTS	53	27			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
 Subcontracted analysis (S)

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 23-01753		Date Sampled	09/02/23		Landfill Waste Acceptance Criteria Limits		
Ground & Environmental Services Ltd		Time Sampled	None Supplied				
Site Reference: New Care Home, Gravesend		TP / BH No	WAC A				
Project / Job Ref: 12992		Additional Refs	None Supplied				
Order No: GES/5081.12992		Depth (m)	None Supplied				
Reporting Date: 21/02/2023		DETS Sample No	633583				
Determinand	Unit	MDL			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
TOC ^{MU}	%	< 0.1	1		3%	5%	6%
Loss on Ignition	%	< 0.01	3.50		--	--	10%
BTEX ^{MU}	mg/kg	< 0.05	< 0.05		6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1		1	--	--
Mineral Oil ^{MU}	mg/kg	< 10	350		500	--	--
Total PAH ^{MU}	mg/kg	< 1.7	< 1.7		100	--	--
pH ^{MU}	pH Units	N/a	7.9		--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	2.6		--	To be evaluated	To be evaluated
Eluate Analysis			10:1 mg/l		Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)	
Arsenic ^U		< 0.01			< 0.1	0.5	2
Barium ^U		< 0.02			< 0.2	20	100
Cadmium ^U		< 0.0005			< 0.005	0.04	1
Chromium ^U		< 0.005			< 0.05	0.5	10
Copper ^U		< 0.01			< 0.1	2	50
Mercury ^U		< 0.0005			< 0.005	0.01	0.2
Molybdenum ^U		0.003			0.03	0.5	10
Nickel ^U		< 0.007			< 0.07	0.4	10
Lead ^U		< 0.005			< 0.05	0.5	10
Antimony ^U		< 0.005			< 0.05	0.06	0.7
Selenium ^U		< 0.005			< 0.05	0.1	0.5
Zinc ^U		< 0.005			< 0.05	4	50
Chloride ^U		4.2			42	800	15000
Fluoride ^U		< 0.5			< 5	10	150
Sulphate ^U		4.6			46	1000	20000
TDS		68			680	4000	60000
Phenol Index		< 0.01			< 0.1	1	-
DOC		15.9			159	500	800
Leach Test Information							
Sample Mass (kg)			0.10				
Dry Matter (%)			94.4				
Moisture (%)			6				
Stage 1							
Volume Eluate L10 (litres)			0.89				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
 Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepancies with current legislation
 M Denotes MCERTS accredited test
 U Denotes ISO17025 accredited test

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 23-01753		Date Sampled	09/02/23		Landfill Waste Acceptance Criteria Limits		
Ground & Environmental Services Ltd		Time Sampled	None Supplied				
Site Reference: New Care Home, Gravesend		TP / BH No	WAC B				
Project / Job Ref: 12992		Additional Refs	None Supplied				
Order No: GES/5081.12992		Depth (m)	None Supplied				
Reporting Date: 21/02/2023		DETS Sample No	633584				
Determinand	Unit	MDL			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
TOC ^{MU}	%	< 0.1	1		3%	5%	6%
Loss on Ignition	%	< 0.01	2.80		--	--	10%
BTEX ^{MU}	mg/kg	< 0.05	< 0.05		6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1		1	--	--
Mineral Oil ^{MU}	mg/kg	< 10	< 10		500	--	--
Total PAH ^{MU}	mg/kg	< 1.7	< 1.7		100	--	--
pH ^{MU}	pH Units	N/a	8.2		--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	4.4		--	To be evaluated	To be evaluated
Eluate Analysis			10:1 mg/l		Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)	
Arsenic ^U		< 0.01			< 0.1	0.5	2
Barium ^U		< 0.02			< 0.2	20	100
Cadmium ^U		< 0.0005			< 0.005	0.04	1
Chromium ^U		< 0.005			< 0.05	0.5	10
Copper ^U		< 0.01			< 0.1	2	50
Mercury ^U		< 0.0005			< 0.005	0.01	0.2
Molybdenum ^U		0.001			0.01	0.5	10
Nickel ^U		< 0.007			< 0.07	0.4	10
Lead ^U		< 0.005			< 0.05	0.5	10
Antimony ^U		< 0.005			< 0.05	0.06	0.7
Selenium ^U		< 0.005			< 0.05	0.1	0.5
Zinc ^U		< 0.005			< 0.05	4	50
Chloride ^U		1.7			17	800	15000
Fluoride ^U		< 0.5			< 5	10	150
Sulphate ^U		1.6			16	1000	20000
TDS		52			520	4000	60000
Phenol Index		< 0.01			< 0.1	1	-
DOC		16.2			161	500	800
Leach Test Information							
Sample Mass (kg)			0.11				
Dry Matter (%)			84.3				
Moisture (%)			18.6				
Stage 1							
Volume Eluate L10 (litres)			0.88				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
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 M Denotes MCERTS accredited test
 U Denotes ISO17025 accredited test



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Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 23-01753	
Ground & Environmental Services Ltd	
Site Reference: New Care Home, Gravesend	
Project / Job Ref: 12992	
Order No: GES/5081.12992	
Reporting Date: 21/02/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
633578	BH1	None Supplied	3.70	15.6	White chalk
633579	BH1	None Supplied	7.00	21.2	White chalk
633580	BH2	None Supplied	2.60	18.3	White chalk
633581	BH2	None Supplied	4.60	20.7	White chalk
633582	BH2	None Supplied	10.00	21	White chalk
633583	WAC A	None Supplied	None Supplied	5.6	Brown sandy clay with stones and chalk
633584	WAC B	None Supplied	None Supplied	15.6	Brown sandy clay with stones and chalk

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-01753

Ground & Environmental Services Ltd

Site Reference: New Care Home, Gravesend

Project / Job Ref: 12992

Order No: GES/5081.12992

Reporting Date: 21/02/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphénylcarbazine followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



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Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-01753

Ground & Environmental Services Ltd

Site Reference: New Care Home, Gravesend

Project / Job Ref: 12992

Order No: GES/5081.12992

Reporting Date: 21/02/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR dete	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered

Parameter	Matrix Type	Suite Reference	Expanded Uncertainty Measurement	Unit
TOC	Soil	BS EN 12457	10.4	%
Loss on Ignition	Soil	BS EN 12457	16.9	%
BTEX	Soil	BS EN 12457	14.0	%
Sum of PCBs	Soil	BS EN 12457	21.1	%
Mineral Oil	Soil	BS EN 12457	9.0	%
Total PAH	Soil	BS EN 12457	17.9	%
pH	Soil	BS EN 12457	0.282	Units
Acid Neutralisation Capacity	Soil	BS EN 12457	18.0	%
Arsenic	Leachate	BS EN 12457	19.5	%
Barium	Leachate	BS EN 12457	12.2	%
Cadmium	Leachate	BS EN 12457	17.2	%
Chromium	Leachate	BS EN 12457	20.7	%
Copper	Leachate	BS EN 12457	14.1	%
Mercury	Leachate	BS EN 12457	16.7	%
Molybdenum	Leachate	BS EN 12457	13.3	%
Nickel	Leachate	BS EN 12457	14.0	%
Lead	Leachate	BS EN 12457	12.1	%
Antimony	Leachate	BS EN 12457	16.1	%
Selenium	Leachate	BS EN 12457	15.5	%
Zinc	Leachate	BS EN 12457	14.0	%
Chloride	Leachate	BS EN 12457	15.7	%
Fluoride	Leachate	BS EN 12457	19.1	%
Sulphate	Leachate	BS EN 12457	27.6	%
TDS	Leachate	BS EN 12457	10.0	%
Phenol Index	Leachate	BS EN 12457	12.9	%
DOC	Leachate	BS EN 12457	20.4	%
Clay Content	Soil	BS 3882: 2015	15.0	%
Silt Content	Soil	BS 3882: 2015	14.0	%
Sand Content	Soil	BS 3882: 2015	13.0	%
Loss on Ignition	Soil	BS 3882: 2015	16.9	%
pH	Soil	BS 3882: 2015	0.282	Units
Carbonate	Soil	BS 3882: 2015	12.0	%
Total Nitrogen	Soil	BS 3882: 2015	12.0	%
Phosphorus (Extractable)	Soil	BS 3882: 2015	24.0	%
Potassium (Extractable)	Soil	BS 3882: 2015	20.0	%
Magnesium (Extractable)	Soil	BS 3882: 2015	26.0	%
Zinc	Soil	BS 3882: 2015	19.8	%
Copper	Soil	BS 3882: 2015	23.2	%
Nickel	Soil	BS 3882: 2015	32.6	%
Available Sodium	Soil	BS 3882: 2015	23.0	%
Available Calcium	Soil	BS 3882: 2015	23.0	%
Electrical Conductivity	Soil	BS 3882: 2015	10.0	%

**APPENDIX C – Environment Agency Pre-Application Response and
The Environment Agency's Approach to ground water protection –
Section G.**

Avery Healthcare Limited
3 Cygnet Drive
Swan Valley
Northampton
NN4 9BS

Our Ref: EPR/GP3120ST/A001

Date: 13/04/2023

Dear Sir/Madam,

**Pre-application checks – Basic service
Ascot Arms**

Following your pre-application request dated 08/03/2023 we have the following advice:

Application reference number	EPR/GP3120ST/A001
Summary and advice	Please find below a summary of our discussions and advice based on information provided within the online pre-application form and correspondence with your contact James Bowkett: You have requested advice about whether you need to apply for a discharge permit for your site 'Ascot Arms'. - You propose to discharge surface water runoff from roofs and hardstanding to ground via a borehole. - The surface water runoff will be treated by SuDS methods including a permeable paving system and infiltration/collection trench. - The maximum daily discharge volume will be around 160 m³/day (160 m³ for 1 in 100 + 40%). - Based on your site plan, the discharge point will be located near to national grid reference TQ 64912 72426. Based on the information that you have provided us within your pre-application form and correspondence, we can provide the following advice: Advice from our local Groundwater Team As part of this pre-application request, I have consulted with our local Area Groundwater Team who have advised that the proposed discharge does not require an environmental permit, so long as the following advice is implemented: The consultant/developer must <u>not</u> allow direct discharges to groundwater and there <u>must</u> be an unsaturated zone beneath the base of the proposed borehole and the highest seasonal groundwater table at all times. Provided that the operator can ensure the above advice is followed,

	which might mean making the borehole shallower, the Groundwater Team would not object here. Please note – the operator should also have regard to the Environment Agency’s Groundwater Protection Position Statements: https://www.gov.uk/government/publications/groundwater-protection-position-statements, Section G. They should also look more generally at the pages on groundwater protection: https://www.gov.uk/government/collections/groundwater-protection. Discharges to boreholes are not our preferred method of surface water disposal, as they bypass the shallow soil layers where natural attenuation of pollutants occurs. If a borehole is proposed for the discharge of <u>clean</u> surface water, it must not discharge directly to groundwater. Direct discharges are <u>not</u> allowed. The borehole should be constructed as shallow as possible when required infiltration rates are reached. The surface water system should include pollution prevention measures, especially if draining roads. Such measures can include treatment methods such as oil interceptors, downstream defenders, etc., which must be maintained as per the manufacturer’s guidance. Please be aware that the proposed site is located within groundwater Safeguard Zone and a Source Protection Zone 2. As such the groundwater is of high vulnerability. If you cannot meet our Groundwater Team’s advice If you are unable to meet the above advice, provided by our Groundwater Team, then you will need to apply for an environmental permit, as outlined in the below sections.
Forms required to be submitted	If you cannot meet our Groundwater Team’s advice and you need to apply for an environmental permit Applying for a permit If you submit an environmental permit application, then please quote this pre-application reference number EPR/GP3120ST/A001. Please ensure that you read the application form guidance and the information in the table below. <u>Important notice</u> The information that you need to submit with your application is explained in the application form and its guidance. The Environment Agency will check that you have submitted this information and the correct application charges. If you haven’t, we will contact you and you will need to send it within 5 working days. If we cannot progress your application any further, we will return your application to you. We’ll retain 20% of the correct application charge to cover our costs in reviewing your application and requesting information. This maximum amount we’ll retain is capped at £1,500. This is explained

	in the environmental permitting charges guidance. Please provide a fully completed version of the appropriate forms for your activity, in this case Forms Part A, Part B2, Part B6 and Part F1. If sections are not applicable to your permit, please indicate this rather than leaving a section blank. Please find links to these forms below: • Part A – https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-a-about-you • Part B2 – https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-b2-new-bespoke • Part B6 – https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-b6-new-bespoke-water-discharge-activity-and-groundwater-point-source-activity • Part F1 – https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-f1-opra-charges-declarations https://www.gov.uk/government/collections/environmental-permit-application-forms-for-a-new-bespoke-permit Please download the application forms and open with <i>Adobe Acrobat Reader</i>. You may not be able to complete the form using other pdf readers, such as the one built into your internet browser. You can also find out further information by following this link: https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits Please ensure all relevant sections of the application forms are completed accurately and all required documents are submitted and fully completed – failure to do so could cause delays in processing and the potential for us to retain a portion of the application fee (should we need to return the application because it is incomplete and you fail to provide us the outstanding information in due time). In addition, the declaration must be signed by a relevant person as described in the form guidance: https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-f1-opra-charges-declarations
Baseline fee required	If you cannot meet our Groundwater Team’s advice and you need to apply for an environmental permit Please refer to the ‘Additional documents required’ section below regarding ‘risk assessment’ screening for specific (e.g. hazardous) pollutants. Your environmental permit application will attract one of the following application fees: Scenario 1 – if all substances are screened out by the pollution risk assessment, and the volume is greater than 5 m³/day, then the cost of the application fee will be £4,652 as detailed in the Environment Agency’s Charging Scheme, activity 1.3.13:

	<i>Trade effluent and/or non-sewage effluent and/or rainfall related discharges to surface water or groundwater with a volume greater than 5m³ a day (not requiring specific substances assessment).</i> https://www.gov.uk/government/publications/environmental-permits-and-abstraction-licences-tables-of-charges If your permit is issued, an annual subsistence fee will be payable. This will be dependent on the type and volume of effluent. Scenario 2 – if any of the substances are not screened out in the pollution risk assessment, then the application fee will be £7,953 as detailed in the Environment Agency’s Charging Scheme, activity 1.3.14: <i>Trade effluent and/or non-sewage effluent and/or rainfall related discharges to surface water or groundwater requiring specific substances assessment (any volume).</i> https://www.gov.uk/government/publications/environmental-permits-and-abstraction-licences-tables-of-charges If your permit is issued, an annual subsistence fee will be payable. This will be dependent on the type and volume of effluent. Please note – the application charges outlined in this section are an estimate based on information provided at the pre-application stage. The application charges cover the work the Environment Agency carries out to determine the permit application. It is possible that, based on the information you submit for the full permit application, the determining permitting officer may decide that different or additional fees are required to cover the determination work. If it is decided that different or additional fees are applicable, then the determining permitting officer will discuss this with you when they are allocated your application.
Habitats screening	If you cannot meet our Groundwater Team’s advice and you need to apply for an environmental permit If we need to complete a habitats assessment during the determination of your application, you will need to pay an extra charge of £779 to cover the costs of this assessment. Further details of what “habitats assessment” refers to can be found in the charging guide at the following link: https://www.gov.uk/government/publications/environmental-permits-and-abstraction-licences-tables-of-charges
Additional documents required	If you cannot meet our Groundwater Team’s advice and you need to apply for an environmental permit Please provide these additional documents / supporting information: • When you submit your application, you will also need to include a site plan. The site plan must be clearly marked and labelled with the locations of the treatment and discharge systems, discharge point(s) and sample point(s). • A non-technical summary (section 5c of form/guidance form B2).

	• A summary of your management system (see section 3d of both Form B2 and Guidance form for B2 – you can find the link in the previous section). • Any other supporting documents that you mention in your form. • A risk assessment (section 8 of form B6). Please see the following links: https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits Risk assessment for groundwater: https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit A screening for hazardous substances in groundwater: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution#hazardous-substances
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If you cannot meet our Groundwater Team's advice and you need to apply for an environmental permit

Please ensure your completed application includes the following information;

Declaration	Please ensure the declaration is signed by a 'relevant person'. For an application from an individual, a relevant person is the person to be named on the permit. For an application from more than one individual, each person who is applying for their name to be on the permit must complete the declaration – you will have to print a separate copy of the declaration page for each additional individual to complete. In the case of a company, a relevant person must be an active director/company secretary as listed on Companies House – https://find-and-update.company-information.service.gov.uk/ Please ensure the declaration tick box is completed.
Site Plan	The site plan must be clearly marked and labelled with the locations of the treatment and discharge systems, discharge point(s) and sample point(s).
Foul sewer	Please check whether you can connect to a foul sewer. To find out if there is a public sewer near your property, contact your local water company https://www.ofwat.gov.uk/contact-companies/
Payment	Please note an application will not be processed until we receive the full payment.

Dealing with the impact of COVID-19

We are following Government advice to manage the risks of Coronavirus to our organisation, to protect the health, safety and wellbeing of our staff and sustain our critical operations.

It is important that you inform us of any applications that are critical to maintain national resilience, national infrastructure and critical environmental protection.

If your application falls under these categories, please highlight this clearly in your cover email.

How to submit your application

Please send your completed application documents via email to:

psc-waterquality@environment-agency.gov.uk

Postal applications

We would advise you to submit applications via email wherever possible, however, if you would like to submit a postal application, please send it to the following address:

Water Quality Team
Permitting Support Centre
Quadrant 2
99 Parkway Avenue
Sheffield
S9 4WF

Disclaimer

The advice given is based on the information you have provided and does not constitute a formal response or decision of the Environment Agency with regards to future permit applications. Any views or opinions expressed are without prejudice to the Environment Agency's formal consideration of any application. Please note that any application is subject to a full technical check during duly making and determination, and additional information may be required based on your detailed submission and site-specific requirements.

This advice covers Groundwater Activities only. Other permissions from the Environment Agency and/or other bodies may be required for associated or other activities.

Please note that a permit does not give any right or permission to discharge where land is not owned by the applicant.

In addition, for discharges to a watercourse it does not imply the suitability, with regards to volumetric capacity of the receiving watercourse. It is the responsibility of any permit holder to negotiate any wayleaves, easements etc. in order to use or cross another person's land; and to identify and negotiate any requirement for downstream improvement works with the riparian owners concerned.

This pre-application request is now closed. Further enquiries resulting from this response must be logged as a new request using the online form:

<https://www.gov.uk/government/publications/environmental-permit-pre-application-advice-form>

If you need more extensive or technical pre-application advice, you can ask for our Enhanced service. The enhanced pre-application advice is charged at £100 per hour plus



VAT. You will need to complete and submit a new online pre-application request to request enhanced pre-application advice.

If you have any questions, please find my contact details below.

Yours faithfully,

Mike Coleman

Permitting Officer
National Permitting Service
preapplicationservice@environment-agency.gov.uk

G. Discharge of liquid effluents into the ground

This section applies to the millions of litres of sewage effluent, surface water run-off, industrial effluent and waste waters that are released into the ground every year. These discharges, if not properly managed could result in pollution of groundwater.

It explains how the Environment Agency will respond to different types and methods of disposal of liquid effluents to the ground. The position statements apply principally to:

- direct discharges to groundwater
- discharges of effluents to ground
- surface water run-off

Regulation and permitting of discharges

You must not cause or knowingly permit the discharge of hazardous substances or non-hazardous pollutants that might lead to an input of that substance into groundwater without an environmental permit unless the discharge qualifies for an exemption (in which case the discharge must meet the conditions relating to that exemption) or exclusion. If necessary, the Environment Agency may serve a notice to prohibit or bring into control, activities that may result in pollution.

The Environment Agency adopts a risk based approach to all discharges (see also [position statement A1](#)) and will not allow those which cannot be mitigated. If discharging to ground, you must be able to comply with the conditions for an exemption or permit. Where planning applications and permits are required, it is recommended that parallel tracking is used.

For certain specified groundwater discharge activities where sufficient information is supplied with the application, the Environment Agency may be able to undertake an initial risk assessment, but generally operators must also assess the environmental impact of their proposal to demonstrate an acceptable environmental outcome at the proposed discharge site.

Exempt small sewage discharges

Discharge of treated sewage of 2 metres cubed per day or less to ground/groundwater are called small sewage discharges (SSDs). The majority of SSDs do not require an environmental permit if they comply with certain qualifying conditions called [general binding rules](#) (GBRs). A permit is required however for all SSDs in source protection zone 1 (SPZ1). See the [small sewage discharge guidance](#).

Direct inputs

G1 - Direct inputs into groundwater

The Environment Agency must take all necessary measures to:

- prevent the input of any hazardous substance to groundwater
- limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater

The Environment Agency will not agree to the [direct input](#) of non-hazardous pollutants into groundwater unless the activity can be included within groundwater activities as stated in paragraph 8 of Schedule 22 to EPR 2016, AND if all of the following apply:

- it will not result in pollution of groundwater
- there are clear and overriding reasons why the discharge cannot reasonably be made indirectly, and
- there is adequate evidence to show that the increased pollution risk from direct inputs will be mitigated

Direct input into groundwater presents a significantly increased risk of pollution. Discharges that concentrate the flow of effluent at one location and bypass some of the soil layers will limit the ability of the ground to attenuate pollutants and protect groundwater.

The Environment Agency is seeking to stop direct discharges to groundwater through wells, boreholes and shafts ([position statement G9](#)). The Environment Agency will only allow them if they meet the criteria in position statement G1.

Sewage and trade effluent

For treated sewage effluent discharges, the Environment Agency encourages the use of shallow infiltration systems, which maximise attenuation within the drainage blanket and the underlying unsaturated zone. [British Standard 6297:2007+A1:2008](#) (or latest version) provides guidance on the design and installation of drainage fields for use in wastewater treatment and should be used to determine if a shallow infiltration system is a feasible option.

G2 - Sewage effluent discharges inside SPZ1

Inside SPZ1 all sewage effluent discharges to ground must have an environmental permit.

All permit applications will be considered on the basis of risk assessment and the appropriateness of the discharge with respect to the local environmental setting. For new discharges you should contact the Environment Agency to discuss whether or not it is likely to grant a permit.

Existing small sewage discharges in SPZ1*

If there is no evidence of pollution or significant risk of pollution associated with the discharge from an existing single sewage treatment system then the Environment Agency will normally grant a permit.

If an unpermitted discharge is discovered in a SPZ1 and there is evidence of pollution or a significant risk of pollution, the Environment Agency will work with the operator to address the issue on a site specific basis. Where necessary, the Environment Agency may use a notice to deal with any unacceptable discharge.

*An existing small sewage discharge is one that was in place before 1 January 2015.

G3 - Cumulative impact from sewage effluent discharges

The Environment Agency will only agree to developments where the addition of new sewage effluent discharges to ground in an area of existing discharges is unlikely to lead to an unacceptable cumulative impact. This will apply especially to sewage effluent in areas where concentrations of non-mains drainage to ground have given rise to known surface water or groundwater pollution.

Whilst some sewage effluent discharges may not pose a risk to groundwater quality individually, the cumulative risk of pollution from aggregations of discharges can be significant. Improvement or pre-operational conditions may be imposed before granting an environmental permit.

G4 - Trade effluent and other discharges inside SPZ1

Inside SPZ1 the Environment Agency will object to any new trade effluent, storm overflow from sewerage system or other significantly contaminated discharges to ground where the risk of groundwater pollution is high and cannot be adequately mitigated. If necessary, the Environment Agency will use a prohibition notice to stop any such existing discharge.

G5 - Connection to public foul sewer

Generally, the Environment Agency will only agree to developments involving release of sewage effluent, trade effluent or other contaminated discharges to ground if it is satisfied that it is not reasonable to make a connection to the public foul sewer. You will have to provide evidence of why your proposed development cannot connect to the foul sewer via your planning application. This position will not

normally apply to surface water run-off via sustainable drainage systems and discharges from sewage treatment works operated by sewerage undertakers with appropriate treatment and discharge controls

G6 - Cesspools and cesspits

The Environment Agency does not encourage the use of cesspools or cesspits, other than in exceptional circumstances. A cesspool or cesspit is a sealed unit that is used for the storage of untreated sewage. There must be no discharge to the environment. Poorly managed cesspools and cesspits present a considerable risk of causing pollution, which can be difficult to monitor and correct.

G7 - Evidence of pollution from liquid effluent

The Environment Agency will work with dischargers to seek solutions to pollution arising from liquid effluent. Where necessary it may use its notice powers to require or vary permits or to prohibit further discharge.

G8 - Sewerage pipework

The Environment Agency will require the use of the highest specification pipework and designs for schemes involving new sewerage systems in SPZ1 to minimise leakage.

Sewage effluent discharges to deep infiltration systems

Deep infiltration systems include deep pit based systems such as boreholes, shafts, concrete rings or other structures that bypass the soil layers. The Environment Agency does not regard the use of boreholes or other deep structures for the discharge of sewage effluent as routinely appropriate disposal options because they concentrate the flow of effluent at one location and bypass the soil layers. This limits the ability of the ground to attenuate pollutants and presents a greater risk of groundwater pollution. For this reason all such discharges require an environmental permit and are not eligible for an exemption from permitting requirements. A detailed risk assessment is a prerequisite for any permit application.

G9 - Use of deep infiltration systems for surface water or sewage effluent disposal

The Environment Agency will only agree to the use of deep infiltration systems for surface water or sewage effluent disposal if the developer can show that all of the following apply:

- the discharge to groundwater is indirect (with the exception of clean uncontaminated roof water to ground - see Position Statement G12)
- there are no other feasible disposal options such as shallow infiltration systems or drainage fields/mounds that can be operated in accordance with the appropriate current [British Standard 6297:2007+A1:2008](#)
- the system is no deeper than is required to obtain sufficient soakage
- acceptable pollution control measures are in place
- risk assessment demonstrates that no unacceptable discharge to groundwater will take place – in particular inputs of hazardous substances to groundwater will be prevented
- there are sufficient mitigating factors or measures to compensate for the increased risk arising from the use of deep structures

For new effluent discharges that meet the above criteria, secondary treatment is required.

The Environment Agency will apply [position statement G1](#) to any deep infiltration systems potentially involving the discharge of non-hazardous pollutants. The Environment Agency will encourage operators of existing deep infiltration systems to alter their facilities so that direct inputs of pollutants are avoided, particularly where there is potential for hazardous substances to enter groundwater.

Mitigating factors for deep infiltration systems may include additional levels of effluent treatment, but for all proposed new systems the depth of the structure must be no deeper than required to obtain sufficient soakage. This will maximise attenuation in the unsaturated zone. Position statement G1 will also apply if the input to groundwater is direct.

While the Environment Agency cannot prevent the use of boreholes or other deep structures for sewage effluent disposal, their use must not be regarded as a routinely appropriate disposal option. BS: 6297 makes it clear that drainage fields are considered to be an important component of a non-mains wastewater treatment system. The British Standard states that deep pit based systems should not be used for sewage effluent disposal, as they do not provide sufficient treatment. This is because the effluent would not be distributed so as to minimise the hydraulic loading and maximise the beneficial effects of biological action around infiltration systems. The deep infiltration system will also not maximise attenuation in the soils and unsaturated zone.

BS: 6297 does not specifically refer to the use of boreholes for disposal but the principles are the same; a borehole may bypass even more of the available attenuation capacity of the soils and unsaturated zone and allow direct input of pollutants to groundwater. It is also possible that bio-fouling within the borehole will diminish the efficiency of the system with time.

The level of prior examination required to support a proposal to use a borehole may be significantly greater than required for near surface infiltration systems, since the Environment Agency cannot make the basic assumptions about the effectiveness of drainage fields that normally form part of our risk-based approach.

The extent of examination is site-specific and a matter for local judgement by Environment Agency staff based on local groundwater sensitivity. In general, the larger the proposed discharge and the more vulnerable the location, the more likely it is that a detailed quantitative risk assessment is required. This may need to be supported by site-specific data on the aquifer properties, seasonal variation in depth to water table and baseline groundwater quality.

Potentially polluting discharges

G10 - Developments posing an unacceptable risk of pollution

The Environment Agency will normally object to new developments that pose an unacceptable risk of pollution to groundwater from sewage effluent, trade effluent or contaminated surface water.

This applies if the source of pollution is an individual discharge or the combined effects of several discharges, or where the discharge will cause pollution by mobilising contaminants already in the ground. In all cases the Environment Agency will normally object to any proposal to discharge untreated sewage* to ground and will use its notice powers to ensure treatment of any existing discharges.

* A sewage treatment system means a septic tank, infiltration system, drainage field and/or a package treatment plant or any other additional treatment in place. It does not include cesspools or cesspits.

G11 - Discharges from areas subject to contamination

Discharges of surface water run-off to ground at sites affected by land contamination, or from sites used for the storage of potential pollutants are likely to require an environmental permit.

This applies especially to sites where storage, handling or use of hazardous substances occurs (for example, garage forecourts, coach and lorry parks/turning areas and metal recycling/vehicle dismantling facilities). These sites will need to be subject to risk assessment with acceptable effluent treatment provided.

See also [position statement C4](#).

Discharge of clean water

Some discharges to ground (such as clean roof drainage or highway drainage) may not require permits. However, they can still have the potential to cause pollution if the discharge is not carefully designed or managed.

G12 - Discharge of clean roof water to ground

The discharge of clean roof water to ground is acceptable both within and outside SPZ1, provided that all roof water down-pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminants already in the ground. No permit is required, if the above criteria can be met.

See also [position statement C4](#).

Sustainable drainage systems

G13 - Sustainable drainage systems

The [Government's expectation](#) is that sustainable drainage systems (SuDS) will be provided in new developments wherever this is appropriate. The Environment Agency supports this expectation.

Where infiltration SuDS are to be used for surface run-off from roads, car parking and public or amenity areas, they should:

- be suitably [designed](#)
- meet [Governments non-statutory technical standards](#) for sustainable drainage systems – these standards should be used in conjunction with the [National Planning Policy Framework and Planning Practice Guidance](#)
- use a SuDS management treatment train – that is, use drainage components in series to achieve a robust surface water management system that does not pose an unacceptable risk of pollution to groundwater

Where infiltration SuDS are proposed for anything other than clean roof drainage (see G12) in a SPZ1, a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply.

This position statement G13 needs to be read in conjunction with [position statement G10](#).

The design of infiltration SuDS schemes and of their treatment stages needs to be appropriate to the sensitivity of the location and subject to a relevant risk assessment, considering the types of pollutants likely to be discharged, design volumes and the dilution and attenuation properties of the aquifer.

Unless the supporting risk assessments show that SuDS schemes in SPZ1 will not pose an unacceptable risk to the drinking water abstraction, the Environment Agency will object to the use of infiltration SuDS under [position statement G10](#).