Remedial Method Statement Report

on
10 Palmerston Road, Sutton, SM1 4QL

For
Canopy Planning Services Ltd

31 August 2023

RSK Raw Limited
Battlegate Road
Boxworth
Cambridgeshire
CB23 4NN

Tel:
0345 166 8491

Pollution response, remediation and environmental protection services

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Written By:	Rory Griggs
Signature:	[redacted]
Reviewed and Approved By:	Fiona Townley
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MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
ISO 45001

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172 Chester Road, Helsby, Cheshire, UK, WA6 0AR.
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Remedial method statement report

MANAGEMENT SYSTEM CERTIFICATION DNV·GL ISO 9001 = ISO 14001 ISO 45001

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1 INTRODUCTION

1.1 Background and Terms of Reference

RSK Raw Limited (RSK Raw) was commissioned by Canopy Planning Services Ltd (the client) to prepare a Remedial Method Statement following previous assessment works carried out by agb Environmental Ltd of a site at 10 Palmerston Road, Sutton, SM1 4QL (the site).

The scope of this report has been developed in accordance with relevant British Standards and authoritative technical guidance as referenced through the report. The assessment of the contamination status of the site is in line with the technical approach presented in Land Contamination: Risk Management (LCRM 2023), an update to CLR 11 Model Procedures for the Management of Land Contamination (Environment Agency, 2004) and in general accordance with BS 10175: 2011 + A2 2017 (BSI, 2017). It is also compliant with relevant planning policy and guidance. A brief summary of relevant legislation and policy relating to land contamination is given in Appendix C, and technical background is given in Appendix D.

This report is subject to the RSK Raw Limitations in Section 9 and other limitations that may be described through this document.

1.2 Development Proposals

Development proposals are understood to include the demolition of existing single-storey buildings and construction of four dwellings over the footprint of the existing structures, together with associated rear private garden and parking areas to the frontages. The proposed development is shown in Appendix A.

1.3 Previous Reports

A Phase II Geoenvironmental Site Investigation Report for the site was completed by agb Environmental, dated 29 September 2022, and should be read in conjunction with this report. A copy of this report is presented in Appendix B, whilst pertinent information has been extracted for inclusion in this report.

2 SITE DETAILS AND SETTING

2.1 Site Location

Site location details are presented in Table 1.

Table 1: Site Location Details	
Site name	10 Palmerston Road, Sutton
Full site address and postcode	10 Palmerston Road, Sutton, SM1 4QL
National Grid Reference	526446 164454

2.2 Site Description

The site is accessible on foot at its western boundary via Palmerston Road. Vehicular access is available via the under pass through the adjacent block of flats which leads to the north western boundary of site.

The site is generally relatively flat. The northern flank of the site is paved with brick, and steps down approximately 0.5 metres (m) into an overgrown garden area in the centre and south of site, becoming increasingly overgrown towards the south. A 2 m high hedge marks the north-eastern boundary.

There are two structures adjacent to each other along the western boundary of site, occupying approximately one third of the site. The northern corner structure has garage shutter doors and is understood to be a garage providing MOT and repairs, although may have ceased trading. The southern structure has a regular glass panelled door, likely for a reception area to an air conditioning service and repair business, which also appears to have ceased trading. Both are single -storey with plastic cream rendering. No access was available into these structures. There are two small wooden storage sheds in the west and centre of site; one was empty and one inaccessible due to the overgrown vegetation, but understood to be gardening equipment storage. A 1.5 m high shiplap fence divides the garden area in two. There is a strip of empty space in the south of the site between the southern boundary and the western building.

2.3 Anticipated Geology and Permeability

2.3.1 Made Ground

Made Ground is not indicated to be present at the location.

2.3.2 Anticipated Geological Sequence

Based on the British Geological Survey (BGS) mapping, superficial deposits are absent and the site is directly underlain by bedrock geology of the Lambeth Group (clay, silt and sand) in the southern half of site and the Thanet Formation (sand) in the northern half. The Thanet Formation is interpreted to underlie the Lambeth Group in the southern half of site.

Table 2: Site Geology (Superficial Deposits)	
Strata	**Description (BGS Lexicon)**
None recorded on site.	-
Relevant information sources: BGS Geology Viewer ☐ BGS Geoindex ☒ Previous SI reports ☐	

Table 3: Site Geology (Bedrock)	
Strata	**Description (BGS Lexicon)**
Thanet Formation (northern half of site)	Typically composed of homogeneous, bioturbated, glauconitic silty fine-grained sand, with sandy silt, silt or sandy, silty clay especially in the lower part, forming a coarsening-upwards sequence. The deposits are generally pale yellow-brown in colour, typically with a 'peppering' of dark-coloured glauconite grains.
Lambeth Group (Southern half of site)	Vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate. The Lambeth Group was deposited in fluvial, estuarine, lagoonal or proximal marine environments. Late Paleocene to Early Eocene (late Thanetian to early Ypresian).
Relevant information sources: BGS Geology Viewer ☐ BGS Geoindex ☒ Previous SI reports ☐	

2.4 Hydrogeology and Hydrology

2.4.1 Hydrogeology

The bedrock geology on site is designated a Secondary A Aquifer with groundwater of high vulnerability.

The closest groundwater and potable abstraction licences are located 196m south-west at Sutton Pumping Station. The site is within Zone 1 (inner catchment) of a source protection zone.

There are no surface water features recorded within 250 m. The site is located within the Beverley Brook (Motspur Park to Thames) and Pyl Brook river catchments. There is a groundwater body recorded beneath the site, namely the Bromley Tertiaries.

2.5 Summary of Historical Land Use

The earliest available mapping of 1871 indicates two structures on the western side of the site. These buildings are demolished and replaced with a structure in the north-west (1896 mapping). An additional structure is apparent in the east (1913), removal in the north-west (1933), construction of a new, larger structure in the north-west (1955), a new structure adjacent to the north-western structure (1969) and an increase in the building footprint (1989). A final additional structure is apparent in the west of site in the 2003 mapping.

From 1871 mapping, the site surroundings are generally residential, terraced houses with private gardens to the north, east and west, increasingly developed on 1896 mapping to the east and south. Redevelopment within 20 m of site is apparent in 1913, 1955, 1969, 1992 and 2003.

Historical land uses of note include sand pits (90 m east), unspecified works (102 m south), water works (117 m south), a lime kiln (152 m south).

Recent land use on site includes two vehicle repair, servicing and testing garages and salient land use in the environs includes electronic equipment companies within 50 m and pest and vermin control, publishing, vehicle repair, servicing and testing, and an electricity substation located 50 m -100 m from the site.

3 PRELIMINARY CONCEPTUAL SITE MODEL (CSM) AND QUALITATIVE RISK ASSESSMENT

For full details of the qualitative risk assessment and preliminary conceptual site model (CSM), reference should be made to the site investigation report by agb Environmental Ltd.

In the UK land contamination is assessed using a risk-based approach taking account of the magnitude (severity of the hazard) and likelihood (probability) of occurrence. A 'receptor' is something that could be adversely affected by contamination (e.g. people, an ecological system, property or a water body). A 'pathway' is a route or means by which a receptor is or could be exposed to or affected by a contaminant. A 'contaminant source' is a hazard but it can only pose a risk to a receptor where a pathway is present. The relationship between sources, pathways and receptors are referred to as a conceptual site model. A risk can only be realised where a contaminant source, pathway and receptor are all in place, referred to as a 'pollutant linkage'.

In line with LCRM 2023 and BS 10175: 2011 + A2 2017 (BSI, 2017), RSK Raw has used information in the preceding sections to identify sources of contaminants, receptors that may be impacted and plausible linking pathways. Where all three are present this is termed a potentially complete contaminant linkage and a qualitative risk estimation is made.

3.1 Potential Soil, Soil Vapour and Groundwater Linkages

Proposed Development

Development proposals are understood to include the demolition of existing single-storey buildings and construction of four dwellings over the footprint to the existing structures, together with associated rear private garden and parking areas on the site frontage.

Potential Sources of Contamination

Potential sources of soil and groundwater contamination identified from current activities and the history of the site and surrounding area include:

Made Ground on site;

Vehicle repair garages on site; and,

Infilled ground within 250 m, as noted on historic mapping 65 m east.

Sensitive Receptors and Linking Exposure/Migration Pathways

Sensitive receptors identified at or in the vicinity of the site that could be affected by the potential sources identified above comprise:

Current and future site users – [oral, dermal and inhalation exposure to operational works, impacted soil, soil vapour, dust, homegrown produce]

Adjacent site users – Residential properties [migration of contamination via dust/fibre deposition, vapour migration combined with inhalation]

Existing services [direct contact with contaminated soils or groundwater and chemical attack]

Surface waters [surface water run off or horizontal migration]

Groundwater [vertical migration].

Potential linking pathways are shown in brackets for each item above.

Construction workers and have not been identified in the conceptual model as receptors because risks are considered to be managed through health and safety procedures according to the CDM Regulations.

3.2 Potential Ground Gas Linkages

Potential sources of ground gas identified from current activities and the history of the site and surrounding area are as follows:

Made Ground and historical use (onsite) – Moderate potential generation of carbon dioxide and methane;

Infilled ground (off-site) - Moderate potential generation of methane and carbon dioxide.

3.3 Preliminary Risk Assessment

The preliminary risk assessment findings and potentially complete contaminant linkages are summarised below. The risk classification is based on the combination of hazard consequence and probability using a risk matrix from CIRIA C552 (Rudland et al., 2001), a summary of which, including the risk matrix presented in Appendix D.

Contaminative linkages with a moderate risk have been identified and comprise:

On-site Made Ground (associated with various phases of construction / demolition and historic use on site)

Off-site Infilled ground within 250 m, as noted on historic mapping 65 m east. (ground gas)

Several potential contaminative linkages with moderate to low risks have been identified and comprise:

On-site Made Ground – current and future site users, potable water supply pipes

4 Summary of Previous Site Investigation

4.1 Previous Site Investigation

The investigation works were carried out by agb Environmental Ltd. The site investigation report is presented in Appendix B and should be read in conjunction with this report. The pertinent details are summarised below.

4.2 Intrusive Investigation

The ground investigation fieldwork was undertaken on 17th August 2022.

The ground investigation comprised the following programme of works.

- Four (4) windowless sample boreholes (WS-01 to WS-04) advanced to a maximum depth of 3.00 m bgl;
- Liner samples were collected from all windowless sample boreholes;
- SPT testing was carried out in all windowless sample boreholes;
- Samples were retrieved for geotechnical and chemical laboratory testing purposes;
- Three (3) combined ground gas and groundwater installations were installed within the cable percussive boreholes (WS-01, WS-02 and WS-04); and,
- Post fieldwork monitoring of all installations at on three occasions.

The exploratory hole positions are shown within the site investigation report in Appendix B.

4.3 Ground Conditions

A brief description of the materials encountered on site is included in the following sections.

The generalised geological sequence beneath the veneer of topsoil on site determined from the ground investigation is summarised in Table 4 below.

Table 4: Generalised Geological Sequence Encountered on Site

STRATA ENCOUNTERED AND DESCRIPTION	RANGE OF THICKNESS (m)	DEPTH TO BASE (mbgl)
A. MADE GROUND (where present)		
Slightly sandy to sandy, gravelly silt	0.70 – 1.10	1.10
B. NATURAL SUPERFICIAL DEPOSITS		
Head Deposits - dark grey and brown gravelly silty sand or soft to very stiff (desiccated by root growth) slightly gravelly to gravelly, sometimes sandy, silty clay	0.60 - 1.50	2.60
C. BEDROCK		
Thanet Formation - very dense slightly greenish, light brown or light grey, fine sand with occasional orange staining	>0.4 - >0.7	>3.00

4.1.1 Made Ground

Made Ground was encountered from surface level in all exploratory hole positions. In positions WS02, WS03 and WS04, located within the soft landscaped garden areas in central, eastern and southern parts of the site, this was encountered as a slightly sandy to sandy, gravelly silt from surface level to 0.70 m bgl - 0.90 m bgl. Gravel was of flint and occasional chalk, with fragments of anthropogenic materials including brick, charcoal, glass, concrete and clinker, occasional rusted nails and white porcelain. Occasional cobbles of concrete, brick and tile. The base of the Made Ground was proven at 0.70 m bgl - 0.90 m bgl in WS02 - WS04.

At position WS01, advanced at a higher elevation on site in the brick paved area in the north, brick paving was present from surface level to 0.06 m bgl, underlain by slightly gravelly sand to 0.20 m bgl. Gravel was of flint, limestone and brick. The Made Ground at this location graded to slightly gravelly sand, becoming gravelly at 0.60 m bgl and silty at 0.90 m bgl. Gravel was of flint with occasional brick, limestone and concrete, then chalk and charcoal, with occasional brick cobbles. The base of the Made Ground was proven in WS01 at 1.10 m bgl.

4.1.2 Natural Superficial Deposits

Soils interpreted to represent superficial Head Deposits were encountered underlying the Made Ground at all borehole positions. BGS mapping indicates Head Deposits to be present to the north of the site.

These soils generally comprised a mix of dark grey and brown gravelly silty sand or soft to very stiff (desiccated by root growth) slightly gravelly to gravelly, sometimes sandy, silty clay. Gravel was of white chalk with orange staining and flint.

4.1.3 Bedrock

Underlying the Head Deposits in all boreholes from 1.30 m bgl - 2.60 m bgl was a very dense slightly greenish, light brown or light grey, fine sand with occasional orange staining. This stratum is considered representative of the Thanet Formation bedrock geology which is shown to underlie the site on BGS mapping and was proven to the base of each borehole between 2.00 m bgl and 3.00 m bgl. The base of the Thanet Formation was not proven.

4.1.4 Groundwater

Groundwater was not encountered during the site investigation or subsequent monitoring.

4.1.5 Contamination Observations

During the site investigation works and subsequent monitoring there were no visual or olfactory indications of gross contamination in soils.

The identification of Made Ground soils underlying the site, containing anthropogenic materials, could indicate the potential presence contaminants of concern.

4.4 Summary of Analysis and Monitoring

The soil samples with determinands that were above their screening values for a residential with home grown produce land use scenario is summarised in Table 5.

Table 5: Summary of Soil Exceedances

Determinand	Samples with Exceedance
Lead	WS01 @ 0.30 m WS02 @ 0.30 m WS03 @ 0.30 m WS04 @ 0.20 m
Benzo[a]anthracene	WS02 @ 0.20 m
Benzo[b]fluoranthene	WS02 @ 0.30 m WS03 @ 0.30 m WS04 @ 0.20 m
Benzo[a]pyrene	WS02 @ 0.30 m WS03 @ 0.30 m WS04 @ 0.20 m
Dibenzo[ah]anthracene	WS01 @ 0.30 m WS02 @ 0.30 m WS03 @ 0.30 m WS04 @ 0.20 m

The standpipes were monitored on three occasions between 24th August 2022 and 26th September 2022. Based on the monitoring undertaken, Characteristic Situation (CS) 1 is identified as the appropriate ground gas regime for the site.

5 RISK ASSESSMENT

5.1 CSM

On the basis of the findings of the intrusive ground investigation and subsequent risk assessment, the identified potential pollutant linkages are summarised below, and detailed in Table 6 below.

Low risk from on-site Made Ground to groundwater – in the absence of significant concentrations of the analysed determinands in soil samples and a continuous groundwater body;

Moderate risk from on-site Made Ground to current and future site users – as the concentrations of PAHs and lead analysed soil samples exceeded the GQRA;

Low risk from on-site Made Ground historic surrounding land use to current and future site users, via the generation of ground gas,

Moderate risk to potable water supply pipes based on TPH concentrations reported within the soil samples.

Table 6: Revised Risk Estimation for Potentially Complete Contaminant Linkages						
Potential Source	**Potential Receptor**	**Possible Pathway**	**Likelihood**	**Severity**	**Potential Risk**	**Justification**
On-site						
Made Ground (associated with various phases of construction / demolition on site and historic use).	Current and future site users	Oral, dermal and inhalation exposure with impacted soil, soil vapour and dust or migration of contamination via dust/fibre deposition, vapour or groundwater migration combined with inhalation	Likely	Medium	Moderate	GACs for proposed land use scenario have been exceeded by concentrations of lead and PAHs in soil samples.
	Adjacent site users		Unlikely	Medium	Low	
	Groundwater in Underlying Aquifers	Leaching from soils/ percolation to aquifer	Unlikely	Medium	Low	There is no current evidence to suggest that groundwater quality beneath the site has been affected by contaminant leaching. The bedrock geology is designated a Secondary A aquifer on site; however, groundwater was not encountered during fieldwork or during monitoring. As such, the risk to receptors is considered to be low.
	Surface water	Surface water run off or horizontal migration	Unlikely	Medium	Low	Current onsite drainage is unknown. The distance to the closest surface water is over 250 m.
	Potable water supply pipes	Direct contact with contaminated soils or groundwater and chemical attack	Likely	Medium	Moderate	Elevated levels of PAH compounds have been identified in Made Ground on site. The agreement of the water provider and Local Authority should be sought regarding the potable water pipework and fittings selected prior to commencement.

6 Remediation and Mitigation Measures

6.1 Introduction

Remediation can be defined as site-specific objectives that relate solely to the reduction or control of risks associated with one or more pollutant linkages that are demonstrated, through risk assessment, to represent unacceptable risks. The proposed remediation approach is detailed below. The proposed remedial measures and approach should be agreed with the Local Authority prior to commencement.

6.2 Summary of Laboratory Test Results and Monitoring

Elevated concentrations of lead and four congeners of polycyclic aromatic hydrocarbons have been identified within shallow Made Ground samples beneath proposed soft landscaping, parking and building footprints, which exceed the screening values for residential developments with homegrown produce for consumption.

6.3 Soil Remediation

Based on the conceptual site model and risk assessment the localised contamination within the Made Ground is considered to pose a risk to ground workers and residential end users. Reduction or removal of the risk could either be by introducing a 'pathway break' in the Source-Pathway-Receptor linkage; or by direct removal of the source. Details of the remedial approach to remove the identified risk to site workers and end users is provided below.

6.3.1 Protection of Site Workers from Contaminated Soil

All site workers, particularly ground workers, would be made aware of the presence of contamination in the soil. It is recommended that the results of the site investigation are provided to contractors to ensure that appropriate risk assessment and health and safety systems can be put in place prior to works commencing as per best practice.

This, as an example, should include the provision of suitable welfare facilities including hand washing facilities, and maintaining adequate levels of hygiene. Site workers will also be required to use suitable personal protective equipment. Additional guidance may be sourced from the Health and Safety Executive.

6.3.2 Protection of End Users from Contaminated Soil

The property will require remediation to remove risk to end users.

A proportion of the site is proposed to comprise buildings and hardstanding, in the completed re-development, and these would form a pathway break between the in-situ soils and end users; thereby removing the risk to end users.

Where soft landscaping is proposed, i.e., private gardens, the pathway break would be introduced by excavation and replacement with clean inert certified topsoil from a known source to a depth of 0.6 m bgl to prevent potential ongoing risks to human health.

Further to the above, the potable water supply pipes should be installed as hydrocarbon resistant barrier pipe from the stopcock at the entrance to the site to the internal stopcock.

This remedial strategy has been based on the proposed site plans, presented in Appendix A. Should any of the proposed hardstanding areas be replaced with soft landscaping,

further assessment by a suitably qualified geo-environmental engineer, and likely further remedial measures, will be required.

6.3.3 Additional Comments

Removal of the soil should be undertaken by a suitable and competent licensed contractor, with mitigation measures taken to minimise dust generation and removed appropriately from site to a suitable treatment or waste facility in accordance with current legislation, guidance and best practice.

Care would be taken where excavation is required close to neighbouring structures to prevent undermining of foundations or damage to the neighbouring properties or roads. The advice of an arboriculturist should be sought where excavation could affect trees.

A competent person would inspect the completed excavations. Records detailing the removal of soil and its subsequent replacement should be retained, along with photographs of the work undertaken. Documents provided by hauliers for both exported and imported soil should be retained along with certification that the imported soil is suitable for use.

6.4 Protection of the Public

Adequate measures will need to be undertaken to prevent the public being affected by contaminated soils. Care should be taken to prevent dust generation and protective measures should include dust suppression and covering of loads during transportation.

6.5 Stockpiling of Contaminated Soil

Excavated soil should be stored in a manner as to prevent contamination of the underlying soil or contamination of surrounding areas from water run-off or dust production. This would involve placing a suitable plastic membrane below and above the stockpiled material. Different soil types would be stored in separate stockpiles prior to possible future re-use or disposal. The stockpiling of soils would be recorded and include the location and date of excavation, the material type and quantity.

6.6 Watching Brief

A watching brief would be implemented during site works operations as detailed above. A site diary documenting each phase of remediation would be kept by the site manager and photographs of the on-going works taken as part of the contract records. Records would be retained for inclusion with a Verification Report.

Soils noted to have either visual or olfactory indications of contamination would be separately stockpiled and tested prior to appropriate removal off-site. If this situation occurs, it is recommended that RSK Raw be consulted.

6.7 Importation of Replacement Materials

Importation of soils to site would be required to infill the excavated void; only soil deemed suitable for use would be accepted. Suitable soil would comprise only soils for which the source and supplier can be readily identified; and for which soil analytical testing has been undertaken by an accredited independent authority.

The imported soil should be certified as suitable for the end use. As a minimum, the certification analysis should include: metals, speciated polycyclic aromatic hydrocarbons, and asbestos screening.

7 Verification Reporting

7.1 Verifcation n of Soil Remediation

A Verification Report would be prepared by a competent professional. The purpose of the report would be to provide evidence confirming that sufficient remediation has been completed through removal of the risk to the identified receptors; and that the requirements of the Local Authority have been met. The report would include:

- Records of all excavations and encountered ground conditions observed during the remediation ground works. Records would include: a site diary; photographic evidence; and logged ground conditions.
- Documents of the exportation and destination of exported soil, including 'Duty of Care' waste disposal documentation.
- Confirmation of source, quality, and quantity of imported soils. This should include: chemical laboratory test certificates for the soil prior to delivery (provided by the supplier); chemical laboratory test certificates for the validation samples and an accompanying validation sampling drawing; and all documentation to confirm the quantity of imported material.
- An updated Conceptual Site Model following completion of remediation and confirmation that the remediation objectives have been met.

It is recommended that a competent professional is engaged to undertake the following:

- Observe remediation excavation to ensure that the target depth has been reached over a sufficient area. If the excavation is undertaken in stages, then each stage should be separately assessed.
- Obtain and analyse representative samples of the imported soil to verify its suitability for use. This can be undertaken upon completion of the soil importation and placement and prior to use of the proposed development. If soils are to be placed prior to certification rather than stockpiled, it should be noted that the cost of removal and replacement of any soil not suitable for use will be increased.

The completed Verificaion Report would be presented to the Local Authority following completion of the works.

8 REFERENCES

BSI, BS 3882:2015 Specification for topsoil. 2015.

BSI, BS 5930:2015 + A1:2020 Code of practice for ground investigations. 2015.

BSI, BS 8485:2015 +A1 2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

Nathanail, C.P.; McCaffrey, C.; Gillett, A.G.; Ogden, R.C. & Nathanail, J.F. LQM/CIEH Suitable 4 Use Levels. 2021

Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites. Report Ref. No. 10/WM/03/21, UK Water Industry Research. 2010

9 LIMITATIONS

The limitations below apply to works including but not limited to, Spill Response, Phase I and Phase II environmental site investigations and due-diligence audits, quantitative risk assessments, and remediation works (including design and validation).

RSK Raw Limited (RSK Raw) has prepared this report in accordance with the instructions and objectives of the Client (or their appointed agent) exercising all reasonable skill, care and diligence ("the Required Standard") to comply within the terms of the instruction provided, and the performance of any related obligations. It should be noted that the instructions given may have limited the time and resource provisions utilised for the works and reporting, and they should not be considered to be exhaustive accordingly.

The opinions, conclusions and recommendations stated herein are based on information (including that supplied by the Client and third parties) available at the time of production and are based on the conditions of the site at the time the investigation and/or remediation works were completed. No warranty as to their relevance or suitability can be provided if the site, or any part of it, is to be utilised for an altered purpose in the future, or if operational procedures or management alter over time.

Any risk assessment and opinions provided, will have applied the Required Standard to take in to consideration currently available guidance and available approaches in the generation of generic or site specific assessment criteria or remedial target concentrations which relate to the assessment of risk in a specific land use scenario and risk posed to specific receptors. No liability can be accepted for the retrospective impact associated with any future changes or amendments to published assessment criteria, associated models, or associated guidance.

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No liability can be accepted for impacts occurring as a result of future works that may compromise the remediation works completed by RSK Raw.

This report is necessarily limited to the aspects reported on and no liability is accepted for any other contamination, impacts or hazards or other aspects on site. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. Should additional information become available which may affect the opinions expressed in this report, RSK Raw reserves the right to review such information and, if warranted, to modify the opinions accordingly.

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APPENDIX A

PLANNING DRAWINGS

0 1 2 3 4 5 6 7 8 9 10
SCALE: 1:100

CANOPY
Planning Services
Tel: 020 3632 2690 Email: info@canopyplanning.co.uk
Mob: 07956371277 Web: www.canopyplanning.co.uk
CIAT Registered Practice

-

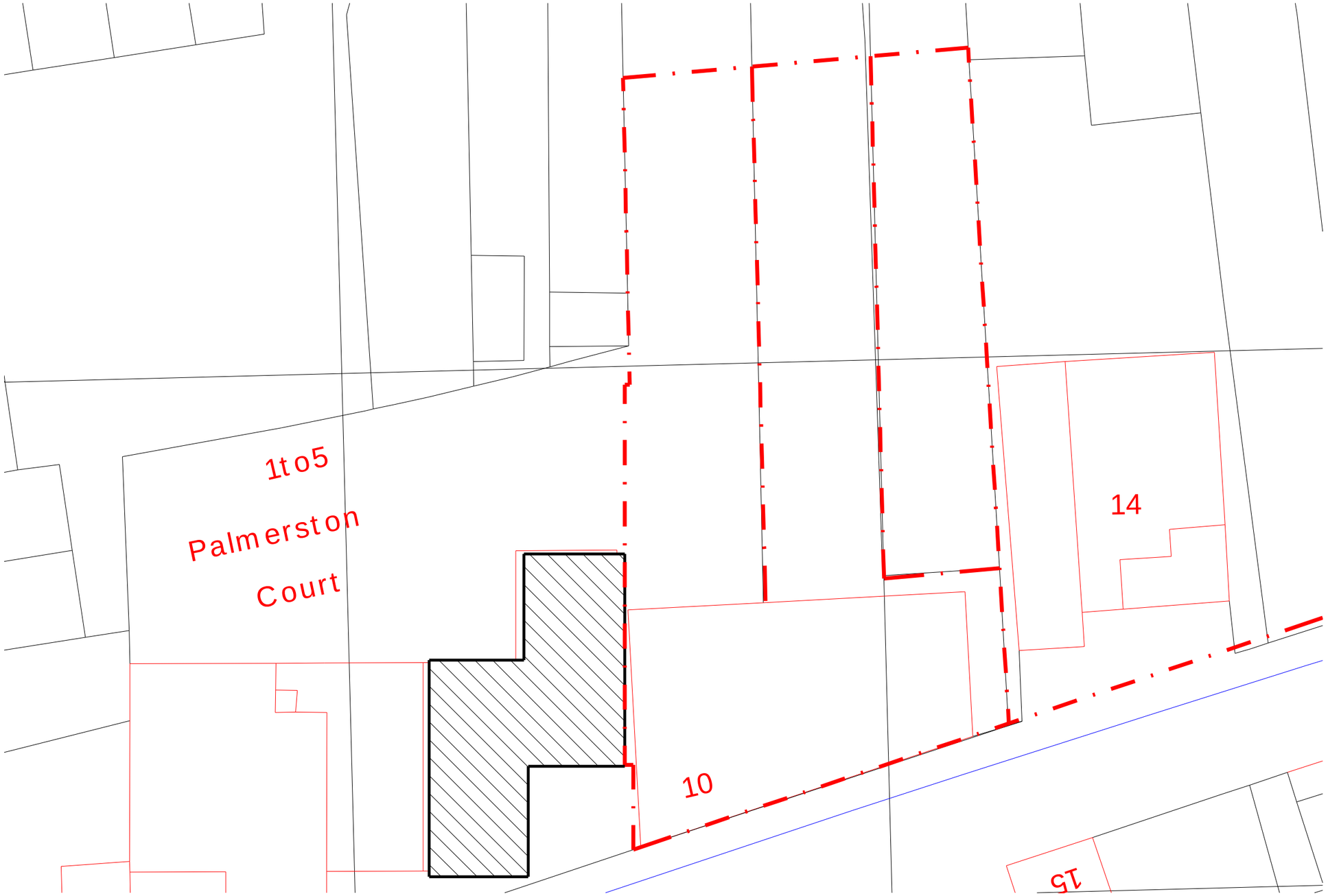
10 -10A Palmerston Road,
Sutton
SM1 4QL

PROPOSED PLAN

Project number	21310
Date	April 2023
Drawn by	O.A
Checked by	Checker

21310/21 B

Scale A3 @ 1 : 200



1 Existing Site Plan

1 : 200

0 2 4 6 8 10 12 14 16 18 20

SCALE: 1:200

CANOPY PLANNING

OFFICES:- SUTTON TEL NO. 020 3632 2690
MOBILE NO: 07956311277 Email:- info@canopyplanning.co.uk

-

10 Palmerston Road,
Sutton
SM1 4QL

EXISTING SITE PLAN

Project number	21310	21310/26	
Date	Nov. 2021		
Drawn by	O.A		
Checked by	Checker	Scale	A3 @ 1 : 200

APPENDIX B

agb ENVIRONMENTAL

Phase II Geoenvironmental Site Investigation Report

10 Palmerston Road, Sutton, SM1 4QL

Client Name:	Canopy Planning Services Ltd
Project Number:	P4455.2.0
Date:	29 September 2022

ENABLING DEVELOPMENT

Client:	Canopy Planning Services Ltd
Site:	10 Palmerston Road, Sutton, SM1 4QL
Report ref.:	P4455.2.0
Prepared:	H. Gildersleeves MSci FGS J. Gooch BSc FGS
Reviewed:	G. Dowlen MSc CGeol FGS RoGEP EurGeol
Approved:	S. Pike MSc MIEnvSc
Date:	29 September 2022
Version:	*Final*

agb Environmental Ltd has prepared this document in accordance with the instructions of the client, Canopy Planning Services Ltd, for their sole and specific use. Any other persons who use any information contained herein do so at their own risk.

© agb Environmental Ltd 2022
1, The Mill, Copley Hill Business Park, Babraham Road, Cambridge, CB22 3GN
Tel: 01223 776 117
www.agbenvironmental.co.uk

Revision	Description	Date
.0	Final	29 September 2022

agb Environmental Ltd

Executive Summary

Client and Site Location

The client, Canopy Planning Services Ltd, commissioned agb Environmental to complete a Phase II site investigation at 10 Palmerston Road, Sutton, SM1 4QL, which is being considered for redevelopment.

Development Proposals

Development proposals are understood to include the demolition of existing single story buildings and construction of four dwellings over the footprint to the existing structures, together with associated rear private garden and parking areas on the site frontage.

Summary of Encountered Ground Conditions

Made Ground was encountered from surface level in all exploratory hole positions to a maximum depth of 1.10 metres below ground level (mbgl).

Beneath the Made Ground in all boreholes, soils interpreted to represent superficial Head Deposits were encountered to depths between 1.30-2.60mbgl, underlain by bedrock of the Thanet Formation to the base of the boreholes at 3.00mgbl.

Groundwater was not encountered during the fieldwork or subsequent monitoring.

Summary of Analysis, Screening and Monitoring Results

Elevated concentrations of lead and four congeners of polycyclic aromatic hydrocarbons have been identified within shallow Made Ground samples beneath proposed soft landscaping, parking and building footprints, which exceed the screening values for residential developments with homegrown produce. Future site users and workers have the potential to come into contact with these soils.

Based on the conceptual site model and risk assessment there is considered to be **moderate** geoenvironmental risk to end users, site workers and other environmental receptors. Ground gas monitoring results and subsequent classification indicate CIRIA 665 Characteristic Situation CS-1 is appropriate for the site based on monitoring undertaken.

Recommendations

It is recommended that a Remediation Method Statement is undertaken to address the risk identified to end users, construction workers and environmental receptors from soil exceedances in the shallow Made Ground.

Geotechnical Comments

It is assumed that finished ground levels will be at or close to current ground levels, if this is not the case then this assessment will need to be reviewed.

Based on the site investigation data and testing, for a 1.0m wide strip/trench fill foundation, bearing on the underlying natural superficial Head Deposits at a depth of 1.0m, a design bearing resistance of 75kN/m^2 is considered appropriate.

Should foundations needed to be locally deepened due to unsuitable soils being encountered at proposed founding depth, such as those at location WS01 where low SPT N values were recorded, or if the design bearing capacity noted above is not achievable, then it

is recommended foundations bear on the underlying natural granular Thanet Formation bedrock.

Based on the site investigation data and testing, for a 1.0m wide strip/trench fill foundation, bearing on the underlying natural granular Thanet Formation at an approximate depth of 2.0m, a design bearing resistance of 350kN/m^{2} is considered appropriate.

The above is only applicable for foundations with loads that are applied vertically and centrally and should result in total settlements of not more than 25mm, keeping differential settlements within acceptable limits.

It is recommended that ground floor slabs are suspended.

A CBR value of 2% is considered suitable for underlying made ground following treatment. It is recommended that once the site has been graded to the appropriate pavement formation level, it is inspected and, if necessary, in situ CBR testing be conducted on the subgrade to confirm the appropriate pavement design.

Analysis indicates an ACEC Class of DS-1/AC-1 for the underlying superficial Head Deposits and bedrock geology of the Thanet Formation.

Further recommendations are made in the report.

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1 Introduction

The client commissioned agb Environmental to complete a Phase II Ground Investigation at a plot of land at 10 Palmerston Road, Sutton, SM1 4QL.

1.1 Development Proposals

Development proposals are understood to include the demolition of existing single storey structures and construction of four dwellings with associated rear private gardens and parking areas to the site frontage. Available plans are provided in **Appendix 1**.

1.2 Previous Reports

A Phase I geoenvironmental desk study for the site and the surrounding area was completed by agb Environmental Ltd, report reference P4455.1.0, dated 4th August 2022, and should be read in conjunction with this report.

1.3 Purpose of Investigation

The principal technical objectives of the report were as follows:

- Review of desk study information,
- Establish the ground conditions,
- Undertake analysis of selected soil samples and groundwater samples,
- Provide a Conceptual Site Model (CSM) and risk assessment,
- Provide geoenvironmental recommendations, and
- Provide geotechnical recommendations for foundation design, floor slabs, pavements, excavations, groundwater control and chemical attack.

The report has been formulated in general accordance with BS10175:2011+A2:2017 Investigation into Potentially Contaminated Sites – Code of Practice, Environment Agency LCRM guidance, BS5930:2015 Code of Practice for Site Investigations, and guidance from the National Planning Policy Framework.

2 Site Details

Details regarding the site and anticipated ground conditions extracted from the desk study are provided below.

2.1 Location and Topography

The irregularly shaped site is located in a predominantly residential setting in the London Borough of Sutton. The site is approximately 0.9 miles north east of Sutton train station. The site covers an area of approximately 0.05ha and is centred at National Grid Reference 526446 164454. The site is at an elevation of approximately 44mOD, and the surrounding is relatively flat. A location plan is presented in **Appendix 1**.

2.2 Site Description

The site is accessible on foot at the western boundary of site via Palmerston Road. Vehicle access is also available via the under pass at the northern end of site, through the adjacent block of flats which leads to the northern boundary of site.

The site is generally relatively flat. The northern flank of site is paved with brick, and steps down approximately 0.5m into an overgrown grass garden area in the centre and south of site, becoming increasingly overgrown towards the south. There was a 2m hedge on the north-eastern boundary.

There are two structures adjacent to each other along the western boundary of site. They take up approximately one third of site. The northern corner structure has garage shutter doors (garage providing MOT and repairs although may have ceased trading), and southern has a regular glass panelled door, likely for a reception area, but previously an air-conditioning service and repair business (also appears to have ceased trading). They are both one storey and made from plastic and cream rendering. No access was available into these structures. There are also two small wooden storage sheds in the west and centre of site; one was empty and one inaccessible due to overgrown vegetation, but believed to be gardening equipment storage. A 1.5m high shiplap fence divides the garden area in two. There is a strip of empty space at the south of site between the southern boundary and western building.

Table 2.1 Summary of Site Boundaries

Direction	Description of Site boundary
North	Brick paving belonging to northern car park for block of flats.
East	1.5m high shiplap fencing.
South	1.5m high shiplap fencing.
West	Asphalt pavement adjacent to on site buildings.

Table 2.2 Summary of Surrounding Land Use

Direction	Description of Surrounding Land Use
North	Block of flats and associated car park.
East	Terraced dwellings and private gardens, with occasional mature trees.
South	Educational centre.
West	Palmerston Road. Gym and associated car park beyond.

3 Summary of Desk Study Information

Salient information extracted from the desk study report is provided below.

3.1 Anticipated Ground Conditions and Permeability

Based on the BGS mapping the site is underlain by bedrock geology of the Lambeth Group (clay, silt and sand) in the southern half of site and the Thanet Formation (sand) in the northern half. The Thanet Formation is interpreted to underlie the Lambeth Group in the southern half of site.

The Thanet Formation is of moderate to very low permeability and the Lambeth Group is of high permeability.

No superficial deposits or artificial ground are mapped on site. The closest superficial geology is Head (36m north), and the closest artificial ground records are Worked Ground (140m south) and Infilled Ground (146m south).

3.2 Geological and Engineering Hazards

According to BGS data the highest risk on site is moderate from shrink-swell clays, with the ground conditions being predominantly high plasticity clays beneath the southern half of site. There is a low risk identified from running sands on site and a very low risk from collapsible deposits and landslides. The risk on site from the ground dissolution of soluble rocks is negligible, however the risk is raised to low 35m south.

There are 22no. records of surface ground workings in the form of unspecified pits, ground workings and heaps located 150-250m distant. There are Class A and Class C records for non coal mining on site: sporadic or small scale underground mining may have occurred; mine shafts, adits and tunnels may be present. Potential for localised difficult ground conditions is at a level where it should be considered.

There are no details regarding railways and tunnels on or within 250m of site.

3.3 Radon

The site is not within a radon-affected area, as between 1% and 3% of properties are above the action level as defined by the Health Protection Agency (HPA). No radon protective measures are considered necessary for new properties or extensions as described in Building Research Establishment (BRE) publication BR211.

3.4 Hydrogeology and Hydrology

The bedrock geology on site is designated a Secondary A Aquifer of high vulnerability.

The closest groundwater and potable abstraction licences are located 196m south-west at Sutton Pumping Station. The site located within a Type 1 (inner catchment) source protection zone.

There are no surface water features recorded within 250m. The site is located within the Beverley Brook (Motspur Park to Thames) and Pyl Brook river catchment. There is a groundwater body recorded beneath the site, namely the Bromley Tertiaries.

3.5 Flooding

The site is not located within a Type 2 or Type 3 Flood Zone. There is no recorded risk of flooding from the rivers and sea rating, or records of historical flood activity or flood

defences. There is a 1 in 30 year risk of flooding to a depth of 0.1-0.3m on site, and a 1 in 30 year risk of flooding to a depth >1.0m within 50m of site. The risk from groundwater flooding on site and within 50m is negligible.

3.6 Summary of Site History

The earliest available mapping of 1871 indicates two structures on the western side of site. These buildings are demolished and replaced with a structure in the north-west (1896 mapping). An additional structure is apparent in the east (1913), removal in the north-west (1933), construction of a new, larger structure in the north-west (1955), a new structure adjacent to the north-western structure (1969) and an increase in the building footprint (1989). A final additional structure is apparent on the west of site in 2003 mapping.

The site surrounds are generally residential, terraced with private gardens to the north, east and west from 1871 mapping, increasingly developed in 1896 mapping to the east and south. Redevelopment within 20m of site is apparent in 1913, 1955, 1969, 1992 and 2003.

Historical land uses of note include sand pits (90m east), unspecified works (102m south), water works (117m south), a lime kiln (152m south).

Recent land use on site include two vehicle repair, servicing and testing garages and salient land use in the environs includes electronic equipment companies within 50mm and pest and vermin control, publishing, vehicle repair, servicing and testing, and an electricity substation located 50-100m distant.

4 Preliminary Conceptual Site Model and Risk Assessment

An initial CSM and preliminary assessment of plausible contaminant source-pathway-receptor linkages is presented in this section. It is aimed at identifying possible risks, if any, arising from substances used or deposited on-site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered.

4.1 Potential Contaminant Sources

Based on the site walkover and desk study research, the identified potentially contaminative land uses on or within the vicinity of the site are summarised in **Table 4.1**.

Table 4.1 Potential Contaminant Sources

Identified Potentially Contaminative Land Uses / Sources	Distance From Site (approx.)	Potential Contaminants Associated with Identified Sources	Plausible Source-Pathway-Receptor Linkage
Historical and Current Made Ground	On site	Metals, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs), asbestos containing materials (ACMs), ground gasses, vapour	**Yes** – The historical redevelopment of the site suggests the likelihood of made ground belonging to the foundations of a previous buildings which has the potential to contain contaminants to cause risk.
Two Mechanic companies (Vehicle Repair, Testing and Servicing)	On site	Metals, TPH, PAH, ACMs, BTEX, MTBE, and Volatile Organic Compounds (VOCs), ground gasses, vapour	**Yes** – There is a likelihood that contaminants from this land use could cause harm to receptors. Without further ground investigation that cannot be discounted.
Historical and Recent electricity substation	4 records within 100m of site, closest being 76m.	Polychlorinated biphenyls (PCBs), Metals, TPH, PAHs.	**No** – Given the distance from site combined with the low mobility, hydrophobic nature and high viscosity of PCB oils, it is considered unlikely that there would be any impact to site from historical or recent potential contaminant leaks.
Historical Unspecified works / pits / ground workings	5 records within 101m S and 161m SW of site	Metals, TPH, PAH, ACMs, ground gasses, vapour	**No** – The unspecified works / pits / ground workings, with a closest proximity to site belong to the identified Water Works and the recreation ground north. It is expected that a large quantity of potentially impacted soil will have been removed and therefore unlikely to cause risk to site. Additionally, given the distance from site it is considered unlikely that there would be any impact to site from ground gases, given the size of the pits.
Historical Nursery	154m SW	Pesticides, herbicides, microbes, ground gasses (including CO_2 and CH_4)	**No -** Given the redevelopment into residential dwellings and time since nursery activity, it is expected that a large quantity of potentially impacted soil will have been removed and therefore unlikely to cause risk to site.
Infilled ground	65m E and 80m E	Metals, TPH, PAH, ground gasses, vapour	**Yes** – There is a likelihood that contaminants from the infilled ground could cause harm to receptors. Without further ground investigation that cannot be discounted.

4.2 Pathways

For this assessment, the principal potential pathways for contaminant migration are provided in **Table 4.2**.

Table 4.2 Pathways

Source	Pathway
Soil / dust / fibres	Dermal contact, ingestion and inhalation.
Liquid (including surface water / groundwater)	Dermal contact, ingestion. Leaching, infiltration and migration through groundwater. Preferential pathways such as service trenches.
Harmful ground gases / vapour	Migration through permeable geological strata and preferential pathways. Inhalation, accumulation within confined spaces with subsequent asphyxiation or explosion.

4.3 Receptors

Based on the proposals and the findings of the desk study the identified receptors are described in **Table 4.3**.

Table 4.3 Receptors

Receptor	Detail
Construction workers	Construction workers are anticipated to include those involved with the construction works at the site which includes any long term, land maintenance workers.
End users	Residents and visitors.
Neighbouring sites	Residents and visitors.
Controlled Waters	The bedrock geology is designated Secondary A aquifer on site. There are no water features within 250m of site. There is one Potable and Groundwater abstraction record 196m SW of site which is active. The site is also located in an SPZ Type 1.
Flora and fauna	Plants and animals that may be affected by proposed development. Soft landscaped areas are planned as part of the redevelopment.
Buildings	The completed buildings.
Buried services	Potable water pipes are anticipated as part of proposals.

4.4 Preliminary Conceptual Site Model

The preliminary conceptual site model presented in **Table 4.4** has been derived using the findings of the desk study. The risk evaluation methodology is presented in **Appendix 4**.

Table 4.4 Preliminary Conceptual Site Model

Source	Pathway	Receptor	Consequence	Probability	Potential Risk	Detail
On Site Historical and Current Made Ground Two Mechanic companies (associated Vehicle Repair, Testing, Servicing and storage of chemicals) *(Metals, TPH, PAH, AMCs, BTEX, MTBE, SVOCs, VOCs, ground gasses, vapour)*	Dermal contact, ingestion and inhalation of contaminated soil, dust and/or fibres	End users	Medium	Likely	Moderate	Contact is likely between future users in shallow soils in the proposed soft landscaping of the site, soil/dust tracked back into premises. Construction workers are likely to come into direct contact during groundworks. Safe working practices should be implemented, and appropriate personal protective equipment (PPE) should be used to mitigate any potential risk.
		Site workers	Medium	Likely	Moderate	
		Adjacent users	Medium	Likely	Moderate	
	Leaching / infiltration through soils and migration via groundwater or soil pore moisture.	End users / Controlled waters	Medium	Likely	Moderate	There is no current evidence to suggest that groundwater quality beneath the site has been affected by contaminant leaching. The bedrock geology is designated Secondary A aquifer on site. There are no water features within 250m of site. There is one Potable and Groundwater abstraction record 196m SW of site which is active. The site is also located in an SPZ Type 1.
	Permeation of water pipes.	Construction materials, future end users	Medium	Likely	Moderate	Hydrocarbons, especially aromatics and chlorinated solvents, are known to permeate plastic pipes. Provision of water supply pipes and connectors formed from proprietary “barrier pipe” materials (e.g. polyethylene aluminium-polyethylene) may be required by the water supply company.
	Gas Migration and build up within buildings.	End users and Adjacent users	Severe	Low likelihood	Moderate	A moderate risk is considered given the potential for Made Ground to be present and from the historical redevelopment which has occurred on site.
		Building and buried services	Severe	Low likelihood	Moderate	
	Plant Uptake	Flora and Fauna	Mild	Likely	Moderate / low risk	There is a considered risk as the study site proposals incorporate soft landscaping.

Source	Pathway	Receptor	Consequence	Probability	Potential Risk	Detail
Off site Infilled Ground (65m E and 80m E) *(Metals, TPH, PAH, ground gasses, vapour)*	Dermal contact, ingestion and inhalation of contaminated soil, dust and/or fibres	End users	Medium	Likely	Moderate	Given the close proximity of the infilled ground to site, it is likely potential contaminants could migrate to site. Without further ground investigation that cannot be confirmed. Contact is likely between future residential occupiers/visitors in shallow soils in the proposed garden and allotment areas of the site, soil/dust tracked back into premises, and from ingestion of home grown produce. Future site workers are likely to come into direct contact with soils during groundworks. Safe working practices should be implemented, and appropriate personal protective equipment (PPE) should be used to mitigate any potential risk.
		Site workers	Medium	Likely	Moderate	
	Leaching / infiltration through soils and migration via groundwater or soil pore moisture.	Controlled waters	Medium	Unlikely	Low	There is no current evidence to suggest that groundwater quality beneath the site has been affected by contaminant leaching. The underlying geology is classified as unproductive strata. The nearest surface water feature is 217m, and given the distance is considered unlikely to be impacted by the contaminants currently associated with the site's history.
	Permeation of water pipes.	Construction materials, future end users	Medium	Unlikely	Low	Hydrocarbons, especially aromatics and chlorinated solvents, are known to permeate plastic pipes. Provision of water supply pipes and connectors formed from proprietary "barrier pipe" materials (e.g., polyethylene aluminium-polyethylene) may be required by the water supply company.
	Gas Migration and build up within buildings.	Future end users and building structures	Severe	Unlikely	Low / Moderate	A low / moderate risk is considered given the ground gas generation potential to migrate to distance to site and the significant time that has since passed.
	Plant Uptake	Flora and Fauna	Mild	Low likelihood	Low	Phytotoxic contamination as a consequence of historic and current land uses is unlikely.

5 Fieldwork and Analysis

The works undertaken as part of the site investigation and subsequent analysis of selected samples is summarised below.

5.1 Site Investigation

The locations of investigative positions were selected based on available access, the objectives of the investigation and proposed development plans. No access was available to the single storey structures fronting onto Palmerston Road.

Statutory services plans were obtained by agb Environmental. Prior to breaking ground, a cable avoidance tool and signal generator were used to confirm each location was clear of detectable services.

The exploratory hole location plan and fieldwork records are presented in **Appendix 2**. The exploratory holes completed as part of the investigation are detailed below.

5.1.1 Dynamic Sampling Boreholes

Four dynamic sampler boreholes, referenced WS01 to WS04, were advanced on 17th August 2022 and completed to depths between 2.00 metres below ground level (mbgl) and 3.00mbgl.

A service inspection pit was completed at each location prior to commencing drilling, to a target depth of 1.20mbgl. The sampling equipment comprised of a track-mounted rig used to drive successive 1.00m long, lined 90mm to 50mm diameter core sample barrels into the ground. The recovered plastic core barrel 'liners' were split, logged and sub-sampled on-site by an engineer. Small disturbed samples, taken at regular intervals throughout the length of the boreholes, were placed in laboratory supplied sealed glass jars or plastic containers prior to being stored in cool boxes during transit to the laboratory.

Standard Penetration Tests (SPTs) were undertaken at 1.0m intervals to provide an indication of the strength or density of the soil, the results are presented as 'N' values on the borehole logs. Excess spoil was stockpiled on site.

All positions were completed between 2.00mbgl and 3.00mbgl following SPT refusal in the Thanet Sand Formation.

5.1.2 Standpipe Installations and Monitoring

Single standpipe installations were placed in boreholes WS01, WS02 and WS04. The standpipe comprised 50mm diameter PTFE piping, plain from surface level to 0.50-0.70mbgl and slotted from 0.70mbgl to 1.90-3.00mbgl. Once introduced into the ground the slotted section was surrounded by suitable gravel pack, above which a sealing material (bentonite) was used. A rubber bung with a gas tap was placed at the top of the pipework and a flush cover concreted at surface to protect the installation from damage.

The standpipes were monitored on three occasions between 24th August 2022 and 26th September 2022. The ground gas flow was monitored for a period of up to two minutes; the concentration of volatile organic compounds (VOCs) was monitored for a period of up to three minutes and the concentrations of ground gases including methane, carbon dioxide, hydrogen sulphide and carbon monoxide were monitored for up to five minutes. Groundwater levels were measured using a dip-meter. The monitoring results are presented in **Appendix 3**.

5.2 Laboratory Analysis

The scheduled chemical analysis and number of samples tested is summarised **Table 5.1**; the scheduled geotechnical laboratory testing is summarised in **Table 5.2**. The results are presented in **Appendix 4**.

Table 5.1 Summary of Scheduled Contamination Testing

Analysis	**No. of Samples Tested**
	Soil
Metals	4
Speciated polycyclic aromatic hydrocarbons (PAHs) (USEPA 16 – PAHs)	4
Total petroleum hydrocarbons (CWG Aromatic/Aliphatic Split)	4
BTEX/MTBE	4
Asbestos screening	4
Asbestos quantification	-
pH	8
Soil organic matter (SOM)	4
Total organic carbon (TOC)	-
Total Sulphate	5
Total Sulphur	5
Water Soluble Sulphate (SO4)	5

Table 5.2 Summary of Scheduled Geotechnical Testing

Test	**No. of Soil Samples Tested**
Plasticity index	6
Natural Water Content	6
Wet Sieve Preparation	5

6 Ground Conditions

The encountered ground conditions are summarised below.

6.1 Encountered Ground Conditions

The ground conditions encountered are summarised in **Table 6.1** and discussed below.

Table 6.1 Summary of Encountered Ground Conditions

Stratum	Location	Surface Depth (mbgl)	Base Depth (mbgl)	Thickness (m)
Made Ground	All locations	0.00	0.70 – 1.10	0.70 – 1.10
Head Deposits	All locations	0.70 – 1.10	1.30 – 2.60	0.60 – 1.50
Thanet Formation	All locations	1.30 – 2.60	>2.00 - >3.00*	>0.40 - >0.70*
Groundwater	During fieldwork and monitoring groundwater was not encountered.			

* base of stratum not proven at all borehole locations.

6.1.1 Made Ground

Made Ground was encountered from surface level in all exploratory hole positions. In positions WS02, WS03 and WS04, located within the soft landscaped garden areas in central, eastern and southern parts of the site, this was encountered as a slightly sandy to sandy, gravelly silt from surface level to 0.70-0.90mbgl. Gravel was flint and occasional chalk, with fragments of anthropogenic materials including brick, charcoal, glass, concrete and clinker, occasional rusted nails and white porcelain. Occasional cobbles of concrete, brick and tile. The base of the Made Ground was proven at 0.70-0.90mbgl in WS02-WS04.

At location WS01, located at higher elevation on site in the brick paved area in the north, brick paving was present from surface level to 0.06mbgl, underlain by slightly gravelly sand to 0.20mbgl. Gravel was flint, limestone and brick. The Made Ground at this location graded to slightly gravelly sand, becoming gravelly at 0.60mbgl and silty at 0.90mbgl. Gravel was flint with occasional brick, limestone and concrete, then chalk and charcoal. Occasional brick cobbles. The base of the Made Ground was proven in WS01 at 1.10mbgl.

6.1.2 Head Deposits

Soils interpreted to represent superficial Head Deposits were encountered underlying the Made Ground at all borehole locations. BGS mapping indicates Head Deposits to be present to the north of the site.

These soils generally comprised a mix of dark grey and brown gravelly silty sand or soft to very stiff (desiccated by root growth) slightly gravelly to gravelly, sometimes sandy, silty clay. Gravel was white chalk with orange staining and flint.

6.1.3 Thanet Formation

Underlying the Head Deposits in all boreholes from 1.30-2.60mbgl was a very dense slightly greenish, light brown or light grey, fine sand with occasional orange staining. This stratum is considered representative of the Thanet Formation bedrock geology which is shown to underlie the site on BGS mapping and was proven to the base of each borehole between 2.00mbgl and 3.00mbgl. The base of the Thanet Formation was not proven.

6.1.4 Groundwater

During fieldwork, groundwater was not encountered. During monitoring, groundwater was not encountered.

6.1.5 Visual and Olfactory Evidence

During the site investigation works and subsequent monitoring there were no visual or olfactory indications of gross contamination in soils.

The identification of Made Ground soils underlying the site, containing anthropogenic materials, could indicate the potential presence contaminants of concern.

7 Chemical Laboratory Test Results and Monitoring

The results of chemical laboratory testing and ground gas monitoring are detailed in the following section.

7.1 Soil Analysis

Based on the proposed end use, the results of chemical laboratory testing of soil samples for inorganic and organic compounds were initially compared to residential with plant uptake scenario screening values. The screening criteria hierarchy used is as follows:

- Chartered Institute of Environmental Health (CIEH) and Land Quality Management Ltd (LQM) Suitable for Use Levels (S4ULs).
- Department for Environment Food and Rural Affairs (Defra) Category 4 Screening Levels (C4SLs).
- Contaminated Land: Applications in Real Environments (CL:AIRE) soil generic assessment criteria (GACs).
- Environment Agency: Soil Guideline Values (SGVs)

Screening levels for certain organic contaminants have been selected based on laboratory testing for soil organic matter (SOM) content. A conservative SOM of 1% has been considered appropriate for this risk assessment based on the range recorded by laboratory testing in made ground samples. It should be noted that if future development plans for the site change and areas of soft landscaping are proposed, then this assessment will need to be reviewed.

7.2 Aggressive Ground Analysis

The results of testing for aggressive ground conditions have been classified using values provided in BRE Special Digest 1:2005: Concrete in aggressive ground.

7.3 Ground Gas Monitoring

Where applicable the results of ground gas and volatile organic compound (VOC) monitoring have been compared to:

- CIRIA 665: Assessing risks posed by hazardous ground gases to buildings.
- BS 8485:2015: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
- HSE EH40/2005 Workplace exposure limits.

7.4 Soil Analysis and Screening Results

Table 7.1 Results of Laboratory Analysis for Metals

Determinand *Metals*	**Concentration Range (mg/kg)**		**Screening Values for Proposed Land Use (mg/kg)**		**No. of Samples with Elevated Concentrations**	**Samples with Elevated Concentrations**
	Minimum	*Maximum*	*S4ULs*	*C4SLs*		
Arsenic	21	32	37	-	0	None elevated
Cadmium	0.6	0.8	11	-	0	None elevated
Chromium (III)	15	26	910	-	0	None elevated
Chromium (VI)	<2	<2	6	-	0	None elevated
Copper	21	81	2400	-	0	None elevated
Lead	139	2380	-	82	3	WS01 @ 0.30m WS02 @ 0.30m WS03 @ 0.30m WS04 @ 0.20m
Mercury	< 1	1.8	40	-	0	None elevated
Nickel	13	21	130	-	0	None elevated
Selenium	< 3	< 3	250	-	0	None elevated
Zinc	359	712	3700	-	0	None elevated

Table 7.2 Results of Laboratory Analysis for Polycyclic Aromatic Hydrocarbons

Determinand *PAHs*	**Concentration Range (mg/kg)**		**Screening Values for Proposed Land Use (mg/kg)**		**No. of Samples with Elevated Concentrations**	**Samples with Elevated Concentrations**
	Minimum	*Maximum*	*S4ULs*	*C4SLs*		
			1% som			
Naphthalene	< 0.1	0.23	2.3	-	0	None elevated
Acenaphthylene	< 0.1	0.65	170	-	0	None elevated
Acenaphthene	< 0.1	0.12	210	-	0	None elevated
Fluorene	< 0.1	0.28	170	-	0	None elevated

Determinand *PAHs*	**Concentration Range (mg/kg)**		**Screening Values for Proposed Land Use (mg/kg)**		**No. of Samples with Elevated Concentrations**	**Samples with Elevated Concentrations**
	Minimum	*Maximum*	*S4ULs*	*C4SLs*		
			1% som			
Phenanthrene	0.58	5.35	95	-	0	None elevated
Anthracene	< 0.1	1.37	2400	-	0	None elevated
Fluoranthene	1.14	27	280	-	0	None elevated
Pyrene	1.04	24.5	620	-	0	None elevated
Benzo[a]anthracene	0.67	16.3	7.2	-	1	WS02 @ 0.20m
Chrysene	0.8	14.1	15	-	0	None elevated
Benzo[b]fluoranthene	1.42	18.3	2.6	-	3	WS02 @ 0.30m WS03 @ 0.30m WS04 @ 0.20m
Benzo[k]fluoranthene	0.42	5.74	77	-	0	None elevated
Benzo[a]pyrene	1.19	17.9	2.2	2.4	3	WS02 @ 0.30m WS03 @ 0.30m WS04 @ 0.20m
Indeno[123-cd]pyrene	1	7.73	27	-	0	None elevated
Dibenzo[ah]anthracene	0.24	2.01	0.24	-	4	WS01 @ 0.30m WS02 @ 0.30m WS03 @ 0.30m WS04 @ 0.20m
Benzo[ghi]perylene	1	6.13	320	-	0	None elevated
Total PAH	9.5	148	-	-	-	-

Table 7.3 Results of Laboratory Analysis for Speciated Total Petroleum Hydrocarbons

Determinand *Petroleum Hydrocarbons*	**Determinand Concentration Range (mg/kg)**		**Screening Values for Proposed Land Use (mg/kg)**	**No. of Samples with Elevated Concentrations**	**Location of Samples with Elevated Concentrations**
			S4ULs		
Speciated - Aliphatic	*Minimum*	*Maximum*	*1% som*		
>C5-C6	< 0.01	< 0.01	42	0	None elevated
>C6-C8	< 0.05	< 0.05	100	0	None elevated
>C8-C10	< 2	< 2	27	0	None elevated
>C10-C12	< 2	< 2	130	0	None elevated
>C12-C16	< 3	< 3	1,100	0	None elevated
>C16-C34	< 13	< 13	65,000	0	None elevated
Aliphatic C5-C34	< 21	< 21	-	-	-
Speciated - Aromatic	*Minimum*	*Maximum*	*1% som*		
>C5-7	< 0.01	< 0.01	70	0	None elevated
>C7-8	< 0.05	< 0.05	130	0	None elevated
>C8-10	< 2	< 2	34	0	None elevated
>C10-12	< 2	< 2	74	0	None elevated
>C12-16	< 2	4	140	0	None elevated
>C16-21	5	75	260	0	None elevated
>C21-35	< 10	165	1100	0	None elevated
Aromatic C5-35	< 42	244	-	-	-

Table 7.4 Results of Laboratory Analysis for BTEX and MTBE

Determinand *BTEX and MTBE*	**Determinand Concentration Range (mg/kg)**		**Screening Values for Proposed Land Use (mg/kg)**	**No. of Samples with Elevated Concentration**	**Location of Samples with Elevated Concentrations**
			S4ULs		
	Minimum	*Maximum*	*1% som*		
Benzene	< 0.002	< 0.002	0.087	0	None elevated
Toluene	< 0.005	< 0.005	130	0	None elevated
Ethylbenzene	< 0.002	< 0.002	47	0	None elevated
o-xylene	< 0.002	< 0.002	60	0	None elevated
m-xylene	< 0.002	< 0.002	59	0	None elevated
p-xylene	< 0.002	< 0.002	56	0	None elevated
MTBE	< 0.005	< 0.005	-	0	None elevated

Table 7.5 Asbestos Screening

Determinand	**Screening Result**	**Asbestos Matrix**	**Asbestos Type**	**Quantification (%)**	**Location of Samples with Detected Asbestos**
Asbestos	Not Detected	-	-	-	-

7.5 Aggressive Ground Analysis

Table 7.6 Summary of Aggressive Ground Analysis

Stratum	**Determinand**					**DS / ACEC Class**
	Total sulphate (%)	**W/S sulphate SO_4 (mg/l)**	**Total sulphur (%)**	**pH**	**Total Potential Sulphate**	
Made Ground	-	-	-	7.8 – 8.8	-	-
Head Deposits	0.04 – 0.07	< 10 – 23	< 0.02 – 0.03	8.4 – 8.5	0.09	DS-1 / AC-1
Thanet Formation	0.04	39	< 0.02	8.3	0.02	DS-1 / AC-1

7.6 Ground Gas Monitoring Results

Table 7.7 Summary of Ground Gas Monitoring Results

Date	Location	CO_2 (%)		CH_4 (%)		O_2 (%)		Flow (Max. l/hr.)	Atmospheric Pressure (mb)
		Min	Max	Min	Max	Min	Max		
24.08.2022	WS01	1.1	2.8	0.0	0.0	17.0	18.0	0.1	1012 (rising)
24.08.2022	WS02	0.1	1.0	0.0	0.0	19.5	19.8	0.2	1012 (rising)
24.08.2022	WS04	0.1	1.7	0.0	0.0	18.4	19.0	0.2	1012 (rising)
20.09.2022	WS01	2.2	2.8	0.1	0.1	18.2	20.0	0.1	1022 (rising)
20.09.2022	WS02	0.2	1.2	0.1	0.1	19.3	20.1	0.1	1022 (rising)
20.09.2022	WS04	1.6	1.7	0.1	0.1	18.6	19.4	0.1	1022 (rising)
26.09.2022	WS01	1.2	3.4	0.1	0.1	17.6	19.5	0.2	996 (falling)
26.09.2022	WS02	1.1	1.2	0.1	0.1	20.2	20.2	0.1	996 (falling)
26.09.2022	WS04	1.7	1.8	0.1	0.2	19.7	19.9	0.2	997 (falling)

Table 7.8 Gas Screening Values for Carbon Dioxide and Methane

Peak Flow Rate (l/hr)	Worst Case CO_2 (%)	CO_2 GSV	Worst Case CH_4 (%)	CH_4 GSV	CIRIA 665 Characteristic Situation
0.2	3.4	0.0068l/hr CO_2	0.2	0.0004l/hr CH_4	GSV = CS-1 Max recorded values = CS-1

Table 7.9 Workplace Exposure Limits

Location	Recorded Concentration (ppm)					
	Carbon monoxide		Hydrogen sulphide		Liquefied Petroleum Gas (VOCs)	
	Min	Max	Min	Max	Min	Max
All Boreholes	<1	2	<1	3	<0.1	<0.1
HSE Workplace Exposure Limits (ppm)	*Long Term*	*Short Term*	*Long Term*	*Short Term*	*Long Term*	*Short Term*
	30	200	5	10	1000	1250
Locations elevated:	None elevated.		None elevated.		None elevated.	

8 Updated Risk Assessment

Discussion of analysis, screening and monitoring results, and an updated qualitative risk assessment are provided below.

8.1 Discussion of Results, Screening and Monitoring Results

The soil and groundwater screening and the results of the three ground gas monitoring visits are summarised below.

8.1.1 Soil

Table 8.1 Soil Screening Summary

Determinand	Samples with Exceedance and Location
Benzo[b]fluoranthene	WS02 @ 0.30m, WS03 @ 0.30m & WS04 @ 0.20m.
Benzo[a]pyrene	
Benzo[a]anthracene	WS02 @ 0.20m.
Lead	WS01 @ 0.30m, WS02 @ 0.30m, WS03 @ 0.30m & WS04 @ 0.20m.
Dibenzo[ah]anthracene	

Asbestos was not detected in shallow Made Ground samples. Elevated concentrations of lead and 4no. congeners of polycyclic aromatic hydrocarbons have been identified in shallow Made Ground samples. No elevated concentrations of any other contaminants of concern have been identified in soil samples.

Positions WS01, WS03 and WS04 are located beneath proposed soft landscaping; however, WS02 is beneath a proposed building.

8.1.2 Groundwater

Groundwater was not encountered during fieldwork or subsequent monitoring.

8.1.3 Ground Gas

Table 8.3 Summary of Ground Gas Monitoring

Item	Result
Characteristic Situation	CS-1 (CIRIA C665)
Workplace Exposure Limits	None elevated.

The standpipes were monitored on three occasions between 24th August 2022 and 26th September 2022. Based on the monitoring undertaken, Characteristic Situation (CS) 1 is identified as the appropriate ground gas regime for the site.

9 Updated Conceptual Site Model and Qualitative Risk Assessment

The updated assessment of plausible contaminant linkages based on the results of the investigation and a summary of the potential geo-environmental risks associated with the site and in the context of the proposed development is provided in **Table 9.1**. The CSM risk evaluation methodology is presented in **Appendix 5.**

Table 9.1 Updated Qualitative Risk Assessment

Source	Pathway	Receptor	Consequence	Probability	Potential Risk	Detail
On Site Historical and Current Made Ground Two Mechanic companies (associated Vehicle Repair, Testing, Servicing and storage of chemicals) *(Metals, TPH, PAH, ACMs, BTEX, MTBE, SVOCs, VOCs, ground gasses, vapour)* **Off site** Infilled Ground (65m east and 80m east) *(Metals, TPH, PAH, ground gasses, vapour)*	Dermal contact, ingestion and inhalation of contaminated soil, dust and/or fibres	End users	Medium	Likely	Moderate	Contaminants of concern have been identified in shallow soil samples. Contact is likely between future users in shallow soils in the proposed soft landscaping of the site, soil/dust tracked back into premises. Construction workers are likely to come into direct contact during groundworks. Safe working practices should be implemented, and appropriate personal protective equipment (PPE) should be used to mitigate any potential risk.
		Site workers	Medium	Likely	Moderate	
		Adjacent users	Medium	Likely	Moderate	
	Leaching / infiltration through soils and migration via groundwater or soil pore moisture.	End users / Controlled waters	Medium	Unlikely	Low	There is no current evidence to suggest that groundwater quality beneath the site has been affected by contaminant leaching. The bedrock geology is designated a Secondary A aquifer on site; however, groundwater was not encountered during fieldwork or during monitoring. As such, the risk to receptors is considered to be low. There are no water features within 250m of site. There is one Potable and Groundwater abstraction record 196m SW of site which is active. The site is also located in an SPZ Type 1.
	Permeation of water pipes.	Construction materials, future end users	Medium	Likely	Moderate	Elevated levels of PAH compounds have been identified in Made Ground on site. The agreement of the water provider and Local Authority should be sought regarding the potable water pipework and fittings selected prior to commencement.
	Gas Migration and build up within buildings.	End users and Adjacent users	Severe	Unlikely	Moderate / low	Based on the gas monitoring results from site, CIRIA characteristic situation CS-1 is considered appropriate and there is a low gas risk identified to end users, buildings and buried services.
		Building and buried services	Severe	Unlikely	Moderate / low	
	Plant Uptake	Flora and Fauna	Mild	Likely	Moderate / low risk	Lead and PAH impacts have been identified in the shallow Made Ground which present a risk to on site flora and fauna.

10 Contamination Conclusion and Recommendations

The following recommendations are based on the results of the conceptual site model and risk assessment.

10.1 Conclusion

Based on the conceptual site model and risk assessment there is a considered **moderate** risk to end users, site workers and other environmental receptors.

Elevated concentrations of lead and four congeners of polycyclic aromatic hydrocarbons have been identified within shallow Made Ground samples beneath proposed soft landscaping, parking and building footprints, which exceed the screening values for residential developments with homegrown produce. Future site users and workers have the potential to come into contact with these soils. Made Ground was encountered to depths between 0.70mbgl at location WS04 and 1.10mbgl at WS01.

Groundwater was not encountered during fieldwork or subsequent monitoring. As such, it is considered unlikely that there would be an unacceptable risk from on site soils to the closest potable abstraction point located 196m south-west.

10.2 Recommendations

10.2.1 Delineation / Remediation

It is recommended that a Remediation Method Statement is undertaken to address the risk identified to end users, construction workers and environmental receptors from soil exceedances in the shallow Made Ground.

A remedial strategy must be undertaken and submitted to the Local Planning Authority prior to any works being undertaken. Any remediation undertaken would then require validation to show that the identified risks have been adequately addressed.

10.2.2 Gas Protection Measures

Based on the gas monitoring results and in line with classification, as detailed within C665 documentation, the CS level has been calculated as CS-1. Consequently, gas protection measures are not considered to be required to be installed within the proposed development.

10.2.3 Protection of Ground Workers

The risk to ground workers due to possible residually impacted soil will be mitigated upon implementation of suitable health and safety measures and should be completed by a suitably qualified and competent contractor with appropriate precautions in place following risk assessment. This should include the adoption of suitable safe systems of work, the provision and use of welfare facilities, and suitable protective measures.

10.2.4 Watching Brief

It is recommended that a watching brief be maintained on site, particularly during the groundwork stage. During any ground works a competent person should make an appraisal of the exposed soils. If any material is noted to show visual and/or olfactory signs of contamination it should be stockpiled separately and tested prior to its appropriate removal off-site or re-use. If soils suspected of being contaminated are encountered, it is recommended that a contaminated land specialist be consulted.

10.2.5 Buried Services

Potable water pipework shall comply with the Water Supply Regulations. The agreement of the water provider and Local Authority should be sought regarding the potable water pipework and fittings selected prior to commencement.

10.2.6 Importing and Re-Use of Soil and Materials Management Plan

Excavated soil that is to remain and be re-used on site, assuming it is suitable for the proposed use, may not be determined as waste and its re-use therefore may not require an Environmental Permit. It may be necessary to consult the Environment Agency or other statutory bodies regarding re-use of soils as part of the proposals and whether a Materials Management Plan or Environmental Permit is required. In any case, a site waste management plan or materials management plan may assist the design and cost assessment of the proposed development. This should be devised within the design phase of the scheme.

10.2.7 Soil Disposal

The client and contractors are advised to follow the process outlined in the Environment Agency's Technical Guidance Document WM3 '*Waste Classification – Guidance on the Classification and Assessment of Waste*', 1st edition 2021, v1.2 GB.

The developer has a statutory responsibility under the Duty of Care Regulations of the Environmental Protection Act 1990 to ensure that contaminated soil and water is disposed of off-site to a suitably licensed waste management facility in a safe and approved manner.

To comply with the Duty of Care all wastes taken off site, in solid or liquid form, must be handled by a registered waste carrier and be accompanied by a consignment note that describes the waste.

10.2.8 Statutory Authority Consultation

It is recommended that this report be sent to the statutory authorities including the Local Authority Environmental Health and Planning Departments prior to site works commencing to seek their comments. Where necessary, they will consult the Environment Agency or other relevant statutory authorities. If applicable to this project, this report should also be provided to the relevant building warranty provider.

11 Geotechnical Assessment

Comments regarding foundation design and construction are provided below.

11.1 Summary of Proposals and Ground Conditions

The development proposals and encountered ground conditions are summarised below.

11.1.1 Development Proposals

Development proposals are understood to include the demolition of existing single storey structures followed by erection of four dwellings (generally over the footprint of the single storey structures) with associated rear private gardens and driveway areas to the site frontage.

11.1.2 Summary of Ground Conditions and Test Results

The encountered ground conditions and in-situ and geotechnical laboratory test results are summarised in **Table 11.1** and **Table 11.2**.

Table 11.1 Summary of Encountered Ground Conditions

Stratum	Location	Surface Depth (mbgl)	Base Depth (mbgl)	Thickness (m)
Made Ground	All locations	0.00	0.70 – 1.10	0.70 – 1.10
Head Deposits	All locations	0.50 – 1.10	1.30 – 2.60	0.60 – 2.50
Thanet Formation	All locations	1.30 – 2.60	>2.00 - >3.00*	>0.40 - >0.70*
Groundwater	During fieldwork, groundwater was not encountered. During monitoring, groundwater was not encountered.			

*base of stratum not proven at all borehole locations

Soils interpreted to represent superficial Head Deposits were encountered on site which were variable, composed of sometimes gravelly, sometimes sandy, silty clay, gravelly silty sand or slightly sandy gravelly silt. Gravel was of chalk and flint.

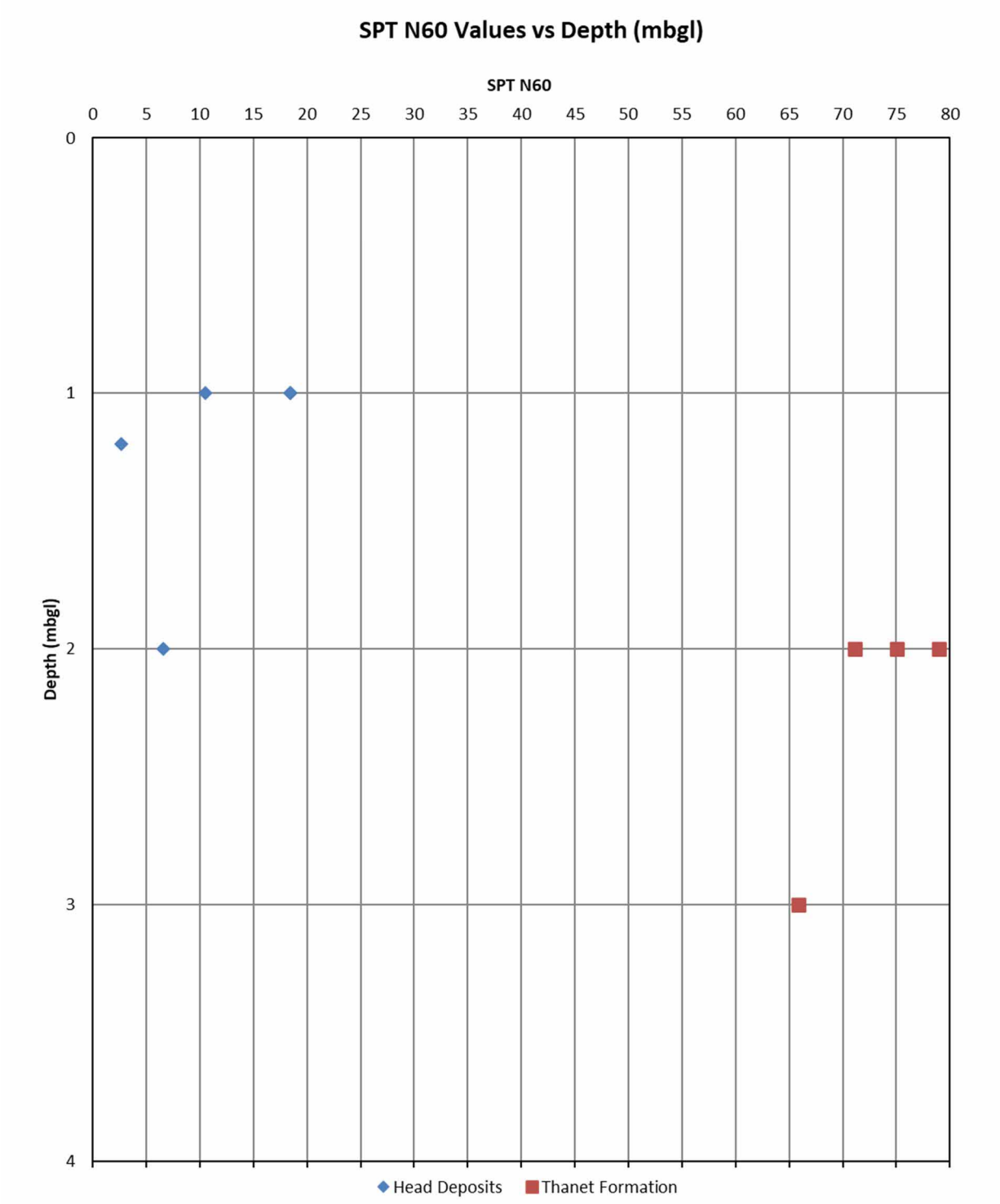
Bedrock soils comprising the Thanet Formation were very dense, yellowish brown to slightly greenish light grey, slightly silty sand.

Table 11.2 Summary of Test Results

Stratum	Corrected SPT 'N60' Value	Angle of Shearing Resistance – *granular soils*	Corrected Moisture Content (%)	Plasticity Index (%)	c_u (kPa) – *cohesive soils - SPT N60 x 5:*
Head Deposits	3 – 18	30 – 32	17 – 25	6 – 50	13 - 92
Thanet Formation	66 – 79	44 – 45	5	-	-

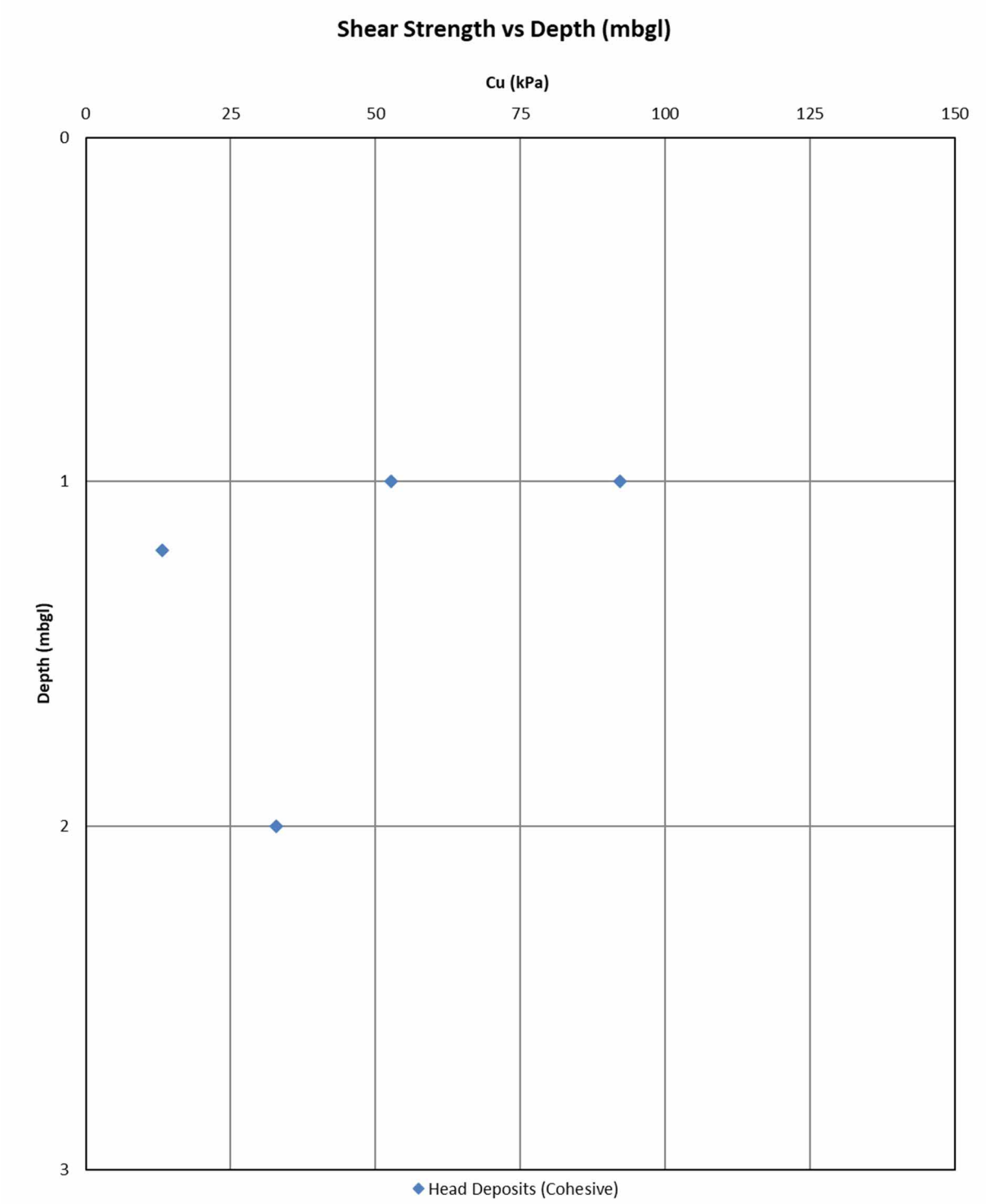
The SPT N60 values have been calculated using an energy ratio of 79% based on calibration data from the dynamic sampling rig. The corrected results are compared to depth in **Figure 11.1** below.

Figure 11.1 SPT N60 Values vs Depth (mbgl)



The undrained shear strengths calculated using a conservative F1 value and N60 values for cohesive soils from the superficial Head Deposits have been plotted against depth below and are presented as **Figure 11.2**.

Figure 11.2 Cu (kPa) vs Depth (mbgl)



11.2 Foundations

The following assessment is based on the ground conditions encountered and parameters determined from the intrusive site investigation, including the results of laboratory analysis. At the time of writing detailed design information and structural loads of the proposed buildings were not available, however it is assumed that the proposed structures will form low rise residential units. It is assumed that finished ground levels will be at or close to current ground levels, if this is not the case then this assessment will need to be reviewed.

Based on the geotechnical data obtained to date, the ground conditions encountered on site are considered appropriate for traditional trench fill/pad foundations bearing on the underlying natural cohesive or granular soils.

The soils encountered on site have been interpreted to represent Made Ground, overlying superficial Head Deposits, which in turn overlie bedrock geology of the Thanet Formation. The superficial Head Deposits encountered on site have been noted to be variable, both in terms of their composition and strength. At location WS01 in the north of the site, soft cohesive soils have been encountered with low SPT N values recorded ranging from 2 at 1.00m bgl to 5 at 2.00m bgl.

Testing undertaken on the cohesive Head Deposits has indicated soils with a low to high volume change potential based on the modified plasticity index. Based on NHBC guidance a minimum foundation depth of 1.00m bgl would be recommended, given the potential for high volume change. The site was overgrown and vegetated with weeds and brambles at the time of the site works. Given the presence of cohesive soils beneath the site, any foundations constructed within the influencing distance of trees (whether on or off site and whether to remain, be removed or planted), should have the foundations locally deepened based on appropriate industry guidance, such as NHBC Standards Chapter 4.2, and will require heave protection.

The underlying bedrock soils of the Thanet Formation were noted to be very dense, slightly silty sand, with high SPT N values greater than 50 reported.

Any Made Ground or reworked soils encountered within the proposed building footprint are considered unsuitable as a founding stratum and all foundations will need to fully penetrate any made ground, low strength or otherwise unsuitable soils and be founded a minimum of 150mm into the natural founding stratum. A competent person should inspect foundation excavations to ensure they comply with design assumptions. Made Ground was encountered to a maximum depth of 1.10mbgl at location WS01 in the north; however, this could be deeper in other areas of the site, particularly where current buildings are located and proposed to be demolished.

Given the very low SPT N values recorded within the superficial Head Deposits at location WS01 in the north of site, these soils are not considered suitable as a founding stratum. Any foundations located within this area around WS01 will need to be locally deepened into the underlying natural Thanet Formation.

Based on the site investigation data and testing across the remaining site area, for a 1.0m wide strip/trench fill foundation, bearing on the underlying natural superficial Head Deposits at a depth of 1.0m, a design bearing resistance of 75kN/m^2 is considered appropriate.

Should foundations needed to be locally deepened due to unsuitable soils being encountered at proposed founding depth, such as those at location WS01, or if the design bearing capacity noted above is not achievable then it is recommended foundations bear on the underlying natural granular Thanet Formation bedrock.

Based on the site investigation data and testing, for a 1.0m wide strip/trench fill foundation, bearing on the underlying natural granular Thanet Formation at an approximate depth of 2.0m, a design bearing resistance of 350kN/m^{2} is considered appropriate.

The above is only applicable for foundations with loads that are applied vertically and centrally and should result in total settlements of not more than 25mm, keeping differential settlements within acceptable limits.

In the absence of design loads the bearing capacity assessment has been undertaken for Design Approach 1, Combination 2 only, and a further assessment taking account of anticipated loadings will be required during detailed design in order to confirm the limit states are satisfied.

11.3 Stability of Excavations and Dewatering Considerations

The sides of excavations through Made Ground or granular soils would not be expected to remain stable and may require temporary support with appropriate shoring to prevent excavation collapse during construction. Should foundations be required to be constructed adjacent to existing buildings, such excavations for foundation construction must not undermine adjacent footings.

Instability is more likely where excavations are left open for longer periods and during inclement weather and may require temporary support with appropriate shoring to prevent excavation collapse during construction.

Where support systems are required, this must be designed by a suitably qualified engineer. Precautionary measures should be adopted should excavations be expected to remain open for an extended period and must be installed if personnel are to enter.

Groundwater was not encountered during fieldwork or monitoring. It is considered that should groundwater be encountered at shallow depths during excavation it will likely be suitably controlled using sump pumps.

11.4 Floor Slabs

Made Ground was encountered to depths of up to 1.10mbgl on site. Due to the variable depth of Made Ground encountered and presence of underlying cohesive soils, it is recommended that that all floor slabs are fully suspended.

11.5 Hardstanding

Following site preparation and regrading it is considered that the subgrade will comprise Made Ground.

The Made Ground on site is likely to be variable and for preliminary design purposes is considered to have a CBR of 2%. It is recommended that once the site has been graded to the appropriate pavement formation level, it is inspected and, if necessary, in situ CBR testing be conducted on the subgrade to confirm the appropriate pavement design (i.e. to determine the subbase and capping thickness). In addition, the formation should be proof-

rolled and any soft/loose pockets encountered should be excavated and replaced with well-compacted granular fill prior to pavement construction. Additional guidance is provided in BS7533-10:2010.

11.6 Chemical Attack on Buried Concrete

The results of testing for aggressive ground conditions have been summarised below in **Table 11.4,** the design sulphate class (DS) and aggressive chemical environment for concrete (ACEC) has also been provided.

Table 11.4 Summary of Test Results

Stratum	Determinand					DS / ACEC Class
	Total sulphate (%)	W/S sulphate SO_4 (mg/l)	Total sulphur (%)	pH	Total Potential Sulphate (%)	
Made Ground	-	-	-	7.8 – 8.8	-	-
Head Deposits	0.04 – 0.07	< 10 – 23	< 0.02 – 0.03	8.4 – 8.5	0.09	DS-1 / AC-1
Thanet Formation	0.04	39	< 0.02	8.3	0.02	DS-1 / AC-1

12 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside the stated scope of the research. Any comments made on the basis of information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third party information has been made by agb Environmental Ltd.

Should any changes to the development be proposed, including changes to the proposed landscaping, then the risks will need to be reassessed. This may require additional site investigation work and may result in the need for alteration of the remedial works.

Advice provided within this report is based on current guidelines available at the time of writing. This report is subject to amendment in light of additional information becoming available or statutory consultee review, including the Environment Agency and Local Authority and the NHBC.

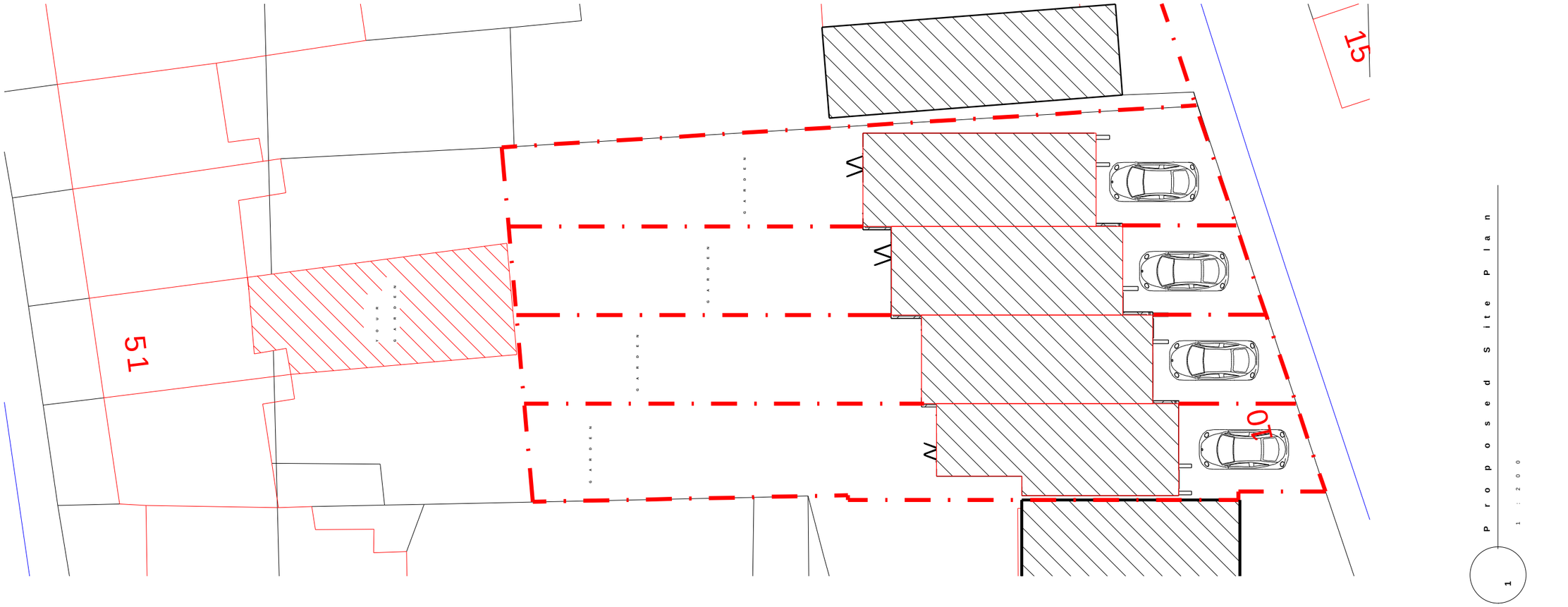
It is possible the conditions observed during the site investigation may change. This may result in changes to sources, pathways or receptors that were unforeseen and unexpected. Statements relating to ground gas or groundwater conditions are based on observations made at the time of the site investigation (unless otherwise stated). Ground gas or groundwater conditions may vary as a result of seasonal fluctuations or other effects.

Ground contamination can exist as small discrete areas of contamination and there can be no certainty that any or all such areas have been sampled or identified. This is particularly significant for an investigation by exploratory holes (as used in this site investigation) as a relatively small sample of soil is extracted, which may not be entirely representative of the surrounding ground conditions.

The geotechnical advice given in this report seeks to provide foundation design guidelines for the proposed building(s). The recommendations/advice given is based on the available information obtained during the investigation. Should any unusual ground conditions be encountered that differ from those proved in the exploratory holes further advice should be sought from agb Environmental Ltd.

This report is written in the context of an agreed scope of work between agb Environmental Ltd and the Client and should only be used in this specific context. Re-interpretation of the Site Investigation and/or this report in whole or part may become necessary if additional information becomes available or practices or legislation changes. agb Environmental Ltd does not provide legal advice; the advice of the Client's legal advisors may also be required. agb Environmental Ltd Terms and Conditions apply.

Appendix 1 Plans



PLANNING DRAWINGS

0 1 2 3 4 5 6 7 8 9 10

SCALE: 1:100

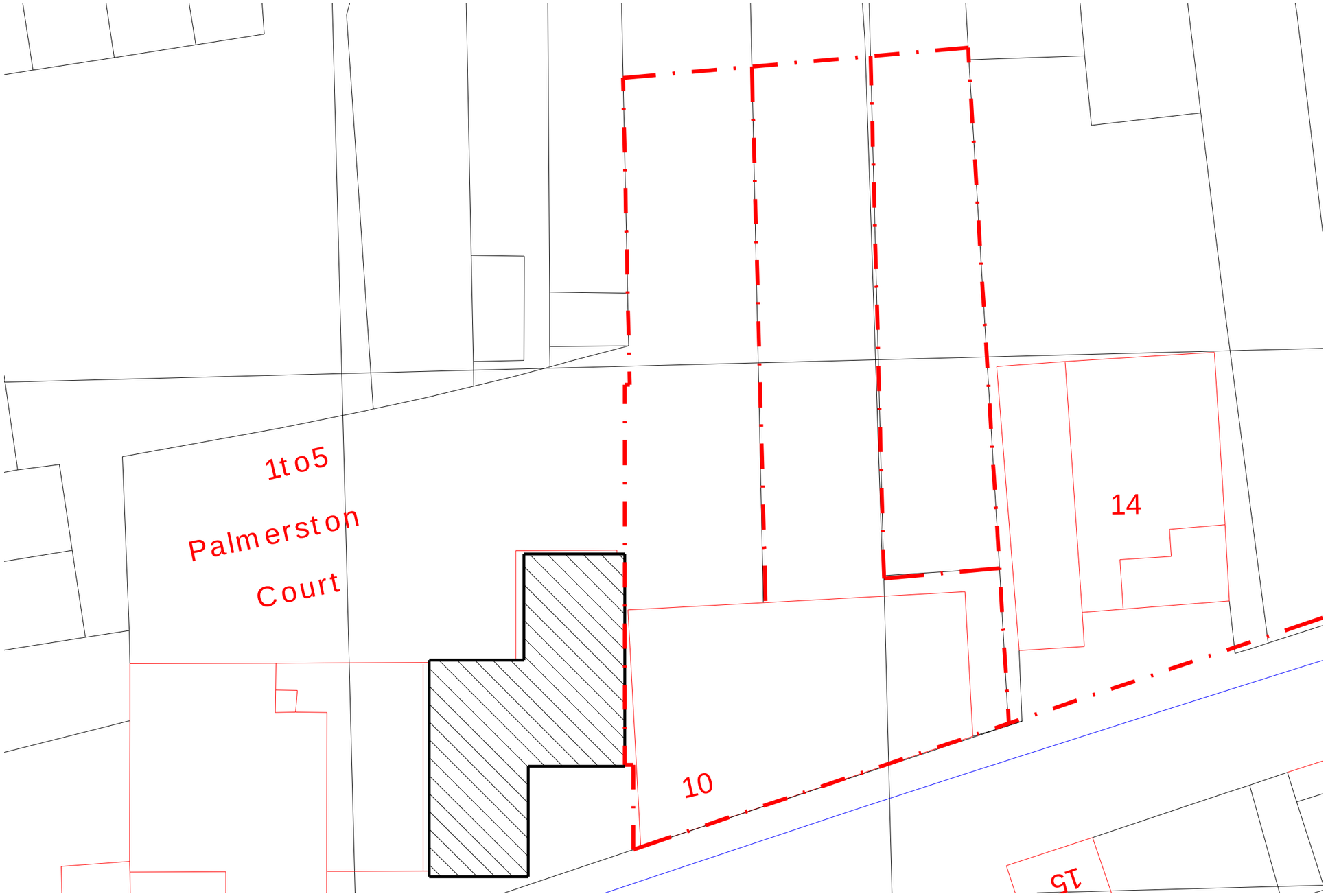
CANOPY
Planning Services
CIAT
Registered Practice
Tel: 020 3632 2690 Email: info@canopyplanning.co.uk
Mob: 07956371277 Web: www.canopyplanning.co.uk

-

10 Palmerston Road,
Sutton
SM1 4QL

PROPOSED PLAN

Project number	21310	21310/21	
Date	Feb. 2022		
Drawn by	Author		
Checked by	Checker	Scale	A3 @ 1 : 200



1 Existing Site Plan

1 : 200

0 2 4 6 8 10 12 14 16 18 20

SCALE: 1:200

CANOPY PLANNING

OFFICES:- SUTTON TEL NO. 020 3632 2690
MOBILE NO: 07956311277 Email:- info@canopyplanning.co.uk

-

10 Palmerston Road,
Sutton
SM1 4QL

EXISTING SITE PLAN

Project number	21310	21310/26	
Date	Nov. 2021		
Drawn by	O.A		
Checked by	Checker	Scale	A3 @ 1 : 200

Appendix 2 Fieldwork Records

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Legend

Window Sampler Location

Window Sampler Location (installed)

Project

10 Palmerston Road, Sutton, SM1 4QL

Title

Exploratory Hole Location Plan

Client

Canopy Planning Services Ltd

agb Environmental Ltd
1, The Mill, Copley Hill Business Park,
Babraham Road, Cambridge, CB22 3GN
Tel: 01223 776117
Email: Info@agbenvironmental.co.uk
Web: www.agbenvironmental.co.uk

Date 22nd August 2022

Scale NTS

Project number . Drawing number

P4455.2.002

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BOREHOLE LOG

Project				BOREHOLE No
10 Palmerston Road, Sutton, SM1 4QL				**WS01**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
P4455.2	17-08-22			
Contractor				Sheet
Agb Environmental Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.06	MADE GROUND: Brick Paving		
						0.15	MADE GROUND: Yellowish brown slightly gravelly SAND. Gravel is fine angular to subangular flint.		
						0.20	MADE GROUND: Light reddish brown and dark grey gravelly SAND. Gravel is flint and limestone with brick fragments.		
0.30	DS1								
0.30	ES1					(0.40)	MADE GROUND: Brown, grey and yellowish brown slightly gravelly SAND. Sand is fine to medium. Gravel is flint and limestone with brick fragments. Occasional grey and red brick cobbles.		
						0.60			
0.60	DS2								
0.60	ES2					(0.30)	MADE GROUND: Yellowish brown and brown gravelly SAND. Gravel is flint with occasional limestone, concrete and brick.		
						0.90			
0.90	DS3								
0.90	ES3					(0.20)	MADE GROUND: Dark brown silty gravelly SAND. Gravel is fine to medium chalk and charcoal with occasional brick.		
1.00		N2				1.10			
1.20	DS4						Soft to firm brown slightly gravelly sandy silty CLAY. Gravel is fine chalk and occasional flint. (HEAD DEPOSITS)		
1.20	ES4								
						(1.00)			
1.80	DS5								
1.80	ES5								
2.00		N5				2.10			
2.20	DS6						Firm brown slightly gravelly sandy silty CLAY. Gravel is flint and occasional chalk. (HEAD DEPOSITS)		
2.20	ES6					(0.50)			
						2.60			
						(0.40)	Very dense yellowish brown to slightly greenish light grey, slightly silty SAND. Sand is fine. (THANET FORMATION)		
2.80	DS7								
2.80	ES7								
3.00		N50/ 150mm				3.00			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater not encountered. Desiccation to approximately 1m. Rare decayed and recent roots to 2m. Refusal at 3m.

All dimensions in metres Scale 1:21.875	Client Canopy Planning Services Ltd	Method/ Plant Used Dynamic sampling rig	Logged By HG

AGS3 UK BH P4455 - PALMERSTON ROAD, SUTTON.GPJ AGB1.GDT 28/9/22

agb Environmental

BOREHOLE LOG

Project				BOREHOLE No
10 Palmerston Road, Sutton, SM1 4QL				**WS02**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
P4455.2	17-08-22			
Contractor				Sheet
Agb Environmental Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.30	DS1					(0.70)	MADE GROUND: Greyish brown gravelly sandy SILT. Sand is fine to medium. Gravel is medium to coarse subrounded to rounded flint, with anthropogenic medium gravel size angular charcoal, medium to coarse brick fragments, angular glass fragments, and medium to coarse angular concrete. Occasional concrete, brick and red tile cobbles.		
0.30	ES1								
						0.70			
0.80	DS2						Brown slightly gravelly slightly sandy SILT. Gravel is off-white to light cream rounded fine to medium chalk with orange staining. (HEAD DEPOSITS)		
0.80	ES2								
1.00		N14				(0.60)			
1.20	DS3								
1.20	ES3					1.30			
							Very dense light brown and light brownish grey, slightly silty SAND. Sand is fine. Occasional orange mottling. (THANET FORMATION)		
						(0.70)			
1.80	DS4								
1.80	ES4								
						2.00			
2.00		N54							

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater not encountered. Desiccation to approximately 1m. Occasional roots to 0.2m. Refusal at 2m.

All dimensions in metres Scale 1:21.875	Client Canopy Planning Services Ltd	Method/ Plant Used Dynamic sampling rig	Logged By HG

AGS3 UK BH P4455 - PALMERSTON ROAD, SUTTON.GPJ AGB1.GDT 28/9/22

agb Environmental

BOREHOLE LOG

Project				BOREHOLE No
10 Palmerston Road, Sutton, SM1 4QL				**WS03**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
P4455.2	17-08-22			
Contractor				Sheet
Agb Environmental Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20	DS1						MADE GROUND: Dark brownish grey slightly sandy gravelly SILT. Sand is fine. Gravel is medium to coarse flint with anthropogenic angular brick, medium gravel size angular charcoal, fine concrete and fine rounded chalk. Occasional rusted nails and white porcelain fragments. Occasional cobbles of red tile.		
0.20	ES1								
						(0.90)			
0.60	DS2								
0.60	ES2								
						0.90			
						1.00	Medium dense dark grey and brown gravelly silty SAND. Gravel is rounded white chalk with orange staining. (HEAD DEPOSITS)		
1.00	DS3								
1.00	ES3								
1.00		N8					Stiff to very stiff brown and grey mottled slightly sandy gravelly silty CLAY. Gravel is subrounded to rounded chalk and flint with occasional fine orange mudstone. (HEAD DEPOSITS)		
						(0.60)			
1.50	DS6								
1.50	ES6					1.60			
1.70	DS4						Very stiff grey and brown silty CLAY. Occasional flint gravel. (HEAD DEPOSITS)		
1.70	ES4					(0.40)			
						2.00			
2.00		N60					Very dense slightly greenish light brown slightly silty SAND. Sand is fine. (THANET FORMATION)		
2.10	DS5					(0.30)			
						2.30			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater not encountered. Desiccation to approximately 1m. Rare decayed and recent roots to 2m. Refusal at 2.3m.

All dimensions in metres Scale 1:21.875	Client Canopy Planning Services Ltd	Method/ Plant Used Dynamic sampling rig	Logged By HG

AGS3 UK BH P4455 - PALMERSTON ROAD, SUTTON.GPJ AGB1.GDT 28/9/22

agb Environmental

BOREHOLE LOG

Project				BOREHOLE No
10 Palmerston Road, Sutton, SM1 4QL				**WS04**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
P4455.2	17-08-22			
Contractor				Sheet
Agb Environmental Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.20 0.20	DS1 ES1					(0.70)	MADE GROUND: Dark brown gravelly sandy SILT. Sand is fine. Gravel is medium to coarse subangular to subrounded flint, subangular to subrounded chalk. Anthropogenic materials include medium to coarse gravel size angular to subangular brick with occasional medium angular clinker and glass.		
0.60 0.60	DS2 ES2					0.70 (0.30)	Slightly greyish yellowish brown slightly gravelly silty SAND. Sand is fine. Gravel is fine to medium chalk with occasional medium subangular to subrounded flint. (HEAD DEPOSITS)		
1.00		N14				1.00			
1.20 1.20	DS3 ES3					(0.50)	Firm light greyish brown slightly silty slightly gravelly sandy CLAY, becoming gravelly at 1.4m. Sand is fine to medium. Gravel is chalk and medium to coarse flint. (HEAD DEPOSITS)		
1.80 1.80	DS4 ES4					1.50 (0.70)	Very dense light greenish grey slightly silty SAND. Sand is fine. Occasional orange staining. (THANET FORMATION)		
2.00		N57				2.20			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater not encountered. Desiccation to approximately 1m. Roots to 1m. Refusal at 2.2m.

All dimensions in metres Scale 1:21.875	Client Canopy Planning Services Ltd	Method/ Plant Used Dynamic sampling rig	Logged By HG

Appendix 3 Monitoring Results

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS01
Date:	24.08.2022
Engineer:	NM
Weather / temp:	Air pressure rising / 22 C sunny.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.1
+1m	0.1
+1m 30s	-
+2m	-
Max	0.1

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	1.1	0.0	19.0	2	3	1012	
+30s	1.5	0.0	18.2	1	3	1012	
+1m	2.2	0.0	17.0	1	2	1012	
+1m 30s	2.6	0.0	17.5	1	3	1012	
+2m	2.7	0.0	17.7	1	2	1012	
+2m 30s	2.8	0.0	17.3	1	2	1012	
+3m	2.8	0.0	17.3	1	2	1012	
+3m 30s	2.8	0.0	17.4	1	2	1012	
+4m	2.8	0.0	17.4	1	2	1012	
+4m 30s	2.8	0.0	17.4	1	2	1012	
+5m	2.8	0.0	17.4	1	2	1012	
Min	*1.1*	*0.0*	*17.0*	*1*	*2*	-	
Max	*2.8*	*0.0*	*19.0*	*2*	*3*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	2.98m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS02
Date:	24.08.2022
Engineer:	NM
Weather / temp:	Air pressure rising / 22 C sunny.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.1
+1m	0.2
+1m 30s	-
+2m	-
Max	0.2

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	0.9	0.0	19.8	0	1	1012	
+30s	1.0	0.0	19.7	0	2	1012	
+1m	1.0	0.0	19.7	0	1	1012	
+1m 30s	1.0	0.0	19.6	0	1	1012	
+2m	1.0	0.0	19.6	0	1	1012	
+2m 30s	1.0	0.0	19.6	0	1	1012	
+3m	1.0	0.0	19.5	0	1	1012	
+3m 30s	1.0	0.0	19.5	0	1	1012	
+4m	1.0	0.0	19.5	0	1	1012	
+4m 30s	1.0	0.0	19.5	0	1	1012	
+5m	1.0	0.0	19.5	0	1	1012	
Min	*0.9*	*0.0*	*19.5*	*0*	*1*	-	
Max	*1.0*	*0.0*	*19.8*	*0*	*2*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	1.70m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS04
Date:	24.08.2022
Engineer:	NM
Weather / temp:	Air pressure rising / 22 C sunny.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.2
+1m	0.2
+1m 30s	-
+2m	-
Max	0.2

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	0.1	0.0	19.0	1	2	1012	
+30s	1.6	0.0	18.6	1	2	1012	
+1m	1.7	0.0	18.5	1	2	1012	
+1m 30s	1.7	0.0	18.5	1	2	1012	
+2m	1.7	0.0	18.4	1	2	1012	
+2m 30s	1.7	0.0	18.4	1	2	1012	
+3m	1.7	0.0	18.4	1	2	1012	
+3m 30s	1.7	0.0	18.4	1	2	1012	
+4m	1.7	0.0	18.4	1	2	1012	
+4m 30s	1.7	0.0	18.4	1	2	1012	
+5m	1.7	0.0	18.4	1	2	1012	
Min	*0.1*	*0.0*	*18.4*	*1*	*2*	-	
Max	*1.7*	*0.0*	*19.0*	*1*	*2*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	1.86m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS01
Date:	20.09.2022
Engineer:	NM
Weather / temp:	Air pressure rising / 18 C Overcast.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.1
+1m	0.1
+1m 30s	-
+2m	-
Max	0.1

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	2.8	0.1	20.0	0	0	1022	
+30s	2.8	0.1	18.3	0	0	1022	
+1m	2.8	0.1	18.2	0	0	1022	
+1m 30s	2.7	0.1	18.2	0	0	1022	
+2m	2.6	0.1	18.3	0	0	1022	
+2m 30s	2.5	0.1	18.4	0	0	1022	
+3m	2.5	0.1	18.4	0	0	1022	
+3m 30s	2.3	0.1	18.5	0	0	1022	
+4m	2.3	0.1	18.5	0	0	1022	
+4m 30s	2.2	0.1	18.6	0	0	1022	
+5m	2.2	0.1	18.6	0	0	1022	
Min	*2.2*	*0.1*	*18.2*	*0*	*0*	-	
Max	*2.8*	*0.1*	*20.0*	*0*	*0*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	2.98m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS02
Date:	20.09.2022
Engineer:	NM
Weather / temp:	Air pressure rising / 18 C Overcast.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.1
+1m	0.1
+1m 30s	-
+2m	-
Max	0.1

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	0.2	0.1	20.1	0	0	1022	
+30s	1.2	0.1	19.7	0	0	1022	
+1m	1.2	0.1	19.6	0	0	1022	
+1m 30s	1.2	0.1	19.6	0	0	1022	
+2m	1.2	0.1	19.5	0	0	1022	
+2m 30s	1.2	0.1	19.5	0	0	1022	
+3m	1.2	0.1	19.5	0	0	1022	
+3m 30s	1.2	0.1	19.5	0	0	1022	
+4m	1.2	0.1	19.7	0	0	1022	
+4m 30s	1.2	0.1	19.7	0	0	1022	
+5m	1.2	0.1	19.3	0	0	1022	
Min	*0.2*	*0.1*	*19.3*	*0*	*0*	-	
Max	*1.2*	*0.1*	*20.1*	*0*	*0*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	1.70m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS04
Date:	20.09.2022
Engineer:	NM
Weather / temp:	Air pressure rising / 18 C Overcast.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.1
+1m	0.1
+1m 30s	-
+2m	-
Max	0.1

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	1.6	0.1	19.4	1	0	1022	
+30s	1.6	0.1	18.9	1	0	1022	
+1m	1.6	0.1	18.9	0	0	1022	
+1m 30s	1.6	0.1	18.9	0	0	1022	
+2m	1.6	0.1	18.9	0	0	1022	
+2m 30s	1.7	0.1	18.7	0	0	1022	
+3m	1.7	0.1	18.7	0	0	1022	
+3m 30s	1.7	0.1	18.7	0	0	1022	
+4m	1.7	0.1	18.6	0	0	1022	
+4m 30s	1.7	0.1	18.6	0	0	1022	
+5m	1.7	0.1	18.6	0	0	1022	
Min	*1.6*	*0.1*	*18.6*	*0*	*0*	-	
Max	*1.7*	*0.1*	*19.4*	*1*	*0*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	1.86m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS01
Date:	26.09.2022
Engineer:	NM
Weather / temp:	Air pressure falling / 13C Overcast.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.2
+1m	0.2
+1m 30s	-
+2m	-
Max	0.2

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	1.2	0.1	19.5	0	0	996	
+30s	3.4	0.1	17.6	0	0	996	
+1m	3.4	0.1	17.6	0	0	996	
+1m 30s	3.4	0.1	17.7	0	0	996	
+2m	3.2	0.1	17.8	0	0	996	
+2m 30s	3.2	0.1	17.8	0	0	996	
+3m	3.2	0.1	19.0	0	0	996	
+3m 30s	3.0	0.1	18.1	0	0	996	
+4m	3.0	0.1	18.1	0	0	996	
+4m 30s	2.9	0.1	18.1	0	0	996	
+5m	2.8	0.1	18.3	0	0	996	
Min	*1.2*	*0.1*	*17.6*	*0*	*0*	-	
Max	*3.4*	*0.1*	*19.5*	*0*	*0*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	2.98m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS02
Date:	26.09.2022
Engineer:	NM
Weather / temp:	Air pressure falling / 13C Overcast.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.1
+30s	0.1
+1m	0.1
+1m 30s	-
+2m	-
Max	0.1

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	1.1	0.1	20.2	0	0	996	
+30s	1.1	0.1	20.2	0	0	996	
+1m	1.1	0.1	20.2	0	0	996	
+1m 30s	1.2	0.1	20.2	0	0	996	
+2m	1.2	0.1	20.2	0	0	996	
+2m 30s	1.2	0.1	20.2	0	0	996	
+3m	1.2	0.1	20.2	0	0	996	
+3m 30s	1.2	0.1	20.2	0	0	996	
+4m	1.2	0.1	20.2	0	0	996	
+4m 30s	1.2	0.1	20.2	0	0	996	
+5m	1.2	0.1	20.2	0	0	996	
Min	*1.1*	*0.1*	*20.2*	*0*	*0*	-	
Max	*1.2*	*0.1*	*20.2*	*0*	*0*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	1.70m
Sample:	
Comment:	

agb Environmental Ltd

Monitoring Record

Site name / location:	10 Palmerston Road, Sutton, SM1 4QL
Installation ref.:	WS04
Date:	26.09.2022
Engineer:	NM
Weather / temp:	Air pressure falling / 13C Overcast.

PID Monitoring

	Reading		Reading
	ppm		ppm
Ambient	0.0	**+3m**	0.0
+10s	0.0	**+4m**	-
+30s	0.0	**+5m**	-
+1m	0.0	**+6m**	-
+1m 30s	0.0	**+7m**	-
+2m	0.0	**+8m**	-
		Max	*0.0*

Flow Rate

	Reading
	l/hr
+10s	0.2
+30s	0.2
+1m	0.2
+1m 30s	-
+2m	-
Max	0.2

Gas Monitoring

	CO2	CH4	O2	CO	H2S	Pressure	Comments
	%	%	%	ppm	ppm	mb	
+10s	1.7	0.1	19.7	0	0	997	
+30s	1.7	0.1	19.7	0	0	997	
+1m	1.7	0.2	19.7	0	0	997	
+1m 30s	1.7	0.2	19.7	0	0	997	
+2m	1.8	0.2	19.7	0	0	997	
+2m 30s	1.8	0.2	19.7	0	0	997	
+3m	1.8	0.2	19.8	0	0	997	
+3m 30s	1.8	0.1	19.8	0	0	997	
+4m	1.8	0.1	19.8	0	0	997	
+4m 30s	1.8	0.1	19.8	0	0	997	
+5m	1.8	0.1	19.9	0	0	997	
Min	*1.7*	*0.1*	*19.7*	*0*	*0*	-	
Max	*1.8*	*0.2*	*19.9*	*0*	*0*	-	

Groundwater

Water Depth (m)	DRY
Well Depth (m)	1.86m
Sample:	
Comment:	

agb Environmental Ltd

Appendix 4 Laboratory Results

Helen Gildersleeves
AGB Environmental Ltd
1 The Mill
Copley Hill Business Park
Abraham Road
Cambridge
CB22 3GN

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

DETS Report No: 22-07100

Site Reference: 10 Palmerston Road, Sutton, SM1 4QL

Project / Job Ref: P4455

Order No: PO 009309

Sample Receipt Date: 22/08/2022

Sample Scheduled Date: 22/08/2022

Report Issue Number: 1

Reporting Date: 26/08/2022

Authorised by:

[redacted]

Nick Watson
General 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.

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Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate							
DETS Report No: 22-07100	Date Sampled	17/08/22	17/08/22	17/08/22	17/08/22	17/08/22
AGB Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	TP / BH No	WS01	WS02	WS03	WS04	WS01
Project / Job Ref: P4455	Additional Refs	ES1	ES1	ES1	ES1	ES5
Order No: PO 009309	Depth (m)	0.30	0.30	0.20	0.20	1.80
Reporting Date: 26/08/2022	DETS Sample No	609904	609905	609906	609907	609908

Determinand	Unit	RL	Accreditation	(n)	(n)			
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	
pH	pH Units	N/a	MCERTS	8.8	8.3	7.8	8.0	8.4
Total Sulphate as SO_4	mg/kg	< 200	MCERTS					459
Total Sulphate as SO_4	%	< 0.02	MCERTS					0.05
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					< 10
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					< 0.01
Total Sulphur	%	< 0.02	NONE					< 0.02
Organic Matter (SOM)	%	< 0.1	MCERTS	1.2	4.4	4.5	4.2	
Arsenic (As)	mg/kg	< 2	MCERTS	27	32	26	21	
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.8	0.8	0.6	0.8	
Chromium (Cr)	mg/kg	< 2	MCERTS	15	26	19	18	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	21	81	68	73	
Lead (Pb)	mg/kg	< 3	MCERTS	139	2380	935	817	
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	1.8	< 1	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS	13	21	21	20	
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	< 3	
Zinc (Zn)	mg/kg	< 3	MCERTS	359	712	398	501	

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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Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate							
DETS Report No: 22-07100	Date Sampled	17/08/22	17/08/22	17/08/22		
AGB Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	TP / BH No	WS02	WS03	WS04		
Project / Job Ref: P4455	Additional Refs	ES2	ES6	ES3		
Order No: PO 009309	Depth (m)	0.80	1.50	1.20		
Reporting Date: 26/08/2022	DETS Sample No	609909	609910	609911		

Determinand	Unit	RL	Accreditation	(n)	(n)	(n)		
Asbestos Screen (S)	N/a	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	8.5	8.4	8.4		
Total Sulphate as SO_4	mg/kg	< 200	MCERTS	720	404	454		
Total Sulphate as SO_4	%	< 0.02	MCERTS	0.07	0.04	0.05		
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	20	23	< 10		
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.02	0.02	< 0.01		
Total Sulphur	%	< 0.02	NONE	0.03	< 0.02	< 0.02		
Organic Matter (SOM)	%	< 0.1	MCERTS					
Arsenic (As)	mg/kg	< 2	MCERTS					
Cadmium (Cd)	mg/kg	< 0.2	MCERTS					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Chromium (hexavalent)	mg/kg	< 2	NONE					
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					
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)

DETS Ltd
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Rose Lane
Lenham Heath
Maidstone
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Tel : 01622 850410

Soil Analysis Certificate - Speciated PAHs							
DETS Report No: 22-07100	Date Sampled	17/08/22	17/08/22	17/08/22	17/08/22	
AGB Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	TP / BH No	WS01	WS02	WS03	WS04	
Project / Job Ref: P4455	Additional Refs	ES1	ES1	ES1	ES1	
Order No: PO 009309	Depth (m)	0.30	0.30	0.20	0.20	
Reporting Date: 26/08/2022	DETS Sample No	609904	609905	609906	609907	

Determinand	Unit	RL	Accreditation	(n)	(n)			
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.23	0.12	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	0.18	0.65	0.27	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.12	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.28	0.17	
Phenanthrene	mg/kg	< 0.1	MCERTS	0.58	1.87	5.35	3	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.38	1.37	0.67	
Fluoranthene	mg/kg	< 0.1	MCERTS	1.14	6.10	27	9.82	
Pyrene	mg/kg	< 0.1	MCERTS	1.04	5.34	24.50	8.56	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.67	3.42	16.30	5.69	
Chrysene	mg/kg	< 0.1	MCERTS	0.80	3.51	14.10	4.98	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	1.42	4.34	18.30	6.70	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.42	1.60	5.74	2.62	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	1.19	3.96	17.90	6.52	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	1	2.42	7.73	3.29	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	0.24	0.58	2.01	0.78	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	1	1.96	6.13	2.56	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	9.5	35.7	148	55.8	

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Maidstone
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Soil Analysis Certificate - TPH CWG Banded							
DETS Report No: 22-07100	Date Sampled	17/08/22	17/08/22	17/08/22	17/08/22	
AGB Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	TP / BH No	WS01	WS02	WS03	WS04	
Project / Job Ref: P4455	Additional Refs	ES1	ES1	ES1	ES1	
Order No: PO 009309	Depth (m)	0.30	0.30	0.20	0.20	
Reporting Date: 26/08/2022	DETS Sample No	609904	609905	609906	609907	

Determinand	Unit	RL	Accreditation	(n)	(n)			
Aliphatic >C5 - C6 : HS_1D_MS_AL	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aliphatic >C6 - C8 : HS_1D_MS_AL	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aliphatic >C8 - C10 : EH_CU_1D_AL	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aliphatic >C10 - C12 : EH_CU_1D_AL	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aliphatic >C12 - C16 : EH_CU_1D_AL	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	
Aliphatic >C16 - C21 : EH_CU_1D_AL	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	
Aliphatic >C21 - C34 : EH_CU_1D_AL	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Aliphatic (C5 - C34) : HS_1D_MS+EH_CU_1D_AL	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	
Aromatic >C5 - C7 : HS_1D_MS_AR	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	
Aromatic >C7 - C8 : HS_1D_MS_AR	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
Aromatic >C8 - C10 : EH_CU_1D_AR	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C10 - C12 : EH_CU_1D_AR	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Aromatic >C12 - C16 : EH_CU_1D_AR	mg/kg	< 2	MCERTS	< 2	< 2	4	< 2	
Aromatic >C16 - C21 : EH_CU_1D_AR	mg/kg	< 3	MCERTS	5	22	75	37	
Aromatic >C21 - C35 : EH_CU_1D_AR	mg/kg	< 10	MCERTS	< 10	44	165	72	
Aromatic (C5 - C35) : HS_1D_MS+EH_CU_1D_AR	mg/kg	< 21	NONE	< 21	67	244	108	
Total >C5 - C35 : HS_1D_MS+EH_CU_1D_Total	mg/kg	< 42	NONE	< 42	67	244	108	

(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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Soil Analysis Certificate - BTEX / MTBE							
DETS Report No: 22-07100	Date Sampled	17/08/22	17/08/22	17/08/22	17/08/22	
AGB Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	TP / BH No	WS01	WS02	WS03	WS04	
Project / Job Ref: P4455	Additional Refs	ES1	ES1	ES1	ES1	
Order No: PO 009309	Depth (m)	0.30	0.30	0.20	0.20	
Reporting Date: 26/08/2022	DETS Sample No	609904	609905	609906	609907	

Determinand	Unit	RL	Accreditation					
Benzene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Toluene : HS_1D_MS	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Ethylbenzene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
p & m-xylene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
o-xylene : HS_1D_MS	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
MTBE : HS_1D_MS	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	

(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
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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 22-07100	
AGB Environmental Ltd	
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	
Project / Job Ref: P4455	
Order No: PO 009309	
Reporting Date: 26/08/2022	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
609904	WS01	ES1	0.30	9.9	Light brown sand with stones and brick
609905	WS02	ES1	0.30	7.5	Light brown sand with stones
609906	WS03	ES1	0.20	5.3	Light brown sandy clay with stones and brick
609907	WS04	ES1	0.20	7.4	Light brown sandy clay with stones
609908	WS01	ES5	1.80	12.2	Light brown sandy clay with stones
609909	WS02	ES2	0.80	8.5	Light brown sand with stones
609910	WS03	ES6	1.50	11.9	Light brown clay with stones
609911	WS04	ES3	1.20	5.3	Light brown sand with stones

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

Insufficient Sample I/S

Unsuitable Sample U/S

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Unit 1, Rose Lane Industrial Estate
Rose Lane
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Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 22-07100
AGB Environmental Ltd
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL
Project / Job Ref: P4455
Order No: PO 009309
Reporting Date: 26/08/2022

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 diphenylcarbazide 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

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

List of HWOL Acronyms and Operators
DETS Report No: 22-07100
AGB Environmental Ltd
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL
Project / Job Ref: P4455
Order No: PO 009309
Reporting Date: 26/08/2022

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym
Benzene - HS_1D_MS
Ethylbenzene - HS_1D_MS
MTBE - HS_1D_MS
TPH CWG - Aliphatic >C10 - C12 - EH_CU_1D_AL
TPH CWG - Aliphatic >C12 - C16 - EH_CU_1D_AL
TPH CWG - Aliphatic >C16 - C21 - EH_CU_1D_AL
TPH CWG - Aliphatic >C21 - C34 - EH_CU_1D_AL
TPH CWG - Aliphatic >C5 - C6 - HS_1D_MS_AL
TPH CWG - Aliphatic >C6 - C8 - HS_1D_MS_AL
TPH CWG - Aliphatic >C8 - C10 - EH_CU_1D_AL
TPH CWG - Aliphatic C5 - C34 - HS_1D_MS+EH_CU_1D_AL
TPH CWG - Aromatic >C10 - C12 - EH_CU_1D_AR
TPH CWG - Aromatic >C12 - C16 - EH_CU_1D_AR
TPH CWG - Aromatic >C16 - C21 - EH_CU_1D_AR
TPH CWG - Aromatic >C21 - C35 - EH_CU_1D_AR
TPH CWG - Aromatic >C5 - C35 - HS_1D_MS+EH_CU_1D_AR
TPH CWG - Aromatic >C5 - C7 - HS_1D_MS_AR
TPH CWG - Aromatic >C7 - C8 - HS_1D_MS_AR
TPH CWG - Aromatic >C8 - C10 - EH_CU_1D_AR
TPH CWG - Total >C5 - C35 - HS_1D_MS+EH_CU_1D_Total
Toluene - HS_1D_MS
m & p-xylene - HS_1D_MS
o-Xylene - HS_1D_MS

Helen Gildersleeves
AGB Environmental Ltd
1 The Mill
Copley Hill Business Park
Abraham Road
Cambridge
CB22 3GN

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

DETS Report No: 22-07326

Site Reference:	10 Palmerston Road, Sutton, SM1 4QL
Project / Job Ref:	P4455
Order No:	009338
Sample Receipt Date:	31/08/2022
Sample Scheduled Date:	30/08/2022
Report Issue Number:	1
Reporting Date:	05/09/2022

Authorised by:

[redacted]
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.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 22-07326	Date Sampled	17/08/22				
AGB Environmental Ltd	Time Sampled	None Supplied				
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	TP / BH No	WS03				
Project / Job Ref: P4455	Additional Refs	ES4				
Order No: 009338	Depth (m)	1.80				
Reporting Date: 05/09/2022	DETS Sample No	610986				

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	8.3				
Total Sulphate as SO_4	mg/kg	< 200	MCERTS	378				
Total Sulphate as SO_4	%	< 0.02	MCERTS	0.04				
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	39				
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.04				
Total Sulphur	%	< 0.02	NONE	< 0.02				

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)

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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 22-07326	
AGB Environmental Ltd	
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL	
Project / Job Ref: P4455	
Order No: 009338	
Reporting Date: 05/09/2022	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
$ 610986	WS03	ES4	1.80	14.2	Brown sandy clay

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

Insufficient Sample I/S

Unsuitable Sample U/S

$ samples exceeded recommended holding times

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Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 22-07326
AGB Environmental Ltd
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL
Project / Job Ref: P4455
Order No: 009338
Reporting Date: 05/09/2022

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 diphenylcarbazide 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

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

List of HWOL Acronyms and Operators
DETS Report No: 22-07326
AGB Environmental Ltd
Site Reference: 10 Palmerston Road, Sutton, SM1 4QL
Project / Job Ref: P4455
Order No: 009338
Reporting Date: 05/09/2022

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

0998

Contract	**10 Palmerston Road, Sutton**
Serial No.	**41299_1**

Client:

AGB Environmental Ltd

341 Exning Road
Newmarket
Suffolk
CB8 0AT

Soil Property Testing Ltd

15, 16, 18 Halcyon Court, St Margaret's Way,
Stukeley Meadows, Huntingdon,
Cambridgeshire, PE29 6DG

Tel: 01480 455579
Email: enquiries@soilpropertytesting.com
Website: www.soilpropertytesting.com

Samples Submitted By:

AGB Environmental Ltd

Samples Labelled:

10 Palmerston Road, Sutton

Approved Signatories:

☑ **J.C. Garner B.Eng (Hons) FGS**
Technical Director & Quality Manager

☐ **W. Johnstone**
Materials Lab Manager

[redacted]

Date Received: 22/08/2022

Samples Tested Between: 22/08/2022 **and** 01/09/2022

Remarks:

For the attention of Helen Gildersleeves
Your Reference No: P4455
Your Order No: PO 009310

Notes:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.
5. The results within this report only relate to the items tested or sampled.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

UKAS TESTING

0998

Contract	10 Palmerston Road, Sutton		
Serial No.	41299_1	Target Date	05/09/2022
Scheduled By	AGB Environmental Ltd		
Schedule Remarks			

Bore Hole No.	Type	Sample Ref.	Top Depth	Water Content (BSEN)	Liquid/Plastic Limits	Wet Sieve Preparation															Sample Remarks
WS01	DS	4	1.20	1	1	1															
WS01	DS	5	1.80	1	1	1															
WS01	DS	6	2.20	1	1	1															
WS03	DS	3	1.00	1	1	1															
WS04	DS	3	1.20	1	1	1															
WS04	DS	4	1.80	1	1																
Totals				6	6	5															End of Schedule

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

0998

Contract	10 Palmerston Road, Sutton
Serial No.	41299_1

SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti-city Index (%)	Liquid-ity Index	Sample Preparation				Description	Class
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
WS01	1.20	DS	4	14.9	25	14	11	0.08	Wet Sieved	11 (M)	16.8*	26	Stiff brown slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium chert and chalk	CL
WS01	1.80	DS	5	17.4	25	17	8	0.05	Wet Sieved	24 (M)	22.9*	24	Firm brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse chert and chalk	CL
WS01	2.20	DS	6	15.3	26	16	10	-0.07	Wet Sieved	18 (M)	18.7*	25	Firm brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse chert and chalk	CL
WS03	1.00	DS	3	19.2	68	17	51	0.04	Wet Sieved	22 (M)	24.6*	24	Stiff mottled light bluish grey and light olive brown slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is fine to coarse chert and chalk	CH
WS04	1.20	DS	3	6.6	25	17	8	-1.30	Wet Sieved	21 (M)	8.4*	24	Brown slightly gravelly slightly sandy silty CLAY (loose and friable lumps). Gravel is fine to coarse chert and chalk	CL
WS04	1.80	DS	4	5.4	33	28	5	-4.51	From Natural	0 (A)		24	Pale olive silty fine SAND	ML

Method Of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3, 5.4

Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

Comments: *Corrected water content assume material greater than 0.425mm is non-porous. See BS1377: Part 2: 1990 Clause 3 Note 1.

Table Notation: Ret'd 0.425mm: (A) = Assumed, (M) = Measured

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

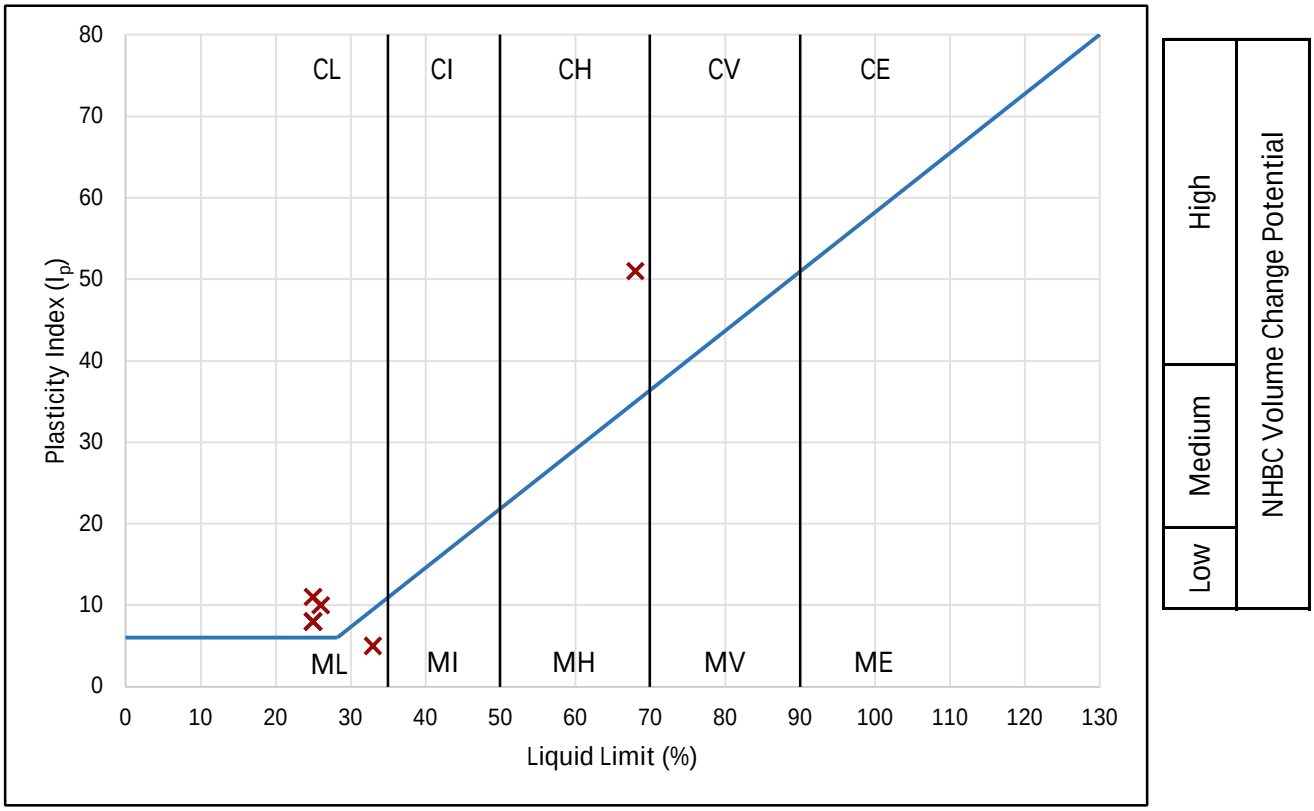
DATE ISSUED: 01/09/2022

0998

Contract	10 Palmerston Road, Sutton
Serial No.	41299_1

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS 1377: Part 2: 1990: 4.2
Method of Test:	BS1377: Part 2: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

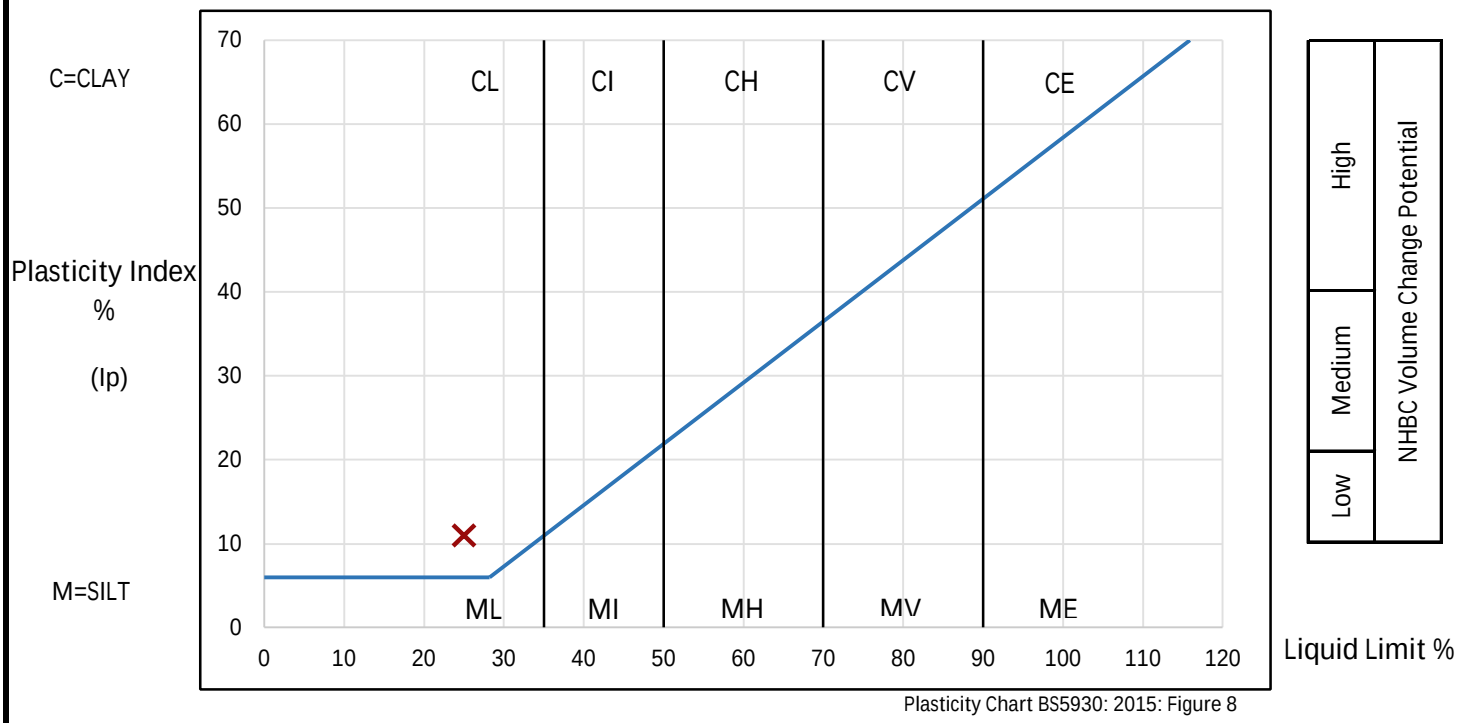
0998

Contract	10 Palmerston Road, Sutton
Serial No.	41299_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS01	1.20	DS	4	14.9	Stiff brown slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium chert and chalk	

PREPARATION			Liquid Limit	25 %
Method of preparation	Wet sieved over 0.425mm sieve		Plastic Limit	14 %
Sample retained 0.425mm sieve	(Measured)	11 %	Plasticity Index	11 %
Corrected water content for material passing 0.425mm		16.8 %	Liquidity Index	0.08
Sample retained 2mm sieve	(Measured)	7 %	NHBC Modified (I'p)	10 %
Curing time	26 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

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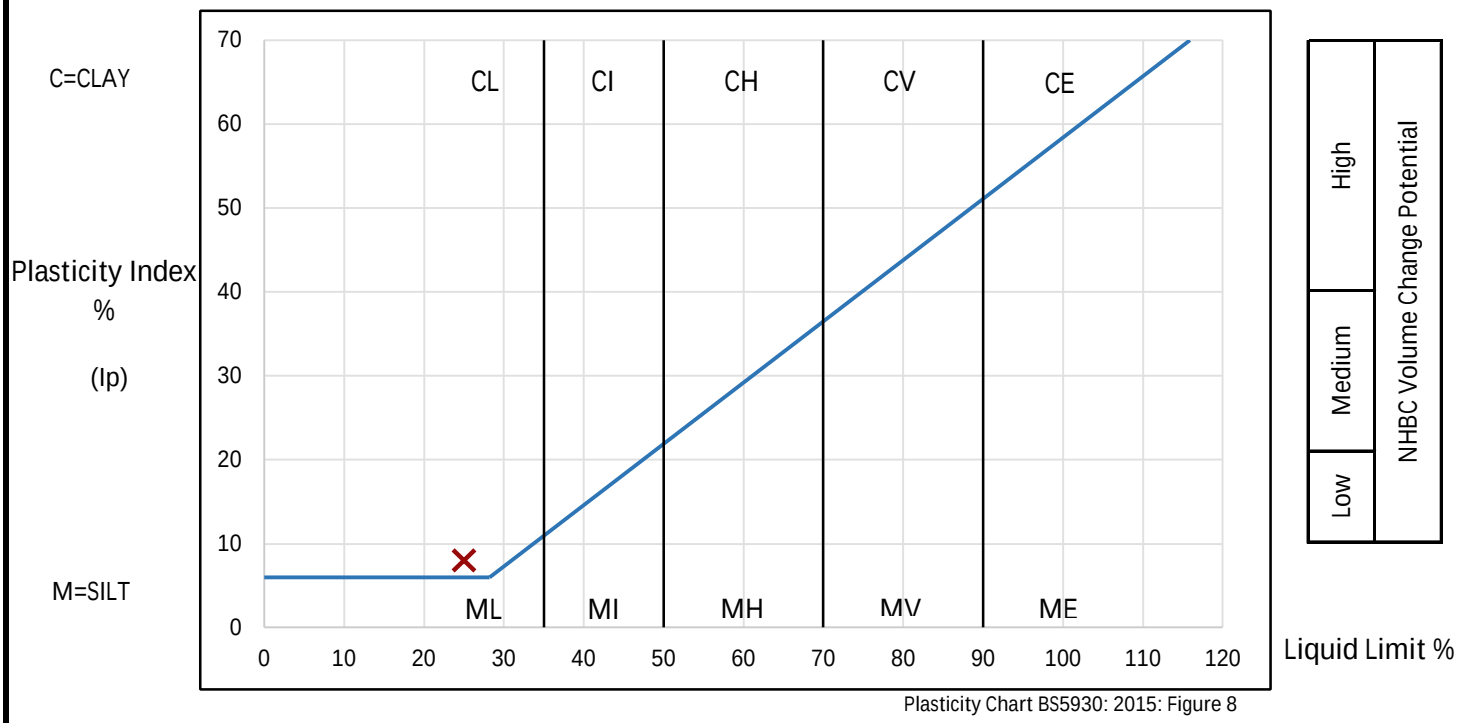
Contract	10 Palmerston Road, Sutton
Serial No.	41299_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS01	1.80	DS	5	17.4	Firm brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse chert and chalk	

PREPARATION			Liquid Limit	25 %
Method of preparation	Wet sieved over 0.425mm sieve		Plastic Limit	17 %
Sample retained 0.425mm sieve	(Measured)	24 %	Plasticity Index	8 %
Corrected water content for material passing 0.425mm		22.9 %	Liquidity Index	0.05
Sample retained 2mm sieve	(Measured)	20 %	NHBC Modified (I'p)	6 %
Curing time	24 hrs	Clay Content: Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

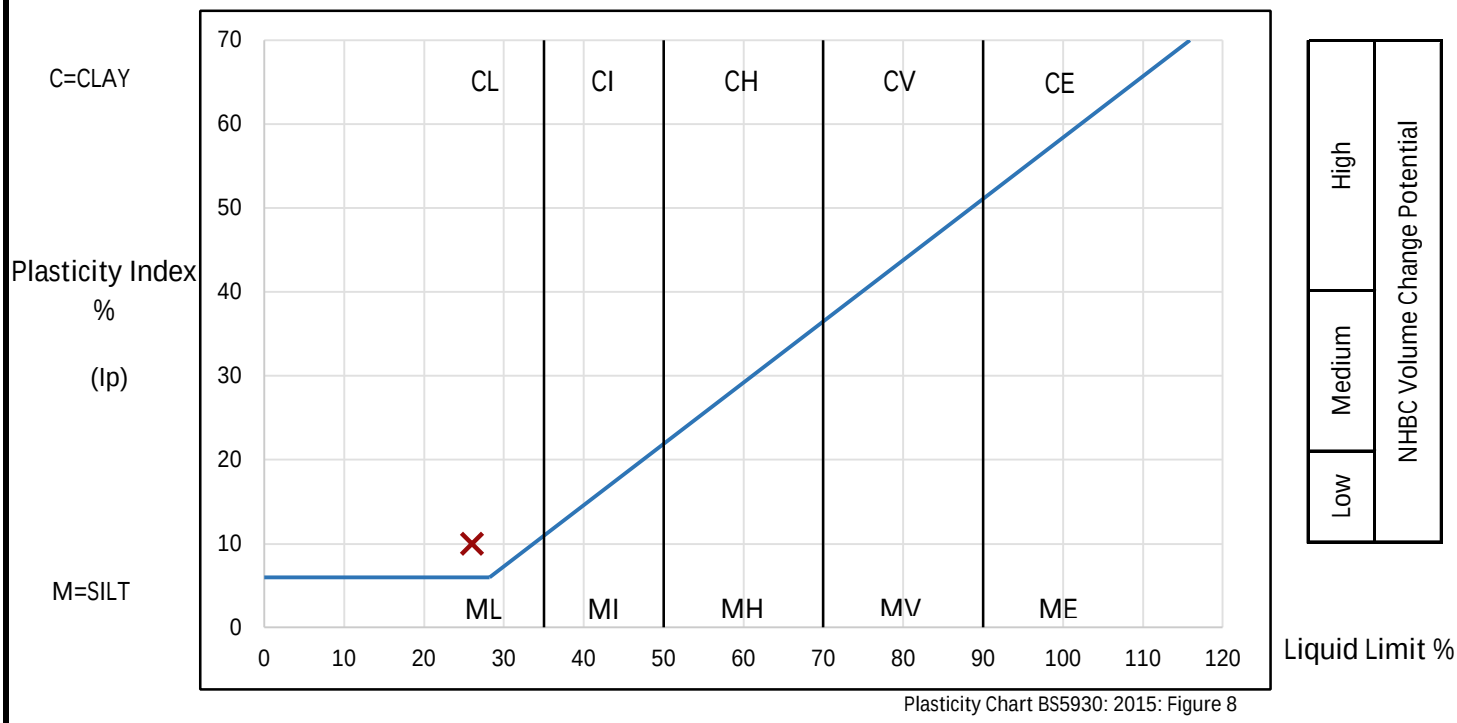
0998

Contract	10 Palmerston Road, Sutton
Serial No.	41299_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS01	2.20	DS	6	15.3	Firm brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse chert and chalk	

PREPARATION			Liquid Limit	26 %
Method of preparation	Wet sieved over 0.425mm sieve		Plastic Limit	16 %
Sample retained 0.425mm sieve	(Measured)	18 %	Plasticity Index	10 %
Corrected water content for material passing 0.425mm		18.7 %	Liquidity Index	-0.07
Sample retained 2mm sieve	(Measured)	14 %	NHBC Modified (I'p)	8 %
Curing time	25 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

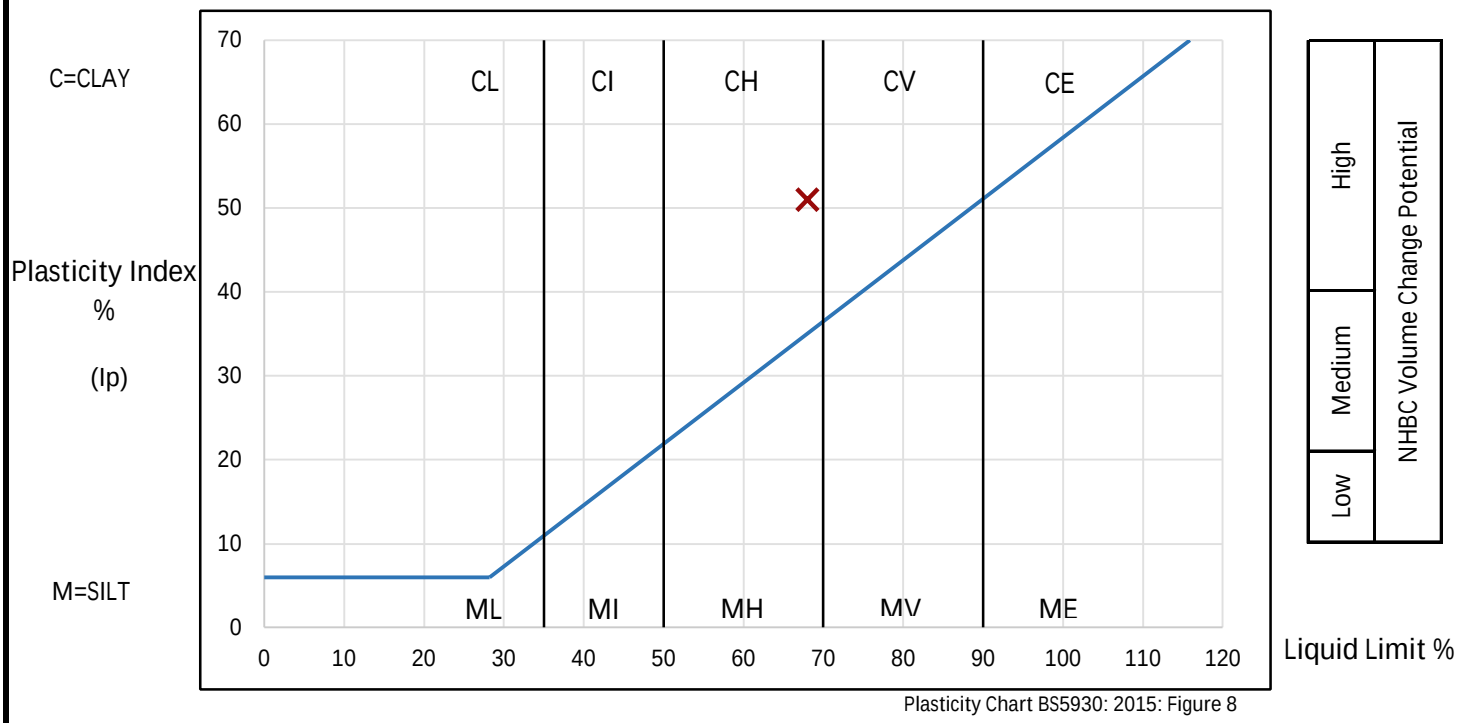
0998

Contract	10 Palmerston Road, Sutton
Serial No.	41299_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS03	1.00	DS	3	19.2	Stiff mottled light bluish grey and light olive brown slightly gravelly slightly sandy silty CLAY with occasional recently active and decayed roots. Gravel is fine to coarse chert and chalk	

PREPARATION				Liquid Limit	68 %
Method of preparation	Wet sieved over 0.425mm sieve			Plastic Limit	17 %
Sample retained 0.425mm sieve	(Measured)	22 %		Plasticity Index	51 %
Corrected water content for material passing 0.425mm		24.6 %		Liquidity Index	0.04
Sample retained 2mm sieve	(Measured)	19 %		NHBC Modified (I'p)	40 %
Curing time	24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 01/09/2022

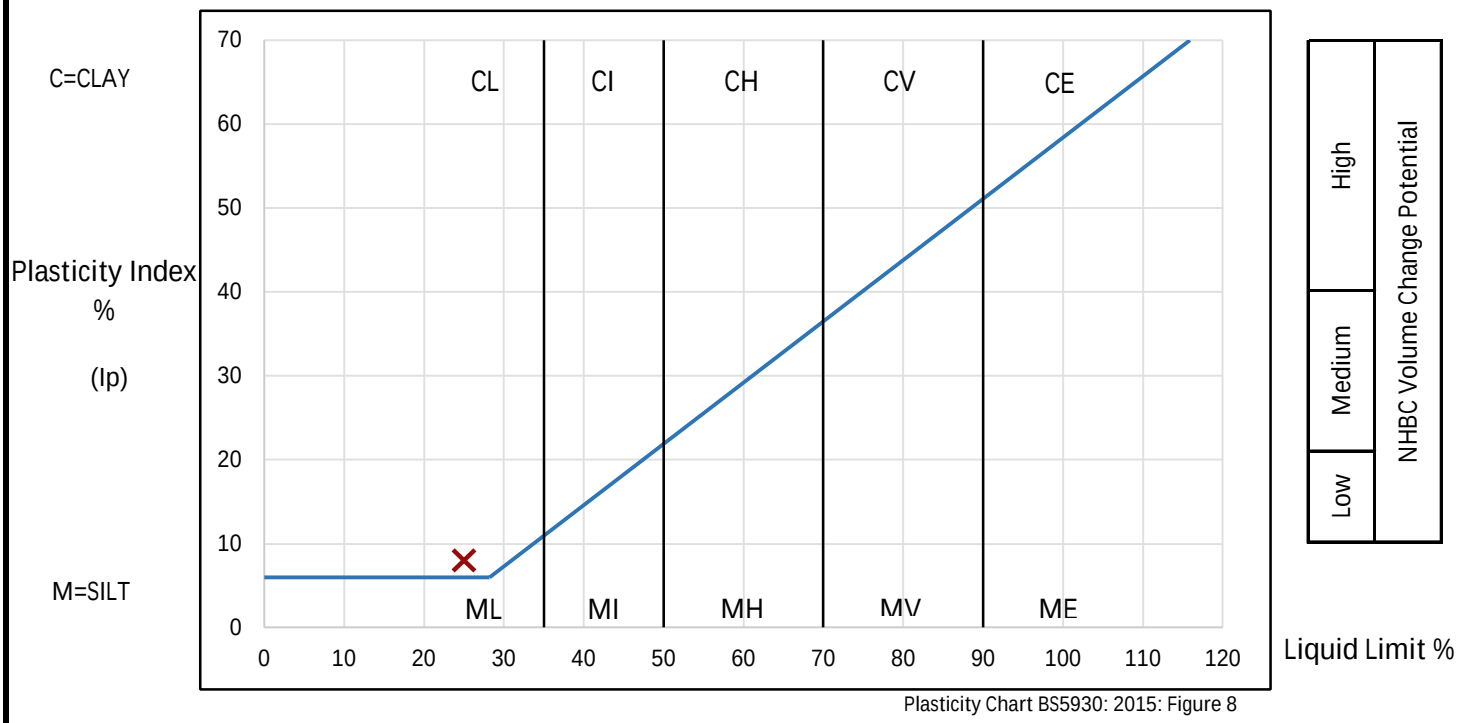
0998

Contract	10 Palmerston Road, Sutton
Serial No.	41299_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS04	1.20	DS	3	6.6	Brown slightly gravelly slightly sandy silty CLAY (loose and friable lumps). Gravel is fine to coarse chert and chalk	

PREPARATION			Liquid Limit	25 %
Method of preparation	Wet sieved over 0.425mm sieve		Plastic Limit	17 %
Sample retained 0.425mm sieve	(Measured)	21 %	Plasticity Index	8 %
Corrected water content for material passing 0.425mm		8.4 %	Liquidity Index	-1.30
Sample retained 2mm sieve	(Measured)	17 %	NHBC Modified (I'p)	6 %
Curing time	24 hrs	Clay Content: Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

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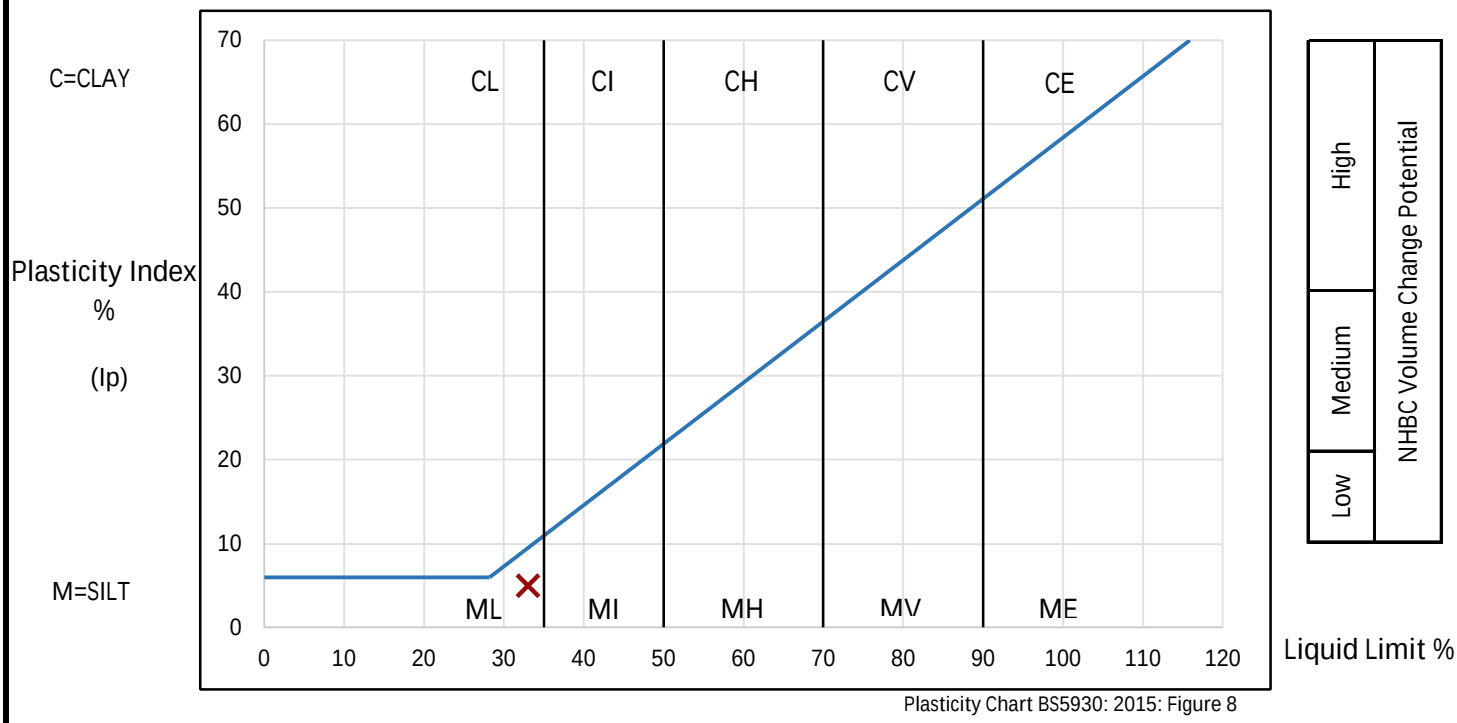
Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS04	1.80	DS	4	5.4	Pale olive silty fine SAND	

PREPARATION			Liquid Limit	33 %
Method of preparation		From natural	Plastic Limit	28 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	5 %
Corrected water content for material passing 0.425mm			Liquidity Index	-4.51
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	24 hrs	Clay Content: Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

Appendix 5 Updated CSM Risk Evaluation Methodology

Classification of Consequence

The classifications of consequence (severity) are taken from R&D Publication 66 (NHBC and Environment Agency, 2008). agb Environmental has chosen to apply the classifications to a broad range of development scenarios.

It should be noted that the categories of pollution incident have no relation to the categories of significant possibility of significant harm to human health or significant possibility of significant pollution of controlled waters in respect of the Part 2A Statutory Guidance.

Classification	Definition
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.
Mild	Exposure to human health unlikely to lead to "significant harm". Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structure and services.

Classification of Probability

The classifications of probability are taken from R&D Publication 66 (NHBC and Environment Agency, 2008). agb Environmental has chosen to apply the classifications to a broad range of development scenarios.

It should be noted that the categories of pollution incident have no relation to the categories of significant possibility of significant harm to human health or significant possibility of significant pollution of controlled waters in respect of the Part 2A Statutory Guidance. Also, in the Part 2A Statutory Guidance "pollutant linkage" is now termed "contaminant linkage", although it is noted that the terms are effectively synonymous.

Category	Definition
High Likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.
Unlikely	There is pollutant linkage but circumstances are such that it is improbably that an event would occur even in the very long-term.

Categorisation of Risk

		Consequence (Severity)			
		Severe	**Medium**	**Mild**	**Minor**
Probability (Likelihood)	**High Likelihood**	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Description of Risk Levels and Likely Action Required

Term	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action or there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action. Realisation of the risk is likely to present a substantial liability to the site owner or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate risk	It is possible that without appropriate remediation action, harm would arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low risk	It is possible that harm could arise to a designated receptor from identified hazard. It is likely that, at worst, if any harm was realised any effects would be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very low risk	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

Summary of Definitions

Term	Description
Hazard	A property or situation which in certain circumstances could lead to harm. (The properties of different hazards must be assessed in relation to their potential to affect the various different receptors).
Consequences	The adverse effects (or harm) arising from a defined hazard which impairs the quality of the environment or human health in the short or longer term.
Probability	The mathematical expression of the chance of a particular event in a given period of time (e.g. probability of 0.2 is equivalent to 20% or a 1 in 5 chance).
Likelihood	Probability; the state of face of being likely.
Risk	A combination of the probability or frequency of the occurrences of a defined hazard AND the magnitude of the consequences of that occurrence.
Contaminant linkage	An identified pathway is capable of exposing a receptor to a contaminant and that contaminant is capable of harming the receptor. In the Part 2A Statutory Guidance the terms “contaminant”, “pollutant” and “substance” have the same meaning, and some non-statutory technical guidance relevant to land contamination uses alternative terms such as “pollutant”, “substance” and associated terms in effect to mean the same thing.

APPENDIX C

SUMMARY OF LEGISLATION AND POLICY RELATING TO LAND CONTAMINATION

Part IIA of the Environmental Protection Act 1990

Part IIA of the Environmental Protection Act 1990 (Part IIA) and its associated Contaminated Land Regulations 2000 (SI 2000/227), which came into force in England on 1 April 2000, formed the basis for the current regulatory framework and the statutory regime for the identification and remediation of contaminated land. Part IIA of the EPA 1990 defines contaminated land as 'any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused, or that there is significant possibility of significant harm being caused, or that pollution of controlled waters is being or is likely to be caused'. Controlled waters are considered to include all groundwater, inland waters and estuaries.

In August 2006, the Contaminated Land (England) Regulations 2006 (SI 2006/1380) were implemented, which extended the statutory regime to include Part IIA of the EPA as originally introduced on 1 April 2000, together with changes intended chiefly to address land that is contaminated by virtue of radioactivity. These have been replaced subsequently by the Contaminated Land (England) (Amendment) Regulations 2012, which now exclude land that is contaminated by virtue of radioactivity.

The intention of Part IIA is to deal with contaminated land issues that are considered to cause significant harm on land that is not undergoing development (see **Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, April 2012). This document replaces Annex III of** Defra Circular 01/2006, published in September 2006 (the remainder of this document is now obsolete).

Planning Policy

Contaminated land is often dealt with through planning because of land redevelopment. This approach was documented in Planning Policy Statement: Planning and Pollution Control PPS23, which states that it remains the responsibility of the landowner and developer to identify land affected by contamination and carry out sufficient remediation to render the land suitable for use. PPS23 was withdrawn early in 2012 and has been replaced by much reduced guidance within the National Planning Policy Framework (NPPF), reference ISBN: 978-1-5286-1033-9, February 2019.

The new framework has only limited guidance on contaminated land, as follows:

Chapter 11. Making effective use of land

117 Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.

118. Planning policies and decisions should:

c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land.

Chapter 15. Conserving and enhancing the natural environment

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

Ground conditions and pollution

178. Planning policies and decisions should ensure that:

a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.

179. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

Water Resources Act (WRA)

The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 updated the Water Resources Act 1991, which introduced the offence of causing or knowingly permitting pollution of controlled waters. The Act provides the Environment Agency with powers to implement remediation necessary to protect controlled waters and recover all reasonable costs of doing so.

Water Framework Directive (WFD)

The Water Framework Directive 2000/60/EC is designed to:

enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands that depend on the aquatic ecosystems

promote the sustainable use of water

reduce pollution of water, especially by ‘priority’ and ‘priority hazardous’ substances

ensure progressive reduction of groundwater pollution.

The WFD requires a management plan for each river basin be developed every six years.

Groundwater Directive (GWD)

The 1980 Groundwater Directive 80/68/EEC and the 2006 Groundwater Daughter Directive 2006/118/EC of the WFD are the main European legislation in place to protect groundwater. The 1980 Directive is due to be repealed in December 2013. The European legislation has been transposed into national legislation by regulations and directions to the Environment Agency.

Priority Substances Directive (PSD)

The Priority Substances Directive 2008/105/EC is a 'Daughter' Directive of the WFD, which sets out a priority list of substances posing a threat to or via the aquatic environment. The PSD establishes environmental quality standards for priority substances, which have been set at concentrations that are safe for the aquatic environment and for human health. In addition, there is a further aim of reducing (or eliminating) pollution of surface water (rivers, lakes, estuaries and coastal waters) by pollutants on the list. The WFD requires that countries establish a list of dangerous substances that are being discharged and EQS for them. In England and Wales, this list is provided in the River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. In order to achieve the objectives of the WFD, classification schemes are used to describe where the water environment is of good quality and where it may require improvement.

Environmental Permitting Regulations (EPR)

The Environmental Permitting (England and Wales) Regulations 2016 (as amended) provide a single regulatory framework that streamlines and integrates waste management licensing, pollution prevention and control, water discharge consenting, groundwater authorisations, and radioactive substances regulation. Schedule 22, paragraph 6 of EPR 2016 states: 'the regulator must, in exercising its relevant functions, take all necessary measures - (a) to prevent the input of any hazardous substance to groundwater; and (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.'

Notes:

1. *The above information is provided for background but does not constitute site-specific advice*
2. *The above summary applies to England only. Variations exist within other countries of the United Kingdom*

APPENDIX D

TECHNICAL BACKGROUND

Desk Study

Aquifer Designation and Source Protection Zones

Principal Aquifer: layers of rock or drift deposit that have high intergranular and/or fracture permeability (usually providing a high level of water storage). They may support water supply and/or river base flow on a strategic scale.

Secondary A Aquifer: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Secondary B Aquifer: predominantly lower permeability layers that may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

Secondary (Undifferentiated) Aquifer: it has not been possible to attribute either a category A or B to a rock type. In most cases this means that it was previously designated as both a minor and non-aquifer in different locations owing to the variable characteristics.

Unproductive strata: low permeability with negligible significance for water supply or river base flow.

The EA generally adopts a three-fold classification of source protection zones (SPZ) surrounding abstractions for public water supply.

Zone 1 or the 'inner protection zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time from any point below the water table to the source. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source;

Zone 2 or the 'outer protection zone' is defined by a 400-day travel time from a point below the water table to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants;

Zone 3 or the 'total catchment' is the area around the source within which all groundwater recharge is presumed to be discharged at the source.

Preliminary Risk Assessment Methodology

The Environment Agency's (EA) land contamination risk management (LCRM) pages outline the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning and replaces the former EA CLR11 guidance, although has the same overriding principles. Under LCRM, three stages of risk assessment exist: preliminary, generic quantitative and detailed quantitative. An outline conceptual model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) contaminant linkages (contaminant–pathway–receptor) and is used as the basis for the design of the site investigation. The outline conceptual model is updated as further information becomes available, for example as a result of the site investigation.

Production of a conceptual model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk. RSK Raw has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

highly likely: the event appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution

likely: it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term

low likelihood: circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term

unlikely: circumstances are such that it is improbable the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

severe: short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000)

medium: chronic damage to human health ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem

mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment

minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the probability of an event occurring and its consequences have been classified, a risk category can be assigned according to the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very low	Very low

Definitions of these risk categories are as follows together with an assessment of the further work that may be required:

very high: There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.

high: Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.

moderate: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

low: It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.

very low: It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.