



RIDGE

GROUND CONDITION ASSESSMENT
WATER LANE, ANGMERING

MCCARTHY STONE LIMITED
February 2021

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Life, well lived

**GROUND CONDITION ASSESSMENT
WATER LANE, ANGMERING**

MCCARTHY STONE LIMITED
February 2021

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VERSION CONTROL

VERSION	DATE	DESCRIPTION	REPORT REFERENCE	CREATED	REVIEWED
1.0	26.02.21	First issue	5013719-RDG-XX-ST-DOC-C-01-GCA	RG/PB	RJH

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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions of the ground investigation undertaken. No reliance should be placed on any part of the executive summary until the whole of the report has been reviewed. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

Proposal	Two-storey block of 33 retirement living apartments and 'local' supermarket, together with associated parking areas.
Site Conditions	Former commercial garage, vacant and secure at time of investigation
Site History	A commercial garage from at least circa 1970, with some minor alterations since
Geology	Head Deposits over Chalk
Investigation	Thirteen windowless sample boreholes and six DCP tests; in situ geotechnical testing, laboratory testing and monitoring
Ground Conditions	Made Ground to a depth of 0.80m over Head Deposits. Underlying chalk encountered at depths ranging 0.30m to 3.50m to maximum intrusive depth of 5.45m. Groundwater at depths ranging 2.00m to 4.30mbgl
Contamination	Strong hydrocarbon odour within underlying chalk (2.00m to 4.00m). TPH exceedances within underlying chalk (~2.50m). Exceedances of lead and PAH within Made Ground soils
Waste Material	Waste classification identified Made Ground as Inert and Non-Hazardous
Foundation Solution	Piled foundation solution recommended
Further Investigation	Further investigations required; ground investigation to inform pile design; tank pull exercise
Fuel Tanks	Remove together with associated fuel lines and breather pipes and adjacent impacted soils. Tank Pull exercise.
Gas Membrane	Permanent ground gas (CO ₂ and CH ₄) and radon gas resistant membrane

1. INTRODUCTION

1.1. Brief

Ridge and Partners LLP (Ridge) was commissioned by McCarthy Stone Limited (the Client) to undertake an intrusive Ground Investigation and compile a Ground Condition Assessment (GCA) Report in relation to the proposed redevelopment at the former BMW Garage, Water Lane, Angmering, BN16 4EH (hereafter referred to as “the site”). A site location plan is included as Figure 1.

The brief was to undertake a ground investigation to identify any ground condition issues that may affect redevelopment of the site in terms of geotechnical and contamination aspects. This report provides an assessment of the identified ground conditions on site, with regard to the proposed works. Further to this, it provides a Conceptual Site Model and Contamination Risk Assessment utilising a ‘Residential’ land-use setting. This report is prepared in line with the agreed brief and is subject to report conditions.

Previously issued reports have been reviewed as part of the assessment; namely a Desk Top Study (DTS) (Report reference: 5013719-RDG-XX-ST-DOC-C-00-DTS01) issued by Ridge in November 2020, and an investigation report undertaken on the study site by Southern Testing (ST) (Report reference: J9299), dated September 2007. These documents should be read in conjunction with this report for completeness.

1.2. Proposals

The proposals comprise the demolition of the existing structures and development of 33no. one- and two-bedroom retirement living apartments spread over a two-storey building within the south and east of the site. The development allows for 21no. residential parking spaces within the west and eastern portions of the site. The proposals also include the development of a ‘local’ Tesco supermarket totalling 4080sq.ft attached to the residential development within the north of the site. 12no. additional parking spaces are proposed for Tesco customer parking within the north of the site.

Much of the west and north of the site is to have a hardstanding cover consisting of the previously mentioned parking areas and on-site vehicle access. To the east of the proposed residential structure is a communal garden and associated areas of soft landscaping. A number of mature trees are to be retained along the southern and south-eastern site boundaries. At present the proposals do not detail any private residential gardens. Proposed development plans are included as Figure 2.



1.3. Report Scope and Limitation

This report is based upon a review of readily available historical and current information and the recent site investigation data detailed herein. The report presents an interpretation of the Ridge Site Investigation undertaken during November 2020. In addition, this report outlines the basic ground conditions encountered in the exploratory holes. This information has been collated, processed and used to provide an interpretation of the ground conditions, with commentary on potential ground contamination risks for the proposed development.

This information has been collated, processed and used to provide an interpretation of the ground conditions, with recommendations on any contamination issues and geotechnical-related design. The recommendations and opinions expressed in this report are based on the strata observed in the exploratory holes, the results of the site and laboratory tests, and information obtained as part of the desk study or provided by others. Ridge takes no responsibility for conditions that have not been revealed by the exploratory holes, or which occur between them or for features which may be more widespread to those found.

Whilst efforts have been made to interpret the conditions between investigation locations, such information is only indicative and liability cannot be accepted for its accuracy. Information provided from other sources is taken in good faith and Ridge cannot guarantee its accuracy. The information contained in this report is intended for the use of **McCarthy Stone Limited** and Ridge can take no responsibility for the use of this information by any other party or for uses other than that described in this report.

2. SITE SETTING

A Geo-Environmental Engineer from Ridge visited the site on 23 October 2020 to conduct a walkover survey of the site and the surrounding areas for the purpose of identifying any potential contamination or evidence of previous contaminative processes. The findings of the walkover summary are included below; it is recommended to review the site walkover notes from the Desk Top Study (Report reference: 5013719-RDG-XX-ST-DOC-C-00-DTS01) for further information.

2.1. Site Location

The investigation area is centred on Easting 575376 and Northing 198409, situated at approximately 10mAOD (Above Ordnance Datum), located within the village of Angmering, West Sussex.

2.2. Current Site Use

The majority of the site is currently disused and was last used as a BMW garage, which provided new and used car sales, servicing, and accident repair services. A derelict two storey residential house and associated garden areas are located within the west of the site. Most of the site is currently secured from public use apart from a courtyard within the west of the site which is currently being used as an area of permitted parking.

2.3. Boundaries and Entrances

Currently the only site entrance is a road leading from High Street to the south-west which provides access to the courtyard area within the west of the site. There are three entrances from Water Lane which have been secured with Heras fencing within the north-west of the site. One further entrance from High Street is secured by palisade fencing within the south of the site. Access was permitted to these areas for the purposes of the intrusive investigation.

The north-west of site is bound by Water Lane and an associated footpath which leads north-east to a Grade II listed building which bounds the south-west corner of the site. The south is bounded by palisade fencing which is overgrown by vegetation. The south-east, east, and north-eastern boundaries consist of a piled retaining wall faced with either brick or steel panelling, the retaining wall is topped by a concrete capping beam and wooden fencing to bound the site from neighbouring residential properties. The retaining wall varies in height from 1.00 – 1.50m within the south and north-east of the site to a maximum height of approximately 4.50m within the south-east of the site. It was noted that parts of the retaining wall facing was cracked and some of the steel panels were damaged/missing.

2.4. Structures

The former BMW garage building is located within the centre of the site and comprises part single and part two storey sections. The building is largely glass fronted to the north-west and has a number of vehicle access roller shutter doors on all sides of the structure. The garage has a largely flat roof with an area of pitched roofing containing inferred corrugated fibre cement sheets within the centre of the structure. The structure has had a number of uses, including a showroom/sales area within the north of the structure, a repairs/servicing area within the centre of the building a parts store within the north and a car paint spray area within the south of the former garage. The second floor was used for associated office use. On top of the northern most section of the structure was a boiler flue, however the boiler was not identified during the walkover.

A former covered vehicle display forecourt associated with the former BMW garage is located at the north-east of the site. The construction includes a single-storey structure comprised of block pillars supporting a part pitched and part flat roof. The irregular part of the structure is a small boarded up room, inferred as a small office space relating to the sale of cars.

A sheltered car wash, with a central culvert style drain is located along the north-eastern boundary on site. This is composed of a brick and glass construction with a flat roof and roller shutter door for vehicle access. The south of the structure contains a storage area with drums containing what was inferred as cleaning solution. On top of the structure was a ventilation unit.

A two-storey derelict residential building with a pitched tile roof is located at the south-west on site. The building has brick elevations. All lower windows and entrances are boarded up with wooden and steel panels, a number of second floor windows have been smashed. A shed is located within the rear garden of the building in addition to various debris, thought to be related to the gutting of the property. The grounds of the property are densely overgrown with various vegetation.

2.5. Surface Coverage

Approximately 90% of the site covering consists of mixed hard standing. Block paving is present within the north-east, and south-west of the site with concrete covering much of the north-east and south-east of the site. The rest of the site consists of overgrown areas to the immediate east and south of the derelict residential building onsite.

2.6. Storage Tanks

Two exterior above ground tanks were noted, the first tank is of a steel construction within the north of the site and adjacent to the main garage building. The tank is within a steel leak catchment bund and no evidence of leaks were recorded around the tank. Adjacent to the tank were seven steel barrels which appeared to be full, in addition to three plastic containers containing a dark liquid. The second exterior tank is a double bunded plastic tank with a capacity of 1150 litres located south-east the former car wash facility within the north-east of the site. A hydrocarbon odour was noted when the tank cover was lifted, although the “Bundman” sensor system recorded the tank as empty.

An interior above ground tank within the south-west of the garage was recorded as having a 1978 litre capacity for the storage of waste engine oil, a number of small oils tanks were noted on top of and adjacent to the tank, some of which contained what was inferred as waste oil.

In addition to the interior tank, three mobile oil collectors were noted within the service area of the garage, two patches of spilt oil were noted around the two of the mobile oil collectors.

Ridge have been made aware of an Underground Storage Tank (UST) below the vehicle display forecourt at the north of the site. Details regarding this feature are discussed within subsequent report sections.

2.7. Topography

Generally, the site gently slopes down towards the south-eastern corner, although most of the west of the site was noted as being relatively flat. The topography of the area however slopes quite considerably downwards towards Water Lane when it becomes relatively flat. This considerable difference in on- and off-site topography is highlighted by the relative height of the retaining walls within the east of the site.

2.8. Vegetation

The majority of onsite vegetation is present within the overgrown residential garden spaces surrounding the derelict residential dwelling. The vegetation includes overgrown grasses, bramble and buddleia. Vegetation is also present within areas of disused hardstanding particularly within the north-east and south of the site, again with bramble and buddleia present between concrete pads. Mature and semi-mature trees including Scots Pine and Beech were recorded to bound the south and east of the site.

2.9. Drainage

A surface drainage system was identified within the north and east of the site with various interconnected surface water drains leading from the south-east of the site to an interceptor system located between buildings. It is also anticipated that roof run off will also enter this system, prior evidence of service clearance also highlighted the presence of a surface water drainage system. No surface water drainage was noted within the west half of the site.

2.10. Previous Site Investigations

During the walkover evidence of eight windowless sample boreholes was recorded, three external and five within the main garage building. The three external holes appear to have been installed with monitoring wells. Spray markings characteristic of service clearance was also noted within the north and east of the site.

2.11. Surroundings

Residential land use was recorded to surround the site on all sides with a commercial and residential land use to the south and south west of the site. The commercial land uses include a number of independent shops, a Co-op and The Lamb at Angmering Public House.

2.12. Site History

Based on review of available Ordnance Survey maps the site was a commercial garage from at least circa 1970. Some alterations to this garage have occurred since, with the extension of the main building and the addition of an annex structure.

3. PHYSICAL SETTING

3.1. Geology and Hydrogeology

The following observations are taken from the British Geological Survey (BGS) Geology of Britain Viewer (2020). The Geology of Britain Viewer indicates that the site is likely underlain by Superficial Head Deposits over a Bedrock Geology of the undifferentiated white chalk - White Chalk Subgroup (formerly Upper Chalk). The table below identifies the expected composition of the published strata and associated aquifer classification.

SUPERFICIAL DEPOSITS	
Unit Name	Head Deposits
Geology Description	Poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep. Typically comprises gravel, sand and clay depending on upslope source and distance from source. In the case of the site, likely to contain clay and gravel of chalk and flint
Aquifer Classification	Secondary Undifferentiated
Aquifer Description	Previously designated as both minor and non-aquifer
BEDROCK GEOLOGY	
Unit Name	White Chalk Subgroup
Geology Description	White chalk with flints
Aquifer Classification	Principal
Aquifer Description	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale

Table 3 1: Geology and Hydrogeology

3.1.1. Radon

The entire site has been identified to lie within a Radon Affected Area estimated to have between 5% and 10% of properties above the action level. This constitutes to a Medium risk area. As a result, basic radon protection measures are required within new developments.

3.2. Hydrology

3.2.1. Surface Water Features

Groundsure records make note of a surface water feature bounding the north-west of the site, this feature was not observed during the site walkover, however subsequent research identified that the stream had been diverted via a culvert beneath Water Lane from a location 260m north-east and 140m south-west of the site. There are no further records within 400m of the site boundary.

Access was not afforded to this culvert during the investigation, due to it being secured by metal fencing; it is assumed that access is permitted via the Environment Agency.

3.2.2. Flooding

The north and west of the site is located within an environment agency flood zone 3 which is defined as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), the flood zone appears to relate to the diverted watercourse below Water Lane. The Risk of Flooding from Rivers and Sea (RoFRaS) flood rating was recorded as medium. There are no flood defences or areas benefiting from flood defences within 250m of the site.

The risk from groundwater flooding is considered high within the north and west of the site and moderate-high with the centre and eastern portions of the site.

3.3. Controlled Waters

3.3.1. Abstraction Licenses

There are five active non-potable groundwater and three active non-potable surface water abstractions all relating to either spray irrigation or general farming and domestic within 2km of the site. The closest abstraction to site is located 1144m south-west with a max annual volume of 11,783m³. There are no further active abstraction licences (including potable) within 2km of the site boundary.

3.3.2. Source Protection Zones

There are no SPZs within 500m of the site boundary.

4. PREVIOUS REPORTS

Previous investigations have been undertaken on the study site and have been summarised below. The reader is referred to the following reports for further information regarding their contents. Ridge takes no responsibility for the accuracy of any third-party documents.

4.1. Southern Testing – Site Investigation Report (2007)

Ridge were provided with a previous investigation report undertaken on the study site by Southern Testing (ST) (Ref: J9299), dated 26 September 2007. The investigation centred on a 10m x 10m area around a known underground tank within the north of the site. The object of ST investigation was to assess the nature and extent of any potential contamination pertaining to the underground feature, assuming a continued commercial use.

The intrusive investigation comprised 6no. windowless sample boreholes to a maximum depth of 4.00mbgl and the installation of 2no. monitoring wells. The investigation encountered the following sequence of materials: Concrete block paving from ground level to 0.10mbgl, underlain by a subbase comprised loose brown sandy gravel from 0.10mbgl to a maximum depth of 0.30mbgl. A concrete slab was encountered between 0.30mbgl to 0.50mbgl. Made Ground, comprising loose dark grey, sandy silty clayey gravel, with occasional brick and flint fragments, was encountered underlaying the concrete slab to a depth of between 0.60mbgl and 1.70mbgl. Natural soils inferred as Head Deposits were encountered directly beneath the Made Ground and typically comprised, firm to stiff brown, silty gravelly Clay. Occasional black speckling and very soft off-white chalky silt was identified at the base of TH2 and TH6. The Head deposits were encountered to the full exploratory depth of 4.00mbgl.

Strong hydrocarbon odours were noted within the chalky silt material encountered within TH2 and TH6. Groundwater was encountered between 0.80m and 1.80mbgl during the investigation. Subsequent monitoring visits confirmed the presence of groundwater between 0.81m and 1.77mbgl.

28no. soil samples were submitted for contamination suite including total petroleum hydrocarbons (TPHs) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), Two soil samples (TH3 at 1.00mbgl and TH6 at 4.00mbgl) presented slightly elevated TPH levels, one sample (TH4 at 1.00mbgl) presented elevated PAHs and Carbazole. The report concluded that despite the slightly elevated levels of soil contaminants that there was no significant risk to the human health receptors assuming a continued commercial land use. It should be noted that the Southern Testing report was written in relation to a continued commercial end-use, as opposed to a residential end-use currently proposed.

Eight groundwater samples were taken from a subsequent monitoring visit and 2no. surface water samples were obtained from the inflow and outflow portals of the culverted watercourse that runs adjacent to the site. All samples were tested in accordance with ST's contamination suites, which included TPHs, VOCs and SVOCs. Slightly elevated levels of TPH were encountered within the downstream culvert sample and in two of the groundwater samples from both TH1 and TH2. Two groundwater samples from TH1 displayed slightly elevated VOCs, including 4-Methylphenol, Diethyl Phthalate, Di-n-butyl phthalate and aniline. The upstream culvert sample tested free from any significant contaminants.

The report recommended further investigation to define the extent of the contamination over the wider site to assess any links and the impact on the adjacent water course and the chalk aquifer.

4.2. Ridge – Desk Top Study (2020)

Ridge issued a Desk Top Study (DTS) (Report reference: 5013719-RDG-XX-ST-DOC-C-00-DTS01) in relation to the site in November 2020. A summary is provided below. The reader is referred to the document for additional information.

The objectives of the DTS were to report on the findings with respect to potential ground contamination and potential associated future liabilities in accordance with the Preliminary Risk Assessment procedure outlined in Land Contamination Risk Management (LCRM, 2020), published by the Environment Agency.

4.2.1. Sources

Following site reconnaissance, review of historical and environmental records, and previous reports, the Ridge DTS identified the following potential sources of contamination:

- Former industrial land use including the recorded tanks, licenced pollution releases and elevated TPH and PAH levels identified during the historical ground investigation.
- Made ground associated with the demolition of historical structures across the site.
- Contamination in relation to the historical coal yard, formally located adjacent to the south-east site boundary (circa 1970-1980s).
- Radon

4.2.2. Pathways

The key environmental pathways and exposure routes by which potentially toxic substances may possibly reach the identified potential receptors are considered to be:

- Vertical and lateral migration of ground gas and soil vapour leading to accumulation in enclosed spaces.
- Vertical and lateral migration of organic and inorganic compounds through underlying geology.
- Inhalation of ground gases and soil vapour.
- Inhalation of contaminated dust.
- Ingestion.
- Dermal contact.

4.2.3. Receptors

Receptors that may be affected by the potential contamination are considered to be:

- Residential end users.
- Construction and groundworkers during development.
- Maintenance workers post site redevelopment.
- Underlying Bedrock Principal Aquifer.
- Culverted stream identified to run adjacent to the northern site boundary.

4.2.4. Preliminary Risk Rating

The upper-most risk of impact to the identified receptors from the potential sources was considered to be **Low/ Moderate**, assuming a residential end use scenario.

4.2.5. Recommendations

Following the formulation of the preliminary risk assessment there was deemed to be the potential for unacceptable risks to identified receptors. Further investigation works were recommended in order to refine these risks. The primary aim of the investigation should be to target specific sources of contamination (i.e. tanks), along with sufficient site coverage. Soil samples should be gathered and submitted for laboratory analysis in order to characterise the encountered ground conditions.

5. FIELDWORK SUMMARY OF SCOPE AND RATIONALE

5.1. Site Management and Preparation

Suitably experienced Ridge staff oversaw the intrusive investigation, which was undertaken over 17 to 19 November 2020. Methods employed during the investigation were carried out in general accordance with statutory guidance including BS5930:2015+A1:2020 *Code of Practice for Site Investigations* and BS10175:2011+A2:2017 *Investigation of Potentially Contaminated Sites: Code of Practice*.

5.1.1. Utility Clearance

A utility clearance scan was undertaken by Groundscan Ltd in September 2020. The associated drawing was provided to Ridge and reviewed prior to breaking ground (Drawing reference: 2253, dated October 2020). Each test location was scanned with a Cable Avoidance Tool (CAT) prior to breaking ground, and any accessible manhole covers lifted to assess the location and direction of drainage runs. Furthermore, each windowless sample borehole was subject to a hand dug buried service inspection pit prior to drilling.

5.2. Rationale and Summary of Scope

The scope of works was to include advancing intrusive locations to assist with the geotechnical design and geo-environmental recommendations in relation to the proposed development. Moreover, and in light of the previous reports, part of the objective was to target the identified Underground Storage Tank (UST) with respect to hydrocarbon-specific contamination.

These objectives were to be achieved with the completion of boreholes to assess the nature of the underlying soils and groundwater conditions, along with specified in-situ testing and monitoring well installations. Monitoring wells enable for future ground gas and groundwater monitoring. Samples were collected for subsequent geotechnical and environmental laboratory analysis. Sample collection and rationale are detailed within subsequent report sections. An intrusive location plan is included as Figure 3.

5.2.1. Windowless Sample Boreholes

Thirteen windowless sample boreholes (WS1-WS13) were advanced through the base of their respective inspection pits to a maximum depth of 5.45mbgl, completed using a tracked dynamic sampling rig. The objective of these boreholes was to allow for the assessment of underlying ground conditions and permit in-situ Standard Penetration Testing (SPT) to provide geotechnical parameters for future use. Furthermore, it allowed for the production of detailed engineering logs and the recovery of samples for geotechnical and environmental testing.

WS1, WS5, WS6 and WS7 were installed with standpipes to enable future ground gas monitoring. The response zones were determined to target a combination of groundwater, Made Ground and hydrocarbon-impacted soils; further information within the engineering logs (Appendix 2). These monitoring wells were secured within traffic-rated flush steel covers. The remaining windowless sample boreholes were backfilled with arisings in reverse order and reinstated in respect of existing conditions upon completion.

5.2.2. Dynamic Cone Penetrometer

Six Dynamic Cone Penetrometer tests (DCP2, DCP3, DCP10, DCP11, DCP12 and DCP13) were completed within the respective windowless sample boreholes, below the surface hardstanding layer, to depths <1.00mbgl by means of a TRL DCP. The results were converted into an equivalent California Bearing Ratio (CBR).

5.2.3. Location Rationale

Rationale for each test location completed is detailed in the table below. The layout of the exploratory positions is presented in Figure 3.

ID	LOCATION AND RATIONALE	MAX DEPTH (MBGL)
WS1, WS7, WS8 and WS9	Targeting proposed UST	<5.45
WS2, WS4, WS10, WS11, WS12 and WS13	Targeting footprint of proposed buildings to provide geotechnical recommendations.	
WS3, WS5 and WS6	Site coverage	

Table 5.1: Test Location Rationale

5.3. Soil Sampling

All intrusive locations were logged, and visual/olfactory evidence of contamination noted in accordance with best practice. Soil sampling of the near surface materials was undertaken to assess the contamination risks to human health and controlled waters. Samples were also removed at varying depths for geotechnical testing. Environmental samples were handled using a fresh pair of nitrile gloves. Selected samples were placed in sealable bags, sealed glass jars or plastic tubs (dependent on the exact laboratory requirement and analysis to be undertaken) and stored in a temperature-controlled environment before transit.

5.4. Ground Gas Monitoring

Spot ground gas monitoring was conducted during three occasions over December 2020 to January 2021. Gas monitoring was conducted in accordance with BS8576:2013 *Guidance on investigations for ground gas – permanent gases and volatile organic compounds*.

Please note that at the time of writing this report the monitoring programme was still underway.

6. GROUND CONDITIONS ENCOUNTERED

6.1. Summary of Ground Conditions

The following soil conditions were encountered during the investigation works. They are generally considered to be consistent with the published geology and previous works. A summary of the encountered ground strata is included within Table 6.1, with further details in subsequent report sections. Please refer to the engineering logs within Appendix 2 for more detailed descriptions.

STRATUM	DEPTH TO TOP (MBGL)	DEPTH TO BASE (MBGL)
Made Ground	Ground level – 0.15	0.25 – 0.80
Head Deposits	0.30 – 0.80	1.00 – 3.50
Chalk	0.30 – 3.50	>5.45

Table 6.1: Summary of Ground Conditions

6.2. Soil Conditions

6.2.1. Made Ground

Made Ground was identified within every exploratory hole from ground level to a maximum depth of 0.80mbgl, in the case of WS6. Generally, the Made Ground was described as an orange and yellow sand, considered to be a sub-base layer for the surface concrete hardstanding. The exception to this being WS6, which recorded the Made Ground as a greyish black sandy Silt with gravel of brick and concrete.

6.2.2. Head Deposits

The initial natural ground was considered to be Head Deposits identified as either a Clay or Gravel. These soils were recorded within six windowless sample boreholes (WS1, WS5, WS6, WS7, WS9 and WS12), below the Made Ground soils described above, to a maximum depth of 3.50mbgl. The cohesive part of this stratum was described as a firm to stiff orangish brown gravelly sometimes sandy Clay. The granular portion was described as brown sandy Gravel, with occasional cobbles. The clasts within these Head Deposits were recorded as flint.

Soils described as predominately flint cobbles were exclusively identified within WS8 from 1.00m to 2.30mbgl.

6.2.3. Chalk

The underlying bedrock chalk was identified within all windowless sample boreholes, with the exception of WS10 and WS11, from depths of 0.30m to the maximum intrusive drilled depth of 5.45mbgl. This material was logged as a Grade Dm (using CIRIA C574), described as a structureless cream and white slightly gravelly Silt/Clay.

6.3. Groundwater Conditions

Groundwater was identified at depths ranging 3.00m to 4.30mbgl within the exploratory holes during the investigation. During subsequent groundwater gauging groundwater levels were recorded ranging 2.00m to 3.90mbgl.

6.4. Visual and Olfactory Observations

The table below summarises observations made during the investigation.

HOLE ID	OBSERVATIONS
WS1	Strong hydrocarbon odour from 3.50 to 4.00m
WS2	Strong hydrocarbon odour from 3.10 to 3.50m
WS6	Strong hydrocarbon odour from 2.00 to 3.00m
WS8	Strong hydrocarbon odour from 3.10 to 3.50m

Table 6.2: Visual and Olfactory Evidence

7. CONTAMINATION ASSESSMENT

7.1. Soil Assessment

Following the formulation of the preliminary risk assessment there was deemed to be the potential for unacceptable risks to identified receptors. Further investigation works were recommended in order to refine these risks. Consequently, an assessment of the underlying soils was completed to understand the levels of contaminants of site.

7.1.1. Generic Assessment Criteria

Ridge have undertaken a screen of the soil laboratory results using generic assessment criteria. Generic assessment criteria (GAC) are conservative contaminant concentration values used for comparison purposes to assess the risk associated with contaminant concentrations found on site and are derived using non-site-specific information.

In order to assess the soil analyses results with regard to potential human health risks, Ridge has adopted published guidance criteria widely referred to by professionals within the industry, which include the following:

- Suitable 4 Use Levels (S4ULs) Generic Assessment Criteria (GAC) developed by the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management Ltd. (LQM);
- Category 4 Screening Levels (C4SL) for lead, produced by CL:AIRE (2014); and
- The UK Soil Guideline Values (SGVs) for selected metals, BTEX and phenols, produced by the EA and Department of Environment, Food and Rural Affairs (2009).

Based on the proposed future use of the site, comparisons have been made against the 'residential end use' land use setting. More specifically, comparisons have been made with the 'residential without possible consumption of homegrown produce' land use setting based on the absence of private gardens. Results were compared to the conservative 1.00% soil organic matter value unless otherwise stated.

7.1.2. Site-Specific Assessment Criteria and Statistical Analysis

GAC are based on a number of assumptions, some of which differ significantly from the site-specific conditions on the study site. Therefore, where required, Site Specific Assessment Criteria (SSAC) may be calculated using the CLEA v1.07 Model. Statistical analysis will be undertaken if deemed necessary. With regard to human health, the CLEA model states that, 'the contamination is assumed to be at or within 1.00m of the surface' (CLR10 pg10). It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds and ground gases as the dominant pathway with regard to human health risks. Therefore, for the purposes of statistical analysis, data from the top 1.00m to 1.50m is used for assessment of risks to human health via direct contact pathways in accordance with the CLEA model, dependant on proposed future site levels, if required.

7.2. Soil Assessment Rationale

Eight soil samples collected during the Ridge site investigation from Made Ground and natural soils at various depths and locations were submitted to a UKAS accredited laboratory for analysis for a suite of a generic contamination suite including heavy metals, phenols, speciated polycyclic aromatic hydrocarbons (PAHs), fractionated total petroleum hydrocarbons (TPH), BTEX and MTBE compounds and an asbestos screen. Laboratory certificates are included as Appendix 3.

It can be expected that sources of contamination will primarily derive from the former garage use on site, leading to heavy metals and hydrocarbon-specific contamination, as discussed within the Ridge DTS (Report reference: 5013719-RDG-XX-ST-DOC-C-00-DTS01). In light of the above, the laboratory contamination suite has been chosen to reflect commonly found contaminants and others indicated by review of the previous report to have a chance of being present.

Sample locations and depths were chosen based on the rationale tabulated below.

SAMPLE	LOCATION AND RATIONALE
WS1 at 3.70m	Located to the west of existing UST, sampled from soils with strong hydrocarbon odour. Assist with determining extent of hydrocarbon-specific contamination.
WS2 at 3.50m	Located at the east of site. Sampled from soils with strong hydrocarbon odour. Assist with determining extent of hydrocarbon-specific contamination and for site coverage
WS4 at 0.50m	Taken from shallow Made Ground soils located at the south-west of site. Assist with determining contamination within Made Ground and for site coverage.
WS6 at 0.50m	Taken from shallow Made Ground soils located at the north-west of site. Assist with determining contamination within Made Ground and for site coverage.
WS6 at 2.50m	Located at the north-west of site. Sampled from soils with strong hydrocarbon odour. Assist with determining extent of hydrocarbon-specific contamination and for site coverage.
WS7 at 0.40m	Taken from shallow Made Ground soils located at the north of site. Assist with determining contamination within Made Ground and for site coverage.
WS8 at 0.20m	Taken from shallow Made Ground soils located at the north of site. Assist with determining contamination within Made Ground and for site coverage.
WS11 at 0.30m	Taken from shallow Made Ground soils located at the centre of the site. Assist with determining contamination within Made Ground and for site coverage.

Table 7.1: Soil Sample Test Location Rationale

7.3. Soil Results

7.3.1. Organic Matter

Organic matter ranged from 0.10% to 3.90%. These values correspond to TOC values ranging approximately <2.50%.

7.3.2. Asbestos

Asbestos was not detected within any of the soil samples submitted for an asbestos screen.

7.3.3. Heavy Metals

An exceedance of the applicable screening criteria was returned for lead from two tested soil samples. There were no other exceedances of the screening criteria for any of the remaining heavy metal determinands from all tested soil samples. Concentrations for chromium VI, mercury and selenium were returned below their respective laboratory Limit of Detection (LOD) from all tested samples. The results are briefly summarised in the table below.

DETERMINAND	MAX. CONCENTRATION (MG/KG)	GAC SCREENING VALUE (MG/KG)	EXCEEDANCES OF SCREENING VALUE
Arsenic	16.00	40.00	None
Cadmium	1.30	85.00	None
Chromium	29.00	910.00	None
Chromium VI	2.00	6.00	None
Copper	92.00	7100.00	None
Lead	408.00	300.00	WS1 at 3.70m – 408mg/kg WS7 at 0.40m – 306mg/kg
Mercury	1.00	56.00	None
Nickel	65.00	180.00	None
Selenium	3.00	350.00	None
Zinc	388.00	40000.00	None
Total Phenols	2.00	750.00	None

Table 7.2: Laboratory Results – Heavy Metals

7.3.4. Polycyclic Aromatic Hydrocarbons (PAHs)

An exceedance of the applicable screening criteria were returned for four PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene) exclusive to one soil sample, WS6 at 0.50m. There were no other exceedances of the screening criteria for any of the remaining PAH determinands from all tested soil samples. PAH concentrations from a deeper soil sample (WS6 at 2.50m) returned all PAH concentrations returned below their respective laboratory LOD. The results are briefly summarised in the table below.

DETERMINAND	MAX CONCENTRATION (MG/KG)	GAC SCREENING VALUE (MG/KG)	EXCEEDANCES OF SCREENING VALUE
Naphthalene	0.19	2.30	None
Acenaphthylene	0.57	2900.00	None
Acenaphthene	1.45	3000.00	None
Fluorene	1.18	2800.00	None
Phenanthrene	17.90	1300.00	None
Anthracene	5.13	31000.00	None
Fluoranthene	53.70	1500.00	None
Pyrene	54.40	3700.00	None
Benzo(a)anthracene	29.30	11.00	WS6 at 0.50m – 29.30mg/kg
Chrysene	22.60	30.00	None
Benzo(b)fluoranthene	39.40	3.90	WS6 at 0.50m – 39.40mg/kg
Benzo(k)fluoranthene	9.97	110.00	None
Benzo(a)pyrene	34.50	3.20	WS6 at 0.50m – 34.50mg/kg
Indeno(1,2,3-cd)pyrene	16.70	45.00	None
Dibenz(a,h)anthracene	2.51	0.31	WS6 at 0.50m – 2.51mg/kg
Benzo(ghi)perylene	16.10	360.00	None

Table 7.3: Laboratory Results – PAHs

7.3.5. Total Petroleum Hydrocarbons (TPHs)

An exceedance of the applicable screening criteria was returned for two TPH determinands (aliphatic >C8-C10 and <C10-C12) exclusive to one soil sample, WS6 at 2.50m. There were no other exceedances from the remaining tested soil samples. It should be noted that the majority of TPH determinands from six of the tested samples (WS1 at 3.70m, WS2 at 3.50m, WS4 at 0.50m, WS7 at 0.40m, WS8 at 0.20m and WS11 at 0.30m) were returned at, or close, to laboratory LOD. The results are summarised in the table below.

DETERMINAND	MAX. CONCENTRATION (MG/KG)	GAC SCREENING VALUE (MG/KG)	EXCEEDANCES OF SCREENING VALUE
Ali >C5-C6	0.01	42.00	None
Ali >C6-C8	7.64	100.00	None
Ali >C8-C10	292.00	27.00	WS6 at 2.50m – 292mg/kg
Ali >C10-C12	178.00	130.00	WS6 at 2.50m – 178mg/kg
Ali >C12-C16	13.00	1100.00	None
Ali >C16-C21	19.00	-	Not applicable
Ali >C21-C34	81.00	-	Not applicable
Aro >C5-C7	0.01	370.00	None
Aro >C7-C8	0.05	860.00	None
Aro >C8-C10	41.00	47.00	None
Aro >C10-C12	111.00	250.00	None
Aro >C12-C16	18.00	1800.00	None
Aro >C16-C21	258.00	1900.00	None
Aro >C21-C35	550.00	1900.00	None

Table 7.4: Laboratory Results – TPHs

7.3.6. BTEX and MTBE

There were no exceedances of the screening criteria from any of the tested samples for all BTEX determinands and MTBE. It should be noted that marginally elevated BTEX was returned from sample WS6 at 2.50m; the same sample recorded TPH exceedances. Results for all BTEX and MTBE were recorded as below laboratory LOD for the remaining tested soil samples.

7.3.7. Discussion of Results

Exceedances of the respective screening criteria were returned for lead from two soil samples (WS7 at 0.40m and WS1 at 3.70m). The lead exceedance from WS7 is likely attributable to the presence of the Made Ground. Made Ground soils often have elevated heavy metals and PAHs due to the presence of anthropogenic materials (i.e. clinker and brick). The exceedance of lead within WS1 at 3.70m may be as a result of fuel additive, as noted by the hydrocarbon odour noted at this depth.

Concentrations of hydrocarbon-specific contaminants have been recorded as exceeding the applicable screening criteria from both tested samples from WS6 (i.e. 0.50m and 2.50m). Elevated TPH values have been recorded from WS6 at 2.50m, within the underlying chalk soils. The exceedances are exclusive to aliphatic >C8-C10 and <C10-C12, which may suggest the presence of petrol fuel given this carbon number range. Moreover, this reflects the former site use as a garage. Exceedances of the screening criteria for PAH determinands have been returned from WS6 at 0.50m within the Made Ground soils. It should be noted that all PAH determinands from the deeper sample (WS6 at 2.50m) were returned below laboratory LOD.

Asbestos was not detected within any of the soil samples following the asbestos screen.

7.4. Waste Material

Results from all eight soil samples were input into a Soils Characterisation Tool (CAT-Waste Soil) to identify whether the materials on site have hazardous properties. Following analysis using CAT-Waste Soil, all samples returned no hazardous properties. The CAT-Waste output is presented in Appendix 5.

Results from two of the eight samples (WS7 at 0.40m and WS11 at 0.30m) were submitted for Waste Acceptance Criteria (WAC) testing to help determine their waste classification. These were selected from Made Ground soils, should there be a requirement to remove these soils in the future to permit the construction of the proposals.

Following review of WAC testing, the sample from WS11 at 0.30mbgl is classified as **Inert**. This material is described as a brownish black silty sandy Gravel with brick and concrete. Whereas, the sample from WS7 at 0.40mbgl is characterised as **Non-Hazardous** due to the elevated concentration of antimony leachate (sample 0.08mg/kg, criteria 0.06mg/kg). The Made Ground soils from WS7 are described as a greyish black silty sand with brick and plastic.

7.5. Leachate Assessment

7.5.1. Leachate Analysis

Three soil samples were submitted to the laboratory for leachate analysis to specifically assess the potential leachability of certain contaminants. Leachate analysis can help assess whether soils have the potential to impact the underlying Principal Aquifer. In light of the contaminants of concern outlined above, all samples were scheduled for a leachate suite including TPH, BTEX and MTBE. Further details are provided below.

SAMPLE	RATIONALE
WS1 at 3.70m	Target hydrocarbon odour noted at this depth
WS2 at 3.50m	
WS6 at 2.50m	

Table 7.1: Soil Sample Test Location Rationale

7.5.2. Screening Criteria

In the absence of dedicated UK groundwater standards, leachate results were screened against the conservative Water Framework Directive (WFD) 2015 Environmental Quality Standards (EQS), UK Drinking Water Standards (DWS) as taken from the Water Supply Regulations (2000), the New Dutch List (Dutch Target and Intervention Values, 2000) and the US EPA Drinking Water Standards (and Health Advisories) 2012.

7.5.3. Leachate Results

Two exceedances of the groundwater screening criteria have been identified exclusively from one soil sample (WS6 at 2.50m). Concentrations from WS6 at 2.50m for aromatic >C10-C12 (36ug/l) and aromatic >C16-C21 (0.013ug/l) exceed the WFD EQS assessment criteria levels of 2.4ug/l and 0.1ug/l, respectively.

Results for all TPH determinands, BTEX and MTBE were recorded below laboratory LOD for both of the remaining soil samples.

7.6. Ground Gas Assessment

7.6.1. Design of Monitoring Program

In accordance with BS8576:2013 *Guidance on investigations for ground gas – permanent gases and volatile organic compounds*, the extent of monitoring deemed necessary to assess the ground gas and vapour regime is determined by the generation potential of the source, i.e. what is the risk that large volumes of gas can be generated and can plausibly migrate to pose a credible hazard to the identified receptors. This is known as a multiple-lines-of-evidence approach.

Factors detailed in the table below were pertinent in the design of the gas monitoring programme. Information detailed in the table has either been taken from a review of previous reports, desk study and/or interpreted from the intrusive investigation conducted.

FACTOR	MORE MONITORING REQUIRED	LESS MONITORING REQUIRED
Landfills and waste sites	N/A	No landfill on or within vicinity of site
Site Investigation	Hydrocarbon odour noted and reflected within laboratory results	Thickness of Made Ground relatively low and therefore limited ground gas generation
Volatiles	Hydrocarbon odours noted. Fuel tank on site	N/A

Table 7.1: Factors influencing Design of Gas Monitoring Programme

7.6.2. Generation Potential of Source

Based on the information within Table 7.1, the generation potential is considered to be **Low to Moderate**. According to guidance gas monitoring will be required.

7.6.3. Monitoring Programme

With respect BS8576:2013 *Guidance on investigations for ground gas – permanent gases and volatile organic compounds*, a **Low to Moderate** ground gas generation potential corresponds to a monitoring programme comprising monitoring over a period of 2 months up to 6 months with up to fortnightly readings.

The locations of the monitoring wells were decided based on the proposed plans and targeting the footprint of the buildings (potential receptor) and sources of contamination (i.e. fuel tank). The monitoring screen response zones of each well was decided before installing in order to target hydrocarbon-impacted soils.

To date, spot ground gas monitoring was conducted by Ridge on three occasions, 4 and 10 December 2020 and 11 January 2021, in accordance with BS8576:2013. Boreholes (WS04, WS05 and WS10) were monitored for the presence of soil gases including methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide. In addition, gas flow rates and downhole pressure were also measured using a GA5000 Geotech Gas Analyser. Gas monitoring was conducted for at least three minutes, with readings taken at 30 second intervals.

At the time of writing this report the monitoring programme was still underway.

7.6.4. Spot-Monitoring Results

To date, spot ground gas monitoring was conducted by Ridge on three occasions, 4 and 10 December 2020 and 11 January 2021. Atmospheric pressure was noted to be decreasing during monitoring round 2 and 3 (MR2 and MR3) and increasing during monitoring round 1 (MR1 and MR4). A summary of the results is tabulated below, with the monitoring sheet included within Appendix 4.

HOLE ID	RESPONSE ZONE AND DEPTH	GROUNDWATER DEPTH (M)	PEAK FLOW (L/HR)	MONITORING ROUND	MAXIMUM CO ₂ CONCENTRATION (% V/V)	MAXIMUM CH ₄ CONCENTRATION (% V/V)	VOC (PPM)
WS01	Chalk 4.00-5.00mbgl	2.60 – 3.29	0.7	1	1.9	0.1	612
				2	2.3	0.1	0.54
				3	2.4	0.2	N/A
WS05	Clay and chalk 1.00-4.50mbgl	2.33 – 3.35	0.1	1	N/A	N/A	N/A
				2	3.2	0.1	1.6
				3	2.4	0.1	N/A
WS06	Chalk 2.00-5.00mbgl	2.00 – 2.95	0.8	1	2.4	0.3	197
				2	2.6	0.1	4.73
				3	N/A	N/A	N/A
WS07	Clay and chalk 1.00-5.00mbgl	3.32 – 3.90	0.7	1	2.1	0.1	347
				2	1.6	0.1	447
				3	2.4	0.1	N/A

Table 7.2: Summary of Spot Monitoring

7.6.5. Gas Screening Value

Worst-case gas levels and flow rates identified across the programme can be used to calculate a conservative Gas Screening Value (GSV) as defined in CIRIA C665 *Assessing Risks Posed by Hazardous Ground Gases to Buildings* (2002). The following worst-case conditions are included below, with a brief justification:

- Flow rate = 0.8L/hr; peak reported flow rate.
- CH₄ = 0.3%v/v; recorded during monitoring round 1 within WS06.
- CO₂ = 3.2%v/v; recorded during monitoring round 2 within WS05.

Methane GSV

$$GSV = \left[\frac{\text{Worst Case CH}_4 \text{ Concentration}}{100} \right] \text{Worst case flow rate}$$

$$GSV = 0.0024 = \left[\frac{0.3}{100} \right] 0.80$$

Carbon Dioxide GSV

$$GSV = \left[\frac{\text{Worst Case Average CO}_2 \text{ Concentration}}{100} \right] \text{Worst case flow rate}$$

$$GSV = 0.0256 = \left[\frac{3.2}{100} \right] 0.80$$

According to the guidance, the worst-case GSV of 0.0256 L/hr equates to a Characteristic Situation (CS) 2 as it falls between 0.007 and <0.7Lhr. CS2 can be defined as **Low** risk, with typical source generation comprising Made Ground soils and those with high organic content.

7.6.6. Discussion

Following three gas monitoring rounds the GSV for the site development area is classified as Characteristic Situation 2. Furthermore, VOC levels were reported as above 300ppm within WS07 during the monitoring regime and elevated elsewhere. This is consistent with the soil laboratory results and observations made during the investigation. In light of the above, some standard remediation measures will need to be incorporated within the design of the proposed development, later discussed within this report.

8. GEOTECHNICAL TESTING AND ASSESSMENT

8.1. Introduction

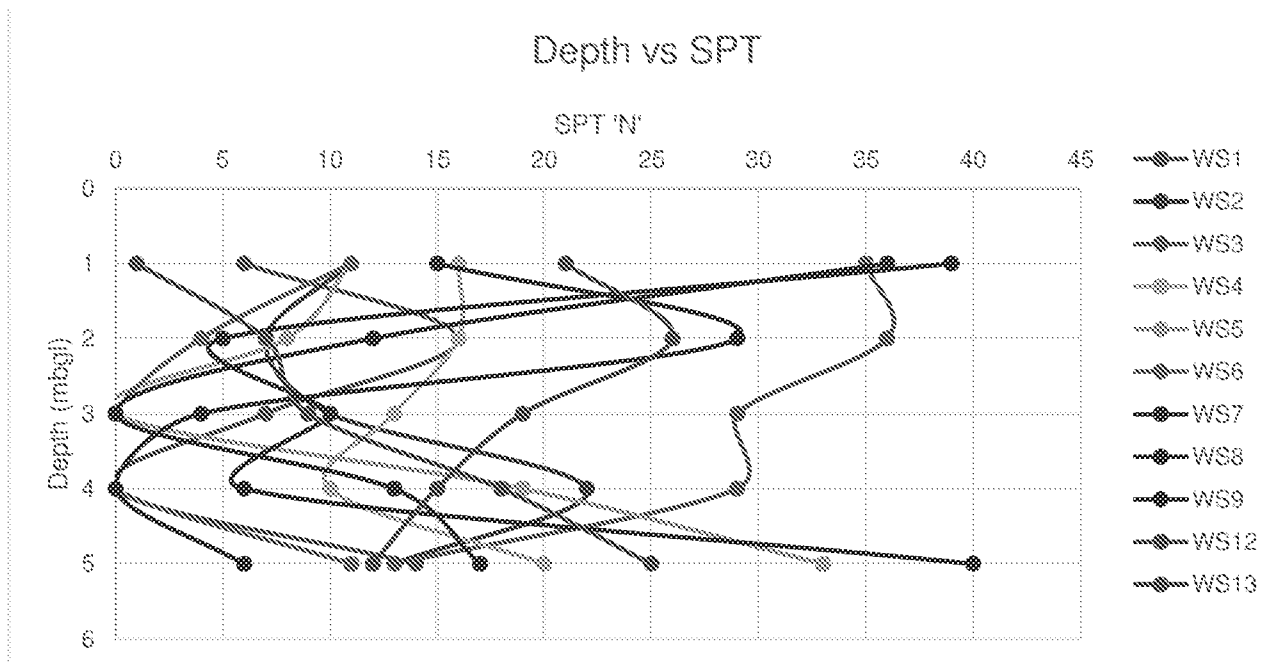
This geotechnical assessment and the subsequent foundation design recommendations will use the findings of the investigation and the results of the in-situ and laboratory geotechnical testing carried out in the boreholes, and on representative samples of the materials encountered across the site.

This section discusses the key geotechnical characteristics of each encountered stratum as determined from field observations, in-situ and laboratory geotechnical testing. The stratigraphy revealed during the ground investigation comprised Concrete & Made Ground over Head Deposits underlain by the Lewes Nodular Chalk Formation.

8.2. In – Situ Testing

8.2.1. Standard Penetration Testing (SPT)

SPTs were completed throughout the drilling of all boreholes at 1.00m centres. SPT is an *in-situ* dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test is completed using a 63.5kg drop hammer weight, over a 750mm drop, measuring the blow counts for six, 75mm increments. The first two values are recorded as seating blows, with the remaining four values, added together to provide an 'N-value'. The results are presented within Graph 8.1 below. It is recommended to review the engineering logs within Appendix 2 for further information.



Graph 8.1: Standard Penetration Testing

8.2.2. Dynamic Cone Penetrometer Testing (DCP)

Testing within the proposed roadways/car park was completed to determine the equivalent in-situ CBR value using a TRL DCP to the maximum depth of <1.00mbgl. Table 8.1 indicates the range of equivalent CBR values considered at various levels based upon testing results. DCP logs showing the full test results are included in Appendix 6.

DEPTH (M)	MEASURED CBR% RANGE
0.50	12.7- 55.0
0.70	21.8-180.0
0.90	15.0-69.8

Table 8.1: DCP Test Results

8.3. Laboratory Testing

Details of the specific procedure used in each case are shown below in Table 8.2 and the geotechnical test certificates are presented in Appendix 3.

TEST	STANDARD (BS1377:1990) UNLESS OTHERWISE INDICATED	SCHEDULED	COMPLETED
Moisture Content	Part 2: 3.2	8	8
Atterberg Limits	Part 2: 3.2, 4.3 & 5.3	8	8
pH	Part 3: 9.5	8	8
Sulphate Testing	Part 3: 5.3 and BRE279	8	8
Saturation Moisture Content	Part 2: 3.3	3	3

Table 8.2: Summary of Geotechnical Testing

8.3.1. Atterberg tests

Eight samples of the encountered cohesive soils underwent Atterberg Testing to determine their plasticity indices (PI). The results are shown in Table 8.4 below.

LOCATION	STRATA	DEPTH (MBGL)	MOISTURE CONTENT, W (%)	LIQUID LIMIT WL (%)	PLASTIC LIMIT WP (%)	PLASTICITY INDEX IP (%)	PASSING 425 MICRON SIEVE (%)	MODIFIED PLASTICITY INDEX (%)
WS1	Gravelly Silty Clay	1.10	19	42	25	17	89	15.13
WS5	Silty Clay	2.40	50	86	37	49	100	49
WS6	Gravelly Silty Clay	1.60	22	65	25	40	58	23.2
WS7	Gravelly Silty Clay	1.20	11	53	18	35	49	17.15
WS8	Silty Clay	0.60	27	43	26	17	100	17
WS9	Gravelly Silty Clay	1.10	20	51	24	27	61	16.47
WS9	Gravelly Silty Clay	2.80	17	54	18	36	41	14.76
WS12	Gravelly Silty Clay	0.80	15	63	14	49	39	19.11

Table 8.3. Consistency Limits

Following analysis, testing returned plasticity index values ranging 17-49%, with liquid limits reported as 18-37%. These values correspond to soils with intermediate to very high plasticity. Considering the percentage left on the 425µm sieve, the modified plasticity index values (I_p) have been calculated as ~15-49%. In accordance with NHBC, Chapter 4.2 'Building near Trees', these values correspond with soils having Low to High volume change potential.

8.3.2. Sulphate Testing

Eight representative samples of the exploratory holes underwent pH/ water soluble sulphate 2:1 extract testing to determine the pH level and sulphate content of the material. The results are shown in Table 8.4 below.

LOCATION	DEPTH (MBGL)	PH VALUE	2:1 SULPHATE EXTRACT (MG/L)	CONCRETE CLASSIFICATION DESIGN CLASS	AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE CLASS
WS2	0.30	7.21	10	DS-1	AC-1
WS3	1.70	7.29	10	DS-1	AC-1
WS4	0.60	7.19	310	DS-1	AC-1
WS5	1.10	6.55	10	DS-1	AC-1
WS7	3.80	6.82	10	DS-1	AC-1
WS8	1.30	6.59	<10	DS-1	AC-1
WS12	1.50	7.21	10	DS-1	AC-1
WS13	4.90	7.16	30	DS-1	AC-1

Table 8.4: pH/Sulphate Results

Based on the results, tables C1 and C2 of BRE SD1 gives a worst-case Design Sulphate Classification of DS-1 and an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1 assuming mobile groundwater conditions above the groundwater table and using a worst-case soluble sulphate value of 310mg/l and a pH 6.59.

8.3.3. Chalk Saturation Moisture Content

Three representative samples of the exploratory holes underwent Saturation Moisture Content testing to determine the saturated moisture content of the material. The results are shown in Table 8.5 below.

LOCATION	DEPTH (MBGL)	SATURATION MOISTURE CONTENT (%)	MOISTURE CONTENT (%)	DRY DENSITY (KN/M ³)
WS2	4.80	38	22	13.4
WS5	4.80	36	21	13.6
WS12	1.50	42	28	12.7

Table 8.5: SMC

8.4. Foundations

The ground investigation proved the expected general strata sequence comprising Made Ground over Head Deposits underlain by the White Chalk Subgroup.

The selection and design of foundations is beyond the scope of current instructions and is the responsibility of the designers of the proposed building. The following recommendations, deriving from observations made during the investigation and testing are provided to assist the design process.

Based on the variable and low SPT[N] values recorded in the upper natural materials and presence of groundwater at relatively shallow depth, it is considered that the ground conditions identified are not suitable for traditional foundations for the proposed development.

It is therefore recommended that an alternative foundation solution is pursued. It is considered that this will likely comprise piled foundations extending into competent strata expected at depth beneath the site.

Further exploratory holes will need to be drilled to provide further information at a deeper level for pile design. These should be to at least 20m depth and are required by NHBC to be 5m longer than the longest pile.

The chalk has been found to be of low to high shrinkage potential. Heave protection, new tree planting and ground floor slab design should take this shrinkage potential into account.

Groundwater has been recorded at depths below 3.00m and therefore is not expected to be encountered in shallow excavations for ground-beams drainage or similar.

8.5. Road and Paved Area Design

Dynamic Cone Penetrometer tests (DCP) were undertaken on site and returned results of between 12.7-55.0% at 0.5mbgl. These values should be used for preliminary pavement design. IAN 73/06 suggests a subbase of 250mm for pavement based upon the geology and CBR values. This should be confirmed with in situ tests at formation level at the appropriate time.

9. CONCEPTUAL SITE MODEL

9.1. Sources

Following investigations conducted to date and screening of chemical analysis results, the following contaminant sources have been identified:

- Contamination relating to the sites former industrial land use including the recorded tanks, licenced pollution releases and elevated TPH and PAH levels identified during this investigation and previous works. The potential for soil vapour is high given the recorded hydrocarbons and initial results from ground gas monitoring (i.e. Elevated VOCs).
- Elevated lead and PAH within shallow (<1.00m) Made Ground soils.
- Radon and ground gas; the site has been identified as CS2 and within a radon affected area.

9.2. Receptors

Receptors that may be affected by the identified contaminant sources are considered to be:

9.2.1. Human

- Residential end users
- Maintenance workers post development
- Construction/groundworkers
- Building and structures

9.2.2. Human

- Underlying Principal Bedrock Aquifer
- Culverted stream identified to run adjacent to the northern site boundary

9.3. Pathways

The key environmental pathways and exposure routes by which potentially toxic substance can reach the identified potential receptors are considered to be:

- Dermal contact
- Direct, ingestion and inhalation of soil and dust
- Inhalation of ground gas/soil vapour
- Vertical and lateral migration of contaminants through the underlying geology;
- Vertical and lateral migration of ground gas and soil vapour leading to accumulation in enclosed space

10. CONTAMINATION RISK ASSESSMENT

10.1. Risk Assessment Procedure

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health/ environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source of contamination can reach a receptor and hence whether it is of major or minor significance.

The risk assessment has been undertaken with reference to BS 10175:2011+A2:2017 and CIRIA Document C552: Contaminated Land Risk assessment 'A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential magnitude of the hazard and the sensitivity of the target, based on the categories provided below.

CATEGORY	EXAMPLES
High	Residential with gardens/Groundwater Source Protection Zone
Medium	Residential without gardens/Principal (Major) Aquifer/sensitive watercourse
Low	Commercial and industrial use/Secondary (Minor) Aquifer
Very Low	Construction and maintenance workers/non-sensitive watercourse

Table 10.1: Sensitivity of receptor

CATEGORY	EXAMPLES
Gross Impact	Heavily contaminated gasworks or industrial Site, hazardous waste landfill
Moderate Impact	Major leaks and spills from fuel infrastructure (e.g. petrol stations), domestic waste landfills
Slight Impact	Minor leaks and spills from fuel infrastructure, 'inert' waste landfills

Table 10.2: Magnitude of impact

MAGNITUDE OF IMPACT	SENSITIVITY OF RECEPTOR			
	HIGH	MEDIUM	LOW	VERY LOW
Gross Impact	Severe	Medium	Mild	Minor
Moderate Impact	Medium	Mild	Minor	Minor
Slight Impact	Mild	Minor	Minor	Minor

Table 10.3: Level of severity of potential hazard

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

CATEGORY	EXAMPLES
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

Table 10.4: Probability of risk definition

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

PROBABILITY OF RISK	SENSITIVITY OF RECEPTOR			
	SEVERE/ HIGH	MEDIUM	MILD/ LOW	MINOR/ V. LOW
High likelihood	Very High	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low likelihood	Moderate	Low/Moderate	Low	Very Low
Unlikely	Low/Moderate	Low	Very Low	Very Low

Table 10.5: Level of risk for potential hazard definition

The assessment is discussed below in terms of plausible pollutant linkages. A complete assessment of the pollutant linkages is presented in Table 10.6.

A description of these risk classifications and likely action required are given in CIRIA 552 as:

Very high risk – High probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.

High risk – Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk – 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, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk – It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk – It is a low possibility that harm could arise to a designated receptor. In the event of such harm being realised it is not likely to be severe.

10.2. Pollutant Linkage Discussion

The following discussion provides justification for outcomes of the Pollutant Linkage Assessment presented in Table 10.6.

The primary risk driver at this stage is associated with the former use as a garage and associated contaminants. For the purposes of this risk assessment a 'Residential' end use has been considered, in light of the proposed development.

10.2.1. Proposed Development

The proposals comprise the demolition of the existing structures and development of 33no. one- and two-bedroom retirement living apartments spread over a two-storey building within the south and east of the site. The development allows for 21no. residential parking spaces within the west and eastern portions of the site. The proposals also include the development of a 'local' Tesco supermarket totalling 4080sq.ft attached to the residential development within the north of the site. 12no. additional parking spaces are proposed for Tesco customer parking within the north of the site.

Much of the west and north of the site is to have a hardstanding cover consisting of the previously mentioned parking areas and onsite vehicle access. To the east of the proposed residential structure is a communal garden and associated areas of soft landscaping.

10.2.2. Soil Contamination

The risk to human health receptors is driven by the elevated lead, TPH and PAH concentrations within the shallow Made Ground soils. The residential end use increases the likelihood of exposure, albeit the absence of private gardens (and associated pathways from consumption of produce) reduces the risk. It can be expected that future maintenance workers and garden contractors could likely be exposed to these Made Ground soils. However, given the short exposure time to this source the overall risk is likely to be low.

Groundworkers are likely to come into contact with Made Ground soils in the short-term during the ground-works phase of development. Correct use of PPE and wash/mess facilities should reduce any salient risks.

The concentrations of the underlying contaminants will likely pose a risk to future services. It will be necessary for suitable barrier water supply pipes will need to be incorporated within the new development.

10.2.3. Controlled Waters

Following leachate analysis, exceedances of the groundwater screening criteria were identified pertaining to hydrocarbon-specific contamination. It is likely that these exceedances are related to the fuel infrastructure on site. These results coincide with the findings from the Southern Testing investigation (Ref: J9299, dated 26 September 2007), i.e. elevated TPH from groundwater samples. In conjunction with the Southern Testing investigation, it is evident that the underlying groundwater is likely being impacted by the hydrocarbon-specific contamination on site. The contaminants have been confirmed to be leachable, and as such, any valid pathway (i.e. fractures within the underlying chalk) will assist migration of these contaminants. Moreover, the presence of the adjacent culvert exacerbates this contamination migration potential.

The sensitivity of the underlying groundwater (Principal Aquifer) increases the overall risk to controlled waters.

Piling has been considered as an option for proposed foundation design. Piling through contaminated ground can generate a preferential pathway and encourage the migration of contaminants to the underlying groundwater.

10.2.4. Ground Gas and Radon

The site has been highlighted as a Characteristic Situation 2 (CIRIA C665, 2002) based on the monitoring undertaken to date. Furthermore, volatile hydrocarbons are present underlying the site. The site is located within a Radon Affected Area. As a result, there are considered to be viable risks to human health receptors and buildings from ground gases and radon.

10.3. Pollutant Linkage Assessment

The Pollutant Linkage Assessment below relates to current site conditions, based on the proposed development, and without mitigation measures applied.

SOURCE	PATHWAY	RECEPTOR	SEVERITY	LIKELIHOOD	RISK LEVEL
Elevated TPH and PAH levels	Dermal contact, inhalation and ingestion of soils and dust	Future site users	Mild	Low likelihood	Low
		Construction/groundworkers	Minor	Likely	Low
	Migration of contaminants through the underlying geology	Building/structures	Minor	Likely	Low
		Principal Aquifer	Mild	Likely	Low/Moderate
		Surface water (culvert)	Minor	Likely	Low
Elevated lead within shallow Made Ground soils	Dermal contact, inhalation and ingestion of soils and dust	Future site users	Mild	Likely	Low/Moderate
		Construction/groundworkers	Minor	Likely	Low
	Migration of contaminants through the underlying geology	Building/structures	Mild	Likely	Low/Moderate
		Principal Aquifer	Mild	Low likelihood	Low
		Surface water (culvert)	Minor	Low likelihood	Very Low
Ground gas and radon	Migration of ground gases through underlying permeable soils and ground leading to inhalation	Future site users	Minor	High Likelihood	Low to Moderate
	Exposure to ground gas during future works	Building/structures and construction/works	Minor	Likely	Low

Table 10.6: Pollutant Linkage Assessment

11. CONCLUSIONS AND RECOMMENDATIONS

11.1. Contamination

The design of the Site Investigation incorporated information from previous reports along with consideration to the proposed development. Potential contamination sources were investigated as far as reasonably practicable.

Currently, there is considered to be **Low to Moderate** risks to future site users and building/structures, relating to the elevated concentrations of lead within the Made Ground and from exposure to ground gas and radon. Similarly, a **Low to Moderate** risk was identified to the underlying Bedrock Principal Aquifer from the migration of TPH and PAH contaminants likely associated with the fuel infrastructure. This level of risk is defined as, '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, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term'.

Based on the risk assessment, we would recommend the following.

11.1.1. Tank Pull

It is recommended that all fuel tanks are decommissioned and subsequently removed along with all connecting pipework. This includes the identified UST and interceptor below and adjacent to the vehicle display forecourt. It will be necessary to undertake soil sampling adjacent to the tanks in order to target potentially impacted soils with the aim to demonstrate betterment. This exercise should be ideally undertaken after demolition of the existing structures with the aim to flag any potential risks.

11.1.2. Buried Services

We would recommend that the local water board are contracted to determine the type of pipework that should be used on site. However, it can be expected that suitable barrier pipes will be incorporated within the new development, due to the former use of the site. Services should be laid within lined trenches and backfilled with clean fill (such a pea shingle), which will demarcate the services, protecting both the services and future maintenance/groundworkers.

11.1.3. Soft-Landscaping

In consideration of the fact that gardening activities will be carried out by a professional contract organisation as opposed to residents, and thereby reducing risks to residential end users significantly, it is recommended that a capping layer, of a minimum thickness of 400mm, of clean imported subsoil and topsoil is placed in all areas of soft landscaping.

Any areas of proposed soft landscaping should ensure that imported topsoil and subsoil is suitable for use. Imported topsoil and subsoil should ensure they do not have levels of common contaminants (such as heavy metals, PAHs and petroleum hydrocarbons) that exceed the applicable screening criteria. Where Made Ground is shallower than 400mm, excavations can be halted on natural soils, subject to visual assessment and verification by an Environmental Consultant. Similarly, it will be possible to re-use natural soils, subject to assessment and verification.

11.1.4. Ground Gas and Radon

Following three gas monitoring rounds the GSV for the site is classified as Characteristic Situation 2. A CS2 corresponds to **Low** risk and consequently some standard remediation measures will need to be incorporated within the design of the proposed development. Based on the above, the following mitigation measures are considered appropriate for the development:

1. Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement); or,
2. Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations; and,
3. Appropriate gas resistant membrane.

The entire site has been identified to lie within a Radon Affected Area estimated to have between 5% and 10% of properties above the action level. This constitutes to a Medium risk area and therefore as a minimum a radon membrane will be required within the building.

The gas resistant membrane should ensure that is sufficiently impervious to both permanent ground gas (CO₂ and CH₄) and radon gas. It is recommended that a gas membrane manufacturer is contacted regarding the most suitable product for this site. As a general rule the membrane should ensure it is sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions, and strong enough to withstand settlement if placed below a floor.

It can be expected that the tank pull exercise (and subsequent removal of impacted soils) will remove a portion of hydrocarbon-impacted soils, and therefore subsequent VOCs. The installation of a gas membrane should go some way to reduce any salient risks associated within inhalation of VOCs. Nevertheless, further decisions can be made once the tank pull exercise has been undertaken and assessed.

11.1.5. Groundwater Assessment

The presence of the underlying Principal Aquifer and proximity of the culvert increases the sensitivity of the underlying controlled waters. Removal of the hydrocarbon-impacted soils will reduce the overall risk to groundwater. However, if these soils remain in-situ or more is found then a detailed quantitative groundwater risk assessment should be undertaken. The assessment should be agreed with the Environment Agency prior to being undertaken. The assessment will likely involve groundwater and surface water monitoring/analysis pre, during and post construction.

11.1.6. Piling Risk Assessment

Piling has been considered as an option for proposed foundation design. Piling through contaminated ground can generate a preferential pathway and encourage the migration of contaminants to the underlying groundwater. A Piling Risk Assessment (PRA), specific to piling into contaminated soils, should be undertaken to address the effects of piling on controlled waters with respect to guidance from the Environment Agency.

11.1.7. Surface Water

Given the proximity of the site to the identified culvert and surrounding river network particular care should be undertaken throughout development to ensure this receptor is not adversely impacted. Any surface water connections should be capped off at the site boundary prior to demolition to avoid contaminants entering the sewers and culvert.

11.1.8. Watching Brief

A Watching Brief should be maintained on site during development works by the Site Manager/ Supervisor. This must be undertaken so actions are implemented correctly in the instance that there are any previously unidentified areas of contamination.

11.1.9. Discovery Strategy

If any material is noted to show visual and/ or olfactory evidence of contamination, in the first instance this material should be stockpiled separately on plyboard or sheeting.

An Environmental Consultant such as Ridge should be contacted to advise what further work is required but this would likely involve characterisation of soils through laboratory analysis prior to removal off site. Local Authorities will be notified, and a future plan of action will be agreed.

11.1.10. Health and Safety

In order to mitigate generic risks associated with development works the following mitigation measures are recommended:

- Compliance with relevant Health and Safety procedures during construction works;
- Contractors on site should wear appropriate PPE to mitigate any risks from chemical and physical impacts of Made Ground at the site; and,
- Adhere to Discovery Strategy as detailed above.

11.1.11. Remedial Method Statement

A stand-alone Remedial Method Statement (RMS) should be submitted under a separate cover. The report should detail required remedial measures, mitigation measures and follow-up validation.

11.2. Waste Removal

Following review of WAC testing, WS11 at 0.30mbgl can be classified as **Inert**. This material has been described as a brownish black silty sandy Gravel with brick and concrete. Whereas, the sample from WS7 at 0.40mbgl can be characterised as **Non-Hazardous** due to the elevated concentration of antimony (sample 0.08mg/kg, criteria 0.06mg/kg). The Made Ground soils from WS7 have been described as a greyish black silty sand with brick and plastic.

It may be prudent to carry out additional testing on Made Ground materials when groundworks are conducted, to attempt to delineate non-hazardous and inert materials. Due to the potential mixing of soils during groundworks further WAC testing may be appropriate on arisings stockpiles prior to removal from site.

All waste materials will need to be properly handled and disposed of in accordance with the Landfill Directive and other relevant legislation.

11.3. Geotechnical

11.3.1. Foundations

Shallow foundations are considered unsuitable within the design of the proposed building due to the thickness and variable composition of the underlying Made Ground and landfill. Consequently, it is recommended that deeper foundations are adopted. Additional ground investigation comprising boreholes to a depth of 20.00mbgl is recommended.

Groundwater has been identified at approximately 3.00mbgl within the underlying Chalk and should be expected in excavations for drainage or similar at this depth.

It is feasible that a piling risk assessment will be required as a planning condition, the preparation of which is outside of our current instructions. It is recommended that superstructure masonry and floor slabs are crushed and re-used on site as piling mat and hard-standing, subject to the necessary testing and approval.

11.3.2. Earthworks / Retaining Situations

Given the current site levels no significant earthworks are considered necessary to accommodate the proposed building.

The bored pile retaining wall in the eastern part of the site appears defective in a number of locations and it is recommended that a structural assessment is undertaken with repairs / facing introduced as necessary.

If it is proposed to change site levels near to the boundaries then an assessment of retaining situations will be necessary if they are created or increased.

11.3.3. Soakaways / Surface Water Drainage

It would appear that surface water from the site currently drains into a foul sewer, surface water sewer and culvert beneath Water Lane immediately north of the site. It may be possible to re-use some of these connections, subject to the necessary permissions.

It is feasible that the chalk encountered beneath the site could be used for soakaway drains, subject to the results of in situ testing. If this option is progressed there would be restrictions on the siting of soakaways, such that they would need to be located a minimum of 5m from buildings and site boundaries. There are also issues with the potential mobilisation of contaminants if soakaways are used and therefore further assessment would be required once the proposed locations and depths are established.

11.3.4. Solution Features

Solution features can occur in chalk. Whilst none were encountered during the investigation it is feasible that such features are present in un-investigated parts of the site. Should such features be encountered or suspected during the course of demolition, site clearance, earthworks or construction the Engineer should be contacted, and the site inspected as necessary.

11.3.5. Concrete in Aggressive Ground

The results of laboratory testing have indicated a Design Sulphate Classification of DS-1 and an ACEC Class of AC-1 assuming mobile groundwater conditions above the groundwater table and using a worst-case soluble sulphate value of 310mg/l and a pH >6.55. Buried concrete should be specified to comply with this classification.

11.3.6. Pavement and Road Design

Dynamic Cone Penetrometer tests (DCP) were undertaken on site and returned results of between 12.7-55.0% at 0.5mbgl. These values should be used for preliminary pavement design. IAN 73/06 suggests a subbase of 250mm for pavement based upon the geology and CBR values. This should be confirmed with in situ tests at formation level at the appropriate time.

11.3.7. Floor slabs

Suspended floor slabs are recommended for the proposed development due to the variable nature and thickness of the Made Ground encountered at ground level across the site.

11.4. Decommissioning of Monitoring Wells

The monitoring wells installed within the boreholes will eventually require decommissioning. This process should be completed in accordance with Environment Agency's guidance document 'Decommissioning Redundant Boreholes and Wells'. Nevertheless, Ridge should be contacted before decommissioning to confirm that the monitoring wells are no longer required. Documentary evidence of decommissioning will likely be required.



FIGURE 1 – SITE LOCATION PLAN

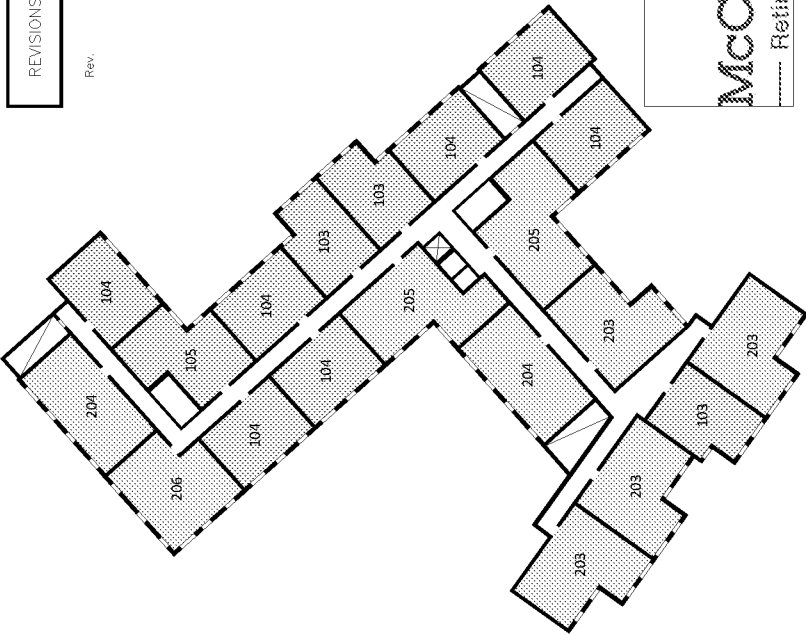
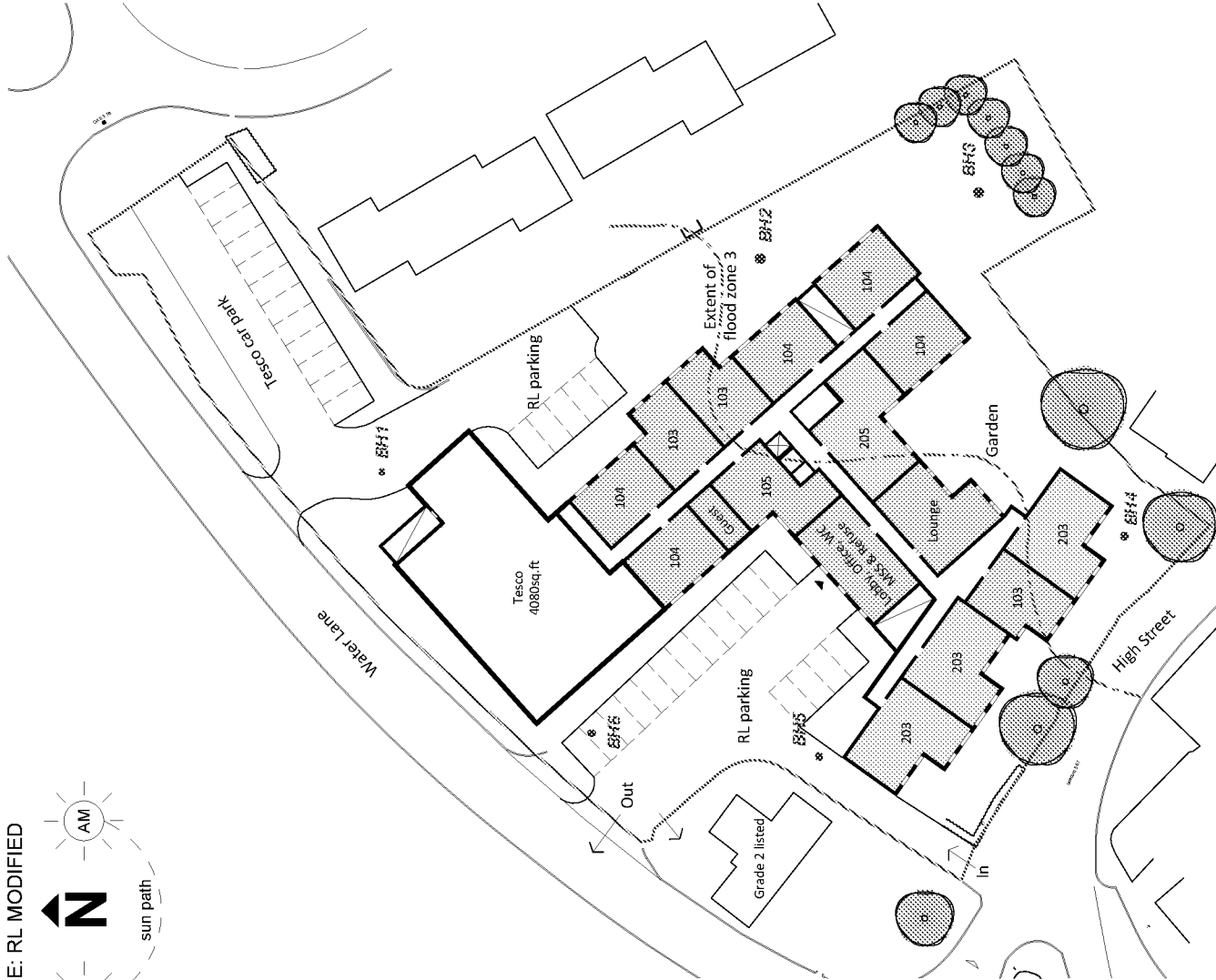
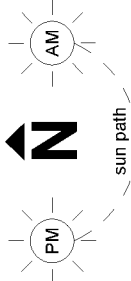


Project:		Water Lane, Angmering		Title:	Site Location Plan	
Job Number:	5013719	Client:	McCarthy Stone Ltd	 Partnership House Moorside Road Winchester Hampshire SO23 7RX		
Drawing:	5013719-Fig1	Revision :	-			
Drawn:	PB	Date:	December 2020			
Checked by:	10/21/PL RJH	Scale:	NTS	Ridge and Partners LLP www.ridge.co.uk		
						TEL: 01962 834300



FIGURE 2 – SITE PLANS

RANGE: RL MODIFIED



WFBA
20105
Suggested borehole/
windowless sample
locations

McCarthy & Stone
Retirement living to the full

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Project Title
Former Chlanders Accident Repair Center
High Street
Angmering
BN16 4DR

Drawing Title
Indicative Site Plan
OPTION 3

Scale 1:500@A3
Date 20.08.2020
Drawn CT
Checked
Drawing No.
SO-0116-03
FP 2694

ALL DIMENSIONS TO BE CHECKED ON SITE. WORK TO FIGURED DIMENSIONS ONLY. REPORT DISCREPANCIES TO THE ARCHITECT AT ONCE BEFORE PROCEEDING

NOTES

- Tree constraints TBC
- Site within conservation area
- Within Flood zone 3, FFL TBC
- Demolition of car workshops, ground contamination TBC
- Mixed use development with Tesco
- 2 storey subject to planning advice
- Right of way for listed building

ACCOMMODATION SCHEDULE

	1 BED 2BED	
01.L GROUND		
02.GROUND	9	4
03.FIRST	11	9
04.SECOND		
05.THIRD		
06.FOURTH		
APARTMENTS	20	13
BUNGALOWS		
PARKING (apts)		21
TOTAL		
TOTAL		
TOTAL		



FIGURE 3 – SITE INVESTIGATION PLAN

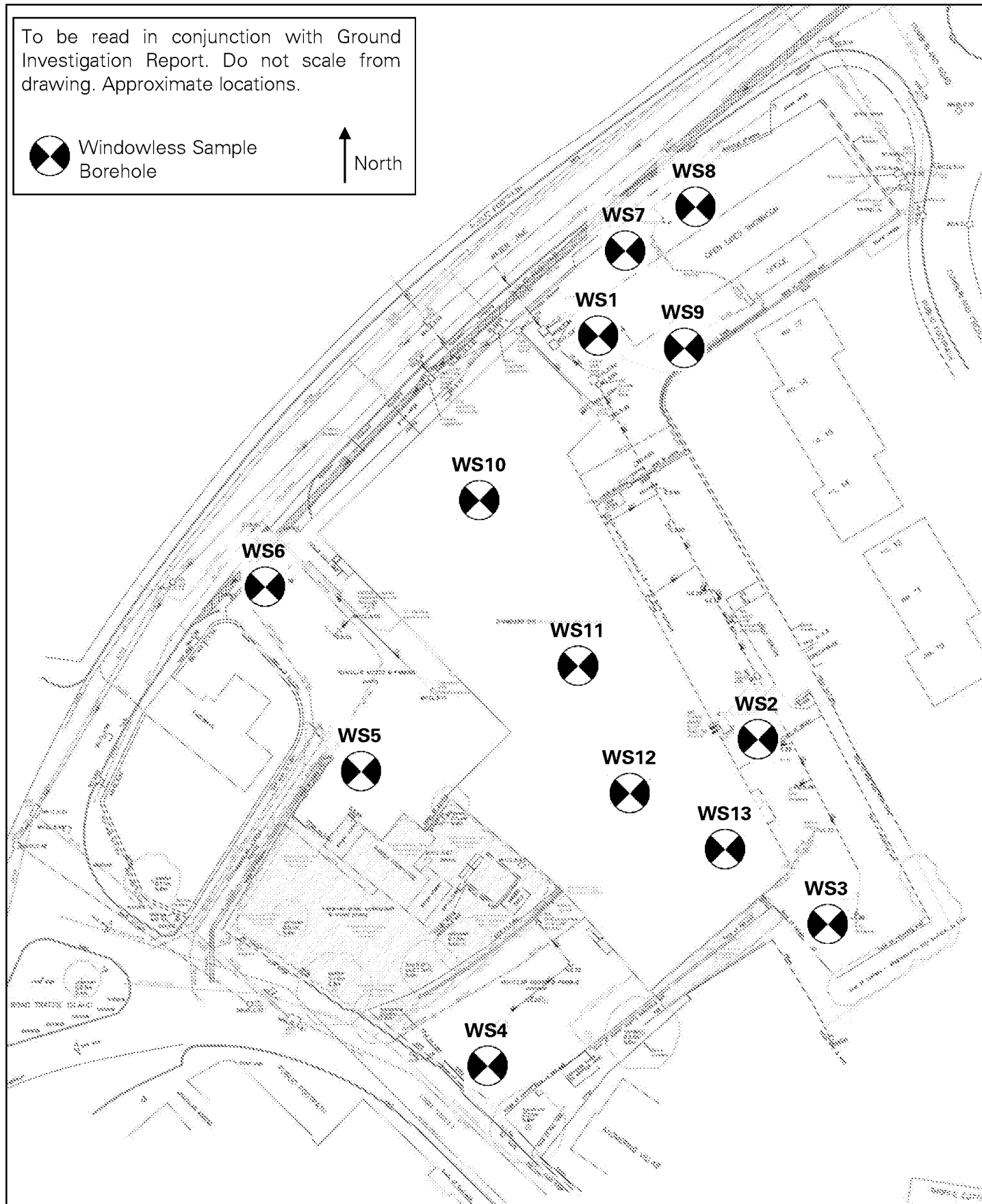
To be read in conjunction with Ground Investigation Report. Do not scale from drawing. Approximate locations.



Windowless Sample
Borehole



North



Project

Water Lane, Angmering

Title

SI Plan – Existing

**Job
Number**

5013719

Client

McCarthy Stone Ltd

Drawing

5013719-Fig3

Revision

-

Drawn

RG

Date

November 2020

Checked by

RSH

Scale

NTS



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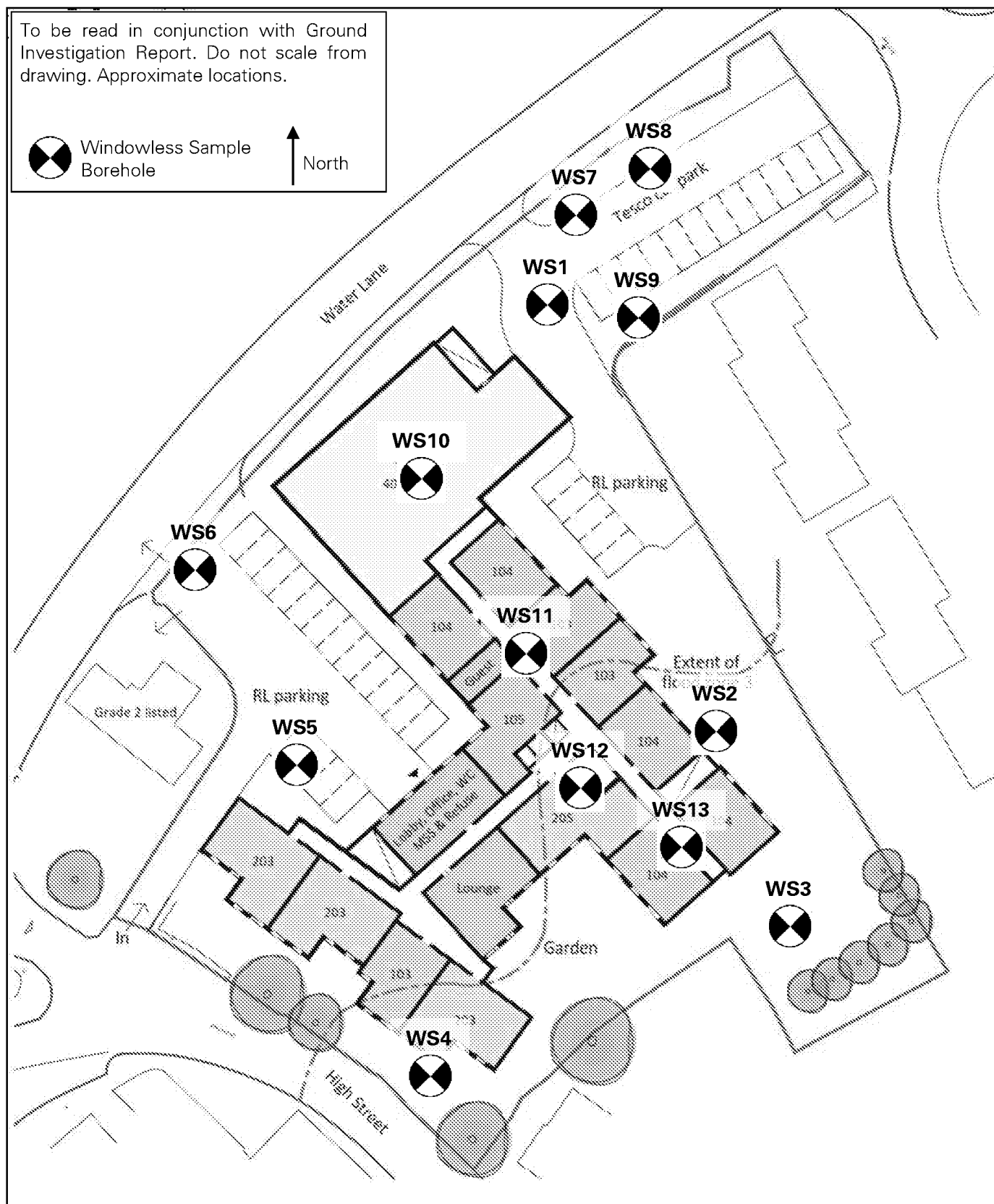
To be read in conjunction with Ground Investigation Report. Do not scale from drawing. Approximate locations.



Windowless Sample Borehole



North



Project Water Lane, Angmering

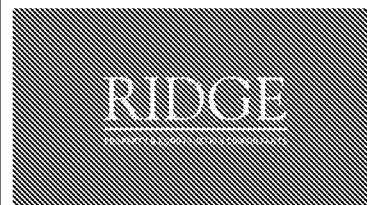
Title SI Plan – Proposed

Job Number 5013719 **Client** McCarthy Stone Ltd

Drawing 5013719-Fig3 **Revision** -

Drawn RG **Date** November 2020

Checked by RSH **Scale** NTS



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APPENDIX 1 – REPORT CONDITIONS

This report is produced solely for the benefit of **McCarthy Stone** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the Site.

This report is based on a visual Site inspection, study of readily accessible referenced historical records, information supplied by those parties noted in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical Site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the Site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Ridge and Partners LLP. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the Site and adjacent Sites. The report concentrates on the Site as defined in the report and provides an opinion on surrounding Sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off Site intrusive investigations and monitoring.



APPENDIX 2 – SOIL LOGS



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS1	
Job No 5013719	Date 18-11-20 18-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor DJ Drilling				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
1.00	N6					0.10	Paving Tiles- CONCRETE		
						0.30	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
2.00	N16					(1.60)	Firm to stiff orangish brown slightly gravelly slightly silty slightly sandy CLAY. Gravel is subangular to angular		
						1.90			
3.00	N7					(0.90)	Medium dense orangish brown slightly sandy slightly clayey angular GRAVEL. Gravels are comprised of flint.		
						2.80			
4.00	N0					(2.65)	CHALK recovered as: firm to stiff brownish white slightly gravelly slightly silty clay. Gravel is subrounded. Strong hydrocarbon odour from 3.5 to 4mbgl.		
						5.45			
5.00	N14								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.5mbgl. Pipe installed and backfilled with gravel.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Prem 3			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE- ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS2	
Job No 5013719	Date 18-11-20 18-11-20	Ground Level (m)	Co-Ordinates (i)		
Contractor DJ Drilling				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00	N11					0.20	Concrete Slab		
						0.25	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
						0.30	Medium dense orangish brown slightly sandy slightly clayey angular GRAVEL. Gravels are comprised of flint.		
2.00	N7						CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded. Strong hydrocarbon odour from 3.1 to 3.5mbgl.		
3.00	N10					(5.15)			
4.00	N22								
5.00	N13								
						5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.8mbgl. Backfilled with arisings.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Prem 3			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE-ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



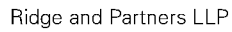
BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS3	
Job No 5013719	Date 18-11-20 18-11-20	Ground Level (m)	Co-Ordinates (i)		
Contractor DJ Drilling				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00	N35					0.20	CONCRETE Slab		
						0.40	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
						0.50	Medium dense orangish brown slightly sandy slightly clayey angular GRAVEL. Gravels are comprised of flint.		
2.00	N36						CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded. Gravel sized flint band present @2.8mbgl		
3.00	N29					(4.95)			
4.00	N29								
5.00	N13								
						5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 4.3mbgl. Backfilled with arisings.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Prem 3			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE-ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS4
Job No 5013719	Date 19-11-20 19-11-20	Ground Level (m)	Co-Ordinates (i)	
Contractor DJ Drilling				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)		
1.00		N16				0.15	TOPSOIL-Blackish brown slightly clayey friable silt with frequent rootlets.	
						(0.55)	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand	
						0.70	CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded.	
2.00		N16						
3.00		N13			(4.75)			
4.00		N10						
5.00		N20						
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 4.2mbgl. Backfilled with arising.

All dimensions in metres Scale 1:50	Client	McCarthy & Stone	Method/ Plant Used	Prem 3	Logged By	PB
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BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS5
Job No 5013719	Date 17-11-20 17-11-20	Ground Level (m)	Co-Ordinates ()	
Contractor DJ Drilling				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
1.00	N11					0.10	CONCRETE- Paving Slab		
						0.30	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
						(1.20)	Firm orangish brown gravelly slightly cobbly CLAY. Gravel and cobble are subangular to subrounded.		
2.00	N8					1.50			
						(0.60)	Medium dense orangish brown slightly sandy slightly clayey angular GRAVEL. Gravels are comprised of flint.		
						2.10			
3.00	N0					(0.60)	Firm orangish brown slightly gravelly CLAY		
						2.70			
							CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded. No Recovery from 3.0-3.8mbgl.		
4.00	N19					(2.75)			
5.00	N33								
						5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.4mbgl. Pipe installed and backfilled with gravel.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Dando Terrier			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE- ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS6	
Job No 5013719	Date 17-11-20 17-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor DJ Drilling				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00	N11					0.10	CONCRETE- Paving Slabs		
						(0.70)	MADE GROUND-Loose greyish black sandy silt with gravel of brick and concrete.		
2.00	N4					0.80	Firm orangish brown slightly sandy gravelly cobbly CLAY		
						(1.00)			
3.00	N0					1.80	CHALK recovered as- medium dense greyish white slightly gravelly slightly clayey SAND. Strong hydrocarbon odour present from 2.00-3.00mbgl. No recovery from 3.00 to 4.00mbgl		
						(2.20)			
4.00	N0					4.00	CHALK recovered as: firm to stiff greyish white slightly gravelly slightly silty clay. Gravel is subrounded.		
						(1.45)			
5.00	N11					5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.0mbgl. Pipe installed and backfilled with gravel.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Dando Terrier			Logged By PB		



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS7
Job No 5013719	Date 17-11-20 17-11-20	Ground Level (m)	Co-Ordinates (l)	
Contractor DJ Drilling				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00	N36					0.10	CONCRETE- Paving Slab		
						0.18	MADE GROUND-OrangishYellow fine subangular sand. Believed to be		
						0.25	builders sand		
						0.40	MACADAM		
						0.50	CONCRETE Slab		
2.00	N12					(0.80)	MADE GROUND- Greyish black slightly silty sand with brick and plastic		
						1.30	Firm greyish brown slightly silty slightly gravelly CLAY		
						(0.80)	Medium dense cobbly sandy angular GRAVEL of flint.		
3.00	N0					2.10	Firm to stiff orangish brown slightly silty CLAY		
						(0.70)			
4.00	N13					2.80	CHALK recovered as: firm to stiff brownish white slightly gravelly slightly silty clay. Gravel is subrounded. No recovery from 4.00-5.45mbgl.		
						(2.65)			
5.00	N17					5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.0mbgl. Pipe installed and backfilled with gravel.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Dando Terrier			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE- ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS8	
Job No 5013719	Date 17-11-20 17-11-20	Ground Level (m)	Co-Ordinates (i)		
Contractor DJ Drilling				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00	N39					0.10	CONCRETE- Paving Slab		
						0.30	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
						(0.70)	Firm to stiff brownish black slightly sandy slightly gravelly CLAY		
						1.00			
2.00	N5					(1.30)	Medium dense orangish brown angular coarse slightly sandy slightly gravelly COBBLES of flint		
						2.30			
3.00	N10						CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded. Strong hydrocarbon odour from 3.1 to 3.5mbgl.		
						(3.15)			
4.00	N6								
5.00	N40								
						5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.0mbgl. Backfilled with arisings.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Dando Terrier			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE- ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS9
Job No 5013719	Date 17-11-20 17-11-20	Ground Level (m)	Co-Ordinates (i)	
Contractor DJ Drilling				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00	N15					0.10	CONCRETE- Paving Slab		
						0.20	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
						0.40	CONCRETE		
2.00	N29					(1.80)	Firm to stiff orangish brown slightly sandy slightly gravelly CLAY		
						2.20			
3.00	N4					(0.40)	Medium dense cobbly sandy angular GRAVEL of flint.		
						2.60			
4.00	N0					(0.90)	Firm to stiff orangish brown slightly sandy slightly gravelly CLAY		
						3.50			
5.00	N6					(1.95)	CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded. No recovery from 3.50-3.90mbgl & 4.00-5.45mbgl		
						5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.0mbgl. Backfilled with arisings.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Dando Terrier			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE- ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS10
Job No 5013719	Date 19-11-20 19-11-20	Ground Level (m)	Co-Ordinates (l)	
Contractor DJ Drilling				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)		
						0.25	CONCRETE- Tiles underlain by floor slab	
						0.43	MADE GROUND- Brownish black slightly silty sandy cobbly GRAVEL . Gravel is composed of brick and concrete	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 0.43mbgl. Backfilled with arisings.

All dimensions in metres Scale 1:50	Client McCarthy & Stone	Method/ Plant Used Hand Dug	Logged By PB
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BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS11
Job No 5013719	Date 19-11-20 19-11-20	Ground Level (m)	Co-Ordinates (l)	
Contractor DJ Drilling				Sheet 1 of 1

[illegible]

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 0.50mbgl. Backfilled with arisings.

All dimensions in metres Scale 1:50	Client McCarthy & Stone	Method/ Plant Used Hand Dug	Logged By PB
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BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS12	
Job No 5013719	Date 19-11-20 19-11-20	Ground Level (m)	Co-Ordinates ()		
Contractor DJ Drilling				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00	N1					0.20	CONCRETE Slab		
						0.40	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
						(0.80)	Medium dense ornagish brown angular coarse clayey cobbly GRAVEL of flint.		
						1.20			
2.00	N7						CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded. No recovery from 4.10 to 5.00mbgl		
3.00	N9								
4.00	N18					(4.25)			
5.00	N25								
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.1mbgl. Backfilled with arisings.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Prem 3			Logged By PB		



BOREHOLE LOG

Project Former BMW Garage, Water Lane				BOREHOLE No WS13
Job No 5013719	Date 19-11-20 19-11-20	Ground Level (m)	Co-Ordinates (l)	
Contractor DJ Drilling				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
1.00	N21					0.25	CONCRETE Slab		
						0.30	MADE GROUND-OrangishYellow fine subangular sand. Believed to be builders sand		
						0.35	Loose orangish brown angular fine to coarse slightly sandy clayey GRAVEL		
							CHALK recovered as: firm to stiff creamish white slightly gravelly slightly silty clay. Gravel is subrounded. No recovery from 4.10 to 5.00mbgl		
2.00	N26								
3.00	N19					(5.10)			
4.00	N15								
5.00	N12					5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Depth	Date	Time	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
											Excavated to 5.45mbgl. Groundwater encountered @ 3.5mbgl. Backfilled with arisings.
All dimensions in metres Scale 1:50			Client McCarthy & Stone			Method/ Plant Used Prem 3			Logged By PB		

Report ID: AGS4 UK BH || Project: 5013719-WATERS LANE- ANGMERING GPJ || Library: GINT STD AGS 4.0.GJ.B || Date: 26 February 2021



APPENDIX 3 – LABORATORY CERTIFICATES



Laboratory Report



Contract Number: 51411

Client Ref: **5013719**
Client PO: **DRAFT-13723**

Report Date: **16-12-2020**

Client **Ridge**
Partnership House
Moorside Road
Winchester
SO23 7RX

Contract Title: **Waters Lane, Angmering**
For the attention of: **Peter Bufton**

Date Received: **23-11-2020**
Date Completed: **16-12-2020**

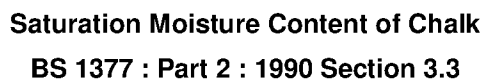
Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	8
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	8
Water Soluble Sulphate 2:1 extract BS 1377:1990 - Part 3 : 5.3 - @ Non Accredited Test	8
pH value of soil BS 1377:1990 - Part 3 : 9.5 - @ Non Accredited Test	8
Saturated Moisture Content of chalk (SMC) BS 1377:1990 - Part 2 : 3.3 - * UKAS	3
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

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.

Approved Signatories:

Emma Sharp (Office Manager/Director) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)



Contract Number	51411	
Site Name	Waters Lane, Angmering	
Date Tested	01/12/2020	

[illegible]

<u>Key</u>	<u>Reported As</u>	<u>Clause</u>
Moisture Content	%	3.2
Bulk Density	Mg/m ³	7.2
Dry Density	Mg/m ³	7.2
SMC	%	3.3.6

If there is a NON-STANDARD in the remarks next to the reported SMC result this means there was no lump of chalk of sufficient volume (300mL-500mL) present in the samples received to meet the testing requirements of the stated standard.

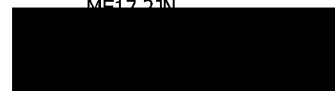
Operators	Checked	15/12/2020	Emma Sharp	
CJ	Approved	16/12/2020	Paul Evans	





Peter Bufton
Ridge
Partnership House
Moorside Road
Winchester
SO23 7RX

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN



DETS Report No: 20-13840

Site Reference: Former BMW Garage, Waters Lane, Anqmering

Project / Job Ref: 5013719

Order No: 5013719-13717

Sample Receipt Date: 24/11/2020

Sample Scheduled Date: 24/11/2020

Report Issue Number: 1

Reporting Date: 02/12/2020

Authorised by:



Kevin Old
General Manager

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

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Rose Lane
Lenham Heath
Maidstone



Soil Analysis Certificate						
DETS Report No: 20-13840	Date Sampled	17/11/20	17/11/20	17/11/20	17/11/20	18/11/20
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Former BMW Garage, Waters Lane, Anamerina	TP / BH No	WS6	WS6	WS8	WS7	WS1
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5013719-13717	Depth (m)	0.50	2.50	0.20	0.40	3.70
Reporting Date: 02/12/2020	DETS Sample No	512402	512403	512405	512406	512407

Determinand	Unit	RL	Accreditation	(n)				
Asbestos Screen ^(S)	N/a	N/a	ISO 17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	9.1	8.3	8.5	10.2	8.2
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Organic Matter	%	< 0.1	MCERTS	3.9	0.1	1.3	3.9	0.9
Arsenic (As)	mg/kg	< 2	MCERTS	9	< 2	12	15	16
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.5	0.8	0.6	1	0.9
Chromium (Cr)	mg/kg	< 2	MCERTS	12	6	17	19	29
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	30	9	64	85	92
Lead (Pb)	mg/kg	< 3	MCERTS	122	8	187	306	408
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	48	28	50	28	65
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	206	26	181	388	379
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

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

Subcontracted analysis (S)

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



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Rose Lane
Lenham Heath
Maidstone



Soil Analysis Certificate						
DETS Report No: 20-13840	Date Sampled	18/11/20	19/11/20	19/11/20		
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Former BMW Garage, Waters Lane, Anamerina	TP / BH No	WS2	WS4	WS11		
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 5013719-13717	Depth (m)	3.50	0.50	0.30		
Reporting Date: 02/12/2020	DETS Sample No	512409	512411	512412		

Determinand	Unit	RL	Accreditation	(n)				
Asbestos Screen ^(S)	N/a	N/a	ISO 17025	Not Detected	Not Detected	Not Detected		
pH	pH Units	N/a	MCERTS	8.5	8.0	7.7		
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2		
Organic Matter	%	< 0.1	MCERTS	< 0.1	3.2	0.6		
Arsenic (As)	mg/kg	< 2	MCERTS	4	< 2	5		
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	1.3	0.4	< 0.2		
Chromium (Cr)	mg/kg	< 2	MCERTS	9	2	8		
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		
Copper (Cu)	mg/kg	< 4	MCERTS	26	9	12		
Lead (Pb)	mg/kg	< 3	MCERTS	15	5	22		
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	MCERTS	24	13	10		
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3		
Zinc (Zn)	mg/kg	< 3	MCERTS	54	13	73		
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		

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



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Unit 1, Rose Lane Industrial Estate
Rose Lane
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Maidstone
Kent ME17 2JN



Soil Analysis Certificate - Speciated PAHs

DETS Report No: 20-13840	Date Sampled	17/11/20	17/11/20	17/11/20	17/11/20	18/11/20
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Former BMW Garage, Waters Lane, Angmering	TP / BH No	WS6	WS6	WS8	WS7	WS1
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5013719-13717	Depth (m)	0.50	2.50	0.20	0.40	3.70
Reporting Date: 02/12/2020	DETS Sample No	512402	512403	512405	512406	512407

Determinand	Unit	RL	Accreditation	(n)				(n)
Naphthalene	mg/kg	< 0.1	MCERTS	0.19	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	0.57	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	1.45	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	1.18	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	17.90	< 0.1	0.17	1.17	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	5.13	< 0.1	< 0.1	0.23	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	53.70	< 0.1	3.03	3.43	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	54.40	< 0.1	3.44	3.14	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	29.30	< 0.1	1.74	1.53	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	22.60	< 0.1	1.64	1.59	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	39.40	< 0.1	2.71	1.84	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	9.97	< 0.1	0.90	0.55	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	34.50	< 0.1	2.32	1.44	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	16.70	< 0.1	1.23	0.67	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	2.51	< 0.1	0.31	0.13	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	16.10	< 0.1	1.27	0.66	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	306	< 1.6	18.8	16.4	< 1.6

(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
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Maidstone
Kent ME17 2JN



Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 20-13840	Date Sampled	18/11/20	19/11/20	19/11/20		
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Former BMW Garage, Waters Lane, Angmering	TP / BH No	WS2	WS4	WS11		
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 5013719-13717	Depth (m)	3.50	0.50	0.30		
Reporting Date: 02/12/2020	DETS Sample No	512409	512411	512412		

Determinand	Unit	RL	Accreditation	(n)			
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	0.28	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.83	< 0.1	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.75	< 0.1	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.44	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	0.43	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.61	0.13	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.28	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.50	0.11	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.35	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	0.37	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	4.8	< 1.6	



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Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 20-13840	Date Sampled	17/11/20	17/11/20	17/11/20	17/11/20	18/11/20
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Former BMW Garage, Waters Lane, Anamering	TP / BH No	WS6	WS6	WS8	WS7	WS1
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5013719-13717	Depth (m)	0.50	2.50	0.20	0.40	3.70
Reporting Date: 02/12/2020	DETS Sample No	512402	512403	512405	512406	512407

Determinand	Unit	RL	Accreditation	(n)				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	7.64	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	292	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	2	178	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	6	13	< 3	< 3	< 3
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	19	< 3	< 3	< 3	< 3
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	81	< 10	21	< 10	11
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	108	491	21	< 21	< 21
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	41	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	111	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	18	15	< 2	< 2	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	258	< 3	13	10	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	550	< 10	35	31	< 10
Aromatic (C5 - C35)	mg/kg	< 21	NONE	826	167	48	42	< 21
Total >C5 - C35	mg/kg	< 42	NONE	934	658	69	< 42	< 42

(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



Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 20-13840	Date Sampled	18/11/20	19/11/20	19/11/20		
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Former BMW Garage, Waters Lane, Anamering	TP / BH No	WS2	WS4	WS11		
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 5013719-13717	Depth (m)	3.50	0.50	0.30		
Reporting Date: 02/12/2020	DETS Sample No	512409	512411	512412		

Determinand	Unit	RL	Accreditation	(n)					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3			
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3			
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10			
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10			
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	< 21			
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	< 42			



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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 20-13840	Date Sampled	17/11/20	17/11/20	17/11/20	17/11/20	18/11/20
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Former BMW Garage, Waters Lane, Anmering	TP / BH No	WS6	WS6	WS8	WS7	WS1
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5013719-13717	Depth (m)	0.50	2.50	0.20	0.40	3.70
Reporting Date: 02/12/2020	DETS Sample No	512402	512403	512405	512406	512407

Determinand	Unit	RL	Accreditation	(n)					(n)
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
p & m-xylene	ug/kg	< 2	MCERTS	< 2	144	< 2	< 2	< 2	< 2
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 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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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 20-13840	Date Sampled	18/11/20	19/11/20	19/11/20		
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Former BMW Garage, Waters Lane, Anmering	TP / BH No	WS2	WS4	WS11		
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 5013719-13717	Depth (m)	3.50	0.50	0.30		
Reporting Date: 02/12/2020	DETS Sample No	512409	512411	512412		

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



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Leachate Analysis Certificate - TPH CWG Banded						
DETS Report No: 20-13840	Date Sampled	17/11/20	18/11/20	18/11/20		
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Former BMW Garage, Waters Lane, Anmering	TP / BH No	WS6	WS1	WS2		
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 5013719-13717	Depth (m)	2.50	3.70	3.50		
Reporting Date: 02/12/2020	DETS Sample No	512404	512408	512410		

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C8 - C10	ug/l	< 10	NONE	11	< 10	< 10		
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C16 - C21	ug/l	< 10	NONE	29	< 10	< 10		
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70	< 70	< 70		
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C8 - C10	ug/l	< 10	NONE	14	< 10	< 10		
Aromatic >C10 - C12	ug/l	< 10	NONE	36	< 10	< 10		
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C16 - C21	ug/l	< 10	NONE	13	< 10	< 10		
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70	< 70	< 70		
Total >C5 - C35	ug/l	< 140	NONE	< 140	< 140	< 140		



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Rose Lane
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Maidstone



Leachate Analysis Certificate - BTEX / MTBE

DETS Report No: 20-13840	Date Sampled	17/11/20	18/11/20	18/11/20		
Ridge	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Former BMW Garage, Waters Lane, Angmering	TP / BH No	WS6	WS1	WS2		
Project / Job Ref: 5013719	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 5013719-13717	Depth (m)	2.50	3.70	3.50		
Reporting Date: 02/12/2020	DETS Sample No	512404	512408	512410		

Determinand	Unit	RL	Accreditation					
Benzene	ug/l	< 1	ISO17025	< 1	< 1	< 1		
Toluene	ug/l	< 5	ISO17025	< 5	< 5	< 5		
Ethylbenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5		
p & m-xylene	ug/l	< 10	ISO17025	< 10	< 10	< 10		
o-xylene	ug/l	< 5	ISO17025	< 5	< 5	< 5		
MTBE	ug/l	< 10	ISO17025	< 10	< 10	< 10		



DETS Report No: 20-13840		Date Sampled	17/11/20		Landfill Waste Acceptance Criteria Limits				
Ridge		Time Sampled	None Supplied						
Site Reference: Former BMW Garage, Waters Lane, Angmering		TP / BH No	WS7						
Project / Job Ref: 5013719		Additional Refs	None Supplied						
Order No: 5013719-13717		Depth (m)	0.40						
Reporting Date: 02/12/2020		DETS Sample No	512406						
Determinand	Unit	MDL							
TOC ^{MU}	%	< 0.1	2.2						
Loss on Ignition	%	< 0.01	7.60						
BTEX ^{MU}	mg/kg	< 0.05	< 0.05						
Sum of PCBs	mg/kg	< 0.1	< 0.1						
Mineral Oil ^{MU}	mg/kg	< 10	< 10						
Total PAH ^{MU}	mg/kg	< 1.7	16.6						
pH ^{MU}	pH Units	N/a	10.2						
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	1.8						
Eluate Analysis			10:1 mg/l			Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)		
Arsenic ^U		< 0.01				< 0.1	0.5	2	25
Barium ^U		< 0.02				< 0.2	20	100	300
Cadmium ^U		< 0.0005				< 0.005	0.04	1	5
Chromium ^U		< 0.005				< 0.05	0.5	10	70
Copper ^U		0.02				0.2	2	50	100
Mercury ^U		< 0.0005				< 0.005	0.01	0.2	2
Molybdenum ^U		0.003				0.03	0.5	10	30
Nickel ^U		< 0.007				< 0.07	0.4	10	40
Lead ^U		< 0.005				< 0.05	0.5	10	50
Antimony ^U		0.008				0.08	0.7	0.7	5
Selenium ^U		< 0.005				< 0.05	0.1	0.5	7
Zinc ^U		0.006				0.06	4	50	200
Chloride ^U		8.2				82	800	15000	25000
Fluoride ^U		0.8				8	10	150	500
Sulphate ^U		11.7				117	1000	20000	50000
TDS		90				900	4000	60000	100000
Phenol Index		< 0.01				< 0.1	1	-	-
DOC		11.4				114	500	800	1000
Leach Test Information									
Sample Mass (kg)			0.11						
Dry Matter (%)			82.2						
Moisture (%)			21.8						
Stage 1									
Volume Eluate L10 (litres)			0.88						

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

Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepancies with current legislation

M Denotes MCERTS accredited test

U Denotes ISO17025 accredited test



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Rose Lane
Lenham Heath



Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 20-13840		Date Sampled	19/11/20				Landfill Waste Acceptance Criteria Limits																											
Ridge		Time Sampled	None Supplied				<table border="1"> <tr> <th>Inert Waste Landfill</th> <th>Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill</th> <th>Hazardous Waste Landfill</th> </tr> <tr> <td>3%</td> <td>5%</td> <td>6%</td> </tr> <tr> <td>--</td> <td>--</td> <td>10%</td> </tr> <tr> <td>6</td> <td>--</td> <td>--</td> </tr> <tr> <td>1</td> <td>--</td> <td>--</td> </tr> <tr> <td>500</td> <td>--</td> <td>--</td> </tr> <tr> <td>100</td> <td>--</td> <td>--</td> </tr> <tr> <td>--</td> <td>>6</td> <td>--</td> </tr> <tr> <td>--</td> <td>To be evaluated</td> <td>To be evaluated</td> </tr> </table>	Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	3%	5%	6%	--	--	10%	6	--	--	1	--	--	500	--	--	100	--	--	--	>6	--	--	To be evaluated	To be evaluated
Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill																																
3%	5%	6%																																
--	--	10%																																
6	--	--																																
1	--	--																																
500	--	--																																
100	--	--																																
--	>6	--																																
--	To be evaluated	To be evaluated																																
Site Reference: Former BMW Garage, Waters Lane, Angmering		TP / BH No	WS11																															
Project / Job Ref: 5013719		Additional Refs	None Supplied																															
Order No: 5013719-13717		Depth (m)	0.30																															
Reporting Date: 02/12/2020		DETS Sample No	512412																															
Determinand	Unit	MDL																																
TOC ^{MU}	%	< 0.1	0.4																															
Loss on Ignition	%	< 0.01	1.27																															
BTEX ^{MU}	mg/kg	< 0.05	< 0.05																															
Sum of PCBs	mg/kg	< 0.1	< 0.1																															
Mineral Oil ^{MU}	mg/kg	< 10	< 10																															
Total PAH ^{MU}	mg/kg	< 1.7	< 1.7																															
pH ^{MU}	pH Units	N/a	7.7																															
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1																															
Eluate Analysis			10:1 mg/l			Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)																											
Arsenic ^U		< 0.01			< 0.1	0.5	2	25																										
Barium ^U		< 0.02			< 0.2	20	100	300																										
Cadmium ^U		< 0.0005			< 0.005	0.04	1	5																										
Chromium ^U		< 0.005			< 0.05	0.5	10	70																										
Copper ^U		0.01			0.1	2	50	100																										
Mercury ^U		< 0.0005			< 0.005	0.01	0.2	2																										
Molybdenum ^U		0.002			0.02	0.5	10	30																										
Nickel ^U		< 0.007			< 0.07	0.4	10	40																										
Lead ^U		< 0.005			< 0.05	0.5	10	50																										
Antimony ^U		< 0.005			< 0.05	0.06	0.7	5																										
Selenium ^U		< 0.005			< 0.05	0.1	0.5	7																										
Zinc ^U		0.010			0.10	4	50	200																										
Chloride ^U		10.8			108	800	15000	25000																										
Fluoride ^U		< 0.5			< 5	10	150	500																										
Sulphate ^U		12.8			128	1000	20000	50000																										
TDS		110			1100	4000	60000	100000																										
Phenol Index		< 0.01			< 0.1	1	-	-																										
DOC		14.6			146	500	800	1000																										
Leach Test Information																																		
Sample Mass (kg)		0.10																																
Dry Matter (%)		90.1																																
Moisture (%)		11																																
Stage 1																																		
Volume Eluate L10 (litres)		0.89																																

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



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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 20-13840

Ridge

Site Reference: Former BMW Garage, Waters Lane, Angmering

Project / Job Ref: 5013719

Order No: 5013719-13717

Reporting Date: 02/12/2020

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
512402	WS6	None Supplied	0.50	12.4	Brown loamy sand with stones and brick
512403	WS6	None Supplied	2.50	24.2	White chalk
512405	WS8	None Supplied	0.20	11.6	Light brown loamy sand with stones
512406	WS7	None Supplied	0.40	17.8	Black loamy sand with stones and concrete
512407	WS1	None Supplied	3.70	35.3	Brown sludge
512409	WS2	None Supplied	3.50	20.3	White chalk
512411	WS4	None Supplied	0.50	16.5	Brown loamy sand with stones and concrete
512412	WS11	None Supplied	0.30	9.9	Brown loamy sand with stones

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

Insufficient Sample ^{1/5}

Unsuitable Sample ^{1/5}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 20-13840

Ridge

Site Reference: Former BMW Garage, Waters Lane, Angmering

Project / Job Ref: 5013719

Order No: 5013719-13717

Reporting Date: 02/12/2020

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	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



Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 20-13840

Ridge

Site Reference: Former BMW Garage, Waters Lane, Angmering

Project / Job Ref: 5013719

Order No: 5013719-13717

Reporting Date: 02/12/2020

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO ₄)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered



APPENDIX 4 – MONITORING SHEETS

Ground Gas and Soil Vapour Monitoring

5013719	Water Lines, Engineering
5013719	

Location	Depth (m)	Direction	Value	Unit	Notes
WS1	35	1	0	980	
WS2	30				
WS3	60				
WS4	90				
WS5	120				
WS6	150				
WS7	180				

Location	Depth (m)	Direction	Value	Unit	Notes
WS1	35	1	0	980	
WS2	30				
WS3	60				
WS4	90				
WS5	120				
WS6	150				
WS7	180				

Ground Gas and Soil Vapour Monitoring

Project Name	Water Lane, Angmering
Project Reference	5013719

Partnership House, Moorside Road, Winchester,
SO23 7RX

	Date	Prevalence	Case Fatality Rate	Seroprevalence (%)	Diagnostic Yield (%)	Significance Level	Study Size	Confidence Interval		
B-06-02	04/12/2021	PB	Increasing	980	981	GA 5020-G035-446	Sunny	0.8	2.4	0.3
B-06-03	10/12/2021	RM	Decreasing	1002	1002	GA 5020-G035-446	Cloudy	0.1	3.2	0.2
B-06-04	11/01/2021	RG	Decreasing	1022	1021	GA 5020-G035-446	Cloudy	0.1	2.7	0.3

[illegible]

Ground Gas and Soil Vapour Monitoring

Water Lines Engineering
5013719

Location	Depth (m)	Gas Type	Concentration (ppm)	Direction	Notes	Weather	Soil Moisture (%)	Soil Temp (°C)
Point 1	0.1	CH ₄	0.1	Increasing	981	Sunny	0.8	2.4
Point 2	0.1	CH ₄	0.1	Decreasing	1022	Cloudy	0.1	3.2
Point 3	0.1	CH ₄	0.1	Decreasing	1021	Cloudy	0.1	2.7

Point	Depth (m)	Gas Type	Concentration (ppm)	Direction	Notes	Weather	Soil Moisture (%)	Soil Temp (°C)
WS01	30	CH ₄	0.1	0.1	0.1	0.1	0.1	0.1
	60							
	90							
	120							
	150							
	180							
WS05	30	CH ₄	0.1	0	0	0	0	0
	60							
	90							
	120							
	150							
	180							
WS06	30	CH ₄	0.1	0.1	0.1	0.1	0.1	0.1
	60							
	90							
	120							
	150							
WS07	30	CH ₄	0.1	0	0	0	0	0
	60							
	90							
	120							
	150							
	180							

Borehole stopcock cover flooded. Surface water ingress into monitoring well. Potentially invalid results.



APPENDIX 5 – CAT WASTE OUTPUT

CatWasteSol

Hofe ID	Sample Depth	Hazardous Waste Y/N
1	1	
2	1	
3	1	
4	1	
5	1	
6	1	
7	1	
8	1	
9	1	
10	1	
11	1	
12	1	
13	1	
14	1	
15	1	
16	1	
17	1	
18	1	
19	1	
20	1	
21	1	
22	1	
23	1	
24	1	
25	1	
26	1	
27	1	
28	1	
29	1	
30	1	
31	1	
32	1	
33	1	
34	1	
35	1	
36	1	
37	1	
38	1	
39	1	
40	1	
41	1	
42	1	
43	1	
44	1	
45	1	
46	1	
47	1	
48	1	
49	1	
50	1	
51	1	
52	1	
53	1	
54	1	
55	1	
56	1	
57	1	
58	1	
59	1	
60	1	
61	1	
62	1	
63	1	
64	1	
65	1	
66	1	
67	1	
68	1	
69	1	
70	1	
71	1	
72	1	
73	1	
74	1	
75	1	
76	1	
77	1	
78	1	
79	1	
80	1	
81	1	
82	1	
83	1	
84	1	
85	1	
86	1	
87	1	
88	1	
89	1	
90	1	
91	1	
92	1	
93	1	
94	1	
95	1	
96	1	
97	1	
98	1	
99	1	
100	1	



APPENDIX 6 – DCP TEST SHEETS

Water Lane, Angmering - DCP Testing

Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

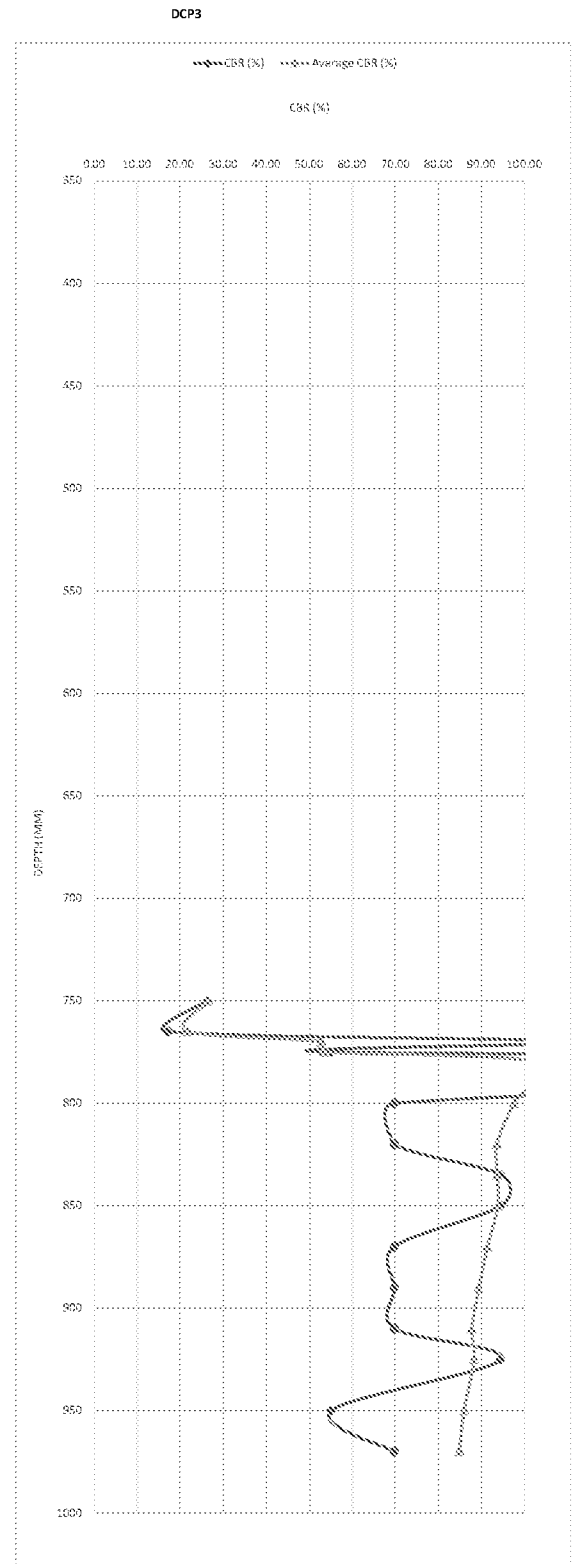
Location	DCP2
Address	Water Lane, Angmering
Date	18/11/2020
Material	Made Ground
Depth	Below surface hardstanding layer

[illegible]

Water Lane, Angmering - DCP Testing

Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

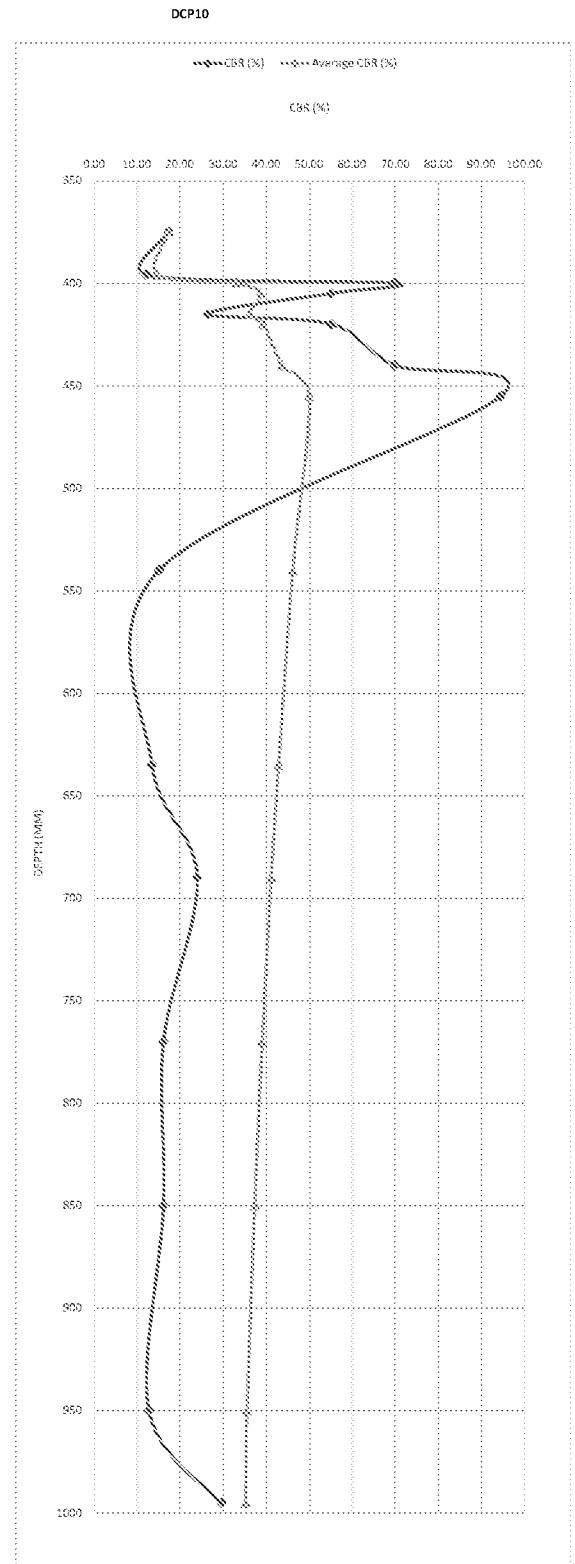
Location	DCP3
Address	Water Lane, Angmering
Date	18/11/2020
Material	Made Ground
Depth	Below surface hardstanding layer

[illegible]

Water Lane, Angmering - DCP Testing

Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

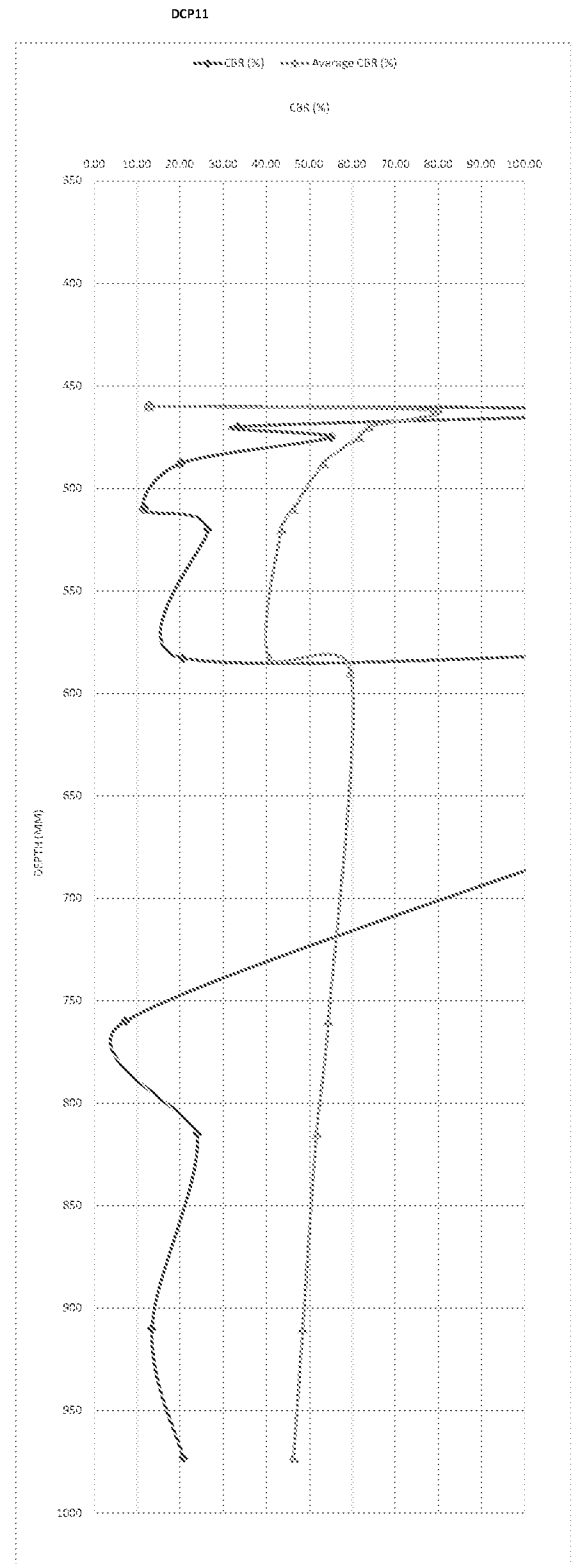
DCP10	Water Lane, Angmering
Date	18/11/2020
Material	Made Ground
Depth	Below surface hardstanding layer

[illegible]

Water Lane, Angmering - DCP Testing

Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

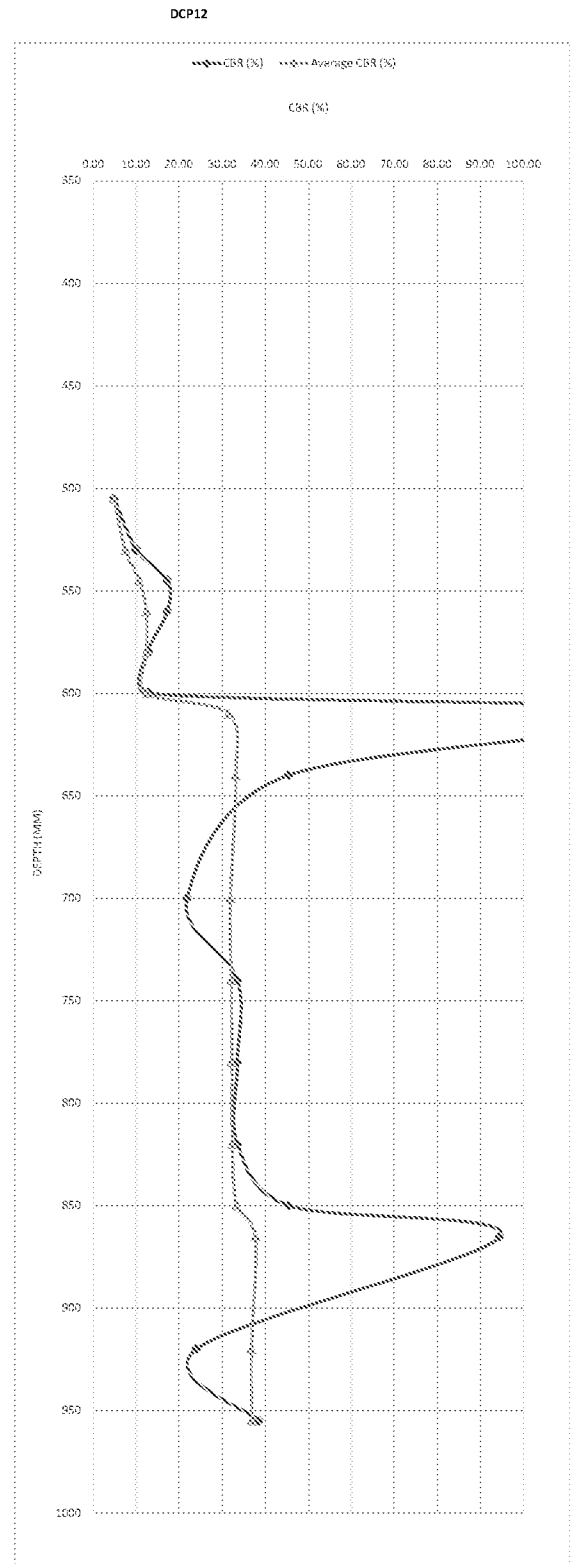
Location	DCP11
Address	Water Lane, Angmering
Date	18/11/2020
Material	Made Ground
Depth	Below surface hardstanding layer

[illegible]

Water Lane, Angmering - DCP Testing

Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

DCP12	
Location	Water Lane, Angmering
Date	18/11/2020
Material	Made Ground
Depth	Below surface hardstanding layer

[illegible]

Water Lane, Angmering - DCP Testing

Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

DCP13	
Location	Water Lane, Angmering
Date	18/11/2020
Material	Made Ground
Depth	Below surface hardstanding layer

[illegible]



RIDGE

