

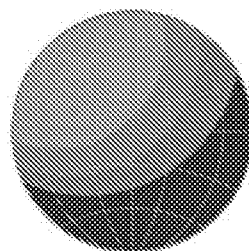
Phase 2: Site Investigation Report

Project Reference: P19.117/SIR

Merry England Nurseries

Prepared For

GD Concepts Ltd



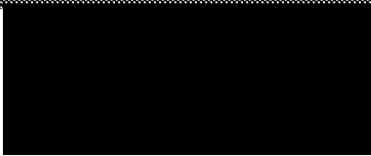
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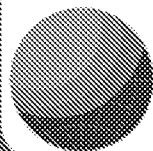


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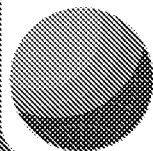
Appendices

Appendix A – Hole Location Plan

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Appendix D – Laboratory Test Certificates



Trading Terms

Unless specifically stated within the tender/quotation or unless identified within the introduction to this report it is confirmed that this report has been compiled wholly in accord with Impact Geotechnical Ltd's terms of engagement. This report is provided for sole use by the Client and is confidential to them. No responsibility whatsoever for the contents of the report will be accepted to anyone other than the Client.

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Context

This report is written in the context of an agreed scope of work between Impact Geotechnical Ltd and the Client and should not be used in a different context. In light of additional information becoming available, improved practices and changes in legislation amendment or re-interpretation of the report in whole or part may be necessary after its original submission.

Professional Interpretation

The recommendations made and opinions expressed in the report are based on the conditions revealed by the site works together with an assessment of the data from the insitu and laboratory testing or in respect of the desktop reports. No responsibility can be accepted for conditions that have not been revealed by the research, site works and testing.

The Client is advised that the conditions observed on site by Impact Geotechnical Ltd at the time of any site survey may be subject to change. Certain indicators of the presence of hazardous substances may have been latent at the time of the most recent site reconnaissance and they may subsequently have become evident. It is not possible to assess areas which are inaccessible or where access is not granted and IGL accept no liability for risks subsequently identified therein.

The conceptual model, Risk assessment and sampling regime has been formulated in accordance with current UK guidance at time of production based upon the relevant information gained from Phase 1 and Phase 2 investigations. While the model and assessment offer opinions and interpretations of these guidelines, the comments made are for guidance only and no liability can be accepted for their accuracy. It is possible that aspects of Geo-environmental reports may need to be altered following consultation with the statutory regulatory bodies to suit planning requirements.

Intrusive Field Operations

The data collected through direct operations in the production of this report has been so obtained, unless directly otherwise stated, in accordance with current UK guidance, law or accepted industry practice, including but not limited to: BS.5930: 1990 Code of Practice for Site Investigations (Amendment 3: 2015), & BS.10175: 2011 + A1: 2013 Investigations into Potentially Contaminated Sites. Exact exploratory locations will depend upon access conditions, site use and plant capability, IGL do not accept liability for issues arising from material identified between or outside of the area of exploratory locations.

Laboratory Testing

Unless stated otherwise within the text, all geotechnical and material laboratory tests have been performed in accordance with the relevant British Standard Documents. Laboratory testing for contaminated land assessment is completed under the UKAS / MCERTS accreditation schemes, unless identified as otherwise in the report.

Human Health Risk Assessment Criteria

The Environment Agency has undertaken revision of the Soil Guideline Values (SGVs) which are partially complete. Where standards are available using the "new" approach, these have been utilised for correlative purposes. Where standards have not yet been revised, guidance following the "old" approach has been utilised. Please note that upon release of the remaining guidelines, the standards contained within this report may be subject to change. In addition, the second edition of the LQM CIEH guidance has now been released and will be utilised in favour of previously published guideline values.

Third Parties

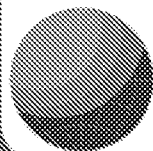
The findings and opinions conveyed in this report are based on information obtained from a variety of sources, including that from previous Site investigations and chemical testing laboratories. IGL has assumed that such information is correct. IGL cannot and does not guarantee the authenticity or reliability of the information it has relied upon and can accept no responsibility for inaccuracies with the data supplied by other parties.

The accuracy of the historical map extracts supplied can not be guaranteed and it should be noted that different conditions may have existed between mapping sheet editions. Therefore, there can be no certainty that all areas of contamination have been identified during the Phase 1 investigation.

Definitions

Reference to the word "contamination" in this report does not relate to the statutory definition of contaminated land under 1990 Environmental Protection Act unless otherwise stated. The definition used in this report is: "Land that contains substances that, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, to the environment, or on occasion to other targets" (NATO CCMS, 1985).

IGL 2019



1.0 INTRODUCTION

Impact Geotechnical Ltd (IGL) were instructed by GD Concepts Limited (the Client) (Q19.132, dated July 2019), to carry out a Phase 2: Site Investigation Report at Merry England Nurseries, Dappers Lane, Angmering, BN16 4EN (hereafter referred to as the "site").

The site is an 'L' shaped parcel of land, the southwest corner of which is occupied by a residential property, the remainder is used for stabling of horses; however disused light industrial buildings are present in the centre of the site from historical use as a nursery.

The site will be developed into a new housing development complete with the following:

- Eighteen new 2 to 4-bed residential premises, inclusive of;
- Private gardens, garages and driveways; and
- New access roadways / pavements which will adjoin Dappers Lane at the west of the site area.

Intrusive works were conducted from 13th to 15th August 2019 and comprised the following:

- Nine windowless sample boreholes to a maximum depth of 5.45mbgl;
- Installation of standpipes within three of the boreholes to allow for continued groundwater monitoring;
- Eight trial pits advanced with both a mechanical excavator and hand tools for additional site coverage and to allow for the completion of soil infiltration testing; and
- The completion of four insitu California Bearing Ratio tests to assist in the design of new roads/ pavements.

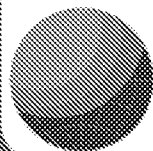
IGL have previously completed a Phase 1: Environmental Risk Assessment (Ref: P19.117/ERA, dated August 2019) which should be read in conjunction with this report.

The purposes of this investigation are two-fold, 1) to provide necessary design parameters for the underlying ground conditions to allow temporary and permanent geotechnical design, and 2) refine the potential pollutant linkages as identified within the Phase 1 Report.

2.0 SITE LAYOUT

Site details are presented in the table below.

Site Address	Merry England Nursery, Dappers Lane, Angmering, West Sussex BN16 4EN
National Grid Reference	507330, 105060
Site Area	1.13 ha
Site Ownership	Private - Client
Site Access	Via a private driveway at the western elevation, this crosses a culverted (dry) ditch.
Site Boundaries	North – Wooden fence
	South – Wooden fence



	East – Wooden fence
	West – wire mesh fence and drainage ditch onto Dappers Lane.
Ground Cover	Soft landscaping (grass and overgrown shrubs, gravel driveway) – 85%
	Hardstanding (concrete slabs and building footprint) – 15%
Site Topography and Elevation	The site is relatively flat, but drops by approximately 1.6m from the northeast to the southwest; at an approximate elevation of 20m AOD.

The site is formed by a recumbent 'L' shaped plot, currently split between residential use and stabling / paddocks for equestrian activities. The residential use is limited to the southwest corner.

The existing two-storey residential house is situated to the immediate south of the site access road, which enters the site approximately half way along the western boundary. From inspection the house is fed by mains electricity and gas and is served by a septic tank, which is located to the immediate east of the property. A prefabricated type concrete domestic garage with (presumed) asbestos cement roof is located to the east of the house, and was observed to house predominantly discarded household fittings.

To the east of the garage is located a concrete slab associated with a demolished building, as evidence by cut steel columns at ground level. This area was noted to house a small amount of demolition material including bricks and broken (presumed) asbestos containing profile roofing board.

The gravelled access roadway leads to a portal framed light industrial building of approximate 10m x 20m dimensions, this has blockwork riser walls and is clad in (presumed) asbestos cement profile sheeting. The building is laid with a concrete slab throughout and is currently used as storage for one vehicle, a plant trailer and some hand tools associated with a construction business. This building also contains various items which are expected to have been associated with the former use of the site as a nursery including tooling, timber, fertilisers, pesticides, rodenticides as well as clerical equipment.

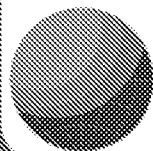
The building contains a vehicle inspection pit at the eastern end, which is presumed to have been used for maintenance of equipment for the nursery. This is adjacent wooden shelving where various, predominantly empty, engine oil and lubricant canisters of up to 10l are located. A waste oil container, within a wooden box, upon newspaper comprising a plastic 5gl drum is present adjacent to the inspection pit. Any hydrocarbon staining to the concrete slab around the oil storage area or inspection pit was very minor.

A further garage / storage building is located immediately adjacent east to the latter, of blockwork construction with a (presumed) asbestos containing profile sheet roof. No access to this building was afforded during the walkover.

A cluster of 7 no single storey stables / sheds are located east of this shed, used for the stabling of horses or storage of associated equipment / materials. Three of these buildings are formed by repurposed box van containers. These stable buildings and the shed are observed to be sited upon concrete slabs, which are observed to be in good condition, where it was possible to inspect.

The remaining site area is laid to grass, separated into paddocks, with the southwest corner used as the residential garden to the house, also a square area along the eastern boundary is laid to overgrown grass and shrubs. This area is also noted to contain a collection of metal and plastic detritus, as well as some limited evidence of bonfire activity.

Limited discrete areas of discarded materials, predominantly wood (including discarded propane bottles, metal and plastic are noted to the immediate north of the eastern end of the access road and at the western end of the site, again to the north of the access road.



3no empty 25gl oil barrels are noted beneath a tree along the northern elevation of the site, it is understood from the current owner that these have been insitu since the previous occupier was resident; it is considered most likely that these were used for equestrian props, rather than a fuel source, given their location next to a former sand paddock.

Mature trees are noted along the western elevation, the southwest elevation and along the flanks of the access road, predominantly of Beech variety. The residential garden includes sporadic trees of Apple, Cherry Laurel, Chestnut and Magnolia varieties.

2.1 Surroundings

The setting is of mixed land use; beyond the western elevation is dominated by residential properties, beyond the eastern is agricultural land. The northern boundary, at the western end flanks a residential house (Greenaways) and also adjoins a small holding growing vegetables, as well as a horse paddock.

To the south west is a further horse paddock with a residential dwelling beyond. The southeast corner flanks a builder's yard which is partly occupied by a paving company. This includes storage containers and several heaps of waste paving materials and soils. The south-eastern corner flanks the gable end frame of a former glasshouse.

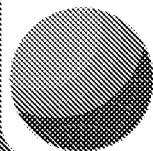
3.0 PHYSICAL SETTING

3.1 Geology and Hydrogeology

The Geology of Britain Viewer (BGS, 2019) indicates the site is underlain by Superficial Deposits of Head Deposits, over Bedrock Geology of London Clay Formation.

The table below identifies the expected composition of the published strata and the associated aquifer classification.

Superficial / Drift Geology	
Unit Name	Head Deposit (shown over western three-quarters of site area)
Geology Description	Polymict deposit generally formed by clay, silt and gravel in variable proportions depending upon the composition of the upslope source and the distance to that source.
Aquifer Class	Secondary (Undifferentiated)
Aquifer Description	Assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. Two separate groundwater vulnerability classifications are listed for this aquifer, indicating a 'medium' combined vulnerability, with a 'Low' to 'Intermediate' Pollutant Speed. This is considered to reflect the presence of Chalk below this superficial deposit to the south of the site.
Bedrock / Solid Geology	
Unit Name	London Clay Formation
Geology Description	Heavy clays and weak mudstones, variability silty and sandy, particularly at the top and base of the succession.
Aquifer Class	Unproductive Strata.
Aquifer Description	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow



3.2 Geological Hazards

The British Geological Survey (BGS) has provided the available published Geological Hazard directory information for the study site. The information returned is displayed in the table below.

Hazard	Risk Level
Shrink Swell Clays	Low to Very Low
Collapsible Ground	Very Low
Landslides	Very Low
Running Sands	Very Low
Compressible Ground	Negligible
Ground dissolution of soluble rocks	Negligible

3.3 Hydrology

Surface Water Features – The nearest surface water feature is noted to be 53m north and from assessment of aerial images is noted to be a pond within a field associated with a private property.

OS Water Network Lines – There are 41no records within 1000m of the site, all relate to the Rother and Arun river network and are predominantly related to inland river entries. Two of these are within 250m, including an inland river 130m north 'on ground surface'; as well as an 'underground' inland River 218m northeast.

River Quality – One record exists 294m southeast for 'Black Ditch', dated 2000; this indicates river Quality 'D'.

BGS Groundwater Flooding Susceptibility – There is potential for groundwater flooding to properties situated below ground level. Additionally there is a risk of groundwater flooding to occur at the surface indicated 4m south and 169m southeast. Note, this data should not be used in isolation as a final indicator of groundwater flooding susceptibility and risk at individual properties.

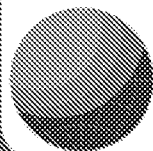
3.4 Controlled Waters

Groundwater Abstraction Licences – Within 2000m there are fifteen records, the closest of these is located 853m west for spray irrigation, no start or end date is provided, it is assumed that this is active. The closest abstraction for potable water supply is a joint agricultural / domestic license 1450m west; Southern Water PLC also have 2no licenses, which are considered active, for abstraction for public supply 1660m northwest.

Surface Water Abstraction Licences – There are four records within 2000m the closest is located 1833m southwest for spray irrigation and is considered to be active.

Source Protection Zones – The site is not situated within a Source Protection Zone, the nearest is located 884m north and is classified as a Zone 2c (outer protection).

Groundwater Vulnerability and Soil Leaching Potential – On site is classified as having Low to intermediate leaching potential.



4.0 PREVIOUS REPORTS

A Phase 1: Environmental Risk Assessment Report was completed by IGL in August in 2019 (ref: P19.117/ERA). The purpose of the Environmental Risk Assessment was to provide information on the following: the expected geology and hydrogeology; the development history and most recent uses of the site; potential sources of contamination; and, to enable the development of a preliminary Conceptual Site Model (CSM) and risk assessment.

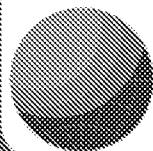
The primary receptor is the proposed residential end-user through potential exposure to contaminated soils. Additionally the site workers during the development and future buried services. Potential receptors also include the underlying Secondary (Undifferentiated) Aquifer and the ditch at the western site boundary.

Following a site walkover, review of historical maps, and information on public record, potential sources of contamination have been identified:

Location	Source No.	Details
On site	1.	Use of lubricant oils and inspection pit area of shed building for equipment repairs. Contaminants of concern include Heavy metals and Hydrocarbons.
	2.	The potential for Made Ground onsite, including areas of former development and those areas which have been subject to tipping of discarded materials including metals, gas bottles, masonry rubble and asbestos containing materials. Contaminants of concern include Heavy metals and Hydrocarbons and asbestos.
	3.	Historical use of the site as a nursery. Contaminants of concern include heavy metals and pesticides.
Off site	4.	Off-site builders' yard. Potential contaminants of concern include heavy metals, hydrocarbons, asbestos.

A summary of the Conceptual Site Model (CSM) and risks perceived to be above **Low** are shown below. An explanation of categories is provided below the CSM table within Section 11.0.

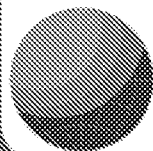
Source	Pathway	Receptor	Likelihood	Potential Risk
1. Use of lubricant oils and inspection pit area of shed building for equipment repairs. Contaminants of concern include Heavy metals and Hydrocarbons.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End Users	Possible	Moderate
		Site workers (during development).	Possible	Low
	Impacted Soils.	Services	Possible	Low
	Volatilisation of hydrocarbons in underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development.	Unlikely	Negligible / Low
		Site workers (during development).	Unlikely	Low
	Infiltration and migration of contaminants through the underlying geology.	Superficial Secondary (Undifferentiated) Aquifers underlying the site.	Possible	Low
	Direct runoff and base flow.	Surface Water – Ditch at western elevation	Unlikely	Negligible



Source	Pathway	Receptor	Likelihood	Potential Risk
2. The potential for Made Ground onsite, including areas of former development and those areas which have been subject to tipping of discarded materials including metals, gas bottles, masonry rubble and asbestos containing materials. Contaminants of concern include Heavy metals and Hydrocarbons and asbestos.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End Users	Likely	Moderate
		Site workers (during development).	Possible	Moderate
	Impacted Soils.	Services	Possible	Moderate
	Volatilisation of hydrocarbons in underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development.	Unlikely	Low
		Site workers (during development).	Unlikely	Low
	Migration of ground gas through the soil pores of the underlying geology.	End users and proposed development.	Unlikely	Negligible
		Site workers (during development).	Unlikely	Negligible
	Infiltration and migration of contaminants through the underlying geology.	Superficial Secondary (Undifferentiated) Aquifers underlying the site.	Possible	Low
3. Historical use of the site as a nursery. Contaminants of concern include heavy metals and pesticides.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End Users	Likely	Moderate
		Site workers (during development).	Possible	Low
	Impacted Soils.	Services	Possible	Low
	Infiltration and migration of contaminants through the underlying geology.	Superficial Secondary (Undifferentiated) Aquifers underlying the site.	Possible	Low
	Direct runoff and base flow.	Surface Water – Ditch at western elevation	Possible	Low
4. Off-site builders' yard. Potential contaminants of concern include heavy metals, hydrocarbons, asbestos.	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End Users	Possible	Low
		Site workers (during development).	Unlikely	Negligible
	Impacted Soils.	Services	Unlikely	Negligible
	Volatilisation of hydrocarbons in underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development.	Unlikely	Negligible
		Site workers (during development).	Unlikely	Negligible
	Infiltration and migration of contaminants through the underlying geology.	Superficial Secondary (Undifferentiated) Aquifers underlying the site.	Possible	Low

Recommendations following Preliminary CSM

Based on the findings of the Phase 1 Report, it was deemed that a Site Investigation would be required in order to quantify the potential pollutant linkages determined with the Preliminary CSM. In particular the risks to the residential end-user, site workers and buried services should be determined from the potential onsite Made Ground, the neighbouring builders' yard and the former use of the site as a nursery. Targeted investigations are also necessary to quantify the risks associated with the storage of oils and maintenance of vehicles / plant within the shed on site.



The investigations that were considered necessary to assess the potential risks are detailed in the subsequent table.

Targeted Investigations	
Investigation Required	Purpose(s)
Window sample / trial pit adjacent to the oil storage and vehicle inspection pit area.	Collect representative soil samples. Assess visual / olfactory evidence of contamination. Consideration given to installation of a monitoring standpipe in the event of evidence of contamination.
Trial pits / window samples adjacent to areas of discarded materials including metals, plastic and masonry; as well as evidence of previous bonfires	Collect representative soil samples. Assess visual / olfactory evidence of contamination.
At least 1no exploratory hole located on the southern boundary adjacent to the builders' yard	Collect representative soil samples. Assess visual / olfactory evidence of contamination. Consideration given to installation of a monitoring standpipe in the event of evidence of contamination.
Non-Targeted Investigations	
Investigation Required	Purpose(s)
A series of approximately 10-12 further exploratory positions to gain site coverage, including areas of proposed garden and former glasshouse	To provide sufficient coverage of site area and assess presence / composition of Made Ground soils. Collect representative soil samples. Assess visual / olfactory evidence of contamination.

Further details of recommendations can be viewed within the previously issued report.

Actual fieldworks conducted, are detailed in Section 5.0 of this report.

5.0 FIELDWORKS

5.1 Site Management and Preparation

The following intrusive works were undertaken on date, supervised by an Engineer from IGL. Where applicable, the works were carried out in accordance with statutory guidance including BS5930:1999 *Code of Practice for Site Investigations (Amendment 3: 2015)*, BS 10175:2011+A1:2013 *Investigation of Potentially Contaminated Sites: Code of Practice*, and BS ISO 5667-11 *Water Quality-Sampling-Guidance on Sampling of Groundwater*.

Prior to any excavations taking place a Cable Avoidance Tool (CAT) was used to check for the position of any underlying electrical services. In addition, starter pits were excavated to 1.20 metres below ground level (mbgl) to clear test locations prior to any intrusive work, where possible.

A plan indicating intrusive locations can be viewed in **Appendix A**.

5.2 Windowless Sample Boreholes

- Nine windowless sample boreholes (WS1-WS9) were advanced to a maximum depth of 5.00mbgl using a tracked windowless sampling rig. Investigation locations were selected to allow coverage of the proposed building footprints for the purposes of providing geotechnical information, as well as targeting proposed private garden areas.



- On completion, three of the boreholes (WS1, WS4 and WS7) were installed as dual purpose gas and groundwater monitoring wells constructed with 50mm internal diameter HDPE plain and slotted pipe. The response zone of the wells was designed to target groundwater within the underlying head deposit.
- A filter pack of washed gravel was placed in the well annulus to just above the screen sections, and the annulus was sealed to the surface with bentonite. The monitoring wells were finished with raised covers.
- The remaining boreholes were backfilled with arisings.

5.3 Trial Pits

- Eight trial pits (TP1-TP8) were advanced to a maximum depth of 2.60mbgl predominantly by means of a mechanical excavator, with TP8 only excavated by means of hand tools. TP1-TP3 were used to target potential areas of proposed soakaway structures and used for BRE 365 testing. TP3 additionally targeted an area of discarded detritus and evidence of bonfires. TP4 was used to target an area of oil / fuel storage and a vehicle inspection pit. TP5 was located adjacent to the boundary with the neighbouring builders yard.
- Trial pits were backfilled using arising materials upon completion.

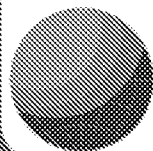
5.4 Soil Sample Collection

- All intrusive locations were logged, visual and/or olfactory evidence of contamination noted and representative soil sample removed in accordance with current protocol for geotechnical and geo-environmental parameters.
- Selected samples were placed in sealed glass jars or plastic tubs (dependent on the exact laboratory requirements and analysis to be undertaken) and stored in a temperature controlled environment before transit. Samples were handled using a fresh pair of nitrile gloves.

The results of the analytical soil testing are discussed in Section 8.2.

5.5 Insitu Testing

- Four insitu CBR (California Bearing Ratio) Tests (CBR1-CBR4) were completed at a depth of 0.30mbgl using a vehicle mounted CBR testing rig.
- Soil infiltration testing in general accordance with the standard identified in BRE 365 was conducted in TP1-TP3.



6.0 GROUND CONDITIONS

6.1 Soils

The following table summarises the strata conditions encountered during the intrusive works:

Stratum	Depth Range Encountered	Detail Description
Made Ground	GL – max.0.25m	Variable material generally described as either gravelly Silt / Clay or gravelly Sand. This material is limited to locations TP3, TP4, TP7 and WS4; predominantly representative of reworked topsoil with scattered detritus described as terracotta, brick, plastic and glass. In WS4 the Made Ground is associated with the sand paddock and is described as gravelly Sand, with gravels of sandstone. CBR test locations CBR2-CBR4 encountered Made Ground soils described as sandy gravel of brick and concrete to a maximum depth of 0.30mbgl associated with the existing access road.
Topsoil	GL – max. 0.30m	Discernable across most exploratory locations, below a surface of grass, the initial soils across the majority of exploratory hole locations were described as Sand or Silt Topsoil, locally with flint gravels.
Sandy SILT / Silty SAND (Head Deposit)	GL-0.30m to 0.60-2.30m	Generally described as stiff to very stiff / compact light brown sandy Silt or silty Sand. Locally with flint gravels and becoming gravelly toward the base of the stratum. This material is considered to be representative of an upper horizon within the Head Deposits.
Gravelly CLAY (Head Deposit)	0.60-0.95m to 1.80-3.00m	Encountered as a firm to stiff and locally stiff consistency material, this is described as brown slightly sandy to sandy, slightly gravelly to gravelly Clay. This stratum is limited to exploratory locations TP2, TP7, WS4, WS5 and WS6, which indicate that this material may be more prevalent across the northern and northwestern areas of the site.
Clayey Gravel (Head Deposit)	0.60-3.00m to 2.40->5.00m	Encountered as dense and locally very dense brown speckled grey clayey Gravel of flint.
Silty Clay (London Clay Formation)	2.40-3.90m to >5.00m	Encountered as stiff and locally very stiff consistency brown, becoming grey silty Clay. Locally encountered as thinly laminated and closely fissured.

Please refer to the stratigraphic logs contained within Appendix B for a more detailed description.

6.2 Groundwater

Groundwater was not encountered within all exploratory holes, however records across the site indicate levels of 1.50-3.33mbgl. On the basis of plans provided this is considered to equate to approximate elevations of 17.10-18.7mAOD.

Borehole locations WS1, WS4 and WS7 were installed to allow subsequent winter groundwater monitoring, which will be detailed in a subsequent report.

6.3 Visual and Olfactory Observations of Contamination

Minor anthropogenic materials were observed in the Made Ground soils. In location WS4 at a depth of 2.15-2.30mbgl a moderate hydrocarbon odour and grey / black staining was observed within the Head Deposit.



6.4 Insitu Testing

6.4.1 California Bearing Ratio (CBR)

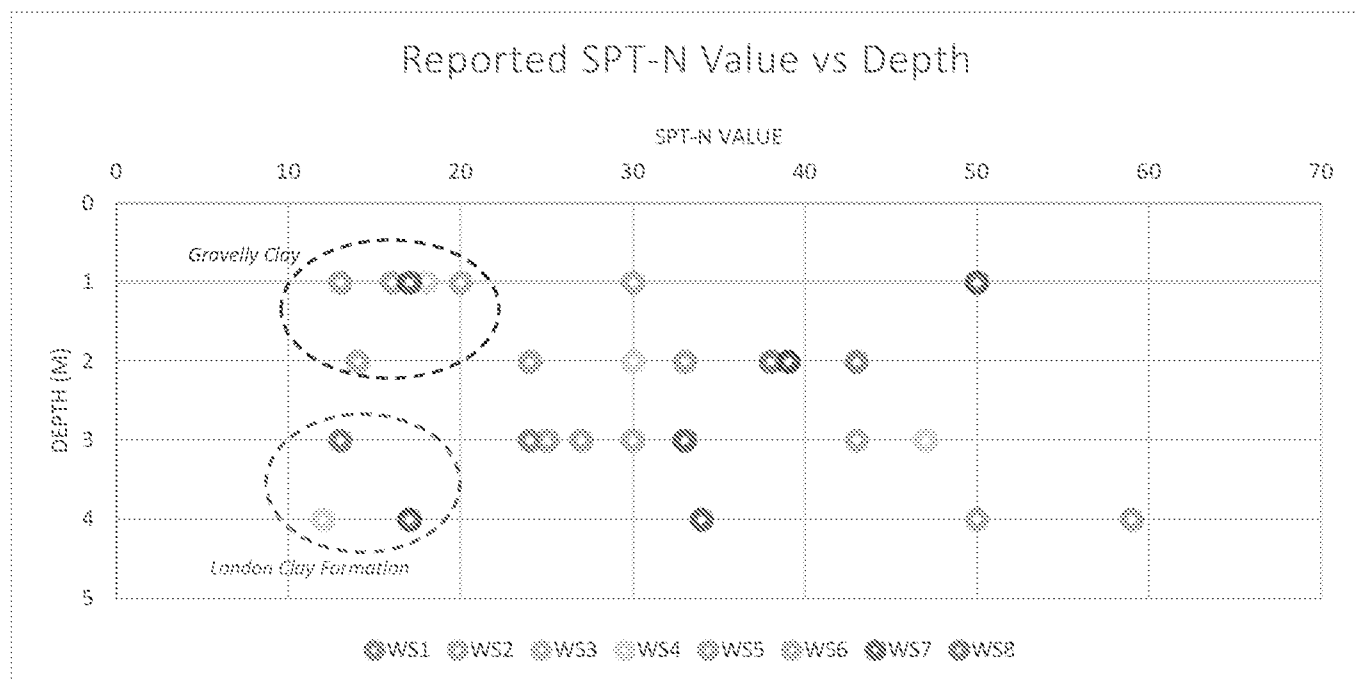
Four insitu CBR tests were completed along the proposed access roadway at a depth of 0.30mbgl using a vehicle mounted test rig. This equipment uses the reaction force of a vehicle to gradually jack a piston into the ground to achieve a penetration of 7.5mm. The applied force to cause the deformation at 2.5 and 5.0mm penetration is measured for conversion to a CBR value.

Measured CBR values ranged from 4-21%, with natural moisture content of the samples found to range from 7.7-18%.

6.4.2 Standard Penetration Testing

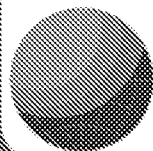
Standard Penetration testing was completed throughout the drilling of WS1-WS8 at 1.00m centres to 4.00mbgl. This form of testing is completed using a 63.5kg drop hammer weight, over a 750mm drop, measuring the blow counts for six, 75mm increments. The first two values are recorded as seating blows, with the remaining four values, added together to provide an 'N-value'.

The graph below summarises the results of this testing, by conversion to equivalent SPT-N values.



Tests within the upper sandy silt / silty Sand stratum and the gravelly clay portion of the Head deposits indicate SPTN values of N=13-20, which is considered to be representative of stiff to very stiff consistency. This is a higher consistency term than was applied by the logging engineers, however the high granular content of this soil is likely to have increased N values slightly.

Testing within the granular Head Deposits, described as clayey gravel show a range of SPTN values of N=24 to >50; indicative of medium dense to dense and locally very dense soils.



The four tests completed in the London Clay Formation bedrock material range from N=12-17, indicative of stiff consistency clay soils, which is considered complimentary to the logging description.

6.4.3 Soil Infiltration Testing

Soil infiltration testing was completed within TP1, TP2 and TP3 in accordance with the testing standards identified in BRE 365: 2016 'Soakaway Design'. The tests included the squaring of the pit sides before filling with potable water, the subsequent decline in water level was measured to allow determination of the coefficient of permeability (k); using this testing method, the rate of outflow between 75% and 25% effective depths are used to determine the infiltration rate.

The table below summarises the test results.

Test ref	Test Depth (m)	Initial fill level (mbgl)	Time at 75% fill depth (mins)	Time at 25% fill Depth (mins)	K (m/s)
TP1	1.40	0.53	40	180	1.4×10^{-5}
TP2	2.00	0.90	330 (estimated)	990 (estimated)	3.1×10^{-6} (Estimated)
TP3	1.70	0.83	55	240 (estimated)	1.1×10^{-5} (Estimated)

These results indicate 'good' and in TP2 'poor' drainage on the basis of table 14.1 'Soil Mechanics in Engineering Practice', Terzaghi, Peck and Mesri (after Casagrande and Fadum (1940)).

Please note that these results are based on a single test, and infiltration rates may be slower during saturated conditions, as simulated in second and third fill tests scenarios.

8.0 LABORATORY TESTING

8.1 Geotechnical Testing

8.1.1 Atterberg Limits and Natural Moisture Content

In total, seventeen disturbed samples of the underlying soils were submitted for determination of their Natural Moisture Content (NMC) with ten subsequently analysed for Plasticity Index (PI).

The samples tested for NMC were selected from depths between 0.30m and 3.50mbgl. Results ranged between 7.7% and 31%.

The results within the upper Head Deposits indicate Liquid Limits between 34% and 54%. Once the portion retained on the 425µm sieve had been taken into account (4-88%), the Modified PI results lie between 3% and 26%.

Within the London Clay Formation soils results indicate Liquid Limits between 74% and 78%. Once the portion retained on the 425µm sieve had been taken into account (0-4%), the Modified PI results lie between 47% and 51%.

Based upon these results the Head Deposit soils are of variable low to intermediate and locally intermediate-to-high plasticity. In accordance with the NHBC guidance (chapter 4.2 'Building Near Trees') these soils have variable



shrinkage potential including non-shrinkable and both and moderate shrinkage potential soils. Notably the gravelly Clay soils encountered in WS4, WS5, WS6 and WS7 are of moderate shrinkage potential. The soils of the London Clay Formation are very high plasticity and would be considered high shrinkage potential in accordance with NHBC guidance.

8.1.2 Sulphate and pH Analysis

Fourteen samples were submitted for determination of pH with nineteen submitted for Water Soluble Sulphate concentration.

Samples were selected from depths of 0.05-5.00mbgl. pH levels ranged from 6.3-8.4. Water soluble sulphate concentrations were found to range from <10-119mg/l.

8.1.3 Laboratory CBR

One sample from TP1 at a depth of 0.40-0.70mbgl was submitted for determination of CBR value. Results indicate a top value of 40% and base value of 31%.

8.1.4 Particle Size Distribution

Seven samples recovered from the Head Deposits were submitted for determination of their constituent clast sizes by means of wet sieving. The results indicate that these samples were 51-79% gravel, 10-18% Sand and 4-34% Silt and Clay. On the basis of these results these soils would be classified as sandy, and variably slightly to very silty / clayey GRAVEL.

8.2 Geo-Environmental Analysis

8.2.1 Soil Analysis

Fourteen soil samples obtained from depths ranging between 0.05 and 3.00mbgl were submitted to DETS, a UKAS and MCERTS accredited laboratory testing facility, for a screen of contamination testing from both the Made Ground and shallow underlying natural soils. Although not all samples were tested for all analytical determinands, suites included an asbestos screen, heavy metals and hydrocarbons including speciated Total Petrol Hydrocarbons (TPH LQM aromatic/aliphatic split), BTEX, MTBE and speciated Polycyclic Aromatic Hydrocarbons (PAH), as well as a background suite of pH, SOM, total cyanide, total phenols organic phosphorous and organic chlorine pesticides.

Rationale for Analysis

The primary driver in the selection of samples for analysis was the need for site coverage, incorporating areas of proposed soft landscaping, however certain samples were selected to target specific sources:

- Samples from WS4 and TP7 were scheduled for testing on the basis of visual and olfactory evidence of hydrocarbon contamination in WS4 at 2.15-2.30mbgl. This included samples from above and below this depth, to indicate whether the source of this contamination was the shallower soils, and also to check for downward migration.
- Samples from TP4 and TP5 were selected to target the oil/fuel storage area and vehicle inspection pit and the neighbouring builders yard respectively.
- Samples from TP3 were selected to target the area of tipped / discarded materials in this area.



- Selected samples were submitted where Made Ground soils were encountered, including in the underlying natural soils to check for any impact caused by said Made Ground.

Screening Criteria

The results of this laboratory testing have been compared to published guidance criteria, widely referred to by consultants and Regulatory Authorities within the industry, and include the following:

The UK Soil Guideline Values (SGVs) for selected metals, BTEX and phenols, produced by the EA and the Department of Environment, Food and Rural Affairs (DEFRA), 2009;

Suitable 4 Use Levels (S4ULs) Generic Assessment Criteria (GAC) for 82no. contaminants developed by the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management Ltd (2015). It is anticipated that this screening criteria will be applied by the Local Authorities, but it should be noted that the CIEH S4ULs have not been issued through the EA or DEFRA;

A further set of GAC for 35no. mainly organic contaminants not already covered by SGV or S4ULs produced by the CIEH and published by Contaminated Land: Applications In Real Environments (CL:AIRE) in conjunction with the Association of Geotechnical and Environmental Specialists (AGS) and the Environmental Industries Commission (EIC), 2010; and,

Provisional Category 4 Screening Levels (pC4SL) for lead, which have been produced by CL:AIRE (2014).

Comparisons were made against guidance criteria for the 'residential with home-grown produce' land use setting, based on the end use of the site. Results were compared to the conservative 1.00% soil organic matter values unless otherwise stated.

8.2.2 Soil Results

Results have not been subject to statistical analysis due to the targeted nature of the sampling strategy. Referring to guidance only systematic or unbiased sampling data should be subject to statistical testing since it is only from this type of data that inferences can be drawn out from conditions within the sampled body of soil as a whole.

A summary of soil results is presented in the following tables, with a discussion of results below.

Organic Matter and Asbestos

Organic matter content ranged from <0.10 – 5.00% in Made Ground. Following the asbestos screen, asbestos was not identified within any of the analysed samples.

Heavy Metals

One determinand in one sample was found to be elevated above the relevant GAC threshold. This is arsenic in WS4 at a depth of 2.20mbgl which recorded a value of 34mg/kg against the GAC value of 32mg/kg.

PAHs

No exceedances of the GAC values were recorded, with the majority of samples returning values below the laboratory of detection.

TPH

Levels of TPH were generally close to, or below the Laboratory Limit of Detection. However the sample from WS4 at 2.20mbgl indicated values in excess of the GAC for several carbon chain congeners, particularly on the basis that the organic matter content for this sample is 1.1%. This includes:



- Aliphatic >C8-C10: 35mg/kg – GAC = 27mg/kg
- Aliphatic >C10-C12: 136mg/kg – GAC = 130mg/kg
- Aliphatic >C12-C16 considered elevated: 611mg/kg, but no GAC exists
- Aliphatic >C16-C21 considered elevated: 614mg/kg, but no GAC exists
- Aromatic >C12-C16: 625mg/kg – GAC = 140mg/kg
- Aromatic >C16-C21: 736mg/kg – GAC = 260mg/kg

On the basis of the concentration of high values in the ~C12-C21 range this is considered to be representative of a Diesel range petroleum hydrocarbon.

BTEX/ MTBE

All values were found to be below the laboratory limit of detection.

Pesticides

Levels of Organophosphorus and Organochlorine pesticides were generally found to be below the laboratory limit of detection. Exceptions to this were in TP3 at 0.05mbgl where o,p' – DDT, p,p' – DDD, p,p' – DDE and p,p' – DDT were encountered at concentrations ranging from 0.02-0.24mg/kg.

Whilst these compounds do not currently benefit from UK soil guidelines, the U.S Acceptable Daily Intake limit for Dieldrin based pesticides is in the order of 0.20mg/kg, per day, indicating that inhalation and ingestion of these soils would need to reach ~1kg per day for this exposure limit to be reached.

Full laboratory test results can be found in Appendix D.

9.0 GEOTECHNICAL DISCUSSION

9.1 Soil Engineering Properties

It is understood that the site is to be developed with eighteen new, predominantly detached residential premises, along with new access roadways etc. The new buildings are expected to be 2-storey and load bearing masonry, full final loadings are not known at the time of writing but are not expected to be excessive.

On the basis of exploratory hole logs the site is predominantly covered by Sand / Silt topsoil, with discrete areas of Made Ground which was encountered to a maximum depth of 0.30mbgl and is predominantly described as reworked topsoil. It should be noted that the majority of the exploratory holes were completed away from existing structures, and that deeper Made Ground will exist locally, particularly around buried foundations and the vehicle inspection pit.

Upper natural soils are described as light brown silty Sand / sandy Silt (locally silt / clay) which was encountered in a dry and friable condition across the site. This material is described to have variable content of flint and rarely chalk gravel, locally becoming gravelly toward the base. This upper portion of the Head Deposits is encountered to depths ranging from 0.60m to 2.30mbgl.

Insitu testing in WS2 and WS7 indicates that this soil is of medium dense / stiff consistency with SPTN values of N=16-17. The results of Atterberg limits testing indicate that this material is of Intermediate to High Plasticity and would be considered to be of low to medium shrinkage potential.

With the exception of WS7, this upper horizon in the Head Deposits is underlain by either gravelly Clay or clayey Gravel to depths of 2.40m to >5.00mbgl.



Gravelly clay is encountered in TP2, TP7, WS4, WS5 and WS6, and is described as firm to stiff or stiff consistency brown gravelly Clay, where the gravel is of flint; extending to depths of 1.80-3.00mbgl. Insitu testing indicates that this stratum is of stiff consistency, with laboratory testing indicating that it is of medium shrinkage potential.

Medium dense to very dense clayey gravel of flint is the dominant soil type of the superficial Head Deposits. The logging engineer's description is confirmed by both insitu SPT and laboratory classification testing. This material is noted to underlie the gravelly Clay in WS4, WS5 and WS6.

The bedrock geology is encountered beneath the variably thick Head Deposits within WS1, WS3, WS4 and WS8, extending to depths in excess of 5.00mbgl. This material is described as stiff consistency brown becoming grey, locally fissured and thinly laminated silty Clay.

Laboratory testing has indicated that the London Clay is Very High Plasticity and would be considered to be, worst case high shrinkage potential in accordance with NHBC guidance.

With correction applied for granular content, it is considered that no evidence for soil desiccation was evident on the basis of the relationship between liquid Limits and Natural Moisture Contents indicated by laboratory testing.

Groundwater was not encountered within all exploratory holes, however records across the site indicate levels of 1.50-3.33mbgl. On the basis of plans provided this is considered to equate to approximate elevations of 17.10-18.7mAOD.

9.2 Shallow Foundations

The Made Ground soils encountered across the site would not be considered suitable as a bearing stratum; soils of this origin are frequently present in a weak and variable condition such that unacceptable settlement would be anticipated even under light loading intensities.

Foundations may be formed within the underlying Head Deposits, albeit that these are variable in terms of composition and strength which will lead to variable consolidation behaviours.

An assessment of the zones of influence of trees on the basis of NHBC guidance should be made as part of the preliminary assessment of foundation depths, with particular reference to the mature trees which are prevalent in the western half of the site area (predominantly beech) and the worst case medium shrinkage potential clay soils.

Furthermore it would be considered that a minimum foundation depth of 0.90mbgl should be used in the medium shrinkage potential upper head Deposit soils.

The main body of the Head Deposits is formed by Gravel. In soils described as medium dense to dense brown speckled grey clayey Gravel, a safe bearing pressure of 150kN/m² is considered to be achievable at a depth of 1.00-1.50mbgl.

Where gravelly Clay soils are encountered, as are observed more frequently in the northern and north-western portions of the site, it would be considered at a safe bearing capacity of 100kN/m² is appropriate at a depth of 1.00-1.50mbgl, increasing to 120kN/m² at 1.50-2.00mbgl.

As a result of the variability in soil type encountered across the site it would be recommended that structural reinforcement is considered to foundations to account for differential settlement. In addition it would be considered prudent that the designing engineer inspect foundation excavations at formation level to ensure that



foundation widths are adequate for the materials encountered and that assumptions in relation to soil volume change potential are adequate.

9.3 Floor Slabs

The floor slab design will depend on the final foundation designs and is dependent on the underlying materials, including bearing capacity and the presence of any cohesive or Made Ground Soils.

Given the medium shrinkage potential soils encountered, it would be recommended that a fully suspended floor slab is used in order to account for these factors; the advice of the NHBC guidelines should be adhered to in the design of such a floor.

9.4 Excavations and Groundwater

It is possible that excavations of less than 1.20mbgl will require support to their faces due to variance in the composition of the Head Deposits, as well as potential Made Ground around existing structures. Should excavations be taken below this, adequate support should be provided in order to satisfy statutory safety regulations.

Groundwater has been identified up to 1.50mbgl during site works; the site is due to undergo monitoring during the period October 2019 – March 2020 and final temporary and permanent works recommendations should be based upon these winter groundwater level figures.

Any excavation made below groundwater levels on site is expected to be subject to the inflow of groundwater which is expected to result in the instability of excavation faces, particularly where granular soils are encountered. It is strongly recommended that provision is made in the specification of ground works for dewatering.

If groundwater is identified within any of the excavations during the construction phase, then it should be dealt with appropriately and removed using good engineering practices.

The design of any temporary retaining structures to support excavation faces should be made assuming the following moderately conservative parameters:

Material	Effective angle of friction (ϕ')	Effective Cohesion; c' (kPa)	Bulk Density kN/m^3
Made Ground / Topsoil	24-25	0	16
Sandy Silt / Clay	25-26	0	17
Gravelly Clay	25-26	0	18
Clayey Gravel	30-32	0	18
London Clay Formation	23-24	0	18



9.5 Aggressive Chemical Environment to Concrete

Sulphate concentrations within the Made Ground and Natural soils were found to range from <10mg/l to 119mg/l and pH levels were noted to range from 6.3 to 8.4 suggesting that a design class of DS-1 and a sub class of AC-1^d should be adopted for buried concrete structures within these soils, (Reference made to current BRE SD1 Guidelines) based on the soils tested.

9.6 Pavements and Road Designs

Insitu and laboratory CBR results range between 4% and 30%. As such we would suggest a design value of 5-6% is adopted for new road and pavement designs, based on the soils tested.

9.7 Drainage Designs

On the basis of soil infiltration testing completed, rates of between 1.4×10^{-5} and 3.1×10^{-6} have been recorded. Testing results suggest drainage conditions on site are on the border of good / poor. Given the variable soil conditions encountered across the site, it is likely that variations in soil infiltration rates will be encountered.

10.0 GEO-ENVIRONMENTAL DISCUSSION

A discussion of findings is detailed below with subsequent refined pollutant linkages detailed in the Conceptual Site Model in Section 10.2.

10.1 Discussion of Findings

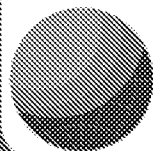
The preliminary CSM identified a number of potential contamination linkages. The most significant of these is related to the proposed residential end user, who are at risk due to potentially contaminated Made Ground soils, the limited use of lubricating oils on the site and the former use as a nursery.

Based on the findings of the Phase 1 Report, it was deemed that a Site Investigation would be required in order to quantify the potential pollutant linkages determined with the Preliminary CSM. In particular the risks to the residential end-user, site workers and buried services should be determined from the potential onsite Made Ground, the neighbouring builders' yard and the former use of the site as a nursery. Targeted investigations are also necessary to quantify the risks associated with the storage of oils and maintenance of vehicles / plant within the shed on site.

The aims of the Site Investigation were to: target the oil / fuel storage area and the adjacent builders' yard; target areas which were historically used as greenhouses; target proposed areas of development and soft landscaping; and, provide additional coverage of the remainder of the site.

Very limited exceedances of the GAC for the Residential with Homegrown Produce land-use setting were recorded, with only Arsenic and several TPH congeners associated with Diesel range hydrocarbons found to exceed the GAC thresholds. These were limited to one sample – WS4 at 2.20mbgl. This is noted to be the sample collected from material exhibiting a moderate hydrocarbon odour and black/grey staining.

The sample below did not indicate any exceedances, or even elevated values. Furthermore these values are noted to be below the Residential Without Homegrown Produce GAC values, which may be considered applicable given the depth of the contamination in this instance.



This instance of exceedances and latent evidence of contamination was limited to one exploratory hole and limited to 150mm thickness – it was not reproduced within the adjacent TP7. It is considered likely that this is associated with the groundwater which was noted at 2.35mbgl, just below the staining / odour and may indicate that this hydrocarbon has migrated to this location as a LNAPL (Light Non-Aqueous Phase Liquid) from a spill elsewhere. Given the history of the site, it is considered likely this would be due to either heating oil or plant spillages within the historical greenhouses / central roadway.

10.2 Conceptual Site Model

The refined Conceptual Site Model (CSM) has been formulated in accordance with BS 10175:2011+A1:2013 and following information collated within the Site Investigation conducted. In this instance, it is used to assess the significance of contaminative sources identified across the site, receptors, and the validity of the pathway between them.

As such, whilst other pollutant linkages may have been acknowledged within the Preliminary CSM, these will not be included within the updated CSM and Risk Assessment. An explanation of categories is provided below the CSM table.

Source	Pathway	Receptor	Likelihood	Potential Risk
1. Exceedances of Arsenic and TPH GAC values associated with staining and odour in WS4 at 2.20m	Inhalation, ingestion and dermal contact from exposure to contaminated soils.	End Users	Very Unlikely	Negligible
		Site workers (during development).	Possible	Low
	Impacted Soils.	Services	Very Unlikely	Low
	Volatilisation of hydrocarbons in underlying soils and groundwater to indoor and/or outdoor air.	End users and proposed development.	Unlikely	Negligible
		Site workers (during development).	Possible	Negligible
	Infiltration and migration of contaminants through the underlying geology.	Bedrock and superficial Secondary (A) Aquifers underlying the site.	Likely.	Low
		Ditch at western elevation (Surface Water)	Very Unlikely	Negligible
	Infiltration and migration of contaminants through the underlying geology.	Bedrock and superficial Secondary (A) Aquifers underlying the site.	Likely.	Negligible

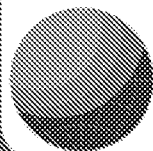
Discussion of Risks

The end-user and future services are very unlikely to come into contact with this material at a depth of 2.20mbgl, however a watching brief should be maintained to ensure that similar contamination is not identified at a shallower level. Additionally, the levels would be acceptable on a residential site without private gardens. The small quantity / thickness of this contamination encountered currently is also considered to reduce the risk to site workers and the risk posed by volatilisation of hydrocarbons to a very low level. Again, the limited extent of this material reduces the risk to controlled waters, which is further reduced by the relatively low sensitivity of the aquifer.

Mitigation Required

Conduct watching brief during ground works in this central portion of the site, with any evidence of further contamination reported to an environmental consultant for further investigations and risk assessments as required. Use of appropriate toolbox talks, wash and mess facilities and PPE to protect site workers.

Negligible Risk	Defined as: the site should be considered suitable for the present or future use and environmental setting. Contaminants unlikely to be present, which might have unacceptable impact on key targets.
Low Risk	Defined as the site should be considered suitable for the present or future use and environmental setting. Contaminants may be present but unlikely to have unacceptable impact on key targets.



Moderate Risk	Defined as the site may not be suitable for the present or future use and environmental setting. Contaminants are probably present and might have unacceptable impact on key targets.
High Risk	Defined as the site is probably or certainly not suitable for the present or future use and environmental setting. Contaminants are probably or certainly present and likely to have unacceptable impact on key targets.

11.0 GEO-ENVIRONMENTAL RECOMMENDATIONS

The following recommendations are based on the plans proposed at the time of writing this report and may be subject to change.

11.1 Remedial Strategy

Subsequent report sections detail required remedial works. The Local Authority must be contacted to confirm whether a standalone Remedial Options Appraisal and Strategy Report is required.

The 'remedial' actions considered necessary for this site are considered to be relatively minor but should include:

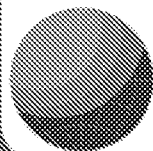
- The undertaking of a thorough watch brief for previously unidentified contamination. Particular attention should be given to the area in the vicinity of WS4 as well as the existing building footprints, including the area of the shed building used for oil / fuel storage and vehicle inspection pit.
- The clearance / demolition of the site including various detritus and building materials including Asbestos Containing materials.
- Made Ground soils, particularly where buildings have been present, are unlikely to be suitable for use as topsoil. These should be removed and replaced with suitable subsoil / topsoil, allowing a minimum surface thickness of 150mm topsoil to be established.
- Made Ground soils elsewhere on site (reworked topsoil) should be subject to inspection by a landscape architect to ascertain whether they are suitable as a growing medium on the basis of detritus such as glass, terracotta, masonry. Where these soils are unsuitable, they should be removed and replaced with suitable subsoil / topsoil, allowing a minimum surface thickness of 150mm topsoil to be established.

Site workers should be given toolbox talks explaining the findings of this investigation and the potential risks associated with land contamination at the site. In addition all workers would be expected to be expected to be offered suitable training, PPE and wash / mess facilities for work on potentially contaminated sites.

11.1.1 Record Keeping

Any actions must be adequately documented in order that an accurate Validation Report may be issued to the statutory authorities upon request.

The table below summarises actions currently identified as necessary, how and by whom the implementation of these should be recorded. Further details are provided in subsequent report sections.



Action Required	Detail Required for Validation	Party to Record Action
Detailed watching of groundworks stage, including photographic record of removal of existing structures / slabs and all excavation works.	Photographic record showing excavations, including depth detail. Watching brief statement.	Site manager/ developer's nominated person.
Removal of appropriate thickness of Made Ground soil where necessary from proposed areas of soft landscaping to expose underlying natural soils	Photographic record showing excavations, including depth detail.	Site manager/ developer's nominated person.
Importation of clean certified material to bring site back up to finished level allowing for minimum 150mm certified topsoil at surface.	Test certificates to prove suitability. Photographic record including depth detail.	Site manager/ developer's nominated person. Testing completed by Environmental Consultant.
Disposal of excess earth spoils from groundworks.	Waste classification testing, waste transfer notes / dockets.	Site manager / developer's nominated person.
Installation of potable water pipework in accordance with local authority requirements.	Detail drawing of trenches, specification of pipework, correspondence from water board confirming acceptance, photographic record.	Site manager / developer's nominated person.

Concise records of these actions must be kept for submission to the Local Authority within a Validation Report if required.

11.1.2 Proposed Areas of Soft Landscaping

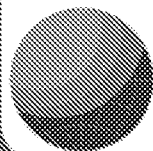
On the basis of the investigation logs and chemical testing the majority of the site is considered likely to be suitable for use as private gardens. Made Ground comprising reworked topsoil should be subject to inspection by a landscape architect to ascertain whether they are suitable as a growing medium on the basis of detritus such as glass, terracotta, masonry. Where these soils are unsuitable, they should be removed and replaced with suitable subsoil / topsoil, allowing a minimum surface thickness of 150mm clean, certified topsoil to be established. The remaining depth should be made up by clean, certified subsoil.

Made Ground soils, particularly where buildings have been present, are unlikely to be suitable for use as topsoil. These should be removed and replaced with suitable subsoil / topsoil, allowing a minimum surface thickness of 150mm clean, certified topsoil to be established. The remaining depth should be made up by clean, certified subsoil.

Areas of previous foundations as well as the vehicle inspection pit may require deeper filling than where ground slabs have been removed. In these areas it would be considered suitable to fill with engineering grade material such as compacted type 1 / type 2 to a depth of 600mm below finished level with the remaining depth taken up by 450mm clean certified subsoil and 150mm clean certified topsoil.

11.1.4 Watching Brief

A watching brief should be maintained on site, particularly during ground works. This must be undertaken as part of good working practices and in case there are any areas of unidentified contamination, with particular attention to the area around WS4, as well as the vehicle inspection pit and the oil / fuel storage area.



During any ground works, an appraisal of the exposed soils should be made by the on-site manager or developer's nominated person. If any material is noted to show visual and/or olfactory sign of contamination this material should be stockpiled separately and tested prior to its appropriate removal off site or re-use where necessary. A suitably qualified environmental specialist should be contacted to advise what further work is required.

The on-site manager / developer's nominated person should be able to display the relevant level of qualification and/or experience in managing construction works on contaminated land.

11.1.4 Imported Material

Any material intended to be used as subsoil or engineered fill should be analysed in order to confirm it is suitable for use.

As a minimum, sampling should consist of at least three samples for each source used. Validation testing of imported materials should be carried out insitu, after materials have been imported to site, and further to this, imported materials should be stored in designated on site areas.

Specific contaminants that should be tested and associated screening criteria are detailed in the table below.

Soil Type	Chemical Testing Required	Testing Frequency
Topsoil – Proven greenfield source	Heavy Metals, TPH, PAH, BTEX, MTBE + BS3882 physical testing.	On site: 1 per 200m ³
Topsoil – Unknown/ mixed/ brownfield source	Heavy Metals, TPH, PAH, BTEX, MTBE, Asbestos Screen + BS3882 physical testing.	On Site: 1 per 50m ³
Subsoil – Proven greenfield source	Heavy Metals, TPH, PAH, BTEX, MTBE, Asbestos Screen	On site: 1 per 200m ³
Engineered Fill	Heavy Metals, TPH, PAH, BTEX, MTBE, Asbestos Screen	On site: 1 per 200m ³

11.1.5 Waste Disposal

An explanation of Waste Disposal Guidance is presented below.

According to Technical Guidance WM3 – Waste Classification: Guidance on the classification and assessment of waste (2015), as part of Duty of Care, waste must be classified:

- Before it is collected, disposed of or recovered;
- To identify the controls that apply to the movement of the waste;
- To complete waste documents and records;
- To identify suitably authorised waste management options; and
- To prevent harm to people and the environment.

Before waste can be accepted at a landfill site, the landfill operator must be satisfied that the waste meets permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).



Waste Acceptance Procedures

The WAP consist of three steps to identify and periodically check the main characteristics of the waste.

Level 1: basic characterisation – before waste is sent to landfill, its composition and properties must be verified to determine it is suitable for acceptance and at which class of site.

Level 2: compliance testing – if production of waste is regular, waste must be periodically checked to ensure that properties have not changed.

Level 3: on-site verification – each delivery must be checked to ensure that it is the expected waste and that it has not been contaminated in storage or transport.

Waste Acceptance Criteria

The European Waste Catalogue (List of Waste Regulations) should be used in the determination of whether a waste is hazardous.

Waste producers must characterise waste for the Duty of Care Description whether or not it is intended to send it to landfill. This includes making an assessment of its hazardousness (is it classified hazardous waste or not) unless it is an absolute non-hazardous entry waste. This is achieved by reference to the List of Waste Regulations.

Note, WAC testing can not be used to make an assessment of whether a waste is hazardous.

Summary

Before a waste producer can take waste to a landfill site for disposal, they must check the landfill has the appropriate permit, and must have completed the following:

- Duty of Care transfer note/ Hazardous Waste consignment note;
- Pre-treatment declaration form;
- Waste code (using List of Wastes);
- Composition of the waste (by testing, if necessary); and
- WAC testing (if required).

Requirements are considered in more detail within Waste Acceptance at Landfills (2010).

It is prudent to ascertain the testing requirements of the waste facility prior to the movement of any spoil. All relevant dockets will need to be kept to provide evidence of the removal of waste. If in doubt, the Environment Agency should be contacted for advice at an early stage to avoid any delays.

A copy of such documentation should be retained and forwarded to the environmental consultant for inclusion into a verification/validation report, where required.

11.1.6 Services

We would recommend that if new services are present in the design of this development, the local water board are contacted to determine the type of pipework that should be used on this site.

11.2 Decommissioning of Monitoring Wells



The client or site owner should ensure that the installed monitoring wells and their protective covers are not damaged or covered until such time as data is no longer required from them. Additional costs may be incurred if it is necessary to reinstate damaged wells.

Nevertheless, the monitoring wells installed on site will require eventual decommissioning. IGL should be consulted prior to decommissioning. This process should be completed in accordance with the EA's (2012) guidance document 'Good Practice for Decommissioning Redundant Boreholes and Wells'.

The above referenced document provides the following guidance - The ground should be restored as closely as possible to its pre-drilled condition. The well should be backfilled with clean (washed), uncontaminated materials so that the permeability of the selected materials are similar to the properties of the geological strata against which they are placed. The backfilled well will then mimic the surrounding natural strata and groundwater flow, and quality will be protected.

11.3 Statutory Consultees

We would recommend that this report be forwarded to the relevant Statutory Consultees including the Local Council's Environmental Health and Planning Department to seek their comments and subsequent approval prior to works commencing on site.

The Statutory Authorities may require a Validation and/or closure report providing documentation/audit trail for the importation/removal/reuse of material on site and any other remedial works completed on site.

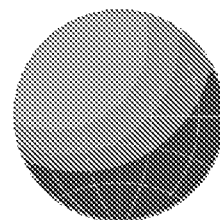
APPENDICES

Appendix A – Site Plan

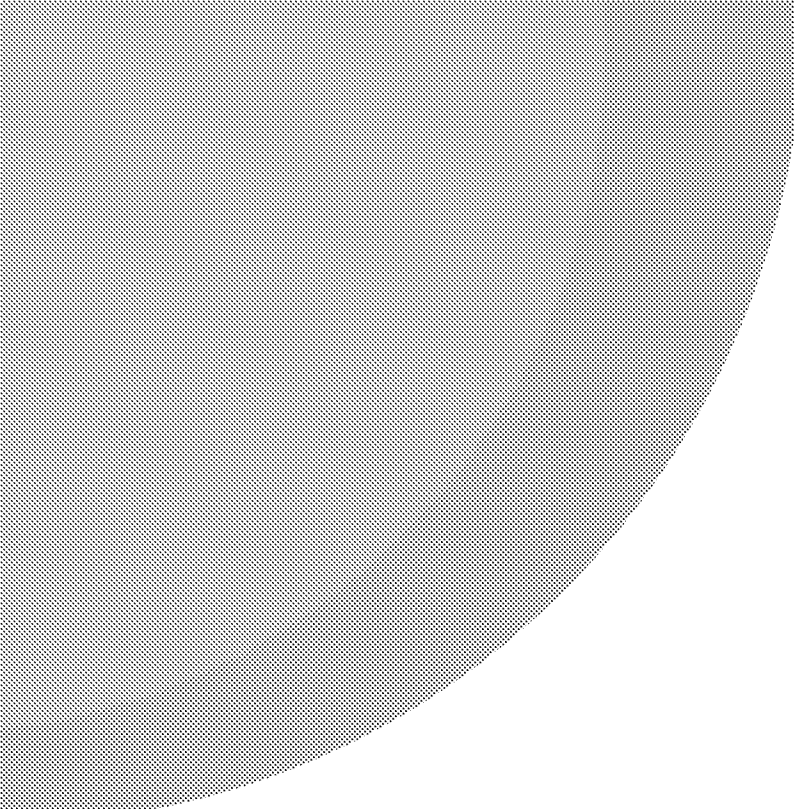
Appendix B – Stratigraphic Logs

Appendix C – Photographs

Appendix D – Laboratory Certificates

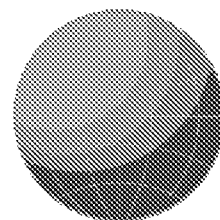


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GEOTECHNICAL

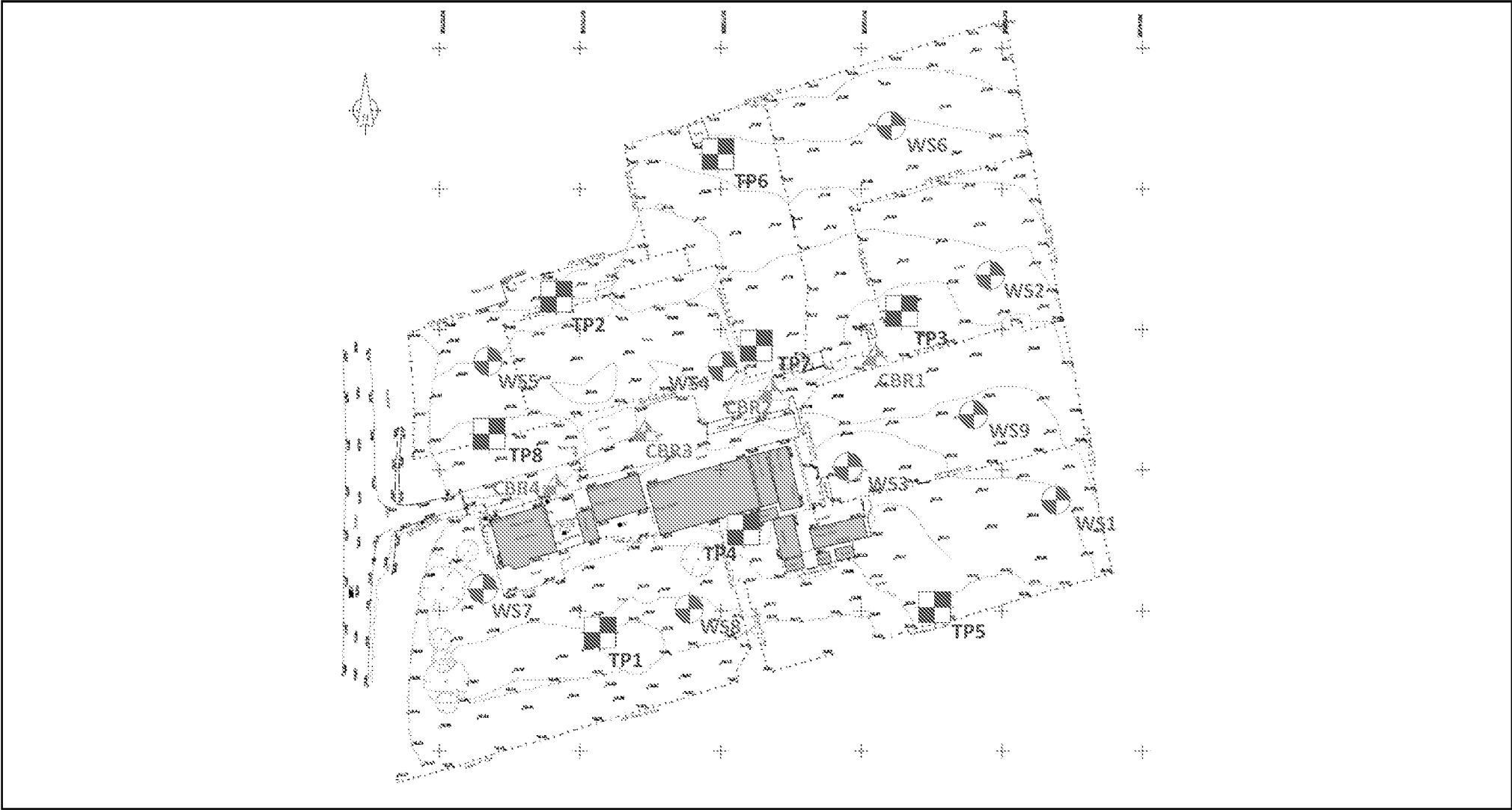


APPENDIX A

Site Plan



IMPACT
GEOTECHNICAL



Notes:

1. Do not scale from this drawing.
2. All dimensions must be checked on site prior to commencement of work.
3. Where applicable this drawing is to be read in conjunction with other consultants drawings.
4. This drawing is the copyright of Impact Geotechnical Ltd.

AFUN DISTRICT COUNCIL A/132/19/DOC

Drawing Title:

Site Investigation Plan

Project Reference:

P19.117

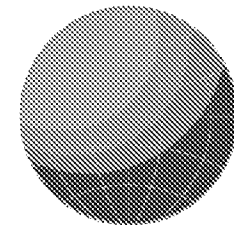
Site Name:

Merry England

Revision: 0

Drawn by: GC

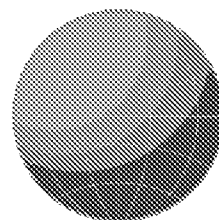
Scale: Not to Scale



IMPACT
GEOTECHNICAL

APPENDIX B

Stratigraphic Logs



IMPACT
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IMPACT
GEOTECHNICAL

Trial Pit Log

Trial Pit No.

TP1

Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

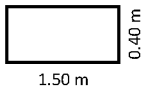
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.15	ES		0.20			Light brown sandy Silt TOPSOIL. Sand is fine to medium	
		0.40-0.60	B					Stiff light brown sandy SILT. Sand is fine. (HEAD DEPOSIT)	
		0.50	ES		1.00			Brown slightly clayey slightly sandy GRAVEL. Sand is medium to coarse. Gravel is subangular to subrounded, fine to coarse sized flint. (HEAD DEPOSIT)	1
					1.40			End of Trial Pit at 1.40mbgl	2
									3

Remarks

No Groundwater encountered. Hole backfilled with arisings. Soil infiltration conducted in general accordance with BRE 365.

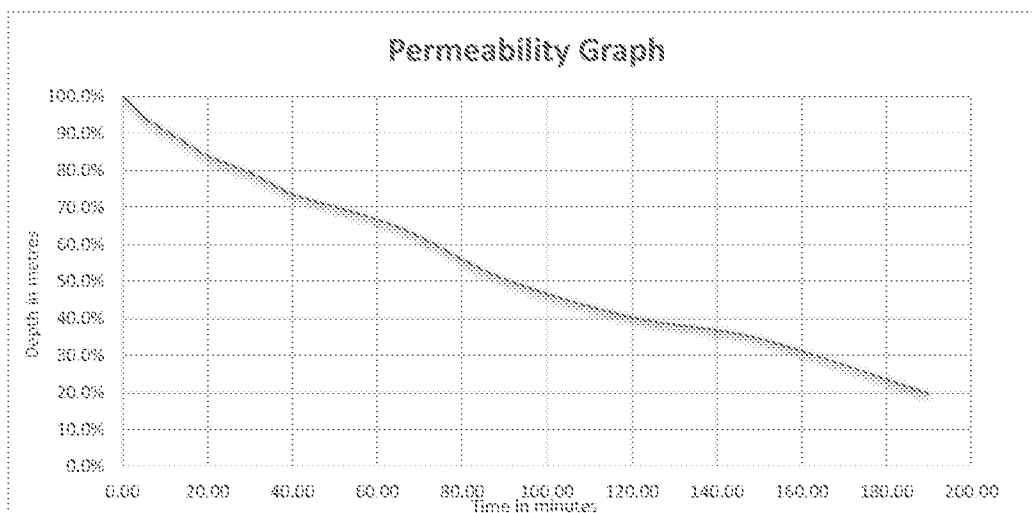
BRE 365 Soil Infiltration Testing			
Project Ref	P19.117	Hole Ref	TP1
Site Name	Merry England	Test Number	1

Hole Ref: **TP1**Test Number **1**[illegible]

INFILTRATION CALCULATED FROM 75%-25% WATER DEPTH RANGE

Pit Size		Time in mins
Length	1.50	40
Width	0.40	180
Depth	1.40	

1.37911E-05





IMPACT
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Trial Pit Log

Trial Pit No.
TP2
Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

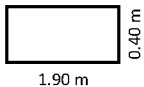
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.05	ES		0.10			Light brown sandy gravelly Silt TOPSOIL. Sand is fine to medium. Gravel is subangular to	
		0.40	ES					Stiff light brown sandy SILT, becoming gravelly at base. Gravel is subangular to subrounded, fine to coarse sized flint. Sand is fine to medium. (HEAD DEPOSIT)	
		1.00	D		0.95			Firm to stiff consistency brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	1
		2.00	d		2.00			End of Trial Pit at 2.00mbgl	2
									3

Remarks

No Groundwater encountered. Hole backfilled with arisings. Soil infiltration conducted in general accordance with BRE 365.

BRE 365 Soil Infiltration Testing

Project Ref **P19.117**Hole Ref **TP2**

Site Name **Merry England**

Test Number 1

[illegible]

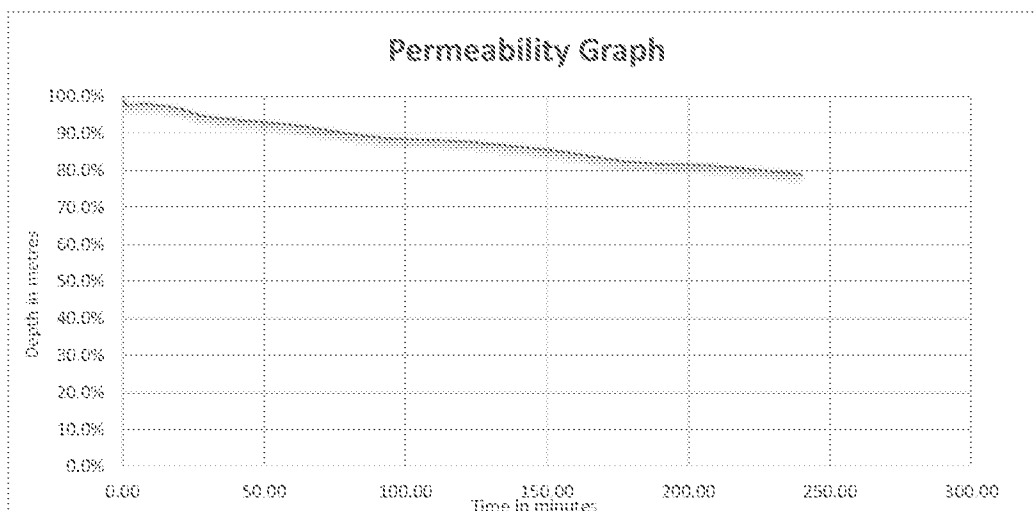
Pit Size		Time in mins	
Length	1.90	330	75% (Estimated)
Width	0.40	990	25% (Estimated)
Depth	2.00		

Infiltration Rate

from 75%-25%

3.05172E-06

(Estimated)





IMPACT
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Trial Pit Log

Trial Pit No.

TP3

Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

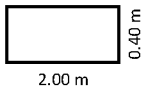
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
	Water Strikes	Depth(s)	Type					
		0.05	ES		0.10			MADE GROUND: Dark brown silty Clay, scattered subangular to subrounded, medium to coarse gravel sized flint and rarely glass, plastic
		0.40	ES					Stiff light brown slightly sandy CLAY / SILT. Scattered subangular to subrounded, fine to coarse sized flint. Sand is fine to medium. Becoming gravelly at base. (HEAD DEPOSIT)
		0.50	D					Medium dense to dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)
		1.00	D		1.40	1.60		End of Trial Pit at 1.60mbgl

Remarks

No Groundwater encountered. Hole backfilled with arisings. Soil infiltration conducted in general accordance with BRE 365.

BRE 365 Soil Infiltration Testing

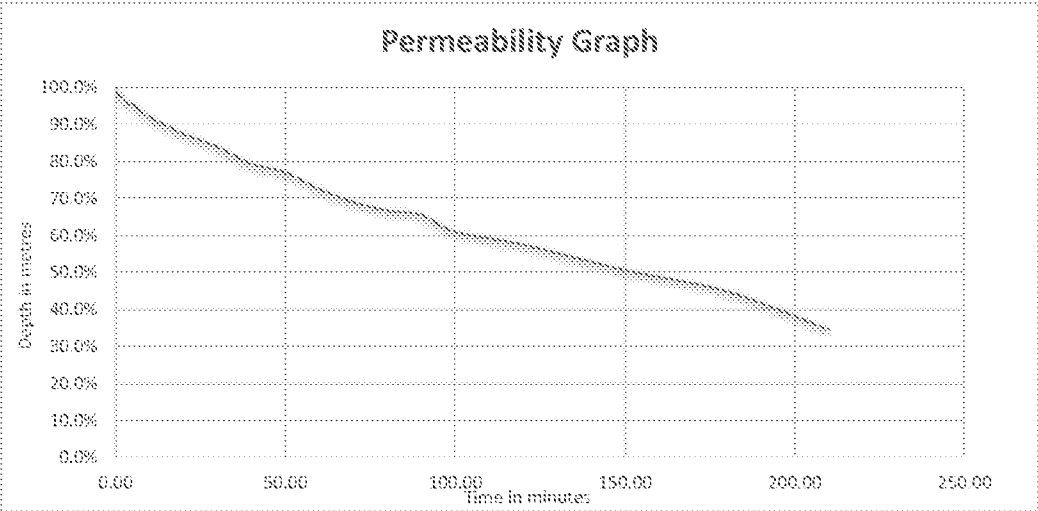
Project Ref **P19.117**Hole Ref **TP3**

Site Name	Merry England
-----------	---------------

Test Number **1**[illegible]

Pit Size		Time in mins	
Length	2.00	55	75%
Width	0.40	240	25% (Estimated)
Depth	1.70		

<u>Infiltration Rate</u>	<u>from 75%-25%</u>	1.08557E-05	(Estimated)
---------------------------------	----------------------------	--------------------	--------------------





IMPACT
GEOTECHNICAL

Trial Pit Log

Trial Pit No.
TP4
Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

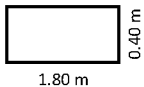
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.10	ES		0.15			MADE GROUND: Dark brown sandy slightly gravelly Silt. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse sized flint and rarely brick.	
		0.40	ES					Stiff light brown slightly sandy CLAY / SILT. Scattered subangular to subrounded, fine to coarse sized flint. Sand is fine to medium. Becoming gravelly at base. (HEAD DEPOSIT)	
		1.30	ES		1.20			Medium dense to dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	
					1.60			End of Trial Pit at 1.60mbgl	

Remarks

Groundwater encountered at 1.50mbgl. Hole backfilled with arisings.



IMPACT
GEOTECHNICAL

Trial Pit Log

Trial Pit No.
TP5
Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

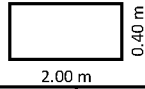
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.20	ES		0.15			Grass over: Stiff light brown slightly sandy CLAY / SILT. Scattered subangular to subrounded, fine to coarse sized flint. Sand is fine to medium. Becoming gravelly at base. (HEAD DEPOSIT)	
		0.70	ES		0.60			Dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	1
					1.20			End of Trial Pit at 1.20mbgl	2 3

Remarks

No Groundwater encountered. Hole backfilled with arisings.



IMPACT
GEOTECHNICAL

Trial Pit Log

Trial Pit No.
TP6
Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

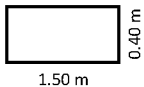
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
	Water Strikes	Depth(s)	Type					
		0.10	ES		0.15			Grass over: Stiff light brown slightly sandy CLAY / SILT. Sand is fine to medium. (HEAD DEPOSIT)
		0.60	ES		0.60 0.70			Dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)
								End of Trial Pit at 0.70mbgl

1

2

3

Remarks

No Groundwater encountered. Hole backfilled with arisings.



IMPACT
GEOTECHNICAL

Trial Pit Log

Trial Pit No.
TP7
Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

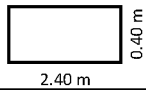
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.20	ES		0.25			MADE GROUND: slightly gravelly sandy Silt. Gravel is subangular to subrounded, medium to coarse sized flint and rarely terracotta, brick, plastic.	
		0.50	ES		0.60			Stiff light brown sandy SILT. Sand is fine to medium. (HEAD DEPOSIT)	
		1.00	ES					Firm to stiff consistency brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	1
		1.50	ES						
		2.50	ES		2.30			(Medium dense) buff light brown slightly clayey sandy GRAVEL. Sand is medium to coarse. Gravel is subangular to subrounded, fine to coarse sized flint. (HEAD DEPOSIT)	2
					2.60			End of Trial Pit at 2.60mbgl	3

Remarks

Groundwater encountered at 2.40m. Hole backfilled with arisings.



IMPACT
GEOTECHNICAL

Trial Pit Log

Trial Pit No.
TP8
Sheet 1 of 1

Project Name: Merry England Nurseries

Project No
P19.117

Co-ords
n/a

Hole Type
TP

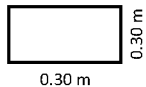
Location: Dappers Lane, Angmering

Pit Dimensions

Level
n/a

Scale
NTS

Client: GD Concepts Ltd



Date(s)
15/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
	Water Strikes	Depth(s)	Type					
		0.15	ES		0.10			Grass over: dark brown very gravelly sandy Silt TOPSOIL. Sand is fine to medium. Gravel is subangular to subrounded, fine to coarse sized flint.
		0.40	ES		0.40			Light brown sandy SILT. Scattered subangular to subrounded fine to medium sized Chalk. (HEAD DEPOSIT)
								End of Trial Pit at 0.40mbgl

1

2

3

Remarks

No Groundwater encountered. Hole backfilled with arisings.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.
WS1
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
14/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.20	ES		0.10			Light brown sandy Silt TOPSOIL. Sand is fine to medium	
		0.50	D					Very stiff light brown sandy SILT, becoming gravelly at base. Gravel is subangular to subrounded, fine to coarse sized flint. Sand is fine to medium. (HEAD DEPOSIT)	
		0.50	ES						
		1.00	D		0.90				
		1.00-1.45	SPT	N=50/270mm (8,17/10,15,15,10 for 45mm)				Dense to very dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	1
		1.50-2.00	D						
		2.00-2.45	SPT	N=43 (11,14/12,12,11,9)					2
		2.50-3.00	D						
		3.00-3.45	SPT	N=24 (8,10/8,6,5,5)	3.10				3
		3.50-4.00	D					Stiff consistency extremely thinly laminated closely fissured brown mottled becoming grey silty CLAY. Fissures are subvertical to subhorizontal. (LONDON CLAY FORMATION)	
		4.00-4.45	SPT	N=17 (3,3/4,4,4,5)	4.00				4
								End of Borehole at 4.00mbgl	5
									6

Remarks

No Groundwater Encountered. Borehole installed with 50mm diameter standpipe to 3.00mbgl (response zone 1.00-3.00mbgl). Finsished with raised barrell cover.



IMPACT
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Borehole Log

Borehole No.
WS2
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
14/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.15	ES		0.20			Light brown sandy Silt TOPSOIL. Sand is fine to medium	
		0.50 0.50	D ES					Very stiff light brown sandy SILT, becoming gravelly at base. Gravel is subangular to subrounded, fine to coarse sized flint. Sand is fine to medium. (HEAD DEPOSIT)	
		1.00 1.00-1.45	D SPT	N=16 (3,3/3,4,4,5)					1
		1.50-2.00	D		1.60				
		2.00-2.45	SPT	N=33 (6,7/9,8,8,8)				Dense to very dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	2
		2.50-3.00	D						
		3.00-3.45	SPT	N=25 (5,5/6,5,6,7)					3
		3.50-4.00	D		4.00			End of Borehole at 4.00mbgl	4
									5
									6

Remarks

Groundwater encountered at 2.80mbgl. Hole terminated at 4.00mbgl due to collapse of borehole sides, up to 3.20mbgl.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.
WS3
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
15/08/2019

Logged By
SG

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.20	ES		0.20			Light brown silty Sand TOPSOIL. Sand is fine to medium	
		0.50	D		0.70			Brown mottled orange brown slightly gravelly silty / clayey fine to medium grained SAND. Gravel is subangular to subrounded, fine to coarse sized flint. (HEAD DEPOSIT)	
		1.00-1.45	SPT	N=30 (4,6/6,8,8,8)				Dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT) * Very clayey and locally gravelly Clay at 1.00-2.10mbgl	1
		1.20	D						
		2.00-2.45	SPT	N=39 (11,10/10,10,10,9)					2
		2.00	D						
		2.50	D						
		3.00-3.45	SPT	N=30 (7,10/7,8,10,5)					3
		3.00	D						
		3.50-4.00	D		3.60				
		4.00	D		4.00			Firm to stiff consistency brown mottled orange brown silty CLAY. (weathered LONDON CLAY FORMATION)	4
								End of Borehole at 4.00mbgl	5
									6

Remarks

Groundwater encountered at 2.05mbgl.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.
WS4
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
15/08/2019

Logged By
SG

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
	Water Strikes	Depth(s)	Type					
		0.10	ES	N=18 (2,2/5,4,4,5)	0.15			MADE GROUND: Brown gravelly Sand. Sand is fine to coarse. Gravel is fine to coarse sized Sandstone
		0.40	ES		0.60			Brown mottled orange brown slightly gravelly silty / clayey fine to medium grained SAND. Gravel is subangular to subrounded, fine to coarse sized flint. (HEAD DEPOSIT)
		0.50	D					
		0.80	ES					
		1.00-1.45	SPT	N=30 (12,9/11,10,10,9)	1.80			Firm to stiff consistency brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)
		1.5	D					
		2.00-2.45	SPT					
		2.00	D	N=47 (10,9/10,11,13,13)	3.90			Dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)
		2.20	ES					* 2.15-2.30mbgl: Dark grey staining and moderate Hydrocarbon odour
		2.50	D					
		3.00-3.45	SPT	N=12 (1,1/2,3,3,4)	5.00			Firm to stiff consistency brown mottled orange brown silty CLAY. (weathered LONDON CLAY FORMATION)
		3.00	D					
		3.00	ES					* Becoming stiff consistency and grey below 4.50mbgl
		4.00-4.45	SPT					
		4.00	D					
		4.00	ES					
		5.00	D					End of Borehole at 5.00mbgl

Remarks

Groundwater encountered at 2.35mbgl. Borehole installed with 50mm diameter standpipe to 4.00mbgl (response zone 1.00-4.00mbgl). Finished with raised barrell cover.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.
WS5
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

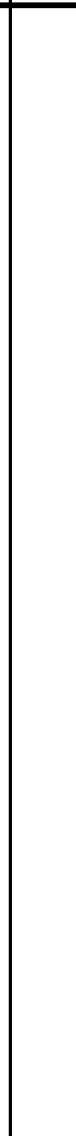
Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
15/08/2019

Logged By
SG

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description			
	Water Strikes	Depth(s)	Type								
		0.10	ES	N=13 (3,3/3,3,3,4)	0.15			Light brown sandy Silt TOPSOIL. Sand is fine to medium			
		0.40	ES					Brown slightly gravelly silty fine to medium grained SAND. Gravel is fine to coarse sized flint. (HEAD DEPOSIT)			
		0.50	D								
		1.00	D		0.90			Stiff consistency brown sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)			
		1.00-1.45	SPT								
		1.50	D								
		2.00-2.45	SPT	N=24 (6,6/7,5,7,5)	2.10			Medium dense to dense brown very clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)			
		2.00	D								
		2.50	D								
		3.00-3.45	SPT	N=27 (5,8/8,7,6,6)							
		3.00	D								
		4.00	D								
		5.00	D	N=59 (6,6/13,11,13,22)	5.00						
											End of Borehole at 5.00mbgl

Remarks

Perched Groundwater encountered at 2.00mbgl.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.
WS6
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
16/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.20	ES	N=20 (3,3/6,5,4,5)	0.80			Grass over: Stiff light brown slightly sand, locally slightly gravelly CLAY / SILT. Sand is fine to medium. Gravel is subangular to subrounded, fine to coarse sized flint. (HEAD DEPOSIT)	
		0.50	D						
		0.90	ES						
		1.00	D						
		1.00-1.45	SPT	N=14 (2,2/3,3,4,4)				Stiff consistency brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT) * 1.20-2.50mbgl recovered as stiff silty CLAY with rare subangular to subrounded, fine to coarse sized flint and chalk gravel.	1
		1.50-2.00	D						
		2.00-2.45	SPT						
		2.50-3.00	D						
		3.00-3.45	SPT	N=43 (6,10/9,9,10,15)	3.00			Dense to very dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	3
		3.50-4.00	D						
		4.00-4.45	SPT						
		4.50-5.00	D						
					5.00			End of Borehole at 5.00mbgl	5
									6

Remarks

Groundwater encountered at 3.80mbgl, rising to 3.33m upon completion of the hole.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.
WS7
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
16/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.20	ES		0.30			Grass over: brown sandy Silt TOPSOIL. Sand is fine to medium	
		0.50 0.50	D ES					Stiff consistency brown SILT / CLAY. Rare scattered subangular to subrounded, fine to coarse sized flint Gravel. (HEAD DEPOSIT)	
		1.00 1.00-1.45	D SPT	N=17 (1,2/3,3,5,6)				*1.20mbgl becoming slightly gravelly.	1
		1.50-2.00	D					*1.60mbgl becoming gravelly.	
		2.00-2.45	SPT	N=39 (4,6/6,10,11,12)	2.30				2
		2.50-3.00	D					Dense to very dense brown slightly clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	
		3.00-3.45	SPT	N=33 (5,8/6,7,7,13)					3
		3.50-4.00	D						
		4.00-4.45	SPT	N=34 (8,9/7,10,9,8)	4.00				4
								End of Borehole at 4.00mbgl	5
									6

Remarks

Groundwater encountered at 2.80mbgl. Borehole installed with 50mm diameter standpipe to 3.40mbgl (response zone 0.40-3.40mbgl). Finished with raised barrell cover.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.
WS8
Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
14/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.15	ES		0.10 0.15			Light brown sandy Silt TOPSOIL. Sand is fine to medium	
		0.50	D					Stiff light brown slightly sandy SILT/CLAY. Sand is fine to medium. (HEAD DEPOSIT)	
		0.80	ES					* Becoming gravelly at 0.60mbgl. Gravel is subangular to subrounded, fine to coarse sized flint	
		1.00 1.00-1.45	D SPT	N=50/240mm (4,7/11 16,20,3 for 15mm)	0.90			Dense to very dense brown clayey GRAVEL. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	1
		1.50-2.00	D						
		2.00-2.45	SPT						2
		2.50-3.00	D	N=38 (8,8/9,9,12,8)	2.40			Stiff consistency brown silty CLAY. (weathered LONDON CLAY FORMATION)	3
		3.00-3.45	SPT						
		3.50-4.00	D						
		4.00-4.45	SPT	N=17 (1,2/2,4,5,6)				* Below 3.60mbgl becoming closely fissured, extremely thinly laminated dark brown gleyed grey silty CLAY. Fissures are subvertical to subhorizontal.	4
		4.50-5.00	D		5.00			* becoming grey below 4.10mbgl	5
								End of Borehole at 5.00mbgl	6

Remarks

perched Groundwater Encountered at 1.70mbgl.



IMPACT
GEOTECHNICAL

Borehole Log

Borehole No.

WS9

Sheet 1 of 1

Project Name: Merry England

Project No
P19.118

Co-ords
n/a

Hole Type
WLS

Location: Dappers Lane, Angmering

Level
n/a

Scale
NTS

Client: GD Concepts Ltd

Date(s)
16/08/2019

Logged By
GC

Well	Sample and Insitu Testing			Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
	Water Strikes	Depth(s)	Type						
		0.20	ES		0.80			Grass over: Stiff light brown slightly sand, locally slightly gravelly CLAY / SILT. Sand is fine to medium. Gravel is subangular to subrounded, fine to coarse sized flint. (HEAD DEPOSIT)	
					1.00			Stiff consistency brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, medium to coarse sized flint. (HEAD DEPOSIT)	1
								End of Borehole at 1.00mbgl	
									2
									3
									4
									5
									6

Remarks

No Groundwater Encountered

Location: Merry Emngland, Angmering	Job No: P19.117
Test Method: BS 1977 : Part 9 : 1990 : 4.3	Location No: CBR1
Soil Description: Brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sized flint	Test No: 1
	Date: 12/08/19

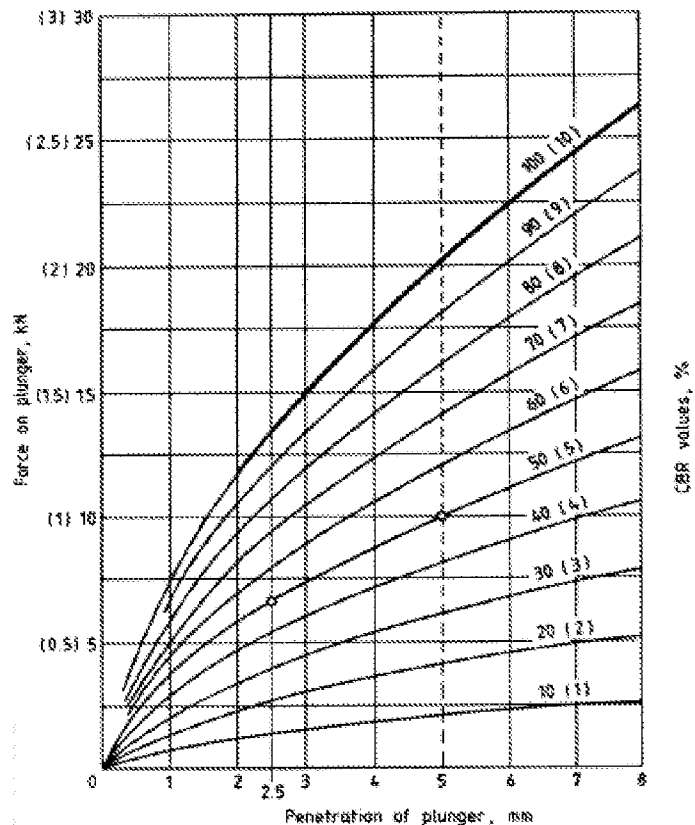
Note: Test applicable only when maximum particle size beneath plunger does not exceed 20mm

Area of annulus of disc used: 1935mm ²	Jack/load ring No: 12389
Mass of surcharge: N/A	Test depth: 300mm below ground level
Comment:	Moisture content of sample: 10%

Field Recordings

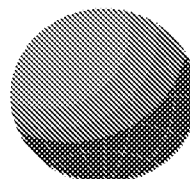
Note: Penetration and force readings after seating load zeroed.

Penetration of Plunger	Force on Plunger	
mm	Load Gauge	kN
0.25	0	0.00
0.50	0	0.00
0.75	0	0.00
1.00	0	0.00
1.25	0	0.00
1.50	0	0.00
1.75	0	0.00
2.00	0	0.00
2.25	0	0.00
2.50	0	0.00
2.75	0	0.00
3.00	1	0.04
3.25	4	0.17
3.50	6	0.26
3.75	8	0.34
4.00	10	0.43
4.25	14	0.60
4.50	15	0.65
4.75	16	0.69
5.00	19	0.82
5.25	21	0.90
5.50	23	0.99
5.75	25	1.08
6.00	26	1.12
6.25	35	1.51
6.50	38	1.63
6.75	39	1.68
7.00	40	1.72
7.25	41	1.76
7.50	42	1.81



RESULTS			
Penetration (mm)	Force (kN)	Standard Force (kN)	CBR (%)
2.5	0	13.2	0.0
5.0	0.817418	20.0	4.1
In-situ CBR Value= 4%			

Operator:	RM
Checked by:	SG



IMPACT
GEOTECHNICAL

Location: Merry Emngland, Angmering	Job No: P19.117
Test Method: BS 1977 : Part 9 : 1990 : 4.3	Location No: CBR2
Soil Description: Brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sized flint	Test No: 1
	Date: 12/08/19

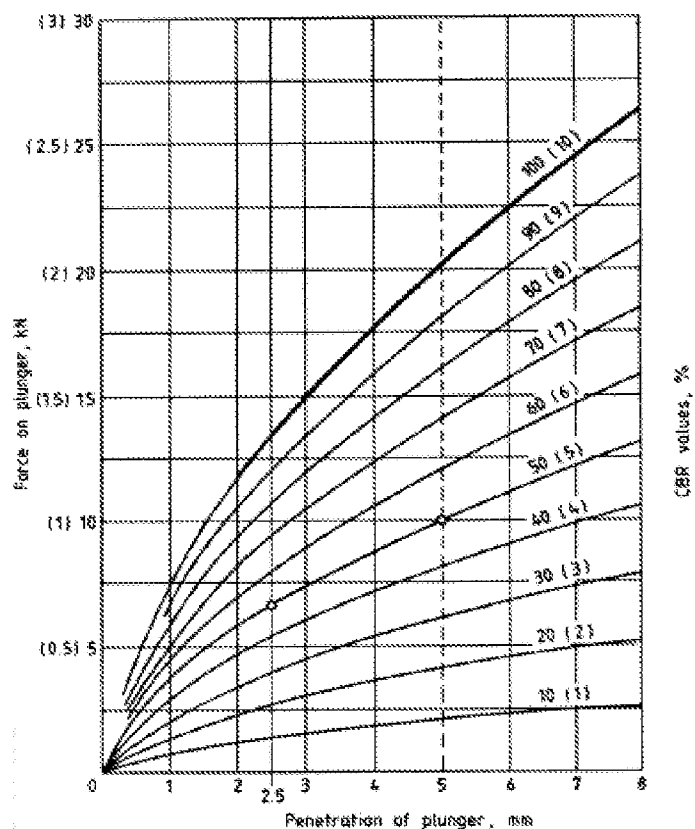
Note: Test applicable only when maximum particle size beneath plunger does not exceed 20mm

Area of annulus of disc used: 1935mm ²	Jack/load ring No: 12389
Mass of surcharge: N/A	Test depth: 300mm below ground level
Comment:	Moisture content of sample: 7.7%

Field Recordings

Note: Penetration and force readings after seating load zeroed.

Penetration of Plunger	Force on Plunger	
	Load Gauge	kN
0.25	19	0.82
0.50	25	1.08
0.75	30	1.29
1.00	35	1.51
1.25	40	1.72
1.50	45	1.94
1.75	49	2.11
2.00	53	2.28
2.25	58	2.50
2.50	60	2.58
2.75	65	2.80
3.00	68	2.93
3.25	72	3.10
3.50	75	3.23
3.75	80	3.44
4.00	85	3.66
4.25	90	3.87
4.50	91	3.92
4.75	95	4.09
5.00	100	4.30
5.25	103	4.43
5.50	108	4.65
5.75	110	4.73
6.00	112	4.82
6.25	119	5.12
6.50	130	5.59
6.75	135	5.81
7.00	140	6.02
7.25	142	6.11
7.50	143	6.15



RESULTS			
Penetration (mm)	Force (kN)	Standard Force (kN)	CBR (%)
2.5	2.58132	13.2	19.6
5.0	4.3022	20.0	21.5
In-situ CBR Value= 21%			

Operator:	RM
Checked by:	SG



IMPACT
GEOTECHNICAL

Location: Merry Emngland, Angmering	Job No: P19.117
Test Method: BS 1977 : Part 9 : 1990 : 4.3	Location No: CBR3
Soil Description: Brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sized flint	Test No: 1
	Date: 12/08/19

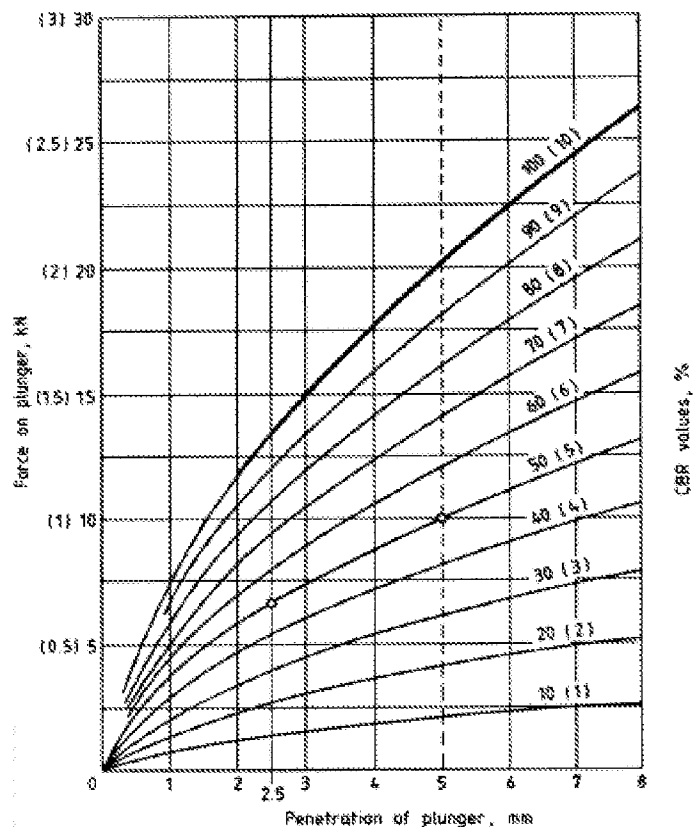
Note: Test applicable only when maximum particle size beneath plunger does not exceed 20mm

Area of annulus of disc used: 1935mm ²	Jack/load ring No: 12389
Mass of surcharge: N/A	Test depth: 300mm below ground level
Comment:	Moisture content of sample: 18%

Field Recordings

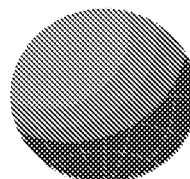
Note: Penetration and force readings after seating load zeroed.

Penetration of Plunger	Force on Plunger	
	Load Gauge	kN
0.25	4	0.17
0.50	5	0.22
0.75	6	0.26
1.00	7	0.30
1.25	10	0.43
1.50	12	0.52
1.75	14	0.60
2.00	16	0.69
2.25	19	0.82
2.50	20	0.86
2.75	22	0.95
3.00	23	0.99
3.25	25	1.08
3.50	26	1.12
3.75	27	1.16
4.00	28	1.20
4.25	28	1.20
4.50	29	1.25
4.75	30	1.29
5.00	32	1.38
5.25	31	1.33
5.50	31	1.33
5.75	32	1.38
6.00	32	1.38
6.25	33	1.42
6.50	34	1.46
6.75	35	1.51
7.00	35	1.51
7.25	36	1.55
7.50	36	1.55



RESULTS			
Penetration (mm)	Force (kN)	Standard Force (kN)	CBR (%)
2.5	0.86044	13.2	6.5
5.0	1.376704	20.0	6.9
In-situ CBR Value= 6%			

Operator:	RM
Checked by:	SG



IMPACT
GEOTECHNICAL

Location: Merry Emngland, Angmering	Job No: P19.117
Test Method: BS 1977 : Part 9 : 1990 : 4.3	Location No: CBR4
Soil Description: Brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse sized flint	Test No: 1
	Date: 12/08/19

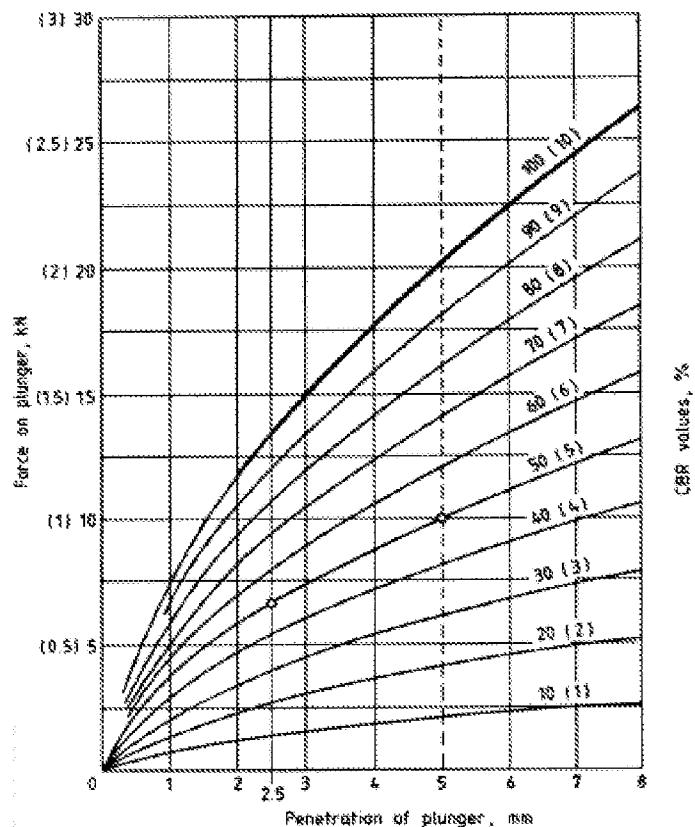
Note: Test applicable only when maximum particle size beneath plunger does not exceed 20mm

Area of annulus of disc used: 1935mm ²	Jack/load ring No: 12389
Mass of surcharge: N/A	Test depth: 300mm below ground level
Comment:	Moisture content of sample: 14%

Field Recordings

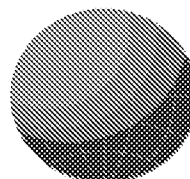
Note: Penetration and force readings after seating load zeroed.

Penetration of Plunger	Force on Plunger	
	Load Gauge	kN
0.25	10	0.43
0.50	15	0.65
0.75	20	0.86
1.00	25	1.08
1.25	31	1.33
1.50	35	1.51
1.75	40	1.72
2.00	45	1.94
2.25	50	2.15
2.50	52	2.24
2.75	54	2.32
3.00	58	2.50
3.25	60	2.58
3.50	64	2.75
3.75	68	2.93
4.00	70	3.01
4.25	72	3.10
4.50	75	3.23
4.75	78	3.36
5.00	80	3.44
5.25	81	3.48
5.50	85	3.66
5.75	89	3.83
6.00	90	3.87
6.25	91	3.92
6.50	91	3.92
6.75	92	3.96
7.00	93	4.00
7.25	94	4.04
7.50	95	4.09



RESULTS			
Penetration (mm)	Force (kN)	Standard Force (kN)	CBR (%)
2.5	2.237144	13.2	16.9
5.0	3.44176	20.0	17.2
In-situ CBR Value= 17%			

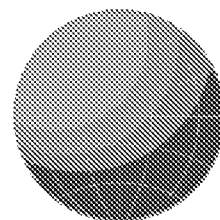
Operator:	RM
Checked by:	SG



IMPACT
GEOTECHNICAL

APPENDIX C

Photographs



IMPACT
GEOTECHNICAL

1.



2.



3.



4.



Investigation Photographs

Project Ref: P19.117

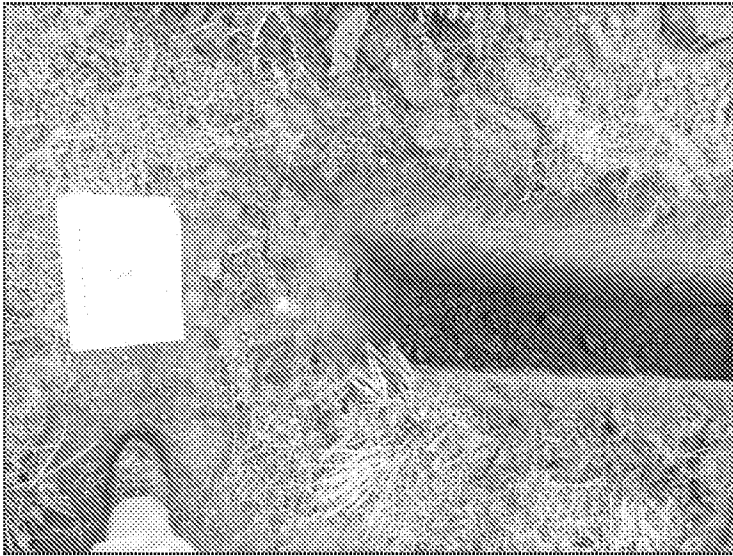
ARUN DISTRICT COUNCIL A/132/19/DOC

Site Name: Merry England

- | | |
|----|-----|
| 1. | TP1 |
| 2. | TP1 |
| 3. | TP2 |
| 4. | TP2 |



5.



6.



7.



8.



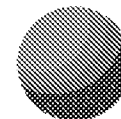
Investigation Photographs

Project Ref: P19.117

ARUN DISTRICT COUNCIL A/132/19/DOC

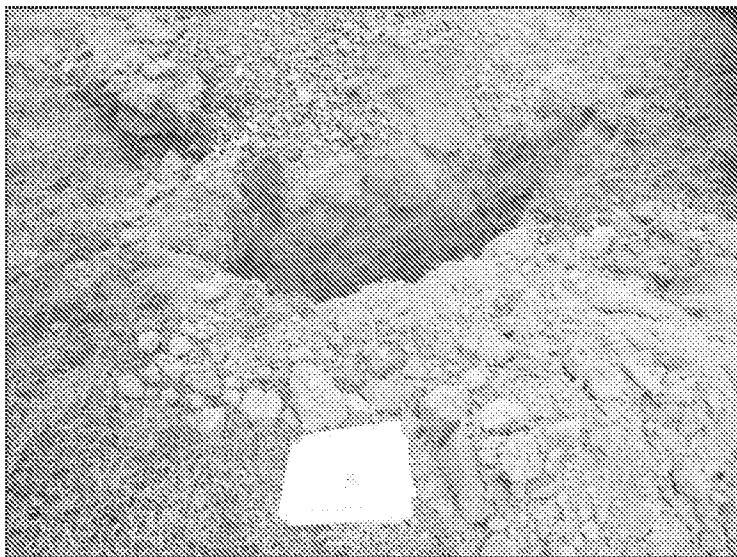
Site Name: Merry England

5. TP3
6. TP3.
7. TP4
8. Tp4



IMPACT
GEOTECHNICAL

9.



10.



11.



12.



Investigation Photographs

Project Ref: P19.117

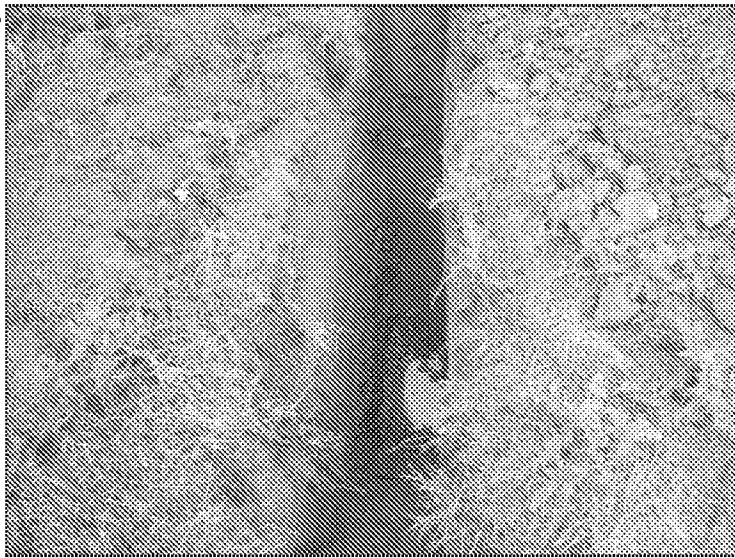
ARUN DISTRICT COUNCIL A/132/19/DOC

Site Name: Merry England

9.	TP5
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11.	TP6
12.	TP6



13.



14.



15.



16.



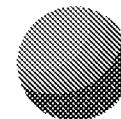
Investigation Photographs

Project Ref: P19.117

ARUN DISTRICT COUNCIL A/132/19/DOC

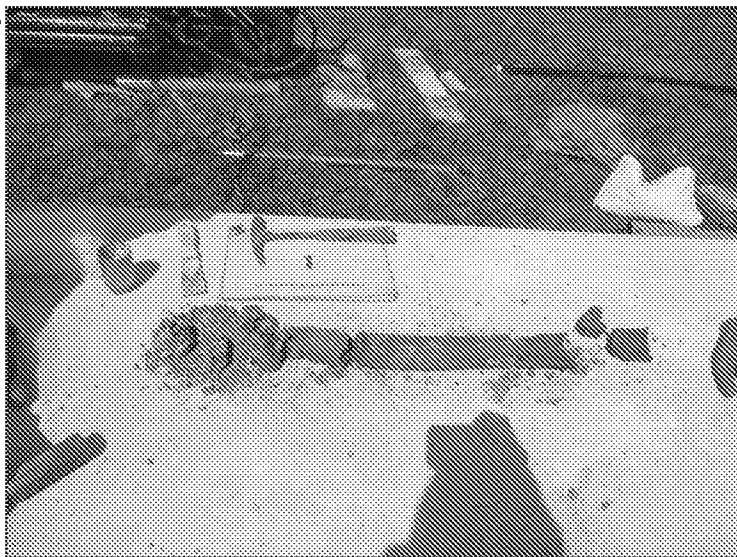
Site Name: Merry England

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15.	WS1
16.	WS1

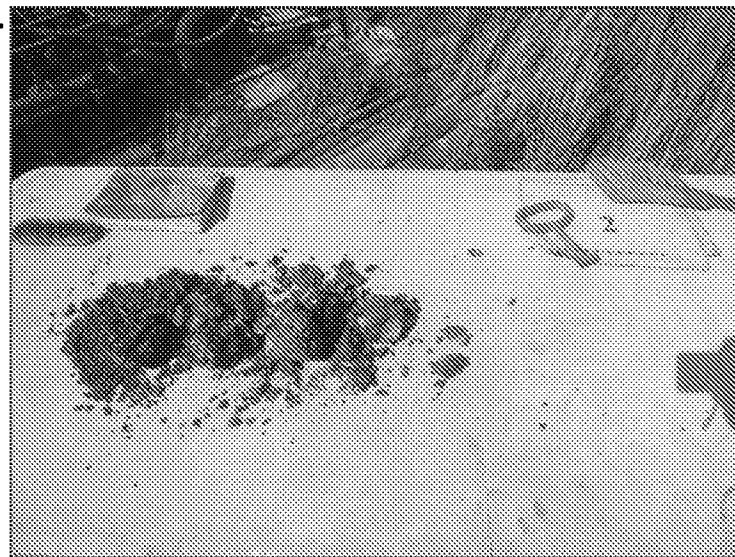


IMPACT
GEOTECHNICAL

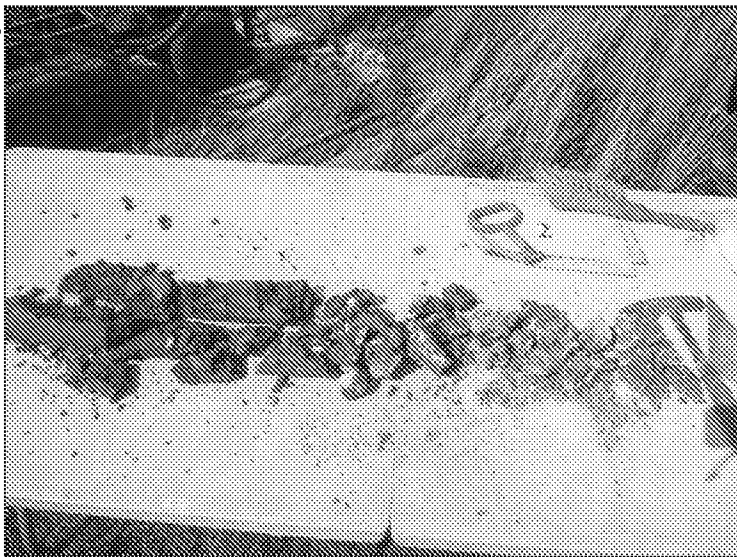
17.



18.



19.



20.



Investigation Photographs

Project Ref: P19.117

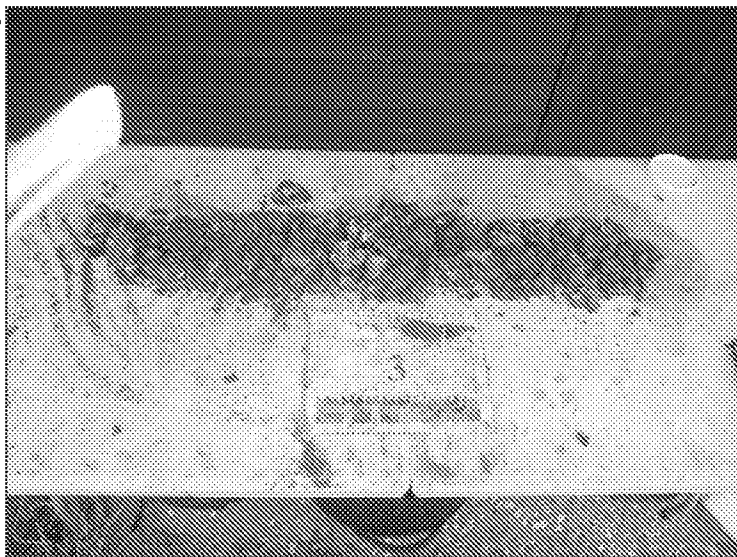
ARUN DISTRICT COUNCIL A/132/19/DOC

Site Name: Merry England

17. WS1
18. WS2
19. WS2
20. WS3



21.



22.



23.



24.



Investigation Photographs

Project Ref: P19.117

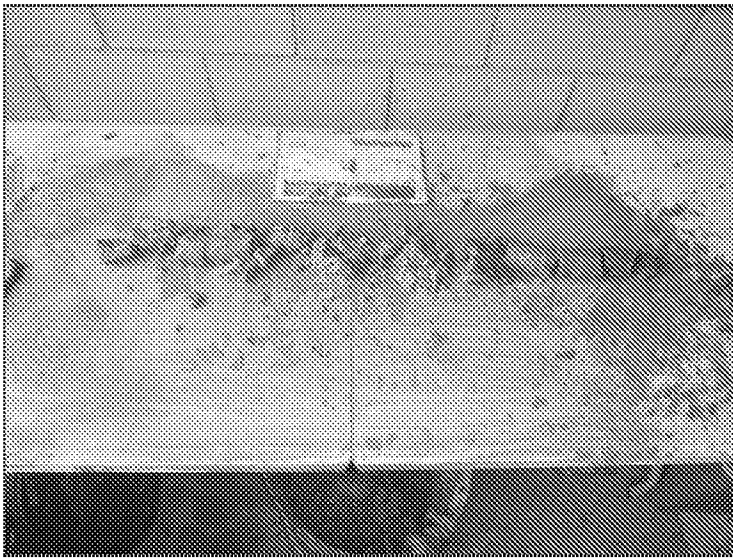
ARUN DISTRICT COUNCIL A/132/19/DOC

Site Name: Merry England

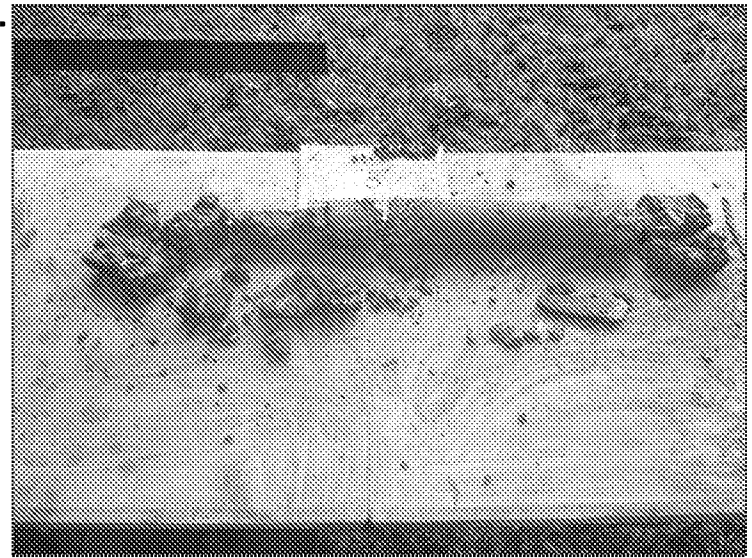
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22. WS3
23. WS4.
24. WS4



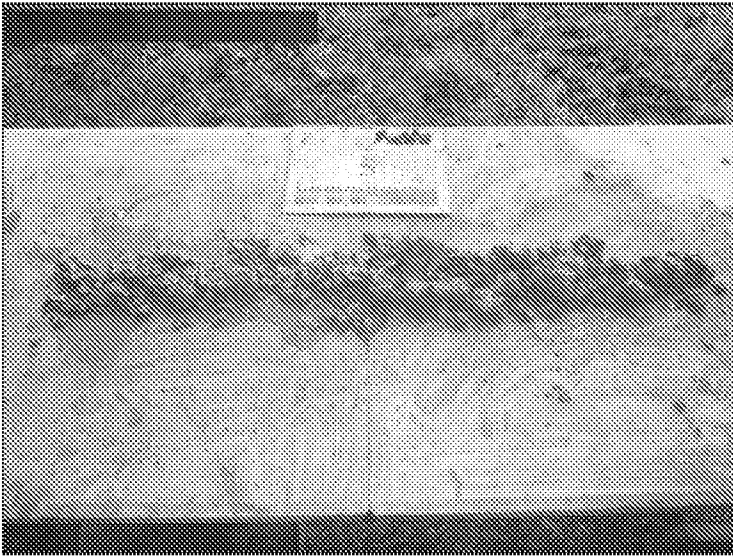
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26.



27.



28.



Investigation Photographs

Project Ref: P19.117

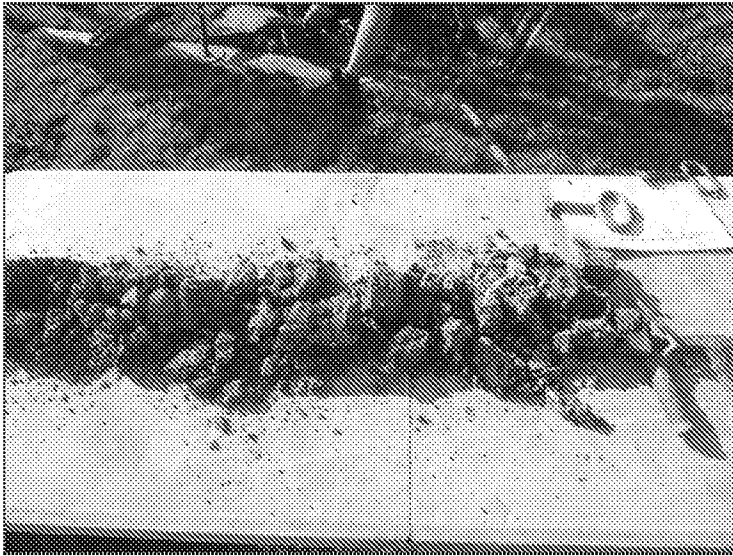
ARUN DISTRICT COUNCIL A/132/19/DOC

Site Name: Merry England

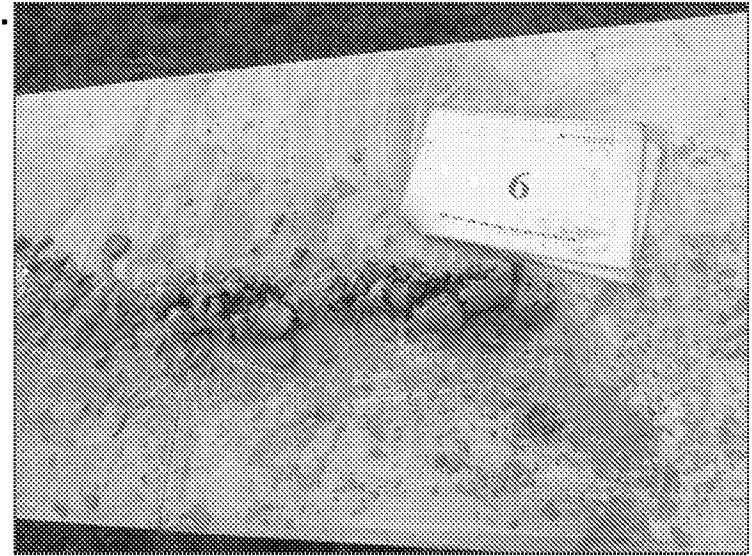
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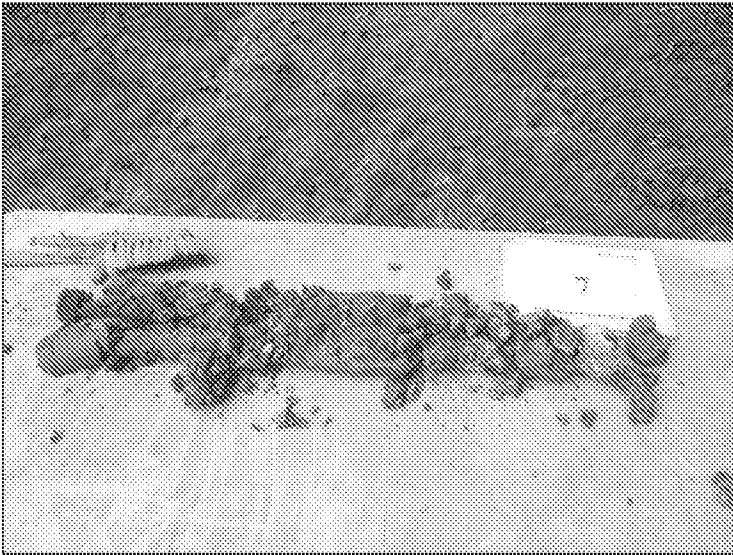
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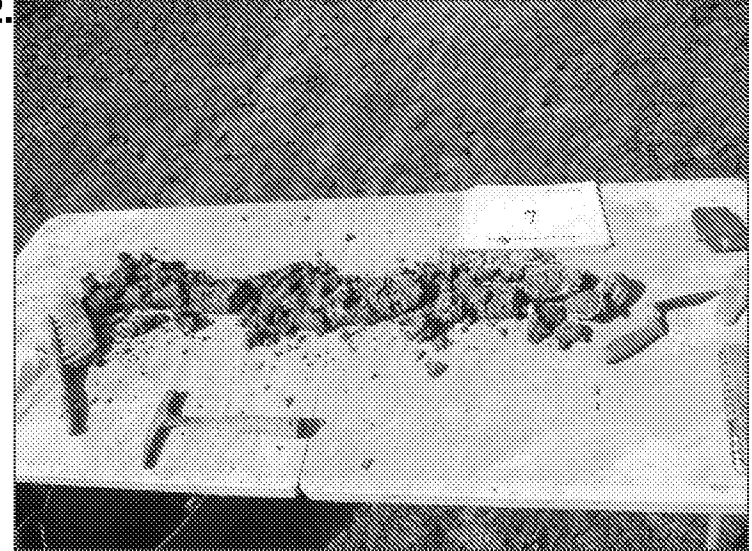
30.



31.



32.



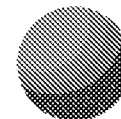
Investigation Photographs

Project Ref: P19.117

ARUN DISTRICT COUNCIL A/132/19/DOC

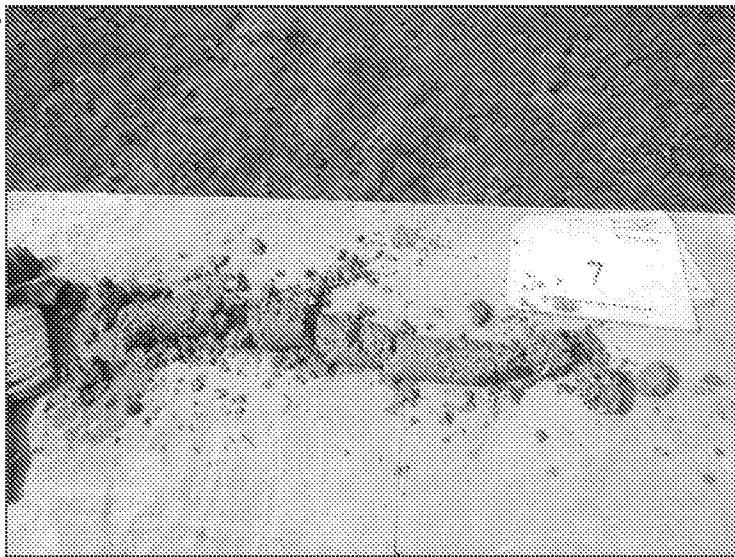
Site Name: Merry England

29. WS6
30. WS6
31. WS7
32. WS7

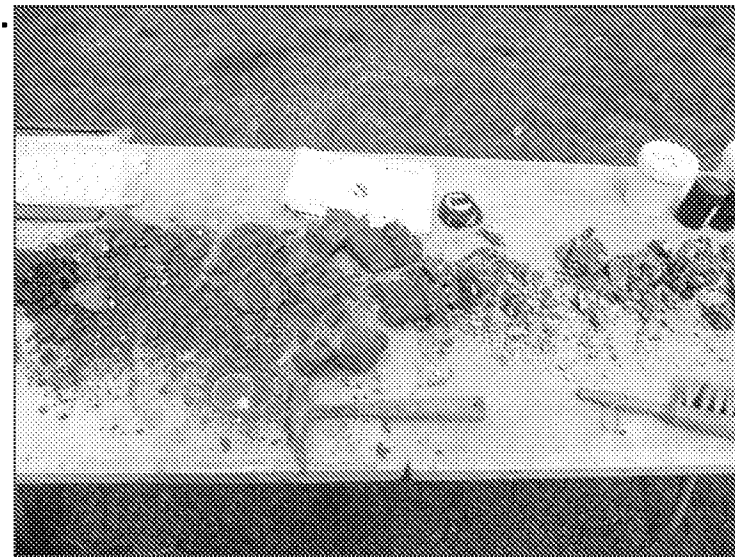


IMPACT
GEOTECHNICAL

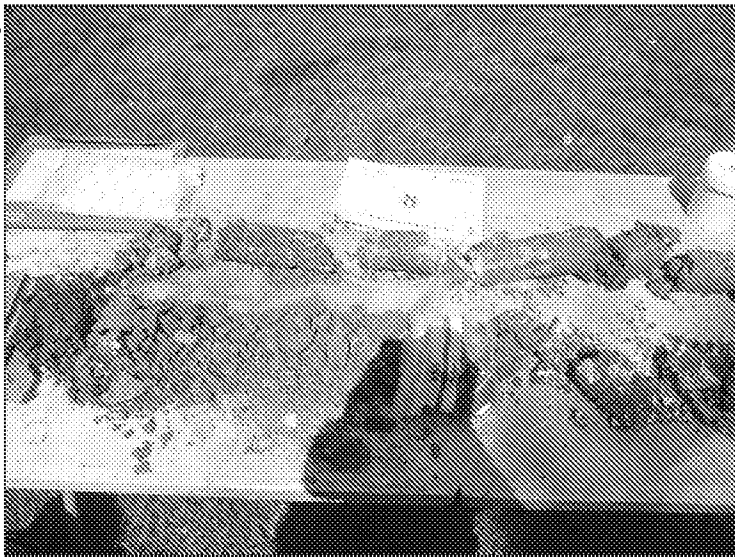
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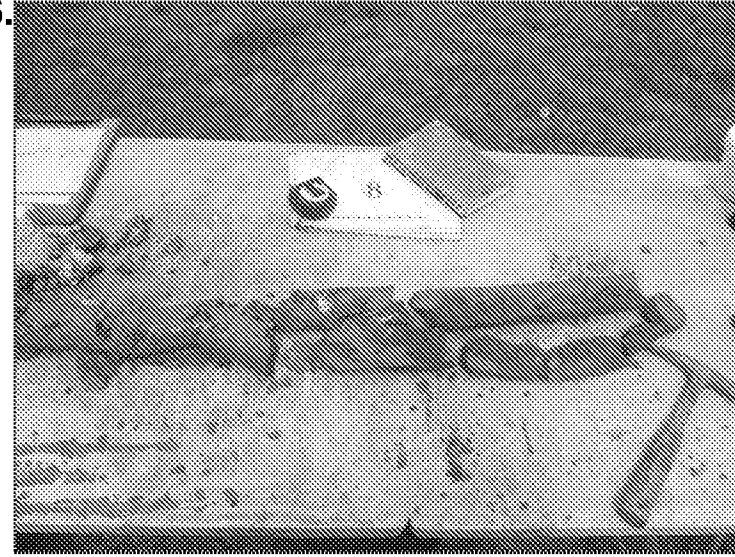
34.



35.



36.



Investigation Photographs

Project Ref: P19.117

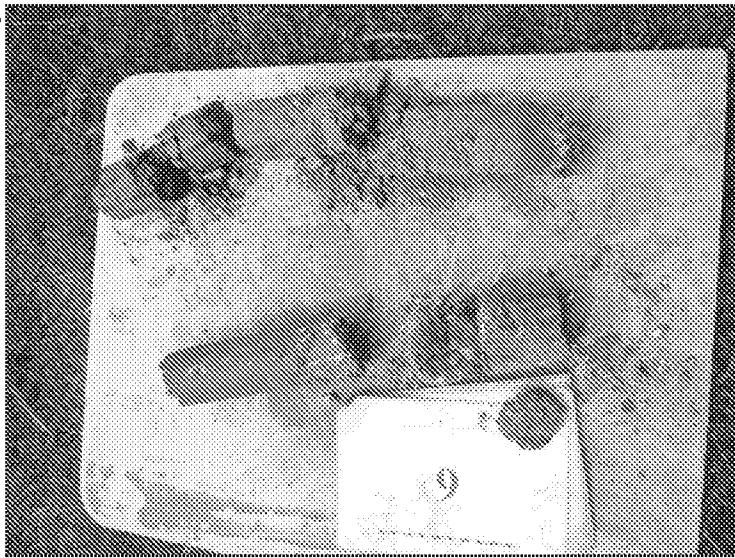
ARUN DISTRICT COUNCIL A/132/19/DOC

Site Name: Merry England

33. WS7
34. WS8.
35. WS8
36. WS8



37.



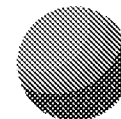
Investigation Photographs

Project Ref: P19.117

ARUN DISTRICT COUNCIL A/132/19/DOC

Site Name: Merry England

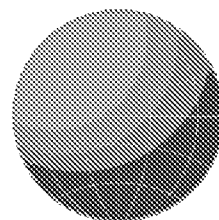
37. WS9



IMPACT
GEOTECHNICAL

APPENDIX D

Laboratory Certificates



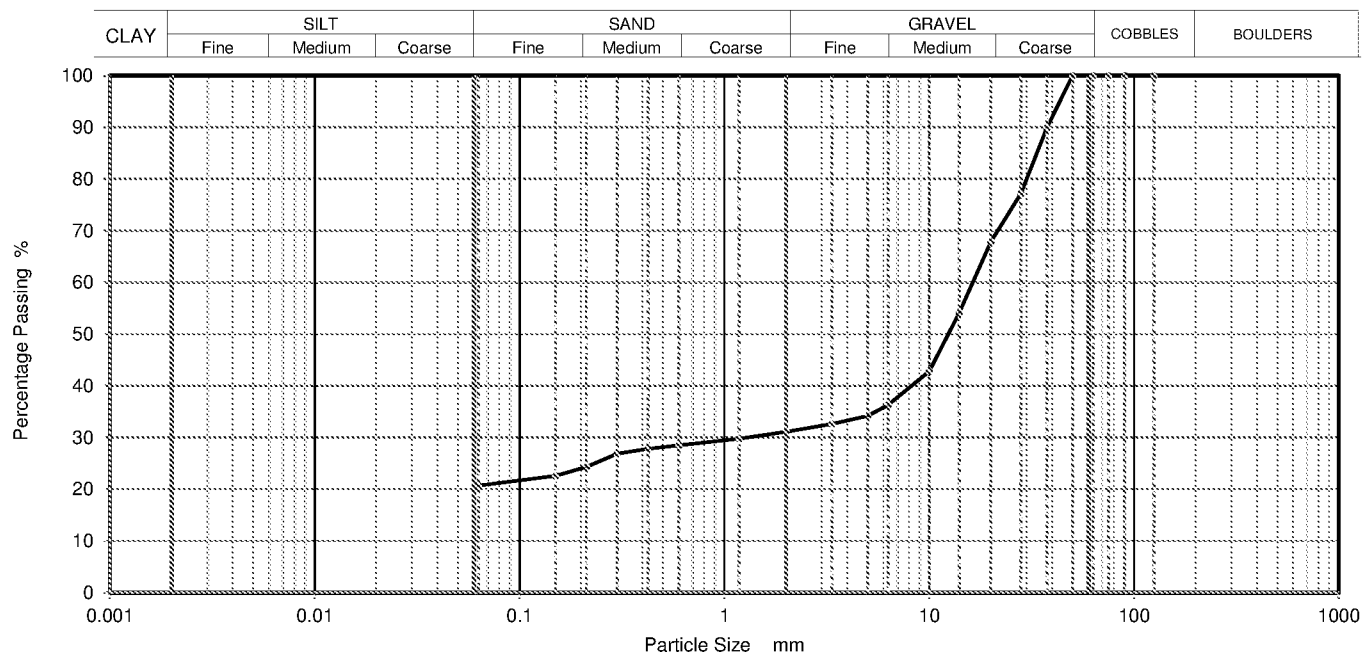
IMPACT
GEOTECHNICAL



PARTICLE SIZE DISTRIBUTION

Job Ref	27018
Borehole/Pit No.	WS2
Sample No.	-
Depth Top	2.00 m
Depth Base	- m
Sample Type	D
Samples received	16/08/2019
Schedules received	15/08/2019
Project started	16/08/2019
Date tested	02/09/2019

Site Name	Merry England		
Project No.	19.1170	Client	Impact Geotechnical
Soil Description	Brown sandy silty clayey GRAVEL (gravel is fmc and sub-angular)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	90		
28	77		
20	68		
14	54		
10	43		
6.3	36		
5	34		
3.35	33		
2	31		
1.18	30		
0.6	29		
0.425	28		
0.3	27		
0.212	24		
0.15	23		
0.063	21		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	68.9
Sand	10.4
Fines <0.063mm	20.7

Grading Analysis	
D100 mm	
D60 mm	16.3
D30 mm	1.29
D10 mm	
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU

Checked and Approved

Initials: J.P

Date: 04/09/2019

MSF-5-R3

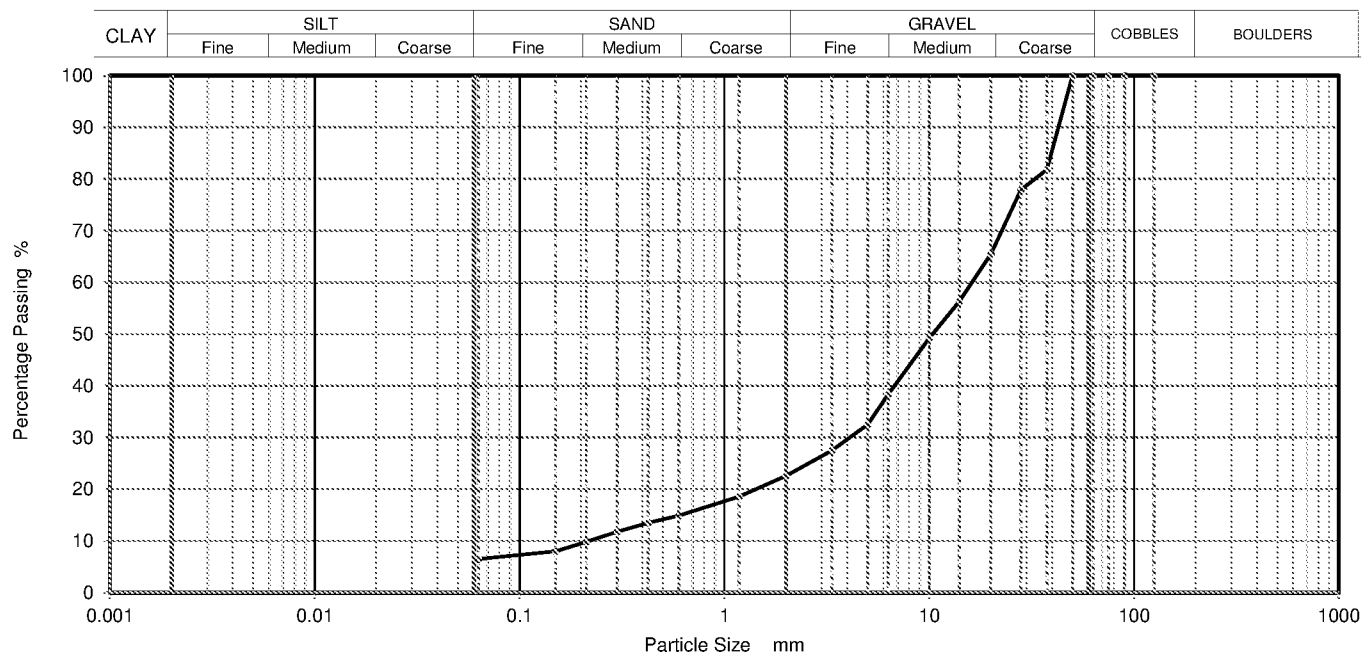
Approved Signatories: K.Phaure (Tech.Mgr) J.J.Phaure (Lab.Mgr)



PARTICLE SIZE DISTRIBUTION

Job Ref	27018
Borehole/Pit No.	WS2
Sample No.	-
Depth Top	3.50 m
Depth Base	4.00 m
Sample Type	D
Samples received	16/08/2019
Schedules received	15/08/2019
Project started	16/08/2019
Date tested	02/09/2019

Site Name	Merry England		
Project No.	19.1170	Client	Impact Geotechnical
Soil Description	Brown clayey sandy GRAVEL (gravel is fmc and sub-angular)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	82		
28	78		
20	66		
14	56		
10	49		
6.3	38		
5	33		
3.35	28		
2	23		
1.18	19		
0.6	15		
0.425	14		
0.3	12		
0.212	10		
0.15	8		
0.063	7		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	77.4
Sand	16.1
Fines <0.063mm	6.5

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	74
Curvature Coefficient	4.7

Remarks
Preparation and testing in accordance with BS1377 unless noted below



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Unit 8, Olds Close, Watford, Herts, WD18 9RU

Checked and Approved

Initials: J.P

Date: 04/09/2019

MSF-5-R3

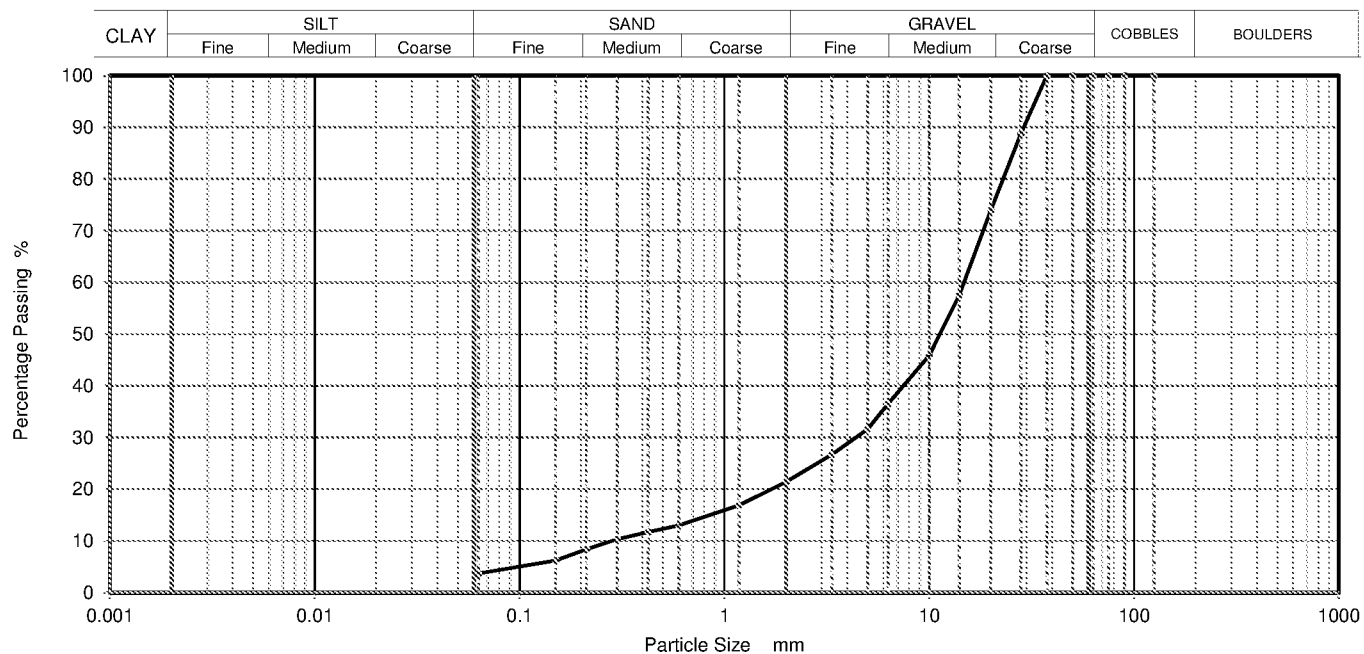
Approved Signatories: K.Phaure



PARTICLE SIZE DISTRIBUTION

Job Ref	27018
Borehole/Pit No.	WS3
Sample No.	-
Depth Top	2.50 m
Depth Base	- m
Sample Type	D
Samples received	16/08/2019
Schedules received	15/08/2019
Project started	16/08/2019
Date tested	02/09/2019

Site Name	Merry England		
Project No.	19.1170	Client	Impact Geotechnical
Soil Description	Brown and greenish grey slightly clayey sandy GRAVEL (gravel is fmc and sub-angular)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	89		
20	74		
14	58		
10	46		
6.3	37		
5	32		
3.35	27		
2	21		
1.18	17		
0.6	13		
0.425	12		
0.3	10		
0.212	8		
0.15	6		
0.063	4		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	78.6
Sand	17.6
Fines <0.063mm	3.7

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	52
Curvature Coefficient	4.6

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU

Checked and Approved

Initials: J.P

Date: 04/09/2019

MSF-5-R3

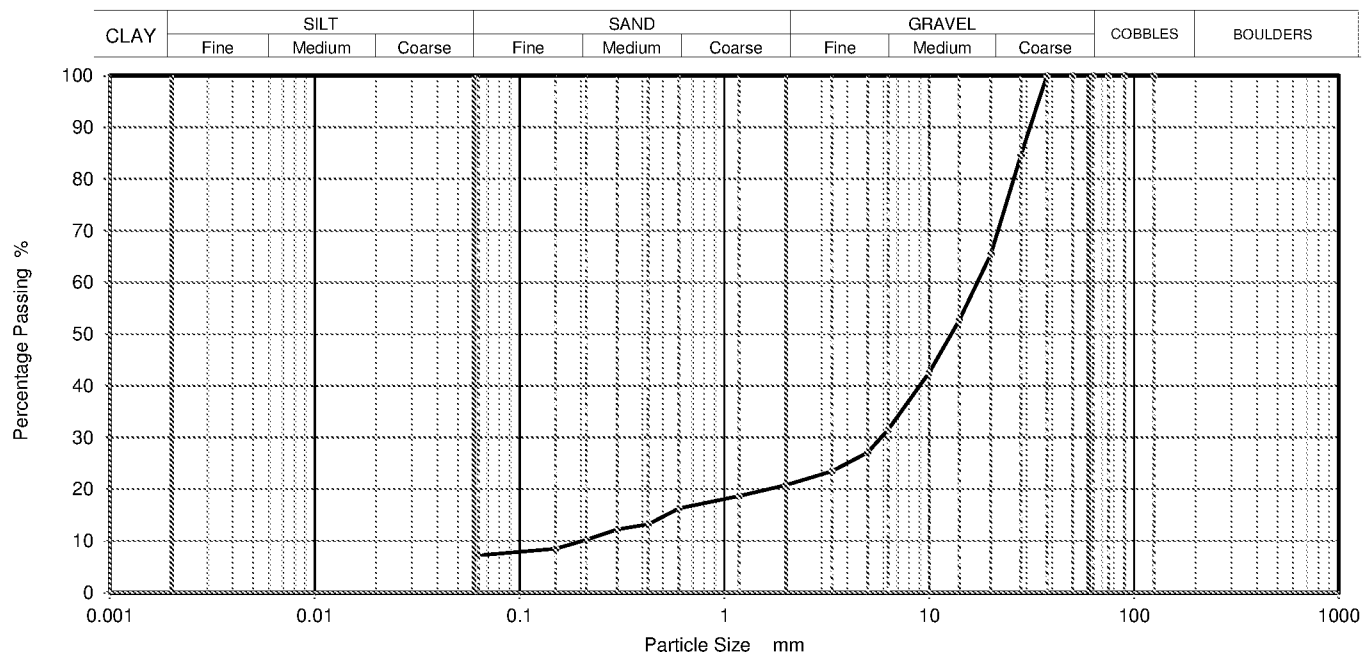
Approved Signatories: K.Phaure (T)



PARTICLE SIZE DISTRIBUTION

Job Ref	27018
Borehole/Pit No.	WS4
Sample No.	-
Depth Top	2.00 m
Depth Base	- m
Sample Type	D
Samples received	16/08/2019
Schedules received	15/08/2019
Project started	16/08/2019
Date tested	02/09/2019

Site Name	Merry England		
Project No.	19.1170	Client	Impact Geotechnical
Soil Description	Brown clayey sandy GRAVEL (gravel is fmc and sub-angular)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	85		
20	66		
14	53		
10	43		
6.3	32		
5	27		
3.35	24		
2	21		
1.18	19		
0.6	16		
0.425	13		
0.3	12		
0.212	10		
0.15	9		
0.063	7		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	79.2
Sand	13.6
Fines <0.063mm	7.2

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	85
Curvature Coefficient	9.7

Remarks
Preparation and testing in accordance with BS1377 unless noted below



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Unit 8, Olds Close, Watford, Herts, WD18 9RU

Checked and Approved

Initials: J.P

Date: 04/09/2019

MSF-5-R3

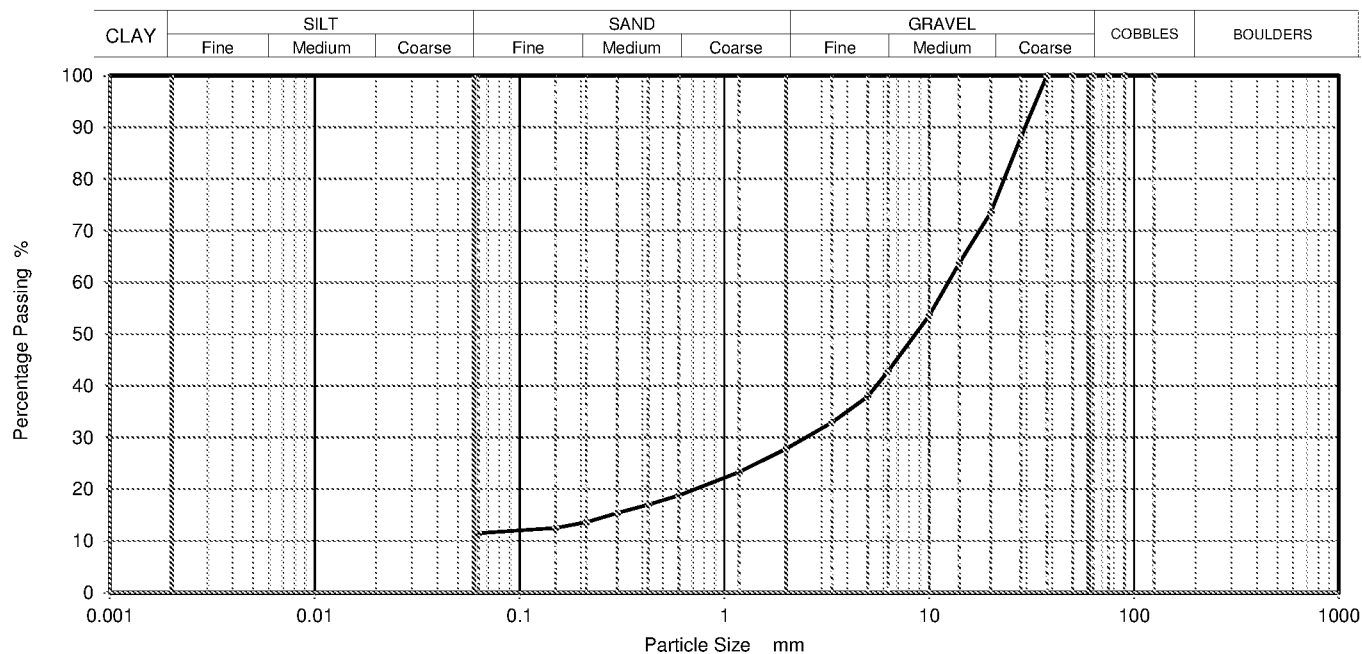
Approved Signatories: K.Phaure (T)



PARTICLE SIZE DISTRIBUTION

Job Ref	27018
Borehole/Pit No.	WS4
Sample No.	-
Depth Top	3.50 m
Depth Base	- m
Sample Type	D
Samples received	16/08/2019
Schedules received	15/08/2019
Project started	16/08/2019
Date tested	02/09/2019

Site Name	Merry England		
Project No.	19.1170	Client	Impact Geotechnical
Soil Description	Brown clayey sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)		
Test Method	BS1377:Part 2: 1990, clause 9.0		

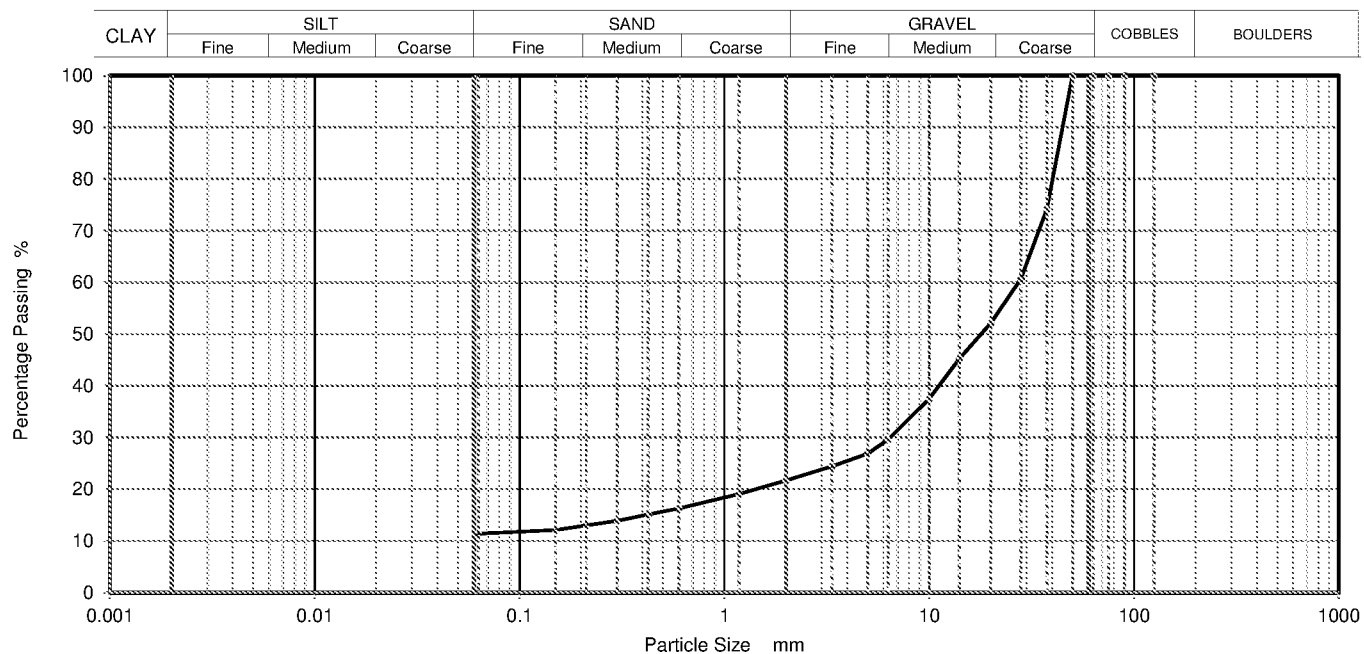




PARTICLE SIZE DISTRIBUTION

Job Ref	27018
Borehole/Pit No.	WS7
Sample No.	-
Depth Top	2.50 m
Depth Base	3.00 m
Sample Type	D
Samples received	16/08/2019
Schedules received	15/08/2019
Project started	16/08/2019
Date tested	02/09/2019

Site Name	Merry England		
Project No.	19.1170	Client	Impact Geotechnical
Soil Description	Brown sandy clayey GRAVEL (gravel is fmc and sub-angular)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	74		
28	61		
20	52		
14	45		
10	38		
6.3	30		
5	27		
3.35	24		
2	22		
1.18	19		
0.6	16		
0.425	15		
0.3	14		
0.212	13		
0.15	12		
0.063	11		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	78.3
Sand	10.3
Fines <0.063mm	11.4

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



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Unit 8, Olds Close, Watford, Herts, WD18 9RU

Checked and Approved

Initials: J.P

Date: 04/09/2019

MSF-5-R3

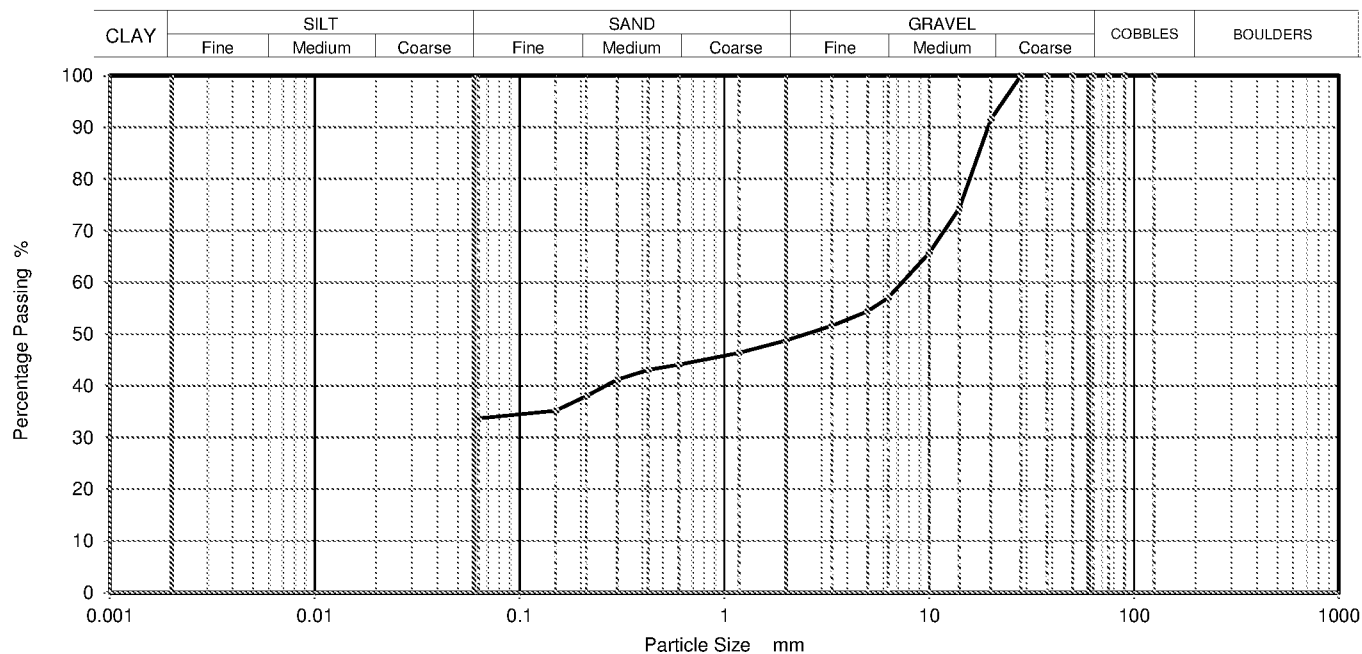
Approved Signatories: K.Phaure



PARTICLE SIZE DISTRIBUTION

Job Ref	27018
Borehole/Pit No.	WS8
Sample No.	-
Depth Top	1.00 m
Depth Base	1.00 m
Sample Type	D
Samples received	16/08/2019
Schedules received	15/08/2019
Project started	16/08/2019
Date tested	02/09/2019

Site Name	Merry England		
Project No.	19.1170	Client	Impact Geotechnical
Soil Description	Brown sandy silty clayey GRAVEL (gravel is fmc and sub-angular)		
Test Method	BS1377:Part 2: 1990, clause 9.0		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	92		
14	74		
10	66		
6.3	57		
5	54		
3.35	52		
2	49		
1.18	46		
0.6	44		
0.425	43		
0.3	41		
0.212	38		
0.15	35		
0.063	34		

Sample Proportions	% dry mass
Very coarse	0.0
Gravel	51.2
Sand	15.1
Fines <0.063mm	33.7

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	
Curvature Coefficient	

Remarks
Preparation and testing in accordance with BS1377 unless noted below



K4 Soils Laboratory
Unit 8, Olds Close, Watford, Herts, WD18 9RU

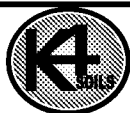
Checked and Approved

Initials: J.P

Date: 04/09/2019

MSF-5-R3

Approved Signatories: K.Phaure (T)



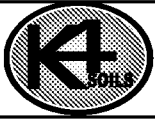
Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No. 27018	Project Name Merry England	Programme	
		Samples received	16/08/2019
Project No. P19.1170	Client Impact Geotechnical	Schedule received	15/08/2019
		Project started	16/08/2019
		Testing Started	29/08/2019

Hole No.	Sample				Soil Description	NMC %	Passing 425µm %	LL %	PL %	PI %	Remarks
	Ref	Top m	Base m	Type							
CBR1	-	0.30	-	D	Brown slightly sandy gravelly silty CLAY (gravel is fm and sub-angular to angular)	10					
CBR2	-	0.30	-	D	Brown slightly sandy gravelly silty CLAY (gravel is fm and sub-angular to angular)	7.7					
CBR3	-	0.40	-	D	Brown slightly sandy slightly gravelly silty CLAY (gravel is fm and sub-angular to angular)	18					
CBR4	-	0.30	-	D	Brown silty CLAY with rare fm sub-angular	14					
WS2	-	1.00	-	D	Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to angular)	12	40	50	17	33	Sample washed to obtain test fraction
WS3	-	1.20	-	D	Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to angular)	12	47	34	14	20	Sample washed to obtain test fraction
WS3	-	2.50	-	D	Brown and greenish grey slightly clayey sandy GRAVEL (gravel is fmc and sub-angular)	14	12	46	19	27	Sample washed to obtain test fraction
WS4	-	1.00	-	D	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to angular)	18	66	44	15	29	Sample washed to obtain test fraction
WS5	-	1.00	-	D	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to angular)	16	65	50	18	32	
WS6	-	1.00	-	D	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)	15	70	54	17	37	
WS6	-	1.50	-	D	Brown slightly gravelly silty CLAY (gravel is fm and sub-angular)	20					
WS6	-	2.50	-	D	Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to angular)	18					

 2519	Test Methods: BS1377: Part 2: 1990: Natural Moisture Content : clause 3.2 Atterberg Limits: clause 4.3, 4.4 and 5.0	Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU	Checked and Approved Initials J.P Date: 04/09/2019
	Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)		MSF-5-R1

[illegible]



California Bearing Ratio (CBR)

Job Ref 27018

Borehole/Pit No. TP1

Site Name Merry England

Sample No. -

Project No. P19.1170

Client

Impact Geotechnical

Depth Top 0.40 m

Soil Description

Brown slightly sandy gravelly silty CLAY with occasional fine roots
(gravel is fmc and angular to sub-rounded)

Depth Base 0.70 m

Sample Type B

Samples received 16/08/2019

Schedules received 15/08/2019

Test Method BS1377 : Part 4 : 1990, clause 7

Project Started 16/08/2019

Date Tested 29/08/2019

Specimen Preparation

Condition REMOULDED

Details Recompacted with specified standard effort using 2.5kg
rammer

Soaking details

Not soaked

Period of soaking - days

Time to surface - days

Amount of swell recorded - mm

Material retained on 20mm sieve removed 5.4 %

Initial Specimen details

Bulk density 1.84 Mg/m³

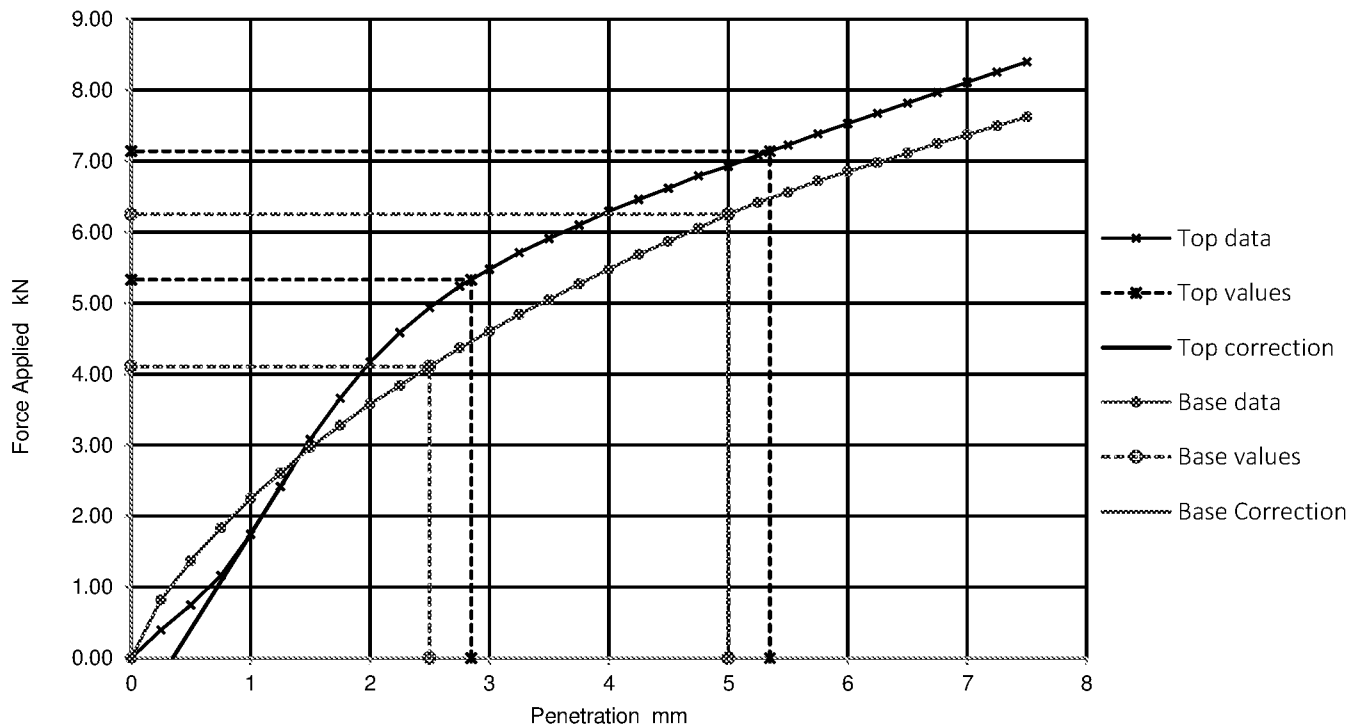
Dry density 1.65 Mg/m³

Moisture content 12 %

Surcharge applied 6 kg

4 kPa

Force v Penetration Plots



Results

TOP
BASE

Curve correction applied	CBR Values, %			
	2.5mm	5mm	Highest	Average
Yes	40	36	40	N/A
No	31	31	31	

Moisture Content %
12
11

Remarks

1



2519

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

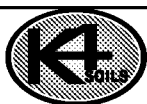
Checked and Approved

Initials: J.P

Date: 04/09/2019

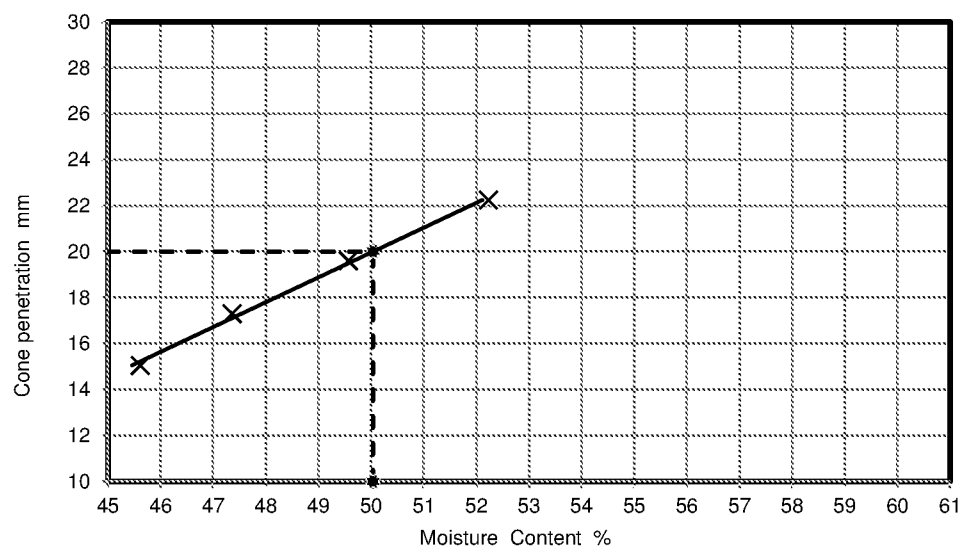
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R16



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Merry England			Job No.	27018
Project No.	P19.1170	Client	Impact Geotechnical	Borehole/Pit No.	WS2
Soil Description	Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to angular)			Sample No.	-
				Depth Top	1.00 m
				Depth Base	- m
				Sample Type	D
				Samples received	16/08/2019
				Schedules received	15/08/2019
				Project Started	16/08/2019
				Date Tested	29/08/2019

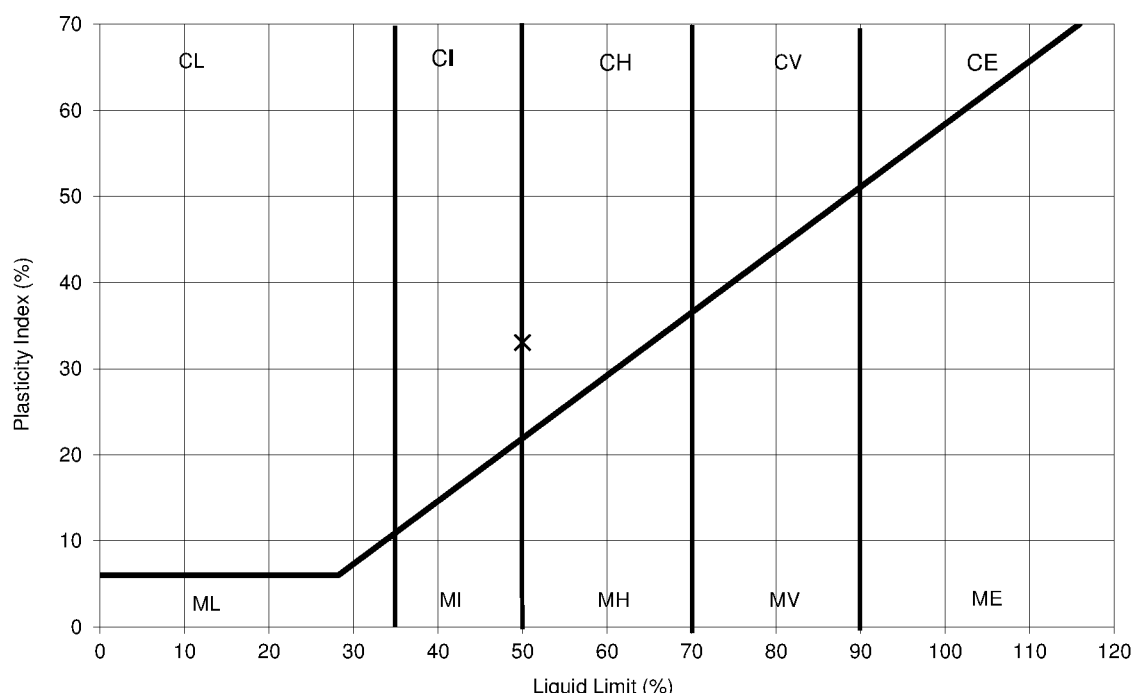


NATURAL MOISTURE CONTENT	12	%
% PASSING 425µm SIEVE	40	%
LIQUID LIMIT	50	%
PLASTIC LIMIT	17	%
PLASTICITY INDEX	33	%

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

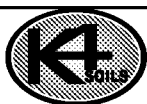
Initials: J.P

Date: 04/09/2019

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 27018

Borehole/Pit No. WS3

Site Name Merry England

Sample No. -

Project No. P19.1170

Client

Impact Geotechnical

Depth Top 1.20 m

Depth Base - m

Sample Type D

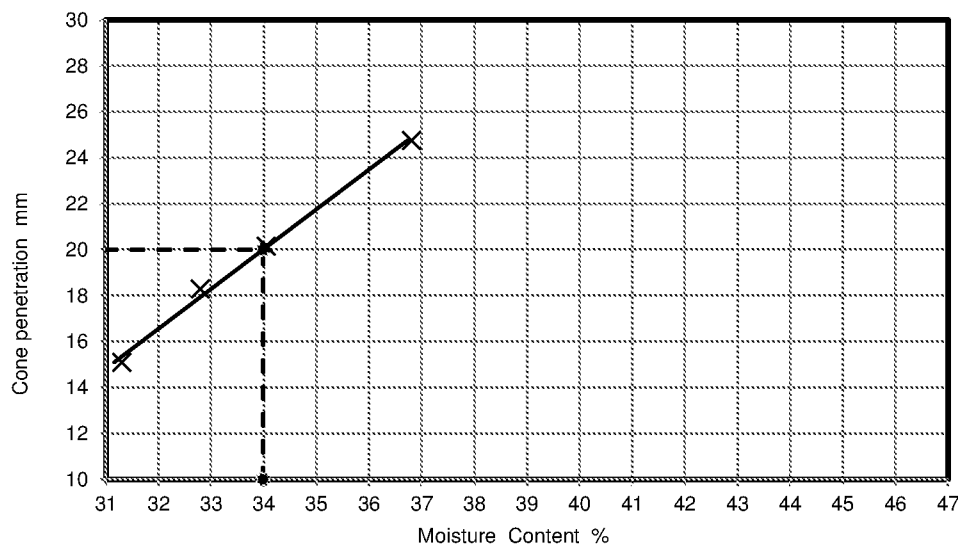
Samples received 16/08/2019

Schedules received 15/08/2019

Project Started 16/08/2019

Date Tested 29/08/2019

Soil Description Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to angular)


NATURAL MOISTURE CONTENT

12 %

% PASSING 425µm SIEVE

47 %

LIQUID LIMIT

34 %

PLASTIC LIMIT

14 %

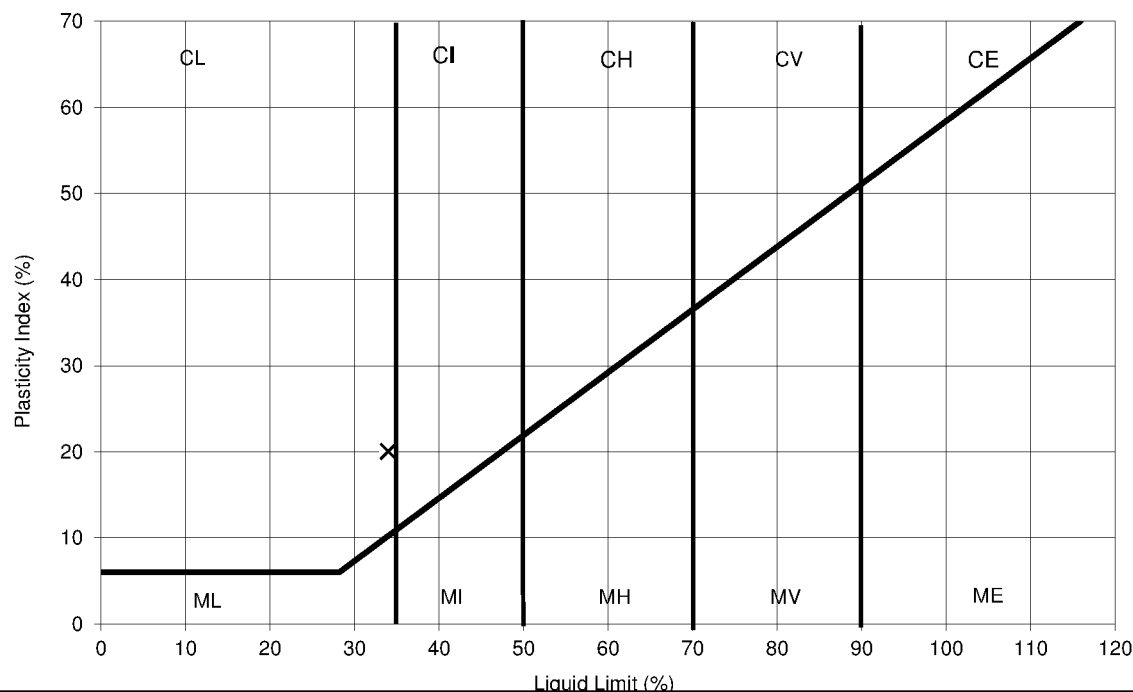
PLASTICITY INDEX

20 %

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

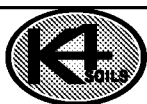
Initials: J.P

Date: 04/09/2019

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 27018

Borehole/Pit No. WS3

Site Name Merry England

Sample No. -

Project No. P19.1170

Client

Impact Geotechnical

Depth Top 2.50 m

Depth Base - m

Sample Type D

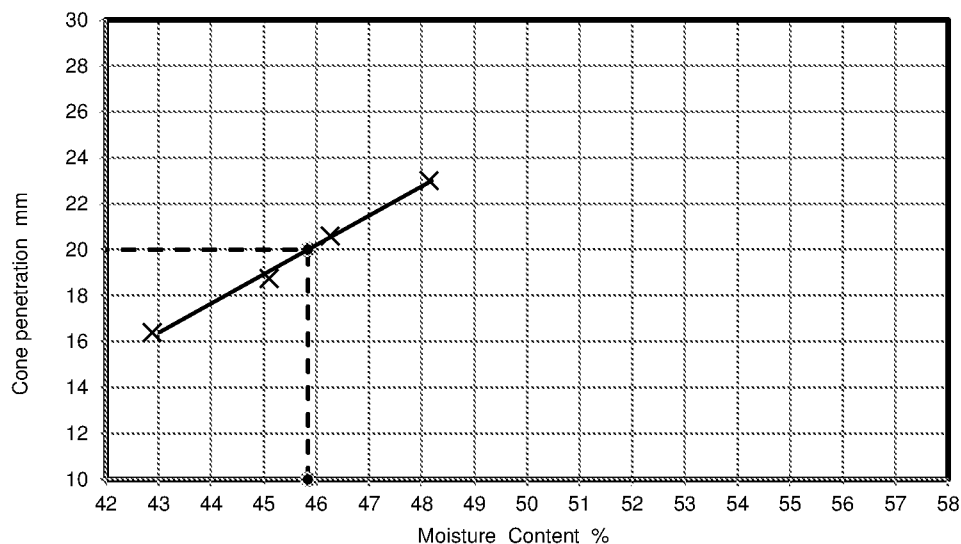
Samples received 16/08/2019

Schedules received 15/08/2019

Project Started 16/08/2019

Date Tested 29/08/2019

Soil Description Brown and greenish grey slightly clayey sandy GRAVEL (gravel is fmc and sub-angular)



NATURAL MOISTURE CONTENT

14 %

% PASSING 425µm SIEVE

12 %

LIQUID LIMIT

46 %

PLASTIC LIMIT

19 %

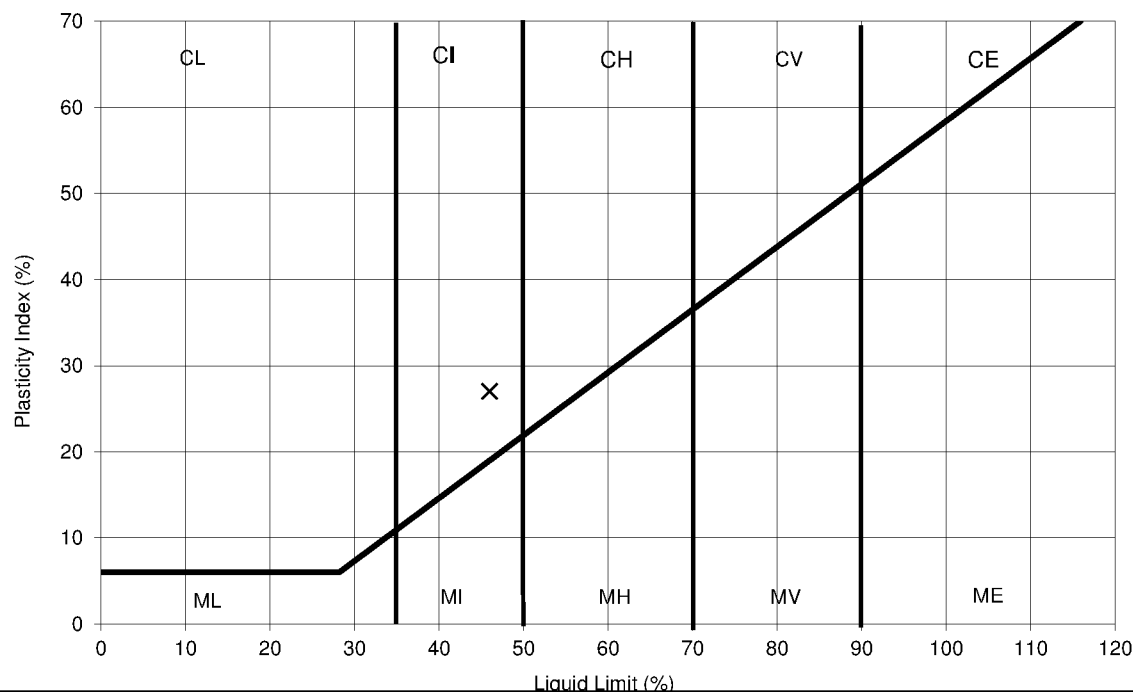
PLASTICITY INDEX

27 %

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

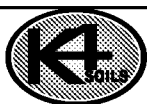
Initials: J.P

Date: 04/09/2019

2519

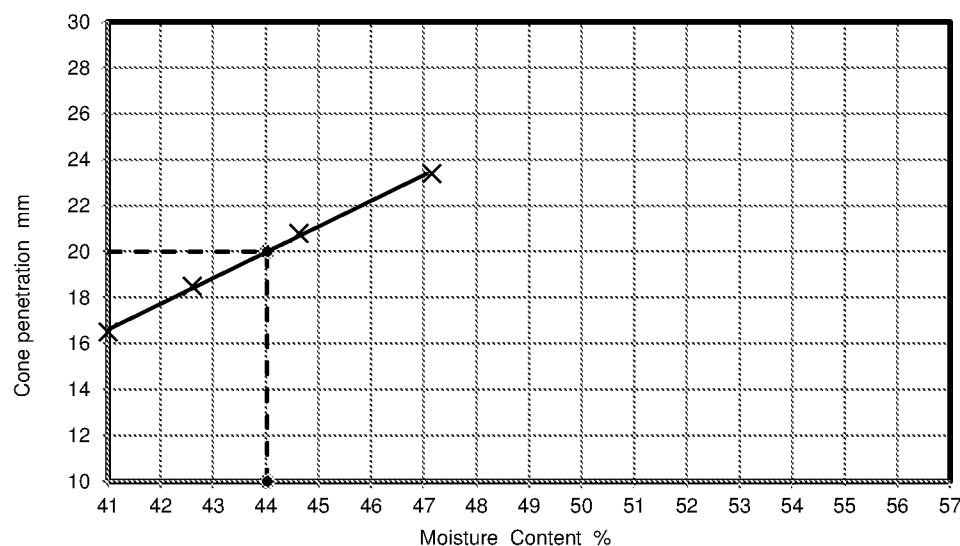
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

				Job No.	27018
				Borehole/Pit No.	WS4
Site Name	Merry England			Sample No.	-
Project No.	P19.1170	Client	Impact Geotechnical	Depth Top	1.00 m
Soil Description	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to angular)			Depth Base	- m
				Sample Type	D
				Samples received	16/08/2019
				Schedules received	15/08/2019
				Project Started	16/08/2019
				Date Tested	29/08/2019

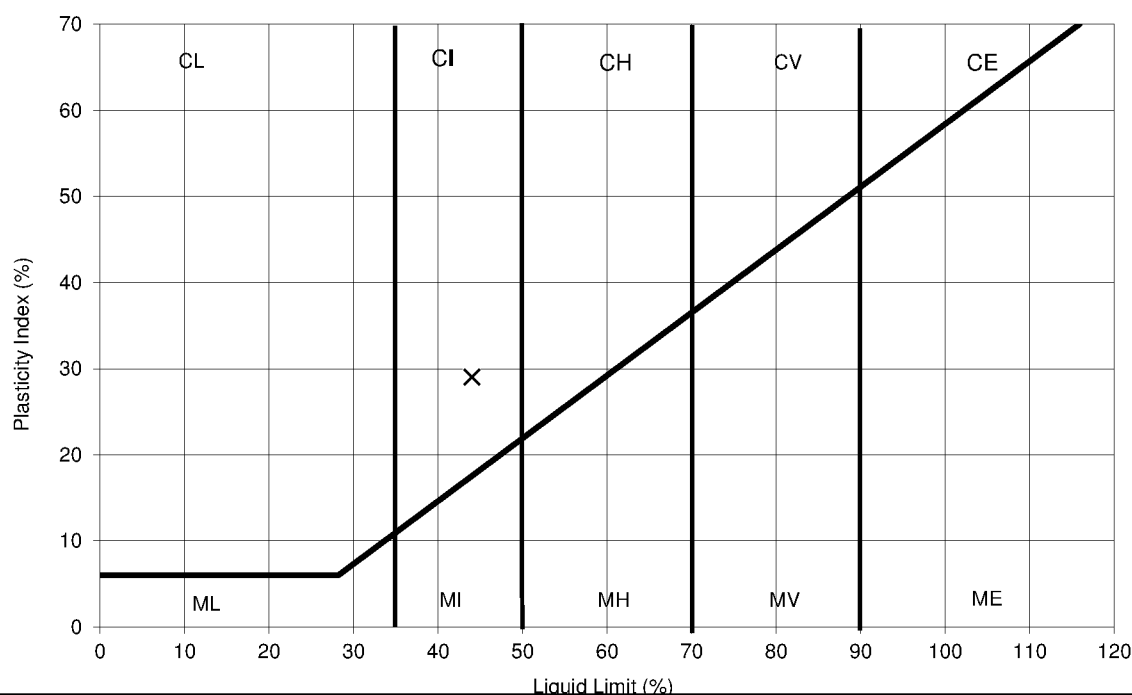


NATURAL MOISTURE CONTENT	18	%
% PASSING 425µm SIEVE	66	%
LIQUID LIMIT	44	%
PLASTIC LIMIT	15	%
PLASTICITY INDEX	29	%

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

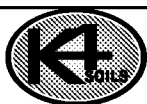
Initials: J.P

Date: 04/09/2019

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

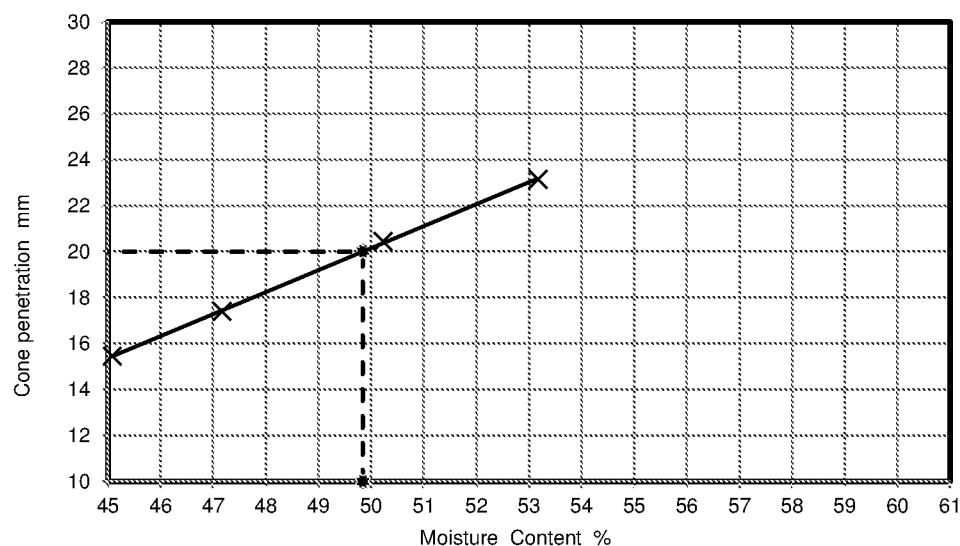
MSF-5 R2

2519



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

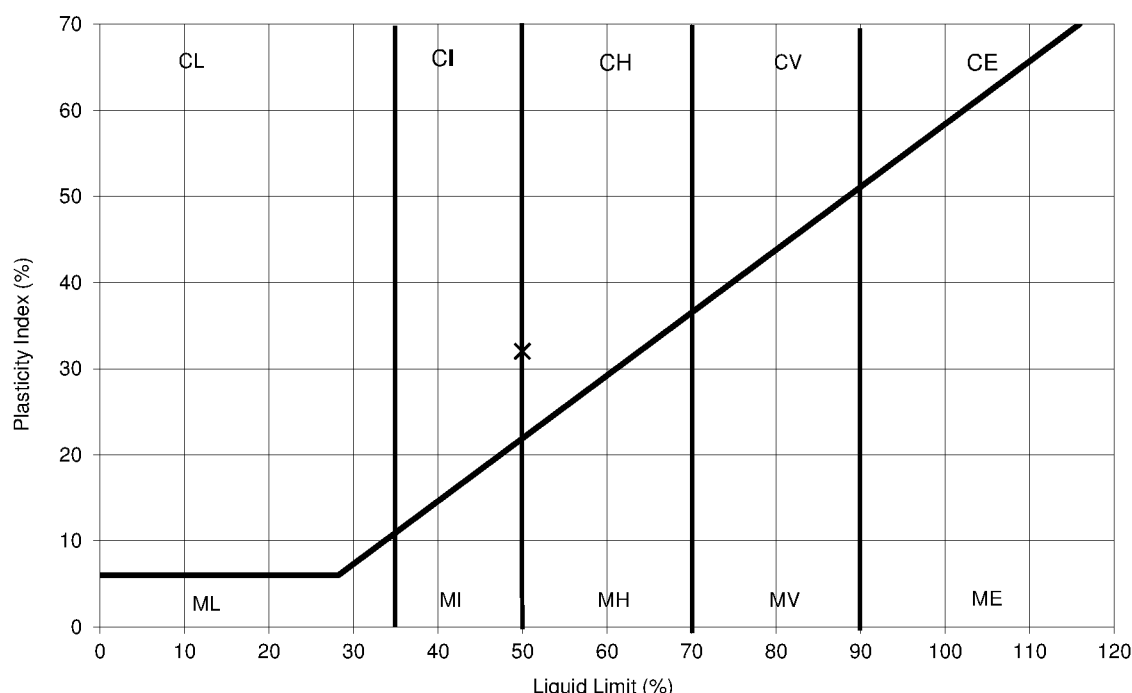
Site Name	Merry England			Job No.	27018
Project No.	P19.1170	Client	Impact Geotechnical	Borehole/Pit No.	WS5
Soil Description	Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to angular)			Sample No.	-
				Depth Top	1.00 m
				Depth Base	- m
				Sample Type	D
				Samples received	16/08/2019
				Schedules received	15/08/2019
				Project Started	16/08/2019
				Date Tested	29/08/2019



NATURAL MOISTURE CONTENT	16	%
% PASSING 425µm SIEVE	65	%
LIQUID LIMIT	50	%
PLASTIC LIMIT	18	%
PLASTICITY INDEX	32	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

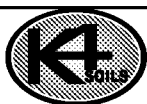
Initials: J.P

Date: 04/09/2019

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

2519



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No. 27018

Borehole/Pit No. WS6

Site Name Merry England

Sample No. -

Project No. P19.1170

Client

Impact Geotechnical

Depth Top 1.00 m

Depth Base - m

Sample Type D

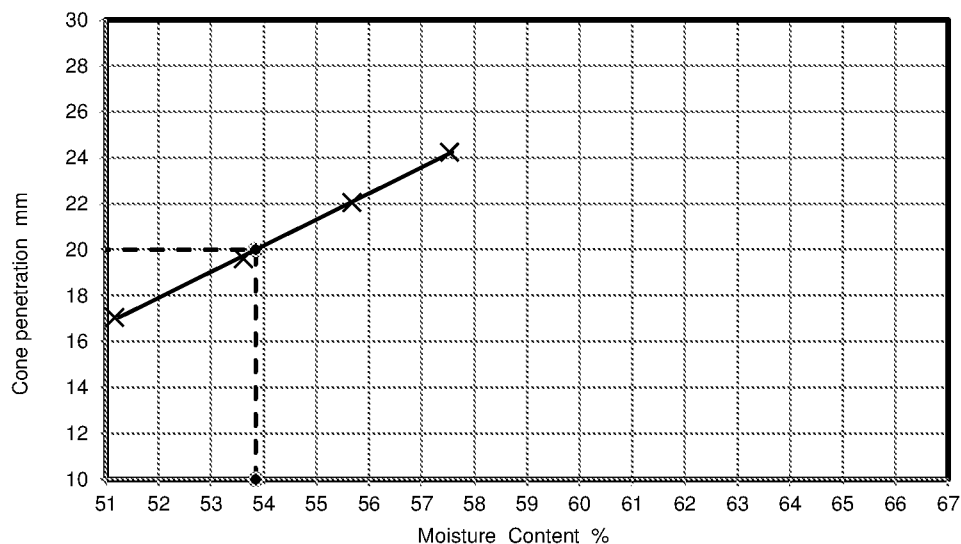
Samples received 16/08/2019

Schedules received 15/08/2019

Project Started 16/08/2019

Date Tested 30/08/2019

Soil Description Brown slightly sandy slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)



NATURAL MOISTURE CONTENT

15 %

% PASSING 425µm SIEVE

70 %

LIQUID LIMIT

54 %

PLASTIC LIMIT

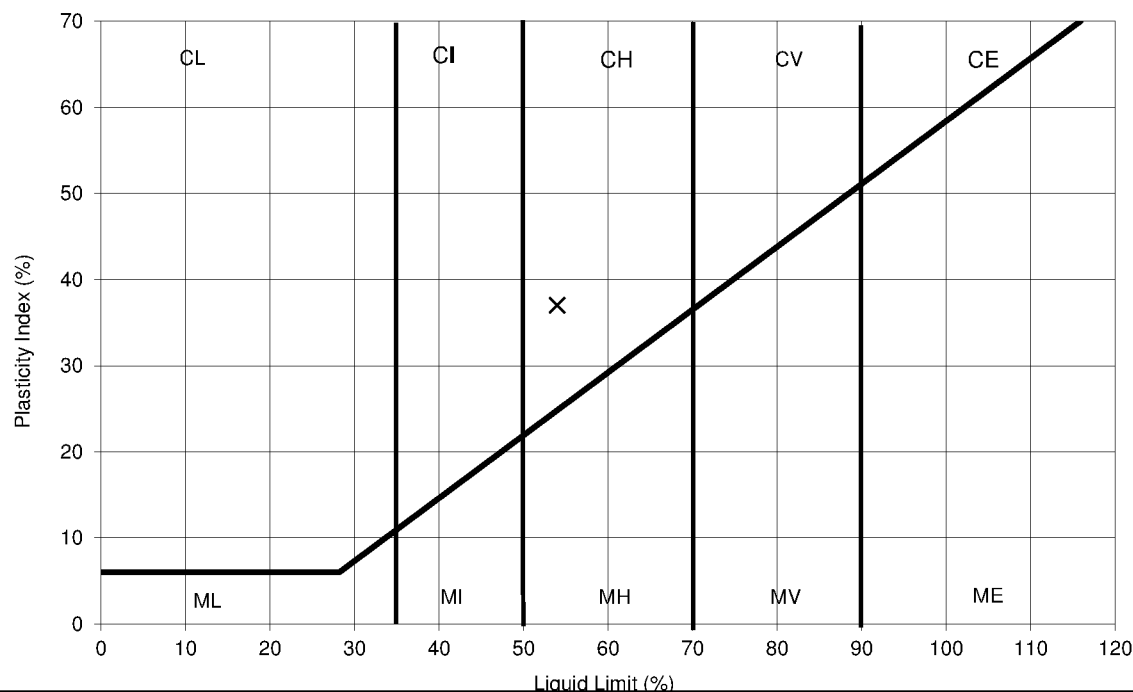
17 %

PLASTICITY INDEX

37 %

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

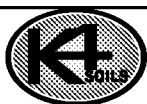
Initials: J.P

Date: 04/09/2019

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

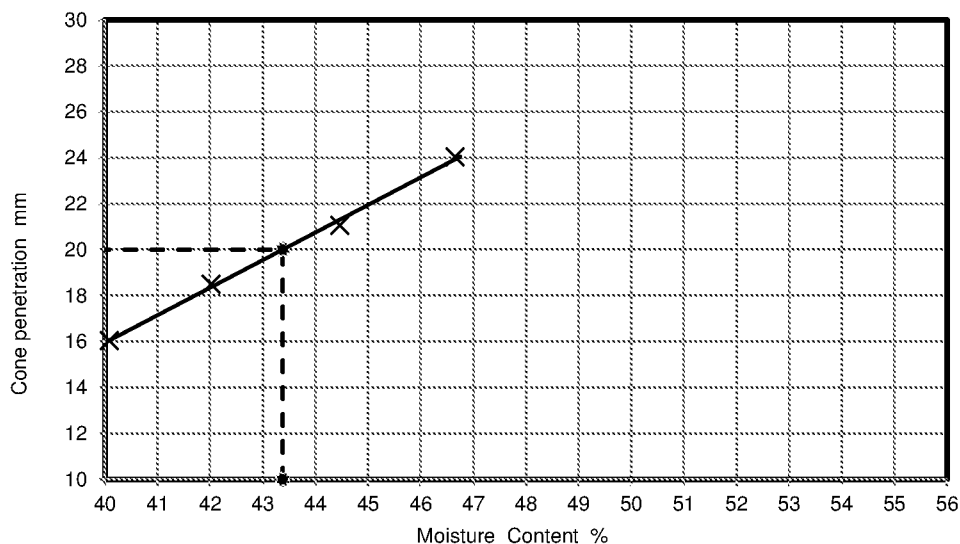
MSF-5 R2

2519



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

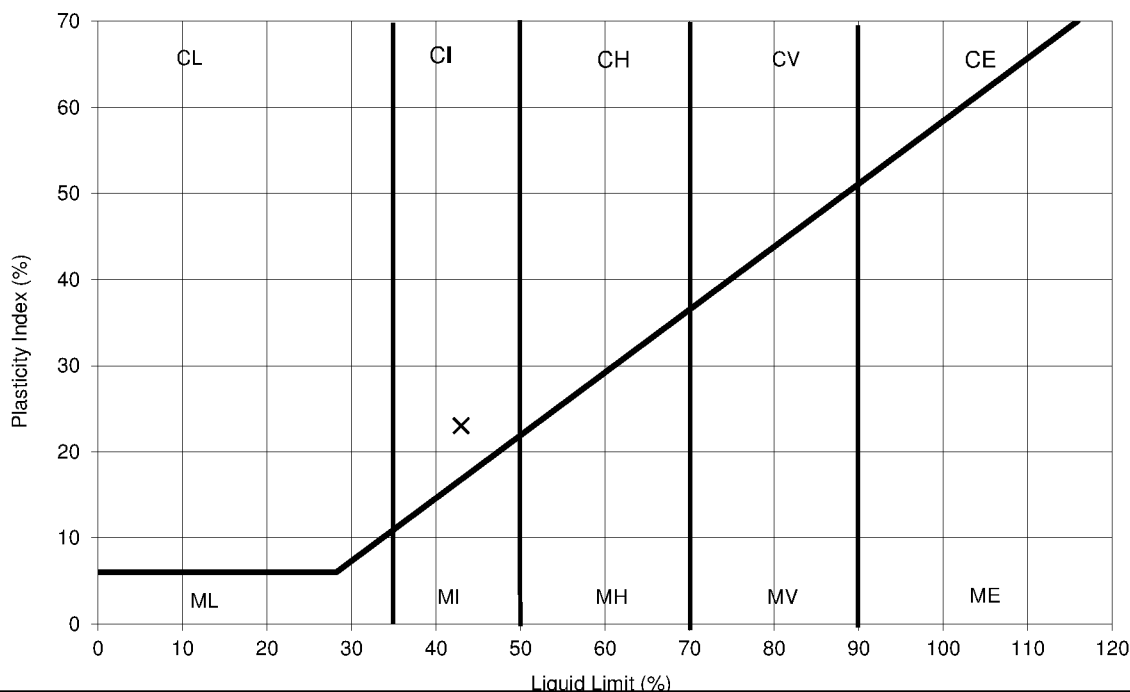
Site Name	Merry England			Job No.	27018
Project No.	P19.1170	Client	Impact Geotechnical	Borehole/Pit No.	WS7
Soil Description	Brown slightly gravelly silty CLAY with occasional roots and rootlets (gravel is fm and sub-angular)			Sample No.	-
				Depth Top	1.00 m
				Depth Base	- m
				Sample Type	D
				Samples received	16/08/2019
				Schedules received	15/08/2019
				Project Started	16/08/2019
				Date Tested	02/09/2019



NATURAL MOISTURE CONTENT	19	%
% PASSING 425µm SIEVE	96	%
LIQUID LIMIT	43	%
PLASTIC LIMIT	20	%
PLASTICITY INDEX	23	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

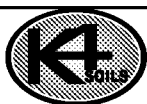
Initials: J.P

Date: 04/09/2019

2519

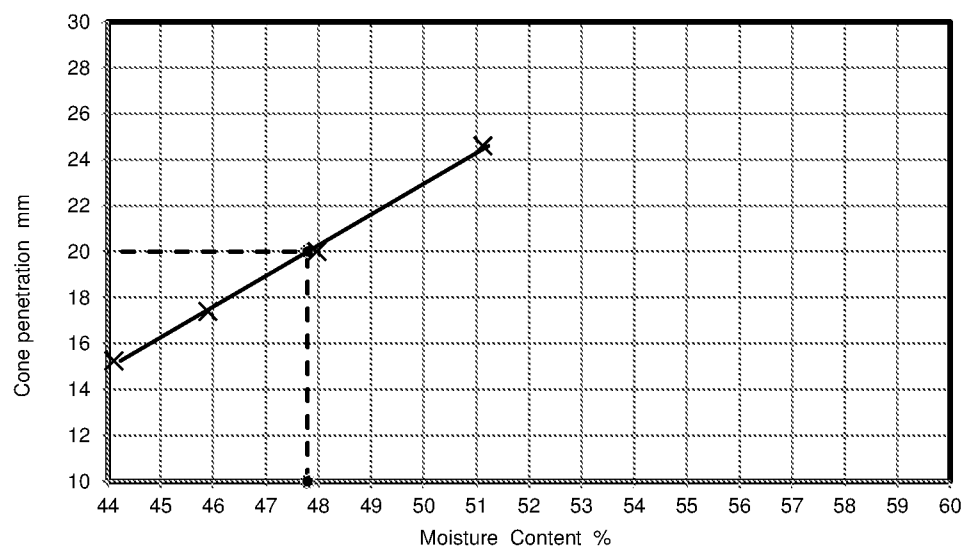
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2



LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

				Job No.	27018
				Borehole/Pit No.	WS7
Site Name	Merry England			Sample No.	-
Project No.	P19.1170	Client	Impact Geotechnical	Depth Top	1.50 m
Soil Description	Brown slightly sandy gravelly silty CLAY (gravel is fmc and sub-angular to angular)			Depth Base	2.00 m
				Sample Type	D
				Samples received	16/08/2019
				Schedules received	15/08/2019
				Project Started	16/08/2019
				Date Tested	30/08/2019

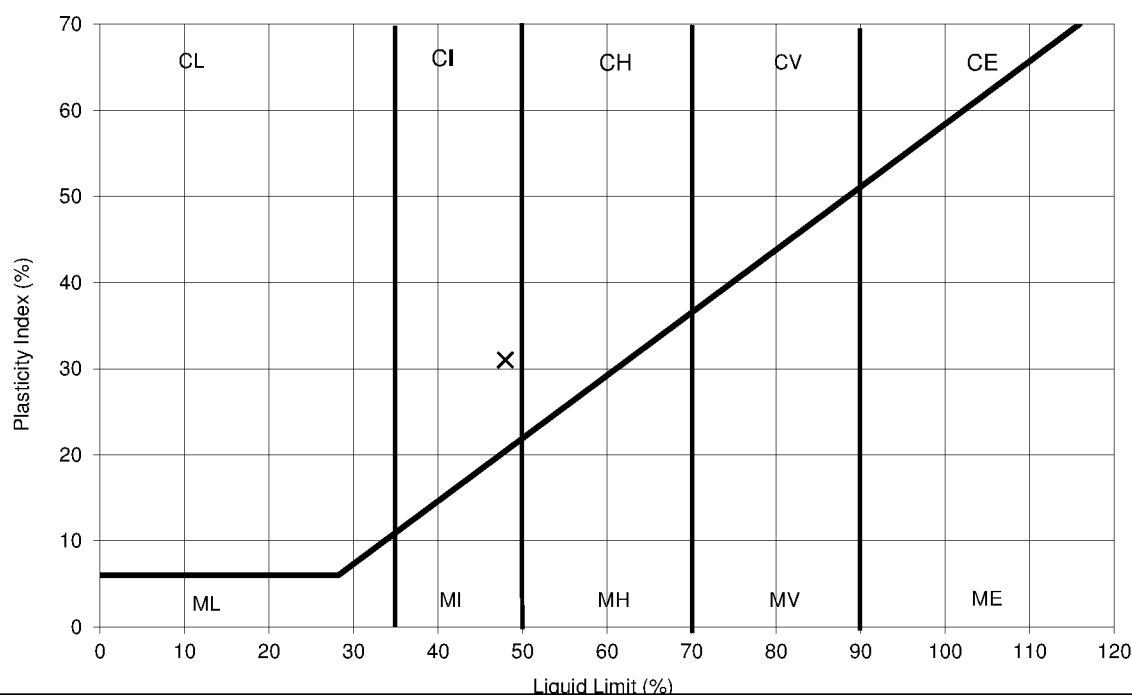


NATURAL MOISTURE CONTENT	16	%
% PASSING 425µm SIEVE	43	%
LIQUID LIMIT	48	%
PLASTIC LIMIT	17	%
PLASTICITY INDEX	31	%

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

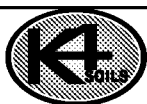
Initials: J.P

Date: 04/09/2019

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

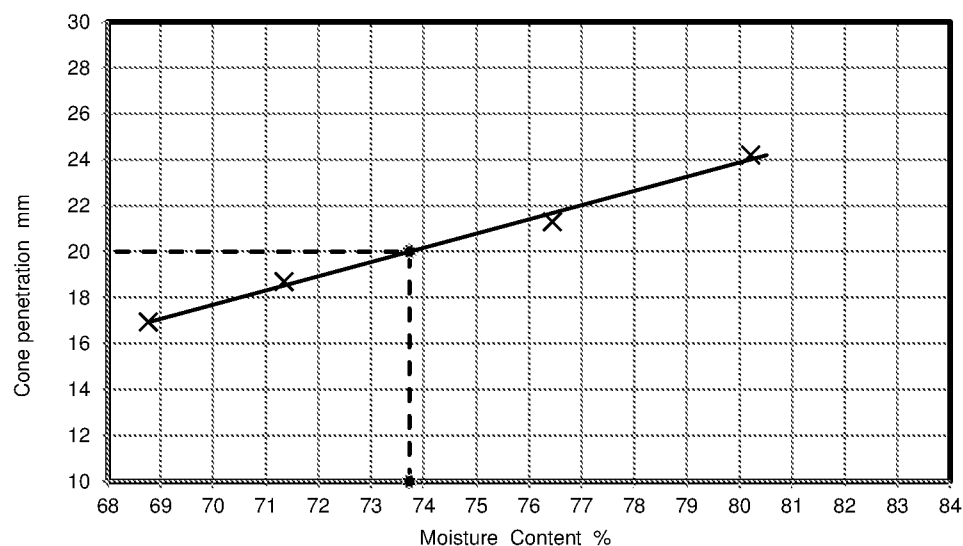
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LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

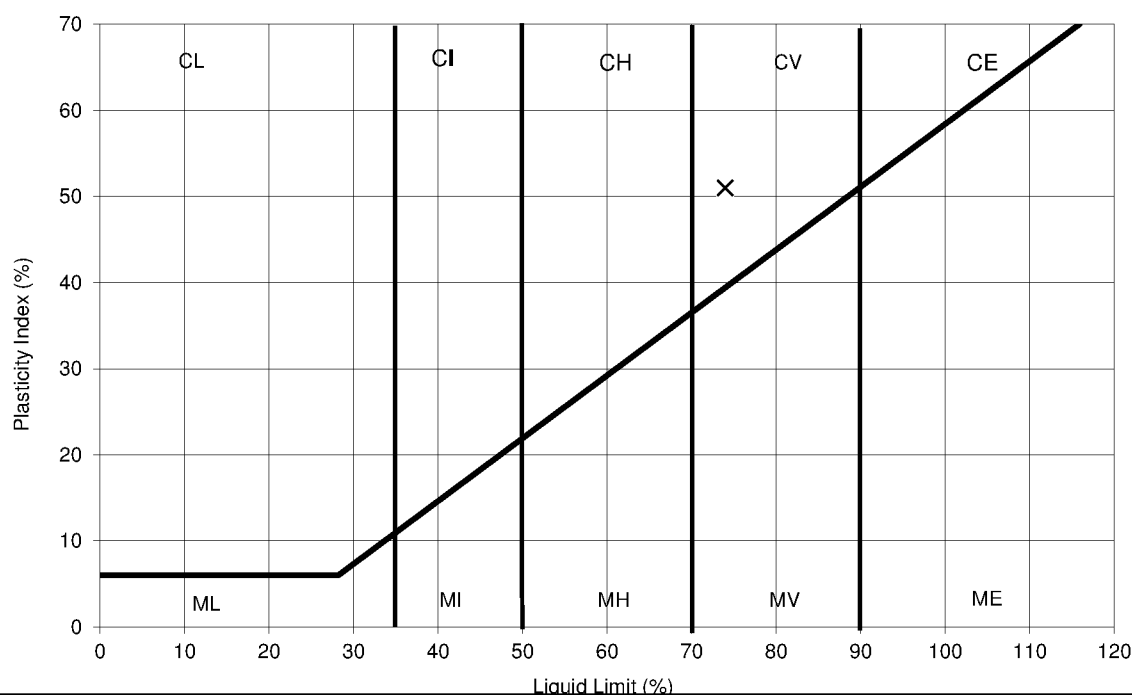
				Job No.	27018
				Borehole/Pit No.	WS8
Site Name	Merry England			Sample No.	-
Project No.	P19.1170	Client	Impact Geotechnical	Depth Top	2.50 m
Soil Description	Brown mottled bluish grey silty CLAY			Depth Base	3.00 m
				Sample Type	D
				Samples received	16/08/2019
				Schedules received	15/08/2019
				Project Started	16/08/2019
				Date Tested	30/08/2019



NATURAL MOISTURE CONTENT	27	%
% PASSING 425µm SIEVE	100	%
LIQUID LIMIT	74	%
PLASTIC LIMIT	23	%
PLASTICITY INDEX	51	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

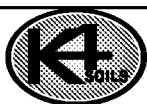
Initials: J.P

Date: 04/09/2019

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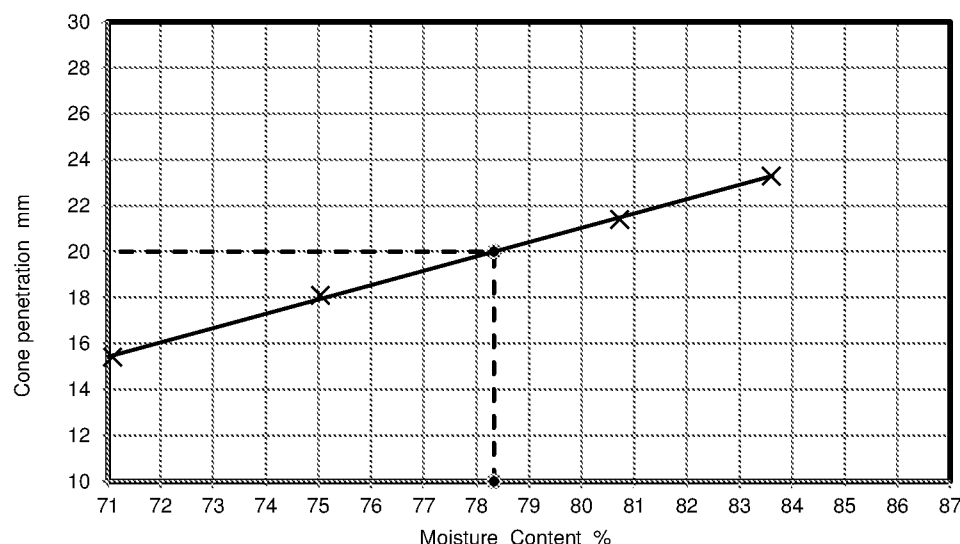
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

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LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

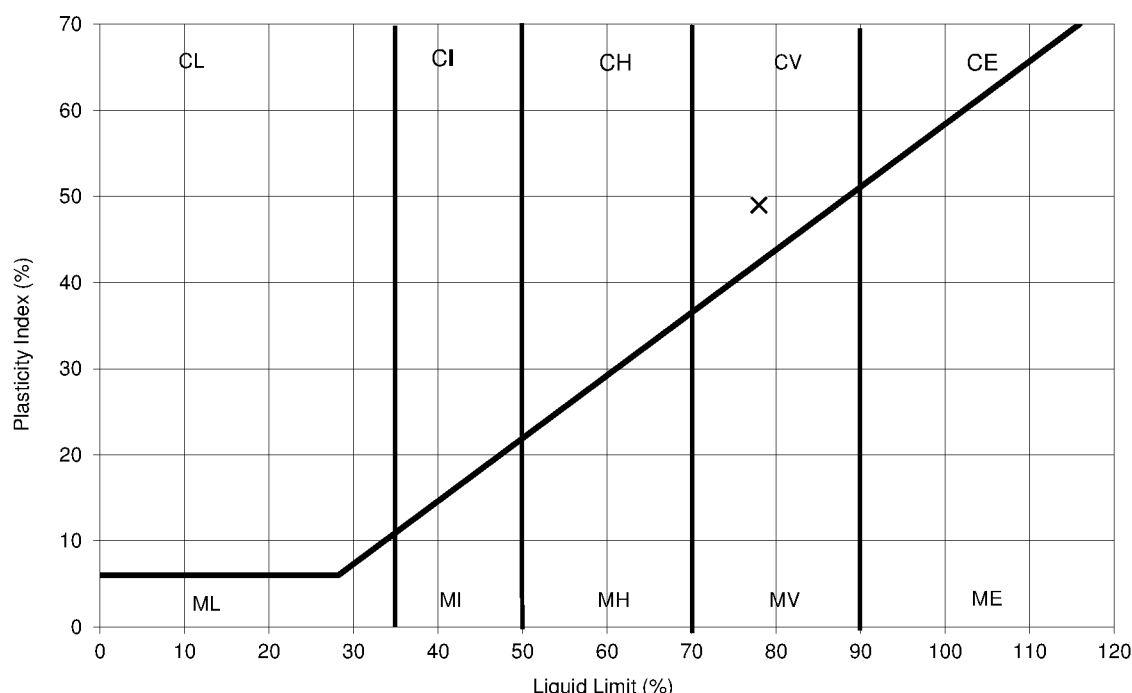
	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX			Job No.	27018	
				Borehole/Pit No.	WS8	
Site Name	Merry England			Sample No.	-	
Project No.	P19.1170	Client	Impact Geotechnical	Depth Top	3.50	m
Soil Description	Brown mottled orange and light grey slightly gravelly silty CLAY (gravel is fm and sub-angular)			Depth Base	4.00	m
				Sample Type	D	
				Samples received	16/08/2019	
				Schedules received	15/08/2019	
				Project Started	16/08/2019	
				Date Tested	02/09/2019	



NATURAL MOISTURE CONTENT	31	%
% PASSING 425µm SIEVE	96	%
LIQUID LIMIT	78	%
PLASTIC LIMIT	29	%
PLASTICITY INDEX	49	%

Remarks

PLASTICITY INDEX



TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method

BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index

BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying method

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

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Checked and Approved

Initials: J.P

Date: 04/09/2019

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5 R2

2519



Graham Carter
Impact Geotechnical Ltd
26 Anmore Road
Denmead
Hants
PO7 6NP

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

DETS Report No: 19-11785

Site Reference: Merry England

Project / Job Ref: 19.1170

Order No: 19.1170/GC

Sample Receipt Date: 16/08/2019

Sample Scheduled Date: 16/08/2019

Report Issue Number: 1

Reporting Date: 22/08/2019

Authorised by:

Dave Ashworth
Technical Manager

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



Soil Analysis Certificate						
DETS Report No: 19-11785	Date Sampled	13/08/19	13/08/19	14/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS1	WS2	WS4	WS4	WS4
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	0.20	0.15	0.10	2.20	3.00
Reporting Date: 22/08/2019	DETS Sample No	428419	428421	428427	428429	428430

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO 17025			Not Detected		
pH	pH Units	N/a	MCERTS			7.1	6.8	7.2
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	14	19	24	43	32
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.01	0.02	0.02	0.04	0.03
Organic Matter	%	< 0.1	MCERTS	2.9	3.4	0.8	1.1	< 0.1
Arsenic (As)	mg/kg	< 2	MCERTS	7	10	6	34	22
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	17	19	14	41	40
Chromium (hexavalent)	mg/kg	< 2	NONE			< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	10	14	10	26	28
Lead (Pb)	mg/kg	< 3	MCERTS	22	26	24	19	13
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	8	9	10	36	38
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	41	104	46	75	96
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
Subcontracted analysis (S)



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



Soil Analysis Certificate						
DETS Report No: 19-11785	Date Sampled	14/08/19	14/08/19	14/08/19	14/08/19	
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Merry England	TP / BH No	TP3	TP3	TP7	TP7	
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 19.1170/GC	Depth (m)	0.05	0.40	0.20	0.50	
Reporting Date: 22/08/2019	DETS Sample No	428439	428440	428443	428444	

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO 17025	Not Detected		Not Detected	
pH	pH Units	N/a	MCERTS	7.4		7.4	
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	15	< 10	< 10	< 10
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02	< 0.01	< 0.01	< 0.01
Organic Matter	%	< 0.1	MCERTS	5	0.6	6	1.6
Arsenic (As)	mg/kg	< 2	MCERTS	7	7	7	8
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.2	< 0.2	0.3	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	20	22	19	21
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2		< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	23	11	26	14
Lead (Pb)	mg/kg	< 3	MCERTS	51	11	90	25
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	10	15	10	10
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	190	45	202	54
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2		< 2	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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



Soil Analysis Certificate - Speciated PAHs

DETS Report No: 19-11785	Date Sampled	13/08/19	13/08/19	14/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS1	WS2	WS4	WS4	WS4
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	0.20	0.15	0.10	2.20	3.00
Reporting Date: 22/08/2019	DETS Sample No	428419	428421	428427	428429	428430

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	1.25	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	2.69	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.11	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	3.9	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - Speciated PAHs

DETS Report No: 19-11785	Date Sampled	14/08/19	14/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	TP3	TP3	TP7	TP7
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	0.05	0.40	0.20	0.50
Reporting Date: 22/08/2019	DETS Sample No	428439	428440	428443	428444

Determinand	Unit	RL	Accreditation				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.37	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.33	< 0.1	1.05	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	0.28	< 0.1	0.93	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.19	< 0.1	0.54	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	0.23	< 0.1	0.53	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.36	< 0.1	0.78	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.29	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.24	< 0.1	0.58	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.23	< 0.1	0.45	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.18	< 0.1	0.46	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	2	< 1.6	6	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-11785	Date Sampled	13/08/19	13/08/19	14/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS1	WS2	WS4	WS4	TP3
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	0.20	0.15	2.20	3.00	0.40
Reporting Date: 22/08/2019	DETS Sample No	428419	428421	428429	428430	428440

Determinand	Unit	RL	Accreditation				
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05		< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1		< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1		< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1		< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	2	5	1107	< 1
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	48	55		< 6
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	50	60		< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - EPH Texas Banded

DETS Report No: 19-11785	Date Sampled	14/08/19				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	TP7				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.50				
Reporting Date: 22/08/2019	DETS Sample No	428444				

Determinand	Unit	RL	Accreditation				
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05			
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1			
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1			
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1			
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1			
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	8			
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	8			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 19-11785	Date Sampled	14/08/19	14/08/19	14/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS4	WS4	WS4	TP3	TP7
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	0.10	2.20	3.00	0.05	0.20
Reporting Date: 22/08/2019	DETS Sample No	428427	428429	428430	428439	428443

Determinand	Unit	RL	Accreditation					
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	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	35	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	136	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	611	< 3	< 3	< 3
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	614	< 3	< 3	< 3
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	137	< 10	< 10	< 10
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	1534	< 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	8	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	59	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	625	< 2	< 2	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	736	< 3	< 3	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	131	< 10	< 10	< 10
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	1559	< 21	< 21	< 21
Total >C5 - C35	mg/kg	< 42	NONE	< 42	3093	< 42	< 42	< 42

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - BTEX / MTBE

DETS Report No: 19-11785	Date Sampled	14/08/19	14/08/19	14/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS4	WS4	WS4	TP3	TP7
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	0.10	2.20	3.00	0.05	0.20
Reporting Date: 22/08/2019	DETS Sample No	428427	428429	428430	428439	428443

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	3	< 2
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - Organochlorine Pesticides						
DETS Report No: 19-11785	Date Sampled	14/08/19				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	TP3				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.05				
Reporting Date: 22/08/2019	DETS Sample No	428439				

Determinand	Unit	RL	Accreditation				
Aldrin	mg/kg	< 0.02	NONE	< 0.02			
alpha-HCH	mg/kg	< 0.02	NONE	< 0.02			
beta-HCH	mg/kg	< 0.02	NONE	< 0.02			
cis-chlordane	mg/kg	< 0.02	NONE	< 0.02			
delta-HCH	mg/kg	< 0.02	NONE	< 0.02			
Dieldrin	mg/kg	< 0.02	NONE	< 0.02			
Endosulfan A	mg/kg	< 0.02	NONE	< 0.02			
Endosulfan B	mg/kg	< 0.02	NONE	< 0.02			
Endrin	mg/kg	< 0.02	NONE	< 0.02			
gamma-HCH (Lindane)	mg/kg	< 0.02	NONE	< 0.02			
Heptachlor	mg/kg	< 0.02	NONE	< 0.02			
Heptachlor epoxide	mg/kg	< 0.02	NONE	< 0.02			
Hexachlorobenzene (HCB)	mg/kg	< 0.02	NONE	< 0.02			
Isodrin	mg/kg	< 0.02	NONE	< 0.02			
Methoxychlor	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDD	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDE	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDT	mg/kg	< 0.02	NONE	0.03			
p,p' - DDD	mg/kg	< 0.02	NONE	0.02			
p,p' - DDE	mg/kg	< 0.02	NONE	0.24			
p,p' - DDT	mg/kg	< 0.02	NONE	0.10			
trans-chlordane	mg/kg	< 0.02	NONE	< 0.02			
Trifluralin	mg/kg	< 0.02	NONE	< 0.02			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 19-11785	
Impact Geotechnical Ltd	
Site Reference: Merry England	
Project / Job Ref: 19.1170	
Order No: 19.1170/GC	
Reporting Date: 22/08/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
428419	WS1	None Supplied	0.20	7.1	Light brown sandy clay with vegetation
428421	WS2	None Supplied	0.15	10.5	Brown loamy sand with vegetation
428427	WS4	None Supplied	0.10	9.2	Brown sandy clay with stones
428429	WS4	None Supplied	2.20	11.3	Brown sandy clay with stones
428430	WS4	None Supplied	3.00	8.9	Brown sandy clay with stones
428439	TP3	None Supplied	0.05	12	Brown sandy clay with stones and vegetation
428440	TP3	None Supplied	0.40	10.1	Brown sandy clay with vegetation
428443	TP7	None Supplied	0.20	12.6	Brown sandy clay with stones and vegetation
428444	TP7	None Supplied	0.50	8.8	Brown sandy clay

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

Insufficient Sample ^{1/5}

Unsuitable Sample ^{u/s}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 19-11785

Impact Geotechnical Ltd

Site Reference: Merry England

Project / Job Ref: 19.1170

Order No: 19.1170/GC

Reporting Date: 22/08/2019

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 @ 450°C	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



Graham Carter
Impact Geotechnical Ltd
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DETS Ltd
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DETS Report No: 19-12348

Site Reference: Merry England

Project / Job Ref: 19.1170

Order No: 19.1170/GC

Sample Receipt Date: 19/08/2019

Sample Scheduled Date: 28/08/2019

Report Issue Number: 1

Reporting Date: 04/09/2019

Authorised by:

Dave Ashworth
Technical Manager

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Soil Analysis Certificate						
DETS Report No: 19-12348	Date Sampled	None Supplied				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	WS4				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.30				
Reporting Date: 04/09/2019	DETS Sample No	431012				

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected			
pH	pH Units	N/a	MCERTS	7.9			
Total Cyanide	mg/kg	< 2	NONE	< 2			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	16			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02			
Organic Matter	%	< 0.1	MCERTS	1			
Arsenic (As)	mg/kg	< 2	MCERTS	12			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	31			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	18			
Lead (Pb)	mg/kg	< 3	MCERTS	24			
Mercury (Hg)	mg/kg	< 1	NONE	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	16			
Selenium (Se)	mg/kg	< 3	NONE	< 3			
Zinc (Zn)	mg/kg	< 3	MCERTS	58			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-12348	Date Sampled	None Supplied				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	WS4				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.30				
Reporting Date: 04/09/2019	DETS Sample No	431012				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1				
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1				
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1				
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 19-12348	Date Sampled	None Supplied				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	WS4				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.30				
Reporting Date: 04/09/2019	DETS Sample No	431012				

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

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



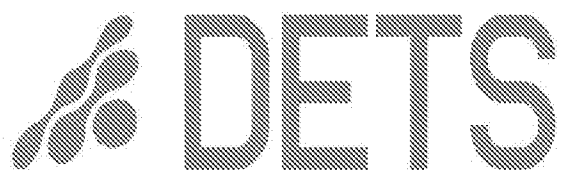
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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 19-12348	Date Sampled	None Supplied				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	WS4				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.30				
Reporting Date: 04/09/2019	DETS Sample No	431012				

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

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-12348	
Impact Geotechnical Ltd	
Site Reference: Merry England	
Project / Job Ref: 19.1170	
Order No: 19.1170/GC	
Reporting Date: 04/09/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 431012	WS4	None Supplied	0.30	13.7	Brown sandy gravel

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

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}

^ no sampling date provided; unable to confirm if samples are within acceptable holding times



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 19-12348

Impact Geotechnical Ltd

Site Reference: Merry England

Project / Job Ref: 19.1170

Order No: 19.1170/GC

Reporting Date: 04/09/2019

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



Graham Carter
Impact Geotechnical Ltd
26 Anmore Road
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DETS Report No: 19-11887

Site Reference: Merry England

Project / Job Ref: 19.1170

Order No: 19.1170/GC

Sample Receipt Date: 19/08/2019

Sample Scheduled Date: 19/08/2019

Report Issue Number: 1

Reporting Date: 23/08/2019

Authorised by:



Dave Ashworth
Technical Manager

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Soil Analysis Certificate						
DETS Report No: 19-11887	Date Sampled	13/08/19	13/08/19	13/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS1	WS1	WS2	WS3	WS3
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	1.50 - 2.00	4.00 - 4.45	2.50 - 3.00	2.00	3.00
Reporting Date: 23/08/2019	DETS Sample No	428978	428979	428980	428981	428982

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	8.4	8.4	8.1	7.9	7.6
Total Cyanide	mg/kg	< 2	NONE					
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	65	119	38	28	22
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.07	0.12	0.04	0.03	0.02
Organic Matter	%	< 0.1	MCERTS					
Arsenic (As)	mg/kg	< 2	MCERTS					
Cadmium (Cd)	mg/kg	< 0.2	MCERTS					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Chromium (hexavalent)	mg/kg	< 2	NONE					
Copper (Cu)	mg/kg	< 4	MCERTS					
Lead (Pb)	mg/kg	< 3	MCERTS					
Mercury (Hg)	mg/kg	< 1	NONE					
Nickel (Ni)	mg/kg	< 3	MCERTS					
Selenium (Se)	mg/kg	< 3	NONE					
Zinc (Zn)	mg/kg	< 3	MCERTS					
Total Phenols (monohydric)	mg/kg	< 2	NONE					

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 19-11887	Date Sampled	14/08/19	14/08/19	14/08/19	14/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS4	WS4	WS4	WS5	WS5
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	1.00 - 1.45	4.30 - 4.45	5.00	1.50	0.10
Reporting Date: 23/08/2019	DETS Sample No	428983	428984	428985	428987	428988

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	7.7	7.5	7.7	7.9	
Total Cyanide	mg/kg	< 2	NONE					< 2
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	27	25	81	25	22
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.03	0.03	0.08	0.03	0.02
Organic Matter	%	< 0.1	MCERTS					3.5
Arsenic (As)	mg/kg	< 2	MCERTS					8
Cadmium (Cd)	mg/kg	< 0.2	MCERTS					< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS					20
Chromium (hexavalent)	mg/kg	< 2	NONE					
Copper (Cu)	mg/kg	< 4	MCERTS					18
Lead (Pb)	mg/kg	< 3	MCERTS					42
Mercury (Hg)	mg/kg	< 1	NONE					< 1
Nickel (Ni)	mg/kg	< 3	MCERTS					11
Selenium (Se)	mg/kg	< 3	NONE					< 3
Zinc (Zn)	mg/kg	< 3	MCERTS					88
Total Phenols (monohydric)	mg/kg	< 2	NONE					

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 19-11887	Date Sampled	15/08/19	15/08/19	15/08/19	15/08/19	14/08/19
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Merry England	TP / BH No	WS6	WS7	WS7	WS8	TP4
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 19.1170/GC	Depth (m)	1.00 - 1.45	1.00 - 1.45	0.20	4.00 - 4.45	0.10
Reporting Date: 23/08/2019	DETS Sample No	428990	428991	428992	428993	428995

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025					Not Detected
pH	pH Units	N/a	MCERTS	6.3	7.2		8.4	7.6
Total Cyanide	mg/kg	< 2	NONE			< 2		< 2
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	44	26	11	22	17
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.04	0.03	0.01	0.02	0.02
Organic Matter	%	< 0.1	MCERTS			2.1		3.5
Arsenic (As)	mg/kg	< 2	MCERTS			9		9
Cadmium (Cd)	mg/kg	< 0.2	MCERTS			< 0.2		0.2
Chromium (Cr)	mg/kg	< 2	MCERTS			21		21
Chromium (hexavalent)	mg/kg	< 2	NONE					< 2
Copper (Cu)	mg/kg	< 4	MCERTS			20		25
Lead (Pb)	mg/kg	< 3	MCERTS			23		47
Mercury (Hg)	mg/kg	< 1	NONE			< 1		< 1
Nickel (Ni)	mg/kg	< 3	MCERTS			13		13
Selenium (Se)	mg/kg	< 3	NONE			< 3		< 3
Zinc (Zn)	mg/kg	< 3	MCERTS			55		216
Total Phenols (monohydric)	mg/kg	< 2	NONE					< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 19-11887	Date Sampled	14/08/19				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	TP4				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.30				
Reporting Date: 23/08/2019	DETS Sample No	428996				

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025				
pH	pH Units	N/a	MCERTS				
Total Cyanide	mg/kg	< 2	NONE	< 2			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	22			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02			
Organic Matter	%	< 0.1	MCERTS	0.9			
Arsenic (As)	mg/kg	< 2	MCERTS	19			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	29			
Chromium (hexavalent)	mg/kg	< 2	NONE				
Copper (Cu)	mg/kg	< 4	MCERTS	23			
Lead (Pb)	mg/kg	< 3	MCERTS	23			
Mercury (Hg)	mg/kg	< 1	NONE	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	28			
Selenium (Se)	mg/kg	< 3	NONE	< 3			
Zinc (Zn)	mg/kg	< 3	MCERTS	78			
Total Phenols (monohydric)	mg/kg	< 2	NONE				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)



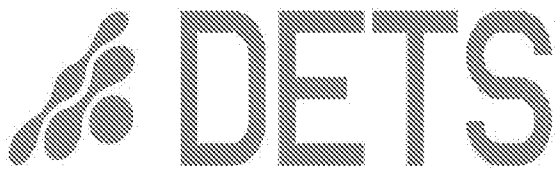
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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-11887	Date Sampled	14/08/19	15/08/19	14/08/19	14/08/19	
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Merry England	TP / BH No	WS5	WS7	TP4	TP4	
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 19.1170/GC	Depth (m)	0.10	0.20	0.10	0.30	
Reporting Date: 23/08/2019	DETS Sample No	428988	428992	428995	428996	

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.29	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	0.26	0.26	0.90	< 0.1	
Pyrene	mg/kg	< 0.1	MCERTS	0.24	0.24	0.77	< 0.1	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.13	0.14	0.47	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	0.18	0.16	0.53	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.27	0.21	0.78	< 0.1	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.24	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.19	0.17	0.57	< 0.1	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.15	0.14	0.42	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.15	0.12	0.37	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	5.3	< 1.6	

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-11887	Date Sampled	14/08/19	15/08/19	14/08/19		
Impact Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Merry England	TP / BH No	WS5	WS7	TP4		
Project / Job Ref: 19.1170	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 19.1170/GC	Depth (m)	0.10	0.20	0.30		
Reporting Date: 23/08/2019	DETS Sample No	428988	428992	428996		

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	5	2	< 1		
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	24	9	< 6		
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	30	11	< 6		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 19-11887	Date Sampled	14/08/19				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	TP4				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.10				
Reporting Date: 23/08/2019	DETS Sample No	428995				

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

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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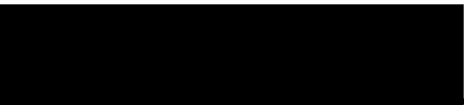
Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 19-11887	Date Sampled	14/08/19				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	TP4				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.10				
Reporting Date: 23/08/2019	DETS Sample No	428995				

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

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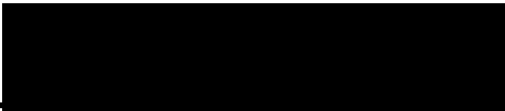
Soil Analysis Certificate - Organochlorine Pesticides						
DETS Report No: 19-11887	Date Sampled	15/08/19				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	WS6				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.20				
Reporting Date: 23/08/2019	DETS Sample No	428989				

Determinand	Unit	RL	Accreditation					
Aldrin	mg/kg	< 0.02	NONE	< 0.02				
alpha-HCH	mg/kg	< 0.02	NONE	< 0.02				
beta-HCH	mg/kg	< 0.02	NONE	< 0.02				
cis-chlordane	mg/kg	< 0.02	NONE	< 0.02				
delta-HCH	mg/kg	< 0.02	NONE	< 0.02				
Dieldrin	mg/kg	< 0.02	NONE	< 0.02				
Endosulfan A	mg/kg	< 0.02	NONE	< 0.02				
Endosulfan B	mg/kg	< 0.02	NONE	< 0.02				
Endrin	mg/kg	< 0.02	NONE	< 0.02				
gamma-HCH (Lindane)	mg/kg	< 0.02	NONE	< 0.02				
Heptachlor	mg/kg	< 0.02	NONE	< 0.02				
Heptachlor epoxide	mg/kg	< 0.02	NONE	< 0.02				
Hexachlorobenzene (HCB)	mg/kg	< 0.02	NONE	< 0.02				
Isodrin	mg/kg	< 0.02	NONE	< 0.02				
Methoxychlor	mg/kg	< 0.02	NONE	< 0.02				
o,p' - DDD	mg/kg	< 0.02	NONE	< 0.02				
o,p' - DDE	mg/kg	< 0.02	NONE	< 0.02				
o,p' - DDT	mg/kg	< 0.02	NONE	< 0.02				
p,p' - DDD	mg/kg	< 0.02	NONE	< 0.02				
p,p' - DDE	mg/kg	< 0.02	NONE	< 0.02				
p,p' - DDT	mg/kg	< 0.02	NONE	< 0.02				
trans-chlordane	mg/kg	< 0.02	NONE	< 0.02				
Trifluralin	mg/kg	< 0.02	NONE	< 0.02				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



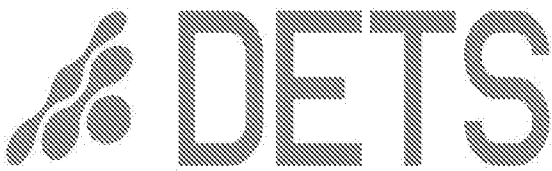
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Soil Analysis Certificate - Organophosphorus Pesticides						
DETS Report No: 19-11887	Date Sampled	15/08/19				
Impact Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Merry England	TP / BH No	WS6				
Project / Job Ref: 19.1170	Additional Refs	None Supplied				
Order No: 19.1170/GC	Depth (m)	0.20				
Reporting Date: 23/08/2019	DETS Sample No	428989				

Determinand	Unit	RL	Accreditation					
Azinphos-methyl	mg/kg	< 0.1	NONE	< 0.1				
Chlorfenvinphos, alpha	mg/kg	< 0.1	NONE	< 0.1				
Chlorfenvinphos, beta	mg/kg	< 0.1	NONE	< 0.1				
Chlorpyriphos-methyl	mg/kg	< 0.1	NONE	< 0.1				
Diazinon	mg/kg	< 0.1	NONE	< 0.1				
Dichlorvos	mg/kg	< 0.1	NONE	< 0.1				
Dimethoate	mg/kg	< 0.1	NONE	< 0.1				
Fenitrothion	mg/kg	< 0.1	NONE	< 0.1				
Fenthion	mg/kg	< 0.1	NONE	< 0.1				
Malathion	mg/kg	< 0.1	NONE	< 0.1				
Mevinphos, E	mg/kg	< 0.1	NONE	< 0.1				
Mevinphos, (Z)	mg/kg	< 0.1	NONE	< 0.1				
Parathion-ethyl	mg/kg	< 0.1	NONE	< 0.1				
Parathion-methyl	mg/kg	< 0.1	NONE	< 0.1				
Phorate	mg/kg	< 0.1	NONE	< 0.1				

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-11887	
Impact Geotechnical Ltd	
Site Reference: Merry England	
Project / Job Ref: 19.1170	
Order No: 19.1170/GC	
Reporting Date: 23/08/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
428978	WS1	None Supplied	1.50 - 2.00	6.8	Brown sandy clay with stones
428979	WS1	None Supplied	4.00 - 4.45	17.2	Brown loamy clay
428980	WS2	None Supplied	2.50 - 3.00	9.3	Light brown sandy clay with stones
428981	WS3	None Supplied	2.00	4.5	Brown sandy clay with stones
428982	WS3	None Supplied	3.00	6.7	Light grey sandy gravel with stones
428983	WS4	None Supplied	1.00 - 1.45	11.2	Brown sandy clay with stones
428984	WS4	None Supplied	4.30 - 4.45	14.2	Brown clay
428985	WS4	None Supplied	5.00	16.6	Brown loamy clay
428987	WS5	None Supplied	1.50	9.9	Light brown sandy clay with stones
428988	WS5	None Supplied	0.10	10.7	Brown loamy sand with stones and vegetation
428989	WS6	None Supplied	0.20	5.9	Brown sandy clay
428990	WS6	None Supplied	1.00 - 1.45	12.6	Brown loamy sand
428991	WS7	None Supplied	1.00 - 1.45	9.2	Brown sandy clay with chalk
& 428992	WS7	None Supplied	0.20	11.3	Brown sandy clay with stones and vegetation
428993	WS8	None Supplied	4.00 - 4.45	15.8	Brown loamy clay
428995	TP4	None Supplied	0.10	9	Brown sandy clay with stones
& 428996	TP4	None Supplied	0.30	7.4	Brown loamy sand with stones and vegetation

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample ^{1/5}
& samples received in inappropriate containers for hydrocarbon analysis



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Soil Analysis Certificate - Methodology & Miscellaneous Information	
DETS Report No: 19-11887	
Impact Geotechnical Ltd	
Site Reference: Merry England	
Project / Job Ref: 19.1170	
Order No: 19.1170/GC	
Reporting Date: 23/08/2019	

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