



Report
Title:

Phase 2 Geo-Environmental Ground Investigation

Project
Name:

Land at Bilsham Road, Yapton



Report Reference: **BRD2693-OR2-C**
Date: **February 2018**

REPORT CONTROL SHEET

REPORT TITLE	PHASE 2 GEO-ENVIRONMENTAL SITE INVESTIGATION
PROJECT	LAND AT BILSHAM ROAD, YAPTON
CLIENT	GLEESON DEVELOPMENTS

REPORT REFERENCE	ISSUE DETAIL	DATE	PREPARED BY	CHECKED BY
BRD2693-OR2-A	First Issue.	27/11/2017	A Plant	B Devonshire
BRD2693-OR2-B	Second Issue with updated ground gas assessment.	04/12/2017	A Plant	J Brockwell
BRD2693-OR2-C	Third Issue with updated site boundary.	28/02/2018	J Brockwell	B Devonshire

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REPORT LAYOUT

This report is divided into the following four sections: Summary Report, Technical Report, Supporting Information and Appendices.

SUMMARY REPORT

This expanded executive summary provides the main findings of the work undertaken in brief non-technical language. This section provides an overview of the key outcomes for the benefit of non-specialists and concludes with the main recommendations. This section should only be relied upon in the context of the whole report and the Technical Report should be referred to with respect to any design decisions.

TECHNICAL REPORT

The main report section is intended to provide the technical detail of the investigation and is intended to provide the level of information required by current guidance documents and practice. The Technical Report is written in a language that, in part, assumes knowledge of subject matter so that it can be written in as concise a form as possible. Its intended audience is peers, regulators and other professionals in related disciplines.

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SUPPORTING INFORMATION

This section of the report provides background details of a generic nature together with specific technical approaches adopted by BRD and details of the guidance documents that are commonly referenced in the report. The section also includes explanations of technical terms to assist non-specialist readers in understanding the Technical Report. It should be noted that not all the information within this section is necessarily applicable to this specific report.

APPENDICES

The final section of the report presents the factual data collected and employed as part of the investigation.

APPENDIX 1 SITE PLANS

Site Location Plan	Ref. BRD2934-OP1-C
Revised Conceptual Site Model	Ref. BRD2934-OP6-B
Exploratory Hole Location Plan	Ref. BRD2934-OD1-B

APPENDIX 2 EXPLORATORY HOLE & MONITORING RECORDS

Logs of trial pits.	Ref. TP01-TP18
Photographic records of trial pits.	Ref. BRD2934-OP5-A
Logs of boreholes.	Ref. WS01-WS12
Logs of inspection pits.	Ref. HD01
BRE365 soakage test records.	15 x A4 pages
Gas monitoring records.	6 x A4 pages
Groundwater monitoring records.	6 x A4 pages

APPENDIX 3 LABORATORY TEST RESULTS

QTS report 17-66060 & 18-69875	25 x A4 pages
SPT report S31998	16 x A4 pages

SUMMARY REPORT - GENERAL INFORMATION

SUBJECT	COMMENTS
CURRENT USE & DESCRIPTION	The site consists of three adjoining agricultural fields bound by trees and hedgerows. The two larger fields are cropped / ploughed and the one to the south west is used for grazing. The northern and eastern site boundaries are typically adjacent to residential properties whilst the southern and western boundaries are adjacent to agricultural fields. The easternmost site boundary lies adjacent to Bilsham Road which affords access to the site as a whole.
PROPOSED USE	It is proposed that the site will be developed as a residential housing estate.
HISTORICAL SUMMARY	The site has remained undeveloped throughout its mapped history. A stream formerly crossed part of the site and was diverted to a culvert at the end of the 19 th century. The residential area immediately to the east has been gradually developed from the 1930s through to the 1980s.
PUBLISHED GEOLOGY	The most recent published information indicates the site to be underlain by some 4m to 6m of superficial deposits of River Terrace Deposits comprising silts with sand and clays that in turn are underlain by Raised Marine Deposits. The superficial deposits are shown to be underlain by the Lewes Nodular Chalk Formation (Upper Chalk) comprising hard, nodular chalk with flint.
ACTUAL GROUND CONDITIONS	The investigation has proved a thin surface cover of Topsoil onto River Terrace Deposits which comprise firm, stiff orange brown and light brown slightly gravelly slightly sandy silty clay. The gravel fraction comprised flint and occasional chalk. The bedrock Chalk Formation was generally encountered within the deeper boreholes and typically below the base of the trial pits. The Chalk was generally structureless silt or gravel, although locally was of rock quality near the base of the boreholes.
HYDROGEOLOGY	The site is situated upon superficial deposits designated a Secondary A Aquifer. The underlying bedrock geology is designated a Principal Aquifer. The site is not located within a groundwater Source Protection Zone.
HYDROLOGY	Within the northern and central 'L-shaped' section of the site, the majority of the field boundaries are formed by drainage ditches. Within the central area, two watercourses are aligned predominantly in open ditches although locally within relatively short culverts to allow for agricultural machinery to transverse and cross the fields. The eastern side of the central 'L-shaped' section of the site in proximity to the culvert stream are shown to be at risk from flooding. Due to the size of the site, a detailed Flood Risk Assessment will be required.
PREVIOUS GROUND REPORTS	BRD is not aware of any previous ground investigations having been conducted at the site.

SUMMARY REPORT - GEOTECHNICAL

SUBJECT	COMMENTS
EXCAVATIONS	It should be possible to forward excavations employing normal equipment. Limited groundwater control in the form of pumping from sumps is likely to be required. It is unlikely that requirements of the Party Wall Act will apply to the development.
SLOPE STABILITY	It is considered that slope stability is unlikely to be a concern at this site.
SUB-SURFACE CONCRETE	Design Sulphate Class of DS-1 and Aggressive Chemical Environment for Concrete class of AC-1 applies.
SOAKAWAYS	Site may not be suitable for surface water disposal to soakaways or other forms of infiltration device.
PAVEMENT DESIGN	A preliminary design California Bearing Ratio (CBR) of 3% has been recommended.
FOUNDATIONS	
LIKELY FOUNDATION TYPE	Given the local pockets of low strength River Terrace Deposits, lightly loaded reinforced strip / trench fill footings could be adopted for the site. Where footings would need to be in excess of 1.5m then a piled foundation should be considered as traditional spread footings may not be acceptable due to the likely settlement characteristics of the low strength soils.
VOLUME CHANGE POTENTIAL	Medium i.e. moderate swelling or shrinking with moisture content changes.
ESTIMATED FOUNDATION DEPTHS	The minimum footing depth required is 0.90m, but 1.25m where required to allow for restricted new tree planting. Pile lengths to be determined by specialist piling contractor.
HEAVE PROTECTION	Will be required for any structure within the potential influence of existing trees predominantly aligned along the western and southern boundaries of the northern field and the western and eastern site boundaries within the central section of the southern field.

SUMMARY REPORT - CONTAMINATION ISSUES

SUBJECT	COMMENTS
SOIL RISKS TO HUMAN HEALTH	No unacceptable contamination in respect of human health have been identified by this investigation.
LANDFILL GAS	The gas monitoring has shown that landfill gas protection measures are not required.
RADON GAS	The site is in an area where no radon protection measures are required in new dwellings.
RISKS TO THE WATER ENVIRONMENT	No unacceptable contamination risks to water resources have been identified by this investigation.
RISKS TO BUILDING MATERIALS AND SERVICES	No unacceptable contamination risks to building materials and services have been identified by this investigation.
REMEDICATION	No remedial works are considered necessary.
ASBESTOS	No asbestos has been detected in the soil samples tested.
WASTE SOIL DISPOSAL	The topsoil is suitable for re-use. Natural sub-soils can be disposed of as inert waste.

SUMMARY REPORT - KEY RECOMMENDATIONS

RECOMMENDATIONS
Once the layout for the proposed development has been finalised it is recommended that additional site investigation works are undertaken in order to establish the variation in the extent and thickness of the low strength deposits present from depths of around 1.70m bgl. Where foundations are required to be deepened in excess of 1.5m due to tree influence or other factors such as nearby drainage, the use of traditional spread footings may not be satisfactory. However, a supplementary site investigation would assist in providing further site specific information beneath the site. Such investigation would also provide information for potential pile designs within the underlying Chalk Formation. It is suggested that these additional investigation works should comprise at least one day of Cone Penetration Testing (CPT) with a combination of numerous shallow probes (to 5m) together with a few deeper tests (to 18m or refusal). Test locations should be spread over the site, although concentrated along the northern section of the main field and along the eastern site boundary where foundations are likely to be deepened due to the influence of the existing trees.

1. INTRODUCTION TO TECHNICAL REPORT

1.1. CONTRACT DETAILS

CLIENT	Gleeson Developments Limited trading as Gleeson Developments.
SITE	Land situated at Bilsham Road in the village of Yapton, West Sussex.
CLIENT'S ADVISORS	BRD Environmental Limited (BRD) has been commissioned directly by the Client.
REPORT CONTEXT	It is understood that the Client intends to purchase the site and develop it for residential housing.
REPORT TYPE	Phase 2, geo-environmental site investigation (i.e. combined geotechnical ground investigation and Phase 2 contamination assessment).
REPORT OBJECTIVES	The site has been the subject of a desk study referenced as follows: • 'Phase 1 Geo-Environmental Desk Study - Land at Bilsham Road, Yapton', BRD Environmental Ltd, report ref. BRD2693-OR1-B, dated April 2017. The purpose of the report is to address the recommendations of the desk study report and to present the findings of a ground investigation and present a geotechnical assessment of the conditions revealed.

1.2. SCOPE OF WORKS

The agreed scope of works was:

- Mobilisation to site and production of health and safety documentation.
- Delivery of 20mm granular material to site for backfilling the pits and supply of 75-100mm diameter perforated pipes for the inspection well in each soakage test pit.
- Two days of trial pitting using a mechanical excavator to provide approximately 18-20No. trial pits to a nominal depth of 3m, ground conditions permitting.
- Performance of soakage tests based upon BRE Digest 365 at 5No. of the trial pit locations. Supply of water to site via a water tanker/bowser unit on three consecutive days for the repeat filling of each test pit. A Geo-Environmental Technician will monitor the soakage tests.
- Removal of pipework at the end of the third day and reinstatement of trial pit surfacing. The surplus soil from excavating the pits will be neatly stockpiled on site. We have not allowed for any disposal of this soil.
- Two days of windowless sampling using a percussive drilling rig to provide approximately 10-12No. boreholes to a nominal depth of 3m-5m, ground conditions permitting. Undertake Standard Penetration Tests (SPT) at 1m intervals. Installation of a 4m depth combined gas and groundwater monitoring well (nominal 50mm diameter) into 7No. boreholes. Installations will be finished with a flush fitting metal stopcock cover.

- All exploratory points will be logged and sampled in general accordance with BS5930:2015 by supervising Geo-Environmental Consultant. In-situ geotechnical testing of any fine soils using a Hand Shear Vane and/or Pocket Penetrometer.
- Determination of the location of exploratory points by tape measurements or the use of a handheld recreational GPS unit.
- Geo-Environmental Technician to undertake a total of 6No. combined gas, vapour and groundwater monitoring visits. For gas, the determination of oxygen, carbon dioxide, methane, hydrogen sulphide and carbon monoxide concentrations, together with atmospheric pressure and flow rates, using portable equipment. For vapours, determination of the concentration of volatile organic compounds by photo ionisation detector. For groundwater, the determination of groundwater levels.
- Chemical testing of soil samples with the budget based on the following testing schedule:
 - 20No. Metals Suite - As, Cd, Cr, CrVI, Hg, Pb, Se, Cu, Ni and Zn.
 - 20No. Inorganics Suite - water soluble sulphate, pH, organic matter.
 - 20No. Speciated Polycyclic Aromatic Hydrocarbons (PAH).
 - 5No. Banded aliphatic/aromatic Total Petroleum Hydrocarbons (TPH).
 - 5No. Benzene, Toluene, Ethylbenzene, Xylene (BTEX) and Methyl Tertiary Butyl Ether (MTBE) compounds.
 - 5No. Asbestos screen and quantification (if present).
 - 4No. Semi-Volatile Organic Compounds (SVOC) suite.
 - 4No. Pesticide screen.
- Chemical testing of 1No. soil sample for Waste Acceptance Criteria (WAC) to assist in establishing the waste classification of the soil for disposal purposes.
- Geotechnical testing as appropriate to the nature of the ground conditions encountered, but the budget is based on the following testing schedule:
 - 8No. Moisture content.
 - 8No. Plasticity indices.
 - 4No. Particle size distribution by wet sieve and with 2No. by follow on hydrometer.
 - 8No. pH and water soluble sulphate analysis.
 - 8No. Total sulphate and sulphur analysis.
- Provision of a combined factual and interpretative investigation report. Factual findings to include all exploratory point records, monitoring and test results. Interpretative reporting to include a summary of information from desk study research, a Generic Quantitative Contamination Risk Assessment (GQRA), waste classification and a Geotechnical Assessment providing comments on pavement design, concrete classification, soakaway feasibility, foundation design recommendations.

The smaller third field to the south west was investigated following the main phase of investigation. Two windowless sample boreholes were completed in this area along with a hand dug inspection pit. Additional chemical testing was then undertaken on samples from these points. As the soils were consistent with the main phase of investigation, no further geotechnical testing was scheduled. This Version C of the report has been updated to incorporate the findings of this additional work.

1.3. REPORT LIMITATIONS

Any site boundary lines depicted on plans included within this report are approximate only and do not imply legal ownership of land. Any observations of tree species, asbestos containing materials within structures or invasive weeds, such as Japanese Knotweed, does not constitute a formal survey of such features. The identification of such features is therefore tentative only. The report does not consider whether sensitive ecology or archaeology is present as these require consideration by professionals specialising in these matters. It should be recognised that the collection of desk study information may not be exhaustive and that other information pertinent to the site may be available.

The recommendations, interpretations and conclusions of this report are based solely on the ground conditions found at the exploratory holes. Due to the variability in the nature of ground, conditions between exploratory holes can only be interpreted and not defined. The description of the site and the ground conditions is accurate only for the dates of the field works. In particular, groundwater levels can vary due to seasonal and other effects.

The assessment and interpretation of contamination risks is based on the scope of works agreed with the Client together with the budgetary and programme constraints imposed. Further investigation, analysis and assessment of contamination may be required by regulators or other third parties with an interest in the site. An ecological risk assessment of contaminated soils is beyond the scope of this report. This report is concerned with assessing those contamination risks which apply to the future use of the site through the proposed development as part of the planning regime. The assessment does not consider the risk to current site users or continued future use of the site in its current state. If development of the site should occur that differs from that proposed, then the findings of the contamination assessment would need to be re-evaluated.

At the time of writing, detailed information on the proposed structure, such as detailed layout, loadings and serviceability limits, was not available. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules. The scope of this investigation excludes a formal slope stability study and any observations made regarding slopes are for information only.

2. SITE CHARACTERISTICS

2.1. SITE SETTING

SITE ADDRESS AND POST CODE	Land at Bilsham Road at the south western edge of the village of Yapton, West Sussex. The nearest post code is BN18 0HB.
NATIONAL GRID REFERENCE	497620E, 102800N.

2.2. SITE SUMMARY

SUBJECT	COMMENTS
CURRENT SITE DESCRIPTION	The site consists of three adjoining agricultural fields separated by open drainage ditches. A second watercourse is aligned within an open ditch along the eastern boundary of the central 'L-shaped' section of the site. The watercourse then continues southwards within a culvert. The two larger fields are cropped /ploughed and the one to the south west is for grazing. The northern and eastern site boundaries are typically adjacent to residential properties whilst the southern and western boundaries are adjacent to other agricultural fields. The easternmost site boundary lies adjacent to Bilsham Road which affords access to the site as a whole. Along the northern and eastern boundaries, there were occasional areas of general garden waste which increases mid-way along the eastern boundary of the northern field towards the central 'L-shaped' section of the site. At these points, there was additional waste that included old tyres and more general domestic rubbish, although considered relatively minor in extent.
SURROUNDING LAND USE	Predominantly residential to the north and east, agricultural land to the west and south.
PROPOSED DEVELOPMENT	It is proposed that the site will be developed as residential housing. At the time of writing, no proposed layout is available.
HISTORICAL SUMMARY	The site has remained undeveloped throughout its mapped history. A stream formerly crossed part of the site and was diverted to a culvert at the end of the 19 th century. The residential area immediately to the east has been gradually developed from the 1930s through to the 1980s.
PUBLISHED GEOLOGY	The most recent published BGS information indicates the site is underlain by superficial deposits comprising silts with sand and clays of River Terrace Deposits that in turn are underlain by Raised Marine Deposits, although until recently the soils were assigned by the BGS as Aeolian Deposits (Brickearths). The superficial deposits are underlain by the Lewes Nodular Chalk Formation (Upper Chalk) comprising hard, nodular chalk with flint.

RADON	The site is located in an area where radon protection measures are not required.
HYDROGEOLOGY	The site is situated upon superficial deposits designated a Secondary A Aquifer. The underlying bedrock geology is designated a Principal Aquifer. The site is not located within a groundwater Source Protection Zone.
HYDROLOGY	The majority of the field boundaries within the western fields and central section of the southern field section comprise boundary ditches or streams. The watercourses comprise a mix of open ditches with culverted sections to allow agricultural machinery to cross. Surface water will infiltrate directly into the underlying soils, or will run-off into the neighbouring drainage ditches or watercourses. A watercourse runs along the eastern boundary of the central section of the site and flows within an open 2m deep ditch to cross the southern 'L-shaped' field within a culvert aligned due southwards. Separating the two western fields were shallow drainage ditches with intermittent standing water, but no obvious flow. A further section of culvert was identified as an overbridge crossing to allow agricultural equipment to pass from the eastern to the northern field. The central areas of the site in proximity to the watercourse and culvert are shown to be at risk from flooding. However, due to the size of the site, a detailed Flood Risk Assessment will be required regardless.

2.3. PREVIOUS INVESTIGATIONS

BRD is not aware of any previous ground investigations having been conducted at the site.

2.4. PRELIMINARY ASSESSMENTS

PRELIMINARY CONTAMINATION RISK ASSESSMENT

The vast majority of the site is unlikely to be significantly contaminated. However, low to medium risks have been identified from infill of a former deep drainage ditch, fly-tipped waste around parts of the site boundary and potential pesticide residues in the soils.

This limited potential contamination may be a cause for concern to human health, the water environment and water supply pipes.

PRELIMINARY GEOTECHNICAL ASSESSMENT

The anticipated near surface geology comprised superficial deposits of River Terrace Deposits underlain by Raised Marine Deposits that each may potentially comprise low strength soils, thereby making the stratum unlikely to be suitable for the adoption of standard trench fill/strip footings. Wider, reinforced strip footings could be employed to spread loads over a wider area, or ground improvement may be required. Alternatively, a piled foundation solution could be considered.

Depending on the composition of the superficial deposits i.e. should clayey or silty soils be encountered at a shallow depth, the trees and hedges along the site boundaries may have an impact on the soils, and foundations in close proximity to existing or proposed trees, may need to be deepened.

Soakaways may be viable at the site, depending on whether granular deposits are encountered within the superficial Aeolian Deposits. If the Chalk bedrock is relatively shallow and/or fractured, deeper borehole style soakaways may be feasible.

3. GROUND INVESTIGATION

3.1. INVESTIGATION DESIGN

METHODOLOGY	Trial pits were selected as they expose more soils which enables a more reliable record of the ground conditions encountered and to enable the performance of soakage tests based upon BRE Digest 365. Windowless sampling boreholes were considered the most appropriate method of investigation to establish the geological profile down to depth over the site. This method could be used to undertake Standard Penetration Tests (SPTs) at regular intervals during boring to determine the presence of any weak superficial deposits or may indicate the potential presence of any chalk dissolution features. The methodology also allowed for the installation of a combined gas and groundwater monitoring installations to establish ground gas values and standing groundwater levels over the site. The use of the above excavation techniques each allow for the collection of high-quality soil samples for both contamination and geotechnical assessment purposes.	
DATES OF SITE WORKS	The main field works were undertaken between the 17th and 20th October 2017. Monitoring visits have so far been undertaken on the 25th and 31st October 2017 and the 7th November 2017. During November 2017, three further monitoring visits are planned. Additional field works were undertaken on 19th January 2018.	
CONSTRAINTS TO EXPLORATORY HOLE LAYOUT	The available historical maps revealed two sections of culverted watercourses that are aligned north to south. Given the depth of the watercourses and extensive brick built culverts, excavations within 3m of the likely alignments were avoided.	
EXPLORATORY HOLE SPACING	Approximately 65m grid.	
LAYOUT RATIONALE	SOURCE / FEATURE	EXPLORATORY HOLE
CONTAMINATION SOURCES TARGETED	Backfilled culverted watercourse aligned along the east boundary of the central section of the southern field.	WS07, WS08, and WS09.
	Backfilled culverted watercourse aligned along the south east boundary of the western field.	WS02
	Fly-tipped waste along or adjacent to site boundaries.	WS02, WS01, WS07, and TP11
	General agricultural practices for potential use of pesticides.	All exploratory holes.

GROUND FEATURES TARGETED	General site coverage with a very low risk of the potential for chalk dissolution features remaining in the ground.	All exploratory holes.
CONTAMINATION SAMPLING PLAN	Based on the proposed end use, the sampling and analysis plan is more positively biased towards near surface samples as these represent the soils most likely to be available to future site users.	
ANALYSIS PLAN	Testing was based on the potential contaminants identified within the Hazard Identification section of the Phase 1 contamination assessment, and BRD has scheduled a general suite of contaminants. Pesticide screening was non targeted within near surface samples taken spread over the large agricultural field. An additional sample from the south western field was also analysed for pesticides. For the assessment of potable water supply pipes, soil samples were tested at depths of between 0.5m and 1.0m and within one Made Ground soil sample, a wider range of contaminants were tested including benzene, toluene, ethylbenzene and xylene (BTEX) compounds and Semi-Volatile Organic Compounds (SVOCs) to meet the requirements of the water supply companies pipe specification assessment.	

3.2. BRD FIELDWORK

TRIAL PITS	
REFERENCES	TP01 to TP18.
DEPTH RANGE	From 1.80m to 3.40m.
EXCAVATOR	JCB 3CX style wheeled backactor.
BACKFILL	Five of the trial pits (TP01 to TP05) were utilised for soakage test based upon BRE 365 and were each backfilled with some 3m³ of gravel, followed by arisings on completion of the tests. The remaining thirteen of the trial pits (TP06 to TP18) were backfilled with arisings upon completion and compacted with rams of the excavator bucket.

HAND DUG INSPECTION PITS	
REFERENCES	HD01
DEPTH RANGE	0.75m.
BACKFILL	The inspection pit was backfilled with arisings upon completion.

WINDOWLESS SAMPLING BOREHOLES	
REFERENCES	WS01 to WS12.
DEPTH RANGE	Each to 5.45m.
RIG TYPE	Premier Drilling Rig.
INSTALLATION / BACKFILL	Five boreholes (WS01, WS05, WS06, WS11 and WS12) were backfilled with arisings. Seven boreholes (WS02, WS03, WS04, WS07, WS08, WS09 and WS10) had monitoring wells installed. These comprised 50mm nominal diameter standpipes fitted with a gas tap plain cap finished with a flush metal cover. The slotted response length of the well is shown on the individual logs. Bentonite seals are also indicated on the logs. The filter medium used was pea gravel.

MONITORING	
TYPE	Ground gases and vapour. Groundwater monitoring.
DATES	A total of six monitoring visits have been undertaken on the 25 th and 31 st October 2017 and the 7 th , 14 th , 21 st and 29 th November 2017.

3.3. LABORATORY TESTING

GEOTECHNICAL TESTING	
The soil samples for geotechnical testing were forwarded to the laboratory of Soil Property Testing Ltd with pH and sulphate analysis undertaken at the laboratory of QTS Environmental Ltd. The geotechnical testing suite is detailed below. The UKAS accreditation of the individual test methods is shown on the laboratory test report included in the Appendices.	
TEST	NUMBER OF SAMPLES TESTED
Moisture content	8
Liquid and plastic limits	8
Particle size distribution by wet sieve	2
Particle size distribution by wet sieve and hydrometer	2
pH and Water soluble Sulphate	29
Total Sulphur and Sulphate	8

SOIL CHEMICAL TESTING	
The soil samples for contamination and/or chemical geotechnical testing were forwarded to the laboratory of QTS Environmental Ltd and the testing suite is detailed below. The UKAS or MCERTS accreditation of the individual test methods is shown on the laboratory test report included in the Appendices.	
SOIL TESTS	NUMBER OF SAMPLES TESTED
Arsenic, Cadmium, Chromium, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Zinc	22
Speciated Polycyclic Aromatic Hydrocarbons (PAH)	22
Total Petroleum Hydrocarbons (TPH) with full carbon banding and aliphatic/aromatic split	5
Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) plus Methyl Tert Butyl Ether (MTBE)	5
Asbestos Identification	5
Semi-Volatile Organic Compounds (SVOCs)	4
Pesticide screen	5
Waste Acceptance Criteria (WAC) testing	1

4. GROUND CONDITIONS

4.1. OVERVIEW

Ground conditions were as anticipated from the review of recent published BGS information with superficial deposits comprising River Terrace Deposits underlain by bedrock of the Lewes Nodular Chalk Formation. Based on the observed soils, the River Terrace Deposits could not be separated with certainty from any underlying Raised Marine Deposits.

Groundwater was encountered during the site works within each of the ten original deep exploratory holes (WS01 to WS12) at depths of between 3.4m and 4.0m. One of the exploratory holes (WS07) encountered groundwater within sand strata of the River Terrace Deposits whilst the remainder (WS01 to WS06, and WS08 to WS10) were recorded within the underlying Lewes Nodular Chalk Formation. The two additional boreholes (WS11 and WS12) encountered groundwater at a depth of 2.0m within the River Terrace Deposits, rising to 0.8m and 1.0m bgl respectively, which likely reflects the difference in the time of year the boreholes were drilled, namely autumn (October 2017) compared to winter (January 2018) conditions.

Details of the various stratigraphic units are given in the following sections.

4.2. ARTIFICIAL GROUND

SURFACE HARDSTANDING	Not encountered in exploratory points.
BURIED STRUCTURES	Not encountered in exploratory points.
BURIED SERVICES	Not encountered in exploratory points.

Made Ground was not encountered in any of the exploratory holes.

4.3. TOPSOIL

TOPSOIL / MADE GROUND TOPSOIL			
LOCATION	Surface cover beneath all of the site.		
DEPTH TO BASE	0.25m to 0.30m	THICKNESS	Generally 0.25m
DESCRIPTION	Generally a friable brown slightly humic, locally fine-sized sandy, silty topsoil was encountered. Very occasional brick and clinker fragments were identified in WS11 and HD01 respectively, which is likely just a function of the surface soils being worked / ploughed over the years.		
COMMENTS	GEOTECHNICAL	Nothing significant noted.	
	CONTAMINATION	No visual or olfactory evidence of contamination.	
	GROUNDWATER	Groundwater was not observed in this stratum.	

4.4. SUPERFICIAL DEPOSITS

RIVER TERRACE DEPOSITS			
LOCATION	Site wide.		
DEPTH TO BASE	1.80m to 5.00m, and >3.4m.	THICKNESS	1.55m to 4.75m, typically 2.85m.
DESCRIPTION	The deposits were of variable composition although were predominantly firm, stiff, brown, orange brown, and light brown, locally slightly gravelly, silty clay. The gravel fraction comprised sub-angular coarse-sized flint. Locally, medium dense pale brown silty sand and gravel of sub-angular and sub-rounded fine- to coarse-sized flint were encountered. Locally below depths of some 1.7m, soft, firm brown clayey silt/ silty clay was encountered generally down to near the top of the underlying bedrock Formation.		
COMMENTS	GEOTECHNICAL	Nothing significant noted.	
	CONTAMINATION	No visual or olfactory evidence of contamination.	
	GROUNDWATER	Generally, groundwater was not observed in this stratum during the original investigation works. WS07 encountered groundwater at 4.0m bgl which promptly rose to 1.7m bgl. During the recent investigation, both WS11 and WS12 encountered groundwater at 2.0m bgl, which promptly rose to 0.8m and 1.0m bgl respectively.	

4.5. BEDROCK

LEWES NODULAR CHALK FORMATION			
LOCATION	Site wide.		
DEPTH TO BASE	>5.45m bgl	THICKNESS	Maximum penetrated thickness of 2.80m.
DESCRIPTION	The Chalk Formation comprised structureless white off-white, light brown, or light grey brown chalk of gravelly silt or silty gravel of flint and chalk rock fragments. Locally, rock quality Chalk was encountered at depth although was typically recovered as a mix of gravel and silt. The Chalk was typically assigned to CIRIA C574 Grade Dm or Grade Dc. Where the rock quality structured Chalk was encountered the CIRIA Grade could not be determined as the structure was destroyed by the percussive nature of the drilling method.		
COMMENTS	GEOTECHNICAL	Nothing significant noted.	
	CONTAMINATION	No visual or olfactory evidence of contamination.	
	GROUNDWATER	Groundwater was recorded on encountering the Chalk in a number of the boreholes.	

4.6. GROUNDWATER MONITORING

DATE	RESTING GROUNDWATER RANGE	COMMENTS
25/10/17	From 1.69m to 3.58m bgl.	Standing groundwater levels are indicated to be under sub-artesian conditions within the Chalk Formation. Groundwater levels appear to indicate a westwards flow towards lower elevations and existing surface watercourse levels.
31/10/17	From 1.70m to 3.63m bgl.	As above. Compared to the 25/10/17, standing water levels rose between 0.01m and 0.10m.
7/11/17	From 1.69m to 3.67m bgl.	As above. Compared to the 31/10/17, standing water levels were within a rise of 0.02m and a fall of 0.04m.
14/11/17	From 1.59m to 3.58m bgl.	As above. Compared to the 7/11/17, standing water levels rose by between 0.02m and 0.70m.
21/11/17	From 1.60m to 3.62m bgl.	As above. Compared to the 14/11/17, standing water levels fell by between 0.01m and 0.11m.
29/11/17	From 1.53m to 3.51m bgl.	As above. Compared to the 21/11/17, standing water levels rose by between 0.05m and 0.20m.

5. GEOTECHNICAL PROPERTIES

5.1. COARSE SOIL PARAMETERS

5.1.1. Standard Penetration Tests

Standard Penetration Tests were undertaken within each of the exploratory holes at 1.0m centres.

Granular soils were locally encountered within two of the boreholes (WS02 and WS07) with recorded SPT N-values of between 11 and 19, indicative of medium dense soils.

5.1.2. Particle Size Distribution

The grading curves of the three samples of River Terrace Deposits subject to PSD determination revealed these to comprise silty very gravelly sand or silty sand and gravel.

A further two soil samples were analysed for index tests associated with fine soils. However, the analysis revealed the samples to be non-shrinkable and have been assigned as fine-sized sandy silt or silty fine-sized sand.

The grading curve of one sample of the underlying Chalk Formation revealed these to comprise a gravelly (20%) silt which indicates a CIRIA C574, 2002, grade of Dm.

The determinations were used to assist in the preparation of the relevant engineering logs.

5.2. FINE SOIL PARAMETERS

5.2.1. Index Property Testing

SOIL TYPE	River Terrace Deposits
PLASTICITY INDEX (PI)	16% to 23% (4No. results).
MODIFIED PI	5% to 12% (4No. results).
NHBC CLASS	Variable soil types from non-shrinkable to low and medium volume change potential.

5.2.2. Undrained Shear Strength

This section discusses all of the laboratory and in-situ tests that produce either direct or indirect measures of undrained shear strength.

5.2.2.1. Hand Shear Vane

SOIL TYPE	River Terrace Deposits
CORRECTION FACTOR μ	1.0
JUSTIFICATION	Professional judgement. After Bjerrum 1972, employing Plasticity Index, PI ~20 so $\mu=1.0$.
DISCUSSION OF CORRECTED RESULTS	Within the firm and stiff consistency fine soils, hand vanes recorded undrained shear strengths in the range 60kN/m ² to over 140kN/m ² . The recorded values are indicative of typically high strength soils. Within the soft silty clay/ clayey silt soils, hand vane results indicated shear strengths in the range 30kN/m ² to 60kN/m ² , typically 30kN/m ² to 40kN/m ² . The recorded values are indicative of typically low strength soils.

5.2.2.2. Hand Penetrometer

SOIL TYPE	River Terrace Deposits
DISCUSSION OF CORRECTED RESULTS	Hand penetrometer tests were undertaken at depths of between 0.7m and 3.7m bgl within the boreholes. Within the firm and stiff consistency soils, recorded values were between 1.0 kg/cm ² and 4.0 kg/cm ² which are indicative of medium and high strength soils. Hand penetrometer tests were undertaken within the locally encountered soft silty clay/ clayey silt at depths of between 1.75m and 2.90m bgl. Within these soils, the recorded values were between 0.50 kg/cm ² and 1.0 kg/cm ² , generally 0.75 kg/cm ² which are indicative of typically low strength soils.

5.2.2.3. Standard Penetration Test Correlations

The SPT N-values have been converted using industry standard correlations, such as Stroud's method, to equivalent undrained shear strengths of a 100mm-diameter triaxial compression test.

In situ Standard Penetration Tests (SPTs) were undertaken in each of the boreholes at 1.0m centres. Within the firm and stiff consistency fine soils of the River Terrace Deposits, the recorded SPT N-values ranged from 4 to 37, typically 9 to 19. Using the recorded SPT N-values and the methodology of Stroud, equivalent typical undrained shear strengths of between 45kN/m² and 95kN/m² have been estimated and indicative of medium strength soils.

The local pockets of sandy silt, silty clay/ clay silt were encountered within four of the boreholes (WS03, WS04, WS05 and WS06) each at a depth of 2m bgl. Within these deposits,

the recorded SPT value was 4 or 6 and indicative of low strength soils with typical undrained shear strengths of some 20kN/m².

Within the underlying Lewes Nodular Chalk Formation, recorded SPT N-values ranged between 8 and 48 indicative of CIRIA Grades Dm, Dc or locally (where >25N) rock quality Chalk.

5.3. WATER SOLUBLE SULPHATE AND PH

	RIVER TERRACE DEPOSITS			
	Sulphate		pH	
Characteristic Value	200 mg/l		7.2 units	
Justification	Highest measured concentration rounded to nearest 100mg/l.		Mean of lowest 20% results.	
	No. of tests	Results Range	No. of tests	Results Range
Soil	14	<10 mg/l to 159 mg/l	14	7.2 to 8.4 units
Groundwater	No samples tested		No samples tested	
Total Potential Sulphate	8	Pyrite geologically unlikely and not indicated in samples tested.		

6. GEOTECHNICAL ASSESSMENT

6.1. INTRODUCTION

The following advice and recommendations are based on the construction of two storey houses. From assessment of the nature of the ground conditions and the type of proposed structures, it is considered that the situation falls within EC7 Geotechnical Category 1.

Should the nature of the development be changed then the results of this investigation would need to be reviewed and reassessed.

6.2. EXCAVATIONS

STABILITY	Any excavation requiring man entry should be battered back to a safe angle, supported by an appropriate proprietary trench support system or adequately shored to provide safe working conditions. Shoring to any excavation requiring man entry must be designed by a suitably qualified and experienced engineer. Any support system will require regular inspection as detailed in published guidelines to ensure the excavation support is adequate and appropriate for the ground conditions present. It is anticipated that narrow trench excavations will remain relatively stable and open for short periods, but minor spalling of side walls could still occur.
EQUIPMENT	It should be possible to progress excavations with conventional equipment.
GROUNDWATER CONTROL	In general, the recorded standing groundwater levels were at depths greater than 2.0m and so for the majority of construction excavations will not require specific groundwater control. Limited pumping from sumps are likely to be required to deal with slight seepages during the wetter times of the year or surface water ingress during the wetter times of the year, as evidenced by the recent drilling of WS11 and WS12. Boreholes located close to the surface watercourse aligned along the eastern side of the central section of the site (WS07 to WS09) revealed standing groundwater levels of approximately 1.70m bgl. These water levels are considered similar to the depth of the adjacent surface watercourse. For these locations, should excavations be deeper than 1.70m bgl, then groundwater control from simple sumps and pumps will be insufficient. Consultation with groundwater control contractors is recommended as specialist measures such as 'well pointing' or by 'exclusion methods' may well be required. Any groundwater control system should be designed and operated to minimise the loss of fines from the soil matrix as this could adversely affect settlements.
PARTY WALL ISSUES	As there are no nearby third party structures, the Party Wall Act is unlikely to apply to the development.

6.3. SLOPE STABILITY

The BGS national landslide database indicates no recorded landslides or mass movement deposits over or surrounding the site of similar anticipated geological profile.

The site itself slopes down gently towards the south east with no obvious significant breaks of slope. As part of the development, there are anticipated to be no significant changes in level. Therefore, slope stability is considered unlikely to be a concern at this site.

6.4. SUBSURFACE CONCRETE

RIVER TERRACE DEPOSITS	
SITE / SOIL CATEGORY	Natural ground.
DESIGN SULPHATE CLASS	DS-1
GROUNDWATER REGIME	Mobile.
AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) CLASS	AC-1
COMMENTS	Perched waters may be encountered at foundation depths within the coarse horizons of the River Terrace Deposits, although standing groundwater levels are anticipated to be within the underlying Lewes Nodular Chalk Formation.

6.5. SOAKAWAYS

6.5.1. Soil Infiltration Rate

The records of the soakage tests are presented in the Appendices that includes the calculation of the soil infiltration rate. A summary of results are presented in the table below:

TRIAL PIT	SOIL INFILTRATION RATE		STRATUM TESTED
TP01	Test 1	1.98×10^{-6} m/s	RIVER TERRRACE DEPOSITS: Firm brown mottled orange brown slightly sandy silty CLAY. Sand is fine-sized.
	Test 2	2.72×10^{-6} m/s	
	Test 3	2.10×10^{-6} m/s	
TP02	Test 1	5.26×10^{-6} m/s	RIVER TERRACE DEPOSITS: Firm, stiff brown light brown slightly gravelly slightly sandy silty CLAY. Gravel is sub-rounded fine-sized flint.
	Test 2	5.54×10^{-6} m/s	
	Test 3	9.91×10^{-6} m/s	
TP03	Test 1	1.86×10^{-6} m/s	RIVER TERRACE DEPOSITS: Firm, stiff light brown and orange brown slightly sandy slightly gravelly silty CLAY. Gravel is sub-angular, sub-rounded fine-sized flint.
	Test 2	Permeability too low to calculate infiltration rate, but close to 50% drop in 24 hours.	
	Test 3	4.41×10^{-6} m/s	
TP04	Test 1	3.45×10^{-6} m/s	RIVER TERRRACE DEPOSITS: Firm, stiff brown, orange brown slightly sandy silty CLAY. Sand is fine-sized.
	Test 2	3.67×10^{-6} m/s	
	Test 3	9.44×10^{-6} m/s	
TP05	Test 1	2.79×10^{-6} m/s	RIVER TERRRACE DEPOSITS: Firm, stiff orange brown, mottled light brown and brown silty CLAY.
	Test 2	2.21×10^{-6} m/s	
	Test 3	8.37×10^{-6} m/s	

Note: The results for the third soakage test in each pit was extrapolated and so those infiltration rate should be viewed as a guide only.

6.5.2. Soakaway Design Advice

The results of soakage tests undertaken within the River Terrace Deposits show that this stratum has typically relatively low soil infiltration rate which would be expected given the predominant fine soil (cohesive) nature.

The disposal of collected surface water to conventional soakaways are considered marginally feasible and additional near surface storage capacity is recommended for anticipated storm water inflows.

Groundwater monitoring has so far indicated the underlying Chalk Aquifer is saturated. Therefore, deep soakaways will not be permitted by the Environment Agency as direct discharge to groundwater is not allowed.

Any soakaways should be located well away from foundations for buildings or roads. The guidance on this issue presented in CIRIA C574 is that where the density of the chalk is unknown, soakaways should be sited at least 10m away from any foundation. Given the monitored standing groundwater levels have indicated the bedrock to be saturated and a new phase of chalk solution is unlikely to be significant. Therefore, the siting of soakaways may be reduced to at least 5m away from any foundations.

6.6. **PAVEMENT CONSTRUCTION**

From consideration of the observed ground conditions and the plasticity of the clay, it is recommended that a preliminary design California Bearing Ratio (CBR) of 3% is assumed. The cohesive deposits will be prone to rapid degradation during wet weather working and this should be avoided where possible.

All unsuitable soils, such as topsoil or desiccated soils, should be removed from beneath proposed paved areas. The exposed sub-grade formation should then be proof rolled to reveal any excessively soft or compressible zones and any such features identified also removed by excavation. Where unsuitable materials are removed, the resultant voids should be filled in layers with appropriately compacted suitable granular fill. To reduce the loss of granular construction materials into the sub-grade, consideration should be given to utilising a geotextile starter layer across the formation level.

6.7. **PRELIMINARY FOUNDATION RECOMMENDATIONS**

6.7.1. Introduction

Ground conditions were similar to the recently published BGS information with superficial deposits comprising River Terrace Deposits underlain by bedrock of the Lewes Nodular Chalk Formation.

River Terrace Deposits were encountered from below a surface cover of Topsoil down to depths of between 1.80m and 4.00m or to the base of the excavations down to a maximum depth of 3.40m bgl. The encountered soils typically comprised firm, stiff, orange brown becoming light brown slightly gravelly slightly sandy silty clay. Shear vane and hand penetrometer tests revealed the soils to be of medium and high strength. Although, locally within eight of the boreholes (WS01 to WS06, WS10 and WS12) and a number of trial pit excavations, pockets of low strength soils of variable thickness were first encountered at depths of some 1.70m bgl down to depths of the top of the underlying bedrock Chalk Formation. The available information reveals the low strength soils do not form a sheet-like deposit beneath the entire site although may have done so in the geological past.

The shallowest groundwater was originally monitored at depth of about 1.70m, however, the two recent boreholes would suggest that it is shallower in the winter months with standing water levels of 0.8m and 1.0m bgl recorded in WS11 and WS12 respectively. It is therefore recommended that construction of footings is undertaken in the summer months when groundwater is expected to be at greater depth.

Using a conservative approach, the local presence of low strength soils will limit the available allowable bearing capacity.

Once the footprint of the development is known, consideration of undertaking a supplementary ground investigation to establish the typical lateral extent and thickness of the low strength soils are likely to assist with final foundation designs for the site.

It is presumed that structures will not be placed over the existing culverts. If these watercourses are re-directed, then building over the former ditches/ culverts will likely require piled foundations.

6.7.2. Floor Slabs

In consideration of the near surface clay soils, fully suspended floor slabs designed and constructed in accordance with NHBC Standards are recommended at this development.

Subject to the completion of the ground gas monitoring, the floor construction will not have to incorporate any gas protection measures.

6.7.3. Traditional Footings

The site is considered suitable for the adoption of shallow strip/trench fill footings founded within the River Terrace Deposits although, due to the presence of local low strength soils, foundations should be reinforced.

An allowable bearing value of 80kN/m² is considered appropriate for foundations up to 1m wide bearing upon the clay soils of the River Terrace Deposits. Away from the influence of trees, immediate and long term settlement should be within tolerable limits and take place over several years.

The use of widened strip footing may be considered, although these may result in increased settlements for similar line loads.

The clay soils have been shown to have a varied volume change potential when assessed against NHBC Standards. Using a conservative approach, a medium volume change potential should be assumed and, therefore, a minimum foundation depth of 0.90 m is required, but deepened to 1.25 m where required to allow for restricted new tree planting. Under the NHBC Standards, foundation depths have to be increased if they are within the influence zone of felled trees, existing trees or proposed tree planting. It should be noted that where trees are in groups the resulting competition for resources can lead to deeper root systems than allowed for in the NHBC Standards. In any event, foundations should be taken below any roots encountered in foundation trench excavation. Where the required foundation depth varies around a structure, this can be accommodated by forming steps in the foundation as per NHBC Standards.

Due to the local presence of low strength soils at depth, the use of traditional footings below 1.50m should be subject to further assessment after the completion of a supplementary ground investigation. This is because there is a concern that these low strength soils could result in unacceptable settlement for deeper footings. Currently, where foundations are

required to be deepened beyond this depth to accord with NHBC Standards for tree influence or other factors such as nearby drainage, the use of piled foundation should be considered.

It is considered that the viability of the construction of footings will be dependent upon actual groundwater levels present at the time of construction. It is recommended that construction of footings is undertaken in the summer and early autumn months when groundwater can be expected to be at its deepest.

Trees and hedgerows are present along the northern field and locally within the southern field. Prior to commencing with the development, it will be necessary to remove all unwanted trees and root balls in the ground. Any resultant void should be backfilled accordingly with respect to the preferred foundation design.

During construction, any soft spot found at foundation level should be excavated and replaced with lean mix concrete. Foundation excavations should be kept dry and left open for the minimum amount of time possible. Where foundations cannot be completed immediately, a blinding layer of concrete should be placed.

6.7.4. Raft Foundations

For small isolated lightly loaded structures, such as detached domestic garages, consideration could be given to employing reinforced raft foundations bearing on the River Terrace Deposits.

6.7.5. Piling

As described above, where footing depths in excess of 1.5m would be required then due to the local low strength soils the use of piled foundations should be considered. Alternatively, piled foundations may be preferred for structures imposing high loads or to eliminate any concerns with the presence of low strength soils, with foundation loads transmitted to the underlying Lewes Nodular Chalk Formation.

Piled foundations are likely to be required should any watercourses be re-directed and buildings are located over these former ditches/ culverts.

Due to the partial granular nature of the soil and the position of perched water, traditional bored piles may be difficult to construct unless they are cased through to the underlying Chalk Formation. The need for casing could be avoided through the use of Continuous Flight Auger (CFA) piling techniques and this may be the best method to construct cast in situ piles.

Driven pre-cast concrete piles would be a viable option. However, the proximity of neighbouring structures to the north and east of the site may make them unsuitable in those areas due to noise and vibration considerations.

For the purposes of pile design it is recommended that skin friction from the River Terrace Deposits is treated conservatively, and that the working load is primarily calculated from a combination of skin friction and end bearing within the underlying Chalk Formation.

The existing trees may cause soil heave. In the influence zone of trees, pile caps and ground beams will have to be separated from the soil by a suitable void former on the sides and in the case of ground beams, underneath. Piles will have to be designed to withstand the seasonal movements exerted by the remaining and proposed vegetation either by the use of suitable reinforcement or by the provision of sleeving through the swelling zone. Such precautions against heave should be designed and constructed in accordance with NHBC Standards.

It is recommended that consultation with a specialist piling contractor is undertaken in order to evaluate likely pile loads, diameter and depths based upon the ground conditions revealed within the context of the specified technical requirements of the chosen piling method. In any event, positive contractual assurances should be sought from the piling contractor in respect of the performance of their proprietary system.

6.8. RECOMMENDATIONS FOR FURTHER GEOTECHNICAL WORK

Once the layout for the proposed development has been finalised it is recommended that additional site investigation works are undertaken in order to establish the variation in the extent and thickness of the low strength deposits first encountered at depths of around 1.70m bgl. Where foundations are required to be deepened in excess of 1.5m due to tree influence or other factors such as nearby drainage, the use of traditional footings may not be satisfactory.

However, a supplementary site investigation would assist in providing further site specific information beneath the site. Such investigation would also provide information for potential pile designs within the underlying Chalk Formation. It is suggested that the additional investigation works should comprise at least one day of Cone Penetration Testing (CPT) with a combination of numerous shallow probes (5m) together with a few deeper tests (18m or refusal). Test locations should be spread over the site, although concentrated along the northern field boundaries and along the central section of the southern field where foundations are likely to be deepened due to the influence of the existing trees.

7. RISK ESTIMATION - SOILS

7.1. HUMAN HEALTH

The Generic Assessment Criteria (GAC) employed below are for residential land use as this is appropriate to the proposed form of development.

CONTAMINANT	UNITS	NUMBER OF TESTS	MAXIMUM CONCENTRATION	GAC	NUMBER EXCEEDING GAC
Arsenic	mg/kg	22	12	37	0
Cadmium	mg/kg	22	<0.2	22	0
Chromium (hexavalent)	mg/kg	22	<2	21	0
Chromium (total)	mg/kg	22	29	910	0
Copper	mg/kg	22	19	2,400	0
Lead	mg/kg	22	30	200	0
Mercury	mg/kg	22	<1	11	0
Nickel	mg/kg	22	31	180	0
Selenium	mg/kg	22	<3	250	0
Zinc	mg/kg	22	80	3,700	0
pH	Units	29	6.0 - 8.7	<5-10>	0
Naphthalene	mg/kg	22	<0.1	2.3	0
Acenaphthylene	mg/kg	22	<0.1	170	0
Acenaphthene	mg/kg	22	<0.1	210	0
Fluorene	mg/kg	22	<0.1	170	0
Phenanthrene	mg/kg	22	<0.1	95	0
Anthracene	mg/kg	22	<0.1	2,400	0
Fluoranthene	mg/kg	22	0.14	280	0
Pyrene	mg/kg	22	0.13	620	0
Benzo(a)anthracene	mg/kg	22	<0.1	7.2	0
Chrysene	mg/kg	22	<0.1	15	0
Benzo(b)fluoranthene	mg/kg	22	0.11	2.6	0
Benzo(k)fluoranthene	mg/kg	22	<0.1	77	0
Benzo(a)pyrene	mg/kg	22	<0.1	2.2	0
Indeno(1,2,3-cd)pyrene	mg/kg	22	<0.1	27	0
Dibenzo(a,h)anthracene	mg/kg	22	<0.1	0.24	0
Benzo(ghi)perylene	mg/kg	22	<0.1	320	0
TPH Aliphatic C5-C6	mg/kg	5	<0.01	42	0
TPH Aliphatic C6-C8	mg/kg	5	<0.05	100	0
TPH Aliphatic C8-C10	mg/kg	5	<2	27	0
TPH Aliphatic C10-C12	mg/kg	5	<2	130	0
TPH Aliphatic C12-C16	mg/kg	5	<3	1,100	0
TPH Aliphatic C16-C35	mg/kg	5	<10	65,000	0
TPH Aliphatic C35-C44	mg/kg	5	<10	65,000	0

CONTAMINANT	UNITS	NUMBER OF TESTS	MAXIMUM CONCENTRATION	GAC	NUMBER EXCEEDING GAC
TPH Aromatic C5-C7	mg/kg	5	<0.01	70	0
TPH Aromatic C7-C8	mg/kg	5	<0.05	130	0
TPH Aromatic C8-C10	mg/kg	5	<2	34	0
TPH Aromatic C10-C12	mg/kg	5	<2	74	0
TPH Aromatic C12-C16	mg/kg	5	<2	140	0
TPH Aromatic C16-C21	mg/kg	5	<3	260	0
TPH Aromatic C21-C35	mg/kg	5	<10	1,100	0
TPH Aromatic C35-C44	mg/kg	5	<10	1,100	0
Benzene	mg/kg	5	<0.002	0.87	0
Toluene	mg/kg	5	<0.005	130	0
Ethylbenzene	mg/kg	5	<0.002	47	0
Xylene (total of all types)	mg/kg	5	<0.002	56	0
Methyl Tert Butyl Ether (MTBE)	mg/kg	5	<0.005	49	0
Semi-Volatile Organic Compounds (SVOCs)	mg/kg	4	<LOD	LOD*	0
Pesticides	mg/kg	5	<LOD	LOD*	0
Asbestos	Presence	5	<0.001%	Fibres Present	0

Notes: *Limit of detection: Given the large amount of compounds in this group, coupled with the lack of GAC for certain compounds, any concentrations above the limit of detection will be highlighted in the first instance.

RESULTS EXCEEDING HUMAN HEALTH ASSESSMENT CRITERIA

None of the samples record any contaminants at concentrations exceeding their respective assessment criteria.

7.2. WATER ENVIRONMENT

It is not appropriate to consider human health assessment criteria for human health in relation to the risk to the water environment, but currently there are no generic soil assessment criteria in respect of the water environment. In the absence of any groundwater sampling data, the soil results are assessed on the basis of professional judgement.

The contaminant concentrations recorded in the soils at the site are not considered to be at such levels that they would present any significant risk to the underlying water environment.

7.3. BUILDING MATERIALS

Contaminant	Units	Number of tests	Maximum Concentration	GAC	Number exceeding GAC
pH	units	29	6.0 - 8.7	<5.5	0
Sulphate (w/s)	mg/l	29	159	500	0
Sum of SVOC + Aliphatic TPH >C5-C10 + Aromatic TPH >C5-C10 above detection limits	mg/kg	4	<LOD	2	0
Sum of Aliphatic TPH >C10-C21 + Aromatic TPH >C10-C21 above detection limits	mg/kg	5	<LOD	10	0
Sum of Aliphatic TPH >C21-C34 + Aromatic TPH >C10-C35 above detection limits	mg/kg	5	<LOD	500	0
Sum of BTEX + MTBE above detection limits	mg/kg	5	<LOD	0.1	0
Phenols	mg/kg	4	<0.1	2	0
Cresols and chlorinated phenols	mg/kg	4	<0.1	2	0
Naphthalene	mg/kg	22	<0.1	0.5	0
Benzo(a)pyrene	mg/kg	22	<0.1	0.5	0

RESULTS EXCEEDING BUILDING MATERIALS ASSESSMENT CRITERIA

None of the samples record any contaminants at concentrations exceeding their respective assessment criteria.

8. RISK ESTIMATION - GROUND GAS

RESULTS SUMMARY			
Parameter	Minimum	Maximum	Comments
Methane	0.0%	0.1%	No significant concentrations recorded.
Carbon Dioxide	1.7%	5.9%	The elevated concentrations recorded are likely to be attributed to the carbonate rich Chalk Formation occurring beneath the site.
Oxygen	11.9%	20.0%	The oxygen levels were typically depleted as carbon dioxide concentrations increased.
Hydrogen Sulphide	0ppm	0ppm	No concentrations recorded.
Carbon Monoxide	0ppm	23ppm	Background concentrations recorded.
Atmospheric pressure	1010mB	1028mB	The third and fifth visits were undertaken during falling atmospheric pressure trends.
Groundwater levels	1.53m	3.67m	The shallowest groundwater levels were recorded in the three exploratory holes located adjacent to the culverted section of the surface watercourse aligned within the central section of the site.
Flow rate	0.0 l/hr	0.3 l/hr	Given a natural carbonate bedrock source (Chalk Formation), the recorded low flow rates are as anticipated.

GAS GENERATION POTENTIAL OF SOURCE		
GAS SOURCE	GENERATION POTENTIAL	COMMENTS
On site infilled culvert within the south eastern corner of the northern field.	Low	WS02 is located close by. Very limited gas potential from this narrow feature.
On site infilled culvert along the eastern boundary of the central section of the site within the southern field.	Low	WS07, WS08 and WS09 are located close by. Very limited gas potential from this narrow feature.
Carbonate Deposits (e.g. Chalk, Limestone)	Low	CIRIA 152 provides a risk ranking of gas sources with natural soils with a low organic content deemed to pose the lowest risk in terms of gas generation. CIRIA 152 placed the presence of carbonate deposits (e.g Chalk) relatively high in terms of gas generation risk order. However, Wilson and Card argued that such soils should be reclassified as low gas generation potential on the basis that thousands of homes have been built on such soils without any protection measures and without any recorded build-up of Carbon Dioxide within these homes. This reclassification has been accepted by other authors.
Natural soils with low organic content	Negligible	Whilst the gas generation potential is low, it is common for natural soils to record low concentrations of Carbon Dioxide due to limited organic or carbonate content.

Sensitivity of development	High (Residential with gardens)	
	Idealised	Actual
Monitoring period	3 months	2 Months
Total number of visits	6 visits	6 visits
Number of visits during falling pressure trends	At least two visits	Two visits.
Comment	Six gas visits have been completed which is considered sufficient for characterisation of the gas regime at the site, and is in accord with CIRIA C665 guidance.	

GAS REGIME CHARACTERISATION			
Radon protection measures required?	No.	Vapour protection measures required?	No.
	Characteristic Gas Concentration (fraction)	Characteristic Gas Flow Rate (l/hr)	Gas Screening Value (l/hr)
Methane	0.001	0.3	0.0003
Carbon Dioxide	0.059	0.3	0.0177
Methodology	Situation A - All development types except low rise housing with gardens.		
Gas Regime	Characteristic situation 1 - Very low risk.		
Gas Protection Measures	Negligible gas regime identified and gas protection measures are not considered necessary.		

9. RISK EVALUATION

9.1. REVISED CONCEPTUAL MODEL

The revised conceptual site model plan is presented in the Appendices.

ADDITIONAL POLLUTANT LINKAGES	During the various phases of ground investigation, no additional sources of contamination were identified.
INVALID POLLUTANT LINKAGES	Within the near surface soils over the site, no pesticide residues or asbestos fibres were recorded. Therefore, from pesticides there are considered to be negligible risks to future residents or surface waters and groundwater environments. From asbestos there are considered to be negligible risks to future residents. Site investigation, chemical testing and ground gas monitoring of soil samples taken from adjacent to the in-filled culverts indicate the site is not contaminated. The site investigation and contamination testing of soil samples taken from adjacent to the on-site fly-tipped areas indicate the site is not contaminated.
LIMITATIONS AND UNCERTAINTIES	All of the potential contamination sources have been targeted by the exploratory holes and therefore it is considered that a sufficient number of exploratory points have been completed for contamination assessment purposes. An appropriate number of gas monitoring visits have been completed for assessment purposes.

9.2. UPDATED CONTAMINATION RISK ASSESSMENT

The pollutant linkages identified in the revised conceptual site model will now be evaluated as to their severity.

SOURCES AND CONTAMINANTS	PATHWAYS (REFERENCE FROM MODEL)	RECEPTORS	POTENTIAL RISK
Contaminated Made Ground associated with infilled/culverted stream/ditch. -Metals. Polycyclic Aromatic Hydrocarbons (PAH). Asbestos containing materials.	Direct contact. Ingestion of soils/dusts. Inhalation of dusts/vapours or gasses. Consumption of homegrown produce.	Future Residents	Negligible risk.
Landfill gases (mainly carbon dioxide and methane).	Horizontal & vertical migration.	Water Environment	Negligible risk
	Direct Contact.	Building materials and services.	Negligible risk

SOURCES AND CONTAMINANTS	PATHWAYS (REFERENCE FROM MODEL)	RECEPTORS	POTENTIAL RISK
Agricultural field -Pesticide residues	Direct contact. Ingestion of soils/dusts. Inhalation of dusts/vapours. Consumption of homegrown produce.	Future Residents	Negligible risk
	Horizontal & vertical migration.	Water Environment	Negligible risk
Soil contamination associated with fly-tipped waste along boundaries. -Metals. Polycyclic Aromatic Hydrocarbons (PAH). Asbestos containing materials.	Direct contact. Ingestion of soils/dusts. Inhalation of dusts/vapours. Consumption of homegrown produce.	Future Residents	Negligible risk
	Horizontal & vertical migration.	Water Environment	Negligible risk
	Direct Contact.	Building materials and services.	Negligible risk

The contamination risks that are presented to the various receptor groups are discussed further in the following sections:

RISK TO HUMAN HEALTH

None of the soil samples recorded any contaminants at concentrations exceeding their respective assessment criteria for human health.

With regards to the potential for ground gas migration, the recorded carbon dioxide and flow rates are typical of the natural carbonate rich bedrock of the Chalk Formation beneath the site. An appropriate monitoring programme has been completed that indicates the risk of gas migration is negligible and that no gas protection measures are required.

RISK TO WATER ENVIRONMENT

No significant risks to the water environment have been identified by this investigation.

RISK TO BUILDING MATERIALS AND SERVICES

No significant risks to the water environment have been identified by this investigation.

9.3. RISK MANAGEMENT

GENERAL	The ground investigation has identified there to be no significant contamination from any on-site sources that would require remediation prior to development for human health, groundwater or the wider environment. It is recommended that this report is submitted to the planning department of the Local Authority, the organisation undertaking the Building Control function and warranty providers to confirm that the investigation completed to date is satisfactory.
FURTHER INVESTIGATION	No further investigation is considered necessary at this time.
OUTLINE REMEDIATION SOLUTION	Due to the absence of contamination risks, no remediation is considered necessary, although subject to agreement with the local regulators.
WASTE SOILS CLASSIFICATION	Topsoil should be viewed as a resource rather than a waste and as it is suitable for residential garden use, the topsoil at the site should be stripped and the surplus reused on other developments. It should be noted that topsoil, even if uncontaminated, is unlikely to constitute 'inert waste' due to its high organic matter content. It is considered that any sub-soils (natural River Terrace Deposits) disposed of from the site would be classified as 'non-hazardous waste' and be able to be disposed of to landfill as 'inert waste'. Waste Acceptance Criteria (WAC) testing of the soils will also be required where the soil is to be disposed of at a landfill permitted to accept inert waste. Such WAC testing has been completed (River Terrace Deposits taken from WS02 at a depth of 0.50m) and the results are in the Appendices which confirm the soil tested complies with the inert waste limits. The waste code from the European Waste Catalogue (EWC) 2002 for the soils would be 17 05 04 'Soil and Stones, not containing dangerous substances'. However, the chemical results should be forwarded to the proposed landfill site and the waste classification confirmed prior to disposing of any surplus soils.

10. HEALTH AND SAFETY FILE INFORMATION

10.1. INTRODUCTION

The aim of the following sections is to present pertinent Health and Safety information that has arisen from the current investigation/survey works discussed in this report. The aim is to identify health and safety controls that may be necessary during any subsequent maintenance, refurbishment, demolition or construction works.

Where BRD has been appointed as a Principal Contractor, then this information shall form the Health and Safety Files as required by the Construction Design and Management (CDM) Regulations 2015.

Reports are always forwarded to the Client and they shall be responsible for ensuring this safety information is disseminated to those who need it.

10.2. WORK UNDERTAKEN

Detail on the works undertaken and the information gained about the site are discussed in previous sections of this report.

In summary, BRD's work comprised the excavation of 18No. trial pits down to a maximum depth of 3.40m and 12No. window sample boreholes each to a depth of 5.45m below existing ground levels.

10.3. HAZARDS

The investigation has revealed the following hazards:

10.3.1. Contamination

Although no contamination has been identified, as with any construction site, if any anomalous material is encountered during the redevelopment then expert environmental advice should be sought.

10.3.2. Asbestos

Within the near surface soil samples, asbestos quantification down to a level of 0.001% by mass recorded no asbestos fibres.

10.3.3. Other Issues

During the BRD works the following safety hazards were identified:

- During the ground investigation, frequently used public footpaths were aligned along the western and southern boundaries of the northern field that crossed into the central section of the southern field with a west to east alignment towards Mill View Road. Measures to secure the site and maintain safety of pedestrians on the public footpaths should be taken in to account during development works.
- After prolonged periods of heavy rainfall, the land located immediately to the south of the culvert aligned along the eastern boundary of the central section of the site was noted to rapidly become very wet and soft ground. In addition, land located immediately to the west of the bridge over the culvert separating the two fields was also noted to be wet and soft after similar prolonged wet weather. Care should be taken with plant and equipment movements in these areas of the site, especially where these are close to existing public footpaths.

10.4. HAZARDOUS MATERIALS USED

BRD did not construct anything with hazardous materials.

Any soils to be imported to the site, in particular topsoil, should be tested to confirm their suitability in the development.

10.5. UTILITY SERVICES

The utility services plans held by the Client should be referred to.

REPORT SPECIFIC REFERENCES

- British Geological Survey, Research Report ICSO/87/2, published 1987, 'Applied geological mapping Southampton area'.
- British Geological Survey sheet 317/ 332, "Chichester and Bognor", Solid and Drift edition (1:50,000) published 1996.
- British Geological Survey, Open Research CR/06/160N, published 2006, 'Guide to Permeability Indices'.

SUPPORTING INFORMATION

GROUND INVESTIGATION

Exploratory holes are logged by an experienced Geo-Environmental Consultant in general accordance with 'Code of practice for site investigations' BS5930:1999 +A2:2010, BSi, August 2010. Soil samples for chemical and geotechnical analysis are taken from the exploratory holes at intervals dictated by the nature of the soils and the objectives of the investigation.

Where stated on the logs of inspection pits, trial pits or boreholes (where insitu testing has not been undertaken), the relative density of coarse (sand and gravel) soils is tentative only. Such assessments of density are on the basis of visual inspection only taking into consideration such factors as drilling rates, stability of pit side walls, appearance and behaviour under excavation.

Where Chalk strata is encountered it is logged and graded in general accordance with CIRIA guidance 'C574 - Engineering in Chalk'. It should be recognised that where percussive drilling methods are employed, the structure of the Chalk is destroyed and therefore the grading stated on such logs is either tentative or absent where it is not possible to assess the grade.

Hand Dug Inspection Pits

Hand tools are used to forward shallow inspection pits as a cost effective method of describing and sampling near surface soils. The technique is also used where exposure of existing footings is required. The depth reached by such techniques is a function of the nature of the ground and generally does not exceed 1.5m

Trial Pits

Mechanically excavated trial pits allow detailed inspection of near surface ground due to the large volume of soil exposed. A wheeled backhoe loader is the usual machine for digging trial pits that are typically 3 to 4.5m deep, 0.5m wide and 3m long.

Windowless Sampling Boreholes

This type of borehole is formed by a small tracked dynamic percussion drilling rig with samples retrieved in thin plastic liners within the narrow diameter steel sampling tubes. Borehole depths of up to 5m are typical, but in exceptional circumstances up to 15m depth can be achieved. This is the smallest type of rig that is capable of undertaking Standard Penetration Tests (SPTs).

Hand Held Window Sampling

Hand held window sampling is a useful method of drilling narrow diameter boreholes particularly where access is difficult. Hand held mechanical percussive hammers are used to drive the sampling tube into the ground. The soil samples are collected within the hollow metal sampling tubes and inspected via the open window along one side. Window sampling boreholes can be forwarded to depths of 3m to 6m depending upon ground conditions.

Cable Percussive Boreholes

This form of drilling involves repetitive dropping of a tube into the soil under its own weight from a tripod support. The sample is obtained from the clay cutter head in fine soils or a bailer for wet granular soils. As the borehole progresses SPTs can be undertaken and relatively undisturbed samples can be obtained. Typically these boreholes are 15 to 25m

deep, but depths of double that can be achieved in soils, but only thin weak rock layers can be penetrated.

Rotary Boreholes

Where competent rock is required to be drilled then rotary drilling techniques are required. The drilling rigs can vary in size from small tracked units to larger units mounted on four wheel drive trucks. Rotary open hole drilling techniques break the rock into small fragments and so recovery of any samples is limited. In contrast, rotary coring retrieves excellent samples. Some rigs also allow windowless sampling to be undertaken through soil layers. There are no practical limits to the depths that this drilling method can achieve.

Dynamic Probing

Dynamic probing comprises a sectional rod with a sacrificial cone at the base of slightly larger diameter than the rod. The rod is driven into the ground by a constant mass falling through a set distance. The number of blows required to forward the rod per 100mm is then recorded and presented in a graph of N_{10} values. The standard applicable to dynamic probing is "BS EN ISO 22476-2:2005 Incorporating corrigendum no. 1, Geotechnical investigation and testing – Field testing – Part 2: Dynamic probing" BSi, February 2007.

Dynamic Penetrometer

The Transport Research Laboratory Dynamic Cone Penetrometer (TRL DCP) uses an 8 kg hammer dropping through a height of 575mm to drive a 60° cone of 20mm maximum diameter into the ground. The depth driven either per blow or per several blows is recorded. The strength of each of the soil layer encountered is then calculated by converting the penetration rate (mm per blow) into an approximate California Bearing Ratio (CBR) value employing the correlation proposed by TRL.

Gas Monitoring

Gas monitoring is undertaken with a portable gas monitor for oxygen, Methane, Carbon Dioxide, Hydrogen Sulphide and Carbon Monoxide together with recording of atmospheric pressure and any flow rate.

Vapour Monitoring

Headspace tests and monitoring for Volatile Organic Compounds (VOC) or Semi Volatile Organic Compounds (SVOC) is undertaken using a Photo Ionisation Detector (PID). The MiniRAE models used have a 10.6 eV lamp calibrated for isobutylene. The PID is useful tool to indicate the presence of a wide range of volatile compounds, but only provides semi-quantitative data as different compounds provide a different response and thus the reading is not a true reflection of the actual concentration present.

Low PID readings can be recorded in natural uncontaminated organic soils or even as a result of atmospheric pollution. It is generally accepted by consultants and regulators that recorded values in excess 50 parts per million (ppm) represents the presence of organic compound pollutants and in excess of 100 ppm such contamination may be significant.

The headspace test procedure involves the collection of a sample of suspected contaminated soils and placing within a sample bag. A tight seal to the bag is formed with a similar volume of air trapped to that of the soil and the sample is left for fifteen minutes to allow volatilisation of any contaminants. The bag is then pierced by, and sealed around, the sample probe of the PID and a reading taken.

Borehole well monitoring is undertaken by connecting the PID directly to the gas tap on the monitoring well installation.

Groundwater Level Monitoring

Groundwater levels are recorded with an electronic dip meter that has a detector end that is lowered into the borehole well. An audible signal is made when water is reached and the depth recorded from the graduated tape used to lower the detector. Where there is potential for a separate Light Non Aqueous Phase Liquid (LNAPL) to be present floating on the groundwater an oil/water interface meter is used in preference to a conventional dip meter so that any such floating product can be detected.

Geotechnical Sampling

BRD schedule a range of geotechnical testing as appropriate to the identified ground conditions, available budget and the proposed development. Different types of soil samples are obtained as appropriate to the ground conditions and planned testing.

SAMPLE TYPE	SYMBOL USED ON LOGS	DESCRIPTION
Disturbed	D	Small disturbed soil samples of about 1 to 2 kg are collected in plastic bags.
Bulk	B	Large disturbed bulk samples up to about 30 kg are collected in plastic bags
Undisturbed	U	'Undisturbed' samples generally collected in plastic or metal tubes within cable percussive boreholes of 100mm diameter for samples of fine soils of firm to stiff consistency. Can also be representative of samples taken by cutting plastic sample liners from windowless sampling drilling methods. It is recognised that such samples do not generally meet Eurocode sample quality requirements for the tests commonly employed. However, given the wealth of experience with these sampling methods this continues to be common in United Kingdom practice particularly for less sensitive developments where more expensive sampling techniques are not economically justifiable.
Undisturbed	UT	A thin walled steel sampler developed by Archway Engineering called a UT100 in an attempt to gain better quality samples of soft to firm fine soils when using cable percussive drilling methods.

Contamination Sampling

BRD schedule contamination testing as appropriate to the ground conditions, available budget, potential contaminants and the proposed development. Samples are collected in single use laboratory supplied containers.

Soil samples are retrieved in plastic containers and/or amber glass jars with a lined plastic cap. Contamination samples are indicated by a 'J' on exploratory hole logs.

Water samples are collected in plastic bottles and/or amber glass jars with a lined plastic cap then placed in cool boxes together with freezer packs. Water samples are indicated by a 'W' on exploratory hole records, but generally such samples are not tested as testing from dedicated monitoring wells is preferred for sample quality reasons.

Samples retrieved from the exploratory holes are dispatched to the laboratory by overnight courier. Where samples cannot be transported directly from site they are temporarily stored in the BRD dedicated sample storage facility which includes refrigeration where necessary. The individual accreditation of the test methods is detailed in the laboratory test report.

GEOTECHNICAL ASSESSMENT

Under Eurocode 7 (EC7) the following risk ranking is applied to geotechnical projects:

GEOTECHNICAL CATEGORY	DESCRIPTION
1	Small and relatively simple structures for which it is possible to ensure that the fundamental requirements will be satisfied on the basis of experience and qualitative geotechnical investigations with negligible risk. For example, straightforward ground conditions, local experience, no excavation below the water table unless this will be straight forward.
2	Conventional types of structures and foundations. No difficult soil or loading conditions. Quantitative geotechnical data and laboratory testing. Routine procedures for field and laboratory testing. Conventional structures and no exceptional geotechnical risk. For example, spread, raft and piled foundations, retaining walls, bridge piers and abutments, embankments, ground anchors, tunnels and excavations.
3	Those structures not in Categories 1 and 2 such as very large or unusual structures, structures involving abnormal risks, or unusual or exceptionally difficult ground or loading conditions. Structures in highly seismic areas. Structures in areas of probable site instability or persistent ground movements that require separate investigation or special measures.

GEOTECHNICAL PARAMETERS

Soakage Tests

Soakage tests comprise the filling of a test pit with water and recording the time taken for the water to drain away. The test are undertaken in general accordance with 'BRE Digest 365: Soakaway design', Building Research Establishment, 1991. Water is generally supplied by a tanker to allow fast filling of the pits with water. Repeat tests are undertaken where possible within the time available on site with the investigation budget.

Standard Penetration Tests

The standard penetration test (SPT) determines the resistance of soils at the base of a borehole to the dynamic penetration of a split barrel sampler and the recovering of disturbed samples for identification purposes. In gravelly soils and some soft rocks a solid cone is used in preference to the sampler.

The basis of the test consists in driving a sampler by dropping a hammer of 63.5 kg mass on from a height of 760 mm. The number of blows (N value) necessary to achieve a penetration of the sampler of 300 mm is recorded. The test is described in 'Geotechnical investigation and testing – Field testing – Part 3: Standard penetration test - BS EN ISO 22476-3:2005 Incorporating corrigendum no. 1', BSi, 2007.

The uncorrected N values of the SPT tests are recorded upon the borehole logs together with a record of blows for each 75mm test portion including the seating blows. Where the full test depth cannot be achieved due to refusal on hard stratum, the number of blows and the distance achieved is recorded and the N value given as >50. The abbreviation SPT(c) is used upon the logs indicates that the test was performed with a solid cone rather than a split spoon sampler.

It is necessary to apply a correction to the N values to account for the effects of energy delivery using the equation: $N_{60} = \frac{E_r}{60} N$ where E_r is the energy ratio of the specific test equipment.

In the case of tests in sand, for the effects of overburden and rod length the equation is modified to $N_{60} = \frac{E_r}{60} \times \lambda \times C_N \times N$ where λ is the correction factor for energy losses due to the rod length and C_N is the correction factor for vertical stress due to overburden of the soil.

Sulphate

In order to compare the laboratory soil test results with 'Concrete in aggressive ground. BRE Special Digest 1: 2005' (BRE, 2005) laboratory results are converted to SO_4 mg/l. QTS Environmental Ltd results are expressed as SO_4 g/l and so are multiplied by a factor of 1000 to convert to mg/l. Soil Property Testing Ltd laboratory results are expressed as SO_3 g/l and are multiplied by a factor of 1200 to express the results as SO_4 mg/l.

Index Property Tests

In accordance with National House Building Council (NHBC) Standards Chapter 4.2 - Building near trees, the laboratory plasticity indexes are assessed against their volume change potential. The Modified Plasticity Index is defined as the Plasticity Index of the soil multiplied by the percentage of particles with a nominal diameter of less than 425µm. Whilst the NHBC Standards were developed for residential buildings, the advice is equally applicable to a large number of other types of low rise structures.

Hand Shear Vane

The undrained shear strength of the fine (i.e. clay) soils at the site can be established using hand shear vane apparatus. Usually three readings are taken at every depth tested and the uncorrected results recorded on the exploratory point log. Shear vane readings from depths below 1.2m depth in trial pits are from tests performed on excavated soil. In accordance with Eurocode 7 – Geotechnical design – Part 2: Ground investigation and testing EN 1997-2:2007 the results should be corrected. BRD employ only simple correction methods as the more complex correction methodologies imply undue accuracy to a test that has distinct disadvantages and limitations.

Pocket Penetrometers

The Pocket Penetrometer is a lightweight instrument for use by field personnel to check visual classification of soils. It is a simple test and there is inherent uncertainty related to the small volume of soil being tested and so the results should be used with appropriate caution. Pocket penetrometers are calibrated in terms of unconfined compressive strength and once converted to undrained shear strength (divide by two) the results are further reduced by a factor of 1.5 - 2.0 as the device tends to overestimate strengths.

Instrument Reading (uncompressive strength in kg/cm ²)	Indicative Undrained Shear Strength (kN/m ²)	Indicative Consistency	Indicative strength
1.0	25 - 33	Soft	Low
1.5	38 - 50	Soft to firm	Low to medium
2.0	50 - 67	Firm	Medium
2.5	63 - 83	Firm to stiff	Medium to high
3.5	88 - 116	Stiff	High
4.5	113 - 150	Stiff to very stiff	High to very high

CONTAMINATION ASSESSMENT METHODOLOGY

UK Policy

The UK Government's policy in relation to land affected by historic contamination is based on a 'suitable for use' approach. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Contamination risks therefore need to be assessed on a site-by-site basis. The 'suitable for use' approach limits requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to either the current use or future use of the land.

The three main drivers for contamination assessment and remediation are:

- *Voluntary action.*
- *Development as part of the planning regime.*
- *Regulatory action to mitigate unacceptable risks e.g. Part 2A of the Environmental Protection Act 1990.*

Pollutant Linkages

For a contamination risk to exist there must be a 'pollutant linkage' from the contaminant (source) via a pathway (the route from contaminant to receptor) to a receptor (the entity that could be harmed). The absence of a contaminant, pathway or receptor breaks the pollutant linkage and therefore no contamination risk exists.

Contamination is typically present at a site (in the ground and/or in the underlying groundwater) as a result of a historic or current industrial use, usually as a result of leaks, spills or disposal of residues, wastes and excess raw materials from the industrial processes. Contamination may also be present due to:

- *The deliberate application of chemicals e.g. the spraying of herbicide/pesticide.*
- *Migration of pollutants from adjacent land.*

Naturally occurring processes e.g. elevated concentrations of particular heavy metals associated with specific geological strata.

Conceptual Site Model

The conceptual site model can be defined as a textual or graphical representation of the identified pollutant linkages for a given site. The model forms the basis for designing the investigation as the aim will be to target all of the potential pollutant linkages to determine, through the subsequent phases of risk assessment, whether or not they pose an actual risk.

It is important that the conceptual site model is updated with new information as the various investigation, risk assessment and remediation works are completed.

Technical Guidance

The technical and legal framework for contamination assessment is complex. The process adopted through this report for assessing contamination risks is in general accordance with the following guidance, as listed below:

- *'Investigation of Potentially Contaminated Sites - Code of Practice - BS 10175: 2011', BSi, 2011.*
- *'Model Procedures for the management of Land Contamination - CLR Document No. 11', Environment Agency, 2004.*
- *'Guidance for the safe development of housing on land affected by contamination - R&D66: 2008', NHBC/Environment Agency, 2008.*

Risk Assessment Methodology

In line with the technical guidance, the contamination risk assessment follows a series of phased stages for each particular site:

PHASE	DESCRIPTION	RISK ASSESSMENT STAGE
PHASE 1	<i>Generally limited to desk based research and a site walkover survey to develop an initial conceptual site model and identify what risks, if any, are likely to be presented by the site.</i>	Hazard Identification and Assessment <i>A preliminary stage of risk assessment concerned with identifying and characterising the hazards that may be associated with a particular site and identifying potential pollutant linkages.</i>
PHASE 2	<i>This phase is concerned with establishing whether contamination is present, usually through intrusive ground investigation, and then evaluating the degree and magnitude of the associated risks.</i>	Risk Estimation <i>A stage concerned with estimating the likelihood that receptors will suffer adverse effects if they come into contact with, or are otherwise affected by, a hazardous substance or agent under defined conditions.</i> Risk Evaluation <i>A stage of risk assessment concerned with evaluating the acceptability of estimated risks, taking into account the nature and scale of the risk estimates, any uncertainties associated with the assessment and the broad costs and benefits of taking action to mitigate risks.</i>
PHASE 3	<i>The appraisal and selection of remediation techniques, their implementation and verification.</i>	Risk Management <i>The process whereby decisions are made to accept a known or assessed risk and/or the implementation of action to reduce the consequences or probabilities of occurrence.</i>

Risk Classification

The objective of risk assessment is to identify the nature and magnitude of the potential risks and should be based on a consideration of both:

- The likelihood/probability of an event [taking into account both the presence of the hazard and receptor and the integrity of the pathway].
- The severity of the potential consequence [taking into account both the potential severity of the hazard and the sensitivity of the receptor].

There is a need for a logical, transparent and repeatable system in defining the categories of severity of consequence and likelihood as well as for the risk itself and therefore the following risk rating matrix is employed:

		SEVERITY OF CONSEQUENCE			
		SEVERE	MEDIUM	MILD	MINOR
PROBABILITY	HIGH LIKELIHOOD	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	LIKELY	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	LOW LIKELIHOOD	Moderate Risk	Moderate/Low Risk	Low Risk	Negligible Risk
	UNLIKELY	Moderate/Low Risk	Low Risk	Negligible Risk	Negligible Risk

These risk classifications are defined as follows:

- **Very High Risk** - There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action.
- **High Risk** - Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.
- **Moderate Risk** - It is possible that without appropriate remediation action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.
- **Low Risk** - It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.
- **Negligible Risk** - The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

This risk assessment matrix and classification system is based on guidance produced by Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency in connection with contaminated land assessment.

RISK ESTIMATION - SOILS

Introduction to Soil Human Health Generic Assessment Criteria (GAC)

The Environment Agency (EA) and Department of Environment Food and Rural Affairs (DEFRA) had previously issued revised guidance following the consultation about the DEFRA publication "Assessing risks from land contamination - a proportionate approach. Soil Guideline Values: the Way Forward". This resulted in a revised version of the Contaminated Land Exposure Model (CLEA) model (version 1.06) and a few of the previously published Soil Guideline Values (SGVs) were revised.

The main legislative driver for dealing with historical land affected by contamination is Part 2A of the Environmental Protection Act 1990. Revised Statutory Guidance to support Part 2A was published in April 2012. This Guidance introduced a new four-category system for classifying land under Part 2A for cases of a Significant Possibility of Significant Harm to human health,¹ where Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is acceptably low. The impact assessment for the new Statutory Guidance stated "The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land". The C4SLs are still derived using the CLEA model, but adopt a slightly different approach to toxicological assessment and exposure modelling.

In March 2014, the outcome of "SP1010 - Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - Final Project Report" (CL:AIRE) was published. Due to slightly ambiguous wording within this report, Lord de Mauley, Parliamentary Under Secretary, DEFRA wrote to all local authorities on 3 September 2014 to confirm that the published C4SLs were final and that they can be used in risk assessment undertaken under the planning regime.

Whilst there are proposals for the industry to develop C4SLs for other contaminants, these have yet to produce any new values. BRD do not believe that C4SLs could be developed by a single organisation with sufficient confidence. BRD has therefore employed other, more conservative guidance based on the CLEA model (detailed below) within this assessment for compounds where C4SLs are not available. However, it should be noted that the results of this investigation may need to be reinterpreted as new C4SLs become available.

Due to the limited number of published C4SL values at this time, the Chartered Institute of Environmental health (CIEH) and Land Quality Management Ltd (LQM) have produced Generic Assessment Criteria (GAC) known as Suitable for Use Levels (S4ULs), for use in contaminated land human health risk assessment. These S4ULs (2014) have been derived for a large number of substances using the current CLEA model and are therefore consistent with current guidance. They also incorporate the revised exposure parameters as adopted by the C4SL programme, but have not adopted the revised toxicological approach adopted by the C4SLs and so remain a more conservative assessment criteria. The substances for which SGVs were previously published have also been revised as new S4ULs in light of the new exposure parameters proposed by the C4SL programme, and therefore effectively replace the existing SGVs.

In addition, in December 2009, other GAC for less common substances were produced by the Environmental Industries Commission (EIC), The Association of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Applications in Real Environments (CL:AIRE) using the CLEA model. These are referred to as the EIC/AGS/CLAIRE GAC.

In summary, C4SLs have been used where these are available. For those substances where C4SLs have yet to be issued, then the S4ULs have been adopted or in some cases, the EIC/AGS/CLAIRE GAC. All of the previously produced SGVs have now either been withdrawn, or superseded by the respective C4SLs or S4ULs.

The only exception to this approach is the PAH compound benzo(a)pyrene (BaP) where a C4SL guideline value has been produced, whereas BRD has adopted the S4UL value. The C4SL for BaP relates to its use as a surrogate marker compound representing all of the genotoxic PAH compounds as a mixture, rather than this individual compound. BRD has therefore adopted the compound specific S4UL value as the initial screening value, for consistency with the other PAH compounds before then employing the C4SL is necessary.

It should be noted that unless otherwise stated, all the assessment criteria adopted within this report have been derived based on a sandy loam soil at pH 7 and the values quoted are for a conservative soil organic matter content of 1% where applicable (i.e. organic contaminants).

Human Health - Soil Generic Assessment Criteria

The results of the soils analysis have been compared to generic assessment criteria for the default exposure scenarios comprising either residential land with plant uptake, residential land without plant uptake, or commercial/industrial land use. The criteria values selected are listed in the table below and full details on the source are referred to above. Where applicable, the results have also been assessed with reference to the required statistical tests presented within CLAIRE document "Guidance on comparing soil contamination data with a critical concentration".

ANALYSIS	GENERIC ASSESSMENT CRITERIA (mg/kg unless stated)			SOURCE
	RESIDENTIAL WITH PLANT UPTAKE	RESIDENTIAL WITHOUT PLANT UPTAKE	COMMERCIAL / INDUSTRIAL	
Arsenic	37	40	640	C4SL
Cadmium	22	150	410	
Chromium (total) ⁵	910	910	8,600	S4UL
Chromium VI	21	21	49	C4SL
Lead	200	310	2,330	
Mercury*	11	15	320	S4UL
Selenium	250	430	12,000	
Nickel	180	180	980	
Copper	2400	7,100	68,000	
Zinc	3,700	40,000	730,000	
pH	< 5 - 10> units			Professional judgement
Naphthalene	2.3	2.3	190	S4UL
Acenaphthylene	170	2,900	83,000	
Acenaphthene	210	3,000	84,000	
Fluorene	170	2,800	63,000	
Phenanthrene	95	1,300	22,000	
Anthracene	2,400	31,000	520,000	
Fluoranthene	280	1,500	23,000	
Pyrene	620	3,700	54,000	
Benzo(a)anthracene	7.2	11	170	
Chrysene	15	30	350	
Benzo(b)fluoranthene	2.6	3.9	44	
Benzo(k)fluoranthene	77	110	1,200	
Benzo(a)pyrene	2.2	3.2	35	
Indeno(1,2,3-cd)pyrene	27	45	500	

ANALYSIS	GENERIC ASSESSMENT CRITERIA (mg/kg unless stated)			SOURCE
	RESIDENTIAL WITH PLANT UPTAKE	RESIDENTIAL WITHOUT PLANT UPTAKE	COMMERCIAL / INDUSTRIAL	
Dibenzo(a,h)anthracene	0.24	0.31	3.5	S4UL
Benzo(ghi)perylene	320	360	3,900	
TPH Aliphatic C5-C6	42	42	3,200	
TPH Aliphatic C6-C8	100	100	7,800	
TPH Aliphatic C8-C10	27	27	2,000	
TPH Aliphatic C10-C12	130	130	9,700	
TPH Aliphatic C12-C16	1,100	1,100	59,000	
TPH Aliphatic C16-C35	65,000	65,000	1,600,000	
TPH Aliphatic C35-C44	65,000	65,000	1,600,000	
TPH Aromatic C5-C7	70	370	26,000	
TPH Aromatic C7-C8	130	860	56,000	
TPH Aromatic C8-C10	34	47	3,500	
TPH Aromatic C10-C12	74	250	16,000	
TPH Aromatic C12-C16	140	1,800	36,000	
TPH Aromatic C16-C21	260	1,900	28,000	
TPH Aromatic C21-C35	1,100	1,900	28,000	
TPH Aromatic C35-C44	1,100	1,900	28,000	
Benzene	0.87	3.3	98	C4SL
Toluene	130	880	56,000	S4UL
Ethylbenzene	47	83	5,700	
Xylene [^]	56	79	5,900	EIC/AGS/CL:AIRE GAC
MTBE	49	73	7,900	

Notes:

* The S4UL for methyl mercury has been adopted as the worst case mercury compound as generally there is no desk study evidence to suggest the potential for elemental mercury on the majority of sites.

[^] The lowest S4UL of either p-xylene, o-xylene or m-xylene has been adopted for each land use as a conservative measure.

⁵ S4UL for Chromium III adopted, as in the absence of Chromium VI it is likely that all of the chromium will be in this form as these are the two most common and stable forms of chromium in the soil environment.

Where no GAC is available, any concentrations exceeding the laboratory limit of detection are identified and discussed in more detail.

Water Environment - Soil Generic Assessment Criteria

There are no UK published Generic Assessment Criteria for soil test results in respect of the risk to the water environment and therefore risk estimation is on the basis of the professional judgement and experience of BRD to employ values that are a reasonable concentration above which concern for water resources is valid.

The Total PAH GAC employed is the sum of the 16No. priority PAH compounds regularly tested for in contaminated land analysis (i.e. US EPA 16PAHs). BRD employ a soil screening based upon the total PAH limit for 'inert waste' of 100mg/kg. The rationale is based on PAHs are recognised to be generally of low solubility and the risk to the water environment is correspondingly low.

In respect of Total Petroleum Hydrocarbons, BRD employ a value of 500 mg/kg as a screening value in comparison to the sum of the component aliphatic and aromatic TPH carbon bands. The employed soil screening value is based upon:

- In common with some other consultants, the professional judgement and experience of BRD suggests that this value is a reasonable concentration above which concern for water resources is valid. The rationale is based on the fact that lower concentrations of fuel based contaminants are more likely to naturally degrade than migrate any great distance.*
- BRD is aware of regional Environment Agency groundwater and contaminated land teams that employ 500 mg/kg as a screening value for considering whether or not TPH could represent a risk to water resources.*
- The value mirrors the mineral oil Waste Acceptance Criteria limits for what is considered 'inert waste'.*

Should elevated contaminants that pose a potential risk to the water environment be identified then site specific assessment criteria should be developed.

Building Materials and Services - Soil Generic Assessment Criteria

Some hydrocarbon compounds are known to both attack and permeate through certain plastic pipe materials, with the primary concern being the degradation and tainting of water supplies. The UK Water Industry Research (UKWIR) has therefore produced a document 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' (ref. 10/WM/03/21) that specifies threshold criteria for the adoption of 'standard' polythene (PE) or PVC pipes, protective barrier pipe and ductile iron/steel/copper pipes.

The UKWIR threshold assessment criteria from Table 3.1 of this document for standard PE pipes have been employed. It should be noted that the approach taken by UKWIR is very conservative, and both the document and research are flawed. However, it is these values that are being using to specify water pipe materials and therefore it is appropriate to consider them.

The UKWIR guidance is particularly flawed in respect of the chemical analysis it expects as it seeks a limit of detection that is generally below limits that are reasonable or commonly employed in contaminated land assessment. The UKWIR seeks that where a substance is below the limit of detection it should be taken as being present at half this concentration. For the larger suite of chemicals where the limit is against a sum of compounds, this approach would mean that a sample of virgin sub-soil from a greenfield site with absolutely no contamination would actually fail the criteria for using standard PE pipes. To avoid this situation, BRD have adopted the approach of summing only those compounds detected above their respective limits of detection.

In terms of building materials, the primary concern is in respect of concrete as certain commonly occurring natural ground conditions can adversely impact on buried concrete as discussed in 'Special digest 1:2005 Concrete in aggressive ground', BRE, 2005.

ANALYSIS	GENERIC ASSESSMENT CRITERIA	SOURCE
pH	<5.5	BRE Special Digest 1:2005
Sulphate (w/s)	500 mg/l	BRE Special Digest 1:2005
Sum of any VOC above detection limits	0.5 mg/kg	Relevant compounds adapted from UKWIR Table 3.1
Sum of SVOC + Aliphatic TPH >C5-C10 + Aromatic TPH >C5-C10 above detection limits	2 mg/kg	
Sum of Aliphatic TPH >C10-C21 + Aromatic TPH >C10-C21 above detection limits	10 mg/kg	
Sum of Aliphatic TPH >C21-C34 + Aromatic TPH >C10-C35 above detection limits	500 mg/kg	
Sum of BTEX + MTBE above detection limits	0.1 mg/kg	
Phenols	2 mg/kg	
Cresols and chlorinated phenols	2 mg/kg	
Naphthalene	0.5 mg/kg	
Benzo(a)pyrene	0.5 mg/kg	

RISK ESTIMATION - GROUNDWATER

The initial assessment of the contamination risk to groundwater is by comparing dissolved groundwater concentrations with screening values that are protective of groundwater resources.

The reference source for the target concentrations is generally the EA's Environmental Quality Standards (EQS), the Water Supply (Water Quality) Regulations (WSR) 1989 / 2000 and the DW1/DW2 criteria from the Surface Water (Abstraction for drinking water)(classification) Regulations 1996. The target concentrations are outlined in the table overleaf.

ANALYSIS	GENERIC ASSESSMENT CRITERIA	SOURCE
Arsenic	50 µg/l	EQS
Cadmium	5 µg/l	EQS
Chromium (total)	50 µg/l	DW2
Copper	50 µg/l	DW2
Nickel	20 µg/l	WSR
Lead	50 µg/l	DW2
Mercury	1 µg/l	EQS
Selenium	10 µg/l	WSR
Zinc	5 mg/l	DW2
Cyanide	50 µg/l	WSR
pH	6 to 9 units	EQS
Benzene	30 µg/l	EQS
Toluene	50 µg/l	EQS
Ethylbenzene	30 µg/l	EQS for benzene as a guide
Xylene	30 µg/l	EQS for benzene as a guide
Naphthalene	2.4 µg/l	EQS
Benzo(a)pyrene	0.05 µg/l	EQS
Total PAH	0.2 µg/l	DW1
TPH (dissolved or emulsified hydrocarbons)	50 µg/l	DW1

There are no available generic assessment criteria for some of the analytical parameters which have been scheduled, for example hexavalent chromium, and individual TPH and PAH and some VOC compounds. These parameters will be assessed based on professional judgement should they exceed the limit of detection.

RISK ESTIMATION - GROUND GAS

Introduction

A variety of potentially hazardous gases occur in naturally in the ground environment. Microbial decay of organic matter under anaerobic conditions and geological processes can lead to the generation of Methane and Carbon Dioxide, but can also include traces gases such as Hydrogen sulphide and Carbon monoxide.

Methane is a colourless and odourless gas that has the hazardous properties of being flammable and, at certain air/Methane mixtures, explosive. Methane has a low toxicity, but can be a simple asphyxiant due to the displacement of oxygen.

Carbon Dioxide is a colourless, odourless and non-combustible gas that has the hazardous property of being a highly toxic chemical. At concentrations of 3% by volume, shortness of breath and headaches will occur becoming acute by 6%. At levels of above 10% by volume headache, visual distortion, tremors and rapid loss of consciousness occur. Concentrations of Carbon Dioxide above 22% by volume are likely to be fatal. The effects of Carbon Dioxide poisoning are made more severe if there is accompanying reduction in oxygen concentrations.

Hydrogen sulphide is a colourless and flammable gas that has an odour of rotten eggs. It is important to that the sense of smell is over powered at higher concentrations. The gas is toxic and can be an asphyxiant.

Carbon monoxide is a colourless, odourless and explosive gas in air mixtures that has the hazardous property of being a highly toxic chemical.

Radon is a naturally occurring colourless and odourless gas that is radioactive. It is formed by the radioactive decay of radium which in turn is derived from the radioactive decay of uranium, both of which are minerals that can be found in many soil types. Whilst it is recognised that the air inside every house contains radon, some houses built in certain defined areas of the country might have unacceptably high concentrations and require special precautions to be taken. The maps contained within BRE211:2007 'Radon: guidance on protective measures for new buildings' identify areas where no radon protection measures are necessary or where higher concentrations are present that either basic or full radon protection measures are required to be fitted to all new dwellings.

Basis of Gas Assessment

In order to classify the level of risk and need, if any, for gas protection measures at a site with the potential for a gas problem, consideration of each of the following is necessary:

- The source of the gas.*
- The generation potential of the gas.*
- The location of the source and the geological setting.*
- Boreholes flow rate and estimated surface emission rate.*

- The nature of the proposed development.
- Confidence in the knowledge of the gas regime.

The gas assessment is made with reference to 'C665 - Assessing risks posed by hazardous ground gases to buildings', Construction Industry Research and Information Association (CIRIA), 2007.

Gas Screening Value

The method within CIRIA C665 uses both the gas concentrations and borehole flow rates to define a characteristic situation for a site based on the limiting borehole gas volume flow for Methane and Carbon Dioxide. This limiting borehole gas volume flow is called the Gas Screening Value (GSV) and is expressed below:

$$\text{Gas Screening Value (l / hr)} = \text{borehole flow rate (l/hr)} \times \text{gas concentration (fraction)}$$

The calculation of GSV is completed for both Methane and Carbon Dioxide and then the 'worse case' maximum values are used in the assessment. The assessment is to determine the gas regime at the site is dependent upon the nature of the development.

Situation A - All development types except low rise housing with gardens.

The characteristic situation for many sites is determined from evaluation of the Gas Screening Value derived against the criteria in the following table.

Characteristic situation	Risk classification	Gas Screening Value (CH ₄ or CO ₂ l/hr)	Additional factors	Typical sources of generation
1	Very low risk	<0.07	Typically Methane ≤1% and/or Carbon Dioxide ≤5%. Otherwise consider an increase to characteristic situation 2.	Natural soils with low organic matter content and 'typical' made ground.
2	Low risk	<0.7	Borehole air flow rate not to exceed 70 l/hr. Otherwise consider an increase to characteristic situation 3.	Natural soil with high organic peat/organic content and 'typical' made ground.
3	Moderate risk	<3.5		Old landfill, inert waste and flooded mine working.
4	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protection measures.	Mine working susceptible to flooding and landfill completed to WMP 26B criteria.
5	High risk	<70		Mine working unflooded inactive with shallow workings near surface.
6	Very high risk	>70		Recent landfill site.

Situation B - Low rise housing with gardens - NHBC 'Traffic Lights'

The NHBC model for low rise housing development considered a typical residential house with a ground floor area of 64m², suspended floor and ventilated sub-floor void of height 150mm. Where the proposed development of a site is consistent with this model, the NHBC traffic light situation of the site is determined from evaluation of the Gas Screening Value against the criteria in the following table.

Traffic Lights	Methane		Carbon Dioxide	
	Typical maximum concentrations (%)	Gas Screening Value (l/hr)	Typical maximum concentrations (%)	Gas Screening Value (l/hr)
Green	≤1	≤0.16	≤5	≤0.78
Amber 1	1 > to ≤5	>0.16 to ≤0.63	>5 to ≤10	>0.78 to ≤1.56
Amber 2	5 > to ≤20	>0.63 to ≤1.56	>10 to ≤30	>1.56 to ≤3.13
Red	>20	>1.56	>30	>3.13

APPENDIX 1

Site Location Plan



Not to scale.

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Project Title: Land at Bilsham Road, Yapton

Client: Gleeson Developments

BRD Reference: BRD2693-OP1-A

Date Issued: April 2016

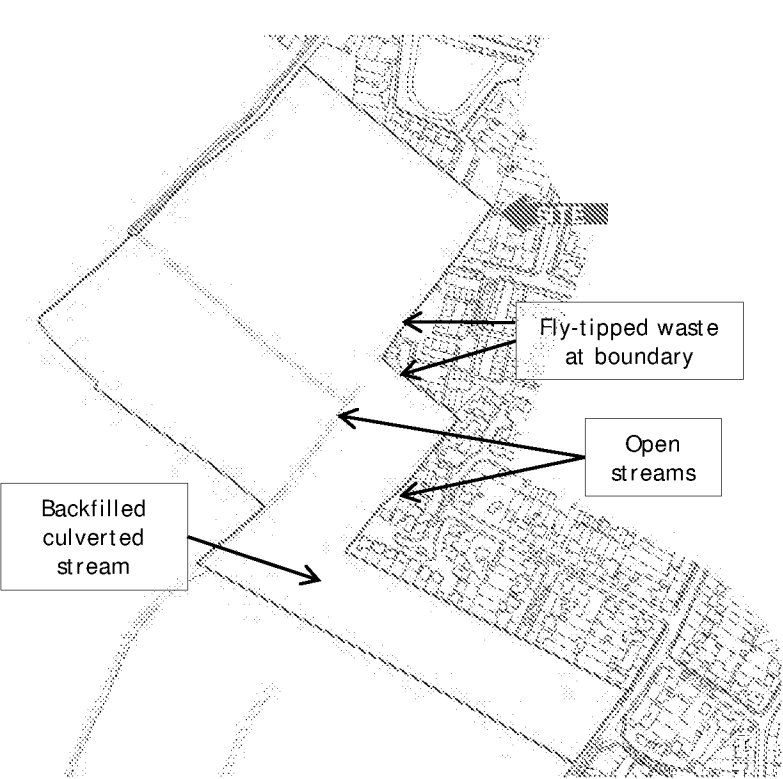
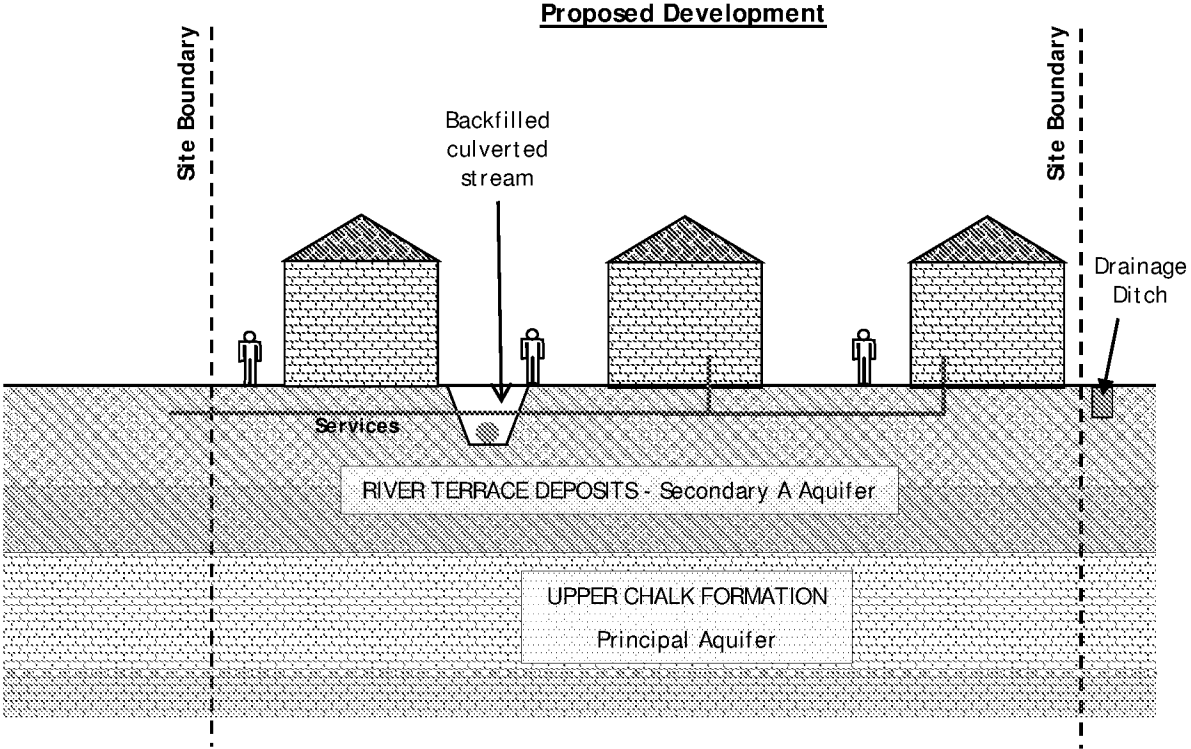


01295 272244

info@brduk.com

Updated Conceptual Model

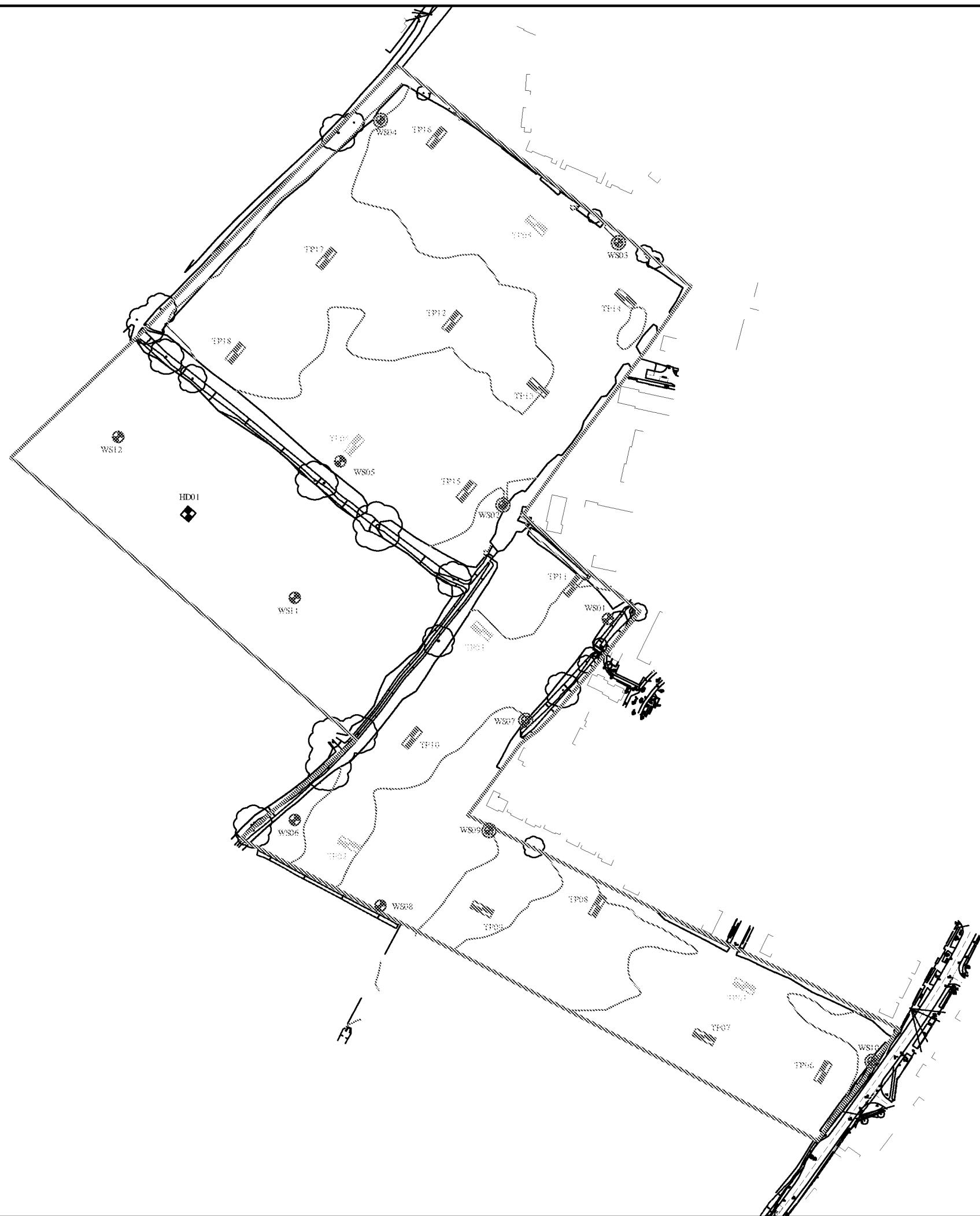
No Pollutant Linkages Identified



Project Title: Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP6-B
Date Issued: February 2018



01295 272244
info@brduk.com



KEY:

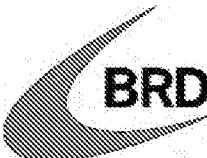
- BRD Windowless Sample Borehole
- BRD Windowless Sample Borehole with Install
- BRD Trial Pit
- BRD Soakage Test Pit
- BRD Hand Dug Pit
- Site Boundary

NOTES:

Drawing reproduced from Digital Terrain Surveys LLP 'Site Survey', Drawing ref. DTS170415-7Q0, Dated. April 2014.

All exploratory point locations were positioned using handheld recreational GPS.

All boundaries are approximate.

B	08/ 02/ 18	Additional investigation points and site boundary change.	HKA	BD
A	03/ 11/ 17	First Issue	HKA	BD
Revision	Date	Description	Drawn	Approved
Drawing title				
EXPLORATORY POINT PLAN				
Project title				
LAND AT BILSHAM ROAD, YAPTON				
Client				
GLEESON DEVELOPMENTS				
Scale	Original drg. size/colour	Date		
1:2500	A3 / C	08/ 02/ 2018		
Drawn	Checked	Approved		
HKA	AN	BD		
Drawing Number				Rev
BRD2693-OD1				B
 BRD Environmental Ltd 01295 272244 info@brduk.com www.brduk.com				

APPENDIX 2

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 17/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP01		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		TOPSOIL: Friable, brown, light brown, slightly humic, sandy, silty topsoil. Sand is fine. Firm, brown mottled orange brown, slightly sandy, silty CLAY. Sand is fine-sized.	0.25 0	TS	
0.80	SV	70 kPa			RIVER TERRACE DEPOSITS	
1.00	SV D1	140 kPa		1		
			1.90 m: Becoming locally soft.	2		
				2.10 0		
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 2.10m bgl for soakage testing.		All dimensions in metres Log Scale 1:25 	

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 17/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP02		
				Sheet 1 of 1		
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, light brown, slightly humic, sandy, silty topsoil. Sand is fine-sized.	0.30 0	TS	
0.50	SV	70 kPa	Firm to stiff, brown, light brown, slightly gravelly, slightly sandy, silty CLAY. Gravel is subrounded, fine-sized flint.			
0.80	SV D1	>140 kPa				
1.90	D2		1.50 m: Cobble of flint (90mm x 120mm x 180mm). 1.60 m: Increasing gravel and sand fractions to slightly sandy, slightly gravelly, silty CLAY. 1.70 m: Firm.	1	RIVER TERRACE DEPOSITS	
				2		
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered				Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Terminated at 2.00m bgl for soakage testing.			
			All dimensions in metres Log Scale 1:25 			

TRIAL PIT RECORD

Client: Project Title: Project No: Logged By: Date Completed: Method Used: Gleeson Developments Land at Bilsham Road, Yapton BRD2693 A Plant 17/10/2017 180° Backhoe excavator (JCB 3CX type)						Trial Pit No. TP03		Sheet 1 of 1	
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend			
Depth	Type & No	Value							
0.20	J1	100 kPa	TOPSOIL: Friable, brown, slightly humic, sandy, silty topsoil. Sand is fine-sized.	0.25 0	TS				
0.50	SV		Firm to stiff, light brown and orange brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is fine-sized, subangular to subrounded flint.						
0.80	SV D1 J2	110 kPa		1	RIVER TERRACE DEPOSITS				
1.90	D2						1.70 m: With increasing chalk content to gravel and to silt matrix fractions. Locally, gravelly clayey SILT.		
				2 2.00 0					
				3					
				4					
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:				
Plan of Trial Pit:			General Remarks: Terminated at 2.00m bgl for soakage testing.			All dimensions in metres Log Scale 1:25			

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 17/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP04		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, slightly humic, sandy, silty topsoil.	0.25 0	TS	
1.00	SV	90 kPa	Firm to stiff, brown, orange brown, slightly sandy, silty CLAY. Sand is fine-sized.		RIVER TERRACE DEPOSITS	
1.90	D1		1.20 m: Becoming slightly gravelly, slightly sandy CLAY. Gravel fraction is fine, subangular flint and chalk.	2		2.00 0
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 2.00m bgl for soakage testing.		All dimensions in metres Log Scale 1:25 	

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 17/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP05		
				Sheet 1 of 1		
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25 0	TS	
1.00	SV	>140 kPa	Firm to stiff, orange brown and mottled light brown and brown, silty CLAY.	1	RIVER TERRACE DEPOSITS	
1.20	D1			1.80 0		
				2		
				3		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 1.80m bgl for soakage testing.		All dimensions in metres Log Scale 1:25 	

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 17/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP06		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25 0	TS	
0.90	J2		Firm to stiff, brown, orange brown, silty CLAY.		RIVER TERRACE DEPOSITS	
1.00	SV	>140 kPa		1		
2.20	SV	80 kPa	2.00 m: Becoming firm.	2		
3.30	D1		Firm to grey and grey brown, slightly gravelly, slightly sandy, silty CLAY. Gravel is fine, subangular flint and chalk.	2.40 0		
				3		
				3.40 0		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered				Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Terminated at 3.40m bgl.			
			All dimensions in metres Log Scale 1:25 			

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 17/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP07		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil. Firm to stiff, brown, light brown and orange brown, silty CLAY.	0.25 0	TS	
0.80	SV	100 kPa			RIVER TERRACE DEPOSITS	
1.00	SV	>140 kPa		1		
1.80	D1					
1.90	SV	100 kPa		2		
			2.60 m: Becoming slightly gravelly, silty CLAY. Gravel is fine, subrounded flint and chalk. 2.80 m: Locally, samples retrieved at surface with soft soil consistency.	3		
				3.00 0		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.			
All dimensions in metres Log Scale 1:25						

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 17/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP08		
				Sheet 1 of 1		
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25 0	TS	
			Firm to stiff, brown, orange brown, silty CLAY.			
0.90	SV	90 kPa		1		
1.00	SV D1	130 kPa				
				2		
			2.00 - 2.80 m: With pockets of orange brown and light brown, silty, predominantly fine and medium-sized SAND AND fine and medium-sized GRAVEL of flint and chalk.	3	3.00 0	
2.80	B1			4		
Pit Stability: Generally stable throughout Groundwater: Not encountered				Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.		All dimensions in metres Log Scale 1:25	

TRIAL PIT RECORD

Client: Gleeson Developments			Trial Pit No. TP09			
Project Title: Land at Bilsham Road, Yapton						
Project No: BRD2693			Sheet 1 of 1			
Logged By: A Plant						
Date Completed: 17/10/2017						
Method Used: 180° Backhoe excavator (JCB 3CX type)						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25 0	TS	
			Firm to stiff, brown, orange brown, silty CLAY.			
1.00	D1			1		
				2		
			2.40 - 3.00 m: SAND AND GRAVEL pockets.	3		
				3.00 0		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.			
			All dimensions in metres Log Scale 1:25			

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP10		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, slightly humic, sandy, silty topsoil. Sand is fine-sized.	0.25 0	TS	
0.60	SV	80 kPa	Firm, orange brown, slightly gravelly, silty CLAY. Gravel is coarse-sized, subangular flint.		RIVER TERRACE DEPOSITS	
0.90	J2			1		
1.00	SV D1	70 kPa	Medium dense, pale brown, chalky (silty), SAND AND GRAVEL of fine to coarse-sized, subangular to subrounded flint.	1.15 0		
1.70	D2		Structureless, off-white, white, locally stained light brown CHALK comprising slightly gravelly SILT. Gravel is fine to medium-sized, subangular flint. (CIRIA, 2002, Chalk Grade Dm)	1.80 0	LEWES NODULAR CHALK FRM	
				2		
				3		
				3.00 0		
				4		
Pit Stability: See General Remarks Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl. Unstable below 1.80m bgl.			All dimensions in metres Log Scale 1:25

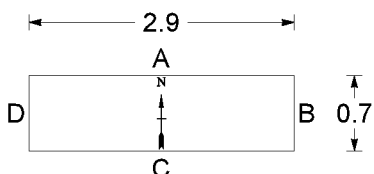
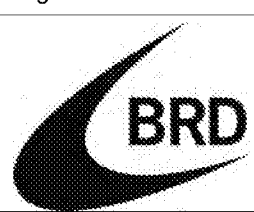
TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP11		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		TOPSOIL: Friable, brown, sandy, silty topsoil. Sand is fine. Firm to stiff, orange brown, silty CLAY.	0.25 0	TS	
0.80	J2			1	RIVER TERRACE DEPOSITS	
1.30	D1			2		
2.40	SV D2	30 kPa	2.00 m: Becoming slightly gravelly with fine-sized, subrounded flint and chalk.	2.30 0		
2.80	SV	40 kPa	2.70 m: Becoming soft, light grey, clayey SILT.	3 3.00 0		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.			
All dimensions in metres Log Scale 1:25						

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP12		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, slightly humic, sandy, silty topsoil.	0.25 0 1 2 2.60 0 3 3.00 0 4	TS	
			Firm to stiff, orange brown, slightly sandy, silty CLAY. Sand is fine-sized,			
1.00	SV D1	110/130/120 kPa				
			1.90 m: Becoming slightly gravelly comprising fine-sized, subrounded flint.			
2.40	D2		2.30 m: With occasional soft, orange brown, clayey SILT (silt sample taken).			
2.90	SV D3	80/60/85 kPa	Firm to stiff, light grey mottled light brown and orange brown, slightly sandy, slightly gravelly, silty CLAY / locally clayey SILT. When SILT, typically soft.			
Pit Stability: Generally stable throughout Groundwater: Not encountered				Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.			
			All dimensions in metres Log Scale 1:25 			

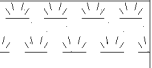
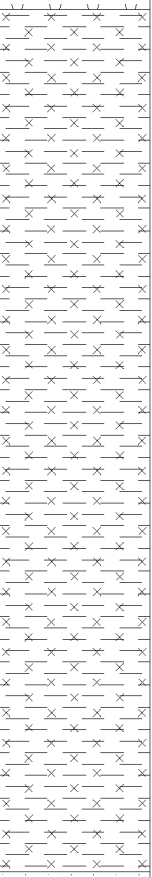
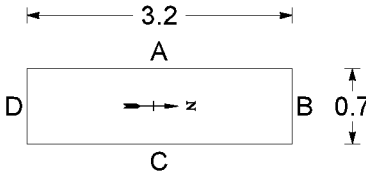
TRIAL PIT RECORD

Client: Gleeson Developments			Trial Pit No. TP13								
Project Title: Land at Bilsham Road, Yapton											
Project No: BRD2693			Sheet 1 of 1								
Logged By: A Plant											
Date Completed: 18/10/2017											
Method Used: 180° Backhoe excavator (JCB 3CX type)											
Samples & Tests			Depth / (Level)			Geology			Legend		
Description of Strata											
Depth			Type & No			Value			TS		
0.20			J1			110 kPa			0.25 0		
0.70			J2								
1.00			SV						1		
2.90			D1						3 3.10 0		
									4		
Pit Stability: Generally stable throughout			Groundwater: Not encountered			Surface Elevation Level:					
Plan of Trial Pit:			General Remarks:			All dimensions in metres			Log Scale 1:25		
			Terminated at 3.10m bgl.								

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP14			
				Sheet 1 of 1			
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend	
Depth	Type & No	Value					
0.20	J1	1.7	TOPSOIL: Friable, brown, slightly humic, sandy, silty topsoil. Sand is fine-sized. Firm to stiff, orange brown mottled brown, silty CLAY.	0.25 0	TS		
1.00	SV	120 kPa		1			
1.70	SV D1	65/60/50 kPa	Firm to stiff, light brown and light grey mottled orange brown, slightly sandy, slightly gravelly, silty CLAY. Gravel fraction is fine and medium-sized, subrounded flint. Local pockets of clayey SILT, possibly soft / loose sandy SILT.	1.70 0			
2.60	B1		Medium dense, light grey and light brown, off-white, chalky (silty), fine to coarse-sized SAND AND fine to coarse-sized, subangular to subrounded GRAVEL of flint and chalk.	2.50 0			
				3	3.00 0		
				4			
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.				
All dimensions in metres Log Scale 1:25							

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP15		
				Sheet 1 of 1		
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25 0	TS	
			Firm to stiff, orange brown mottled brown, silty CLAY.			
0.90 1.00	SV J2 D1	100 kPa		1	RIVER TERRACE DEPOSITS	
				2		
			2.50 m: Becoming slightly gravelly, silty CLAY. Gravel is fine-sized, subrounded flint and chalk.	3		
			Medium dense, off-white, chalky (silt) SAND AND fine to coarse-sized, subrounded GRAVEL of flint and chalk.	3.10 0 3.20 0		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered				Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Terminated at 3.20m bgl.			All dimensions in metres Log Scale 1:25
						

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP16		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1	120 kPa	TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25 0	TS	
0.90	J2		Firm to stiff, brown, orange brown, silty CLAY.	1		
1.00	SV			1.40 0		
1.50	D1		Firm to stiff, light grey, light brown and orange brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is fine to medium-sized, subrounded flint and chalk. Sand is fine-sized.	2	RIVER TERRACE DEPOSITS	
				3		
				3.00 0		
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.			
All dimensions in metres Log Scale 1:25						

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP17		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.10	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25 0	TS	
1.00	SV	100 kPa	Firm to stiff, orange brown, silty CLAY.	1	RIVER TERRACE DEPOSITS	
2.80	D1		Firm to stiff, light grey, light brown, locally orange brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine-sized. Gravel is fine-sized, subrounded flint and chalk.	1.50 0 2 3 3.00 0 4		
Pit Stability: Generally stable throughout Groundwater: Not encountered				Surface Elevation Level:		
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.		All dimensions in metres Log Scale 1:25 	

TRIAL PIT RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Completed: 18/10/2017 Method Used: 180° Backhoe excavator (JCB 3CX type)				Trial Pit No. TP18		
Sheet 1 of 1						
Samples & Tests			Description of Strata	Depth / (Level)	Geology	Legend
Depth	Type & No	Value				
0.20	J1		TOPSOIL: Friable, brown, slightly humic, silty topsoil. Firm to stiff, orange brown, slightly sandy, silty CLAY. Sand is fine.	0.25 0	TS	
1.00	SV D1	110 kPa		1	RIVER TERRACE DEPOSITS	
1.50	SV	90 kPa				
1.70	SV	60 kPa				
2.00	SV D2	30 kPa	Firm, light brown, silty CLAY / locally soft clayey SILT.	1.90 0		
				2		
				3	3.00 0	
				4		
Pit Stability: Generally stable throughout Groundwater: Not encountered					Surface Elevation Level:	
Plan of Trial Pit: 			General Remarks: Terminated at 3.00m bgl.			
All dimensions in metres Log Scale 1:25						

Trial Pit Photographs

TP01



Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP02

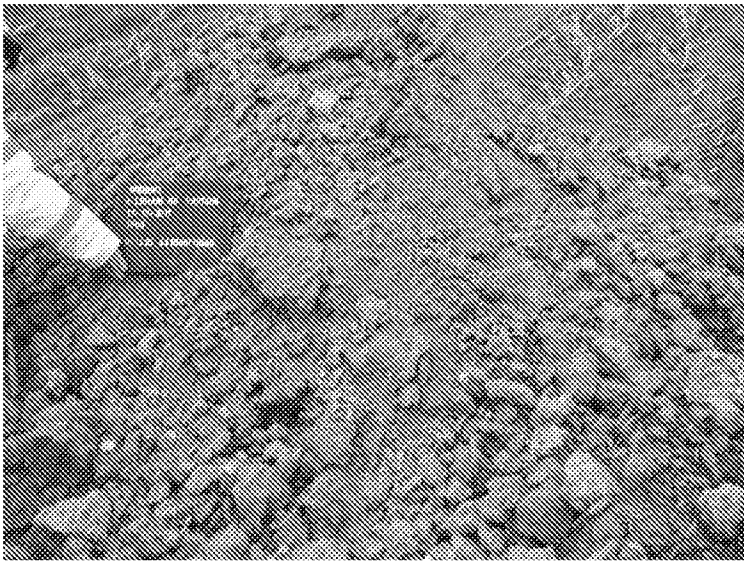


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP03

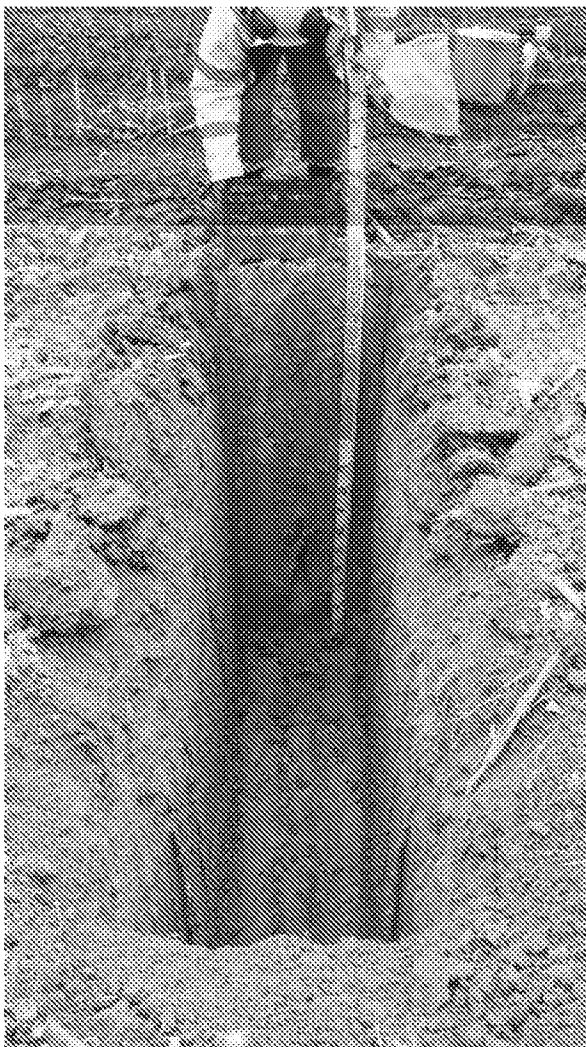


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP04

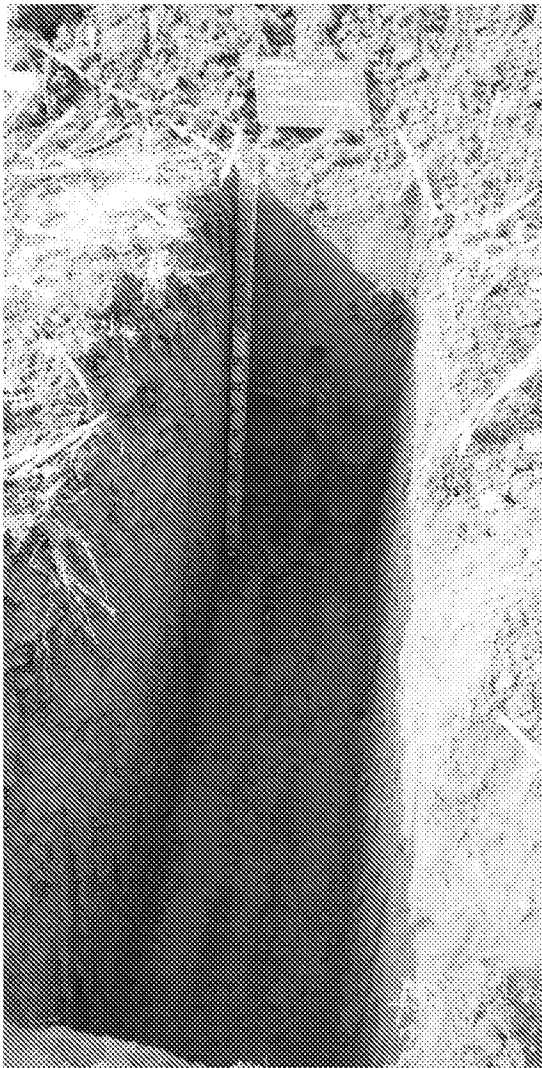


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP05

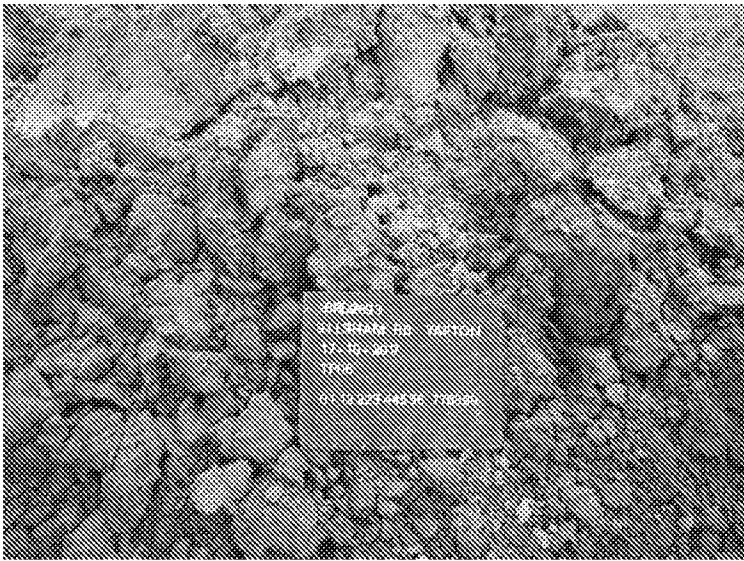


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP06



Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP07



Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP08

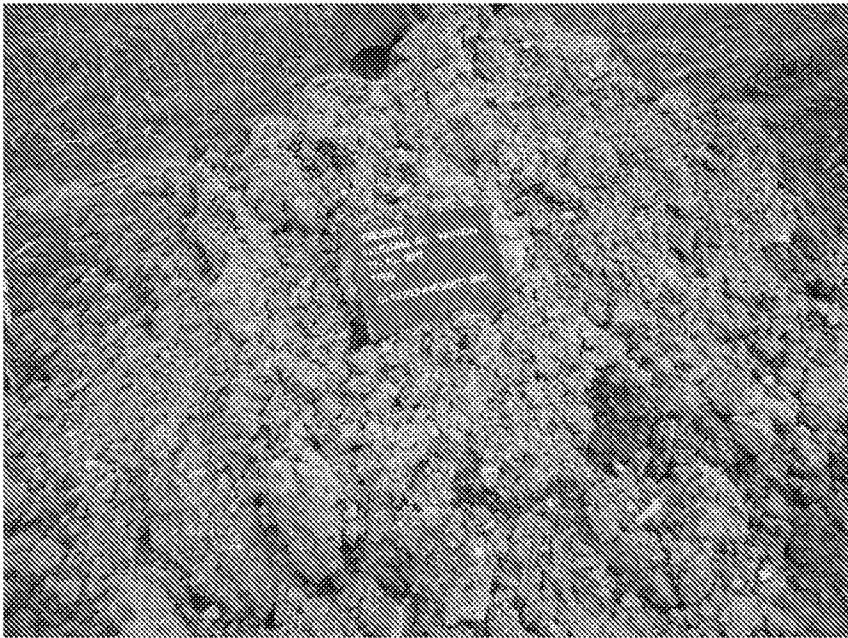
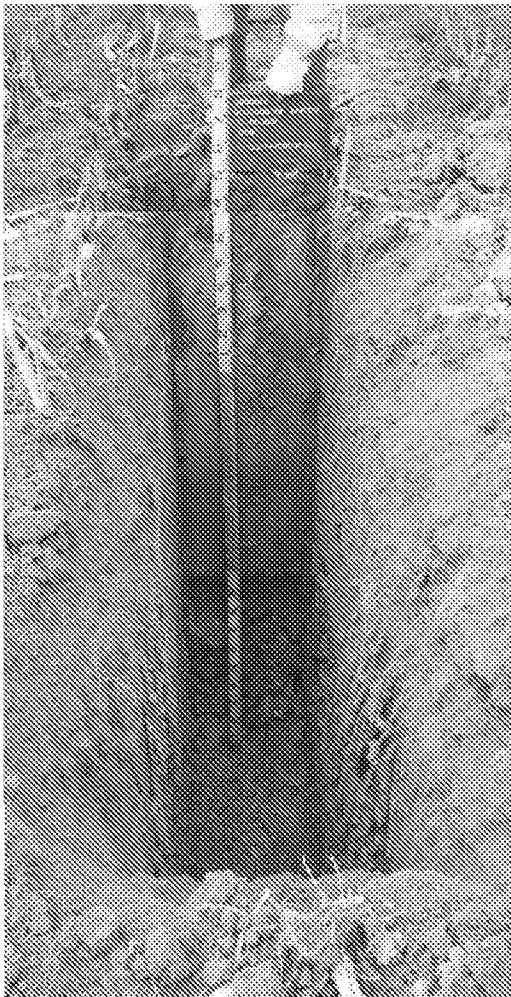


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP09



Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP10

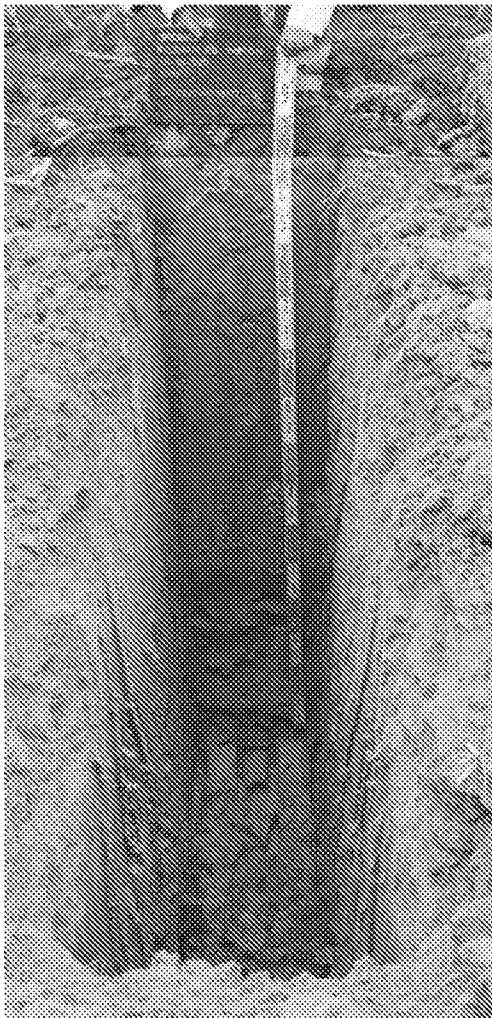


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP11

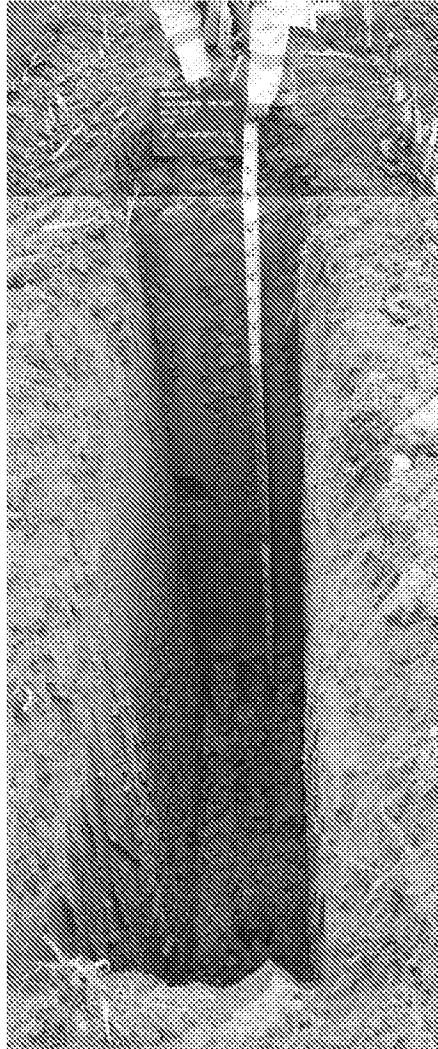


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP12

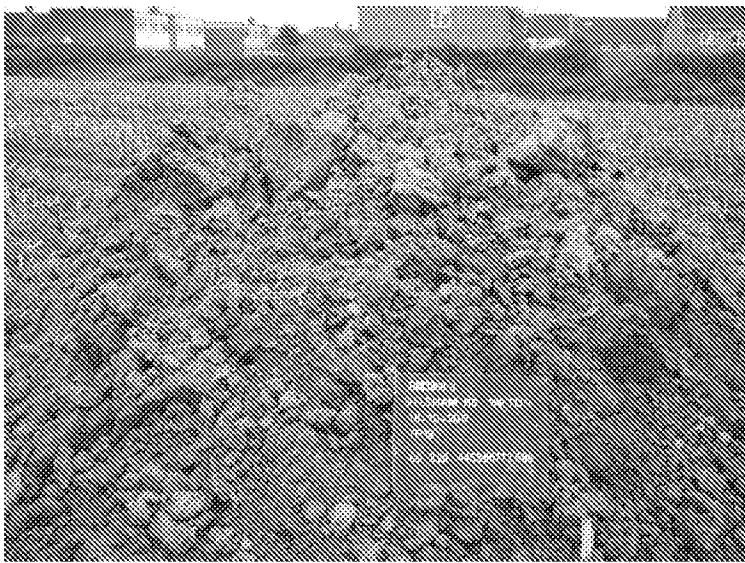


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP13

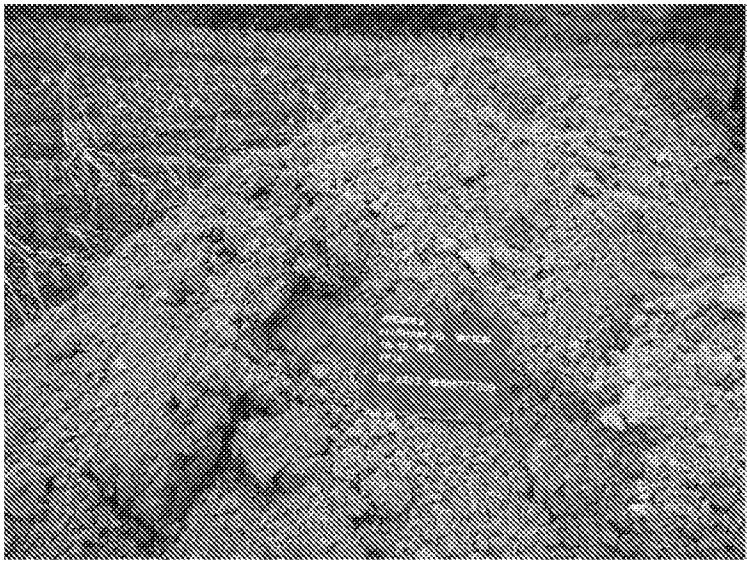
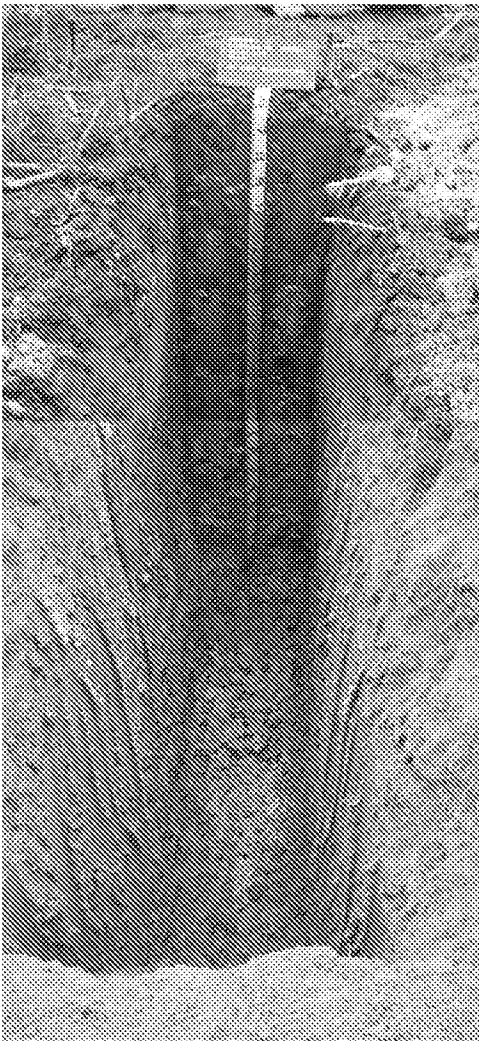


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



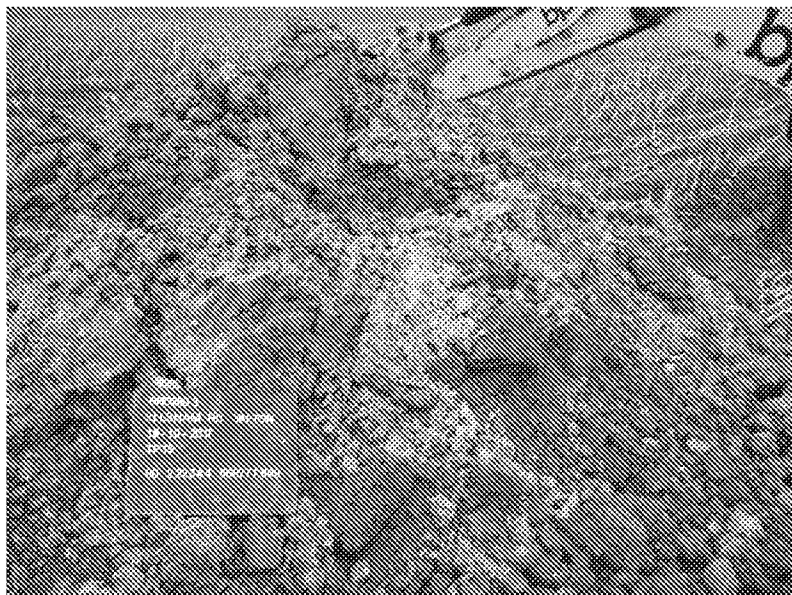
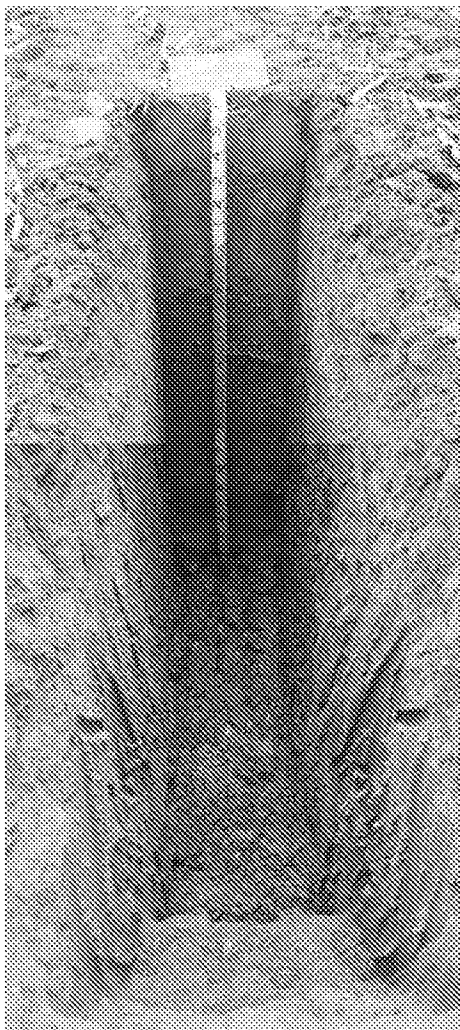
Trial Pit Photographs

TP14



Trial Pit Photographs

TP15

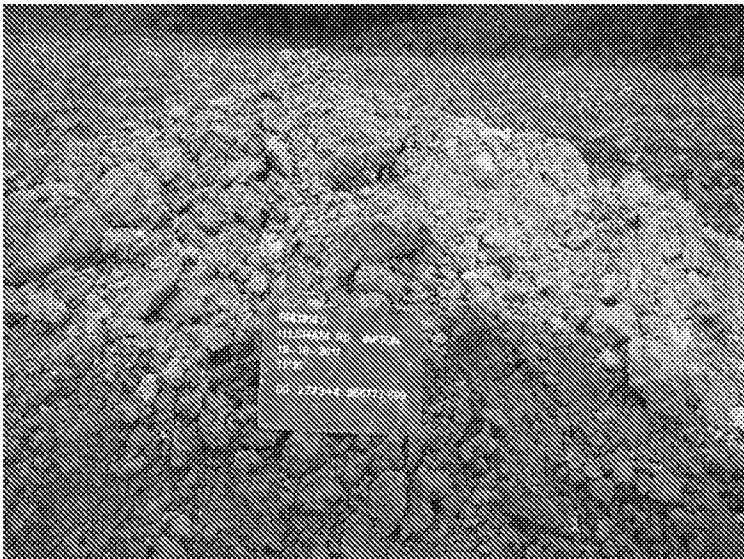
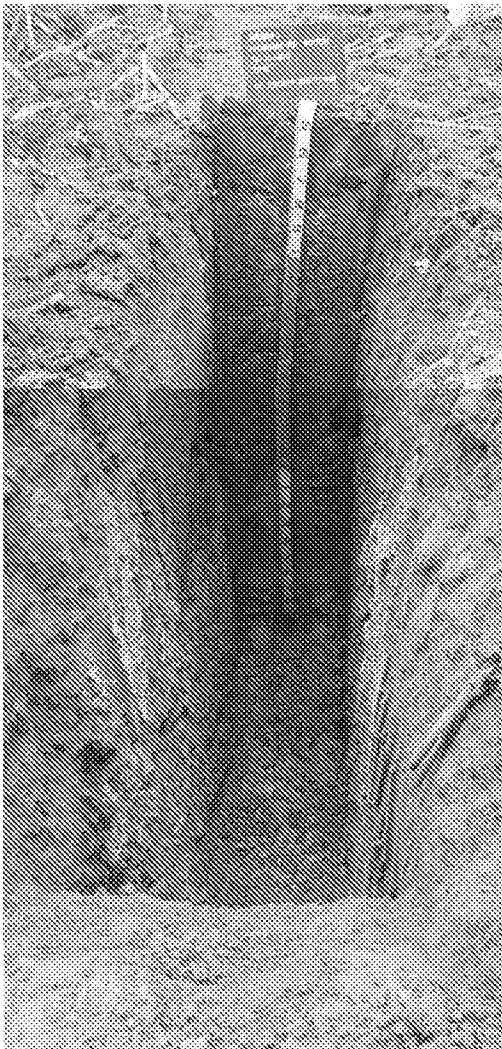


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP16

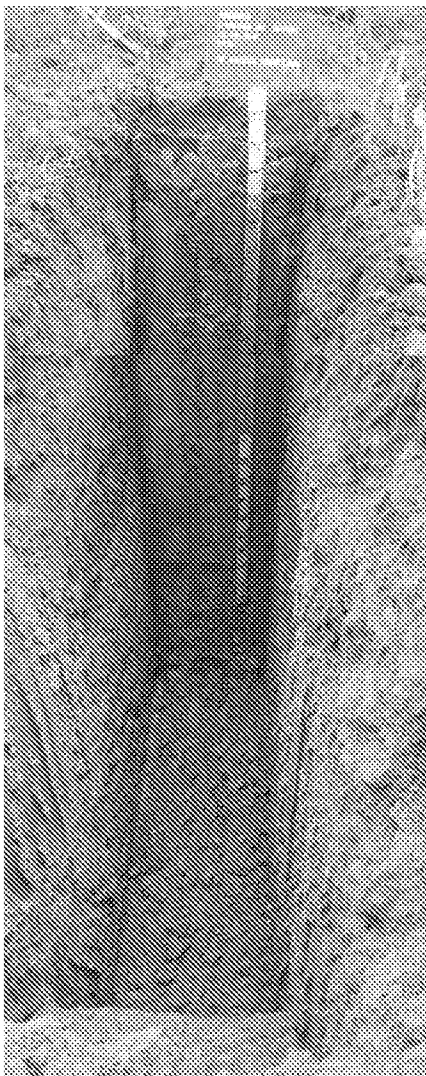


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP17

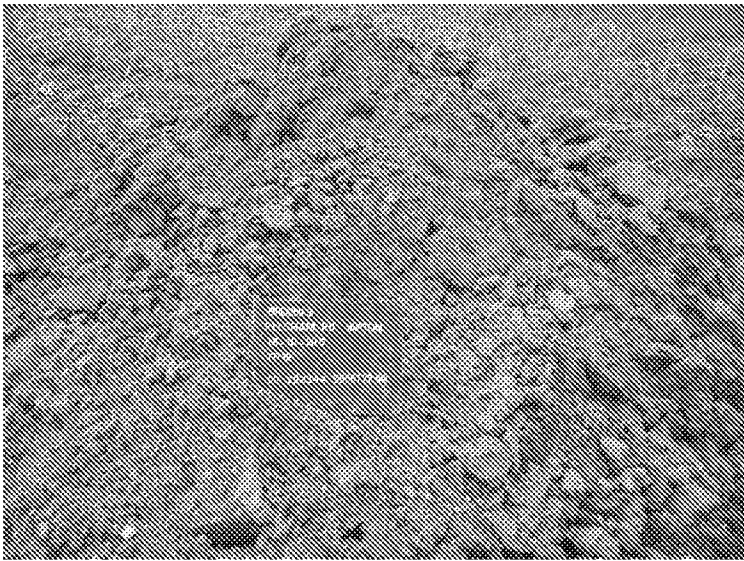
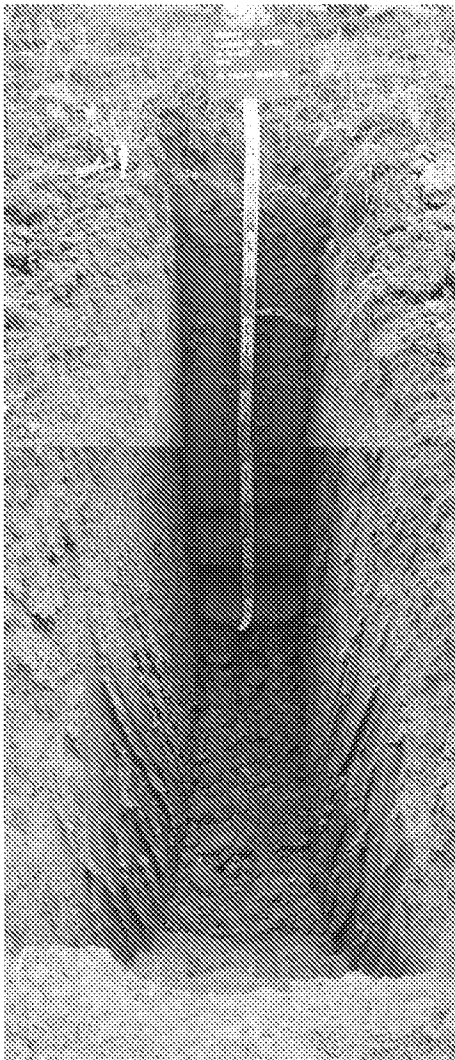


Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



Trial Pit Photographs

TP18



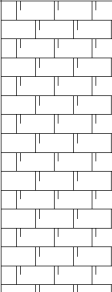
Project Title: Land at Bilsham Road, Yapton
Client: Gleeson Developments
BRD Reference: BRD2693-OP5-A
Date Issued: April 2016



PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 19/10/2017 Date Completed: 19/01/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS01		
						Sheet 1 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.20	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25		TS	
0.60	J2			Firm to stiff, brown, slightly gravelly, silty CLAY. Gravel is coarse-sized, subangular flint.				
0.80	PEN	4.0/4.0/3.5			0.90			
0.90	J3	kg/cm²						
1.00	SPT	11 N		Stiff, brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is fine and medium-sized, subangular to subrounded flint and chalk.	1.0		RIVER TERRACE DEPOSITS	
1.10	D1	3.0/3.0/3.0		1.00 - 1.45 m: SPT: 3 for 150mm/3,3,2,3				
	PEN	kg/cm²						
1.75	PEN	0.75/0.75/0.75		Firm, locally soft, brown, slightly sandy, slightly gravelly, silty CLAY / clayey SILT.	1.70		RIVER TERRACE DEPOSITS	
1.95	PEN	2.0/2.0/2.0			2.0			
2.00	SPT	kg/cm²		2.00 - 2.45 m: SPT: 5 for 150mm/3,2,2,2				
2.10	D2	9 N						
2.30	PEN	0.5/0.5/0.5					LEWES NODULAR CHALK FORMATION	
2.40	PEN	kg/cm²			2.45			
		1.5/1.5/1.5		Structureless, off-white CHALK comprising very silty GRAVEL (45%) of very weak chalk. (CIRIA, 2002, Grade Dc)				
		kg/cm²						
3.00	SPT	17 N		3.00 - 3.45 m: SPT: 5 for 150mm/3,6,5,3	3.0		LEWES NODULAR CHALK FORMATION	
4.00	SPT	9 N	1	3.80 m: With occasional medium-sized, subangular and angular flint.	4.0		LEWES NODULAR CHALK FORMATION	
				4.00 - 4.45 m: SPT: 4 for 150mm/1,3,2,3				
General Remarks: Terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 19/10/2017 Date Completed: 19/01/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS01		
						Sheet 2 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
5.00	SPT	16 N		Continued fro 2.45m bgl: Structureless, off-white CHALK comprising very silty GRAVEL (45%) of very weak chalk. (CIRIA, 2002, Grade Dc)	5.0		LNCF	
				5.00 - 5.45 m: SPT: 6 for 150mm/5,4,3,4	5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 19/10/2017 Date Completed: 19/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS02	
						Sheet 1 of 2	

Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation / Backfill
Depth	Type & No	Value						
0.10	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.			TS	
				Firm to stiff, orange brown, silty CLAY.	0.25			
0.50	PEN J2	3.0/3.0/2.5 kg/cm²					RIVER TERRACE DEPOSITS	
0.70	J3							
0.95	PEN SPT D1	3.0/2.5/2.5 kg/cm² 6 N		1.00 - 1.45 m: SPT: 4 for 150mm/1,1,2,2	1.0			
1.00				1.30 m: Becoming locally soft, sandy, clayey SILT. Sand is fine-sized.				
1.50	PEN	1.0/1.0/1.0 kg/cm²		Medium dense, light brown, orange brown, slightly clayey, silty, fine to coarse-sized SAND AND fine to coarse-sized, angular to subangular flint and subrounded chalk GRAVEL.	1.65		RIVER TERRACE DEPOSITS	
2.00	SPT D2	19 N		2.00 - 2.45 m: SPT: 5 for 150mm/4,4,5,6	2.0			
					2.50			
3.00	SPT	10 N		Structureless, brown, dark brown, off-white and cream CHALK comprising gravelly (20%) SILT. Gravel fraction comprises fine to coarse-sized angular flint and fine and medium-sized subangular to subrounded chalk. (CIRIA 2002, Grade Dm)	3.0		LEWES NODULAR CHALK FORMATION	
				3.00 - 3.45 m: SPT: 5 for 150mm/3,2,3,2				
					3.70			
4.00	SPT	10 N	1	Structureless, off-white, cream, locally smeared brown CHALK comprising silty GRAVEL (45%) of angular to subangular, very weak to weak chalk. (CIRIA 2002, Grade Dc)	4.0		LEWES NODULAR CHALK FORMATION	
				4.00 - 4.45 m: SPT: 6 for 150mm/2,3,2,3				
					4.50			

General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.	Surface Elevation Level:	
	All dimensions in metres Log Scale 1:25	

PROBEHOLE RECORD

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PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 19/10/2017 Date Completed: 19/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS03		
Sheet 1 of 2								
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.20	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25		TS	
0.50	PEN	1.5/1.5/1.5 kg/cm²		Firm to stiff, brown, silty CLAY.				
0.80	PEN J2	1.5/1.5/1.5 kg/cm²						
1.00	SPT D1	5 N		1.00 - 1.45 m: SPT: 2 for 150mm/1,1,2,1	1.0			
1.20	PEN	1.0/1.0/1.0 kg/cm²						
1.60	PEN	1.0/1.0/1.0 kg/cm²						
2.00	SPT D2	4 N		Soft, light brown, slightly sandy, clayey SILT. Locally grades to loose, sandy SILT. 2.00 - 2.45 m: SPT: 2 for 150mm/1,1,1,1	2.0			
2.25	PEN	0.5/0.5/0.5 kg/cm²						
3.00	SPT D3	11 N		Firm, locally stiff, light grey, grey brown, chalky (silty) gravelly CLAY. Gravel is fine and medium-sized chalk and flint. 3.00 - 3.45 m: SPT: 5 for 150mm/3,2,3,3	3.0			
3.50	PEN	1.5/1.5/2.0 kg/cm²						
4.00	SPT	9 N		Structureless, off-white, cream, light brown CHALK comprising gravelly (20%) SILT. Gravel is fine and medium-sized flint and very weak chalk. (CIRIA 2002, Grade Dm) 4.00 - 4.45 m: SPT: 6 for 150mm/2,3,2,2	4.0		LNCF	
					4.50			
General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

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PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 19/10/2017 Date Completed: 19/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS04	
						Sheet 1 of 2	

Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.10	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25		TS	
				Firm to stiff, orange brown, silty CLAY.				
0.60	J2							
0.70	PEN	1.5/1.0/1.5 kg/cm²						
0.90	PEN	1.0/1.0/1.0 kg/cm²						
1.00	SPT	6 N		1.00 - 1.45 m: SPT: 2 for 150mm/1,1,2,2	1.0			
1.20	PEN	1.0/1.0/1.0 kg/cm²						
1.50	PEN	1.0/1.0/1.0 kg/cm²						
				1.75 m: Locally soft, clayey SILT.				
1.90	PEN	0.5/0.5/0.5 kg/cm²			2.0			
2.00	SPT	4 N		Firm, light brown, grey brown, slightly gravelly, slightly sandy, silty CLAY. Sand is fine-sized. Gravel is fine and medium-sized, subangular to subrounded chalk.	2.00			
2.25	PEN	1.0/1.0/1.0 kg/cm²		2.00 m: Becoming locally soft.				
2.50	PEN	1.0/1.0/1.0 kg/cm²		2.00 - 2.45 m: SPT: 2 for 150mm/-,1,1,2				
2.75	PEN	1.0/1.0/0.5 kg/cm²						
3.00	SPT	8 N		3.00 - 3.45 m: SPT: 2 for 150mm/2,2,2,2	3.0			
3.20	PEN	1.0 kg/cm²						
3.50	PEN	1.0 kg/cm²		3.50 m: Becoming more grey and grey brown with increasing chalky (silt) material.				
3.75	PEN	1.0 kg/cm²		3.60 m: Local pockets of brown, sandy and fine-sized gravel of chak.				
4.00	SPT	19 N	1	Structureless, off-white, dark brown and brown CHALK comprising silty GRAVEL (60%) of fine and medium-sized, very weak, angular chalk and fine, angular flint. (CIRIA 2002, Grade Dc) 4.00 - 4.45 m: SPT: 8 for 150mm/4,5,5,5	4.0 3.95			
					4.0			
					4.50			

General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.	Surface Elevation Level:	
	All dimensions in metres Log Scale 1:25	

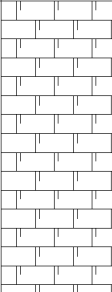
PROBEHOLE RECORD

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PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 19/10/2017 Date Completed: 19/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS05		
Sheet 1 of 2								
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.20	J1			TOPSOIL: Friable, brown, slightly humic, silty, sandy topsoil.	0.25		TS	
0.50	PEN	3.5/3.5/3.5		Firm to stiff, orange brown, silty CLAY.				
0.60	J2	kg/cm²						
0.90	PEN	4.0/3.5/4.0						
1.00	SPT	kg/cm²		1.00 - 1.45 m: SPT: 2 for 150mm/2,1,2,1	1.0			
	D1	6 N						
1.50	PEN	2.0/2.0/1.5		1.50 m: Becoming slightly sandy.				
		kg/cm²						
1.90	PEN	1.0/0.5/0.5		Soft, brown, orange brown and dark brown, slightly gravelly clayey SILT.	1.70			
2.00	SPT	kg/cm²		2.00 - 2.45 m: SPT: 0 for 150mm/1,1,1,1	2.0			
	D2	4 N						
2.50	PEN	0.5/1.0/0.5						
		kg/cm²						
2.90	PEN	0.5/0.5/0.5						
3.00	SPT	kg/cm²		3.00 - 3.45 m: SPT: 3 for 150mm/3,5,5,6	3.0			
	D3	19 N						
3.50	D4		↓	Structureless, light brown, brown and grey brown CHALK comprising gravelly (20%) SILT. Gravel is fine and medium-sized, subangular chalk and flint. (CIRIA, 2002, Grade Dm) 3.45 m: Pocket of gravelly, silty, fine SAND typically waterbound with perched water.	3.22		LNCF	
4.00	SPT	26 N		Structured CHALK recovered as off-white, light grey, gravelly (20%) silt. Gravel is fine and medium-sized angular chalk. (CIRIA, 2002, Grade A-C undifferentiated) 4.00 - 4.45 m: SPT: 11 for 150mm/6,5,7,8	4.0			
					4.00			
					4.50			
General Remarks: Terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 19/10/2017 Date Completed: 19/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS05		
						Sheet 2 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
5.00	SPT D5	39 N		Continued from 4.00m bgl: Structured CHALK recovered as off-white, light grey, gravelly (20%) silt. Gravel is fine and medium-sized angular chalk. (CIRIA, 2002, Grade A-C undifferentiated)	5.0		LNCF	
				5.00 - 5.45 m: SPT: 11 for 150mm/8,9,10,12	5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

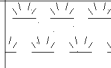
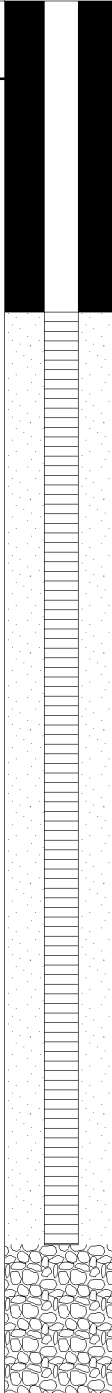
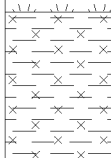
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 20/10/2017 Date Completed: 20/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS06		
						Sheet 1 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.10	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25		TS	
0.60	J2			Firm to stiff, orange brown, silty CLAY.			RIVER TERRACE DEPOSITS	
0.80	PEN	2.0/1.5/2.0 kg/cm²						
1.00	SPT D1	7 N		1.00 - 1.45 m: SPT: 2 for 150mm/1,2,2,2	1.0			
1.20	PEN	1.5/1.5/2.0 kg/cm²						
1.80	PEN	1.0/1.0/1.0 kg/cm²		Soft, locally firm, grey brown and orange brown, clayey SILT.	1.70			
2.00	SPT D2	6 N		2.00 - 2.45 m: SPT: 2 for 150mm/1,1,2,2	2.0			
2.20	PEN	1.0/1.0/1.0 kg/cm²						
2.50	PEN	1.0/1.0/1.0 kg/cm²						
2.80	PEN	1.0/1.0/1.0 kg/cm²			2.90			
3.00	SPT D3	8 N	↓	Structureless, light grey and light brown CHALK comprising gravelly (30%) SILT. Gravel is fine and medium-sized angular chalk. (CIRIA, 2002, Grade Dm) 3.00 - 3.45 m: SPT: 2 for 150mm/1,2,2,3	3.0		LNCF	
					3.60			
4.00	SPT	23 N		Recovered as structureless, off-white, cream, light brown CHALK comprising gravelly (20%) SILT. Gravel is subangular to subrounded, fine and medium-sized chalk, very weak and occasional medium-sized subrounded flint. (CIRIA, 2002, Grade Dm, probable Dc in situ) 4.00 - 4.45 m: SPT: 11 for 150mm/6,6,6,5	4.0			
					4.50			
General Remarks: Terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments				Borehole No.				
Project Title: Land at Bilsham Road, Yapton				WS06				
Project No: BRD2693								
Logged By: A Plant								
Date Commenced: 20/10/2017								
Date Completed: 20/10/2017								
Method Used: Windowless Percussive Sampling Rig				Sheet 2 of 2				
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
5.00	SPT	23 N		Continued from 3.60m bgl: Structureless, off-white, cream, light brown CHALK comprising gravelly (20%) SILT. Gravel is subangular to subrounded, fine and medium-sized chalk, very weak (CIRIA, 2002, Grade Dm, probable Dc in situ) and occasional medium-sized subrounded flint.	5.0		LNCf	
				5.00 - 5.45 m: SPT: 10 for 150mm/5,6,6,6	5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 20/10/2017 Date Completed: 20/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS07	
						Sheet 1 of 2	

Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.10	J1			TOPSOIL: Friable, brown, slightly humic, silty clay.	0.25		TS	
				Firm to stiff, orange brown, silty CLAY.				
0.70	J2				0.75			
0.80	PEN	3.5/3.5/3.5 kg/cm²		Firm to stiff, light grey, light brown and orange brown, slightly gravelly, sandy CLAY. Gravel is fine-sized, subangular flint and chalk.	1.0			
1.00	SPT D1	10 N		1.00 - 1.45 m: SPT: 3 for 150mm/2,2,3,3				
1.30	PEN	2.5/2.5/2.5 kg/cm²						
2.00	SPT D2	11 N		Medium dense, orange brown, silty, very gravelly, predominantly fine-sized SAND. Gravel is fine and medium-sized, subrounded flint.	2.0 2.00		RIVER TERRACE DEPOSITS	
				2.00 - 2.45 m: SPT: 5 for 150mm/3,2,3,3				
3.00	SPT D3	17 N		3.00 - 3.45 m: SPT: 3 for 150mm/4,5,4,4 3.00 - 3.50 m: Light grey.	3.0			
4.00	SPT D4	13 N		4.00 - 4.45 m: SPT: 7 for 150mm/3,3,3,4	4.0			
					4.50			

General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.	Surface Elevation Level:	
	All dimensions in metres Log Scale 1:25	

PROBEHOLE RECORD

Client: Gleeson Developments				Borehole No.				
Project Title: Land at Bilsham Road, Yapton				WS07				
Project No: BRD2693								
Logged By: A Plant				Sheet 2 of 2				
Date Commenced: 20/10/2017								
Date Completed: 20/10/2017								
Method Used: Windowless Percussive Sampling Rig								
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
4.95 5.00	PEN SPT D5	4.0/4.0/4.0 kg/cm² 19 N		Continued from 2.00m bgl: Medium dense, orange brown, gravelly, fine and medium-sized SAND. Gravel is fine-sized, subrounded flint.	4.90		RTD	
				Stiff, light grey, slightly gravelly, silty CLAY. Gravel is fine and medium-sized, subrounded chalk. 5.00 - 5.45 m: SPT: 8 for 150mm/4,5,5,5	5.0			
					5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 20/10/2017 Date Completed: 20/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS08	
						Sheet 1 of 2	

Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.20	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25		TS	
0.50 0.60	PEN J2	4.0/4.0/4.0 kg/cm²		Firm to stiff, orange brown, silty CLAY.				
1.00	SPT D1	15 N		1.00 - 1.45 m: SPT: 6 for 150mm/4,4,3,4	1.0			
1.50	PEN	3.5/3.0/3.5 kg/cm²		Firm to stiff, orange brown, light grey, slightly gravelly, sandy, silty CLAY. Locally grades to sand soil.	1.25			
1.75	PEN	2.5 (silt) kg/cm²						
2.00	SPT D2	16 N		2.00 - 2.45 m: SPT: 6 for 150mm/4,5,4,3	2.0			
					2.50			
3.00	SPT	9 N		Firm, light grey and grey green, chalky (silt matrix), gravelly, silty CLAY / SILT. Gravel is fine and medium-sized, angular, subangular and subrounded chalk with occasional medium-sized subangular flint. 3.00 m: Increasing chalk gravel content and becoming green grey and pale green. 3.00 - 3.45 m: SPT: 7 for 150mm/3,2,2,2	3.0			
					3.75			
4.00	SPT	15 N		Structureless, off-white, cream and local smears of light brown CHALK comprising gravelly (15%) SILT. Gravel is fine to angular chalk, very weak with occasional fine to subangular flint. (CIRIA, 2002, Grade Dm) 4.00 - 4.45 m: SPT: 4 for 150mm/2,5,5,3	4.0		LNCF	
					4.50			

General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.	Surface Elevation Level:	
	All dimensions in metres Log Scale 1:25	

PROBEHOLE RECORD

Client: Gleeson Developments				Borehole No.				
Project Title: Land at Bilsham Road, Yapton				WS08				
Project No: BRD2693								
Logged By: A Plant								
Date Commenced: 20/10/2017								
Date Completed: 20/10/2017								
Method Used: Windowless Percussive Sampling Rig				Sheet 2 of 2				
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
5.00	SPT	8 N		Continued from 3.75m bgl: Structureless, off-white, cream and local smears of light brown CHALK comprising gravelly (15%) SILT. Gravel is fine to angular chalk, very weak with occasional fine to subangular flint. (CIRIA, 2002, Grade Dm)	5.0		LNCf	
				5.00 - 5.45 m: SPT: 3 for 150mm/1,2,2,3	5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 20/10/2017 Date Completed: 20/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS09	
						Sheet 1 of 2	

Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation / Backfill		
Depth	Type & No	Value								
0.10	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25		TS			
0.50	PEN J2	1.5/2.5/2.0 kg/cm²		Medium dense, orange brown, light grey, slightly gravelly, sandy SILT.						
0.90	J3			1.00 - 1.45 m: SPT: 4 for 150mm/3,4,3,3	1.0		RIVER TERRACE DEPOSITS			
1.00	SPT D1	13 N								
1.60	PEN	2.5/2.0/2.5 kg/cm²		Firm, light grey and grey green, chalky (silt matrix), gravelly, silty CLAY / SILT. Gravel is fine and medium-sized, angular, subangular and subrounded chalk with occasional medium-sized subangular flint.	1.35					
2.00	SPT D2	11 N		2.00 - 2.45 m: SPT: 4 for 150mm/3,3,2,3	2.0					
2.20	PEN	2.0/2.5/2.5 kg/cm²		2.30 - 3.45 m: Locally grades to medium dense, fine-sized, sandy SILT / silty SAND.						
2.80	PEN	2.5 (silt) kg/cm²		3.00 - 3.45 m: SPT: 5 for 150mm/2,2,3,4	3.0					
3.00	SPT D3	11 N								
3.60	PEN	1.5/1.5/2.0 kg/cm²		Structureless, off-white, cream and local smears of light brown CHALK comprising gravelly (15%) SILT. Gravel is fine to angular chalk, very weak with occasional fine to subangular flint. (CIRIA, 2002, Grade Dm) 4.00 - 4.45 m: SPT: 5 for 150mm/2,2,3,4	3.80				LNCF	
4.00	SPT	11 N				4.0				
					4.50					

General Remarks:
 Terminated at 5.45m bgl.
 Installation to 4.00m bgl for monitoring.

Surface Elevation Level:

All dimensions in metres
 Log Scale 1:25

PROBEHOLE RECORD

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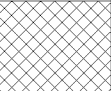
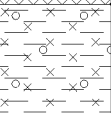
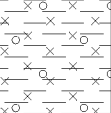
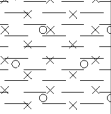
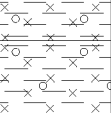
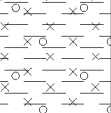
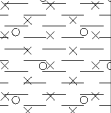
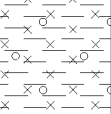
PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 20/10/2017 Date Completed: 20/10/2017 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS10		
						Sheet 1 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.10	J1			TOPSOIL: Friable, brown, slightly humic, silty topsoil.	0.25		TS	 RIVER TERRACE DEPOSITS
				Firm to stiff, orange brown, silty CLAY.				
0.60	J2							
0.80	J3							
1.00	SPT D1	4 N		1.00 m: Becoming soft. 1.00 - 1.45 m: SPT: 1 for 150mm/1,1,1,1	1.0			
2.00	SPT	10 N		2.00 - 2.45 m: SPT: 6 for 150mm/3,3,2,2	2.0			
				Firm, orange brown, slightly gravelly, sandy, silty CLAY. Gravel is fine, subrounded and subangular chalk.	1.50			
					2.25			
				Stiff, off-white and brown, chalky (silt matrix), gravelly, silty CLAY. Gravel is fine and medium-sized, angular and subangular chalk.	2.65			
3.00	SPT	11 N		Structureless, off-white, cream and local smears of light brown CHALK comprising gravelly (10%) SILT. Gravel is fine to angular chalk, very weak with occasional medium and coarse-sized flint. (CIRIA, 2002, Grade Dm) 3.00 - 3.45 m: SPT: 4 for 150mm/2,2,2,5	3.0		LEWES NODULAR CHALK FORMATION	
4.00	SPT	20 N		4.00 m: Probably silty GRAVEL (Grade Dc) in situ. 4.00 - 4.45 m: SPT: 8 for 150mm/5,4,5,6	4.0			
					4.50			
General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

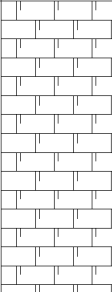
PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Plant Date Commenced: 20/10/2017 Date Completed: 20/10/2017 Method Used: Windowless Percussive Sampling Rig				Borehole No. WS10				
				Sheet 2 of 2				
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
5.00	SPT	29 N		Continued from 4.0m bgl: Structureless, off-white, cream and local smears of light brown CHALK comprising silty GRAVEL. Gravel is fine to angular chalk, very weak with occasional medium and coarse-sized flint. (CIRIA, 2002, Grade Dc) 5.00 m: Probably chalk of rock quality (CIRIA, 2002, Grade A-C undifferentiated) 5.00 - 5.45 m: SPT: 12 for 150mm/8,6,7,8	5.0		LNCF	
					5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Terminated at 5.45m bgl. Installation to 4.00m bgl for monitoring.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Neyt Date Commenced: 19/01/2018 Date Completed: 19/01/2018 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS11		
						Sheet 1 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.15	J1			MADE GROUND/TOPSOIL: Grass over soft, brown, silty clay with rootlets and rare gravel of subangular to subrounded flint and brick.	0.30		TS	
				Firm, orangish brown to greyish brown mottled orange and light grey, slightly gravelly, very silty CLAY. Gravel of medium to coarse, angular flint.				
0.70	PEN 2.25/2.00/1.50	kg/cm²						
1.00	SPT D1	4 N		1.00 - 1.45 m: SPT: 1 for 150mm/1,1,1,1	1.0			
1.80	D2			Firm, light orangish brown mottled light grey, gravelly, silty CLAY with occasional dark iron oxide staining. Gravel of fine to medium, subrounded chalk and angular to subangular flint.	1.50		RIVER TERRACE DEPOSITS	
1.90	PEN 1.50/2.25/1.50	kg/cm²						
2.00	SPT D3	14 N		2.00 - 2.45 m: SPT: 4 for 150mm/2,3,4,5	2.0			
2.70	D4						RIVER TERRACE DEPOSITS	
2.80	PEN 3.00/2.50/3.25	kg/cm²						
3.00	SPT D5	18 N		3.00 - 3.45 m: SPT: 3 for 150mm/3,3,6,6	3.0			
				Structured CHALK: Recovered as white mottled orange to white, firm, very gravelly silt. Gravel of fine to coarse, subangular flint and subrounded chalk. (CIRIA, 2002, Grade A-C undifferentiated).	3.50		LNCF	
4.00	SPT D6	45 N		4.00 - 4.45 m: SPT: 12 for 150mm/9,11,13,12 4.00 - 5.00 m: Lenses of weathered chalk in a yellowish and orangish brown silt matrix.	4.0			
					4.50		LNCF	
General Remarks: Borehole terminated at 5.45m bgl.				Surface Elevation Level:				
				All dimensions in metres Log Scale 1:25				

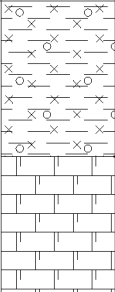
PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Neyt Date Commenced: 19/01/2018 Date Completed: 19/01/2018 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS11		
						Sheet 2 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
4.80	D7			Continued from 3.50m bgl.: Structured CHALK: Recovered as white mottled orange to white, firm, very gravelly silt. Gravel of fine to coarse, subangular flint and subrounded chalk. (CIRIA, 2002, Grade A-C undifferentiated).	5.0		LNCF	
5.00	SPT D8	48 N		5.00 - 5.45 m: SPT: 17 for 150mm/17,11,16,14	5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Borehole terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

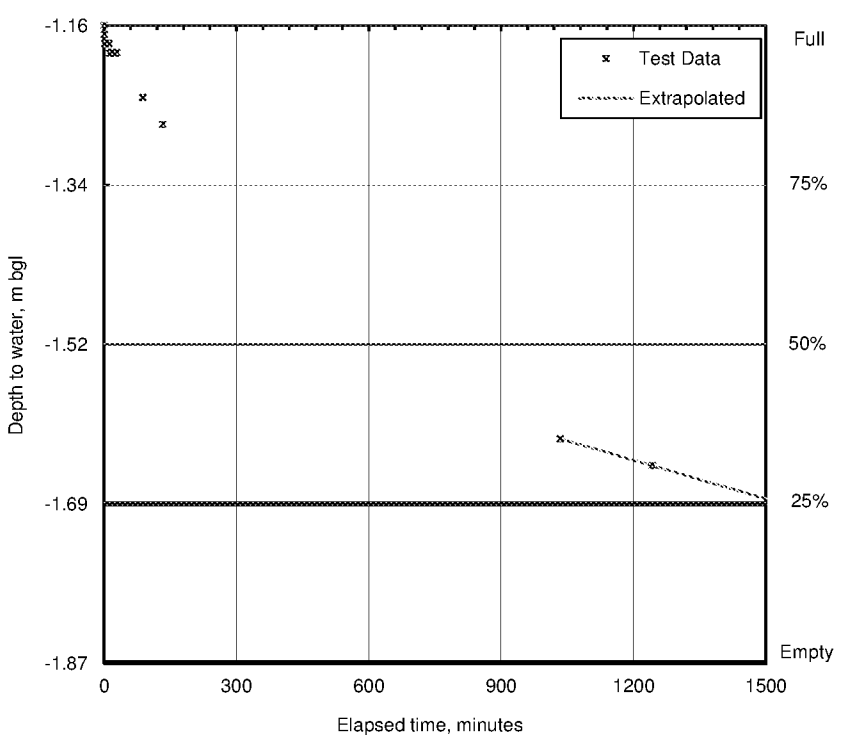
PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Neyt Date Commenced: 19/01/2018 Date Completed: 19/01/2018 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS12		
						Sheet 1 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
0.15	J1			TOPSOIL: Grass over soft, brown, silty clay with rootlets and rare gravel of subangular to subrounded flint.	0.25		TS	
0.50	PEN 1.25/1.00/1.50	kg/cm²		Firm, orangish brown to greyish brown mottled orange and light grey, very silty CLAY.				
0.65	J2							
1.00	SPT D1	6 N		1.00 - 1.45 m: SPT: 2 for 150mm/1,2,1,2	1.0			
1.60	D2							
1.70	PEN 2.00/1.75/1.50	kg/cm²						
2.00	SPT D3	5 N		2.00 - 2.45 m: SPT: 1 for 150mm/1,1,1,2	2.0			
2.60	PEN 1.25/1.50/1.50	kg/cm²		Firm, light orangish brown mottled light grey, gravelly, silty CLAY. Gravel of fine to medium, subrounded chalk.	2.50			
3.00	SPT D5	6 N		2.90 - 3.50 m: Sandy. 3.00 - 3.45 m: SPT: 2 for 150mm/1,1,2,2	3.0			
3.60	PEN 3.00/2.50/2.50	kg/cm²						
3.75	D6							
4.00	SPT D7	9 N		4.00 - 4.45 m: SPT: 2 for 150mm/1,2,3,3	4.0			
4.00					4.50			
General Remarks: Borehole terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

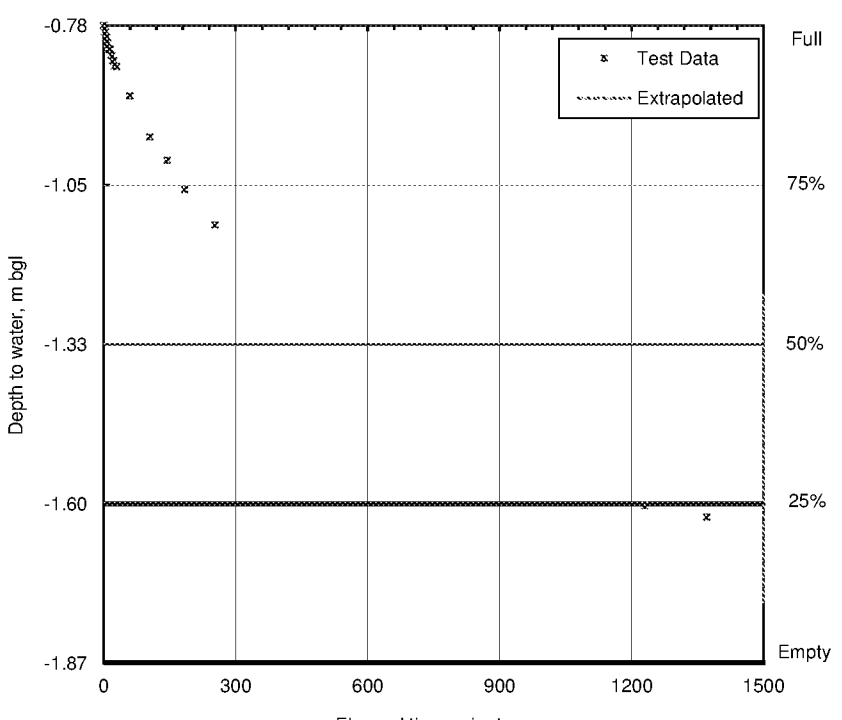
PROBEHOLE RECORD

Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No: BRD2693 Logged By: A Neyt Date Commenced: 19/01/2018 Date Completed: 19/01/2018 Method Used: Windowless Percussive Sampling Rig						Borehole No. WS12		
						Sheet 2 of 2		
Samples & Tests			Water	Description of Strata	Depth / (Level)	Legend	Geology	Installation /Backfill
Depth	Type & No	Value						
4.70	D8			Continued from 4.50m bgl: Firm, light orangish brown mottled light grey, gravelly, silty CLAY. Gravel of fine to medium, subrounded chalk.	5.0 5.00		RTD	
5.00 5.00	SPT D9	34 N		Structured CHALK: Recovered as firm, light brown and white, very gravelly silt. Gravel of fine to medium, subangular chalk and medium to coarse, angular to subangular flint. (CIRIA, 2002, Grade A-C undifferentiated). 5.00 - 5.45 m: SPT: 13 for 150mm/6,7,10,11	5.45			
					6.0			
					7.0			
					8.0			
					9.0			
General Remarks: Borehole terminated at 5.45m bgl.					Surface Elevation Level:			
					All dimensions in metres Log Scale 1:25			

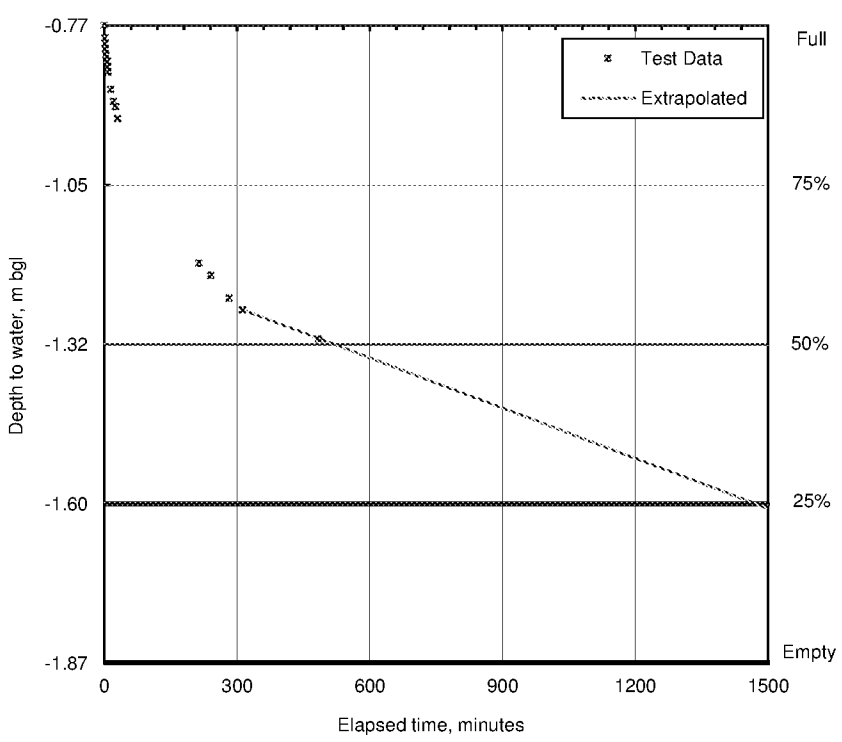
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP01 1 1.87 2.10 0.65 Dry 18/10/2017 S Raymundo	m m m m Firm, brown mottled orange brown, slightly sandy, silty CLAY. Sand is fine-sized.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 25 27 29 88 133 1034 1243	1.16 1.17 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.18 1.19 1.19 1.19 1.19 1.19 1.19 1.19 1.19 1.19 1.19 1.24 1.27 1.62 1.65	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (307 mins) is the time for the water level to fall to 75% effective depth (1.34m bgl) and T_{25} (1539* mins) is the time for the water level to fall to 25% effective depth (1.69m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 1232$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.48 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 3.32 \text{ m}^2$ Soil Infiltration Rate $f = 1.98 \times 10^{-6} \text{ m/s}$		
Comments Calculation based on extrapolated results. Use as a guide only.		

SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP01 2 1.87 2.10 0.65 1.65 19/10/2017 S Raymundo	m m m m Firm, brown mottled orange brown, slightly sandy, silty CLAY. Sand is fine-sized.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 25 29 59 105 144 185 253 1230 1371	0.78 0.78 0.79 0.79 0.79 0.80 0.80 0.80 0.81 0.81 0.82 0.82 0.82 0.83 0.83 0.84 0.84 0.85 0.85 0.90 0.97 1.01 1.06 1.12 1.60 1.62	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (179 mins) is the time for the water level to fall to 75% effective depth (1.05m bgl) and T_{25} (1225 mins) is the time for the water level to fall to 25% effective depth (1.60m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 1046$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.74 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 4.36 \text{ m}^2$ Soil Infiltration Rate $f = 2.72 \times 10^{-6} \text{ m/s}$		
Comments		

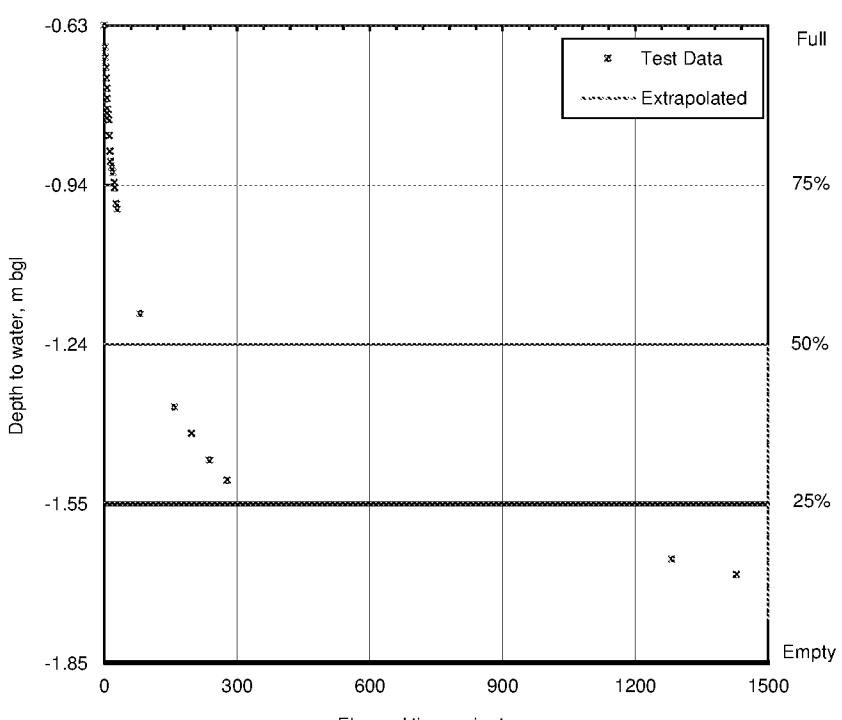
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP01 3 1.87 2.10 0.65 Dry 31/10/2017 S Raymundo	m m m m Firm, brown mottled orange brown, slightly sandy, silty CLAY. Sand is fine-sized.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 10 15 20 25 30 214 240 281 312 485	0.77 0.79 0.80 0.81 0.82 0.82 0.83 0.83 0.84 0.85 0.85 0.88 0.90 0.91 0.93 1.18 1.20 1.24 1.26 1.31	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (115 mins) is the time for the water level to fall to 75% effective depth (1.05m bgl) and T_{25} (1471* mins) is the time for the water level to fall to 25% effective depth (1.60m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 1356$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.75 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 4.39 \text{ m}^2$ Soil Infiltration Rate $f = 2.10 \times 10^{-6} \text{ m/s}$		
Comments Calculation based on extrapolated results. Use as a guide only.		

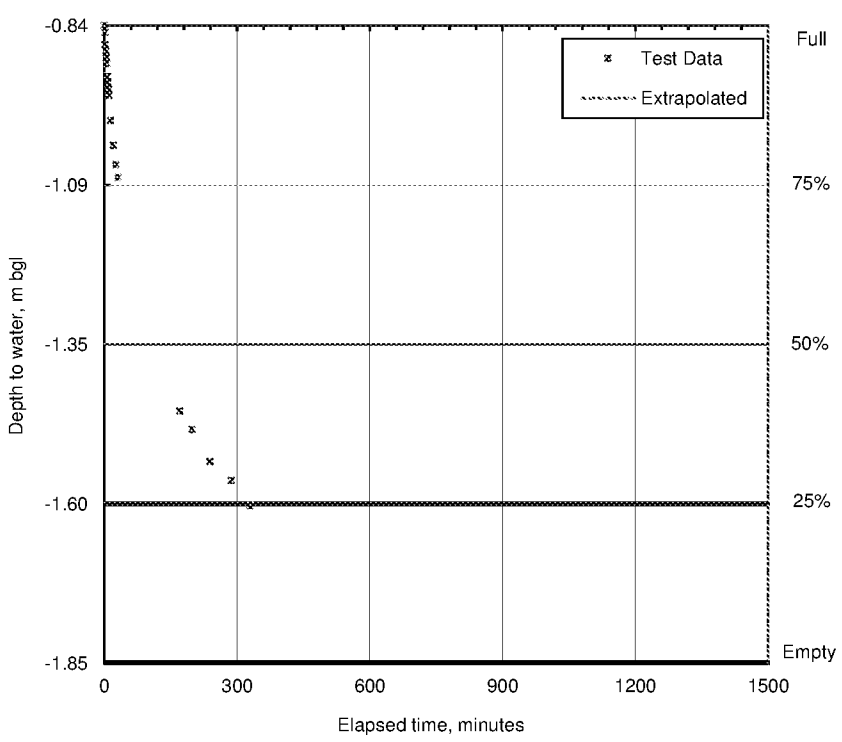
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP02 1 1.85 2.90 0.65 Dry 18/10/2017 S Raymundo	m m m m Firm, stiff, brown, light brown, slightly gravelly, slightly sandy, silty CLAY. Gravel is subrounded, fine-sized flint.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 25 27 29 81 139 173 976 1123	0.79 0.82 0.83 0.84 0.86 0.87 0.89 0.90 0.90 0.91 0.93 0.95 0.96 0.98 1.00 1.01 1.02 1.03 1.04 1.06 1.26 1.40 1.44 1.72 1.72	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (29 mins) is the time for the water level to fall to 75% effective depth (1.06m bgl) and T_{25} (589 mins) is the time for the water level to fall to 25% effective depth (1.59m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 560$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 1.00 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.65 \text{ m}^2$ Soil Infiltration Rate $f = 5.26 \times 10^{-6} \text{ m/s}$		
Comments		

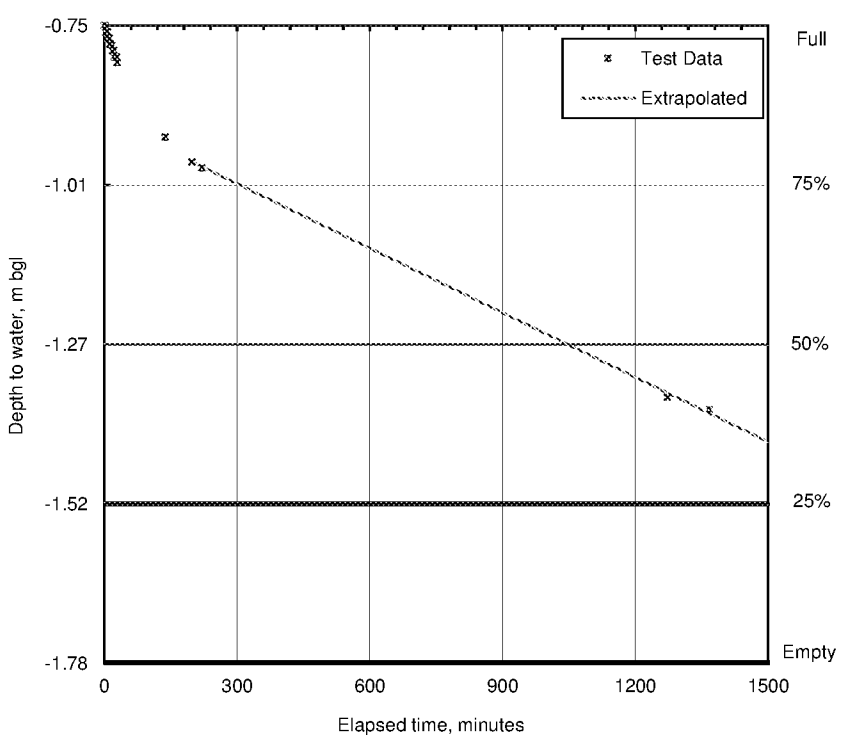
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP02 2 1.85 2.90 0.65 1.72 19/10/2017 S Raymundo	 m m m m
Firm, stiff, brown, light brown, slightly gravelly, slightly sandy, silty CLAY. Gravel is subrounded, fine-sized flint.		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 27 29 81 158 197 238 277 1283 1428	0.63 0.67 0.69 0.71 0.73 0.75 0.77 0.79 0.80 0.81 0.84 0.87 0.89 0.90 0.91 0.93 0.94 0.97 0.98 1.18 1.36 1.41 1.46 1.50 1.65 1.68	
Summary of Calculations and Result		
Soil infiltration rate, f , is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (22 mins) is the time for the water level to fall to 75% effective depth (0.94m bgl) and T_{25} (579 mins) is the time for the water level to fall to 25% effective depth (1.55m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 557 \text{ mins}$ $V_{75}-V_{25} \text{ is the effective storage volume in the trial pit between 75% and 25% effective depth:}$ $V_{75}-V_{25} = 1.15 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 6.22 \text{ m}^2$		
Soil Infiltration Rate f = <u>5.54×10^{-6}</u> m/s		
Comments		

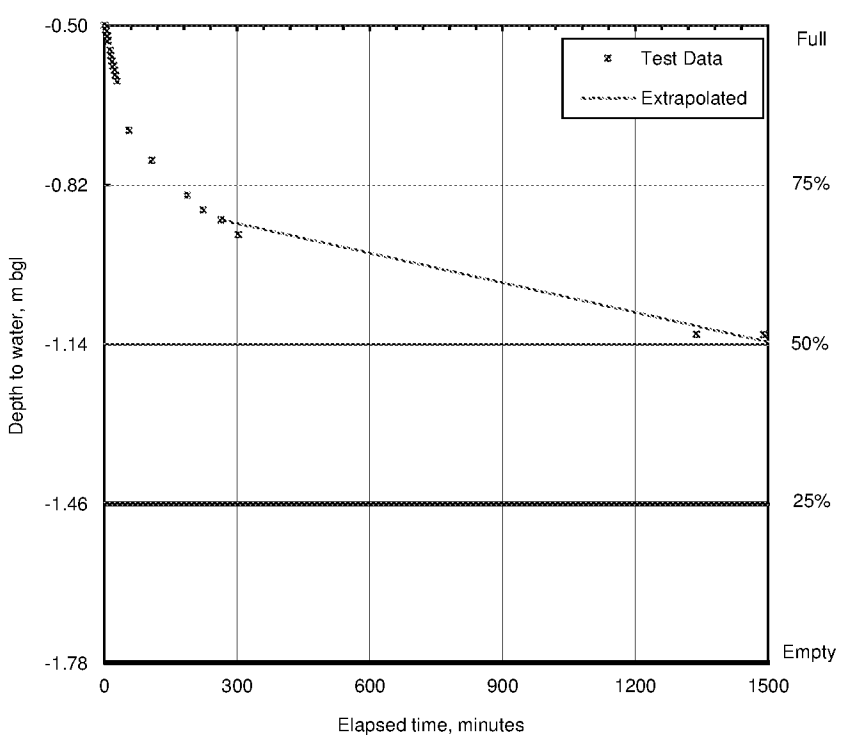
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP02 3 1.85 2.90 0.65 Dry 31/10/2017 S Raymundo	m m m m Firm, stiff, brown, light brown, slightly gravelly, slightly sandy, silty CLAY. Gravel is subrounded, fine-sized flint.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 10 15 20 25 30 171 198 239 287 330	0.84 0.85 0.87 0.88 0.89 0.90 0.92 0.92 0.93 0.94 0.95 0.99 1.03 1.06 1.08 1.45 1.48 1.53 1.56 1.60	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (35 mins) is the time for the water level to fall to 75% effective depth (1.09m bgl) and T_{25} (327 mins) is the time for the water level to fall to 25% effective depth (1.60m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 293$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.95 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.47 \text{ m}^2$ Soil Infiltration Rate $f = 9.91 \times 10^{-6} \text{ m/s}$		
Comments		

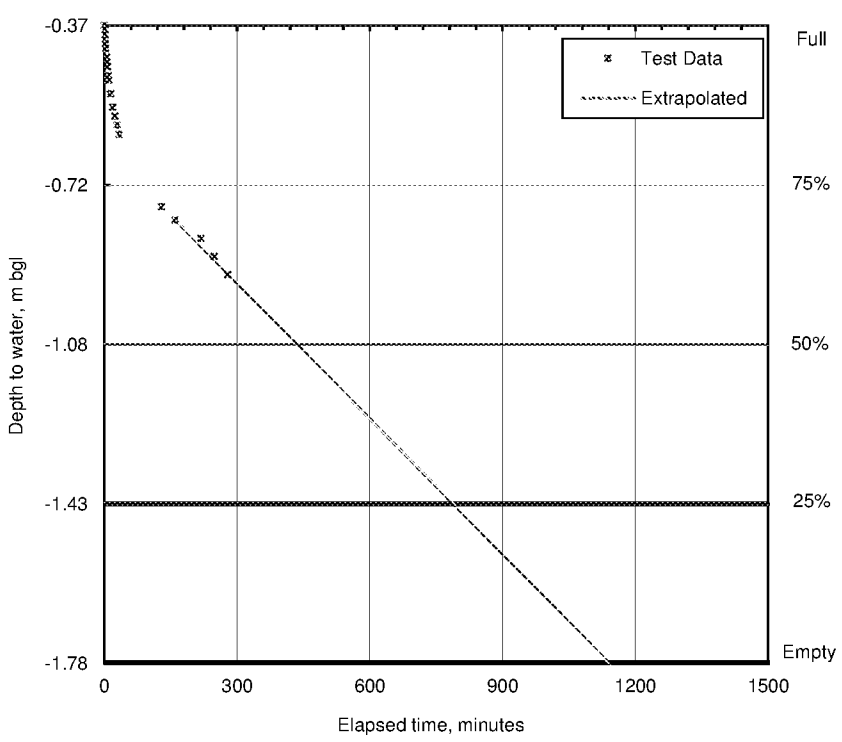
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP03 1 1.78 2.00 0.65 Dry 18/10/2017 S Raymundo	m m m m Firm, stiff, light brown and orange brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is fine-sized, subangular to subrounded flint.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 25 27 29 137 198 220 1272 1367	0.75 0.75 0.75 0.76 0.76 0.76 0.76 0.77 0.77 0.77 0.78 0.78 0.78 0.78 0.79 0.79 0.80 0.80 0.80 0.81 0.93 0.97 0.98 1.35 1.37	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (298 mins) is the time for the water level to fall to 75% effective depth (1.01m bgl) and T_{25} (1789* mins) is the time for the water level to fall to 25% effective depth (1.52m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 1491$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.67 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 4.03 \text{ m}^2$ Soil Infiltration Rate $f = 1.86 \times 10^{-6} \text{ m/s}$		
Comments Calculation based on extrapolated results. Use as a guide only.		

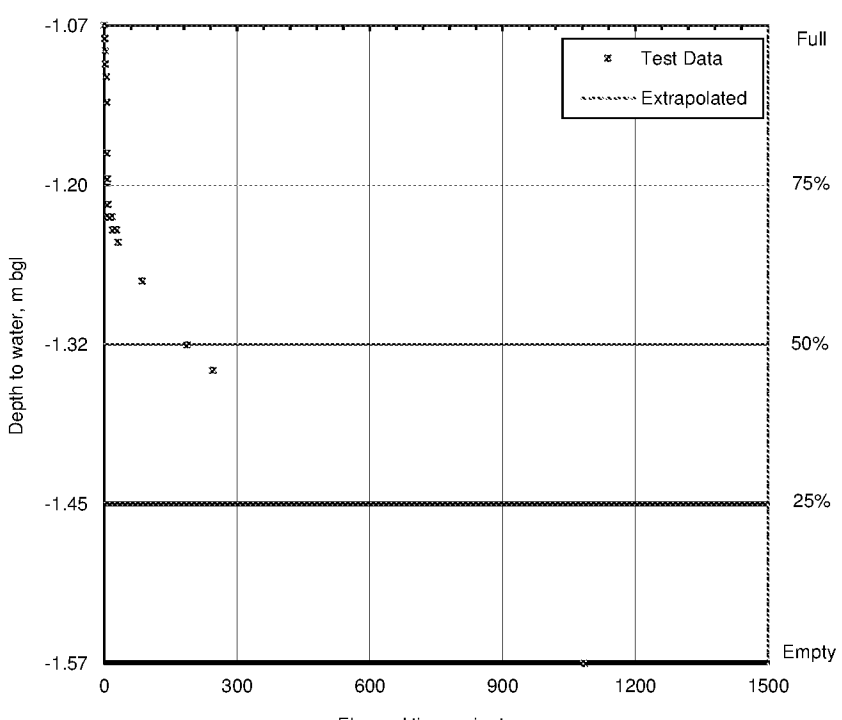
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP03 2 1.78 2.00 0.65 1.56 19/10/2017 S Raymundo	m m m m Firm, stiff, light brown and orange brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is fine-sized, subangular to subrounded flint.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 13 15 17 19 21 23 25 29 55 107 187 223 264 303 1338 1490	0.50 0.50 0.51 0.51 0.51 0.52 0.52 0.52 0.53 0.53 0.55 0.56 0.57 0.58 0.58 0.59 0.60 0.61 0.71 0.77 0.84 0.87 0.89 0.92 1.12 1.12	
Summary of Calculations and Result		
RESULT COULD NOT BE CALCULATED AS TEST PIT WOULD NOT REACH HALF EMPTY WITHIN 24 HOURS		
Comments		

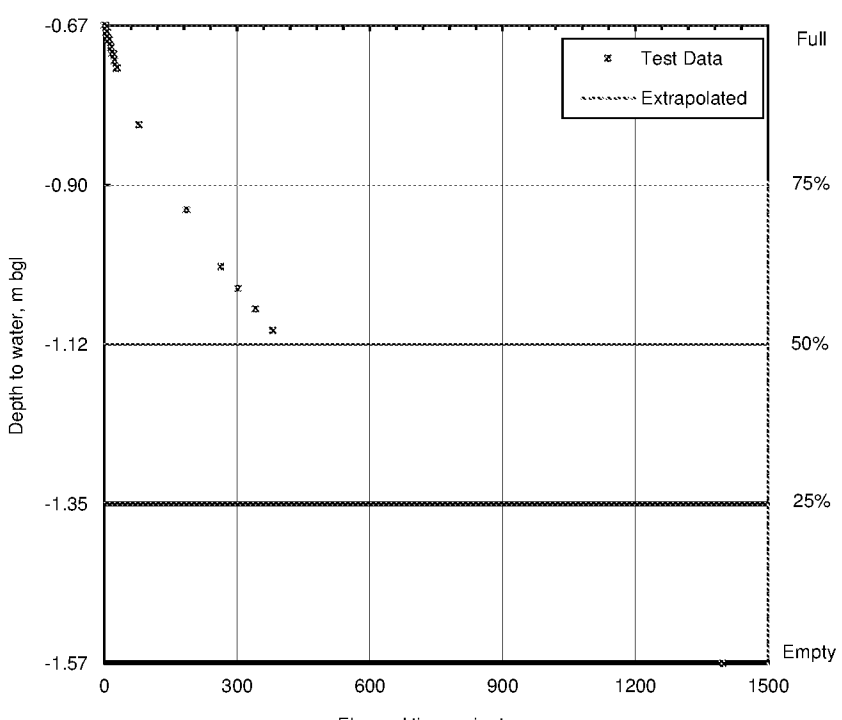
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP03 3 1.78 2.00 0.65 Dry 31/10/2017 S Raymundo	m m m m Firm, stiff, light brown and orange brown, slightly sandy, slightly gravelly, silty CLAY. Gravel is fine-sized, subangular to subrounded flint.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 14 19 24 29 34 129 160 218 248 279	0.37 0.38 0.39 0.41 0.42 0.44 0.45 0.46 0.48 0.49 0.52 0.55 0.57 0.59 0.61 0.77 0.80 0.84 0.88 0.92	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (101 mins) is the time for the water level to fall to 75% effective depth (0.72m bgl) and T_{25} (788* mins) is the time for the water level to fall to 25% effective depth (1.43m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 688$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.92 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.04 \text{ m}^2$ Soil Infiltration Rate $f = 4.41 \times 10^{-6} \text{ m/s}$		
Comments Calculation based on extrapolated results. Use as a guide only.		

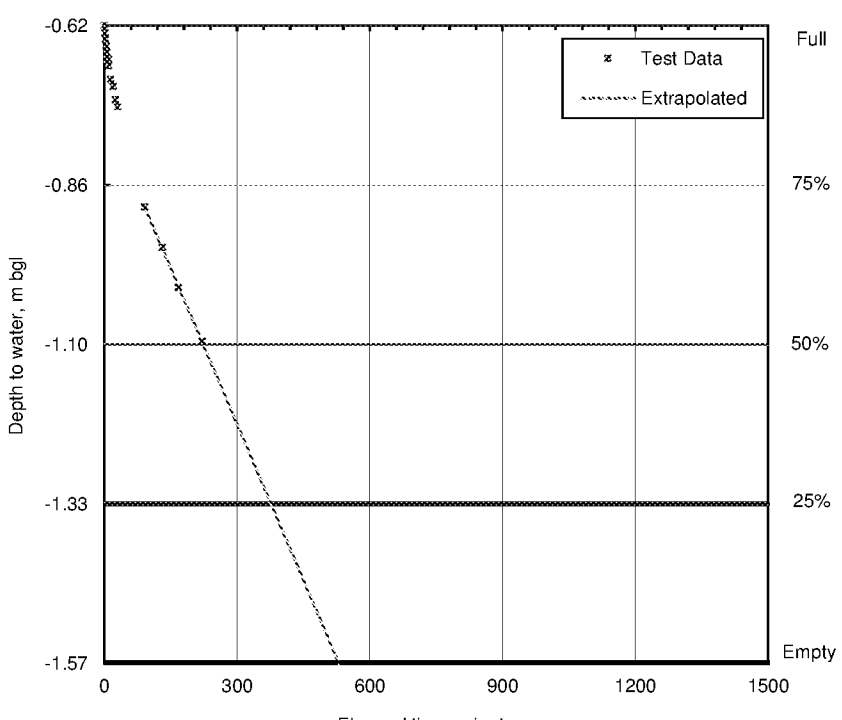
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP04 1 1.57 2.80 0.65 Dry 18/10/2017 S Raymundo	m m m m Firm, stiff, brown, orange brown, slightly sandy, silty CLAY. Sand is fine-sized.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 25 27 31 86 187 245 1084	1.07 1.08 1.09 1.10 1.11 1.13 1.17 1.19 1.21 1.22 1.22 1.22 1.22 1.23 1.23 1.23 1.23 1.23 1.24 1.27 1.32 1.34 1.57	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (7.3 mins) is the time for the water level to fall to 75% effective depth (1.20m bgl) and T_{25} (628 mins) is the time for the water level to fall to 25% effective depth (1.45m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 621$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.46 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 3.55 \text{ m}^2$ Soil Infiltration Rate $f = 3.45 \times 10^{-6} \text{ m/s}$		
Comments		

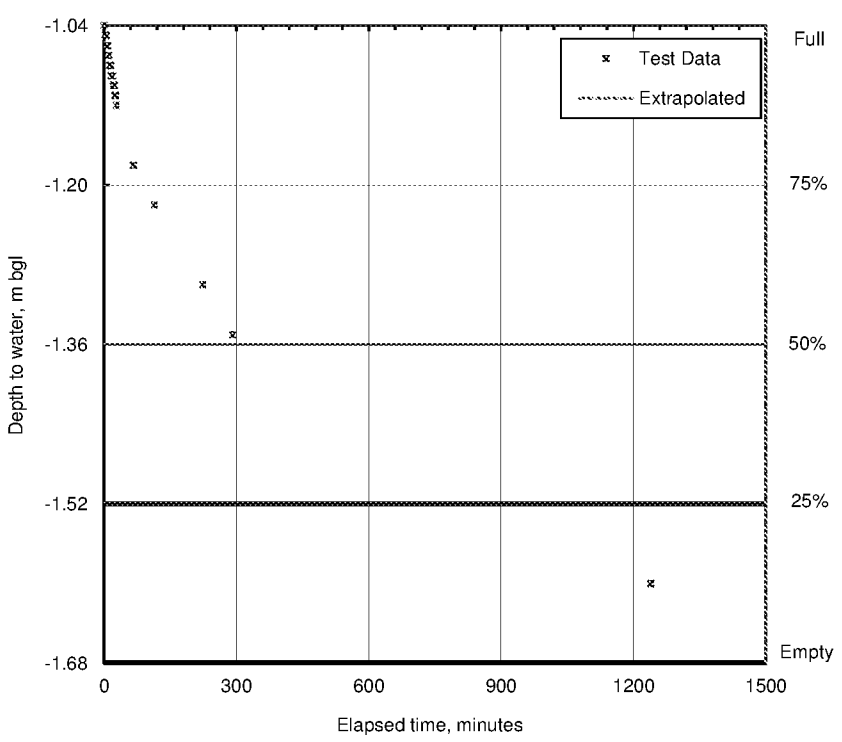
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP04 2 1.57 2.80 0.65 Dry 19/10/2017 S Raymundo	m m m m
Firm, stiff, brown, orange brown, slightly sandy, silty CLAY. Sand is fine-sized.		
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 27 29 78 186 264 302 342 380 1397	0.67 0.67 0.67 0.67 0.68 0.68 0.68 0.69 0.69 0.69 0.70 0.70 0.71 0.71 0.71 0.72 0.73 0.73 0.81 0.93 1.01 1.04 1.07 1.10 1.57	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (155 mins) is the time for the water level to fall to 75% effective depth (0.90m bgl) and T_{25} (910 mins) is the time for the water level to fall to 25% effective depth (1.35m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 756$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.82 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 4.93 \text{ m}^2$ Soil Infiltration Rate $f = 3.67 \times 10^{-6} \text{ m/s}$		
Comments		

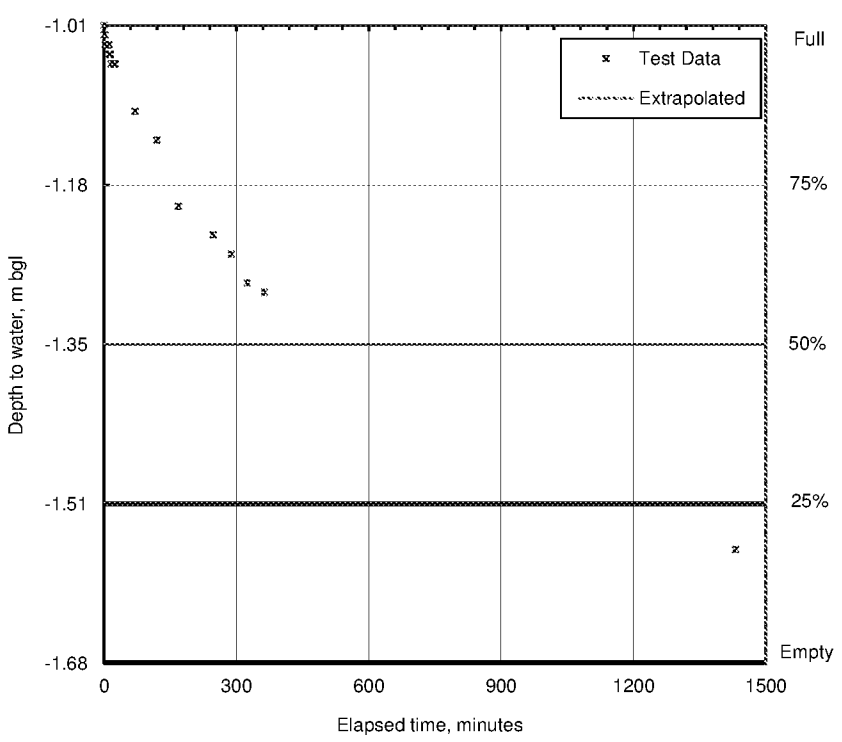
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP04 3 1.57 2.80 0.65 Dry 31/10/2017 S Raymundo	m m m m Firm, stiff, brown, orange brown, slightly sandy, silty CLAY. Sand is fine-sized.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 10 15 20 25 30 91 131 167 221	0.62 0.63 0.63 0.64 0.65 0.66 0.66 0.67 0.67 0.67 0.68 0.70 0.71 0.73 0.74 0.89 0.95 1.01 1.09	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (78 mins) is the time for the water level to fall to 75% effective depth (0.86m bgl) and T_{25} (377* mins) is the time for the water level to fall to 25% effective depth (1.33m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 299$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.86 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 5.10 \text{ m}^2$ Soil Infiltration Rate $f = 9.44 \times 10^{-6} \text{ m/s}$		
Comments Calculation based on extrapolated results. Use as a guide only.		

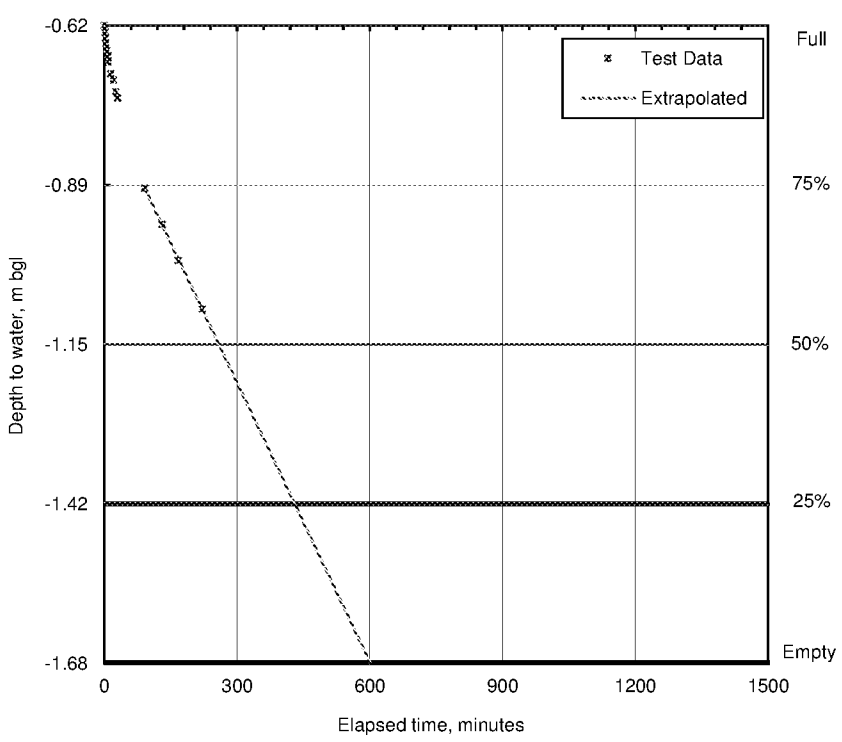
SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP05 1 1.68 2.30 0.65 Dry 18/10/2017 S Raymundo	m m m m Firm, stiff, orange brown and mottled light brown and brown, silty CLAY.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 25 27 29 67 115 225 292 1240	1.04 1.04 1.05 1.05 1.05 1.06 1.06 1.06 1.06 1.07 1.08 1.08 1.09 1.09 1.10 1.10 1.11 1.11 1.12 1.18 1.22 1.30 1.35 1.60	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (91 mins) is the time for the water level to fall to 75% effective depth (1.20m bgl) and T_{25} (937 mins) is the time for the water level to fall to 25% effective depth (1.52m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 846$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.48 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 3.38 \text{ m}^2$ Soil Infiltration Rate $f = 2.79 \times 10^{-6} \text{ m/s}$		
Comments		

SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP05 2 1.68 2.30 0.65 1.60 19/10/2017 S Raymundo	m m m m Firm, stiff, orange brown and mottled light brown and brown, silty CLAY.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 11 13 15 17 19 21 23 25 71 120 169 247 288 325 363 1431 1584	1.01 1.02 1.02 1.03 1.03 1.03 1.03 1.03 1.03 1.03 1.04 1.04 1.05 1.05 1.05 1.05 1.10 1.13 1.20 1.23 1.25 1.28 1.29 1.56 1.58	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (153 mins) is the time for the water level to fall to 75% effective depth (1.18m bgl) and T_{25} (1243 mins) is the time for the water level to fall to 25% effective depth (1.51m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 1090$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.50 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 3.47 \text{ m}^2$ Soil Infiltration Rate $f = 2.21 \times 10^{-6} \text{ m/s}$		
Comments		

SOAKAGE TEST RECORD

SOIL INFILTRATION RATE (BRE Digest 365 : Soakaway Test)		
Client: Gleeson Developments Project Title: Land at Bilsham Road, Yapton Project No.: BRD2693		
Test Details		
Trial Pit Number Test Number Pit Depth Pit Length Pit Width Depth to groundwater prior to test Date of Test Logged by Description of Soil under Test	TP05 3 1.68 2.30 0.65 Dry 31/10/2017 S Raymundo	m m m m Firm, stiff, orange brown and mottled light brown and brown, silty CLAY.
Test Record		
Elapsed Time min	Depth to Water m	Plot of water level against elapsed time
0 1 2 3 4 5 6 7 8 9 10 15 20 25 30 91 131 167 221	0.62 0.63 0.63 0.64 0.65 0.66 0.66 0.67 0.67 0.67 0.68 0.70 0.71 0.73 0.74 0.89 0.95 1.01 1.09	
Summary of Calculations and Result		
Soil infiltration rate, f, is calculated from the time taken for the water to fall from 75% to 25% effective storage depth in the pit. $f = (V_{75}-V_{25})/A_{50}(T_{75}-T_{25})$ where, T_{75} (89 mins) is the time for the water level to fall to 75% effective depth (0.89m bgl) and T_{25} (430* mins) is the time for the water level to fall to 25% effective depth (1.42m bgl) thus, $T_{75}-T_{25}$ is the time for the water level to fall from 75% to 25% effective depth: $T_{75}-T_{25} = 341$ mins $V_{75}-V_{25}$ is the effective storage volume in the trial pit between 75% and 25% effective depth: $V_{75}-V_{25} = 0.79 \text{ m}^3$ and A_{50} is the internal surface area of the trial pit up to 50% effective depth and including the base area: $A_{50} = 4.62 \text{ m}^2$ Soil Infiltration Rate $f = 8.37 \times 10^{-6} \text{ m/s}$		
Comments Calculation based on extrapolated results. Use as a guide only.		



Gas Monitoring Record

Project Name: Land at Bilsham Road, Yapton

Client: Gleeson Developments

Project No: BRD2693

Date:	25/10/2017	Ground conditions:	Wet	Recorded by:	AN
Time at start:	09:45	Weather conditions:	Overcast with some drizzle	Pressure trend:	Steady
Time at finish:	11:05	Air Temperature (°C):	15	Monitor serial no:	G501688

The gas monitoring equipment is a Geotech GA5000 portable analyser. As per manufacturers recommendations this is factory calibrated every six months and in addition BRD undertake calibration checks against bottled standard gases on at least a monthly basis. Gas monitor pump is run for three minutes unless otherwise stated and the steady readings are an average reading taken over this pump run time. Vapour monitoring equipment is miniRAE lite PGM-7350 Photo Ionisation Detector (PID) with 10.6 eV lamp calibrated for isobutylene. PID calibration check is performed on site against ambient air and also against a 100ppm isobutylene standard gas. Barometric pressure trend and ambient air temperature is recorded from weather websites at the nearest reported weather station.

CH₄ = Methane CO₂ = Carbon Dioxide O₂ = Oxygen H₂S = Hydrogen Sulphide CO = Carbon Monoxide NR = Not Recorded PID = Photo Ionisation Detector

GWL = Groundwater level measured from ground surface and top of standpipe.

Base = Base of standpipe measured from ground surface.

Monitoring point				Gas Concentration								Pressure	Flow rate	Vapour	Comments
Borehole	GWL Ground (m)	GWL Pipe (m)	Base Ground (m)	Steady			Peak		Minimum	Peak		Baro - metric (mb)	Steady (l/hr)	PID (ppm)	
				CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)				
WS04	3.58	3.44	3.98	0.1	4.5	14.5	0.1	4.5	14.5	3	0	1021	0.3	29.6	
WS03	2.94	2.79	4.01	0.1	3.3	15.3	0.1	3.3	15.3	8	0	1021	0.1	22.6	
WS02	2.42	2.30	3.96	0.1	2.9	14.8	0.1	3.0	14.8	5	0	1021	0.2	21.5	
WS07	1.69	1.54	3.89	0.1	4.1	15.4	0.1	4.2	15.4	2	0	1022	0.2	25.0	
WS08	1.83	1.71	3.89	0.1	2.1	19.5	0.1	2.1	19.3	1	0	1022	0.2	35.9	
WS09	1.80	1.66	3.99	0.1	1.7	16.0	0.1	1.7	16.0	3	0	1022	0.2	35.8	
WS10	2.03	1.88	3.00	0.1	2.5	16.9	0.1	2.6	16.8	23	0	1022	0.1	24.3	



Gas Monitoring Record

Project Name: Land at Bilsham Road, Yapton

Client: Gleeson Developments

Project No: BRD2693

Date:	31/10/2017	Ground conditions:	Moist	Recorded by:	AN
Time at start:	08:20	Weather conditions:	Cloudy	Pressure trend:	Steady
Time at finish:	09:25	Air Temperature (°C):	10	Monitor serial no:	G501688

The gas monitoring equipment is a Geotech GA5000 portable analyser. As per manufacturers recommendations this is factory calibrated every six months and in addition BRD undertake calibration checks against bottled standard gases on at least a monthly basis. Gas monitor pump is run for three minutes unless otherwise stated and the steady readings are an average reading taken over this pump run time. Vapour monitoring equipment is miniRAE lite PGM-7350 Photo Ionisation Detector (PID) with 10.6 eV lamp calibrated for isobutylene. PID calibration check is performed on site against ambient air and also against a 100ppm isobutylene standard gas. Barometric pressure trend and ambient air temperature is recorded from weather websites at the nearest reported weather station.

CH₄ = Methane CO₂ = Carbon Dioxide O₂ = Oxygen H₂S = Hydrogen Sulphide CO = Carbon Monoxide NR = Not Recorded PID = Photo Ionisation Detector

GWL = Groundwater level measured from ground surface and top of standpipe.

Base = Base of standpipe measured from ground surface.

Monitoring point				Gas Concentration								Pressure	Flow rate	Vapour	Comments
Borehole	GWL Ground (m)	GWL Pipe (m)	Base Ground (m)	Steady			Peak		Minimum	Peak		Baro - metric (mb)	Steady (l/hr)	PID (ppm)	
				CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)				
WS04	3.63	3.51	3.97	0.1	3.2	17.5	0.1	3.2	17.5	2	0	1028	0.3	42.4	AMP 1022 to 1028 9th Nov 17: 1022 improbable
WS03	3.03	2.87	4.00	0.1	2.9	16.7	0.1	2.9	16.7	0	0	1028	0.2	18.0	
WS02	2.52	2.40	3.95	0.1	1.9	19.7	0.1	1.9	19.7	0	0	1028	0.1	33.3	
WS07	1.70	1.56	3.85	0.1	4.5	14.8	0.1	4.5	14.8	0	0	1028	0.1	23.9	
WS08	1.88	1.75	3.89	0.1	3.5	14.5	0.1	3.5	14.5	0	0	1028	0.2	34.2	
WS09	1.84	1.71	3.99	0.1	3.8	15.5	0.1	3.8	15.5	2	0	1028	0.1	36.2	
WS10	2.08	1.93	3.97	0.1	5.2	12.9	0.1	5.2	12.9	0	0	1028	0.1	13.3	



Gas Monitoring Record

Project Name: Land at Bilsham Road, Yapton

Client: Gleeson Developments

Project No: BRD2693

Date:	07/11/2017	Ground conditions:	Wet	Recorded by:	NK
Time at start:	12:42 PM	Weather conditions:	Overcast, some light rain	Pressure trend:	Falling
Time at finish:	3:04 PM	Air Temperature (°C):	11	Monitor serial no:	G501688

The gas monitoring equipment is a Geotech GA5000 portable analyser. As per manufacturers recommendations this is factory calibrated every six months and in addition BRD undertake calibration checks against bottled standard gases on at least a monthly basis. Gas monitor pump is run for three minutes unless otherwise stated and the steady readings are an average reading taken over this pump run time. Vapour monitoring equipment is miniRAE lite PGM-7350 Photo Ionisation Detector (PID) with 10.6 eV lamp calibrated for isobutylene. PID calibration check is performed on site against ambient air and also against a 100ppm isobutylene standard gas. Barometric pressure trend and ambient air temperature is recorded from weather websites at the nearest reported weather station.

CH₄ = Methane CO₂ = Carbon Dioxide O₂ = Oxygen H₂S = Hydrogen Sulphide CO = Carbon Monoxide NR = Not Recorded PID = Photo Ionisation Detector

GWL = Groundwater level measured from ground surface and top of standpipe.

Base = Base of standpipe measured from ground surface.

Monitoring point				Gas Concentration								Pressure	Flow rate	Vapour	Comments
Borehole	GWL Ground (m)	GWL Pipe (m)	Base Ground (m)	Steady			Peak		Minimum	Peak		Baro - metric (mb)	Steady (l/hr)	PID (ppm)	
				CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)				
WS04	3.67	3.55	3.95	0.0	5.7	11.8	0.0	5.7	11.8	0	0	1016	0.0	24.7	
WS03	3.07	2.92	4.01	0.0	3.2	16.6	0.0	3.3	16.5	0	0	1016	0.1	23.6	
WS02	2.53	2.43	3.94	0.0	3.6	14.3	0.1	3.6	14.3	0	0	1016	0.1	9.1	
WS07	1.69	1.55	3.88	0.0	4.5	15.2	0.0	4.5	15.2	0	0	1017	0.1	15.2	
WS08	1.86	1.73	3.89	0.0	2.4	20.0	0.1	2.4	19.9	0	0	1016	0.1	16.9	
WS09	1.83	1.70	3.98	0.0	2.0	18.4	0.0	2.1	18.4	0	0	1017	0.0	15.0	
WS10	2.08	1.93	3.93	0.0	3.7	18.0	0.0	3.7	18.0	0	0	1017	0.0	29.1	



Gas Monitoring Record

Project Name: Land at Bilsham Road, Yapton

Client: Gleeson Developments

Project No: BRD2693

Date:	14/11/2017	Ground conditions:	Wet	Recorded by:	NK
Time at start:	10:58 AM	Weather conditions:	Overcast	Pressure trend:	Steady
Time at finish:	12:47 PM	Air Temperature (°C):	12	Monitor serial no:	G501688

The gas monitoring equipment is a Geotech GA5000 portable analyser. As per manufacturers recommendations this is factory calibrated every six months and in addition BRD undertake calibration checks against bottled standard gases on at least a monthly basis. Gas monitor pump is run for three minutes unless otherwise stated and the steady readings are an average reading taken over this pump run time. Vapour monitoring equipment is miniRAE lite PGM-7350 Photo Ionisation Detector (PID) with 10.6 eV lamp calibrated for isobutylene. PID calibration check is performed on site against ambient air and also against a 100ppm isobutylene standard gas. Barometric pressure trend and ambient air temperature is recorded from weather websites at the nearest reported weather station.

CH₄ = Methane CO₂ = Carbon Dioxide O₂ = Oxygen H₂S = Hydrogen Sulphide CO = Carbon Monoxide NR = Not Recorded PID = Photo Ionisation Detector

GWL = Groundwater level measured from ground surface and top of standpipe.

Base = Base of standpipe measured from ground surface.

Monitoring point				Gas Concentration								Pressure	Flow rate	Vapour	Comments
Borehole	GWL Ground (m)	GWL Pipe (m)	Base Ground (m)	Steady			Peak		Minimum	Peak		Baro - metric (mb)	Steady (l/hr)	PID (ppm)	
				CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)				
WS04	3.58	3.46	3.97	0.1	5.7	11.9	0.1	5.7	11.9	0	0	1025	0.2	6.9	
WS03	2.91	2.77	4.01	0.1	3.7	14.7	0.1	3.8	14.7	0	0	1025	0.2	20.7	
WS02	2.33	2.23	3.96	0.0	3.4	14.4	0.1	3.4	14.3	0	0	1025	0.2	18.9	
WS07	1.59	1.45	3.86	0.0	4.3	15.2	0.1	4.4	15.2	0	0	1025	0.2	10.9	
WS08	1.72	1.59	3.87	0.1	2.0	18.9	0.1	2.0	18.9	0	0	1025	0.1	9.7	
WS09	1.76	1.62	3.97	0.0	1.1	18.7	0.0	1.1	18.7	0	0	1025	0.2	9.7	
WS10	1.98	1.81	3.88	0.0	3.5	18.1	0.1	3.5	18.1	0	0	1025	0.1	20.4	



Gas Monitoring Record

Project Name: Land at Bilsham Road, Yapton

Client: Gleeson Developments

Project No: BRD2693

Date:	21/11/2017	Ground conditions:	Wet	Recorded by:	NK
Time at start:	11:08 AM	Weather conditions:	Overcast	Pressure trend:	Falling
Time at finish:	12:49 PM	Air Temperature (°C):	12	Monitor serial no:	G501688

The gas monitoring equipment is a Geotech GA5000 portable analyser. As per manufacturers recommendations this is factory calibrated every six months and in addition BRD undertake calibration checks against bottled standard gases on at least a monthly basis. Gas monitor pump is run for three minutes unless otherwise stated and the steady readings are an average reading taken over this pump run time. Vapour monitoring equipment is miniRAE lite PGM-7350 Photo Ionisation Detector (PID) with 10.6 eV lamp calibrated for isobutylene. PID calibration check is performed on site against ambient air and also against a 100ppm isobutylene standard gas. Barometric pressure trend and ambient air temperature is recorded from weather websites at the nearest reported weather station.

CH₄ = Methane CO₂ = Carbon Dioxide O₂ = Oxygen H₂S = Hydrogen Sulphide CO = Carbon Monoxide NR = Not Recorded PID = Photo Ionisation Detector

GWL = Groundwater level measured from ground surface and top of standpipe.

Base = Base of standpipe measured from ground surface.

Monitoring point				Gas Concentration								Pressure	Flow rate	Vapour	Comments
Borehole	GWL Ground (m)	GWL Pipe (m)	Base Ground (m)	Steady			Peak		Minimum	Peak		Baro - metric (mb)	Steady (l/hr)	PID (ppm)	
				CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)				
WS04	3.62	3.50	3.96	0.1	5.7	11.9	0.1	5.8	11.9	0	0	1012	0.2	6.9	
WS03	3.02	2.85	4.02	0.1	3.9	14.5	0.1	3.9	14.5	0	0	1013	0.2	19.3	
WS02	2.44	2.34	3.96	0.1	3.3	13.7	0.1	3.4	13.7	0	0	1013	0.2	20.3	
WS07	1.60	1.47	3.87	0.1	4.2	15.0	0.1	4.2	15.0	0	0	1013	0.2	12.5	
WS08	1.77	1.65	3.86	0.1	2.4	18.9	0.1	2.4	18.9	0	0	1013	0.3	13.9	
WS09	1.79	1.65	3.98	0.1	2.0	16.1	0.1	2.0	16.1	0	0	1014	0.2	11.5	
WS10	2.02	1.87	3.90	0.1	3.6	17.7	0.1	3.6	17.7	0	0	1013	0.2	18.4	



Gas Monitoring Record

Project Name: Land at Bilsham Road, Yapton

Client: Gleeson Developments

Project No: BRD2693

Date: 29/11/2017 Ground conditions: Wet Recorded by: NK
 Time at start: 11:21 AM Weather conditions: Cloudy Pressure trend: Steady
 Time at finish: 1:09 PM Air Temperature (°C): 4 Monitor serial no: G501688

The gas monitoring equipment is a Geotech GA5000 portable analyser. As per manufacturers recommendations this is factory calibrated every six months and in addition BRD undertake calibration checks against bottled standard gases on at least a monthly basis. Gas monitor pump is run for three minutes unless otherwise stated and the steady readings are an average reading taken over this pump run time. Vapour monitoring equipment is miniRAE lite PGM-7350 Photo Ionisation Detector (PID) with 10.6 eV lamp calibrated for isobutylene. PID calibration check is performed on site against ambient air and also against a 100ppm isobutylene standard gas. Barometric pressure trend and ambient air temperature is recorded from weather websites at the nearest reported weather station.

CH₄ = Methane CO₂ = Carbon Dioxide O₂ = Oxygen H₂S = Hydrogen Sulphide CO = Carbon Monoxide NR = Not Recorded PID = Photo Ionisation Detector

GWL = Groundwater level measured from ground surface and top of standpipe.

Base = Base of standpipe measured from ground surface.

Monitoring point				Gas Concentration								Pressure	Flow rate	Vapour	Comments
Borehole	GWL Ground (m)	GWL Pipe (m)	Base Ground (m)	Steady			Peak		Minimum	Peak		Baro - metric (mb)	Steady (l/hr)	PID (ppm)	
				CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CO (ppm)	H ₂ S (ppm)				
WS04	3.51	3.39	3.97	0.1	5.9	12.0	0.2	5.9	12.0	0	0	1010	0.2	3.6	
WS03	2.89	2.74	4.01	0.1	4.0	15.6	0.1	4.0	15.6	0	0	1010	0.2	12.0	
WS02	2.24	2.13	3.96	0.1	2.8	15.2	0.1	2.9	15.1	0	0	1010	0.2	12.0	
WS07	1.53	1.39	3.84	0.1	4.3	15.6	0.1	4.3	15.6	0	0	1011	0.1	7.1	
WS08	1.67	1.55	3.86	0.0	2.2	16.8	0.1	2.2	16.8	0	0	1010	0.3	5.0	
WS09	1.74	1.60	3.98	0.1	2.6	16.7	0.1	2.6	16.7	0	0	1011	0.2	5.9	
WS10	1.94	1.80	3.90	0.1	3.8	17.1	0.1	3.8	17.0	0	0	1011	0.0	11.9	



Groundwater Monitoring Record

Project: Land at Bilsham Road, Yapton
Client: Gleeson Developments
Project No: BRD2693

Borehole name	Date	Monitored by (initials)	Borehole depth (m)	Qty free product detected (mm)	Groundwater level below ground surface (m)	Groundwater level below top of standpipe (m)	Amount purged (l)	Post purge groundwater level below top of standpipe (m)	Comments
WS04	25/10/2017	AN	3.98	0.00	3.58	3.44	n/a	n/a	No odour noted on retrieval of interface meter.
WS03	25/10/2017	AN	4.01	0.00	2.94	2.79	n/a	n/a	No odour noted on retrieval of interface meter.
WS02	25/10/2017	AN	3.96	0.00	2.42	2.30	n/a	n/a	No odour noted on retrieval of interface meter.
WS07	25/10/2017	AN	3.89	0.00	1.69	1.54	n/a	n/a	No odour noted on retrieval of interface meter.
WS08	25/10/2017	AN	3.89	0.00	1.83	1.71	n/a	n/a	No odour noted on retrieval of interface meter. Borehole located immediately next to a dry ditch.
WS09	25/10/2017	AN	3.99	0.00	1.80	1.66	n/a	n/a	No odour noted on retrieval of interface meter.
WS10	25/10/2017	AN	3.00	0.00	2.03	1.88	n/a	n/a	No odour noted on retrieval of interface meter.



Groundwater Monitoring Record

Project: Land at Bilsham Road, Yapton
 Client: Gleeson Developments
 Project No: BRD2693

Borehole name	Date	Monitored by (initials)	Borehole depth (m)	Qty free product detected (mm)	Groundwater level below ground surface (m)	Groundwater level below top of standpipe (m)	Amount purged (l)	Post purge groundwater level below top of standpipe (m)	Comments
WS04	31/10/2017	AN	3.97	0.00	3.63	3.51	n/a	n/a	No odour noted on retrieval of interface meter.
WS03	31/10/2017	AN	4.00	0.00	3.03	2.87	n/a	n/a	No odour noted on retrieval of interface meter.
WS02	31/10/2017	AN	3.95	0.00	2.52	2.40	n/a	n/a	No odour noted on retrieval of interface meter.
WS07	31/10/2017	AN	3.85	0.00	1.70	1.56	n/a	n/a	No odour noted on retrieval of interface meter.
WS08	31/10/2017	AN	3.89	0.00	1.88	1.75	n/a	n/a	No odour noted on retrieval of interface meter. Borehole located immediately next to a dry ditch.
WS09	31/10/2017	AN	3.99	0.00	1.84	1.71	n/a	n/a	No odour noted on retrieval of interface meter.
WS10	31/10/2017	AN	3.97	0.00	2.08	1.93	n/a	n/a	No odour noted on retrieval of interface meter.



Groundwater Monitoring Record

Project: Land at Bilsham Road, Yapton
 Client: Gleeson Developments
 Project No: BRD2693

Borehole name	Date	Monitored by (initials)	Borehole depth (m)	Qty free product detected (mm)	Groundwater level below ground surface (m)	Groundwater level below top of standpipe (m)	Amount purged (l)	Post purge groundwater level below top of standpipe (m)	Comments
WS04	07/11/2017	NK	3.95	0.00	3.67	3.55	n/a	n/a	No odour noted on retrieval of interface meter.
WS03	07/11/2017	NK	4.01	0.00	3.07	2.92	n/a	n/a	No odour noted on retrieval of interface meter.
WS02	07/11/2017	NK	3.94	0.00	2.53	2.43	n/a	n/a	No odour noted on retrieval of interface meter.
WS07	07/11/2017	NK	3.88	0.00	1.69	1.55	n/a	n/a	No odour noted on retrieval of interface meter.
WS08	07/11/2017	NK	3.89	0.00	1.86	1.73	n/a	n/a	No odour noted on retrieval of interface meter. Borehole located immediately next to a dry ditch.
WS09	07/11/2017	NK	3.98	0.00	1.83	1.70	n/a	n/a	No odour noted on retrieval of interface meter.
WS10	07/11/2017	NK	3.93	0.00	2.08	1.93	n/a	n/a	No odour noted on retrieval of interface meter.



Groundwater Monitoring Record

Project: Land at Bilsham Road, Yapton
 Client: Gleeson Developments
 Project No: BRD2693

Borehole name	Date	Monitored by (initials)	Borehole depth (m)	Qty free product detected (mm)	Groundwater level below ground surface (m)	Groundwater level below top of standpipe (m)	Amount purged (l)	Post purge groundwater level below top of standpipe (m)	Comments
WS04	14/11/2017	NK	3.97	0.00	3.58	3.46	n/a	n/a	No odour noted on retrieval of interface meter.
WS03	14/11/2017	NK	4.01	0.00	2.91	2.77	n/a	n/a	No odour noted on retrieval of interface meter.
WS02	14/11/2017	NK	3.96	0.00	2.33	2.23	n/a	n/a	No odour noted on retrieval of interface meter.
WS07	14/11/2017	NK	3.86	0.00	1.59	1.45	n/a	n/a	No odour noted on retrieval of interface meter.
WS08	14/11/2017	NK	3.87	0.00	1.72	1.59	n/a	n/a	No odour noted on retrieval of interface meter. Borehole located immediately next to a dry ditch.
WS09	14/11/2017	NK	3.97	0.00	1.76	1.62	n/a	n/a	No odour noted on retrieval of interface meter.
WS10	14/11/2017	NK	3.88	0.00	1.98	1.81	n/a	n/a	No odour noted on retrieval of interface meter.



Groundwater Monitoring Record

Project: Land at Bilsham Road, Yapton
 Client: Gleeson Developments
 Project No: BRD2693

Borehole name	Date	Monitored by (initials)	Borehole depth (m)	Qty free product detected (mm)	Groundwater level below ground surface (m)	Groundwater level below top of standpipe (m)	Amount purged (l)	Post purge groundwater level below top of standpipe (m)	Comments
WS04	21/11/2017	NK	3.96	0.00	3.62	3.50	n/a	n/a	No odour noted on retrieval of interface meter.
WS03	21/11/2017	NK	4.02	0.00	3.02	2.85	n/a	n/a	No odour noted on retrieval of interface meter.
WS02	21/11/2017	NK	3.96	0.00	2.44	2.34	n/a	n/a	No odour noted on retrieval of interface meter.
WS07	21/11/2017	NK	3.87	0.00	1.60	1.47	n/a	n/a	No odour noted on retrieval of interface meter.
WS08	21/11/2017	NK	3.86	0.00	1.77	1.65	n/a	n/a	No odour noted on retrieval of interface meter. Borehole located immediately next to a dry ditch.
WS09	21/11/2017	NK	3.98	0.00	1.79	1.65	n/a	n/a	No odour noted on retrieval of interface meter.
WS10	21/11/2017	NK	3.90	0.00	2.02	1.87	n/a	n/a	No odour noted on retrieval of interface meter.

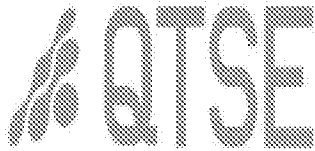


Groundwater Monitoring Record

Project: Land at Bilsham Road, Yapton
 Client: Gleeson Developments
 Project No: BRD2693

Borehole name	Date	Monitored by (initials)	Borehole depth (m)	Qty free product detected (mm)	Groundwater level below ground surface (m)	Groundwater level below top of standpipe (m)	Amount purged (l)	Post purge groundwater level below top of standpipe (m)	Comments
WS04	29/11/2017	NK	3.97	0.00	3.51	3.39	n/a	n/a	No odour noted on retrieval of interface meter.
WS03	29/11/2017	NK	4.01	0.00	2.89	2.74	n/a	n/a	No odour noted on retrieval of interface meter.
WS02	29/11/2017	NK	3.96	0.00	2.24	2.13	n/a	n/a	No odour noted on retrieval of interface meter.
WS07	29/11/2017	NK	3.84	0.00	1.53	1.39	n/a	n/a	No odour noted on retrieval of interface meter.
WS08	29/11/2017	NK	3.86	0.00	1.67	1.55	n/a	n/a	No odour noted on retrieval of interface meter. Borehole located immediately next to a dry ditch.
WS09	29/11/2017	NK	3.98	0.00	1.74	1.60	n/a	n/a	No odour noted on retrieval of interface meter.
WS10	29/11/2017	NK	3.90	0.00	1.94	1.80	n/a	n/a	No odour noted on retrieval of interface meter.

APPENDIX 3



Andy Plant
BRD Environmental Ltd
Hawthorne Villa
1 Old Parr Road
Banbury
Oxfordshire
OX16 5HT

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



QTS Environmental Report No: 17-66060

Site Reference: Bilsham Road, Yapton

Project / Job Ref: BRD 2693

Order No: None Supplied

Sample Receipt Date: 24/10/2017

Sample Scheduled Date: 24/10/2017

Report Issue Number: 1

Reporting Date: 30/10/2017

Authorised by:



Russell Jarvis
Associate Director of Client Services

Authorised by:



Dave Ashworth
Deputy Quality Manager

QTSE is the trading name of DETS Ltd, company registration number 03705645



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



Soil Analysis Certificate						
QTS Environmental Report No: 17-66060	Date Sampled	18/10/17	18/10/17	19/10/17	20/10/17	20/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP13	TP16	WS01	WS07	WS10
Project / Job Ref: BRD 2693	Additional Refs	J2	J2	J2	J2	J3
Order No: None Supplied	Depth (m)	0.70	0.90	0.90	0.70	0.80
Reporting Date: 30/10/2017	QTSE Sample No	297753	297754	297755	297756	297757

Determinand	Unit	RL	Accreditation					
Asbestos Quantification ^(S)	%	< 0.001	ISO17025					
pH	pH Units	N/a	MCERTS	7.8	7.4	7.2	8.3	7.5
Total Sulphate as SO ₄	mg/kg	< 200	NONE					
Total Sulphate as SO ₄	%	< 0.02	NONE					
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	159	27	24	16	15
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.16	0.03	0.02	0.02	0.02
Total Sulphur	%	< 0.02	NONE					
Organic Matter	%	< 0.1	MCERTS	0.5	0.6	0.5	0.1	0.6
Arsenic (As)	mg/kg	< 2	MCERTS	12	9	9	3	10
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	29	23	26	11	27
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	19	11	12	6	12
Lead (Pb)	mg/kg	< 3	MCERTS	30	12	14	7	12
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	21	14	22	7	20
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	80	47	48	23	50

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



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



Soil Analysis Certificate						
QTS Environmental Report No: 17-66060	Date Sampled	17/10/17	17/10/17	17/10/17	17/10/17	17/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP01	TP02	TP03	TP05	TP06
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	J1
Order No: None Supplied	Depth (m)	0.20	0.10	0.20	0.20	0.10
Reporting Date: 30/10/2017	QTSE Sample No	297758	297759	297760	297761	297762

Determinand	Unit	RL	Accreditation					
Asbestos Quantification ^(S)	%	< 0.001	ISO17025		< 0.001	< 0.001		
pH	pH Units	N/a	MCERTS	7.0	6.9	6.7	6.4	7.3
Total Sulphate as SO ₄	mg/kg	< 200	NONE					
Total Sulphate as SO ₄	%	< 0.02	NONE					
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	21	19	16	15	14
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02	0.02	0.02	0.01	0.01
Total Sulphur	%	< 0.02	NONE					
Organic Matter	%	< 0.1	MCERTS	1.6	1.2	2	1.3	2
Arsenic (As)	mg/kg	< 2	MCERTS	7	5	7	6	8
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	18	14	18	17	20
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	9	8	10	9	10
Lead (Pb)	mg/kg	< 3	MCERTS	15	15	17	18	15
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	10	8	12	10	11
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	38	37	44	42	40

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



QTS Environmental Ltd
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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN



Soil Analysis Certificate						
QTS Environmental Report No: 17-66060	Date Sampled	17/10/17	18/10/17	18/10/17	18/10/17	19/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP09	TP11	TP13	TP18	WS02
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	J2
Order No: None Supplied	Depth (m)	0.20	0.20	0.20	0.20	0.50
Reporting Date: 30/10/2017	QTSE Sample No	297763	297764	297765	297766	297767

Determinand	Unit	RL	Accreditation					
Asbestos Quantification ^(S)	%	< 0.001	ISO17025				< 0.001	
pH	pH Units	N/a	MCERTS	6.8	6.4	6.0	6.3	7.5
Total Sulphate as SO ₄	mg/kg	< 200	NONE					
Total Sulphate as SO ₄	%	< 0.02	NONE					
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	21	15	24	28	16
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02	0.02	0.02	0.03	0.02
Total Sulphur	%	< 0.02	NONE					
Organic Matter	%	< 0.1	MCERTS	1.8	1.8	1.9	2.1	0.6
Arsenic (As)	mg/kg	< 2	MCERTS	8	7	8	7	11
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	19	19	19	16	29
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	9	9	10	10	15
Lead (Pb)	mg/kg	< 3	MCERTS	13	15	16	17	11
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	11	11	12	10	31
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	38	40	41	39	53

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



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



Soil Analysis Certificate						
QTS Environmental Report No: 17-66060	Date Sampled	19/10/17	19/10/17	20/10/17	20/10/17	20/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	WS03	WS05	WS07	WS08	WS09
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	J1
Order No: None Supplied	Depth (m)	0.20	0.20	0.10	0.20	0.10
Reporting Date: 30/10/2017	QTSE Sample No	297768	297769	297770	297771	297772

Determinand	Unit	RL	Accreditation					
Asbestos Quantification ^(S)	%	< 0.001	ISO17025			< 0.001		< 0.001
pH	pH Units	N/a	MCERTS	7.4	6.2	7.0	7.0	6.9
Total Sulphate as SO ₄	mg/kg	< 200	NONE					
Total Sulphate as SO ₄	%	< 0.02	NONE					
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	17	18	16	17	15
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02	0.02	0.02	0.02	0.02
Total Sulphur	%	< 0.02	NONE					
Organic Matter	%	< 0.1	MCERTS	1.7	2.4	2.5	2.4	2.4
Arsenic (As)	mg/kg	< 2	MCERTS	8	7	6	6	6
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	20	18	18	19	17
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	14	10	10	8	8
Lead (Pb)	mg/kg	< 3	MCERTS	24	19	13	13	13
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	12	10	11	10	9
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	52	43	43	39	37

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



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



Soil Analysis Certificate						
QTS Environmental Report No: 17-66060	Date Sampled	17/10/17	17/10/17	18/10/17	18/10/17	18/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP07	TP08	TP10	TP12	TP16
Project / Job Ref: BRD 2693	Additional Refs	D1	D1	D2	D1	D1
Order No: None Supplied	Depth (m)	1.00	1.00	1.70	1.00	1.50
Reporting Date: 30/10/2017	QTSE Sample No	297773	297774	297775	297776	297777

Determinand	Unit	RL	Accreditation					
Asbestos Quantification ^(S)	%	< 0.001	ISO17025					
pH	pH Units	N/a	MCERTS	7.8	8.2	8.7	7.2	8.3
Total Sulphate as SO ₄	mg/kg	< 200	NONE	< 200	< 200	274	< 200	< 200
Total Sulphate as SO ₄	%	< 0.02	NONE	< 0.02	< 0.02	0.03	< 0.02	< 0.02
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	12	10	< 10	12	11
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.01	0.01	< 0.01	0.01	0.01
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 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					

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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
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Soil Analysis Certificate						
QTS Environmental Report No: 17-66060	Date Sampled	19/10/17	20/10/17	20/10/17		
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Bilsham Road, Yapton	TP / BH No	WS02	WS06	WS08		
Project / Job Ref: BRD 2693	Additional Refs	D2	D2	D1		
Order No: None Supplied	Depth (m)	2.00	2.00	1.00		
Reporting Date: 30/10/2017	QTSE Sample No	297778	297779	297780		

Determinand	Unit	RL	Accreditation				
Asbestos Quantification ^(S)	%	< 0.001	ISO17025				
pH	pH Units	N/a	MCERTS	8.4	8.2	8.0	
Total Sulphate as SO ₄	mg/kg	< 200	NONE	224	< 200	< 200	
Total Sulphate as SO ₄	%	< 0.02	NONE	0.02	< 0.02	< 0.02	
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	< 10	12	< 10	
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	< 0.01	0.01	< 0.01	
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	< 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				

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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
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Soil Analysis Certificate - Speciated PAHs

QTS Environmental Report No: 17-66060	Date Sampled	18/10/17	18/10/17	19/10/17	20/10/17	20/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP13	TP16	WS01	WS07	WS10
Project / Job Ref: BRD 2693	Additional Refs	J2	J2	J2	J2	J3
Order No: None Supplied	Depth (m)	0.70	0.90	0.90	0.70	0.80
Reporting Date: 30/10/2017	QTSE Sample No	297753	297754	297755	297756	297757

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	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 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	< 0.1	< 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	< 1.6	< 1.6

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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
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Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 17-66060	Date Sampled	17/10/17	17/10/17	17/10/17	17/10/17	17/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP01	TP02	TP03	TP05	TP06
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	J1
Order No: None Supplied	Depth (m)	0.20	0.10	0.20	0.20	0.10
Reporting Date: 30/10/2017	QTSE Sample No	297758	297759	297760	297761	297762

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	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 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	0.14
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.13
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	< 0.1	< 0.1	< 0.1	0.11
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	< 1.6	< 1.6

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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
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Soil Analysis Certificate - Speciated PAHs

QTS Environmental Report No: 17-66060	Date Sampled	17/10/17	18/10/17	18/10/17	18/10/17	19/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP09	TP11	TP13	TP18	WS02
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	J2
Order No: None Supplied	Depth (m)	0.20	0.20	0.20	0.20	0.50
Reporting Date: 30/10/2017	QTSE Sample No	297763	297764	297765	297766	297767

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	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 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	< 0.1	< 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	< 1.6	< 1.6

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



QTSE Environmental Ltd
Unit 1, Rose Lane Industrial Estate
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Maidstone
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Soil Analysis Certificate - Speciated PAHs

QTS Environmental Report No: 17-66060	Date Sampled	19/10/17	19/10/17	20/10/17	20/10/17	20/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	WS03	WS05	WS07	WS08	WS09
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	J1
Order No: None Supplied	Depth (m)	0.20	0.20	0.10	0.20	0.10
Reporting Date: 30/10/2017	QTSE Sample No	297768	297769	297770	297771	297772

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	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 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	< 0.1	< 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	< 1.6	< 1.6

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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
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Soil Analysis Certificate - TPH LQM Banded

QTS Environmental Report No: 17-66060	Date Sampled	18/10/17	18/10/17	19/10/17	20/10/17	20/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP13	TP16	WS01	WS07	WS10
Project / Job Ref: BRD 2693	Additional Refs	J2	J2	J2	J2	J3
Order No: None Supplied	Depth (m)	0.70	0.90	0.90	0.70	0.80
Reporting Date: 30/10/2017	QTSE Sample No	297753	297754	297755	297756	297757

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	< 2	< 2	< 2	< 2
Aliphatic > C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic > C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic > C16 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aliphatic > C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	< 10
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	< 30	< 30	< 30
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	< 2	< 2	< 2	< 2
Aromatic > C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic > C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic > C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aromatic > C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aromatic > C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	< 10
Aromatic (> C5 - C44)	mg/kg	< 30	NONE	< 30	< 30	< 30	< 30	< 30
Total > C5 - C44	mg/kg	< 60	NONE	< 60	< 60	< 60	< 60	< 60

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



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Unit 1, Rose Lane Industrial Estate
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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 17-66060	Date Sampled	18/10/17	18/10/17	19/10/17	20/10/17	20/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP13	TP16	WS01	WS07	WS10
Project / Job Ref: BRD 2693	Additional Refs	J2	J2	J2	J2	J3
Order No: None Supplied	Depth (m)	0.70	0.90	0.90	0.70	0.80
Reporting Date: 30/ 10/ 2017	QTSE Sample No	297753	297754	297755	297756	297757

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	< 2	< 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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Unit 1, Rose Lane Industrial Estate
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Soil Analysis Certificate - Semi Volatile Organic Compounds (SVOC)					
QTS Environmental Report No: 17-66060	Date Sampled	18/10/17	18/10/17	20/10/17	20/10/17
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bilsham Road, Yapton	TP / BH No	TP13	TP16	WS07	WS10
Project / Job Ref: BRD 2693	Additional Refs	J2	J2	J2	J3
Order No: None Supplied	Depth (m)	0.70	0.90	0.70	0.80
Reporting Date: 30/10/2017	QTSE Sample No	297753	297754	297756	297757

Determinand	Unit	RL	Accreditation					
Phenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitrophenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Nitrobenzene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
0-Cresol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
bis(2-chloroethoxy)methane	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
bis(2-chloroethyl)ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dichlorobenzene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	mg/kg	< 0.15	ISO17025	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
Isophorone	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachloroethane	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
p-Cresol	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
2,4,6-Trichlorophenol	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
2-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethyl phthalate	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloroaniline	mg/kg	< 0.15	NONE	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
4-Nitrophenol	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenyl phenyl ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitroaniline	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenyl phenyl ether	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibutyl phthalate	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	mg/kg	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
bis(2-ethylhexyl)phthalate	mg/kg	< 0.15	MCERTS	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
Benzyl butyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octyl phthalate	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

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



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Maidstone
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Soil Analysis Certificate - Organochlorine Pesticides						
QTS Environmental Report No: 17-66060	Date Sampled	17/10/17	17/10/17	18/10/17	18/10/17	
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Bilsham Road, Yapton	TP / BH No	TP01	TP03	TP13	TP18	
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	
Order No: None Supplied	Depth (m)	0.20	0.20	0.20	0.20	
Reporting Date: 30/10/2017	QTSE Sample No	297758	297760	297765	297766	

Determinand	Unit	RL	Accreditation					
Aldrin	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
alpha-HCH	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
beta-HCH	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
cis-chlordane	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
delta-HCH	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dieldrin	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Endosulfan A	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Endosulfan B	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Endrin	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
gamma-HCH (Lindane)	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Heptachlor	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Heptachlor epoxide	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Hexachlorobenzene (HCB)	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Isodrin	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Methoxychlor	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
o,p' - DDD	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
o,p' - DDE	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
o,p' - DDT	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
p,p' - DDD	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
p,p' - DDE	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
p,p' - DDT	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
trans-chlordane	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Trifluralin	mg/kg	< 0.02	NONE	< 0.02	< 0.02	< 0.02	< 0.02	< 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						
QTS Environmental Report No: 17-66060	Date Sampled	17/10/17	17/10/17	18/10/17	18/10/17	
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Bilsham Road, Yapton	TP / BH No	TP01	TP03	TP13	TP18	
Project / Job Ref: BRD 2693	Additional Refs	J1	J1	J1	J1	
Order No: None Supplied	Depth (m)	0.20	0.20	0.20	0.20	
Reporting Date: 30/ 10/ 2017	QTSE Sample No	297758	297760	297765	297766	

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

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



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Waste Acceptance Criteria Analytical Certificate - BS EN 12457/ 3

QTS Environmental Report No: 17-66060		Date Sampled	19/10/17		Landfill Waste Acceptance Criteria Limits		
BRD Environmental Ltd		Time Sampled	None Supplied		Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Site Reference: Bilsham Road, Yapton		TP / BH No	WS02				
Project / Job Ref: BRD 2693		Additional Refs	J2				
Order No: None Supplied		Depth (m)	0.50				
Reporting Date: 30/ 10/ 2017		QTSE Sample No	297767				
Determinand	Unit	MDL					
TOC ^{MU}	%	< 0.1	0.3		3%	5%	6%
Loss on Ignition	%	< 0.01	2.40		--	--	10%
BTEX ^{MU}	mg/kg	< 0.05	< 0.05		6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1		1	--	--
Mineral Oil ^{MU}	mg/kg	< 10	< 10		500	--	--
Total PAH ^{MU}	mg/kg	< 1.7	< 1.7		100	--	--
pH ^{MU}	pH Units	N/a	7.5		--	> 6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1		--	To be evaluated	To be evaluated

Eluate Analysis		2:1 mg/ l	8:1 mg/ l	Cumulative 10:1 mg/ kg	Limit values for compliance leaching test using BS EN 12457-3 at L/ S 10 l/ kg (mg/ kg)		
Arsenic ^U		< 0.01	< 0.01	< 0.2	0.5	2	25
Barium ^U		< 0.02	< 0.02	< 0.1	20	100	300
Cadmium ^U		< 0.0005	< 0.0005	< 0.02	0.04	1	5
Chromium ^U		< 0.005	< 0.005	< 0.20	0.5	10	70
Copper ^U		< 0.01	< 0.01	< 0.5	2	50	100
Mercury ^U		< 0.005	< 0.005	< 0.01	0.01	0.2	2
Molybdenum ^U		< 0.001	< 0.001	< 0.1	0.5	10	30
Nickel ^U		< 0.007	< 0.007	< 0.2	0.4	10	40
Lead ^U		< 0.005	< 0.005	< 0.2	0.5	10	50
Antimony ^U		< 0.005	< 0.005	< 0.06	0.06	0.7	5
Selenium ^U		< 0.005	< 0.005	< 0.1	0.1	0.5	7
Zinc ^U		< 0.005	< 0.005	< 0.2	4	50	200
Chloride ^U		5	4	40	800	15000	25000
Fluoride ^U		< 0.5	< 0.5	< 1	10	150	500
Sulphate ^U		4	2	< 20	1000	20000	50000
TDS		46	29	305	4000	60000	100000
Phenol Index		< 0.01	< 0.01	< 0.5	1	-	-
DOC		3.8	5.2	51	500	800	1000

Leach Test Information							
Sample Mass (kg)		0.20					
Dry Matter (%)		86.6					
Moisture (%)		15.4					
Stage 1							
Volume Eluate L2 (litres)		0.32					
Filtered Eluate VE1 (litres)		0.15					

Results are expressed on a dry weight basis, after correction for moisture content where applicable
 Stated limits are for guidance only and QTS Environmental cannot be held responsible for any discrepancies with current legislation
 M Denotes MCERTS accredited test
 U Denotes ISO17025 accredited test



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Soil Analysis Certificate - Sample Descriptions

QTS Environmental Report No: 17-66060

BRD Environmental Ltd

Site Reference: Bilsham Road, Yapton

Project / Job Ref: BRD 2693

Order No: None Supplied

Reporting Date: 30/ 10/ 2017

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
297753	TP13	J2	0.70	12.7	Brown sandy clay
297754	TP16	J2	0.90	11.4	Brown sandy clay
297755	WS01	J2	0.90	14	Brown sandy clay
297756	WS07	J2	0.70	8	Brown sandy clay
297757	WS10	J3	0.80	15.2	Brown sandy clay
297758	TP01	J1	0.20	12.8	Brown sandy clay with vegetation
297759	TP02	J1	0.10	11.6	Brown sandy clay
297760	TP03	J1	0.20	15.1	Brown sandy clay with vegetation
297761	TP05	J1	0.20	15.1	Brown sandy clay
297762	TP06	J1	0.10	12.7	Brown sandy clay
297763	TP09	J1	0.20	12.8	Brown sandy clay
297764	TP11	J1	0.20	13.9	Brown sandy clay
297765	TP13	J1	0.20	13.7	Brown sandy clay
297766	TP18	J1	0.20	13.2	Brown sandy clay
297767	WS02	J2	0.50	13.4	Brown sandy clay
297768	WS03	J1	0.20	15.1	Brown sandy clay
297769	WS05	J1	0.20	11	Brown sandy clay
297770	WS07	J1	0.10	13.8	Brown sandy clay
297771	WS08	J1	0.20	11.3	Brown sandy clay
297772	WS09	J1	0.10	14.5	Brown sandy clay
297773	TP07	D1	1.00	12.6	Brown sandy clay
297774	TP08	D1	1.00	15.5	Brown sandy clay
297775	TP10	D2	1.70	15.4	Light grey sandy clay
297776	TP12	D1	1.00	14.6	Brown sandy clay
297777	TP16	D1	1.50	12.1	Brown sandy clay
297778	WS02	D2	2.00	10.4	Brown sandy clay with stones
297779	WS06	D2	2.00	14.7	Brown sandy clay
297780	WS08	D1	1.00	16.4	Brown sandy clay

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

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 17-66060

BRD Environmental Ltd

Site Reference: Bilsham Road, Yapton

Project / Job Ref: BRD 2693

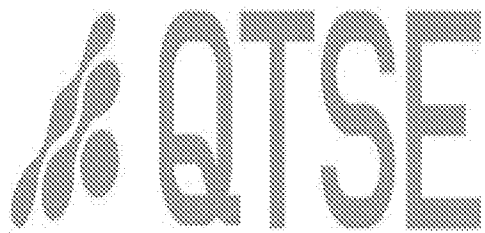
Order No: None Supplied

Reporting Date: 30/10/2017

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



Anthony Neyt
BRD Environmental Ltd
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QTS Environmental Report No: 18-69875

Site Reference: Bilsham Road, Yapton

Project / Job Ref: BRD2693

Order No: None Supplied

Sample Receipt Date: 25/01/2018

Sample Scheduled Date: 25/01/2018

Report Issue Number: 2

Reporting Date: 12/02/2018

Authorised by:



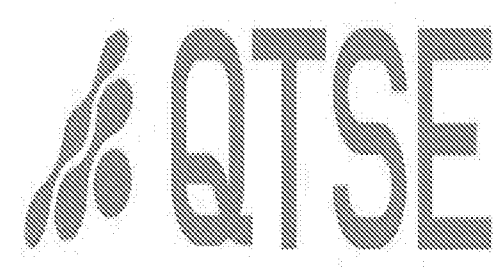
Russell Jarvis
Associate Director of Client Services

Authorised by:



Dave Ashworth
Deputy Quality Manager

QTS Environmental is the trading name of DETS Ltd, company registration number 03705645



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Soil Analysis Certificate						
QTS Environmental Report No: 18-69875	Date Sampled	19/01/18	19/01/18			
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Bilsham Road, Yapton	TP / BH No	HD01	WS11			
Project / Job Ref: BRD2693	Additional Refs	J1	J1			
Order No: None Supplied	Depth (m)	0.15	0.15			
Reporting Date: 12/ 02/ 2018	QTSE Sample No	313071	313072			

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	5.2	4.9			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	265	31			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.26	0.03			
Organic Matter	%	< 0.1	MCERTS	2.7	2.7			
Arsenic (As)	mg/kg	< 2	MCERTS	10	5			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	24	24			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	12	16			
Lead (Pb)	mg/kg	< 3	MCERTS	27	32			
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	12	13			
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3			
Zinc (Zn)	mg/kg	< 3	MCERTS	56	54			

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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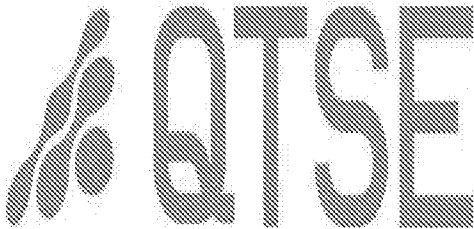


Soil Analysis Certificate - Speciated PAHs

QTS Environmental Report No: 18-69875	Date Sampled	19/01/18	19/01/18			
BRD Environmental Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Bilsham Road, Yapton	TP / BH No	HD01	WS11			
Project / Job Ref: BRD2693	Additional Refs	J1	J1			
Order No: None Supplied	Depth (m)	0.15	0.15			
Reporting Date: 12/ 02/ 2018	QTSE Sample No	313071	313072			

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Fluoranthene	mg/kg	< 0.1	MCERTS	0.14	< 0.1			
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6			

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



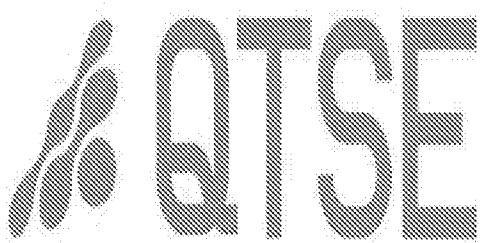
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Soil Analysis Certificate - Organochlorine Pesticides						
QTS Environmental Report No: 18-69875	Date Sampled	19/01/18				
BRD Environmental Ltd	Time Sampled	None Supplied				
Site Reference: Bilsham Road, Yapton	TP / BH No	HD01				
Project / Job Ref: BRD2693	Additional Refs	J1				
Order No: None Supplied	Depth (m)	0.15				
Reporting Date: 12/ 02/ 2018	QTSE Sample No	313071				

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 - Sample Descriptions	
QTS Environmental Report No: 18-69875	
BRD Environmental Ltd	
Site Reference: Bilsham Road, Yapton	
Project / Job Ref: BRD2693	
Order No: None Supplied	
Reporting Date: 12/ 02/ 2018	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
313071	HD01	J1	0.15	13.1	Brown sandy clay with vegetation
313072	WS11	J1	0.15	16.3	Brown sandy clay with vegetation

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

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information	
QTS Environmental Report No: 18-69875	
BRD Environmental Ltd	
Site Reference: Bilsham Road, Yapton	
Project / Job Ref: BRD2693	
Order No: None Supplied	
Reporting Date: 12/ 02/ 2018	

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

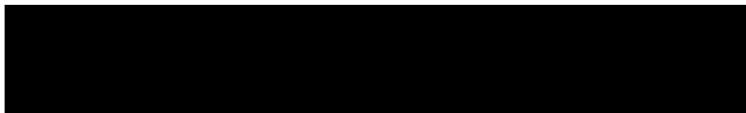
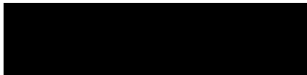
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AR As Received



TEST REPORT
ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 13/11/2017



0998

Contract		Bilsham Road, Yapton	
Serial No.		S31998	
Client: BRD Environmental Ltd BRD Environmental Ltd Hawthorne Villa 1 Old Parr Road Banbury Oxfordshire OX16 5HT		Soil Property Testing Ltd 15, 16, 18 Halcyon Court, St Margaret's Way, Stukeley Meadows, Huntingdon, Cambridgeshire, PE29 6DG  Website: www.soilpropertytesting.co.uk	
Samples Submitted By: BRD Environmental Ltd Samples Labelled: Bilsham Road, Yapton		Approved Signatories: ☒ J.C. Garner B.Eng (Hons) FGS Technical Director ☐ S.P. Townend FGS Quality Manager ☐ W. Johnstone Materials Lab Manager ☐ D. Sabnis Operations Manager 	
Date Received: 25/10/2017		Samples Tested Between: 25/10/2017 and 13/11/2017	
Remarks: For the attention of Mr A Plant Your Reference No: BRD2693			
Notes: 1 All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary. 2 (a) UKAS - United Kingdom Accreditation Service (b) Opinions and interpretations expressed herein are outside the scope of UKAS accreditation 3 Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory. 4 This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.			



TEST REPORT

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DATE ISSUED: 13/11/2017



0998

Contract		Bilsham Road, Yapton																		
Serial No.		S31998										Target Date		08/11/2017						
Scheduled By		BRD Environmental Ltd																		
SCHEDULE OF LABORATORY TESTS																				
Schedule Remarks																				
Bore Hole No.	Type	Sample Ref.	Top Depth	Water Content BS EN Liquid/Plastic Limits Wet Sieve Preparation PSD by Wet Sieve & Hydro																Sample Remarks
				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
TP01	D	1	1.00	1	1															
TP03	D	1	0.80	1	1	1														
TP08	B	1	2.80				1													
TP11	D	1	1.30	1	1															
TP14	D	1	1.70	1	1															
TP14	B	1	2.60				1													
TP17	D	1	2.80	1	1	1														
TP18	D	2	2.00	1	1															
WS05	D	4	3.50				1													
WS07	D	3	3.00				1													
WS09	D	1	1.00	1	1	1														
WS09	D	3	3.00	1	1	1														
Totals				8	8	4	4													End of Schedule



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Contract		Bilsham Road, Yapton												
Serial No.		S31998												
SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX														
Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti- city Index (%)	Liquid- ity Index (%)	SAMPLE PREPARATION				Description	CLASS
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
TP01	1.00	D	1	21.9	42	19	23	0.13	From Natural	0 (A)		24	Firm yellowish brown silty CLAY with rare recently active roots	CI
TP03	0.80	D	1	19.1	34	17	17	0.12	Wet Sieved	30 (M)	27.2*	96	Firm yellowish brown slightly gravelly slightly sandy silty CLAY with rare recently active roots. Gravel is fine to coarse chalk and flint	CL
TP11	1.30	D	1	19.7	38	16	22	0.17	From Natural	<1% (A)		24	Firm slightly friable yellowish brown slightly sandy silty CLAY with rare fine flint gravel and recently active roots. Sand is fine	CI
TP14	1.70	D	1	22.5	40	18	22	0.20	From Natural	0 (A)		24	Firm mottled light grey and brown silty CLAY	CI
TP17	2.80	D	1	20.6	28	15	13	0.43	Wet Sieved	8 (M)	22.4*	24	Soft yellowish brown slightly gravelly slightly sandy silty CLAY with rare recently active roots. Gravel is fine and medium chalk and rare flint	CL
TP18	2.00	D	2	22.5	34	18	16	0.28	From Natural	0 (A)		24	Soft yellowish brown silty CLAY	CL
WS09	1.00	D	1	15.0	23	14	9	0.11	Wet Sieved	22 (M)	19.2*	72	Stiff pale olive grey slightly gravelly slightly sandy silty CLAY with rare yellowish brown mottling. Gravel is fine to coarse chalk and flint	CL
WS09	3.00	D	3	18.9	23	15	8	0.48	Wet Sieved	35 (M)	29.0*	24	Stiff mottled yellow, light grey and brownish yellow slightly gravelly slightly sandy silty CLAY with rare black speckling. Gravel is fine and medium chalk and rare flint	CL
Method Of Preparation:				BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2										
Method of Test:				BS EN ISO: 17892-1: 2014 & BS1377:Part 2:1990:3.2, 4.4										
Type of Sample Key:				U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter										
Comments:				*Corrected water content assume material greater than 0.425mm is non-porous. See BS1377: Part 2: 1990: Clause 3 Note 1										
Remarks to Include:				Sample disturbance, loss of water, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110C										



TEST REPORT

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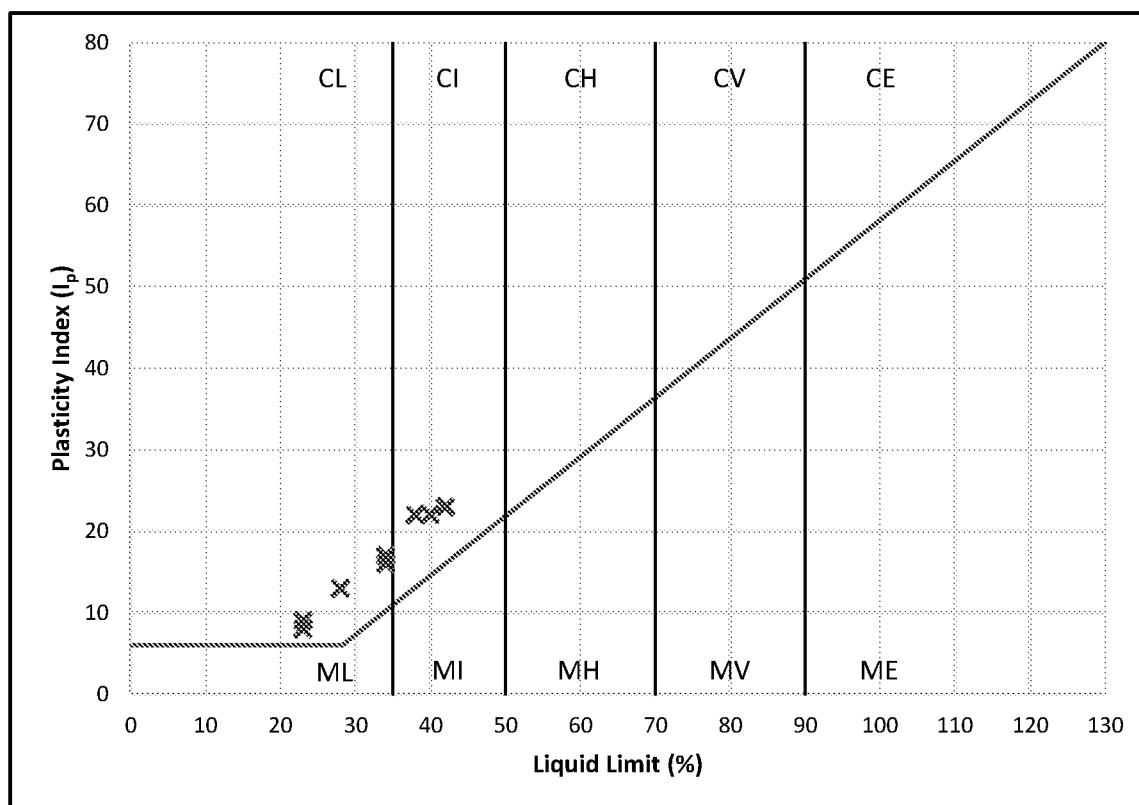


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Contract	Bilsham Road, Yapton
Serial No.	S31998

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High

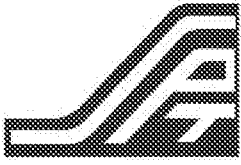


Plasticity Chart BS5930: 2015: Figure 8

High
Medium
Low

NHBC Volume Change Potential

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS1377: Part 2: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index



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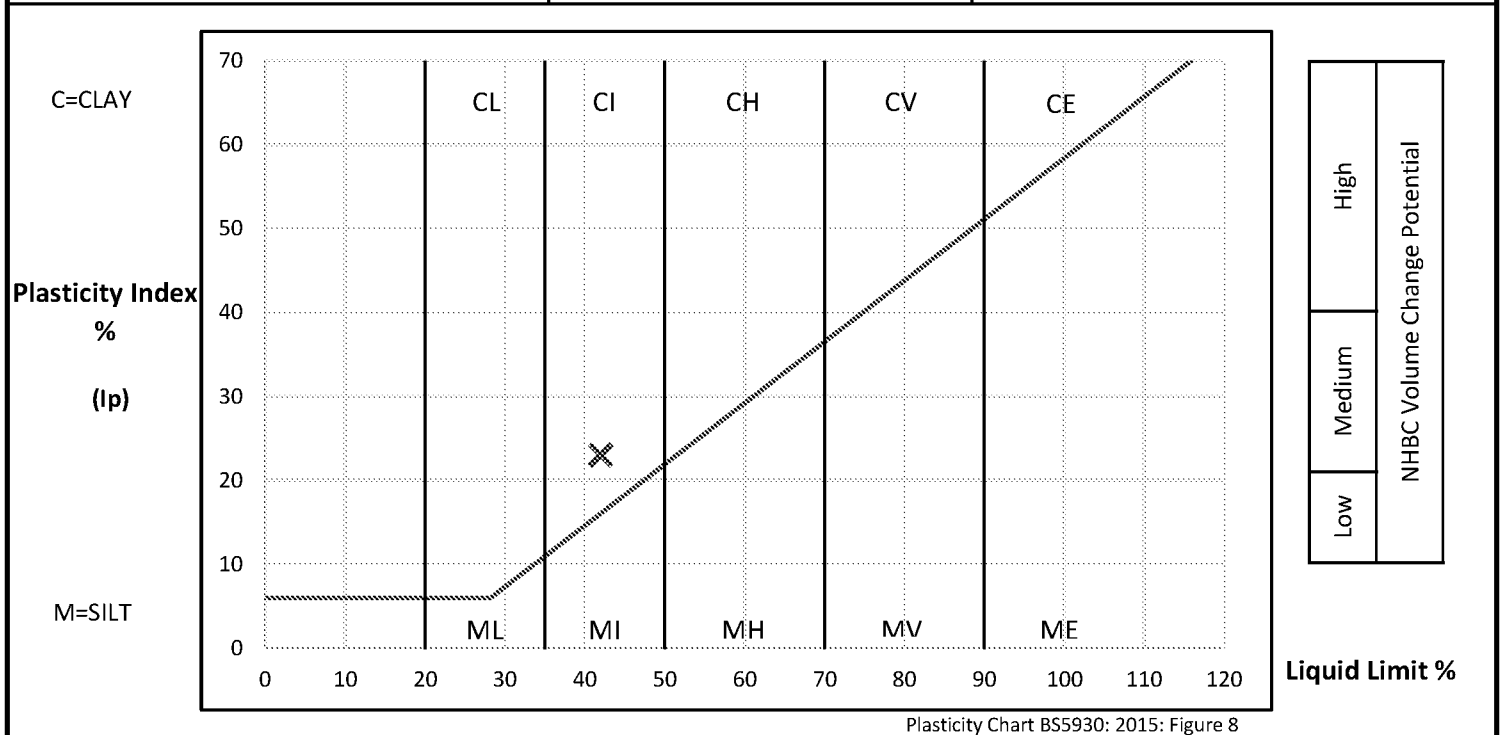
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Contract	Bilsham Road, Yapton
Serial No.	S31998

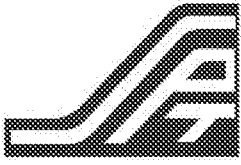
DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
TP01	1.00	D	1	21.9	Firm yellowish brown silty CLAY with rare recently active roots	

PREPARATION				Liquid Limit	42 %	
Method of preparation		From natural		Plastic Limit	19 %	
Sample retained 0.425mm sieve		(Assumed)		0 %	Plasticity Index	23 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.13	
Sample retained 2mm sieve		(Assumed)		0 %	NHBC Modified (I'p)	n/a
Curing time		24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1337: Part 2: 1990: 4.2
 Method of Test: BS EN ISO: 17892-1: 2014 & BS1377: PART 2: 1990: 3.2, 4.4, 5.3, 5.4
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 13/11/2017



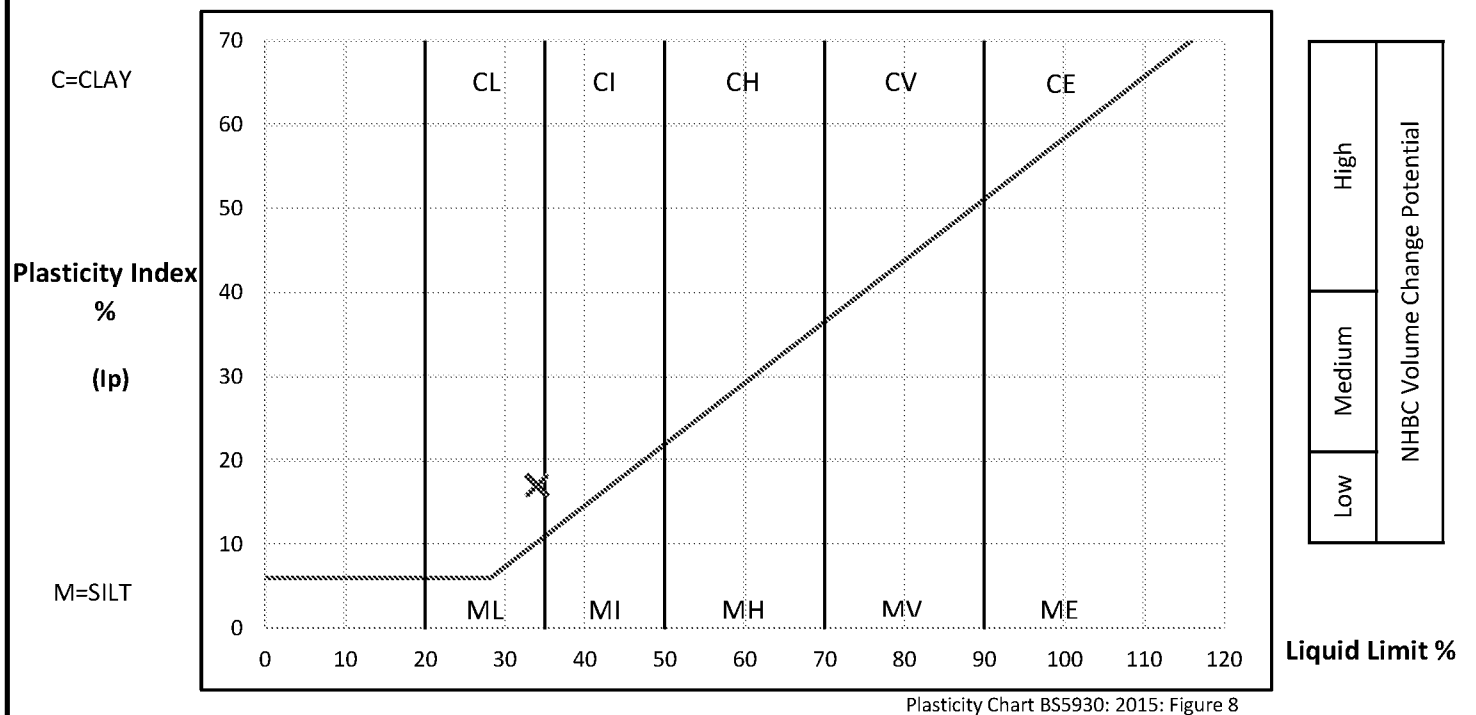
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Contract	Bilsham Road, Yapton
Serial No.	S31998

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

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
TP03	0.80	D	1	19.1	Firm yellowish brown slightly gravelly slightly sandy silty CLAY with rare recently active roots. Gravel is fine to coarse chalk and flint	

PREPARATION				Liquid Limit	34 %	
Method of preparation		Wet sieved over 0.425mm sieve		Plastic Limit	17 %	
Sample retained 0.425mm sieve		(Measured)	30 %	Plasticity Index	17 %	
Corrected water content for material passing 0.425mm			27.2 %	Liquidity Index	0.12	
Sample retained 2mm sieve		(Measured)	9 %	NHBC Modified (I'p)	12 %	
Curing time		96 hrs	Clay Content	Not analysed	Derived Activity	Not analysed

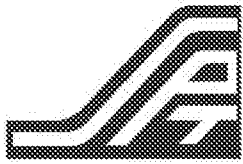


Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1337: Part 2: 1990: 4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS1377: PART 2: 1990: 3.2, 4.4, 5.3, 5.4

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

Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1
Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 13/11/2017



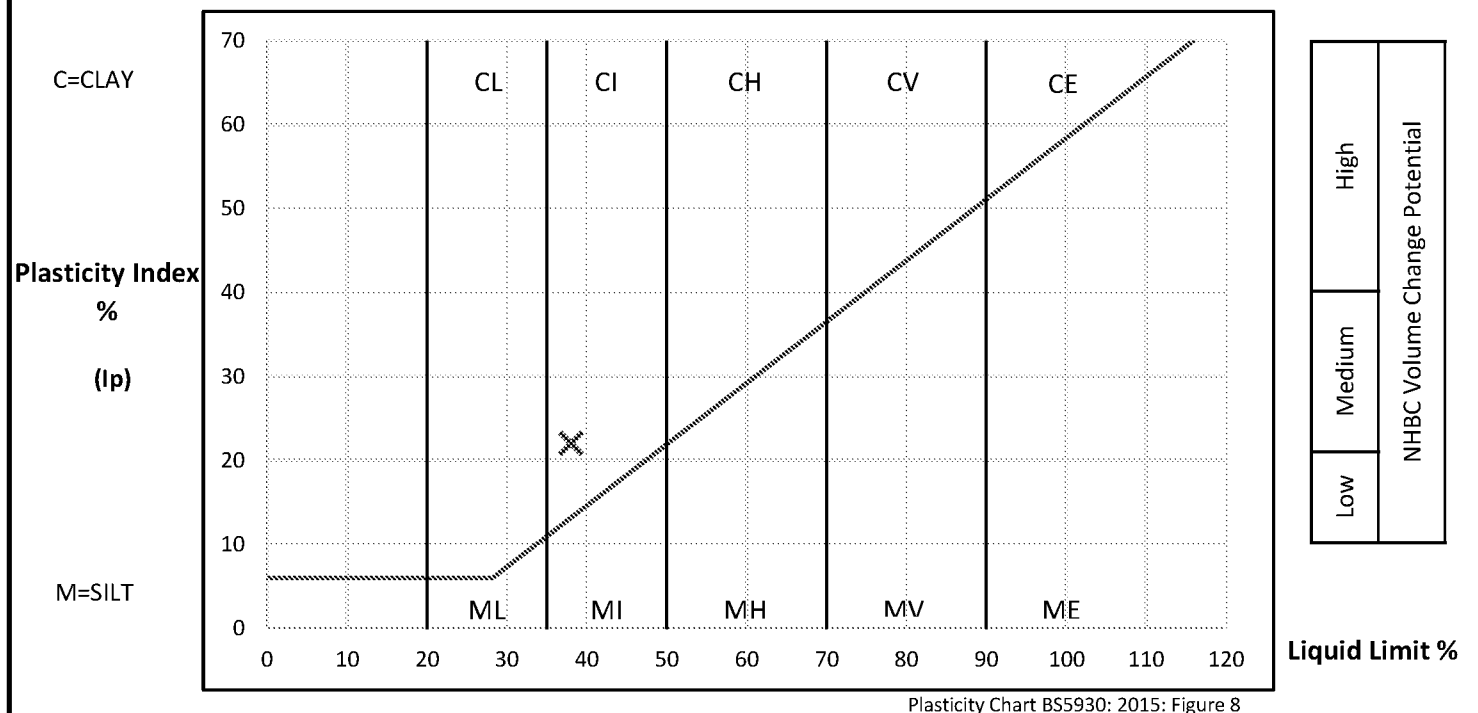
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Contract	Bilsham Road, Yapton
Serial No.	S31998

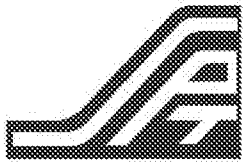
DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
TP11	1.30	D	1	19.7	Firm slightly friable yellowish brown slightly sandy silty CLAY with rare fine flint gravel and recently active roots. Sand is fine	

PREPARATION				Liquid Limit	38 %	
Method of preparation		From natural/gravel picked out by hand		Plastic Limit	16 %	
Sample retained 0.425mm sieve		(Assumed)	0 %	Plasticity Index	22 %	
Corrected water content for material passing 0.425mm				Liquidity Index	0.17	
Sample retained 2mm sieve		(Assumed)	<1 %	NHBC Modified (I'p)	n/a	
Curing time		24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1337: Part 2: 1990: 4.2
 Method of Test: BS EN ISO: 17892-1: 2014 & BS1377: PART 2: 1990: 3.2, 4.4, 5.3, 5.4
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:



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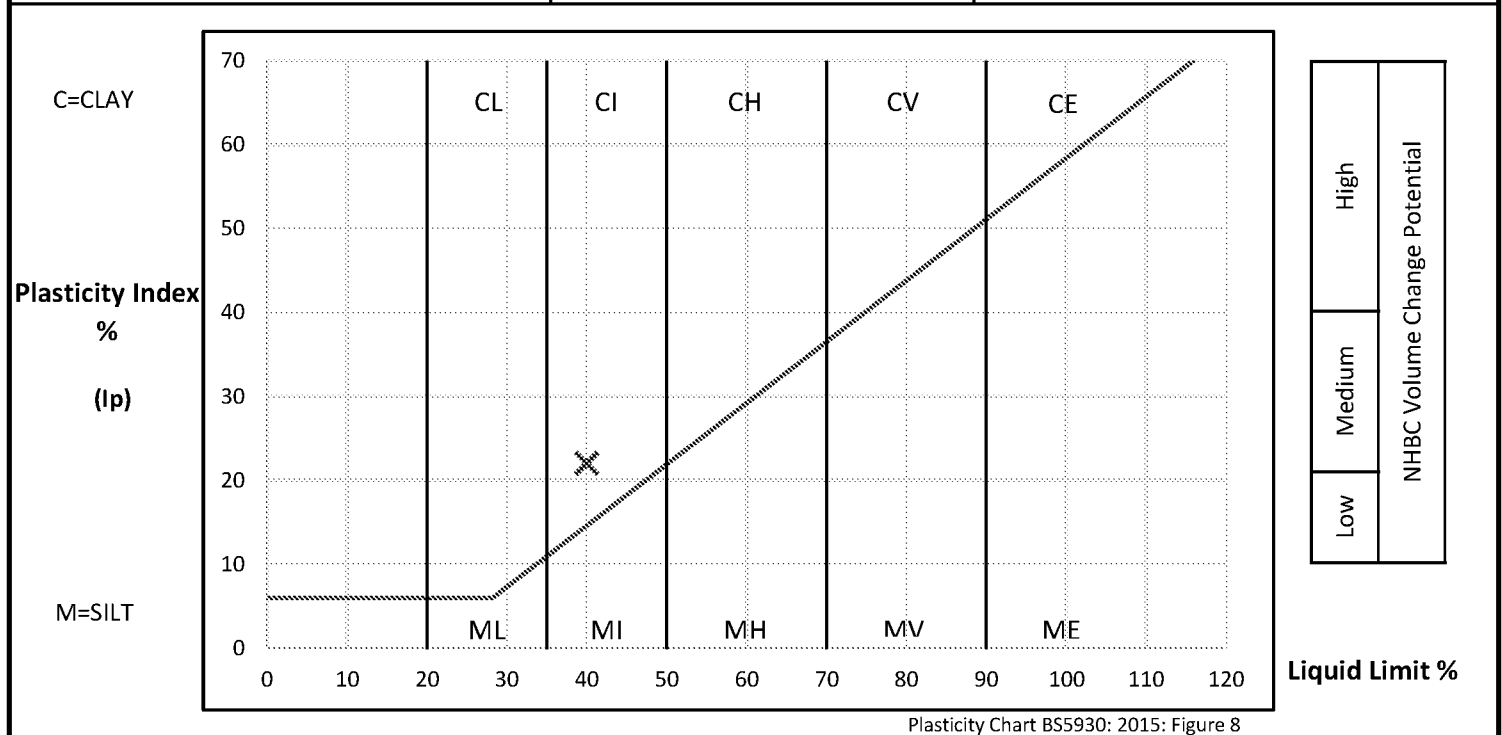
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DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

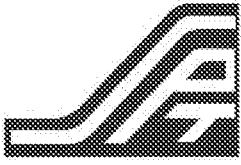
Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
TP14	1.70	D	1	22.5	Firm mottled light grey and brown silty CLAY	

PREPARATION				Liquid Limit	40 %	
Method of preparation		From natural		Plastic Limit	18 %	
Sample retained 0.425mm sieve		(Assumed)		0 %	Plasticity Index	22 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.20	
Sample retained 2mm sieve		(Assumed)		0 %	NHBC Modified (I'p)	n/a
Curing time		24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1337: Part 2: 1990: 4.2
 Method of Test: BS EN ISO: 17892-1: 2014 & BS1377: PART 2: 1990: 3.2, 4.4, 5.3, 5.4
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:





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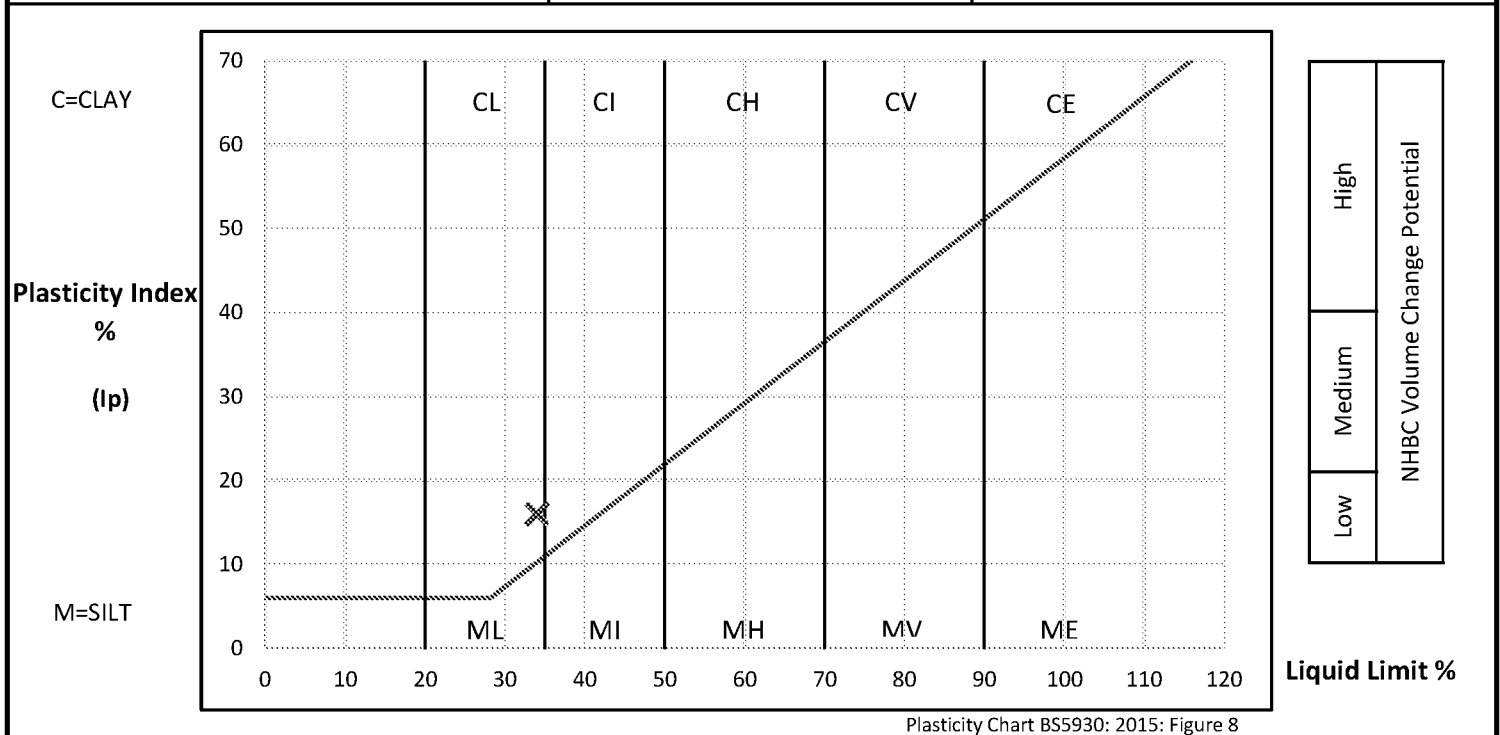
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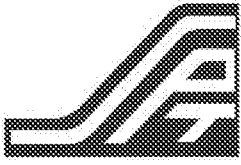
DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
TP18	2.00	D	2	22.5	Soft yellowish brown silty CLAY	

PREPARATION				Liquid Limit	34 %	
Method of preparation			From natural	Plastic Limit	18 %	
Sample retained 0.425mm sieve		(Assumed)	0 %	Plasticity Index	16 %	
Corrected water content for material passing 0.425mm				Liquidity Index	0.28	
Sample retained 2mm sieve		(Assumed)	0 %	NHBC Modified (I'p)	n/a	
Curing time		24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1337: Part 2: 1990: 4.2
 Method of Test: BS EN ISO: 17892-1: 2014 & BS1377: PART 2: 1990: 3.2, 4.4, 5.3, 5.4
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:



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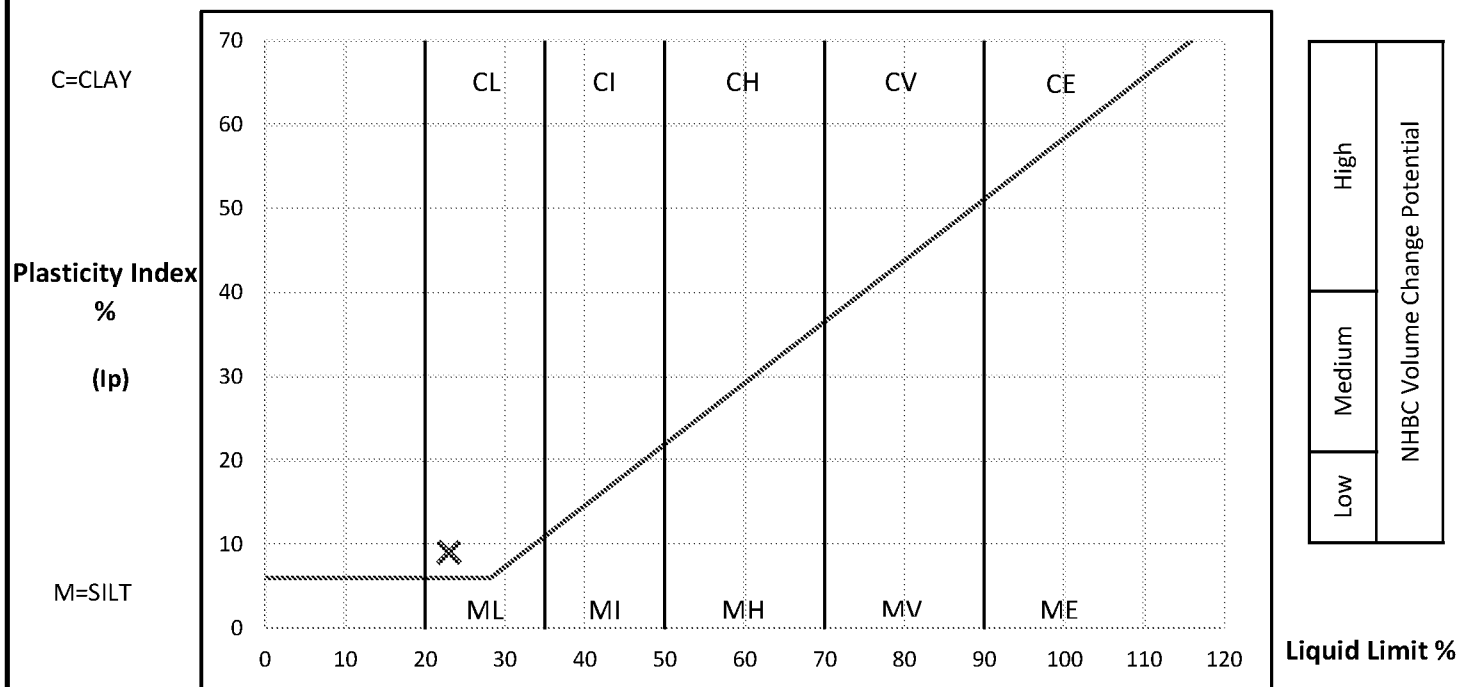
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DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS09	1.00	D	1	15.0	Stiff pale olive grey slightly gravelly slightly sandy silty CLAY with rare yellowish brown mottling. Gravel is fine to coarse chalk and flint	

PREPARATION				Liquid Limit	23 %	
Method of preparation		Wet sieved over 0.425mm sieve		Plastic Limit	14 %	
Sample retained 0.425mm sieve		(Measured)	22 %	Plasticity Index	9 %	
Corrected water content for material passing 0.425mm			19.2 %	Liquidity Index	0.11	
Sample retained 2mm sieve		(Measured)	17 %	NHBC Modified (I'p)	7 %	
Curing time		72 hrs	Clay Content	Not analysed	Derived Activity	Not analysed

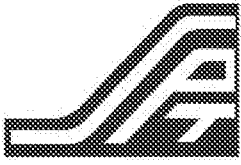


Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1337: Part 2: 1990: 4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS1377: PART 2: 1990: 3.2, 4.4, 5.3, 5.4

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

Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1
Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



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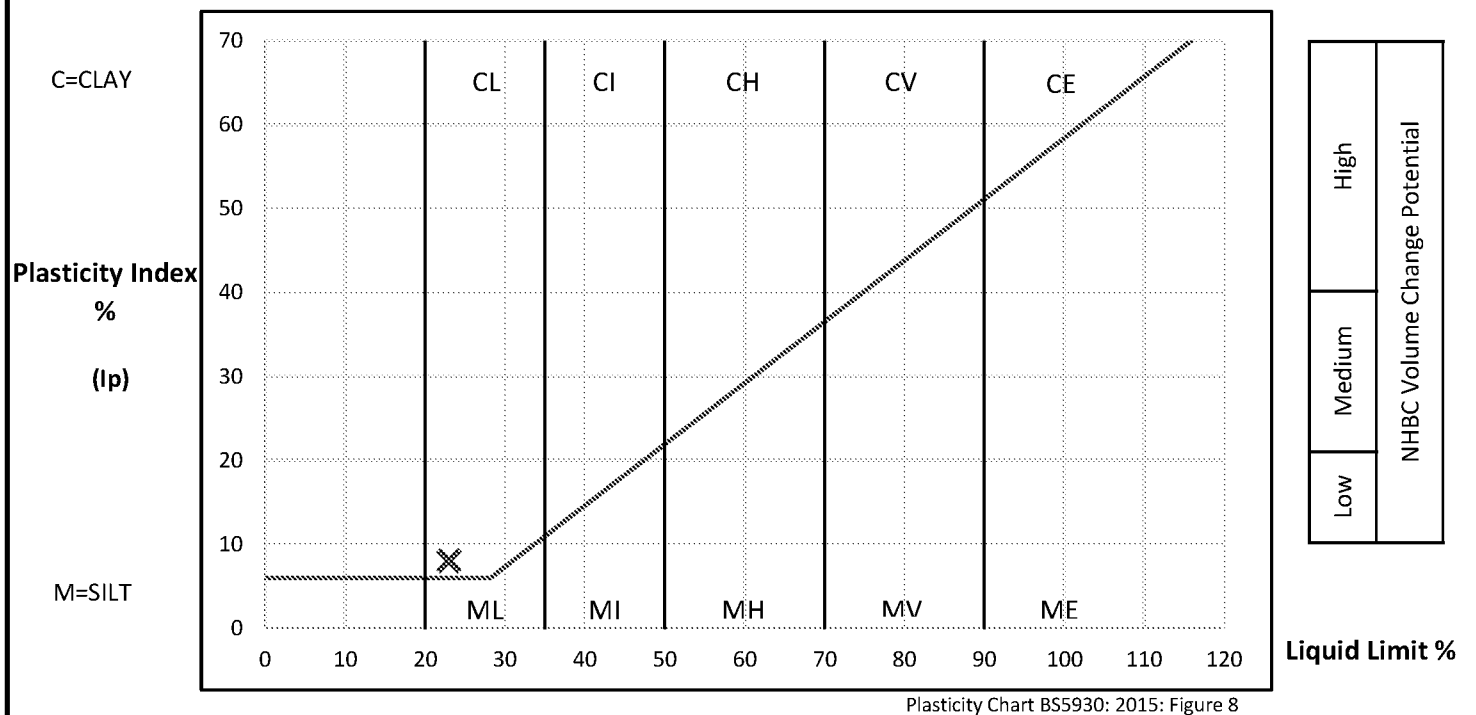
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DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WS09	3.00	D	3	18.9	Stiff mottled yellow, light grey and brownish yellow slightly gravelly slightly sandy silty CLAY with rare black speckling. Gravel is fine and medium chalk and rare flint	

PREPARATION				Liquid Limit 23 %	
Method of preparation				Wet sieved over 0.425mm sieve	
Sample retained 0.425mm sieve (Measured)				35 %	Plastic Limit 15 %
Corrected water content for material passing 0.425mm				29.0 %	Plasticity Index 8 %
Sample retained 2mm sieve (Measured)				30 %	Liquidity Index 0.48
Curing time 24 hrs				Clay Content Not analysed	NHBC Modified (I'p) 5 %
				Derived Activity	Not analysed



Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1337: Part 2: 1990: 4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS1377: PART 2: 1990: 3.2, 4.4, 5.3, 5.4

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

Comments: Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1
Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



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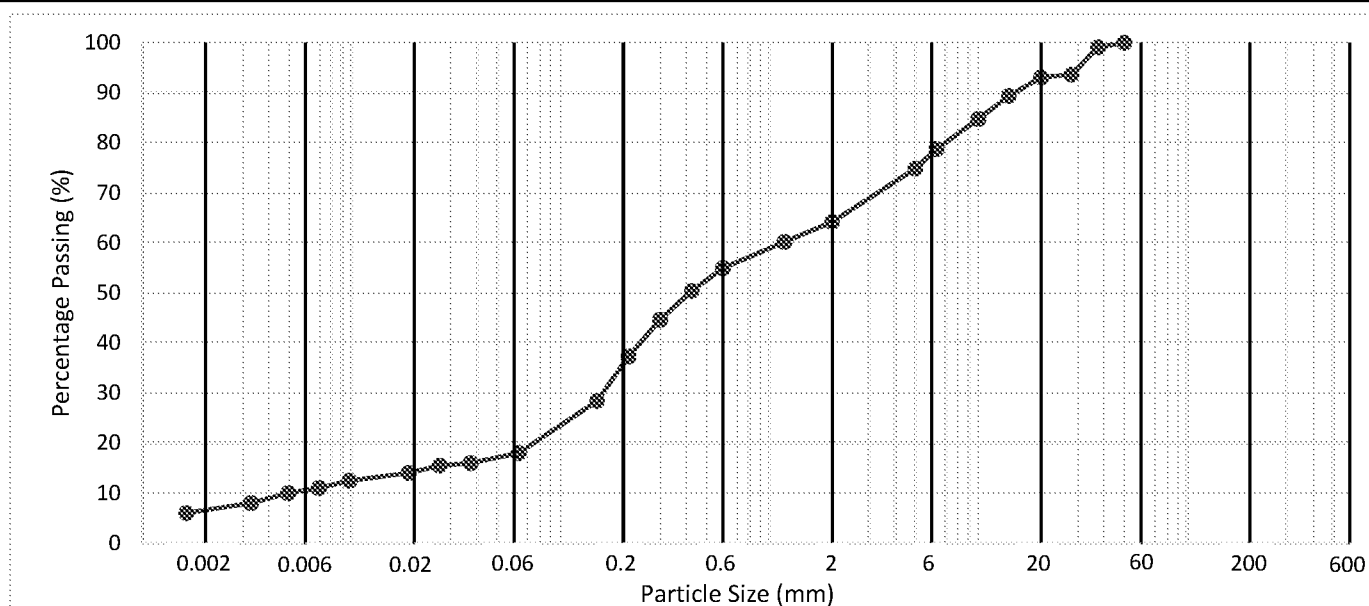
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Contract	Bilsham Road, Yapton
Serial No.	S31998

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample		Description	Remarks
		Type	Reference		
TP08	2.80	B	1	Yellowish brown clayey silty very gravelly SAND. Gravel is black and white angular flint and occasional white subangular chalk	

Method of Test: Wet Sieve + Hydrometer Method of Pretreatment: Not Required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

H y d r o m e t e r	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0372	16	11
	0.0264	15	
	0.0188	14	
	0.0098	12	Clay by Dry Mass (%)
	0.0070	11	
	0.0050	10	
	0.0033	8	7
	0.0016	6	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	64	46
1.18	60	
0.600	55	
0.425	50	
0.300	45	
0.212	37	
0.150	28	
0.063	18	

Fines By Dry Mass (%)	
<0.063mm	18

Sieve Size (mm)	Passing (%)	Gravel By Dry Mass (%)
150		36
125		
90		
63		
50	100	
37.5	99	
28	94	
20	93	
14	89	
10	85	
6.3	79	
5	75	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
 Method of test: BS1377: Part2: 1990: 9.2, 9.5
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:



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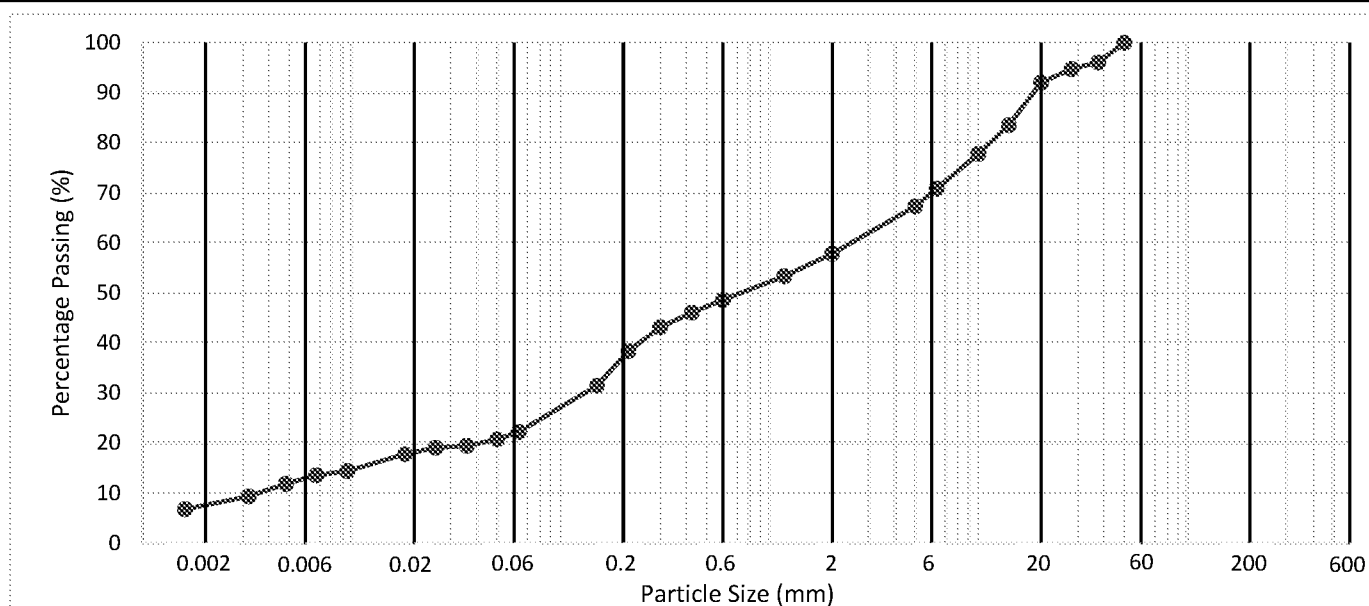
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Contract	Bilsham Road, Yapton
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample		Description	Remarks
		Type	Reference		
TP14	2.60	B	1	Light brown clayey silty very gravelly SAND. Gravel is white subangular chalk and black and brown angular and subangular flint	

Method of Test: Wet Sieve + Hydrometer Method of Pretreatment: Not Required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

H y d r o m e t e r	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0498	21	15
	0.0356	19	
	0.0253	19	
	0.0180	18	Clay by Dry Mass (%)
	0.0095	14	
	0.0068	14	
	0.0049	12	7
	0.0032	9	
	0.0016	7	

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	58	36
1.18	53	
0.600	49	
0.425	46	
0.300	43	
0.212	38	
0.150	31	
0.063	22	

Fines By Dry Mass (%)	
<0.063mm	22

Sieve Size (mm)	Passing (%)	Gravel By Dry Mass (%)
150		42
125		
90		
63		
50	100	
37.5	96	
28	95	
20	92	
14	84	
10	78	
6.3	71	
5	67	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
 Method of test: BS1377: Part2: 1990: 9.2, 9.5
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:



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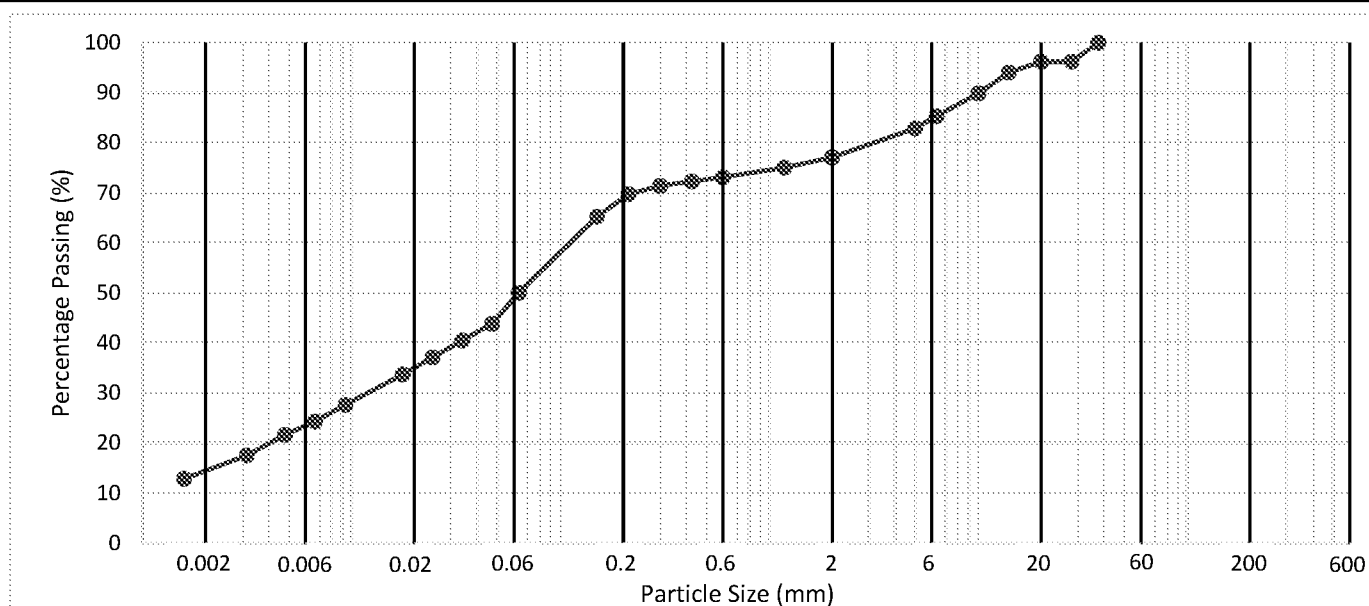
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Contract	Bilsham Road, Yapton
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample		Description	Remarks
		Type	Reference		
WS05	3.50	D	4	Firm yellowish brown slightly gravelly slightly sandy silty CLAY. Gravel is white subangular chalk and black angular flint	

Method of Test: Wet Sieve + Hydrometer Method of Pretreatment: Not Required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

H y d r o m e t e r	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0471	44	36
	0.0339	40	
	0.0244	37	
	0.0176	34	
	0.0093	28	Clay by Dry Mass (%)
	0.0067	24	
	0.0048	22	
	0.0032	18	
	0.0016	13	14

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	77	27
1.18	75	
0.600	73	
0.425	72	
0.300	71	
0.212	70	
0.150	65	
0.063	50	

Fines By Dry Mass (%)	
<0.063mm	50

Sieve Size (mm)	Passing (%)	Gravel By Dry Mass (%)
150		23
125		
90		
63		
50		
37.5	100	
28	96	
20	96	
14	94	
10	90	
6.3	85	
5	83	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
 Method of test: BS1377: Part2: 1990: 9.2, 9.5
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments:



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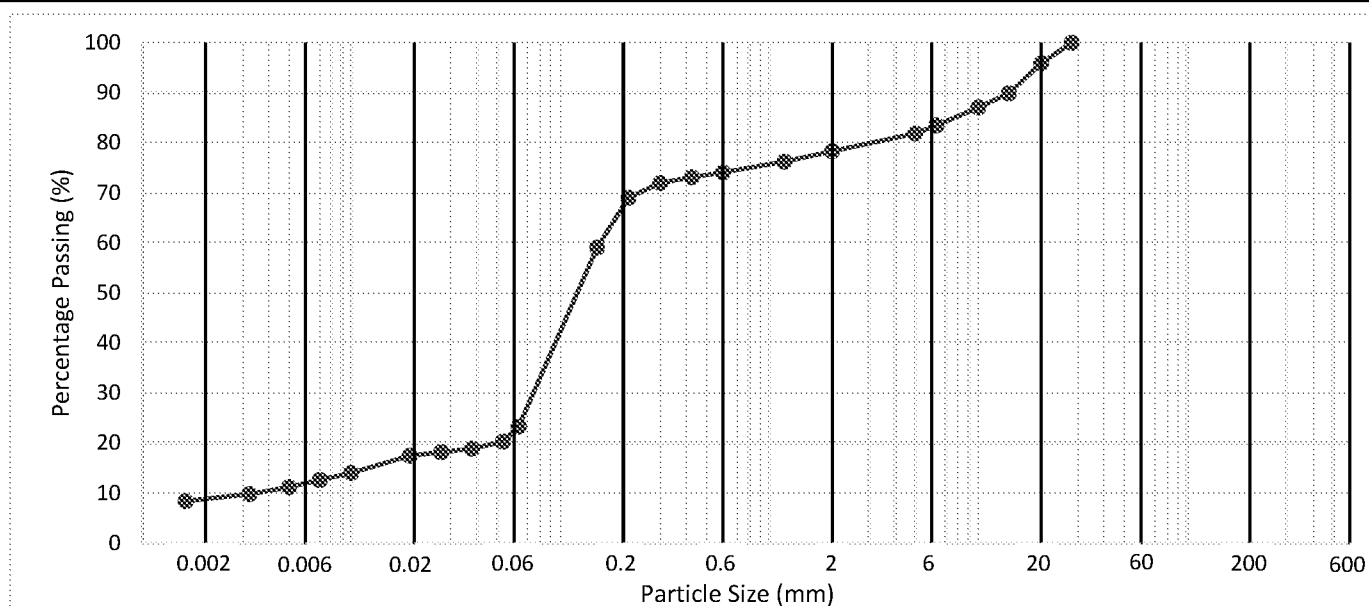
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Contract	Bilsham Road, Yapton
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DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Pit No.	Depth (m)	Sample		Description	Remarks
		Type	Reference		
WS07	3.00	D	3	Yellowish brown clayey silty very gravelly SAND with occasional light brownish grey pockets. Gravel is white subangular chalk and black angular flint	

Method of Test: Wet Sieve + Hydrometer Method of Pretreatment: Not Required



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

H y d r o m e t e r	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)
	0.0532	20	14
	0.0378	19	
	0.0268	18	
	0.0190	17	
	0.0100	14	Clay by Dry Mass (%)
	0.0071	13	
	0.0050	11	
	0.0032	10	
	0.0016	8	9

Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)
2.00	78	55
1.18	76	
0.600	74	
0.425	73	
0.300	72	
0.212	69	
0.150	59	
0.063	23	

Fines By Dry Mass (%)	
<0.063mm	23

Sieve Size (mm)	Passing (%)	Gravel By Dry Mass (%)
150		22
125		
90		
63		
50		
37.5		
28	100	
20	96	
14	90	
10	87	
6.3	83	
5	82	

Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5
 Method of test: BS1377: Part2: 1990: 9.2, 9.5
 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
 Comments: