



**Former Reptune Garage
Main Road
Yapton
West Sussex**

**Combined Geotechnical and
Ground Contamination Risk Assessment
and Remediation Strategy**

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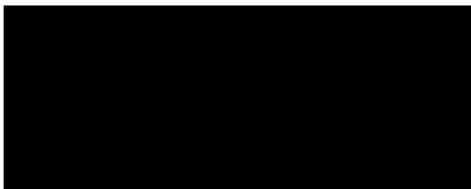
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The risk assessment presented in this report follows 'source-pathway-receptor' techniques for the determination of whether a site is contaminated. This is standard practice in the UK, being intrinsic to Part 2A of the Environmental Protection Act 1990 as amended.

The report considers the proposed end users as the most sensitive human health receptors. If significant risks to construction workers are identified by the preliminary assessment attention is drawn to this, although it is noted that no assessment of risk from acute exposure has been undertaken in this connection.

This report is not intended to be either an ecological, archaeological or flood risk assessment. An appropriate specialist should be consulted about any concerns that may arise in this regard.

EXECUTIVE SUMMARY

The following presents a summary of the main findings of the ground investigation. It is emphasised that no reliance should be placed on any individual point until the whole of the report has been read as other sections of the report may put into context the information contained herein.

It is proposed to redevelop the former Reptune Garage located at Main Road, Yapton, West Sussex. The development proposals are understood to comprise the demolition of the existing structures in the south of the site and the construction of a new dwelling, areas of car parking and a garden area.

The site currently comprises a former, now derelict garage structure in the south west of the site. A hardstanding area was present in the north eastern part of the site. Adjacent to the buildings was an area where the hardstanding had been removed and where vegetation was present. It is understood from discussions with the client that this area is where an underground tank (5,000 gallons) had been removed.

The site comprised part of an area of gardens at the time of the earliest historical map referenced in 1874. The site is shown as developed by the 1897 mapping and is labelled as a garage on the 1974 mapping. Planning application records for the site indicate the tank was installed in 1963, with the site becoming a garage in approximately 1967.

Reference to geological datasets indicates that the site is expected to be underlain by the River Terrace Deposits overlying the White Chalk Subgroup. The ground investigation confirmed the underlying soils to comprise a generally shallow thickness of made ground, overlying River Terrace Deposits and, in turn, White Chalk Subgroup deposits. An area of deep made ground was encountered in the location of the former underground tank.

The River Terrace Deposits are classed as a Secondary A Aquifer. The White Chalk Subgroup is classed as a Principal Aquifer. The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply. Groundwater was encountered at depths of between 0.90m and 2.80m.

The preliminary contamination risk assessment identified a number of potential pollutant linkages with regard to proposed end users of the site and controlled waters.

The ground investigation confirmed the presence of elevated concentrations of lead and PAH compounds within the made ground that pose a risk to end users of the site.

Elevated concentrations of petroleum hydrocarbons were recorded at depths below 2.0m within the River Terrace Deposit soils. Given the concentrations recorded and that the only viable pathway would be inhalation of indoor soil vapours, the concentrations are not considered to pose a significant risk to future end users of the site.

A low risk to controlled waters is present from the concentrations of petroleum hydrocarbons within the River Terrace Deposits, but remediation works are not considered to be justified, given the depth to the contamination, the sensitivity of the groundwater, that the potential source of petroleum hydrocarbon contamination has been removed and that natural attenuation of petroleum hydrocarbon is likely to occur over time.

Remedial measures have been proposed to safeguard end users of the site.

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It is recommended that the design of precautions against shrinkage and heave for any new foundation system should assume a medium volume change potential for the fine-grained River Terrace Deposits.

A net allowable bearing capacity of 100kN/m^2 may be assumed for spread (pad or strip) foundations up to 1.0m across bearing within the River Terrace Deposits of at least firm consistency.

A DS-1 Design Sulfate Class and an AC-1 ACEC classification should be assumed as a minimum for the design of concrete in contact with the ground.

In view of the variable thickness of made ground and the presence of soils of up to medium volume change potential, it is recommended that ground floors should be suspended.

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1. INTRODUCTION

It is proposed to redevelop the former Reptune Garage located at Main Road, Yapton, West Sussex. The development proposals are understood to comprise the demolition of the existing structures in the south of the site and the construction of a new dwelling, areas of car parking and a garden area. A copy of the proposed development layout is presented in Appendix A.

Ashdown Site Investigation Ltd. has previously obtained historical maps and geo-environmental data¹ for the site and undertaken a limited ground investigation at the site². Additional works were subsequently undertaken and a ground contamination assessment of the site³, based on a different development proposal, was prepared.

Ashdown Site Investigation Limited was requested to provide an estimate for providing a revised geotechnical and ground contamination risk assessment and a remediation strategy for the new development layout by Peter Mountford of 44 Kingsmere, London Road, Brighton, BN1 6UX. The scope of the works allowed for and the terms and conditions under which the works were to be undertaken were set out within the offer letter Q18-7380/Rev1, dated 29th June 2018. The instruction to proceed was received from the client in an email dated 5th July 2018.

The objectives of the works were to:

- a) Establish the expected geology, hydrogeology and hydrology at the site;
- b) Ascertain the development history and current site use;
- c) Develop a preliminary conceptual model of the site identifying potential complete pollutant linkages relating to end users of the proposed development works, to controlled waters beneath and in the vicinity of the site, or to other off-site sensitive receptors, if identified;
- d) Investigate the ground and groundwater conditions;
- e) Provide advice to assist others in undertaking design of foundations and ground floors;
- f) Test for the presence of contaminants identified by the preliminary conceptual model; and
- g) Develop a quantitative conceptual model of the site, refining the preliminary model to identify any remaining pollutant linkages.

Relevant information from previous investigations, including borehole records and laboratory test results, are presented in this report and have been considered as part of the assessment.

The preliminary conceptual model presented within this report has been based on the findings of a walkover survey and reference to the historical Ordnance Survey maps and published geological and environmental information obtained from various sources as presented in the document referenced above, as well as from information sourced from the Local Authority and West Sussex County Council Petroleum Officer.

¹ Geo-Environmental Data and Historical Maps (Ashdown Site Investigation Ltd, Report Number R16-11757/map, dated November 2016.

² Ashdown Site Investigation Report No. R16-11757, dated 2nd December 2016.

³ Ground Contamination Risk Assessment Report (Ashdown Site Investigation Ltd., Report Ref: R18-12744, March 2018)

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2. WALKOVER SURVEY

The site is located to the south of Main Road, Yapton and is centred on the approximate Ordnance Survey national grid reference SU 9753 0330. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively. Photographs taken during the walkover survey in February 2018 are included in Appendix B.

At the time of the walkover, the site comprised a former, now derelict garage. The garage buildings occupied the south western end of the site. A hardstanding area was present in the north eastern part of the site. Adjacent to the buildings was an area where the hardstanding had been removed and where vegetation was present. It is understood from discussions with the client that an underground tank had been removed from this area.

3. ENVIRONMENTAL AND GEO-ENVIRONMENTAL DATA REVIEW

3.1 Geological and Hydrogeological Information

3.1.1 Expected Geology and Aquifer Designation

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Strata, Aquifer Designation and Description

Type	Stratum	Aquifer Designation
Superficial	River Terrace Deposits	Secondary A Aquifer
Bedrock	White Chalk Subgroup	Principal Aquifer

The River Terrace Deposits in this area were formerly denoted as the Brickearth and comprise brown sandy (fine) silt or clay largely originating from the solution weathering of the previously existing chalk. The material will have been reworked by water flow to produce some lateral variability in the grain size of the soil (sand and gravel) and can be expected to contain a variable content of flint.

The White Chalk Subgroup comprises a weak, white chalk locally with flint bands together with scattered nodular flints. It may be expected to have a deeply convoluted upper surface as a result of solution weathering. The presence of natural cavities in the chalk is very rare and solution features, if present, can be expected to be infilled with Quaternary deposits such as the River Terrace Deposits.

The infill material may be significantly weaker than the surrounding chalk. Solution features can comprise pipes extending to several metres deep into the chalk or conical depressions and basin shaped structures.

3.1.2 Other Geological features

A fold axis is located 95m to the north of the site.

3.1.3 Radon

Table 2. Radon

Section	Risk Assessment
Radon Affected Areas	The site is reported to be within an area where less than 1% of properties are at or above the action level requiring radon gas protection measures to be installed in new buildings.
Radon Protection Measures	No radon protection measures are reported by the British Geological Survey to be necessary in the construction of new dwellings or extensions.

3.1.4 Ground Workings

The south westernmost part of the site and an area along the south western boundary are identified as being a disused/old canal. A review of the historical maps, confirms the canal was present along the south western boundary of the site but did not extend onto the site.

The nearest ground working is identified to be a Brick Yard some 400m south east of the site.

3.1.5 Mining, Extractions and Natural Cavities Hazards

The Groundsure data does not identify any significant risks from mining, natural cavities or extractions on or in the vicinity of the site.

Historically, chalk deposits were often mined locally. Most commonly historical mines characteristically comprise a narrow shaft with a number of chambers radiating from the base. These structures are colloquially known as "deneholes", "chalk-wells" or "chalkangles". The depth of the features reflects the depth to the underlying chalk bedrock. The shaft width was commonly in the order of 2m to 3m, widening out into galleries at depth.

The chalk was extracted for soil improvement and was usually applied directly to fields though sometimes the chalk was processed, typically by burning in kilns where the chalk was used to produce quicklime (calcium oxide). Once they had reached their limits the mines were commonly capped. Various capping techniques were used; examples include the use of upturned trees or brick arching. Records pertaining to the distribution of these localised mines are incomplete, usually being limited to features marked as shafts or the occurrence of circular depressions on historic Ordnance Survey maps. In the field they are most likely to be visible as shallow depressions, if at all.

Inspection of historical maps extending back in time to 1876 does not reveal the presence of any significant features at the site though, for reasons given above, their presence cannot be fully discounted. It is therefore recommended that all stripped formation levels should be inspected for evidence of historical backfilled shafts as a precaution.

3.1.6 Natural Ground Subsidence

The maximum hazard rating of natural subsidence within the site boundary (including a 50m buffer zone) is Low. This hazard rating is based on the interrogation of the six British Geological Survey natural ground stability datasets. These are reviewed individually in the table below.

Table 3. Natural Ground Subsidence Hazards

Section	Risk Assessment (GroundSure)
Soil Volume Change Potential (Shrink-Swell)	Low
Landslides	Very Low
Ground Dissolution of Soluble Rocks	Very Low
Compressible Deposits	Negligible
Collapsible Deposits	Low
Running Sands	Low

It should be noted that the assessment provided within the GroundSure report represents a generic assessment only. Detailed assessment of the geotechnical characteristics of the soils encountered at the site is presented in Section 10 of this report.

3.1.7 Groundwater Source Protection Zones

The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.

3.1.8 Groundwater and Surface Water Abstraction Licences

The closest groundwater abstraction licence is recorded to lie 588m to the north east of the site. The licence was for horticultural watering and is identified to be a historical licence.

No groundwater abstraction licences for potable water abstraction are recorded to lie within 2000m of the site.

The closest surface water abstraction licence is recorded to lie some 1170m to the north east of the site. The licence was for spray irrigation and is identified to be a historical licence.

3.1.9 Surface Water Features

The nearest recorded significant surface water feature is a culvert located 319m north west of the site.

3.1.10 Flooding

The site lies within an Environment Agency Flood Zone 1 and the Risk of Flooding from Rivers and Sea (RoFRaS) is reported to be very low.

There are no flood defences, areas benefiting from flood defences or areas used for flood storage within 250m of the site.

The site lies within 50m of an area where the British Geological Survey report there to be a potential for groundwater flooding relating to Clearwater Flooding (flooding associated with an unconfined aquifer). The BGS consider the confidence rating of their data in this area to be High.

3.2 Environmental Data Review

Records of potentially contaminative activities, authorisations, pollution incidents and land uses recorded by the regulatory authorities and compiled by GroundSure in their EnviroInsight Report have been reviewed.

3.2.1 Historical Industrial Sites

The data provides an analysis from 1:10,560, 1:10,000, 1:2,500 and 1:1,250 mapping to provide data on potential historical industrial sites and these are discussed below.

Table 4. *Historical Industrial Sites*

Section	Discussion
Potentially Contaminative Uses Identified from 1:10,000 scale mapping	The disused canal/old canal located in the south westernmost part of the site and further to the south west, as discussed in Section 3.1.4, is identified by the data.
Historical Tank Database	No historical tanks are identified within 50m of the site.
Historical Energy Features Database	No energy features are identified within 50m of the site.
Historical Petrol and Fuel Site Database	The site is identified by the data to be a "garage".
Historical Garage and Motor Vehicle Repair Database	The only entries within 250m of the site are the disused canal/old canal discussed above.

3.2.2 Environmental Permits, Incidents and Registers

No environmental permits, incidents or register entries considered to pose a significant risk have been identified on or in the vicinity of the site.

3.2.3 Landfill and Other Waste Sites

Table 5. Landfill and Other Waste Sites

Section	Discussion
Environment Agency Historic Landfill Sites	A historical landfill is identified 170m north east of the site. The landfill is recorded to have accepted inert waste.

No other landfills or other waste sites considered to pose a significant risk have been identified on or in the vicinity of the site.

3.2.4 Current Land Uses

Table 6. Current Land Uses

Section	Discussion
Current Industrial Data	No sites are recorded to be located within 100m of the site.
Records of Petrol and Fuel Sites	An obsolete petrol station record is recorded 74m north west of the site.
Underground High Pressure Oil and Gas Pipelines	No entries are recorded within 500m of the site.

3.2.5 Sensitive Land Use

The site is recorded to be located within a Nitrate Vulnerable Zone (NVZ). The development proposals are not considered to pose a risk to the NVZ.

4. HISTORICAL MAP REVIEW

Historical Ordnance Survey maps covering the area of the site have been reviewed and are summarised in the following table.

It is noted that each map presents information applicable at the time of the survey (or revision date) and is subject to surveying and cartographic errors and/or advances. Revisions to maps are made at irregular intervals and it is possible that significant developments may have taken place on or within the vicinity of the site that are not shown on the maps.

'In the Vicinity of the Site' generally refers to features of relevance within approximately 250m of the site boundary but may also include more distant features if considered to be pertinent to the assessment of the development history.

Table 7. Summary of Significant Features Identified on Historical Maps

Map Details	On-Site	In the Vicinity of the Site
1876 1:2,500	The site comprises part of a garden associated with properties to the north west of the site.	The Chichester and Arundel Canal is present along the south western boundary of the site. Buildings are present to the north of the site.
1897 1:2,500	A building is present along the south western boundary of the site, which extends to the northwest.	The canal to the south west of the site is shown as a cutting. Buildings are present close to the north western boundary of the site.
1912 1:2,500	An additional building is shown on the south eastern boundary of the site.	The section of the canal to the south west of the site is shown as backfilled.
1938 1:2,500	The building along the south eastern boundary is no longer shown.	No significant changes.
1974 1:2,500	A structure is shown along the south western boundary and is labelled as a "Garage".	The buildings are no longer present along the north western boundary of the site.

No further changes are shown on the site or in its immediate vicinity, up to and including the 2016 map.

5. CONSULTATIONS

5.1 Petroleum Officer

Records from the West Sussex County Council Petroleum Officer are included in Appendix C. The only records they have pertain to a 22,730 litre petrol tank being present on the site, with the tank being foam filled in 2008.

5.2 Arun District Council

The Officer Report for the planning application for the site⁴ is included as Appendix D. This shows a number of previous historical planning applications for the site, including for its uses as a garage/workshop in 1967 and the installation of a 5,000 gallon (22,730 litre) tank in 1963.

The Senior Pollution Officer also requested the imposition of planning conditions due to the previous uses of the site and that "Fuel tanks may exist on site".

6. PREVIOUS GROUND INVESTIGATION

At the time the preliminary contamination risk assessment was originally prepared, Ashdown Site Investigation Ltd. had previously undertaken only a limited ground investigation at the site. Three boreholes were drilled to depths of between 3.0m and 6.0m. Two of the boreholes were undertaken within the existing garage building.

⁴ Arun District Council, Planning Application Reference Y/68/17/PL.
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Made ground was encountered to depths of between 0.40m and 0.80m and generally comprised gravelly sandy clay. The gravel fraction contained variable quantities of ash-lime material, brick, concrete, chalk and clinker-like materials.

A layer of gravel of concrete, metal, slate, brick, plastic, ceramic and glass was encountered in a borehole undertaken inside the garage building (borehole WS01).

Beneath the made ground the boreholes progressed into sandy clay with gravel of flint, considered to represent the River Terrace Deposits. At depths of 5.2m and 4.5m, respectively, boreholes WS02 and WS03 encountered chalk with flint, considered to represent the White Chalk Subgroup deposits.

Five samples of the shallow made ground were tested for a range of heavy metals and polycyclic aromatic (PAH) hydrocarbons and were also screened for asbestos.

Three of the five samples recorded concentrations of lead above the generic soil screening value for a residential land use.

Two of the samples also recorded slightly elevated concentrations of some PAH compounds.

Samples of the deeper soils encountered were tested for the presence of petroleum hydrocarbons.

Significantly elevated concentrations of petroleum hydrocarbons were recorded within stained and odorous soils encountered within borehole WS02. The highest concentration was recorded at a depth of 3.2m. The concentrations then decreased with depth, with the sample tested from 5.5m depth recording only negligible concentrations.

The samples tested from 3.2m and 4.6m depth also recorded relatively high concentrations of a number of volatile organic compounds (VOC).

7. PRELIMINARY CONTAMINATION RISK ASSESSMENT

7.1 Introduction

The risk assessment considers the potential sources of contamination identified, the receptors that may be present in view of the development proposals and the contaminant pathways by which these may be linked. A complete pollutant linkage is only deemed to exist where all three are present and a site is considered suitable for use where no complete pollutant linkages are identified.

Where a complete pollutant linkage is deemed to be present, an assessment of the level of risk associated with the pollutant linkage has been carried out in line with current guidance⁵.

The level of risk is determined using the risk matrix presented in the following table. Classifications of probability, consequence and risk are presented in Appendix E.

Table 8. Risk Assessment Matrix

		Probability			
		Very Low	Low	Moderate	High
Consequence	Very Minor	Negligible	Very Low	Low	Low/Moderate
	Minor	Very Low	Low	Low/Moderate	Moderate
	Moderate	Low	Low/Moderate	Moderate	High
	Severe	Low/Moderate	Moderate	High	Very High

7.2 Basis of Assessment

The development is to comprise new residential buildings together with areas of private garden where end users can expect to come into contact with the underlying soils, where soil derived dusts may be generated and where the growing of fruit and vegetables may feasibly occur.

The proposed development layout is presented in Appendix A. Should the proposed development plans be altered, a revised risk assessment may be required.

It is noted that an asbestos survey of existing structures and infrastructure⁶ was beyond the brief of this report. The risk assessment has been undertaken on the basis that should asbestos be identified within buildings or infrastructure; these materials will be removed appropriately by licensed contractors and asbestos materials disposed of in accordance with legal requirements prior to any demolition or other works in order to avoid contaminating soils at the site.

The findings of the preliminary contamination assessment have been used to inform the ground investigation works which are discussed in the following section of the report.

⁵ Contaminated Land Risk Assessment: A guide to good practice, CIRIA C552, 2001.

⁶ As defined under Section 5(a) of the Control of Asbestos Regulations, 2012.

7.3 Potential Contamination Sources Identified

The following potential sources of contamination have been identified by the preliminary contamination risk assessment:

- Historical use of the site as a garage;
- Removed underground tank in the centre of the site;
- Made ground from potential historical demolition on the site and in its vicinity;
- Ground gases from backfilled canal to the south west of the site; and
- Ground gases from historical landfill to the north east of the site.

The former petrol station to the north west of the site is considered too distant to pose a significant risk to the site.

7.4 Preliminary Conceptual Model

The preliminary conceptual model for the proposed development is presented in Appendix F.

8. GROUND INVESTIGATION

8.1 Introduction

The most recent phase of the ground investigation works comprised the drilling of a series of dynamic sampler boreholes. Gas and groundwater monitoring standpipes were installed in selected exploratory holes and monitored during subsequent site visits. The fieldwork was carried out on 1st March 2018. The exploratory hole locations from both phases of intrusive investigations are shown on Figure 2.

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in Appendix G, together with notes to assist in their interpretation.

8.2 Dynamic Sampler Boreholes

Seven boreholes (designated WS101 to WS107) were drilled to depths of between 2.00m and 5.00m below ground level.

The boreholes were formed by a series of 1.0m long, open ended, hollow steel tubes of up to 100mm diameter, each containing a removable plastic liner. The tubes, progressively reducing in diameter, were driven into the ground by means of a track-mounted drop weight. Each tube was extracted from the ground using a hydraulically operated jack and the enclosed sample was recovered in its plastic liner.

The system enables the recovery of relatively undisturbed samples for laboratory testing and detailed examination.

8.3 Sampling

Disturbed samples of soil were taken at the depths shown in the exploratory hole records and were collected in plastic liners, plastic bags, plastic tubs or amber jars fitted with gas tight lids.

On collection the amber jars were stored in cool boxes with cooling blocks to maintain temperatures below 4°C until transferred to refrigerators upon return to the office and subsequently forwarded to the external accredited chemical testing laboratory.

8.4 Head Space Testing

Head space testing of selected samples was undertaken using a photo-ionisation device (PID). Whilst the PID provides quantitative readings of the relative concentrations of volatile compounds within head space of enclosed samples, on its own the technique cannot be used to provide a direct measurement of the concentrations of specific compounds within the soils. Nevertheless, the device is useful in providing an indication of whether such compounds are likely to be present and allows an assessment to be made on the extent of any such contamination present. The results of the PID readings are presented in Appendix G.

8.5 Installations

Gas and groundwater monitoring standpipes were installed to depths of between 2.0m and 3.0m in four boreholes. Descriptions of the installations are shown on the exploratory hole records in Appendix G.

The concentrations of gases and depths to groundwater were recorded within the standpipes on three occasions between 9th March 2018 and 19th March 2018. The readings are presented in Appendix G.

8.6 Laboratory Testing

Laboratory testing was scheduled by Ashdown Site Investigation Ltd. Results from the laboratory tests are provided in Appendix H.

8.6.1 Geotechnical Testing

Geotechnical testing was undertaken by Ashdown Site Investigation Ltd in accordance with the methods given in BS1377⁷. Chemical testing to enable classification of the chemical environment of soils in accordance with BRE SD1⁸ was undertaken by an external UKAS accredited laboratory.

8.6.2 Chemical Testing

Chemical testing of selected samples was undertaken by a laboratory with recognised (UKAS and MCERTS) accreditation for quality control.

⁷ BS1377:1990 Parts 1 to 8, Methods of test for soils for civil engineering purposes.

⁸ BRE Special Digest 1:2005 Concrete in Aggressive Ground.

9. GROUND CONDITIONS

9.1 Stratigraphy

9.1.1 Surface Covering

The most recent boreholes undertaken within the existing building were excavated through a surface cover of concrete some 100mm in thickness. Borehole WS02, undertaken as part of the previous works, recorded concrete some 250mm in thickness, though borehole WS01 did not encounter any hard surfacing; a gravel surface being present at this location.

No surfacing materials were encountered in boreholes WS101 and WS102 undertaken through the backfill to the removed tank. Hard surfacing was also absent at the location of borehole WS03 at the time of the earlier works.

9.1.2 Made Ground

Beneath the building, made ground, generally comprising sandy gravelly silty clay, was recorded to depths of between 0.30m and 0.45m below ground level. The gravel fraction comprised variable quantities of chalk, concrete, flint, brick and carbonaceous materials.

Made ground persisted to depths of 3.10m and 2.40m in boreholes WS101 and WS102, respectively; these boreholes having been drilled through the backfill to the removed tank. The made ground comprised sandy gravelly silty clay. The gravel fraction comprised variable quantities of chalk, concrete, flint and brick materials. Black staining was encountered between 2.30m and 2.40m depth in WS101. Made ground was encountered to a depth of 0.80m within borehole WS03 drilled in this area of the site during the previous phase of ground investigation works.

9.1.3 River Terrace Deposits

Underlying the made ground/surfacing, the investigation progressed into undisturbed slightly gravelly silty clay deposits considered to represent the River Terrace Deposits indicated on the published geological map. The consistency of these clay deposits was typically firm becoming stiff with depth.

The River Terrace Deposits extended to the full depth of boreholes WS01, WS103 and WS106, and was proven to depths of between 2.30m and 5.20m below ground level at the remaining borehole positions.

Grey staining and odours were noted within the River Terrace Deposits at depths of between 3.80m and 4.10m in borehole WS101.

9.1.4 White Chalk Subgroup

Beneath the River Terrace Deposits, where penetrated, the boreholes encountered generally off-white chalk, considered to be representative of the White Chalk Subgroup soils indicated on the published geology map.

Black staining was noted within the chalk deposits in borehole WS104 between 2.30m and 4.00m depth.

9.2 Stability

Each of the exploratory holes was recorded to remain stable during the course of drilling.

9.3 Groundwater Conditions

Whilst each borehole was recorded to be dry on completion of drilling, standing water depths of between 0.90m and 2.80m were recorded in the standpipes during the monitoring visits.

10. GEOTECHNICAL ASSESSMENT

The geotechnical assessment has been prepared in connection with the development proposals shown within Appendix A.

At the time of writing, no details were available concerning the specific loads likely to be applied to the foundations.

10.1 Foundations

10.1.1 Soil Shrinkage/Heave Potential

The fine-grained soils of the River Terrace Deposits have been classified as clays of low to intermediate plasticity and with modified plasticity indices in the range of 15% to 22% the soils may be expected to exhibit up to a medium volume change potential.

It is recommended that the design of precautions against shrinkage and heave for any new foundation system should assume a medium volume change potential for the fine-grained River Terrace Deposits and take into account current guidance such as that given by the Building Research Establishment (BRE)⁹ or the National House Builders Council (NHBC)¹⁰.

Whilst this report has been prepared to provide advice to assist designers in undertaking detailed design, the report itself does not represent a detailed design statement. It is recommended that an arboricultural survey of the site should be conducted to establish the species and maturity of the existing trees in the areas of the proposed new buildings. The survey should be extended to include a review of historical photographs and detailed site plans (if available) to establish the species and location of any felled trees that may affect foundation design. The information obtained from the arboricultural survey, information on proposed planting schemes and the findings of this report should be provided to the structural engineer responsible for the detailed design of foundation systems, including assessment of minimum founding depths for spread foundations and requirements for placement of void formers et cetera.

10.1.2 Spread Foundations

10.1.2.1 Foundation Depths for Spread Foundations

Foundations should be constructed so as to bear below soils that are likely to be affected by significant soil volume changes caused by seasonal changes in moisture content in order to avoid damage to foundations that could otherwise arise. In addition, all made ground and any soils disturbed by the construction or removal of any previously existing foundations or services should be regarded as being variable in nature and state of compaction and, as such, unsuitable as a founding medium for shallow footings. New footings should be constructed so as to bear below made ground/disturbed natural soils and soil subject to seasonal soil volume changes, whichever is the deeper, and onto undisturbed, competent, natural deposits.

Summary guidance on suitable minimum foundation depths to protect against the effects of seasonal soil volume changes is presented in the table below but designers undertaking detailed design of foundations should follow the detailed guidance provided within Chapter 4.2 of the NHBC Standards.

⁹ www.bre.co.uk : BRE Digests 240, 241 and 242, Low rise buildings on shrinkable clay soils, parts 1, 2 and 3; and BRE Digest 298 , The influence of trees on house foundations in clay soils and BRE Digest 412, Desiccation in clay soils.

¹⁰ <http://www.nhbc.co.uk/> : NHBC Standards, Chapter 4.2.

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Table 9. Indicative Minimum Foundation Depths

Tree Type	Water Demand of Tree	Tree Distance to Tree Height Ratio (D/H)									
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.25
		Minimum Foundation Depth Required in Medium Volume Change Potential Soils (m)									
Broad Leaf	High	†			2.50	2.35	2.20	2.00	1.70	1.35	0.90*
	Moderate	2.00	1.85	1.70	1.60	1.45	1.30	1.15	0.90*	0.90*	0.90*
	Low	1.50	1.40	1.30	1.15	1.05	0.90*	0.90*	0.90*	0.90*	0.90*
Coniferous	High	†		2.30	1.95	1.60	1.25	0.90*	0.90*	0.90*	0.90*
	Moderate	2.00	1.70	1.40	1.10	0.90*	0.90*	0.90	0.90*	0.90*	0.90*

* Minimum foundation depth required to protect against soil volume changes.

† Foundations deeper than 2.50m require specialist design to protect against soil volume changes.

Details on the water demand and mature height of common trees is given within Table 3 of Chapter 4.2 of the NHBC standards which should be referred to when assessing minimum foundation depths required for the proposed development. A summary is provided in the table below.

Table 10. Indicative Summary of Water Demand and Mature Height of Common Trees

Tree Type	High Water Demand		Moderate Water Demand		Low Water Demand	
	Tree	Height (m)	Tree	Height (m)	Tree	Height (m)
Broad Leaf	Elm	18 – 24*	Acacia	18	Birch	14
	Oak	16 – 24*	Alder	18	Elder	10
	Poplar	15 – 28*	Apple	10	Fig	8
	Willow	16 – 24*	Ash	11 – 23*	Hazel	8
	Eucalyptus	18	Laurel	10	Holly	12
	Hawthorn	10	Beech	20	Honey Locust	14
			Blackthorn	8	Hornbeam	17
			Cherry	8 – 17*	Laburnum	12
			Chestnut	20 – 24*	Magnolia	9
			Lime	22	Mulberry	9
			Maple	8 – 18*	Tulip Tree	20
			Pear	12		
			Plane	26		
			Plum	10		
			Sycamore	22		
			Tree of Heaven	20		
			Walnut	18		
			Whitebeam	12		
Coniferous	Cypress	18 – 20*	Cedar	20		
			Douglas Fir	20		
			Larch	20		

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Tree Type	High Water Demand		Moderate Water Demand		Low Water Demand	
	Tree	Height (m)	Tree	Height (m)	Tree	Height (m)
			Monkey Puzzle	18		
			Pine	20		
			Spruce	18		
			Wellingtonia	30		
			Yew	12		

* Dependent on particular species.

10.1.2.2 Bearing Capacity for Spread Foundations

For design purposes, a net allowable bearing capacity of 100kN/m² may be assumed for spread (pad or strip) foundations up to 1.0m across bearing within the River Terrace Deposits of at least firm consistency. The quoted bearing capacity is expected to limit settlement to less than 25mm.

10.2 Groundwater

Standing water depths of between 0.90m and 2.80m below ground level were recorded during monitoring of standpipes at the site. The potential for perched groundwater to be present above the groundwater table, for example within the made ground etc, should not be overlooked. It is also possible that heavy precipitation during construction could lead to the ingress of perched groundwater or surface water run-off into excavations. In any case it would be expected that water entering into excavations would be adequately managed by either pumping from sumps or natural drainage, or a combination of the two.

10.3 Stability of Excavations

All made ground should be assumed to be unstable, even in the short term. Whilst fine-grained natural soils and chalk deposits may remain stable for a short period of time if not subjected to surcharge loads (such as may be imposed by existing foundations, traffic or storage of materials), the stability of these deposits if left unsupported should be assumed to have the potential to deteriorate. Where stable excavations are required, excavations should either be suitably supported, or side slopes should be battered back to a safe angle of repose. All excavations should be suitably supported.

All excavations requiring human entry must be shored or battered as necessary to conform to current best practice, as accepted by the Health and Safety Executive (HSE)¹¹. Current legislation requires that where personnel access is required into any excavation a competent person must inspect excavation supports or battering of slopes at the start of the working shift and at other specified times. No work should take place until the excavation is safe. Excavations should also be inspected after any event that may have affected their stability, such as a significant weather event, changes in surcharge loadings imposed by temporary storage of materials or changes in site traffic plans or alteration of support systems. Inspections should be formally recorded and any faults that are found should be corrected immediately.

Particular attention must be paid to ensuring the stability of neighbouring sites.

¹¹ Relevant guidance is given on the HSE website, www.hse.gov.uk
Former Reptune Garage, Main Road, Yapton, West Sussex

10.4 Aggressivity to Concrete

The aggressivity of the soils to concrete has been assessed in accordance with guidance published by the BRE¹².

In consideration of the soils encountered beneath the site and its historical usage it is recommended that 'brown field conditions' should be conservatively assumed for the purpose of assessing the aggressivity of the chemical environment for concrete classification (ACEC class). Given the noted occurrence of groundwater at shallow depth, 'mobile groundwater' conditions should also be assumed.

Assessment of the chemical analysis of the soil indicates a sulphate content falling into Design Sulfate Class DS-1 of Table C2 of the guidance document. The results of the pH tests indicate that the underlying soils are slightly alkaline.

In accordance with the digest, a DS-1 Design Sulfate Class and an AC-1 ACEC classification should be assumed as a minimum for the design of concrete in contact with the ground.

10.5 Ground Floors

In view of the variable thickness of made ground and the presence of soils of up to medium volume change potential, it is recommended that ground floors should be suspended.

¹² BRE Special Digest 1:2005 Concrete in Aggressive Ground.

11. QUANTITATIVE CONTAMINATION ASSESSMENT

11.1 Assessment Strategy

The design of the ground investigation considered the potential contaminant sources identified by the preliminary ground contamination risk assessment. The investigation strategy employed to assess the potential sources is detailed in the following table.

Table 11. Investigation Works Carried Out

Contaminant source	Exploratory Positions
Historical use of the site as a garage	WS103-WS106 and WS01-WS02.
Removed underground tank in the centre of the site	WS101 and WS102.
Made ground from potential historical demolition on the site and in its vicinity	All exploratory hole positions.
Ground gases from backfilled canal to the south west of the site	Standpipes installed in boreholes WS103, WS104, WS106 and WS107.
Ground gases from historical landfill to the north east of the site	The standpipe installed in WS01 during the first phase of the ground investigation could not be located.

11.2 Analysis of Contamination Test Results

For an assessment of the risk posed to future end users of the site, the results of the laboratory testing have been compared to generic soil screening values (SSV).

The SSV used in this assessment comprise the 'Suitable For Use Levels' (S4ULs) calculated as a joint project between LQM and CIEH¹³. In lieu of an S4UL screening value for lead, the Category 4 Screening Level (C4SL) was used, as published within SP1010¹⁴.

In view of the development proposals for the site, assessment has been made against SSV calculated using the generic "Residential" land use¹⁵. The critical receptor for this land use is considered to be a young female child resident on site from birth to age 6. Exposure routes that are considered include the potential for direct ingestion of the soil, the outdoor and indoor ingestion of dust, the potential inhalation of dust and vapours, ingestion of site grown vegetables and ingestion of soil attached to vegetables.

¹³ The LQM/CIEH Suitable 4 Use Levels, 2015.

¹⁴ SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.

¹⁵ As defined within Science Report SC050021/SR3, January 2009, with the amendments discussed in the LQM/CIEH report.

For the assessment of risk to controlled waters a qualitative assessment has been undertaken based upon the concentrations of contaminants recorded within the soil samples and the information obtained about the sensitivity of the underlying strata or nearby surface water receptors.

11.3 Made Ground

Statistical analysis of the concentrations of heavy metals and polycyclic aromatic hydrocarbon (PAH) compounds within the nine samples of the shallow made ground soils encountered during both phases of the ground investigation (samples were tested from depths of up to 0.60m below ground level) has been undertaken in line with CIEH/CL:AIRE guidance.

The CIEH/CL:AIRE guidance provides a framework for assessing measured contaminant concentrations on a site against user defined critical concentrations – or indicators of risk.

Under a planning scenario, the null hypothesis tested is that the true population mean is greater than a “critical concentration”. The critical concentration used within this assessment is the relevant screening value for the proposed end use.

The null hypothesis can be rejected if it can be shown (with a sufficient degree of confidence) that the true population mean lies below the critical concentration. The confidence level recommended within the guidance is 95% i.e. the statistical evidence must show that there is 95% likelihood that the true population mean lies below the critical concentration. In this instance the site is considered suitable for the proposed use.

Where there is insufficient evidence to reject the null hypothesis, further risk assessment and/or remediation may be necessary.

Guidance on comparing soil contamination data with a critical concentration is provided in Appendix I along with the summary sheets from the statistical analysis.

For the purposes of this assessment the “critical concentration” used are the SSVS discussed above.

11.3.1 Heavy Metals

The following table summarises the soil screening values, maximum, minimum and mean concentrations and the 95th percentile upper confidence limits for the heavy metals tested for.

Table 12. Summary of Test Results and Statistical Analysis for Heavy Metals

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	Mean Concentration (mg/kg)	95% Upper Confidence Limit (mg/kg)	No of exceedances	Can H ₀ be rejected
Arsenic	37	9	5.1	9.0	5 / 2	6.8	7.6	0	Yes
Water Soluble Boron	290	9	<LOD	9.5	0.5 / 1	2.2	6.3	0	Yes
Cadmium	11	9	<LOD	1.2	0.5/0.2	0.4	1.0	0	Yes
Chromium	910	9	6.6	18.5	5 / 2	13.0	15.3	0	Yes
Hexavalent Chromium	6	9	<LOD	<LOD	0.8 / 2	0.7	1.1	0	Yes
Copper	2400	9	15	37.5	5 / 4	27.9	32.2	0	Yes
Lead	200	9	37	284	5 / 3	184.7	239.6	4	No
Mercury	40	9	<LOD	0.5	0.5 / 1	0.4	0.6	0	Yes
Nickel	180	9	6.9	13	5 / 3	10.7	14.0	0	Yes
Selenium	250	9	<LOD	<LOD	1 / 3	0.9	1.7	0	Yes
Zinc	3700	9	76	432	5 / 3	172.7	334.0	0	Yes

Four of the nine samples of made ground tested recorded concentrations of lead in excess of its SSV. None of the samples recorded concentrations of any other heavy metal above its SSV.

The statistical analysis undertaken indicates that the 95th percentile concentration of lead exceeds the SSV. On this basis, the concentrations of lead within the made ground soils are considered to pose a significant risk to end users should the soils remain within areas of soft landscaping where contact with soils and soil generated dust could occur.

Whilst the concentrations of lead are above the generic SSVs, they would not be considered to be significantly leachable at the concentrations recorded. Given the limited depth of the made ground, they are not considered to pose a significant risk to controlled waters beneath the site.

11.3.2 Polycyclic Aromatic Hydrocarbon (PAH) Compounds

The following table summarises the soil screening values, maximum, minimum and mean concentrations and the 95th percentile upper confidence limits for the PAH compounds tested for.

Table 13. Summary of Test Results and Statistical Analysis for PAH Compounds

Contaminant	SSV (mg/kg)	No. of Samples	Minimum Concentration (mg/kg)	Maximum concentration (mg/kg)	Limit of Detection (mg/kg)	Mean Concentration (mg/kg)	95% Upper Confidence Limit (mg/kg)	No of exceedances	Can H ₀ be rejected
Naphthalene	2.3	9	<LOD	0.3	0.1	0.09	0.21	0	Yes
Acenaphthylene	170	9	<LOD	0.2	0.1	0.08	0.18	0	Yes
Acenaphthene	210	9	<LOD	0.1	0.1	0.06	0.08	0	Yes
Fluorene	170	9	<LOD	<LOD	0.1	0.05	0.05	0	Yes
Phenanthrene	95	9	<LOD	0.8	0.1	0.32	0.47	0	Yes
Anthracene	2400	9	<LOD	0.3	0.1	0.10	0.23	0	Yes
Fluoranthene	280	9	<LOD	2.8	0.1	0.74	2.00	0	Yes
Pyrene	620	9	<LOD	2.6	0.1	0.74	1.91	0	Yes
Benz(a)anthracene	7.2	9	<LOD	1.6	0.1	0.43	1.14	0	Yes
Chrysene	15	9	<LOD	1.7	0.1	0.44	1.20	0	Yes
Benzo(b)fluoranthene	2.6	9	<LOD	1.6	0.1	0.52	0.83	0	Yes
Benzo(k)fluoranthene	77	9	<LOD	1.6	0.1	0.36	1.08	0	Yes
Benzo(a)pyrene	2.2	9	<LOD	1.8	0.1	0.49	1.29	0	Yes
Indeno(123-cd)pyrene	27	9	<LOD	1.4	0.1	0.36	1.04	0	Yes
Dibenz(ah)anthracene	0.24	9	<LOD	0.4	0.1	0.11	0.28	1	No
Benzo(ghi)perylene	320	9	<LOD	1.5	0.1	0.39	1.14	0	Yes

One of the nine samples of made ground tested recorded concentrations of dibenz(ah)anthracene in excess of its SSV. None of the samples recorded concentrations of any other PAH compound above its SSV.

The statistical analysis undertaken indicates that the 95th percentile concentration of dibenz(ah)anthracene exceeds the SSV. On this basis, the concentrations of PAH compounds within the made ground soils are considered to pose a significant risk to end users should the soils remain within areas of soft landscaping where contact with soils and soil generated dust could occur.

PAH compounds are not significantly soluble and would not be expected to exhibit significant mobility at the concentrations recorded. The presence of PAH compounds within the limited thickness of made ground is not considered to pose a significant risk to controlled waters beneath the site.

11.3.3 Asbestos

In addition to the testing for heavy metals and PAH compounds, the nine samples of the made ground were screened for the presence of asbestos.

No suspected asbestos materials were noted within any of the exploratory holes undertaken at the site. None of the samples recorded the presence of any asbestos materials.

Based on the findings of this investigation, no significant risk to end users is considered to be posed by asbestos materials within soils. However, due to the heterogeneity of made ground, there will always remain the potential for localised asbestos materials to be encountered during construction works, though the likelihood of this is considered to be very low. All workers at the site should be made aware of what actions to take in the event that suspected asbestos materials are identified at any time during the development works.

As discussed previously, an asbestos survey of existing structures and infrastructure¹⁶ was beyond the scope of this investigation. The potential for asbestos containing materials to be present within the fabric of buildings or infrastructure located on the site cannot be dismissed by reference to the soil test results contained within this report. It is recommended that relevant asbestos registers be inspected prior to commencing any demolition works at the site. Where asbestos is identified to be present within buildings or infrastructure, these materials should be appropriately removed by licensed contractors and asbestos materials disposed of in accordance with legal requirements prior to demolition or other works to avoid contaminating soils at the site.

11.4 Historical Use of the Site as a Garage and Underground Tanks

Testing was undertaken on a number of samples of made ground and undisturbed soils to determine their total concentrations of petroleum hydrocarbons, with the results either speciated by equivalent carbon weight fractions or by aromatic and aliphatic equivalent carbon weight fractions. A number of samples were also tested for concentrations of BTEX compound and volatile organic compounds (VOCs).

The following tables list the screening values for petroleum hydrocarbon equivalent carbon weight fractions calculated for 1% organic content and for BTEX compounds.

Table 14. SSVs for petroleum hydrocarbon equivalent carbon weight fractions

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC 5-6	42	Aromatic EC 5-7	70
Aliphatic EC >6-8	100	Aromatic EC >7-8	130
Aliphatic EC >8-10	27	Aromatic EC >8-10	34
Aliphatic EC >10-12	130	Aromatic EC >10-12	74
Aliphatic EC >12-16	1100	Aromatic EC >12-16	140
Aliphatic EC >16-35	65000	Aromatic EC >16-21	260
Aliphatic EC >35-44	65000	Aromatic EC >21-35	1100
		Aromatic EC >35-44	1100

¹⁶ As defined under Section 5(a) of the Control of Asbestos Regulations, 2012.

Table 15. Soil Screening Values for BTEX Compounds (shown as mg/kg and µg/kg)

BTEX Compound	SSV (mg/kg)	SSV (µg/kg)
Benzene	0.087	87
Toluene	130	130,000
Ethylbenzene	47	47,000
p-Xylene ¹	56	56,000

¹ Xylene has three structural isomers, the SSV presented is for p-Xylene, which has the most conservative SSV.

Where full speciation of petroleum hydrocarbons by aromatic and aliphatic fractions was not undertaken, the results of the testing undertaken can still be compared with the more stringent of the SSVs for the respective equivalent carbon weight fraction and, where the concentration recorded is found to be lower, then it can be concluded that no significant risk is present.

A number of samples were taken from boreholes WS101 and WS102; the area where the underground tank was removed. This included sampling from an area of stained soils between 2.3m and 2.4m depth encountered in borehole WS101.

In general, none of the shallow samples tested recorded significant concentrations of petroleum hydrocarbons. Only a single sample taken from borehole WS103 recorded concentrations of total petroleum hydrocarbons of over 100mg/kg and the results of each of the fractions were below the more conservative SSV for the fraction.

Deeper samples from both phases of investigation, but notably from within the River Terrace Deposits encountered at boreholes WS101, WS104 and WS02 (generally below a depth of 2.3m), recorded concentrations of petroleum hydrocarbons above their SSVs for aliphatic >C8-C10, >C10-C12 and >C12-C16 fractions and aromatic >C8-C10, >C10-C12, >C12-C16 and >C16-C21 fractions.

It is noted that the SSV for petroleum hydrocarbons are derived from the direct contact pathways (both with soil and soil derived dust), consumption of homegrown vegetables and inhalation of vapour (indoors). At the depths encountered the only viable pathways by which future end users could come into contact is inhalation of soil vapours.

In general inhalation of soil vapours only makes a contribution of between approximately 38%-50% for each of the aliphatic fractions (<C16) and aromatic fractions (<C12).

The likely source of the petroleum hydrocarbon contamination is from leakage of the now removed underground tank, which has been mobilised within the shallow groundwater within the River Terrace Deposit soils at the site.

As the source of petroleum hydrocarbons contamination (the underground tank) has been removed, the concentrations of petroleum hydrocarbons within the groundwater are likely to undergo naturally occurring attenuation over time. This may already be evident in the significant differences between the concentrations of petroleum hydrocarbons recorded at depth in borehole WS02 by the first phase of the ground investigation (November 2016) and those recently recorded in the nearby borehole WS104 (March 2018).

Given the above, the depths at which the elevated concentrations of petroleum hydrocarbons have been recorded and that such concentrations should decrease over time in the groundwater, no significant risk to future end users is considered to be present.

Whilst detectable concentrations of petroleum hydrocarbons have been recorded in the River Terrace Deposits, a Secondary A Aquifer, no detectable concentration has been recorded within the White Chalk Subgroup. Whilst a low risk to the groundwater has been identified, the risk is likely to diminish over time.

Given the depth to the potentially impacted soils encountered and the presence of the buildings on site, remediation of the residual low level petroleum hydrocarbon contamination is considered unfeasible, as it would require the removal of significant volumes of soil at the site and is unlikely to be achievable given the constraints of the site and adjacent sites. Any risk posed to aquifers is likely to decrease over time by natural attenuation with the source having been removed.

11.5 Ground Gases

Monitoring of the gas concentrations within the standpipes in the four boreholes was carried out on three occasions. The monitoring was undertaken during periods of both falling and rising atmospheric pressure, with on-site pressures recorded between 989mb and 1012mb.

Peak concentrations of carbon dioxide of just 0.4% by volume were recorded. No detectable concentrations of methane and no detectable gas flow were recorded in any borehole during any monitoring visit.

The results of the monitoring have been assessed in accordance with the current guidance¹⁷.

The guidance provides a methodology for assessing the risk from ground gases by the calculation of site specific gas screening values (GSV) for each key asphyxiating or explosive gas (carbon dioxide and methane). These are calculated by multiplying the concentration (percentage/volume) of a gas by a gas flow rate (l/hr).

The initial assessment has been made by calculating GSV using the highest flow rate recorded during any of the visits multiplied by the highest gas concentration recorded during any of the visits. This is considered to represent a highly conservative assessment of the risk posed by ground gases.

Where no detectable gas concentrations or flow rates are recorded, the GSV are calculated assuming values equal to the limit of detection of the instrument are present.

The following table summarises the calculated GSV:

Table 16. Calculated GSV for Carbon Dioxide and Methane

Gas	GSV
Carbon Dioxide	$0.004 \times 0.1 = 0.0004$
Methane	$0.001 \times 0.1 = 0.0001$

For "typical" 2 storey housing, the guidance references a characterisation system which compares either the calculated GSV or typical maximum values to generic "traffic light" scenarios.

¹⁷ CIRIA document C665, *Assessing risks posed by hazardous ground gases to buildings*, 2007.
Former Reptune Garage, Main Road, Yapton, West Sussex

For the calculated GSV Table 8.7 of the CIRIA document would classify the site as “Green” and, provided that a well-ventilated sub floor void is installed, no other specific gas protection measures are considered to be necessary.

It is noted that the guidance on monitoring suggests for a site where the generation potential is very low (due to the distance and age of the historical pits identified) and the sensitivity of the proposed development is high (residential use with garden) that the idealised period and frequency of monitoring would be 6 visits over 2 months.

It is noted that the period of monitoring carried out is less than the idealised period. However, in view of the effectively negligible concentrations of gases recorded and the absence of any detectable gas flow rates, it would be anticipated with a high degree of confidence that further monitoring, if conducted, would simply confirm the conclusion already drawn that no specific remedial measures, beyond provision of a well ventilated sub floor void, would be necessary to protect end users from ground gases.

11.6 Quantitative Contamination Risk Assessment

11.6.1 Basis of Assessment

The development is to comprise new residential buildings together with areas of private garden where end users can expect to come into contact with the underlying soils, where soil derived dusts may be generated and where the growing of fruit and vegetables may feasibly occur.

The proposed development layout is presented in Appendix A. Should the proposed development plans be altered, a revised risk assessment may be required.

11.6.2 Contamination Sources Identified

The following sources of contamination have been identified by the quantitative contamination risk assessment:

- Made ground across the site containing elevated concentrations of lead and PAH compounds; and
- Petroleum hydrocarbon impacted River Terrace Deposit soils below 2m depth.

11.6.3 Quantitative Conceptual Model

The quantitative conceptual model for the proposed development is presented in Appendix J.

12. REMEDIATION STRATEGY

CLR11 - Model Procedures for the Management of Contaminated Land recommends that any remedial action proposed for the site should be justified. The requirement for remedial action is considered to be justified due to the identification of complete pollutant linkages.

The remediation works have been developed to meet the technical objectives for the development, the major drivers behind which are:

- To achieve successful remediation within a particular timescale and budget;
- Familiarity with the methodology by the developer/ground worker;
- Confidence that the remediation can be carried out by good technical practices; and
- Likely success of the style of remediation.

12.1 Options Appraisal

The driver for remediation at the site is the presence of made ground soils containing lead and PAH compounds that are considered to pose an unacceptable level of risk to human health in the context of the development, together with concentrations of petroleum hydrocarbons which are above screening levels for standard PE water supply pipe. There are no in situ or ex situ remediation techniques available to reduce the concentrations of lead or PAH compounds within the made ground soils to below that of the published screening values.

The method chosen for remediation must be achievable by the groundworker, using techniques that they are familiar with. It is therefore considered that the remediation proposals could either comprise the complete removal of the contaminant source (the made ground soils), or the provision of a cover system to sever the contaminant pathways in areas where the end users may reasonably be expected to be exposed to the soils or soil derived dust i.e. the proposed garden area.

Both approaches are considered to be equally straightforward and both would be an effective approach to reducing the risk to end users of the site to an acceptable level. Given the variable depth of the made ground encountered the complete removal of made ground may not be practicable across the whole of the proposed garden area and therefore a combination of the two methods may be required.

12.2 Proposed Treatment of Existing Contamination

12.2.1 Protection of Human Health

Within the proposed area of private garden, where possible the made ground soils should be excavated to either expose the undisturbed soils or to a sufficient depth to allow the placement of a cover system of at least 600mm of verified "clean" topsoil and/or subsoil underlain by a high visibility geotextile marker.

The depth of the cover system specified represents "two spade depths" to allow for planting of trees, shrubs etc. without residents coming into contact with the contaminated soils remaining at depth.

In the event that any smaller planting beds are proposed it is recognised that it may be difficult to provide the full 600mm of cover due to the presence of concrete haunching or other adjacent

fixtures. In such area, the made ground should be excavated to the maximum feasible depth, the geotextile placed, and the area backfilled to ground level with “clean” cover soils.

Elsewhere on the site the presence of building cover, roadways and permanent access ways comprising hard cover will also act to sever the contaminant pathways and thereby reduce the risk to end users to an acceptable level.

12.2.2 Protection of Controlled Waters

The risk assessment did not identified only a low and diminishing risk to controlled waters beneath the site and concluded that no specific remedial works are warranted.

12.2.3 Protection of Services

Unless confirmed otherwise in writing by the water supply company, it should be assumed that barrier pipe is required for all new water supply connections.

All service providers’ requirements must be fully adhered to in order to reduce the risk to end users and services to an acceptable level.

Details of any measures required by service providers and confirmation of their implementation should be included within the verification report.

12.2.4 Protection of Construction Workers

As a minimum and in accordance with industry best practice, all ground-workers should be issued with the appropriate PPE and should be instructed in safe working methods. Site clearance should be undertaken by a suitably experienced contractor and appropriate working procedures and PPE should be employed to ensure the health and safety of the site operatives.

As a precautionary measure instruction should be given in the recognition of potentially hazardous materials, including oily and odorous soil and water and discoloured or fibrous substances. Any oil-like substances contacting the skin must be washed off immediately using an appropriate cleanser. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food and smoking must be confined to designated clean areas. Suitable welfare (washing) facilities should be provided. These precautions should be taken in addition to anything highlighted by a site-specific risk assessment which should be undertaken by any contractor prior to commencing work.

Particular attention should be paid to minimising dust arising from soils and appropriate precautions in this regard should include damping down of soils when in dry conditions.

All site personnel should be appropriately briefed on what actions to take in the event that evidence of significant contamination is identified or suspected.

12.3 Watching Brief on Development Works

If, during the course of the site clearance and development works, any materials not previously identified by the investigation that are suspected of being ‘contaminants’ are encountered, then the following procedure should apply:

- a) All works in that area should cease and the site manager should be informed.
- b) Advice should be sought from suitably qualified and experienced personnel as to whether any further site inspection, sampling, testing and/or assessment is deemed necessary.
- c) If required, the conclusions of any assessment and any associated remedial works (if required) should be agreed by the local authority.
- d) If necessary, full details of any remedial works should be included in the verification report for the site.

Suspected 'contamination' may take the following form, though it is noted that this list is not exhaustive and site operatives should ask if they are at all unsure of any findings:

- Soil or water looks oily and/or has an oily odour
- Soil or water has a solvent type of odour
- Significant quantities of man-made materials within fill such as paint cans, car parts, glass fragments
- Suspected asbestos containing materials (insulating boards, cement, loose fibres etc.)
- Significant volumes of clinker like or ashy material
- Sand bags, and or/subsurface concrete structures
- Animal carcasses or evidence of animal burial pits

13. VERIFICATION PLAN

A checklist summarising the requirements of the verification report is presented within Appendix K.

13.1 Inspection of Stripped Formations and Placement of Geotextile Marker

For all areas where remediation works are required (reference Figure 3) stripped formations will be inspected prior to placement of any cover soils to confirm that excavations are sufficiently deep to enable placement of the required thickness of cover soils, and to document the placement of the geotextile. A photographic record of all stripped formations will be maintained for inclusion in the verification report.

If for any reason inspections are not undertaken for any given area where remediation works were specified, retrospective validation may comprise excavation of trial pits by hand on a grid basis to confirm that the specified works have been undertaken. In such exceptional circumstances these works may be undertaken in conjunction with the works detailed in Section 13.2 below.

13.2 Cover System Depth

The final depth of cover material placed in all required areas should be confirmed by use of tape measurements made within excavations to the base of the cover soils. In the event that all made ground soils have been removed from site, then the depth of cover soils will not be measured.

Photographic evidence of the depth of cover soils present will be included in the verification report.

13.3 Cover System Materials

Any imported material from a potentially contaminated (e.g. industrial) site should be rejected. It is recommended that chemical testing results are obtained and supplied for comment prior to accepting the soils on site.

Once imported cover materials have been brought to site they should be stockpiled and protected from cross contamination with any other materials already on site. They will then be inspected, sampled and tested by Ashdown Site Investigation Ltd.

All materials used to form the cover system must comply with current CLEA guidance for soils suitable for use within private gardens. The table below summarises the screening values against which any imported soils will be assessed.

These screening values comprise the 'Suitable For Use Levels' (S4ULs) calculated as a joint project between LQM and CIEH and published in 'The LQM/CIEH Suitable 4 Use Levels, 2015'. In lieu of an S4UL screening value for lead, the Category 4 Screening Level (C4SL) is used, as published within SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.

All materials should be free from any visual or olfactory evidence of petroleum hydrocarbon contamination and should contain no significant quantity of putrescible material (incl. wood or paper). The materials must be free from any asbestos containing materials. In addition to testing for the contaminants listed in the table below, screening of soil samples for the presence of asbestos fibres and petroleum hydrocarbons will be carried out.

In addition to the above, all topsoil and subsoil materials used within the cover system should be free from propagules of aggressive weeds, fragments of glass, bricks, concrete, wire or other potentially hazardous foreign matter and bulk vegetative growth, in order to ensure negligible risk of subsequent weed problems (introduced in the soil) or traumatic injury.

Table 17. Calculated soil screening values for imported soils

Contaminant	Screening Value (mg/kg)	Contaminant	Screening Value (mg/kg)
Arsenic	37	Fluorene	170
Cadmium	11	Phenanthrene	95
Chromium	910	Anthracene	2400
Copper	2400	Fluoranthene	280
Lead	200	Pyrene	620
Mercury	40	Benz(a)anthracene	7.2
Nickel	180	Chrysene	15
Selenium	250	Benzo(b)fluoranthene	2.6
Zinc	3700	Benzo(k)fluoranthene	77
Hexavalent Chromium	6	Benzo(a)pyrene	2.2
Water Soluble Boron	290	Indeno(123-cd)pyrene	27
Naphthalene	2.3	Dibenz(ah)anthracene	0.24
Acenaphthylene	170	Benzo(ghi)perylene	320
Acenaphthene	210		

It is noted that the SSV are only protective of long term risk to human health and do not necessarily represent suitable concentrations for planting or landscaping. If necessary, a horticulturalist should be consulted in this regard.

In the event that any individual sample of imported material records concentrations of contaminants above the screening values listed above, the following method of assessment will be undertaken:

- Statistical analysis of the results, along with an assessment of whether any statistical 'outliers' should be removed from the dataset and treated as 'hotspots'. If the data indicates that the majority of the soil mass as a whole may be considered to contain contaminant concentrations below the screening values then it may be deemed suitable to remain.
- Depending on the findings of the analysis additional testing (which may include retests of the original sample) may be undertaken along with further analysis of the results to determine if this is representative of a widespread issue, or may be attributed to a smaller part of the site, or batch of imported soils.
- Liaison with the regulators may be undertaken to agree whether or not the materials are to be considered suitable to remain.

Where testing and analysis identify a significant failure and the procedures above do not provide sufficient evidence that the imported materials are suitable to remain, then the imported soils will be removed and replaced with other suitable soils.

14. POST REMEDIATION RISK ASSESSMENT

The remedial works set out in this report are considered to remove or sever the identified pollutant linkages. A post remediation conceptual model is presented in the following table.

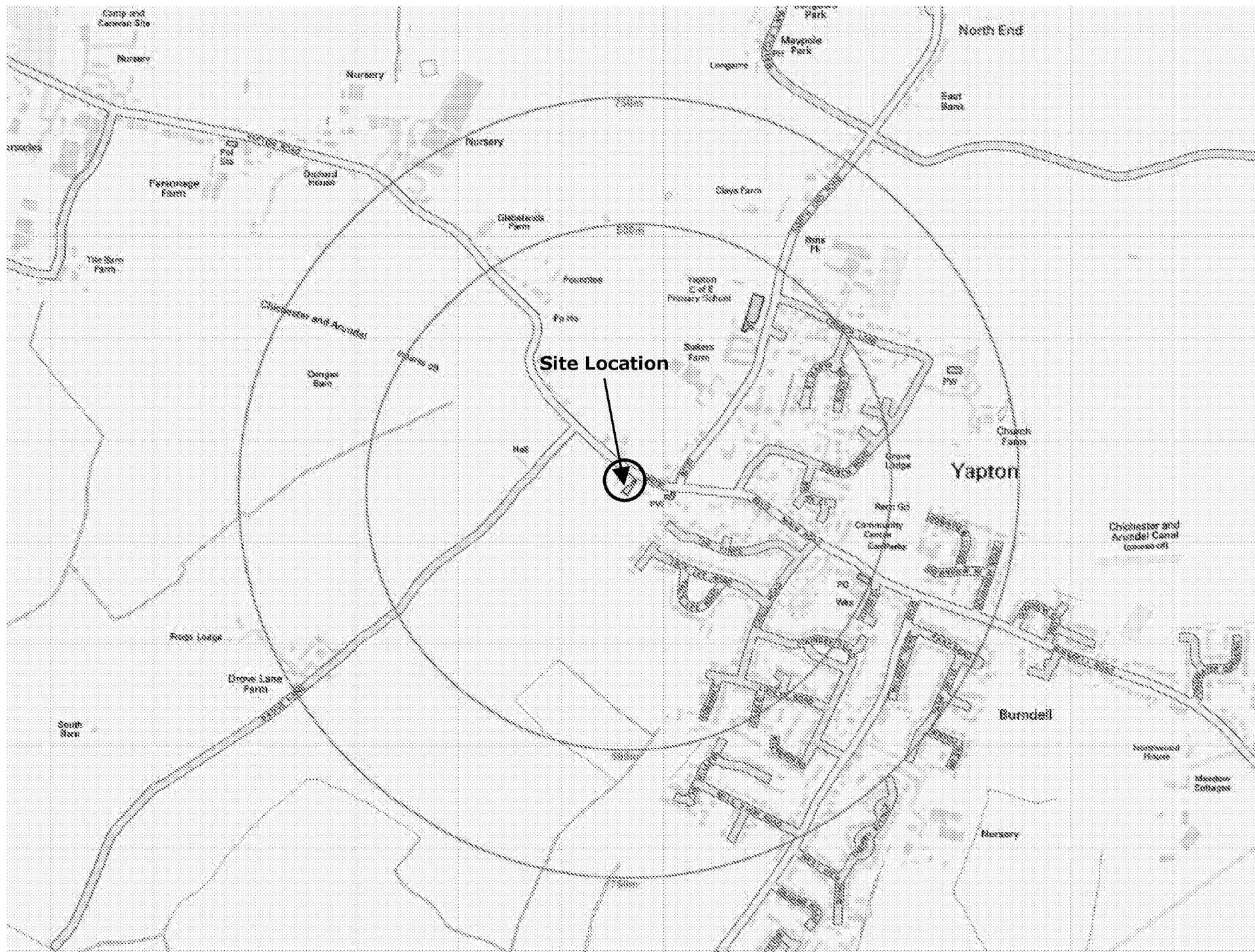
Table 18. Post Remediation Conceptual Model for End Users – Potential Pollutant Linkages and Assessment of Risk

Contaminant Source	Remedial Measures	Potential Pathway(s)	Assessment of Risk to Human Health
Elevated concentrations of lead and PAH compounds within the made ground soils across the site.	Private Gardens Removal of all made ground soils OR Placement of 600mm of verified 'clean' cover soils over a high visibility geotextile marker.	Pathways severed by remedial measures	No significant pollutant linkages identified.
	Narrow Planters Removal of made ground soils to maximum feasible depth and placement of verified 'clean' cover soils over a geotextile marker.	Pathways severed by remedial measures and construction works.	
	Provision of building cover, parking areas and permanent access ways comprising hard cover	Pathways severed by construction works	
Petroleum hydrocarbon impacted River Terrace Deposit soils below 2m depth	Provision of barrier pipe unless confirmed otherwise in writing by the water supply company	Pathways severed by remedial measures	No significant pollutant linkages identified.

Ashdown Site Investigation Ltd.

FIGURES

- Figure 1 Site Location Plan
- Figure 2 Site Walkover Plan
- Figure 3 Remedial Works Plan

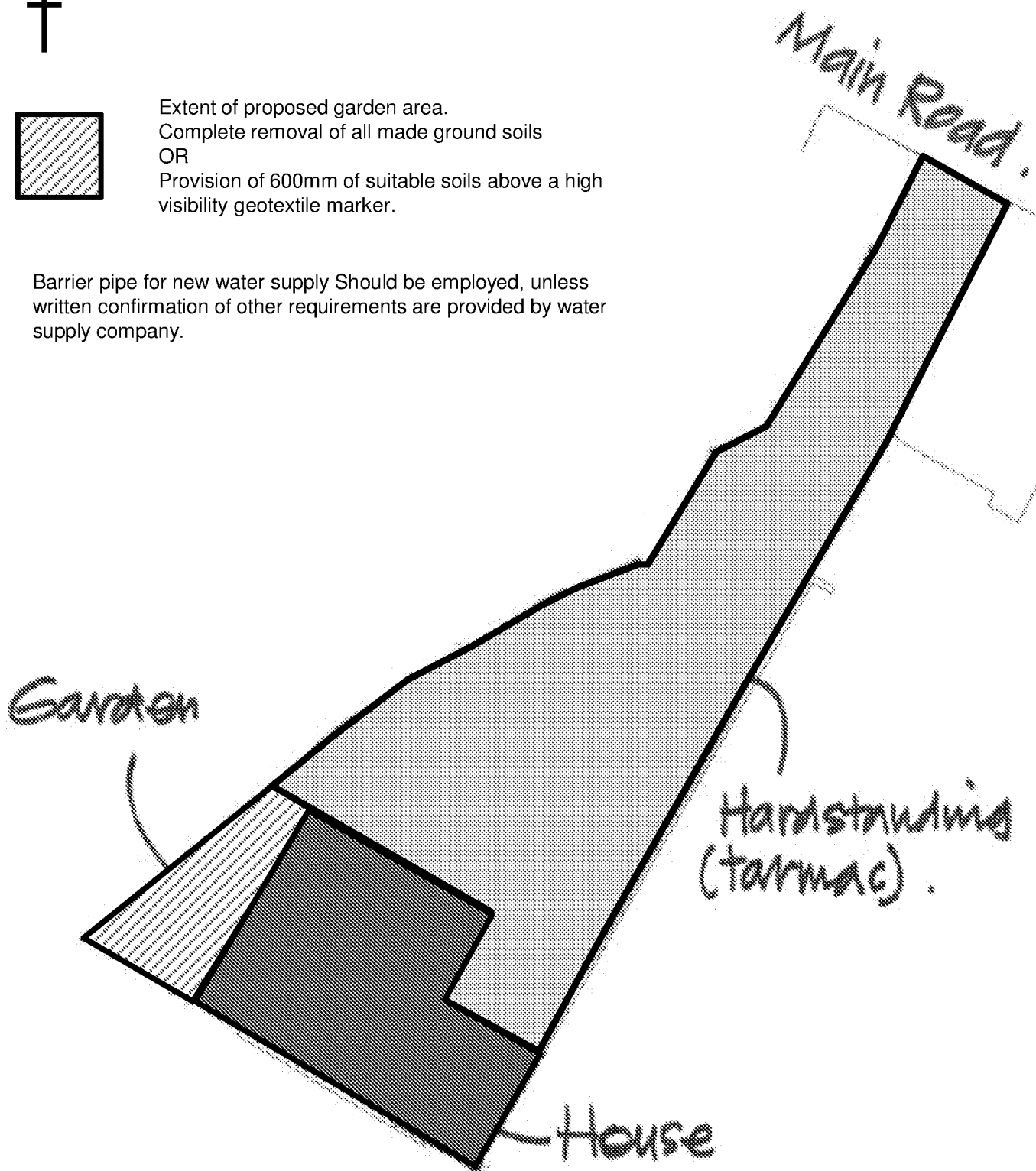






Extent of proposed garden area.
Complete removal of all made ground soils
OR
Provision of 600mm of suitable soils above a high
visibility geotextile marker.

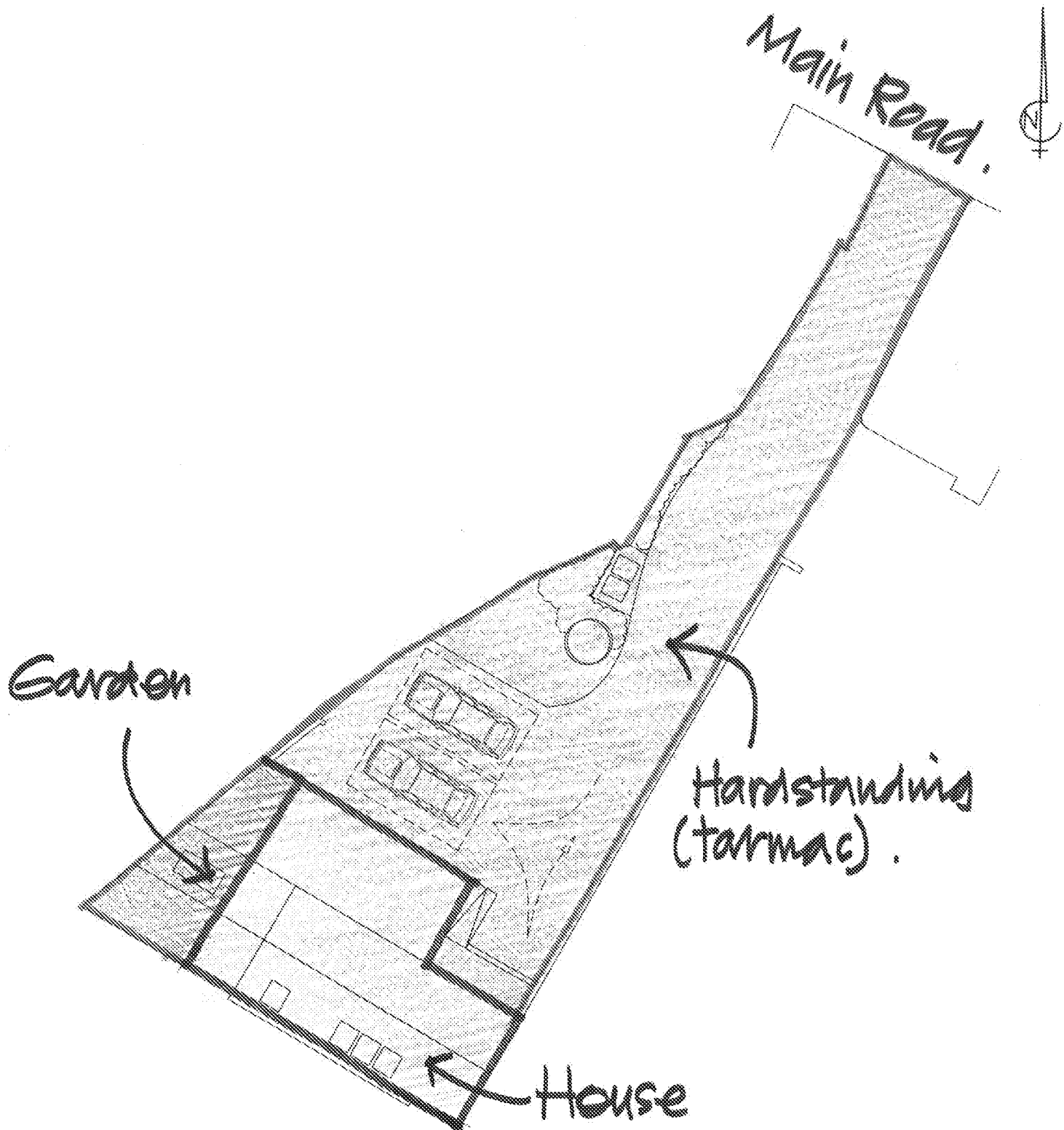
Barrier pipe for new water supply Should be employed, unless
written confirmation of other requirements are provided by water
supply company.



R18-13073

APPENDIX A

Proposed Development Layout

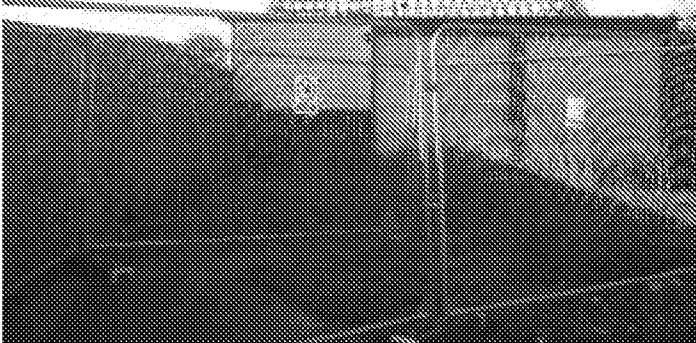


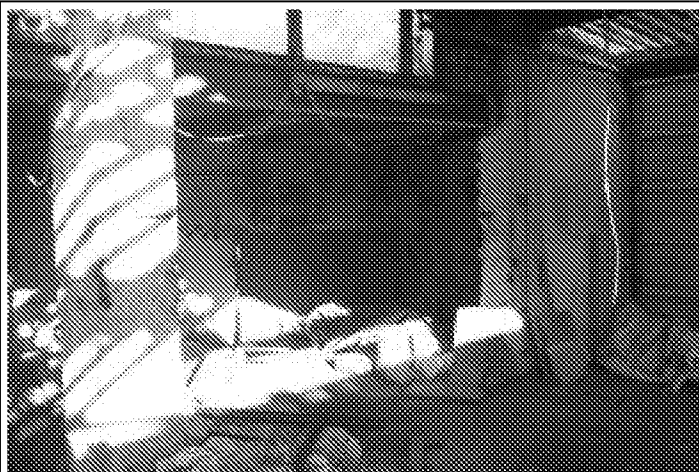
Garage
Main Road
YAPTON.

R18-13073

APPENDIX B

Site Walkover Photographs

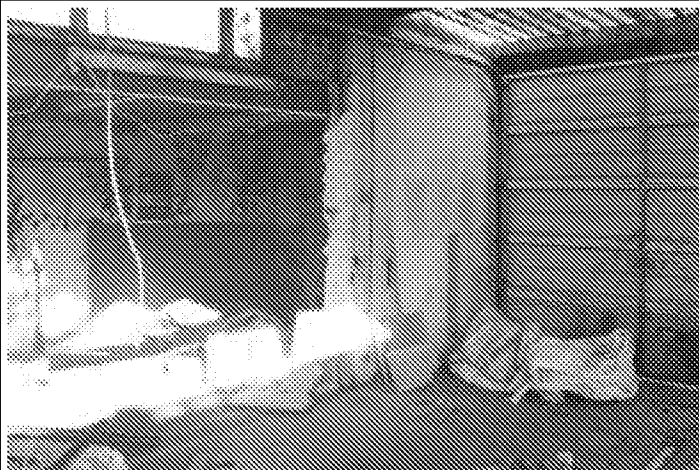
	Hard standing in the north east of the site
	Broken hardstanding from removal of underground tanks
	Existing derelict buildings on site



Existing derelict buildings on site



Existing derelict buildings on site



Existing derelict buildings on site

R18-13073

APPENDIX C

West Sussex County Council Petroleum Officer Correspondence

Stuart Card

From: Jackie Richmond <[REDACTED]>
Sent: 22 February 2018 15:18
To: Stuart Card
Subject: RE: Reptune Garage Yapton

Importance: High

Hello Stuart,

Please see below all the information we have on Reptune Garage Yapton

SR330190 Licence number 493001

Health and Safety at Work etc Act 1974
The Petroleum (Consolidation) Regulations 2014
Dangerous Substances and Explosive Atmospheres Regulations 2002
Public Health Act 1961

History Enquiry at Reptune Garage Yapton

Further to your recent enquiry relating to the history of the above filling station I hope the following information is of assistance.

Details of former contents of the tanks:

Tank	Capacity (Litres)	Fuel	Date Installed / Age	Date / How Made Safe
3	22730L	Petrol	Pre 1949	06/03/2008 Foam Filled (no info if removed)

Please note that although West Sussex County Council makes every effort to ensure that the information provided is accurate,
we cannot be held responsible for any error or omission in the data provided.

If I can be of any further assistance please do not hesitate to contact me.

Kind regards

Jackie

Jackie Richmond, Operational Support Officer, OSU, West Sussex County Council. Address:
Parkside, Chart Way, Horsham, West Sussex, RH12 1XH.

[REDACTED]

APPENDIX D

Arun District Council Officers' Report

Recommendation Report for Planning Permission

REF NO:	Y/68/17/PL
LOCATION:	Garage Premises Main Road Yapton BN18 0EA
PROPOSAL:	Alterations & extensions to existing redundant garage building to create 1 No. dwelling & associated works. This application affects the character & appearance of the Main Road/Church Road, Yapton Conservation Area & may affect the setting of a Listed Building.

SITE AND SURROUNDINGS

DESCRIPTION OF APPLICATION	Lean-to sections to front of the existing fire damaged, derelict building removed and replaced with an oak framed single storey extension. The front wall of the original barn will be reinstated and two roof lights in lower section front roof included. To the southwest (rear), the slate roofs will be reinstated to the main barn roof and lower roof. The main barn roof will also include two no high level windows integrating into sloped glazing within the roof slope. 4 no brick quoined slots will be included in the rear wall to add light into the downstairs living area. A new high level window is proposed in the gable end of the roof on the south east elevation which will serve the staircase. Two off street parking spaces are proposed to front with turning to side, small garden area with bin collection to front of that. The site is accessed by foot and vehicle between The old Malt House and Yapton House. There is no back garden as the rear of the site bounds the former Arundel to Portsmouth canal.
SITE AREA	0.03 hectares (95.81m2)
RESIDENTIAL DEVELOPMENT DENSITY (NET)	33 dph.
TOPOGRAPHY	Slopes downwards from rear (south west) to front (north east)
TREES	None of any significance affected by the proposed development.
BOUNDARY TREATMENT	None to front, the building abuts the boundary to the rear, 2m flint and brick walls to sides.
SITE CHARACTERISTICS	Derelict single storey former garage premises (originally a barn), the barn is fire damaged and the site has been vacant for more than 2 years. Tarmac driveway to front.

CHARACTER OF LOCALITY

Semi-rural, historic ribbon development of Yapton within a conservation area. The grouping of buildings are heritage assets with some listed buildings and the former Arundel to Portsmouth canal to south. The buildings vary in size from single to two storey and are a mix of residential and commercial with some retail and office uses. The ribbon of development is on the edge of Yapton's built up area boundary and is surrounded predominantly by agricultural land.

RELEVANT SITE HISTORY

Y/12/17/OUT	Outline Application with some matters reserved for the demolition of existing garage/outbuilding & erection of 1 No. dwelling (resubmission following Y/83/16/OUT). This application affects the character & appearance of the Main Road/Church Road Yapton Conservation Area & the setting of a Listed Building.	Withdrawn 25-04-17
Y/2/63/A	Canopy Over Petrol Pumps	Refused 31-07-63
Y/2/63	Installation Of 5000 Gallon Petrol Storage Tank	Approve 01-05-63
Y/17/67	Garage/Workshop	ApproveConditionally 10-05-67
Y/83/16/OUT	Outline application with some matters reserved for 2No. dwellings. This application affects the character and appearance of Main Road/Church Road Yapton Conservation Area	Withdrawn 25-01-17

Two previous applications for conversion to two storey dwelling withdrawn owing to detrimental impact on residential amenity, visual amenity, setting of listed buildings and the conservation area.

REPRESENTATIONS

REPRESENTATIONS RECEIVED:

Yapton Parish Council

No objection to the principle of converting a disused garage premises to a small detached dwelling conditional upon:

REPORT(008)

1. Environmental survey to ensure no contaminants from the previous garage repair use remain in the soil/ground.
2. Full consideration and use of sympathetic materials for a conservation area in the construction/refurbishment of the dwelling.
3. Conservation style/appropriate fenestration throughout the dwelling.
4. Satisfactory highway solution for access/egress onto Main Road.
5. Roofline not to exceed the existing building's ridge and eaves heights.

COMMENTS ON REPRESENTATIONS RECEIVED:

Comments noted.

Pre-commencement conditions regarding contaminated land will be imposed on the application in line with Pollution Officer request.

Submission of materials condition will be imposed in line with Conservation Officer request, including details of conservation style roof lights.

WSCC have no objection in highways terms.

The roofline to be put back in place will match the former (part of building is lost to fire damage) and existing roofline.

CONSULTATIONS

Engineering Services Manager
Engineers (Drainage)
Southern Water Planning
Listed Building Officer
Conservation Officer
WSCC Strategic Planning
Environmental Health

CONSULTATION RESPONSES RECEIVED:

Drainage Engineers

Please apply standard condition ENGD2A.

Soakaways must be investigated for surface water disposal.

Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period and at the location and depth of the proposed structures. The percolation tests must be carried out in accordance with BRE 365, CIRIA R156 or a similar approved method and cater for the 1 in 10 year storm between the invert of the entry pipe to the soakaway, and the base of the structure. It must also have provision to ensure that there is capacity in the system to contain below ground level the 1 in 100 year event plus 30% on stored volumes, as an allowance for climate change. Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded annual groundwater level identified in that location.

Any SuDS or soakaway design must include adequate groundwater monitoring data to determine the highest winter groundwater table in support of the design. The applicant is advised to discuss the extent of groundwater monitoring with the Council's Engineers. Supplementary guidance notes are also enclosed for information.

Southern Water

Please apply standard informatives.

WSCC strategic planning (Highways)- full comments available on the website.

In summary the LHA do not anticipate that a highway safety or capacity reason for resisting the proposals could be substantiated. The application is therefore in line with policies set out in paragraph 32 of the National Planning Policy Framework in that it would not have 'severe' impact on the operation of the Highway network, and there are no transport grounds to resist the proposal.

If the LPA are minded to approve the application the following conditions should be secured:

Cycle parking

No part of the development shall be first occupied until covered and secure cycle parking spaces have been provided in accordance with plans and details submitted to and approved by the Local Planning Authority.

Reason: To provide alternative travel options to the use of the car in accordance with current sustainable transport policies.

Vehicle parking and turning

No part of the development shall be first occupied until the vehicle parking and turning spaces have been constructed in accordance with the approved plan. These spaces shall thereafter be retained for their designated use.

Reason: To provide adequate on-site car parking and turning space for the development.

Conservation Officer

The proposal site is a former garage on Main Road, Yapton. The site is to the rear of the Grade II Listed The Old Malt House, and is within Yapton Conservation Area.

The proposal site is visible from the street and thus impact on the character of the Conservation Area. The proposal site is dilapidated, and although the flint and brick walls appear to be extant, the roof is largely missing. The proposals would therefore have little impact on the existing physical form. The proposed scheme is considered an enhancement to the 'backland' setting, and is considered suitable in terms of scale and massing.

There are no objections to this proposal in conservation terms, however due to the visibility from the street scene, it is recommended that details of material finishes be subject to condition.

Environmental Health (Senior Pollution Officer comments)

Please apply the below conditions due to the previous use of the site thanks. Fuel tanks may exist onsite.

REPORT(ODE)

ENV3 Universal condition for development on land affected by contamination

Environmental Health position

We consider that planning permission should only be granted to the proposed development as submitted if the following planning condition is imposed as set out below. Without this condition, the proposed development on this site poses an unacceptable risk to the environment and we would wish to object to the application.

Condition: Prior to the commencement of development (parts 1, 2) and prior to occupation (parts 3, 4) approved by this planning permission (or such other date or stage in development as may be agreed in writing with the Local Planning Authority), the following components of a scheme to deal with the risks associated with contamination of the site shall each be submitted to and approved, in writing, by the local planning authority:

1.A preliminary risk assessment which has identified:

- all previous uses
- potential contaminants associated with those uses
- a conceptual model of the site indicating sources, pathways and receptors
- potentially unacceptable risks arising from contamination at the site.

2.A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.

3.The site investigation results and the detailed risk assessment (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.

4.A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.

Any changes to these components require the express consent of the local planning authority. The scheme shall be implemented as approved.

Reason

To ensure that the development complies with approved details in the interests of protection of the environment and prevention of harm to human health in accordance with policies GEN7 and GEN31 of the Arun District Local Plan .

ENV 5 Unsuspected contamination

Environmental Health position

We consider that planning permission should only be granted to the proposed development as submitted if the following planning condition is imposed as set out below. Without this condition, the proposed development on this site poses an unacceptable risk to the environment and we would wish to object to the application.

Condition: If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until the developer has submitted, and obtained written approval from the Local Planning Authority for, an amendment to the remediation strategy detailing how this unsuspected

REPORT(000)

contamination shall be dealt with.

Reason

To ensure that the development complies with approved details in the interests of protection of the environment and prevention of harm to human health in accordance with policies GEN7 and GEN31 of the Arun District Local Plan

ENV 6 Verification report

Environmental Health position

We consider that planning permission should only be granted to the proposed development as submitted if the following planning condition is imposed as set out below. Without this condition, the proposed development on this site poses an unacceptable risk to the environment and we would wish to object to the application.

Condition: Prior to occupation of any part of the permitted development, a verification report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved, in writing, by the local planning authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a "long-term monitoring and maintenance plan") for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan, and for the reporting of this to the local planning authority.

REASON

To ensure that the development complies with approved details in the interests of protection of the environment and prevention of harm to human health in accordance with policies GEN7 and GEN31 of the Arun District Local Plan.

COMMENTS ON CONSULTATION RESPONSES:

Comments noted.

Conditions will be imposed. A cycle storage condition is not considered to be necessary as there will be a store room to front with space for bicycles.

POLICY CONTEXT

Designation applicable to site:

Built up area boundary

Conservation area

Lidsey foul water treatment catchment area

Setting of Grade 2 listed buildings (The Old Malt House and Yapton Evangelical Free Church)

Bounds heritage asset Arundel to Portsmouth Canal

DEVELOPMENT PLAN POLICES

Arun District Local Plan (2003):

AREA18	Portsmouth and Arundel Canal
AREA2	Conservation Areas
DEV2	Conversion of Rural Buildings for Residential Use
GEN12	Parking in New Development

REPORT(000)

GEN2	Built-up Area Boundary
GEN3	Protection of the Countryside
GEN32	Noise Pollution
GEN5	Provision of New Residential Development
GEN7	The Form of New Development
GEN9	Foul and Surface Water Drainage

Publication Version of the Local Plan (October 2014):

D DM1 Aspects of Form and Design Quality
C SP1 Countryside
D DM2 Internal Space Standards
D DM3 External Space Standards
D DM4 Extensions & Alterations to Existing Buildings
D SP1 Design
ECC SP1 Adapting to Climate Change
ECC SP2 Energy and climate change mitigation
EMP DM1 Employment land:Development Management
HER DM1 Listed Buildings
HER DM3 Conservation Areas
HER DM5 Remnants of the Portsmouth and Arundel Canal
HER SP1 The Historic Environment
QE DM1 Noise Pollution
QE DM4 Contaminated Land
SD SP1 Sustainable Development
SD SP2 Built -Up Area Boundary
SKILLS SP1 Employment and Skills
T SP1 Transport and Development
W DM2 Flood Risk
W SP1 Water

<u>Yapton neighbourhood plan 2014 Policy BB1</u>	Built-up Area Boundary
Yapton neighbourhood plan 2014 Policy BE1	Protection of existing commercial premises or land
Yapton neighbourhood plan 2014 Policy E10	The former Portsmouth and Arundel Canal
Yapton neighbourhood plan 2014 Policy E11	Minimising the impact of flooding from development
Yapton neighbourhood plan 2014 Policy E8	Conservation Areas
Yapton neighbourhood plan 2014 Policy E9	Listed Buildings and Buildings or Structures of Character
Yapton neighbourhood plan 2014 Policy H1	Housing requirement
Yapton neighbourhood plan 2014 Policy PK1	Parking standards for new residential development

PLANNING POLICY GUIDANCE:

NPPF	National Planning Policy Framework
------	------------------------------------

REPORT(000)

SUPPLEMENTARY POLICY GUIDANCE:**POLICY COMMENTARY**

The Development Plan consists of the Arun District Local Plan 2003, West Sussex County Council's Waste and Minerals Plans and Made Neighbourhood Development Plans.

A new local plan is in preparation and is a material consideration when determining Planning Applications. At this stage the Arun District Local Plan 2011-2031 (Publication Version) October 2014 and supporting documents were submitted for independent examination on 30 January 2015.

A number of Main Modifications to the Arun District Local Plan 2011-2031 (Publication Version) October 2014 were approved by the Council on 22nd March 2017 and consultation on these has taking place. The Main Modifications should be read alongside the Arun District Local Plan 2011-2031 (Publication Version) October 2014 and where there are changes the Main Modification. The examination was completed in September 2017.

The policies are published under Regulations 19 and 35 of the Town and Country Planning (Local Planning) (England) Regulations 2012.

The Neighbourhood Development Plan

Where applicable, Neighbourhood Development Plan's (more commonly known as a neighbourhood plan or NDP), once made by Arun District Council, will form part of the statutory local development plan for the relevant designated neighbourhood area. Whilst an NDP is under preparation it will afford little weight in the determination of planning applications. Its status will however gain more weight as a material consideration the closer it is towards it being made. Arun District Council will make reference to an NDP when it has, by the close of planning application consultation, been publicised for pre-submission consultation (Reg.14).

Made Plans in Arun District Council's Local Planning Authority Area are: Aldingbourne; Angmering; Arundel; Barnham & Eastergate; Bersted; Bognor Regis; Clymping; East Preston; Felpham; Ferring; Kingston; Littlehampton; Rustington; Walberton; Yapton. The written Ministerial Statement of 13 December 2016 confirms that relevant policies for the supply of housing in Neighbourhood Plans should not be deemed to be out of date where all of the following circumstances arise;

- The NDP has been part of the development plan for 2 years or less or the ministerial statement is less than 2 years old
- The NDP allocates sites for housing
- The Council can demonstrate a three-year supply of deliverable housing sites

Arun District Council will make reference to an NDP when it has, by the close of planning application consultation, been publicised for pre-submission consultation(Reg.14).

The development is considered to comply with relevant Yapton NDP policies BB1, BE1, E8, E9, E10, E11, HK1 and PK1 for reasons to be discussed in the conclusions section.

DEVELOPMENT PLAN AND/OR LEGISLATIVE BACKGROUND

Section 38(6) of the Planning and Compulsory Purchase Act 2004 states:-

"If regard is to be had to the development plan for the purpose of any determination to be made under the planning Acts the determination must be made in accordance with the plan unless material considerations indicate otherwise."

The proposal is considered to comply with relevant Development Plan policies in that it would have no materially adverse effect on the visual amenities of the locality or the residential amenities of the adjoining properties, nor would it have an adverse impact upon the established character of the surrounding area.

OTHER MATERIAL CONSIDERATIONS

It is considered that there are no other material considerations to warrant a decision otherwise than in accordance with the Development Plan and/or legislative background.

CONCLUSIONS

Principle

The site is within the built up area boundary where the principle of new development is acceptable in line with saved policy GEN2 and Yapton NDP policy BB1.

The premises have been vacant for over two years (it is understood the building caught fire and was abandoned in late 2015/ early 2016) and is substantially fire damaged requiring substantial and therefore does not offer an attractive use as commercial. As such, although the development will result in loss of employment land, it is considered to be acceptable in this instance owing to abandonment and vacant use in compliance with saved policy DEV2 and Yapton NDP policy BE1.

Visual Amenity, Impact on settings of listed buildings, Conservation area and site of former Arundel and Portsmouth Canal

The development is a modest conversion and would partly reinstate the appearance of the barn as it was prior to conversion to a garage. It is considered the removal of the un-sympathetic lean-to extensions to front and replacement with oak framed extension. The scale of the building will decrease and it will not be made any higher, meaning the form remains similar to existing/original, respecting the setting of the two nearby listed buildings, preserves the appearance of the conservation area, adjoining countryside and would have a limited impact on the former Arundel and Portsmouth Canal.

External material samples and details will be required via condition and overall the development is considered to meet requirements of saved policies AREA2, AREA18, GEN7 & GEN3, emerging policies C SP1, D SP1, D DM1, D DM4, HER SP1, HER DM1, HER DM3 & HER DM5 and Yapton NDP policies

Residential Amenity

The development will have little impact on residential amenity. The scale of the building will decrease and no first floor or high level windows will face neighbouring dwellings that could result in detrimental overlooking. The window serving the staircase on the south west facing elevation (looking over Yapton House's rear garden) will be conditioned to be obscure glazed a fixed shut to a height 1.7m above finished floor level. The development is not considered to lead to any overbearing impact or loss of light to the neighbouring dwellings as it would not be larger than the existing structure.

The use of the site for residential purposes is not considered to lead to a significant increase in noise and disturbance to neighbouring dwellings. Especially considering its former use as a commercial garage which is likely to have been significantly noisier.

The development is considered to be acceptable in terms of impact on residential amenity in compliance with saved policies GEN7 and DEV19.

Amenity standards

The proposed dwelling would meet internal space standards for a three bedroom, two storey dwelling creating 140.02m² of internal floor space. A small private garden to front would be created. Whilst it would not meet the standards for a new 3 bedroom dwelling contained in emerging policy DDM3, the site is located adjacent the Arundel canal and has good access to local open space and countryside. Furthermore, a garden space will be created that is considered to be private and useable. The development is considered to be acceptable in terms of external and internal amenity standards.

Surface Water Drainage

The development will reduce the surface area which would create run-off and create a garden area which would allow surface water drainage. As such, it is not considered reasonable to impose a pre-commencement surface water drainage condition. The development is considered to comply with saved policy GEN9.

Contaminated Land

The site was previously used as a garage and had planning permission granted for an underground fuel tank. As such, the Council's Pollution officer has suggested pre-commencement condition which are considered to be reasonable and necessary and will be imposed. The development is considered to comply with emerging Arun Local Plan policy

Parking and Highways safety

WSCC have not objected to the parking layout or use of the access. The site will provide two off street parking spaces which meets with emerging Arun Local Plan policy TSP1 requirements.

The application is considered to comply with the development plan and is recommended for conditional permission.

HUMAN RIGHTS ACT

Human Rights Act:

The Council in making a decision should be aware of and take into account any implications that may arise from the Human Rights Act 1998. Under the Act, it is unlawful for a public authority such as Arun District Council to act in a manner, which is incompatible with the European Convention on Human Rights.

Consideration has been specifically given to Article 8 (right to respect private and family life) and Article 1 of the First Protocol (protection of property). It is not considered that the recommendation for approval of the grant of permission in this case interferes unreasonably with any local residents' right to respect for their private and family life and home, except insofar as it is necessary to protect the rights and freedoms of others (in this case, the rights of the applicant). The Council is also permitted to control the use of property in accordance with the general interest and the recommendation for approval is considered to

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be a proportionate response to the submitted application based on the considerations set out in this report.

DUTY UNDER THE EQUALITIES ACT 2010

Duty under the Equalities Act 2010

In assessing this proposal the following impacts have been identified upon those people with the following protected characteristics (age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex or sexual orientation).

The proposal would have a neutral impact on the protected characteristics.

RECOMMENDATION

APPROVE CONDITIONALLY

- 1 The development hereby permitted shall be begun before the expiration of 3 years from the date of this permission.

Reason: To comply with Section 91 of the Town and Country Planning Act 1990 (as amended).

- 2 The development hereby approved shall be carried out in accordance with the following approved plans:

1045/DPA01 Revision 01
1045/DPA03 Revision 01
1045/DPA04 Revision 01
1045/DPA05 Revision 01
1045/DPA06 Revision 01

Reason: For the avoidance of doubt and in the interests of amenity and the environment in accordance with policy GEN7 of the Arun District Local Plan.

- 3 The first floor window on the south east elevation of the building shall at all times be glazed with obscured glass and fixed to be permanently non-opening.

Reason: To protect the amenities and privacy of the adjoining property in accordance with policies GEN7, DEV19 of the Arun District Local Plan.

- 4 Prior to the commencement of development approved by this planning permission (or such other date or stage in development as may be agreed in writing with the Local Planning Authority), the following components of a scheme to deal with the risks associated with contamination of the site shall each be submitted to and approved, in writing, by the local planning authority:

1.A preliminary risk assessment which has identified:
all previous uses
potential contaminants associated with those uses
a conceptual model of the site indicating sources, pathways and receptors
potentially unacceptable risks arising from contamination at the site.

2.A site investigation scheme, based on (1) to provide information for a detailed assessment of

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the risk to all receptors that may be affected, including those off site.

3. The site investigation results and the detailed risk assessment (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.

4. A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.

Any changes to these components require the express consent of the local planning authority. The scheme shall be implemented as approved.

Where demolition is required 1. and 2. above should be submitted prior to demolition. Parts 3. and 4. can take place post demolition if necessary.

Reason: To ensure that the development complies with approved details in the interests of protection of the environment and prevention of harm to human health in accordance with Arun District Local Plan policy GEN7. This is required to be a pre-commencement condition because these details have to be agreed and in place before any work commences.

- 5 If during development, contamination not previously identified, is found to be present at the site then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until the developer has submitted, and obtained written approval from the Local Planning Authority for, an amendment to the remediation strategy detailing how this unsuspected contamination shall be dealt with.

Reason: To ensure that the development complies with approved details in the interests of protection of the environment and prevention of harm to human health in accordance with Arun District Plan policy GEN7.

- 6 Prior to occupation of any part of the development, a verification report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved, in writing, by the local planning authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a "long-term monitoring and maintenance plan") for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan, and for the reporting of this to the local planning authority.

Reason: To protect the environment and prevent harm to human health by ensuring that the remediated site has been reclaimed in an appropriate standard in accordance with Arun District Local Plan policy GEN7.

- 7 No part of the development shall be first occupied until the vehicle parking and turning spaces have been constructed in accordance with approved plan 1045/DPA03 Revision 1. These spaces shall thereafter be retained for their designated use.

Reason: To provide adequate on-site car parking and turning space for the development.

- 8 INFORMATIVE: A formal application for connection to the public sewerage system is required in order to service this development. To initiate a sewer capacity check to identify the appropriate connection point for the development, please contact Southern Water, Southern House, Sparrowgrove, Otterbourne, Hampshire, SO21 2SW (Tel 033 0303 0119) or www.southernwater.co.uk.

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- 9 INFORMATIVE: Statement pursuant to Article 35 of the Town and Country Planning (Development Management Procedure)(England) Order 2015. The Local Planning Authority has acted positively and proactively in determining this application by assessing the proposal against all material considerations, including planning policies and any representations that may have been received and subsequently determining to grant planning permission in accordance with the presumption in favour of sustainable development, as set out within the National Planning Policy Framework.

APPENDIX E

Classification of Probability, Consequence and Risk

Probability of risk being realised	
Classification	Definition
High	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Moderate	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Very Low	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Consequence of risk being realised		
Classification	Category	Definition
Severe	Human Health	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA.
	Controlled Waters	Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource.
	Property	Catastrophic damage to buildings/property.
	Ecological Systems	A short term risk to a particular ecosystem or organisation forming part of such ecosystem.
Moderate	Human Health	Chronic damage to Human Health.
	Controlled Waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution).
	Ecological System	A significant change in a particular ecosystem or organism forming part of such ecosystem.
Minor	Controlled Waters	Pollution of non-sensitive water resources.
	Property	Significant damage to crops, buildings, structures and services.
	Ecological Systems	Damage to sensitive buildings/structures/services or the environment.
Very Minor	Human Health	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc).
	Property	Easily repairable effects of damage to buildings, structures and services.
	Project	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve.

Risk classification definitions	
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

APPENDIX F

Preliminary Conceptual Model

Reptune Garage, Main Road, Yapton, West Sussex				Preliminary Conceptual Model		R18-13073	
Potential Source	Potential Receptor	Potential Contaminants	Potential Pathway	Complete Linkage Present?	Probability	Consequence	Risk
• Historical use of the site as a garage	End Users	Petroleum Hydrocarbons	Dermal contact with soil and dust (indoor & outdoor)	Yes	P2: Low	C3: Moderate	Low/Moderate
			Ingestion of soil and indoor dust	Yes	P2: Low	C3: Moderate	Low/Moderate
			Consumption of home-grown produce and attached soil	Yes	P1: Very Low	C3: Moderate	Low
			Inhalation of soil dust (indoor and outdoor)	Yes	P2: Low	C3: Moderate	Low/Moderate
			Inhalation of soil vapours	Yes	P3: Moderate	C3: Moderate	Moderate
			Inhalation of soil gases/ Risk of explosion	No potential gas source identified			N/A
	End Users (via Water Supply Pipework)	Petroleum Hydrocarbons	Contamination of incoming services	Yes	P3: Moderate	C3: Moderate	Moderate
	Groundwater	Petroleum Hydrocarbons	Migration to groundwater	Yes	P3: Moderate	C2: Minor	Low/Moderate
• Removed underground tank in the centre of the site	End Users	Petroleum Hydrocarbons	Dermal contact with soil and dust (indoor & outdoor)	Yes	P1: Very Low	C3: Moderate	Low
			Ingestion of soil and indoor dust	Yes	P1: Very Low	C3: Moderate	Low
			Consumption of home-grown produce and attached soil	Yes	P1: Very Low	C3: Moderate	Low
			Inhalation of soil dust (indoor and outdoor)	Yes	P1: Very Low	C3: Moderate	Low
			Inhalation of soil vapours	Yes	P3: Moderate	C3: Moderate	Moderate
			Inhalation of soil gases/ Risk of explosion	No potential gas source identified			N/A
	End Users (via Water Supply Pipework)	Petroleum Hydrocarbons	Contamination of incoming services	Yes	P3: Moderate	C3: Moderate	Moderate
	Groundwater	Petroleum Hydrocarbons	Migration to groundwater	Yes	P3: Moderate	C2: Minor	Low/Moderate

Reptune Garage, Main Road, Yapton, West Sussex				Preliminary Conceptual Model		R18-13073	
Potential Source	Potential Receptor	Potential Contaminants	Potential Pathway	Complete Linkage Present?	Probability	Consequence	Risk
• Made ground from potential historical demolition on the site and in its vicinity	End Users	Asbestos, Heavy Metals and PAH Compounds	Dermal contact with soil and dust (indoor & outdoor)	Yes	P3: Moderate	C3: Moderate	Moderate
			Ingestion of soil and indoor dust	Yes	P2: Moderate	C3: Moderate	Moderate
			Consumption of home-grown produce and attached soil	Yes	P1: Very Low	C3: Moderate	Low
			Inhalation of soil dust (indoor and outdoor)	Yes	P3: Moderate	C3: Moderate	Moderate
			Inhalation of soil vapours	No potential contaminants identified			N/A
			Inhalation of soil gases/ Risk of explosion	No potential gas source identified			N/A
	End Users (via Water Supply Pipework)		Contamination of incoming services	No potential contaminants identified			N/A
	Groundwater	Heavy Metals and PAH Compounds	Migration to groundwater	Yes	P1: Very Low	C2: Minor	Very Low
• Ground gases from backfilled canal to the south west of the site	End Users	Land Gases	Dermal contact with soil and dust (indoor & outdoor)	No potential contaminants identified			N/A
			Ingestion of soil and indoor dust	No potential contaminants identified			N/A
			Consumption of home-grown produce and attached soil	No potential contaminants identified			N/A
			Inhalation of soil dust (indoor and outdoor)	No potential contaminants identified			N/A
			Inhalation of soil vapours	No potential contaminants identified			N/A
			Inhalation of soil gases/ Risk of explosion	Yes	P1: Very Low	C3: Moderate	Low
	End Users (via Water Supply Pipework)		Contamination of incoming services	No potential contaminants identified			N/A
	Groundwater		Migration to groundwater	No contaminants likely to impact groundwater identified			N/A

Reptune Garage, Main Road, Yapton, West Sussex				Preliminary Conceptual Model		R18-13073	
Potential Source	Potential Receptor	Potential Contaminants	Potential Pathway	Complete Linkage Present?	Probability	Consequence	Risk
• Ground gases from historical landfill to the north west of the site	End Users	Land Gases	Dermal contact with soil and dust (indoor & outdoor)	No potential contaminants identified			N/A
			Ingestion of soil and indoor dust	No potential contaminants identified			N/A
			Consumption of home-grown produce and attached soil	No potential contaminants identified			N/A
			Inhalation of soil dust (indoor and outdoor)	No potential contaminants identified			N/A
			Inhalation of soil vapours	No potential contaminants identified			N/A
			Inhalation of soil gases/ Risk of explosion	Yes	P1: Very Low	C3: Moderate	Low
	End Users (via Water Supply Pipework)		Contamination of incoming services	No potential contaminants identified			N/A
	Groundwater		Migration to groundwater	No contaminants likely to impact groundwater identified			N/A

APPENDIX G

Exploratory Hole Notes

Exploratory Hole Records

Head Space Testing Results

Gas Concentration and Groundwater Monitoring Results

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U	'Undisturbed' Sample: - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
Uo	Sample not obtained.
U*	Full penetration of sample not obtained.
Pi	Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D	Disturbed Sample.
R	Root Sample.
B	Bulk Disturbed Sample.
W	Water Sample.
J	Jar Sample (sample taken in amber glass jar fitted with gas tight lid)
T	Tub Sample
Vi	Vial Sample

In situ Testing

S	Standard penetration test (SPT): Using the split spoon sampler.
C	Standard Penetration Test (SPT): using a solid cone instead of the sampler - conducted usually in coarse grained soils or weak rocks.
V	Shear Vane Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
H	Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
P	Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP	Cable Percussion Borehole
WLS	Dynamic Sampler Borehole using windowless sampler tubes
WS	Dynamic Sampler Borehole using window sampler tubes
TP	Trial Pit excavated using mechanic excavator
HDP	Trial Pit excavated using hand tools

2 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1:2002+A1:2013) and Part 2 Principles of classification (BS EN 14688-2:2004+A1:2013) as well as the BS5930:2015 code of Practice for Ground Investigations.

3 Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1:2003) as well as the BS5930:2015 code of Practice for Ground Investigations.

4 Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk. See additional chalk classification notes.

Site Name: Reptune Garage, Main Road, Yapton, West Sussex

Job Number: R18-12744

Start Date: 01/03/2018

End Date: 01/03/2018

Borehole Number: **WS101**

Sheet 1 of 1

Samples and In Situ Testing						Depth	Stratum Description
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend		
	D J T	0.20 0.30				0.00	MADE GROUND: Dark brown grey sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick, concrete and flint.
	J T	0.80				0.40	MADE GROUND: Light grey brown sandy gravelly silty clay. Sand is fine to medium. Gravel is angular to subangular fine to coarse flint, concrete and brick.
	J T D	1.50 1.60					
	J T	2.30					with black staining between 2.30m and 2.40m depth.
	J T	3.20				3.10	Light orange brown slightly sandy gravelly silty CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium chalk and flint. (River Terrace Deposits)
	D J T	3.90 4.00					with dark grey staining and a hydrocarbon(?) odour between 3.80m and 4.10m depth.
	D J T	4.60 4.70				4.50	Off white CHALK. (White Chalk Subgroup)
						5.00	End of borehole at 5.00m

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

Site Name: Reptune Garage, Main Road, Yapton, West Sussex

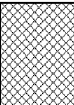
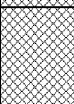
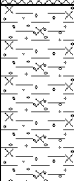
Job Number: R18-12744

Start Date: 01/03/2018

End Date: 01/03/2018

Borehole Number: **WS102**

Sheet 1 of 1

Samples and In Situ Testing					Legend	Depth	Stratum Description
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
	J T	0.10				0.00	MADE GROUND: Dark grey brown slightly sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to medium flint, brick and concrete.
	D	0.40					
	J T	0.60					
	J T	1.20				1.10	MADE GROUND: Light orange brown mottled dark brown gravelly silty clay. Gravel is angular to subrounded fine to medium flint and chalk with a trace of brick.
	D	1.90					
	J T	2.00					
	J T	3.00				2.40	Light orange brown mottled off white gravelly silty CLAY. Gravel is subangular to rounded fine to medium flint and chalk. (River Terrace Deposits)
	D	3.50					
	J T	4.00					
	D	4.80				3.00	Off white CHALK. (White Chalk Subgroup)
						5.00	End of borehole at 5.00m

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

Site Name: Reptune Garage, Main Road, Yapton, West Sussex

Job Number: R18-12744

Start Date: 01/03/2018

End Date: 01/03/2018

Borehole Number: **WS103**

Sheet 1 of 1

Samples and In Situ Testing						Legend		Depth		Stratum Description	
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result							
	J T	0.30						0.00		Concrete.	
	D	0.50						0.10		MADE GROUND: Dark grey slightly sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to medium concrete, flint, brick and carbonaceous material.	
	J T	0.80						0.30			
										Light orange brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine flint. (River Terrace Deposits)	
	D	1.40									
	J T	1.60									
								2.00		End of borehole at 2.00m	

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 2.00m depth; 2.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

Site Name: Reptune Garage, Main Road, Yapton, West Sussex

Job Number: R18-12744

Start Date: 01/03/2018

End Date: 01/03/2018

Borehole Number: **WS104**

Sheet 1 of 1

Samples and In Situ Testing					Legend	Depth	Stratum Description
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
						0.00	Concrete.
	J T	0.20				0.10	MADE GROUND: Dark brown and off white gravelly silty clay. Gravel is angular to subrounded fine to coarse brick, flint and concrete.
	J T	0.40				0.40	
							Light orange brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to medium flint. (River Terrace Deposits)
	J T	1.60					Light grey with black staining CHALK. (White Chalk Subgroup)
	J T	2.30				2.30	End of borehole at 4.00m
	J T	3.00					
	J T	3.90				4.00	

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 2.00m depth; 2.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface. 1.00m bentonite seal beneath standpipe.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

Site Name: Reptune Garage, Main Road, Yapton, West Sussex

Job Number: R18-12744

Start Date: 01/03/2018

End Date: 01/03/2018

Borehole Number: **WS105**

Sheet 1 of 1

Samples and In Situ Testing					Stratum Description	
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth
						0.00
						0.10
	J T	0.20				
	D	0.30				
						0.40
	J T	0.70				
	D	1.30				
	J T	1.40				
	J T	2.40				2.30
	D	2.60				
	J	3.80				3.60
						4.00

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

Site Name: Reptune Garage, Main Road, Yapton, West Sussex

Job Number: R18-12744

Start Date: 01/03/2018

End Date: 01/03/2018

Borehole Number: **WS106**

Sheet 1 of 1

Samples and In Situ Testing						Stratum Description	
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Legend	Depth	
	J T	0.20				0.00	Concrete.
	D	0.25				0.10	MADE GROUND: Dark grey slightly sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to medium brick, concrete and flint.
	J T	0.70				0.30	Light orange brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine flint. (River Terrace Deposits)
	J T	1.50					
	D	1.60					
						2.00	End of borehole at 2.00m

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 2.00m depth; 2.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

Site Name: Reptune Garage, Main Road, Yapton, West Sussex

Job Number: R18-12744

Start Date: 01/03/2018

End Date: 01/03/2018

Borehole Number: **WS107**

Sheet 1 of 1

Samples and In Situ Testing					Legend	Depth	Stratum Description	
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result				
	D J T	0.20				0.00	Concrete.	
		0.30				0.10	MADE GROUND: Dark grey and off white gravelly silty clay. Gravel is angular to subrounded fine to coarse chalk, concrete, brick and flint.	
	J T	0.90				0.40	Light orange brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to medium flint. (River Terrace Deposits)	
	D J T	1.50						
		1.60						
	J T	2.40					2.20	Cream and light orange brown gravelly silty CLAY. Gravel is subangular to subrounded fine to medium flint and chalk. (River Terrace Deposits)
	D	2.80						
						3.00	End of borehole at 3.00m	

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 3.00m depth; 3.00m to 1.00m slotted pipe with gravel surround; 1.00m to ground level plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

Site Name: Reptune Garage Site, Main Road, Yapton, West Sussex.

Job Number: R16-11757

Start Date: 04/11/2016

End Date: 04/11/2016

Borehole Number: **WS01**

Sheet 1 of 1

Standpipe		Samples and In Situ Testing		Dynamic Probe		Legend		Depth		Stratum Description	
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Blows/100mm							
J T	0.20							0.00		MADE GROUND: Grey brown angular to subangular fine to coarse gravel of concrete, metal, slate, brick, plastic, ceramic and glass.	
D	0.40							0.30		MADE GROUND: Grey brown gravelly sandy clay. Sand is fine. Gravel is angular to subrounded brick, flint and clinker-like material. Soft to firm brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium flint, chalk and ironstone. (River Terrace Deposits) becoming stiff below 0.80m depth.	
J T	0.40							0.45			
D	0.50										
H	0.60		35								
J T	0.60										
H	0.80		90								
V	1.00		110								
D	1.30										
H	1.30		90								
H	1.70		90								
H	2.20		100								
D	2.70										
H	2.80		115								
								3.00		End of borehole at 3.00m	

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

Site Name: Reptune Garage Site, Main Road, Yapton, West Sussex.

Job Number: R16-11757

Start Date: 04/11/2016

End Date: 04/11/2016

Borehole Number:
WS02

Sheet 1 of 2

Samples and In Situ Testing				Dynamic Probe		Legend	Depth	Stratum Description
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Blows/100mm			
	D	0.10					0.00	Concrete.
	J T	0.30					0.25	MADE GROUND: Black brown gravelly sandy clay. Gravel is subangular to subrounded fine to coarse brick, flint and ash-like material.
	J T	0.50					0.40	
	D	0.80						Firm brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine flint, chalk and ironstone. (River Terrace Deposits)
	J T	1.20						
	D	1.50						
	J T	1.70						
	D	2.10						becoming grey / grey stained below 2.10m depth.
	J T	2.30					2.30	Stiff grey gravelly CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint. (River Terrace Deposits) with a black staining and strong hydrocarbon odour between 2.30m and 5.10m depth. with no gravel below 2.60m depth.
	J T	2.60						
	D	2.70						
	J T	2.90						
	J T	3.20						
	D	3.50						
	J T	3.80						
	D	4.20						
	J T	4.60						
							5.00	Continued on next sheet

Remarks
Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ



E-mail: contact@ashdownsi.co.uk
Web: www.ashdownsi.co.uk
Tel: 01273 483119

Site Name: Reptune Garage Site, Main Road, Yapton, West Sussex.

Job Number: R16-11757

Start Date: 04/11/2016

End Date: 04/11/2016

Borehole Number: **WS02**

Sheet 2 of 2

Samples and In Situ Testing		Dynamic Probe				Legend	Depth	Stratum Description						
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Blows/100mm									
					0	5	10	15	20	25	30			
	D	5.30											5.20	Stiff grey gravelly CLAY. Gravel is subangular to subrounded fine to coarse chalk and flint. (River Terrace Deposits)
	J T	5.50												White cream and light grey stained CHALK with flint. (White Chalk Subgroup)
													6.00	End of borehole at 6.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

Site Name: Reptune Garage Site, Main Road, Yapton, West Sussex.

Job Number: R16-11757

Start Date: 04/11/2016

End Date: 04/11/2016

Borehole Number: **WS03**

Sheet 1 of 2

Standpipe		Samples and In Situ Testing		Dynamic Probe		Legend	Depth	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Blows/100mm				
J T	0.20						0.00	MADE GROUND: Dark brown gravelly sandy clay. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse brick, concrete, chalk and clinker-like material.
D	0.30							
J T	0.60							Very stiff light brown orange slightly gravelly CLAY. Gravel is angular to rounded fine to medium flint and chalk. (River Terrace Deposits)
D	0.70							
H	0.80		185				0.80	
J T	1.10							becoming stiff below 1.50m depth.
D	1.50							
H	1.50		140					
H	1.80		135					
J T	2.30							
H	2.40		120					
D	2.50							
H	2.70		135					
J T	3.50							
D	3.60							
H	3.60		90					
J T	4.60						4.50	White mottled cream CHALK with flint. (White Chalk Subgroup)
D	4.80							
							5.00	Continued on next sheet

Remarks
Groundwater: Standing water at 4.60m depth on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

Site Name: Reptune Garage Site, Main Road, Yapton, West Sussex.

Job Number: R16-11757

Start Date: 04/11/2016

End Date: 04/11/2016

Borehole Number: **WS03**

Sheet 2 of 2

Samples and In Situ Testing			Dynamic Probe					Legend		Stratum Description			
Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	0	5	10	15	20	25	30	Depth	
													White mottled cream CHALK with flint. (White Chalk Subgroup)
												6.00	End of borehole at 6.00m

Remarks

Groundwater: Standing water at 4.60m depth on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: RJ

ASHDOWN SITE INVESTIGATION LIMITED

Site: Reptune Garage, Main Road, Yapton, West
Sussex

Report No.: R18-12744
Sheet No.: 1 of 1

SUMMARY OF PHOTO-IONISATION DEVICE READINGS

BH Number	Date	Sample Depth (m)	PID Reading (ppm)
WS101	01/03/18	0.30	0.3
		0.80	0.3
		1.50	0.3
		3.20	2.6
		4.00	8.0
		4.70	0.1
WS104	01/03/18	0.20	0.7
		0.40	0.6
		1.60	0.9
		2.30	16.3
		3.00	18.4
		3.90	20.3
WS105	01/03/18	0.70	0.8
		1.40	0.5
		2.40	0.8

Gas Concentrations and Groundwater Monitoring Results

Site Name:				Yapton Garage, Yapton																		
Report Ref:				R18-12744																		
Position	Date	Time	Gas Pressure (mb)	Emission Rate (l/hr)	Atmospheric Pressure	Atmospheric Trend	Standpipe Depth (m)	Standing Water Depth (m bgl)	Methane (%)				Carbon Dioxide (%)				Oxygen (%)				H2S (ppm)	CO (ppm)
									Seconds				Seconds				Seconds					
									15	30	45	60	15	30	45	60	15	30	45	60		
WS103	09/03/18	09:30	0	0.0	1002	Falling	2.00	1.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	20.3	20.4	20.4	0	0
WS104	09/03/18	09:35	0	0.0	1002	Falling	2.00	0.90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	20.5	20.4	20.4	0	0
WS106	09/03/18	09:40	0	0.0	1002	Falling	2.00	1.50	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	20.5	20.4	20.3	20.3	0	0
WS107	09/03/18	09:45	0	0.0	1002	Falling	3.00	1.25	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	20.4	20.4	20.4	20.4	0	0
WS103	15/03/18	10:48	0	0.0	989	Rising	2.00	Dry	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	20.5	20.5	20.5	20.5	0	0
WS104	15/03/18	11:50	0	0.0	989	Rising	2.00	1.75	0.0	0.0	0.0	0.0	0.4	0.3	0.3	0.3	20.4	20.4	20.4	20.4	0	0
WS106	15/03/18	11:55	0	0.0	989	Rising	2.00	Dry	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.6	20.4	20.4	20.4	0	0
WS107	15/03/18	12:00	0	0.0	989	Rising	3.00	2.65	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	21.0	21.0	21.0	21.0	0	0
WS103	19/03/18	10:00	0	0.0	1012	Rising	2.00	Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	20.5	20.5	20.5	0	0
WS104	19/03/18	10:05	0	0.0	1012	Rising	2.00	1.90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	20.5	20.5	20.5	0	0
WS106	19/03/18	09:55	0	0.0	1012	Rising	2.00	Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	20.2	20.2	20.2	0	0
WS107	19/03/18	10:10	0	0.0	1012	Rising	3.00	2.80	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.5	20.4	20.4	20.3	0	0

APPENDIX H

Geotechnical Test Results
Contamination Test Results



Alex Bewick
Ashdown Site Investigations Ltd
Unit 3 The Grain Store
Ditchling Common Business Park
Ditchling Common
West Sussex
BN6 8SG

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

QTS Environmental Report No: 18-71768

Site Reference: Reptune Garage, Main Road, Yapton

Project / Job Ref: R18-12744

Order No: P18-5802

Sample Receipt Date: 07/03/2018

Sample Scheduled Date: 07/03/2018

Report Issue Number: 1

Reporting Date: 13/03/2018

Authorised by:

Authorised by:

Russell Jarvis
Associate Director of Client Services

Dave Ashworth
Deputy Quality Manager

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



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 3TN



Soil Analysis Certificate - EPH Texas Banded

QTS Environmental Report No: 18-71768	Date Sampled	01/03/18				
Ashdown Site Investigations Ltd	Time Sampled	None Supplied				
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS104				
Project / Job Ref: R18-12744	Additional Refs	None Supplied				
Order No: P18-5802	Depth (m)	0.20				
Reporting Date: 13/03/2018	QTSE Sample No	320436				

Determinand	Unit	RL	Accreditation				
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05			
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1			
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1			
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1			
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	10			
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	9			
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	18			

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



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

Tel: 01622 878112



Soil Analysis Certificate - Sample Descriptions

QTS Environmental Report No: 18-71768
Ashdown Site Investigations Ltd
Site Reference: Reptune Garage, Main Road, Yapton
Project / Job Ref: R18-12744
Order No: P18-5802
Reporting Date: 13/03/2018



QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
320436	WS104	None Supplied	0.20	17.3	Brown sandy clay with stones

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

Insufficient Sample ^{1/5}

Unsuitable Sample ^{4/5}



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone



Soil Analysis Certificate - Methodology & Miscellaneous

QTS Environmental Report No: 18-71768

Ashdown Site Investigations Ltd

Site Reference: Reptune Garage, Main Road, Yapton

Project / Job Ref: R18-12744

Order No: P18-5802

Reporting Date: 13/03/2018

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 diphenylcarbazine 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



Alex Bewick
Ashdown Site Investigations Ltd
Unit 3 The Grain Store
Ditchling Common Business Park
Ditchling Common
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BN6 8SG

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME18 2NU



QTS Environmental Report No: 18-71610

Site Reference: Reptune Garage, Main Road, Yapton

Project / Job Ref: R18-12744

Order No: P18-5802

Sample Receipt Date: 05/03/2018

Sample Scheduled Date: 05/03/2018

Report Issue Number: 1

Reporting Date: 09/03/2018

Authorised by:



Kevin Old
Associate Director of Laboratory

Authorised by:

Russell Jarvis
Associate Director of Client Services

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



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone



Soil Analysis Certificate						
QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18	01/03/18	
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS101	WS102	WS103	WS107	
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: P18-5802	Depth (m)	0.30	0.60	0.30	0.30	
Reporting Date: 09/03/2018	QTSE Sample No	319881	319886	319889	319903	

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO 17025	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	8.4	8.3	8.0	7.8
Total Sulphate as SO ₄	mg/kg	< 200	NONE			393	765
Total Sulphate as SO ₄	%	< 0.02	NONE			0.04	0.08
Organic Matter	%	< 0.1	MCERTS	1	0.9	1.3	1.6
Arsenic (As)	mg/kg	< 2	MCERTS	8	6	9	6
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	1.6
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	13	9	17	13
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	24	15	25	25
Lead (Pb)	mg/kg	< 3	MCERTS	140	117	266	37
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	11	7	13	11
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	169	127	119	76

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



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



Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18	01/03/18	
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS101	WS102	WS103	WS107	
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: P18-5802	Depth (m)	0.30	0.60	0.30	0.30	
Reporting Date: 09/03/2018	QTSE Sample No	319881	319886	319889	319903	

Determinand	Unit	RL	Accreditation				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.14
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	0.13	0.39	0.22	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.51	1.16	0.43	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	0.51	1.05	0.37	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.30	0.60	0.20	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	0.32	0.60	0.23	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.49	0.82	0.33	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.18	0.30	0.13	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.37	0.55	0.21	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.24	0.47	0.14	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.22	0.42	0.14	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	3.3	6.4	2.4	< 1.6

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



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Soil Analysis Certificate - EPH Texas Banded						
QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18	01/03/18	01/03/18
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS102	WS102	WS103	WS103	WS104
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: P18-5802	Depth (m)	3.00	4.00	0.80	1.60	1.60
Reporting Date: 09/03/2018	QTSE Sample No	319887	319888	319890	319891	319892

Determinand	Unit	RL	Accreditation	(n)				
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	2
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	< 6	< 6	10	10	< 6
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	< 6	< 6	10	10	< 6

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

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Soil Analysis Certificate - EPH Texas Banded						
QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18	01/03/18	01/03/18
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS105	WS105	WS106	WS106	WS106
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: P18-5802	Depth (m)	0.20	1.40	0.20	0.70	1.50
Reporting Date: 09/03/2018	QTSE Sample No	319896	319897	319900	319901	319902

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	3	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	< 1	11	< 1	< 1
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	< 6	< 6	81	< 6	18
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	< 6	< 6	94	< 6	18

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



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Soil Analysis Certificate - EPH Texas Banded						
QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18			
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS107	WS107			
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied			
Order No: P18-5802	Depth (m)	1.60	2.40			
Reporting Date: 09/03/2018	QTSE Sample No	319904	319905			

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

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



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Soil Analysis Certificate - EPH Banded (Type F)						
QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18			
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS103	WS107			
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied			
Order No: P18-5802	Depth (m)	0.30	0.30			
Reporting Date: 09/03/2018	QTSE Sample No	319889	319903			

Determinand	Unit	RL	Accreditation				
EPH (>C8 - C10)	mg/kg	< 1	MCERTS	5	< 1		
EPH (>C10 - C12)	mg/kg	< 1	MCERTS	29	< 1		
EPH (>C12 - C16)	mg/kg	< 1	MCERTS	59	< 1		
EPH (>C16 - C21)	mg/kg	< 1	MCERTS	47	< 1		
EPH (>C21 - C40)	mg/kg	< 6	MCERTS	300	< 6		
EPH (C8 - C40)	mg/kg	< 6	MCERTS	441	< 6		

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Soil Analysis Certificate - TPH LQM Banded

QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18	01/03/18	01/03/18
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS101	WS101	WS101	WS101	WS104
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: P18-5802	Depth (m)	2.30	3.20	4.00	4.70	2.30
Reporting Date: 09/03/2018	QTSE Sample No	319882	319883	319884	319885	319893

Determinand	Unit	RL	Accreditation	(n)				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	0.25	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	9.08	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	86	< 2	< 2	< 2	21
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	44	< 2	7	< 2	48
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	13	< 3	4	< 3	85
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	55
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	< 10	< 10
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	152	< 30	< 30	< 30	210
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	40	< 2	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	102	< 2	< 2	< 2	5
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	37	< 2	< 2	< 2	12
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	10	< 3	< 3	< 3	9
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	190	< 30	< 30	< 30	< 30
Total >C5 - C44	mg/kg	< 60	NONE	342	< 60	< 60	< 60	236

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

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Soil Analysis Certificate - TPH LQM Banded

QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18		
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS104	WS104	WS105		
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: P18-5802	Depth (m)	3.00	3.90	2.40		
Reporting Date: 09/03/2018	QTSE Sample No	319894	319895	319898		

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	0.29	< 0.05	< 0.05	
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	129	63	< 2	
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	323	173	< 2	
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	777	538	< 3	
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	647	419	< 10	
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	1876	1192	< 30	
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	8	4	< 2	
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	73	35	< 2	
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	232	165	< 2	
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	209	207	< 3	
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	42	45	< 10	
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10	< 10	
Aromatic (>C5 - C44)	mg/kg	< 30	NONE	565	456	< 30	
Total >C5 - C44	mg/kg	< 60	NONE	2441	1648	< 60	

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



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Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18	01/03/18	01/03/18
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS101	WS101	WS101	WS101	WS104
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: P18-5802	Depth (m)	2.30	3.20	4.00	4.70	2.30
Reporting Date: 09/03/2018	QTSE Sample No	319882	319883	319884	319885	319893

Determinand	Unit	RL	Accreditation	(n)					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 2	MCERTS	498	< 2	< 2	< 2	< 2	< 2
p & m-xylene	ug/kg	< 2	MCERTS	170	< 2	< 2	< 2	< 2	< 2
o-xylene	ug/kg	< 2	MCERTS	56	< 2	< 2	< 2	< 2	< 2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5	< 5

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

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Soil Analysis Certificate - BTEX / MTBE

QTS Environmental Report No: 18-71610	Date Sampled	01/03/18	01/03/18	01/03/18		
Ashdown Site Investigations Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Reptune Garage, Main Road, Yapton	TP / BH No	WS104	WS104	WS105		
Project / Job Ref: R18-12744	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: P18-5802	Depth (m)	3.00	3.90	2.40		
Reporting Date: 09/03/2018	QTSE Sample No	319894	319895	319898		

Determinand	Unit	RL	Accreditation				
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	
Ethylbenzene	ug/kg	< 2	MCERTS	5	4	< 2	
p & m-xylene	ug/kg	< 2	MCERTS	20	7	< 2	
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	

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



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Soil Analysis Certificate - Sample Descriptions

QTS Environmental Report No: 18-71610

Ashdown Site Investigations Ltd

Site Reference: Reptune Garage, Main Road, Yapton

Project / Job Ref: R18-12744

Order No: P18-5802

Reporting Date: 09/03/2018

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
319881	WS101	None Supplied	0.30	8.9	Brown sandy clay with brick
319882	WS101	None Supplied	2.30	10	Brown sandy clay with brick
319883	WS101	None Supplied	3.20	10.1	Brown sandy clay with stones
319884	WS101	None Supplied	4.00	9.9	Light grey sandy clay with chalk
319885	WS101	None Supplied	4.70	15.7	White chalk
319886	WS102	None Supplied	0.60	11.1	Brown sandy clay with stones and brick
319887	WS102	None Supplied	3.00	13.9	Brown sandy clay
319888	WS102	None Supplied	4.00	16.6	White chalk
319889	WS103	None Supplied	0.30	14.7	Brown sandy clay with brick
319890	WS103	None Supplied	0.80	13.3	Brown sandy clay
319891	WS103	None Supplied	1.60	16.5	Brown sandy clay
319892	WS104	None Supplied	1.60	12.5	Brown sandy clay
319893	WS104	None Supplied	2.30	11.3	Black sandy clay
319894	WS104	None Supplied	3.00	10.3	Brown sand
319895	WS104	None Supplied	3.90	11.7	Brown sand
319896	WS105	None Supplied	0.20	14.9	Brown sandy clay with brick
319897	WS105	None Supplied	1.40	13	Brown sandy clay
319898	WS105	None Supplied	2.40	11.4	Brown sandy clay
319900	WS106	None Supplied	0.20	15	Brown sandy clay
319901	WS106	None Supplied	0.70	13.6	Brown sandy clay
319902	WS106	None Supplied	1.50	14.3	Brown sandy clay
319903	WS107	None Supplied	0.30	19.1	Brown sandy clay
319904	WS107	None Supplied	1.60	13.6	Brown sandy clay
319905	WS107	None Supplied	2.40	11.2	Brown sandy clay with chalk

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

Insufficient Sample ^{1/5}

Unsuitable Sample ^{1/5}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 18-71610

Ashdown Site Investigations Ltd

Site Reference: Reptune Garage, Main Road, Yapton

Project / Job Ref: R18-12744

Order No: P18-5802

Reporting Date: 09/03/2018

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

D Dried
AR As Received



2683



Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 16-09377

Issue: 1

Date of Issue: 10/11/2016

Contact: David Harris

Customer Details: Ashdown Site Investigation Ltd
The Old Dairy
Swanborough Farm
Lewes
East Sussex BN7 3PF

Quotation No: Q15-00267

Order No: P16-4225

Customer Reference: R16-11757

Date Received: 07/11/2016

Date Approved: 10/11/2016

Details: Reptune Garage Site, Main Road, Yapton, West Sussex

Approved by:

John Wilson, Operations Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 16-09377

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
79574	WS01 0.20	04/11/2016	07/11/2016	Sand + Stones	
79575	WS01 0.40	04/11/2016	07/11/2016	Sandy silty loam + Chalk	
79576	WS01 0.60	04/11/2016	07/11/2016	Silty loam	
79577	WS02 0.30	04/11/2016	07/11/2016	Sandy silty loam + Chalk	
79578	WS02 0.50	04/11/2016	07/11/2016	Silty loam	
79579	WS02 1.20	04/11/2016	07/11/2016	Silty loam	
79580	WS02 1.70	04/11/2016	07/11/2016	Silty clayey loam	
79581	WS02 2.30	04/11/2016	07/11/2016	Sandy loam	
79582	WS02 2.60	04/11/2016	07/11/2016	Silty clayey loam	
79583	WS02 2.90	04/11/2016	07/11/2016	Loamy sand	
79584	WS02 3.20	04/11/2016	07/11/2016	Sandy loam	
79585	WS02 3.80	04/11/2016	07/11/2016	Sandy loam + Chalk	
79586	WS02 4.60	04/11/2016	07/11/2016	Sandy loam + Chalk	
79587	WS02 5.50	04/11/2016	07/11/2016	Chalk	
79588	WS03 0.20	04/11/2016	07/11/2016	Sandy silty loam	
79589	WS03 0.60	04/11/2016	07/11/2016	Silty clayey loam	
79590	WS03 1.10	04/11/2016	07/11/2016	Silty loam	
79591	WS03 2.30	04/11/2016	07/11/2016	Silty loam	
79592	WS03 3.50	04/11/2016	07/11/2016	Sandy silty loam	
79593	WS03 4.60	04/11/2016	07/11/2016	Chalky Silty loam	



Results Summary

Report No.: 16-09377

2683

ELAB Reference				79574	79575	79576	79577	79578	79579
Customer Reference									
Sample ID									
Sample Type				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location				WS01	WS01	WS01	WS02	WS02	WS02
Sample Depth (m)				0.20	0.40	0.60	0.30	0.50	1.20
Sampling Date				04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016
Determinand	Codes	Units	LOD						
Metals									
Arsenic	M	mg/kg	1	^ 6.8	^ 6.0	n/t	^ 5.1	n/t	n/t
Cadmium	M	mg/kg	0.5	^ 1.2	^ 0.7	n/t	^ < 0.5	n/t	n/t
Chromium	M	mg/kg	5	^ 18.5	^ 14.6	n/t	^ 6.6	n/t	n/t
Copper	M	mg/kg	5	^ 27.6	^ 37.5	n/t	^ 28.9	n/t	n/t
Lead	M	mg/kg	5	^ 284	^ 280	n/t	^ 238	n/t	n/t
Mercury	M	mg/kg	0.5	^ < 0.5	^ < 0.5	n/t	^ 0.5	n/t	n/t
Nickel	M	mg/kg	5	^ 11.8	^ 12.9	n/t	^ 6.9	n/t	n/t
Selenium	M	mg/kg	1	^ < 1.0	^ < 1.0	n/t	^ < 1.0	n/t	n/t
Zinc	M	mg/kg	5	^ 432	^ 261	n/t	^ 92.1	n/t	n/t
Inorganics									
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	n/t	< 0.8	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	1.4	2.3	n/t	9.5	n/t	n/t
Miscellaneous									
pH	M	pH units	0.1	^ 10.3	^ 8.6	n/t	^ 9.0	n/t	n/t
Soil Organic Matter	U	%	0.1	2.1	2.5	n/t	6.5	n/t	n/t
Organics									
>C8-C10 BCB	N	mg/kg	1	n/t	n/t	< 1.0	n/t	n/t	n/t
>C10-C12 BCB	N	mg/kg	1	n/t	n/t	< 1.0	n/t	n/t	n/t
>C12-C16 BCB	N	mg/kg	1	n/t	n/t	< 1.0	n/t	n/t	n/t
>C16-C21 BCB	N	mg/kg	1	n/t	n/t	< 1.0	n/t	n/t	n/t
>C21-C35 BCB	N	mg/kg	1	n/t	n/t	< 1.0	n/t	n/t	n/t
>C35-C40 BCB	N	mg/kg	1	n/t	n/t	< 1.0	n/t	n/t	n/t
Total (>C8-C40) BCB	N	mg/kg	1	n/t	n/t	< 1.0	n/t	n/t	n/t
Polyaromatic hydrocarbons									
Naphthalene	M	mg/kg	0.1	^ < 0.1	^ < 0.1	n/t	^ 0.3	n/t	n/t
Acenaphthylene	M	mg/kg	0.1	^ 0.2	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Acenaphthene	M	mg/kg	0.1	^ < 0.1	^ < 0.1	n/t	^ 0.1	n/t	n/t
Fluorene	M	mg/kg	0.1	^ < 0.1	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Phenanthrene	M	mg/kg	0.1	^ 0.6	^ < 0.1	n/t	^ 0.4	n/t	n/t
Anthracene	M	mg/kg	0.1	^ 0.3	^ < 0.1	n/t	^ 0.1	n/t	n/t
Fluoranthene	M	mg/kg	0.1	^ 0.9	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Pyrene	M	mg/kg	0.1	^ 1.1	^ < 0.1	n/t	^ 0.1	n/t	n/t
Benzo(a)anthracene	M	mg/kg	0.1	^ 0.6	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Chrysene	M	mg/kg	0.1	^ 0.6	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Benzo (b) fluoranthene	M	mg/kg	0.1	^ 0.6	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Benzo(k)fluoranthene	M	mg/kg	0.1	^ 0.4	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Benzo (a) pyrene	M	mg/kg	0.1	^ 0.6	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	^ < 0.1	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Dibenzo(a,h)anthracene	M	mg/kg	0.1	^ < 0.1	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Benzo[g,h,i]perylene	M	mg/kg	0.1	^ < 0.1	^ < 0.1	n/t	^ < 0.1	n/t	n/t
Total PAH(16)	M	mg/kg	0.4	^ 6.1	^ < 0.4	n/t	^ 1.2	n/t	n/t

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Results Summary

Report No.: 16-09377

2683

ELAB Reference	79574	79575	79576	79577	79578	79579
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	WS01	WS01	WS01	WS02	WS02	WS02
Sample Depth (m)	0.20	0.40	0.60	0.30	0.50	1.20
Sampling Date	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016

Determinand	Codes	Units	LOD						
TPH CWG									
>C5-C6 Aliphatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t	< 0.01	< 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t	< 0.01	< 0.01
>C8-C10 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C10-C12 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C12-C16 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C16-C21 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C21-C35 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t	1.2	< 1.0
>C35-C40 Aliphatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t	< 0.01	< 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	n/t	n/t	n/t	n/t	< 0.01	< 0.01
>C8-C10 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C10-C12 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C12-C16 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C16-C21 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C21-C35 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
>C35-C40 Aromatic	N	mg/kg	1	n/t	n/t	n/t	n/t	< 1.0	< 1.0
Total (>C5-C40) Ali/Aro	N	mg/kg	1	n/t	n/t	n/t	n/t	1.2	< 1.0

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Results Summary

Report No.: 16-09377

2683

ELAB Reference	79580	79581	79582	79583	79584	79585
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	WS02	WS02	WS02	WS02	WS02	WS02
Sample Depth (m)	1.70	2.30	2.60	2.90	3.20	3.80
Sampling Date	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016

Determinand	Codes	Units	LOD						
Metals									
Arsenic	M	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
Cadmium	M	mg/kg	0.5	n/t	n/t	n/t	n/t	n/t	n/t
Chromium	M	mg/kg	5	n/t	n/t	n/t	n/t	n/t	n/t
Copper	M	mg/kg	5	n/t	n/t	n/t	n/t	n/t	n/t
Lead	M	mg/kg	5	n/t	n/t	n/t	n/t	n/t	n/t
Mercury	M	mg/kg	0.5	n/t	n/t	n/t	n/t	n/t	n/t
Nickel	M	mg/kg	5	n/t	n/t	n/t	n/t	n/t	n/t
Selenium	M	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
Zinc	M	mg/kg	5	n/t	n/t	n/t	n/t	n/t	n/t
Inorganics									
Hexavalent Chromium	N	mg/kg	0.8	n/t	n/t	n/t	n/t	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	n/t	n/t	n/t	n/t	n/t	n/t
Miscellaneous									
pH	M	pH units	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Soil Organic Matter	U	%	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Organics									
>C8-C10 BCB	N	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
>C10-C12 BCB	N	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
>C12-C16 BCB	N	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
>C16-C21 BCB	N	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
>C21-C35 BCB	N	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
>C35-C40 BCB	N	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
Total (>C8-C40) BCB	N	mg/kg	1	n/t	n/t	n/t	n/t	n/t	n/t
Polyaromatic hydrocarbons									
Naphthalene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Acenaphthylene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Acenaphthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Fluorene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Phenanthrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Anthracene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Fluoranthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Pyrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Benzo(a)anthracene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Chrysene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Benzo (b) fluoranthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Benzo(k)fluoranthene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Benzo (a) pyrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Dibenzo(a,h)anthracene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Benzo[g,h,i]perylene	M	mg/kg	0.1	n/t	n/t	n/t	n/t	n/t	n/t
Total PAH(16)	M	mg/kg	0.4	n/t	n/t	n/t	n/t	n/t	n/t

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The Environmental Laboratory Ltd. Reg. No. 3882193



Results Summary

Report No.: 16-09377

2683

ELAB Reference	79580	79581	79582	79583	79584	79585
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	WS02	WS02	WS02	WS02	WS02	WS02
Sample Depth (m)	1.70	2.30	2.60	2.90	3.20	3.80
Sampling Date	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016

Determinand	Codes	Units	LOD						
TPH CWG									
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	72.7	8.8	495	230
>C10-C12 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	254	25.6	938	466
>C12-C16 Aliphatic	N	mg/kg	1	< 1.0	75.0	782	80.4	2480	1110
>C16-C21 Aliphatic	N	mg/kg	1	< 1.0	172	633	64.6	1810	711
>C21-C35 Aliphatic	N	mg/kg	1	1.9	62.3	169	17.8	482	189
>C35-C40 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aromatic	N	mg/kg	1	< 1.0	< 1.0	40.1	4.9	256	130
>C10-C12 Aromatic	N	mg/kg	1	< 1.0	< 1.0	169	17.7	539	295
>C12-C16 Aromatic	N	mg/kg	1	< 1.0	21.1	537	54.5	1460	711
>C16-C21 Aromatic	N	mg/kg	1	< 1.0	71.7	483	48.6	1140	510
>C21-C35 Aromatic	N	mg/kg	1	< 1.0	36.6	145	14.8	336	152
>C35-C40 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total (>C5-C40) Ali/Aro	N	mg/kg	1	1.9	439	3280	338	9930	4500

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Results Summary

Report No.: 16-09377

2683

ELAB Reference	79586	79587	79588	79589	79590	79591
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	WS02	WS02	WS03	WS03	WS03	WS03
Sample Depth (m)	4.60	5.50	0.20	0.60	1.10	2.30
Sampling Date	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016
Determinand	Codes	Units	LOD			
Metals						
Arsenic	M	mg/kg	1	n/t	n/t	7.5
Cadmium	M	mg/kg	0.5	n/t	n/t	1.0
Chromium	M	mg/kg	5	n/t	n/t	13.4
Copper	M	mg/kg	5	n/t	n/t	37.1
Lead	M	mg/kg	5	n/t	n/t	192
Mercury	M	mg/kg	0.5	n/t	n/t	< 0.5
Nickel	M	mg/kg	5	n/t	n/t	11.9
Selenium	M	mg/kg	1	n/t	n/t	< 1.0
Zinc	M	mg/kg	5	n/t	n/t	155
Inorganics						
Hexavalent Chromium	N	mg/kg	0.8	n/t	n/t	< 0.8
Water Soluble Boron	N	mg/kg	0.5	n/t	n/t	1.0
Miscellaneous						
pH	M	pH units	0.1	n/t	n/t	8.9
Soil Organic Matter	U	%	0.1	n/t	n/t	2.9
Organics						
>C8-C10 BCB	N	mg/kg	1	n/t	n/t	n/t
>C10-C12 BCB	N	mg/kg	1	n/t	n/t	n/t
>C12-C16 BCB	N	mg/kg	1	n/t	n/t	n/t
>C16-C21 BCB	N	mg/kg	1	n/t	n/t	n/t
>C21-C35 BCB	N	mg/kg	1	n/t	n/t	n/t
>C35-C40 BCB	N	mg/kg	1	n/t	n/t	n/t
Total (>C8-C40) BCB	N	mg/kg	1	n/t	n/t	n/t
Polyaromatic hydrocarbons						
Naphthalene	M	mg/kg	0.1	n/t	n/t	< 0.1
Acenaphthylene	M	mg/kg	0.1	n/t	n/t	< 0.1
Acenaphthene	M	mg/kg	0.1	n/t	n/t	< 0.1
Fluorene	M	mg/kg	0.1	n/t	n/t	< 0.1
Phenanthrene	M	mg/kg	0.1	n/t	n/t	0.2
Anthracene	M	mg/kg	0.1	n/t	n/t	< 0.1
Fluoranthene	M	mg/kg	0.1	n/t	n/t	0.7
Pyrene	M	mg/kg	0.1	n/t	n/t	0.8
Benzo(a)anthracene	M	mg/kg	0.1	n/t	n/t	0.4
Chrysene	M	mg/kg	0.1	n/t	n/t	0.4
Benzo (b) fluoranthene	M	mg/kg	0.1	n/t	n/t	0.7
Benzo(k)fluoranthene	M	mg/kg	0.1	n/t	n/t	0.5
Benzo (a) pyrene	M	mg/kg	0.1	n/t	n/t	0.7
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	n/t	n/t	0.8
Dibenzo(a,h)anthracene	M	mg/kg	0.1	n/t	n/t	0.2
Benzo[g,h,i]perylene	M	mg/kg	0.1	n/t	n/t	1.0
Total PAH(16)	M	mg/kg	0.4	n/t	n/t	6.5

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Results Summary

Report No.: 16-09377

2683

ELAB Reference	79586	79587	79588	79589	79590	79591
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	WS02	WS02	WS03	WS03	WS03	WS03
Sample Depth (m)	4.60	5.50	0.20	0.60	1.10	2.30
Sampling Date	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016	04/11/2016

Determinand	Codes	Units	LOD						
TPH CWG									
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t	n/t	n/t
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t	n/t	n/t
>C8-C10 Aliphatic	N	mg/kg	1	109	< 1.0	n/t	n/t	n/t	n/t
>C10-C12 Aliphatic	N	mg/kg	1	244	< 1.0	n/t	n/t	n/t	n/t
>C12-C16 Aliphatic	N	mg/kg	1	573	< 1.0	n/t	n/t	n/t	n/t
>C16-C21 Aliphatic	N	mg/kg	1	311	2.0	n/t	n/t	n/t	n/t
>C21-C35 Aliphatic	N	mg/kg	1	78.8	< 1.0	n/t	n/t	n/t	n/t
>C35-C40 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	n/t	n/t	n/t	n/t
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t	n/t	n/t
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	n/t	n/t	n/t	n/t
>C8-C10 Aromatic	N	mg/kg	1	55.5	< 1.0	n/t	n/t	n/t	n/t
>C10-C12 Aromatic	N	mg/kg	1	137	< 1.0	n/t	n/t	n/t	n/t
>C12-C16 Aromatic	N	mg/kg	1	329	< 1.0	n/t	n/t	n/t	n/t
>C16-C21 Aromatic	N	mg/kg	1	203	1.4	n/t	n/t	n/t	n/t
>C21-C35 Aromatic	N	mg/kg	1	58.7	< 1.0	n/t	n/t	n/t	n/t
>C35-C40 Aromatic	N	mg/kg	1	< 1.0	< 1.0	n/t	n/t	n/t	n/t
Total (>C5-C40) Ali/Aro	N	mg/kg	1	2100	3.3	n/t	n/t	n/t	n/t

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2683



Results Summary

Report No.: 16-09377

ELAB Reference	79592	79593
Customer Reference		
Sample ID		
Sample Type	SOIL	SOIL
Sample Location	WS03	WS03
Sample Depth (m)	3.50	4.60
Sampling Date	04/11/2016	04/11/2016

Determinand	Codes	Units	LOD		
Metals					
Arsenic	M	mg/kg	1	n/t	n/t
Cadmium	M	mg/kg	0.5	n/t	n/t
Chromium	M	mg/kg	5	n/t	n/t
Copper	M	mg/kg	5	n/t	n/t
Lead	M	mg/kg	5	n/t	n/t
Mercury	M	mg/kg	0.5	n/t	n/t
Nickel	M	mg/kg	5	n/t	n/t
Selenium	M	mg/kg	1	n/t	n/t
Zinc	M	mg/kg	5	n/t	n/t
Inorganics					
Hexavalent Chromium	N	mg/kg	0.8	n/t	n/t
Water Soluble Boron	N	mg/kg	0.5	n/t	n/t
Miscellaneous					
pH	M	pH units	0.1	n/t	n/t
Soil Organic Matter	U	%	0.1	n/t	n/t
Organics					
>C8-C10 BCB	N	mg/kg	1	< 1.0	< 1.0
>C10-C12 BCB	N	mg/kg	1	< 1.0	< 1.0
>C12-C16 BCB	N	mg/kg	1	< 1.0	2.6
>C16-C21 BCB	N	mg/kg	1	< 1.0	< 1.0
>C21-C35 BCB	N	mg/kg	1	< 1.0	< 1.0
>C35-C40 BCB	N	mg/kg	1	< 1.0	< 1.0
Total (>C8-C40) BCB	N	mg/kg	1	< 1.0	2.6
Polyaromatic hydrocarbons					
Naphthalene	M	mg/kg	0.1	n/t	n/t
Acenaphthylene	M	mg/kg	0.1	n/t	n/t
Acenaphthene	M	mg/kg	0.1	n/t	n/t
Fluorene	M	mg/kg	0.1	n/t	n/t
Phenanthrene	M	mg/kg	0.1	n/t	n/t
Anthracene	M	mg/kg	0.1	n/t	n/t
Fluoranthene	M	mg/kg	0.1	n/t	n/t
Pyrene	M	mg/kg	0.1	n/t	n/t
Benzo(a)anthracene	M	mg/kg	0.1	n/t	n/t
Chrysene	M	mg/kg	0.1	n/t	n/t
Benzo (b) fluoranthene	M	mg/kg	0.1	n/t	n/t
Benzo(k)fluoranthene	M	mg/kg	0.1	n/t	n/t
Benzo (a) pyrene	M	mg/kg	0.1	n/t	n/t
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	n/t	n/t
Dibenzo(a,h)anthracene	M	mg/kg	0.1	n/t	n/t
Benzo[g,h,i]perylene	M	mg/kg	0.1	n/t	n/t
Total PAH(16)	M	mg/kg	0.4	n/t	n/t

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2683



Results Summary

Report No.: 16-09377

ELAB Reference	79592	79593
Customer Reference		
Sample ID		
Sample Type	SOIL	SOIL
Sample Location	WS03	WS03
Sample Depth (m)	3.50	4.60
Sampling Date	04/11/2016	04/11/2016

Determinand	Codes	Units	LOD		
TPH CWG					
>C5-C6 Aliphatic	N	mg/kg	0.01	n/t	n/t
>C6-C8 Aliphatic	N	mg/kg	0.01	n/t	n/t
>C8-C10 Aliphatic	N	mg/kg	1	n/t	n/t
>C10-C12 Aliphatic	N	mg/kg	1	n/t	n/t
>C12-C16 Aliphatic	N	mg/kg	1	n/t	n/t
>C16-C21 Aliphatic	N	mg/kg	1	n/t	n/t
>C21-C35 Aliphatic	N	mg/kg	1	n/t	n/t
>C35-C40 Aliphatic	N	mg/kg	1	n/t	n/t
>C5-C7 Aromatic	N	mg/kg	0.01	n/t	n/t
>C7-C8 Aromatic	N	mg/kg	0.01	n/t	n/t
>C8-C10 Aromatic	N	mg/kg	1	n/t	n/t
>C10-C12 Aromatic	N	mg/kg	1	n/t	n/t
>C12-C16 Aromatic	N	mg/kg	1	n/t	n/t
>C16-C21 Aromatic	N	mg/kg	1	n/t	n/t
>C21-C35 Aromatic	N	mg/kg	1	n/t	n/t
>C35-C40 Aromatic	N	mg/kg	1	n/t	n/t
Total (>C5-C40) Ali/Aro	N	mg/kg	1	n/t	n/t



Results Summary

2683

Report No.: 16-09377

ELAB Reference	79581	79584	79586
Customer Reference			
Sample ID			
Sample Type	SOIL	SOIL	SOIL
Sample Location	WS02	WS02	WS02
Sample Depth (m)	2.30	3.20	4.60
Sampling Date	04/11/2016	04/11/2016	04/11/2016

Determinand	Codes	Units	LOD			
VOC						
Heptane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Octane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Nonane	N	ug/kg	10	< 10.0	58.3	17.8
Benzene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Toluene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
m+p-xylene	M	ug/kg	10	< 10.0	30.4	^ < 10.0
o-xylene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
cis-1,2-dichloroethene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
1,1-Dichloroethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Chloroform	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Tetrachloromethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
1,1,1-Trichloroethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Trichloroethylene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Tetrachloroethylene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
1,1,1,2-Tetrachloroethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
1,1,2,2-Tetrachloroethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Chlorobenzene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Bromobenzene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Bromodichloromethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Methylethylbenzene	M	ug/kg	10	< 10.0	55.1	^ 18.7
1,1-Dichloro-1-propene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Trans - 1,2 -dichloroethylene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
2,2-Dichloropropane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Bromochloromethane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
1,2-Dichloroethane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Dibromomethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
1,2-Dichloropropane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
cis-1,3-Dichloro-1-propene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
trans-1,3-Dichloro-1-propene	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
1,1,2-Trichloroethane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Dibromochloromethane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
1,3-Dichloropropane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
1,2-dibromoethane	M	ug/kg	10	< 10.0	< 10.0	^ < 10.0
Styrene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Propylbenzene	N	ug/kg	10	< 10.0	119	46.0
2-Chlorotoluene	N	ug/kg	10	< 10.0	134	34.6
1,2,4-Trimethylbenzene	N	ug/kg	10	< 10.0	55.1	18.7
4-Chlorotoluene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
t-butylbenzene	N	ug/kg	10	< 10.0	19.6	< 10.0
1,3,5-Trimethylbenzene	N	ug/kg	10	< 10.0	861	303
1-methylpropylbenzene	N	ug/kg	10	< 10.0	99.6	51.1
o-cymene	N	ug/kg	10	< 10.0	291	99.0
1,3-Dichlorobenzene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Butylbenzene	N	ug/kg	10	< 10.0	116	73.3
1,2-Dibromo-3-chloropropane	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Hexachlorobutadiene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
1,2,3-Trichlorobenzene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Naphthalene	N	ug/kg	10	< 10.0	17.9	< 10.0
1,2,4-Trichlorobenzene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
1,4-Dichlorobenzene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
1,2-Dichlorobenzene	N	ug/kg	10	< 10.0	< 10.0	< 10.0
Bromoform	N	ug/kg	10	< 10.0	< 10.0	< 10.0

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Results Summary

Report No.: 16-09377

Asbestos Qualitative Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Result
79574	0.20	WS01	Sand + Stones	No asbestos detected
79575	0.40	WS01	Sandy silty loam + Chalk	No asbestos detected
79577	0.30	WS02	Sandy silty loam + Chalk	No asbestos detected
79588	0.20	WS03	Sandy silty loam	No asbestos detected
79589	0.60	WS03	Silty clayey loam	No asbestos detected

Method Summary

Report No.: 16-09377

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	10/11/2016	110	Colorimetry
pH	M	Air dried sample	10/11/2016	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	09/11/2016	118	ICPMS
PAH (GC-FID)	M	As submitted sample	09/11/2016	133	GC-FID
VOC in solids	M	As submitted sample	09/11/2016	181	GC-MS
Water soluble boron	N	Air dried sample	09/11/2016	202	Colorimetry
Aliphatic hydrocarbons in soil	N	As submitted sample	09/11/2016	214	GC-FID
Aliphatic/Aromatic hydrocarbons in soil	N	As submitted sample	10/11/2016	214	GC-FID
Aromatic hydrocarbons in soil	N	As submitted sample	09/11/2016	214	GC-FID
Low range Aliphatic hydrocarbons soil	N	As submitted sample	10/11/2016	214	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	10/11/2016	214	GC-MS
Basic carbon banding in soil	N	As submitted sample	09/11/2016	218	GC-FID
Soil organic matter	U	Air dried sample	10/11/2016	BS1377:P3	Titrimetry
Asbestos identification	U	As submitted sample	09/11/2016	PMAN	Microscopy

Tests marked N are not UKAS accredited



Report Information

Report No.: 16-09377

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

-
- | | |
|---|--|
| a | No date of sampling supplied |
| b | No time of sampling supplied (Waters Only) |
| c | Sample not received in appropriate containers |
| d | Sample not received in cooled condition |
| e | The container has been incorrectly filled |
| f | Sample age exceeds stability time (sampling to receipt) |
| g | Sample age exceeds stability time (sampling to analysis) |

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

APPENDIX I

Guidance on Comparing Soil Contamination Data with a Critical Concentration
Statistical Analysis Summary Sheets

ASHDOWN SITE INVESTIGATION LIMITED

Notes on the “Guidance on Comparing Soil Contamination Data with a Critical Concentration” (CIEH & CL: AIRE, May 2008)

The Chartered Institute of Environmental Health & CL:AIRE, have published updated guidance on the statistical assessment of contaminated land data, “*Guidance on Comparing Soil Contamination Data with a Critical Concentration*” (May 2008). This is an update to previous guidance published within Contaminated Land Report CLR7 (Defra, 2002).

The CIEH/CL:AIRE guidance forms part of a package of proposed improved UK guidance highlighted in the Defra discussion paper, “*Assessing risks from land contamination –a proportionate approach. Soil guideline values: The Way Forward (CLAN 06/2006)*”. This discussion paper discussed the role and use of SGVs for managing the risks associated with soil contamination.

The guidance states that its overall aim is to “increase understanding amongst stakeholders of the role that statistics can play in quantifying the uncertainty attached to estimates of the mean concentration of contaminants in soil, thereby creating a more informed basis for regulatory decision-making”.

The initial question, on which the guidance is based, is whether the Site under consideration is to be assessed under the Planning System or under Part 2A of the Environmental Protection Act 1990. The key questions asked when considering contaminant concentrations vary depending on the scenario under consideration. The key questions will generally be:

- **Planning Scenario** – “can we confidently say that the level of contamination on this land is low relative to some appropriate measure of risk?” or “that the level of contamination is lower than the critical concentration” (alternative hypothesis).
- **Part 2A Scenario** – “can we confidently say that the level of contamination on this land is high relative to some appropriate measure of risk?” or “that the level of contamination is higher than the critical concentration” (alternative hypothesis).

Within the guidance, to ‘answer’ the relevant question above, a null hypothesis has been outlined for each scenario, which, if rejected with a high degree of confidence, means that the alternative hypothesis can be accepted. The null hypothesis for a planning scenario is that the soils contain levels of contamination above the critical concentration (i.e. the soils are assumed to be unsuitable for use until proven otherwise). Under the Part 2A scenario, the null hypothesis is that the soils contain levels of contamination below the critical concentration (i.e. the land is assumed not to fall within Part 2A legislation until proved otherwise).

For the planning scenario the null hypothesis may be rejected if it is considered that the 95th percentile of the normally distributed population as a whole lies below the critical concentration i.e. there is a 95% probability that your true population mean lies below the critical concentration. A lower probability of the true mean lying below the critical concentration may be used, but deviation from the standard 95% requires justification.

For the Part 2A scenario the null hypothesis may be rejected if it can be shown that the lower 95th percentile lies above the critical concentration. If the lower 95th percentile lies below the critical concentration but the true population mean lies above the critical concentration further assessment should be undertaken before the Site can be classified under Part 2A.

Guidance on the treatment of outliers (results that are not representative of a sample population), is also provided in the report. The guidance confirms that outliers should only be excluded from the dataset where they are either demonstrably the result of an error that can be identified and explained, or clearly indicate that more than one soil population exists within the dataset.

Where an individual result is recognised as a ‘statistical outlier’ or ‘contamination hot-spot’ within the data set (and where the critical concentration for that contaminant is exceeded), remediation work and or further investigation may be required.

Assessment of
 Project 01 01 1144
 Special Reserve Design Main Road, Yapan
 Ward Section
 Site location Main road with
 Comprehensive PAH Composite
 Two stations Planning
 Date: 22 March 2019

	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz[a]anthracene	Chrysene	Benzofluoranthene	Benzokjufuranthene	Benz[ghi]perylene	Indeno[1,2,3-cd]pyrene	Dibenz[ah]anthracene	Benz[ghi]perylene
Concentration (mg/kg)	2.3	170	210	170	95	2400	280	620	7.2	15	2.6	77	2.2	27	0.24	320
Issue	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake
PAH detection limit	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Exceeds present?	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of samples exceeding detection	0															
Number samples in S4UL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exceeds limit	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Exceeds limit	0.087777778	0.053333333	0.055555556	0.05	0.315555556	0.1	0.73888889	0.73666667	0.427777778	0.44444444	0.521111111	0.362222222	0.48666667	0.361111111	0.105555556	0.38666667
Exceeds limit	0.08496731	0.06614378	0.01666667	7.3598E-18	0.25647179	0.09013878	0.86779094	0.80935159	0.49124276	0.51901616	0.49933607	0.49192931	0.55333062	0.4656298	0.12104366	0.51947088
Number of samples	7	7	8	9	2	6	3	2	3	3	3	3	3	4	7	4
Exceeds limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Exceeds limit	Non-normal	Non-normal	Non-normal	Non-normal	Normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal
Exceeds limit	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev	Auto One sample	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev	Auto One sample	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev	Auto-Chenrychev
Exceeds limit	Mean: 0.10846732	Mean: 0.05333333	Mean: 0.05555556	Mean: 0.05	Mean: 0.31555556	Mean: 0.1	Mean: 0.73888889	Mean: 0.73666667	Mean: 0.42777778	Mean: 0.44444444	Mean: 0.52111111	Mean: 0.36222222	Mean: 0.48666667	Mean: 0.36111111	Mean: 0.10555556	Mean: 0.38666667
Exceeds limit	0.211123242	0.17943802	0.07977186	0.05	0.47452943	0.23096861	1.99975989	1.31262727	1.14153595	1.19855745	0.83063952	1.07897894	1.29063771	1.03765955	0.28143518	1.14144036
Exceeds limit	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	99%	100%	92%	100%
Exceeds limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Exceeds limit	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$	$\mu < Cc$
Exceeds limit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exceeds limit	Back to data	Go to outlier test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test	Go to normality test

Client ref: R18-12744
 Project ref: R18-12744
 Site ref: Repture Garage, Main Road, Yarpole, West Sussex
 Data description: Made ground soils
 Contaminant(s): Heavy Metals
 Test scenario: Planning
 Date: 22 March 2016

Critical concentration, C _c	37	290	11	910	6	2400	200	40	180	250	3700
Notes	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	C4SL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake	S4UL Residential with Plant Uptake
Full dataset size	9	9	9	9	9	9	9	9	9	9	9
Outliers present?	No	Yes	No	No	No	No	No	No	No	No	Yes
Number of outliers temporarily excluded	0										
Number removed by filter	0	0	0	0	0	0	0	0	0	0	0
Sample size, n	9	9	9	9	9	9	9	9	9	9	9
Sample mean, $\bar{x}$	6.82222222	2.16666667	0.42222222	13.0222222	0.66666667	27.9333333	184.666667	0.38888889	10.7	0.94444444	172.677778
Standard deviation, s	1.20496657	2.83725219	0.43164736	3.65266265	0.31622777	6.96311712	88.5480096	0.13176157	2.26660539	0.52704628	111.046092
Number of non-defects	0	3	6	0	9	0	0	8	0	9	0
Set non-defect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Distribution	Normal	Non-normal	Non-normal	Normal	Non-normal	Normal	Normal	Non-normal	Non-normal	Non-normal	Non-normal
Statistical approach	Auto: One-sample t; Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: One-sample t; Auto: Chebyshev	Auto: Chebyshev	Auto: One-sample t; Auto: Chebyshev	Auto: One-sample t; Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev	Auto: Chebyshev

Test scenario	Planning: is true mean lower than critical concentration ($\mu < C_c$)						Evidence level required	95%	Use normal distribution to test for outliers		
Statistic, t, for μ_0	-75.13348112	-304.34376	-73.51680141	-736.7045879	-50.89644256	-1021.984821	-0.519492197	-901.8815887	-224.079587	-1417.649076	-95.29346247
Upper confidence limit for true mean concentration, μ	7.56911996	6.28909853	1.0493913	15.2863228	1.12613496	32.2494169	239.553092	0.58033401	13.9933013	1.71022493	334.024008
Evidence level	100%	100%	100%	100%	100%	100%	69%	100%	100%	100%	100%
Base decision rule	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu \geq C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$
Test dataset	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Back to data

Go to outlier test

Go to normality test

Show individual summary

APPENDIX J

Quantitative Conceptual Model

Reptune Garage, Main Road, Yapton, West Sussex				Quantitative Conceptual Model		R18-13070	
Source	Receptor	Contaminants	Pathway	Complete Linkage Present?	Probability	Consequence	Risk
Elevated concentrations of lead and PAH compounds within made ground across the site	End Users	Heavy Metals and PAH Compounds	Dermal contact with soil and dust (indoor & outdoor)	Yes	P2: Low	C3: Moderate	Low/Moderate
			Ingestion of soil and indoor dust	Yes	P2: Low	C3: Moderate	Low/Moderate
			Consumption of home-grown produce and attached soil	Yes	P1: Very Low	C3: Moderate	Low
			Inhalation of soil dust (indoor and outdoor)	Yes	P2: Low	C3: Moderate	Low/Moderate
			Inhalation of soil vapours	Contaminants do not pose a risk via this pathway			N/A
			Inhalation of soil gases/ Risk of explosion	No source of ground gases identified			N/A
	End Users (via Water Supply Pipework)		Contamination of incoming services	No contaminants present above screening criteria			N/A
	Groundwater	Heavy Metals and PAH Compounds	Migration to groundwater	Yes	P1: Very Low	C1: Very Minor	Negligible
Petroleum hydrocarbon impacted River Terrace Deposit soils below 2m depth	End Users	Petroleum Hydrocarbons	Dermal contact with soil and dust (indoor & outdoor)	No direct contact pathways are considered to be present			N/A
			Ingestion of soil and indoor dust	No direct contact pathways are considered to be present			N/A
			Consumption of home-grown produce and attached soil	No direct contact pathways are considered to be present			N/A
			Inhalation of soil dust (indoor and outdoor)	No direct contact pathways are considered to be present			N/A
			Inhalation of soil vapours	Yes	P1: Very Low	C1: Very Minor	Negligible
			Inhalation of soil gases/ Risk of explosion	No source of ground gases identified			N/A
	End Users (via Water Supply Pipework)	Petroleum Hydrocarbons	Contamination of incoming services	Yes	P1: Very Low	C3: Moderate	Low
	Groundwater	Petroleum Hydrocarbons	Migration to groundwater	Yes	P2: Low	C2: Minor	Low

APPENDIX K

Checklist for Verification Report(s)

Item	Tick (☐)
Documentation (Including Photographs) of Stripped Formation	
Documentation (Including Photographs) of Placed Geotextile	
Documentation (Including Photographs) Confirming Depth of Cover Soils	
Laboratory Test Data for Imported Materials	