From: Ken Argent
Sent: 04 December 2013 13:16
To: 'mroberts@gtacivils.co.uk'
Cc: Peter Barnett
Subject: AWDM/0334/13 - land rear of 77-83 Southview Rd and 82-88 Underdown Rd
Attachments: Attachments.zip

Follow Up Flag: Follow up
Flag Status: Flagged

Martin

Thank you for the attached.

I have one observation and two questions that require your answer before I advise Peter Barnett in the Planning department that I am satisfied with your drainage proposals.

Observation.

Whilst I accept that the impermeable area on this site has potentially decreased from 1025m2 to around 495m2, your comment below that this reduction is a huge benefit to the area is a little misleading.

If 100 mm of rain falls onto the current site all that water eventually runs off the existing hard surfaces and begins to permeate into the soil increasing the volume of "ground water" exactly the same amount of rain will fall on your development and exactly the same volume will eventually percolate into the ground accepting it's not concentrated at the periphery of the existing hard standing but distributed across the development as a whole and is retained to a degree.

As the flooding problems associated with this area are not primarily due to surface water runoff but in fact ground water eruption, which may last for weeks, then the increase in ground water associated with this site remains largely unaltered.

Therefore your belt and braces approach which I accept keeps this development dry does not significantly help to alleviate the potential of ground water flooding affecting the residents further south.

Question 1.

Within Richard Seymour's email 16 may 2013, there was mention of a connection to the main surface water drain :-

The development, if approved, will provide the opportunity to enhance the drainage situation in the immediate and wider area around the development with the use of trench soakaways which will work in times of low groundwater with a higher level overflow taking ***any excess storm water to the main surface water drain in times of heavier loading*** *with onsite storage reducing flow rates to the main sewer should this option be required. The removal of a lot of current commercial hard standing will also give an opportunity to permeate over a wider area.*

There is no connection shown to any surface water sewer on the current drainage drawing 4999/100 Rev D, please confirm that this comment was erroneous and that there is no intention to connect off site and that all surface water will be dealt with on site.

Question 2.

You have added baffles into the porous paving. With the north south cross fall of around 300mm (SCP CL 13.2 – running to SCP CL 12.95) you have 300 mm less storage capacity to the north than against the baffle. Will your system operate satisfactorily and is there a risk of overtopping, adjacent to Plot 5.

Regards

Ken Argent - Engineer BSc, RMaPS| Technical Services, Adur District Council and Worthing Borough Council
Location: The Town Hall, Chapel Road, Worthing, West Sussex, BN11 1HA.
Internal: 1374 | External: 01903 221374 | E-mail: ken.argent@adur-worthing.gov.uk

Please think before you print this and save paper

From: Martin Roberts [mailto:MRoberts@gtacivils.co.uk]
Sent: 28 November 2013 17:55
To: Ken Argent
Cc: Richard C25; 'David Smart B.Eng(Hons)C.Eng M.I.Struct.E'; Paul Calland; 'Russell Ashby'; 'Simon Pilbeam'; 'Tony Hulejczuk'; 'Henry Burrows'; Simon Dent
Subject: RE: AWDM/0334/13 - land rear of 77-83 Southview Rd and 82-88 Underdown Rd

Ken,

Further to your recent comments regarding the drainage at the above site, we have prepared the attached for your consideration and comment:

- Drawing 4999_100d revised to show the roof areas draining to the deep permeable paving sub-base. External works updated to suit to show the formation level and baffles. (this has been carried out due to the recently received soakage rates)
- Further to your comments regarding possible standing water in the rear gardens, we have now shown a soakaway trench to act as a land drain soakaway to provide some void space along with a cut off land drain to the north boundary to protect the housing. We would comment that groundwater itself doesn't appear to be a problem as the soil report carried out by Ashdown this month (attached) states that groundwater was only encountered at 7.3m deep. (section 4.3) Therefore the land drainage we have shown is a 'belt and braces' approach to ensure there will be no water ponding in the rear gardens and to allay your concerns.
- The soakage tests which Ashdown carried out were in the winter so we are confident that with the surface area available for infiltration within the permeable paving and volume available up to the 1 in 100 year storm +30% there should not be a problem. Please see attached the microdrainage calculations to support this and permeable paving area plan.
- With regards to impermeable areas and flood risk, we would highlight that the existing site had a total impermeable area of 1025m/squared (see drg 107 attached). As can be seen from drg 106, total impermeable areas now are just the roof area of 495m/squared, clearly a huge benefit to the surrounding area in terms of flood risk. I would also highlight that this site previously drained via soakaways which were

clearly built some time ago and would have likely been silted up and not been provided with storage to the 1 in 100 year event.

As can be seen from above the proposed drainage scheme will provide a huge benefit to the area and hopefully you will now be able to approve this scheme. However, if you would like any further clarifications, please do not hesitate to call before providing a written response.

Kind regards

Martin Roberts IEng, ACIWEM, MCIHT
Managing Director

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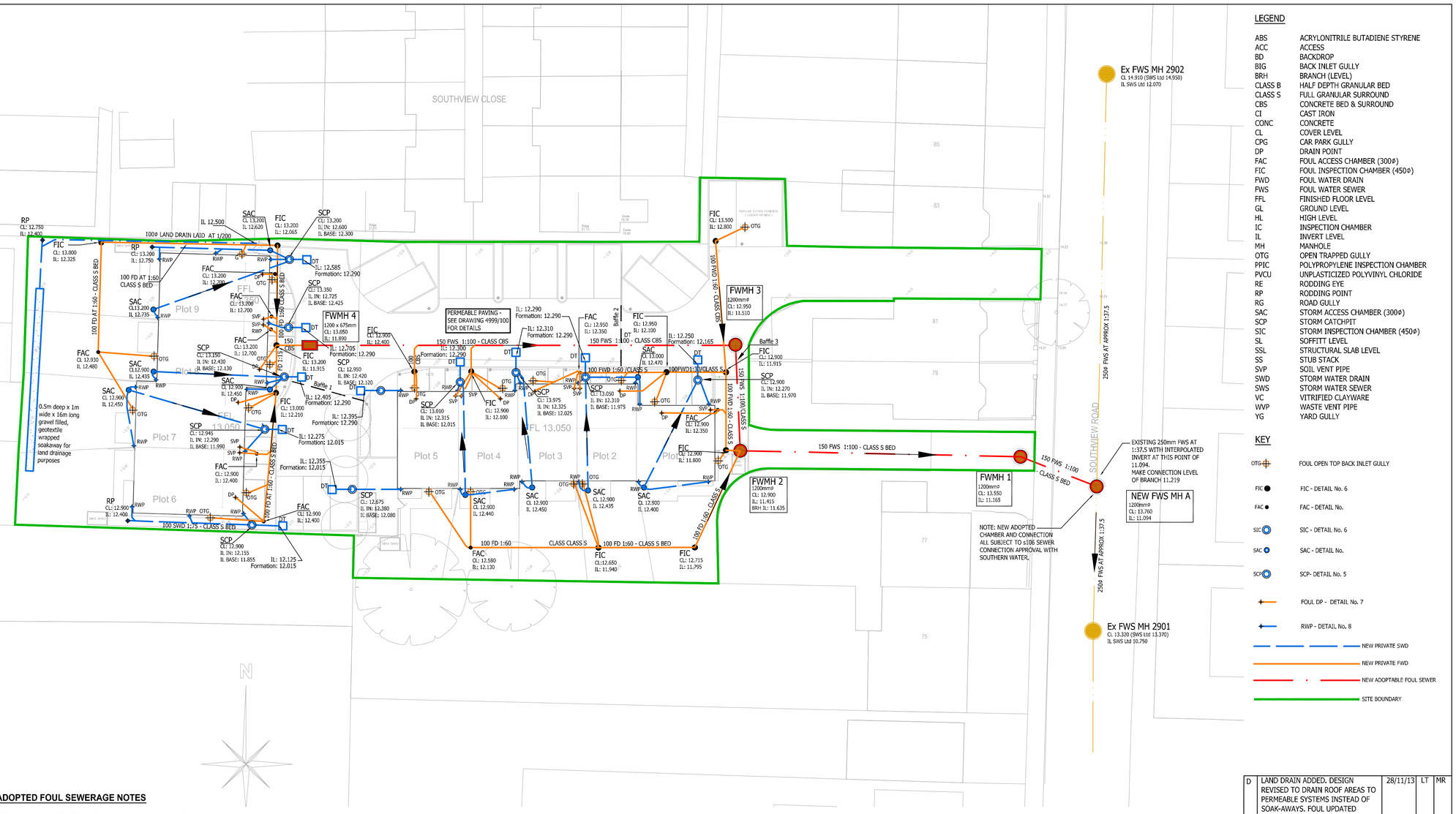

LEGEND

ABS	ACRYLONITRILE BUTADIENE STYRENE
ACC	ACCESS
BD	BACKDROP
BIG	BACK INLET GULLY
BRH	BRANCH (LEVEL)
CLASS B	HALF DEPTH GRANULAR BED
CLASS S	FULL GRANULAR SURROUND
CBS	CONCRETE BED & SURROUND
CI	CAST IRON
CONC	CONCRETE
CL	COVER LEVEL
CPG	CAR PARK GULLY
DP	DRAIN POINT
FAC	FOUL ACCESS CHAMBER (300ø)
FIC	FOUL INSPECTION CHAMBER (450ø)
FWD	FOUL WATER DRAIN
FWS	FOUL WATER SEWER
FFL	FINISHED FLOOR LEVEL
GL	GROUND LEVEL
HL	HIGH LEVEL
IC	INSPECTION CHAMBER
IL	INVERT LEVEL
MH	MANHOLE
OTG	OPEN TRAPPED GULLY
PPIC	POLYPROPYLENE INSPECTION CHAMBER
PVCU	UNPLASTICIZED POLYVINYL CHLORIDE
RE	RODDING EYE
RP	RODDING POINT
RG	ROAD GULLY
SAC	STORM ACCESS CHAMBER (300ø)
SCP	STORM CATCHPIT
SIC	STORM INSPECTION CHAMBER (450ø)
SL	SOFFITT LEVEL
SSL	STRUCTURAL SLAB LEVEL
SS	STUB STACK
SVP	SOIL VENT PIPE
SWD	STORM WATER DRAIN
SWS	STORM WATER SEWER
VC	VITRIFIED CLAYWARE
WVP	WASTE VENT PIPE
YG	YARD GULLY

KEY

OTG	FOUL OPEN TOP BACK INLET GULLY
FIC	FIC - DETAIL No. 6
FAC	FAC - DETAIL No.
SIC	SIC - DETAIL No. 6
SAC	SAC - DETAIL No.
SCP	SCP- DETAIL No. 5
	FOUL DP - DETAIL No. 7
	RWP - DETAIL No. 8
	NEW PRIVATE SWD
	NEW PRIVATE FWD
	NEW ADOPTABLE FOUL SEWER
	SITE BOUNDARY

EXTERNAL PRIVATE FOUL AND STORM WATER DRAINAGE NOTES

1. THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE DETAIL SHEETS SERIES AND ALL RELEVANT ARCHITECT AND STRUCTURAL DRAWINGS.

2. BELOW GROUND DRAINAGE SHALL BE INSTALLED IN PVCu AS THE TERRAIN PUSHFIT SYSTEM OF PIPES AND FITTINGS TO BS EN 1401 OR EQUAL AND APPROVED. NO SHARP 90 DEGREE BENDS SHALL BE USED. ALL BRANCHES SHALL BE MADE USING 45 DEGREE BRANCH WITH 45 DEGREE BEND WITH MIN RADIUS TO CENTRE OF 200MM.

3. PIPES SHALL GENERALLY BE BEDDED IN CLASS S GRANULAR BEDDING WITH FULL GRANULAR MATERIAL BED AND SURROUND AS GTA DETAILS BUT WILL REQUIRE PARTICULAR CONCRETE SLAB PROTECTION OVER IN SHALLOW DEPTHS LESS WITH THAN 0.6m COVER.

4. SHALLOW INSPECTION CHAMBERS (SIC) AND SHALLOW ACCESS CHAMBERS (SAC) SHALL BE AS THE GTA DETAILS AND LOCATED AS THE LAYOUT DRAWING TO BE USED FOR THE APPROPRIATE DEPTH OF DRAINAGE.

5. DRAINAGE POINTS BENEATH THE BUILDING SHALL BE APPROPRIATE TO THE CONSTRUCTION OF THE FLOOR SLAB. REFER TO RELEVANT GTA AND STRUCTURAL DETAILS.

6. ALL WORKS SHALL BE CARRIED OUT TO THE SATISFACTION OF THE BUILDING CONTROL OFFICER / NHBC AND IN ACCORD WITH APPROVED BUILDING CONTROL DOCUMENTS, BS EN 12056, BS EN 752, BS EN 8000 AND RELEVANT HEALTH AND SAFETY CODES OF PRACTICE.

7. THE DRAINAGE SHALL BE TESTED SEQUENTIALLY DURING THE INSTALLATION AND THE NHBC / BCO REPRESENTATIVE INVITED TO THEN WITNESS THE FINAL TEST TO GAIN THE COMPLETION CERTIFICATE.

8. ALL FOUL WATER DRAIN RUNS SHALL HAVE A FALL OF 1:40 OR STEEPER, UNLESS NOTED OTHERWISE.

9. ALL CEMENT USED FOR CONCRETE DRAINAGE INSTALLATIONS SHALL BE SULPHATE RESISTANT TO CLASS 3 OF BRE DIGEST 363. (GRADE ST5)

10. ALL DRAINS SHALL HAVE GRANULAR BED AND SURROUND AS CLASS `S` BEDDING, UNLESS NOTED OTHERWISE.

11. ALL DRAINAGE WORKS SHALL COMMENCE FROM THE UPSTREAM END FIRST UNLESS AGREED OTHERWISE. OUTFALL LEVEL TO BE CHECKED BY CONTRACTOR PRIOR TO ANY WORKS COMMENCING AND ANY DISCREPANCY IDENTIFIED TO ENGINEER PRIOR TO LAYING AND

EXTERNAL ADOPTED FOUL SEWERAGE NOTES

1. THE PROPOSED PUBLCI FOUL SEWER ROUTE AND DESIGN IS SUBJECT TO APPROVAL BY SOUTHERN WATER.

2. THE BELOW GROUND FOIUL SEWERAGE SHALL BE INSTALLED IN VITRIFIED CLAYWARE TO BS EN 295 USING PUSHFIT COUPLINGS AS THE HEPWORTH 'SUPERSLEVE' RANGE OF PIPES AND FITTINGS. PIPES SHALL HAVE CRUSHING STRENGTH 40 Kn/m. BE NO SHARP 90 DEGREE BENDS SHALL BE USED. ALL BRANCHES SHALL BE MADE USING 45 DEGREE BRANCH WITH 45 DEGREE BEND WITH MIN RADIUS TO CENTRE OF 200MM.

3. PIPES SHALL GENERALLY BE BEDDED IN CLASS S GRANULAR BEDDING WITH FULL GRANULAR MATERIAL BED AND SURROUND AS GTA DETAILS.

4. THE EXTERNAL ADOPTED CHAMBERS SHALL BE AS SHOWN ON THE DRAWINGS AND DETAILS AND BE CONSTRUCTED IN ACCORD WITH THE LATES EDITION OF 'SEWERS FOR ADOPTION'.

6. ALL WORKS SHALL BE CARRIED OUT TO THE SATISFACTION OF THE SOUTHERN WATER INSPECTOR AND TO THE REQUIREMENTS OF THE LATEST EDITION OF 'SEWERS FOR ADOPTION'.

7. THE SEWERAGE PIPELINES AND CHAMBERS SHALL BE TESTED SEQUENTIALLY DURING THE INSTALLATION AND THE SOUTHERN WATER REPRESENTATIVE INVITED TO THEN WITNESS THE FINAL TEST TO GAIN THE COMPLETION CERTIFICATE.

8. ALL CEMENT USED FOR CONCRETE DRAINAGE INSTALLATIONS SHALL BE SULPHATE RESISTANT TO CLASS 3 OF BRE DIGEST 363. (GRADE ST5)

9. ALL DRAINS SHALL HAVE GRANULAR BED AND SURROUND AS CLASS `S` BEDDING, UNLESS NOTED OTHERWISE.

10. ALL DRAINAGE WORKS SHALL COMMENCE FROM THE UPSTREAM END FIRST UNLESS AGREED OTHERWISE. OUTFALL LEVEL TO BE CHECKED BY CONTRACTOR PRIOR TO ANY WORKS COMMENCING AND ANY DISCREPANCY IDENTIFIED TO ENGINEER PRIOR TO LAYING AND DRAINAGE.

DESIGN NOTES

1. PERMEABLE PAVING DESIGN BASED ON 1 IN 100 YR STORM + 30% AND INFILTRATION RATE OF 1.95X10-6M/S AS STATED IN ASHDOWN REPORT DATED NOV 2013.

2. DRAIN POINTS AND LOCATIONS TO BE CONFIRMED BY ARCHITECT.

3. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.

4. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.

5. APPROVAL TO BE GAINED FROM SOUTHERN WATER FOR CONNECTION TO SEWER

6. INFILTRATION RATE ASSUMED (1.29X10-6m/s) CONTRACTOR TO CARRY OUT SOAKAGE TESTS TO BRE DIGEST 365

Rev	Amendments	Date	Dsn	Chk
D	LAND DRAIN ADDED. DESIGN REVISED TO DRAIN ROOF AREAS TO PERMEABLE SYSTEMS INSTEAD OF SOAK-AWAYS. FOUL UPDATED	28/11/13	LT	MR
C	SITE BOUNDARY ADDED	30/10/13	SAD	MR
B	PRIVATE CLAYWARE SPEC ALTERED TO PVCu	10/10/13	SAD	MR
A	TENDER ISSUE	09/10/13	SAD	MR
-	INITIAL ISSUE	04/09/13	SAD	

Status: TENDER

Client: MUMFORD DEVELOPMENTS LTD

Architect: C25 DESIGN

Project: 77-83 SOUTHVIEW ROAD SOUTHWICK

Title: DRAINAGE LAYOUT

Date: NOVEMBER 13	Scale @ A1: 1:200
Base Layout Ref.	CAD File ref.
Clients Ref.	Project Ref.: 4999

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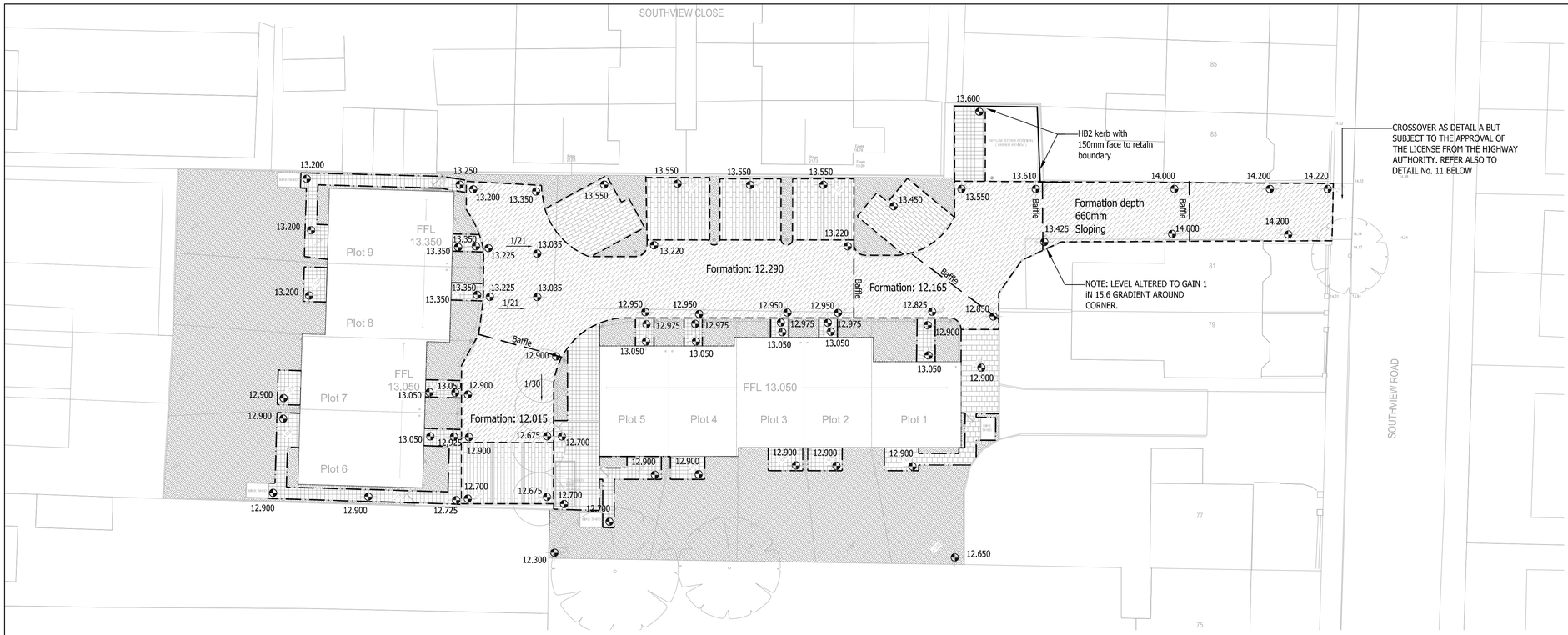
Drawing Number: 4999/100

Rev.: D



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PERMEABLE CONSTRUCTION AS DETAIL No. 2 BELOW

CAR PARK BAYS WITH SEPARATION COLOURING AS PERMEABLE CONSTRUCTION AS DETAIL No. 2 BELOW

FOOTWAY PERMEABLE CONSTRUCTION AS DETAIL No. 1 BELOW

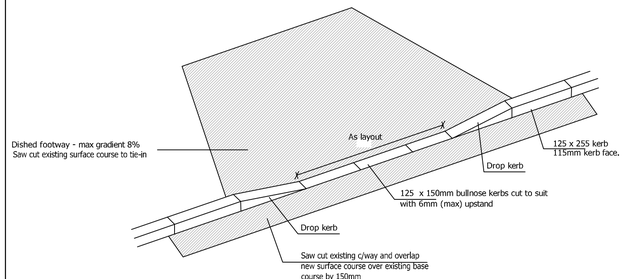
SOFT AREAS TO ARCHITECTS DETAILS.

DETAIL C - SEE BELOW

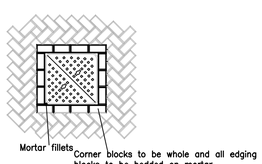
DETAIL D - SEE BELOW

DETAIL E - SEE BELOW

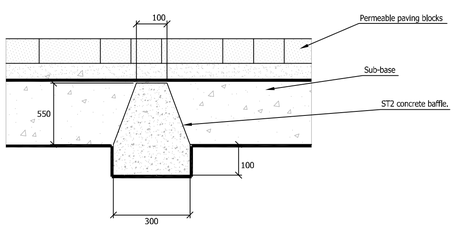
13.050 PROPOSED LEVEL



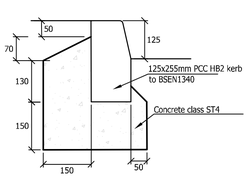
DETAIL A - VEHICLE CROSSOVER



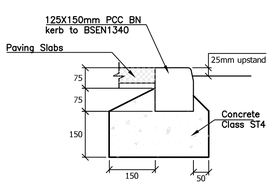
DETAIL B - MANHOLE COVER DETAILS



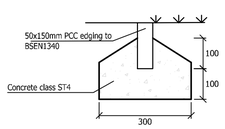
PERMEABLE PAVING CONCRETE BAFFLE



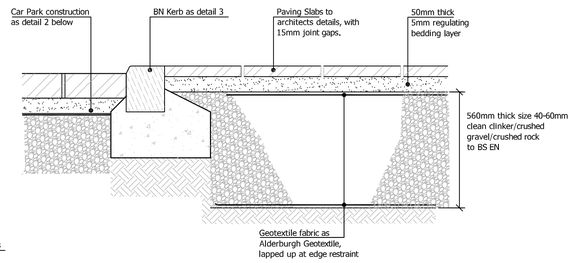
DETAIL C - FULL HEIGHT KERB DETAIL



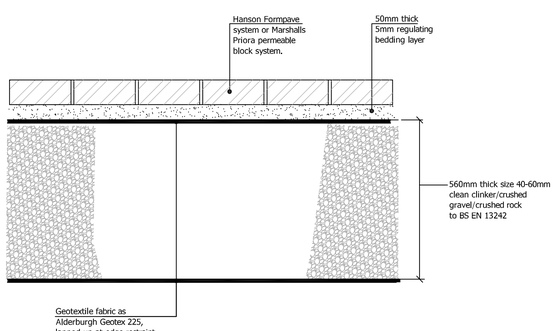
DETAIL D - DROPPED BN KERB DETAIL



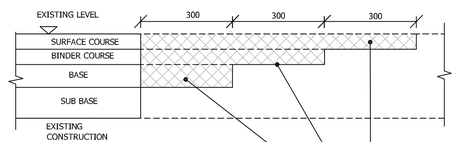
DETAIL E - PCC EDGING KERB



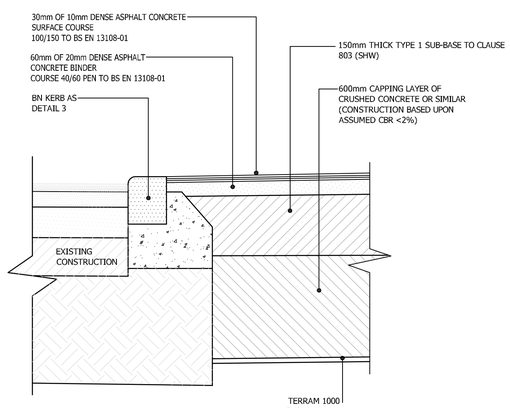
PRIVATE FOOTPATH PERMEABLE CONSTRUCTION DETAIL 1



PRIVATE DRIVEWAY PERMEABLE CONSTRUCTION DETAIL 2



ROAD CONSTRUCTION TIE-IN DETAIL DETAIL 10



VEHICLE CROSSOVER DETAIL DETAIL 11

Rev	Amendments	Date	Dsn	Chk
B	Permeable paving baffles added	28.11.13	LT	MR
A	Levels to thresholds revised	18.11.13	SD	MR
	TENDER ISSUE	9.10.13	SD	MR

Status: TENDER

Client: MUMFORD DEVELOPMENTS LTD

Architect: C25 DESIGN

Project: 77-83 SOUTHVIEW ROAD SOUTHWICK

Title: EXTERNAL WORKS LAYOUT & DETAILS

Date	Scale @ A1
	1 : 200
Base Layout Ref.	CAD File ref.
Clients Ref.	Project Ref. 4999

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Drawing Number: 4999 / 104

Rev.: B

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HONDA SITE
SOUTHVIEW ROAD
SOUTHWICK
WEST SUSSEX

GEOTECHNICAL AND CONTAMINATION (PHASE II) ASSESSMENT REPORT

Report No. LW24275 November 2013

Report prepared for the benefit of:

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94 Southview Road
Southwick
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Managing Director
J.E.Bewick
BSc MSc CEnv CEng MICE

Company Secretary
V.Bewick
BSc MSc FRSS

Company Registration Number
242 6786

nqa. ISO 9001 Registered
UKAS QUALITY MANAGEMENT 015
AGS
ace consultancy engineering business environment
INVESTOR IN PEOPLE

HONDA SITE
SOUTHVIEW ROAD
SOUTHWICK
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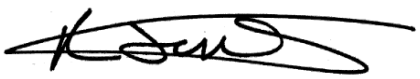
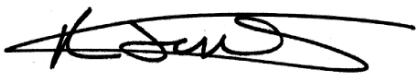
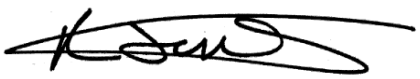
GEOTECHNICAL AND CONTAMINATION (PHASE II) ASSESSMENT REPORT

Report No. LW24275 November 2013

FACTUAL REPORT	
Prepared By:  **Rebecca Jones** **BSc FGS**	Approved By:  **Steven McSwiney** **BA mod Geol MSc FGS**
GEOTECHNICAL ASSESSMENT	
Prepared By:  **Rebecca Jones** **BSc FGS**	Approved By:  **Steven McSwiney** **BA mod Geol MSc FGS**
PHASE 2 CONTAMINATION ASSESSMENT	
Prepared By:  **Rebecca Jones** **BSc FGS**	Approved By:  **Steven McSwiney** **BA mod Geol MSc FGS**

HONDA SITE
SOUTHVIEW ROAD
SOUTHWICK
WEST SUSSEX

GEOTECHNICAL AND CONTAMINATION (PHASE II) ASSESSMENT REPORT

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HONDA SITE
SOUTHVIEW ROAD
SOUTHWICK
WEST SUSSEX

GEOTECHNICAL AND CONTAMINATION (PHASE II) ASSESSMENT REPORT

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HONDA SITE
SOUTHVIEW ROAD
SOUTHWICK
WEST SUSSEX

GEOTECHNICAL AND CONTAMINATION (PHASE II) ASSESSMENT REPORT

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1. INTRODUCTION

The site comprises the Honda preparation yard and buildings located off Southview Road and the rear gardens of No. 82 and No. 88 Underdown Road, Southwick, West Sussex. It is proposed to redevelop the site with the construction of new residential houses with associated access road, car parking, gardens and soft landscaping.

Ashdown Site Investigation Limited was commissioned to carry out a combined geotechnical and contamination assessment of the site by Mr P Calland of:

SD Holdings Ltd
94 Southview Road
Southwick
West Sussex
BN24 4TT

The instruction to proceed was received from the client by an email dated 18th October 2013. A further instruction to accelerate the laboratory testing and provide preliminary information was received by email dated 6th November 2013.

The purpose of the works was to:

i. assess the expected geology and hydrogeology underlying the site;
ii. assess ground and groundwater conditions prevailing at the site;
iii. provide information to assist others in undertaking design of foundations, ground floors, road pavements and soakaways;
iv. test for the presence of potentially hazardous contamination in the ground;
v. provide a quantitative contamination risk assessment; and
vi. provide a quantitative site specific conceptual model.

The analysis and discussions contained in this report are based on the ground conditions encountered during the recent site work together with the findings from a programme of laboratory analyses. The possibility of a variation in ground and groundwater conditions away from the positions investigated should not be overlooked. Groundwater conditions can vary both seasonally and due to other effects.

A Phase 1 Geo-Environmental Risk Assessment Report has been prepared by Aviron Associates Limited (Report Ref: 13-133.01, dated February 2013) and is referenced within the body of this report.

It is noted that the investigation was undertaken and the report was prepared specifically for the Client's project and the recommendations given may not be appropriate to alternative schemes. The copyright for the report and licence for its use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not

originally commissioned, or where the exploratory hole records and test results contained therein are interpreted by anyone other than the Company.

The general methodology adopted for the investigation of the site follows the guidance published within:

- BS10175:2011 Investigation of Potentially Contaminated Sites - Code of Practice;
- BS5930:1999 +A2:2010 Code of Practice for Site Investigations;
- BS EN 1997-2:2007 Geotechnical Design – Part 2: Ground investigation and testing;
- CLR11 - Model Procedures for the Management of Land Contamination.

The risk assessment presented in this report follows 'source-pathway-receptor' techniques for the determination of whether a site is contaminated, which are standard practice in the UK, being intrinsic to the Contaminated Land (England) Regulations 2000 as amended - Part 2A of the Environmental Protection Act 1990.

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

2. SITE DETAILS

2.1 Site Description

The site was visited by Ashdown Site Investigation Ltd on the 24th October 2013 in order to ascertain site conditions in advance of the ground investigation works.

The site comprises an irregular shaped plot of land comprising the Honda Site located on Southview Road and the rear gardens of No. 82 and No. 88 Underdown Road, Southwick, West Sussex. It is centred on the approximate Ordnance Survey national grid reference TQ 2416 0597. A site location plan and site plan are presented as Figure 1 and Figure 2 respectively.

The Honda yard site lies to the west of the properties fronting Southview Road. The rear gardens of properties No. 82 and No. 88 Underdown Road are located to the west of the Honda site and are separated by a brickwork wall. The surrounding area comprises residential properties.

At the time of the intrusive works the Honda site comprised an asphalt surfaced area with a single storey garage workshop building located in the north western corner. The garage building floors comprised concrete with a catch pit present within the easternmost part of the building. Several oil and lubricant storage barrels and a bunded oil tank were present within the garage building which all appeared to be in good condition. The tank was located against the southern wall of the structure. No significant staining of the concrete surfacing was noted. The northern part of the Honda premises was used to store tyres and parked cars. Brick piers were present in the northern most part of the site which may have been used for an above ground fuel tank. The southern part of the site was used to wash down the vehicles and the surface drainage was linked to five soakaway chambers on site. The topography of the Honda site sloped moderately down from the north to the south.

The rear gardens of 82-88 Underdown Road comprised a mixture of grassed areas with flower beds and patio areas near to the existing properties. The properties comprised detached bungalows with associated garages, drives and gardens.

Numerous mature trees and hedges were present on and across the site.

2.2 Expected Geology

The stratigraphic succession expected to underlie the site is presented in the following table. In preparing the table reference has been made to the British Geological Survey 1:50,000 series scale map Sheet 318 and the British Geological Survey lexicon of named rock units.

Table 1. Expected Geological Strata

Type	Stratum	Age
Superficial Deposits	Head	Quaternary
Bedrock Geology	White Chalk Subgroup	Cretaceous

2.2.1 Head

The Head deposits generally comprise silty clay with variable amounts of gravel and cobbles of chalk and flint. The lithology of the Head reflects the nature of the parent chalk and previously existing Quaternary, largely clay, strata. It may form infill to solution features within the underlying chalk deposits, discussed below.

2.2.2 White Chalk Subgroup

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 cavities in the chalk is very rare and solution features, if present, can be expected to be infilled with Quaternary deposits such as the Head. 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.

2.3 Hydrogeology

2.3.1 Groundwater Vulnerability & Soil Classification

The Environment Agency designates aquifers in accordance with the Water Framework Directive. These designations reflect not only the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The Head expected beneath the site is classified as a Secondary A Aquifer. Secondary A Aquifers are characterised by permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The White Chalk Subgroup is classed as a Principal Aquifer. Principal Aquifers comprise deposits that have high intergranular and/or fracture permeability, usually providing a high level of water storage. They may support water supply and/or river base flow on a strategic scale

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.

2.4 Hydrology

The site does not lie within an Environment Agency Zone 2 or Zone 3 floodplain.

3. GROUND INVESTIGATION

3.1 Introduction

The ground investigation comprised the excavation of a series of dynamic sampler boreholes together with a hand dug trial pit. The fieldwork was carried out on the 29th October and 4th November 2013. The exploratory hole locations are shown on the Site Plan (Figure 2).

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in Appendix A. Notes to assist in the interpretation of the records are also contained in the appendix.

3.2 Investigation and Sampling Strategy

The phase 1 preliminary geo-environmental risk assessment report prepared by Aviron Associates Limited, dated February 2013, highlighted the follow potential sources of contamination:

- Potential contaminated made ground beneath buildings and hardstanding.
- Potential petroleum hydrocarbons and volatile organic compounds (VOC) from current site use as a vehicle servicing garage.

It is noted that the phase 1 assessment recorded an oily puddle to the south west of the garage building, however during the recent intrusive works no evidence of an oily puddle was present. It is considered that any potential petroleum hydrocarbon and VOC contamination from surface run off would likely impact soils in the vicinity of the soakaways present on site.

The following table provides a summary of the rationale behind the positioning of the exploratory holes.

Table 2. Sampling Location Rationale

Exploratory Hole	**Reason for positioning**
Boreholes BH1 and WS2	Located to target potential contamination in the vicinity of the soakaways and to provide geotechnical information.
Trial Pit FP1	Located to investigate the foundations of the existing wall along the boundary and to obtain soil samples beneath the garage floors slab for contamination testing.
Boreholes WS1 and WS3 to WS7	Located to provide geotechnical information and non-targeted contamination sampling.

The results from the ground investigation are considered sufficient to allow the preparation of a quantitative risk assessment for the site.

3.3 Methodology

3.3.1 Dynamic Sampler Boreholes

Eight boreholes (designated BH1 and WS1 to WS7) were drilled to depths of between 2m and 12m below ground level.

The dynamic sampler boreholes were formed by a series of 1.0m long hollow steel tubes, reducing in diameter from 100mm to 35mm, driven into the ground by means of a track-mounted drop weight. The sampler was extracted from the ground using a hydraulically operated jack and the enclosed samples recovered in 1.0m long plastic liners. The system enables sub-samples to be taken for detailed examination and laboratory testing.

3.3.2 Foundation Inspection Pit

A single pit (designated FP1) was excavated using hand-tools to a depth of 0.6m below ground level to enable inspection of the foundations to existing garage boundary wall.

3.4 Sampling

Disturbed samples of soil were taken at the depths shown in the exploratory hole records and collected in either plastic bags, plastic tubs or amber jars fitted with gas tight lids. On collection amber jars were stored in cool boxes with cooling blocks to maintain temperatures below 4°C and transferred to refrigerators upon return to the office until forwarded to the external accredited laboratory.

3.5 In Situ Testing

The depths of in situ testing, together with the test results, are given on the exploratory hole records or are summarised separately in Appendix A. Notes providing additional information on the tests that were performed are also included in Appendix A.

3.5.1 DPSH Dynamic Probe (Super Heavy) Testing

Dynamic probe testing was carried out adjacent to a majority of the dynamic sampler boreholes. The dynamic probing was undertaken in accordance with BS EN ISO 22476-2:2005 using a super heavy probing geometry.

The DPSH-B configuration is similar to that of the standard penetration test (SPT) except that the tip comprises a 90° cone, the driving rods are lighter than those used for SPT testing and the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT. The blow counts recorded and

calculated dynamic point resistances are presented on the probe records; the latter account for inertia of the anvil and driving rods.

3.5.2 Undrained Shear Strength

Undrained shear strength determinations were made in situ within the fine grained soils using a Geonor hand shear vane.

Additionally undrained shear strength determinations were made within samples of the fine grained soils held in the dynamic sampler liners using a hand penetrometer. Although samples taken by the dynamic sampling technique cannot be regarded as being undisturbed for testing purposes, penetrometer testing can provide a useful indication of the strength of the material.

3.5.3 California Bearing Ratio Tests

Testing to determine the in situ California Bearing Ration (CBR) of soils was conducted at shallow depths adjacent to boreholes WS3, WS4, WS5 and WS6 using a Transport Road Laboratory (TRL) cone penetrometer.

3.5.4 Soakage Testing

Falling head soakage testing was carried out in boreholes WS2 and WS7 at a depth of 2.0m below ground level within the Head deposits. The tests were carried out in general accordance with The Soakaway Design Guide published by Kent County Council (2000).

3.6 Laboratory Testing

Results from the laboratory tests are provided in Appendix B.

3.6.1 Geotechnical Testing

Geotechnical testing was undertaken by Ashdown Site Investigation Ltd in accordance with the methods given in BS1377:1990 Parts 1 to 8 ‘Methods of test for soils for civil engineering purposes’. Notes to assist with the interpretation of the tests are contained within Appendix B.

The types and numbers of tests carried out are detailed in the following table. The test results are discussed in Section 5.

Table 3. Geotechnical Testing

Type of test	No. of samples tested
Moisture Content	12
Atterberg Limits	7
Particle Size Distribution	2

3.6.2 Chemical Testing

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

The types and numbers of tests undertaken are detailed in the following table. The test results are discussed in Sections 5 and 6.

Table 4. Chemical Testing

Determinand	No. of soil samples tested
Arsenic	9
Cadmium	9
Chromium	9
Lead	9
Mercury	9
Nickel	9
Selenium	9
Copper	9
Zinc	9
Hexavalent Chromium	9
Water Soluble Boron	9
pH	16
Organic Matter	9
Speciated PAH	9
Volatile Organic Compounds (VOC)	3
Speciated Petroleum Hydrocarbons (Equivalent Carbon Weight Fractions)	9
Asbestos	3
Water Soluble Sulphate	7

4. GROUND CONDITIONS

4.1 Stratigraphy

4.1.1 Surface Covering

The boreholes excavated within the Honda Yard were excavated through a surface cover of asphalt over a sub-base some 200mm to 300mm in thickness. The foundation inspection pit, FP1, recorded concrete some 125mm thick at the surface.

The boreholes excavated within the rear gardens of No. 82 and No.88 Underdown Road recorded topsoil and/or block paving some 150mm to 300mm in thickness.

4.1.2 Made Ground

Made ground, generally comprising gravelly clays and gravelly clayey sands was recorded to depths of between 0.4m and 0.8m below ground level within exploratory holes WS2, WS3, WS4, WS6 and FP1. The coarse grained fraction contained a variable quantity of flint, brick, concrete, breeze blocks, clinker and ash.

4.1.3 Head

Underlying the surfacing and/or made ground, the investigation progressed into undisturbed typically firm becoming firm to stiff and stiff clays with subordinate horizons of very clayey sands and gravels. These soils, considered to represent the Head deposits as indicated on the geology map, were recorded to the full depth of the shallow exploratory holes and to a depth of 8.4m in the deep borehole BH1.

4.1.4 White Chalk Subgroup

Beneath the Head deposits, the deep borehole encountered structured chalk of the White Chalk Subgroup to the full depth of the investigation of 12m.

4.2 Stability

Each of the shallow exploratory holes was recorded as being stable during the course of the investigation. Slight instability was recorded within the coarse grained soils encountered at depth within BH1.

4.3 Groundwater Conditions

Groundwater was recorded at a depth of 7.2m within the deep borehole. Each of the shallow exploratory holes remained dry during excavation.

4.4 Existing Foundations

Details of the foundations encountered within the foundation inspection pits are included as Figure 3 of this report.

The foundation of the garage/boundary wall was recorded to comprise a mass concrete spread foundation bearing at a depth of some 0.52m below the garage floor level. The foundation, which projected some 220mm from the face of the wall, was supported within the Head deposits.

5. GEOTECHNICAL ASSESSMENT

The geotechnical assessment has been prepared in connection with the development proposals shown on the drawing produced by Circle 25 (Reference 12038_SL_01 revision A, dated March 2013). In addition a drainage layout drawing (referenced 4999/100, dated October 2013) prepared by GTS Civils Ltd was provided by the client.

In summary these drawings indicate the proposed development to comprise demolition of the existing structures and the construction of new houses with associates access road, car parking, gardens, and soft landscaping.

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

5.1 Foundations

5.1.1 Soil Shrinkage/Heave Potential

The fine grained soils of the Head have been classified as clays of intermediate to high plasticity and with modified plasticity indices in the range of 7% to 23% 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 (spread footings, piles, pile caps and ground beams etc) should assume a medium volume change potential for the fine grained Head soils and take into account current guidance such as that given by the Building Research Establishment (BRE) or the National House Builders Council (NHBC).

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. All detailed foundation design including assessment of minimum founding depths for spread foundations, requirements for sleeving or reinforcing of piled foundations and requirements for placement of void formers must take into account the volume change potential of the soil and the presence of trees (previous, present and proposed).

It is recommended that an arboriculturalist should be consulted to establish the species and maturity of existing trees in the area of the proposed works. It would be prudent to review any available historical photographs or detailed site plans (if available) to establish the 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 engineers responsible for design of foundation systems.

5.1.2 Spread Foundations

Any made ground and any soils disturbed by the construction or removal of any previously existing foundations or services should be regarded as potentially 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 such soils and onto undisturbed, competent, natural deposits.

For design purposes, a net allowable bearing capacity of 125kN/m^2 may be assumed for the construction of spread (pad or strip) foundations up to 1.0m across bearing within the Head deposits. The quoted bearing capacity is expected to limit settlement to less than 25mm. In general a minimum depth to formation of 0.9m should be adopted, though foundations may need to be deepened where made ground is found to extend below this depth or where there is a requirement to protect foundations against deep seasonal soil volume changes induced by trees.

Attention is drawn to the presence of interbedded fine grained (clays) and coarse grained (sands and gravels) soils beneath the site. Where there is the potential for mixed soil conditions to be present beneath footings, designers will need to consider whether foundations need to be reinforced due to the potential for cracking of foundations to occur as a result of differential settlement across individual foundations, as coarse grained and fine grained soils will settle at different rates under loading.

5.1.3 Piled Foundations

It is considered that the Head and underlying White Chalk Subgroup deposits would provide support to piled foundations by a combination of side adhesion (skin friction) and end bearing.

The proven ground conditions would indicate that bored piles could be employed to provide a suitable foundation solution. However the method of installation will have to accommodate the presence of groundwater. It is noted that unstable coarse grained soils were encountered at depth by the deep borehole drilled as part of this investigation. In addition, the selection of piling techniques should consider access constraints applicable to particular plant and potential vibration effects on existing adjacent structures and particularly the roadways.

Depending on the method employed it is considered likely that driving displacement (driven piles) through the structured chalk deposits to sufficient depth would prove difficult and could be disruptive to nearby structures.

For the purposes of this initial discussion and for reasons given above, consideration has been given to the adoption of cast in situ piles (e.g. CFA). The use of CFA piles would prove beneficial as this method does not require casing or the use of bentonite slurries. However, there are certain practical constraints that should be taken into account in the selection of pile type when considering the incorporation of pile reinforcement.

Calculations to determine illustrative working loads for axially loaded piles have been undertaken; each calculation assuming a single pile acting in compression. Indicative capacities are presented in the following table. Available capacities may vary for piles acting in tension.

The competency of the soil profile used for these calculations has been based on the examination of the recovered samples and the results of in situ and laboratory testing. A modelled ground profile comprising some 5m thickness of firm to stiff clays overlying medium dense sands to a depth of 8.5m and in turn overlying structured chalk has been adopted. Groundwater has been assumed to be present below a depth of 7.0m.

In consideration of the variable made ground, and the medium volume change potential of the natural clay soils, the benefit of shaft resistance within the upper 2m of each pile shaft has been discounted.

Table 5. Indicative Axially Loaded Pile Working Capacities

Working Loads of Piles (kN)			
Length	**Size (mm)**		
(m)	300	400	500
10	165	250	340
12	215	310	415

Notes:
The structural strength of the concrete used in construction may limit the available working loads of the piles. Indicated pile lengths are from existing ground level. A factor of safety of 3.0 has been applied. The benefit of shaft resistance within the upper 2m has been discounted.

Working capacities for pile groups should be assessed when final design details are known, although for preliminary design purposes it is likely that piles spaced at least 3 x pile diameter from other piles in any group will behave as single piles.

Where preliminary and working pile load tests are undertaken it may be appropriate to reduce Safety Factors, although 2.5 may be a minimum local authority requirement. Should testing not be undertaken it is suggested that a factor of safety of at least 3.0 should be adopted.

For all piling options it is recommended that the advice of specialist foundation contractors be sought at the earliest opportunity, from whom piling specifications should be obtained with reference to their particular products as this may affect the calculated capacity.

5.2 Groundwater

A standing water depth of 7.2m was recorded within borehole BH1 during excavation. Groundwater was not encountered within the shallow exploratory holes.

However there remains the possibility that heavy precipitation events during construction may lead to ingress of perched or surface water run-off. In such

circumstances water within excavations is expected to be adequately managed by pumping from sumps or natural drainage.

5.3 Stability of Excavations

All unsupported excavations within made ground and coarse grained Head soils should be assumed to be subject to short term instability. It is expected that unsupported excavations within the fine grained Head soils will be stable in the short term. Where stable excavations are required in the short term in the made ground and coarse grained soils or in the medium to long term in the fine grained soils they should be suitably supported or side slopes battered back to a safe angle of repose.

Where personnel access is required into any excavation, its stability must be assessed by a suitably qualified, experienced and responsible person. In any case it is recommended that where personnel access into excavations greater than 1.2m depth is necessary, excavations should be fully supported or side slopes battered back to a safe angle of repose.

Particular attention must be paid to ensuring the stability of adjacent structures, neighbouring sites as well as the road frontages.

5.4 Aggressivity to Concrete

In view of the soils encountered beneath the site it is considered that 'natural ground conditions' may be assumed for the purposes of assessing the aggressivity of the chemical environment for concrete classification (ACEC class). Given the noted occurrence of groundwater seepages, 'mobile groundwater' conditions should be assumed.

Chemical analysis of the soil indicates a sulphate content falling into Design Sulfate Class DS-1 of Table C1 of the Building Research Establishment Special Digest No 1 "Concrete in aggressive ground", 2005. The results of the pH tests indicate that the underlying soils are alkaline.

In accordance with the BRE 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 at the site.

5.5 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 be suspended for all sensitive structures.

Ground bearing floor slabs may, however, be considered where made ground soils are not present or are to be removed from beneath building footprints and the depth of foundations required to protect against seasonal soil volume changes

close to trees is less than 1.5m. In such circumstances further works should be undertaken to demonstrate, that close to the time of construction, no significant soil desiccation is present. If ground bearing floors are adopted it is recommended that the potential for differential movement both between the floor slab and walls and across the floor slab itself should be anticipated. Such floors should be fully debonded from walls. Formations should be adequately proof rolled and any excessively soft materials excavated and replaced with a suitable well graded granular fill. The depth of any fill should be limited to a maximum of 600mm unless placed to an engineering specification designed to limit internal settlement of the fill materials to a tolerance to be advised by the designer.

The detailing of services through, or under, ground-bearing floors should incorporate flexible connections and, where appropriate, enhanced falls.

5.6 Pavement Design

TRL cone penetrometer tests undertaken to establish the California bearing ratio (CBR) of the in situ soils indicated CBR values ranging between 1% and >100% but typically in the range 1% to 6% in the underlying Head and made ground at the time of the investigation. It is noted that CBR values are, in part, dependent on the moisture content of the tested soils and are consequently subject to seasonal variation.

The former Department of the Environment, Transport and the Regions Design Manual for Roads and Bridges, Volume 7 (Pavement Design & Maintenance), Section 2, Part 2 1994 provides a useful correlation between plasticity indices and equilibrium (long term) CBR values. This guidance suggests a design equilibrium CBR value of 3% to 5% applicable to the natural clay soils for the construction of thin (300mm) pavement in poor to average construction conditions and assuming a low groundwater table.

Based upon review of the in situ test results and the quoted guidance it is recommended that, for the clay Head deposits or derived made ground soils, a CBR value of no greater than 3% should be adopted for preliminary pavement design.

All formations should be proof rolled and any very loose, bulky, soft, degradable or otherwise unsuitable materials thus identified should be removed and replaced with well compacted coarse grained fill. Prepared subgrades should be protected from severe adverse weather by ensuring they are graded to falls to prevent ponding, and they should be reasonably protected from trafficking during construction.

The subgrade may be assumed not to be susceptible to frost heave.

If new roads are to be adopted the local highway authority should be consulted with reference to the acceptability of the proposed figures prior to designs being finalised and construction undertaken.

5.7 Drainage

In situ soakage testing was undertaken in accordance with 'The Soakaway Design Guide' published by Kent County Council (July 2000). From the results of the tests, calculations were made in accordance with the guide to estimate the infiltration rate that could be expected for soakaways constructed to discharge into the underlying Head soils within the test zones.

The following infiltration rates have been derived from the tests.

WS2 f = 1.95 x 10^{-6} m/s under 1m head of water assumed
WS7 f = 9.27 x 10^{-6} m/s under 1m head of water assumed

The value 'f' is equivalent to the soil infiltration coefficient 'q' quoted in the Construction Industry Research and Information Association (CIRIA) Report 156.

Given the low infiltration rates recorded, it is considered that the near surface Head soils may be capable of accepting surface water run-off via soakaway provided that the design of soakaway geometries is carefully considered to ensure they are capable of half emptying within a 24hour period as is required by the BRE 365 Guide.

To minimise the risk of subsidence, soakaways should be constructed a minimum of 5.0m away from proposed or existing buildings.

It is noted that coarse grained soils were encountered at depth within borehole BH1 directly overlying the chalk deposits. Consideration could be given to the construction of deep conventional ring chamber soakaways or borehole soakaways discharging into these deposits where greater infiltration rates may be obtained. Further testing would be required to establish specific infiltration rates for deep soakaway design.

In the event that discharge to ground via soakaways is proposed, it is recommended that designers refer to Pollution Prevention Guidance Notes (PPGs) published by the Environment Agency for advice on legal requirements and good practice to reduce risks to groundwater. In particular reference should be made to PPGs 1 and 3, providing general advice on the prevention of pollution and the use and design of oil separators in surface water drainage systems, respectively. The Local Authority and/or relevant water company should be consulted in relation to consent for discharge of water from rooftops, areas of hardstanding and roadways to drains.

6. PHASE 2 CONTAMINATION ASSESSMENT

6.1 Introduction

In consideration of the current and historical site use and the findings of the phase 1 geo-environmental risk assessment prepared by Aviron Associates the following commonly occurring significant contaminants have been considered for assessment: arsenic, cadmium, chromium, lead (including lead compounds), mercury, nickel, copper, zinc, selenium, boron, asbestos, cyanide, petroleum hydrocarbons, Volatile Organic Compounds (VOC) and polycyclic aromatic hydrocarbons (PAH). The polycyclic aromatic hydrocarbons were speciated into the sixteen individual compounds specified by the United States Environmental Protection Agency (USEPA).

6.1.1 Soils

The results from the majority of the analyses can be assessed by way of careful consideration of the proposed end use as well as physical features of the soil type and wider environment as part of a quantitative 'Contaminated Land Exposure Assessment' or 'CLEA model' assessment.

Quantitative risk assessment using the CLEA model is the method preferred by the regulatory authorities in the UK to assist in determining the contamination status of soils in terms of risk to human health.

6.2 Analysis of Contamination Test Results

Results from the chemical (contamination) testing are summarised in Appendix B.

A quantitative assessment of the results of this investigation has been undertaken comparing soil contaminant concentrations on site against Soil Screening Values generated by Ashdown Site Investigation Ltd. using the CLEA Model published by the Environment Agency. For further information on the derivation of these values see the notes in Appendix C. The chemical data used within the CLEA model is also presented within Appendix C. This data was obtained from various sources including guidance documents published by the Environment Agency as well as other statutory bodies.

In view of the proposed development the soil screening values used in this assessment have been calculated using the default "Residential" land use as set out in Science Report SC050021/SR3, January 2009. 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.

6.2.1 Data Set

A total of six samples of the made ground and topsoil collected from across the site were tested for a range of metals and PAH compounds. In addition selected samples were screened for petroleum hydrocarbons, VOCs, asbestos and cyanides.

The data set on which statistical analysis has been undertaken therefore comprises six samples of the shallow topsoil and made ground soils.

In addition to this, three samples of the undisturbed Head soils were also tested as part of the current investigation. As only limited numbers of samples of the undisturbed soils were tested no statistical analysis has been undertaken and the results have simply been compared directly with calculated screening values.

6.2.2 Statistical Analysis

Statistical analysis of the data set discussed above has been undertaken in line with guidance set out in 'Comparing Soil Contamination Data with a Critical Concentration' report, published by the CIEH/ CL:AIRE (May 2008).

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 whether 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 are provided in Appendix C. The summary sheets from the statistical analysis are also presented in Appendix C.

6.3 Inorganic Contamination

6.3.1 Metals

The following table summarises the calculated soil screening values along with sample means and 95th percentile upper confidence limits.

Table 6. Soil Screening Values and Upper Confidence Limits for Inorganic Contaminants

Contaminant	Soil Screening Value (mg/kg)	Sample Mean (mg/kg)	95% Upper Confidence Limit (mg/kg)	Can H_o be rejected	Evidence against H_o (%)
Arsenic	32	10.59	12.22	Yes	100
Cadmium	10	0.39	0.79	Yes	100
Chromium	627	19.14	24.49	Yes	100
Lead	226	126.57	432.19	No	67
Mercury	170	0.47	1.41	Yes	100
Nickel	130	18.11	27.86	Yes	100
Copper	2330	19.43	30.74	Yes	100
Zinc	3750	118.00	185.62	Yes	100
Selenium	350	0.80	1.20	Yes	100
Boron	300	0.80	1.29	Yes	100
Chromium VI	4.3	1.00	1.00	Yes	100

The statistical analysis of the test data indicates elevated concentrations of lead contamination. It is noted that the reduced confidence level for lead is due to elevated concentrations of this element within a sample of made ground taken from a depth of 0.6m within borehole WS4 and a sample of topsoil obtained from borehole WS7 at 0.2m depth.

The testing of the three samples of natural soil did not record any concentrations of metals above the soil screening values for residential development.

In view of the above it is considered that a risk to the proposed end users of the site should be considered to be present from the lead contamination within the near surface soils.

For the purposes of assessment of risk to controlled water (groundwater) the concentrations of lead recorded would be expected to exhibit very low mobility unless present at significantly higher concentrations than have been recorded. Therefore there is not considered to be a significant risk to controlled waters in respect of lead contamination within the near surface soils.

6.3.2 Asbestos

No visual evidence of any suspected asbestos containing materials was recorded either on the surface of the site or within the near surface soils during the intrusive investigation.

Notwithstanding the above, as a precaution three samples of the near surface soils were screened for the presence of asbestos fibres. None of the samples recorded the presence of asbestos.

There is not considered to be a significant risk to the proposed end users of the site from asbestos contamination within the near surface soils.

An asbestos survey of existing structures and infrastructure (as defined under Section 5(a) of the Control of Asbestos Regulations 2012) was beyond the brief of this report. 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 to avoid contaminating soils at the site.

6.3.3 Other Inorganic Contaminants

Two samples of the near surface soils were screened for cyanide as a precautionary screen. Neither of the samples tested recorded cyanide concentrations above the detection limit of the test.

There is not considered to be a significant risk to the proposed end users or controlled waters from cyanide contamination within the near surface soils.

6.4 Organic Contamination

6.4.1 Polycyclic Aromatic Hydrocarbons (PAH)

The following table summarises the calculated soil screening values along with sample means and 95th percentile upper confidence limits.

Table 7. Soil Screening Values and Upper Confidence Limits for PAH Compounds

Contaminant	Soil Screening Value (mg/kg)	Sample Mean (mg/kg)	95% Upper Confidence Limit (mg/kg)	Can H_o be rejected	Evidence against H_o (%)
Naphthalene	1.5	0.34	0.72	Yes	99
Acenaphthylene	170	0.25	0.25	Yes	100
Acenaphthene	210	0.25	0.25	Yes	100
Fluorene	160	0.25	0.25	Yes	100
Phenanthrene	92	0.32	0.63	Yes	100
Anthracene	2300	0.25	0.25	Yes	100
Fluoranthene	260	0.25	0.25	Yes	100
Pyrene	560	0.32	0.62	Yes	100
Benz(a)anthracene	3.1	0.37	0.87	Yes	100
Chrysene	6.0	0.50	1.32	Yes	100
Benzo(b)fluoranthene	5.6	0.36	0.84	Yes	100
Benzo(k)fluoranthene	8.5	0.47	1.17	Yes	100
Benzo(a)pyrene	0.8	0.45	1.04	No	89
Indeno(123-cd)pyrene	3.2	0.35	0.64	Yes	100
Dibenz(ah)anthracene	0.8	0.25	0.25	Yes	100
Benzo(ghi)perylene	44.0	0.34	0.74	Yes	100

* Based on a SOM concentration of 1%

The statistical analysis indicates a marginally elevated concentration of benzo(a)pyrene within the near surface soils.

Although only a single sample of the topsoil from WS7 recorded a marginally elevated concentration of benzo(a)pyrene given that the made ground was noted to contain clinker and ash there is certainly the potential for similar concentrations of PAH compounds to be present in other parts of the site and a potentially significant risk to end users should be assumed to be present from PAH contamination within the made ground soils.

The three samples of natural deposits tested did not record any concentrations of PAH compounds above the detection limit of the test.

For the purposes of assessment of risk to controlled water (groundwater) the concentrations of PAH compounds recorded within the made ground would be expected to exhibit very low mobility unless present at significantly higher concentrations than have been recorded. Therefore there is not considered to be a significant risk to controlled waters from the PAH contamination identified within the near surface soils.

6.4.2 Petroleum Hydrocarbons

Nine samples were tested for total concentrations of petroleum hydrocarbons with the results speciated by equivalent carbon weight fractions.

Soil screening values for equivalent carbon fractions of petroleum hydrocarbons have been calculated as a joint project between LQM and CIEH and published in 'The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment' 2nd Edition, 2009." The screening values have been developed for the standard "Residential" land use as set out in Science Report SC050021/SR3, January 2009.

The following table lists the screening values for equivalent carbon weight fractions calculated for 1% organic content.

Table 8. Soil Screening Values for petroleum hydrocarbons calculated by LQM/CIEH.

Petroleum Hydrocarbon Fraction	Screening Value (mg/kg)
Aliphatic EC 5-6	30
Aliphatic EC >6-8	73
Aliphatic EC >8-10	19
Aliphatic EC >10-12	93
Aliphatic EC >12-16	740
Aliphatic EC >16-35	45000
Aliphatic EC >35-44	45000
Aromatic EC 5-7	65
Aromatic EC >7-8	120
Aromatic EC >8-10	27
Aromatic EC >10-12	69
Aromatic EC >12-16	140
Aromatic EC >16-21	250
Aromatic EC >21-35	890
Aromatic EC >35-44	890

A majority of the samples tested did not recorded petroleum hydrocarbons above the detection limit of the test. Samples collected from BH1 at 0.25m and FP1 at 0.4m recorded total concentrations of petroleum hydrocarbons of 25mg/kg and 26mg/kg, respectively. Where detectable concentrations of petroleum hydrocarbons were found these were mainly recorded in the heavier, and less mobile, C_{21}-C_{35} fraction.

None of the concentrations recorded were above the more stringent SSV, whether aromatic or aliphatic, for a residential development.

The testing undertaken appears to indicate that widespread petroleum hydrocarbon contamination is not present beneath the site. However, there remains the potential for some localised petroleum hydrocarbon contamination to be present beneath the footprint of the garage building, particularly in the areas of the inspection pit and fuel tank. Similarly although the samples tested from the two boreholes located adjacent to two of the soakaways did not record petroleum hydrocarbons there remains the potential for petroleum hydrocarbons to have impacted the coarse grained backfill materials of the soakaways.

6.4.3 Volatile Organic Compounds (VOC)

In view of the potential risk from volatile organic compounds from the current use of part of the site as a vehicle service garage three samples were tested for volatile organic compounds.

None of the samples tested recorded concentrations of VOCs above the detection limit of the test.

Although the test results indicate that wide spread VOC contamination is not present, there remains the potential for localised contamination to be present beneath the footprint of the garage building and in the backfill of the soakaways.

6.5 Quantitative Contamination Risk Assessment

An appropriate contamination risk assessment of a site considers the potential sources of contamination, the potential receptors and how the sources and receptors may be linked (the pathways).

A significant risk is only deemed to exist where a significant pollutant linkage has been identified i.e. where a potentially significant source is linked to the receptor via a significant pollutant pathway. A site is considered suitable for use where no significant pollutant linkages are present.

The quantitative risk assessment takes into account the findings of the intrusive works and laboratory testing along with on-site observations in order to identify potentially significant risks.

The assessment of risk has been carried out in line with guidance published within “Contaminated Land Risk Assessment: A guide to good practice” published by CIRIA (C552, 2001). The level of risk is determined using the risk matrix presented in the following table. Classifications of likelihood, severity and risk are provided in subsequent tables.

Table 9. Risk Assessment Matrix – Comparison of Consequence and Probability

		Likelihood of significant impact			
Severity of potential impact		**Very Low Likelihood**	**Low Likelihood**	**Moderate Likelihood**	**High likelihood**
	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

Table 10. Classification of Likelihood

Likelihood 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.

Table 11. Classification of Severity

Severity Classification	Definition
Severe	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short term risk to a particular ecosystem or organisation forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).
Moderate	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem or organism forming part of such ecosystem, (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).
Minor	Pollution of non sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the Draft Circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures/services or the environment.
Very Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.

Table 12. Classification of Risk

Risk Classification	Definition
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.

The risk assessment has been carried out based on the site being developed for residential purposes including the provision of private gardens. Should the proposed end use be altered, a revised risk assessment may be required.

6.5.1 Quantitative Contamination Risk Assessment for Human Health

The following identified sources and potential source of contamination that may pose a risk to end users have been identified by the investigation at the site:

1) Elevated lead and benzo(a)pyrene contamination within the made ground and topsoil.
2) Potential petroleum hydrocarbon and volatile organic compound contamination beneath the footprint of the garage building and in the backfill of the soakaways.

A quantitative human health risk assessment conceptual model is presented in the following table of this report and is presented diagrammatically as Figure 4.

Table 13. Quantitative Human Health Conceptual Model - Pollutant Linkages and Assessment of Risk

Contaminant Source	Potential Pathway(s)	Likelihood	Severity	Initial Assessment of Risk to Human Health
Elevated lead and benzo(a)pyrene contamination within the made ground and topsoil.	• Dermal contact with soil (Indoor & Outdoor). • Direct soil and dust ingestion. • Consumption of home-grown produce, including soils attached to home-grown produce. • Inhalation of indoor and outdoor soil dust.	Moderate	Moderate	Moderate
Potential petroleum hydrocarbon and volatile organic compound contamination beneath the footprint of the garage building and in the backfill of the soakaways.	• Dermal contact with soil (Indoor & Outdoor). • Direct soil and dust ingestion. • Consumption of home-grown produce, including soils attached to home-grown produce. • Inhalation of indoor and outdoor soil dust. • Inhalation of soil vapours.	Low	Moderate	Low/Moderate

6.5.2 Quantitative Contamination Risk Assessment for Controlled Water

The following potential source of contamination that has the potential to pose a significant risk to controlled waters is considered to remain at the site:

1) Potential petroleum hydrocarbon and volatile organic compound contamination beneath the footprint of the garage building and in the backfill of the soakaways.

A quantitative controlled water risk assessment conceptual model is presented in the following table of this report and is presented diagrammatically as Figure 4.

Table 14. Quantitative Controlled Water Conceptual Model - Pollutant Linkages and Assessment of Risk

Contaminant Source	Potential Pathway(s)	Likelihood	Severity	Initial Assessment of Risk to Controlled Water
Potential petroleum hydrocarbon and volatile organic compound contamination beneath the footprint of the garage building and in the backfill of the soakaways.	• Groundwater Flow	Low	Minor	Low

6.6 Risks to Other Potential Receptors

The following general guidance is given with regard to other potential on site receptors, which may not necessarily be statutory drivers for remedial works.

6.6.1 Construction Workers

The possibility that petroleum hydrocarbon and volatile organic compound contamination may be present beneath the footprint of the garage building and in the backfill of the soakaways cannot be discounted at this stage. Whilst any such contamination would be expected to have a low potential to pose a direct risk to construction workers, an assessment of the risks should be undertaken before commencing demolition/construction works and appropriate training undertaken and appropriate Personal Protective Equipment should be issued and used were necessary.

As a minimum and in accordance with industry best practise all ground-workers should be issued with the appropriate PPE and should be instructed in safe working methods. As a precaution instructions should also 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.

6.6.2 Services

The risk of damage to services from contamination identified is considered to be low. However, it is noted that further assessment taking into account the service providers' requirements should be undertaken following the works recommended by the discovery strategy discussed below. It is recommended that all service providers should be contacted with regard to specific precautions they may require and all precautions complied with.

6.6.3 Planting

Maximum concentrations of the phytotoxic elements copper, zinc and boron of 32mg/kg, 236mg/kg and 1.9mg/kg, respectively, were recorded within the samples tested. Whilst these concentrations are not considered to pose a risk to general planting, a horticulturist should be consulted with regard to any specific planting schemes proposed.

Attention is also drawn to the need for structural engineers to consider any proposed planting of trees or significant shrubs and reference should be made to Section 5.1.1 in this regard.

6.7 Recommendations and Discovery Strategy

Elevated concentration of lead and benzo(a)pyrene contamination has been identified within the shallow soils by this risk assessment. As such it is considered that remedial measures will be required as part of the proposed development, particularly where the topsoil and made ground soils may remain on site within areas of the proposed garden.

In view of the potential for petroleum hydrocarbon and volatile organic compound contamination to be present beneath the footprint of the garage and backfill material of the soakaways it is recommended that, following demolition, the stripped formations in these areas are inspected and additional samples collected for testing.

Various options for remediation of the site will need to be considered. The remediation works which are ultimately adopted will need to be detailed within a separate remediation strategy, along with a verification plan. This should be produced once this risk assessment report has been reviewed and approved by the local authority.

In addition, should materials not previously identified or suspected of being 'contaminants' be encountered during the course of the works advice should be sought immediately on their identification and how they should be treated.

If necessary the newly identified contaminants will be subject to a revised risk assessment and remediation strategy.

6.8 Handling and Disposal of Waste and Quality of Imported Materials

6.8.1 Waste Management

Soils and other materials taken for disposal should be handled, transferred and disposed of as controlled waste in accordance with the requirements of the Waste Management, Duty of Care Regulations. Copies of waste transfer notes detailing the site address, the waste type, details of the haulage contractor and full details of the disposal site must be kept.

The Site Waste Management Plans Regulations, 2008, require a site waste management plan to be prepared and implemented by clients and principal contractors for all construction projects with an estimated cost greater than £300,000 excluding VAT. The plans must record details of the construction project, estimates of the types and quantities of waste that will be produced, and confirmation of the actual waste types generated and how they have been managed. More detailed reporting requirements apply to projects exceeding £500,000.

6.8.2 Quality of Imported Soils

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

Materials must comply with current CLEA guidance for the proposed end use of the site. Sufficient verification testing should be carried out to demonstrate this compliance.

Topsoil should, when inspected visually, 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.

It is stressed that the quality of any materials imported onto the site is critical to the successful completion of any remediation works.

7. CONCLUSIONS

The following conclusions present a summary of the main findings of the investigation. However, no reliance should be placed on any point of the conclusions until the whole of the report has been read as other sections of the report may put into context the information contained herein.

7.1 Geotechnical Assessment

- The ground investigation confirmed the underlying soils to comprise a variable thickness of made ground, overlying Head soils and White Chalk Subgroup deposits.

- A standing water depth of 7.2m was recorded within borehole BH1 during excavation. Groundwater was not encountered within the shallow exploratory holes.

- Precautions against shrinkage and heave for any new foundation system (spread footings, piles, pile caps and ground beams etc) should assume a medium volume change potential for the fine grained Head soils and take into account current guidance such as that given by the Building Research Establishment (BRE) or the National House Builders Council (NHBC).

- A net allowable bearing capacity of 125kN/m^2 may be assumed for the construction of spread (pad or strip) foundations up to 1.0m across bearing within the Head deposits. The quoted bearing capacity is expected to limit settlement to less than 25mm.

- Indicative pile capacities are included in the body of the report.

- Where encountered, ingress of perched water or surface run off into excavations during heavy precipitation should be adequately managed by pumping from sumps or natural drainage.

- Where stable excavations are required in the short term in the made ground and coarse grained soils or in the medium to long term in the fine grained soils they should be suitably supported or side slopes battered back to a safe angle of repose.

- A DS-1Design 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 be suspended for all sensitive structures. Ground bearing floors may be adopted where the conditions outlined in the report are met.

- A design equilibrium CBR value of 3% may be assumed for the design of pavement bearing on the Head and derived made ground subgrade. The subgrade is not likely to be susceptible to frost heave.

- It is considered that the Head soils may be capable of accepting surface water run-off via soakaways, though the design of soakaway geometries will need to be carefully considered to ensure they are capable of half emptying within a 24hour period as is required by the BRE 365 Guide.

7.2 Contamination Status Assessment

- The eastern part site is currently occupied by the Honda yard used for servicing vehicles. The western part of the site comprises the rear gardens of No. 82 and No.88 Underdown Road, Southwick.

- The Head and White Chalk Subgroup deposits expected beneath the site are classed as a secondary A Aquifer and a Principal Aquifer, respectively.

- 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.

- The testing undertaken has identified elevated concentrations of lead and benzo(a)pyrene in comparison with soil screening values. There also remains the potential for localised petroleum hydrocarbon and volatile organic compound contamination to be present beneath the footprint of the garage and in the backfill of the soakaways.

- Specific remedial action is likely to be required to address the risks identified. These should be detailed in a separate remediation strategy once the risk assessment has been reviewed and agreed by the local authority.

- Quantitative conceptual models have been prepared of the complete pollutant linkages that have been identified in relation to human health and controlled waters. These are presented in Tables 13 and 14. A diagrammatic conceptual model is presented as Figure 4.

- It is advised that the local authority has ultimate jurisdiction over contamination assessment, and, as such, they must be involved in discussions relating to the scope of the investigation works undertaken and the conclusions drawn, along with any specific proposals for remedial action.

Ashdown Site Investigation Limited
November 2013

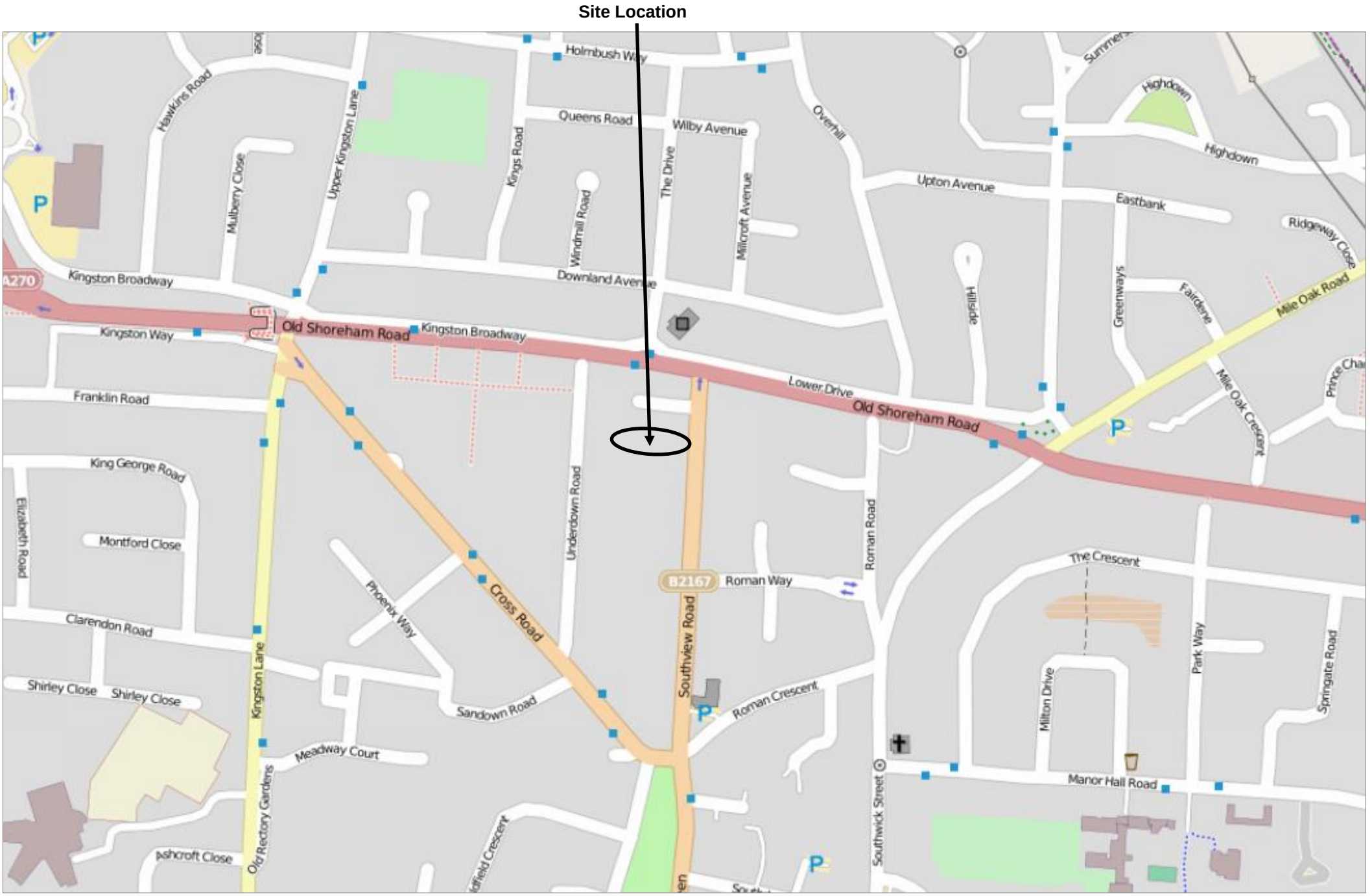
FIGURES

Figure 1 Site Location Plan

Figure 2 Site Plan

Figure 3 Foundation Details

Figure 4 Quantitative Conceptual Model



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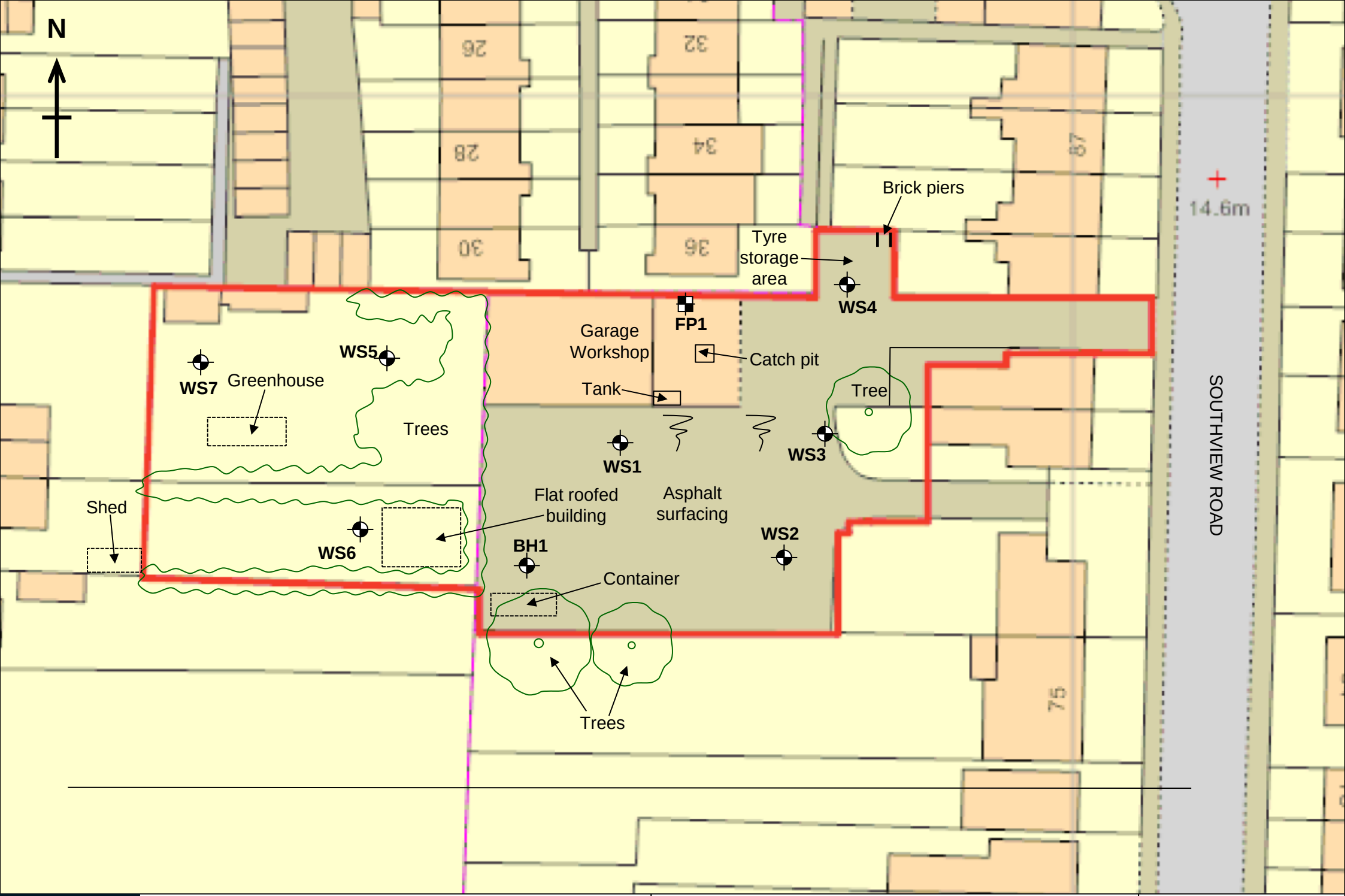
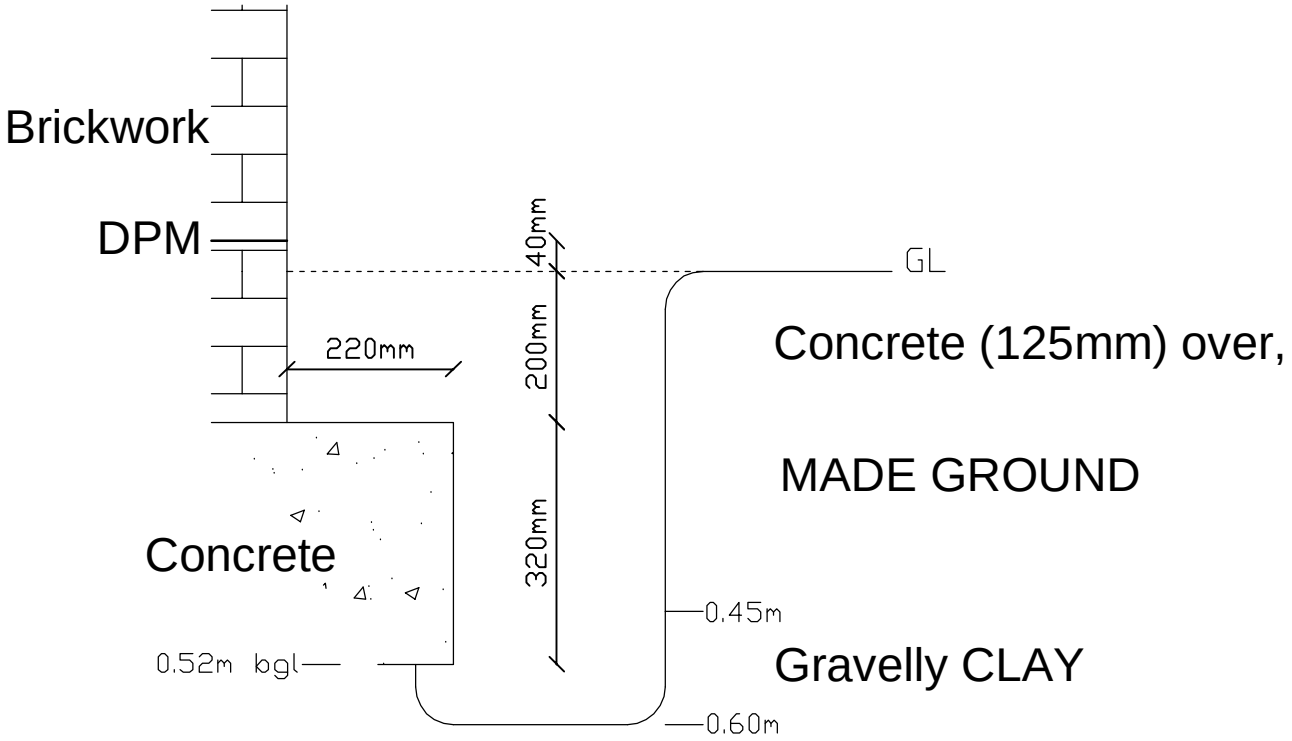
ASHDOWN SITE INVESTIGATION LIMITED	SITE: Honda Site, Southview Road, Southwick, West Sussex	Site Location Plan Not To Scale	Figure 1 LW24275



ASHDOWN SITE INVESTIGATION LIMITED	SITE: Honda Site, Southview Road, Southwick, West Sussex	Site Plan Not To Scale
		Figure 2 LW24275

FP1



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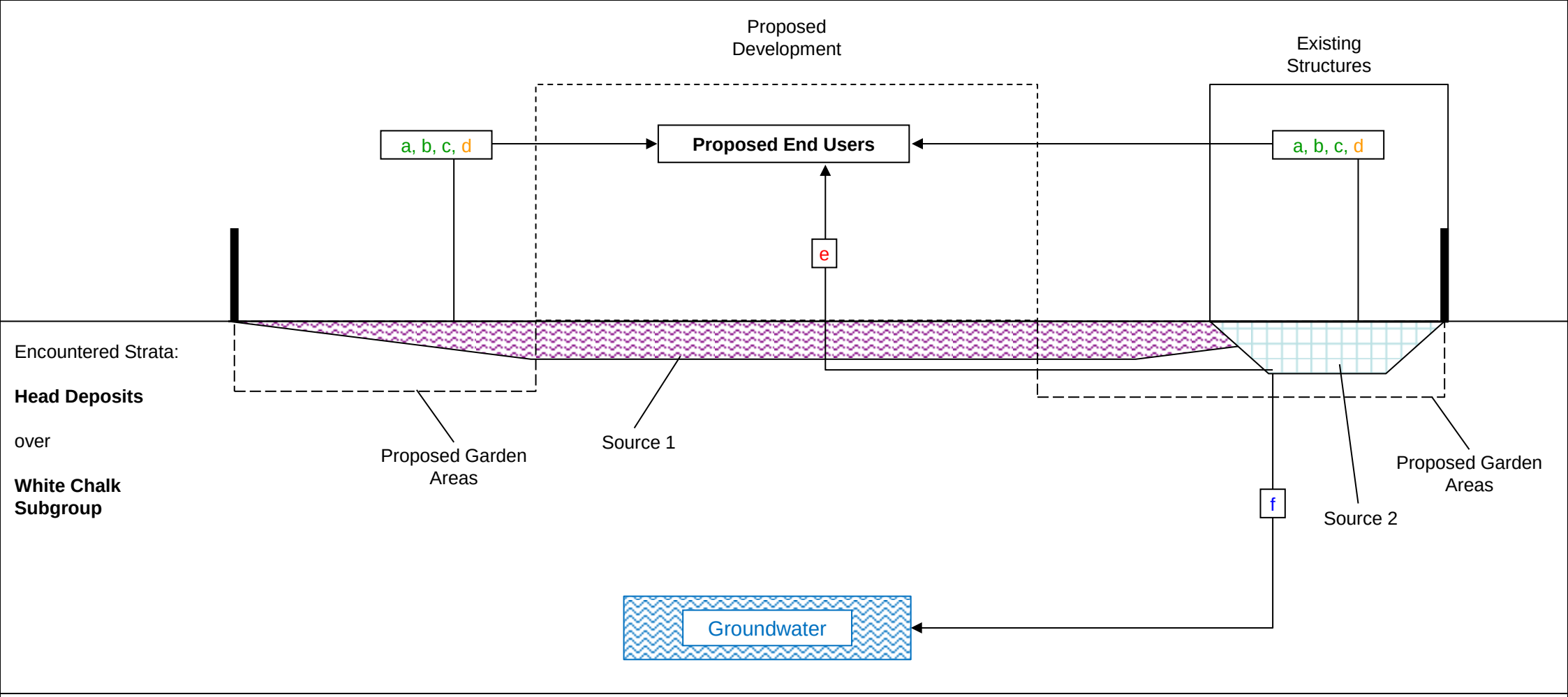
DRAWN BY:	DATE:	SCALE (at A4):
TSH	Nov 2013	1:10

SITE:
Honda Site
Southview Road
Southwick
West Sussex

REPORT REF.:	FIGURE NO.:
LW24275	3

DRAWING TITLE:
Foundation Details



Key

Sources

1. Elevated lead and benzo(a)pyrene contamination within the made ground and topsoil.
2. Potential petroleum hydrocarbon and volatile organic compound contamination beneath the footprint of the garage building and in the backfill of the soakaways.

Pathways

a. Dermal contact with soil (Indoor & Outdoor);
b. Direct soil and dust ingestion;
c. Consumption of home-grown produce, including soils attached to home-grown produce;
d. Inhalation of indoor and outdoor soil dust;
e. Inhalation of soil vapours; and
f. Groundwater flow

ASHDOWN SITE INVESTIGATION LIMITED	SITE: Honda Site, Southview Road, Southwick, West Sussex	Quantitative Conceptual Model. Not To Scale
		Figure 4 LW24275

APPENDIX A

Exploratory Hole Notes

Chalk Classification Notes

In Situ Testing Notes

Exploratory Hole Records

DPSH Continuous Dynamic Probe Records

TRL Dynamic Cone Penetrometer Records

Summary of Borehole Falling Head Soakage Test Results

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U 'Undisturbed' Sample: - also known as 'U100' or 'U4' - 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.
U** Full penetration obtained but limited sample recovered.
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
E Environmental Suite (including a jar sample, tub sample and vial sample)

In situ Testing

S Standard penetration test (SPT): In the borehole record the depth of the test is that at the start of the normal 450mm penetration, the number of blows to achieve the standard penetration of 300mm (the 'N' value) is shown after the test index letter, but the seating blows through the initial 150mm penetration are not reported unless the full penetration of 450mm cannot be achieved. In the latter case, the symbols below are added to the test index letter:-
S(R) Refusal of standard penetration test. Blow count reported includes seating blows. Total penetration of refused SPT reported in mm in brackets on borehole record.
So 'Split spoon' SPT sampler sank under its own weight.
The test is usually completed when the number of blows reaches 50 (25 blows for seating count). The depths of both the top and bottom of the test drive are shown in the sample column on the Borehole Record. If a sample is not recovered in the sampler, a disturbed sample is taken over the depth of the test as boring continues.

C Standard Penetration Test (SPT) conducted usually in coarse grained soils or weak rocks using the same procedure as for the SPT but with a 50mm diameter, 60º apex solid cone fitted in place of the sampler. Variations in test results are indicated by the same symbols as for the SPT (above).

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: See Insitu Testing Notes in Appendix C for full description. Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column. In sand the number of blows is approximately equivalent to the SPT "N" value.

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) and Part 2 Principles of classification (BS EN 14688-2:2004) as well as the BS5930:1990 + A2:2010 code of Practice for Site Investigations.

Fine Grained Soils

The consistency of fine grained soils given in the report is based on visual inspection of the samples and the strength is based on results of in situ and/or laboratory undrained shear strength tests when carried out.

The consistency is determined on the following basis:

Consistency	**Manual Test**
Very Soft	Soil exudes between fingers when squeezed in hand
Soft	Soils can be moulded by light finger pressure
Firm	Cannot be moulded by finger but rolled to 3mm threads without breaking/crumbling
Stiff	Crumbles/breaks when rolled to 3mm thick threads but can be moulded into a lump again
Very Stiff	Cannot be moulded and crumbles under pressure, can be indented by thumbnail

Based on BS EN ISO 14688-1:2002

The terms used for the designation of the undrained shear strength are as follows:

Undrained Shear Strength	
Extremely to Very Low	<20 kPa
Low	20-40 kPa
Medium	40-75 kPa
High	75-150 kPa
Very High	150-300 kPa
Extremely high	300-600 kPa

Based on BS EN ISO 14688-2:2004

Note: The undrained shear strength of the soils is measured either by laboratory testing or in the field using hand penetrometer or shear vane.

It is recognised that any coarse grained soil that has in excess of approximately 35% fine grained soil (clay and silt) can often be expected to behave as a fine grained soil despite the dominance of coarse grained material within the soil mass. To reflect this, it is the soil type that dominates the behaviour of the soil mass that appears on the exploratory hole records.

Coarse Grained Soils

The relative densities of coarse grained soils (sand and gravel) given in the report are based on field estimations and the results of the Standard Penetration Test (SPT) and equivalent correlation from other testing. The classification in terms of "N" Values is as follows:

SPT 'N' Value	**Relative Density**
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Greater than 50	Very Dense

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 BS5930:1990 + A2:2010 code of Practice for Site Investigations.

The description of rock mass includes the type of rock, structure, discontinuities and weathering.

The unconfined compressive strength of rock material is determined on the following basis:

Term	**Field Identification**	**Unconfined Compressive Strength (MPa)**
Extremely Weak	Indented by thumbnail	Less than 1
Very Weak	Crumbles under firm blows with point of geological hammer, peeled by pocket knife	1 to 5
Weak	Peeled by pocket knife with difficulty, shallow indentations made by firm blow with geological hammer	5 to 25
Medium Strong	Cannot be peeled or scraped with knife, can be fractured with single firm blow of geological hammer	25 to 50
Strong	Requires more than one blow of geological hammer to fracture	50 to 100
Very Strong	Requires may blows of geological hammer to fracture it	100 to 250
Extremely Strong	Can only be chipped with geological hammer	Greater and 250

The terms describing discontinuity and bedding spacing are as follows:

Bedding Thickness	
Very Thick	>2000mm
Thick	2000-600mm
Medium	600-200mm
Thin	200-60mm
Very Thin	60-20mm
Thickly Laminated	20-6mm
Thinly Laminated	<6mm

Discontinuity Spacing	
Very Wide	>2000mm
Wide	2000-600mm
Medium	600-200mm
Close	200-60mm
Very Close	60-20mm
Extremely Close	<20mm

Chalk

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.

CHALK CLASSIFICATION NOTES

Classification of chalk based from Construction Industry Research and Information Association (CIRIA) Report C574 'Engineering in Chalk' (2002). Description of chalk based on BS EN 1SO 14688 and BS EN 1SO 14689.

1 Engineering classification of chalk

Structure			***Grades***	***Suffix***
Structureless	Melange of fines and intact chalk lumps		Grade D	c <35% fines m >35% fines
Structured	Intact chalk with bedding, discontinuity.	Density Scale see below	Grade A, B or C see below	1, 2, 3, 4 or 5 see below

2 Density Scale

Field Identification	***Density Scale***	***Intact Dry Density (Mg/m^3)***	***Porosity (n) (G_s of calcite 2.7)***	***Saturation Moisture Content***
30-40mm fragments crushed by finger pressure and remould to putty	Low density	<1.55	>0.43	>27.5%
30-40mm fragments break with both hands, will not crush with finger pressure.	Medium density	1.55 to 1.70	0.43 to 0.37	27.5% to 21.8%
Cannot break 30-40mm fragments in two, difficult to break slabs, <10mm thick corners/edges broken of lumps.	High density	1.70 to 1.95	0.37 to 0.28	21.8% to 14.3%
Unable to break by hand, 100mm lump held in hand broken by single hammer blow.	Very high density	>1.95	<0.28	<14.3

3 Discontinuities

Typical discontinuity aperture

Grade A	No infill, closed
Grade B	Open, infilled <3mm
Grade C	Open, infilled <3mm

Typical discontinuity spacing

Suffix	Typical Spacing (t)
1	t > 600mm
2	200mm <t < 600mm
3	60mm < t < 200mm
4	20mm < t < 60mm
5	t < 20mm

Notes: Chalk classifications will be made where possible. Within boreholes chalk will be described recovered as.

Examples: Structureless CHALK composed of off white silty gravel. Clasts are weak medium density. Matrix is pale brown. (White Chalk Subgroup, Grade Dc)

Structured weak high density off white with black speckling CHALK. Fractures are closely spaced (50/100/200), infilled (0/1/3) with comminuted chalk. With occasional flints. (White Chalk Subgroup, Grade B3)

IN-SITU TESTING NOTES

1 Standard Penetration Testing

Standard penetration testing (SPT) is carried out within a cased cable percussion borehole. The test is performed using a either a split spoon (barrel) sampler in finer grained deposits, or, in coarser grained soils or weak rocks, using a 50mm diameter, 60º apex solid cone fitted in place of the sampler.

The sampler is driven into the deposits at the base of the borehole by means of a 63.5kg hammer falling freely through 760mm.

In the borehole record the depth of the test is that at the start of the normal 450mm penetration, the number of blows to achieve the standard penetration of 300mm (the "N" value) is shown after the test index letter, but the seating blows through the initial 150mm penetration are not reported unless the full penetration of 450mm cannot be achieved.

(BS EN ISO 22476-3:2005, Geotechnical investigation and testing – Field Testing, Part 3)

2 Dynamic Probe Testing

The DPH (heavy) dynamic probing rig drives a 32mm diameter rod with a 15cm^2 area, 90º end cone into the ground by means of a 50kg hammer which falls freely through a distance of 0.5m. The number of blows per 100mm penetration (N_{100}) is recorded.

The DPSH (super heavy) dynamic probing rig drives a 35mm diameter rod with a 20cm^2 area, 90º end cone into the ground by means of a 63.5kg hammer that falls freely through a distance of 0.75m. The number of blows per 100mm penetration (N_{100}) is recorded. The results can provide a useful indication of the relative strength of the material. The dynamic probing is carried out in accordance with BS EN ISO 22476-2:2005.

3 Perth Penetrometer Test

In this test a hardened stainless steel rod is driven into the deposit by a 9.5kg sliding hammer falling freely through 600mm. After an initial penetration of 150mm the number of blows required to drive the rod a further 300mm is recorded. In sand the Perth blow count gives a close correlation to the "N-value" that could be expected from a standard penetration test (SPT) made in similar materials. The results are less reliable in coarser grained materials but can give an indication of their engineering properties. The perth penetrometer test is carried out in accordance with the Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes, there is no European equivalent code.

4 Undrained Shear Strength

Undrained shear strength determinations are made in situ within the fine grained soils using a Geonor hand shear vane or (usually in the case of window sampler boreholes) a hand penetrometer. The test records the undrained shear strength (cohesion) in kN/m^2. The shear vane records a maximum shear strength of 130kN/m^2 and the hand penetrometer records a maximum shear strength of 250kN/m^2.

3 California Bearing Ratio Test

In this test a hand held Farnell cone penetrometer apparatus is pushed into the deposits for the estimation of the California bearing ratio of the subgrade (for use in pavement design). The test equipment is design for the estimation of the bearing ratio of fine grained soils (clay and silt) only and is unsuitable for use in coarse grained soils and rock.

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Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: BH1

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 29/10/13 | End Date: 29/10/13

Standpipe Installation	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	T J	0.20					0.30	Asphalt over, Sandy fine to coarse gravel of flint and crystalline rock (sub base).
	T J	0.40						Stiff brown silty gravelly CLAY. Gravel is fine to coarse flint. (Head)
	D	0.50						
	T J H	0.60		90				becoming very clayey GRAVEL betwwen 0.7m and 1.0m depth.
	D	1.00						
	H	1.20		90				
	H	1.30		170				becoming very stiff below 1.3m depth.
	D	1.50						
	H	1.60		195				
	H	1.80		185				becoming clayey GRAVEL between 2.0m and 2.3m depth.
	H	2.40		170				
	D J	2.50						
	H	2.60		130				
	H	2.80		170			2.90	Loose yellow brown silty clayey GRAVEL of fine to medium flint and chalk. (Head)
	H	3.30		145				becoming stiff gravelly silty CLAY between 3.3m and 3.7m depth.
	H D	3.50		225				
	H	3.70		185				
	H	4.00		>250			4.00	
	V D	4.00		>130				Stiff to very stiff orange brown silty CLAY with occasional orange staining. (Head)
	H	4.30		210				.
	D	4.50						
	H	4.60		>250				
	H	4.90		115				
	H D	5.00		115				

Remarks:

Standing water level at 7.2m on completion.

Borehole slightly unstable in coarse grained soils.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: BH1

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 29/10/13 | End Date: 29/10/13

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
	V H	5.05 5.10		>130 >250			5.30	Stiff to very stiff orange brown silty CLAY with occasional orange staining. (Head)
	D	5.50						Medium dense orange brown slightly gravelly fine SAND. Gravel is fine to medium flint. (Head)
	D	7.10						becoming very clayey very sandy fine to coarse GRAVEL of flint between 7.1m and 7.4m depth.
	D	8.00					8.40	
	D	9.00						Structured weak low to medium density off white CHALK recovered as silt and gravel. (White Chalk Subgroup, Grade C or better)
	D	10.00						

Remarks:

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: BH1

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 29/10/13 | End Date: 29/10/13

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Legend	Depth / Reduced Level	Strata Descriptions
	D	11.00						Structured weak low to medium density off white CHALK recovered as silt and gravel. (White Chalk Subgroup, Grade C or better)
	D	12.00					12.00	
								End of Borehole

Remarks:

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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Trial Pit No.: FP1

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 29/10/13 | End Date: 29/10/13

Samples and Testing				Strata		
Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
					0.00	Ground Level
J T	0.20					Concrete (125mm) over, MADE GROUND: Black brown gravelly clay. Gravel is fine to medium flint, brick, concrete, ash and clinker.
J T	0.40				0.45	
J T	0.50					Firm brown gravelly CLAY. Gravel is fine to medium flint. (Head)
D	0.60				0.60	
						End of Pit

Remarks:

Trial pit dry and stable on completion.

Excavation Method: Hand Dug

Dimensions:

Made By: IT

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Borehole No.: WS1

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 29/10/13 | End Date: 29/10/13

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
							0.20	Asphalt over, Sandy fine to coarse gravel of flint (sub base).
	J T	0.25						Firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse flint. (Head)
	J T H	0.40		75				
	D	0.50						
	H	0.80		65				
	D	1.00						
	H	1.20		100				becoming gravelly at 1.0m, 2.0m and 2.9m depths. becoming stiff below 1.2m depth.
	D	1.50						
	H	1.80		100				
	H	2.20		225				
	D H	2.50		210				
	H	2.80		170				
							2.95	Loose light brown silty clayey fine to coarse GRAVEL of chalk and flint. (Head)
							3.00	End of Borehole

Remarks:
Borehole dry and stable on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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Borehole No.: WS2

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 29/10/13 | End Date: 29/10/13

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
							0.20	Asphalt over, Sandy fine to coarse gravel of flint (sub base).
	J T	0.30					0.40	MADE GROUND: Green brown slightly gravelly clay with blue green staining. Gravel is fine to medium flint.
	J T D H	0.50		90				Firm brown gravelly CLAY. Gravel is fine to coarse flint. (Head)
	H	0.80		90			0.90	
	D	1.00						Loose light brown silty clayey fine to coarse GRAVEL of chalk and flint. (Head)
							1.50	
								Stiff light brown CLAY. (Head)
	H	1.70		140				
	H	1.90		140				
	J D V	2.00		>130			2.00	
								End of Borehole

Remarks:
Borehole dry and stable on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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BN7 3PF

Borehole No.: WS3

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 04/11/13 | End Date: 04/11/13

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
							0.30	Asphalt (50mm) over, Sandy fine to coarse gravel of flint (sub base).
	J T	0.40						MADE GROUND: Brown silty gravelly clayey fine sand. Gravel is fine to coarse flint, brick, roadstone, breeze block, clinker and ash.
	J T	0.70					0.80	
	J T D	1.00						Stiff to very stiff brown gravelly CLAY. Gravel is fine to coarse flint. (Head)
	H	1.30		>250				
	H	1.70		>250				
	D	2.00						
	H	2.20		>250				
	H	2.50		225				
	H	2.70		185				
	D H	3.00		155			3.00	becoming silty below 2.7m depth.
								End of Borehole

Remarks:
Borehole dry and stable on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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Borehole No.: WS4

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 04/11/13 | End Date: 04/11/13

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
							0.30	Asphalt (50mm) over, Sandy fine to coarse gravel of flint (sub base).
	J T	0.40						MADE GROUND: Brown slightly clayey gravelly sand. Gravel is fine to coarse chalk, brick, concrete, clinker and ash.
	J T	0.60					0.70	
	J T	0.80						Stiff brown silty gravelly CLAY. Gravel is fine to coarse flint. (Head)
	D	1.00						
	D	2.00						
	H	2.20		170				becoming slightly gravelly below 2.1m depth.
	H	2.50		170				
	H	2.70		140				
	H	3.00		90				
	D V	3.00		>130			3.00	
								End of Borehole

Remarks:
Borehole dry and stable on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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Borehole No.: WS5

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 04/11/13 | End Date: 04/11/13

Standpipe Installation	Samples and Testing				Strata		
	Sample Type	Depths From (m)	Depths To (m)	Vane/ Pen Test N Value	Legend	Depth / Reduced Level	Strata Descriptions
						0.00	Ground Level
	J T	0.20				0.30	Topsoil.
	D H	0.40		35			Soft to firm orange brown slightly gravelly CLAY. Gravel is fine to coarse flint. (Head)
	J T	0.50					
	H	0.60		35			
	H	0.80		60			becoming firm below 0.8m depth.
	D V	1.00		80		1.10	
	H	1.10		60			Firm brown very gravelly CLAY. Gravel is fine to coarse flint. (Head)
	D	1.50				2.30	
	H	2.40		170			Stiff to very stiff brown slightly gravelly CLAY. Gravel is fine flint. (Head)
	D	2.50					
	H	2.60		140			
	H	2.80		140			
	H	2.90		170		3.00	
							End of Borehole

Remarks:

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: DC

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Borehole No.: WS6

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 04/11/13 | End Date: 04/11/13

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	J T	0.20					0.15	Block paving (100mm) over, Topsoil.
	J T	0.30					0.40	MADE GROUND: Black slightly gravelly silty clay. Gravel is fine to medium flint with brick, ash and clinker.
	J T H	0.50		90				Firm to stiff slightly gravelly CLAY. Gravel is flint and chalk. (Head)
	H	0.70		100				
	H	0.90		100				
	D	1.00						
	H	1.10		75				
	H	1.30		90				becoming gravelly below 1.3m depth.
	D	2.00						
	D	2.90					2.95	
							3.00	Loose to medium dense yellow brown silty clayey fine to medium GRAVEL of flint and chalk. (Head)
								End of Borehole

Remarks:
Borehole dry and stable on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: IT

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Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS7

Site Name: Honda Site, Southview Road, Southwick.

Job No.: LW24275

Start Date: 04/11/13 | End Date: 04/11/13

Standpipe Installation	Samples and Testing: Sample Type	Depths: From (m)	Depths: To (m)	Vane/ Pen Test N Value	DPSH Profile Blows/100mm (5 15 25)	Strata: Legend	Depth / Reduced Level	Strata Descriptions
							0.00	Ground Level
	J T	0.20					0.30	Topsoil.
	H	0.40		60				Firm brown slightly gravelly CLAY. Gravel is fine flint. (Head)
	J T	0.50						
	D	0.60						
	D H	0.80		40				
	H	1.00		60			1.10	
	D	1.20						Stiff orange brown slightly gravelly CLAY. Gravel is fine to coarse flint. (Head)
	H	1.60		90				
	D	2.00					2.00	
								End of Borehole

Remarks:
Borehole dry and stable on completion.

Dynamic probe carried out adjacent to borehole.

Excavation Method: Dynamic Sampler

Borehole Diameter: Various

Made By: DC

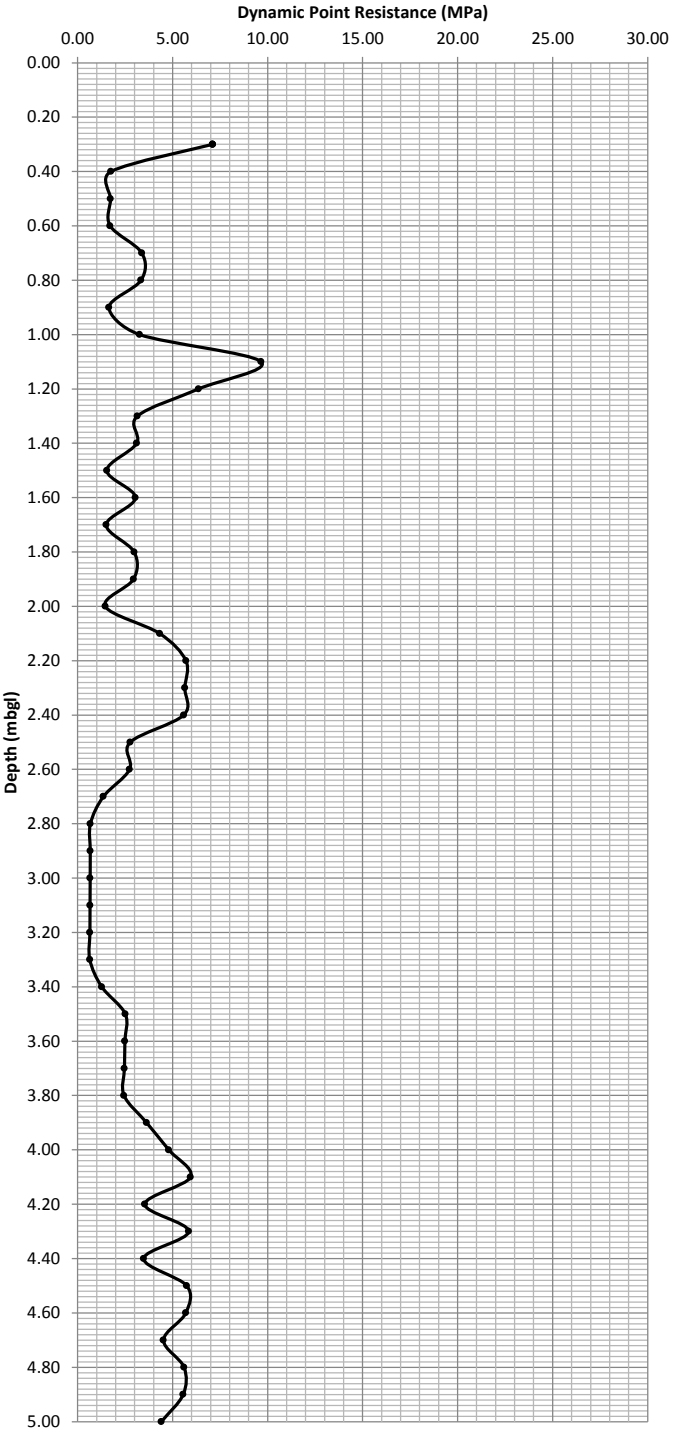
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	BH1

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30	4.0	0.03	7.54	7.11
0.40	1.0	0.10	1.89	1.75
0.50	1.0	0.10	1.89	1.73
0.60	1.0	0.10	1.89	1.71
0.70	2.0	0.05	3.77	3.38
0.80	2.0	0.05	3.77	3.34
0.90	1.0	0.10	1.89	1.65
1.00	2.0	0.05	3.77	3.26
1.10	6.0	0.02	11.32	9.66
1.20	4.0	0.03	7.54	6.36
1.30	2.0	0.05	3.77	3.14
1.40	2.0	0.05	3.77	3.11
1.50	1.0	0.10	1.89	1.54
1.60	2.0	0.05	3.77	3.04
1.70	1.0	0.10	1.89	1.50
1.80	2.0	0.05	3.77	2.97
1.90	2.0	0.05	3.77	2.94
2.00	1.0	0.10	1.89	1.46
2.10	3.0	0.03	5.66	4.32
2.20	4.0	0.03	7.54	5.70
2.30	4.0	0.03	7.54	5.64
2.40	4.0	0.03	7.54	5.58
2.50	2.0	0.05	3.77	2.76
2.60	2.0	0.05	3.77	2.73
2.70	1.0	0.10	1.89	1.35
2.80	0.5	0.20	0.94	0.67
2.90	0.5	0.20	0.94	0.66
3.00	0.5	0.20	0.94	0.66
3.10	0.5	0.20	0.94	0.65
3.20	0.5	0.20	0.94	0.64
3.30	0.5	0.20	0.94	0.64
3.40	1.0	0.10	1.89	1.27
3.50	2.0	0.05	3.77	2.51
3.60	2.0	0.05	3.77	2.49
3.70	2.0	0.05	3.77	2.46
3.80	2.0	0.05	3.77	2.44
3.90	3.0	0.03	5.66	3.63
4.00	4.0	0.03	7.54	4.80
4.10	5.0	0.02	9.43	5.94
4.20	3.0	0.03	5.66	3.54
4.30	5.0	0.02	9.43	5.84
4.40	3.0	0.03	5.66	3.48
4.50	5.0	0.02	9.43	5.74
4.60	5.0	0.02	9.43	5.69
4.70	4.0	0.03	7.54	4.52
4.80	5.0	0.02	9.43	5.60
4.90	5.0	0.02	9.43	5.56
5.00	4.0	0.03	7.54	4.41



Notes:

Hammer Mass	63.5 kg
Fall Height	0.76 m
Cone Area	0.0019 m^2
E_{theor}	473 J
Energy Ratio	0.757
Anvil Mass	1.25 kg
Rod Mass	8.79 kg/m

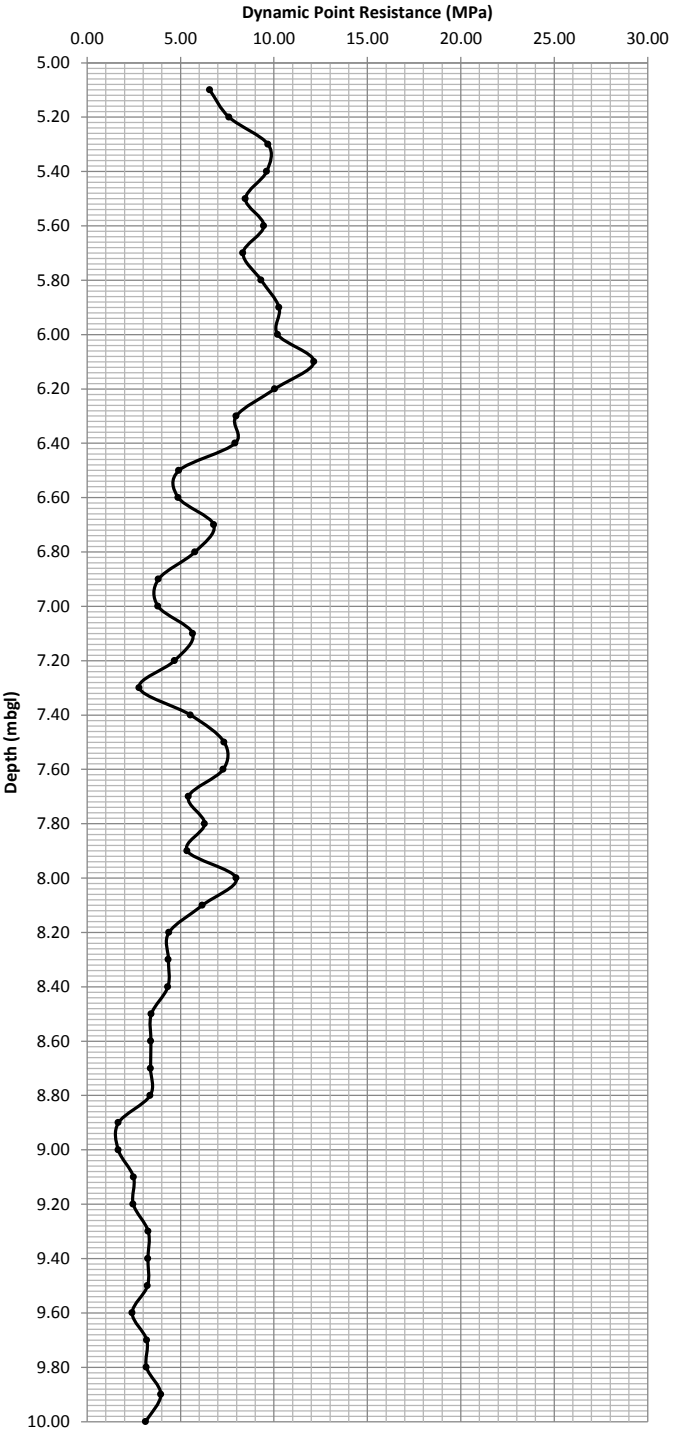
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	BH1

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
5.10	6.0	0.02	11.32	6.56
5.20	7.0	0.01	13.20	7.59
5.30	9.0	0.01	16.98	9.68
5.40	9.0	0.01	16.98	9.61
5.50	8.0	0.01	15.09	8.47
5.60	9.0	0.01	16.98	9.46
5.70	8.0	0.01	15.09	8.35
5.80	9.0	0.01	16.98	9.32
5.90	10.0	0.01	18.86	10.27
6.00	10.0	0.01	18.86	10.20
6.10	12.0	0.01	22.63	12.15
6.20	10.0	0.01	18.86	10.05
6.30	8.0	0.01	15.09	7.98
6.40	8.0	0.01	15.09	7.92
6.50	5.0	0.02	9.43	4.91
6.60	5.0	0.02	9.43	4.88
6.70	7.0	0.01	13.20	6.78
6.80	6.0	0.02	11.32	5.77
6.90	4.0	0.03	7.54	3.82
7.00	4.0	0.03	7.54	3.80
7.10	6.0	0.02	11.32	5.65
7.20	5.0	0.02	9.43	4.68
7.30	3.0	0.03	5.66	2.79
7.40	6.0	0.02	11.32	5.54
7.50	8.0	0.01	15.09	7.33
7.60	8.0	0.01	15.09	7.29
7.70	6.0	0.02	11.32	5.43
7.80	7.0	0.01	13.20	6.29
7.90	6.0	0.02	11.32	5.36
8.00	9.0	0.01	16.98	7.98
8.10	7.0	0.01	13.20	6.17
8.20	5.0	0.02	9.43	4.38
8.30	5.0	0.02	9.43	4.35
8.40	5.0	0.02	9.43	4.32
8.50	4.0	0.03	7.54	3.44
8.60	4.0	0.03	7.54	3.41
8.70	4.0	0.03	7.54	3.39
8.80	4.0	0.03	7.54	3.37
8.90	2.0	0.05	3.77	1.68
9.00	2.0	0.05	3.77	1.67
9.10	3.0	0.03	5.66	2.48
9.20	3.0	0.03	5.66	2.47
9.30	4.0	0.03	7.54	3.27
9.40	4.0	0.03	7.54	3.25
9.50	4.0	0.03	7.54	3.23
9.60	3.0	0.03	5.66	2.41
9.70	4.0	0.03	7.54	3.19
9.80	4.0	0.03	7.54	3.18
9.90	5.0	0.02	9.43	3.95
10.00	4.0	0.03	7.54	3.14



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.757	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

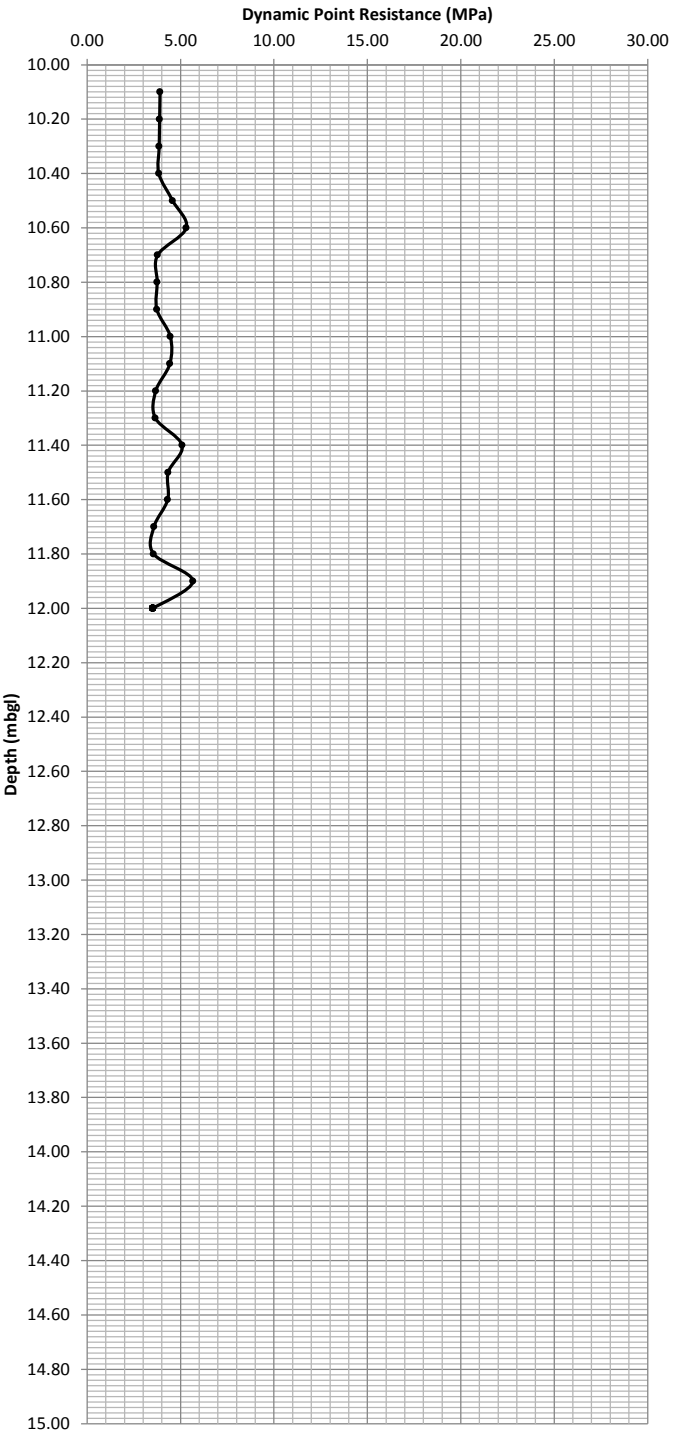
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	BH1

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
10.10	5.0	0.02	9.43	3.90
10.20	5.0	0.02	9.43	3.88
10.30	5.0	0.02	9.43	3.86
10.40	5.0	0.02	9.43	3.84
10.50	6.0	0.02	11.32	4.58
10.60	7.0	0.01	13.20	5.31
10.70	5.0	0.02	9.43	3.77
10.80	5.0	0.02	9.43	3.75
10.90	5.0	0.02	9.43	3.73
11.00	6.0	0.02	11.32	4.45
11.10	6.0	0.02	11.32	4.43
11.20	5.0	0.02	9.43	3.67
11.30	5.0	0.02	9.43	3.65
11.40	7.0	0.01	13.20	5.08
11.50	6.0	0.02	11.32	4.34
11.60	6.0	0.02	11.32	4.31
11.70	5.0	0.02	9.43	3.57
11.80	5.0	0.02	9.43	3.56
11.90	8.0	0.01	15.09	5.66
12.00	5.0	0.02	9.43	3.52
12.10				
12.20				
12.30				
12.40				
12.50				
12.60				
12.70				
12.80				
12.90				
13.00				
13.10				
13.20				
13.30				
13.40				
13.50				
13.60				
13.70				
13.80				
13.90				
14.00				
14.10				
14.20				
14.30				
14.40				
14.50				
14.60				
14.70				
14.80				
14.90				
15.00				



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.757	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

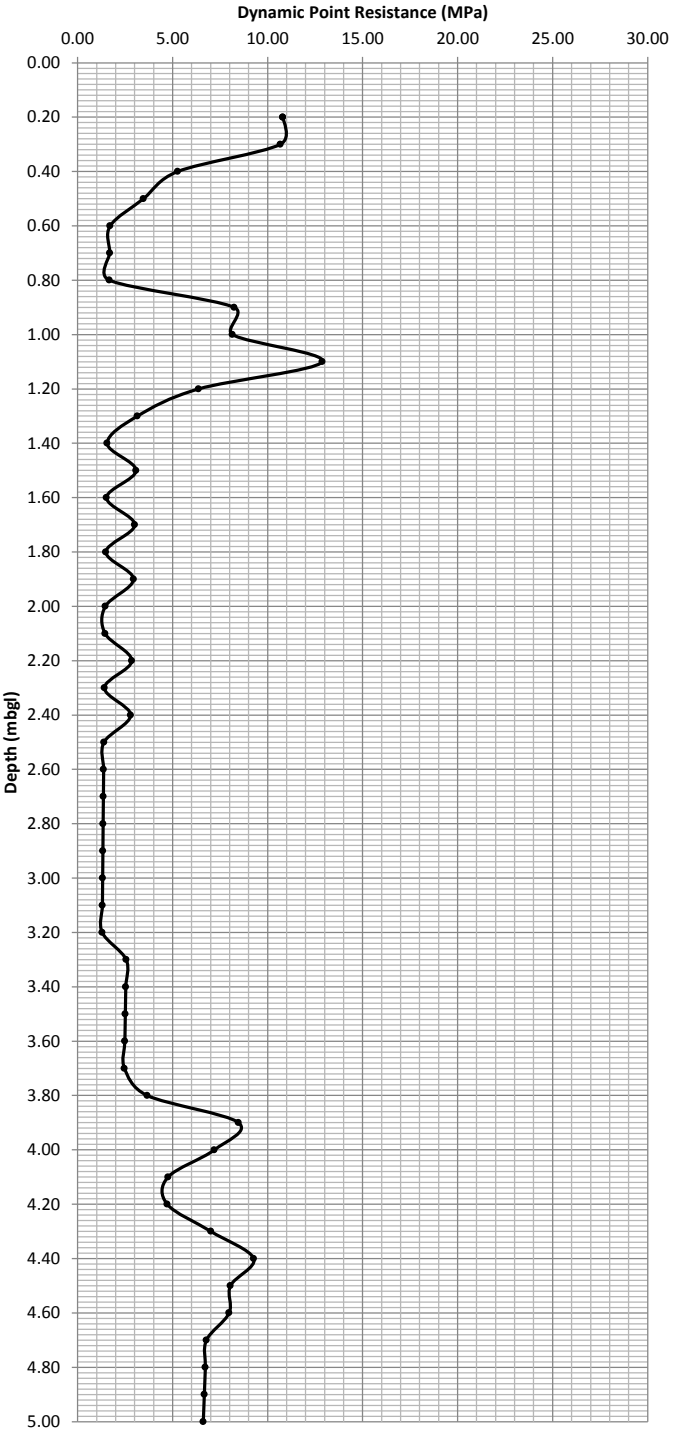
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS1

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	6.0	0.02	11.32	10.81
0.30	6.0	0.02	11.32	10.66
0.40	3.0	0.03	5.66	5.26
0.50	2.0	0.05	3.77	3.46
0.60	1.0	0.10	1.89	1.71
0.70	1.0	0.10	1.89	1.69
0.80	1.0	0.10	1.89	1.67
0.90	5.0	0.02	9.43	8.24
1.00	5.0	0.02	9.43	8.14
1.10	8.0	0.01	15.09	12.88
1.20	4.0	0.03	7.54	6.36
1.30	2.0	0.05	3.77	3.14
1.40	1.0	0.10	1.89	1.55
1.50	2.0	0.05	3.77	3.07
1.60	1.0	0.10	1.89	1.52
1.70	2.0	0.05	3.77	3.01
1.80	1.0	0.10	1.89	1.49
1.90	2.0	0.05	3.77	2.94
2.00	1.0	0.10	1.89	1.46
2.10	1.0	0.10	1.89	1.44
2.20	2.0	0.05	3.77	2.85
2.30	1.0	0.10	1.89	1.41
2.40	2.0	0.05	3.77	2.79
2.50	1.0	0.10	1.89	1.38
2.60	1.0	0.10	1.89	1.37
2.70	1.0	0.10	1.89	1.35
2.80	1.0	0.10	1.89	1.34
2.90	1.0	0.10	1.89	1.33
3.00	1.0	0.10	1.89	1.31
3.10	1.0	0.10	1.89	1.30
3.20	1.0	0.10	1.89	1.29
3.30	2.0	0.05	3.77	2.56
3.40	2.0	0.05	3.77	2.53
3.50	2.0	0.05	3.77	2.51
3.60	2.0	0.05	3.77	2.49
3.70	2.0	0.05	3.77	2.46
3.80	3.0	0.03	5.66	3.66
3.90	7.0	0.01	13.20	8.47
4.00	6.0	0.02	11.32	7.19
4.10	4.0	0.03	7.54	4.75
4.20	4.0	0.03	7.54	4.71
4.30	6.0	0.02	11.32	7.01
4.40	8.0	0.01	15.09	9.27
4.50	7.0	0.01	13.20	8.04
4.60	7.0	0.01	13.20	7.97
4.70	6.0	0.02	11.32	6.78
4.80	6.0	0.02	11.32	6.72
4.90	6.0	0.02	11.32	6.67
5.00	6.0	0.02	11.32	6.61



Notes:

Hammer Mass	63.5 kg
Fall Height	0.76 m
Cone Area	0.0019 m^2
E_{theor}	473 J
Energy Ratio	0.757
Anvil Mass	1.25 kg
Rod Mass	8.79 kg/m

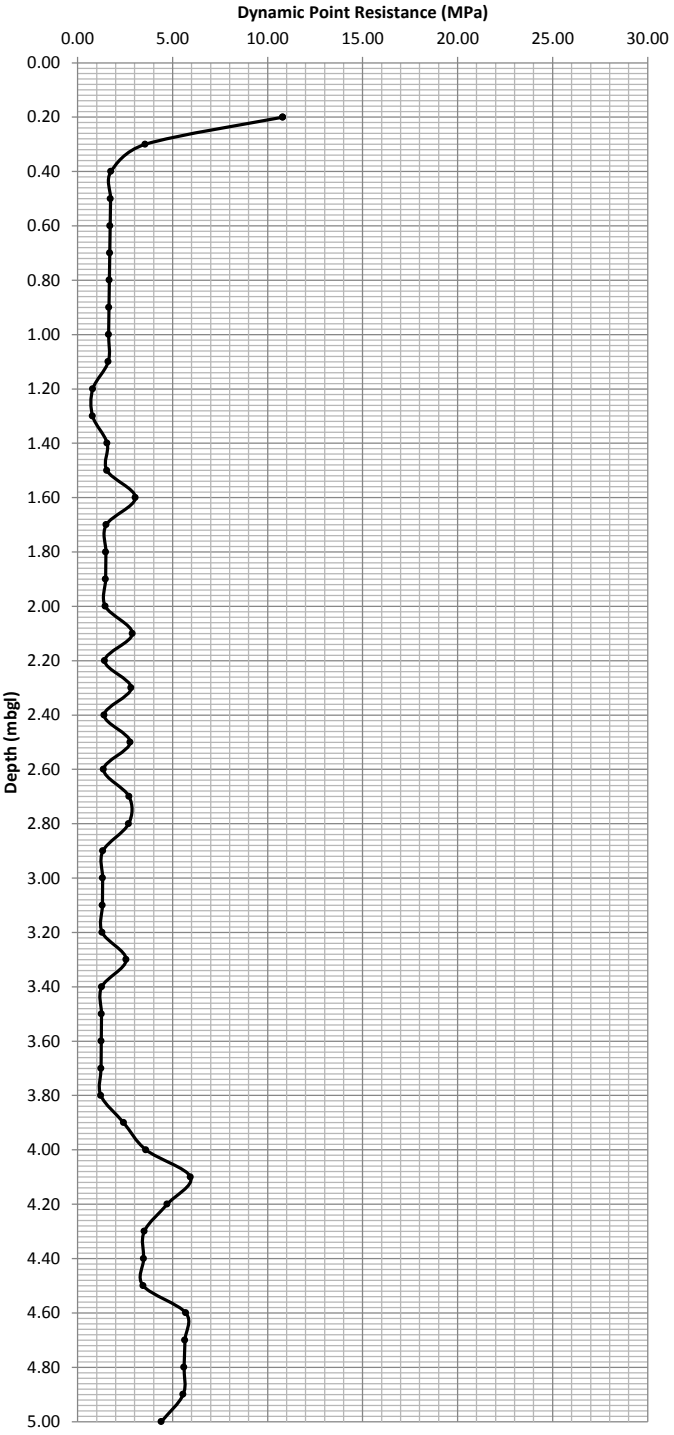
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS2

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	6.0	0.02	11.32	10.81
0.30	2.0	0.05	3.77	3.55
0.40	1.0	0.10	1.89	1.75
0.50	1.0	0.10	1.89	1.73
0.60	1.0	0.10	1.89	1.71
0.70	1.0	0.10	1.89	1.69
0.80	1.0	0.10	1.89	1.67
0.90	1.0	0.10	1.89	1.65
1.00	1.0	0.10	1.89	1.63
1.10	1.0	0.10	1.89	1.61
1.20	0.5	0.20	0.94	0.80
1.30	0.5	0.20	0.94	0.79
1.40	1.0	0.10	1.89	1.55
1.50	1.0	0.10	1.89	1.54
1.60	2.0	0.05	3.77	3.04
1.70	1.0	0.10	1.89	1.50
1.80	1.0	0.10	1.89	1.49
1.90	1.0	0.10	1.89	1.47
2.00	1.0	0.10	1.89	1.46
2.10	2.0	0.05	3.77	2.88
2.20	1.0	0.10	1.89	1.42
2.30	2.0	0.05	3.77	2.82
2.40	1.0	0.10	1.89	1.40
2.50	2.0	0.05	3.77	2.76
2.60	1.0	0.10	1.89	1.37
2.70	2.0	0.05	3.77	2.71
2.80	2.0	0.05	3.77	2.68
2.90	1.0	0.10	1.89	1.33
3.00	1.0	0.10	1.89	1.31
3.10	1.0	0.10	1.89	1.30
3.20	1.0	0.10	1.89	1.29
3.30	2.0	0.05	3.77	2.56
3.40	1.0	0.10	1.89	1.27
3.50	1.0	0.10	1.89	1.25
3.60	1.0	0.10	1.89	1.24
3.70	1.0	0.10	1.89	1.23
3.80	1.0	0.10	1.89	1.22
3.90	2.0	0.05	3.77	2.42
4.00	3.0	0.03	5.66	3.60
4.10	5.0	0.02	9.43	5.94
4.20	4.0	0.03	7.54	4.71
4.30	3.0	0.03	5.66	3.50
4.40	3.0	0.03	5.66	3.48
4.50	3.0	0.03	5.66	3.45
4.60	5.0	0.02	9.43	5.69
4.70	5.0	0.02	9.43	5.65
4.80	5.0	0.02	9.43	5.60
4.90	5.0	0.02	9.43	5.56
5.00	4.0	0.03	7.54	4.41



Notes:

Hammer Mass	63.5 kg
Fall Height	0.76 m
Cone Area	0.0019 m^2
E_{theor}	473 J
Energy Ratio	0.757
Anvil Mass	1.25 kg
Rod Mass	8.79 kg/m

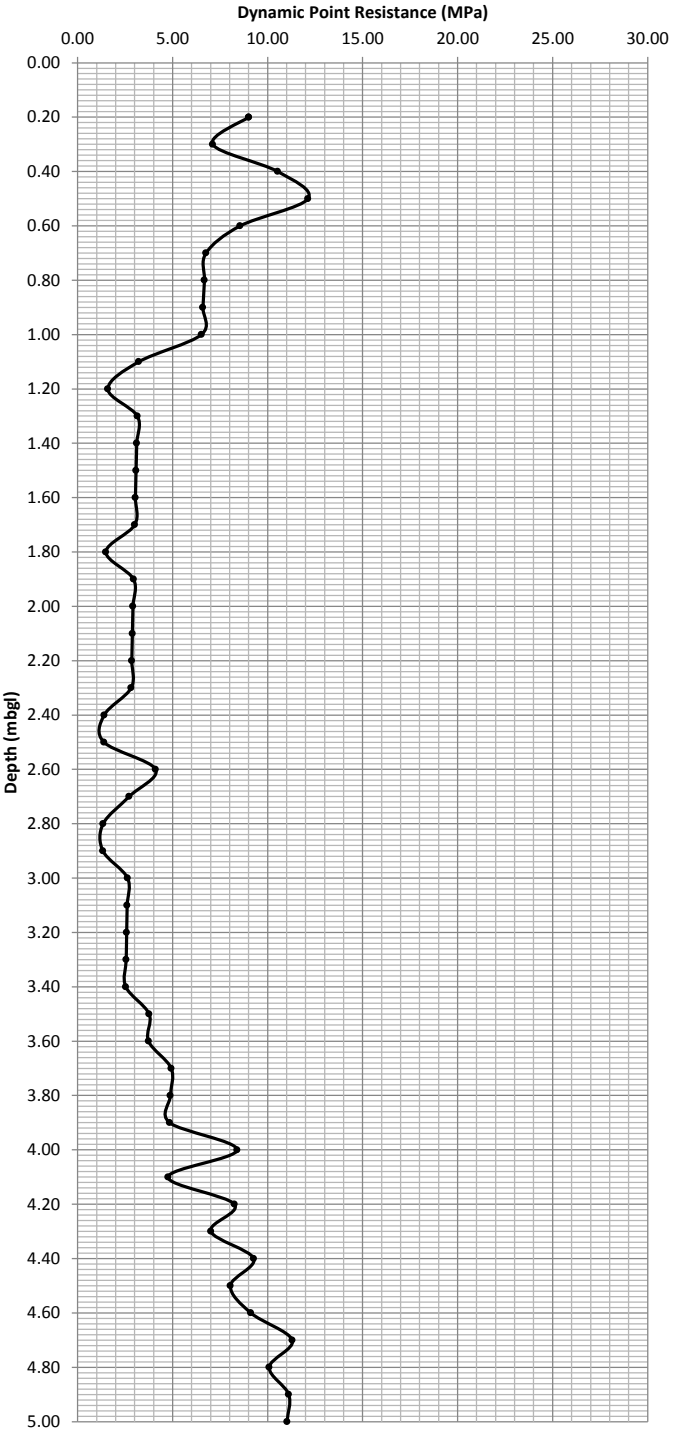
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS3

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	5.0	0.02	9.43	9.00
0.30	4.0	0.03	7.54	7.11
0.40	6.0	0.02	11.32	10.53
0.50	7.0	0.01	13.20	12.13
0.60	5.0	0.02	9.43	8.55
0.70	4.0	0.03	7.54	6.76
0.80	4.0	0.03	7.54	6.67
0.90	4.0	0.03	7.54	6.59
1.00	4.0	0.03	7.54	6.52
1.10	2.0	0.05	3.77	3.22
1.20	1.0	0.10	1.89	1.59
1.30	2.0	0.05	3.77	3.14
1.40	2.0	0.05	3.77	3.11
1.50	2.0	0.05	3.77	3.07
1.60	2.0	0.05	3.77	3.04
1.70	2.0	0.05	3.77	3.01
1.80	1.0	0.10	1.89	1.49
1.90	2.0	0.05	3.77	2.94
2.00	2.0	0.05	3.77	2.91
2.10	2.0	0.05	3.77	2.88
2.20	2.0	0.05	3.77	2.85
2.30	2.0	0.05	3.77	2.82
2.40	1.0	0.10	1.89	1.40
2.50	1.0	0.10	1.89	1.38
2.60	3.0	0.03	5.66	4.10
2.70	2.0	0.05	3.77	2.71
2.80	1.0	0.10	1.89	1.34
2.90	1.0	0.10	1.89	1.33
3.00	2.0	0.05	3.77	2.63
3.10	2.0	0.05	3.77	2.60
3.20	2.0	0.05	3.77	2.58
3.30	2.0	0.05	3.77	2.56
3.40	2.0	0.05	3.77	2.53
3.50	3.0	0.03	5.66	3.76
3.60	3.0	0.03	5.66	3.73
3.70	4.0	0.03	7.54	4.93
3.80	4.0	0.03	7.54	4.88
3.90	4.0	0.03	7.54	4.84
4.00	7.0	0.01	13.20	8.39
4.10	4.0	0.03	7.54	4.75
4.20	7.0	0.01	13.20	8.25
4.30	6.0	0.02	11.32	7.01
4.40	8.0	0.01	15.09	9.27
4.50	7.0	0.01	13.20	8.04
4.60	8.0	0.01	15.09	9.11
4.70	10.0	0.01	18.86	11.30
4.80	9.0	0.01	16.98	10.08
4.90	10.0	0.01	18.86	11.11
5.00	10.0	0.01	18.86	11.02



Notes:

Hammer Mass	63.5 kg
Fall Height	0.76 m
Cone Area	0.0019 m^2
E_{theor}	473 J
Energy Ratio	0.757
Anvil Mass	1.25 kg
Rod Mass	8.79 kg/m

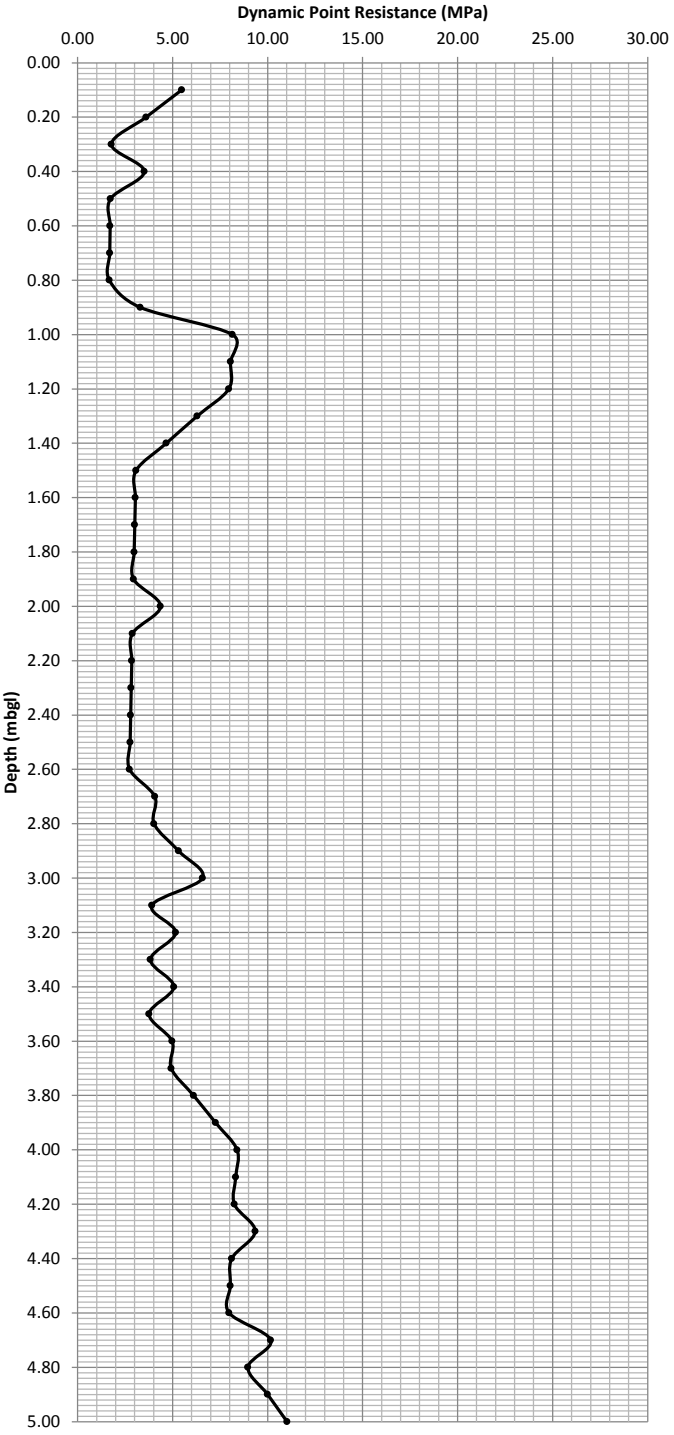
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS4

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10	3.0	0.03	5.66	5.48
0.20	2.0	0.05	3.77	3.60
0.30	1.0	0.10	1.89	1.78
0.40	2.0	0.05	3.77	3.51
0.50	1.0	0.10	1.89	1.73
0.60	1.0	0.10	1.89	1.71
0.70	1.0	0.10	1.89	1.69
0.80	1.0	0.10	1.89	1.67
0.90	2.0	0.05	3.77	3.30
1.00	5.0	0.02	9.43	8.14
1.10	5.0	0.02	9.43	8.05
1.20	5.0	0.02	9.43	7.95
1.30	4.0	0.03	7.54	6.29
1.40	3.0	0.03	5.66	4.66
1.50	2.0	0.05	3.77	3.07
1.60	2.0	0.05	3.77	3.04
1.70	2.0	0.05	3.77	3.01
1.80	2.0	0.05	3.77	2.97
1.90	2.0	0.05	3.77	2.94
2.00	3.0	0.03	5.66	4.37
2.10	2.0	0.05	3.77	2.88
2.20	2.0	0.05	3.77	2.85
2.30	2.0	0.05	3.77	2.82
2.40	2.0	0.05	3.77	2.79
2.50	2.0	0.05	3.77	2.76
2.60	2.0	0.05	3.77	2.73
2.70	3.0	0.03	5.66	4.06
2.80	3.0	0.03	5.66	4.02
2.90	4.0	0.03	7.54	5.31
3.00	5.0	0.02	9.43	6.57
3.10	3.0	0.03	5.66	3.91
3.20	4.0	0.03	7.54	5.16
3.30	3.0	0.03	5.66	3.83
3.40	4.0	0.03	7.54	5.06
3.50	3.0	0.03	5.66	3.76
3.60	4.0	0.03	7.54	4.97
3.70	4.0	0.03	7.54	4.93
3.80	5.0	0.02	9.43	6.10
3.90	6.0	0.02	11.32	7.26
4.00	7.0	0.01	13.20	8.39
4.10	7.0	0.01	13.20	8.32
4.20	7.0	0.01	13.20	8.25
4.30	8.0	0.01	15.09	9.35
4.40	7.0	0.01	13.20	8.11
4.50	7.0	0.01	13.20	8.04
4.60	7.0	0.01	13.20	7.97
4.70	9.0	0.01	16.98	10.17
4.80	8.0	0.01	15.09	8.96
4.90	9.0	0.01	16.98	10.00
5.00	10.0	0.01	18.86	11.02



Notes:

Hammer Mass	63.5 kg
Fall Height	0.76 m
Cone Area	0.0019 m^2
E_{theor}	473 J
Energy Ratio	0.757
Anvil Mass	1.25 kg
Rod Mass	8.79 kg/m

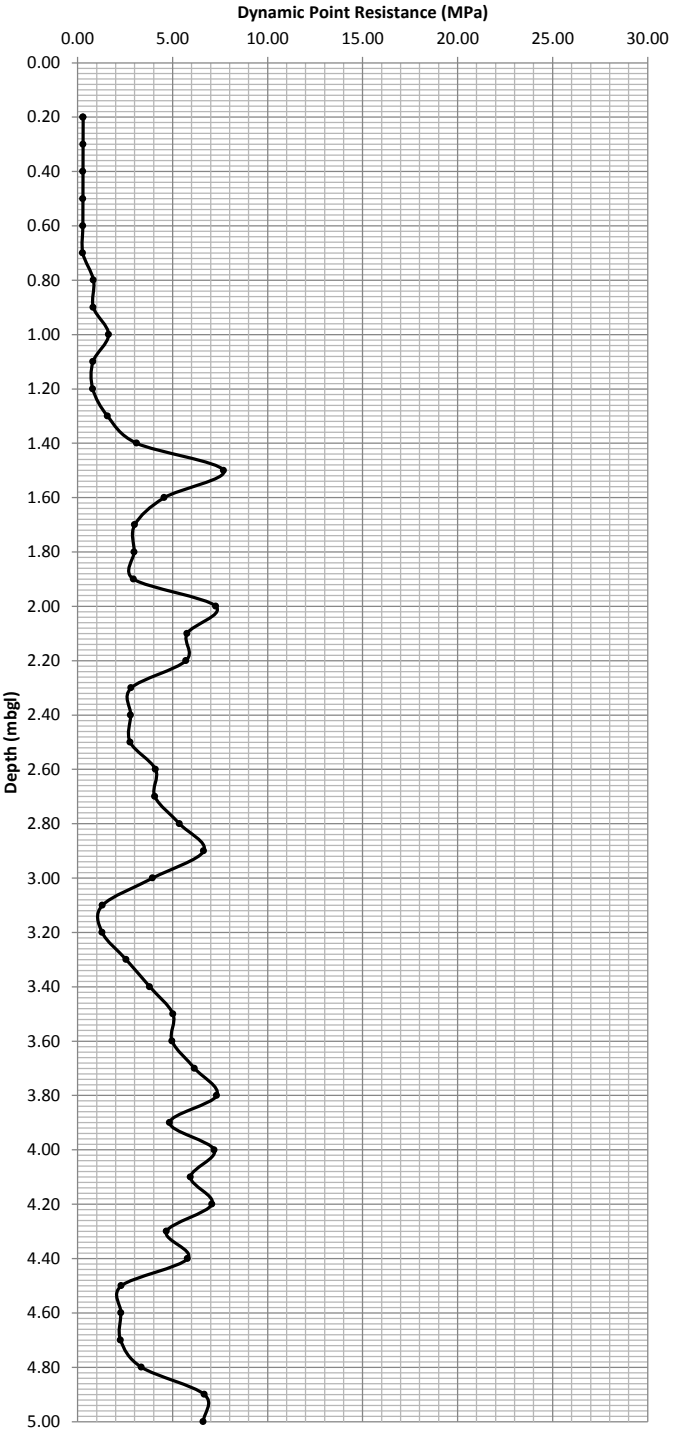
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS6

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	0.2	0.63	0.30	0.29
0.30	0.2	0.63	0.30	0.28
0.40	0.2	0.63	0.30	0.28
0.50	0.2	0.63	0.30	0.28
0.60	0.2	0.63	0.30	0.27
0.70	0.2	0.63	0.30	0.27
0.80	0.5	0.20	0.94	0.83
0.90	0.5	0.20	0.94	0.82
1.00	1.0	0.10	1.89	1.63
1.10	0.5	0.20	0.94	0.80
1.20	0.5	0.20	0.94	0.80
1.30	1.0	0.10	1.89	1.57
1.40	2.0	0.05	3.77	3.11
1.50	5.0	0.02	9.43	7.69
1.60	3.0	0.03	5.66	4.56
1.70	2.0	0.05	3.77	3.01
1.80	2.0	0.05	3.77	2.97
1.90	2.0	0.05	3.77	2.94
2.00	5.0	0.02	9.43	7.28
2.10	4.0	0.03	7.54	5.76
2.20	4.0	0.03	7.54	5.70
2.30	2.0	0.05	3.77	2.82
2.40	2.0	0.05	3.77	2.79
2.50	2.0	0.05	3.77	2.76
2.60	3.0	0.03	5.66	4.10
2.70	3.0	0.03	5.66	4.06
2.80	4.0	0.03	7.54	5.36
2.90	5.0	0.02	9.43	6.64
3.00	3.0	0.03	5.66	3.94
3.10	1.0	0.10	1.89	1.30
3.20	1.0	0.10	1.89	1.29
3.30	2.0	0.05	3.77	2.56
3.40	3.0	0.03	5.66	3.80
3.50	4.0	0.03	7.54	5.02
3.60	4.0	0.03	7.54	4.97
3.70	5.0	0.02	9.43	6.16
3.80	6.0	0.02	11.32	7.32
3.90	4.0	0.03	7.54	4.84
4.00	6.0	0.02	11.32	7.19
4.10	5.0	0.02	9.43	5.94
4.20	6.0	0.02	11.32	7.07
4.30	4.0	0.03	7.54	4.67
4.40	5.0	0.02	9.43	5.79
4.50	2.0	0.05	3.77	2.30
4.60	2.0	0.05	3.77	2.28
4.70	2.0	0.05	3.77	2.26
4.80	3.0	0.03	5.66	3.36
4.90	6.0	0.02	11.32	6.67
5.00	6.0	0.02	11.32	6.61



Notes:

Hammer Mass	63.5 kg
Fall Height	0.76 m
Cone Area	0.0019 m^2
E_{theor}	473 J
Energy Ratio	0.757
Anvil Mass	1.25 kg
Rod Mass	8.79 kg/m

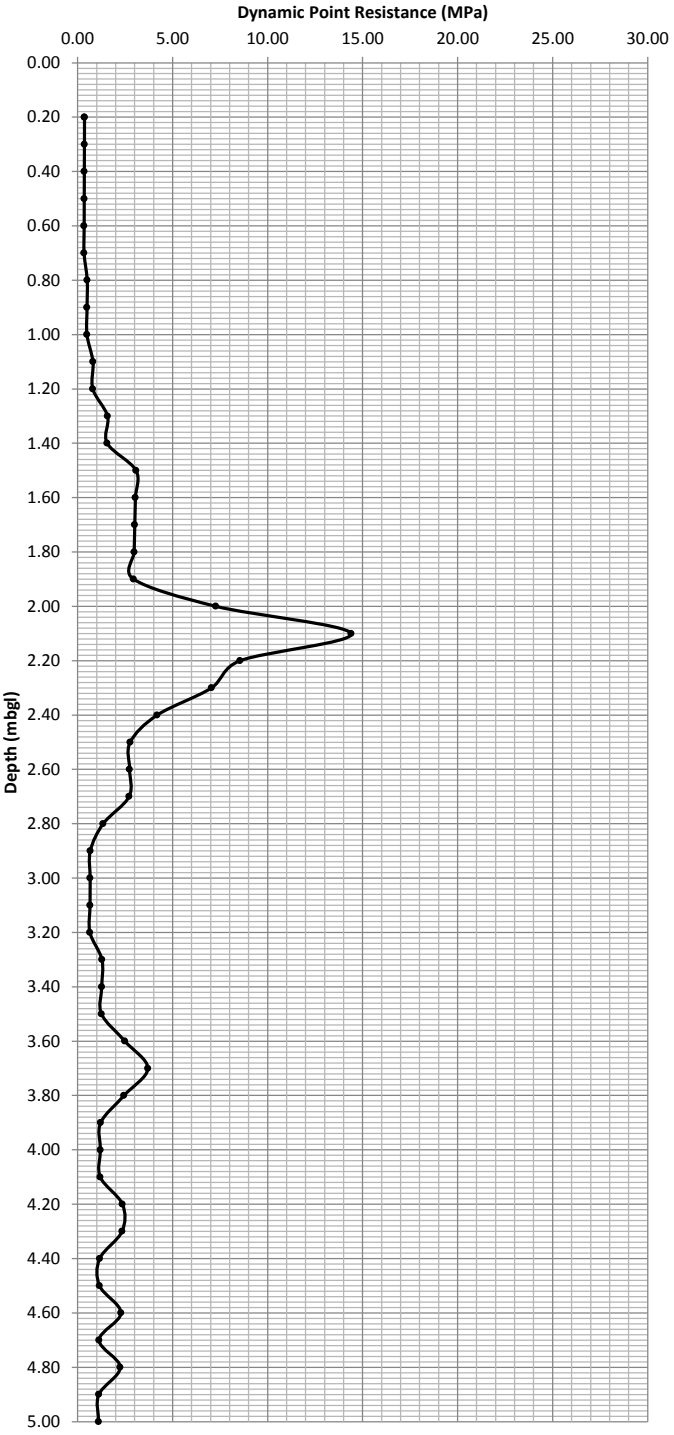
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS7

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	0.2	0.50	0.38	0.36
0.30	0.2	0.50	0.38	0.36
0.40	0.2	0.50	0.38	0.35
0.50	0.2	0.50	0.38	0.35
0.60	0.2	0.50	0.38	0.34
0.70	0.2	0.50	0.38	0.34
0.80	0.3	0.33	0.57	0.50
0.90	0.3	0.33	0.57	0.49
1.00	0.3	0.33	0.57	0.49
1.10	0.5	0.20	0.94	0.80
1.20	0.5	0.20	0.94	0.80
1.30	1.0	0.10	1.89	1.57
1.40	1.0	0.10	1.89	1.55
1.50	2.0	0.05	3.77	3.07
1.60	2.0	0.05	3.77	3.04
1.70	2.0	0.05	3.77	3.01
1.80	2.0	0.05	3.77	2.97
1.90	2.0	0.05	3.77	2.94
2.00	5.0	0.02	9.43	7.28
2.10	10.0	0.01	18.86	14.40
2.20	6.0	0.02	11.32	8.55
2.30	5.0	0.02	9.43	7.05
2.40	3.0	0.03	5.66	4.19
2.50	2.0	0.05	3.77	2.76
2.60	2.0	0.05	3.77	2.73
2.70	2.0	0.05	3.77	2.71
2.80	1.0	0.10	1.89	1.34
2.90	0.5	0.20	0.94	0.66
3.00	0.5	0.20	0.94	0.66
3.10	0.5	0.20	0.94	0.65
3.20	0.5	0.20	0.94	0.64
3.30	1.0	0.10	1.89	1.28
3.40	1.0	0.10	1.89	1.27
3.50	1.0	0.10	1.89	1.25
3.60	2.0	0.05	3.77	2.49
3.70	3.0	0.03	5.66	3.69
3.80	2.0	0.05	3.77	2.44
3.90	1.0	0.10	1.89	1.21
4.00	1.0	0.10	1.89	1.20
4.10	1.0	0.10	1.89	1.19
4.20	2.0	0.05	3.77	2.36
4.30	2.0	0.05	3.77	2.34
4.40	1.0	0.10	1.89	1.16
4.50	1.0	0.10	1.89	1.15
4.60	2.0	0.05	3.77	2.28
4.70	1.0	0.10	1.89	1.13
4.80	2.0	0.05	3.77	2.24
4.90	1.0	0.10	1.89	1.11
5.00	1.0	0.10	1.89	1.10



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.757	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

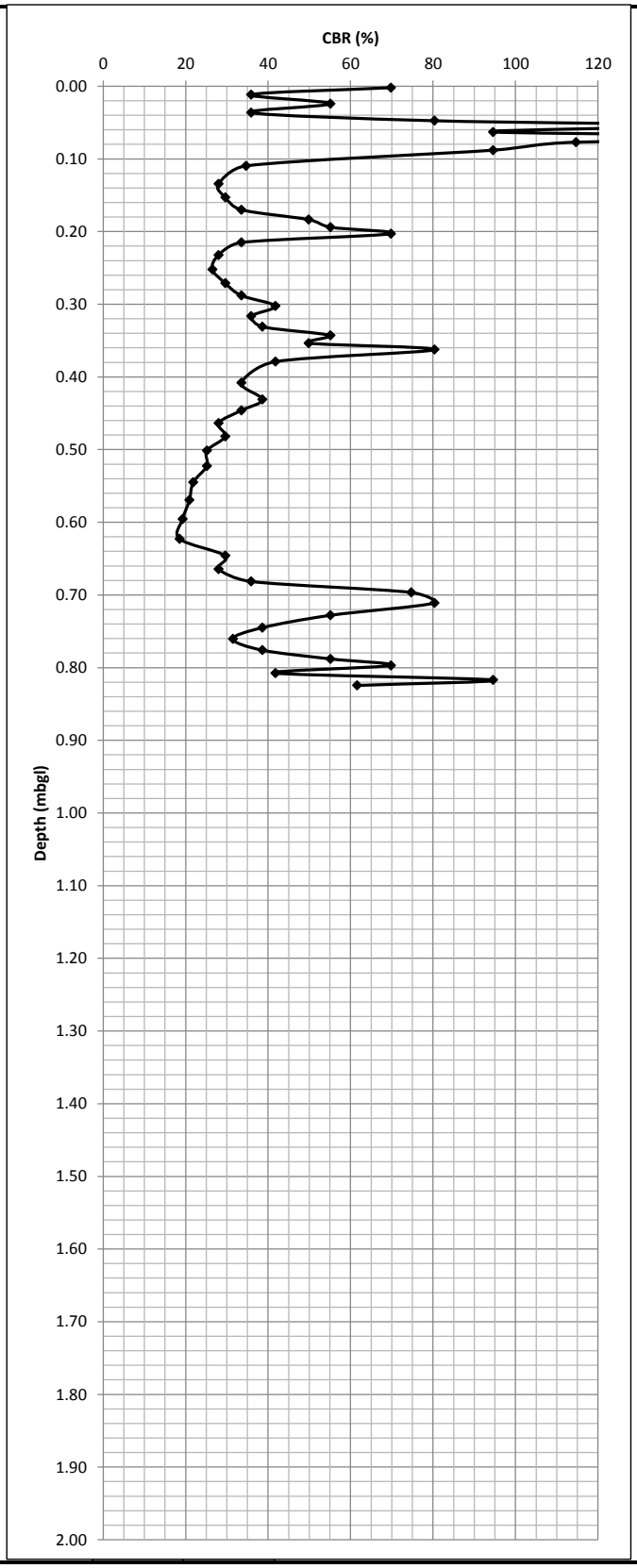
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS3
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		90	0.00	
1	1	94	0.00	70
2	3	109	0.02	36
2	5	119	0.03	55
2	7	134	0.04	36
2	9	141	0.05	80
3	12	147	0.06	145
4	16	159	0.07	95
2	18	162	0.07	197
4	22	172	0.08	115
4	26	184	0.09	95
4	30	215	0.13	35
2	32	234	0.14	28
2	34	252	0.16	30
2	36	268	0.18	34
2	38	279	0.19	50
2	40	289	0.20	55
2	42	297	0.21	70
2	44	313	0.22	34
2	46	332	0.24	28
2	48	352	0.26	26
2	50	370	0.28	30
2	52	386	0.30	34
2	54	399	0.31	42
2	56	414	0.32	36
2	58	428	0.34	39
2	60	438	0.35	55
2	62	449	0.36	50
2	64	456	0.37	80
4	68	482	0.39	42
4	72	514	0.42	34
2	74	528	0.44	39
2	76	544	0.45	34
2	78	563	0.47	28
2	80	581	0.49	30
2	82	602	0.51	25
2	84	623	0.53	25
2	86	647	0.56	22
2	88	672	0.58	21
2	90	699	0.61	19
2	92	727	0.64	19
2	94	745	0.66	30
2	96	764	0.67	28
2	98	779	0.69	36
4	102	794	0.70	75
4	106	808	0.72	80
4	110	828	0.74	55
2	112	842	0.75	39
2	114	859	0.77	31
2	116	873	0.78	39
2	118	883	0.79	55
2	120	891	0.80	70
2	122	904	0.81	42
2	124	910	0.82	95
2	126	919	0.83	62



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

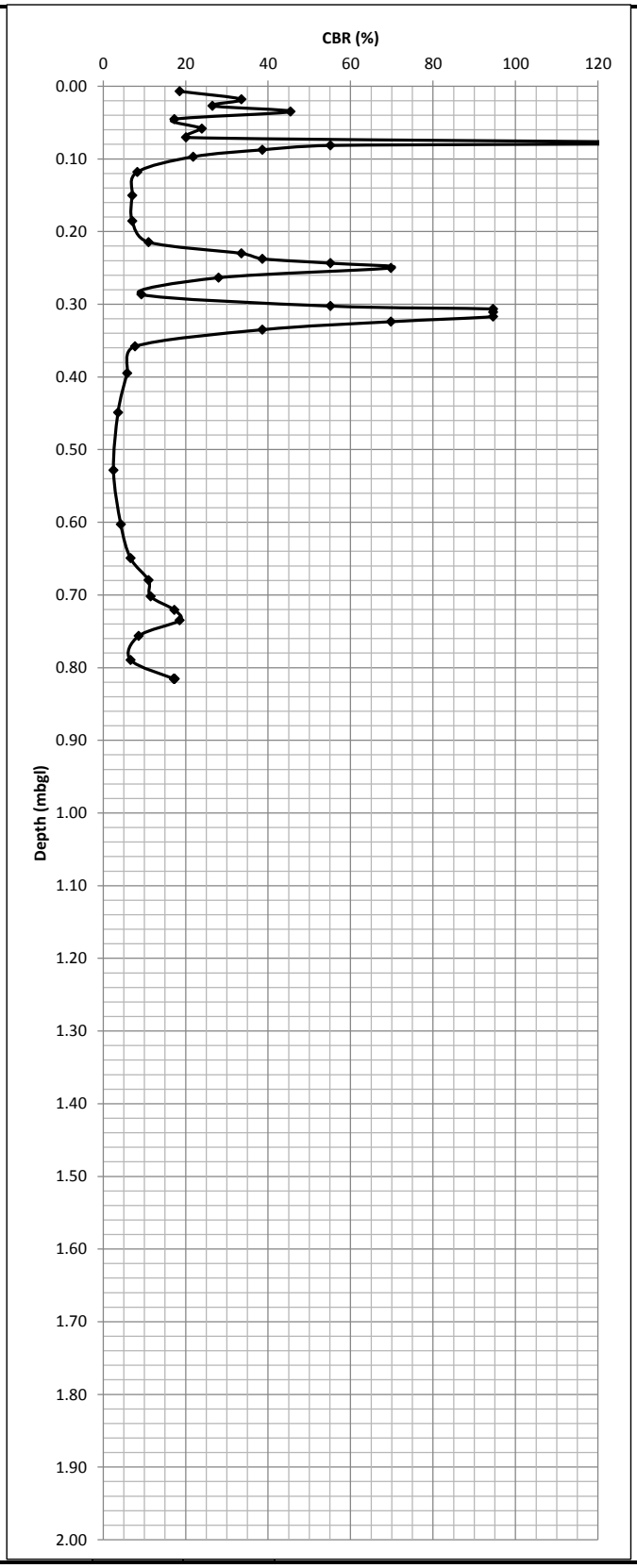
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS4
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		128	0.00	
1	1	142	0.01	19
1	2	150	0.02	34
1	3	160	0.03	26
1	4	166	0.04	45
1	5	181	0.05	17
1	6	192	0.06	24
1	7	205	0.08	20
1	8	207	0.08	145
1	9	212	0.08	55
1	10	219	0.09	39
1	11	231	0.10	22
1	12	261	0.13	8
1	13	296	0.17	7
1	14	331	0.20	7
1	15	354	0.23	11
1	16	362	0.23	34
1	17	369	0.24	39
1	18	374	0.25	55
2	20	382	0.25	70
2	22	401	0.27	28
1	23	428	0.30	9
1	24	433	0.31	55
1	25	436	0.31	95
2	27	442	0.31	95
2	29	448	0.32	95
2	31	456	0.33	70
2	33	470	0.34	39
1	34	502	0.37	8
1	35	544	0.42	6
1	36	610	0.48	4
1	37	703	0.58	3
1	38	759	0.63	4
1	39	796	0.67	7
1	40	819	0.69	11
1	41	841	0.71	12
1	42	856	0.73	17
1	43	870	0.74	19
1	44	899	0.77	9
1	45	936	0.81	7
1	46	951	0.82	17



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

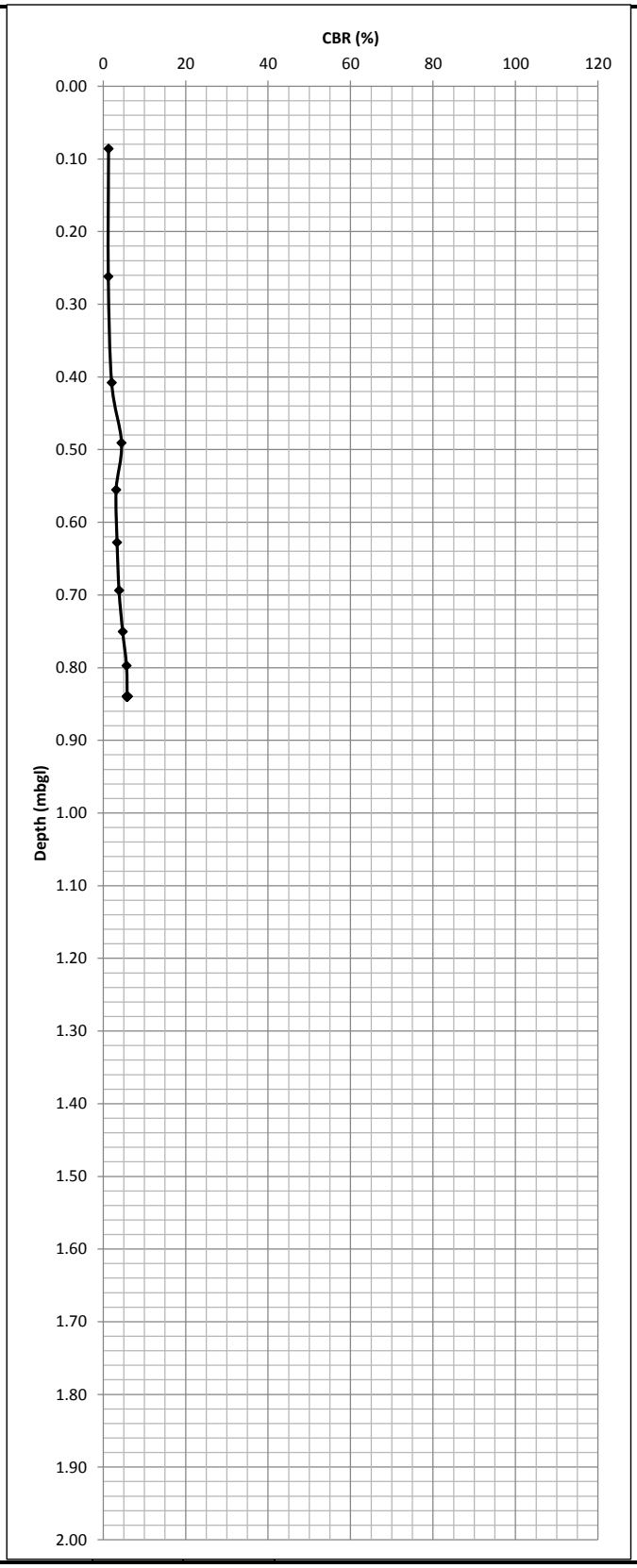
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS5
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		95	0.00	
1	1	267	0.17	1
1	2	447	0.35	1
1	3	559	0.46	2
1	4	613	0.52	4
1	5	688	0.59	3
1	6	758	0.66	3
1	7	820	0.73	4
1	8	871	0.78	5
1	9	914	0.82	6
1	10	956	0.86	6



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

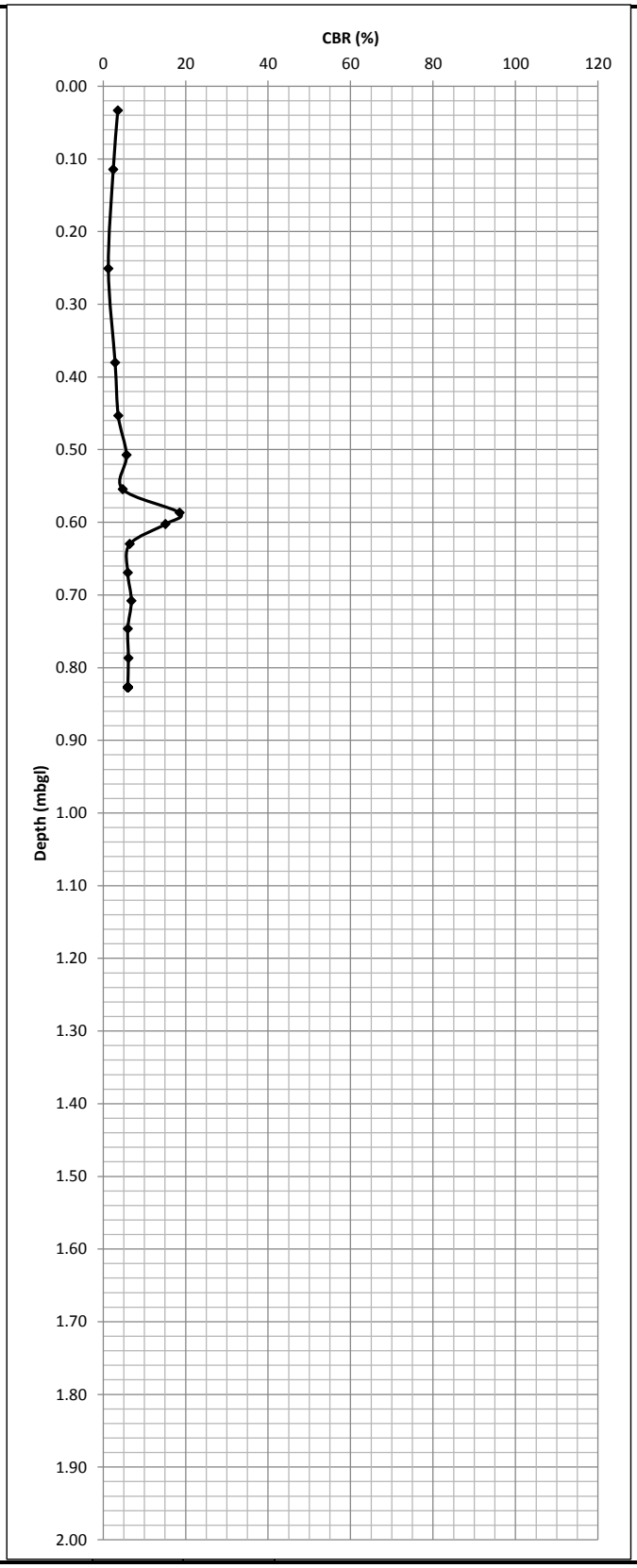
ASHDOWN SITE INVESTIGATION LTD

TRL Dynamic Cone Penetrometer Record

SITE Honda Site, Southview Road, Southwick. **Report Ref.** LW24275

Test Location Reference	WS6
Depth of Start of Test (mbgl)	0.00

No. Blows	Total Blows	Reading (mm)	Depth (mbgl)	CBR%
DCP Zero Reading		97	0.00	
1	1	164	0.07	4
1	2	259	0.16	2
1	3	437	0.34	1
1	4	518	0.42	3
1	5	583	0.49	4
1	6	626	0.53	6
1	7	677	0.58	5
1	8	691	0.59	19
1	9	708	0.61	15
1	10	746	0.65	6
1	11	787	0.69	6
1	12	823	0.73	7
1	13	864	0.77	6
1	14	904	0.81	6
1	15	945	0.85	6



Notes: CBR Value calculated in accordance with the TRRL equation given in TRL Road Note 8.

ASHDOWN SITE INVESTIGATION LIMITED

Site: Honda Site, Southview Road, Southwick.	Report No.: LW24275 Sheet No.: 1 of 1

SUMMARY OF BOREHOLE FALLING HEAD SOAKAGE TEST RESULTS

Borehole **WS2**	
Time (mins)	Depth to water (m bgl)
0	0.10
1	0.11
2	0.12
3	0.13
6	0.14
9	0.16
11	0.17
14	0.19
17	0.20
30	0.26
62	0.38
81	0.46
Borehole Depth (m bgl)	2.00
Casing Depth (m bgl)	1.00
Borehole Diameter (mm)	92.00
Casing Diameter (mm)	105.00

Borehole **WS7**	
Time (mins)	Depth to water (m bgl)
0	0.00
1	0.02
2	0.03
3	0.08
4	0.15
5	0.26
10	0.32
15	0.39
30	0.76
60	1.08
100	1.16
137	1.22
Borehole Depth (m bgl)	2.00
Casing Depth (m bgl)	1.00
Borehole Diameter (mm)	92.00
Casing Diameter (mm)	105.00

Notes: bgl – below ground level.

APPENDIX B

Geotechnical Laboratory Testing Notes

Laboratory Test Results

i) Geotechnical Testing

ii) Contamination Testing

GEOTECHNICAL LABORATORY TESTING NOTES

1 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) and Part 2 Principles of classification (BS EN 14688-2:2004) as well as the BS5930:1990 + A2:2010 code of Practice for Site Investigations.

2 Index Tests

Index (Atterberg Limit) tests are undertaken on samples of fine grained soils provide the primary information for the classification of fine grained soils.

Fine grained soil is tested to determine its liquid and plastic limits, which are moisture contents that define boundaries between material consistency states. These tests are used to evaluate indices used for soil identification and to help determine the shrinkage and swelling characteristics of the soil under conditions of changing moisture content. The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

The consistency index is derived from the Index Tests and is summarized in the following table. These divisions may be approximate, particularly for low plasticity soils. The consistency recorded on the soil classification summary is derived from the consistency index.

Consistency	Consistency Index
Very Soft	<0.25
Soft	0.25 to 0.50
Firm	0.50 to 0.75
Stiff	0.75 to 1.00
Very Stiff	>1.00

Based on BN EN ISO 14688-2:2004

3 Particle Size Distribution Tests

Sieve analyses are carried out soil samples to establish their particle size distribution that can assist in the assessment of the permeability and classification of granular soils.

The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

4 Natural Moisture/ Saturated Moisture Content Determination of Chalk

The results of natural moisture or saturated moisture content tests of disturbed samples of chalk are used to assist in the classification of the chalk to determine key geotechnical parameters of strength, density and crushing properties.

The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

5 Soil Suction Testing

Soil suction tests are undertaken for the determination of the state of desiccation in clay soils.

The testing is carried out in accordance with the Building Research Establishment Information Paper IP4/93, dated February 1993.

6 Triaxial Compression Tests

Undrained triaxial compression tests are carried out on undisturbed samples of cohesive soil in order to assist in the determination of the undrained shear strength of the soil. The results of moisture content and density determinations are also included.

The tests are carried out in accordance with BS1377: Part 7: 1990 + A1:1994 Shear strength tests (total stress).

7 Shear Vane and Hand Penetrometer Testing

Undisturbed samples are tested in the laboratory using a Geonor Hand Shear Vane for the determination of their undrained shear strength.

The vane tests are carried out in general accordance with BS1377: Part 7: 1990 + A1:1994 Shear strength tests (total stress).

8 One Dimensional Consolidation Tests

One-dimensional consolidation tests are performed on undisturbed soil samples to ascertain their settlement characteristics.

The tests are carried out in accordance with BS1377: Part 5: 1990 + A1:1994 Compressibility, Permeability and Durability tests.

9 Dry Density / Moisture Content Relationship (Compaction) Testing

Compaction testing for the determination of the dry density / moisture content relationship is carried out on using either a 2.5kg, 4.5kg hammer or a vibrating hammer.

The tests are carried out in accordance with the British Standard BS1377: Part 4: 1990 + A1 & A2:2002 Compaction-related tests.

10 California Bearing Ratio

The soil is usually compacted at the as dug “natural” moisture content and often at moisture contents around the natural moisture content.

The California bearing ratio is determined in accordance with the British Standard BS1377: Part 4: 1990 + A1 & A2:2002 Compaction related tests.

11 Chemical Testing

Soil samples are tested for their concentration of water soluble sulphate and pH for use in concrete mix design.

Water samples are tested for total sulphate concentration and pH value.

Where a water soluble sulphate content in soils or a total sulphate content in groundwater exceeds 3000mg/l SO_4 the magnesium sulphate content of the samples is required to be determined (BRE Special Digest 1:2005).

Swanborough Farm Swanborough Lewes, East Sussex BN73PF	**ASHDOWN SITE INVESTIGATION LTD** **Geotechnical and Geoenvironmental Engineers**	ASHDOWN SITE INVESTIGATION LIMITED

Site:	Honda Site, Southview Road, Southwick, West Sussex.	Job No:	LW24275
		Sheet No:	1

SOIL CLASSIFICATION SUMMARY

BH/TP No.	Depth (m)	Nat. Moist. Cont. (w %)	Equiv. Moist. Cont. (w_a %)	Atterberg Limits			Class'n	Cons. Index (I_c)	% passing 425 µm sieve	Visual Description of Sample
				W_l %	W_p %	I_p %				
BH1	1.00	11		40	20	20	CI	1.45*	33	Very stiff brown slightly sandy gravelly CLAY. Gravel is fine to coarse flint.
WS1	2.50	23		59	23	36	CH	1.00*	65	Very stiff brown slightly gravelly sandy CLAY. Gravel is fine to coarse flint.
WS3	1.00	9.4		48	19	29	CI	1.33*	37	Very stiff brown gravelly CLAY. Gravel is fine to coarse flint.
WS4	1.00	13		42	20	22	CI	1.32*	34	Very stiff brown gravelly CLAY. Gravel is fine to coarse flint.
WS5	0.40	26		38	20	18	CI	0.67*	95	Firm dark brown slightly gravelly silty CLAY. Gravel is fine to coarse flint.
WS6	2.00	14		37	19	18	CI	1.28*	38	Very stiff brown gravelly CLAY. Gravel is fine to coarse flint.
WS7	1.20	16		37	19	18	CI	1.17*	62	Very stiff brown slightly gravelly CLAY. Gravel is fine to coarse flint.

Test Method: Classification Tests BS1377: Part 2: 1990

* Consistency index based on natural moisture content and not the equivalent moisture content.

Swanborough Farm Swanborough Lewes, East Sussex BN73PF	**ASHDOWN SITE INVESTIGATION LTD** **Geotechnical and Geoenvironmental Engineers**	ASHDOWN SITE INVESTIGATION LIMITED

Site:	Honda Site, Southview Road, Southwick, West Sussex.	Job No: Sheet No:	LW24275 1

MOISTURE CONTENT SUMMARY

BH/TP No.	Depth (m)	Natural Moisture Content (w %)	Visual Description of Sample	Remarks
BH1	3.50	19	Fine grained soil.	
BH1	9.00	26	CHALK.	
BH1	10.00	27	CHALK.	
BH1	11.00	27	CHALK.	
BH1	12.00	27	CHALK.	

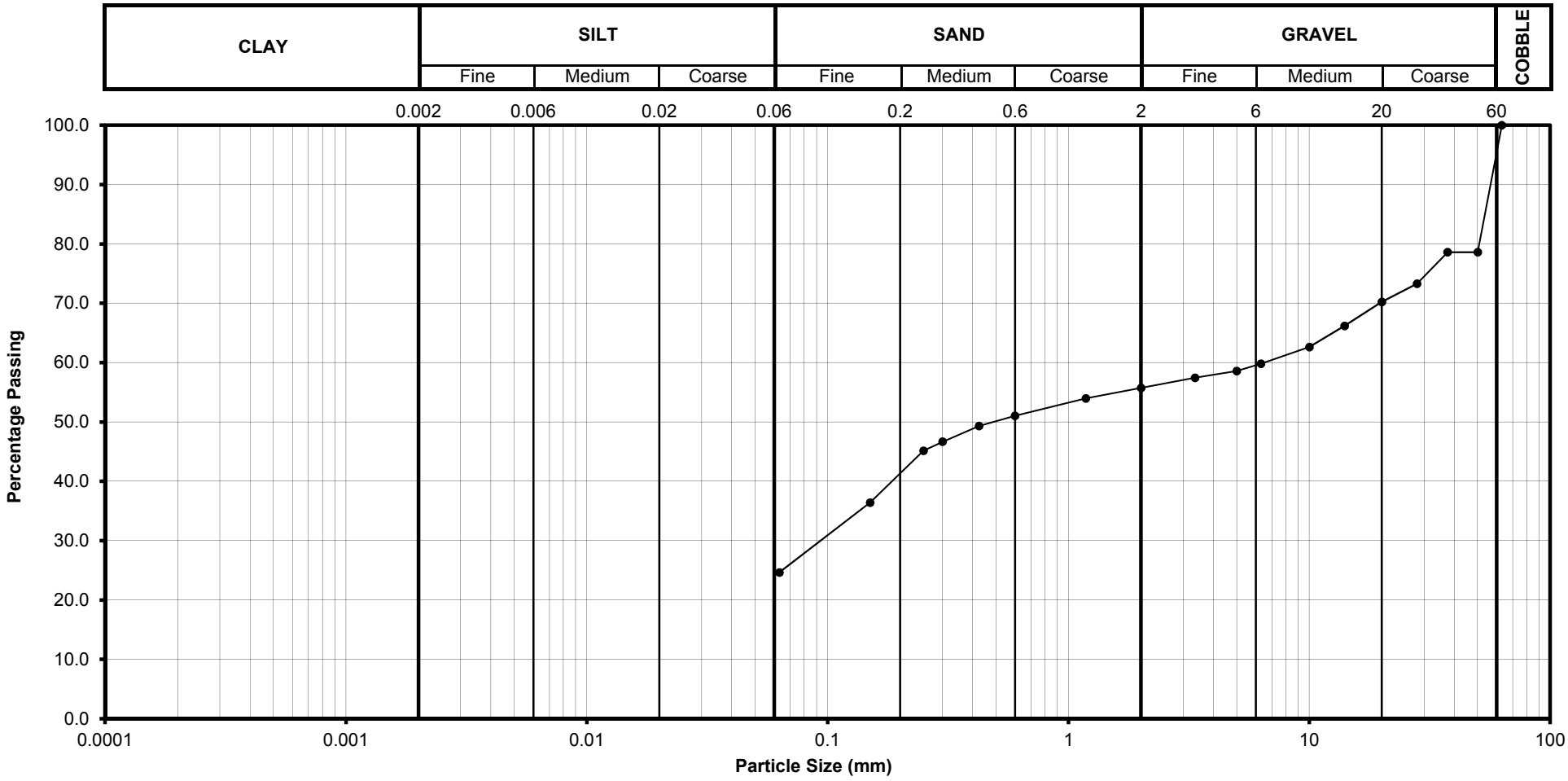
Test Method: Moisture Content BS1377: Part 2: 1990 3.2

Swanborough Farm
Swanborough
Lewes, East Sussex
BN73PF

ASHDOWN SITE INVESTIGATION LTD
Geotechnical and Geoenvironmental Engineers

ASHDOWN SITE INVESTIGATION LIMITED

Particle Size Distribution by Wet Sieve; BS1377: Part 2 1990



Job Name	Honda Site, Southview Road, Southwick, West Sussex.	**BH/ TP No.**	BH1	**Sample Description**	very clayey very sandy GRAVEL.
Job No.	LW24275	**Sample Depth (m)**	7.10		

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Lewes, East Sussex
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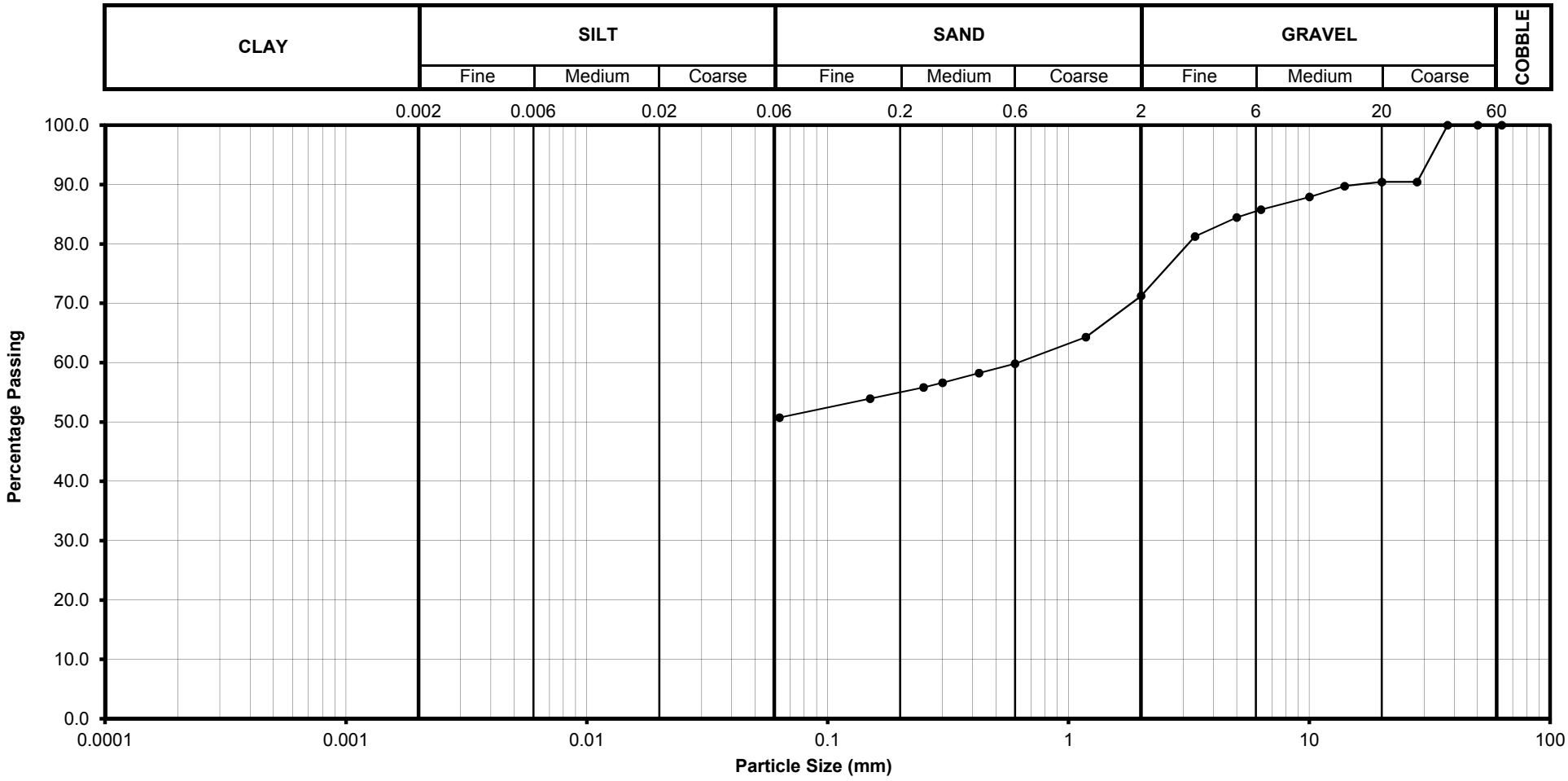
Particle Size Distribution by Wet Sieve; BS1377: Part 2 1990



Job Name	Honda Site, Southview Road, Southwick, West Sussex.	**BH/ TP No.**	WS2	**Sample Description**	Slightly sandy slightly gravelly CLAY.
Job No.	LW24275	**Sample Depth (m)**	1.00		

Unit A2
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St Leonards on Sea
East Sussex
TN38 9BY
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2683

THE ENVIRONMENTAL LABORATORY LTD

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Reporting Date: 13 November 2013

ANALYTICAL REPORT No. AR51559

Samples Received By: Laboratory Courier
Sample Receipt Date: 06/11/13
Your Job No: LW24275
Your Order No: 130739
Site Location: Honda Site, Southview Road, Southwick
ELAB Invoice Number: 1023
No Samples Received: 7
Date of Sampling: ---

This report was written by: G Rouse

Authorised By;

Steve Knight
Reporting Manager

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

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51559

Location: Honda Site, Southview Road, Southwick

Your Job No: LW24275
Your Order No: 130739
Reporting Date: 13/11/13

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F.A.O. David Harris
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The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

	TP/BH	BH1	BH1	WS1	WS2	WS3	WS5	WS6
	Depth (m)	2.50	10.00	1.00	2.00	3.00	2.50	1.00
	Our ref	89770	89771	89772	89773	89774	89775	89776
pH Value**	(Units)	8.1	8.5	8.0	8.5	8.0	8.2	7.9
Water Soluble Sulphate	(mg/l as SO_4)	81	42	38	26	89	33	37

All results expressed on dry weight basis
** - MCERTS accredited test

G Rouse

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THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR51559
Your Job No:	LW24275
Sample Receipt Date:	06/11/13
Reporting Date:	13/11/13
Registered:	06/11/13
Prepared:	07/11/13
Analysis complete:	13/11/13

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
pH Value**	Air dried sample	12/11/13	113	Probe
Water Soluble Sulphate	Air dried sample	13/11/13	209	Colorimetry

** - MCERTS Accredited test
Determinands not marked with * or ** are non accredited
MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

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F.A.O. David Harris
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East Sussex, BN7 9PF

Reporting Date: 06 November 2013

ANALYTICAL REPORT No. AR51420A (Amended Report)

Samples Received By: Laboratory Courier
Sample Receipt Date: 30/10/13
Your Job No: LW24275
Your Order No: 130722
Site Location: Honda Site, Southview Road, Southwick, West Sussex
ELAB Invoice Number: 924
No Samples Received: 6
Date of Sampling: ---

This report was written by: G Rouse

Authorised By;

Steve Knight
Reporting Manager

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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51420A

Location: Honda Site, Southview Road, Southwick, West Sussex

Your Job No: LW24275
Your Order No: 130722
Reporting Date: 06/11/13

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F.A.O. David Harris
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The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils		Characteristic	Sandy clay	Silty clay loam	Silty clay
		TP/BH	WS1	WS2	FP1
		Depth (m)	0.25	0.50	0.40
		Our ref	89032	89034	89036
Stone Content		(%)	20	7	10
Arsenic**		(mg/kg)	9.6	10.7	9.8
Cadmium**		(mg/kg)	<0.5	0.6	<0.5
Chromium**		(mg/kg)	20	33	24
Lead**		(mg/kg)	33	19	27
Mercury**		(mg/kg)	<0.5	<0.5	<0.5
Nickel**		(mg/kg)	21	28	22
Copper**		(mg/kg)	19	16	17
Zinc**		(mg/kg)	87	84	92
Selenium**		(mg/kg)	1.4	1.2	<0.5
Hexavalent Chromium		(mg/kg)	<2	<2	<2
Water Soluble Boron		(mg/kg)	0.9	0.8	1.9
pH Value**		(Units)	7.9	7.7	7.8
Soil Organic Matter*		(%)	2.1	1.6	1.9

All results expressed on dry weight basis
** - MCERTS accredited test
* - UKAS accredited test

G Rouse

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51420A

Location: Honda Site, Southview Road, Southwick, West Sussex

Your Job No: LW24275
Your Order No: 130722
Reporting Date: 06/11/13

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F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

	Characteristic	Sandy clay	Silty clay loam	Silty clay
	TP/BH	WS1	WS2	FP1
	Depth (m)	0.25	0.50	0.40
	Our ref	89032	89034	89036
Naphthalene**	(mg/kg)	<0.5	<0.5	<0.5
Acenaphthylene**	(mg/kg)	<0.5	<0.5	<0.5
Acenaphthene**	(mg/kg)	<0.5	<0.5	<0.5
Fluorene**	(mg/kg)	<0.5	<0.5	<0.5
Phenanthrene**	(mg/kg)	<0.5	<0.5	<0.5
Anthracene**	(mg/kg)	<0.5	<0.5	<0.5
Fluoranthene**	(mg/kg)	<0.5	<0.5	<0.5
Pyrene**	(mg/kg)	<0.5	<0.5	<0.5
Benz(a)anthracene**	(mg/kg)	<0.5	<0.5	<0.5
Chrysene**	(mg/kg)	<0.5	<0.5	<0.5
Benzo(b)fluoranthene**	(mg/kg)	<0.5	<0.5	<0.5
Benzo(k)fluoranthene**	(mg/kg)	<0.5	<0.5	<0.5
Benzo(a)pyrene**	(mg/kg)	<0.5	<0.5	<0.5
Indeno(123-cd)pyrene**	(mg/kg)	<0.5	<0.5	<0.5
Dibenz(ah)anthracene**	(mg/kg)	<0.5	<0.5	<0.5
Benzo(ghi)perylene**	(mg/kg)	<0.5	<0.5	<0.5
Total PAH**	(mg/kg)	<0.5	<0.5	<0.5

All results expressed on dry weight basis
** - MCERTS accredited test

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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51420AA

Location: Honda Site, Southview Road, Southwick, West Sussex

Your Job No: LW24275
Your Order No: 130722
Reporting Date: 06/11/13

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

		Characteristic	Silty clay loam	Silty clay loam	Silty clay loam	Silty clay
		TP/BH	BH1	WS1	WS2	FP1
		Depth (m)	2.50	0.40	2.00	0.40
		Our ref	89031	89033	89035	89036
C_8-C_{10}	(mg/kg)		<5	<5	<5	<5
$>C_{10}$-C_{12}	(mg/kg)		<5	<5	<5	<5
$>C_{12}$-C_{16}	(mg/kg)		<5	<5	<5	<5
$>C_{16}$-C_{21}	(mg/kg)		<5	<5	<5	7
$>C_{21}$-C_{35}	(mg/kg)		<5	<5	<5	19
Total Petroleum Hydrocarbons	(mg/kg)		<5	<5	<5	26

All results expressed on dry weight basis

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

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51420A

Location: Honda Site, Southview Road, Southwick, West Sussex

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No:	LW24275
Your Order No:	130722
Reporting Date:	06/11/13

Asbestos Identification

Sample ref:	**FP1**
Depth (m)	**0.40**
Our ref:	**89036**
#Description of Sample Matrix:	Silty clay
***Result**	No asbestos identified

*= UKAS accredited
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

G Rouse

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51420A

Location: Honda Site, Southview Road, Southwick, West Sussex

2683 2683

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No: LW24275
Your Order No: 130722
Reporting Date: 06/11/13

VOC ANALYSIS

Soils		Characteristic	Silty clay loam	Silty clay loam
		TP/BH	WS2	FP1
		Depth (m)	0.50	0.40
		Our ref	89034	89036
Benzene**		(µg/kg)	<10	<10
Toluene**		(µg/kg)	<10	<10
Ethyl Benzene**		(µg/kg)	<10	<10
mpXylene**		(µg/kg)	<10	<10
oXylene**		(µg/kg)	<10	<10
1, 2-Dichloroethene-cis**		(µg/kg)	<10	<10
1, 1-Dichloroethane**		(µg/kg)	<10	<10
Chloroform**		(µg/kg)	<10	<10
Carbontetrachloride**		(µg/kg)	<10	<10
1, 1, 1-Trichloroethane**		(µg/kg)	<10	<10
Trichloroethylene**		(µg/kg)	<10	<10
Tetrachloroethylene**		(µg/kg)	<10	<10
1, 1, 1, 2-Tetrachloroethane**		(µg/kg)	<10	<10
1, 1, 2, 2-Tetrachloroethane**		(µg/kg)	<10	<10
Chlorobenzene**		(µg/kg)	<10	<10
Bromobenzene**		(µg/kg)	<10	<10
Bromodichloromethane**		(µg/kg)	<10	<10
Methylethylbenzene**		(µg/kg)	<10	<10
1, 1-Dichloro-1-propene**		(µg/kg)	<10	<10
1, 2-Dichloroethene-trans		(µg/kg)	<10	<10
2, 2-Dichloropropane		(µg/kg)	<10	<10
Bromochloromethane		(µg/kg)	<10	<10
1, 2-Dichloroethane		(µg/kg)	<10	<10
Dibromomethane**		(µg/kg)	<10	<10
1, 2-Dichloropropane**		(µg/kg)	<10	<10
1, 3-Dichloro1propene**		(µg/kg)	<10	<10
1, 3-Dichloro1propene trans		(µg/kg)	<10	<10
1, 1, 2-Trichloroethane		(µg/kg)	<10	<10
Dibromochloromethane		(µg/kg)	<10	<10
1, 3-Dichloropropane		(µg/kg)	<10	<10
Dibromoethane**		(µg/kg)	<10	<10
Styrene		(µg/kg)	<10	<10
Propylbenzene		(µg/kg)	<10	<10
2-Chlorotoluene		(µg/kg)	<10	<10
1, 2, 4-Trimethylbenzene		(µg/kg)	<10	<10
4-Chlorotoluene		(µg/kg)	<10	<10
t-Butylbenzene		(µg/kg)	<10	<10
Trimethylbenzene		(µg/kg)	<10	<10
1-Methylpropylbenzene		(µg/kg)	<10	<10
o-Cymene		(µg/kg)	<10	<10
1, 4-Dichlorobenzene		(µg/kg)	<10	<10
Butylbenzene		(µg/kg)	<10	<10
1, 2-Dibromo-3-chloropropane		(µg/kg)	<10	<10
Hexachlorobutaciene		(µg/kg)	<10	<10
1, 2, 3-Trichlorobenzene		(µg/kg)	<10	<10
1, 2, 4-Trichlorobenzene		(µg/kg)	<10	<10
1, 3-Dichlorobenzene		(µg/kg)	<10	<10
1, 2-Dichlorobenzene		(µg/kg)	<10	<10
Bromoform		(µg/kg)	<10	<10

** - MCERTS accredited test

G Rouse

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St Leonards on Sea
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THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR51420A
Your Job No:	LW24275
Sample Receipt Date:	30/10/13
Reporting Date:	06/11/13
Registered:	30/10/13
Prepared:	31/10/13
Analysis complete:	06/11/13

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	04/11/13	118	ICPMS
Cadmium**	Air dried sample	04/11/13	118	ICPMS
Chromium**	Air dried sample	04/11/13	118	ICPMS
Lead**	Air dried sample	04/11/13	118	ICPMS
Mercury**	Air dried sample	04/11/13	118	ICPMS
Nickel**	Air dried sample	04/11/13	118	ICPMS
Copper**	Air dried sample	04/11/13	118	ICPMS
Zinc**	Air dried sample	04/11/13	118	ICPMS
Selenium**	Air dried sample	04/11/13	118	ICPMS
Hexavalent Chromium	As submitted sample	01/11/13	110	Colorimetry
Water Soluble Boron	Air dried sample	04/11/13	202	Colorimetry
pH Value**	Air dried sample	04/11/13	113	Probe
Soil Organic Matter*	Air dried sample	04/11/13	111	Titration
Asbestos*	As submitted sample	04/11/13	179	See note
Speciated PAH**	As submitted sample	04/11/13	133	Gas Chromatography
Carbon Banding (TPH BCB)	As submitted sample	04/11/13	218	Gas Chromatography
VOC**	As submitted sample	05/11/13	181	GCMS

Asbestos analysis qualitative only
Note:- Documented In-house procedure based on HSG 248 2005
* = UKAS Accredited test
** - MCERTS Accredited test
Determinands not marked with * or ** are not accredited
MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

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THE ENVIRONMENTAL LABORATORY LTD

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Reporting Date: 11 November 2013

ANALYTICAL REPORT No. 51552

Samples Received By: Laboratory Courier
Sample Receipt Date: 06/11/13
Your Job No: LW24275
Your Order No: 130736
Site Location: Honda Site, Southview Road, Southwick, West Sussex
No Samples Received: 5
Date of Sampling: 06/11/13

This report was written by: N. Williams

Authorised By;

Steve Knight
Reporting Manager

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

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. 51552

Location: Honda Site, Southview Road, Southwick, West Sussex

Your Job No: LW24275
Your Order No: 130736
Reporting Date: 11/11/13

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F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

	Characteristic	Silt loam	Sandy silt	Clay loam	Silt loam	Silt loam
	TP/BH	WS3	WS4	WS5	WS6	WS7
	Depth (m)	0.40	0.60	0.50	0.30	0.20
	Our ref	89750	89751	89752	89753	89754
Stone Content	(%)	<1	15	13	5	9
Arsenic**	(mg/kg)	12.3	13.5	9.6	9.3	10.6
Cadmium**	(mg/kg)	<0.5	<0.5	0.6	0.5	0.8
Chromium**	(mg/kg)	25	12	23	21	23
Lead**	(mg/kg)	21	417	22	22	261
Mercury**	(mg/kg)	<0.5	1.5	<0.5	<0.5	<0.5
Nickel**	(mg/kg)	23	11	21	20	22
Copper**	(mg/kg)	17	18	18	17	32
Zinc**	(mg/kg)	72	236	73	62	207
Selenium**	(mg/kg)	1.4	1.1	0.7	0.7	1.0
Hexavalent Chromium	(mg/kg)	<2	<2	<2	<2	<2
Water Soluble Boron	(mg/kg)	1.0	<0.5	0.5	0.6	0.9
pH Value**	(Units)	7.9	8.9	8.6	7.6	7.2
Soil Organic Matter*	(%)	2.6	1.6	2.0	2.6	1.8
Total Cyanide**	(mg/kg)	<1	<1	n/t	n/t	n/t

n/t = not tested
All results expressed on dry weight basis
** - MCERTS accredited test
* - UKAS accredited test

N. Williams

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. 51552

Location: Honda Site, Southview Road, Southwick, West Sussex

Your Job No: LW24275
Your Order No: 130736
Reporting Date: 11/11/13

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

	Characteristic	Silt loam	Sandy silt loam	Clay loam	Silt loam	Silt loam
	TP/BH	WS3	WS4	WS5	WS6	WS7
	Depth (m)	0.40	0.60	0.50	0.30	0.20
	Our ref	89750	89751	89752	89753	89754
Naphthalene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	0.7
Anthracene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene**	(mg/kg)	<0.5	0.7	<0.5	<0.5	<0.5
Benz(a)anthracene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	0.9
Chrysene**	(mg/kg)	<0.5	0.6	<0.5	<0.5	1.4
Benzo(b)fluoranthene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	0.9
Benzo(k)fluoranthene**	(mg/kg)	<0.5	0.6	<0.5	<0.5	1.2
Benzo(a)pyrene**	(mg/kg)	<0.5	0.7	<0.5	<0.5	1.0
Indeno(123-cd)pyrene**	(mg/kg)	<0.5	0.6	<0.5	<0.5	0.6
Dibenz(ah)anthracene**	(mg/kg)	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(ghi)perylene**	(mg/kg)	0.8	<0.5	<0.5	<0.5	<0.5
Total PAH**	(mg/kg)	0.8	3.1	<0.5	<0.5	6.7

All results expressed on dry weight basis
** - MCERTS accredited test

N. Williams

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. 51552

Location: Honda Site, Southview Road, Southwick, West Sussex

Your Job No: LW24275
Your Order No: 130736
Reporting Date: 11/11/13

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soils

		Characteristic	Silt loam	Sandy silt loam	Clay loam	Silt loam
		TP/BH	WS3	WS4	WS5	WS6
		Depth (m)	0.40	0.60	0.50	0.30
		Our ref	89750	89751	89752	89753
C_8-C_{10}		(mg/kg)	<5	<5	<5	<5
>C_{10}-C_{12}		(mg/kg)	<5	<5	<5	<5
>C_{12}-C_{16}		(mg/kg)	<5	<5	<5	<5
>C_{16}-C_{21}		(mg/kg)	<5	<5	<5	<5
>C_{21}-C_{35}		(mg/kg)	<5	<5	<5	<5
Total Petroleum Hydrocarbons		(mg/kg)	<5	<5	<5	<5

All results expressed on dry weight basis

N. Williams

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. 51552

Location: Honda Site, Southview Road, Southwick, West Sussex

2683

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No: LW24275
Your Order No: 130736
Reporting Date: 11/11/2013

VOC ANALYSIS

Soils

Characteristic		Clay loam
Date Sampled		06/11/2013
TP/BH		WS5
Depth (m)		0.50
Our ref		89752
Benzene**	(µg/kg)	<10
Toluene**	(µg/kg)	<10
Ethyl Benzene**	(µg/kg)	<10
mpXylene**	(µg/kg)	<10
oXylene**	(µg/kg)	<10
1, 2-Dichloroethene-cis**	(µg/kg)	<10
1, 1-Dichloroethane**	(µg/kg)	<10
Chloroform**	(µg/kg)	<10
Carbontetrachloride**	(µg/kg)	<10
1, 1, 1-Trichloroethane**	(µg/kg)	<10
Trichloroethylene**	(µg/kg)	<10
Tetrachloroethylene**	(µg/kg)	<10
1, 1, 1, 2-Tetrachloroethane**	(µg/kg)	<10
1, 1, 2, 2-Tetrachloroethane**	(µg/kg)	<10
Chlorobenzene**	(µg/kg)	<10
Bromobenzene**	(µg/kg)	<10
Bromodichloromethane**	(µg/kg)	<10
Methylethylbenzene**	(µg/kg)	<10
1, 1-Dichloro-1-propene**	(µg/kg)	<10
1, 2-Dichloroethene-trans	(µg/kg)	<10
2, 2-Dichloropropane	(µg/kg)	<10
Bromochloromethane	(µg/kg)	<10
1, 2-Dichloroethane	(µg/kg)	<10
Dibromomethane**	(µg/kg)	<10
1, 2-Dichloropropane**	(µg/kg)	<10
1, 3-Dichloro1propene**	(µg/kg)	<10
1, 3-Dichloro1propene trans	(µg/kg)	<10
1, 1, 2-Trichloroethane	(µg/kg)	<10
Dibromochloromethane	(µg/kg)	<10
1, 3-Dichloropropane	(µg/kg)	<10
Dibromoethane**	(µg/kg)	<10
Styrene	(µg/kg)	<10
Propylbenzene	(µg/kg)	<10
2-Chlorotoluene	(µg/kg)	<10
1, 2, 4-Trimethylbenzene	(µg/kg)	<10
4-Chlorotoluene	(µg/kg)	<10
t-Butylbenzene	(µg/kg)	<10
Trimethylbenzene	(µg/kg)	<10
1-Methylpropylbenzene	(µg/kg)	<10
o-Cymene	(µg/kg)	<10
1, 4-Dichlorobenzene	(µg/kg)	<10
Butylbenzene	(µg/kg)	<10
1, 2-Dibromo-3-chloropropane	(µg/kg)	<10
Hexachlorobutaciene	(µg/kg)	<10
1, 2, 3-Trichlorobenzene	(µg/kg)	<10
1, 2, 4-Trichlorobenzene	(µg/kg)	<10
1, 3-Dichlorobenzene	(µg/kg)	<10
1, 2-Dichlorobenzene	(µg/kg)	<10
Bromoform	(µg/kg)	<10

** - MCERTS accredited test

N. Williams

THE ENVIRONMENTAL LABORATORY LTD

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

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. 51552

Location: Honda Site, Southview Road, Southwick, West Sussex

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No: LW24275
Your Order No: 130736
Reporting Date: 11/11/13

Asbestos Identification

Sample ref:	**WS6**
Depth (m)	**0.30**
Our ref:	**89753**
#Description of Sample Matrix:	Clay loam
***Result**	No asbestos identified

*= UKAS accredited
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

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2683 2683

THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	51552
Your Job No:	LW24275
Sample Receipt Date:	06/11/13
Reporting Date:	11/11/13
Registered:	06/11/13
Prepared:	07/11/13
Analysis complete:	11/11/13

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	08/11/13	118	ICPMS
Cadmium**	Air dried sample	08/11/13	118	ICPMS
Chromium**	Air dried sample	08/11/13	118	ICPMS
Lead**	Air dried sample	08/11/13	118	ICPMS
Mercury**	Air dried sample	08/11/13	118	ICPMS
Nickel**	Air dried sample	08/11/13	118	ICPMS
Copper**	Air dried sample	08/11/13	118	ICPMS
Zinc**	Air dried sample	08/11/13	118	ICPMS
Selenium**	Air dried sample	08/11/13	118	ICPMS
Hexavalent Chromium	As submitted sample	08/11/13	110	Colorimetry
Water Soluble Boron	Air dried sample	08/11/13	202	Colorimetry
pH Value**	Air dried sample	08/11/13	113	Probe
Soil Organic Matter*	Air dried sample	08/11/13	111	Titration
Asbestos*	As submitted sample	11/11/13	179	See note
Speciated PAH**	As submitted sample	08/11/13	133	Gas Chromatography
Carbon Banding (TPH BCB)	As submitted sample	08/11/13	218	Gas Chromatography

Asbestos analysis qualitative only
Note:- Documented In-house procedure based on HSG 248 2005
* = UKAS Accredited test
** - MCERTS Accredited test
Determinands not marked with * or ** are not accredited
MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

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THE ENVIRONMENTAL LABORATORY LTD

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Reporting Date: 19 November 2013

ANALYTICAL REPORT No. AR51679

Samples Received By: Laboratory Courier
Sample Receipt Date: 12/11/13
Your Job No: LW24275
Your Order No: 130722
Site Location: Honda Site, Southview Road, Southwick, West Sussex
No Samples Received: 1
Date of Sampling: ---

This report was written by: G Rouse

Authorised By;

Steve Knight
Reporting Manager

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THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51679

Location: Honda Site, Southview Road, Southwick, West Sussex

2683 2683

Your Job No: LW24275
Your Order No: 130722
Reporting Date: 19/11/13

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soil		Characteristic	Sandy silt
		TP/BH	BH1
		Depth (m)	0.20
		Our ref	90663
Stone Content		(%)	29
Arsenic**		(mg/kg)	8.1
Cadmium**		(mg/kg)	<0.5
Chromium**		(mg/kg)	10
Lead**		(mg/kg)	12
Mercury**		(mg/kg)	<0.5
Nickel**		(mg/kg)	12
Copper**		(mg/kg)	16
Zinc**		(mg/kg)	39
Selenium**		(mg/kg)	<0.5
Hexavalent Chromium		(mg/kg)	<2
Water Soluble Boron		(mg/kg)	<0.5
pH Value**		(Units)	8.4
Soil Organic Matter*		(%)	1.4

All results expressed on dry weight basis
** - MCERTS accredited test
* - UKAS accredited test

G Rouse

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51679

Location: Honda Site, Southview Road, Southwick, West Sussex

Your Job No: LW24275
Your Order No: 130722
Reporting Date: 19/11/13

2683 2683

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soil

Characteristic		Sandy silt loam
TP/BH		BH1
Depth (m)		0.20
Our ref		90663
Naphthalene**	(mg/kg)	0.8
Acenaphthylene**	(mg/kg)	<0.5
Acenaphthene**	(mg/kg)	<0.5
Fluorene**	(mg/kg)	<0.5
Phenanthrene**	(mg/kg)	<0.5
Anthracene**	(mg/kg)	<0.5
Fluoranthene**	(mg/kg)	<0.5
Pyrene**	(mg/kg)	<0.5
Benz(a)anthracene**	(mg/kg)	<0.5
Chrysene**	(mg/kg)	<0.5
Benzo(b)fluoranthene**	(mg/kg)	<0.5
Benzo(k)fluoranthene**	(mg/kg)	<0.5
Benzo(a)pyrene**	(mg/kg)	<0.5
Indeno(123-cd)pyrene**	(mg/kg)	<0.5
Dibenz(ah)anthracene**	(mg/kg)	<0.5
Benzo(ghi)perylene**	(mg/kg)	<0.5
Total PAH**	(mg/kg)	0.8

All results expressed on dry weight basis
** - MCERTS accredited test

G Rouse

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Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR51679

Location: Honda Site, Southview Road, Southwick, West Sussex

2683 2683

Your Job No: LW24275
Your Order No: 130722
Reporting Date: 19/11/13

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Soil

		Characteristic	Sandy silt loam
		TP/BH	BH1
		Depth (m)	0.20
		Our ref	90663
C_8-C_{10}	(mg/kg)		<5
>C_{10}-C_{12}	(mg/kg)		<5
>C_{12}-C_{16}	(mg/kg)		<5
>C_{16}-C_{21}	(mg/kg)		<5
>C_{21}-C_{35}	(mg/kg)		25
Total Petroleum Hydrocarbons**	(mg/kg)		25

Accredited for TPH only, not banding
** - MCERTS Accredited test
All results expressed on dry weight basis

G Rouse

THE ENVIRONMENTAL LABORATORY LTD

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards On Sea, East Sussex, TN38 9BY
Tel: 01424 718618 Fax: 01424 729911

UKAS TESTING
2683

ANALYTICAL REPORT No. AR51679

Location: Honda Site, Southview Road, Southwick, West Sussex

F.A.O. David Harris
Ashdown Site Investigation Limited
The Old Dairy, Swanborough Farm
Swanborough, Lewes,
East Sussex, BN7 9PF

Your Job No:	LW24275
Your Order No:	130722
Reporting Date:	19/11/13

Asbestos Identification

Sample ref:	**BH1**
Depth (m)	**0.20**
Our ref:	**90663**
#Description of Sample Matrix:	Sandy silt loam
***Result**	No asbestos identified

*= UKAS accredited
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

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THE ENVIRONMENTAL LABORATORY LTD

SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number	AR51679
Your Job No:	LW24275
Sample Receipt Date:	12/11/13
Reporting Date:	19/11/13
Registered:	12/11/13
Prepared:	13/11/13
Analysis complete:	19/11/13

TEST METHOD SUMMARY

PARAMETER	Analysis Undertaken on	Date Tested	Method Number	Technique
Arsenic**	Air dried sample	19/11/13	118	ICPMS
Cadmium**	Air dried sample	19/11/13	118	ICPMS
Chromium**	Air dried sample	19/11/13	118	ICPMS
Lead**	Air dried sample	19/11/13	118	ICPMS
Mercury**	Air dried sample	19/11/13	118	ICPMS
Nickel**	Air dried sample	19/11/13	118	ICPMS
Copper**	Air dried sample	19/11/13	118	ICPMS
Zinc**	Air dried sample	19/11/13	118	ICPMS
Selenium**	Air dried sample	19/11/13	118	ICPMS
Hexavalent Chromium	As submitted sample	18/11/13	110	Colorimetry
Water Soluble Boron	Air dried sample	18/11/13	202	Colorimetry
pH Value**	Air dried sample	16/11/13	113	Probe
Soil Organic Matter*	Air dried sample	18/11/13	111	Titration
Asbestos*	As submitted sample	18/11/13	179	See note
Speciated PAH**	As submitted sample	18/11/13	133	Gas Chromatography
Carbon Banding (TPH BCB)**	As submitted sample	15/11/13	218	Gas Chromatography

Asbestos analysis qualitative only
Note:- Documented In-house procedure based on HSG 248 2005
* = UKAS Accredited test
** - MCERTS Accredited test
Determinands not marked with * or ** are not accredited
MCERTS accreditation covers samples which are predominantly sand, clay, loam or combinations of these three soil types

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APPENDIX C

Notes on CLEA

Guidance on Comparing Soil Contamination Data with a Critical Concentration

CLEA Model Chemical Data Inputs

Statistical Analysis Summary Sheets

ASHDOWN SITE INVESTIGATION LIMITED

Notes on the Contaminated Land Exposure Assessment & Calculation of Soil Screening Values

Assessing risk to human health using the CLEA Model

Background to the CLEA Model

The Environment Agency and DEFRA published the Contaminated Land Exposure Assessment (CLEA) model in 2002. The methodology for the generation of assessment criteria was set out within Contaminated Land Reports (CLR) 7 to 10.

Toxicological data reports (TOX documents) for 23 individual contaminants were also published between 2002 and 2004 for use within the CLEA model.

Following the release of the TOX documents the Environment Agency published a series of Soil Guideline Values (SGVs) for the contaminants arsenic, cadmium, chromium, lead, mercury, nickel, selenium, phenol, toluene and ethylbenzene. SGVs are generic assessment criteria developed for three land uses, the assumptions for each land use were included within the CLR reports.

The generic land uses considered were:

- Residential (with and without plant uptake/vegetable growing)
- Allotments
- Commercial and Industrial

The SGVs can be used as preliminary screening values for sites which fit with the conceptual model (assumptions) of the generic land uses.

The CLEA UK version of the model was released in 2005. This model could be used to generate more detailed and site specific assessment criteria. The CLEA UK model could also be used to generate generic assessment criteria for sites which lie outside of the generic land uses.

Current Guidance

In August 2008 the CLR 7 to 10 documents were officially 'withdrawn' by the Environment Agency along with published SGV reports.

Three new guidance documents were released, replacing the withdrawn CLR7-CLR10 documents, these were:

"*Guidance on Comparing Soil Contamination Data with a Critical Concentration",* CIEH/CL:AIRE (May 2008) – replacing CLR7;
"Human health toxicological assessment of contaminants in soil (Science Report SC050021/SR2)" Environment Agency, August 2008 – replacing CLR9; and,
"Updated technical background to the CLEA model (Science Report SC050021/SR3)" , Environment Agency, August 2008 - replacing CLR10

A revised version of the CLEA UK software model (ver 1.04) was also released in conjunction with the revised guidance. The latest version of the model uses purely deterministic calculations to derive assessment criteria.

The Environment Agency website (www.environment-agency.go.uk) presents the latest guidance. They advise that the current schedule of work includes the review, revision if necessary and re-issue of the TOX reports previously published. As each new TOX report is published, the previous one will be withdrawn.

In the absence of official government figures for some of the contaminants Ashdown Site Investigation Ltd have used the CLEA model to generate Soil Screening Values (SSVs) for a number of the priority contaminants. Where possible the chemical data used to generate these figures has

been taken from reports published by the Environment Agency, where no data exists, reference has been made to other published data.

Discussion on Adjustment of Background Daily Intake of Contaminants for Child Targets

As exposure to soils is unlikely to be the sole means through which people may be exposed to a contaminant a background exposure or Mean Daily Intake (MDI) is calculated for each contaminant. Adjustment factors for the MDI are included within Science Report SC050021/SR2 in order to take into consideration the different bodyweights and respiration rates for different age classes.

The starting principle for deriving SSVs is that they are set so that the Average Daily Exposure (ADE) from soils plus the MDI equals the Tolerable Daily Intake (TDI) for that contaminant.

Where the MDI is equal to 50% or greater than TDI then exposure from soils is to be allowed to contribute up to 50% of the TDI when deriving SSVs. When calculating an SSV, this portion of the TDI is referred to as the Tolerable Daily Soil Intake (TDSI).

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.

CLEA Model Chemical Data Inputs

Chemical	Chemical Type	Oral HCV						Inhalation HCV					
		Type	µg kg^{-1} BW day^{-1}	Notes	Compare with oral exposure	Compare with dermal exposure	Compare with inhalation exposure	Type	µg kg^{-1} BW day^{-1}	Notes	Compare with oral exposure	Compare with dermal exposure	Compare with inhalation exposure
Chromium (III)	inorganic	TDI	150	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	TDI	0.03	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Chromium (VI)	inorganic	TDI	1	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0001	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Lead	inorganic	TDI	3.57	Evaluation of certain food additives and contaminants (Fifty-third report of the Joint FAO/WHO Expert Committee on Food Additives). WHO Technical Report Series, No. 896, 2000.	Yes	Yes	No	TDI	0.071	EPAQS, 1998. Lead. Department of the Environment, Transport and the Regions. Expert Panel on Air Quality Standards. London: The Stationary Office. ISBN 0117534471	No	No	Yes
Copper	inorganic	TDI	160	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	TDI	0.286	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Zinc	inorganic	TDI	600	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR	0	No Inhalation HCV	No	No	No
Boron	inorganic	TDI	160	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	TDI	2.9	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Naphthalene	organic	TDI	20	TOX20	Yes	Yes	No	TDI	0.86	TOX20	No	No	Yes
Acenaphthylene	organic	TDI	60	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Acenaphthene	organic	TDI	60	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Fluorene	organic	TDI	40	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Phenanthrene	organic	TDI	12.5	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Anthracene	organic	TDI	300	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Fluoranthene	organic	TDI	12.5	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	No	No	No
Pyrene	organic	TDI	30	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	Yes	NR		LQM/CIEH GAC 2nd Edition (2009)	Yes	No	No
Benz(a)anthracene	organic	ID	0.138	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.00048	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Chrysene	organic	ID	0.2	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0007	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(b)fluoranthene	organic	ID	0.142	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0005	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(k)fluoranthene	organic	ID	0.2	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0007	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(a)pyrene	organic	ID	0.02	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.00007	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Indeno(123-cd)pyrene	organic	ID	0.086	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0003	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Dibenz(ah)anthracene	organic	ID	0.018	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.000063	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes
Benzo(ghi)perylene	organic	ID	0.909	LQM/CIEH GAC 2nd Edition (2009)	Yes	Yes	No	ID	0.0032	LQM/CIEH GAC 2nd Edition (2009)	No	No	Yes

Chemical	Chemical Type	Combine oral and inhalation AC	Oral MDI for Adults		Inhalation MDI for adults		Air-water partition coefficient (K_{aw})		Diffusion coefficient in air	
			µg day^{-1}	Notes	µg day^{-1}	Notes	cm^3 cm^{-3}	Notes (measured or calculated at 283K unless stated)	m^2 s^{-1}	Notes (measured or calculated at 283K unless stated)
Chromium (III)	inorganic	Yes	60.2	LQM/CIEH GAC 2nd Edition (2009)	0.27	LQM/CIEH GAC 2nd Edition (2009)	NR	0	NR	0
Chromium (VI)	inorganic	Yes	6.7	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)	NR	0	NR	0
Lead	inorganic	Yes	31	Environment Agency, 2002. Contaminants in soil: Collation of toxicological data and intake values for humans - lead, TOX 6	2	Department of the Environment, Transport and the Regions. Air Quality Information Archive, http://www.aeat.co.uk/netcen/aqarchive/nonauto/pbdata.html	NR	Inorganic Chemical	NR	Inorganic Chemical
Copper	inorganic	Yes	7000	LQM/CIEH GAC 2nd Edition (2009)	0.68	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical	NR	Inorganic Chemical
Zinc	inorganic	Yes	27000	LQM/CIEH GAC 2nd Edition (2009)	2.4	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical	NR	Inorganic Chemical
Boron	inorganic	Yes	3700	LQM/CIEH GAC 2nd Edition (2009)	0.398	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical	NR	Inorganic Chemical
Naphthalene	organic	Yes	7	TOX20	2.8	TOX20	0.00662	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000652	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthylene	organic	Yes	0.14	LQM/CIEH GAC 2nd Edition (2009)	0.011	LQM/CIEH GAC 2nd Edition (2009)	0.000568	LQM/CIEH GAC 2nd Edition (2009)	0.00000597	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthene	organic	Yes	0.98	LQM/CIEH GAC 2nd Edition (2009)	0.025	LQM/CIEH GAC 2nd Edition (2009)	0.000759	LQM/CIEH GAC 2nd Edition (2009)	0.00000585	LQM/CIEH GAC 2nd Edition (2009)
Fluorene	organic	Yes	0.59	LQM/CIEH GAC 2nd Edition (2009)	0.096	LQM/CIEH GAC 2nd Edition (2009)	0.000412	LQM/CIEH GAC 2nd Edition (2009)	0.00000558	LQM/CIEH GAC 2nd Edition (2009)
Phenanthrene	organic	Yes	1.54	LQM/CIEH GAC 2nd Edition (2009)	0.518	LQM/CIEH GAC 2nd Edition (2009)	0.000143	LQM/CIEH GAC 2nd Edition (2009)	0.00000534	LQM/CIEH GAC 2nd Edition (2009)
Anthracene	organic	Yes	0.08	LQM/CIEH GAC 2nd Edition (2009)	0.041	LQM/CIEH GAC 2nd Edition (2009)	0.000181	LQM/CIEH GAC 2nd Edition (2009)	0.00000536	LQM/CIEH GAC 2nd Edition (2009)
Fluoranthene	organic	Yes	0.35	LQM/CIEH GAC 2nd Edition (2009)	0.084	LQM/CIEH GAC 2nd Edition (2009)	0.0000629	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000501	LQM/CIEH GAC 2nd Edition (2009)
Pyrene	organic	Yes	0.35	LQM/CIEH GAC 2nd Edition (2009)	0.065	LQM/CIEH GAC 2nd Edition (2009)	0.0000564	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000501	LQM/CIEH GAC 2nd Edition (2009)
Benz(a)anthracene	organic	Yes	NR	index dose used	NR	index dose used	0.0000316	Environment Agency, 2008. Science Report - SC050021/SR7	0.0000046	LQM/CIEH GAC 2nd Edition (2009)
Chrysene	organic	Yes	NR	index dose used	NR	index dose used	0.00000318	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000457	LQM/CIEH GAC 2nd Edition (2009)
Benzo(b)fluoranthene	organic	Yes	NR	index dose used	NR	index dose used	0.00000205	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000436	LQM/CIEH GAC 2nd Edition (2009)
Benzo(k)fluoranthene	organic	Yes	NR	index dose used	NR	index dose used	0.00000174	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000436	LQM/CIEH GAC 2nd Edition (2009)
Benzo(a)pyrene	organic	Yes	NR	index dose used	NR	index dose used	0.00000176	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000438	LQM/CIEH GAC 2nd Edition (2009)
Indeno(123-cd)pyrene	organic	Yes	NR	index dose used	NR	index dose used	0.00000205	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000417	LQM/CIEH GAC 2nd Edition (2009)
Dibenz(ah)anthracene	organic	Yes	NR	index dose used	NR	index dose used	0.0000054	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000408	LQM/CIEH GAC 2nd Edition (2009)
Benzo(ghi)perylene	organic	Yes	NR	index dose used	NR	index dose used	0.00000286	Environment Agency, 2008. Science Report - SC050021/SR7	0.00000422	LQM/CIEH GAC 2nd Edition (2009)

Chemical	Chemical Type	Diffusion coefficient in water		Relative molecular mass		Vapour pressure		Water solubility		Organic carbon - water partition coefficient (K_{oc})	
		$m^2 s^{-1}$	Notes (measured or calculated at 283K unless stated)	g mol^{-1}	Notes	Pa	Notes (measured or calculated at 283K and standard pressure unless stated)	mg L^{-1}	Notes (measured or calculated at 283K unless stated)	Log ($cm^3 g^{-1}$)	Notes
Chromium (III)	inorganic	NR	0	NR	0	NR	0	585000	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)
Chromium (VI)	inorganic	NR	0	NR	0	NR	0	2300000	LQM/CIEH GAC 2nd Edition (2009)	NR	LQM/CIEH GAC 2nd Edition (2009)
Lead	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	100000	0	NR	Inorganic Chemical
Copper	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	1378000	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical
Zinc	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	4320000	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical
Boron	inorganic	NR	Inorganic Chemical	NR	Inorganic Chemical	NR	Inorganic Chemical	63500	LQM/CIEH GAC 2nd Edition (2009)	NR	Inorganic Chemical
Naphthalene	organic	5.16E-10	LQM/CIEH GAC 2nd Edition (2009)	128.17	LQM/CIEH GAC 2nd Edition (2009)	2.31	LQM/CIEH GAC 2nd Edition (2009)	19	LQM/CIEH GAC 2nd Edition (2009)	2.81	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthylene	organic	4.82E-10	LQM/CIEH GAC 2nd Edition (2009)	152.19	LQM/CIEH GAC 2nd Edition (2009)	0.0708	LQM/CIEH GAC 2nd Edition (2009)	7.95	LQM/CIEH GAC 2nd Edition (2009)	3.26	LQM/CIEH GAC 2nd Edition (2009)
Acenaphthene	organic	4.7E-10	LQM/CIEH GAC 2nd Edition (2009)	154.21	LQM/CIEH GAC 2nd Edition (2009)	0.0737	LQM/CIEH GAC 2nd Edition (2009)	4.11	LQM/CIEH GAC 2nd Edition (2009)	3.37	LQM/CIEH GAC 2nd Edition (2009)
Fluorene	organic	4.47E-10	LQM/CIEH GAC 2nd Edition (2009)	166.22	LQM/CIEH GAC 2nd Edition (2009)	0.0156	LQM/CIEH GAC 2nd Edition (2009)	1.86	LQM/CIEH GAC 2nd Edition (2009)	3.45	LQM/CIEH GAC 2nd Edition (2009)
Phenanthrene	organic	4.32E-10	LQM/CIEH GAC 2nd Edition (2009)	178.23	LQM/CIEH GAC 2nd Edition (2009)	0.00282	LQM/CIEH GAC 2nd Edition (2009)	1.12	LQM/CIEH GAC 2nd Edition (2009)	3.74	LQM/CIEH GAC 2nd Edition (2009)
Anthracene	organic	4.36E-10	LQM/CIEH GAC 2nd Edition (2009)	178.23	LQM/CIEH GAC 2nd Edition (2009)	0.0000849	LQM/CIEH GAC 2nd Edition (2009)	0.056	LQM/CIEH GAC 2nd Edition (2009)	3.75	LQM/CIEH GAC 2nd Edition (2009)
Fluoranthene	organic	4.11E-10	LQM/CIEH GAC 2nd Edition (2009)	202.25	LQM/CIEH GAC 2nd Edition (2009)	0.000131	LQM/CIEH GAC 2nd Edition (2009)	0.23	LQM/CIEH GAC 2nd Edition (2009)	4.26	LQM/CIEH GAC 2nd Edition (2009)
Pyrene	organic	4.15E-10	LQM/CIEH GAC 2nd Edition (2009)	202.25	LQM/CIEH GAC 2nd Edition (2009)	0.0000153	LQM/CIEH GAC 2nd Edition (2009)	0.13	LQM/CIEH GAC 2nd Edition (2009)	4.21	LQM/CIEH GAC 2nd Edition (2009)
Benz(a)anthracene	organic	3.8E-10	LQM/CIEH GAC 2nd Edition (2009)	228.29	LQM/CIEH GAC 2nd Edition (2009)	0.00000124	LQM/CIEH GAC 2nd Edition (2009)	0.0038	LQM/CIEH GAC 2nd Edition (2009)	4.89	LQM/CIEH GAC 2nd Edition (2009)
Chrysene	organic	3.77E-10	LQM/CIEH GAC 2nd Edition (2009)	228.29	LQM/CIEH GAC 2nd Edition (2009)	4.52E-08	LQM/CIEH GAC 2nd Edition (2009)	0.002	LQM/CIEH GAC 2nd Edition (2009)	4.74	LQM/CIEH GAC 2nd Edition (2009)
Benzo(b)fluoranthene	organic	3.62E-10	LQM/CIEH GAC 2nd Edition (2009)	252.31	LQM/CIEH GAC 2nd Edition (2009)	6.34E-08	LQM/CIEH GAC 2nd Edition (2009)	0.002	LQM/CIEH GAC 2nd Edition (2009)	5.02	LQM/CIEH GAC 2nd Edition (2009)
Benzo(k)fluoranthene	organic	3.62E-10	LQM/CIEH GAC 2nd Edition (2009)	252.31	LQM/CIEH GAC 2nd Edition (2009)	1.64E-08	LQM/CIEH GAC 2nd Edition (2009)	0.0008	LQM/CIEH GAC 2nd Edition (2009)	5.17	LQM/CIEH GAC 2nd Edition (2009)
Benzo(a)pyrene	organic	3.67E-10	LQM/CIEH GAC 2nd Edition (2009)	252.31	LQM/CIEH GAC 2nd Edition (2009)	0.00000002	LQM/CIEH GAC 2nd Edition (2009)	0.0038	LQM/CIEH GAC 2nd Edition (2009)	5.11	LQM/CIEH GAC 2nd Edition (2009)
Indeno(123-cd)pyrene	organic	3.51E-10	LQM/CIEH GAC 2nd Edition (2009)	276.33	LQM/CIEH GAC 2nd Edition (2009)	2.12E-09	LQM/CIEH GAC 2nd Edition (2009)	0.0002	LQM/CIEH GAC 2nd Edition (2009)	4.94	LQM/CIEH GAC 2nd Edition (2009)
Dibenz(ah)anthracene	organic	3.4E-10	LQM/CIEH GAC 2nd Edition (2009)	278.35	LQM/CIEH GAC 2nd Edition (2009)	1.66E-10	LQM/CIEH GAC 2nd Edition (2009)	0.0006	LQM/CIEH GAC 2nd Edition (2009)	5.27	LQM/CIEH GAC 2nd Edition (2009)
Benzo(ghi)perylene	organic	3.56E-10	LQM/CIEH GAC 2nd Edition (2009)	276.33	LQM/CIEH GAC 2nd Edition (2009)	1.55E-10	LQM/CIEH GAC 2nd Edition (2009)	0.00026	LQM/CIEH GAC 2nd Edition (2009)	5.62	LQM/CIEH GAC 2nd Edition (2009)

Chemical	Chemical Type	Octanol - water partition coefficient (K_{ow})		Soil-water partition coefficient (K_d)		Dermal absorption fraction		Soil-plant availability correction	Root - shoot correction factor	Root - root store correction factor	Root - tuber correction factor	Root - fruit correction factor	Soil-to-plant concentration factor (green vegetables)		
		Log (dimensionless)	Notes	$cm^3 g^{-1}$	Notes	dimensionless	Notes	dimensionless	dimensionless	dimensionless	dimensionless	dimensionless	$mg\ g^{-1}$ plant (DW or FW basis) over $mg\ g^{-1}$ DW soil	Type	Notes
Chromium (III)	inorganic	NR	LQM/CIEH GAC 2nd Edition (2009)	4800	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Chromium (VI)	inorganic	NR	LQM/CIEH GAC 2nd Edition (2009)	18	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.0002	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Lead	inorganic	NR	Inorganic Chemical	36000	RIVM report 711701 023, 2001. Technical evaluation of the Intervention Values for Soil/sediment and Groundwater	0	Environment Agency, 2009. Science Report Final SC050021/SR3	5	0.5	0.5	0.5	0.5	0	model	CLEA to estimate
Copper	inorganic	NR	Inorganic Chemical	100	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.0206	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Zinc	inorganic	NR	Inorganic Chemical	38	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	0.5	0.5	0.5	0.5	0.054	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Boron	inorganic	NR	Inorganic Chemical	10	LQM/CIEH GAC 2nd Edition (2009)	0	LQM/CIEH GAC 2nd Edition (2009)	5	1	0.5	0.5	0.5	0.4	numeric fw	LQM/CIEH GAC 2nd Edition (2009)
Naphthalene	organic	3.34	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Acenaphthylene	organic	3.91	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Acenaphthene	organic	4.03	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Fluorene	organic	4.13	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Phenanthrene	organic	4.5	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Anthracene	organic	4.5	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Fluoranthene	organic	5.13	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Pyrene	organic	5.08	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benz(a)anthracene	organic	5.91	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Chrysene	organic	5.73	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(b)fluoranthene	organic	6.08	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(k)fluoranthene	organic	6.26	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(a)pyrene	organic	6.18	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Indeno(123-cd)pyrene	organic	5.97	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Dibenz(ah)anthracene	organic	6.38	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate
Benzo(ghi)perylene	organic	6.81	LQM/CIEH GAC 2nd Edition (2009)	NR		0.13	LQM/CIEH GAC 2nd Edition (2009)	NR	NR	NR	NR	NR	0	model	CLEA to estimate

Chemical	Chemical Type	Soil-to-plant concentration factor (root vegetables)			Soil-to-plant concentration factor (tuber vegetables)			Soil-to-plant concentration factor (herbaceous fruit)			Soil-to-plant concentration factor (shrub fruit)			Soil-to-plant concentration factor (tree fruit)			Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (Dimensionless)
		mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes	mg g^{-1} plant (DW or FW basis) over mg g^{-1} DW soil	Type	Notes		
Chromium (III)	inorganic	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.00003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.5	1
Chromium (VI)	inorganic	0.0001	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0001	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.09	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0003	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.09	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.5	1
Lead	inorganic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Copper	inorganic	0.0206	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0206	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0233	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0206	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.0206	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.5	1
Zinc	inorganic	0.054	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.054	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.143	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.054	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.054	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.5	1
Boron	inorganic	0.2	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.2	numeric fw	LQM/CIEH GAC 2nd Edition (2009)	0.5	1
Naphthalene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Acenaphthylene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Acenaphthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Fluorene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Phenanthrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Anthracene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Fluoranthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Pyrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benz(a)anthracene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Chrysene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(b)fluoranthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(k)fluoranthene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(a)pyrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Indeno(123-cd)pyrene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Dibenz(ah)anthracene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1
Benzo(ghi)perylene	organic	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0	model	CLEA to estimate	0.5	1

Statistical Analysis Summary Sheets

Client/client ref:
Project ref: LW24275
Site ref: Honda Site, Southview Road, Southwick, West Sussex
Data description: Shallow Made Ground and Topsoil
Contaminant(s): Arsenic, Cadmium, Chromium, Lead, Mercury, Nickel, Copper, Zinc, Selenium, Boron

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Copper (mg/kg)	Zinc (mg/kg)	Selenium (mg/kg)	Boron (mg/kg)	Chromium VI (mg/kg)
Critical concentration, C_c	**32**	**10**	**627**	**226**	**170**	**130**	**2330**	**3750**	**350**	**300**	**4.3**
Notes	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake
Sample size, n	6	6	6	6	6	6	6	6	6	6	6
Sample mean, $\bar{X}$	10.5888983	0.38704065	19.1433341	126.57349	0.46569399	18.1067053	19.4343316	117.998877	0.80022764	0.79666667	1
Standard deviation, s	1.98107767	0.22492058	6.50076441	171.742056	0.52834021	5.47944337	6.35467253	82.2051115	0.48421522	0.59689519	0
Number of non-detects	0	**4**	0	0	**5**	0	0	0	**2**	**2**	**6**
Set non-detect 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
Outliers?	No	No	No	No	Yes	No	Yes	No	No	No	No
Distribution	Normal	Non-normal	Normal	Non-normal	Non-normal	Non-normal	Non-normal	Normal	Normal	Normal	Single value
Statistical approach	Auto: One-sample t	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: One-sample t	Auto: One-sample t	Auto: One-sample t	Auto: Chebychev

Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?				**Evidence level required:**		**95%**	Use Normal distribution to test for outliers			
t statistic, t_0 (or k_0)	-26.47360823	-104.6895993	-229.040552	-1.418081401	-785.9945878	-50.01994894	-890.6370672	-108.2237994	-1766.489842	-1227.846211	N/A
Upper confidence limit (on true mean concentration, μ)	12.2186121	0.78728975	24.4911233	432.190719	1.40588228	27.8574462	30.7425543	185.624095	1.19856247	1.28769656	1
Evidence level	**100%**	**100%**	**100%**	**67%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ ≈≥ Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**

Client/client ref:
Project ref: LW24275
Site ref: Honda Site, Southview Road, Southwick, West Sussex
Data description: Shallow Made Ground and Topsoil
Contaminant(s): Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene

	Naphthalene (mg/kg)	Acenaphthylene (mg/kg)	Acenaphthene (mg/kg)	Fluorene (mg/kg)	Phenanthrene (mg/kg)	Anthracene (mg/kg)	Fluoranthene (mg/kg)	Pyrene (mg/kg)
Critical concentration, C_c	**1.5**	**170**	**210**	**160**	**92**	**2300**	**260**	**560**
Notes	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake
Sample size, n	6	6	6	6	6	6	6	6
Sample mean, $\overline{X}$	0.33845075	0.25	0.25	0.25	0.32183888	0.25	0.25	0.31992229
Standard deviation, s	0.2166592	0	0	0	0.1759686	0	0	0.17127392
Number of non-detects	**5**	**6**	**6**	**6**	**5**	**6**	**6**	**5**
Set non-detect 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
Outliers?	Yes	No	No	No	Yes	No	No	Yes
Distribution	Non-normal	Single value	Single value	Single value	Non-normal	Single value	Single value	Non-normal
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev

Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?				**Evidence level required:**		**95%**	Use Normal distribut
t statistic, t_0 (or k_0)	-13.13215891	N/A	N/A	N/A	-1276.163589	N/A	N/A	-8004.31612
Upper confidence limit (on true mean concentration, μ)	0.72399861	0.25	0.25	0.25	0.63497729	0.25	0.25	0.62470646
Evidence level	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**

Client/client ref:
Project ref: LW24275
Site ref: Honda Site, Southview Road, Southwick, West Sussex
Data description: Shallow Made Ground and Topsoil
Contaminant(s): Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene

	Benz(a)anthracene (mg/kg)	Chrysene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Benzo(a)pyrene (mg/kg)	Indeno(123-cd)pyrene (mg/kg)	Dibenz(ah)anthracene (mg/kg)	Benzo(ghi)perylene (mg/kg)
Critical concentration, C_c	**3.1**	**6**	**5.6**	**8.5**	**0.83**	**3.2**	**0.76**	**44**
Notes	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake	ASI Ltd SSV Residential with Plant Uptake
Sample size, n	6	6	6	6	6	6	6	6
Sample mean, $\overline{X}$	0.36563052	0.50109561	0.35982403	0.47151913	0.45116774	0.35388039	0.25	0.34177485
Standard deviation, s	0.28323578	0.45850306	0.26901284	0.39210552	0.33221326	0.16096591	0	0.22480156
Number of non-detects	**5**	**4**	**5**	**4**	**4**	**4**	**6**	**5**
Set non-detect 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
Outliers?	Yes	Yes	Yes	Yes	No	No	No	Yes
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Single value	Non-normal
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev

Test scenario:	tion to test for outliers							
t statistic, t_0 (or k_0)	-23.64747108	-29.37714257	-47.71429268	-50.1540546	-2.793223125	-43.31066593	N/A	-475.7101153
Upper confidence limit (on true mean concentration, μ)	0.86965229	1.31700779	0.83853588	1.16927601	1.04234556	0.64032133	0.25	0.74181215
Evidence level	**100%**	**100%**	**100%**	**100%**	**89%**	**100%**	**100%**	**100%**
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level
Result	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**	**μ ≈≥ Cc**	**μ < Cc**	**μ < Cc**	**μ < Cc**

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 680 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	13.804	0.254	0.0	1.1	O K
30 min Summer	13.853	0.303	0.0	1.5	O K
60 min Summer	13.896	0.346	0.0	2.0	O K
120 min Summer	13.933	0.383	0.0	2.4	Flood Risk
180 min Summer	13.951	0.401	0.0	2.7	Flood Risk
240 min Summer	13.960	0.410	0.0	2.8	Flood Risk
360 min Summer	13.970	0.420	0.0	2.9	Flood Risk
480 min Summer	13.973	0.423	0.0	3.0	Flood Risk
600 min Summer	13.975	0.425	0.0	3.0	Flood Risk
720 min Summer	13.976	0.426	0.0	3.0	Flood Risk
960 min Summer	13.976	0.426	0.0	3.0	Flood Risk
1440 min Summer	13.971	0.421	0.0	2.9	Flood Risk
2160 min Summer	13.960	0.410	0.0	2.8	Flood Risk
2880 min Summer	13.946	0.396	0.0	2.6	Flood Risk
4320 min Summer	13.919	0.369	0.0	2.3	O K
5760 min Summer	13.895	0.345	0.0	2.0	O K
7200 min Summer	13.874	0.324	0.0	1.7	O K
8640 min Summer	13.855	0.305	0.0	1.5	O K
10080 min Summer	13.838	0.288	0.0	1.4	O K
15 min Winter	13.823	0.273	0.0	1.2	O K
30 min Winter	13.873	0.323	0.0	1.7	O K
60 min Winter	13.919	0.369	0.0	2.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	121.090	0.0	19
30 min Summer	81.353	0.0	34
60 min Summer	52.120	0.0	64
120 min Summer	32.198	0.0	122
180 min Summer	23.910	0.0	182
240 min Summer	19.209	0.0	242
360 min Summer	14.146	0.0	360
480 min Summer	11.363	0.0	460
600 min Summer	9.579	0.0	510
720 min Summer	8.327	0.0	570
960 min Summer	6.669	0.0	694
1440 min Summer	4.867	0.0	968
2160 min Summer	3.545	0.0	1384
2880 min Summer	2.827	0.0	1788
4320 min Summer	2.051	0.0	2592
5760 min Summer	1.632	0.0	3344
7200 min Summer	1.367	0.0	4104
8640 min Summer	1.183	0.0	4840
10080 min Summer	1.048	0.0	5552
15 min Winter	121.090	0.0	19
30 min Winter	81.353	0.0	33
60 min Winter	52.120	0.0	62

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	13.959	0.409	0.0	2.8	Flood Risk
180 min Winter	13.978	0.428	0.0	3.0	Flood Risk
240 min Winter	13.988	0.438	0.0	3.2	Flood Risk
360 min Winter	13.999	0.449	0.0	3.3	Flood Risk
480 min Winter	14.004	0.454	0.1	3.4	Flood Risk
600 min Winter	14.006	0.456	0.1	3.4	Flood Risk
720 min Winter	14.005	0.455	0.1	3.4	Flood Risk
960 min Winter	14.004	0.454	0.1	3.4	Flood Risk
1440 min Winter	13.996	0.446	0.0	3.3	Flood Risk
2160 min Winter	13.979	0.429	0.0	3.0	Flood Risk
2880 min Winter	13.959	0.409	0.0	2.8	Flood Risk
4320 min Winter	13.922	0.372	0.0	2.3	Flood Risk
5760 min Winter	13.888	0.338	0.0	1.9	O K
7200 min Winter	13.860	0.310	0.0	1.6	O K
8640 min Winter	13.835	0.285	0.0	1.3	O K
10080 min Winter	13.813	0.263	0.0	1.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
120 min Winter	32.198	0.0	120
180 min Winter	23.910	0.0	178
240 min Winter	19.209	0.0	236
360 min Winter	14.146	0.0	350
480 min Winter	11.363	0.0	460
600 min Winter	9.579	0.0	564
720 min Winter	8.327	0.0	602
960 min Winter	6.669	0.0	740
1440 min Winter	4.867	0.0	1050
2160 min Winter	3.545	0.0	1492
2880 min Winter	2.827	0.0	1928
4320 min Winter	2.051	0.0	2728
5760 min Winter	1.632	0.0	3520
7200 min Winter	1.367	0.0	4256
8640 min Winter	1.183	0.0	5016
10080 min Winter	1.048	0.0	5752

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.006

Time (mins) From:	To:	Area (ha)
0	4	0.006

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Model Details

Storage is Online Cover Level (m) 14.220

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00720	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	11.5
Max Percolation (l/s)	15.3	Slope (1:X)	23.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	13.550	Cap Volume Depth (m)	0.000

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Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 1241 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	12.165	0.150	0.1	4.0	O K
30 min Summer	12.222	0.207	0.1	5.5	O K
60 min Summer	12.281	0.266	0.1	7.1	O K
120 min Summer	12.340	0.325	0.1	8.7	O K
180 min Summer	12.372	0.357	0.1	9.6	O K
240 min Summer	12.391	0.376	0.1	10.1	Flood Risk
360 min Summer	12.416	0.401	0.1	10.7	Flood Risk
480 min Summer	12.430	0.415	0.1	11.1	Flood Risk
600 min Summer	12.437	0.422	0.1	11.3	Flood Risk
720 min Summer	12.440	0.425	0.1	11.4	Flood Risk
960 min Summer	12.438	0.423	0.1	11.3	Flood Risk
1440 min Summer	12.427	0.412	0.1	11.0	Flood Risk
2160 min Summer	12.406	0.391	0.1	10.5	Flood Risk
2880 min Summer	12.383	0.368	0.1	9.9	Flood Risk
4320 min Summer	12.337	0.322	0.1	8.6	O K
5760 min Summer	12.294	0.279	0.1	7.5	O K
7200 min Summer	12.255	0.240	0.1	6.4	O K
8640 min Summer	12.219	0.204	0.1	5.5	O K
10080 min Summer	12.187	0.172	0.1	4.6	O K
15 min Winter	12.186	0.171	0.1	4.6	O K
30 min Winter	12.249	0.234	0.1	6.3	O K
60 min Winter	12.316	0.301	0.1	8.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	121.090	0.0	19
30 min Summer	81.353	0.0	34
60 min Summer	52.120	0.0	64
120 min Summer	32.198	0.0	124
180 min Summer	23.910	0.0	182
240 min Summer	19.209	0.0	242
360 min Summer	14.146	0.0	362
480 min Summer	11.363	0.0	482
600 min Summer	9.579	0.0	602
720 min Summer	8.327	0.0	720
960 min Summer	6.669	0.0	934
1440 min Summer	4.867	0.0	1154
2160 min Summer	3.545	0.0	1536
2880 min Summer	2.827	0.0	1936
4320 min Summer	2.051	0.0	2764
5760 min Summer	1.632	0.0	3568
7200 min Summer	1.367	0.0	4320
8640 min Summer	1.183	0.0	5096
10080 min Summer	1.048	0.0	5752
15 min Winter	121.090	0.0	19
30 min Winter	81.353	0.0	33
60 min Winter	52.120	0.0	62

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	12.383	0.368	0.1	9.9	Flood Risk
180 min Winter	12.419	0.404	0.1	10.8	Flood Risk
240 min Winter	12.441	0.426	0.1	11.4	Flood Risk
360 min Winter	12.472	0.457	0.1	12.2	Flood Risk
480 min Winter	12.490	0.475	0.1	12.7	Flood Risk
600 min Winter	12.500	0.485	0.1	13.0	Flood Risk
720 min Winter	12.506	0.491	0.1	13.2	Flood Risk
960 min Winter	12.510	0.495	0.1	13.2	Flood Risk
1440 min Winter	12.496	0.481	0.1	12.9	Flood Risk
2160 min Winter	12.467	0.452	0.1	12.1	Flood Risk
2880 min Winter	12.435	0.420	0.1	11.3	Flood Risk
4320 min Winter	12.366	0.351	0.1	9.4	O K
5760 min Winter	12.300	0.285	0.1	7.6	O K
7200 min Winter	12.240	0.225	0.1	6.0	O K
8640 min Winter	12.187	0.172	0.1	4.6	O K
10080 min Winter	12.142	0.127	0.1	3.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
120 min Winter	32.198	0.0	122
180 min Winter	23.910	0.0	180
240 min Winter	19.209	0.0	240
360 min Winter	14.146	0.0	356
480 min Winter	11.363	0.0	472
600 min Winter	9.579	0.0	588
720 min Winter	8.327	0.0	700
960 min Winter	6.669	0.0	924
1440 min Winter	4.867	0.0	1340
2160 min Winter	3.545	0.0	1664
2880 min Winter	2.827	0.0	2108
4320 min Winter	2.051	0.0	2984
5760 min Winter	1.632	0.0	3808
7200 min Winter	1.367	0.0	4608
8640 min Winter	1.183	0.0	5352
10080 min Winter	1.048	0.0	5960

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.020

Time (mins) From:	To:	Area (ha)
0	4	0.020

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Model Details

Storage is Online Cover Level (m) 12.675

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00720	Width (m)	7.2
Membrane Percolation (mm/hr)	1000	Length (m)	12.4
Max Percolation (l/s)	24.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	12.015	Cap Volume Depth (m)	0.000

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Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 1122 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	12.426	0.136	0.3	12.7	O K
30 min Summer	12.477	0.187	0.3	17.5	O K
60 min Summer	12.532	0.242	0.3	22.6	O K
120 min Summer	12.586	0.296	0.3	27.7	O K
180 min Summer	12.615	0.325	0.3	30.3	O K
240 min Summer	12.632	0.342	0.3	31.9	O K
360 min Summer	12.654	0.364	0.3	34.0	Flood Risk
480 min Summer	12.666	0.376	0.3	35.1	Flood Risk
600 min Summer	12.671	0.381	0.3	35.6	Flood Risk
720 min Summer	12.673	0.383	0.3	35.8	Flood Risk
960 min Summer	12.670	0.380	0.3	35.5	Flood Risk
1440 min Summer	12.660	0.370	0.3	34.5	Flood Risk
2160 min Summer	12.639	0.349	0.3	32.6	O K
2880 min Summer	12.617	0.327	0.3	30.5	O K
4320 min Summer	12.572	0.282	0.3	26.4	O K
5760 min Summer	12.531	0.241	0.3	22.5	O K
7200 min Summer	12.493	0.203	0.3	19.0	O K
8640 min Summer	12.460	0.170	0.3	15.9	O K
10080 min Summer	12.431	0.141	0.3	13.2	O K
15 min Winter	12.444	0.154	0.3	14.4	O K
30 min Winter	12.502	0.212	0.3	19.8	O K
60 min Winter	12.564	0.274	0.3	25.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	120.726	0.0	19
30 min Summer	81.228	0.0	34
60 min Summer	52.120	0.0	64
120 min Summer	32.243	0.0	124
180 min Summer	23.959	0.0	182
240 min Summer	19.268	0.0	242
360 min Summer	14.194	0.0	362
480 min Summer	11.407	0.0	482
600 min Summer	9.619	0.0	600
720 min Summer	8.364	0.0	720
960 min Summer	6.702	0.0	878
1440 min Summer	4.895	0.0	1112
2160 min Summer	3.567	0.0	1512
2880 min Summer	2.846	0.0	1904
4320 min Summer	2.066	0.0	2724
5760 min Summer	1.644	0.0	3512
7200 min Summer	1.378	0.0	4256
8640 min Summer	1.194	0.0	5008
10080 min Summer	1.057	0.0	5656
15 min Winter	120.726	0.0	19
30 min Winter	81.228	0.0	33
60 min Winter	52.120	0.0	62

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	12.626	0.336	0.3	31.4	O K
180 min Winter	12.658	0.368	0.3	34.4	Flood Risk
240 min Winter	12.679	0.389	0.3	36.3	Flood Risk
360 min Winter	12.705	0.415	0.3	38.8	Flood Risk
480 min Winter	12.721	0.431	0.3	40.3	Flood Risk
600 min Winter	12.730	0.440	0.3	41.1	Flood Risk
720 min Winter	12.734	0.444	0.3	41.5	Flood Risk
960 min Winter	12.735	0.445	0.3	41.6	Flood Risk
1440 min Winter	12.719	0.429	0.3	40.1	Flood Risk
2160 min Winter	12.692	0.402	0.3	37.6	Flood Risk
2880 min Winter	12.659	0.369	0.3	34.5	Flood Risk
4320 min Winter	12.592	0.302	0.3	28.2	O K
5760 min Winter	12.528	0.238	0.3	22.2	O K
7200 min Winter	12.471	0.181	0.3	16.9	O K
8640 min Winter	12.423	0.133	0.3	12.4	O K
10080 min Winter	12.384	0.094	0.3	8.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
120 min Winter	32.243	0.0	122
180 min Winter	23.959	0.0	180
240 min Winter	19.268	0.0	238
360 min Winter	14.194	0.0	356
480 min Winter	11.407	0.0	472
600 min Winter	9.619	0.0	584
720 min Winter	8.364	0.0	700
960 min Winter	6.702	0.0	920
1440 min Winter	4.895	0.0	1298
2160 min Winter	3.567	0.0	1624
2880 min Winter	2.846	0.0	2080
4320 min Winter	2.066	0.0	2944
5760 min Winter	1.644	0.0	3752
7200 min Winter	1.378	0.0	4536
8640 min Winter	1.194	0.0	5192
10080 min Winter	1.057	0.0	5848

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.347	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.064

Time (mins) From:	To:	Area (ha)
0	4	0.064

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Model Details

Storage is Online Cover Level (m) 12.950

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00720	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	64.9
Max Percolation (l/s)	86.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	12.290	Cap Volume Depth (m)	0.000

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Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 1419 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	12.328	0.163	0.0	2.0	O K
30 min Summer	12.390	0.225	0.0	2.8	O K
60 min Summer	12.456	0.291	0.0	3.6	O K
120 min Summer	12.523	0.358	0.0	4.4	O K
180 min Summer	12.559	0.394	0.0	4.9	Flood Risk
240 min Summer	12.581	0.416	0.0	5.2	Flood Risk
360 min Summer	12.611	0.446	0.0	5.5	Flood Risk
480 min Summer	12.629	0.464	0.0	5.7	Flood Risk
600 min Summer	12.639	0.474	0.0	5.9	Flood Risk
720 min Summer	12.645	0.480	0.0	5.9	Flood Risk
960 min Summer	12.647	0.482	0.0	6.0	Flood Risk
1440 min Summer	12.637	0.472	0.0	5.8	Flood Risk
2160 min Summer	12.616	0.451	0.0	5.6	Flood Risk
2880 min Summer	12.594	0.429	0.0	5.3	Flood Risk
4320 min Summer	12.548	0.383	0.0	4.7	Flood Risk
5760 min Summer	12.504	0.339	0.0	4.2	O K
7200 min Summer	12.463	0.298	0.0	3.7	O K
8640 min Summer	12.426	0.261	0.0	3.2	O K
10080 min Summer	12.391	0.226	0.0	2.8	O K
15 min Winter	12.350	0.185	0.0	2.3	O K
30 min Winter	12.419	0.254	0.0	3.2	O K
60 min Winter	12.494	0.329	0.0	4.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	120.533	0.0	19
30 min Summer	81.373	0.0	34
60 min Summer	52.391	0.0	64
120 min Summer	32.504	0.0	124
180 min Summer	24.180	0.0	182
240 min Summer	19.473	0.0	242
360 min Summer	14.368	0.0	362
480 min Summer	11.560	0.0	482
600 min Summer	9.757	0.0	602
720 min Summer	8.490	0.0	720
960 min Summer	6.809	0.0	960
1440 min Summer	4.980	0.0	1214
2160 min Summer	3.634	0.0	1580
2880 min Summer	2.902	0.0	1988
4320 min Summer	2.109	0.0	2808
5760 min Summer	1.680	0.0	3624
7200 min Summer	1.410	0.0	4392
8640 min Summer	1.222	0.0	5184
10080 min Summer	1.083	0.0	5856
15 min Winter	120.533	0.0	19
30 min Winter	81.373	0.0	33
60 min Winter	52.391	0.0	64

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	12.570	0.405	0.0	5.0	Flood Risk
180 min Winter	12.611	0.446	0.0	5.5	Flood Risk
240 min Winter	12.637	0.472	0.0	5.8	Flood Risk
360 min Winter	12.673	0.508	0.0	6.3	Flood Risk
480 min Winter	12.695	0.530	0.0	6.6	Flood Risk
600 min Winter	12.710	0.545	0.0	6.7	Flood Risk
720 min Winter	12.718	0.553	0.0	6.9	Flood Risk
960 min Winter	12.726	0.561	0.0	6.9	Flood Risk
1440 min Winter	12.719	0.554	0.0	6.9	Flood Risk
2160 min Winter	12.690	0.525	0.0	6.5	Flood Risk
2880 min Winter	12.659	0.494	0.0	6.1	Flood Risk
4320 min Winter	12.591	0.426	0.0	5.3	Flood Risk
5760 min Winter	12.523	0.358	0.0	4.4	O K
7200 min Winter	12.461	0.296	0.0	3.7	O K
8640 min Winter	12.403	0.238	0.0	2.9	O K
10080 min Winter	12.352	0.187	0.0	2.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
120 min Winter	32.504	0.0	122
180 min Winter	24.180	0.0	180
240 min Winter	19.473	0.0	240
360 min Winter	14.368	0.0	356
480 min Winter	11.560	0.0	472
600 min Winter	9.757	0.0	588
720 min Winter	8.490	0.0	702
960 min Winter	6.809	0.0	930
1440 min Winter	4.980	0.0	1358
2160 min Winter	3.634	0.0	1708
2880 min Winter	2.902	0.0	2160
4320 min Winter	2.109	0.0	3068
5760 min Winter	1.680	0.0	3920
7200 min Winter	1.410	0.0	4688
8640 min Winter	1.222	0.0	5456
10080 min Winter	1.083	0.0	6160

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Shortest Storm (mins)	15
Ratio R	0.340	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)
0	4	0.010

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Model Details

Storage is Online Cover Level (m) 12.825

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00720	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	8.6
Max Percolation (l/s)	11.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	12.165	Cap Volume Depth (m)	0.000

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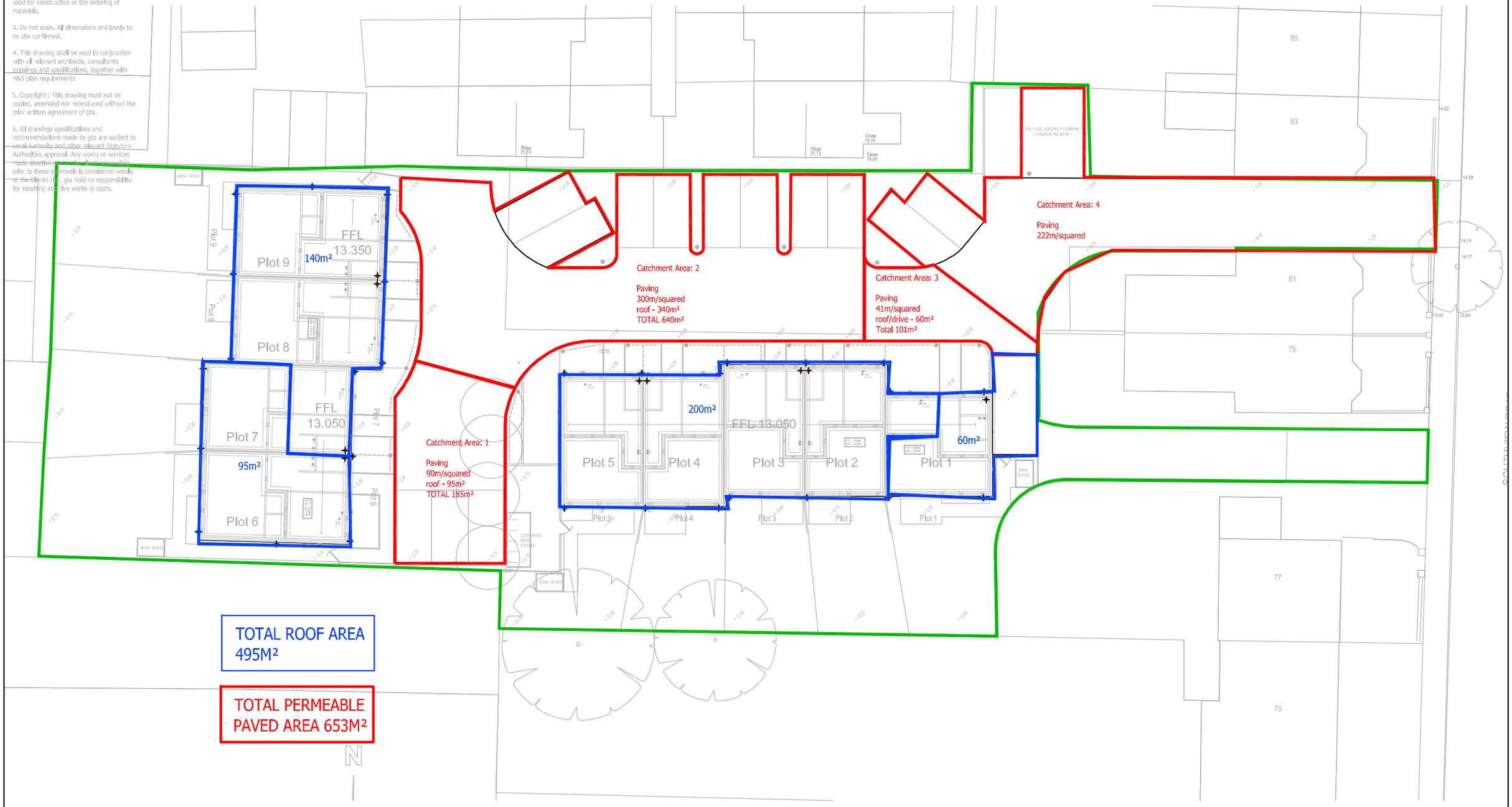
Rev	Amendments	Date	Dsn	Chk
-	Initial Issue	28.11.13	LT	MR



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Client	MUMFORD DEVELOPMENTS LTD
Architect	C25 DESIGN
Project	77-83 SOUTHVIEW ROAD SOUTHWICK
Title	PERMEABLE PAVING CATCHMENT AREAS
Status	PRELIMINARY
Date	NOVEMBER 2013
Scale @ A3	1:250
Drawing Number	4999/106
Rev.	-

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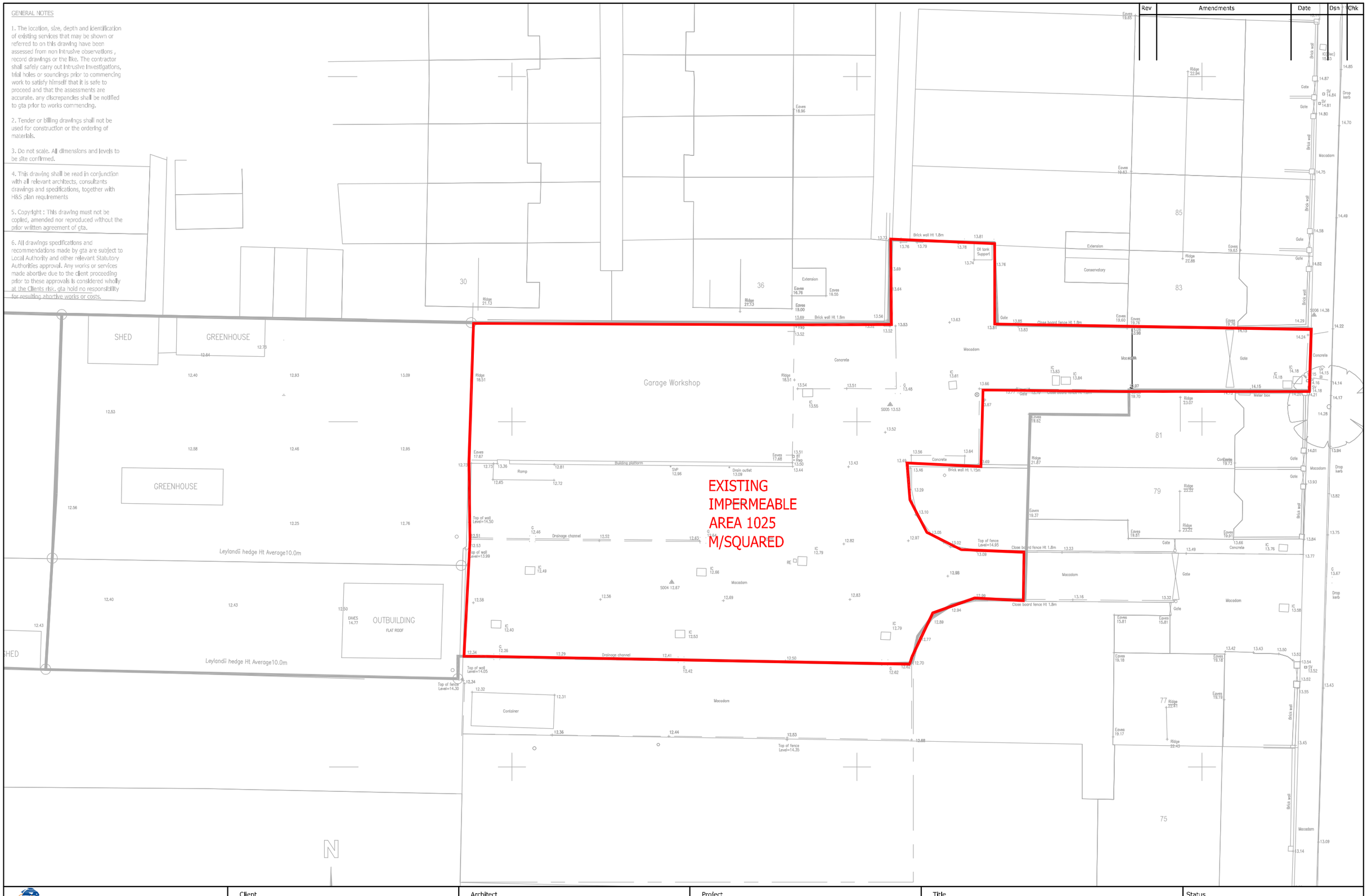
Rev	Amendments	Date	Dsn	Chk

EXISTING IMPERMEABLE AREA 1025 M/SQUARED



gta civils ltd CONSULTING ENGINEERS gloucester house, 66a church walk, burgess Hill, west sussex, rh15 9as tel.01444 871444 fax.01444 871401 web: www.gtacivils.co.uk	Client MUMFORD DEVELOPMENTS LTD	Architect C25 DESIGN	Project 77-83 SOUTHVIEW ROAD SOUTHWICK	Title EXISTING IMPERMEABLE AREAS

Status	PRELIMINARY
Date	NOVEMBER 2013
Scale @ A3	1:250
Drawing Number	4999/107
Rev.	-