

RDM
Environmental and Geotechnical Engineering Ltd

REPORT
on a
PHASE II INTRUSIVE ASSESSMENT
and
GEOTECHNICAL INVESTIGATION
at the site of the proposed
HEART OF ENGLAND BOXING CLUB
LEICESTER ROAD,
HINCKLEY,
LEICESTERSHIRE LE10 3DR

For:

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1. EXECUTIVE SUMMARY

1.1. General

1.1.1. This executive summary should be read in conjunction with the whole report to avoid omission of relevant and important information.

1.1.2. The proposed development area at Hinckley Rugby Club, Leicester Road, Hinckley is currently part of a sports complex inclusive of the Hinckley Rugby Club and Hinckley Town Cricket Club. The site itself is associated with the cricket field and occupies an area within the northeast of the field.

1.2. Geology

1.2.1. Reference to geological maps published by the British Geological Survey (BGS) indicates that the site is underlain by bedrock deposits of Mercia Mudstone Group (MMG) and Bosworth Clay, with superficial deposits of the Thrussington Member which is a glaciogenic clay formation.

1.2.2. The MMG is the dominant formation and this was formed during the mid Triassic Period (246 million years ago) in hot and dry (desert) conditions with minimal rainfall, resulting in the near surface soils being interspersed with subordinate layers of anhydrites (gypsum).

1.2.3. The Bosworth Clay was not readily identified in the samples recovered from the boreholes, however a thin layer (nominally around 0.50m) of Thrussington Member was identified. This is a glaciogenic deposit formed during the mid-Pleistocene Epoch, around 420 thousand years ago.

1.3. Contamination

1.3.1. The site has formerly been used as an area where excess top-soil, grass cuttings and general grounds maintenance waste has been stored/piled, prior to disposal. Consequently, it was considered that some contamination may exist in stock-piled soils or through association with maintenance machinery/vehicles accessing the site. Contamination may also occur naturally.

1.3.2. However, testing for naturally occurring metalloids, such as arsenic (As) or lead (Pb), for polyaromatic hydrocarbons, associated with presence of oil/fuel spillages and for the presence of bituminous materials or asbestos has shown that no significant risk to human health exists.

1.3.3. Waste acceptance criteria (WAC) testing has shown that waste soils will be inert and thus designated as acceptable for inert landfill sites.

1.4. Preliminary Engineering Recommendations

- 1.4.1. During the investigation, the near surface soils of the MMG were shown to have an affinity with water so that clays encountered had quite a high moisture content. A small borehole rig was used to advance six boreholes, and at depths of around 3.00m below ground level (bgl) in the deeper bores, this affinity manifested as localised pockets of softer silty clay or saturated (running) sand and silt.
- 1.4.2. The consequence of these features is that they contribute a factor of significant variation in the ability of the soils to resist vertical loading, which can lead to distortion of built structures through differential settlement. So, a raft type founding solution will be the most suitable method of founding. It will also be necessary to include measures to improve soil stability in soils beneath the proposed structure.
- 1.4.3. Further discussion is given in the Engineering Assessment and Recommendations section of the report.

1.5. Drainage

- 1.5.1. Despite having an affinity with water, the passage of groundwater through the near surface soils is too slow for the soils to be considered as suitable for soakaways. Consequently, surface water will need to be dissipated via a method of attenuation before being discharged into drainage ditches evident at the side of the neighbouring highway, and at the northern boundary.

2. INTRODUCTION

- 2.1. This report has been prepared by RDM Environmental and Geotechnical Engineering Ltd on the instruction of Mr Jack Geary of Corporate Architecture Limited, Market Harborough, on behalf of Mr Nick Griffin who proposes to develop the site for commercial purposes.
- 2.2. The proposals were outlined in a fee quote to Mr Geary dated 18th January 2024 reference *Enq - FQ- RDM E2058 - 2024.01.18 - SI Prpsd Boxing Club at Leicester Rd Hinckley*, and this report follows the works outlined in the fee quotation.
- 2.3. Where applicable, this report has been prepared generally in accordance with EA procedures given in Land Contamination: Risk Management (LCRM 2019) and to satisfy the requirements of Part C of the Building Regulations. Where appropriate it also takes account of the requirements for land quality management in the NHBC Standards and the National Planning Policy Framework (NPPF).
- 2.4. To minimise on costs, a phase II detailed quantitative risk assessment (DQRA) was initiated as the site was suspected to be contaminated, albeit to a small extent. This would identify any risk to human health and provide the basis for a remediation scheme.
- 2.5. As part of the assessment, a site reconnaissance was made to obtain visual evidence of potential pollution linkages that may have been present on site, or in the immediate vicinity, and thereby assess the pollution linkages that maybe present on the site. On this basis, a program of testing was devised for a series of recovered samples.
- 2.6. To complement the environmental assessment, a geotechnical investigation was undertaken to assess the soil engineering properties of the site. Results are discussed in the Engineering Recommendations section of the report.
- 2.7. The conditions stated in the final appendix to this report were applied to this investigation and the report is to be read and construed accordingly.

3. SITE LOCATION

- 3.1. The site is located at National Grid reference 444831 , 295796. It lies 3km northeast of the centre of Hinckley and is accessed from the B4668 Leicester Road.
- 3.2. The site is non-regular in shape and occupies an area in a northeast section of Hinckley Town Cricket Club. The area of the site is less than 0.1Ha.
- 3.3. Summary details of the site boundaries and adjacent land use are:

Boundary	Boundary Construction	Adjacent Land Use	Proximal Land Use
North	Hedgerow/trees/ditch	Commercial	Agricultural/Commercial
East	Hedgerow/trees/ditch	Highway (B4668)	Agricultural/Commercial
South	Mesh fence	Commercial	Agricultural/Commercial
West	Low wooden fence	Commercial	Agricultural/Commercial

4. FIELDWORK

- 4.1. On Thursday 25th January 2024, the site was attended with a small borehole rig (window sampler) to undertake a series of boreholes so that the engineering properties of the soils on the site could be identified.
- 4.2. Locations for each of the boreholes was decided after a brief site survey to identify any buried services, and these were arranged so that soil data for both the access road and foundations of the proposed building could be recorded.
- 4.3. In total, six windowless boreholes (WSBH1-WSBH6) were advanced to depths of between 1.00m and 4.00m around the site and standard penetration tests were undertaken in accordance with BS1377 Part 9.
- 4.4. WSBH1-WSBH3 were advanced to just 1.00m so that soil data can be used to provide an engineering solution for an access road, whilst the remaining three (WSBH4-WSBH6) were used to determine the bearing capacity of deeper soils for foundation purposes. A dynamic probe (DP1) was also deployed to complement data generated from the boreholes.
- 4.5. A standard penetration test (SPT) involves counting the number of blows required to drive a standard 50.8mm diameter cone a distance of 300mm vertically through the soil using a 63.5kg monkey falling dropped from a height of 760mm. This data is then considered together with the type of soils present. Where the number of blows (SPT(N)), required to achieve the 300mm penetration, exceeds 50 a refusal is recorded.
- 4.6. Samples were recovered from the windowless boreholes and these were logged under laboratory conditions. Driller's logs were used to generate borehole logs and these are appended to this report.
- 4.7. Fieldwork also included an assessment of the infiltration properties of the soils, and this was undertaken in a selected borehole using a PPG4 falling head test rather than a BRE 365. This was done to minimise costs as a low infiltration rate was expected for the site-specific soils. Results are discussed in the Engineering Assessment and Recommendations section.
- 4.8. The site was also tested for contamination and four locations were selected for sampling. Only one area (stock-piled top-soils in the northeast corner) was actually suspected of containing elevated levels of contaminants, but this was based on visually evident fragmented masonry (concrete and brick) and not on specific identification of e.g. bituminous materials or asbestos containing materials (ACMs).

- 4.9. Samples recovered from the boreholes were transported to a laboratory where they were subject to logging, scheduling and testing for determination of various geotechnical properties.
- 4.10. Small disturbed samples of the strata encountered were recovered from shallow trial pits, placed in suitable containers and taken to a laboratory for contamination testing.

5. LABORATORY TESTING

- 5.1. A programme of geotechnical testing was scheduled and carried out in accordance with the requirements of BS1377:1990. Samples from varying depths were tested for moisture content, Atterberg Limits (classification tests) and for pH value and sulphate content.
- 5.2. The laboratory testing to determine geotechnical properties of the near surface soils was undertaken by Soil Property Testing of Huntingdon. Soil Property Testing also follow a Quality Audit system which has been designed to ensure continual compliance to BSEN ISO/IEC 17025:2005. The laboratory is also regularly audited by UKAS and holds accreditation for specific tests identified.
- 5.3. A programme of contamination testing was scheduled and carried out following the site reconnaissance survey and review of the desktop data. Reference was also made to the Industrial Profiles produced by the EA but these were not considered applicable.
- 5.4. Laboratory testing to determine environmental properties of the near surface soils was CTS Group of Leicester. Testing was undertaken and, where shown in the results, MCERTS accreditation was provided. CTS Group also follow a Quality Audit system which has been designed to ensure continual compliance to BSEN ISO/IEC 17025:2005. The laboratory is also regularly audited by UKAS and holds accreditation for specific tests identified.
- 5.5. As prior information about the site and the walkover survey revealed a possibility that some contamination may exist, the following programme of contamination testing on the near-surface soils across the site was scheduled for the following contaminants:
- | | |
|--------------------------|--|
| Arsenic | Speciated Poly-Aromatic Hydrocarbons (PAH). |
| Cadmium | Chromium |
| Copper | Chromium (Hexavalent) (if total significant) |
| Lead | Mercury |
| Nickel | Selenium |
| Sulphate (water soluble) | Zinc |
| Total Cyanide | Free Cyanide (if total significant) |
| PH | Sulphide (acid soluble) |
- 5.6. The results of all the laboratory tests are appended.

6. GENERAL GEOLOGY AND REVEALED STRATA

- 6.1. The geological maps produced by the British Geological Survey for the area indicates that the site has superficial deposits of Thrussington Member, from the Quaternary Period, overlying bedrock material from the Mercia Mudstone Group (formerly Keuper Marl). The map indicates that the bedrock is often greater than a kilometre in thickness in the Leicestershire region.
- 6.2. The Thrussington Member was revealed as red-brown firm moist clay with occasional gravel. The lower horizon of the clay was difficult to discern, but it was generally considered that the layer extended no more than 0.9m below ground level (bgl) with an overlying top-soil layer of around 0.40m thickness. Hence, the clay layer is around 0.50m in thickness.
- 6.3. The weathered upper horizon of the Mercia Mudstone Group was identified from a depth of 0.90m bgl to 4.00m bgl as a reddish-brown and grey marl. Within the stratum, the water table was also encountered where a greater moisture presence often resulted in layers of softer clays or sand/silt overlying the more competent mudstone. In the final borehole (WSBH6), soils between 2.00m and 3.00m bgl were found to be very weak and were logged as running silty sand.
- 6.4. Also noted was that the level of ground water had risen inside the borehole when drilling had ceased, indicating pore-water pressure. The level of groundwater will also vary depending upon the seasonal rainfall and soil moisture deficit consequently groundwater levels are usually at their highest towards the end of winter or early spring. This may have a significant effect on any excavations that are undertaken during this time.
- 6.5. It is this tendency for weaker saturated soils to be present in pockets of less cohesive soils (sandy or silty clays) fairly close to the ground surface that will mean that the engineering solution for founding will be generally required to consider localised weaker soils.

7. ENGINEERING ASSESSMENT AND RECOMMENDATIONS

- 7.1. As discussed in the previous section, and with reference to the appended borehole logs, the soils identified on the site vary in shear strength with the presence of localised water-logged weaker layers close the impermeable mudstone, at a depth of 4.00m bgl.
- 7.2. Therefore, a founding solution needs to consider the variability within the stratum, so that the depths and bearing capacity of weaker layers, are assessed to avoid foundation loading on upper soils displacing weaker deeper soils, thereby resulting in foundation failure.
- 7.3. With reference to the borehole logs, it can be seen that WSBH6 represents the worst case of the variation in soil strength where $SPT(N) = 4$ between 2.00m and 3.00m. Elsewhere, it can be seen that the depth of the impervious and much stronger mudstone ($SPT(N)=50$) is also shallower (WSBH5) with stronger soils occurring at around 2.30m bgl, though weaker (moister) soils overlie with $SPT(N)=12$.
- 7.4. The practical approach in this case would be to consider the load generated by the proposed structure on the bearing capacity of the softer soils within the perspective of more cohesive upper soils acting as pressure dispersal layer. However, this approach does not account for markedly different bearing capacities within the near surface soils across the site, or for the varying depth of the more competent mudstone head (2.20m bgl in WSBH5 and 3.00 in WSBH6) which varies by as much as 1.00m.
- 7.5. It is recommended that a method of ground improvement be used to reduce the variation in soil bearing capacity on the site, and this should take the form of shallow soil mixing using standard plant machinery. The aim of the treatment is to create a series of soil-cementitious columns which provide a net increase in soil bearing capacities so that a reinforced raft can be adopted as a column supported foundation solution for the development. Column positions should be located using a grid pattern approach, nominally at 1.5m spacing, and design of the raft should be undertaken by a structural engineer. Soil treatment should be carried out by a reputable contractor.
- 7.6. Once treatment is completed, the bearing capacity of the improved soils should be confirmed by the contractor, though a minimum requirement of $75kN/m^2$ should be achievable. This capacity should be confirmed as acceptable for the structure by the structural engineer.
- 7.7. Alternative methods of founding would include a pad foundation, though the variation in suitable soil depth would mean that bearing strata would often be beyond economical and practical limits in some areas of the site. The use of driven piles would also be a suitable method of founding, however the cost would perhaps prove prohibitive.

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- 7.8. The investigation revealed that groundwater levels were as high as 1.00m bgl, and excavations deeper than 1.0m in these areas and possibly across other areas of the site should expect to encounter groundwater, leading to partial or total collapse of any excavation sides. In these circumstances the use of a submersible pump should be sufficient to keep water levels sufficiently low to enable concrete or services to be placed in the excavations.
- 7.9. Laboratory test results indicate that the near surface clays possess a medium potential for change in soil volume with change in moisture content. Consequently, the proximity of any proposed tree planting scheme should be considered where it encroaches upon the proposed building.
- 7.10. The results of soluble sulphate concentration tests were assessed in accordance with BS8500-1 Table A:2 and accordingly the site is classified in Sulphate Class AC-1 of the ACEC classification. Concrete placed in direct contact with the ground should be chosen to comply with the requirements of DS-1.
- 7.11. A California Bearing Ratio (CBR) of 5% has been obtained using laboratory-based testing of soils, at 0.50m bgl, and SPT(N) values from the borehole logs (WSBH1-WSBH3). Subsequently, the construction of the access road and car park areas for the proposed structure should comprise an excavated and proof rolled formation base to 0.5m bgl, with minimum of 400mm sub-base (proof rolled) with 100mm of surface wearing materials (i.e. coarse sand layer with pavers).
- 7.12. The Thrussington Member is known as having a silty content and so will deteriorate very quickly as soon as it becomes wet as its strength rapidly decreases with a small increase in moisture content. Consequently, the finished formation should be suitably protected as soon as possible to avoid degradation. The capping layer would be regarded as suitable protection.
- 7.13. Surface water run-off from the site should pass through trapped gullies prior to attenuation before then being discharged into ditches located adjacent to the neighbouring highway, and at the northern boundary of the site. Testing of near surface soils on the site indicated that soakaways are unlikely to be an acceptable means of disposing of surface water. Impermeable area to be drained is 1890m² requiring an attenuation capacity of 74m³. Calculation details are appended.
- 7.14. Should soils be revealed during construction works that are different in any way to those revealed in the windowless boreholes then the engineer should be consulted prior to proceeding with further excavations.
- 7.15. No radon protection is required for any proposed structure on this site.
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- 7.16. Where any person is required to enter into a trench or excavation it is recommended that the sides are shored up in accordance with current best practice and as accepted by the Health and Safety Executive which is published in "Health and Safety in Construction (HSG 150)" which is available to download from www.hse.gov.uk.

8. GUIDANCE ON ASSESSMENT OF ANALYSIS OF CONTAMINATION

- 8.1. Prior to 2015, the principal numerical criteria used in the UK to assess the significance of the results of contamination testing on soil samples were the Soil Guideline Values which were published in Contaminated Land Research Reports Nos. 7-10 inclusive, and the accompanying Research and Development Publications (TOX and SGV series) published by the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (2002). Also, between 2002 and 2005 CLEA UK(beta) software was released along with briefing note 1 to 4. Then in 2006 the Department for Environment, Food and Rural Affairs (DEFRA) release "Soil Guideline Values - The Way Forward" in an attempt to clarify matters.
- 8.2. In August 2008, the Environment Agency published revised CLEA framework guidance in SR2, 3 and 4 along with CLEA v1.03 (beta software), this software was a testing version and comments upon its usefulness were requested. The original SGVs were withdrawn together with CIR7-10 but strangely enough the accompanying TOX reports that were issued at the same time were not.
- 8.3. Soil Guideline Values (SGVs) were formulated to represent a combination of authoritative science and policy judgements. The scientific information included human toxicological information on health effects of different contaminants, and judgement on what is regarded as "unacceptable risk". Soil is also only one source of contaminant exposure, and its effects need to be kept in proportion with total exposure from all sources.
- 8.4. Generic SGVs were capable of use over a wide range of soil conditions and types of site. They were based on the underlying, albeit incomplete, science of contaminant behaviour, human activity patterns, and contaminant toxicology. Although these make the derivation of generally applicable criteria difficult, use of "worst-case" assumptions are more likely to result in impracticable or over-conservative criteria.
- 8.5. The SGVs were designed to generate a consistent approach to the investigation of contaminated land and also to assist in focusing resources on situations that required a more detailed assessment. Guidance on additional organic contaminants, in particular, has yet to be published.
- 8.6. DEFRA is actively promoting a site-specific risk assessment methodology to support professional judgement. The Contaminated Land Exposure Assessment Model (CLEA) was originally detailed in CLR10 and this described the conceptual exposure models for each standard land use used to derive the SGVs, this was replaced by SR3 in August 2008 and then revised again in January 2009. The CLEA model itself was also revised in January 2009 to v1.04 and a handbook (SR4) was also issued.

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- 8.7. In late 2009 the LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment Second Edition was published which provides GAC values for the 'common' contaminants based upon the principles published by the Environment Agency and uses the CLEA model to define values.
- 8.8. Category 4 Screening Levels (C4SLs) were prepared by DEFRA under the Research Project SP1010 and these may replace the CLEA Soil Guideline Values but these have yet to be published. In July 2013, provisional values for Arsenic, Benzene, Benz[a]pyrene, Cadmium, Hexavalent Chromium and Lead were released. Of these, only the values for Lead (pC4SLs), presented at the Yorkshire Contaminated Land Forum (July 2013) are used in this assessment.
- 8.9. Contamination in near surface soils needs to be considered with respect to water supply pipes and initially risk guidance was supplied by Water Regulations Advisor Scheme (WRAS) but these have recently been replaced with guidance produced by United Kingdom Water Industry Research (UKWIR), however, some local water authorities still use the old guidance. For the purposes of this report it is assumed that all water supply pipes will be in MDPE however, if other types of pipes are used then lower threshold values may be appropriate.
- 8.10. In early 2015, LQM/CIEH S4ULs for Human Health Risk Assessment was published providing clarification on S4ULs to be used for the assessment of risk posed to human health by contaminants in soil. Concentrations of contaminants above these levels indicate that further assessment of risk is required and not necessarily that a problem exists.

9. CONTAMINATION ASSESSMENT

- 9.1. For the purposes of this risk assessment, it has been assumed that the S4ULs (and C4SLs for lead (Pb) only) for a commercial development represent the maximum concentrations for the substances assessed.
- 9.2. Each determinand for which a published S4UL exists has a mean and standard deviation calculated, followed by "T-tests" (mean value and maximum value tests). Reference is then made to the S4UL for the individual determinand in order to assess the level of risk posed.
- 9.3. Assessment of contamination has been based on "Guidance on Comparing Soil Contamination Data with a Critical Concentration" (Chartered Institute of Environmental Health and Contaminated Land: Application in Real Environments, May 2008), SR2, 3 and 4 inclusive, the LQM/CIEH (2015) S4UL Human Health Risk Assessment and Human Toxicity (TOX) Research and Development Reports (Environment Agency, 2002 to 2005).
- 9.4. Mean concentrations of a determinand based on a low number of samples may be a poor indicator of the true mean (population) for the site as a whole. A conclusion over remediation based on a comparison of such a sample mean against the S4UL may not be sufficiently health protective. Therefore, the mean value test allows a statement to be made with a given level of confidence (usually 95%) that the population mean is less than the S4UL, taking into account the number of samples analysed.
- 9.5. The calculated values of the upper confidence level of the sample group (US95) may be compared with the S4UL, and if it is less, then the mean value test has been passed and the site may be considered not to present a significant possibility of harm to human health within the context of Part IIA of the Environment Protection Act. Where a result shows the concentration to be less than the limit of detection adopted for the analysis, the value of the limit of detection has been used in the calculation.
- 9.6. The calculation is based on the following equation:

$$US_{95} = \bar{x} + t.s/\sqrt{n}$$

Where: $\bar{x}$ is the mean, t is a statistical function based on sample size, s is standard deviation and n is the number of samples.

- 9.7. The maximum value test is used to determine whether the maximum value of a determinand from a set of analyses is likely to have come from the same population as other concentrations for that determinand, or whether it is a statistical outlier (hot-spot).

- 9.8. If the value of T is smaller than some critical value, determined from statistical tables and based on the number of samples, the maximum value may be accepted (at the prescribed level of confidence) as a member of the underlying population from which the other results were drawn.
- 9.9. If T is greater than the critical value, the maximum value is treated as an outlier. This may indicate a hot-spot of contamination requiring additional investigation in order to reveal its extent. The Maximum Value Test uses the relationship:

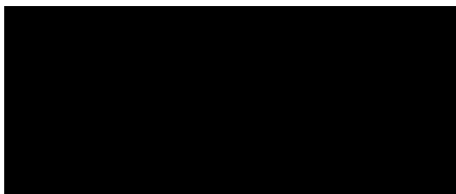
$$T = (y_{\max} - \bar{y})/S_y$$

Where: $y_{\max}$ is the log of the maximum value of a population, $\bar{y}$ is the mean value of the logs of the population and S_y is the standard deviation from the mean of the logs of the population.

- 9.10. Of the contaminants for which commercial S4ULs without plant uptake are currently available, none were detected in excess of the respective S4ULs. Results are appended.

10. CONTAMINATION RECOMMENDATIONS

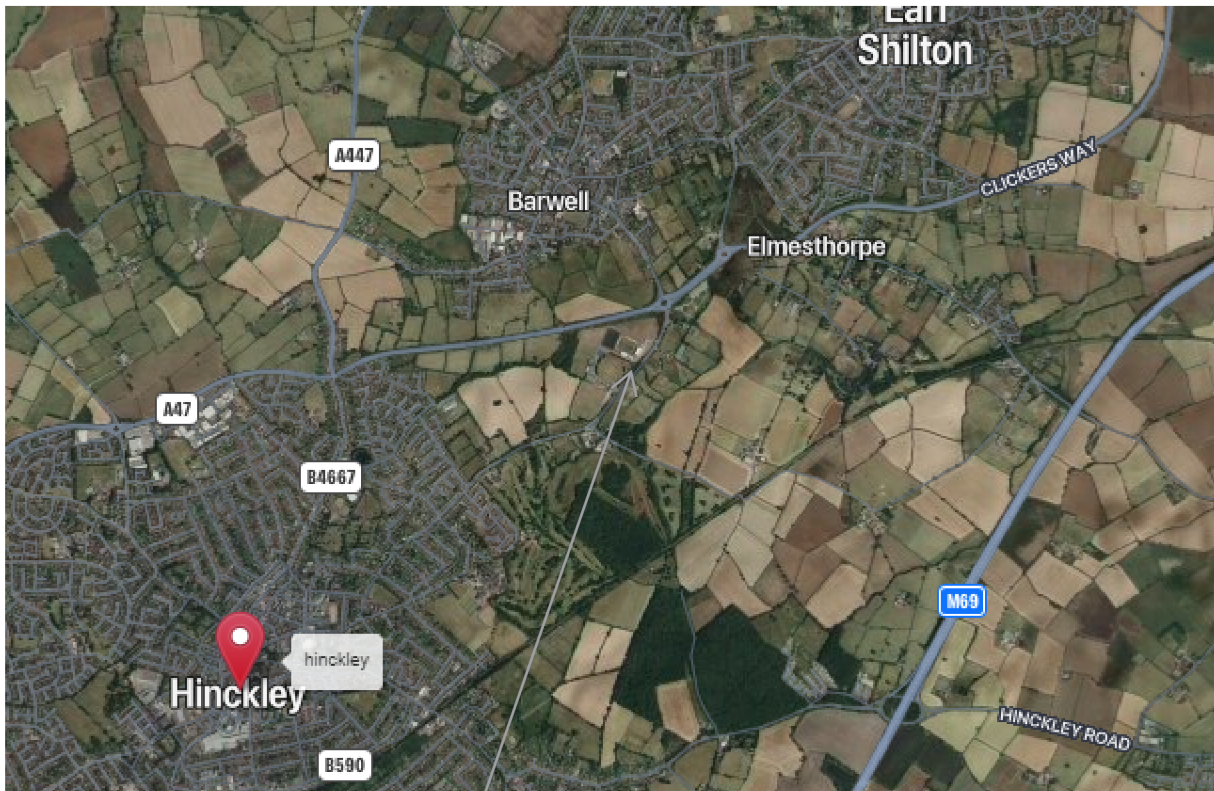
- 10.1. None of the soil samples recovered from the site were found to contain contamination exceeding the relevant published limits given in LQM/CIEH (2015) S4UL Human Health Risk Assessment. Consequently, the risk associated with ingestion or inhalation of soil-based contamination causing significant harm to the site end user (21 year old female) is considered acceptable.
- 10.2. Since no significant concentrations of source contaminants was identified on site, the risk associated with construction workers and site visitors is also considered acceptable. However, this should be further minimized by wearing protective clothing and keeping the site damp to minimise air-borne dust concentrations. It is outside the brief of this report to provide guidance on site working practices, however the appendices provide some references.
- 10.3. Care should be taken during excavation working of the site to investigate any soils which seem by appearance or odour to be of different or unusual character. Should materials of this nature be uncovered then it is likely that further testing will need to be undertaken to validate levels of contamination.
- 10.4. Following completion of the desktop study there is no evidence to suggest that the site is not suitable for its intended purpose which indicates that it meets the requirements of the National Planning Policy Framework.



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RDM Environmental and Geotechnical Engineering Ltd

APPENDIX I

SITE LOCATION PLAN

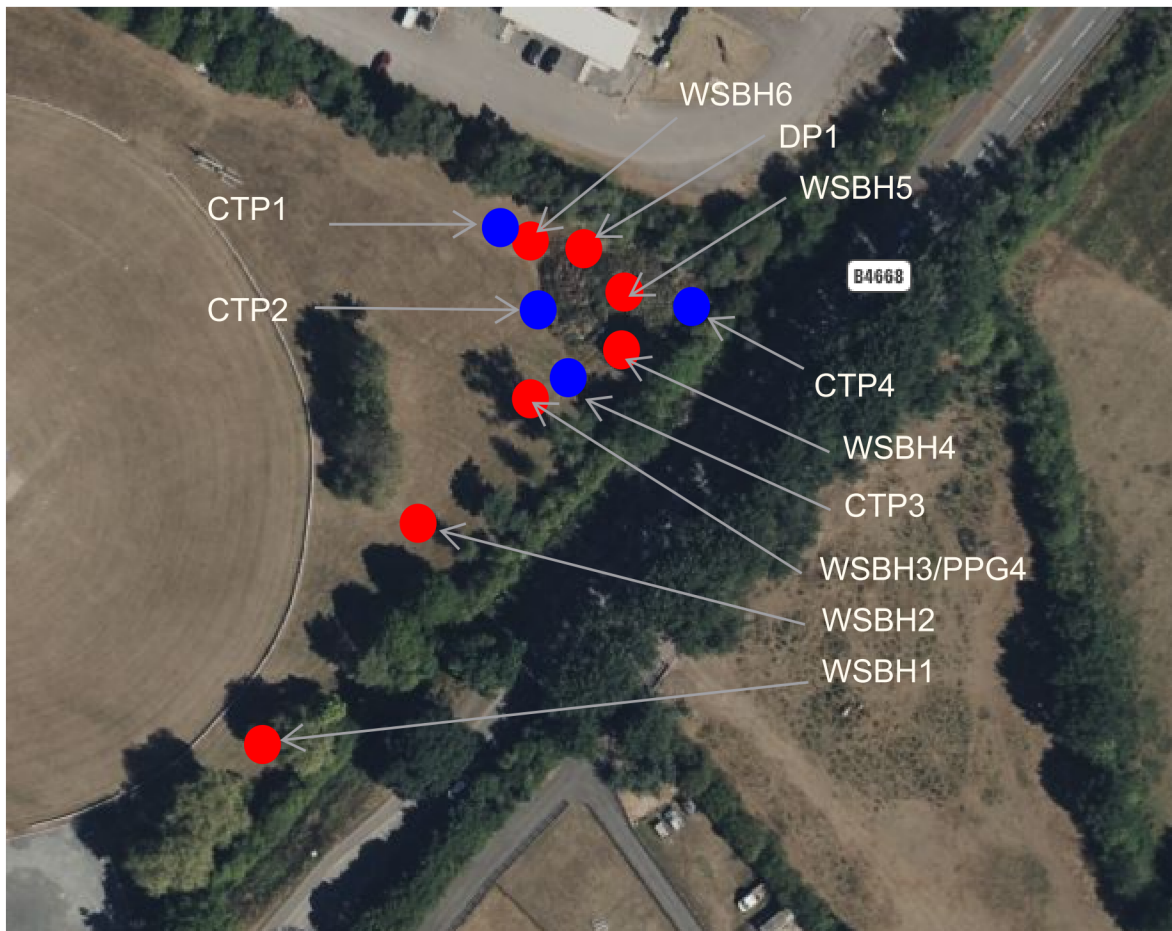


Proposed site of the Heart of England Boxing Club



APPENDIX II

BOREHOLE/PPG4 AND CONTAMINATION TEST PIT LOCATION PLAN



Borehole/PPG4 and Contamination Trial Pit Locations

APPENDIX III

BOREHOLE AND DYNAMIC PROBE LOGS

Borehole Log

Borehole ref: RDM1185/WSBH1		Project Name: Hinckley RFC		Client: Nick Griffin		Project Number: RDM 1185	
Address: Hinckley RFC Leicester Road Hinckley				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 25/01/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 25/01/2024		Depth of bore (m) 1		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: None /			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	n/a	8				TOPSOIL with grass over	0.2
						Firm to stiff reddish brown gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded chert (THRUSSINGTON MEMBER)	0.8
		14	GL				

Key:

 Clays

 Sands

 Topsoil

 Fill

 Limestone/Chalk

 Other

 G/W Struck

 G/W Last

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Borehole Log

Borehole ref: RDM1185/WSBH2		Project Name: Hinckley RFC		Client: Nick Griffin		Project Number: RDM 1185	
Address: Hinckley RFC Leicester Road Hinckley				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 25/01/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 25/01/2024		Depth of bore (m) 1		Diameter (mm) 115	
Elevation n/a		Backfilled yes		G/water depth(m) First/Last: None /			

Depth (m) Sample No	% Ret`d	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	n/a	8				TOPSOIL with grass over	0.2
		15	GL			Firm to stiff reddish brown gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded chert (THRUSSINGTON MEMBER)	0.8
	1						

Key:

	Clays		Topsoil		Limestone/ Chalk		G/W Struck
	Sands		Fill		Other		G/W Last

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Borehole Log

Borehole ref: RDM1185/WSBH3		Project Name: Hinckley RFC		Client: Nick Griffin		Project Number: RDM 1185	
Address: Hinckley RFC Leicester Road Hinckley				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 25/01/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 25/01/2024		Depth of bore (m) 1		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: None /			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	n/a	11				TOPSOIL with grass over	0.2
						Firm to stiff reddish brown gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded chert (THRUSSINGTON MEMBER)	0.8
		14	GL				

Key:

 Clays

 Sands

 Topsoil

 Fill

 Limestone/Chalk

 Other

 G/W Struck

 G/W Last

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Engineering Ltd

Borehole Log

Borehole ref: RDM1185/WSBH4		Project Name: Hinckley RFC		Client: Nick Griffin		Project Number: RDM 1185	
Address: Hinckley RFC Leicester Road Hinckley				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 25/01/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 25/01/2024		Depth of bore (m) 4		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: 3.5 / 1.3			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	90					TOPSOIL with grass over	0.3
						Firm to stiff reddish brown gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded chert (THRUSSINGTON MEMBER)	0.5
U2	100	20	1.15-1.45			Firm to stiff reddish brown silty slightly sandy CLAY. Some lithorelicts (MERCIA MUDSTONE GROUP)	3.2
U3	100	22	2.15-2.45				
U4	80	36	3.15-3.45				
		50	4.15-4.45				

Key:

 Clays

 Sands

 Topsoil

 Fill

 Limestone/Chalk

 Other

 G/W Struck

 G/W Last

RDM
Environmental and Geotechnical
Engineering Ltd

Borehole Log

Borehole ref: RDM1185/WSBH5		Project Name: Hinckley RFC		Client: Nick Griffin		Project Number: RDM 1185	
Address: Hinckley RFC Leicester Road Hinckley				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 25/01/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 25/01/2024		Depth of bore (m) 4		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: 3.5 / 1.07			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	90					TOPSOIL with grass over	0.4
						Firm to stiff reddish brown gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded chert (THRUSSINGTON MEMBER)	0.4
U2	100	27	1.15-1.45			Firm to stiff reddish brown silty slightly sandy CLAY becoming SOFT CLAY with increased moisture content. Mudstone at 2.50m bgl. Some lithorelicts (MERCIA MUDSTONE GROUP)	3.2
U3	100	12	2.15-2.45				
U4	80	50	3.15-3.45				
							
							
							
							

Key:

 Clays

 Sands

 Topsoil

 Fill

 Limestone/Chalk

 Other

 G/W Struck

 G/W Last

RDM
Environmental and Geotechnical
Engineering Ltd

Borehole Log

Borehole ref: RDM1185/WSBH6		Project Name: Hinckley RFC		Client: Nick Griffin		Project Number: RDM 1185	
Address: Hinckley RFC Leicester Road Hinckley				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 25/01/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 25/01/2024		Depth of bore (m) 4		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: 3.5 / 1.11			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	80					TOPSOIL with grass over	0.4
						Firm to stiff reddish brown gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded chert (THRUSSINGTON MEMBER)	0.5
U2	90	25	1.15-1.45				
U3	90	13	2.15-2.45			Firm to stiff reddish brown silty slightly sandy CLAY becoming SOFT CLAY with increased moisture content. Mudstone at 3.00m bgl. Some lithorelicts (MERCIA MUDSTONE GROUP)	3.1
U4	80	4	3.15-3.45				
		50	4.15-4.45				

Key:

 Clays

 Sands

 Topsoil

 Fill

 Limestone/Chalk

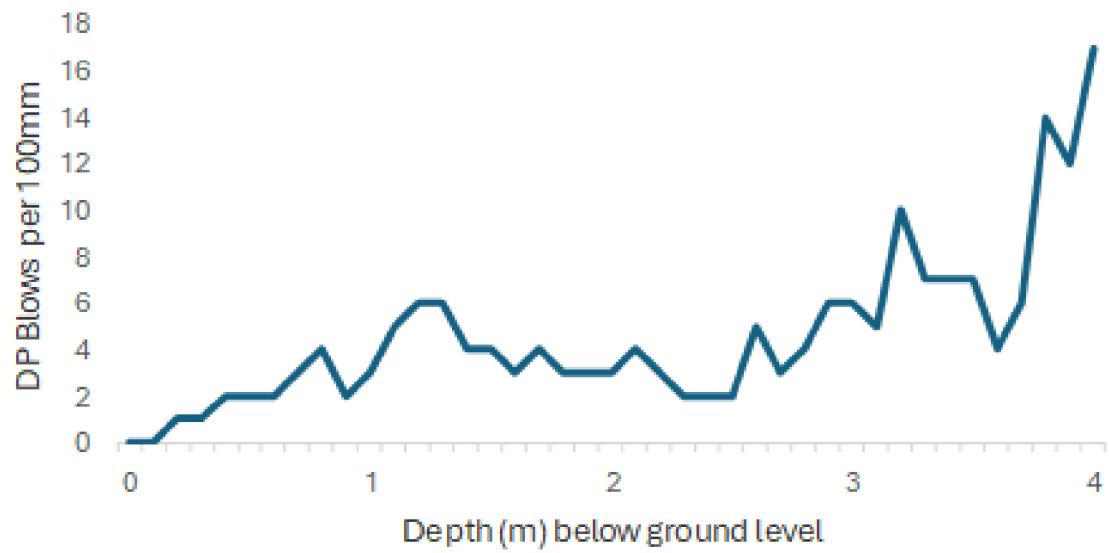
 Other

 G/W Struck

 G/W Last

RDM
Environmental and Geotechnical
Engineering Ltd

Heart of England Boxing Club Hinckley



APPENDIX IV

LABORATORY TEST RESULTS



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024



Contract	Hinckley Rugby Club		
Serial No.	44098_1		
Client:	RDM Environmental and Geotechnical Engineering Ltd 42 High Street Gretton Northamptonshire NN17 3DE <i>Soil Property Testing Ltd</i> 15, 16, 18 Halcyon Court, St Margaret's Way, Stukeley Meadows, Huntingdon, Cambridgeshire, PE29 6DG Tel: 01480 455579 Email: enquiries@soilpropertytesting.com Website: www.soilpropertytesting.com		
Samples Submitted By:	RDM Environmental and Geotechnical Engineering Ltd Samples Labelled: Hinckley Rugby Club Approved Signatories: ☒ J.C. Garner B.Eng (Hons) FGS Technical Director & Quality Manager ☐ W. Johnstone Materials Lab Manager		
Date Received:	30/01/2024	Samples Tested Between:	30/01/2024 and 09/02/2024
Remarks:	For the attention of Richard Gray Your Reference No: RDM 1185		
Notes:	1 All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary. 2 Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. 3 Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory. 4 This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory. 5 The results within this report only relate to the items tested or sampled.		



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024



Contract		Hinckley Rugby Club																					
Serial No.		44098_1										Target Date		13/02/2024									
Scheduled By		RDM Environmental and Geotechnical Engineering Ltd																					
Schedule Remarks																							
Bore Hole No.	Type	Sample Ref.	Top Depth	Water Content (BS EN) Liquid/Plastic Limits Wet Sieve Preparation California Bearing Ratio Test Sulphate Content/pH Value														Sample Remarks					
WSBH1	U	1	0.50	1	1		1																
WSBH4	U	2	1.50	1	1	1		1															
WSBH5	U	3	2.50	1	1	1																	
Totals				3	3	2	1	1											End of Schedule				



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024



Contract	Hinckley Rugby Club
Serial No.	44098_1

SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index	Sample Preparation				Description	Class
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
WSBH1	0.50	U	1	21.6	50	20	30	0.05	From Natural	<1% (A)		72	Stiff mottled bluish grey and reddish brown silty CLAY with rare fine to medium lithorelicts and occasional recently active and decayed roots.	CI/CH
WSBH4	1.50	U	2	23.9	40	22	18	0.11	Wet Sieved	33 (M)	35.7*	71	Firm mottled bluish grey and reddish brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium angular to sub angular lithorelicts and mudstone.	CI
WSBH5	2.50	U	3	17.9	33	19	14	-0.08	Wet Sieved	21 (M)	22.7*	71	Mottled bluish grey and reddish brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium angular to sub angular lithorelicts, siltstone and mudstone.	CL

Method Of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	*Corrected water content assume material greater than 0.425mm is non-porous. See BS1377: Part 2: 1990 Clause 3 Note 1.
Table Notation:	Ret'd 0.425mm: (A) = Assumed, (M) = Measured



TEST REPORT

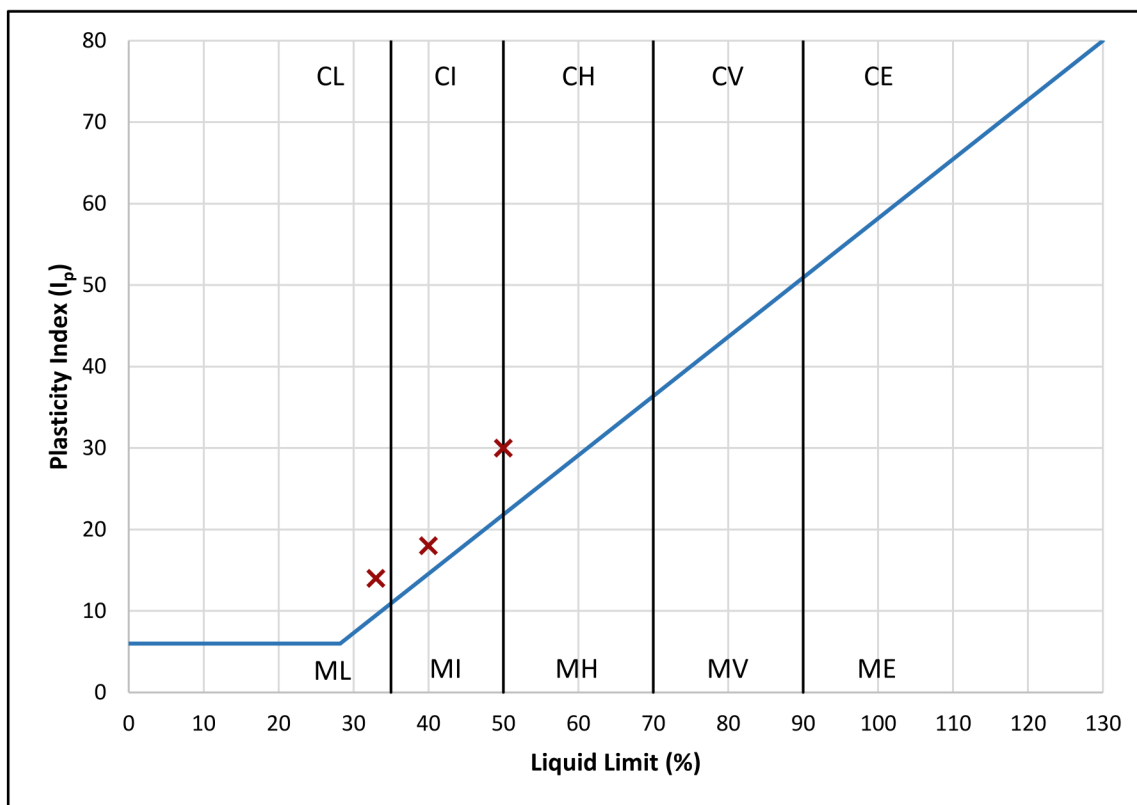
ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024



Contract	Hinckley Rugby Club
Serial No.	44098_1

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High



Plasticity Chart BS5930: 2015: Figure 8

High	NHBC Volume Change Potential
Medium	
Low	

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



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024

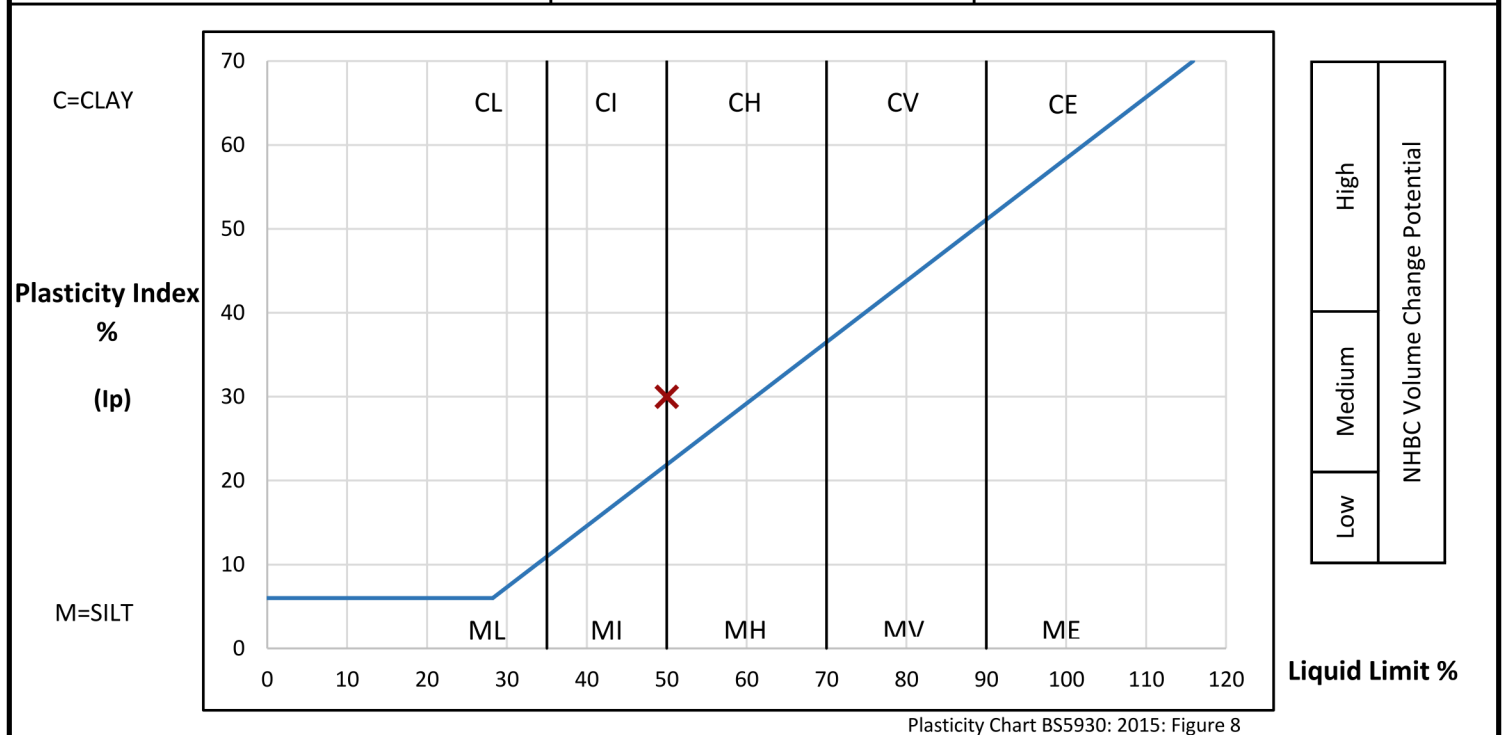


Contract	Hinckley Rugby Club
Serial No.	44098_1

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

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WSBH1	0.50	U	1	21.6	Stiff mottled bluish grey and reddish brown silty CLAY with rare fine to medium lithorelicts and occasional recently active and decayed roots.	

PREPARATION			Liquid Limit	50 %
Method of preparation			From natural/gravel picked out by hand	Plastic Limit 20 %
Sample retained 0.425mm sieve (Assumed)			0 %	Plasticity Index 30 %
Corrected water content for material passing 0.425mm				Liquidity Index 0.05
Sample retained 2mm sieve (Assumed)			<1 %	NHBC Modified (I'p) n/a
Curing time 72 hrs		Clay Content	Not analysed	Derived Activity Not analysed



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



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024

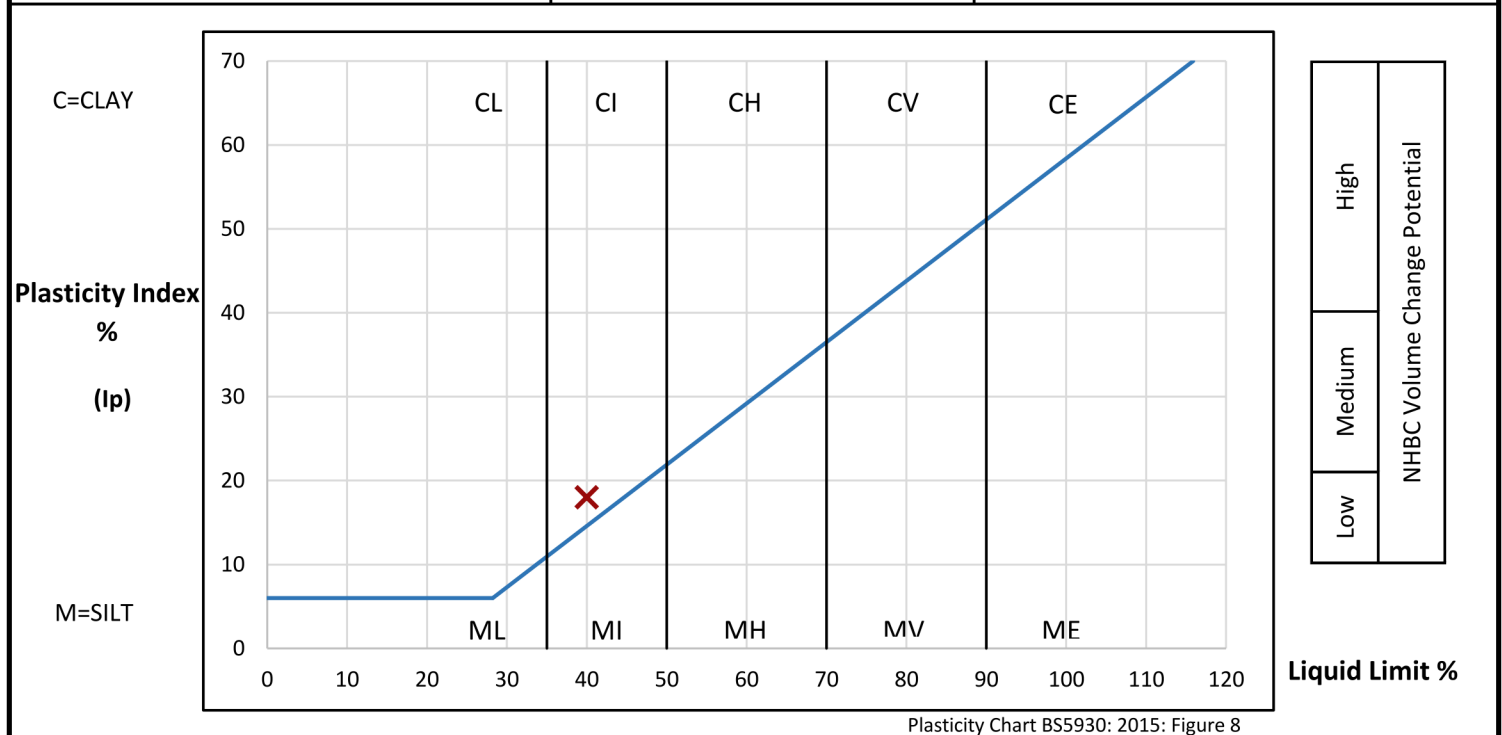


Contract	Hinckley Rugby Club
Serial No.	44098_1

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

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WSBH4	1.50	U	2	23.9	Firm mottled bluish grey and reddish brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium angular to sub angular lithorelicts and mudstone.	

PREPARATION				Liquid Limit 40 %	
Method of preparation Wet sieved over 0.425mm sieve				Plastic Limit 22 %	
Sample retained 0.425mm sieve (Measured) 33 %				Plasticity Index 18 %	
Corrected water content for material passing 0.425mm 35.7 %				Liquidity Index 0.11	
Sample retained 2mm sieve (Measured) 31 %				NHBC Modified (I'p) 12 %	
Curing time 71 hrs		Clay Content Not analysed		Derived Activity Not analysed	



Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024

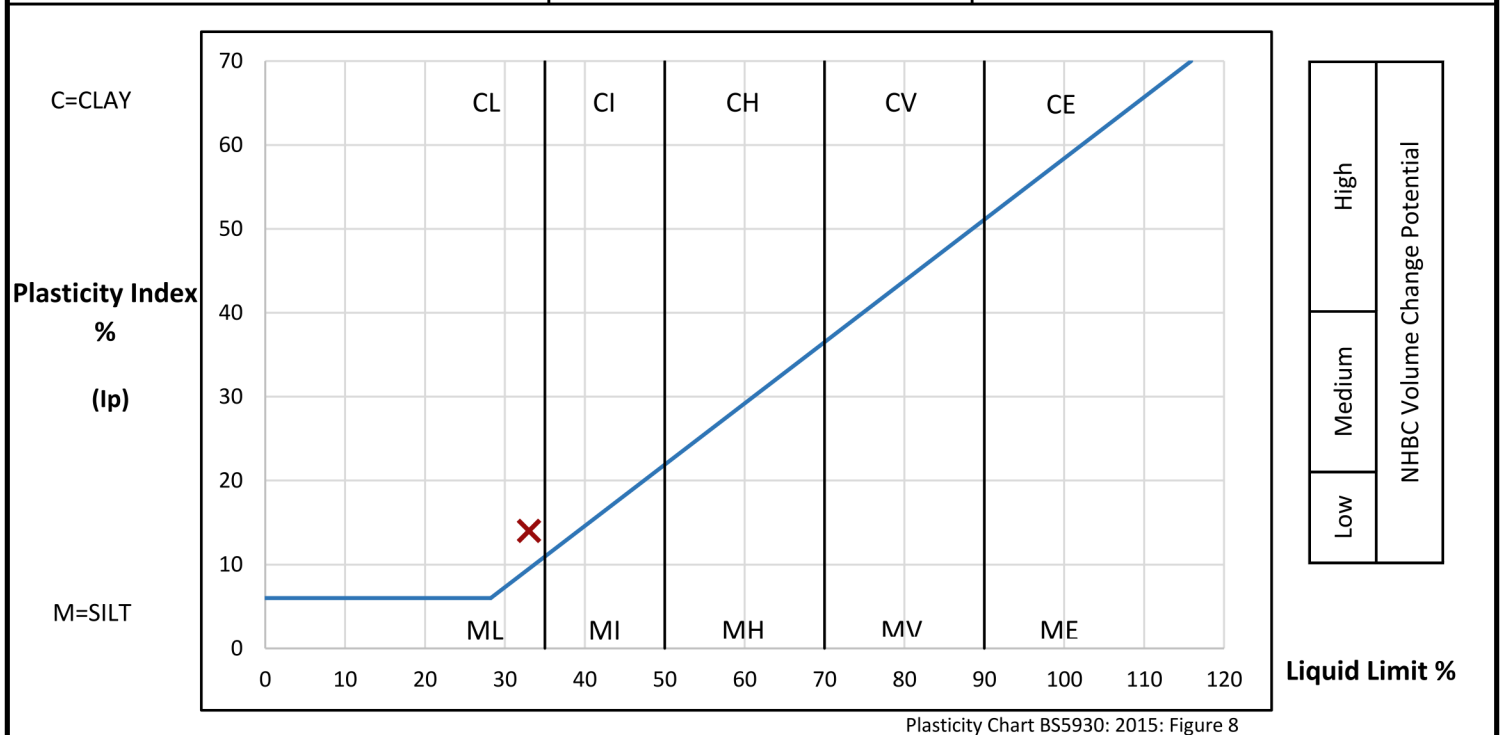


Contract	Hinckley Rugby Club
Serial No.	44098_1

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

Borehole / Pit No.	Depth m	Sample		Water Content (W) %	Description	Remarks
		Type	Reference			
WSBH5	2.50	U	3	17.9	Mottled bluish grey and reddish brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium angular to sub angular lithorelicts, siltstone and mudstone.	

PREPARATION				Liquid Limit 33 %	
Method of preparation				Wet sieved over 0.425mm sieve	
Sample retained 0.425mm sieve (Measured)				21 %	
Corrected water content for material passing 0.425mm				22.7 %	
Sample retained 2mm sieve (Measured)				20 %	
Curing time				71 hrs	
Clay Content				Not analysed	
Derived Activity				Not analysed	
Plastic Limit				19 %	
Plasticity Index				14 %	
Liquidity Index				-0.08	
NHBC Modified (I'p)				11 %	



Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024



Contract	Hinckley Rugby Club
Serial No.	44098_1

CALIFORNIA BEARING RATIO TEST

Borehole /Pit No.	Depth (m)	Sample		Description	Remarks
		Type	Reference		
WSBH1	0.50	U	1	Stiff mottled bluish grey and reddish brown silty CLAY with rare fine to medium lithorelicts and occasional recently active and decayed roots.	

Specimen Preparation

Condition	Remoulded
Details	Recompacted with specified standard effort using 2.5kg rammer

Soaking Details	Not Soaked	
Period of Soaking		days
Time to Surface		days
Amount of Swell Recorded		mm
Initial Water Content		%

Material Retained on 20mm Sieve Removed	0.0	%
Initial Specimen Details:	Bulk Density	2.01 Mg/m ³
	Dry Density	1.65 Mg/m ³

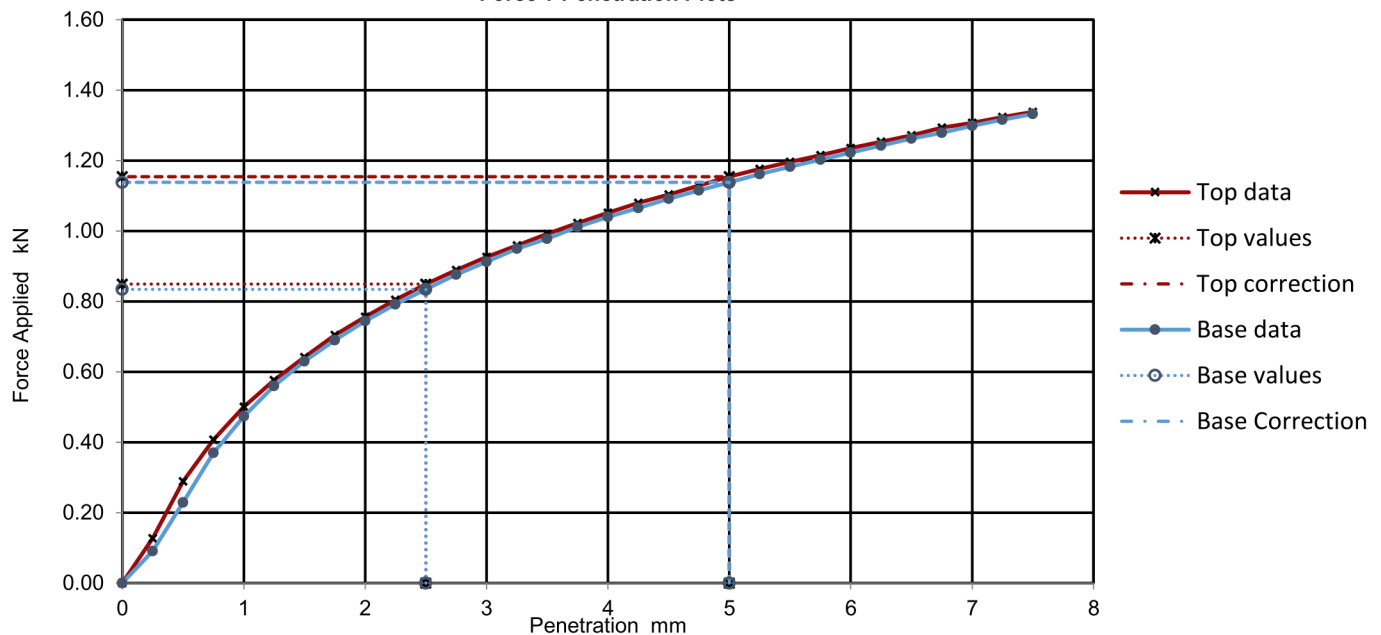
Surcharge Applied	15	kg
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Test Results

	Curve Correction	CBR Values (%)			
		2.5mm	5.0mm	Highest	Mean*
TOP	No	6.4	5.8	6.4	6.4
BASE	No	6.3	5.7	6.3	

Water Content (%)
21.7
21.5

Force v Penetration Plots



Method of Preparation:	BS1377: Part1: 2016 & BS1377: Part 4: 1990: 7.2.4.4
Method of Test:	BS 1377: Part 4: 1990: 7
Type of Sample Key	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT= Split Spoon Sample, C = Core Cutter
Comments:	*Only reported if the results from each end of the sample are within $\pm 10\%$ of the mean value. Note:- CBR Results are water content dependent - an increase in water content will result in a decrease of CBR value.



TEST REPORT
ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 09/02/2024

Contract:	Hinckley Rugby Club
Serial No:	44098_1

DETERMINATION OF THE SULPHATE CONTENT AND pH OF SOIL AND GROUNDWATER										
Borehole / Pit No.	Depth (m)	Sample		Conc. of Soluble SO ₃		Calc'd	pH Value	% Sample Passing 2mm Sieve	Description	Remarks
		Type	Ref.	Water Soluble 2:1 (g/L)	Ground Water (g/L)	Conc. Of SO ₄ (g/L)				
WSBH4	1.50	U	2	0.13		0.16	7.5	69	Firm mottled bluish grey and reddish brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium angular to sub angular lithorelicts and mudstone.	
Method of Preparation: BS1377: Part 1: 2016: 8.5, BS1377: Part 3: 1990: 5.3 Soil/Water Extract, 5.4 Groundwater										
Method of Test: BS1377: Part 3: 1990: 5.5										
Type of Sample Key: U= Undisturbed, B= Bulk, D= Disturbed, J= Jar, W= Water, SPT= Split Spoon Sample, C= Core Cutter										
Comments: Test not UKAS accredited										
Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location, and origin of test specimen within original sample. Oven drying temperature if not 105-110C.										



4161



7 - 11 Harding Street
Leicester
LE1 4DH

RDM Environmental and Geotechnical Engineering

42 High Street

Gretton

NN17 3DE

Analytical Test Report: L24/00724/RDM - 24-41182

Your Project Reference:	Hinckley Rugby Club Hinckley RDM1185		
Your Order Number:	RDM 1185	Samples Received / Instructed:	30/01/2024 / 30/01/2024
Report Issue Number:	1	Sample Tested:	30/01 to 12/02/2024
Samples Analysed:	4 soil samples	Report issued:	12/02/2024

Signed



James Gane

Analytical Services Manager

CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where further analysis is required samples identified as containing asbestos are screened and tested on an as received basis. No correction is made for moisture content and these results are not covered by our accreditation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 30.10.2023

Issued by: J. Gane

Issue No: 4

Rev No: 5



4161

7 - 11 Harding Street
Leicester
LE1 4DH

L24/00724/RDM - 24-41182

Project Reference - Hinckley Rugby Club Hinckley RDM1185

Analytical Test Results - Solid

Lab Reference			338430	338431	338432	338433
Client Sample ID			CTP1	CTP2	CTP3	CTP4
Client Sample Location			CTP1	CTP2	CTP3	CTP4
Client Sample Type			soil/clay	soil/clay	soil/clay	soil/clay
Client Sample Number			-	-	-	-
Depth - Top (m)			0.30	0.40	0.30	0.40
Depth - Bottom (m)			0.30	0.40	0.30	0.40
Date of Sampling			26/01/2024	26/01/2024	26/01/2024	26/01/2024
Time of Sampling			-	-	-	-
Sample Matrix			Clay	Clay	Clay	Clay
Determinant	Units	Accreditation				
Arsenic	(mg/kg)	MCERTS	< 10	-	< 10	< 10
Cadmium	(mg/kg)	MCERTS	0.7	-	0.6	0.8
Chromium (III)	(mg/kg)	u	22	-	-	20
Chromium (Total)	(mg/kg)	UKAS	23	-	22	21
Copper	(mg/kg)	MCERTS	18	-	13	74
Lead	(mg/kg)	MCERTS	19	-	9.0	42
Mercury	(mg/kg)	UKAS	< 2.5	-	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	34	-	35	26
Selenium	(mg/kg)	u	< 8.0	-	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	55	-	39	93
Total Phenols	(mg/kg)	MCERTS	< 1.0	-	-	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0	-	-	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	-	-	< 1.0
pH	pH Units	MCERTS	7.9	-	-	7.5
Sulphate (Water soluble as SO ₄)	(mg/l)	u	12	-	-	12
Sulphide	(mg/kg)	u	< 15	-	-	< 15
Sulphur (Total)	(%)	UKAS	< 0.01	-	-	0.03
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	-	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	-	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02	< 0.02	-	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	0.03	< 0.02	-	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	0.03	< 0.02	-	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.03	< 0.02	-	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02	< 0.02	-	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	-	< 0.02
Chrysene	(mg/kg)	MCERTS	0.03	< 0.02	-	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	-	< 0.02
Fluoranthene	(mg/kg)	MCERTS	0.06	< 0.02	-	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	-	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02	< 0.02	-	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	-	< 0.02
Phenanthrene	(mg/kg)	MCERTS	0.03	< 0.02	-	< 0.02
Pyrene	(mg/kg)	MCERTS	0.05	< 0.02	-	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.48	< 0.32	-	< 0.32
Gasoline Range Organics (>C ₈ to C ₁₀) [EH ₁₀ _Total]	(mg/kg)	MCERTS	< 5.0	-	-	< 5.0
Diesel Range Organics (>C ₁₀ to C ₂₁) [EH ₁₀ _Total]	(mg/kg)	MCERTS	< 10	-	-	< 10
Mineral Range Organics (>C ₂₁ to C ₄₀) [EH ₁₀ _Total]	(mg/kg)	MCERTS	30	-	-	44
Total TPH (>C ₈ to C ₄₀) [EH ₁₀ _Total]	(mg/kg)	MCERTS	40	-	-	58
Asbestos	-	UKAS	-	-	-	No asbestos detected

L24/00724/RDM - 24-41182

Project Reference - Hinckley Rugby Club Hinckley RDM1185

Certificate Of Analysis - WAC Suite

Lab Reference		338432
Client Sample ID	CTP3	
Client Sample Location	CTP3	
Client Sample Type	soil/clay	
Client Sample Number	-	
Depth - Top (m)	0.3	
Depth - Bottom (m)	0.3	
Date of Sampling	26/01/2024	
Time of Sampling	-	
Sample Description	Reddish brown gravelly slightly sandy silty clay	
Sample Matrix	Clay	
Moisture Content (%)	16	
Stone content (%)	9.2	

Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
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Solid Analysis

Total Organic Carbon	%	MCERTS	< 1.0	3.0	5.0	6.0
Loss on Ignition	%	UKAS	3.2	-	-	10.0
BTEX	mg/kg	MCERTS	< 0.06	6.00	-	-
PCB's (7 Congeners)	mg/kg	u	< 0.028	1.00	-	-
Mineral Oil (>C ₁₀ to C ₄₀) [EH ₁₀ _Total]	mg/kg	MCERTS	33	500	-	-
PAH	mg/kg	u	< 0.34	100	-	-
pH	units	MCERTS	7.4	-	> 6	-

Eluate Analysis

Arsenic	mg/kg	u	< 0.03	0.50	2	25
Barium	mg/kg	u	< 0.05	20	100	300
Cadmium	mg/kg	u	< 0.03	0.04	1	5
Chromium (total)	mg/kg	u	< 0.03	0.5	10	70
Copper	mg/kg	u	0.07	2.0	50	100
Mercury	mg/kg	u	< 0.01	0.01	0.2	2
Molybdenum	mg/kg	u	< 0.03	0.5	10.0	30
Nickel	mg/kg	u	< 0.03	0.4	10.0	40
Lead	mg/kg	u	< 0.05	0.5	10.0	50
Antimony	mg/kg	u	< 0.03	0.06	0.7	5
Selenium	mg/kg	u	< 0.01	0.1	0.5	7
Zinc	mg/kg	u	< 0.05	4	50	200
Chloride	mg/kg	u	3	800	15000	25000
Fluoride	mg/kg	u	1	10	150	500
Sulphate (as SO ₄)	mg/kg	u	< 10	1000	20000	50000
Total Dissolved Solids	mg/kg	u	450	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	u	54.0	500	800	1000



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Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
338430	CTP1	CTP1	soil/clay	-	Reddish brown gravelly slightly sandy silty clay	20	< 0.1	55
338431	CTP2	CTP2	soil/clay	-	Reddish brown gravelly slightly sandy silty clay	24	< 0.1	-
338432	CTP3	CTP3	soil/clay	-	Reddish brown gravelly slightly sandy silty clay	16	9.2	52
338433	CTP4	CTP4	soil/clay	-	Reddish brown gravelly slightly sandy silty clay	22	3.0	48



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Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
338430	CTP1	CTP1	soil/clay	-	
338431	CTP2	CTP2	soil/clay	-	
338432	CTP3	CTP3	soil/clay	-	VPH/BTEX - Sample taken from container with headspace.
338433	CTP4	CTP4	soil/clay	-	

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Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
WACMETALS	MS - CL - ICP - Metals in Waters (WAC)	As received	BSEN:12457 Leaching	Determination of metals in a leachate as part of a WAC test via ICP
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
SULPHIDES	MS - CL - Sulphide in Soils	As received	Passing 10mm test sieve	Determination of sulphide in soil via titration
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
SKALARPHS	MS - CL - Phenols by Skalar	As received	Passing 10mm test sieve	Determination of total phenols in soil using Skalar segmented flow analyser
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
ENLEACHP	BS EN 12457-2	As Received	-	Leaching in accordance with BSEN 12457-2 (10:1 Ratio)
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis



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Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
1377LOI	BS1377 Lol	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

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Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

- A - No date of sampling provided
- C - Received in inappropriate container
- H - Contains headspace

T - Temperature on receipt exceeds storage temperature

R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
338430	CTP1	CTP1	soil/clay	-	MS - CL - pH in Soils	R
338432	CTP3	CTP3	soil/clay	-	MS - CL - VPH	R
338432	CTP3	CTP3	soil/clay	-	MS - CL - pH in Soils (WAC)	R
338433	CTP4	CTP4	soil/clay	-	MS - CL - pH in Soils	R



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HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

Exposure Demographic: Commercial

Soil Sample	1	2	3	4	5	6	7	8	9	10	Mean	Max Concen:	SD	Resi pass/ fail	Com pass/ fail	US95	S4UL Residential	S4UL Commercial	N (no of samples)	Value t	n	t
Arsenic	10.00		10.00	10.00							10.00	10.00	0.00	pass	pass	10.00	37	635	3	2.92	2	6.314
Cadmium	0.70		0.60	0.80							0.70	0.80	0.07	pass	pass	0.82	4.6	49.6	3	2.92	3	2.92
Chromium (total)	22.00			20.00							21.00	22.00	0.71	pass	pass	24.16	910	8600	2	6.314	4	2.353
Copper	23.00		22.00	21.00							22.00	23.00	0.71	pass	pass	23.19	2400	6800	3	2.92	5	2.312
Lead (C4SL)	19.00		9.00	42.00							23.33	42.00	13.20	pass	pass	45.59	200	200	3	2.92	6	2.015
Mercury	2.50		2.50	2.50							2.50	2.50	0.00	pass	pass	2.50	15	320	3	2.92	7	1.943
Nickel	34.00		35.00	26.00							31.67	35.00	2.36	pass	pass	35.64	180	980	3	2.92	8	1.895
Selenium	8.00		8.00	8.00							8.00	8.00	0.00	pass	pass	8.00	250	12000	3	2.92	9	1.86
Zinc	55.00		39.00	93.00							62.33	93.00	21.68	pass	pass	98.89	3700	730000	3	2.92	10	1.833
																				11	1.812	
Cyanide	1.00			1.00							1.00	1.00	0.00	pass	pass	1.00	5	5	2	6.314	12	1.796
																				13	1.782	
Acenaphthene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	200	1000000	3	2.92	14	1.771
Acenaphthylene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	160	1000000	3	2.92	15	1.761
Anthracene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	2200	540000	3	2.92	16	1.753
Benzo[a]anthracene	0.03	0.02		0.02							0.02	0.03	0.00	pass	pass	0.03	13	180	3	2.92	17	1.746
Benzo[a]pyrene	0.03	0.02		0.02							0.02	0.03	0.00	pass	pass	0.03	3.5	36	3	2.92	18	1.74
Benzo[b]fluoranthene	0.03	0.02		0.02							0.02	0.03	0.00	pass	pass	0.03	3.9	45	3	2.92	19	1.734
Benzo[g,h,i]perylene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	640	4000	3	2.92	20	1.729
Benzo[k]fluoranthene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	130	1200	3	2.92	21	1.725
Chrysene	0.03	0.02		0.02							0.02	0.03	0.00	pass	pass	0.03	19	350	3	2.92	22	1.721
Dibenzo[a,h]anthracene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	0.43	3.6	3	2.92	23	1.717
Fluoranthene	0.06	0.02		0.02							0.03	0.06	0.02	pass	pass	0.07	290	23000	3	2.92	24	1.714
Fluorene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	160	71000	3	2.92	25	1.711
Indeno[1,2,3,-cd]pyrene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	39	510	3	2.92	26	1.708
Naphthalene	0.02	0.02		0.02							0.02	0.02	0.00	pass	pass	0.02	24	1100	3	2.92	27	1.706
Phenanthrene	0.03	0.02		0.02							0.02	0.03	0.00	pass	pass	0.03	90	23000	3	2.92	28	1.703
Pyrene	0.05	0.02		0.02							0.03	0.05	0.01	pass	pass	0.05	620	54000	3	2.92	29	1.701
																				30	1.699	
Total PAH	0.48	0.32		0.32																		
Gasoline Organics	5			5.00																		
Diesel Organics	10			10.00																		
Mineral Organics	30			44.00																		
Total TPH	40			58.00																		
Asbestos	None detected																					

APPENDIX V

ATTENUATION CALCULATIONS

GENERAL DATA

site location: **England and Wales**60 min rainfall depth of 5 year return period 'R' [mm] = **20**M5-60 to M5-2d rainfall ratio 'r' = **0.45**proposed discharge rate 'v₁' [litre/s] = **5.00**proposed discharge rate 'v₂' [litre/s] = **5.00**allowance for climate change: **40%**

SUMMARY OF CALCULATIONS

required storage volume for discharge rate 'v₁' = **63.67** m³required storage volume for discharge rate 'v₂' = **73.55** m³

AREA DATA

impermeability
[%]effective area
[m²]impermeable area 'A₁' [m²] = **1890**

100.00

1890

landscaping and/or green roof area 'A₂' [m²] = **0****80.00**

0

other partially permeable area 'A₃' [m²] = **0****20.00**

0

AREA DRAINED TO ATTENUATION TANK = **1890 m²**REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₁

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M20-D			M30-D			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.39	7.80	1.21	13.18	24.91	1.39	15.16	28.65	1.46	15.97	30.18	1.50	28.68
10	0.54	10.80	1.22	18.49	34.96	1.41	21.39	40.43	1.50	22.62	42.75	3.00	39.75
15	0.65	13.00	1.23	22.42	42.38	1.43	25.99	49.12	1.51	27.52	52.01	4.50	47.51
30	0.82	16.40	1.24	28.47	53.81	1.44	33.13	62.61	1.53	35.16	66.45	9.00	57.45
60	1.00	20.00	1.24	34.72	65.62	1.45	40.60	76.73	1.54	43.21	81.67	18.00	63.67
120	1.19	23.80	1.24	41.32	78.09	1.44	48.06	90.83	1.54	51.17	96.71	36.00	60.71
240	1.38	27.60	1.23	47.51	89.80	1.43	55.24	104.40	1.52	58.85	111.22	72.00	39.22
360	1.51	30.20	1.22	51.56	97.44	1.42	60.00	113.41	1.51	63.94	120.85	108.00	12.85
600	1.68	33.60	1.21	56.88	107.50	1.41	66.12	124.97	1.50	70.40	133.05	180.00	0.00
1440	2.03	40.60	1.19	67.57	127.71	1.38	78.30	147.99	1.46	83.21	157.26	432.00	0.00

* Z2 is a growth factor from M5 rainfalls

REQUIRED STORAGE VOLUME PER RAINFALL DURATION FOR DISCHARGE RATE v₂

rainfall duration [min]	rainfall factor Z1	M5-D rainfalls [mm]	M10-D			M30-D			M50-D			outflow from attenuation tank [m ³]	required storage [m ³]
			Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]	Z2	rainfalls [mm]	inflow [m ³]		
5	0.39	7.80	1.21	13.18	24.91	1.46	15.97	30.18	1.61	17.59	33.24	1.50	31.74
10	0.54	10.80	1.22	18.49	34.96	1.50	22.62	42.75	1.66	25.07	47.38	3.00	44.38
15	0.65	13.00	1.23	22.42	42.38	1.51	27.52	52.01	1.68	30.58	57.79	4.50	53.29
30	0.82	16.40	1.24	28.47	53.81	1.53	35.16	66.45	1.71	39.22	74.13	9.00	65.13
60	1.00	20.00	1.24	34.72	65.62	1.54	43.21	81.67	1.73	48.44	91.55	18.00	73.55
120	1.19	23.80	1.24	41.32	78.09	1.54	51.17	96.71	1.72	57.39	108.47	36.00	72.47
240	1.38	27.60	1.23	47.51	89.80	1.52	58.85	111.22	1.71	66.06	124.85	72.00	52.85
360	1.51	30.20	1.22	51.56	97.44	1.51	63.94	120.85	1.70	71.83	135.75	108.00	27.75
600	1.68	33.60	1.21	56.88	107.50	1.50	70.40	133.05	1.68	78.95	149.22	180.00	0.00
1440	2.03	40.60	1.19	67.57	127.71	1.46	83.21	157.26	1.64	93.01	175.79	432.00	0.00

* Z2 is a growth factor from M5 rainfalls

APPENDIX VI

1. This report has been prepared and written specifically for the Client named in the introduction and is exclusively for his/her/their benefit. No reliance may be placed in the contents of this report by any third party except with the express agreement of the original Client and the written agreement of RDM. Such written agreement may require the payment of an additional fee.
2. The Executive Summary and Recommendations sections of this report only provide an overview of the guidance and should not be specifically relied upon in their own right but should be considered in relation to the whole report and the development described in this report.
3. This report has been prepared and written in the context of the proposals for the development of the site as stated by the Client and will not be valid in a differing context. Furthermore, new information, improved practices, or legislation may necessitate alterations to the report in whole or in part after its submission. Therefore, with any change in circumstances or after the expiry of one year from the date of this report, it should be referred to us for re-assessment.
4. The assessment and interpretation of contamination and associated risks are based upon the scope of the work described in the fee proposal and agreed with the client, the report may not be sufficient to fully address the contamination or allow a detailed remediation scheme to proceed without further investigation or analysis.
5. Any assessments made in this report are based on the ground conditions and as revealed by the test pits and boreholes together with the results of any field or laboratory testing undertaken and where appropriate other relevant data which may have been obtained for the site. The sources of such information are detailed in this report and while RDM use only such sources as are believed to be reliable, RDM will not be liable for the authenticity or reliability of information obtained from others.
6. Notwithstanding that factual reports from third parties concerning asbestos or mould of any kind may have been included for information purposes in this report, RDM will have no liability whatsoever for any claim or claims arising related to asbestos or mould of any kind.
7. There may also be special conditions appertaining to the site which were not revealed by the investigation and which will not, therefore, have been taken into account in this report. Any assessments may be subject to amendment in the light of additional information becoming available.
8. Whilst an opinion may be expressed or implied in this report on possible configurations of strata between or beyond test pit or borehole locations, or on the possible presence of features based on either visual, verbal or published evidence, this is for guidance only and no liability can be accepted for the accuracy of such opinions.
9. Comments on groundwater conditions will have been based on observations made only at the time of the investigation unless otherwise stated. It should be noted, however, that groundwater levels vary due to seasonal and other effects.
10. This report is not a site categorisation, and hazards could occur which have not been detected.
11. Where data has been provided or is made available to RDM and this has been used in the report, it has been assumed that the information is correct. No responsibility can be accepted by RDM for inaccuracies within the data supplied.
12. The copyright in this report and other related plans and documents prepared by RDM is owned by them and no such report, plan or document may be reproduced, published or adapted without their written consent. Complete copies of the report may however be made and distributed by the Client as an expedient in dealing with matters related to its commission.
13. This report has been prepared solely for the client's purposes in obtaining planning permission and discharge of the planning conditions related to the proposed development indicated in the report. The discharge of these conditions does not constitute that the site could be determined under Part IIA of the Environmental Protection Act 1990.