West Winch Housing Access Road

Environmental Statement Chapter 12: Appendix 12.3: Ground Investigation report

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1 Introduction

1.1.1 This document contains the Ground Investigation Report produced by WSP. Some users may not be able to access all technical details. If you require this document in a more accessible format please contact westwinchhar@norfolk.gov.uk.

Ground Conditions Appraisal

DATE:	02 February 2021	**CONFIDENTIALITY:**	Confidential
SUBJECT:	West Winch Housing Access Road Ground Conditions Appraisal		
PROJECT:	70039893 - West Winch Housing Access Road	**AUTHOR:**	Holly Smith / Hannah Davies
CHECKED:	Abi Barton / Alex Mann	**APPROVED:**	Mark Wheeler

1 INTRODUCTION

1.1 AUTHORISATION AND OBJECTIVES

WSP have been instructed by Norfolk County Council (NCC) ("the Client") who are working in partnership with the Borough Council of Kings Lynn and West Norfolk (BCKLWN) to undertake a ground investigation and associated geotechnical appraisal work for along the route of the proposed West Winch Housing Access Road (WWHAR) scheme (furthermore referred to as "the Scheme"), as shown in **Figure 1** in **Appendix A**.

This appraisal does not form a Ground Investigation Report (GIR) nor Geotechnical Design Report (GDR) as described in BS EN 1997-2 Eurocode 7. It provides a preliminary geotechnical assessment and updates the geotechnical and geo-environmental aspects of the Preliminary Risk Assessment (PRA) completed by WSP in June 2019. The document provides a preliminary overview of the ground conditions encountered along the proposed road to assist outline design, however, does not provide sufficient information for the detailed design of any structures (including over bridges / cuttings / embankments).

1.2 SITE INFORMATION AND PROPOSED DEVELOPMENT

The scheme is located between the A47 at the northern extent and the A10 at the southern extent, crossing a number of existing Grade 2 and 3 agricultural land parcels. The village of West Winch is located to the south of Kings Lynn with the area immediately to the east of the town allocated for up to 4,000 dwellings.

The scheme proposes minor modification of the existing highway network on and adjacent to the existing alignment and the A10 to introduce traffic calming measures. For this assessment, and to enable easier reference of features, the scheme has been separated into three sections;

- The Northern section (north of Mill Lane);
- The Central Section (between Mill Lane and Chequers Lane); and
- The Southern Section (south of Chequers Lane).

1.3 OBJECTIVES

The objectives of the Ground Conditions Appraisal are:

- Identify existing ground conditions along the alignment of the scheme;
- Consider geotechnical behaviour of strata influencing settlement, foundation and earthworks design; and
- To provide preliminary geotechnical parameters to inform outline geotechnical design.

1.4 SCOPE OF WORKS

To meet the objectives detailed in Section 1.3, the following scope of works was specified to be completed along the proposed alignment of the scheme:

- 17no. trial pits;
- 8no. window sample boreholes;
- Geotechnical and Geo-Environmental in-situ testing;
- Geotechnical and Geo-Environmental laboratory testing;
- Groundwater level monitoring; and
- Falling head tests.

Due to site restrictions associated with access permissions, ecology and time, a number of the proposed positions were not completed. Table 1 summarises the site restrictions.

Table 1 - Site Investigation Constraints

Exploratory Hole	Completed as planned	Not completed	Altered on-site
Trial Pits	9no. TP205 – TP207, TP210 and TP213 – TP217	6no. TP201 – TP204 and TP212 (ecology) TP209 (access)	2no. TP208 and TP211 (completed as WS due to time constraints associated with excavator / ecology)
Window Sample Boreholes	6no. WS101 – WS103 and WS105 – WS107	2no. WS104 (access) WS108 (ecology)	

1.5 LIMITATIONS

This report is addressed to and may be relied upon by the following parties:

Norfolk County Council

Borough of Kings Lynn and West Norfolk

This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party unless expressly agreed upon.

The report needs to be read and used in full. Other limitations associated with the report are included in **Appendix B**.

2 PREVIOUS REPORTING

Geo Environmental Group (GEG) completed a soakaways report in April 2012 for the land north of the scheme. The geological units identified comprised the Lowestoft Formation, the Mintlyn Member and the Roxham and Runcton Member (Undifferentiated).

The conclusion of the GEG report was that the sands of the Mintlyn, Roxham and Runcton Members are likely to be the most permeable strata.

Atkins completed a Geo-Environmental Assessment Report in January 2017 for land in the northern section of the scheme. Ground conditions generally confirmed published information and previous investigations. Groundwater was recorded on site between 1.10m and 7.5m bgl. Atkins reported permeabilities, calculated from the in-situ tests. Infiltration rates within the different strata are summarised below;

- $5.61x10^{-06}$ m/s within the Made Ground;
- $1.55x10^{-06}$ m/s within the Lowestoft Formation;
- Between $6.35x10^{-08}$ to $2.34x10^{-09}$ m/s within the Leziate Member;
- $5.62x10^{-06}$ m/s within the Mintlyn Beds;
- Between $1.04x10^{-06}$ and $6.03x10^{-07}$ m/s within the Roxham and Runcton (undifferentiated) beds; and
- $1.61x10^{-05}$ m/s within the Kimmeridge Clay.

WSP completed a Preliminary Risk Assessment (PRA) in June 2019.

3 SITE INVESTIGATION AND ASSESSMENT RATIONAL

3.1 FIELDWORKS

The supplementary ground investigation works were completed by Norse Group between 22 July 2020 and 1 August 2020 and comprised the scope of works detailed in **Section 1.4**. A summary of the findings of ground investigation works is presented in **Section 4**.

The exploratory hole plan is presented as **Figure 2,** included in **Appendix A** and illustrates the locations of the exploratory holes undertaken within this ground investigation.

3.2 IN-SITU AND FIELD SOIL TESTING

SPTs were performed within all original window sample exploratory hole locations, with the exception of WS208 and WS211; the results are presented on the exploratory hole records attached in **Appendix C**.

3.3 SAMPLING AND LABORATORY ANALYSIS

GEOTECHNICAL - SOILS

A programme of geotechnical laboratory testing was undertaken on selected samples recovered during the investigation in general accordance with the requirements of BS 1377:1990, BS EN 1997-2:2007, and BRE Special Digest 1:2005. **Table 2** shows a summary of geotechnical laboratory testing.

Table 2 – Summary of Laboratory Testing

Test	Number of Tests
Moisture Content	3
Atterberg Limit Analysis	13
Particle Size Distribution	10
BRE Suite pH and SO4 (Pyrite Present)	12

Geotechnical laboratory testing was undertaken at the UKAS accredited laboratory of Norfolk Partnership Laboratory with ISO17025 and MCERTS accredited test methods specified where applicable for contamination testing and as shown in the laboratory test certificates appended to this report.

ENVIRONMENTAL – SOILS

The sampling was undertaken to allow vertical and lateral coverage of the site. Four samples from the Topsoil; one sample from the Head Deposits; nine soil samples from the Tottenhill Sands and Gravels; three soil samples from the Lowestoft Till Formation; and two soil samples from the Mintlyn Beds Formation were scheduled for analysis. The chemical laboratory analysis consisted of pH, metals, cyanide, sulphate (water soluble), hexavalent chromium, phenols, pesticides, herbicides, PAHs, PCBs, semi-volatile organic compounds (SVOCs, VOCs, Total Petroleum Hydrocarbon Criteria Working Group (TPH-CWG), asbestos and soil organic matter (SOM). Laboratory certificates are appended.

ENVIRONMENTAL – GROUNDWATER

Five groundwater samples were collected on 18 August from WS101, WS103, WS105, WS106 and WS107. Six groundwater samples were collected on 9 November 2020 from WS101, WS102, WS103, WS105, WS106 and WS107.

All of the groundwater samples were analysed for a chemical suite including pH, ammoniacal nitrogen, nitrite, nitrate, sulphate, cyanide, phenols, metals, PAHs, PCBs, SVOCs, VOCs, TPH-CWG and BTEX. Three of the groundwater samples were analysed for the above suite plus pesticides, insecticides and herbicides. Laboratory certificates are appended to this report.

4 GROUND CONDITIONS

4.1 GROUND CONDITIONS ENCOUNTERED ON-SITE

Ground conditions encountered during the drilling works undertaken by the Norse Group between 22 July and 1 August 2020 are summarised in **Tables 3, 4 and 5** and descriptions of the strata provided in the following sections.

Table 3 – Summary of ground conditions recorded in the northern section (WSP Investigation 2020; taken from two exploratory holes)

Strata	Top Depth (m bgl) Elevation [m AOD]	Depth to Base (m bgl) Elevation [m AOD]	Thickness (Average)
Topsoil	0.00 [7.29 – 13.45]	0.30 – 0.65 [6.69 – 13.10]	0.30 – 0.65 (0.48)
Alluvium[1]	0.60 [6.69]	1.60 [5.69]	1.00 (1.00)
Mintlyn Beds Formation	0.35 – 1.60 [5.69 – 13.10]	1.65 – 2.30 [4.99 – 11.80]	0.70 – 1.30 (1.00)
Roxham and Runcton Beds	1.65 – 2.30 [4.99 to 11.80]	2.60 – 3.00 (NP) [4.69 to 10.45]	0.30 – 1.35 (NP) (0.83)
Kimmeridge Clay[2]	2.60 [4.69]	3.00 (NP) [4.29]	0.40 (NP) (0.40)

[1/2] Encountered in one location within TP217 in the very north of the Site.
Note, the base depth of some units was not confirmed at the investigation locations.

Table 4 – Summary of ground conditions recorded in the central section (WSP Investigation 2020; taken from seven exploratory holes)

Strata	Top Depth (m bgl) Elevation [m AOD]	Depth to Base (m bgl) Elevation [m AOD]	Thickness (Average)
Topsoil	0.00 [15.29 – 20.36]	0.30 – 0.65 [14.94 – 20.06]	0.30 – 0.65 (0.39)
Tottenhill Sands and Gravels	0.30 – 0.35 [17.32 – 20.06]	1.50 - 2.00 [16.17 – 18.76]	1.15 – 1.70 (1.38)
Lowestoft Till Formation	0.35 – 1.50 [14.94 – 18.04]	1.90 – 5.45 (NP) [12.19 – 15.77]	0.40 – 4.80 (NP) (2.65)
Mintlyn Beds Formation	0.40 – 2.00 [15.77 – 19.52]	3.00 – 5.00 (NP) [14.67 – 16.46]	1.10 – 4.60 (NP) (2.46)
Roxham and Runcton Beds	3.85 – 3.90 [15.33 – 16.46]	5.00 - 5.45 (NP) [13.73 – 14.18]	1.10 - 1.60 (NP) (1.35)
Kimmeridge Clay	Not encountered during this investigation within the central section, anticipated to be present underlying site.		

Note, the base depth of some units was not confirmed at the investigation locations.

Table 5 – Summary of ground conditions recorded in the southern section (WSP Investigation 2020; taken from eight exploratory holes)

Strata	Top Depth (m bgl) Elevation [m AOD]	Depth to Base (m bgl) Elevation [m AOD]	Thickness (Average)
Topsoil	0.00 [10.71 – 17.74]	0.30 – 0.60 [10.31 – 17.14]	0.30 – 0.60 (0.43)

Strata	Top Depth (m bgl) Elevation [m AOD]	Depth to Base (m bgl) Elevation [m AOD]	Thickness (Average)
Head Deposits[1]	0.50 [11.20]	2.00 [9.70]	1.50 (1.50)
Tottenhill Sands and Gravels	0.30 – 2.00 [9.70 – 16.24]	0.85 – 3.85 [7.85 – 15.34]	0.40 – 1.85 (0.95)
Lowestoft Till Formation	0.60 – 3.85 [7.85 – 17.14)	1.40 – 5.00 (NP) [6.70 – 15.74]	0.55 – 1.40 (NP) (0.91)
Mintlyn Beds Formation	0.80 – 2.00 [10.01 – 15.74]	1.90 – 3.30 [9.51 – 15.04]	0.50 – 2.10 (1.15)
Roxham and Runcton Beds	1.35 – 3.30 [9.36 to 15.04]	1.90 – 5.45 (NP) [8.81 to 15.36]	0.20 – 2.60 (NP) (1.16)
Kimmeridge Clay	1.50 – 2.10 [8.81 – 9.73]	2.60 – 5.45 (NP) [5.26 – 8.81]	0.50 – 3.55 (NP) (1.73)

[1/2] Encountered in one location within WS106, located in the south west of the Site.
Note, the base depth of some units was not confirmed at the investigation locations.

4.1.1 TOPSOIL

Topsoil was encountered within all exploratory hole locations, ranging in thickness from 0.30 to 0.65m. Topsoil was recorded as dark brown to brownish grey, slightly gravelly, sandy silty slightly clayey topsoil, with some rootlets and straw and an organic odour.

4.1.2 ALLUVIUM

Alluvium was encountered underlying the topsoil at one location in the north of the scheme, in TP217. Alluvium was recorded as dark grey, very sandy silty clay with occasional roots and a slight organic odour. The Alluvium measured 1m in thickness and reached up to 1.60m bgl.

4.1.3 HEAD DEPOSITS

Head deposits were encountered underlying the topsoil at one location in the south of the scheme, in WS106. The Head deposits were granular in nature, recorded as mottled orange brown and grey, slightly silty to very silty, slightly gravelly clayey fine to medium sand. The gravel was medium sub-angular to sub-rounded of flint. The Head deposits measured 1.50m thick. Some orange staining was noted at 1.50 to 2.00m bgl.

4.1.4 TOTTENHILL SANDS AND GRAVELS

Tottenhill Sands and Gravels was encountered within the central and southern portion of the scheme and were absent in the north of the site. Deposits ranged in thickness between 0.40 and 1.85m. The Tottenhill Sands and Gravels were recorded as dark brown to brownish grey, slightly clayey, silty very gravelly fine to medium sand. Gravel was fine to coarse, angular to sub-rounded of flint, quartz, ironstone and carstone. WS103 recorded a number of lenses of grey clay at 0.60m bgl.

4.1.5 LOWESTOFT FORMATION

The Lowestoft Formation was encountered within the central and southern portion of the scheme and was absent in the north of the site. Ranging in thickness between 0.40 to 4.80m the full thickness of the Lowestoft Formation was not proven in this investigation. The Lowestoft Formation was recorded as firm to very stiff, orange brown to dark grey, sandy slightly silty gravelly clay. Gravel was fine to coarse, angular to sub-rounded of flint, chalk and mudstone. Occasional flint cobbles were encountered with depth. In TP205, numerous lenses of orange brown very sandy silty clay was reported at 0.80m bgl.

4.1.6 MINTLYN BEDS FORMATION

The Mintlyn Beds Formation was encountered throughout the scheme, ranging from 0.50 to 4.60m in thickness. The base of the unit was not proven in parts of the central portion of the scheme in this investigation. The Mintlyn Beds were predominantly encountered as granular deposits, recorded as light brown to dark grey, slightly clayey silty slightly gravelly fine to medium sand, within laminations and thin beds of weak to moderately weak sandstone, weak reddish-brown ironstone and siltstone. Cohesive deposits were recorded as stiff, mottled reddish brown and orange brown very sandy gravelly clay. Gravel was fine to coarse, angular to sub-rounded of flint, ironstone, chert and phosphatic nodules.

4.1.7 ROXHAM AND RUNCTON BEDS

The Roxham and Runcton Beds were encountered throughout the scheme and ranged in thickness from 0.20 to 2.60m. The base of the unit was not always proven in this investigation. The Roxham and Runcton Beds were recorded as predominantly cohesive material, a firm to very stiff, silty sandy clay. Granular deposits, comprising dark grey to brown, very silty slightly gravelly fine to medium sand were also recorded. Gravel was fine to medium, sub-rounded of flint, sandstone, pyrite nodules and occasional phosphate nodules.

4.1.8 KIMMERIDGE CLAY

The Kimmeridge Clay was encountered predominantly in the northern and southern portion of the scheme and was not encountered in the central section as the exploratory holes terminated in the overlying units. The top of the unit was encountered from 1.5 to 2.6m bgl. The Kimmeridge Clay was recorded as a firm to stiff, dark grey to bluish grey laminated clay with lenses of light grey silty fine sand and occasional shell fragments. In TP215 at 1.95m bgl, a channel infilled with greyish brown fine to medium sand was noted. The maximum depth encountered was 5.45m bgl, due to exploratory holes terminating within the stratum.

4.2 GROUNDWATER CONDITIONS

Total of 10 falling head tests were undertaken within four exploratory holes, WS102, WS103, WS105 and WS107. **Table 6** below summarises the results of the testing.

Table 6 – Summary of Soakaway testing

Borehole ID	Depth to water (m bgl)	No. of Tests	Infiltration Rate (m/sec)			Strata
			Min	Max	Average	
WS102	4.90	1	4.40E-09	4.40E-09	4.40E-09	Lowestoft Formation
WS103	1.50	3	1.5E-05	2.0E-05	1.7E-05	Tottenhill Sands and Gravels
WS105	3.25	3	3.5E-06	9.2E-06	5.6E-06	Mintlyn Beds
WS107	1.70	3	7.2E-05	7.7E-05	7.4E-05	Roxham and Runcton Beds Formation

Groundwater strikes were associated with the predominantly granular strata, such as the Tottenhill Sands and Gravels, Mintlyn Beds and Roxham and Runcton Beds Formation, which corresponds with previous investigations.

11 groundwater monitoring visits were completed between 08 August 2020 and 16 December 2020. During the monitoring visits on 18 August 2020 and 9 November 2020, groundwater samples were collected from the installed window sample locations.

Table 7 below outlines the well installation details and **Table 8** provides a summary of the encountered groundwater during the monitoring visits on 18 August 2020 and 9 November 2020.

Table 7 – Summary of Monitoring Installations

Exploratory Hole	Ground Level (m AOD**)	Screen Top and Base Depth (m bgl)*	Screen Top and Base Elevation (m AOD**)	Strata
WS101	19.92	1.00 to 5.00	18.92 to 14.92	Mintlyn Beds
WS102	18.18	1.00 to 5.00	17.18 to 13.18	Lowestoft Till Formation
WS103	19.18	1.00 to 5.00	18.18 to 14.18	Tottenhill Sand and Gravels, Mintlyn Beds and Roxham and Runcton Beds
WS105	16.54	1.00 to 5.00	15.54 to 11.54	Tottenhill Sand and Gravels, Mintlyn Beds and Roxham and Runcton Beds
WS106	11.70	1.00 to 5.00	10.70 to 6.70	Head Deposits, Tottenhill Sand and Gravels and Lowestoft Till Formation
WS107	10.71	1.00 to 5.00	9.71 to 5.71	Tottenhill Sand and Gravels, Roxham and Runcton Beds and Kimmeridge Clay

***** metres below ground level
** metres above ordnance datum

Table 8 – Post-works Groundwater Monitoring Visits

Exploratory Hole	Elevation of screen top (m AOD)	Elevation of screen base (m AOD)	Geology of Response Zone	Groundwater Level m bgl (m AOD)		
				Min	Mean	Max
WS101	18.92	14.92	Mintlyn Beds	1.20 (18.72)	2.30 (17.62)	2.79 (17.13)
WS102	17.18	13.18	Lowestoft Till Formation	0.10 (18.08)	0.69 (17.49)	0.90 (17.28)
WS103	18.18	14.18	Tottenhill Sand and Gravels	0.65 (18.58)	1.33 (17.85)	1.82 (17.36)
WS105	15.54	11.54	Roxham and Runcton Beds	1.10 (15.44)	2.82 (13.72)	3.41 (13.13)
WS106	10.70	6.70	Head Deposits, Tottenhill Sand and Gravels and Lowestoft Till Formation	0.70 (11.00)	1.17 (10.53)	1.55 (10.15)

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Exploratory Hole	Elevation of screen top (m AOD)	Elevation of screen base (m AOD)	Geology of Response Zone	Groundwater Level m bgl (m AOD)		
				Min	Mean	Max
WS107	9.71	5.71	Roxham and Runcton Beds and Kimmeridge Clay	0.76 (9.95)	1.34 (9.37)	1.80 (8.91)

***** metres below ground level

** metres above ordnance datum

5 GEOTECHNICAL RESULTS AND MATERIAL PROPERTIES

5.1 GENERAL

This section presents an interpretation of the ground conditions encountered based on available data, the geotechnical laboratory results are presented in the **Appendix D**. Geotechnical Plots are attached in **Appendix A**.

The results of geotechnical testing have been separated by strata to provide a distinct information set for each geology. **Table 9** below presents the results of in-situ and laboratory testing within the site.

Table 9 – Results of Geotechnical Testing

Test Results	Minimum value	Maximum value	Average value	Number of values	Remarks
Alluvium					
Moisture Content, MC (%)	44	44	44	1	
Liquid Limit, LL (%)	67	67	67	1	
Plastic Limit, PL (%)	45	45	45	1	
Plasticity Index, PI (%)	22	22	22	1	
Head Deposits					
SPT N Value	11	11	11	1	
pH Value	7.39	7.71	7.55	2	
SO4 2:1 Extract (mg/l)	<10	<10	<10	1	
Tottenhill Sands and Gravels					
SPT N Value	13	21	17	4	
pH Value	6.24	7.69	7.03	3	
Sulphate 2:1 Extract, SO4 (mg/l)	<10	<10	<10	2	
Lowestoft Till Formation					
Moisture Content, MC (%)	12	22	17	7	
Liquid Limit, LL (%)	30	40	34	4	
Plastic Limit, PL (%)	12	17	15	4	
Plasticity Index, PI (%)	17	24	19	4	
SPT N Value	18	28	22	6	
Undrained Shear Strength, Cu (kPa)	83 (SPT)	129 (SPT)	103 (SPT)	6 (SPT)	A factor of 4.6 based on an average PI of 19% was used to correlate SPT and Cu.

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Test Results	Minimum value	Maximum value	Average value	Number of values	Remarks
pH Value	7.63	7.71	7.67	2	
Sulphate 2:1 Extract, SO4 (mg/l)	<10	20	15	2	
Mintlyn Beds Formation					
Moisture Content, MC (%)	14	28	21	5	
Liquid Limit, LL (%)	27	50	40	6	
Plastic Limit, PL (%)	15	20	18	4	2 results returned at Non-Plastic (NP)
Plasticity Index, PI (%)	24	34	29	4	
SPT N Value	11	40	24	9	
Undrained Shear Strength, Cu (kPa)	46 (SPT)	168 (SPT)	43 (SPT)	3 (SPT)	A factor of 4.2 based on an average PI of 29% was used to correlate SPT and Cu.
pH Value	7.23	7.23	7.23	1	
Roxham and Runcton Beds					
SPT N Value	22	48	32	4	
pH Value	7.20	7.44	7.32	2	
Kimmeridge Clay					
Moisture Content, MC (%)	16	28	22	2	
Liquid Limit, LL (%)	27	60	44	2	
Plastic Limit, PL (%)	14	19	17	2	
Plasticity Index, PI (%)	13	41	27	2	
SPT N Value	9	43	23	4	
Undrained Shear Strength, Cu (kPa)	39 (SPT)	185 (SPT)	97 (SPT)	4 (SPT)	A factor of 4.3 based on an average PI of 27% was used to correlate SPT and Cu.
pH Value	7.60	7.61	7.605	2	
Sulphate 2:1 Extract, SO4 (mg/l)	760	860	810	2	

5.2 CHARACTERISTIC PARAMETERS

Preliminary characteristic geotechnical parameters for the geological units encountered are summarised in **Table 10**. Unless otherwise noted, representative parameters and likely parameter ranges are presented based on engineering assessment of the available project data.

5.2.1 UNIT WEIGHT

The unit weight has been determined form laboratory testing, the soil description and published data.

5.2.2 ALLUVIUM

NATURAL MOISTURE CONTENT AND PLASTICITY

Alluvium was very limited, encountered in a single location in the north of the site. Testing for Natural Moisture Content (NMC) was undertaken on a single sample of the Alluvium, reporting a value of 44%. Plasticity testing was undertaken on a single sample, reporting a Plasticity Index (PI) value of 22%, and identified as an intermediate plasticity material.

5.2.3 HEAD

STANDARD PENETRATION TESTING

Head deposits at the Site were very limited, encountered as a granular soil in a single location in the south of the site. A single SPT was undertaken and recorded a value of 11. This indicates a low to medium dense material.

5.2.4 TOTTENHILL SANDS AND GRAVELS

STANDARD PENETRATION TESTING

Four SPT's were undertaken within the Tottenhill Sands and Gravels and recorded values of between 13 and 21. These values indicate a medium dense granular material.

5.2.5 LOWESTOFT FORMATION

NATURAL MOISTURE CONTENT AND PLASTICITY

Testing for NMC was undertaken on seven samples within the Lowestoft Formation reporting values ranging between 12% and 22%. Plasticity testing was undertaken on four samples, reporting PI values ranging from 17% to 24%, and identifying as a low / intermediate plasticity soil. A characteristic PI of 19% is recommended.

UNDRAINED SHEAR STRENGTH

Six SPT's were undertaken within the Lowestoft Formation, reporting SPT N Values of between 18 and 28. Using a correlation factor of 4.6 based on an average PI value of 19% to correlate N to estimated

undrained shear strength (Cu), in accordance with Stroud CIRIA143, the data generates a Cu range of 83 to 129kPa. There appears to be a linear increase in strength with depth.

5.2.6 MINTLYN BEDS

NATURAL MOISTURE CONTENT AND PLASTICITY

Testing for Natural Moisture Content (NMC) was undertaken on 5 samples of the Mintlyn Formation, reporting results of between 14% to 28%. The Mintlyn Beds are predominantly granular material, and two samples returned Atterberg limit classifications as Non-Plastic. Plasticity testing on four samples reported PI values ranging between 24% and 34%, identifying as an intermediate plasticity soil (where cohesive) with an average PI of 29%.

STANDARD PENETRATION TESTING

Nine SPT's were undertaken within the Mintlyn Beds and recorded SPT N Values of between 11 and 40. Of these nine SPT's, six were undertaken within granular soils, with N Values recorded between 18 and 28. This indicates a medium dense material.

UNDRAINED SHEAR STRENGTH

Three SPT tests undertaken within the Mintlyn Beds were taken within cohesive soils (all within WS105), reporting SPT N Values of between 11 and 40. Using a correlation factor of 4.2 based on an average PI value of 29% to correlate N to estimated undrained shear strength, in accordance with Stroud CIRIA143, the data generates a Cu range of 46 to 168kPa, increasing linearly with depth.

5.2.7 ROXHAM AND RUNCTON BEDS

STANDARD PENETRATION TESTING

Four SPT's were undertaken within the Roxham and Runcton Beds, recording values of between 22 and 48. Based on the scatter of data, there is no discernible pattern. These values indicate a medium dense to very dense material.

5.2.8 KIMMERIDGE CLAY

NATURAL MOISTURE CONTENT AND PLASTICITY

Testing for NMC was undertaken on two samples of the Kimmeridge Clay and reported values of between 16% and 28%. Plasticity testing was undertaken on two samples and reported Plasticity Index (PI) values of between 13% and 41% plasticity, identifying as a low plasticity and high plasticity respectively.

UNDRAINED SHEAR STRENGTH / DENSITY

Four SPT's were undertaken within the Kimmeridge Clay, reporting SPT N Values of between 9 and 43. Using a correlation factor of 4.3 based on an average PI value of 27% to correlate N to estimated

undrained shear strength, in accordance with Stroud CIRIA143, the data generates a Cu range of 39 to 185kPa, also increasing linearly with depth.

Table 10 – Geotechnical parameters summary

Stratum	Unit Weight	Plasticity (%)	SPT N Value	Undrained Shear Strength, Cu (kPa)
Alluvium	16	22	-	-
Head deposits	16	-	11	-
Tottenhill Sands and Gravels	19	-	13 – 21	-
Lowestoft Formation	18	19	18 – 28	83 – 129
Mintlyn Beds	19	29 (where cohesive)	18 – 28 (granular)	46 – 168 (cohesive)
Roxham and Runcton Beds	18	-	22 - 48	-
Kimmeridge Clay	18	13 - 41	9 - 43	39 - 185

6 GEOTECHNICAL ASSESSMENT

6.1 GENERAL

Characteristic soil properties are suggested in **Table 9** in **Section 5.** As part of the design process the designer should review these and make modifications as required for the specific engineering applications considered.

The assessment below is considered as a preliminary appraisal, to inform outline design. Further ground investigation and laboratory testing and subsequently a Ground Investigation Report, are required to inform detailed design.

6.2 FOUNDATIONS

Culvert and bridge structures are proposed within the scheme; however, the ground investigation is not sufficient to inform on the structural foundations.

The Alluvium and Head deposits are not considered suitable as bearing stratums, any foundations shown to bear within these strata should be locally deepened to bear within the underlying material.

It is anticipated shallow foundations will be suitable for simple lightly loaded structures (such as road signs or street lighting). Where lightly loaded structures are proposed within soft or compressible material, this should be removed beneath the proposed foundation area and replaced with well compacted granular material.

Based on the likely anticipated loads, it is assumed that shallow spread foundations may be suitable for culvert structures and the NMU bridge. The vehicle bridge may need deeper foundations, dependent on the loads.

The final foundation solutions will follow once the structural loads, lines and levels have been provided, and will be reassessed as part of detailed design.

Further intrusive investigation is recommended targeted to the specific structures to inform their foundation design.

6.3 EARTHWORKS

The topography at the site suggests the road would be at grade, with little need for cuttings and embankments. The exception to this may be if the route is required to be elevated above a potential flood level.

It is recommended that the earthworks are designed based on the requirements of BS6031.

The fill materials required to raise ground levels should be placed and adequately compacted, in accordance with an Earthworks Specification, reducing the potential for differential settlement and future ground movement.

It is considered that excavated material will be suitable for re-use within the scheme for low embankments, with most of the likely site-won material comprising Lowestoft Formation clays anticipated to be Class 2A/B, Mintlyn Bed clayey sands identified as a combination of both Class 1B (granular) and Class 2A/B (cohesive), due to the variability observed in the field and the Tottenhill Sands and Gravels identified to be a combination of Class 1B and Class 2A/B, although anticipated to be predominantly Class 1B. Mixing of the different types of strata, (and sub-units where encountered) should be avoided as the materials are likely to have different earthwork compaction requirements.

Subsequent earthworks design should be progressed in the form of an Earthworks Specification. Further targeted earthworks testing is recommended to confirm the earthwork compaction requirements of material likely to be re-used onsite.

6.4 EXTERNAL PAVEMENTS

Pavements and sub-base design are recommended based on California Bearing Ratio (CBR) values. No testing was undertaken to directly measure CBR in-situ. Preliminary design CBR values for cohesive material have been estimated from plasticity index (PI) data based on the correlation presented in IAN73/06 Table 5.1 (Highways England, 2009).

Note, shallow groundwater may impact CBR values on site. It is recommended that CBR values are confirmed with in-situ testing during construction.

Table 11 – California Bearing Ratios

Geology	Characteristic PI (%)	Preliminary Design CBR (%)	Comments
Alluvium	22%	2%	Present locally at formation level.
Head	-	4%	Present locally at formation level.
Tottenhill Sands and Gravels (Granular)	-	10%	Widespread across the Site at formation level.

Geology	Characteristic PI (%)	Preliminary Design CBR (%)	Comments
Lowestoft Formation	19%	3%	Widespread across the Site at formation level.
Mintlyn Beds	29% (where cohesive)	4-5%	Underlying the Site at formation level. It is possible the Mintlyn Beds are susceptible to heave, and fracture caused by frost.

6.5 GROUNDWATER

The groundwater at the Site was identified between approximately 0.5-3m bgl. During design stages the need for dewatering will require consideration.

6.6 INFILTRATION

Infiltration tests were undertaken within four strata. Tests were conducted and interpreted in accordance with BRE365. This standard requires that a water filled pit drained from being 75% full to being 25% full and repeated 3 times.

The infiltration rate for the Tottenhill Sands and Gravels was $1.7x10^{-5}$m/s.

The infiltration rate for the Lowestoft Formation was $4.40x10^{-9}$ m/s.

The infiltration rate for the Mintlyn Beds was $5.6x10^{-6}$m/s.

The infiltration rare for the Roxham and Runcton Beds was $7.4x10^{-5}$m/s.

The poorer infiltration rate within the Lowestoft Formation are as anticipated due to the cohesive nature of the units.

6.7 BURIED CONCRETE

Buried concrete class has been determined using BRE suite testing. Classification has been undertaken assuming that the site is a greenfield location, with mobile groundwater. The buried concrete classifications for each area of site have been determined based on BRE Special Digest 1:2005 (Table C1) and are detailed in **Table 12.** Please note, no samples within the Alluvium were tested, and no samples within the Mintlyn Beds or Roxham and Runcton Formation (Undifferentiated) were tested.

Table 12- Buried concrete classifications

Stratum	2:1 water/soil extract (SO4mg/l) Max value	pH Min Value	Design Sulphate Class	Aggressive Chemical Environment for Concrete Class
Head Deposits	<10	7.39	DS-1	AC-1
Tottenhill Sands and Gravels	<10	6.24	DS-1	AC-1
Lowestoft Formation	20	7.63	DS-1	AC-1
Kimmeridge Clay	860	7.60	DS-2	AC-2

7 QUANTITATIVE RISK ASSESSMENT

7.1 HUMAN HEALTH RISK ASSESSMENT

A direct comparison of GAC/C4SLs for public open space has been undertaken for the analytical results of the selected soil samples. Laboratory certificates are appended to this report.

No exceedances were noted within the soils sampled from across the site. It should be noted that the results are also below the thresholds for the most conservative end use (residential with plant uptake).

One soil sample from WS101 was analysed for asbestos. No asbestos was detected within this sample.

The WSP Human Health methodology is appended to this report.

7.2 CONTROLLED WATERS GQRA

The most sensitive controlled water receptors for the site are the surrounding ponds, field drains, ditches and Pierpoint Drain, and the groundwater anticipated within the Tottenhill Gravel Member and Raised Beach Deposits (Secondary (A) Aquifer), Lowestoft Till Formation and Head Deposits (Secondary Undifferentiated Aquifer) and Sandringham Sands Formation (Principal Aquifer). Alluvium Deposits (Secondary (A) Aquifer) were also encountered in one location (TP217), therefore these deposits are included as a controlled water receptor.

The controlled waters assessment approach is appended to this report.

The groundwater exceedances are detailed in **Table 13** below.

Table 13 – Groundwater Exceedances

Contaminant	Exceedances	Max Result (µg/) (µg/)	Criteria Source	Threshold	Units
Copper	WS101 (R1 & R2) WS102 (R2) WS103 (R1 & R2) WS105 (R1 & R2) WS106 (R1 & R2) WS107 (R1 & R2)	361	EQS 2015(1)	1 3 4	µg/l

Nickel	WS101 (R1 & R2) WS103 (R1 & R2) WS105 (R1) WS106 (R1 & R2) WS107 (R1 & R2)	14	EQS 2015(1)	4[3]	µg/l
Zinc	WS101 (R1 & R2) WS102 (R2) WS103 (R1 & R2) WS105 (R1 & R2) WS106 (R1 & R2) WS107 (R1 & R2)	1030	EQS 2015(1)	10.9[3] [4]	µg/l
Fluoranthene	WS101 (R1)	0.06	EQS 2015(1)	0.0063	µg/l
Benzo (a) pyrene	WS101 (R1)	0.02	EQS 2015(1) and UK DWS(2)	0.00017 for EQS and 0.01 for UK DWS(2)	µg/l
Total PAH summed	WS101 (R1)	0.25	EQS 2015(1)	0.8	µg/l

R1: Round one of groundwater sampling (18 August 2020)
R2: Round two of groundwater sampling (09 November 2020)
[1]The Water Framework Directive (Standards and Classification) Directions (England and Wales), 2015
[2]The Water Supply (Water Quality) Regulations, 2016
[3]Receptor specific values using bioavailability tool have not been derived therefore, current values are considered to be conservative
[4]Ambient background concentration has been set to 0µg/l to remain conservative

8 REVISED CONCEPTUAL SITE MODEL

8.1 INTRODUCTION

The preliminary conceptual site model from the Preliminary Risk Assessment produced by WSP in June 2019 (Ref 70039893-PRA) has been revised based on the data collected during the supplementary ground investigation. The revised CSM is available in **Table 14.**

Table 14 - Revised Conceptual Site Model

Sources	Contaminants	Pathways	Receptors	Revised Risk Rating
On-site current and historical roads including A10, A47, Rectory Lane and Chequers Lane and agricultural land use including a sheep wash (Hardwick Interchange). Historical railway to the	Metals (copper, nickel and zinc) and PAHs.	Human Health Dermal contact; Direct exposure to impacted shallow groundwater and/or surface water; Inhalation of particulates/fibres and/or soil/water derived vapours Controlled Waters Leaching of contaminants through the unsaturated zone and subsequent	Current / future site users (construction / maintenance workers)	**LOW** No Made Ground or asbestos was encountered during the investigation. No exceedances were identified within the soils to the public open space GAC or the most conservative land use (residential with plant uptake). Mitigation measures will be in place during any construction / maintenance works to further reduce any risk.
			Surrounding ponds, field drains, ditches and Pierpoint Drain, Tottenhill Gravel Member and Raised Beach Deposits (Secondary (A) Aquifer) Head	**LOW** Groundwater was encountered during the investigation works and subsequent monitoring visits. This shallow groundwater was identified within the granular deposits of the Head Deposits, Tottenhill Sand and Gravels, Mintlyn Beds and Roxham and Runcton Beds (part of the Sandringham Sands Formation).

south of the Hardwick interchange. Inactive clay pit in the northern section of the site.		impact on groundwater; Lateral migration of impacted groundwater; Surface water runoff into) Buildings and below ground services	Deposits and Lowestoft Till Formation (Secondary Undifferentiated Aquifer) and Sandringham Sands Formation (Principal Aquifer).	Minor Exceedances in metal (copper, nickel and zinc) concentrations were noted within groundwater sampled from six locations across the site. Minor Exceedances in PAHs were also noted in groundwater from one location, No exceedances were noted to the sampled soils and limited onsite sources indicating the elevated concentrations are likely representative of regional background concentrations. Contamination identified in the shallow groundwater has the potential to migrate laterally across the site and offsite. Significant vertical migration is anticipated to be limited within the underlying cohesive Kimmeridge Clay anticipated to be located beneath the site. A low risk is considered to surface waters, as a number of these are located downgradient to the site and in addition many of these surface water features were noted to be dry during the site walkover in 2018.
			Current and future below ground structures and services.	**LOW** No VOCs, which have the potential to degrade water supply pipes, were detected above the GACs in the soil samples analysed.
Offsite surrounding current and historical			Current / future site users (construction / maintenance workers).	**LOW** No Made Ground, asbestos or exceedances were identified within the soils sampled from across the site.

industrial and agricultural land uses. Mineral extraction sites. Current and historical landfills and unknown filled ground.			Surrounding ponds, field drains, ditches and Pierpoint Drain, Tottenhill Gravel Member and Raised Beach Deposits (Secondary (A) Aquifer) Head Deposits and Lowestoft Till Formation (Secondary Undifferentiated Aquifer) and Sandringham Sands Formation (Principal Aquifer).	**LOW** Minor metal exceedances were identified within the groundwater sampled These minor exceedances do not correspond with the analysed soil samples; therefore, these exceedances are not indicative of contamination from onsite sources. Shallow groundwater encountered within granular deposits across the site indicates contamination has the potential migrate laterally on or offsite. significant vertical migration is anticipated to be limited due to the presence of the cohesive deposits of the Kimmeridge Clay anticipated beneath the site. A low risk is considered to the surrounding ponds, field drains and ditches as these are predominantly located to the east and west, which is downgradient to the site.
			Current and future below ground structures and services.	**LOW** No VOCs, which have the potential to degrade water supply pipes, were detected above the GACs in the soil samples analysed.

DATE:	02 February 2021	**CONFIDENTIALITY:**	Confidential
SUBJECT:	West Winch Housing Access Road Ground Conditions Appraisal		
PROJECT:	70039893 - West Winch Housing Access Road	**AUTHOR:**	Holly Smith / Hannah Davies
CHECKED:	Abi Barton / Alex Mann	**APPROVED:**	Mark Wheeler

9 RECOMMENDATIONS

WSP recommend that the following work is undertaken to progress the geotechnical design within the project:

- Further targeted ground investigation to inform on the design of the scheme structures;
- A Ground Investigation Report (GIR) shall be prepared for the scheme;
- Using the parameters detailed above and those from further ground investigation, a detailed design of the proposed foundation solutions and earthworks solutions should be carried out; and
- Geotechnical Design Report (GDR) and Earthworks Specification for the foundation solutions and required earthworks.

Appendix A: Drawings and Figures

DO NOT SCALE

KEY

TP201 — TRIAL PIT

WS101 — WINDOW SAMPLE

NATIONAL GRID HIGH PRESSURE GAS MAIN

WINDOW SAMPLE CO-ORDINATES		
ID	X CO-ORDINATE	Y CO-ORDINATE
WS101	563965	316912
WS102	563945	316599
WS103	563887	316128
WS104	563743	315780
WS105	563676	315420
WS106	563355	315142
WS107	563500	314739
WS108	563568	317971

TRIAL PIT CO-ORDINATES		
ID	X CO-ORDINATE	Y CO-ORDINATE
TP201	563951	317369
TP202	563925	317121
TP203	563965	316958
TP204	563965	316899
TP205	563950	316652
TP206	563920	316347
TP207	563864	316199
TP208	563811	315998
TP209	563705	315584
TP210	563697	315543
TP211	563645	315287
TP212	563585	315013
TP213	563563	314945
TP214	563485	314834
TP215	563428	315013
TP216	563858	317576
TP217	563682	317834

NOTES:

1. ALL WORKS TO BE CARRIED OUT MUST COMPLY WITH HSG47 (THIRD EDITION) "AVOIDING DANGER FROM UNDERGROUND SERVICES".
2. THE DRAWING HAS BEEN BASED ON INFORMATION PROVIDED BY OTHER PARTIES AND WSP DO NOT WARRANT THE ACCURACY OF THIS INFORMATION
3. THE CONTRACTOR MUST ENSURE THE PROVISION OF A SAFE SYSTEM OF WORK. THIS MUST INCLUDE THE PLANNING OF THE WORK, DETECTING/IDENTIFYING AND MARKING UNDERGROUND SERVICES AND SAFE EXCAVATION/DIGGING PRACTICES.
4. THE CONTRACTOR MUST IDENTIFY CLEARLY THE EXTENT OF THE WORK AREA, SURVEY THE SITE TO IDENTIFY THE SERVICES AND OTHER UNDERGROUND STRUCTURES. CONTRACTOR TO CONTACT UTILITY COMPANIES AND OTHER ORGANISATIONS IF UNCHARTED SERVICES ARE IDENTIFIED.
5. THE CONTRACTOR MUST LOCATE THE SERVICES IDENTIFIED AT THE PLANNING STAGE SURVEY AS BEING IN THE WORK AREA PRIOR TO ANY EXCAVATION. THIS MUST BE DONE USING A SUITABLE DETECTING DEVICE OR LOCATOR. OPERATORS MUST RECEIVE THOROUGH TRAINING IN ITS USE AND LIMITATIONS AND SHOULD USE IT IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
6. THOSE DOING THE WORK SHOULD BE COMPETENT, PROVIDED WITH APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT AND WORK EQUIPMENT AND ALLOWED SUFFICIENT TIME.
7. ONCE THE POSITION AND ROUTE OF THE CABLES HAVE BEEN IDENTIFIED, EXCAVATION WORK MAY PROCEED FOLLOWING SAFE DIGGING PRACTICES WITH TRIAL HOLES DUG (USING SUITABLE HAND TOOLS OR VACUUM EXCAVATION) TO CONFIRM THE POSITION OF ANY DETECTED SERVICES. SPECIAL CARE MUST BE TAKEN WHEN DIGGING ABOVE OR CLOSE TO THE ASSUMED LINE OF SUCH A SERVICE. SAFE METHODS OF EXCAVATING MAY INCLUDE VACUUM EXCAVATION, WHICH MAY INCORPORATE USE OF WATER JETTING AND HIGH-VELOCITY AIR JETS.
8. MAKE FREQUENT AND REPEATED USE OF LOCATORS DURING THE COURSE OF THE WORK. SERVICE LOCATION IS LIKELY TO BECOME MORE ACCURATE AS COVER IS REMOVED.
9. THE STATED CO-ORDINATES OF THE EXPLORATORY HOLES ARE INDICATIVE AND SHOULD BE SCANNED PRIOR TO EXCAVATION/DRILLING
10. ARE BASED ON INFORMATION EXTRACTED FROM HISTORIC RECORDS PROVIDED BY THE STATUTORY UNDERTAKERS. THESE MUST BE REGARDED AS APPROXIMATE ONLY.

AREA OF POTENTIAL HISTORIC AGGREGATE EXTRACTION – MAINTAIN WATCHING BRIEF FOR MADE GROUND

THERE ARE EXISTING NATIONAL HIGH PRESSURE GAS MAINS WITHIN THE SITE AND IN CLOSE PROXIMITY TO THE SITE.
THE LOCATION OF UTILITY SERVICES SHALL BE CONFIRMED ON SITE PRIOR TO COMMENCING ANY WORKS.

THERE ARE EXISTING NATIONAL HIGH PRESSURE GAS MAINS WITHIN THE SITE AND IN CLOSE PROXIMITY TO THE SITE.
THE LOCATION OF UTILITY SERVICES SHALL BE CONFIRMED ON SITE PRIOR TO COMMENCING ANY WORKS.

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	31/05/2019	JJL	FOR INFORMATION	LB	AG

DRAWING STATUS: S2 - FOR INFORMATION

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CLIENT: NORFOLK COUNTY COUNCIL

PROJECT: WEST WINCH HOUSING ACCESS ROAD

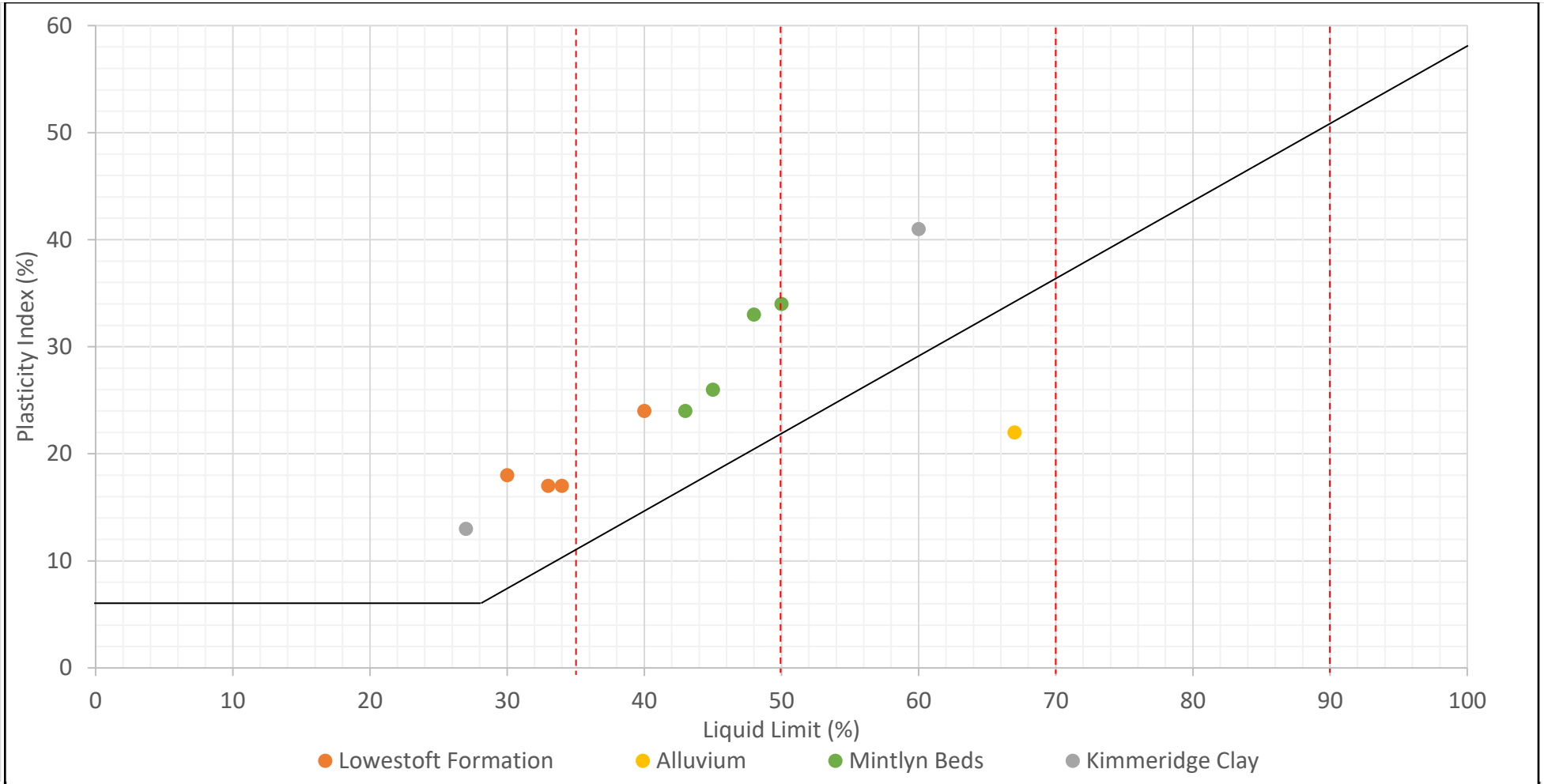
ARCHITECT:

TITLE: EXPLORATORY HOLE LOCATIONS

SCALE @ A1:	CHECKED:		APPROVED:
1:5000	LB		AG
PROJECT No:	DESIGNED:	DRAWN:	DATE:
70039893	JJL	JJL	May 19

DRAWING No: 9893-WSP-XX-00-AL-SK-0012 REV: P01

File name \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70039893XX\70039893 - WEST WINCH RELIEF ROAD\02 WIP\CV CIVIL ENGINEERING\01 MODEL\9893-WSP-XX-00-AL-SK-0012 - EXPLORATORY HOLE LOCATIONS.DWG, printed on 06 June 2019 13:37:28, by Leslie, Joe



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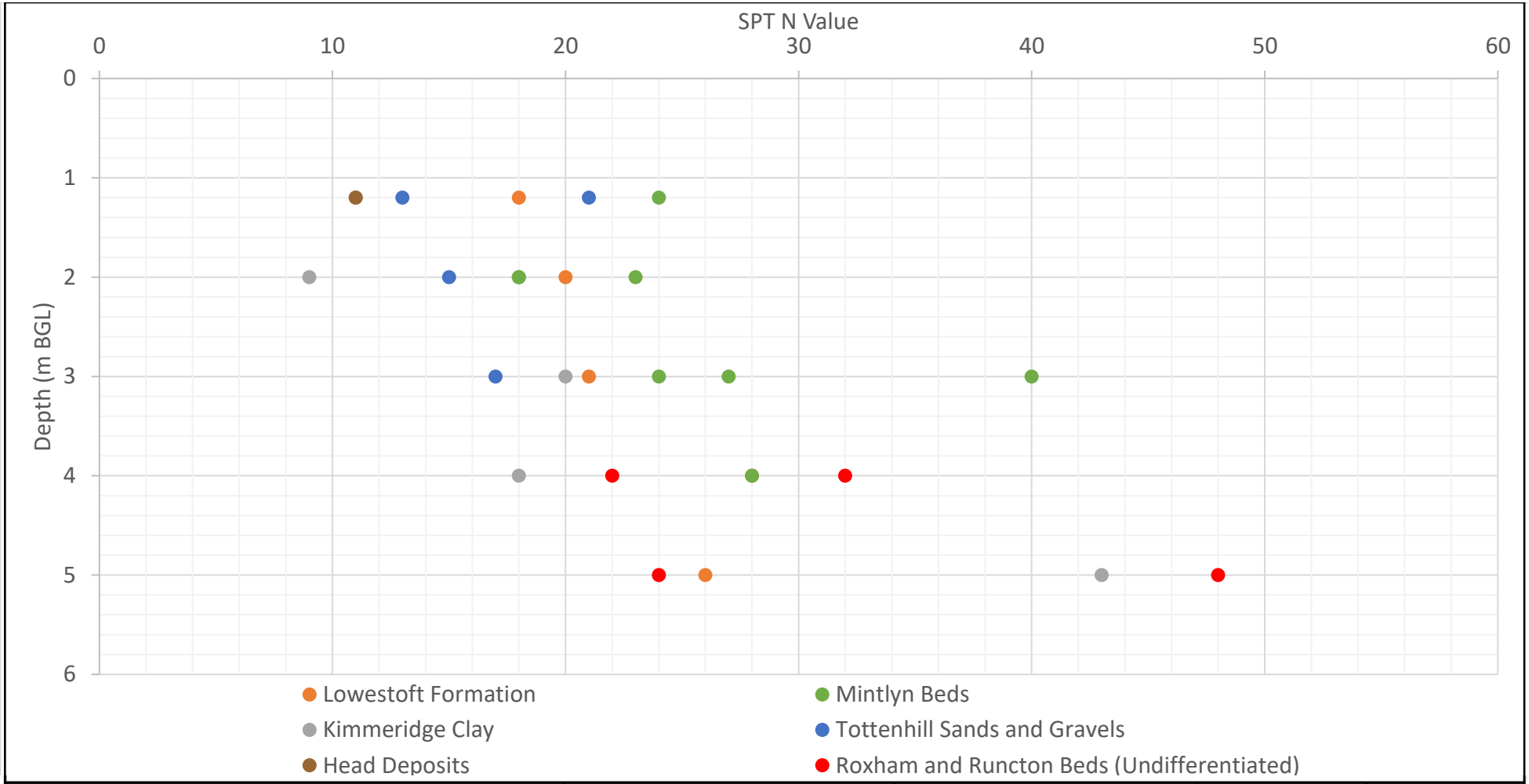
http:// www.wsp.com

CLIENT: Norfolk County Council	TITLE: Plasticity - All Strata	REPORT No: 70039893	FIGURE No: Plasticity_01
PROJECT: West Winch Housing Access Road	SCALE@SIZE: NTS		
	DESIGN/DRAWN: HS		



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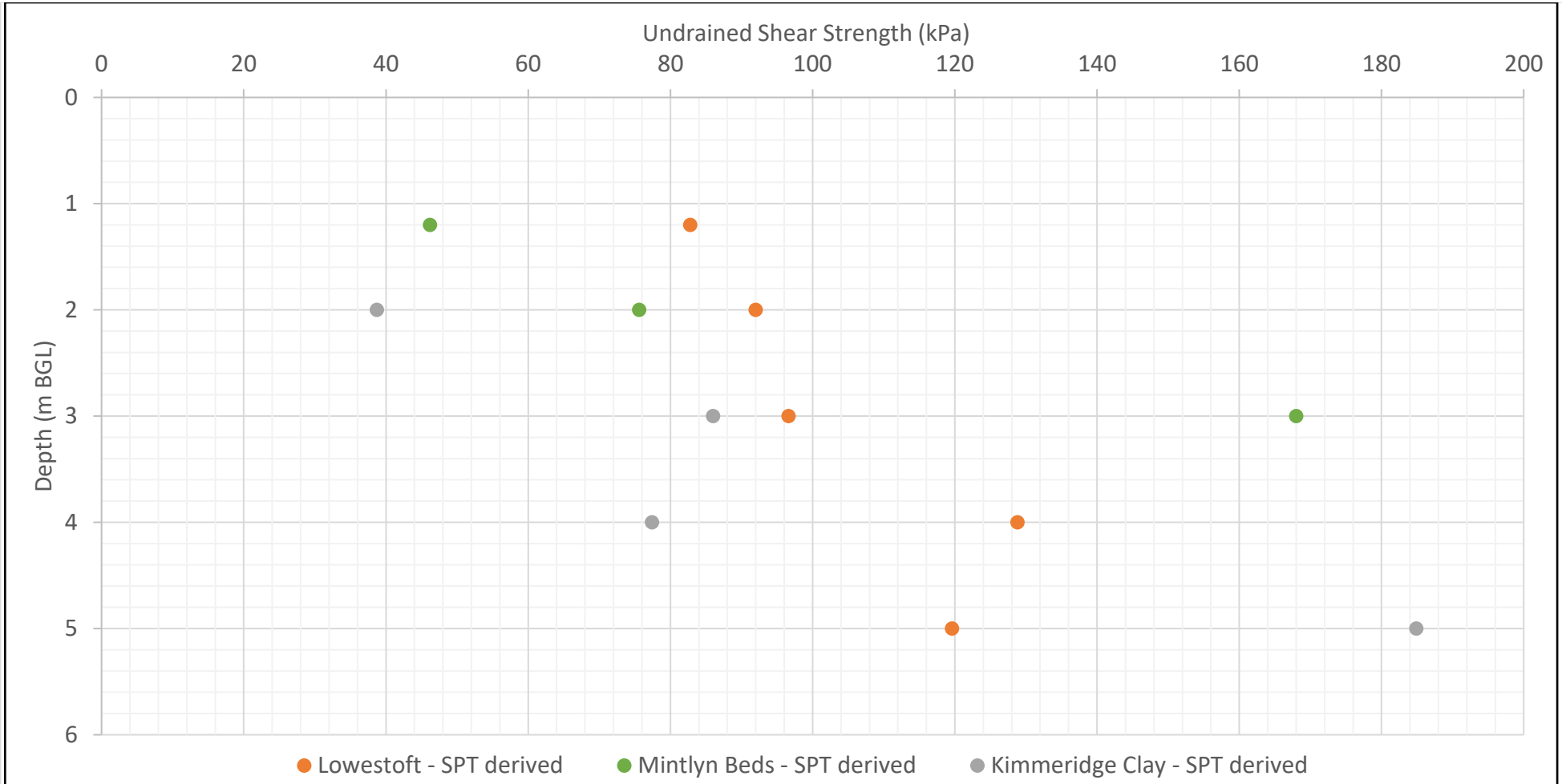
CLIENT: Norfolk County Council	TITLE: SPT N Value vs Depth	REPORT No: 70039893	FIGURE No: SPT_01
PROJECT: West Winch Housing Access Road	SCALE@SIZE: NTS		
	DESIGN/DRAWN: HS		



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CLIENT: Norfolk County Council	TITLE: Cu vs Depth (m BGL)	REPORT No: 70039893	FIGURE No: Cu_01
PROJECT: West Winch Housing Access Road	SCALE@SIZE: NTS		
	DESIGN/DRAWN: HS		

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.

3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.

4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.

6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:

- **i.** The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
- **ii.** Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.

16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.

19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.

20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.

28. The data is presented and will be compared with assessment criteria.

Appendix C: Exploratory Hole Logs and Laboratory Data

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	205
Carried out for	WSP	Date Started	23/07/2020	Date Finished	23/07/2020
Dimensions:	0.45m x 1.80m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Dry on completion and Stable. Not surveyed. Environmental sample at 0.4m.	Depth (m)	3.00	Ground Level (m AOD) 18.39	Drawn by JR
		Co-ords	563950 - 316652		Checked by MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown clayey TOPSOIL TOPSOIL												
			Soft to firm orangey brown sandy silty slightly gravelly CLAY. Gravel is fine to medium angular flint LOWESTOFT TILL		0.35					16	30	12	18		
								2							
			Stiff mottled brown and grey gravelly silty CLAY. Gravel is fine to coarse angular to sub-rounded chalk, flint and mudstone. Numerous lenses of orangey brown very sandy silty clay. LOWESTOFT TILL		0.80										
			Numerous lenses of orangey brown very sandy silty clay from 0.80 to 1.60 metres			1.00		3							
										13					
								4							
			Becoming dark grey with occasional chalk and flint cobbles and occasional carstone gravel from 2.10 metres			2.00									
								5							
					3.00	3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	206
Carried out for	WSP	Date Started	23/07/2020	Date Finished	23/07/2020
Dimensions:	0.45m x 1.70m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Dry on completion and Stable. Not surveyed. Environmental sample at 0.4m.	Depth (m)	3.10	Ground Level (m AOD) 15.29	Drawn by JR
		Co-ords	563858 - 317576		Checked by MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown clayey TOPSOIL TOPSOIL												
			Firm brown very sandy silty slightly gravelly CLAY. Gravel is fine to coarse angular flint and chert. Occasional shell fragments. LOWESTOFT TILL		0.35			2							
			Land drain trending NE-SW												
			Stiff mottled brown and grey gravelly silty CLAY. Gravel is fine to coarse angular to sub-roundedchalk, flint and mudstone, occasional red chalk. LOWESTOFT TILL		0.70			3							
						1.00									
								4		22	40	16	24		
			Lenses of greenish grey silty fine sand from 1.60 to 1.70 metres *Becoming grey from 1.60 metres*												
						2.00									
			Flint cobbles from 2.2 to 2.3 metres												
										17					
								5							
						3.00									
					3.10										
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	207
Carried out for	WSP	Date Started	23/07/2020	Date Finished	23/07/2020
Dimensions:	0.45m x 1.90m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Dry and Stable. Not surveyed. Environmental sample at 0.4m.	Depth (m)	3.00	Ground Level (m AOD)	17.67
		Co-ords	563864 - 316199	Drawn by	JR
				Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Dark brown silty TOPSOIL TOPSOIL												
			Brown slightly clayey slightly silty slightly gravelly fine SAND. Gravel is fine to coarse angular to sub rounded flint. TOTTENHILL SAND AND GRAVEL		0.35										
			Becoming dark brown from 0.60 metres					2							
						1.00									
			Soft to firm light blue grey and reddish brown sandy silty CLAY with some up to medium gravel size ironstone nodules. LOWESTOFT TILL		1.50			3							
			Dark grey slightly clayey very sandy SILT with laminae and thin beds of siltstone. MINTLYN BEDS		1.90			4		22	43	20	24		
						2.00									
								5							
					3.00	3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	210
Carried out for	WSP	Date Started	24/07/2020	Date Finished	24/07/2020
Dimensions:	0.45m x 1.90m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Dry and Stable. Not surveyed. Environmental sample at 0.3 and 0.7m.	Depth (m)	3.00	Ground Level (m AOD)	17.74
		Co-ords	563710 - 315538	Drawn by	JR
				Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Dark brownish grey silty TOPSOIL TOPSOIL												
			Firm to stiff mottled light grey and orangey brown very sandy slightly gravelly silty CLAY. Gravel is fine to medium angular flint LOWESTOFT TILL		0.60	1.00		3		12	33	16	17		
			Grey clayey slightly silty fine to medium SAND with thin beds of grey sandstone, weak to moderately weak and reddish brown ironstone, weak. MINTLYN BEDS		2.00	2.00		4		20					
								5							
			Dark grey very sandy SILTSTONE, weak. ROXHAM AND RUNCTON BEDS		2.70			6							
					3.00	3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	213
Carried out for	WSP	Date Started	24/07/2020	Date Finished	24/07/2020
Dimensions:	0.45m x 1.80m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Abandoned due to collapse. Not surveyed. Environmental sample at 0.4m.	Depth (m)	2.60	Ground Level (m AOD) 11.41	Drawn by JR
		Co-ords	563561 - 314943		Checked by MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown silty TOPSOIL TOPSOIL												
			Light brown gravelly fine to medium SAND. Gravel is fine to coarse angular to sub-angular flint and carstone. TOTTENHILL SAND AND GRAVEL		0.35			2							
			Firm to stiff mottled brown, orangey brown and light grey very sandy slightly gravelly silty CLAY. Gravel is fine to coarse angular to sub-angular flint. LOWESTOFT TILL		0.85	1.00		3							
			Brown very gravelly silty fine SAND Gravel is medium to coarse sub angular to sub rounded ironstone.. with lenses of soft light grey clay. MINTLYN BEDS *Thin bed of grey cementstone from 1.70 to 1.75 metres.* *Bed of reddish brown ironstone, weak. from 1.85 to 1.90 metres*		1.40			4		14	27				
			Brown silty fine SAND ROXHAM AND RUNCTON BEDS		1.90	2.00		5							
			Stiff grey CLAY KIMMERIDGE CLAY		2.10			6							
					2.60	3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	214
Carried out for	WSP	Date Started	24/07/2020	Date Finished	24/07/2020
Dimensions:	0.45m x 1.90m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Dry on completipon and Stable. Not surveyed. Environmental sample at 0.5m.	Depth (m)	3.10	Ground Level (m AOD) 11.03	Drawn by JR
		Co-ords	563493 - 314834	Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown silty TOPSOIL TOPSOIL												
			Orangey brown slightly clayey silty gravelly fine to medium SAND. Gravel is fine to medium angular to sub-rounded flint. TOTTENHILL SAND AND GRAVEL		0.40			2							
						1.00									
			Firm to stiff dark grey CLAY. Occasional shell fragments. KIMMERIDGE CLAY		1.50			3		28	60	19	41		
			Becoming stiff from 1.80 metres.			2.00		4							
						3.00		5							
					3.10										
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	215
Carried out for	WSP	Date Started	24/07/2020	Date Finished	24/07/2020
Dimensions:	0.45m x 1.80m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Some collapse in water bearing sand. Not surveyed. Environmental sample at 0.5m.	Depth (m)	3.20	Ground Level (m AOD)	11.68
		Co-ords	563426 - 315010	Drawn by	JR
				Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown silty TOPSOIL TOPSOIL												
			Brownish grey silty sl gravelly fine SAND. Gravel is Fine to coarse angular to sub-angular flint. TOTTENHILL SAND AND GRAVEL		0.45			2							
			Mottled orangey brown, yellowish brown and reddish brown gravelly fine to medium SAND. Gravel is fine to medium angular to rounded flint and quartz. TOTTENHILL SAND AND GRAVEL		0.80	1.00		3							
			Moist, soft mottled orangey brown, light grey and reddish brown very sandy silty slightly gravelly CLAY. Gravel is fine to medium angular to rounded flint and chalk. LOWESTOFT TILL		1.40			4		17	34	16	17		
			$tif dark grey CLAY with laminae of grey siltstone KIMMERIDGE CLAY *Channel infilled with greyish brown silty gravelly fine to medium sand in south end of pit to 2.70 metres.*		1.95	2.00		5							
						3.00		6							
					3.20										
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	216
Carried out for	WSP	Date Started	22/07/2020	Date Finished	22/07/2020
Dimensions:	0.45m x 2.30m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Stable. Not surveyed. Environmental sample at 0.5m.	Depth (m)	3.00	Ground Level (m AOD)	13.45
		Co-ords	563858 - 317576	Drawn by	JR
				Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown sandy TOPSOIL TOPSOIL												
			Brown very clayey silty fine to medium SAND. MINTLYN BEDS		0.35			2							
			Stiff mottled brown and grey slightly sandy silty CLAY. MINTLYN BEDS		0.65			3		21	50	16	34		
			Reddish brown and orangey brown very sandy gravelly CLAY. Gravel is fine to medium angular to sub-angular ironstone, chert and phosphatic nodules. Lenses of soft light blue grey clay. MINTLYN BEDS		0.90	1.00		4			45	19	26		
			Reddish brown IRONSTONE, weak to moderately weak, becoming moderately strong. MINTLYN BEDS		1.55 1.65			5							
			Moist grey clayey silty fine SAND with occasional phosphatic nodules. ROXHAM AND RUNCTON BEDS			2.00		6							
					3.00	3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

TRIAL PIT LOG

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AGS

Scheme	West Winch Relief Road	Job No.	100746	Trial Pit No.	217
Carried out for	WSP	Date Started	22/07/2020	Date Finished	22/07/2020
Dimensions:	0.45m x 1.80m	Type of Rig	JCB 3CX	Logged by	MB
Remarks:	Dry on completion. Not surveyed. Environmental sample at 0.5m.	Depth (m)	3.00	Ground Level (m AOD)	7.29
		Co-ords	563682 - 317834	Drawn by	JR
				Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Dark brown sandy silty TOPSOIL TOPSOIL												
			Dark grey very sandy silty CLAY. Some roots. Slight organic odour. ALLUVIUM		0.60										
	▼					1.00		2		44	67	45	22		
	▽		*Water bearing land drain (150mm diameter) trending E-W in corner of pit. Water initially rose to 1.00 metre but dried on bailing.*												
			Grey clayey silty fine SAND with thin beds of sandstone, weak. MINTLYN BEDS		1.60	2.00		3		28	28				
			Brown clayey silty gravelly fine to medium SAND. Gravel is sandstone and pyrite nodules. ROXHAM AND RUNCTON BEDS		2.30			4							
			Stiff dark blueish grey laminated silty CLAY with lenses of lt grey silty fine sand. Occasional shell fragments. KIMMERIDGE CLAY		2.60			5							
					3.00	3.00									
						4.00									

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Sheet 1 of 2

Scheme	West Winch Relief Road	Job No.	100746	WS No.	101
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental samples at 0.10 & 0.40m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.00	Ground Level (m AOD) 19.92	Drawn by	JR
		Co-ords	563965 - 316994		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			TOPSOIL (Drillers description) TOPSOIL												
			Light brown slightly gravelly fine to medium SAND. Gravel is fine to medium sub angular to sub rounded flint. Some orange staining. MINTLYN BEDS		0.40			3							
			Orangey brown slightly clayey slightly silty fine SAND. Occasional lenses of grey fine to medium sand. MINTLYN BEDS		0.80	1.00		4							
								5	S 24						
			Grey slightly silty slightly clayey fine to medium SAND. MINTLYN BEDS		1.75										
			Soft mottled dark grey and grey slightly silty sandy CLAY. MINTLYN BEDS		1.95										
			Light greyish brown silty slightly clayey fine to medium SAND. Some orange staining. MINTLYN BEDS		2.00	2.00			S 23						
	▼		Mottled grey and orangey brown silty slightly clayey fine to medium SAND. Some dark orange staining. MINTLYN BEDS		2.50			6							
			Greyish brown silty slightly clayey fine to medium SAND. Occasional orange staining. MINTLYN BEDS		3.00	3.00			S 27						
			Dark grey very silty slightly clayey fine to medium SAND. Some black staining. MINTLYN BEDS		3.50			7							
						4.00			S 28						
								8							
			Firm dark grey very sandy CLAY. MINTLYN BEDS		4.65										
			Stiff dark greenish blue silty very sandy CLAY. Some black brown pink and purple staining. MINTLYN BEDS		4.70 4.90										
					5.00										

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

AGS

Scheme	West Winch Relief Road	Job No.	100746	WS No.	101
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental samples at 0.10 & 0.40m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.00	Ground Level (m AOD) 19.92	Drawn by	JR
		Co-ords	563965 - 316994		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Fine to coarse angular to sub angular ironstone GRAVEL. MINTLYN BEDS			6.00 7.00 8.00 9.00									

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Sheet 1 of 2

Scheme	West Winch Relief Road	Job No.	100746	WS No.	102
Carried out for	WSP	Date Started	24/07/2020	Date Finished	24/07/2020
Remarks:	Environmental sample at 0.30m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 18.18	Drawn by	JR
		Co-ords	563945 - 316599		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			TOPSOIL (Drillers description) TOPSOIL												
			Firm mottled brown grey and orangey brown sandy gravelly CLAY. Gravel is fine to medium sub angular to sub rounded chalk. LOWESTOFT TILL		0.65	1.00		2							
			Stiff brown silty sandy gravelly CLAY. Gravel is fine to medium sub angular to sub rounded chalk and occasional flint. Some grey clay lenses. LOWESTOFT TILL		1.20 1.30				S 18						
			Very stiff grey silty gravelly CLAY. Gravel is fine to medium sub angular to sub rounded chalk and occasional mudstone. Much orange staining. LOWESTOFT TILL					3							
			Very stiff dark grey slightly silty gravelly CLAY. Gravel is fine to medium sub angular to sub rounded chalk and mudstone. LOWESTOFT TILL		1.90	2.00			S 20						
								4							
						3.00			S 21						
								5							
						4.00			S 28						
								6							

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Sheet 2 of 2

Scheme	West Winch Relief Road	Job No.	100746	WS No.	102
Carried out for	WSP	Date Started	24/07/2020	Date Finished	24/07/2020
Remarks:	Environmental sample at 0.30m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 18.18	Drawn by	JR
		Co-ords	563945 - 316599		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Very stiff dark grey slightly silty gravelly CLAY. Gravel is fine to medium sub angular to sub rounded chalk and mudstone. LOWESTOFT TILL		5.45	6.00 7.00 8.00 9.00			S 26						

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Scheme	West Winch Relief Road	Job No.	100746	WS No.	103
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental sample at 0.30m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 19.18	Drawn by JR
		Co-ords	563888 - 316129		Checked by MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown slightly clayey sandy slightly gravelly TOPSOIL. TOPSOIL					2							
			Orangey brown silty clayey slightly gravelly SAND, Gravel is fine to medium sub angular to sub rounded flint. TOTTENHILL SAND AND GRAVEL		0.30			3							
			Orangey brown very silty gravelly fine to coarse SAND. Gravel is fine to coarse flint and ironstone. Many large grey clay lenses. TOTTENHILL SAND AND GRAVEL		0.60			4							
						1.00									
			Orangey brown very silty fine to medium SAND. Many large grey clay lenses. TOTTENHILL SAND AND GRAVEL		1.20				S 21						
			Brown very silty fine SAND. Some orange and dark grey staining. TOTTENHILL SAND AND GRAVEL		1.50			5							
			Laminated with fine grey sand and grey silty clay.												
			Laminated grey dark grey olive green and purple silty clayey fine to medium SAND. Occasional black staining. MINTLYN BEDS		2.00	2.00			S 18						
			Fossilised wood fragment.												
			Mottled grey and orangey brown very silty CLAY. MINTLYN BEDS		2.50			6							
			Dark grey very silty clayey SAND. MINTLYN BEDS		3.00	3.00			S 24						
								7							
			Orangey brown and grey slightly sandy fine to coarse angular to sub rounded mudstone GRAVEL. Occasional iron pyrites. MINTLYN BEDS		3.60										
			Firm dark grey silty very sandy CLAY. ROXHAM AND RUNCTON BEDS		3.85										
						4.00			S 22						
								8							

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Scheme	West Winch Relief Road	Job No.	100746	WS No.	103
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental sample at 0.30m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 19.18	Drawn by	JR
		Co-ords	563888 - 316129		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Firm dark grey silty very sandy CLAY. ROXHAM AND RUNCTON BEDS		5.45	6.00 7.00 8.00 9.00			S 24						

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Scheme	West Winch Relief Road	Job No.	100746	WS No.	105
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental sample at 0.30m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 16.54	Drawn by JR
		Co-ords	563676 - 315421		Checked by MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown silty sandy TOPSOIL. Organic odour. Some rootlets and straw. TOPSOIL					2							
			Dark brown silty clayey gravelly fine to medium SAND. Gravel is fine to medium sub angular to sub rounded Carrstone TOTTENHILL SAND AND GRAVEL		0.30			3							
			Orangey brown silty very clayey gravelly fine to course SAND. Gravel is fine to medium sub angular to sub rounded flint. TOTTENHILL SAND AND GRAVEL		0.80	1.00		4							
			Firm to stiff mottled grey and orangey brown sandy CLAY. Occasional dark brown and black staining. MINTLYN BEDS		1.20			5	S 11						
			Layer of fine to coarse angular flint gravel.												
			Laminated firm grey, orangey brown and dark grey CLAY and orangey brown and grey fine SAND. MINTLYN BEDS		1.70										
			Stiff mottled dark grey and orangey brown slightly sandy CLAY. Occasional fine to medium ironstone and occasional black staining. MINTLYN BEDS		1.85	2.00			S 18						
			Very stiff mottled dark green and orangey brown slightly sandy CLAY. MINTLYN BEDS		2.30			6							
			Becoming firm.												
			Very stiff orangey brown CLAY. MINTLYN BEDS		3.05	3.00			S 40						
			Dark orangey brown very silty very clayey very gravelly fine to medium SAND. Gravel is fine to medium sub angular flint and ironstone. MINTLYN BEDS		3.20 3.30 3.40			7							
			Very stiff mottled dark green and orangey brown slightly sandy CLAY. ROXHAM AND RUNCTON BEDS												
			Dark greenish blue very silty slightly gravelly fine to medium SAND. Gravel is fine to medium sub rounded flint. ROXHAM AND RUNCTON BEDS		3.80										
			Becoming very gravelly												
			Very stiff mottled dark green and orangey brown slightly sandy CLAY. ROXHAM AND RUNCTON BEDS			4.00			S 32						
			Very sandy with orange staining between 4.20m and 4.40m.					8							
			Becoming dark olive green with fine to medium shell and phosphatic nodules.												

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Scheme	West Winch Relief Road	Job No.	100746	WS No.	105
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental sample at 0.30m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 16.54	Drawn by JR
		Co-ords	563676 - 315421	Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Very stiff mottled dark green and orangey brown slightly sandy CLAY. ROXHAM AND RUNCTON BEDS		5.45	6.00 7.00 8.00 9.00			S 48						

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	WS No.	106
Carried out for	WSP	Date Started	01/08/2020	Date Finished	01/08/2020
Remarks:	Environmental sample at 0.50m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.00	Ground Level (m AOD) 11.70	Drawn by JR
		Co-ords	563355 - 315142		Checked by MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown silty sandy TOPSOIL. Organic odour. Some rootlets and straw. TOPSOIL					2							
			Orangey brown slightly silty slightly gravelly fine to medium SAND. Gravel is medium sub angular to sub rounded flint. HEAD		0.50			3							
			Mottled grey and orangey brown very silty clayey fine to medium SAND. HEAD		0.80										
						1.00		4	S 11						
			Firm dark grey slightly silty CLAY. Some orange staining. HEAD		1.50			5							
			Greyish brown slightly silty fine to medium SAND. TOTTENHILL SAND AND GRAVEL		2.00	2.00			S 15						
			Large clay lens.					6							
			Becoming dark grey.												
						3.00			S 17						
			Occasional shell and flint fragments.					7							
			Flint COBBLE. TOTTENHILL SAND AND GRAVEL		3.55 3.60										
			Dark grey very silty gravelly SAND. Gravel is fine to medium chalk and flint. TOTTENHILL SAND AND GRAVEL		3.85										
			Soft dark grey very silty sandy very gravelly CLAY. Gravel is fine to medium chalk and flint. LOWESTOFT TILL		4.00	4.00			S 21						
			Dark grey very silty gravelly SAND. Gravel is fine sub angular chalk. LOWESTOFT TILL												
			Firm dark grey silty gravelly CLAY. Gravel is fine sub angular chalk and fine to medium angular to sub angular flint. LOWESTOFT TILL		4.40			8							
			Dark grey very silty gravelly SAND. Gravel is fine to medium sub angular to rounded chalk. LOWESTOFT TILL		4.60										
					5.00										

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Sheet 1 of 2

Scheme	West Winch Relief Road	Job No.	100746	WS No.	107
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental sample at 0.40m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 10.71	Drawn by	JR
		Co-ords	563500 - 314746		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Dark brown silty sandy very gravelly TOPSOIL. Some roots and straw. TOPSOIL					2							
			Orangey brown silty very gravelly fine to medium SAND. Gravel is fine to medium angular to sub rounded flint. TOTTENHILL SAND AND GRAVEL		0.40			3							
			Light brown slightly silty slightly clayey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to sub rounded flint. TOTTENHILL SAND AND GRAVEL		0.70			4							
						1.00									
			Orangey brown silty very clayey very gravelly SAND. Gravel is fine to coarse angular flint. TOTTENHILL SAND AND GRAVEL		1.20										
			Mottled grey blueish green orangey brown dark brown and brown very silty sightly gravelly SAND. Gravel is fine ironstone. ROXHAM AND RUNCTON BEDS		1.35			5	S 13						
			Becoming very gravelly.												
			Dark orangey brown silty very gravelly SAND. Gravel is fine to medium ironstone. ROXHAM AND RUNCTON BEDS		1.80 1.90										
			Stiff mottled dark blueish green and orangey brown silty CLAY. KIMMERIDGE CLAY			2.00				16	27	14	13		
			Firm to soft dark grey silty CLAY. KIMMERIDGE CLAY		2.20				S 9						
								6							
	▼		*Laminated from 2.90m to 3.00m*			3.00									
			No recovery		3.20				S 20						
								7							
			Soft dark grey silty CLAY. KIMMERIDGE CLAY		4.00	4.00			S 18						
								8							
			No recovery		4.60										

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Scheme	West Winch Relief Road	Job No.	100746	WS No.	107
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental sample at 0.40m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.45	Ground Level (m AOD) 10.71	Drawn by	JR
		Co-ords	563500 - 314746		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
					5.45	6.00 7.00 8.00 9.00			S 43						

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	WS No.	208
Carried out for	WSP	Date Started	27/07/2020	Date Finished	27/07/2020
Remarks:	Environmental sample at 0.50m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.00	Ground Level (m AOD) 20.36	Drawn by JR
		Co-ords	563811 - 315998		Checked by MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown silty sandy gravelly TOPSOIL. TOPSOIL					2							
			Orangey brown light brown and dark brown silty fine to medium SAND. Some dark orange staining. TOTTENHILL SAND AND GRAVEL		0.30			3							
			Mottled light brown orangey brown and dark orangey brown silty gravelly SAND. Gravel is fine to medium sub angular to sub rounded flint TOTTENHILL SAND AND GRAVEL		1.00	1.00		4							
			Fine to medium sub angular to sub rounded ironstone GRAVEL with some orangey brown silty clayey fine to medium sand and blueish grey clay lenses. MINTLYN BEDS		1.60 1.75										
			Laminated dark orangey brown silty gravelly fine to medium SAND. Gravel is fine to medium sub angular to sub rounded ironstone. with numerous laminae of firm grey silty CLAY. Some lenses of blueish grey clay. MINTLYN BEDS			2.00		5							
						3.00		6							
			Greyish brown slightly silty slightly clayey fine SAND. ROXHAM AND RUNCTON BEDS		3.90	4.00		7							
			Laminated grey and black clayey very silty fine SAND with grey and light brown silty clay laminae and lenses. ROXHAM AND RUNCTON BEDS		4.60										
					5.00										

NORFOLK PARTNERSHIP LABORATORY

Window Sampler Log

Sheet 1 of 1

Scheme	West Winch Relief Road	Job No.	100746	WS No.	211
Carried out for	WSP	Date Started	01/08/2020	Date Finished	01/08/2020
Remarks:	Environmental sample at 0.40m	Type of Rig	Dando Terrier	Logged by	DJ
		Depth (m)	5.00	Ground Level (m AOD) 14.89	Drawn by	JR
		Co-ords	563644 - 315287		Checked by	MB

Backfill	Water	Casing	Description	Legend	Depth (m)	Scale	Sample Type	Sample No.	Field Tests	Laboratory Tests MC%	LL	PL	MPI	Org.	CBR
			Brown silty sandy gravelly TOPSOIL with some rootlets and straw. TOPSOIL					2							
			Brown silty clayey slightly gravelly fine to coarse SAND. Gravel is fine to coarse sub angular to sub rounded flint. Some rootlets. TOTTENHILL SAND AND GRAVEL		0.40			3							
			Firm mottled orangey brown and grey slightly silty very sandy CLAY. Some rootlets. MINTLYN BEDS *Desiccated from 1.20m to 1.40m.*		0.80	1.00		4		20	48	15	33		
			Stiff mottled green orangey brown and brown silty very sandy CLAY. Some mudstone and dark brown staining.. MINTLYN BEDS		1.40			5							
			Mottled green reddish brown brown and orangey brown silty very gravelly SAND. Gravel is fine to medium phosphatic nodules. MINTLYN BEDS		2.10	2.00									
			Mottled green and orangey brown very silty very clayey fine to medium SAND. Occasional dark orange staining. ROXHAM AND RUNCTON BEDS		2.40			6							
			Grey very silty very clayey fine to medium SAND. Occasional dark orange staining. ROXHAM AND RUNCTON BEDS *Becoming dark grey.*		2.85	3.00		7							
						4.00		8							
					5.00										

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Our Project No. 100746

Our Report No. NCCL 72 to 713-602

Your Order No.

Date Report Issued 12 Aug 2020

Determination of Moisture Content to BS1377 : Part 2 : 1990 : Section 3.2

Scheme West Winch Relief Road

Report No.	Hole ID	Specimen Depth (m)	Sample Type	Sample Ref.	Drying Temp	Natural MC %	Sample description
8072	205	1.8	B	4	105	13	Stiff mottled brown and grey gravelly silty CLAY. Gravel is fine to coarse angular to sub-rounded chalk, flint and mudstone. Numerous lenses of orangey brown very sandy silty clay.
80713	210	1.8	B	4	105	20	Firm to stiff mottled light grey and orangey brown very sandy slightly gravelly silty CLAY. Gravel is fine to medium angular flint.
8077	206	2.8	B	5	105	17	Stiff mottled brown and grey gravelly silty CLAY. Gravel is fine to coarse angular to sub-roundedchalk, flint and mudstone, occasional red chalk.

Remarks
Not all of the information required by the Standard is shown on this report but is available on request.
All samples prepared in accordance with BS 1377:Part 1:1990.

Test Code = 602

UKAS TESTING
0920

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Our reference No. **NNPL202009022-604**
Our Project No 100746
Your Sample Ref U6
Your Project or Order No.
Date Report Issued 25 Sep 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	107	**Depth**	2m
Date sampled	27 Jul 2020	**Date received**	27 Jul 2020
Date tested	16 Sep 2020		
Sample type	Undisturbed Sample	**Sample Mass (g)**	799

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Firm very dark brown slightly gravelly CLAY. Gravel is fine to medium shell fragments.
Supplier	Not applicable
Source	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Wet sieving	Oven dried @ 40°C
Retained 425µm (%)	18.1	
Natural MC (%)	16	
Drying Temp. (ºC)	105-110	
Liquid Limit (%)	27	
Plastic Limit (%)	14	
Plasticity Index (%)	13	
Modified PI *(%)	11	*BRE Digest 240:1993. *This calculation is outside the scope of UKAS accreditation.*
BS Soil Classification	**CL**	

Remarks NHBC Volume change potential classification is low.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL202008070-604**
Our Project No 100746
Your Sample Ref B2
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	205	**Depth**	0.5m
Date sampled	23 Jul 2020	**Date received**	23 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	425

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil		
Description	Stiff mottled brown and grey gravelly silty CLAY. Gravel is fine to coarse angular to sub-rounded chalk, flint and mudstone. Numerous lenses of orangey brown very sandy silty clay.		
Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Wet sieving	Oven dried @ 40°C
Retained 425µm (%)	4.5	
Natural MC (%)	16	
Drying Temp. (ºC)	105-110	
Liquid Limit (%)	30	
Plastic Limit (%)	12	
Plasticity Index (%)	18	
Modified PI *(%)	17	*BRE Digest 240:1993. *This calculation is outside the scope of UKAS accreditation.*

BS Soil Classification **CL**

Remarks NHBC Volume change potential classification is low.

Test Code = 604

UKAS TESTING
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Our reference No. **NNPL202008076-604**
Our Project No 100746
Your Sample Ref B4
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	206	**Depth**	1.4m
Date sampled	23 Jul 2020	**Date received**	23 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	585

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil		
Description	Stiff mottled brown and grey gravelly silty CLAY. Gravel is fine to coarse angular to sub-roundedchalk, flint and mudstone, occasional red chalk.		
Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Hand picking	Oven dried @ 40°C
Retained 425µm (%)		
Natural MC (%)	22	
Drying Temp. (ºC)	105-110	
Liquid Limit (%)	40	
Plastic Limit (%)	16	
Plasticity Index (%)	24	
Modified PI *(%)	24	*BRE Digest 240:1993.
		This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **C I**

Remarks NHBC Volume change potential classification is medium.

Test Code = 604

UKAS TESTING
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Our reference No. **NNPL2020080712-604**
Our Project No 100746
Your Sample Ref B3
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	210	**Depth**	0.8m
Date sampled	24 Jul 2020	**Date received**	24 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	435

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil		
Description	Firm to stiff mottled light grey and orangey brown very sandy slightly gravelly silty CLAY. Gravel is fine to medium angular flint		
Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Hand picking	Oven dried @ 40°C
Retained 425µm (%)		
Natural MC (%)	12	
Drying Temp. (ºC)	105-110	
Liquid Limit (%)	33	
Plastic Limit (%)	17	
Plasticity Index (%)	17	
Modified PI *(%)	17	*BRE Digest 240:1993. *This calculation is outside the scope of UKAS accreditation.*
BS Soil Classification	**CL**	

Remarks NHBC Volume change potential classification is low.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080710-604**
Our Project No 100746
Your Sample Ref B4
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	207	**Depth**	1.9m
Date sampled	23 Jul 2020	**Date received**	23 Jul 2020
Date tested	12 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	435

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Dark grey clayey sandy SILT with laminae and thin beds of siltstone.

Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Hand picking	Oven dried @ 40°C
Retained 425µm (%)		

Natural MC (%)	22
Drying Temp. (ºC)	105-110
Liquid Limit (%)	43
Plastic Limit (%)	20
Plasticity Index (%)	24
Modified PI *(%)	24

*BRE Digest 240:1993.
This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **C I**

Remarks NHBC Volume change potential classification is medium.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL202009023-604**
Our Project No 100746
Your Sample Ref B4
Your Project or Order No.
Date Report Issued 25 Sep 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	211	**Depth**	0.8m
Date sampled	27 Jul 2020	**Date received**	27 Jul 2020
Date tested	10 Sep 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	475

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil		
Description	Frim dark orangey-brown slightly gravelly sandy CLAY. Gravel is fine to medium subangular to subrounded flint.		
Supplier	Not applicable	**Source**	Ex site

	Test Specimen	
Location	Not applicable	
Orientation	Not applicable	
	Preparation Details	
Method of Division	Quartering	
Preparation Method	Wet sieving	Oven dried @ 40°C
Retained 425µm (%)	5.5	
Natural MC (%)	20	
Drying Temp. (ºC)	105-110	
Liquid Limit (%)	48	
Plastic Limit (%)	15	
Plasticity Index (%)	33	
Modified PI *(%)	31	*BRE Digest 240:1993. *This calculation is outside the scope of UKAS accreditation.*
BS Soil Classification	**C I**	

Remarks NHBC Volume change potential classification is medium.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080718-604**
Our Project No 100746
Your Sample Ref B4
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	213	**Depth**	1.7m
Date sampled	24 Jul 2020	**Date received**	24 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	839

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Brown gravelly silty fine SAND with lenses of soft light grey clay.

Supplier	Not applicable	**Source**	Ex site

	Test Specimen
Location	Not applicable
Orientation	Not applicable
	Preparation Details
Method of Division	Quartering
Preparation Method	Wet sieving — Oven dried @ 40°C
Retained 425µm (%)	12.9
Natural MC (%)	14
Drying Temp. (ºC)	105-110
Liquid Limit (%)	27
Plastic Limit (%)	Non Plastic
Plasticity Index (%)	
Modified PI *(%)	*BRE Digest 240:1993. *This calculation is outside the scope of UKAS accreditation.*
BS Soil Classification	**Non Plastic**

Remarks

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080722-604**
Our Project No 100746
Your Sample Ref B3
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	214	**Depth**	1.5m
Date sampled	24 Jul 2020	**Date received**	24 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	418

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Firm to stiff dark grey CLAY. Occasional shell fragments.

Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Hand picking	Oven dried @ 40°C
Retained 425µm (%)		

Natural MC (%)	28
Drying Temp. (ºC)	105-110
Liquid Limit (%)	60
Plastic Limit (%)	19
Plasticity Index (%)	41
Modified PI *(%)	41

*BRE Digest 240:1993.
This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **C H**

Remarks NHBC Volume change potential classification is high.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080727-604**
Our Project No 100746
Your Sample Ref B4
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	215	**Depth**	1.5m
Date sampled	24 Jul 2020	**Date received**	24 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	551

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Soft mottled orangey brown, light grey and reddish brown very sandy silty slightly gravelly CLAY. Gravel is fine to medium angular to rounded flint and chalk.

Supplier Not applicable **Source** Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Wet sieving	Oven dried @ 40°C
Retained 425µm (%)	11.3	
Natural MC (%)	17	
Drying Temp. (ºC)	105-110	
Liquid Limit (%)	34	
Plastic Limit (%)	16	
Plasticity Index (%)	17	
Modified PI *(%)	15	*BRE Digest 240:1993.
		This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **CL**

Remarks NHBC Volume change potential classification is low.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080731-604**
Our Project No 100746
Your Sample Ref B3
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	216	**Depth**	0.7m
Date sampled	22 Jul 2020	**Date received**	22 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	412

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Stiff mottled brown and grey slightly sandy silty CLAY.

Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Wet sieving	Oven dried @ 40°C
Retained 425µm (%)		

Natural MC (%)	21
Drying Temp. (ºC)	105-110
Liquid Limit (%)	50
Plastic Limit (%)	16
Plasticity Index (%)	34
Modified PI *(%)	34

*BRE Digest 240:1993.
This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **C H**

Remarks NHBC Volume change potential classification is medium.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080732-604**
Our Project No 100746
Your Sample Ref B4
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	216	**Depth**	0.9m
Date sampled	22 Jul 2020	**Date received**	22 Jul 2020
Date tested	12 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	706

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Reddish brown and orangey brown very sandy gravelly CLAY. Gravel is fine to medium angular to sub-angular ironstone, chert and phosphatic nodules. Lenses of soft light blue grey clay.
Supplier	Not applicable
Source	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Wet sieving	Oven dried @ 40°C
Retained 425µm (%)	5.6	
Natural MC (%)		
Drying Temp. (ºC)	105-110	
Liquid Limit (%)	45	
Plastic Limit (%)	19	
Plasticity Index (%)	26	
Modified PI *(%)	25	*BRE Digest 240:1993.

This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **C I**

Remarks NHBC Volume change potential classification is medium.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080735-604**
Our Project No 100746
Your Sample Ref B2
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	217	**Depth**	1m
Date sampled	22 Jul 2020	**Date received**	22 Jul 2020
Date tested	12/0/8/2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	442

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Dark grey very sandy silty CLAY. Some roots. Slight organic odour.

Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartering	
Preparation Method	Wet sieving	Oven dried @ 40°C
Retained 425µm (%)	7.7	

Natural MC (%)	44
Drying Temp. (ºC)	105-110
Liquid Limit (%)	67
Plastic Limit (%)	45
Plasticity Index (%)	22
Modified PI *(%)	20

*BRE Digest 240:1993.
This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **M H**

Remarks NHBC Volume change potential classification is medium.

Test Code = 604

UKAS TESTING
0920

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Our reference No. **NNPL2020080736-604**
Our Project No 100746
Your Sample Ref B3
Your Project or Order No.
Date Report Issued 19 Aug 2020

Determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5

Scheme	West Winch Relief Road		
Location	217	**Depth**	2m
Date sampled	22 Jul 2020	**Date received**	22 Jul 2020
Date tested	11 Aug 2020		
Sample type	Bulk Disturbed	**Sample Mass (g)**	486

If a Sample Certificate was provided it is available for inspection.
The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Grey clayey very sandy SILT with thin beds of sandstone, weak.

Supplier Not applicable **Source** Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division	Quartered	
Preparation Method	Hand picking	Oven dried @ 40°C
Retained 425µm (%)	1.0	

Natural MC (%)	28
Drying Temp. (ºC)	105-110
Liquid Limit (%)	28
Plastic Limit (%)	Non Plastic
Plasticity Index (%)	
Modified PI *(%)	

*BRE Digest 240:1993.
This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **Non Plastic**

Remarks

Test Code = 604

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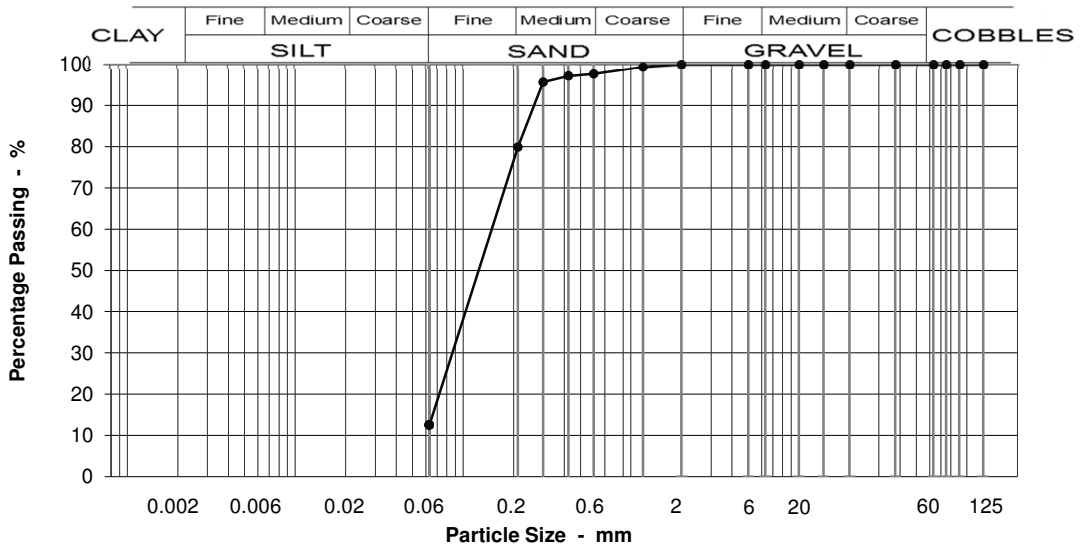
Our reference No. NNPL202009021-610
Our Project No. 100746
Your Sample Ref. 5
Your Order No.
Date Tested 21/09/2020
Date Report Issued 25 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 101 @ 1.2 - 2m
Disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	100
10	100
6.3	100
5	100
2	100
1.18	99
0.600	98
0.425	97
0.300	96
0.212	80
0.063	13

Specification for Highway Works Classification
Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6J.

Moisture content % 19
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	0
Fine GRAVEL	0
Coarse SAND	2
Medium SAND	18
Fine SAND	67
Silt & Clay	13

Grading Analysis	
D100	1
D60	0.17
D10	0.03
Uniformity Coefficient[!]	6 *

Description
Orangey-brown slightly silty slightly clayey fine SAND.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

Test Code = 610

UKAS TESTING 0920

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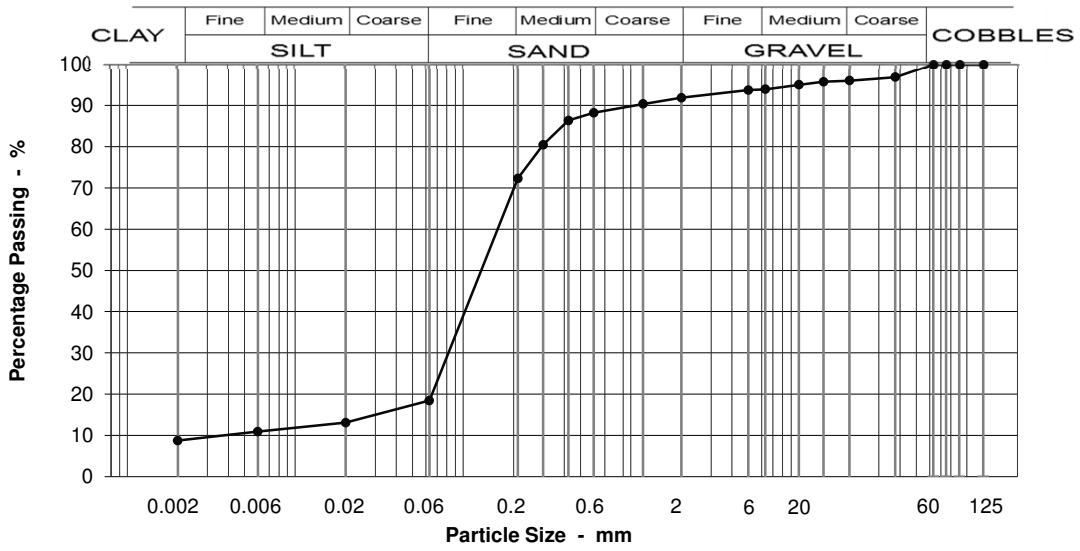
Our reference No. NNPL202008078-610
Our Project No. 100746
Your Sample Ref. 2
Your Order No.
Date Tested 17/08/2020
Date Report Issued 29 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 207 @ 0.5 - 0.7m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	97
20	96
14	96
10	95
6.3	94
5	94
2	92
1.18	90
0.600	88
0.425	86
0.300	80
0.212	72
0.063	18
0.020	13
0.006	11
0.002	9

Specification for Highway Works Classification

Table 6/2

This material complies with the following material classes 2A/2B.

Moisture content % 10
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	4
Medium GRAVEL	2
Fine GRAVEL	2
Coarse SAND	4
Medium SAND	16
Fine SAND	54
Silt & Clay	18

Grading Analysis	
D100	38
D60	0.18
D10	0.03
Uniformity Coefficient[!]	5 *

Description
Brown slightly clayey slightly silty slightly gravelly fine SAND. Gravel is fine to coarse angular to subrounded flint.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

Test Code = 610

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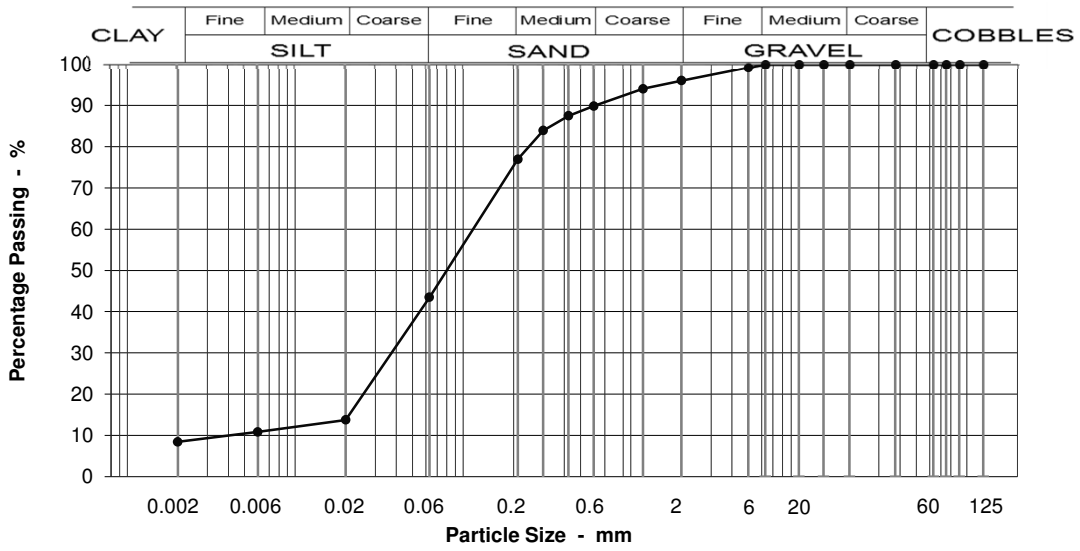
Our reference No. NNPL2020080710-610
Our Project No. 100746
Your Sample Ref. 4
Your Order No.
Date Tested 17/08/2020
Date Report Issued 29 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 207 @ 1.9 - 2.1m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	100
10	100
6.3	100
5	99
2	96
1.18	94
0.600	90
0.425	87
0.300	84
0.212	77
0.063	43
0.020	14
0.006	11
0.002	8

Specification for Highway Works Classification

Table 6/2

This material complies with the following material classes 2A/2B.

Moisture content % 22
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	0
Fine GRAVEL	4
Coarse SAND	6
Medium SAND	13
Fine SAND	33
Silt & Clay	43

Grading Analysis	
D100	5
D60	0.14
D10	0.03
Uniformity Coefficient[!]	5 *

Description
Dark grey clayey sandy SILT with laminae and thin beds of siltstone.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

Test Code = 610

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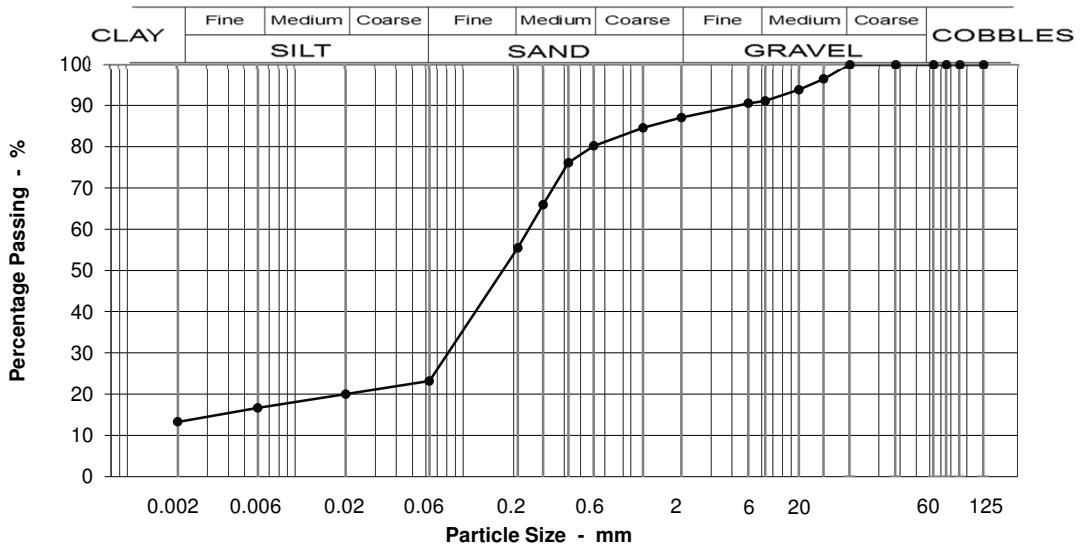
Our reference No. NNPL2020080714-610
Our Project No. 100746
Your Sample Ref. 5
Your Order No.
Date Tested 14/08/2020
Date Report Issued 29 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 210 @ 2.1 - 2.3m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	96
10	94
6.3	91
5	90
2	87
1.18	85
0.600	80
0.425	76
0.300	66
0.212	55
0.063	23
0.020	20
0.006	17
0.002	13

Specification for Highway Works Classification

Table 6/2

This material complies with the following material classes 2A/2B.

Moisture content % 22
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	9
Fine GRAVEL	4
Coarse SAND	7
Medium SAND	25
Fine SAND	32
Silt & Clay	23

Grading Analysis	
D100	14
D60	0.25
D10	0.00
Uniformity Coefficient[!]	>10 *

Description
Grey clayey slightly silty fine to medium SAND.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

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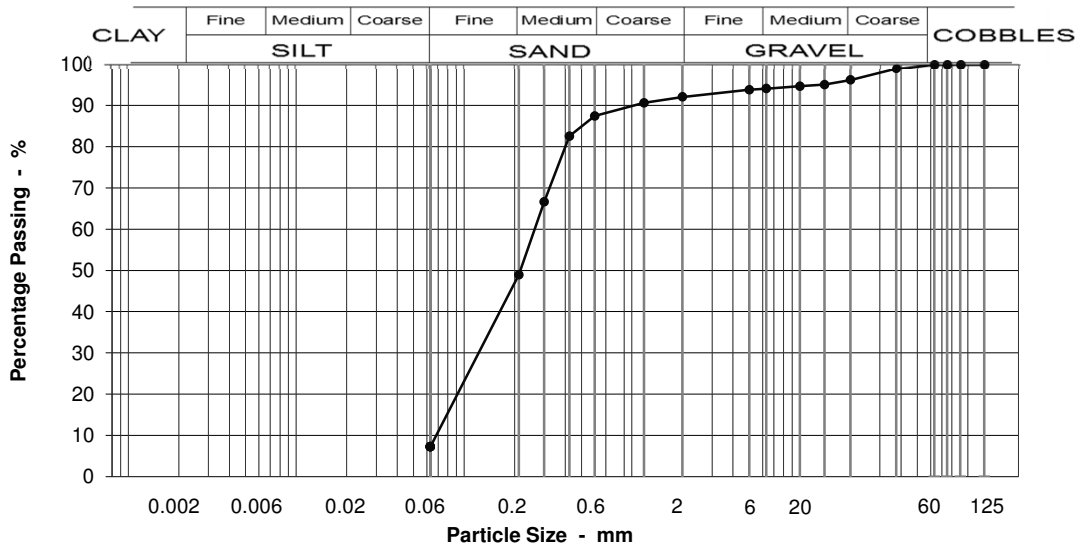
Our reference No. NNPL2020080716-610
Our Project No. 100746
Your Sample Ref. 2
Your Order No.
Date Tested 17/08/2020
Date Report Issued 25 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 213 @ 0.5 - 0.7m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	99
20	96
14	95
10	95
6.3	94
5	94
2	92
1.18	91
0.600	87
0.425	83
0.300	67
0.212	49
0.063	7

Specification for Highway Works Classification
Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6M.

Moisture content % 3.2
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	4
Medium GRAVEL	2
Fine GRAVEL	2
Coarse SAND	5
Medium SAND	38
Fine SAND	42
Silt & Clay	7

Grading Analysis	
D100	38
D60	0.27
D10	0.07
Uniformity Coefficient[1]	4

Description
Light brown gravelly fine to medium SAND. Gravel is fine to coarse angular to subangular flint and carstone.

S

Test Code = 610

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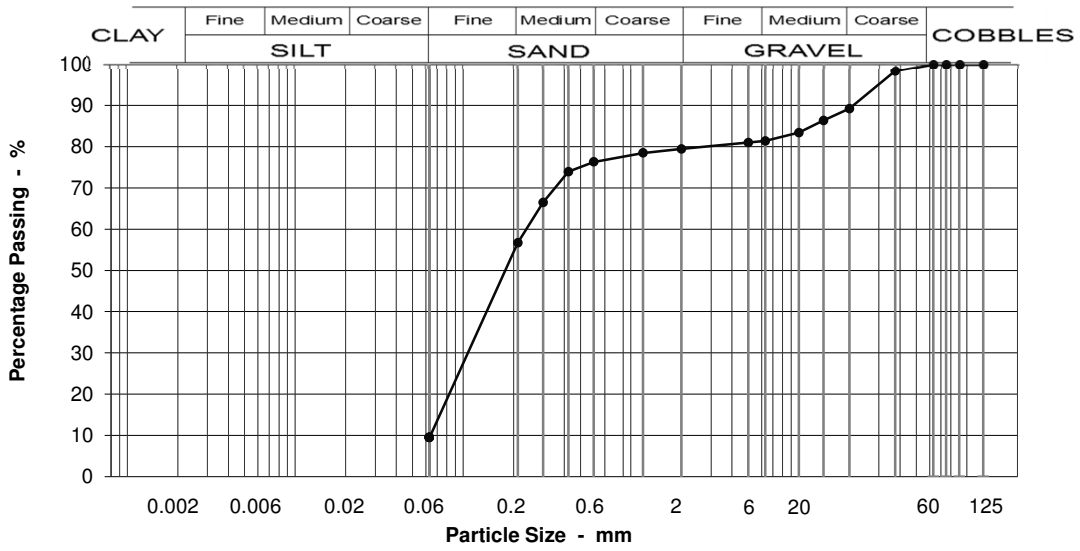
Our reference No. NNPL2020080718-610
Our Project No. 100746
Your Sample Ref. 4
Your Order No.
Date Tested 17/08/2020
Date Report Issued 25 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 213 @ 1.7 - 1.9m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	98
20	89
14	86
10	83
6.3	81
5	81
2	79
1.18	78
0.600	76
0.425	74
0.300	66
0.212	57
0.063	10

Specification for Highway Works Classification
Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6M.

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	11
Medium GRAVEL	8
Fine GRAVEL	2
Coarse SAND	3
Medium SAND	20
Fine SAND	47
Silt & Clay	10

Grading Analysis	
D100	38
D60	0.24
D10	0.06
Uniformity Coefficient[1]	4

Description
Brown gravelly silty fine SAND with lenses of soft light grey clay. Gravel is medium to coarse subangular to subrounded ironstone.

Moisture content % 17
(BS1377-Part 1, 1990)

S

Test Code = 610

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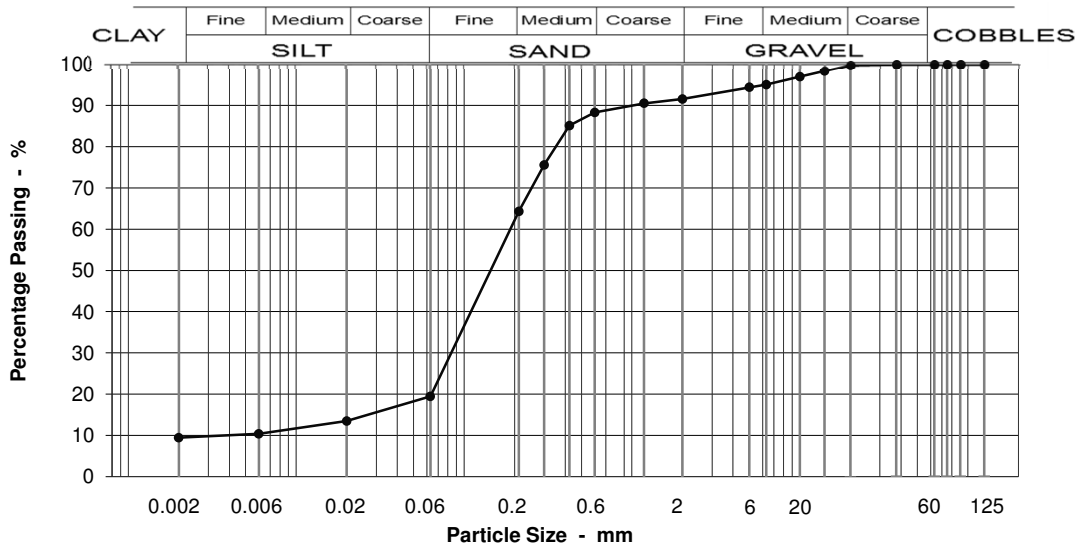
Our reference No. NNPL2020080721-610
Our Project No. 100746
Your Sample Ref. 2
Your Order No.
Date Tested 14/08/2020
Date Report Issued 29 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 214 @ 0.5 - 0.7m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	98
10	97
6.3	95
5	94
2	92
1.18	90
0.600	88
0.425	85
0.300	76
0.212	64
0.063	19
0.020	14
0.006	10
0.002	9

Specification for Highway Works Classification

Table 6/2

This material complies with the following material classes 2A/2B.

Moisture content % 14
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	5
Fine GRAVEL	3
Coarse SAND	3
Medium SAND	24
Fine SAND	45
Silt & Clay	19

Grading Analysis	
D100	20
D60	0.20
D10	0.04
Uniformity Coefficient[!]	5 *

Description
Orangey-brown slightly clayey silty gravelly fine and medium SAND. Gravel is fine to medium angular to subrounded flint.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

Test Code = 610

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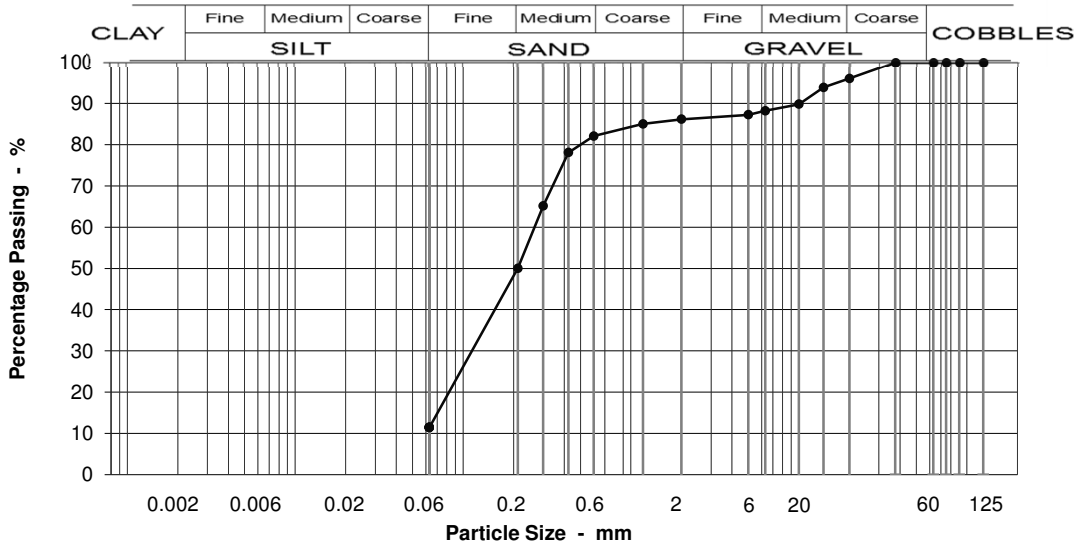
Our reference No. NNPL2020080725-610
Our Project No. 100746
Your Sample Ref. 2
Your Order No.
Date Tested 17/08/2020
Date Report Issued 25 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 215 @ 0.5 - 0.7m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	96
14	94
10	90
6.3	88
5	87
2	86
1.18	85
0.600	82
0.425	78
0.300	65
0.212	50
0.063	12

Specification for Highway Works Classification

Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6J.

Moisture content % 9.7
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	4
Medium GRAVEL	8
Fine GRAVEL	2
Coarse SAND	4
Medium SAND	32
Fine SAND	39
Silt & Clay	12

Grading Analysis	
D100	20
D60	0.27
D10	0.04
Uniformity Coefficient[!]	6 *

Description
Orangey-brown clayey gravelly fine to medium SAND. Gravel is medium to coarse angular to subrounded flint.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

Test Code = 610

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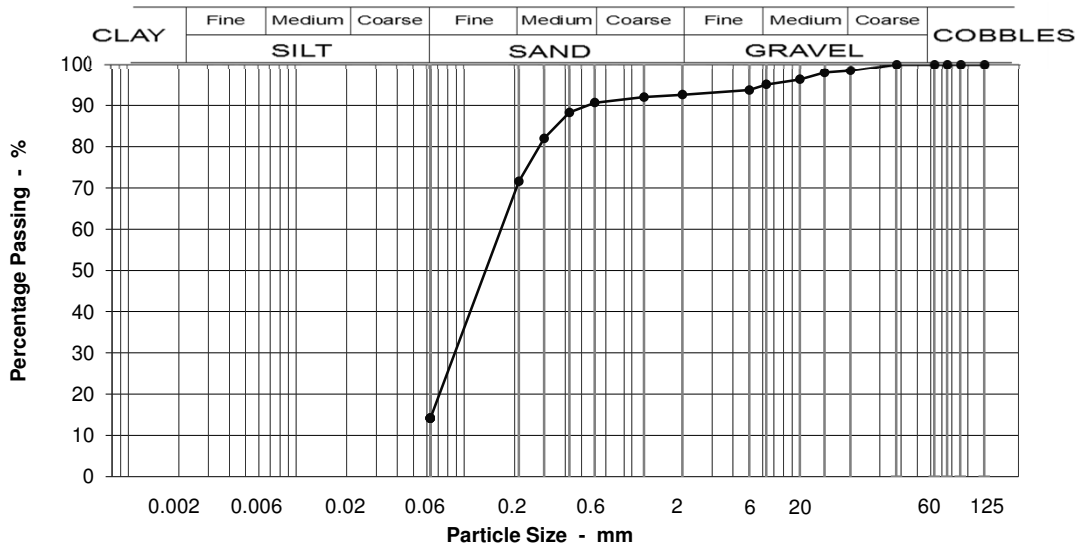
Our reference No. NNPL2020080734-610
Our Project No. 100746
Your Sample Ref. 6
Your Order No.
Date Tested 17/08/2020
Date Report Issued 25 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 216 @ 2 - 2.5m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	98
14	98
10	96
6.3	95
5	94
2	93
1.18	92
0.600	91
0.425	88
0.300	82
0.212	72
0.063	14

Specification for Highway Works Classification

Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6J.

Moisture content % 22
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	2
Medium GRAVEL	3
Fine GRAVEL	2
Coarse SAND	2
Medium SAND	19
Fine SAND	57
Silt & Clay	14

Grading Analysis	
D100	20
D60	0.18
D10	0.03
Uniformity Coefficient[!]	6 *

Description
Grey clayey silty fine SAND.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

Test Code = 610

UKAS TESTING 0920

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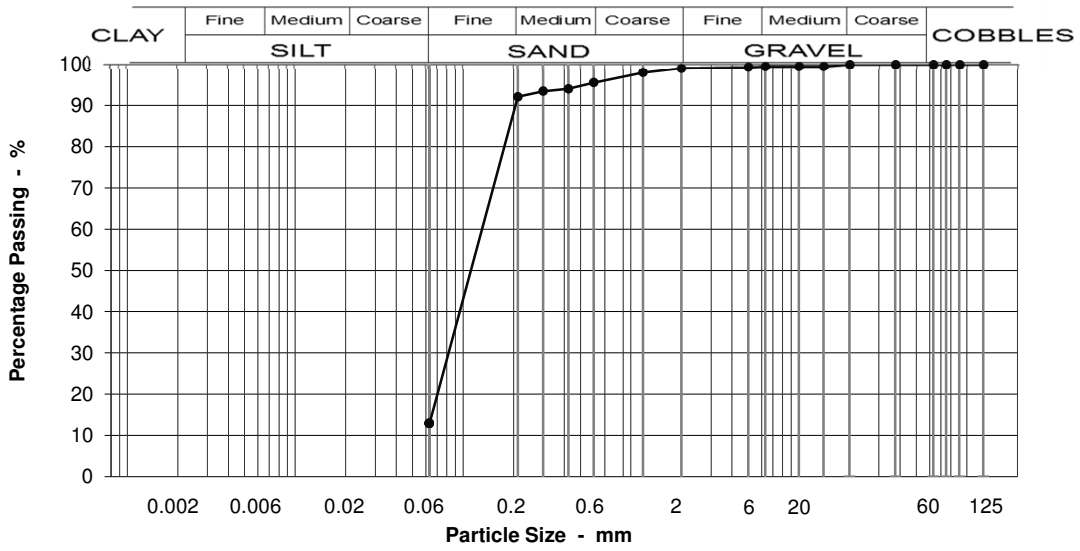
West Yorkshire
LS11 1ED

Our reference No. NNPL2020080736-610
Our Project No. 100746
Your Sample Ref. 3
Your Order No.
Date Tested 17/08/2020
Date Report Issued 25 Sep 2020

Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: West Winch Relief Road
Location and orientation within sample not applicable

Location: 217 @ 2 - 2.3m
Bulk disturbed sample



Sieving

Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	100
10	100
6.3	100
5	99
2	99
1.18	98
0.600	96
0.425	94
0.300	93
0.212	92
0.063	13

Specification for Highway Works Classification

Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6J.

Moisture content % 27
(BS1377-Part 1, 1990)

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	0
Fine GRAVEL	0
Coarse SAND	4
Medium SAND	3
Fine SAND	79
Silt & Clay	13

Grading Analysis	
D100	14
D60	0.15
D10	0.02
Uniformity Coefficient[!]	6 *

Description
Grey clayey silty fine SAND.

* Uniformity coefficient extrapolated

! UC to Spec. For Highway Works, table 6/1 footnote 5

S

Test Code = 610

UKAS TESTING 0920

Simon Holden (Operations Manager)

AGS

Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS102
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	4.90
No of runs	1

Note: if dry enter BH depth

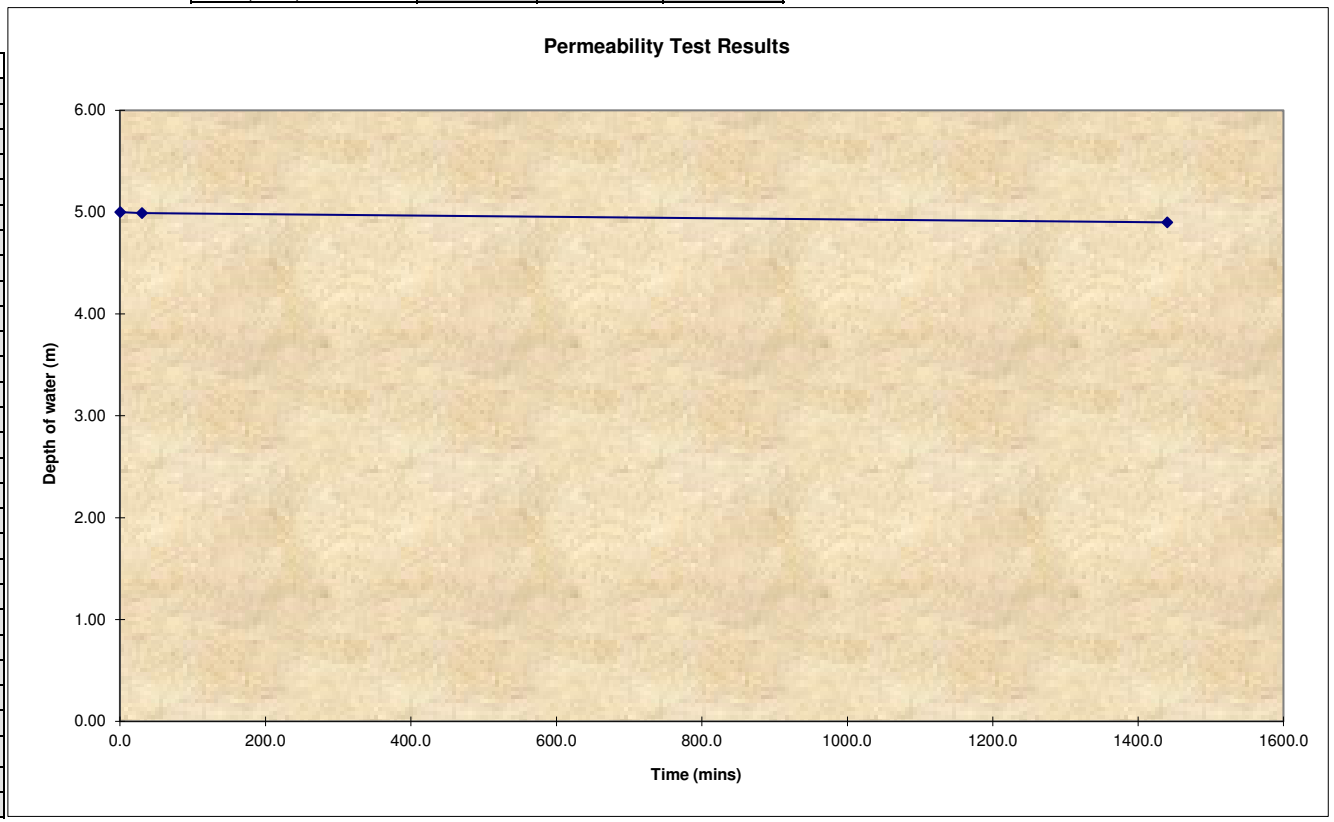
Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
30.0	4.99	0.01
1440.0	4.90	0.10

Time of Emptying of Soakaway
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	3.7750	2.5500	1.3250
Time (mins)	19065	38257	57448

Gravel fill	Yes
Voids %	39.9

Infiltration Rate
4.4E-09 m/sec



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS103
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	1.50
No of runs	3

Note: if dry enter BH depth

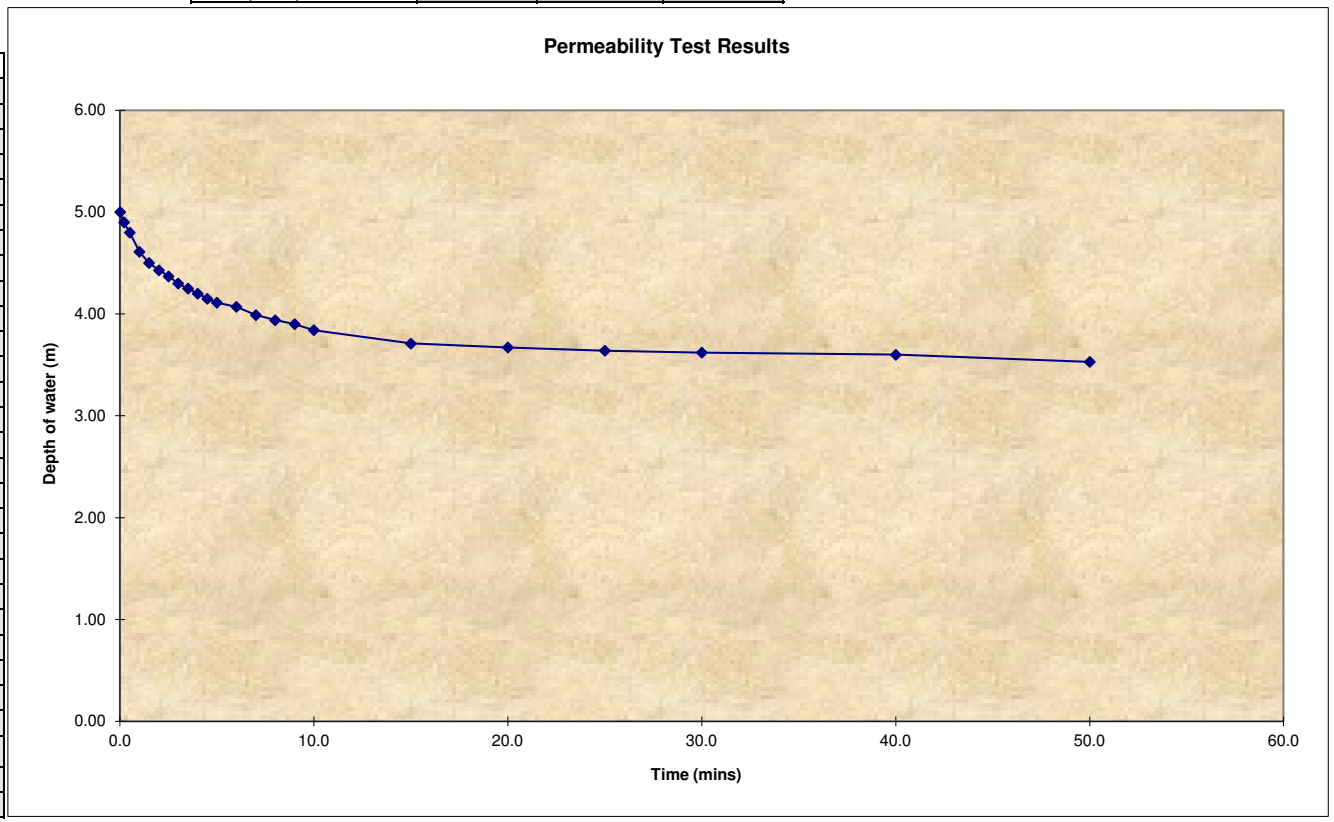
Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.2	4.90	0.10
0.5	4.80	0.20
1.0	4.61	0.39
1.5	4.50	0.50
2.0	4.43	0.57
2.5	4.37	0.63
3.0	4.30	0.70
3.5	4.25	0.75
4.0	4.20	0.80
4.5	4.15	0.85
5.0	4.11	0.89
6.0	4.07	0.93
7.0	3.99	1.01
8.0	3.94	1.06
9.0	3.90	1.10
10.0	3.84	1.16
15.0	3.71	1.29
20.0	3.67	1.33
25.0	3.64	1.36
30.0	3.62	1.38
40.0	3.60	1.40
50.0	3.53	1.47

Time of Emptying of Soakaway
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.6250	4.2500	3.8750
Time (mins)	1	4	9

Gravel fill	Yes
Voids %	39.9

Infiltration Rate
2.0E-05 m/sec



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS103
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	1.50
No of runs	3

Note: if dry enter BH depth

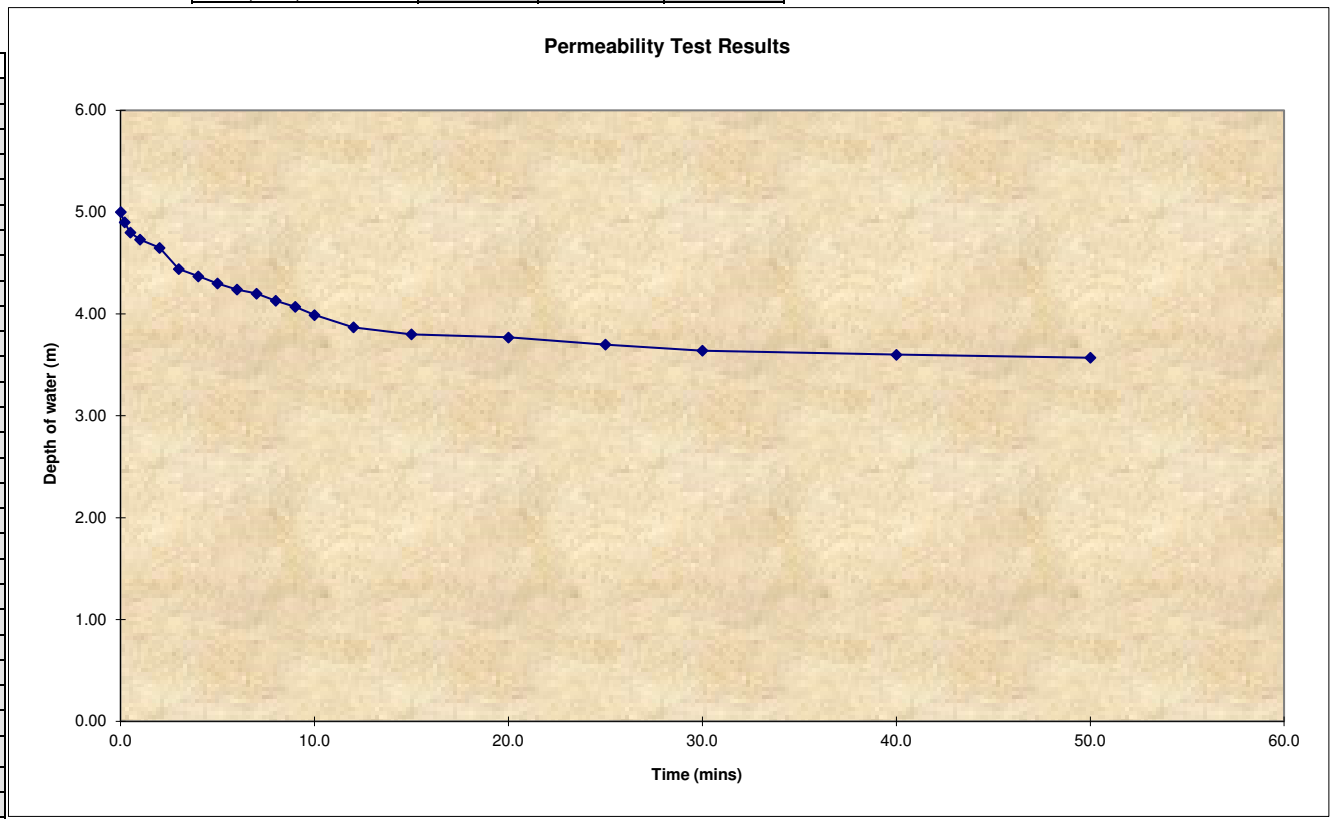
Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.2	4.90	0.10
0.5	4.80	0.20
1.0	4.73	0.27
2.0	4.65	0.35
3.0	4.44	0.56
4.0	4.37	0.63
5.0	4.30	0.70
6.0	4.24	0.76
7.0	4.20	0.80
8.0	4.13	0.87
9.0	4.07	0.93
10.0	3.99	1.01
12.0	3.87	1.13
15.0	3.80	1.20
20.0	3.77	1.23
25.0	3.70	1.30
30.0	3.64	1.36
40.0	3.60	1.40
50.0	3.57	1.43

Time of Emptying of Soakaway
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.6250	4.2500	3.8750
Time (mins)	2	6	12

Gravel fill	Yes
Voids %	39.9

Infiltration Rate	Mean	Min
1.7E-05 m/sec	1.8E-05	1.7E-05



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS103
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	1.50
No of runs	3

Note: if dry enter BH depth

Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.2	4.90	0.10
0.5	4.83	0.17
1.0	4.77	0.23
2.0	4.65	0.35
3.0	4.47	0.53
4.0	4.40	0.60
5.0	4.32	0.68
6.0	4.26	0.74
7.0	4.21	0.79
8.0	4.15	0.85
9.0	4.08	0.92
10.0	4.00	1.00
12.0	3.91	1.09
15.0	3.84	1.16
20.0	3.81	1.19
25.0	3.76	1.24
30.0	3.71	1.29
40.0	3.64	1.36
50.0	3.60	1.40

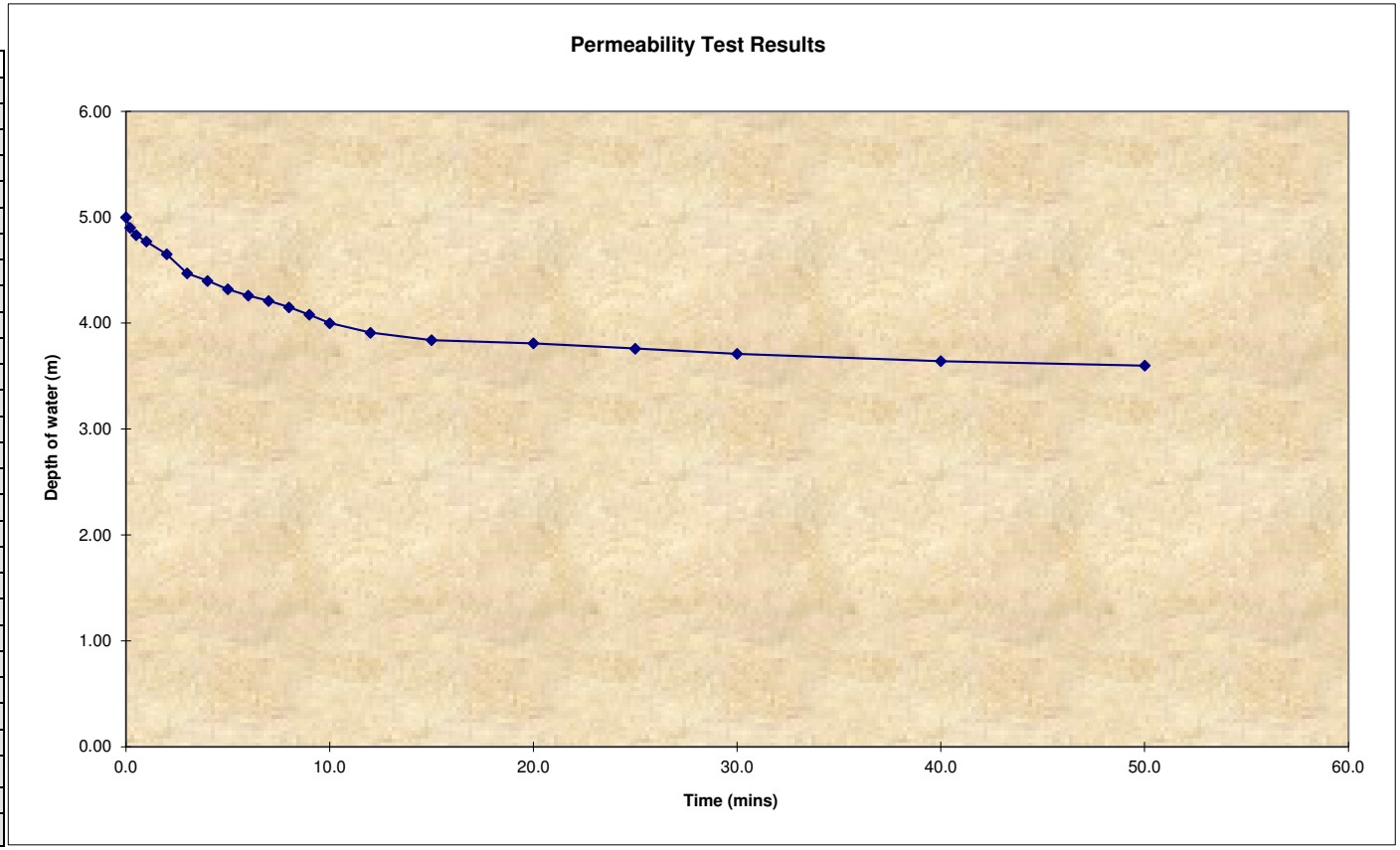
Time of Emptying of Soakaway

(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.6250	4.2500	3.8750
Time (mins)	2	6	14

Gravel fill	Yes
Voids %	39.9

Infiltration Rate	**Mean**	**Min**
1.5E-05 m/sec	1.7E-05	1.5E-05



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS105
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	3.25
No of runs	3

Note: if dry enter BH depth

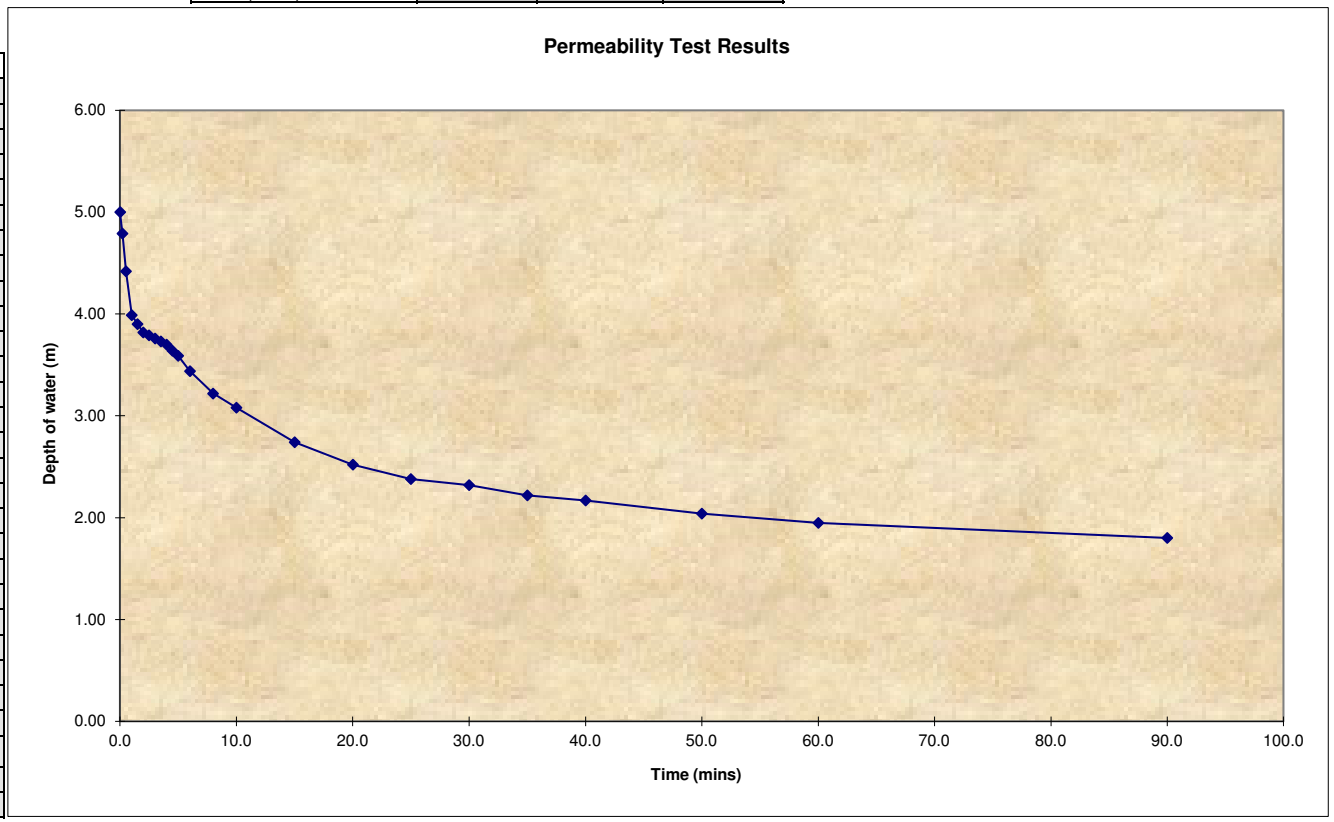
Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.2	4.79	0.21
0.5	4.42	0.58
1.0	3.99	1.01
1.5	3.90	1.10
2.0	3.82	1.18
2.5	3.79	1.21
3.0	3.76	1.24
3.5	3.73	1.27
4.0	3.70	1.30
4.5	3.64	1.36
5.0	3.59	1.41
6.0	3.44	1.56
8.0	3.22	1.78
10.0	3.08	1.92
15.0	2.74	2.26
20.0	2.52	2.48
25.0	2.38	2.62
30.0	2.32	2.68
35.0	2.22	2.78
40.0	2.17	2.83
50.0	2.04	2.96
60.0	1.95	3.05
90.0	1.80	3.20

Time of Emptying of Soakaway
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.1875	3.3750	2.5625
Time (mins)	1	7	19

Gravel fill	Yes
Voids %	39.9

Infiltration Rate
9.2E-06 m/sec



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS105
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	3.25
No of runs	3

Note: if dry enter BH depth

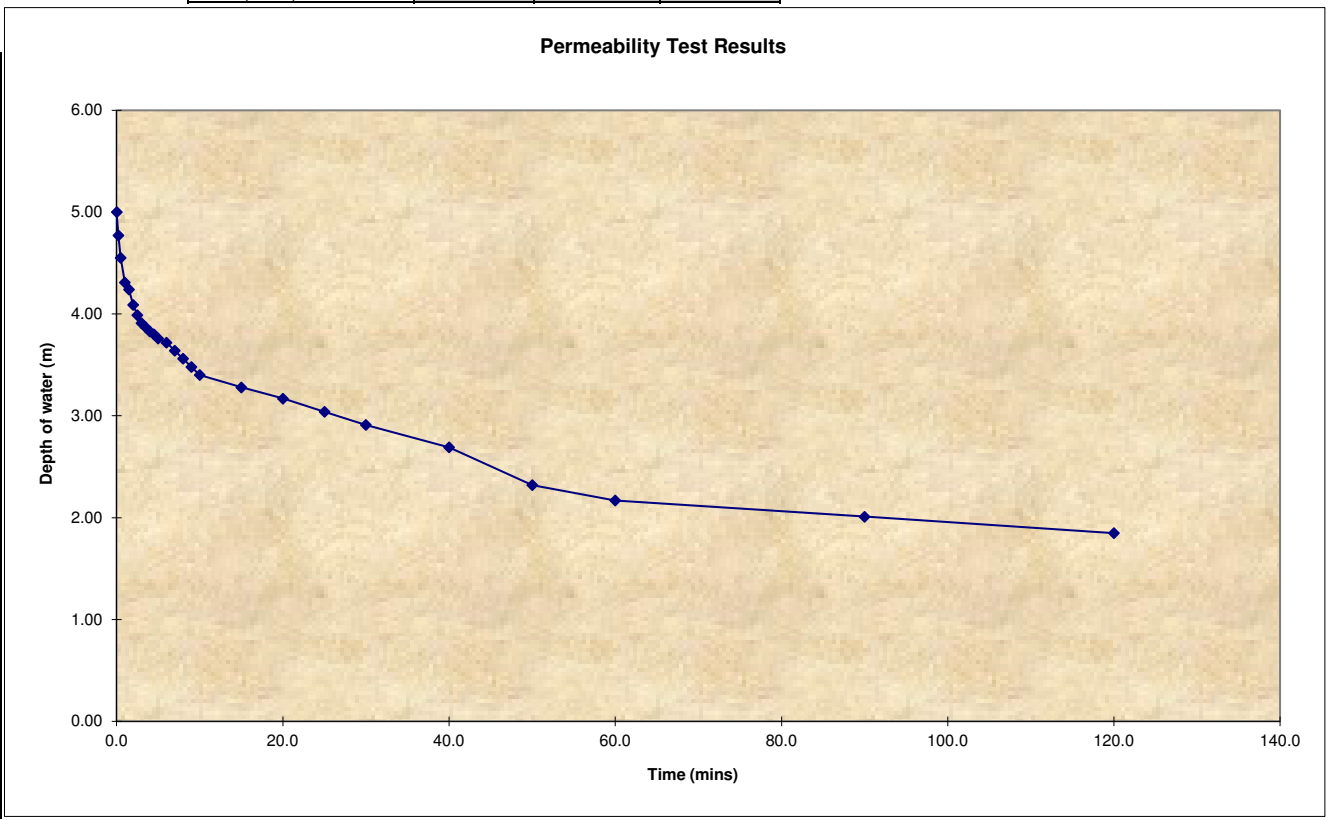
Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.2	4.77	0.23
0.5	4.55	0.45
1.0	4.31	0.69
1.5	4.24	0.76
2.0	4.09	0.91
2.5	3.99	1.01
3.0	3.91	1.09
3.5	3.87	1.13
4.0	3.83	1.17
4.5	3.80	1.20
5.0	3.76	1.24
6.0	3.72	1.28
7.0	3.64	1.36
8.0	3.56	1.44
9.0	3.48	1.52
10.0	3.40	1.60
15.0	3.28	1.72
20.0	3.17	1.83
25.0	3.04	1.96
30.0	2.91	2.09
40.0	2.69	2.31
50.0	2.32	2.68
60.0	2.17	2.83
90.0	2.01	2.99
120.0	1.85	3.15

Time of Emptying of Soakaway
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.1875	3.3750	2.5625
Time (mins)	2	11	43

Gravel fill	Yes
Voids %	39.9

Infiltration Rate	Mean	Min
4.0E-06 m/sec	5.6E-06	4.0E-06



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS105
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	3.25
No of runs	3

Note: if dry enter BH depth

Time of Emptying of Soakaway

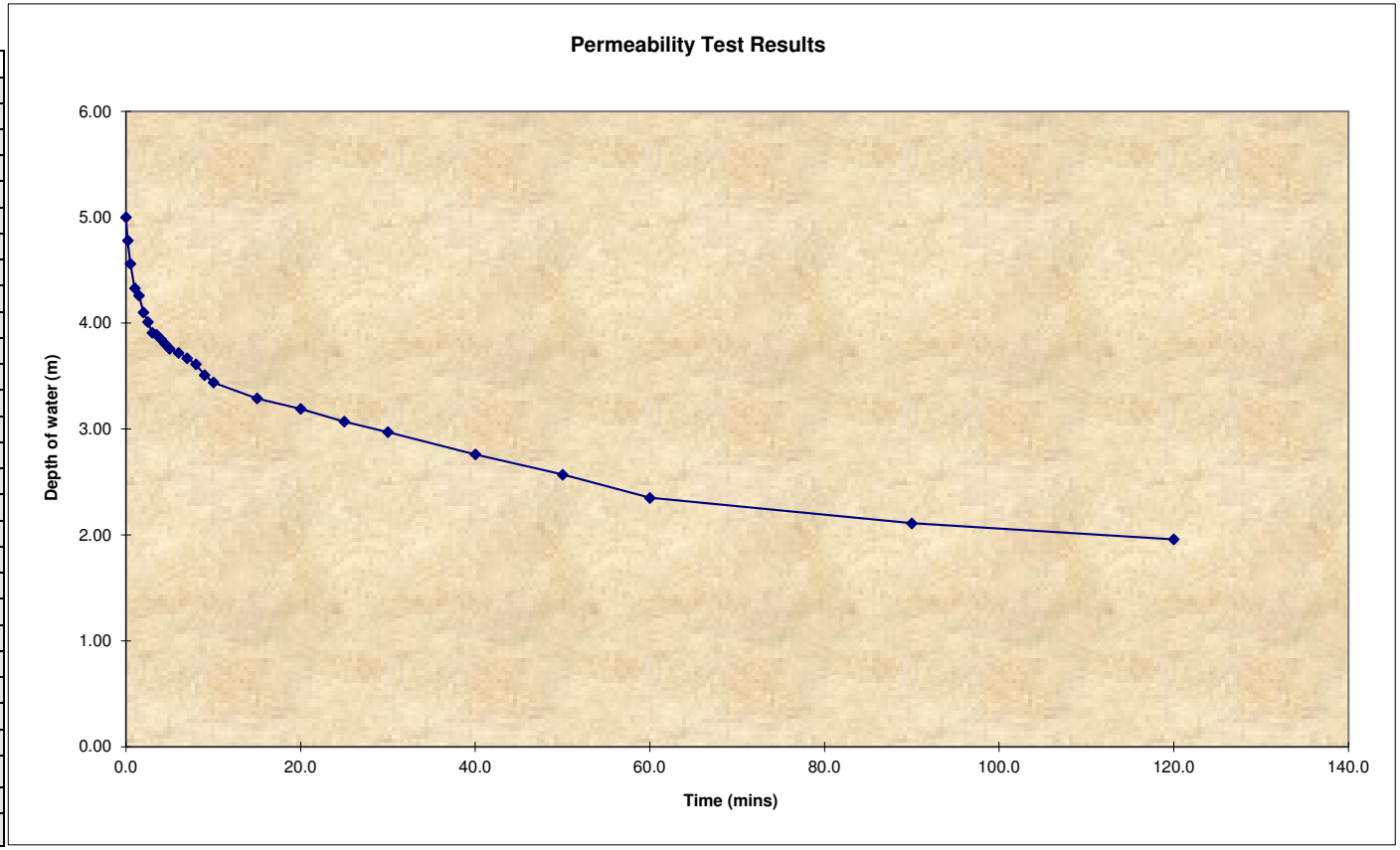
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.1875	3.3750	2.5625
Time (mins)	2	12	50

Gravel fill	Yes
Voids %	39.9

Infiltration Rate	**Mean**	**Min**
3.5E-06 m/sec	4.6E-06	3.5E-06

Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.2	4.78	0.22
0.5	4.56	0.44
1.0	4.33	0.67
1.5	4.26	0.74
2.0	4.10	0.90
2.5	4.01	0.99
3.0	3.91	1.09
3.5	3.89	1.11
4.0	3.85	1.15
4.5	3.80	1.20
5.0	3.76	1.24
6.0	3.72	1.28
7.0	3.67	1.33
8.0	3.61	1.39
9.0	3.51	1.49
10.0	3.44	1.56
15.0	3.29	1.71
20.0	3.19	1.81
25.0	3.07	1.93
30.0	2.97	2.03
40.0	2.76	2.24
50.0	2.57	2.43
60.0	2.35	2.65
90.0	2.11	2.89
120.0	1.96	3.04



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS107
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	1.70
No of runs	3

Note: if dry enter BH depth

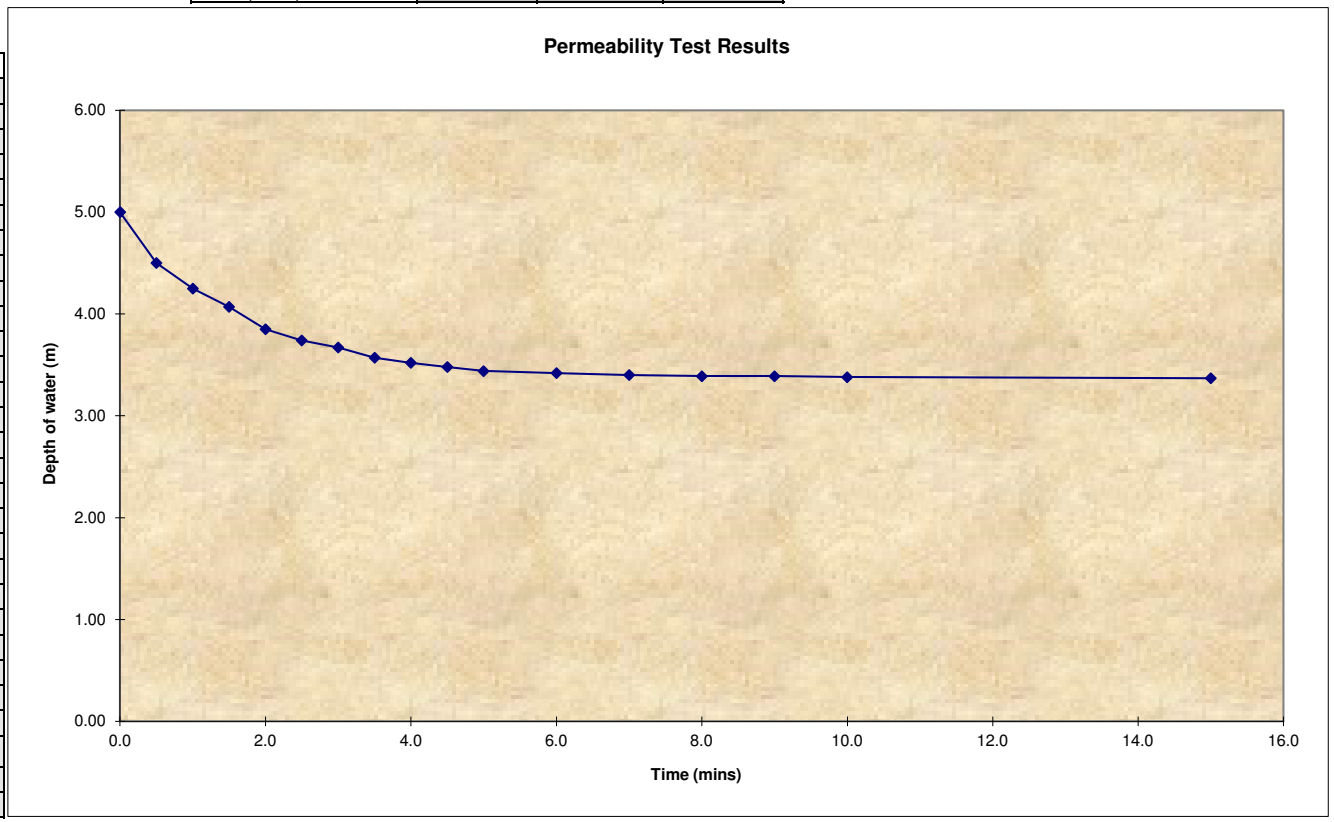
Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.5	4.50	0.50
1.0	4.25	0.75
1.5	4.07	0.93
2.0	3.85	1.15
2.5	3.74	1.26
3.0	3.67	1.33
3.5	3.57	1.43
4.0	3.52	1.48
4.5	3.48	1.52
5.0	3.44	1.56
6.0	3.42	1.58
7.0	3.40	1.60
8.0	3.39	1.61
9.0	3.39	1.61
10.0	3.38	1.62
15.0	3.37	1.63

Time of Emptying of Soakaway
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.5750	4.1500	3.7250
Time (mins)	0	1	3

Gravel fill	Yes
Voids %	39.9

Infiltration Rate
7.7E-05 m/sec



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS107
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	1.70
No of runs	3

Note: if dry enter BH depth

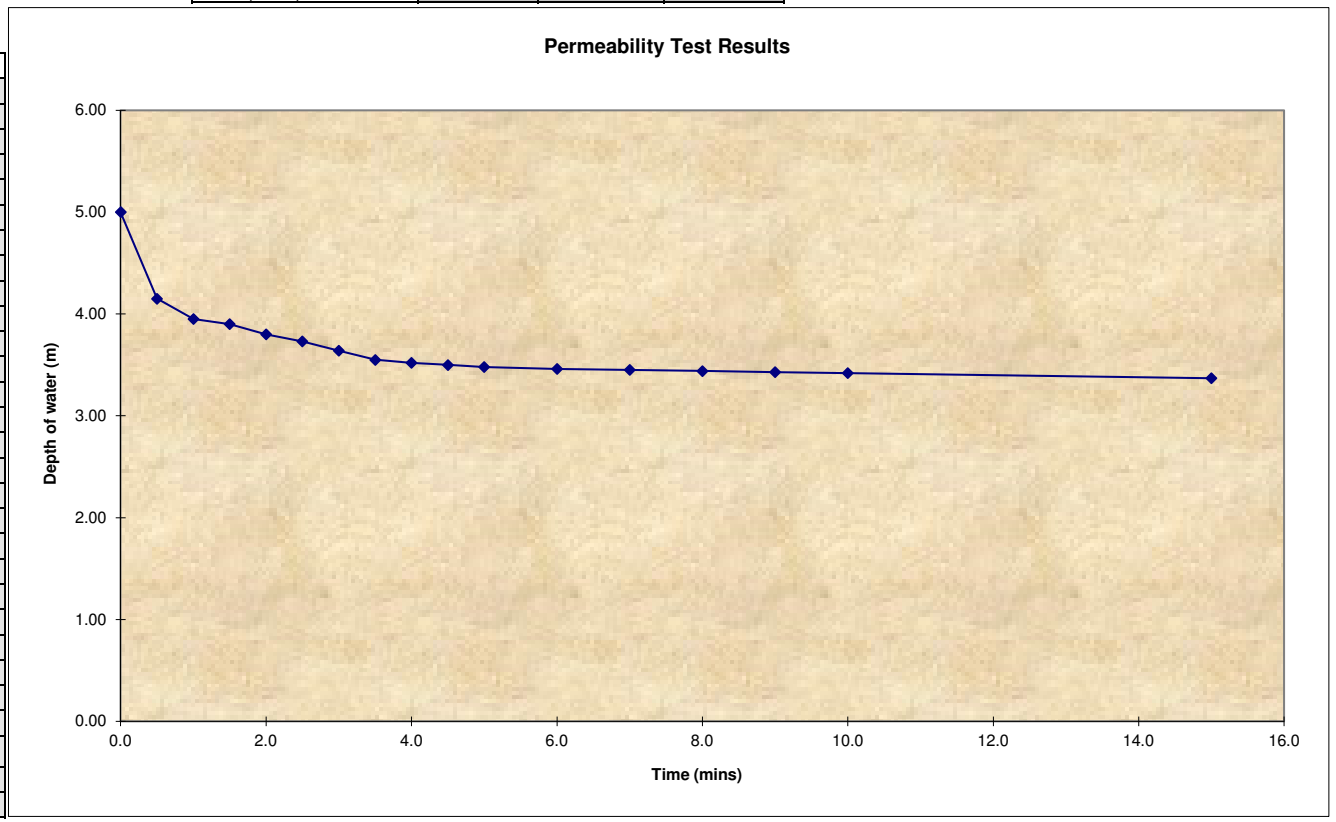
Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.5	4.15	0.85
1.0	3.95	1.05
1.5	3.90	1.10
2.0	3.80	1.20
2.5	3.73	1.27
3.0	3.64	1.36
3.5	3.55	1.45
4.0	3.52	1.48
4.5	3.50	1.50
5.0	3.48	1.52
6.0	3.46	1.54
7.0	3.45	1.55
8.0	3.44	1.56
9.0	3.43	1.57
10.0	3.42	1.58
15.0	3.37	1.63

Time of Emptying of Soakaway
(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.5750	4.1500	3.7250
Time (mins)	0	1	3

Gravel fill	Yes
Voids %	39.9

Infiltration Rate	Mean	Min
7.4E-05 m/sec	7.5E-05	7.4E-05



Results from Site Observation

Scheme:	**West Winch**
Project No	**100746**
Borehole No.	WS107
Depth of Borehole (m)=	5.00
Diameter (m)=	0.10
Depth of casing (m)	0.00
Depth to water (m)	1.70
No of runs	3

Note: if dry enter BH depth

Minutes	Depth of Water (m)	Depth Below E.G.L.(m)
0.0	5.00	0.00
0.5	4.37	0.63
1.0	4.10	0.90
1.5	3.94	1.06
2.0	3.82	1.18
2.5	3.77	1.23
3.0	3.64	1.36
3.5	3.56	1.44
4.0	3.52	1.48
4.5	3.48	1.52
5.0	3.44	1.56
6.0	3.43	1.57
7.0	3.42	1.58
8.0	3.41	1.59
9.0	3.40	1.60
10.0	3.38	1.62
15.0	3.37	1.63

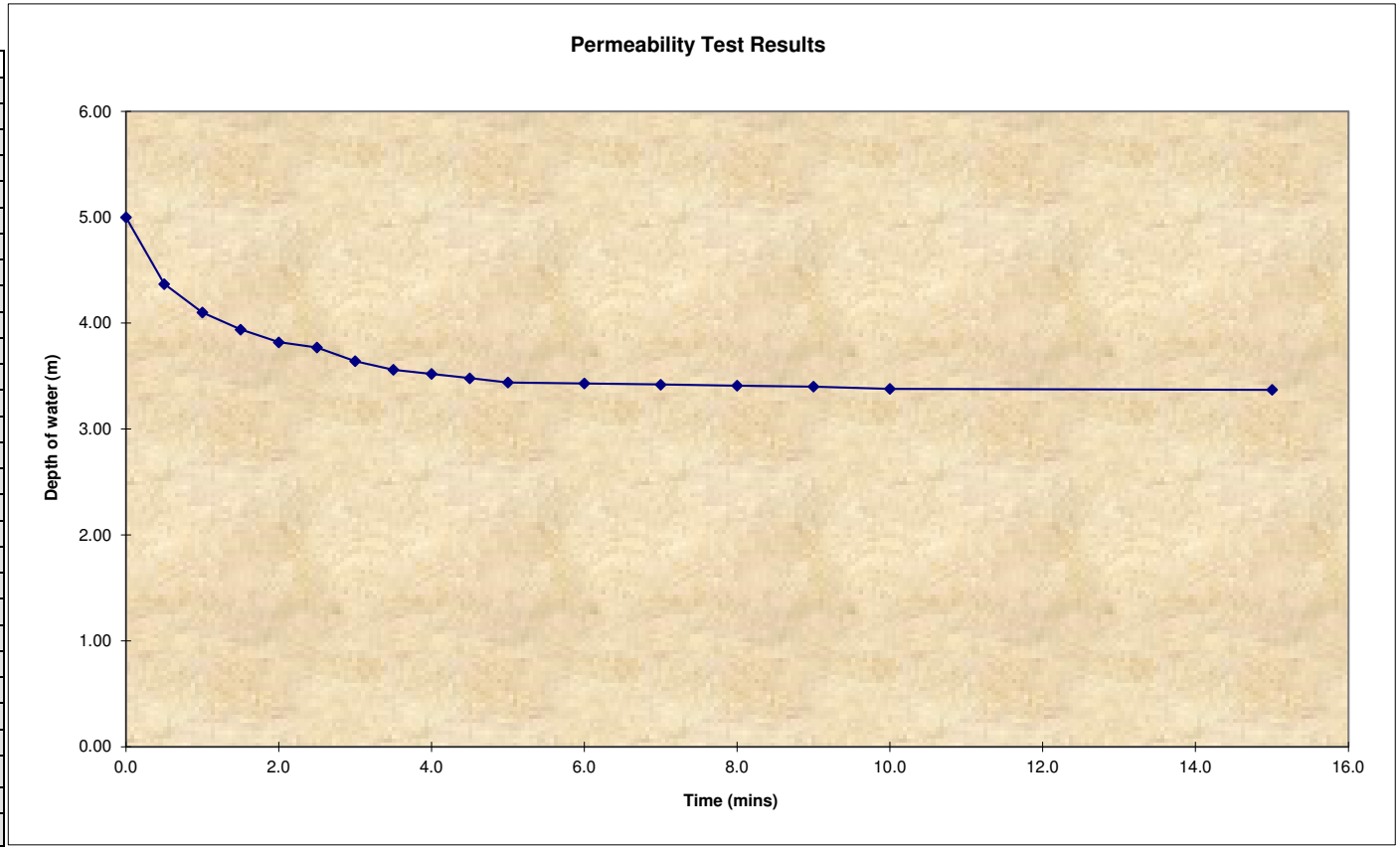
Time of Emptying of Soakaway

(Values to be checked on chart)

% Full	25% Empty	50% Empty	75% Empty
Depth of Water (m)	4.5750	4.1500	3.7250
Time (mins)	0	1	3

Gravel fill	Yes
Voids %	39.9

Infiltration Rate	**Mean**	**Min**
7.2E-05 m/sec	7.4E-05	7.2E-05



envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/06509
Issue Number: 1 **Date:** 14 August, 2020

Client: Norse Eastern Ltd t/a Norse Highways
280 Fifers Lane
Norwich
Norfolk
NR6 6EQ

Project Manager: Civil Lab/Sharon Woods; Simon Holden
Project Name: West Winch By Pass
Project Ref: 100746
Order No: PN05006788
Date Samples Received: 06/08/20
Date Instructions Received: 06/08/20
Date Analysis Completed: 14/08/20

Prepared by:

Sophie France
Client Service Manager

Approved by:

John Gustafson
Managing Director

Envirolab Job Number: 20/06509

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06509/1	20/06509/2	20/06509/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	106	208	211							
Depth to Top	0.5	0.5	0.4							
Depth To Bottom										
Date Sampled	01-Aug-20	01-Aug-20	01-Aug-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6AB	4AE	6AE							
% Stones >10mm$_A$	15.1	0.5	<0.1					% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.71	7.16	7.69					pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	<0.01	<0.01					g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$$^{M\#}$	<200	<200	210					mg/kg	200	A-T-028s
Cyanide (total)$_A$$^{M\#}$	<1	<1	<1					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2					mg/kg	0.2	A-T-050s
Sulphide$_A$	<5	<5	<5					mg/kg	5	A-T-S2-s
Sulphur (elemental)$_D$$^{M\#}$	<5	<5	<5					mg/kg	5	A-T-029s
Organic matter$_D$$^{M\#}$	1.0	0.8	1.7					% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	2	4	6					mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0	<1.0	<1.0					mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	<0.5					mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	3	4	7					mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	8	6	11					mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1					mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	10	7	19					mg/kg	1	A-T-024s
Mercury$_D$	0.18	<0.17	<0.17					mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	6	4	7					mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1					mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	14	23	29					mg/kg	5	A-T-024s

Envirolab Job Number: 20/06509

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06509/1	20/06509/2	20/06509/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	106	208	211							
Depth to Top	0.5	0.5	0.4							
Depth To Bottom										
Date Sampled	01-Aug-20	01-Aug-20	01-Aug-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6AB	4AE	6AE							
PAH-16MS										
Acenaphthene$_{A}^{M\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-019s
Acenaphthylene$_{A}^{M\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-019s
Anthracene$_{A}^{M\#}$	<0.02	<0.02	<0.02					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_{A}^{M\#}$	<0.04	<0.04	<0.04					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_{A}^{M\#}$	<0.04	<0.04	<0.04					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_{A}^{M\#}$	<0.05	<0.05	<0.05					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_{A}^{M\#}$	<0.05	<0.05	<0.05					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_{A}^{M\#}$	<0.07	<0.07	<0.07					mg/kg	0.07	A-T-019s
Chrysene$_{A}^{M\#}$	<0.06	<0.06	<0.06					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_{A}^{M\#}$	<0.04	<0.04	<0.04					mg/kg	0.04	A-T-019s
Fluoranthene$_{A}^{M\#}$	<0.08	<0.08	<0.08					mg/kg	0.08	A-T-019s
Fluorene$_{A}^{M\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_{A}^{M\#}$	<0.03	<0.03	<0.03					mg/kg	0.03	A-T-019s
Naphthalene $_{A}^{M\#}$	<0.03	<0.03	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_{A}^{M\#}$	<0.03	<0.03	0.06					mg/kg	0.03	A-T-019s
Pyrene$_{A}^{M\#}$	<0.07	<0.07	<0.07					mg/kg	0.07	A-T-019s
Total PAH-16MS$_{A}^{M\#}$	<0.08	<0.08	<0.08					mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/06509

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06509/1	20/06509/2	20/06509/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	106	208	211							
Depth to Top	0.5	0.5	0.4							
Depth To Bottom										
Date Sampled	01-Aug-20	01-Aug-20	01-Aug-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6AB	4AE	6AE							
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C21-C35$_A$	<1	<1	9					mg/kg	1	A-T-055s
Ali >C35-C44$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Total Aliphatics$_A$	<1	<1	9					mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	<1	<1	5					mg/kg	1	A-T-055s
Aro >C35-C44$_A$	<1	<1	1					mg/kg	1	A-T-055s
Total Aromatics$_A$	<1	<1	6					mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44)$_A$	<1	<1	15					mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/06736
Issue Number: 1 **Date:** 24 August, 2020

Client: Norse Eastern Ltd t/a Norse Highways
280 Fifers Lane
Norwich
Norfolk
NR6 6EQ

Project Manager: Scott Viner/Sharon Woods; Simon Holden
Project Name: West Winch Relief Road
Project Ref: 100746
Order No: PN05006964
Date Samples Received: 14/08/20
Date Instructions Received: 14/08/20
Date Analysis Completed: 21/08/20

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Richard Wong
Client Manager

Envirolab Job Number: 20/06736

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06736/1	20/06736/2	20/06736/3	20/06736/4				Units	Limit of Detection	Method ref
Client Sample No	3	4	4	6						
Client Sample ID	207	210	214	213						
Depth to Top	1.50	1.80	2.20	2.30						
Depth To Bottom										
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20						
Sample Type	Soil - B	Soil - B	Soil - B	Soil - B						
Sample Matrix Code	5	6	3	6						
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1				% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.63	7.71	7.61	7.60				pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.02	<0.01	0.86	0.76				g/l	0.01	A-T-026s

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For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

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Please contact us if you need any further information.

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/06956
Issue Number: 1 **Date:** 01 September, 2020

Client: Norse Eastern Ltd t/a Norse Highways
280 Fifers Lane
Norwich
Norfolk
NR6 6EQ

Project Manager: Civil Lab/Sharon Woods; Simon Holden
Project Name: West Winch Relief Road
Project Ref: 100746
Order No: PN05007149
Date Samples Received: 20/08/20
Date Instructions Received: 21/08/20
Date Analysis Completed: 01/09/20

Prepared by:

Holly Neary-King
Client Services Supervisor

Approved by:

Richard Wong
Client Manager

UKAS TESTING
1247

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
pH (w)$_A^{\#}$	7.23	6.24	7.44	7.39	7.20			pH	0.01	A-T-031w
Hardness Total$_A^{\#}$	428	226	420	374	747			mg/l Ca CO3	2	A-T-049w
Ammoniacal nitrogen as N (w)$_A^{\#}$	0.53	0.31	0.14	0.64	0.21			mg/l	0.02	A-T-033w
Nitrite (w)$_A^{\#}$	0.9	<0.1	0.2	<0.1	0.2			mg/l	0.1	A-T-026w
Nitrate (w)$_A^{\#}$	169	0.2	3.9	0.2	28.7			mg/l	0.1	A-T-026w
Sulphate (w)$_A^{\#}$	76	189	59	48	234			mg/l	1	A-T-026w
Cyanide (total) (w)$_A^{\#}$	<0.005	<0.005	0.007	<0.005	<0.005			mg/l	0.005	A-T-042wTCN
Phenols - Total by HPLC (w)$_A$	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	0.01	A-T-050w
Sulphide (w)$_A$	<0.1	<0.1	<0.1	<0.1	<0.1			mg/l	0.1	A-T-S2-w
Arsenic (dissolved)$_A^{\#}$	2	3	<1	4	2			µg/l	1	A-T-025w
Boron (dissolved)$_A^{\#}$	53	30	76	58	68			µg/l	10	A-T-025w
Cadmium (dissolved)$_A^{\#}$	<0.2	<0.2	<0.2	<0.2	<0.2			µg/l	0.2	A-T-025w
Copper (total)$_A$	104	94	99	88	31			µg/l	1	A-T-025w
Chromium (dissolved)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-025w
Chromium (hexavalent) (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			mg/l	0.01	A-T-040w
Lead (dissolved)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-025w
Mercury (dissolved)$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1			µg/l	0.1	A-T-025w
Nickel (dissolved)$_A^{\#}$	7	14	8	8	12			µg/l	1	A-T-025w
Selenium (dissolved)$_A^{\#}$	2	<1	<1	<1	<1			µg/l	1	A-T-025w
Sulphur (elemental/free) (w)$_A$	<0.1	<0.1	<0.1	<0.1	<0.1			mg/l	0.1	A-T-029w
Zinc (total)$_A$	492	791	230	198	71			µg/l	1	A-T-025w
Aldrin (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
alpha-Hexachlorocyclohexane (HCH) (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Azinphos-methyl (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
beta-Hexachlorocyclohexane (HCH) (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Diazinon (Dimpylate) (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Dichlorvos (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Dieldrin (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Endrin (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Ethion (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Endosulphan Sulphate (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Endosulphan II (Beta) (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Endosulphan I (Alpha) (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
Fenitrothion (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
gamma-Hexachlorocyclohexane (HCH / Lindane) (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Heptachlor (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Heptachlor epoxide (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Malathion (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Methyl Parathion (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w
Mevinphos (w)$_A$	<0.5	<0.5	<0.5	-	-			µg/l	0.5	A-T-056w
Parathion (Ethyl Parathion) (w)$_A$	<0.1	<0.1	<0.1	-	-			µg/l	0.1	A-T-056w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
PAH 16MS (w)										
Acenaphthene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Acenaphthylene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Anthracene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Benzo(a)anthracene (w)$_A^{\#}$	0.02	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Benzo(a)pyrene (w)$_A^{\#}$	0.02	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w)$_A^{\#}$	0.03	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w)$_A^{\#}$	0.02	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Chrysene (w)$_A^{\#}$	0.02	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Fluoranthene (w)$_A^{\#}$	0.06	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Fluorene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w)$_A^{\#}$	0.02	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Naphthalene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Phenanthrene (w)$_A^{\#}$	0.01	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Pyrene (w)$_A^{\#}$	0.05	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w
Total PAH 16MS (w)$_A^{\#}$	0.25	<0.01	<0.01	<0.01	<0.01			µg/l	0.01	A-T-019w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
Speciated PCB-EC7 (w)										
PCB BZ 28 (w)$_A^{\#}$	<0.001	<0.001	<0.001	-	-			µg/l	0.001	A-T-004w
PCB BZ 52 (w)$_A^{\#}$	<0.001	<0.001	<0.001	-	-			µg/l	0.001	A-T-004w
PCB BZ 101 (w)$_A^{\#}$	<0.001	<0.001	<0.001	-	-			µg/l	0.001	A-T-004w
PCB BZ 118 (w)$_A^{\#}$	<0.002	<0.002	<0.002	-	-			µg/l	0.002	A-T-004w
PCB BZ 138 (w)$_A^{\#}$	<0.001	<0.001	<0.001	-	-			µg/l	0.001	A-T-004w
PCB BZ 153 (w)$_A^{\#}$	<0.001	<0.001	<0.001	-	-			µg/l	0.001	A-T-004w
PCB BZ 180 (w)$_A^{\#}$	<0.001	<0.001	<0.001	-	-			µg/l	0.001	A-T-004w
Total Speciated PCB-EC7 (w)$_A^{\#}$	<0.002	<0.002	<0.002	-	-			µg/l	0.001	A-T-004w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
SVOC (excluding PAH-16) (w)										
2,4,5-Trichlorophenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2,4,6-Trichlorophenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2,4-Dichlorophenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2,4-Dimethylphenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2,4-Dinitrotoluene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2,6-Dinitrotoluene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2-Chloronaphthalene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2-Chlorophenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2-Methylnaphthalene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2-Methylphenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
2-Nitrophenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
4-Bromophenyl phenyl ether$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
4-Chloro-3-methylphenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Bis(2-chloroisopropyl)ether$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
3+4-Methylphenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
4-Nitrophenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Bis(2-chloroethyl)ether$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Bis(2-chloroethoxy)methane$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Bis(2-ethylhexyl)phthalate$_A$	<10	<10	<10	-	-			µg/l	10	A-T-052w
Butylbenzyl phthalate$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Carbazole$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Dibenzofuran$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
n-Dibutylphthalate$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
n-Dioctylphthalate$_A$	<10	<10	<10	-	-			µg/l	10	A-T-052w
n-Nitroso-n-dipropylamine$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Diethyl phthalate$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Dimethyl phthalate$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Hexachlorobenzene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Pentachlorophenol (SVOC)$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Phenol$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Hexachloroethane$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Nitrobenzene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
Isophorone$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Hexachlorocyclopentadiene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w
Perylene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-052w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
VOC (w)										
Dichlorodifluoromethane$_A$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Chloromethane$_A$	<10	<10	<10	-	-			µg/l	10	A-T-006w
Vinyl Chloride$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Bromomethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Chloroethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Trichlorofluoromethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
trans 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Dichloromethane$_A$	<5	<5	<5	-	-			µg/l	5	A-T-006w
Carbon Disulphide$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,1-Dichloroethene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,1-Dichloroethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
cis 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Bromochloromethane$_A^{\#}$	<5	<5	<5	-	-			µg/l	5	A-T-006w
Chloroform$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
2,2-Dichloropropane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,2-Dichloroethane$_A^{\#}$	<2	<2	<2	-	-			µg/l	2	A-T-006w
1,1,1-Trichloroethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,1-Dichloropropene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Benzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Carbon Tetrachloride$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Dibromomethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,2-Dichloropropane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Bromodichloromethane$_A^{\#}$	<10	<10	<10	-	-			µg/l	10	A-T-006w
Trichloroethene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
cis 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
trans 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,1,2-Trichloroethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Toluene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,3-Dichloropropane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Dibromochloromethane$_A^{\#}$	<3	<3	<3	-	-			µg/l	3	A-T-006w
1,2-Dibromoethane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Tetrachloroethene$_A$	<1	<1	<1	-	-			µg/l	1	A-T-006w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
1,1,1,2-Tetrachloroethane$_A$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Chlorobenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Ethylbenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
m & p Xylene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Bromoform$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Styrene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,1,2,2-Tetrachloroethane$_A$	<1	<1	<1	-	-			µg/l	1	A-T-006w
o-Xylene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,2,3-Trichloropropane$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Isopropylbenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
Bromobenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
2-Chlorotoluene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
n-propylbenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
4-Chlorotoluene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,2,4-Trimethylbenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
4-Isopropyltoluene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,3,5-Trimethylbenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,2-Dichlorobenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,4-Dichlorobenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
sec-Butylbenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
tert-Butylbenzene$_A^{\#}$	<2	<2	<2	-	-			µg/l	2	A-T-006w
1,3-Dichlorobenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
n-butylbenzene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w
1,2-Dibromo-3-chloropropane$_A^{\#}$	<2	<2	<2	-	-			µg/l	2	A-T-006w
1,2,4-Trichlorobenzene$_A^{\#}$	<3	<3	<3	-	-			µg/l	3	A-T-006w
1,2,3-Trichlorobenzene$_A^{\#}$	<3	<3	<3	-	-			µg/l	3	A-T-006w
Hexachlorobutadiene$_A^{\#}$	<1	<1	<1	-	-			µg/l	1	A-T-006w

Envirolab Job Number: 20/06956

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/06956/1	20/06956/2	20/06956/3	20/06956/4	20/06956/5			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	103	105	106	107					
Depth to Top	2.7	1.6	3.4	1.5	1.7					
Depth To Bottom										
Date Sampled	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20	18-Aug-20					
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW					
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A					
TPH UKCWG (w)										
Ali >C5-C6 (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
Ali >C6-C8 (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
Ali >C8-C10 (w)$_A^{\#}$	5	<5	<5	<5	<5			µg/l	5	A-T-055w
Ali >C10-C12 (w)$_A^{\#}$	<5	<5	<5	<5	<5			µg/l	5	A-T-055w
Ali >C12-C16 (w)$_A^{\#}$	<5	<5	<5	<5	<5			µg/l	5	A-T-055w
Ali >C16-C21 (w)$_A^{\#}$	<5	<5	<5	<5	<5			µg/l	5	A-T-055w
Ali >C21-C35 (w)$_A^{\#}$	6	<5	<5	<5	<5			µg/l	5	A-T-055w
Ali >C35-C44 (w)$_A$	<5	<5	<5	<5	<5			µg/l	5	A-T-055w
Total Aliphatics (w)$_A$	11	<5	<5	<5	<5			µg/l	5	A-T-055w
Aro >C5-C7 (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
Aro >C7-C8 (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
Aro >C8-C10 (w)$_A$	16	<5	<5	<5	<5			µg/l	5	A-T-055w
Aro >C10-C12 (w)$_A^{\#}$	16	<5	<5	<5	<5			µg/l	5	A-T-055w
Aro >C12-C16 (w)$_A^{\#}$	9	<5	<5	<5	<5			µg/l	5	A-T-055w
Aro >C16-C21 (w)$_A^{\#}$	6	<5	<5	<5	<5			µg/l	5	A-T-055w
Aro >C21-C35 (w)$_A^{\#}$	11	<10	<10	<10	<10			µg/l	10	A-T-055w
Aro >C35-C44 (w)$_A$	<5	<5	<5	<5	<5			µg/l	5	A-T-055w
Total Aromatics (w)$_A$	58	<10	<10	<10	<10			µg/l	10	A-T-055w
TPH (Ali & Aro >C5-C44) (w)$_A$	69	<10	<10	<10	<10			µg/l	10	A-T-055w
BTEX - Benzene (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
BTEX - Toluene (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
BTEX - Ethyl Benzene (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
BTEX - m & p Xylene (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
BTEX - o Xylene (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w
MTBE (w)$_A^{\#}$	<1	<1	<1	<1	<1			µg/l	1	A-T-022w

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/06245
Issue Number: 1 **Date:** 14 August, 2020

Client: Norse Eastern Ltd t/a Norse Highways
280 Fifers Lane
Norwich
Norfolk
NR6 6EQ

Project Manager: Civil Lab/Sharon Woods; Simon Holden
Project Name: West Winch By Pass
Project Ref: 100746
Order No: PN05006589
Date Samples Received: 27/07/20
Date Instructions Received: 30/07/20
Date Analysis Completed: 14/08/20

Prepared by:

Sophie France
Client Service Manager

Approved by:

Richard Wong
Client Manager

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/1	20/06245/2	20/06245/3	20/06245/4	20/06245/5	20/06245/6	20/06245/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	205	206	207	216	217	210	213			
Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
% Natural Moisture Content (NMC) at 105C$_A$	-	-	-	-	19.4	8.5	-	% w/w	0.1	A-T-044
% Stones >10mm$_A$	<0.1	5.8	0.8	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH$_D$ M#	8.11	8.20	7.95	7.68	8.01	7.58	7.49	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$ M#	<200	200	220	430	340	250	<200	mg/kg	200	A-T-028s
Cyanide (total)$_A$ M#	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Sulphide$_A$	<5	<5	22	<5	7	<5	7	mg/kg	5	A-T-S2-s
Sulphur (elemental)$_D$ M#	<5	<5	<5	<5	<5	<5	<5	mg/kg	5	A-T-029s
Organic matter$_D$ M#	0.8	0.9	1.2	0.7	2.3	1.6	1.1	% w/w	0.1	A-T-032 OM
Arsenic$_D$ M#	5	4	5	5	7	5	2	mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0	<1.0	1.1	<1.0	1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_D$ M#	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	0.5	A-T-024s
Copper$_D$ M#	13	3	13	7	28	9	3	mg/kg	1	A-T-024s
Chromium$_D$ M#	27	10	31	19	17	14	10	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$ M#	13	14	27	18	65	29	6	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D$ M#	17	5	18	6	9	7	6	mg/kg	1	A-T-024s
Selenium$_D$ M#	1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_D$ M#	39	17	64	27	47	42	16	mg/kg	5	A-T-024s
Acid Herbicides										
2,4,5-T$_A$	-	-	-	-	<0.5	<0.5	-	mg/kg	0.5	Subcon Chemtest
2,4-D$_A$	-	-	-	-	<0.5	<0.5	-	mg/kg	0.5	Subcon Chemtest
2,4-DP; (Dichlorprop)$_A$	-	-	-	-	<0.5	<0.5	-	mg/kg	0.5	Subcon Chemtest
MCPA$_A$	-	-	-	-	<0.5	<0.5	-	mg/kg	0.5	Subcon Chemtest
MCPB$_A$	-	-	-	-	<0.5	<0.5	-	mg/kg	0.5	Subcon Chemtest
MCPP; (Mecoprop)$_A$	-	-	-	-	<0.5	<0.5	-	mg/kg	0.5	Subcon Chemtest

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

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Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	205	206	207	216	217	210	213			
Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
OPP										
Dichlorvos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Mevinphos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Demeton-S$_A$	-	-	-	-	<0.50	<0.50	-	mg/kg	0.5	A-T-056
Phorate$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Dimethoate$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Demeton-O$_A$	-	-	-	-	<0.50	<0.50	-	mg/kg	0.5	A-T-056
Propetamphos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Diazinon (Dimpylate)$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Disulfoton$_A$	-	-	-	-	<0.10	<0.10	-	mg/kg	0.1	A-T-056
Etrimphos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Chlorpyrifos-methyl$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Methyl Parathion$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Pirimiphos-methyl$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Fenitrothion$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Malathion$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Chlorpyrifos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Fenthion$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Parathion (Ethyl Parathion)$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Trichloronate$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Chlorfenvinphos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Fensulphothion$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Ethion$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Triazophos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Sulprofos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Carbophenothion$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Phosalone$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Azinphos-methyl$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Azinphos-ethyl$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Coumaphos$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056
Prothiofos (Tokuthion)$_A$	-	-	-	-	<0.01	<0.01	-	mg/kg	0.01	A-T-056

Envirolab Job Number: 20/06245

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Lab Sample ID	20/06245/1	20/06245/2	20/06245/3	20/06245/4	20/06245/5	20/06245/6	20/06245/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	205	206	207	216	217	210	213			
Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	0.23	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	0.33	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	<0.05	<0.05	<0.05	0.42	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.05	<0.05	<0.05	0.23	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07	<0.07	<0.07	0.14	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	<0.06	<0.06	<0.06	0.32	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	<0.08	<0.08	<0.08	0.48	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	0.26	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	0.13	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	<0.07	<0.07	<0.07	0.42	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	<0.08	<0.08	<0.08	2.98	<0.08	<0.08	mg/kg	0.01	A-T-019s

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Lab Sample ID	20/06245/1	20/06245/2	20/06245/3	20/06245/4	20/06245/5	20/06245/6	20/06245/7	Units	Limit of Detection	Method ref
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Client Sample ID	205	206	207	216	217	210	213			
Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
Speciated PCB-EC7										
PCB BZ 28_A	-	-	-	-	<0.002	<0.002	-	mg/kg	0.002	A-T-004s
PCB BZ $52_A^{M\#}$	-	-	-	-	<0.002	<0.002	-	mg/kg	0.002	A-T-004s
PCB BZ $101_A^{M\#}$	-	-	-	-	<0.004	<0.004	-	mg/kg	0.004	A-T-004s
PCB BZ $118_A^{M\#}$	-	-	-	-	<0.007	<0.007	-	mg/kg	0.007	A-T-004s
PCB BZ $138_A^{M\#}$	-	-	-	-	<0.006	<0.006	-	mg/kg	0.006	A-T-004s
PCB BZ $153_A^{M\#}$	-	-	-	-	<0.004	<0.004	-	mg/kg	0.004	A-T-004s
PCB BZ $180_A^{M\#}$	-	-	-	-	<0.004	<0.004	-	mg/kg	0.004	A-T-004s
Total Speciated PCB-$EC7_A$	-	-	-	-	<0.007	<0.007	-	mg/kg	0.002	A-T-004s

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Client Sample ID	205	206	207	216	217	210	213			
Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
SVOC										
Hexachlorobenzene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Diethyl phthalate$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Dibenzofuran$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Carbazole$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	-	-	-	-	<500	<500	-	µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
4-Nitrophenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2-Nitrophenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2-Methylphenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2-Chlorophenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Phenol$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Pentachlorophenol (SVOC)$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
n-Dioctylphthalate$_A$	-	-	-	-	<500	<500	-	µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Nitrobenzene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Isophorone$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Hexachloroethane$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s

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Client Sample No	1	1	1	1	1	1	1			
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Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
Hexachlorocyclopentadiene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s
Perylene$_A$	-	-	-	-	<100	<100	-	µg/kg	100	A-T-052s

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Client Sample No	1	1	1	1	1	1	1			
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Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
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Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
VOC										
Dichlorodifluoromethane$_{A}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Chloromethane$_{A}$	-	-	-	-	<10	<10	-	µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Dichloromethane$_{A}$	-	-	-	-	<5	<5	-	µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	-	-	-	-	<5	<5	-	µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	-	-	-	-	<2	<2	-	µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	-	-	-	-	<10	<10	-	µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	-	-	-	-	<3	<3	-	µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/1	20/06245/2	20/06245/3	20/06245/4	20/06245/5	20/06245/6	20/06245/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	205	206	207	216	217	210	213			
Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
Chlorobenzene$_{A}^{\#}$	-	-	-	-	*<1*	*<1*	-	µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	-	-	-	-	*<1*	*<1*	-	µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	-	-	-	-	<2	<2	-	µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	-	-	-	-	<2	<2	-	µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	-	-	-	-	<3	<3	-	µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	-	-	-	-	<1	<1	-	µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	-	-	-	-	<3	<3	-	µg/kg	3	A-T-006s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/1	20/06245/2	20/06245/3	20/06245/4	20/06245/5	20/06245/6	20/06245/7	Units	Limit of Detection	Method ref
Client Sample No	1	1	1	1	1	1	1			
Client Sample ID	205	206	207	216	217	210	213			
Depth to Top	0.40	0.40	0.40	0.50	0.50	0.30	0.40			
Depth To Bottom										
Date Sampled	23-Jul-20	23-Jul-20	23-Jul-20	22-Jul-20	22-Jul-20	24-Jul-20	24-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	5A	1AE	5AE	5AE	4AE	4AE	1AE			
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C21-C35$_A$	<1	<1	<1	<1	7	9	2	mg/kg	1	A-T-055s
Ali >C35-C44$_A$	<1	<1	<1	<1	2	1	<1	mg/kg	1	A-T-055s
Total Aliphatics$_A$	<1	<1	<1	<1	10	10	2	mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1	<1	<1	1	1	<1	mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	<1	<1	<1	1	<1	<1	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	<1	<1	<1	<1	4	1	<1	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	<1	<1	<1	<1	23	5	1	mg/kg	1	A-T-055s
Aro >C35-C44$_A$	<1	<1	<1	<1	2	1	<1	mg/kg	1	A-T-055s
Total Aromatics$_A$	<1	<1	<1	<1	31	10	1	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44)$_A$	<1	<1	<1	<1	40	19	3	mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
% Natural Moisture Content (NMC) at 105C$_A$	13.9	-	-	13.6	-	-	11.5	% w/w	0.1	A-T-044
% Stones >10mm$_A$	<0.1	<0.1	<0.1	4.0	3.8	5.2	18.4	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.98	8.04	8.08	6.84	7.49	7.90	7.73	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$$^{M\#}$	<200	<200	<200	260	<200	<200	<200	mg/kg	200	A-T-028s
Cyanide (total)$_A$$^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Sulphide$_A$	17	<5	<5	<5	<5	<5	<5	mg/kg	5	A-T-S2-s
Sulphur (elemental)$_D$$^{M\#}$	<5	<5	<5	<5	<5	<5	<5	mg/kg	5	A-T-029s
Organic matter$_D$$^{M\#}$	0.6	0.6	0.3	3.5	1.0	0.9	1.1	% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	3	3	13	5	<1	4	19	mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	4	2	5	10	3	12	5	mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	18	6	23	11	5	28	20	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	10	5	16	26	7	13	20	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	13	3	8	7	3	19	20	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	18	8	35	28	9	46	101	mg/kg	5	A-T-024s
Acid Herbicides										
2,4,5-T$_A$	<0.5	-	-	<0.5	-	-	<0.5	mg/kg	0.5	Subcon Chemtest
2,4-D$_A$	<0.5	-	-	<0.5	-	-	<0.5	mg/kg	0.5	Subcon Chemtest
2,4-DP; (Dichlorprop)$_A$	<0.5	-	-	<0.5	-	-	<0.5	mg/kg	0.5	Subcon Chemtest
MCPA$_A$	<0.5	-	-	<0.5	-	-	<0.5	mg/kg	0.5	Subcon Chemtest
MCPB$_A$	<0.5	-	-	<0.5	-	-	<0.5	mg/kg	0.5	Subcon Chemtest
MCPP; (Mecoprop)$_A$	<0.5	-	-	<0.5	-	-	<0.5	mg/kg	0.5	Subcon Chemtest

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	-	-	-	NAD	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	-	-	-	N/A	-	-	-			A-T-045
OPP										
Dichlorvos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Mevinphos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Demeton-S$_{A}$	<0.50	-	-	<0.50	-	-	<0.50	mg/kg	0.5	A-T-056
Phorate$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Dimethoate$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Demeton-O$_{A}$	<0.50	-	-	<0.50	-	-	<0.50	mg/kg	0.5	A-T-056
Propetamphos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Diazinon (Dimpylate)$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Disulfoton$_{A}$	<0.10	-	-	<0.10	-	-	<0.10	mg/kg	0.1	A-T-056
Etrimphos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Chlorpyrifos-methyl$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Methyl Parathion$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Pirimiphos-methyl$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Fenitrothion$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Malathion$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Chlorpyrifos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Fenthion$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Parathion (Ethyl Parathion)$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Trichloronate$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Chlorfenvinphos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Fensulphothion$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Ethion$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Triazophos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Sulprofos$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Carbophenothion$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Phosalone$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Azinphos-methyl$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Azinphos-ethyl$_{A}$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
Coumaphos$_A$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056
Prothiofos (Tokuthion)$_A$	<0.01	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-056

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
Speciated PCB-EC7										
PCB BZ 28_A	<0.002	-	-	<0.002	-	-	<0.002	mg/kg	0.002	A-T-004s
PCB BZ $52_A^{M\#}$	<0.002	-	-	<0.002	-	-	<0.002	mg/kg	0.002	A-T-004s
PCB BZ $101_A^{M\#}$	<0.004	-	-	<0.004	-	-	<0.004	mg/kg	0.004	A-T-004s
PCB BZ $118_A^{M\#}$	<0.007	-	-	<0.007	-	-	<0.007	mg/kg	0.007	A-T-004s
PCB BZ $138_A^{M\#}$	<0.006	-	-	<0.006	-	-	<0.006	mg/kg	0.006	A-T-004s
PCB BZ $153_A^{M\#}$	<0.004	-	-	<0.004	-	-	<0.004	mg/kg	0.004	A-T-004s
PCB BZ $180_A^{M\#}$	<0.004	-	-	<0.004	-	-	<0.004	mg/kg	0.004	A-T-004s
Total Speciated PCB-$EC7_A$	<0.007	-	-	<0.007	-	-	<0.007	mg/kg	0.002	A-T-004s

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Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
SVOC										
Hexachlorobenzene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Diethyl phthalate$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Dibenzofuran$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Carbazole$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	<500	-	-	<500	-	-	<500	µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
4-Nitrophenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2-Nitrophenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2-Methylphenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2-Chlorophenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Phenol$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Pentachlorophenol (SVOC)$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
n-Dioctylphthalate$_A$	<500	-	-	<500	-	-	<500	µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Nitrobenzene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Isophorone$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Hexachloroethane$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
Hexachlorocyclopentadiene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s
Perylene$_A$	<100	-	-	<100	-	-	<100	µg/kg	100	A-T-052s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
VOC										
Dichlorodifluoromethane$_{A}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Chloromethane$_{A}$	<10	-	-	<10	-	-	<10	µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Dichloromethane$_{A}$	<5	-	-	<5	-	-	<5	µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	<5	-	-	<5	-	-	<5	µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	<2	-	-	<2	-	-	<2	µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	<10	-	-	<10	-	-	<10	µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	<3	-	-	<3	-	-	<3	µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
Chlorobenzene$_{A}^{\#}$	*<1*	-	-	*<1*	-	-	*<1*	µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	*<1*	-	-	*<1*	-	-	*<1*	µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	<2	-	-	<2	-	-	<2	µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	<2	-	-	<2	-	-	<2	µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	<3	-	-	<3	-	-	<3	µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	<1	-	-	<1	-	-	<1	µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	<3	-	-	<3	-	-	<3	µg/kg	3	A-T-006s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/8	20/06245/9	20/06245/10	20/06245/11	20/06245/12	20/06245/13	20/06245/14	Units	Limit of Detection	Method ref
Client Sample No	1	1	2							
Client Sample ID	214	215	210	101	101	102	103			
Depth to Top	0.50	0.50	0.70	0.10	0.40	0.30	0.30			
Depth To Bottom							0.60			
Date Sampled	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	24-Jul-20	27-Jul-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	1AE	1AE	5AE	4AE	1AE	5AE	1AB			
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C21-C35$_A$	2	<1	<1	8	3	<1	3	mg/kg	1	A-T-055s
Ali >C35-C44$_A$	<1	<1	<1	1	<1	<1	<1	mg/kg	1	A-T-055s
Total Aliphatics$_A$	2	<1	<1	10	3	<1	3	mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	2	<1	<1	5	2	<1	<1	mg/kg	1	A-T-055s
Aro >C35-C44$_A$	<1	<1	<1	2	3	<1	<1	mg/kg	1	A-T-055s
Total Aromatics$_A$	2	<1	<1	8	5	<1	<1	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44)$_A$	5	<1	<1	16	7	<1	3	mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/15	20/06245/16						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	105	107								
Depth to Top	0.30	0.40								
Depth To Bottom		0.70								
Date Sampled	27-Jul-20	27-Jul-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	1ABE	1AB								
% Stones >10mm$_A$	5.2	12.6						% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.62	7.19						pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	0.02						g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$$^{M\#}$	<200	<200						mg/kg	200	A-T-028s
Cyanide (total)$_A$$^{M\#}$	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2						mg/kg	0.2	A-T-050s
Sulphide$_A$	67	14						mg/kg	5	A-T-S2-s
Sulphur (elemental)$_D$$^{M\#}$	<5	<5						mg/kg	5	A-T-029s
Organic matter$_D$$^{M\#}$	0.5	0.4						% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	5	3						mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0	<1.0						mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5						mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	6	4						mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	12	7						mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1						mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	9	4						mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17						mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	10	5						mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1						mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	28	15						mg/kg	5	A-T-024s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/15	20/06245/16						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	105	107								
Depth to Top	0.30	0.40								
Depth To Bottom		0.70								
Date Sampled	27-Jul-20	27-Jul-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	1ABE	1AB								
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	<0.01						mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01						mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02						mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	<0.04						mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	<0.04						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	<0.05						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.05						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07						mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	<0.06						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04						mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	<0.08						mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	<0.03						mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03						mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	<0.03						mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	<0.07						mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	<0.08						mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/06245

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06245/15	20/06245/16						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	105	107								
Depth to Top	0.30	0.40								
Depth To Bottom		0.70								
Date Sampled	27-Jul-20	27-Jul-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	1ABE	1AB								
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1						mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Ali >C21-C35$_A$	<1	<1						mg/kg	1	A-T-055s
Ali >C35-C44$_A$	<1	<1						mg/kg	1	A-T-055s
Total Aliphatics$_A$	<1	<1						mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1						mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	<1						mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Aro >C35-C44$_A$	<1	<1						mg/kg	1	A-T-055s
Total Aromatics$_A$	<1	<1						mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44)$_A$	<1	<1						mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/06509
Issue Number: 1 **Date:** 14 August, 2020

Client: Norse Eastern Ltd t/a Norse Highways
280 Fifers Lane
Norwich
Norfolk
NR6 6EQ

Project Manager: Civil Lab/Sharon Woods; Simon Holden
Project Name: West Winch By Pass
Project Ref: 100746
Order No: PN05006788
Date Samples Received: 06/08/20
Date Instructions Received: 06/08/20
Date Analysis Completed: 14/08/20

Prepared by:

Sophie France
Client Service Manager

Approved by:

John Gustafson
Managing Director

Envirolab Job Number: 20/06509

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06509/1	20/06509/2	20/06509/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	106	208	211							
Depth to Top	0.5	0.5	0.4							
Depth To Bottom										
Date Sampled	01-Aug-20	01-Aug-20	01-Aug-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6AB	4AE	6AE							
% Stones >10mm$_A$	15.1	0.5	<0.1					% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.71	7.16	7.69					pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	<0.01	<0.01					g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$$^{M\#}$	<200	<200	210					mg/kg	200	A-T-028s
Cyanide (total)$_A$$^{M\#}$	<1	<1	<1					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2					mg/kg	0.2	A-T-050s
Sulphide$_A$	<5	<5	<5					mg/kg	5	A-T-S2-s
Sulphur (elemental)$_D$$^{M\#}$	<5	<5	<5					mg/kg	5	A-T-029s
Organic matter$_D$$^{M\#}$	1.0	0.8	1.7					% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	2	4	6					mg/kg	1	A-T-024s
Boron (water soluble)$_D$	<1.0	<1.0	<1.0					mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	<0.5					mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	3	4	7					mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	8	6	11					mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1					mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	10	7	19					mg/kg	1	A-T-024s
Mercury$_D$	0.18	<0.17	<0.17					mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	6	4	7					mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1					mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	14	23	29					mg/kg	5	A-T-024s

Envirolab Job Number: 20/06509

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06509/1	20/06509/2	20/06509/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	106	208	211							
Depth to Top	0.5	0.5	0.4							
Depth To Bottom										
Date Sampled	01-Aug-20	01-Aug-20	01-Aug-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6AB	4AE	6AE							
PAH-16MS										
Acenaphthene$_{A}^{M\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-019s
Acenaphthylene$_{A}^{M\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-019s
Anthracene$_{A}^{M\#}$	<0.02	<0.02	<0.02					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_{A}^{M\#}$	<0.04	<0.04	<0.04					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_{A}^{M\#}$	<0.04	<0.04	<0.04					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_{A}^{M\#}$	<0.05	<0.05	<0.05					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_{A}^{M\#}$	<0.05	<0.05	<0.05					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_{A}^{M\#}$	<0.07	<0.07	<0.07					mg/kg	0.07	A-T-019s
Chrysene$_{A}^{M\#}$	<0.06	<0.06	<0.06					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_{A}^{M\#}$	<0.04	<0.04	<0.04					mg/kg	0.04	A-T-019s
Fluoranthene$_{A}^{M\#}$	<0.08	<0.08	<0.08					mg/kg	0.08	A-T-019s
Fluorene$_{A}^{M\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_{A}^{M\#}$	<0.03	<0.03	<0.03					mg/kg	0.03	A-T-019s
Naphthalene $_{A}^{M\#}$	<0.03	<0.03	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_{A}^{M\#}$	<0.03	<0.03	0.06					mg/kg	0.03	A-T-019s
Pyrene$_{A}^{M\#}$	<0.07	<0.07	<0.07					mg/kg	0.07	A-T-019s
Total PAH-16MS$_{A}^{M\#}$	<0.08	<0.08	<0.08					mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/06509

Client Project Name: West Winch By Pass

Client Project Ref: 100746

Lab Sample ID	20/06509/1	20/06509/2	20/06509/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	106	208	211							
Depth to Top	0.5	0.5	0.4							
Depth To Bottom										
Date Sampled	01-Aug-20	01-Aug-20	01-Aug-20							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	6AB	4AE	6AE							
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C21-C35$_A$	<1	<1	9					mg/kg	1	A-T-055s
Ali >C35-C44$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Total Aliphatics$_A$	<1	<1	9					mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	<1	<1	5					mg/kg	1	A-T-055s
Aro >C35-C44$_A$	<1	<1	1					mg/kg	1	A-T-055s
Total Aromatics$_A$	<1	<1	6					mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C44)$_A$	<1	<1	15					mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s

REPORT NOTES

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Analytical results reflect the quality of the sample at the time of analysis only.
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A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/09647
Issue Number: 1 **Date:** 25 November, 2020

Client:
Norse Eastern Ltd t/a Norse Highways
280 Fifers Lane
Norwich
Norfolk
NR6 6EQ

Project Manager: Civil Lab/Sharon Woods; Simon Holden
Project Name: West Winch Relief Road
Project Ref: 100746
Order No: PN05009386
Date Samples Received: 11/11/20
Date Instructions Received: 11/11/20
Date Analysis Completed: 25/11/20

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Holly Neary-King
Client Services Supervisor

UKAS TESTING
1247

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
pH (w)$_A^{\#}$	6.97	7.23	6.16	7.48	7.48	7.33		pH	0.01	A-T-031w
Hardness Total$_A^{\#}$	173	469	181	386	283	419		mg/l Ca CO3	2	A-T-049w
Ammoniacal nitrogen as N (w)$_A^{\#}$	0.07	0.18	0.20	0.08	0.14	0.37		mg/l	0.02	A-T-033w
Nitrite (w)$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		mg/l	0.1	A-T-026w
Nitrate (w)$_A^{\#}$	192	0.5	<0.1	95.9	0.4	77.5		mg/l	0.1	A-T-026w
Sulphate (w)$_A^{\#}$	51	100	214	87	41	97		mg/l	1	A-T-026w
Cyanide (total) (w)$_A^{\#}$	<0.005	<0.005	<0.005	0.020	<0.005	0.015		mg/l	0.005	A-T-042wTCN
Phenols - Total by HPLC (w)$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/l	0.01	A-T-050w
Sulphide (w)$_A$	0.1	<0.1	<0.1	<0.1	<0.1	0.1		mg/l	0.1	A-T-S2-w
Arsenic (dissolved)$_A^{\#}$	4	2	2	1	4	1		µg/l	1	A-T-025w
Boron (dissolved)$_A^{\#}$	30	71	31	76	56	91		µg/l	10	A-T-025w
Cadmium (dissolved)$_A^{\#}$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		µg/l	0.2	A-T-025w
Copper (total)$_A$	361	45	155	34	43	22		µg/l	1	A-T-025w
Chromium (dissolved)$_A^{\#}$	<1	<1	<1	<1	1	<1		µg/l	1	A-T-025w
Chromium (hexavalent) (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/l	0.01	A-T-040w
Lead (dissolved)$_A^{\#}$	<1	<1	<1	<1	3	<1		µg/l	1	A-T-025w
Mercury (dissolved)$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		µg/l	0.1	A-T-025w
Nickel (dissolved)$_A^{\#}$	9	2	13	3	7	5		µg/l	1	A-T-025w
Selenium (dissolved)$_A^{\#}$	<1	<1	<1	2	<1	1		µg/l	1	A-T-025w
Sulphur (elemental/free) (w)$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		mg/l	0.1	A-T-029w
Zinc (total)$_A$	768	89	1030	79	153	34		µg/l	1	A-T-025w
Aldrin (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
alpha-Hexachlorocyclohexane (HCH) (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Azinphos-methyl (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
beta-Hexachlorocyclohexane (HCH) (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Diazinon (Dimpylate) (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Dichlorvos (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Dieldrin (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Endrin (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Ethion (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Endosulphan Sulphate (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Endosulphan II (Beta) (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Endosulphan I (Alpha) (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
Fenitrothion (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
gamma-Hexachlorocyclohexane (HCH / Lindane) (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Heptachlor (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Heptachlor epoxide (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Malathion (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Methyl Parathion (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w
Mevinphos (w)$_A$	<0.5	-	<0.5	<0.5	-	-		µg/l	0.5	A-T-056w
Parathion (Ethyl Parathion) (w)$_A$	<0.1	-	<0.1	<0.1	-	-		µg/l	0.1	A-T-056w

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
PAH 16MS (w)										
Acenaphthene (w)$_A^{\#}$	<0.01	<0.01	0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Acenaphthylene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Anthracene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Benzo(a)anthracene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Benzo(a)pyrene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Chrysene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Fluoranthene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Fluorene (w)$_A^{\#}$	<0.01	<0.01	0.02	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Naphthalene (w)$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Phenanthrene (w)$_A^{\#}$	<0.01	<0.01	0.03	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Pyrene (w)$_A^{\#}$	<0.01	<0.01	0.01	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w
Total PAH 16MS (w)$_A^{\#}$	<0.01	<0.01	0.07	<0.01	<0.01	<0.01		µg/l	0.01	A-T-019w

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
Speciated PCB-EC7 (w)										
PCB BZ 28 $(w)_A^{\#}$	<0.001	-	<0.001	<0.001	-	-		µg/l	0.001	A-T-004w
PCB BZ 52 $(w)_A^{\#}$	<0.001	-	<0.001	<0.001	-	-		µg/l	0.001	A-T-004w
PCB BZ 101 $(w)_A^{\#}$	<0.001	-	<0.001	<0.001	-	-		µg/l	0.001	A-T-004w
PCB BZ 118 $(w)_A^{\#}$	<0.002	-	<0.002	<0.002	-	-		µg/l	0.002	A-T-004w
PCB BZ 138 $(w)_A^{\#}$	<0.001	-	<0.001	<0.001	-	-		µg/l	0.001	A-T-004w
PCB BZ 153 $(w)_A^{\#}$	<0.001	-	<0.001	<0.001	-	-		µg/l	0.001	A-T-004w
PCB BZ 180 $(w)_A^{\#}$	<0.001	-	<0.001	<0.001	-	-		µg/l	0.001	A-T-004w
Total Speciated PCB-EC7 $(w)_A^{\#}$	<0.002	-	<0.002	<0.002	-	-		µg/l	0.001	A-T-004w

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
SVOC (excluding PAH-16) (w)										
2,4,5-Trichlorophenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2,4,6-Trichlorophenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2,4-Dichlorophenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2,4-Dimethylphenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2,4-Dinitrotoluene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2,6-Dinitrotoluene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2-Chloronaphthalene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2-Chlorophenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2-Methylnaphthalene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2-Methylphenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
2-Nitrophenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
4-Bromophenyl phenyl ether$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
4-Chloro-3-methylphenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Bis(2-chloroisopropyl)ether$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
3+4-Methylphenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
4-Nitrophenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Bis(2-chloroethyl)ether$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Bis(2-chloroethoxy)methane$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Bis(2-ethylhexyl)phthalate$_A$	I.S	-	I.S	<10	-	-		µg/l	10	A-T-052w
Butylbenzyl phthalate$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Carbazole$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Dibenzofuran$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
n-Dibutylphthalate$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
n-Dioctylphthalate$_A$	I.S	-	I.S	<10	-	-		µg/l	10	A-T-052w
n-Nitroso-n-dipropylamine$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Diethyl phthalate$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Dimethyl phthalate$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Hexachlorobenzene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Pentachlorophenol (SVOC)$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Phenol$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Hexachloroethane$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Nitrobenzene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
Isophorone$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Hexachlorocyclopentadiene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w
Perylene$_A$	I.S	-	I.S	<1	-	-		µg/l	1	A-T-052w

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Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
VOC (w)										
Dichlorodifluoromethane$_A$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Chloromethane$_A$	<10	-	<10	<10	-	-		µg/l	10	A-T-006w
Vinyl Chloride$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Bromomethane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Chloroethane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Trichlorofluoromethane$_A^{\#}$	*<1*	-	*<1*	<1	-	-		µg/l	1	A-T-006w
trans 1,2-Dichloroethene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Dichloromethane$_A$	<5	-	<5	<5	-	-		µg/l	5	A-T-006w
Carbon Disulphide$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,1-Dichloroethene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,1-Dichloroethane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
cis 1,2-Dichloroethene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Bromochloromethane$_A^{\#}$	<5	-	<5	<5	-	-		µg/l	5	A-T-006w
Chloroform$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
2,2-Dichloropropane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,2-Dichloroethane$_A^{\#}$	<2	-	<2	<2	-	-		µg/l	2	A-T-006w
1,1,1-Trichloroethane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,1-Dichloropropene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Benzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Carbon Tetrachloride$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Dibromomethane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,2-Dichloropropane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Bromodichloromethane$_A^{\#}$	<10	-	<10	<10	-	-		µg/l	10	A-T-006w
Trichloroethene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
cis 1,3-Dichloropropene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
trans 1,3-Dichloropropene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,1,2-Trichloroethane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Toluene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,3-Dichloropropane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Dibromochloromethane$_A^{\#}$	<3	-	<3	<3	-	-		µg/l	3	A-T-006w
1,2-Dibromoethane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Tetrachloroethene$_A$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
1,1,1,2-Tetrachloroethane$_A$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Chlorobenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Ethylbenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
m & p Xylene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Bromoform$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Styrene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,1,2,2-Tetrachloroethane$_A$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
o-Xylene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,2,3-Trichloropropane$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Isopropylbenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
Bromobenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
2-Chlorotoluene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
n-propylbenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
4-Chlorotoluene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,2,4-Trimethylbenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
4-Isopropyltoluene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,3,5-Trimethylbenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,2-Dichlorobenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,4-Dichlorobenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
sec-Butylbenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
tert-Butylbenzene$_A^{\#}$	<2	-	<2	<2	-	-		µg/l	2	A-T-006w
1,3-Dichlorobenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
n-butylbenzene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w
1,2-Dibromo-3-chloropropane$_A^{\#}$	<2	-	<2	<2	-	-		µg/l	2	A-T-006w
1,2,4-Trichlorobenzene$_A^{\#}$	<3	-	<3	<3	-	-		µg/l	3	A-T-006w
1,2,3-Trichlorobenzene$_A^{\#}$	<3	-	<3	<3	-	-		µg/l	3	A-T-006w
Hexachlorobutadiene$_A^{\#}$	<1	-	<1	<1	-	-		µg/l	1	A-T-006w

Envirolab Job Number: 20/09647

Client Project Name: West Winch Relief Road

Client Project Ref: 100746

Lab Sample ID	20/09647/1	20/09647/2	20/09647/3	20/09647/4	20/09647/5	20/09647/6		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	101	102	103	105	106	107				
Depth to Top	1.48	0.46	0.75	1.45	0.77	0.85				
Depth To Bottom										
Date Sampled	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20	09-Nov-20				
Sample Type	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW	Water - EW				
Sample Matrix Code	N/A	N/A	N/A	N/A	N/A	N/A				
TPH UKCWG (w)										
Ali >C5-C6 (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
Ali >C6-C8 (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
Ali >C8-C10 (w)$_A^{\#}$	<5	<5	8	<5	6	<5		µg/l	5	A-T-055w
Ali >C10-C12 (w)$_A^{\#}$	<5	<5	13	<5	8	<5		µg/l	5	A-T-055w
Ali >C12-C16 (w)$_A^{\#}$	<5	<5	<5	<5	<5	<5		µg/l	5	A-T-055w
Ali >C16-C21 (w)$_A^{\#}$	<5	<5	<5	<5	5	<5		µg/l	5	A-T-055w
Ali >C21-C35 (w)$_A^{\#}$	<5	<5	21	<5	39	<5		µg/l	5	A-T-055w
Ali >C35-C44 (w)$_A$	<5	<5	<5	<5	8	<5		µg/l	5	A-T-055w
Total Aliphatics (w)$_A$	<5	<5	42	<5	66	<5		µg/l	5	A-T-055w
Aro >C5-C7 (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
Aro >C7-C8 (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
Aro >C8-C10 (w)$_A$	<5	<5	13	<5	10	<5		µg/l	5	A-T-055w
Aro >C10-C12 (w)$_A^{\#}$	<5	<5	14	<5	9	<5		µg/l	5	A-T-055w
Aro >C12-C16 (w)$_A^{\#}$	<5	<5	9	<5	10	<5		µg/l	5	A-T-055w
Aro >C16-C21 (w)$_A^{\#}$	<5	<5	9	<5	10	<5		µg/l	5	A-T-055w
Aro >C21-C35 (w)$_A^{\#}$	<10	<10	11	<10	12	<10		µg/l	10	A-T-055w
Aro >C35-C44 (w)$_A$	<5	<5	<5	<5	<5	<5		µg/l	5	A-T-055w
Total Aromatics (w)$_A$	<10	<10	56	<10	51	<10		µg/l	10	A-T-055w
TPH (Ali & Aro >C5-C44) (w)$_A$	<10	<10	98	<10	117	<10		µg/l	10	A-T-055w
BTEX - Benzene (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
BTEX - Toluene (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
BTEX - Ethyl Benzene (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
BTEX - m & p Xylene (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
BTEX - o Xylene (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w
MTBE (w)$_A^{\#}$	<1	<1	<1	<1	<1	<1		µg/l	1	A-T-022w

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

100746 West Winch Bypass

Groundwater dips

Location	08/08/2020	13/08/2020	18/08/2020	27/08/2020	11/09/2020	17/09/2020	22/09/2020	06/10/2020	20/10/2020	09/11/2020	16/12/2020	
101	2.79	2.78	2.70	2.70	2.62	2.37	2.65	2.53	1.52	1.48	1.20	
102	0.80	0.82	0.90	0.76	0.85	0.81	0.83	0.83	0.43	0.46	0.10	
103	1.70	1.66	1.60	1.57	1.30	1.82	1.37	1.51	0.75	0.75	0.65	
105	3.40	3.41	3.40	3.38	3.39	3.31	3.29	3.30	1.63	1.45	1.10	
106	1.50	1.55	1.50	1.28	1.12	1.22	1.25	1.24	0.76	0.77	0.70	
107	1.70	1.80	1.70	1.59	1.17	1.38	1.46	1.40	0.93	0.85	0.76	

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Methane Concentration (%)

Location	13/08/2020	18/08/2020	27/08/2020	11/09/2020	17/09/2020	22/09/2020	06/10/2020	20/10/2020	09/11/2020	16/12/2020		
101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
102	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
103	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

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Carbon Dioxide Concentration (%)

Location	13/08/2020	18/08/2020	27/08/2020	11/09/2020	17/09/2020	22/09/2020	06/10/2020	20/10/2020	09/11/2020	16/12/2020		
101	0.3	1.1	0.3	3.2	3.1	1.8	1.9	2.9	1.3	1.3		
102	0.3	0.2	0.2	0.3	3.1	0.7	0.9	0.8	0.7	1.8		
103	0.3	0.4	0.7	1.5	1.6	0.9	0.8	3.9	1.3	0.6		
105	0.4	0.9	0.7	0.8	0.6	0.5	0.6	0.9	0.8	0.3		
106	0.4	0.1	0.3	0.2	0.2	0.3	0.5	0.5	0.7	0.4		
107	0.5	0.4	0.6	0.3	0.3	0.3	0.4	0.5	0.6	0.4		

100746 West Winch Bypass

Oxygen concentration (%)

Location	13/08/2020	18/08/2020	27/08/2020	11/09/2020	17/09/2020	22/09/2020	06/10/2020	20/10/2020	09/11/2020	16/12/2020		
101	19.6	19.3	20.0	17.3	16.8	19.0	19.1	17.2	19.1	19.1		
102	19.3	19.7	19.9	18.6	16.9	19.1	19.3	18.6	19.3	19.2		
103	19.4	19.6	19.6	19.0	18.5	19.9	19.5	17.9	18.3	18.2		
105	19.7	19.3	19.1	19.3	19.4	19.6	19.6	18.6	19.1	19.2		
106	19.4	19.6	19.3	19.3	19.5	19.5	19.5	19.3	19.1	19.3		
107	19.5	19.5	19.3	19.3	19.5	19.3	19.5	19.3	18.1	19.1		

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(Atmospheric Pressure (mbar)

Location	13/08/2020	18/08/2020	27/08/2020	11/09/2020	17/09/2020	22/09/2020	06/10/2020	20/10/2020	09/11/2020	16/12/2020		
101	1008	1003	1006	1009	1025	1004	1001	994	1009	1000		
102	1008	1003	1006	1009	1025	1004	1001	994	1009	1000		
103	1008	1003	1006	1009	1026	1004	1001	994	1009	1000		
105	1009	1003	1008	1011	1026	1004	1001	995	1009	999		
106	1009	1003	1008	1011	1026	1005	1001	995	1009	999		
107	1009	1003	1008	1011	1026	1005	1001	995	1009	999		

100746 West Winch Bypass

Flow (l/hr)

Location	13/08/2020	18/08/2020	27/08/2020	11/09/2020	17/09/2020	22/09/2020	06/10/2020	20/10/2020	09/11/2020	16/12/2020		
101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
102	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
103	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

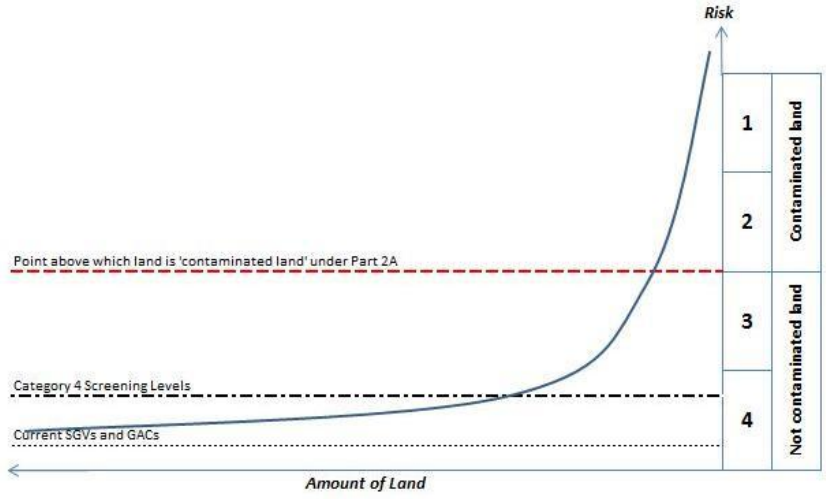
METHODOLOGY FOR THE DERIVATION OF GENERIC QUANTITATIVE ASSESSMENT CRITERIA TO EVALUATE RISKS TO HUMAN HEALTH FROM SOIL & GROUNDWATER CONTAMINATION

UK APPROACH

In the UK, the potential risks to human health from contamination in the ground are usually evaluated through a generic quantitative risk assessment (GQRA) approach. This allows generic and conservative exposure assumptions to be readily applied to risk assessments and can be a useful tool for rapidly screening data and to identify those contaminants or scenarios that could benefit from further investigation and/or site-specific detailed quantitative risk assessment (DQRA). Current industry good practice is to use the approach presented in the Environment Agency (EA) publications SR2[1] and SR3[2]. This approach allows the derivation of Generic Assessment Criteria (GACs), primarily for chronic exposure.

In April 2012, the Department of Environment, Food and Rural Affairs (Defra) published updated statutory guidance[3] which introduced a four category approach to determining whether land in England and Wales is contaminated or not on the grounds of significant possibility of significant harm (SPOSH). **Figure 1** presents a graphical representation of the categories.

Figure 1: Four Categories for Determining if Land Represent a SPOSH



Cases classified as Category 1 are considered to be SPOSH based on actual evidence or an unacceptably high probability of harm existing. Category 4 cases are those where there is no risk, or a low risk of SPOSH.

[1] Environment Agency '*Human Health Toxicological Assessment of Contaminants in Soil',* Report SC050021/SR2. January 2009.
[2] Environment Agency '*Updated Technical Background to the CLEA Model*,' Report SC050021/SR3. January 2009.
[3] Defra '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance'.* April 2012.

GACs represent a minimal risk level, well within Category 4. A 2014 publication by Contaminated Land: Applicatons in Real Environments (CL:AIRE),SP1010[4] and endorsed by Defra[5] provided an approach to determine Category 4 Screening Levels (C4SLs) which are higher than the GACs whilst being "more pragmatic but still strongly precautionary". It also provided C4SLs for six contaminants of concern. Although the C4SLs were designed to support Part 2A assessments to determine 'contaminated land' they are specifically mentioned, along with reference to the Part 2A statutory guidance, by the Department for Communities and Local Government (DCLG) for use in a planning context[6].

An updated version the Contaminated Land Exposure Assessment (CLEA) Workbook (v1.071) was released by the EA in September 2015 to take into account the publication of SP1010. The updates comprised: additional toxicity data for the six chemicals for which C4SLs were derived; two new public open space land use scenarios; updated exposure parameters; options to run the model using C4SL exposure assumptions; and increased functionality. There were no changes to algorithms, so it is still possible to replicate the withdrawn SGVs using the input parameters held within v1.071.

It should be noted that the four category approach has not been adopted in Scotland under Part 2A or the planning regime. The Part 2A statutory guidance applicable in Scotland (Paper SE/2006/44 dated May 2006) does not reflect the changes introduced by Defra in April 2012 which allow for the use of C4SLs within Part 2A risk assessments. Additionally, it is considered that the principal of 'minimal risk' should still apply under planning in Scotland, based on current guidance.

WSP APPROACH

Following the withdrawal of the SGVs, and in the absence of an industry-wide, accepted set of GACs it is down to individual practitioners to derive their own soil assessment criteria. WSP has used the approach provided within SR2, SR3, SP1010, CLEA Workbook v1.071and SR4[7] to produce a set of minimal risk GACs. The chemical-specific data within two key publications were considered during their production: CL:AIRE 2010[8] and LQM 2015[9]. Both documents provide comprehensive sets of GACs for different contaminants of concern.

The LQM Suitable For Use Levels (S4ULs) have selected exposure parameters someway between those of the SR3 land uses and the C4SL exposure scenarios. This approach was rejected by WSP as not representing minimal risk, however, the LQM S4UL document was critically reviewed and the approach and chemical input parameters were utilised where considered to be appropriate.

An industry-led C4SL Working Group is in the process of deriving a larger set of C4SLs in the near future, for approximately 20 contaminants. This will include a critical review of the chemical input data for all selected substances, and may therefore lead to further amendments to the chemical input data used in the WSP in-house screening values. It is considered likely that the contaminant list will

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[4] CL:AIRE *'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination'* SP1010, Final Project Report (Revision 2). September 2014.
[5] Defra 'SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document'*. December 2014.
[6] DCLG Planning Practice Guidance '*Land Affected by Contamination'*, particularly Paragraphs 001 and 007. Ref IDs: 33-001-20140306 & 33-007-20140612.
[7] Environment Agency '*CLEA Software (Version 1.05) Handbook (and Software)',* Report SC050021/SR4. September 2009.
[8] CL:AIRE 'The EIC/AGS/CL:AIRE *Soil Generic Assessment Criteria for Human Health Risk Assessment'.* ISBN 978-1-05046-20-1. January 2010.
[9] Nathanail et al '*The LQM/CIEH S4ULs for Human Health Risk Assessment*', Land Quality Press, ISBN 978-0-9931084-0-2. 2015.

crossover with the current CL:AIRE GACs. As such, this document was not critically reviewed by WSP.

WSP's current approach to the assessment of risks to human health is to continue to evaluate minimal risk through the use of in-house derived GACs, and to use the published C4SLs as a secondary tier of assessment until such time as additional C4SLs are published and/or in-house values are derived.

EXPOSURE MODELS

LAND USES

WSP has largely adopted the exposure assumptions of the generic land use scenarios included within SR3, with two additional public open space scenarios included from within SP1010:

- Residential with homegrown produce consumption;
- Residential without homegrown produce consumption;
- Allotments;
- Commercial;
- Public open space near residential housing (POS_{resi}); and
- Public park (POS_{park}).

Exceptions are described in the following Sections.

SOIL PROPERTIES

SR3 assumes a sandy loam soil with a pH of 7 and a Soil Organic Matter (SOM) content of 6% for its generic land uses, based on the geographical spread of topsoils in the UK. WSP has adopted these default values. In addition, GACs based on an SOM of 1% and 2.5% have been derived, based on common experience of the nature of Made Ground and lack of topsoil on many brownfield sites.

RECEPTOR CHARACTERISTICS AND BEHAVIOURS

SP1010 provides some updated exposure parameters for long-term inhalation rates[10] and the consumption rates for homegrown produce[11] compared to those provided in SR3. This data was used to derived WSP's GACs.

The changes in inhalation rates do not apply to the allotment generic land use scenario, as these are based on the breathing rates for short-term exposure of light to moderate intensity activity which were derived from a study that was not updated in USEPA 2011, so the SR3 rates were retained.

[10] USEPA, National Centre for Environmental Assessment '*Exposure Factors Handbook: 2011 Edition*' EPA/600/R-09/052F. September 2011.
[11] National Diet and Nutrition Survey 2008/2009 to 2010/2011.

CHEMICAL DATA

PHYSICO-CHEMICAL PARAMETERS

Physico-chemical properties for the contaminants for which GACs have been derived have been obtained following critical review of the following hierarchy of data sources:

1. Environment Agency/Defra SGV reports where available.
2. Environment Agency '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', Report SC050021/SR7, November 2008.
3. Published fate and transport reviews within Nathanail et. al 2015 and CL:AIRE 2010.

Where appropriate, and where sufficient data is available, values were adjusted to reflect a UK soil temperature of 10ºC (e.g. K_{aw}).

TOXICOLOGICAL DATA

Toxicological data for the derivation of minimal risk Health Criteria Values (HCV) for each contaminant was selected with due regard to the approach presented in SR2. Where appropriate, the following hierarchy of data sources was used:

1. UK toxicity reviews published by authoritative bodies including:
   - EA;
   - Public Health England (PHE);
   - Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT); and
   - Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC).
2. Authoritative European sources such as European Food Standards Agency (EFSA)
3. International organisations including:
   - World Health Organisation (WHO); and
   - Joint FAO/WHO Expert Committee on Food Additives (JECFA).
4. Authoritative country-specific sources including:
   - United States Environmental Protection Agency (USEPA);
   - US Agency for Toxic Substances and Disease Registry (ATSDR);
   - US Integrated Risk Information System (IRIS); and
   - Netherlands National Institute for Public Health and the Environment (RIVM).

Factors such as the applicability of the data to human health (e.g. epidemiological vs. animal studies), the quality of the data, the level of uncertainty in the results and the age of the data were also taken into account in the final selection. Details for specific substances are available on request.

MEAN DAILY INTAKES

Estimations of background exposure for each threshold substance have been updated. In line with the SR2 approach, the exposure from non-threshold substances in the soil does not take into account exposure from other sources, and as such GACs were derived without consideration of the Mean Daily Intake (MDI) for those substances.

The data published by the EA in its series of TOX reports between 2002 and 2009 was evaluated to determine whether the values were considered to remain valid today. Values from these current UK published sources were not amended unless they were considered to be significantly different so that the GACs remained as comparable as possible with the revoked SGVs.

ORAL MEAN DAILY INTAKES

Oral MDI were generally estimated as the sum of exposure via the ingestion of food and drinking water using the default adult physiological parameters presented in Table 3.3 of SR2.

Data on the exposure of substances from food ingestion was generally obtained from UK Total Diet Studies (TDS) published by the Food Standards Agency (FSA) and its predecessor the Ministry of Agriculture, Fisheries and Food (MAFF) and from studies commissioned by COT. Where no UK-specific data was available, MDI were derived from the European Food Safety Authority (EFSA), Health Canada and US sources. This was a rare occurrence, and in these instances, the data was evaluated to determine its applicability to the UK.

Data on the concentrations of substances in tap water was obtained from a variety of sources. UK data was used where available, with preference given to Drinking Water Inspectorate (DWI) 2014 data from water company tap water testing (LOD, 1st and 99th percentile data is available). Where the substance was not included in tap water testing, other UK sources of information were considered including:

- à DWI data from water company tap water testing from previous years;
- à COT; and
- à FSA.

Where UK data was not available, a number of other data sources were considered, largely WHO International Programme on Chemical Safety (IPCS) Concise International Chemical Assessment Documents (CICADs) and background documents for the development of Guidelines for Drinking Water Quality, using professional judgement on the relevance of the data to the UK. The final decision on the MDI from drinking water was made using professional judgement on the balance of relevance and probability, taking into account the detection limit where not detected, Koc and solubility, reduction in use of the substance, banned substances, tight controls (e.g. on explosives) and with due consideration to the SR2 instruction that “if no data or information in background exposure are available, background exposure should be assumed to be negligible and the MDI set to zero….”.

Data from other countries was generally not used because it was considered that the hydrogeology of these countries along with industrial practices were unlikely to be reflective of the UK.

INHALATION MEAN DAILY INTAKES

Inhalation MDIs were based on estimates of average daily exposure by the inhalation pathway and calculated using the default adult physiological parameters presented in Table 3.3 of SR2.

The inhalation MDIs were generally estimated using background exposure data from the UK, derived from Defra's UK-AIR: Air Information Resource[12], which provides ambient air quality data from a number of sites forming a UK-wide monitoring network. The MDIs for heavy metals were based on rolling annual average metal mass concentration data from Defra's UK Heavy Metals Monitoring Network from the period October 2009 to September 2010[13].

Information for some substances was obtained from UK sources including Environment Agency TOX reports and data from the UK Expert Panel on Air Quality Standards (EPAQS). Where recent UK data was not available, data was sourced from the International Programme on Chemical Safety (IPCS), the World Health Organisation (WHO), the Agency for Toxic Substances and Diseases Registry (ATSDR), Health Canada, and various other peer-reviewed sources summarised by LQM/CIEH[14].

For other substances, where no data or information on background exposure was available, background exposure was assumed to be negligible and the MDI set at 0.5*TDI in accordance with guidance in SR2.

PLANT UPTAKE

Soil to plant concentration factors are available in CLEA v1.071 for arsenic, cadmium, hexavalent chromium, lead, mercury, nickel and selenium. For all remaining inorganic chemicals, concentration factors were obtained using the PRISM model. Substance-specific correction factors have been selected in accordance with the guidance established within SR3. This is consistent to the approach utilised in the derivation of the LQM S4UL values and the EIC/AGS/CL:AIRE GAC.

Where there is a lack of appropriate data to enable the derivation of specific soil to plant concentrations factors for organic chemicals, plant uptake was modelled within CLEA v1.071 using the generic equations recommended within SR3, as follows:

- Green Vegetables – Ryan et al. (1988);
- Root Vegetables – Trapp (2002);
- Tuber Vegetables – Trapp et al. (2007); and
- Tree Fruit – Trapp et al. (2003).

There are no suitable models available for modelling uptake for herbaceous fruit or shrub fruit. Exposure is considered negligible.

[12] Crown 2016 copyright Defra via uk-air.defra.gov.uk, licenced under the Open Government Licence (OGL).
[13] Defra, 2013 Spreadsheet of historic data for multiple years for the Metals network. Available online at: http://uk-air.defra.gov.uk/data/metals-data. [Accessed 13/03/2016].
[14] LQM/CIEH, 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment.

SOIL SATURATION LIMITS

GACs are not limited to their theoretical soil saturation within CLEA, although where either the aqueous or the vapour-based saturation is exceeded, this is highlighted within the Workbook (compared with the lower of the two values). This affects pathways which depend on partitioning calculations so in reality this only affects the vapour pathways and is relevant to organic substances and other substances, such as elemental mercury, that have a significant volatile component. However, the Workbook highlights saturation for direct contact pathways to indicate to the user where further qualitative consideration of free phase contamination at surface may be required.

Where the lower of the two saturation limits is exceeded and the vapour pathway is the only exposure route being considered, the chronic risks to human health are likely to be negligible. Further evaluation could be undertaken using an alternative model suitable for evaluating non-aqueous phase liquids (NAPLs), such as the Johnson & Ettinger (J&E) approach described in USEPA 2003. However, WSP considers that if NAPLs are suspected, given the known limitations and over-simplifications of J&E, soil vapour monitoring is a more accurate way of assessing potential risks.

Where the lower saturation limit is exceeded for the vapour pathway and a number of exposure routes are being considered, then the contribution from the NAPL via vapour inhalation to the overall exposure can be evaluated using the procedure provided in SR4. WSP would evaluate this as part of a DQRA process or through soil vapour monitoring on-site to determine site-specific soil vapour concentrations.

CHEMICAL SPECIFIC ASSUMPTIONS

CYANIDES

Cyanide has high acute toxicity, and short term exposure is an important consideration when assessing the risks from soils contaminated with cyanide. The primary risk to human receptors from free cyanide in soils is an acute risk.

There is no current UK guidance available for calculating acute risks from free cyanide. Consequently, GAC for acute exposure were derived using the algorithms presented in MADEP 1992[15] and assuming a one-off ingestion of 10g of soil (this conservative value has been taken as an upper bound estimate for a one-off soil ingestion rate amongst children). Receptor body weights have been selected according to the critical receptor for each exposure scenario. The lowest of the chronic and acute GAC for each land use scenario were adopted by WSP. Brinckerhoff.

LEAD

The SGV for lead was withdrawn by the EA in 2009, and in 2011 the EA withdrew their published TOX report in light of new scientific evidence. The C4SL for lead was derived using the latest scientific evidence from a large human dataset. As such, no chemical-specific margin was applied in the derivation of the C4SL for lead. It may be possible for WSP to derive a GAC for lead using the same dataset and applying a chemical-specific margin, but the value is likely to be lower than UK natural background concentrations. Therefore, WSP has adopted the toxicological data used to derive the C4SLs in deriving the GAC for lead until such time as alternative GACs are published by an authoritative body. The relative bioavailability was set at 100% in line with the approach taken for other GACs, whereas the C4SL assumes 60% for soil and 64% for airborne dust. Thus, the WSP GAC are lower than the C4SLs.

[15] MADEP '*Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration'* 1992. http://www.mass.gov/dep/toxics/cn_soil.htm

POLYCYCLIC AROMATIC HYDROCARBONS

WSP's approach to the assessment of polycyclic aromatic hydrocarbons (PAHs) uses the surrogate marker approach. BaP was used as a surrogate marker for all genotoxic PAHs in line with the Health Protection Agency 2010[16] recommendations and SP1010. This assumes that the PAH profile of the data is similar to that of the coal tars used in the Culp *et al* oral carcinogenicity study from which the toxicity data for BaP was produced. In reality, this profile has been shown by HPA to be applicable on the majority of contaminated sites based on assessment of sites across the country.

The alternative is the Toxic Equivalency Factor (TEF) approach which uses a reference compound and assigns TEFs for other compounds based on estimates of potency. Key uncertainties with this approach include the assumption that all compounds have the same toxic mechanism of action within the body and that no compounds with a greater potency than the reference compound are present. It is considered by the HPA that the TEF approach is likely to under predict the true carcinogenicity of PAHs and therefore favours the surrogate marker approach.

For these reasons, WSP considers that the adoption of BaP as a surrogate marker for genotoxic PAHs as opposed to the TEF approach is reasonable, even in cases where the PAH profile may differ from that of the Culp *et al* study. In addition, WSP has derived a GAC for naphthalene, which is commonly a risk driver due to its high volatility, relative to other PAH compounds, as an indicator compound for threshold PAHs.

TRIMETHYLBENZENES

The GAC for trimethylbenzenes can be used for the assessment of any individual isomer (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene or 1,3,5-trimethylbenzene), or a mixture of the three isomers.

CHEMICAL GROUPS

For a number of chemical groups, the available toxicity data is for combinations of chemicals. Given that the physico-chemical parameters may differ between the chemicals, the GACs for the chemicals within the groups have been calculated and then the lowest GAC selected to represent the entire group. This was the approach taken by the EA for m-, o- and p-xylenes, and has also been adopted by WSP for:

- 2-chlorophenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol and 2,3,4,6-tetrachlorophenol;
- 2-, 3- and 4-methylphenol (total cresols);
- aldrin and dieldrin; and
- α- and β-endosulphan.

[16] HPA Contaminated Land Information Sheet '*Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)* 2010

EXPOSURE TO VAPOURS

INHALATION OF MEASURED VAPOURS

WSP has derived a set of soil vapour GACs (GAC_{sv}) that allow for the assessment of measured site soil vapour concentrations, using J&E, in order to establish potential risks via indoor inhalation of vapours. This methodology enables a more robust assessment of exposure via the inhalation of soil vapours indoors than using CLEA-derived soil GAC, as it is based upon measured soil vapour concentrations beneath the site. It also allows for the assessment of vapours from all source terms (i.e. groundwater, soil or NAPL). Outdoor inhalation was not included. WSP considers that the indoor inhalation pathway is the significantly dominant risk-driver.

The generic land use scenarios within CLEA (residential and commercial) that were used to derive the soil GAC were used to define the receptor and building characteristics for the soil vapour GAC. Only residential and commercial generic land use scenarios include the indoor inhalation of vapours pathway.

The GAC_{sv} were derived for three different soil types; sand, sandy loam and clay, reflecting the importance of this parameter within the J&E model. A depth to contamination of 0.85 m below the base of the building foundation was assumed (i.e. 1 m below ground level). This differs from the depth assumed for the soil GAC (0.5 m bgl), but was selected by WSP as a reasonable worst case scenario.

It is acknowledged that the J&E commonly over-predicts indoor vapour concentrations. In particular, it will significantly over-predict vapour concentrations for suspended floor slabs, which many new builds are constructed with, it does not take into account lateral migration and assumes an infinite source of contamination at steady state conditions. In addition, it is common for soil gas/vapour wells to be installed with at least 1 m of plain riser at the surface and this equates to a total depth of 0.85 m below the building foundation plus a 0.15 m thick foundation, and so is more representative of the depth that samples will be taken from.

The TDSIs and IDs for each substance were converted from $\mu gkg^{-1}{}_{bw}day^{-1}$ to μgm^{-3} using the standard conversions quoted in Table 3.3 of SR2, thereby replacing the need to model C_{air} in the equation:

$$C_{air} = \alpha . C_{vap} . 1{,}000{,}000 cm^3 m^{-3}$$

Where:

C_{air} is the concentration of vapours within the building, mg^{-3}

α is the steady state attenuation coefficient between soil and indoor air, dimensionless

C_{vap} is the soil vapour concentration, $mgcm^{-3}$

The target concentrations within indoor air for each substance (C_{air}) are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual exposure model (assuming standard CLEA occupancy periods and receptors).

The attenuation factor was calculated using J&E (Equation 10.4 in SR3) and the resulting C_{vap} is equivalent to the GAC_{sv} for the modelled exposure scenario.

Where the calculated GAC_{sv} for a substance exceeds the vapour saturation limit, no GAC_{sv} has been proposed.

INHALATION OF GROUNDWATER-DERIVED VAPOURS

The CLEA model does not have the capacity to derive GACs to assess vapours derived from dissolved phase contamination. WSP has derived a set of groundwater GACs (GAC_{gw}) to evaluate the potential risks through the indoor inhalation of groundwater-derived vapours by first applying the approach described above for the derivation of the WSP GAC_{sv} to determine the acceptable concentration in soil vapour directly above the water table.

The depth to groundwater was assumed to be 1 m bgl (i.e. 0.85 m below the base of the building foundation). This depth was considered to be more representative of commonly encountered groundwater conditions than the 0.5 m below the base of the building foundation (i.e. 0.65 m bgl) that is used by CLEA for an unsaturated source present in the overlying soil.

The GAC_{gw} was then back-calculated from the GAC_{sv} using the air-water partition coefficient (K_{aw}) for each substance.

Where the calculated GAC_{gw} for a substance exceeds the solubility limit, no GAC_{gw} has been proposed.

UK APPROACH

THE LEGISLATION

OVERVIEW OF POINTS PERTINENT TO CONTROLLED WATERS RISK ASSESSMENT

The EU Water Framework Directive 2000/60/EC (WFD) is designed to:

- Protect, improve and enhance the status and to prevent further deterioration of aquatic ecosystems and associated wetlands which depend on the aquatic ecosystems.
- Promote the sustainable use of water.
- Reduce and reverse all pollution of water, especially by 'priority' and 'priority hazardous' substances.

River Basin Management (RBM) Plans are part of the WFD strategic framework and are based on detailed analysis of the impacts of human activity on the water environment. They are designed to protect and improve the quality of our water environment and are reviewed and updated every six years. They include improvement measures to progress all ground and surface water bodies to 'Good' status by 2021. The latest system of standards and classification are set out in the 2015 Directions for England and Wales[1] and Scotland[2&3], and also listed for Scotland in WAT-SG-53[4].

The EU Groundwater Daughter Directive 2006/118/EC (GWDD) further protects groundwater. It states that hazardous substances must be prevented from entering groundwater and that non-hazardous substances should be limited from entering groundwater to concentrations that do not cause pollution.

The Environmental Quality Standards Directive (EQSD), also known as the Priority Substances Directive 2008/105/EC (PSD) as amended by 2013/39/EU, further protects surface waters and defines Environmental Quality Standards for hazardous and non-hazardous substances in surface waters.

GROUNDWATER BODY CLASSIFICATION

Groundwater bodies are classified on their quantitative and chemical status. The quantitative status is not generally relevant to controlled waters risk assessments The chemical status requires analytical data collected by the Environment Agency (EA), Natural Resources Wales (NRW) and the Scottish Environment Protection Agency (SEPA) across the water body to be evaluated against five sets of Threshold Values which are used by the regulators to decide if further, specific evaluation is required. They are not used to classify the groundwater bodies' chemical status and the 2014 and 2015 Standards Directions state that they should not be used as part of site-specific investigations.

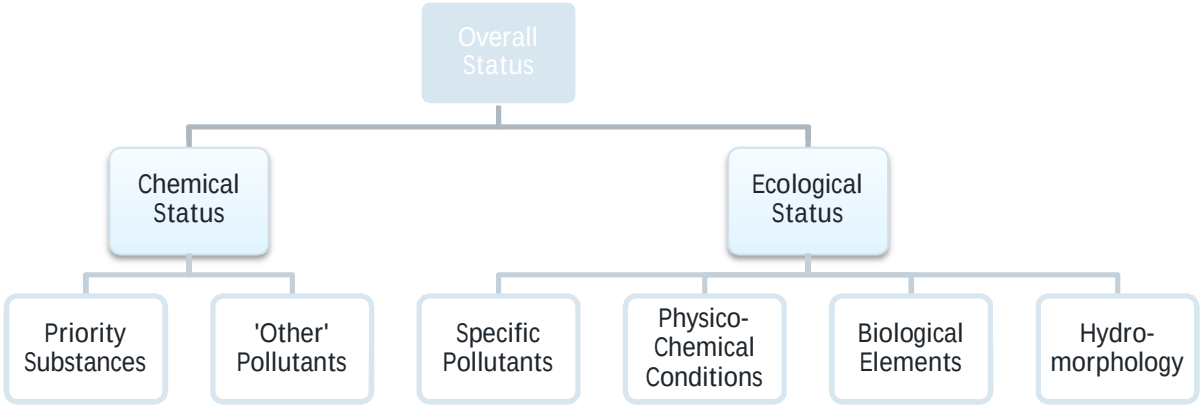
[1] The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
[2] The Scotland River Basin District (Standards) Directions 2014
[3] The Scotland River Basin District (Standards) Amendment Directions 2015
[4] SEPA '*Supporting Guidance (WAT-SG-53): Environmental Quality Standards and Standards for Discharges to Surface Waters'* v6. December 2015

SURFACE WATER BODY CLASSIFICATION

Environmental Quality Standards (EQSs) are used by the EA, NRW and SEPA to characterise, monitor and classify water bodies and to help these regulators establish measures to progress all water bodies to 'Good' status. For surface water bodies the following applies:

- Chemical status is determined on a 'Good' or 'Fail' basis.
- Ecological status is determined on a scale of 'High', 'Good', 'Moderate', 'Poor' and 'Bad'.
- The overall ecological status is determined by the lowest classification of all the parameters that are assessed.
- For an overall 'Good' status both ecological and chemical status must be at least 'Good' (see **Figure 1**).

Figure 1 – Elements of Water Body Status Classification



Priority substances – are defined by the European Commission (EC) and are reviewed every six years to ensure they stay relevant and that EQSs are up to date.

Other pollutants – not priority substances, but defined by the EC and the EQSs are identical to those laid down in legislation applied prior to 13 January 2009.

Specific pollutants - European Union (EU) Member states are required to identify nationally significant pollutants to support the assessment of 'Good' ecological status.

Physico-chemical conditions - includes parameters such as dissolved oxygen, pH, ammonia and phosphate that define the general chemistry of the surface water body and may influence the degree to which an aquatic ecosystem can thrive.

Biological elements – the condition and abundance of fish and invertebrates within the surface water body including the presence of invasive species.

Hydromorphology – includes water flow, sediment composition and the structure of the habitat and its ability to support an aquatic ecosystem.

GUIDANCE ON THE SELECTION OF ASSESSMENT CRITERIA

The Remedial Targets Methodology (RTM)[5] is the framework for controlled waters risk assessment which is used in England and Wales. The equivalent document used for the water environment in Scotland is WAT-PS-10-01[6]. Although the RTM preceded the formal adoption of the WFD in England and Wales, the document was cognisant of the requirements of the forthcoming WFD i.e. no discernible entry of hazardous substances into groundwater bodies, and no new pollution by non-hazardous substances. The methodology for the selection of assessment criteria in both documents states that where a hazardous substance is present in the soil beneath the site but is yet to enter groundwater, no discernible entry of that hazardous substance into groundwater is allowed. This effectively requires the allowable concentration of the contaminant of concern within the groundwater body to be either background or the limit of detection. The EA and SEPA use a published set of Minimum Reporting Values (MRVs) to support the assessment of 'discernible entry'.

With respect to groundwater, where a hazardous substance has already entered the groundwater body to a discernible level, the regulators generally allow appropriate quality standards to be used to quantify the risk to allow pragmatic remedial targets and to take into account the requirements of other legislation such as Part 2A and NPPF.

Where non-hazardous pollutants enter groundwater, no new pollution (or substantial risk of pollution) of groundwater is allowable and quality standards are generally an acceptable concentration.

Where the receptor is a surface water body or groundwater-dependent terrestrial ecosystem quality standards are acceptable irrespective of whether the substance is hazardous or non-hazardous.

Both RTM and WAT-PS-10-01 state that any standard used should be relevant to the current or intended use of the aquifer and that they should be 'fit for purpose' in terms of the specific period of time over which they should be measured.

[5] EA *'Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination'* 2006.
[6] SEPA *'Position Statement (WAT-PS-10-01): Assigning Groundwater Assessment Criteria for Pollutant Inputs'* v3.0, August 2014.

WSP APPROACH

OVERVIEW

WSP follows the RTM approach in England and Wales and the WAT-PS-10-01 approach in Scotland to assess the potential or actual risks to water bodies on sites that it investigates. In deriving a hierarchy of assessment concentrations with which to quantify the risks, WSP uses relevant EU and UK legislation and World Health Organisation (WHO) guidance, considers the background quality of the water resources and takes account of the current and feasible future uses of the resource. In Scotland the assessment concentrations are referred to as '*assessment limits'* and in England as *'target concentrations'*.

For all substances that are detected in groundwater, the quantitative risk assessment is undertaken by comparing the modelled or actual concentration in water to an appropriate published standard where one is available; this is the target concentration / assessment limit. The selection of the standards is described in further detail in the following Sections.

Where hazardous substances are either detected in soil leachates or are calculated using theoretical partitioning equations, an evaluation is undertaken to determine if discernible concentrations have entered the groundwater. This information is used to determine the most appropriate target concentration / assessment limit to adopt with which to evaluate the potential risks from the contaminants in the unsaturated zone. Where no published standards are available, WSP determines on a case-by-case basis whether site-specific or chemical-specific targets should be derived through additional research or studies.

WSP seeks to ensure that the best available limit of detections (LOD) are achieved for analysis that it commissions. Where this is the case and the LOD is greater than a published target standard, WSP will not conclude that a potential risk exists to the relevant water body. This is in line with the approach that the EA and SEPA take in determining the classification status of the water bodies.

APPROACH TO HAZARDOUS SUBSTANCES

For sites in England and Wales, WSP evaluates the soil leachate analytical results or theoretical partitioning calculations for hazardous substances as listed on the EA website[7] (updated 13 January 2017). For sites in Scotland, the MRVs provided in Annex 4 of WAT-PS-10-01 are used and these are the same as those produced by the EA. Where an MRV is not available, the limit of detection is used for hazardous substances.

Where groundwater analytical results are also available these are evaluated alongside the unsaturated concentration data to determine if the hazardous substances have entered the groundwater by a discernible amount (taken to be the MRV or limit of detection). If hazardous substances are detected in the groundwater, then the quantitative risk assessment of the soil concentrations continues using published standards appropriate for drinking water (see *'Impact to Drinking Water'* below). If the hazardous substances have not yet entered the groundwater, then the soil concentrations are evaluated using the MRVs/LODs.

[7] https://www.gov.uk/government/publications/values-for-groundwater-risk-assessments/hazardous-substances-to-groundwater-minimum-reporting-values

IMPACT TO AQUATIC LIFE IN SURFACE WATERS

Although the surface water EQSs are primarily designed to support the EA and SEPA in their programmes of classification and monitoring of the quality of surface water bodies across England, Wales and Scotland under their WFD and EQSD obligations, the EQSs are also commonly used by contaminated land professionals to quantitatively evaluate the potential impact of site-specific ground contamination to surface waters. This approach is also suggested in RTM and WAT-PS-10-01.

The 2014 and 2015 Standards Directions provide EQSs for the assessment of ecological and chemical surface water body status. When quantifying potential impacts to surface waters, WSP's approach is to focus on the chemical status by evaluating the 'priority' and 'other' pollutants that are listed in those Directions. In addition, the 'specific' pollutants, (which are actually part of the evaluation of ecological status), are also assessed. These three classes of pollutants are used by the EA to mark the boundary between a Good status surface water and failing quality. As such, exceedances of these EQSs can be considered to highlight a potential risk that the surface water will not achieve or maintain its 'Good' status, which contravenes the requirements of the WFD. WSP adopts this approach irrespective of whether the EA or SEPA has determined if the surface water body requires an assessment of chemical status or not, so as to ensure that the requirements of the WFD are met for all surface water bodies that it evaluates in the context of ground contamination.

The EQSs are designed to be applied over a specific period of time. WSP selects the annual average or long term mean as the target concentration for each priority substance, specific pollutant and other pollutant. In most cases, the number of groundwater sampling events will be limited and as such, there are limitations to this approach that WSP highlights on a case by case basis.

A number of EQSs do not come into force until 22 December 2018. WSP may use these values because they can be used as an indicator of long term contamination issues that may pose issues for a site in the near future. This is determined on a case-by-case basis.

Maximum Allowable Concentration (MAC) EQSs are designed to assess acute exposure of the aquatic environment to pollutants. As such, WSP does not consider the use of MACs to be appropriate to use as a target concentration in the majority of cases. An exception could be the evaluation of potential ecological risks to a surface water from a one-off catastrophic spill or leak in an emergency response scenario.

WSP does not assess the potential ecological risks posed by physico-chemical quality elements on a regular basis. pH, dissolved oxygen, biological oxygen demand, acid neutralising capacity, phosphorus, temperature and salinity are considered too unstable to be modelled from groundwater to surface water and these parameters are only measured in the receiving surface water body.

Where a published EQS is not available, WSP follows the WAT-PS-10-01 guidance for sites in Scotland and applies non-WFD EQSs. These comprise repealed Dangerous Substances Directive (DSD) substances as well as EQSs from other sources that should be used with caution. For sites in England and Wales, WSP uses the EA's operational environmental quality standards for Environmental Permitting which are essentially the repealed DSD substances that are applied in Scotland. WSP uses the proposed ethylbenzene EQS from R&D Technical Report P2-115/TR4 2002[8] for sites in England and Wales. This is equivalent to the SEPA non-statutory EQS.

[8] EA '*Proposed Environmental Quality Standards for Ethylbenzene in Water*' R&D Technical Report P2-115/TR4. 2002.

With respect to petroleum hydrocarbons, WSP refers to the CL:AIRE 2017 guidance[9] in order to derive alternative assessment criteria. In cases where no equivalent VOC, SVOC or PAH data is available, the following proxy compounds are used:

- Aromatic EC5-EC7 benzene (EC6.5)
- Aromatic >EC6-EC7 benzene (EC6.5)
- Aromatic >EC6-EC8 benzene (EC6.5)
- Aromatic >EC7-EC8 toluene (EC7.6)
- Aromatic >EC8-EC10 ethylbenzene (EC8.5)
- Aromatic >EC10-EC12 naphthalene (EC11.7)
- Aromatic >EC12-EC16 naphthalene (EC11.7)
- Aromatic >EC16-EC21 anthracene (EC19.4)
- Aromatic >EC21-EC35 benzo(a)pyrene (EC31.3)

IMPACT TO DRINKING WATER

ABSTRACTION FOR PUBLIC POTABLE SUPPLY

In line with the RTM and WAT-PS-10-01, WSP uses drinking water quality standards to evaluate the potential risk to aquifers from both the perspective of current abstraction for potable supply and also to evaluate the risk to future resource potential. The sources of drinking water standards are applied by WSP in the following hierarchy with the UK Drinking Water Standards (DWS) as the first tier:

- UK Water Supply (Water Quality) Regulations of England, Wales and Scotland
- EC Drinking Water Directive 1998
- WHO Drinking Water Guidelines 2011
- WHO Petroleum Products in Drinking Water 2008

RTM does not advocate country-specific standards outside the UK.

In Scotland, SEPA's published Resource Protection Values (RPVs) use the published US EPA National Primary Drinking Water Regulations where they are more conservative than the WHO standards. Where no RPV exists, WSP applies the remainder of the WHO standards as a second, non-statutory tier.

ABSTRACTION FOR PRIVATE SUPPLY

The Private Water Supplies Regulations of England, Scotland and Wales prescribe maximum concentrations and values of inorganic and organic constituents as well as radioactivity and bacteria for natural waters intended for private supply. The concentrations and values are the same as those for public potable supply.

ABSTRACTION FOR BOTTLED WATER

The Natural Mineral Water, Spring Water and Bottled Drinking Water Regulations of England, Scotland and Wales prescribe maximum concentrations and values of inorganic and organic constituents as well as radioactivity and bacteria for natural waters intended for sale for human consumption.

[9] CL:AIRE '*Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies'* v1.1 March 2017.

OTHER RECEPTORS

WSP also considers other less common controlled waters receptors, where applicable, including but not limited to:

- *The Bathing Water Regulations 2013* which provides standards for the classification of the quality of bathing waters at specified locations on the basis of intestinal enterococci and *E. coli* levels.
- *WAT-SG-53, Table 9a: Operational Standards for Aquaculture* which provides the operational water quality standards used by SEPA for regulating the use of chemicals in aquaculture.