

Appendix 2.3

PRELIMINARY GEOTECHNICAL AND
ENVIRONMENTAL ASSESSMENT



NOTE

Jackson's Row Developments Ltd (hereinafter referred to as 'the Applicant') is seeking to construct a major development proposal known as St Michael's, Jackson's Row, Manchester, UK

The planning application for the development was originally registered in January 2017. Following feedback, the decision was taken to revise the scheme. Revised plans and documents were submitted in November 2017 and the development was granted planning permission in June 2018.

Through the detailed design process, a number of relatively minor improvements to the original scheme have been identified; these will also provide technical and functional improvements through the next stage design process. The Applicant wishes to progress these proposed changes, which are considered to require amendments to the original scheme, through a Section 73 application.

An Environmental Statement, produced in accordance with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011, was submitted in support of the Approved Development in 2017. The 2017 Environmental Statement comprised three volumes, as follows:

Volume 1: Main Text and Figures;
Volume 2: Technical Appendices;
Volume 3: Non-Technical Summary

With reference to Volumes 1 and 2 of the 2017 Environmental Statement, it has been decided that rather than updating and re-submitting the entire Volumes in support the Section 73 application, an 'Addendum' to the 2017 Environmental Statement should be submitted. This is because the Proposed Amendments to the scheme are minor in nature and the potential to affect the environmental assessment is limited.

This Environmental Statement Volume 2 (2017) appendix formed part of the application package for the June 2018 approved scheme and remains valid.

REPORT N° 70010925/002/10482

JACKSON'S ROW

PRELIMINARY GEOTECHNICAL &
ENVIRONMENTAL ASSESSMENT

CONFIDENTIAL

NOVEMBER 2016

JACKSON'S ROW

PRELIMINARY GEOTECHNICAL & ENVIRONMENTAL ASSESSMENT

Jackson's Row Developments Limited

Preliminary Geotechnical & Environmental Assessment Confidential

Project no: 70010925

Date: November 2016

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QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1
Remarks	Draft	Issue
Date	December 2015	November 2016
Prepared by	R. Home	R. Home
Signature		 Home, Robert 2017.01.04 12:05:21 Z
Checked by	M Neden	M Neden
Signature		 Digitally signed by michael.neden@wspgroup.co m DN: michael.neden@wspgroup.com, cn=michael.neden@wspgroup.com, email=michael.neden@wspgroup.com Date: 2017.01.04 13:12:58 Z
Authorised by	R Thompson	R Thompson
Signature	pp	 Digitally signed by michael.neden@wspgroup.co m DN: michael.neden@wspgroup.com, cn=michael.neden@wspgroup.com, email=michael.neden@wspgroup.com Date: 2017.01.04 13:13:13 Z
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A P P E N D I X A LIMITATIONS

A P P E N D I X B EXPLORATORY HOLE RECORDS, LABORATORY TESTING
& MONITORING RESULTS

1 INTRODUCTION

1.1 AUTHORISATION

On the instruction of Jackson's Row Developments Limited, WSP | Parsons Brinckerhoff has been commissioned to undertake limited ground investigations in support of a proposed development at Jackson's Row, Manchester.

1.2 PROPOSED DEVELOPMENT

The propose development involves the demolition of existing structures and construction of two towers of 21 and 31 storeys in height, with a one level basement, which will occupy the full footprint of the site. The towers will be of mixed use including residential, retail, office space, and gardens.

1.3 PREVIOUS REPORTING & OBJECTIVES

WSP | Parsons Brinckerhoff has previously produced a Phase I preliminary Geo-environmental risk assessment (Ref. 70010925/001/10465), dated November 2015, which should be read in conjunction with this report.

The objectives of the current works were to provide an initial assessment of the ground conditions and provide preliminary advice on;

- Basement excavation;
- Contamination risk;
- Ground gas risk; and,
- Site waste classification.

This report is not intended to fulfil the requirements of either a regulatory compliant generic qualitative risk assessment or a Eurocode 7 complaint Ground Investigation or Geotechnical Design Report. Additional investigations are required in order to discharge the relevant planning conditions and ensure the economic design of the substructure.

1.4 CONFIDENTIALITY STATEMENT

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

Jackson's Row Developments Limited
4 Jordan Street
Manchester
M15 4PY

This report has been prepared for the sole use of the above named party. This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP | Parsons Brinckerhoff. No responsibility will be accepted where this report is used in its entirety, or in part, by any other party.

Information provided by others is taken in good faith as being accurate. WSP | Parsons Brinckerhoff cannot and will not accept liability for any deficiencies in third party information.

General limitations are presented in **Appendix A**.

2 SCOPE OF WORKS

2.1 FIELDWORK

Fieldworks were undertaken by Geo Site Surveys under the supervision of WSP | Parsons Brinckerhoff on 2 and 7 November 2015. The procedures followed in the investigation were in general accordance with guidance presented in BS5930:2015 and BS10175:2011.

Table 2.1 summarises the fieldworks undertaken.

Table 2.1 – Summary of fieldwork

INVESTIGATION METHOD	NO. OF POSITIONS	DEPTH (m BGL*)	COMMENTS
Rotary borehole	1 (RT01)	15	Air / mist flush
Window sample borehole	3 (WS01 – WS03)	3 – 4	Terminated at refusal
Dynamic probe	1 (follow on in WS01)	4.5	Terminated at 4.5mbgl due to exceeding range of the downhole magnetometer

* below ground level

Borehole locations are shown on **Figure 2.1** below.

Figure 2.1 – Exploratory Hole Locations



WS02 and WS03 were located underneath the arches leading to the central courtyard of the former Bootle Street Police Station.

Borehole positions with scanned for buried services by a specialist contractor using a GPR and cable avoidance tool.

An Unexploded Ordnance (UXO) surveyor equipped with a magnetometer was used to supervise the formation of WS01, which falls within a perceived Medium Risk Zone (see Phase I and Section 6.4).

Exploratory hole records are presented in **Appendix B**.

MONITORING INSTALLATIONS

Monitoring installation details are summarised in **Table 2.2** and are detailed on the exploratory hole records.

Table 2.2 – Summary of monitoring installations

EXPLORATORY HOLE REF.	STANDPIPE DIAMETER (MM)	SCREEN TOP AND BASE DEPTH (m BGL)
RT01	50	2.00 – 15.00
WS01	50	1.00 – 3.00
WS02	50	1.00 – 3.00
WS03	50	1.00 – 3.00

2.2 IN-SITU TESTING

STANDARD PENETRATION TESTS

Standard Penetration Tests (SPTs) were performed in the window sample boreholes. The test results are presented on the exploratory hole records.

2.3 LABORATORY TESTING

A programme of geotechnical and chemical laboratory testing was scheduled by WSP | Parsons Brinckerhoff and comprised:

GEOTECHNICAL TESTING

- Unconfined Compressive Strength (UCS)
- Point Load Index

CHEMICAL TESTING

SOILS (4NO. SAMPLES)

- pH and water soluble sulphate
- Toxic metals
- Asbestos ID
- PAH
- TPH-CWG
- Soil Organic Matter (SOM)

GROUNDWATER (1NO. SAMPLE)

- pH and sulphate
- Ammoniacal Nitrogen as NH_4

- Chloride
- Dissolved toxic metals
- Hexavalent Chromium
- VOCs
- TPH-CWG

Test results are presented in **Appendix B**.

2.4 GROUNDWATER & GROUND GAS MONITORING

Six monitoring visits were undertaken between 10 November and 15 December 2015. The following parameters were measured and recorded in each standpipe:

- Groundwater level
- Concentrations (% vol.) of CH₄, O₂, CO₂.
- Concentrations (ppm) of H₂S and CO
- Flow Rate
- Barometric pressure

A water sample was taken from RT01 on the second monitoring visit.

Monitoring results are presented in are presented in **Appendix B**.

3 GROUND SUMMARY

Published geological mapping indicates the eastern half of the site to be underlain by Glacial Till and Sherwood Sandstone. The western half of the site is indicated to be directly underlain by Sherwood Sandstone. Previous phases of historical development and demolition on the site suggests that Made Ground is likely to be present.

The current ground investigation has confirmed the presence of Made Ground and Sherwood Sandstone. Glacial Till was encountered in RT01 located in the eastern half of the site.

On the basis of the information obtained, the following ground summary has been derived for the site.

Table 3.1 – Ground Summary

STRATUM	TYPICAL DESCRIPTION	DEPTH TO BASE (m)	THICKNESS (m)	NOTES
Concrete / Asphalt/subbase		0.08 – 0.4	0.08 – 0.4	Encountered in all boreholes
Made Ground	Red brown slightly gravelly medium sand & cobbly gravel.	2.50 – 4.0	2.3 – 3.38	Encountered in all window sampler holes. Likely represents reworked natural ground and demolition derived materials.
Glacial Till	Soft red-brown slightly gravelly clay.	2.0	1.60	Only encountered in RT01
Completely Weathered Sherwood Sandstone	Brown-red slightly gravelly slightly clayey fine and medium sand.	3.90	1.90	Encountered in WS01, WS02, and RT01.
Intact Sherwood Sandstone	Very weak, becoming weak red-brown medium grained sandstone.	>15m	>11.10	Encountered at approx. 34.5mAOD in RT01.

Groundwater was encountered in BH1 during drilling and observations made by Geotechnics are summarised in **Table 3.2**, along with groundwater monitoring results.

Table 3.2 – Water Strike and Monitoring Summary

EXPLORATORY HOLE	WATER STRIKE (m BGL)	FINAL DEPTH AFTER 20 MINUTES (m BGL)	WATER LEVEL DURING MONITORING (m BGL)		WATER LEVEL DURING MONITORING (m AOD – APPROX.)	
			Min.	Max.	Min.	Max.
RT01	13.5	-	12.42	12.01	25.49	25.08

4 ROCK STRENGTH

As outlined in **Table 3.1**, the upper level of the Sherwood Sandstone is weathered to gravelly sand. Intact rock was encountered at approximately 3mbgl in RT01 (approximately 34.5mAOD) although core recovery was poor to around 4mbgl (approximately 33.5mAOD). The following section provides an initial assessment of rock strength based on testing of rock core from RT01.

UNCONFINED COMPRESSIVE STRENGTH

Four unconfined compressive strength (UCS) tests were scheduled on the Sherwood Sandstone. The results are detailed in **Table 4.1** below.

Table 4.1 – UCS test results

BOREHOLE	DEPTH (m BGL)		ELEVATION (m AOD – APPROX.)		UCS (MPa)
	FROM	To	Top	Base	
RT01	7.77	8.00	29.23	29	11.5
	9.38	9.58	27.62	27.42	14.4
	11.10	11.34	25.9	25.66	17.9
	13.39	13.69	23.61	23.31	10.3

POINT LOAD TESTS

To further evaluate UCS and to determine values for sections of core not suitable for direct UCS testing, a series of point load tests were undertaken. Conversion of the point load index I_{S50} results to an equivalent UCS is achieved through application of a correction factor (K). This was derived by correlating with direct UCS tests at equivalent depths, and a figure of 30 was adopted.

The results are detailed in **Table 4.2**.

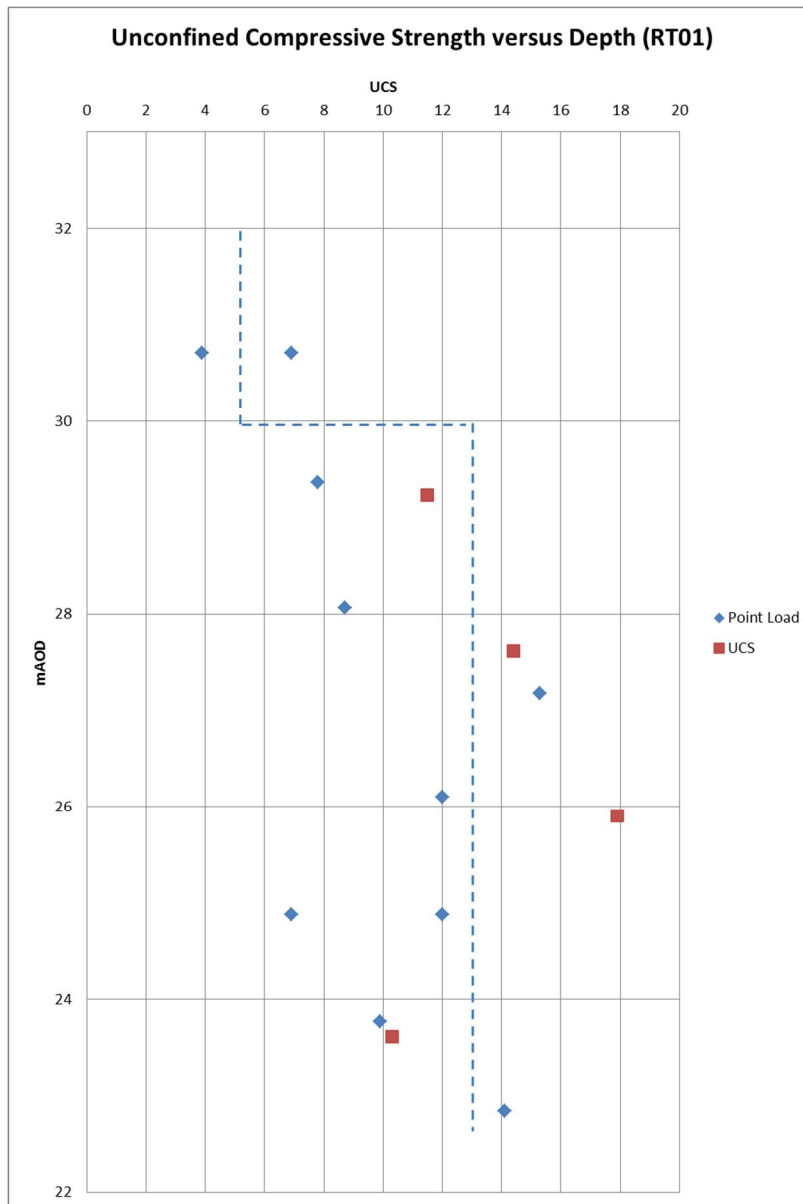
Table 4.2 – Point Load Test results

BOREHOLE	DEPTH (m BGL)	ELEVATION (m AOD – APPROX.)	I_{S50} (MPa)	UCS (MPa)
RT01	6.29	30.71	0.13	3.9
	6.29	30.71	0.23	6.9
	7.64	29.36	0.26	7.8
	8.94	28.06	0.29	8.7
	9.82	27.18	0.51	15.3
	10.90	26.10	0.40	12
	12.12	24.88	0.23	6.9
	12.12	24.88	0.40	12
	13.23	23.77	0.33	9.9
	14.16	22.84	0.47	14.1

Values of UCS derived from the above relationships are presented on **Figure 4.1** below and suggest the following strength profile;

UCS = 5MPa to 30mAOD, then increasing to 13MPa.

Figure 4.1 – UCS versus Elevation



5 PRELIMINARY ENVIRONMENTAL ASSESSMENT

5.1 SOILS

In terms of soil borne contamination at shallow depth at the site, four samples of Made Ground ranging from 0.8-2.75mbgl were taken and submitted to a UKAS accredited laboratory for a general screening suite comprising a range of inorganic and organic analytes. The results of the samples were screened against the Residential Land Use (Without Plant Uptake) Human Health GAC values.

All of the samples returned contaminant concentrations below the relevant GACs, with the exception of four results from WS01, taken at 2.0mbgl. These GAC exceedances are shown in **Table 5.1** below.

Table 5.1 – GAC Exceedances

ANALYTE	RESULT (mg/kg)	GAC (mg/kg)
Arsenic	40.2	35
Lead	3310	310
Benzo(a)anthracene	4.28	3.7
Benzo(a)pyrene	3.72	1.0

In all cases except lead, it is considered that the exceedances are marginal and given that the basement will encompass the whole site, the risk to end users is insignificant.

Concentrations of lead are significantly elevated to classify material excavated from this area as Hazardous Waste. It is therefore considered that, in order to provide cost surety over waste disposal and additional information regarding the nature and extent of the contamination present at the site, further site investigation works are undertaken to include a more statistically valid quantity of sample locations and depths. This will allow for more accurate soil waste classification of the Made Ground and quantities to be derived, and potentially identify significant project cost savings.

It is noted that no asbestos was identified in the samples. Any further analysis undertaken should also include asbestos screens within the Made Ground to ensure statistical validity.

5.2 GROUNDWATER

No exceedances of the Controlled Waters screening criteria were recorded. Based on the current limited data, the risks to Controlled Waters are considered low.

5.3 GROUND GAS

Ground gas concentrations recorded to date are presented in **Appendix B** and summarised in **Table 5.2**. WS01 could not be monitored due to the presence of parked cars.

Table 5.2 – Summary of Ground Gas Results

HOLE REF.	METHANE (% VOL.)		CARBON DIOXIDE (% VOL.)		OXYGEN (% VOL.)		HYDROGEN SULPHIDE (ppm)		CARBON MONOXIDE (ppm)		FLOW RATE (l/hr)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
WS02	0.0	0.0	0.1	0.6	19.0	20.2	0.0	0.0	0.0	0.0	0.0	0.0
WS03	0.0	0.0	0.1	0.6	18.9	20.4	0.0	0.0	0.0	0.0	0.0	0.0
RT01	0.0	0.0	0.1	0.6	19.0	20.2	0.0	0.0	0.0	0.0	0.0	0.0

The ground gas monitoring indicates CS1 conditions for both methane and carbon dioxide, requiring no special gas protection measures. Further monitoring positions will be required to confirm this assessment.

6

PRELIMINARY ENGINEERING ASSESSMENT

6.1 FOUNDATIONS & BASEMENT EXCAVATION

Rock strength is significant at proposed formation level and at this stage, supporting the structure on a raft/pad foundation is considered feasible.

The possible presence of the West Manchester Fault on the south western corner of the site is noted in the Phase I report. It is possible that the rock mass in the immediate vicinity of the fault may have an increased weathering profile or have a weakened / broken state compared to the typical rock mass. Such zones may be very localised and difficult to locate through investigation, particularly as the position of the fault is conjectured.

If such weathered/weakened zones are encountered during foundation excavation an appropriately qualified engineer should inspect the formation to determine the appropriate remedial action. This may comprise grouting, or the deepening of the foundations locally.

The basement construction will likely require the use of an embedded bored pile wall. Propping of the basement wall is likely to be required to control deflections and ground movement at the site boundaries. Further details are required as to the nature of the foundations for the structure on the western boundary (210 Deansgate) to determine if any additional remedial works need to be undertaken in advance of basement excavation.

The top of the lowest basement slab is currently anticipated to be 29.8mAOD. Excavations to around 28.3mAOD will likely be required for foundations, with excavations locally to around 26.8mAOD for lift pits. Based on groundwater standing at approximately 25mAOD, suggests that the excavation may be above the groundwater table.

However, groundwater level may vary seasonally and additional monitoring is required. On the assumption that changes in the design may occur, determining the permeability of the bedrock should form part of any future ground investigation. If in the final design deeper construction is required then groundwater level and permeability may dictate the type of embedded wall required (e.g. secant or contiguous).

6.2 OBSTRUCTIONS & EXCAVATABILITY

As well as the existing foundations, below ground obstructions, associated with previous phases of development should be anticipated. Other features, such as underground fuel tanks may also be present.

The majority of the basement excavation will be undertaken through bedrock. Based on the currently observed rock strengths and generally closely spaced discontinuities, hard digging conditions (for a large tracked excavator) should be anticipated, possibly with the use of hydraulic breakers and ripping techniques.

6.3 MATERIAL REUSE

Following appropriate asbestos removal, the crushed and screened demolition arisings may have some value as a recycled aggregate.

Based on the current chemical testing, it is anticipated that excavated Made Ground soils will need to go to landfill. Detailed waste characterisation will be required to ensure that disposal costs are appropriately managed (see **Section 5.0**).

Sherwood Sandstone is frequently used in the local area as a general fill material and it is possible that a ready market could be found for the arisings from the basement excavation.

6.4 UXO

As discussed in the Phase I report, the site has been divided by Dynasafe BACTEC into a Low Risk Zone and a Medium Risk Zone (see extract below).



The following risk mitigation measures are recommended by Dynasafe BACTEC to support the proposed works:

BOTH RISK ZONES

- Site specific explosive ordnance safety and awareness briefings to all personnel conducting intrusive investigation and contraction works; and,
- The provision of unexploded ordnance site safety instructions to all personnel.

MEDIUM RISK ZONE ONLY

- The presence of an Explosive Ordnance Disposal (EOD) engineer to supervise open excavations; and,
- Intrusive Magnetometer Survey of any borehole locations down to the maximum bomb penetration depth.

It is the responsibility of the principal contractor to ensure that the UXO risk is appropriately addressed and mitigated during the groundworks. In planning mitigation measures, reference should be made to CIRIA 681.

Appendix A

LIMITATIONS

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

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

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

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

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.

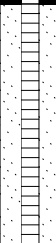
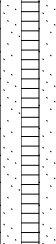
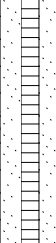
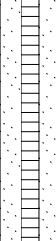
MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

- 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.

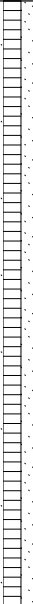
Appendix B

**EXPLORATORY HOLE RECORDS, LABORATORY TESTING &
MONITORING RESULTS**

 WSP Parsons Brinckerhoff The Victoria, 150-182 The Quays Salford, M50 3SP Telephone: 0161 886 2400 Fax: 0161 886 2401		ROTARY DRILLHOLE LOG		Hole No. RT01	
Project Jackson's Row		Sheet 1 of 2			
Job No 70010278		Client Jackson's Row Developments Limited		Date 07-11-15 07-11-15	
Contractor / Driller Geo Site Surveys		Method/Plant Used Rotary Core		Logged By RH	
		Co-Ordinates (NGR)		Ground Level (m AOD) 37.500	

RUN DETAILS					STRATA										Install / Backfill
Depth	TCR	SCR	RQD	(SPT 'N') Fracture Spacing	Rock Test Result (MPa) Water Depth	Elev. (mAOD)	Depth (Thickness)	Discontinuities	Detail	Description Main	Legend	Geology	Dia. 50 mm		
3.00				NI		37.30	0.20	3.50 - 3.90 m bgl. Recovered as sand.		Grey CONCRETE		MG			
						37.10	0.40			MADE GROUND: Grey limestone gravel and limestone cobbles. Subbase.		MG			
										Soft red-brown sandy slightly gravelly CLAY. Gravel is fine and medium subangular to subrounded of mixed lithologies. (Glacial Till).		GT			
							(1.60)								
						35.50	2.00								
							(1.00)								
						34.50	3.00								
							(0.50)								
						34.00	3.50								
							33.60			3.90					
4.00	60	0	0	13	NI			4.84 - 5.28 m bgl. Discontinuity Set 2: Subvertical, planar, rough joint with sandy clay infill and yellow staining to 10mm depth. 5.63 - 5.79 m bgl. Discontinuity Set 3: Subhorizontal (45°), planar, smooth, clean joints.		Very weak red-brown medium grained SANDSTONE. (Completely weathered Sherwood Sandstone).		SSG			
										Very weak red-brown medium grained highly weathered SANDSTONE.		SSG			
										Discontinuity Set 1: horizontal, closely spaced, planar, smooth, clean bedding fractures.					
										Non-intact between 4.74m and 4.82m.					
										Becoming weak and micaceous from 5.18m.					
										Non-intact from 6.00m to 6.23m. Recovered as sand.					
										Fine and medium grained from 6.23m.					
										Non-intact from 6.67m to 6.75m. Recovered as sand and medium gravel.					
5.00	100	71	20	4	NI			9.19 - 9.36 m bgl. Discontinuity Set 3: Subhorizontal (30°-45°) planar, smooth, clean joints		Assumed Zone of Core Loss		NR			
										Weak red-brown micaceous medium and coarse grained SANDSTONE.		NR			
										Discontinuity Set 1: horizontal to subhorizontal (15°), closely spaced, planar, smooth, clean bedding fractures.					
										From 11.44m to 14.50m becoming fine to coarse grained and slightly gravelly. Gravel is fine to coarse subrounded quartz.					
										Discontinuity Set 1 is medium spaced from 13m to 14m.					
6.00	93	72	50	5	NI	30.60	6.90					SSG			
						30.47	7.03								
7.00	100	100	64	3	NI							SSG			
8.50	100	95	81	15	NI							SSG			
10.00	100	95	81	2	NI							SSG			

 WSP Parsons Brinckerhoff The Victoria, 150-182 The Quays Salford, M50 3SP Telephone: 0161 886 2400 Fax: 0161 886 2401		ROTARY DRILLHOLE LOG		Hole No. RT01	
Project Jackson's Row		Sheet 2 of 2			
Job No 70010278		Client Jackson's Row Developments Limited		Date 07-11-15 07-11-15	
Contractor / Driller Geo Site Surveys		Method/Plant Used Rotary Core		Logged By RH	
		Co-Ordinates (NGR)		Ground Level (m AOD) 37.500	

RUN DETAILS					STRATA										Install / Backfill
Depth	TCR	SCR	RQD	(SPT 'N') Fracture Spacing	Rock Test Result (MPa) Water Depth	Elev. (mAOD)	Depth (Thick- ness)	Discontinuities	Detail	Description	Main	Legend	Geology	Dia. 50 mm	
11.50	100	100	78	29			(7.97)	11.66 - 11.70 m bgl. Coarse gravel (25mm) inclusions. 11.79 - 11.79 m bgl. Discontinuity Set 3: Subhorizontal (30) planar, smooth, clean joint.	Weak red-brown micaceous medium and coarse grained SANDSTONE. Discontinuity Set 1: horizontal to subhorizontal (15°), closely spaced, planar, smooth, clean bedding fractures. From 11.44m to 14.50m becoming fine to coarse grained and slightly gravelly. Gravel is fine to coarse subrounded quartz. Discontinuity Set 1 is medium spaced from 13m to 14m. (continued)			SSG			
13.00	100	90	80												
14.50	100	90	80	8											
15.00	100	88	84	7			22.50	15.00						14.69 - 14.73 m bgl. Discontinuity Set 3: Subhorizontal (30°), planar, rough, clean, closely spaced joints.	

Boring Progress						Rotary Flush					
Date	Time	Depth	Casing Dpt	Core Dia. (mm)	Water Strike	From	To	Type	Return	Depth Casing	Casing Dia
Chiselling				Water Added		General Remarks					
From	To	Hours	Tool	From	To						
						Groundwater encountered at 13.50m BGL during drilling period. Ground Level estimated from Topographical Survey (Drawing No.13643-100_2DT)					
Scale 1:62.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

08 WSP DRILLHOLE/ROTARY LOG 70010278 - JACKSON'S ROW.GPJ WSPETEMPLATE1.03.GDT 4/1/17

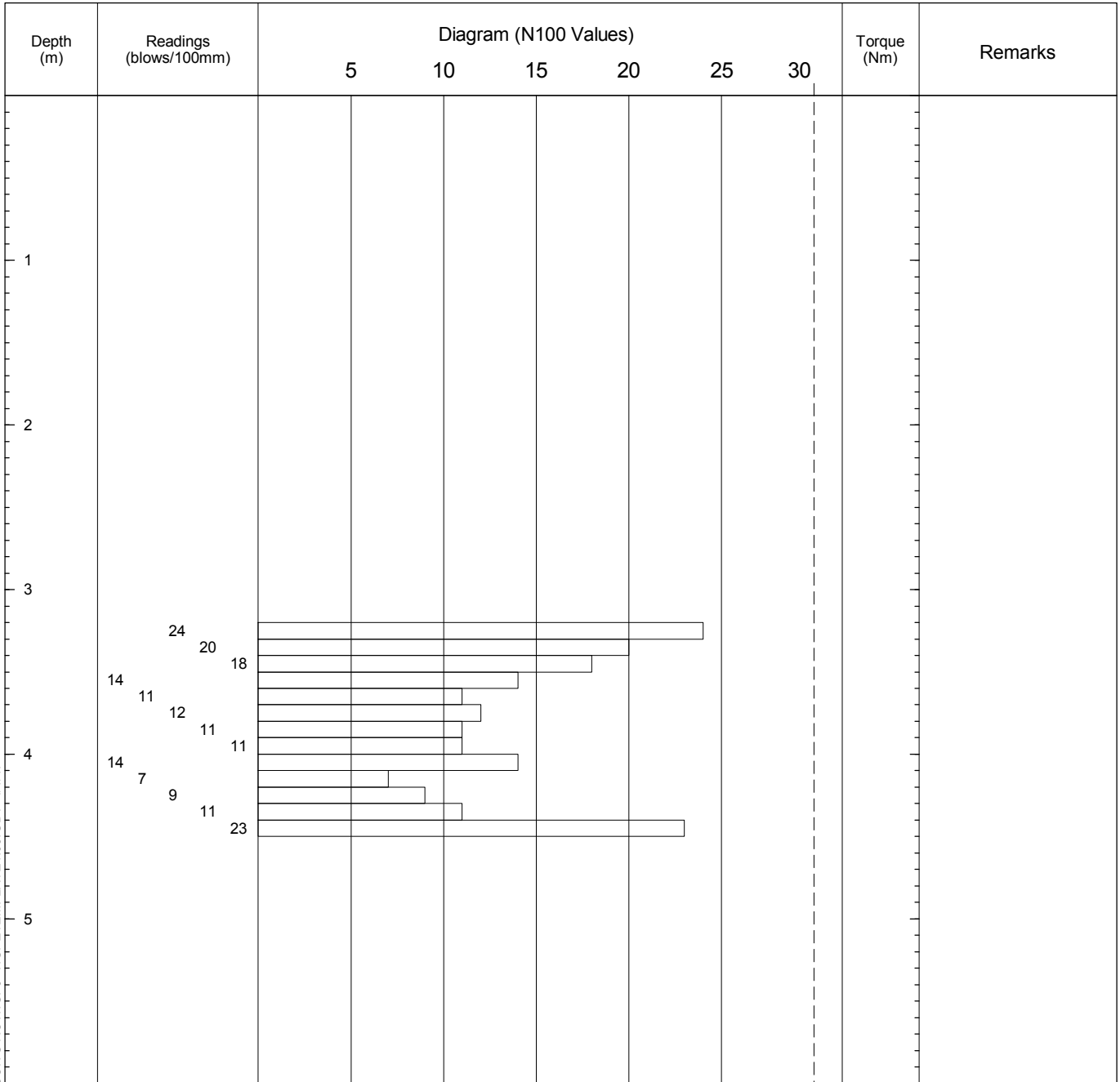
 WSP Parsons Brinckerhoff The Victoria, 150-182 The Quays Salford, M50 3SP Telephone: 0161 886 2400 Fax: 0161 886 2401		WINDOW SAMPLE LOG		Hole No. WS01	
Project Jackson's Row		Sheet 1 of 1			
Job No 70010278		Client Jackson's Row Developments Limited		Date 02-11-15 02-11-15	
Contractor / Driller Geo Site Surveys		Method/Plant Used Competitor 130		Logged By RH	
		Co-Ordinates (NGR)		Ground Level (m AOD)	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kNm2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. 50 mm
								0.08	MADE GROUND: Asphalt		MG	
								0.20	MADE GROUND: Grey limestone gravel and limestone cobbles. Subbase.		MG	
1.00	(S)	3,3,3 4,4,2 N=13.						(2.30)	MADE GROUND: Red-brown sandy cobbly gravel. Gravel is medium and coarse primarily of brick with minor concrete and glass.		MG	
1.80-2.00	ES	.										
2.00	(S)	4,8,6 4,4,6 N=20.						2.50				
2.60-2.75	ES	.						(0.50)	Light orange-brown silty gravelly becoming very gravelly fine and medium SAND with rootlets at top of unit. Gravel is medium and coarse red-brown sandstone. (Completely weathered Sherwood Sandstone).		SSG	
3.00	(S)	16,9,12 12,12,14 N=50/ 0.28.						3.00	Window sampling terminated at 3m BGL due to refusal. Dynamic Probing continued to 4.5m BGL. Dynamic probe results: 3.00m - 4.00m: -, -, 24, 20, 18, 14, 11, 12, 11, 11 4.00m - 5.00m: 14, 7, 9, 11, 23		END	

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
						General Remarks Magnetomer survey undertaken in the borehole due to UXO risk. Refusal at 3m BGL. Borehole continued with Dynamic Probe to 4.5m BGL. Probing stopped at 4.5m BGL due to 1.5m range of magnetometer. No groundwater observed during investigation period. 50mm standpipe installed to 3m BGL (1m plain, 3m slotted).					
Scale 1:37.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

08 WSP WINDOW SAMPLE LOG 70010278 - JACKSON'S ROW.GPJ WSPTEMPLATE1.03.GDT 4/1/17

 WSP Parsons Brinckerhoff The Victoria, 150-182 The Quays Salford, M50 3SP Telephone: 0161 886 2400 Fax: 0161 886 2401		DYNAMIC PROBE LOG		Hole No. WS01	
Project Jackson's Row		Sheet 1 of 1			
Job No 70010278		Client Jackson's Row Developments Limited		Date 02-11-15 02-11-15	
Contractor / Driller Geo Site Surveys		Method/Plant Used Competitor 130		Logged By RH	
		Co-Ordinates (NGR)		Ground Level (m AOD) 1 of 1	



Hammer Wt (kg)		General Remarks Magnetomer survey undertaken in the borehole due to UXO risk. Refusal at 3m BGL. Borehole continued with Dynamic Probe to 4.5m BGL. Probing stopped at 4.5m BGL due to 1.5m range of magnetometer. No groundwater observed during investigation period. 50mm standpipe installed to 3m BGL (1m plain, 3m slotted).
Hammer Drop (mm)		
Cone Dia (mm)		
Cone Type		
Damper		
Scale 1:37.5	Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.	

08 WSP DYNAMIC PROBE LOG 70010278 - JACKSON'S ROW.GPJ WSPTEMPLATE1.03 GDT 4/1/17

 WSP Parsons Brinckerhoff The Victoria, 150-182 The Quays Salford, M50 3SP Telephone: 0161 886 2400 Fax: 0161 886 2401		WINDOW SAMPLE LOG		Hole No. WS02	
Project Jackson's Row		Sheet 1 of 1			
Job No 70010278		Client Jackson's Row Developments Limited		Date 02-11-15 02-11-15	
Contractor / Driller Geo Site Surveys		Method/Plant Used Competitor 130		Logged By RH	
		Co-Ordinates (NGR)		Ground Level (m AOD)	

SAMPLES & TESTS							STRATA					Install / Backfill
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. 50 mm
								0.19	MADE GROUND: Grey concrete		MG	
0.60-0.80	ES	.							MADE GROUND: Loose red-brown slightly gravelly fine and medium sand. Gravel is medium and coarse sandstone, brick, and shells.			
1.00	(S)	2,1,1 1,1,1 N=4.						(2.74)	0.60 - 0.70 m bgl. Shell fragments.		MG	
2.00	(S)	3,2,2 2,1,2 N=7.							1.65 - 1.80 m bgl. Brick gravel.			
3.00	(S)	25,-,50 N=50/ 0.05.						2.70 - 2.75 m bgl. Coal fragments. 2.85 - 2.93 m bgl. Brick gravel.	2.70 - 2.75 m bgl. Coal fragments. 2.85 - 2.93 m bgl. Brick gravel.		SSG END	
								3.00	Red-brown medium grained SANDSTONE. Borehole terminated due to refusal.			

Hole Diameter			Recovery			Water Strikes					
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing
						General Remarks Refusal at 3.00m BGL. No groundwater was observed during the investigation period. 50mm standpipe installed to 3m BGL. (1m plain, 2m slotted).					
Scale 1:37.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.									

08 WSP WINDOW SAMPLE LOG 70010278 - JACKSON'S ROW.GPJ WSPTEMPLATE1.03.GDT 4/1/17

 WSP Parsons Brinckerhoff The Victoria, 150-182 The Quays Salford, M50 3SP Telephone: 0161 886 2400 Fax: 0161 886 2401		WINDOW SAMPLE LOG				Hole No. WS03						
		Project Jackson's Row				Sheet 1 of 1						
Job No 70010278		Client Jackson's Row Developments Limited				Date 02-11-15 02-11-15						
Contractor / Driller Geo Site Surveys		Method/Plant Used Competitor 130		Logged By RH		Co-Ordinates (NGR)		Ground Level (m AOD)				
SAMPLES & TESTS							STRATA				Install / Backfill	
Depth	Type	Test Result	PID (ppmV)	HSV (kN/m2)	P Pen (kN/m2)	Water	Elev. (mAOD)	Depth (Thickness)	Description	Legend	Geology	Dia. 50 mm
0.80-1.00	ES							0.22	MADE GROUND: Grey concrete.		MG	
1.00	(S)	1.0.0 0.1.0 N=1.						0.42	MADE GROUND: Red-brown slightly clayey slightly gravelly medium sand MADE GROUND. Gravel comprises brick.		MG	
								0.62	MADE GROUND: Light grey limestone gravel. subbase.		MG	
								(0.58)	MADE GROUND: Light orange-brown slightly clayey slightly gravelly sand. Gravel is fine and medium coal and brick.		MG	
								1.20				
								1.41	MADE GROUND: Light orange-brown slightly sandy clay.		MG	
2.00	(S)	2.2.2 2.1.2 N=7.						(1.09)	MADE GROUND: Red brown slightly gravelly medium sand. Gravel is coarse red brown sandstone.		MG	
								2.50				
3.00	(S)	2.3.4 2.2.3 N=11.						(1.50)	MADE GROUND: Red-orange sandy medium and coarse gravel. Gravel is primarily brick with occasional concrete.		MG	
								4.00				
4.00	(S)	2.1.4 16.20.10 N=50/ 0.27.							Borehole terminated due to refusal. Possible sandstone rockhead.		END	
Hole Diameter			Recovery			Water Strikes						
Depth	Diameter (mm)	Remarks	Core Top (m)	Core Base (m)	% Recovery	Date	Time	Strike	Minutes	Standing	Casing	
						General Remarks Refusal at 4.25m BGL. Possible sandstone rockhead. No groundwater was observed during the investigation period. Standpipe installed to 3m BGL (1m plain, 2m slotted).						
Scale 1:37.5		Notes: All dimensions in metres. Logs should be read in accordance with the provided Key. Descriptions are based on visual and manual identification.										

08 WSP WINDOW SAMPLE LOG 70010278 - JACKSON'S ROW.GPJ WSPTEMPLATE1.03.GDT 4/1/17

**TESTCONSULT LIMITED**

Ruby House, 40A Hardwick Grange, Warrington WA1 4RF

Tel (01925) 286880 Fax (01925) 286881

**LABORATORY TEST CERTIFICATE
UNIAXIAL COMPRESSIVE STRENGTH OF ROCK SPECIMEN**

Site:	Jacksons Row	Job No.:	
Client:	WSP Group	Lab Ref No.:	SA 22538
		Date Received:	24/11/2015
		Date Tested:	30/11/2015
		Date Reported:	16/12/2015
Originator:	Robert Home		

Sample Reference	Moisture Content	Density (Mg/m ³)	Uniaxial Compressive Strength (mPa)
7.77-8.00	6.1	2030	11.5
9.38-9.58	7.2	2100	14.4
11.10-11.34	6.5	2090	17.9
13.39-13.69	8.5	2010	10.3

Tested in accordance with ISRM

Approved Signature**TESTCONSULT LIMITED**

■ Liam Williams, Operations Manager

TESTCONSULT LIMITED

Ruby House, 40A Hardwick Grange, WARRINGTON, WA1 4RF

Tel (01925) 286880 Fax (01925) 286881

**Laboratory Test Report
Point Load Strength Index**

Project : Jacksons Row	Job Number -
Client : WSP Group	Lab Ref No SA 22538
	Date Received 24/11/2015
	Date Tested
Originator : Robert Home	Date Reported 16/12/2015

Point Load Strength Index

Sample No:-	Depth (m)	Description	Type	Orientation	W (mm)	D (mm)	P (kN)	De ² (mm ²)	De (mm)	I _s	F	I _{s(50)} MN/m ²
WSP	6.29	1	d	II	63	75	0.60	5625.00	75.00	0.107	1.20	0.13
WSP	6.29	1	a	⊥	75	54	1.00	5156.62	71.81	0.194	1.18	0.23
WSP	7.64	1	a	⊥	75	110	2.00	10504.23	102.49	0.190	1.38	0.26
WSP	8.94	1	a	⊥	75	86	1.80	8212.40	90.62	0.219	1.31	0.29
WSP	9.82	1	a	⊥	75	50	2.10	4774.65	69.10	0.440	1.16	0.51
WSP	10.90	1	a	⊥	75	59	1.90	5634.08	75.06	0.337	1.20	0.40
WSP	12.12	1	d	II	72	75	1.10	5625.00	75.00	0.196	1.20	0.23
WSP	12.12	1	a	⊥	75	72	2.20	6875.49	82.92	0.320	1.26	0.40
WSP	13.23	1	a	⊥	75	52	1.40	4965.63	70.47	0.282	1.17	0.33
WSP	14.16	1	a	⊥	75	84	2.90	8021.41	89.56	0.362	1.3	0.47
Description 1: Weak reddish brown coarse grained SANDSTONE												

I_{s(50)} MN/m² for Description 1

	Description 1
Min	0.13
Mean	0.32
Max	0.51

Test

A = axial

D = diametrical

Relationship to planes of weakness

IL = irregular lump

II = parallel

⊥ = perpendicular

	I _{s(50)} MN/m ²	U.C.S. MN/m ²
Extremely Weak	<0.05	0.6-1.0
Very Weak	0.05-0.20	1.0-5.0
Weak	0.20-0.50	5.0-25.0
Medium Strong	0.50-2.00	25-50
Strong	2.00-4.50	50-100
Very Strong	4.50-9.00	100-250
Extremely Strong	9.00 +	>250

Approved Signature**TESTCONSULT LIMITED**

■ Liam Williams, Operations Manager



WSP Environmental
The Victoria
150-182 The Quays
Salford
Manchester
Lancashire
M50 3SP

Attention: Robert Home

CERTIFICATE OF ANALYSIS

Date: 14 November 2015
Customer: H_WSP_MAN
Sample Delivery Group (SDG): 151106-84
Your Reference: 70010278
Location: Jackson's Row
Report No: 337982

We received 4 samples on Friday November 06, 2015 and 4 of these samples were scheduled for analysis which was completed on Friday November 13, 2015. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG:	151106-84	Location:	Jackson's Row	Order Number:	70010278
Job:	H_WSP_MAN-277	Customer:	WSP Environmental	Report Number:	337982
Client Reference:	70010278	Attention:	Robert Home	Superseded Report:	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
12392681	WS01		2.00	02/11/2015
12392683	WS01		2.75	02/11/2015
12392684	WS02		0.80	02/11/2015
12392685	WS03		1.00	02/11/2015

Only received samples which have had analysis scheduled will be shown on the following pages.



SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

SOLID**Results Legend**

Test

No Determination
Possible**Lab Sample No(s)****Customer
Sample Reference****AGS Reference****Depth (m)****Container**

12392685	WS03	1.00	1kg TUB
12392684	WS02	0.80	1kg TUB
12392683	WS01	2.75	1kg TUB
12392681		2.00	1kg TUB

Anions by Kone (soil)	All	NDPs: 0 Tests: 4	X	X	X	X
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 4	X	X	X	X
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 4	X	X	X	X
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 4	X	X	X	X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 4	X	X	X	X
Metals in solid samples by OES	All	NDPs: 0 Tests: 4	X	X	X	X
PAH by GCMS	All	NDPs: 0 Tests: 4	X	X	X	X
pH	All	NDPs: 0 Tests: 4	X	X	X	X
Sample description	All	NDPs: 0 Tests: 4	X	X	X	X
Total Organic Carbon	All	NDPs: 0 Tests: 4	X	X	X	X
TPH CWG GC (S)	All	NDPs: 0 Tests: 4	X	X	X	X



SDG:	151106-84	Location:	Jackson's Row	Order Number:	70010278
Job:	H_WSP_MAN-277	Customer:	WSP Environmental	Report Number:	337982
Client Reference:	70010278	Attention:	Robert Home	Superseded Report:	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
12392681	WS01	2.00	Dark Brown	Sand	0.1 - 2 mm	Brick	Concrete/Aggregate
12392683	WS01	2.75	Dark Brown	Sandy Silt Loam	0.1 - 2 mm	Stones	None
12392684	WS02	0.80	Dark Brown	Sand	0.1 - 2 mm	Stones	None
12392685	WS03	1.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Order Number: 70010278
Report Number: 337982
Superseded Report:

Page 5 of 24

CERTIFICATE OF ANALYSIS

SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

PAH by GCMS

[illegible]



CERTIFICATE OF ANALYSIS

SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

TPH CWG (S)

Results Legend			Customer Sample R		WS01	WS01	WS02	WS03		
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sampled Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		2.00	2.75	0.80	1.00		
M	mCERTS accredited.				Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
aq	Aqueous / settled sample.				02/11/2015	02/11/2015	02/11/2015	02/11/2015		
diss.filt	Dissolved / filtered sample.									
tot.unfilt	Total / unfiltered sample.									
*	Subcontracted test.									
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery				06/11/2015	06/11/2015	06/11/2015	06/11/2015		
(F)	Trigger breach confirmed				151106-84	151106-84	151106-84	151106-84		
1-5&*\$@	Sample deviation (see appendix)				12392681	12392683	12392684	12392685		
Component	LOD/Units	Method								
GRO Surrogate % recovery**	%	TM089			54	109	110	107		
					2	2	2	2		
GRO TOT (Moisture Corrected)	<0.044 mg/kg	TM089			<0.044	<0.044	<0.044	<0.044		
					2 M	2 M	2 M	2 M		
Methyl tertiary butyl ether (MTBE)	<0.005 mg/kg	TM089			<0.005	<0.005	<0.005	<0.005		
					2 #	2 #	2 #	2 #		
Benzene	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2 M	2 M	2 M	2 M		
Toluene	<0.002 mg/kg	TM089			0.0022	<0.002	<0.002	<0.002		
					2 M	2 M	2 M	2 M		
Ethylbenzene	<0.003 mg/kg	TM089			<0.003	<0.003	<0.003	<0.003		
					2 M	2 M	2 M	2 M		
m,p-Xylene	<0.006 mg/kg	TM089			<0.006	<0.006	<0.006	<0.006		
					2 M	2 M	2 M	2 M		
o-Xylene	<0.003 mg/kg	TM089			<0.003	<0.003	<0.003	<0.003		
					2 M	2 M	2 M	2 M		
sum of detected mpo xylene by GC	<0.009 mg/kg	TM089			<0.009	<0.009	<0.009	<0.009		
					2	2	2	2		
sum of detected BTEX by GC	<0.024 mg/kg	TM089			<0.024	<0.024	<0.024	<0.024		
					2	2	2	2		
Aliphatics >C5-C6	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aliphatics >C6-C8	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aliphatics >C8-C10	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aliphatics >C10-C12	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aliphatics >C12-C16	<0.1 mg/kg	TM173			4.34	<0.1	<0.1	<0.1		
Aliphatics >C16-C21	<0.1 mg/kg	TM173			5.98	<0.1	<0.1	<0.1		
Aliphatics >C21-C35	<0.1 mg/kg	TM173			22.8	<0.1	<0.1	<0.1		
Aliphatics >C35-C44	<0.1 mg/kg	TM173			7.21	<0.1	<0.1	<0.1		
Total Aliphatics >C12-C44	<0.1 mg/kg	TM173			40.3	<0.1	<0.1	<0.1		
Aromatics >EC5-EC7	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aromatics >EC7-EC8	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aromatics >EC8-EC10	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aromatics >EC10-EC12	<0.01 mg/kg	TM089			<0.01	<0.01	<0.01	<0.01		
					2	2	2	2		
Aromatics >EC12-EC16	<0.1 mg/kg	TM173			20.4	<0.1	<0.1	<0.1		
Aromatics >EC16-EC21	<0.1 mg/kg	TM173			86.6	<0.1	0.99	0.474		
Aromatics >EC21-EC35	<0.1 mg/kg	TM173			124	<0.1	4.43	4.04		
Aromatics >EC35-EC44	<0.1 mg/kg	TM173			31.1	<0.1	3.85	4.61		
Aromatics >EC40-EC44	<0.1 mg/kg	TM173			10.8	<0.1	2	2.42		
Total Aromatics >EC12-EC44	<0.1 mg/kg	TM173			262	<0.1	9.27	9.13		
Total Aliphatics & Aromatics >C5-C44	<0.1 mg/kg	TM173			303	<0.1	9.27	9.13		



SDG:	151106-84	Location:	Jackson's Row	Order Number:	70010278
Job:	H_WSP_MAN-277	Customer:	WSP Environmental	Report Number:	337982
Client Reference:	70010278	Attention:	Robert Home	Superseded Report:	

Asbestos Identification - Soil

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS01 2.00 SOLID 02/11/2015 00:00:00 09/11/2015 11:25:47 151106-84 12392681 TM048	11/11/2015	Rebecca Rawlings	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS01 2.75 SOLID 02/11/2015 00:00:00 09/11/2015 12:22:02 151106-84 12392683 TM048	11/11/2015	Rebecca Rawlings	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS02 0.80 SOLID 02/11/2015 00:00:00 09/11/2015 11:32:55 151106-84 12392684 TM048	11/11/2015	Rebecca Rawlings	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS03 1.00 SOLID 02/11/2015 00:00:00 09/11/2015 11:18:12 151106-84 12392685 TM048	11/11/2015	Rebecca Rawlings	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



SDG:	151106-84	Location:	Jackson's Row	Order Number:	70010278
Job:	H_WSP_MAN-277	Customer:	WSP Environmental	Report Number:	337982
Client Reference:	70010278	Attention:	Robert Home	Superseded Report:	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample ¹	Surrogate Corrected
ASB_PREP				
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
TM243		Mixed Anions In Soils By Kone		

¹ Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.



SDG:	151106-84	Location:	Jackson's Row	Order Number:	70010278
Job:	H_WSP_MAN-277	Customer:	WSP Environmental	Report Number:	337982
Client Reference:	70010278	Attention:	Robert Home	Superseded Report:	

Test Completion Dates

Lab Sample No(s)	12392681	12392683	12392684	12392685
Customer Sample Ref.	WS01	WS01	WS02	WS03
AGS Ref.				
Depth	2.00	2.75	0.80	1.00
Type	SOLID	SOLID	SOLID	SOLID
Anions by Kone (soil)	13-Nov-2015	13-Nov-2015	13-Nov-2015	13-Nov-2015
Asbestos ID in Solid Samples	11-Nov-2015	11-Nov-2015	11-Nov-2015	11-Nov-2015
EPH CWG (Aliphatic) GC (S)	11-Nov-2015	11-Nov-2015	11-Nov-2015	11-Nov-2015
EPH CWG (Aromatic) GC (S)	11-Nov-2015	11-Nov-2015	11-Nov-2015	11-Nov-2015
GRO by GC-FID (S)	10-Nov-2015	10-Nov-2015	10-Nov-2015	10-Nov-2015
Metals in solid samples by OES	12-Nov-2015	12-Nov-2015	11-Nov-2015	11-Nov-2015
PAH by GCMS	11-Nov-2015	11-Nov-2015	11-Nov-2015	11-Nov-2015
pH	12-Nov-2015	12-Nov-2015	12-Nov-2015	12-Nov-2015
Sample description	09-Nov-2015	09-Nov-2015	09-Nov-2015	09-Nov-2015
Total Organic Carbon	13-Nov-2015	13-Nov-2015	12-Nov-2015	13-Nov-2015
TPH CWG GC (S)	11-Nov-2015	11-Nov-2015	11-Nov-2015	11-Nov-2015



SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

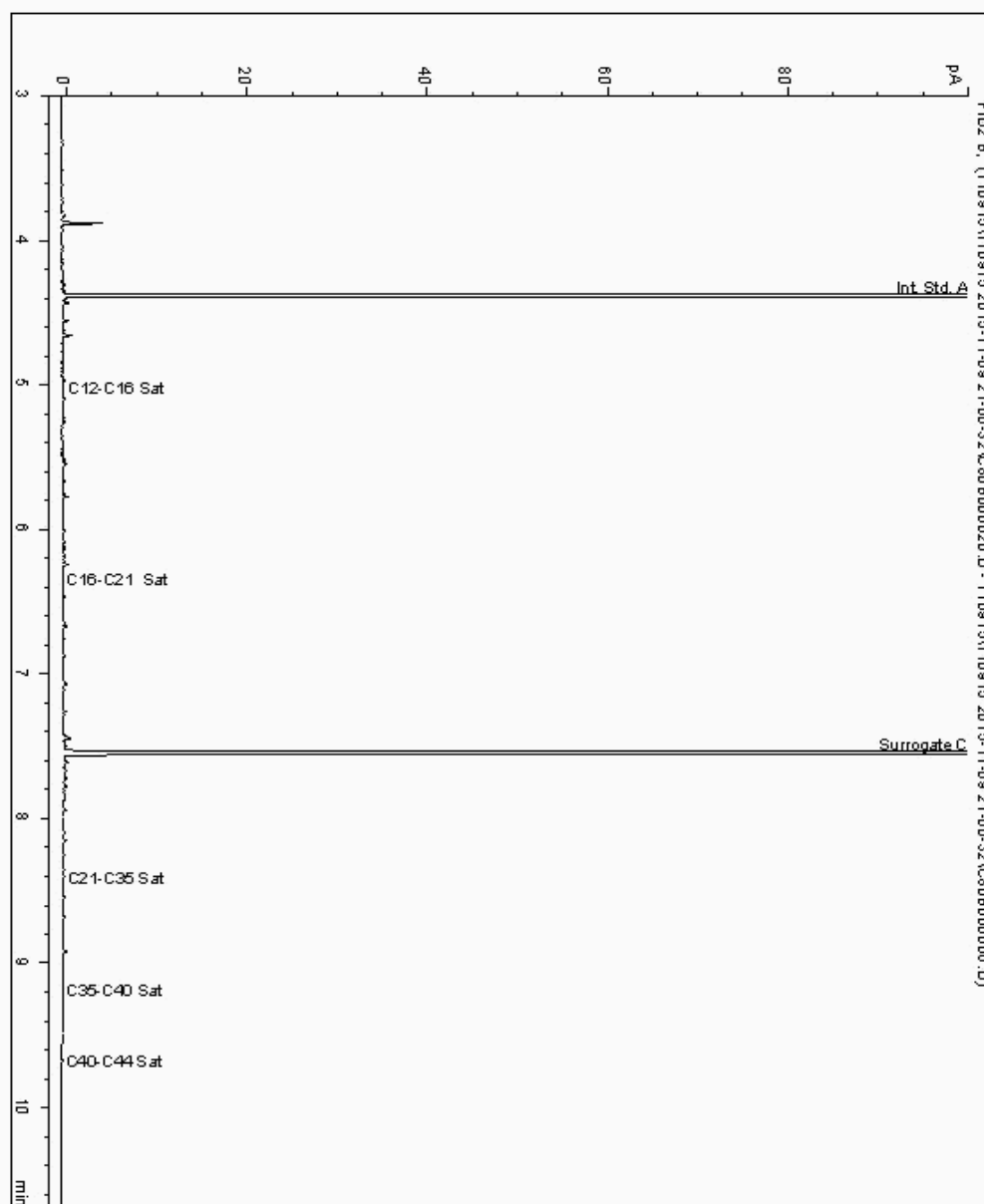
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 12403681
Sample ID : WS03

Depth : 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 11727299-
Date Acquired : 10/11/15 03:33:17
Units : ppb
Dilution :
CF : 1
Multiplier : 0.980





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

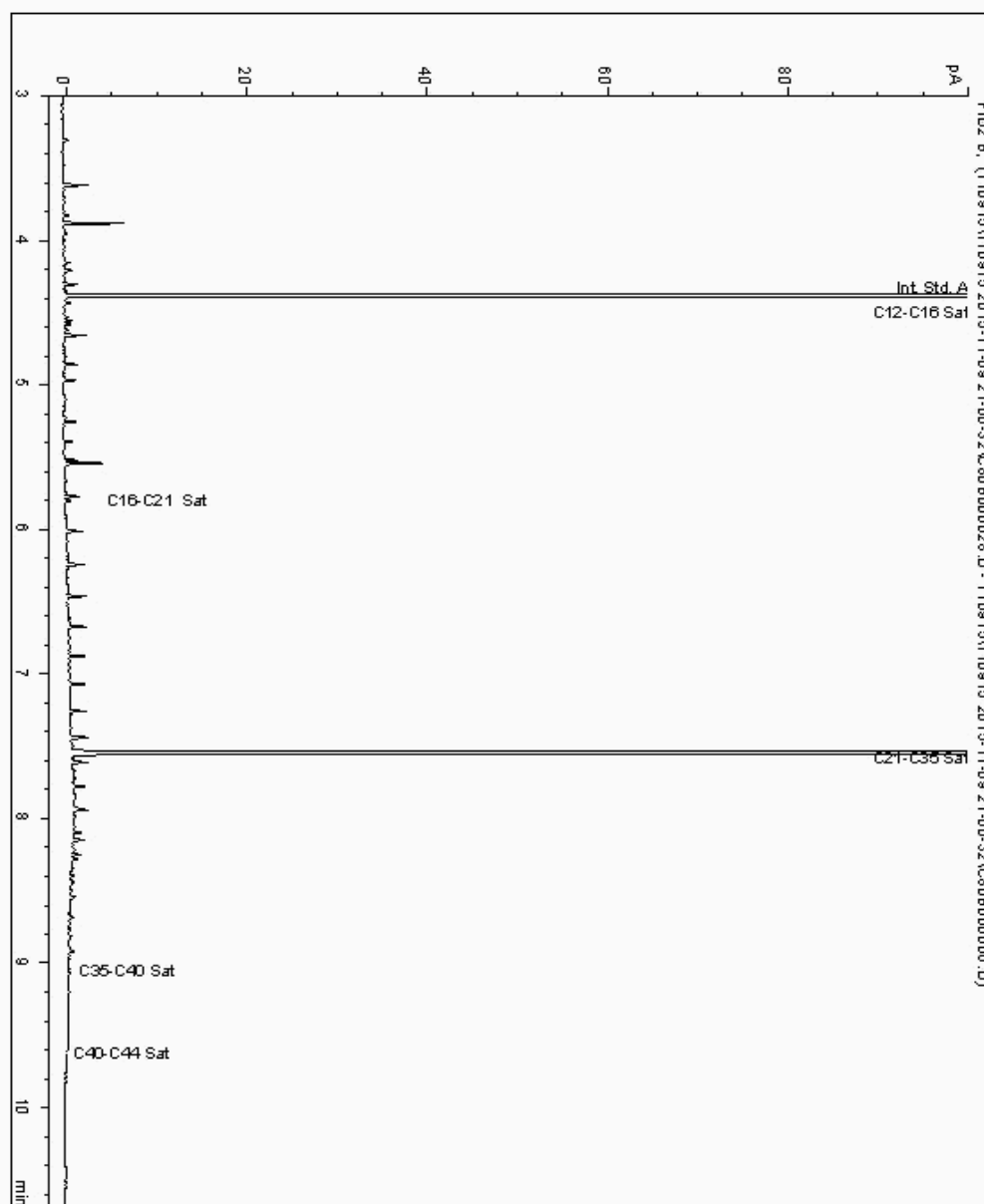
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 12403737
Sample ID : WS01

Depth : 2.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 11727228-
Date Acquired : 10/11/15 06:14:58
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

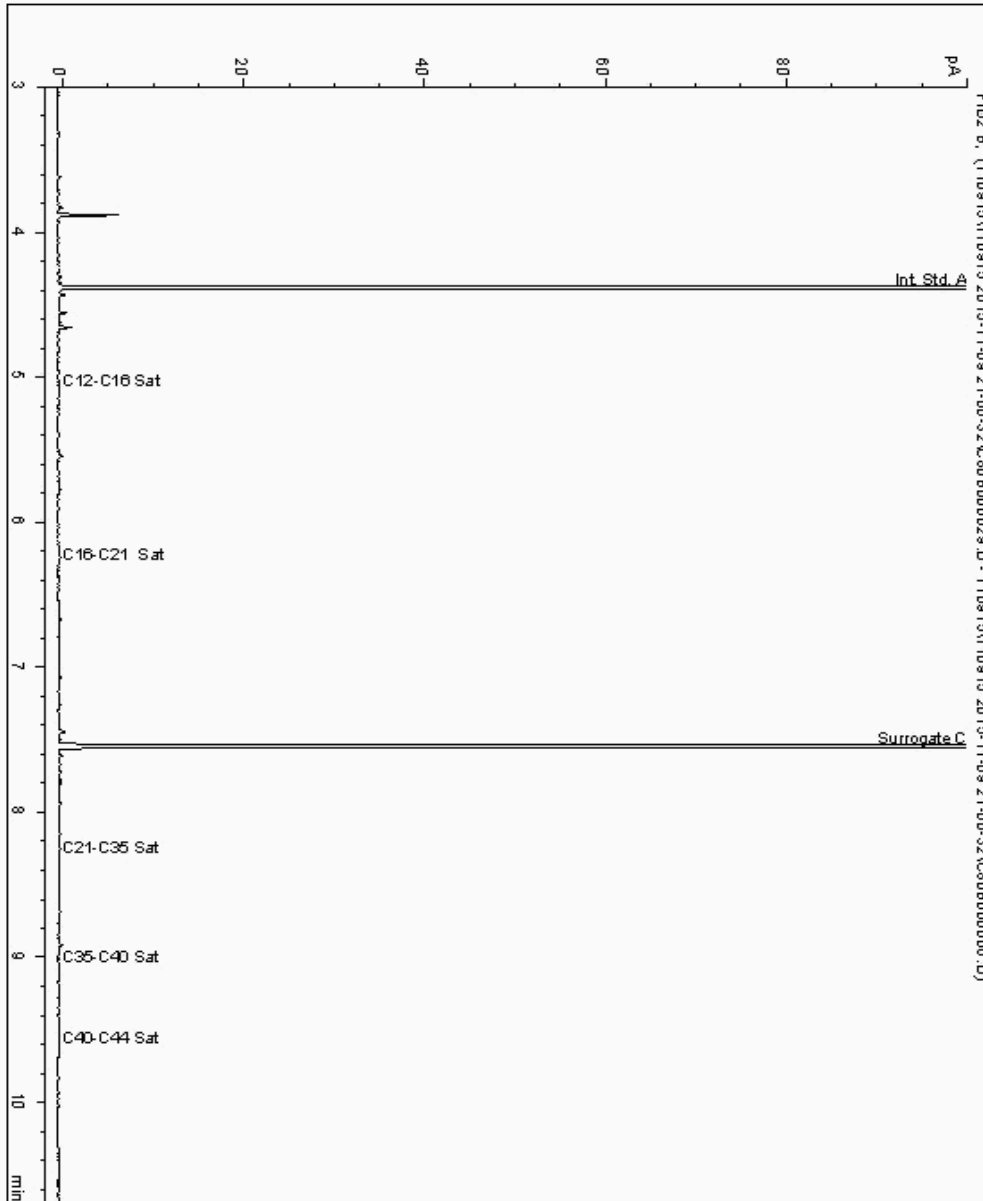
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 12403808
Sample ID : WS02

Depth : 0.80

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 11727271-
Date Acquired : 10/11/15 06:35:04
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

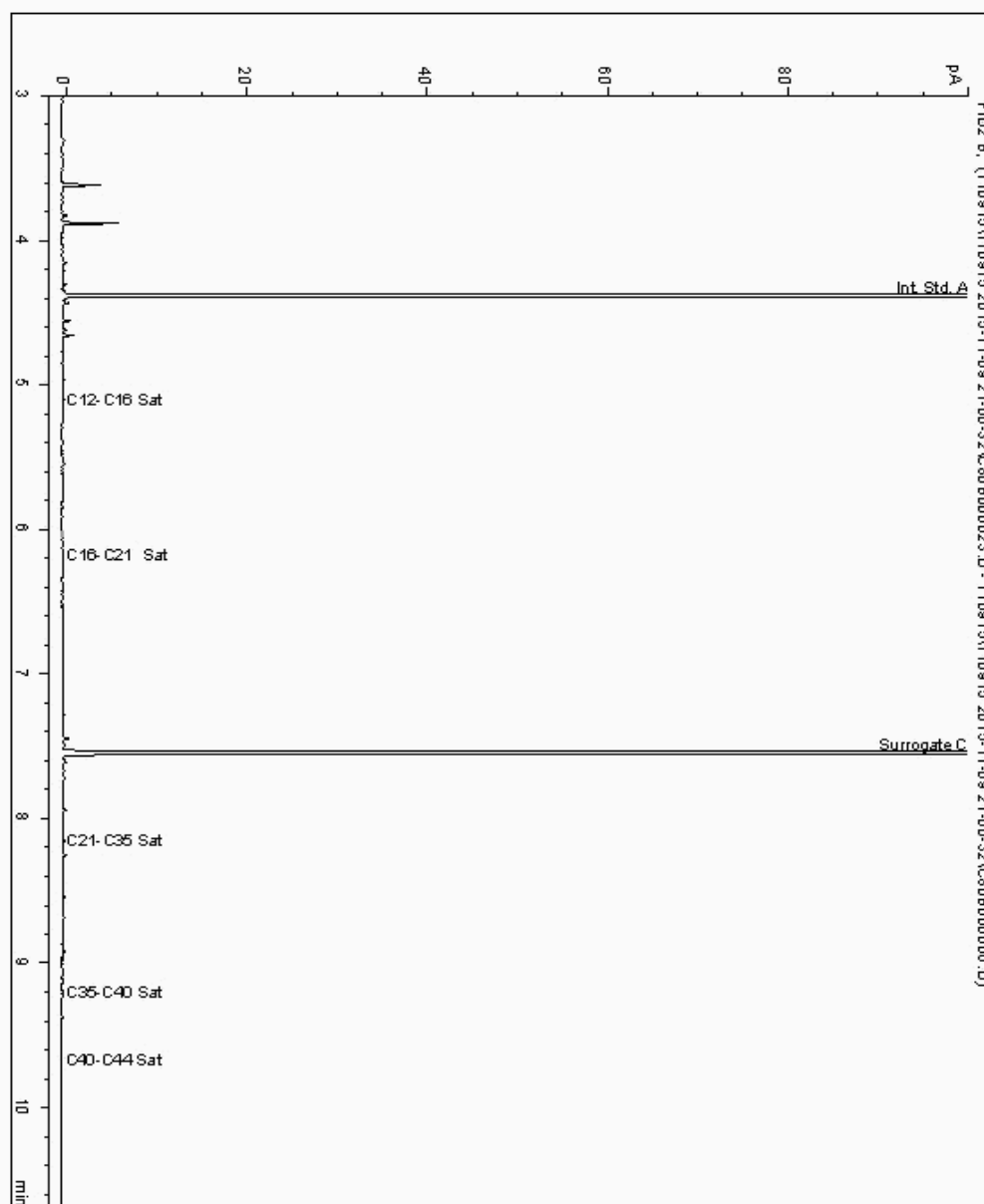
Analysis: EPH CWG (Aliphatic) GC (S)

Sample No : 12404148
Sample ID : WS01

Depth : 2.75

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 11727252-
Date Acquired : 10/11/15 04:33:53
Units : ppb
Dilution :
CF : 1
Multiplier : 0.980





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

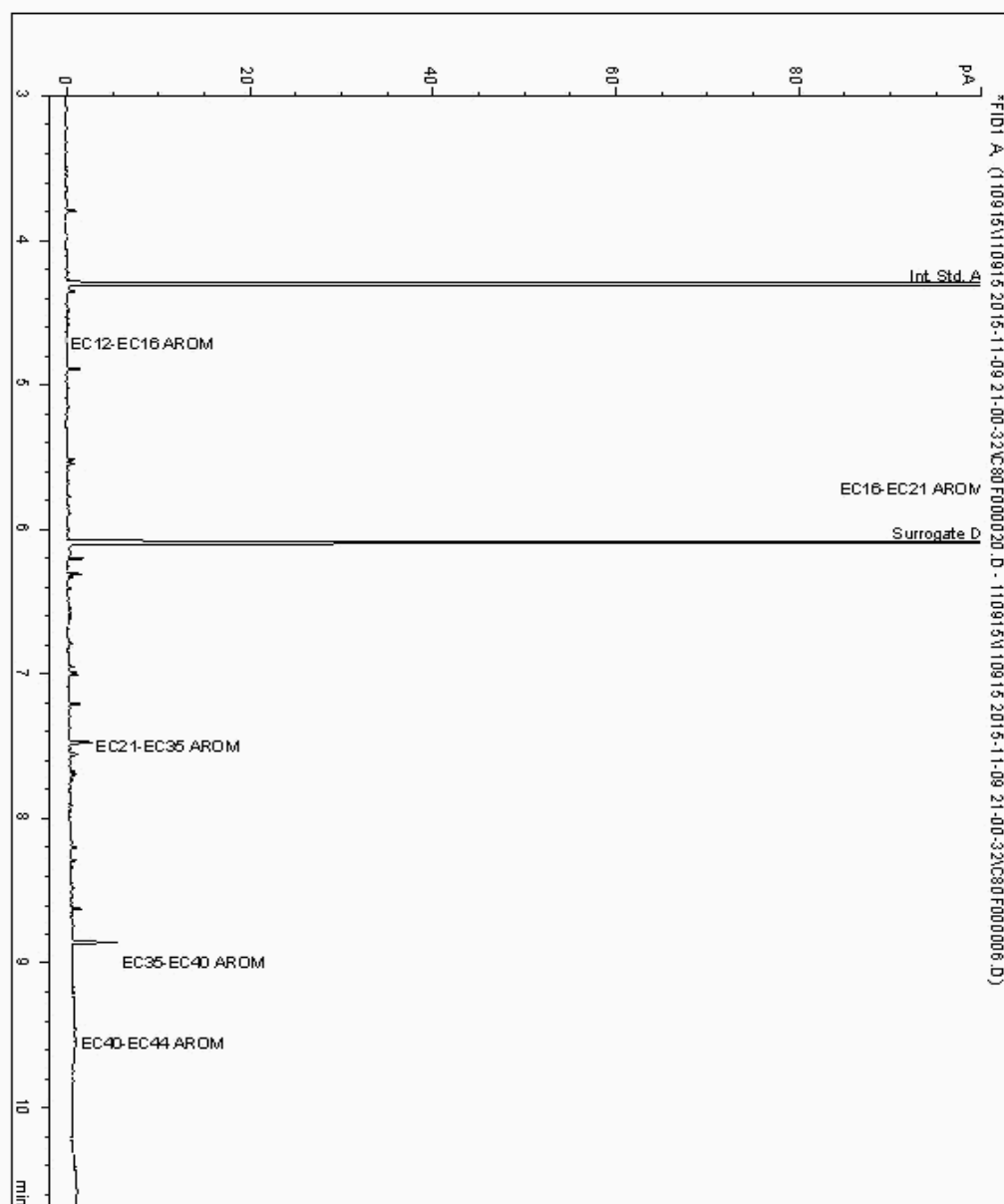
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 12403681
Sample ID : WS03

Depth : 1.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROMS (C12 - C44)

Sample Identity: 11727300-
Date Acquired : 10/11/15 03:33:17
Units : ppb
Dilution :
CF : 1
Multiplier : 0.980





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

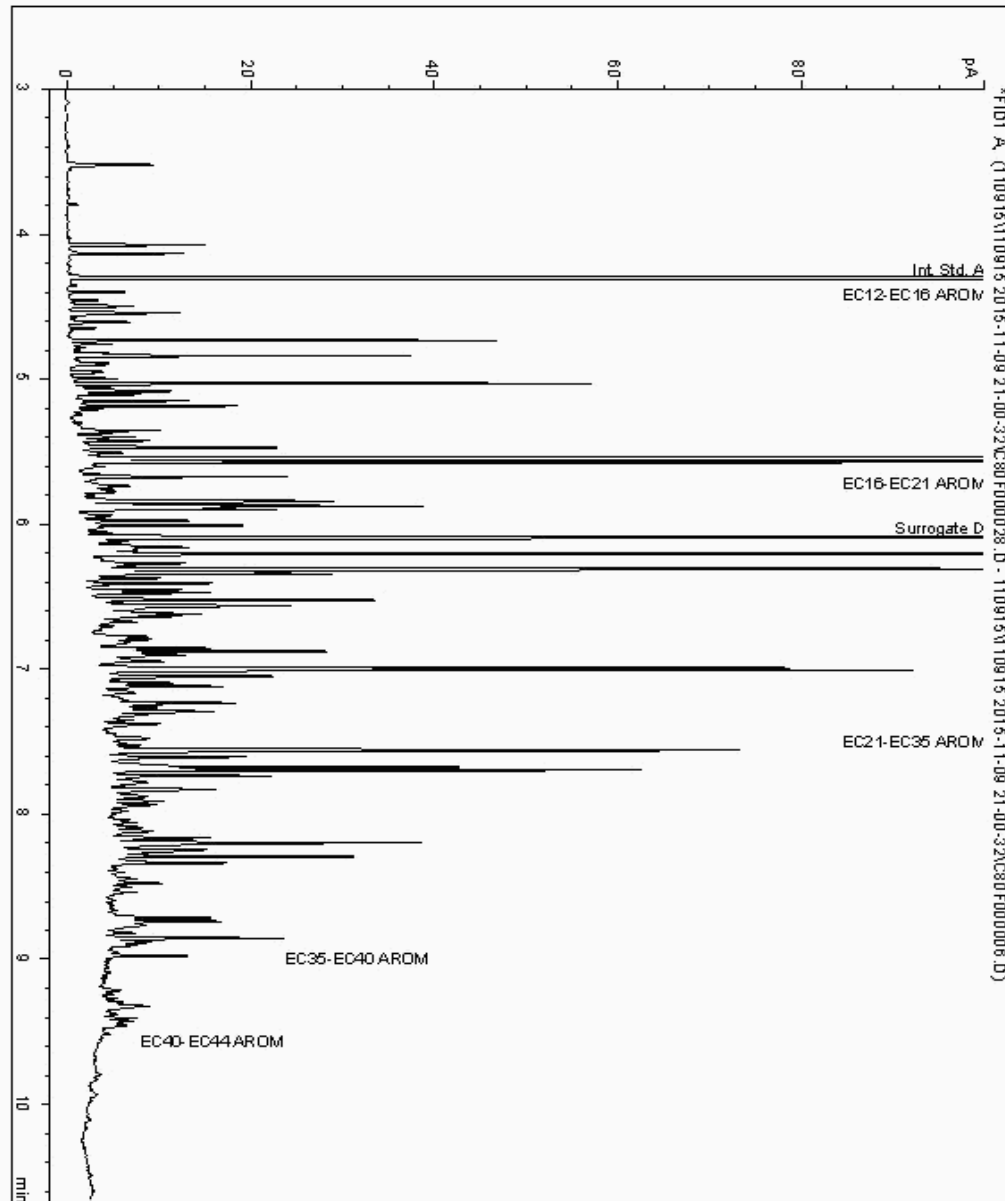
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 12403737
Sample ID : WS01

Depth : 2.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROMS (C12 - C44)

Sample Identity: 11727229-
Date Acquired : 10/11/15 06:14:58
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

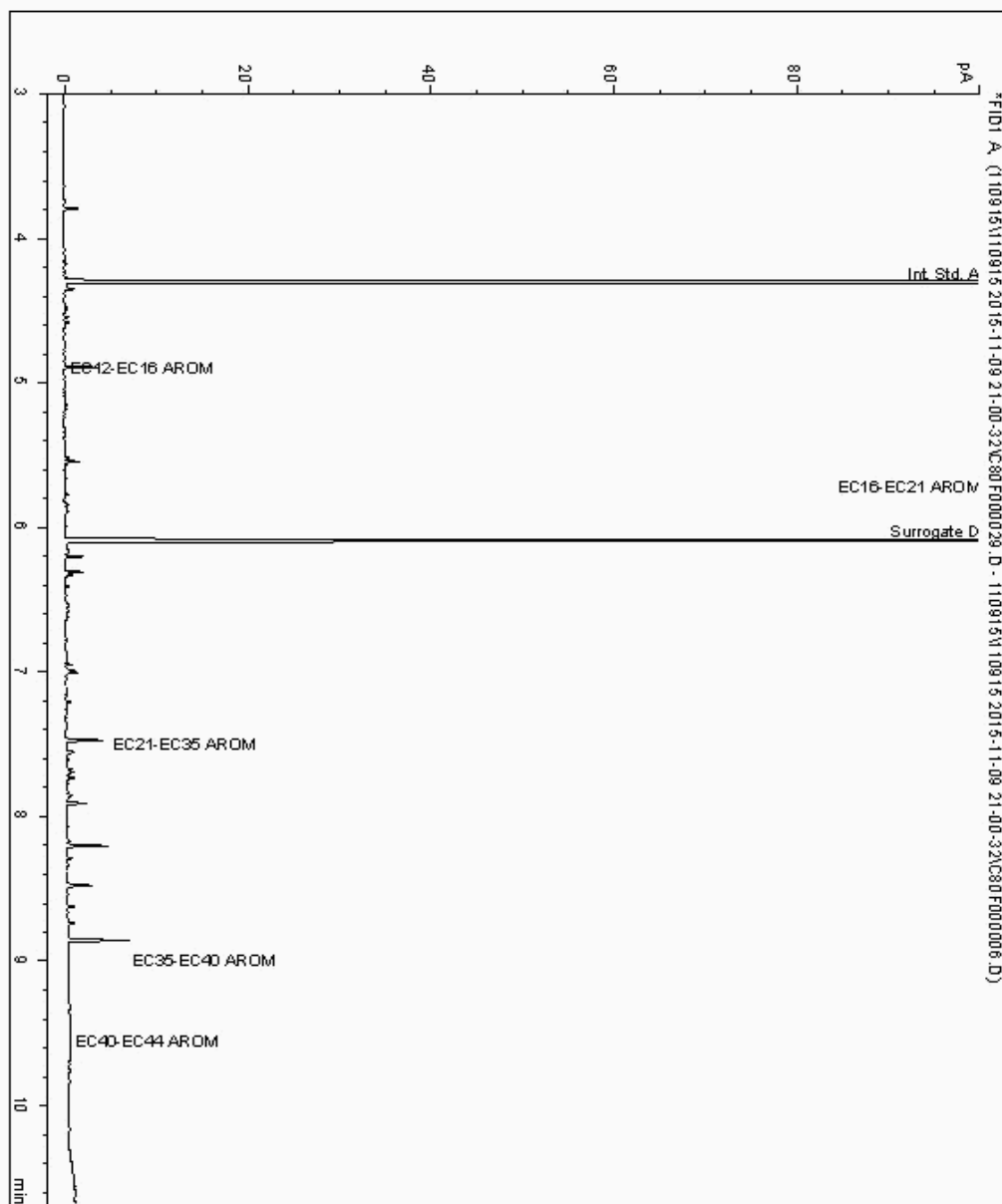
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 12403808
Sample ID : WS02

Depth : 0.80

Alcontrol/Geochem Analytical Services
Speciated TPH - AROMS (C12 - C44)

Sample Identity: 11727272-
Date Acquired : 10/11/15 06:35:04
Units : ppb
Dilution :
CF : 1
Multiplier : 1.010





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

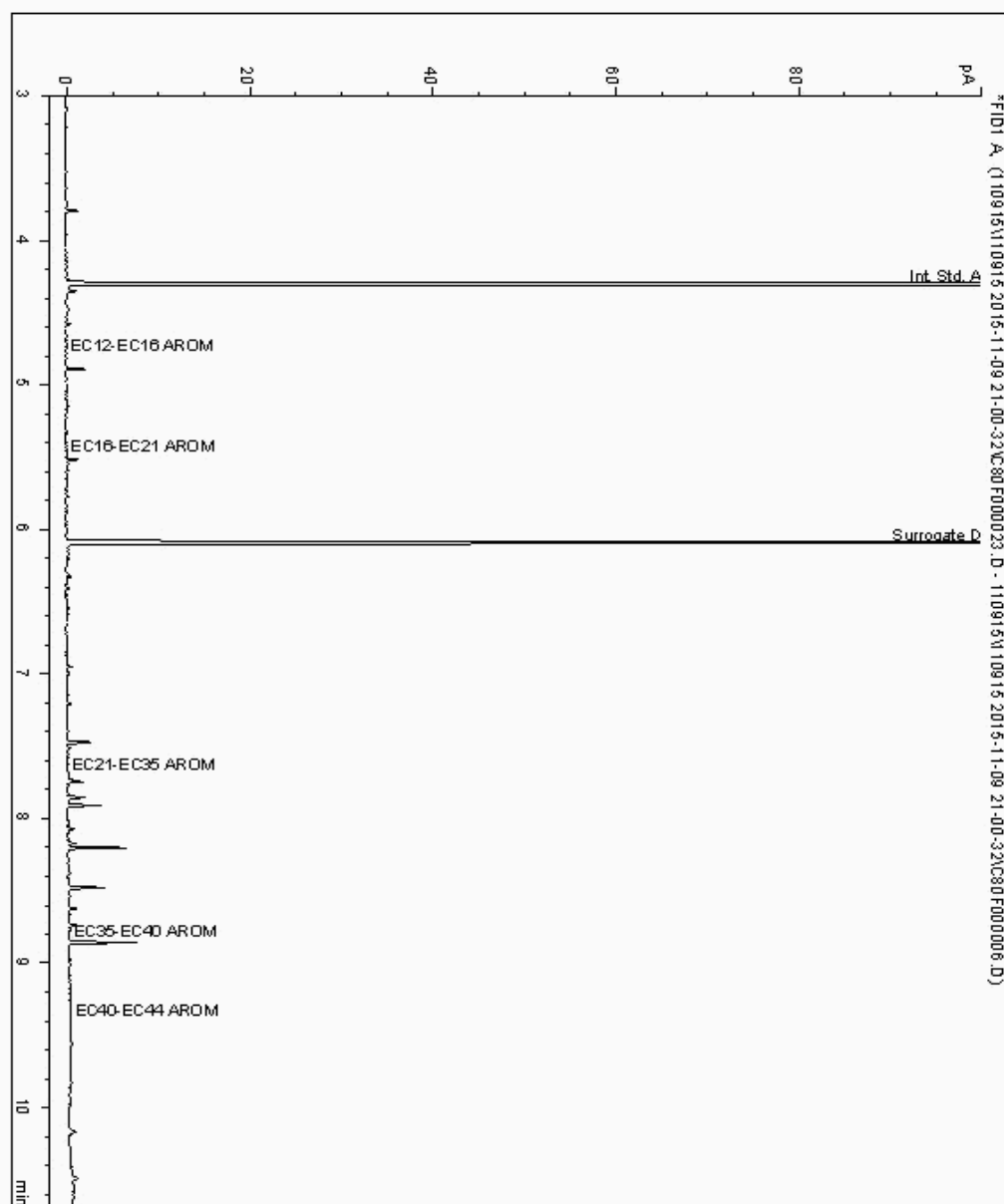
Analysis: EPH CWG (Aromatic) GC (S)

Sample No : 12404148
Sample ID : WS01

Depth : 2.75

Alcontrol/Geochem Analytical Services
Speciated TPH - AROMS (C12 - C44)

Sample Identity: 11727253-
Date Acquired : 10/11/15 04:33:53
Units : ppb
Dilution :
CF : 1
Multiplier : 0.980





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

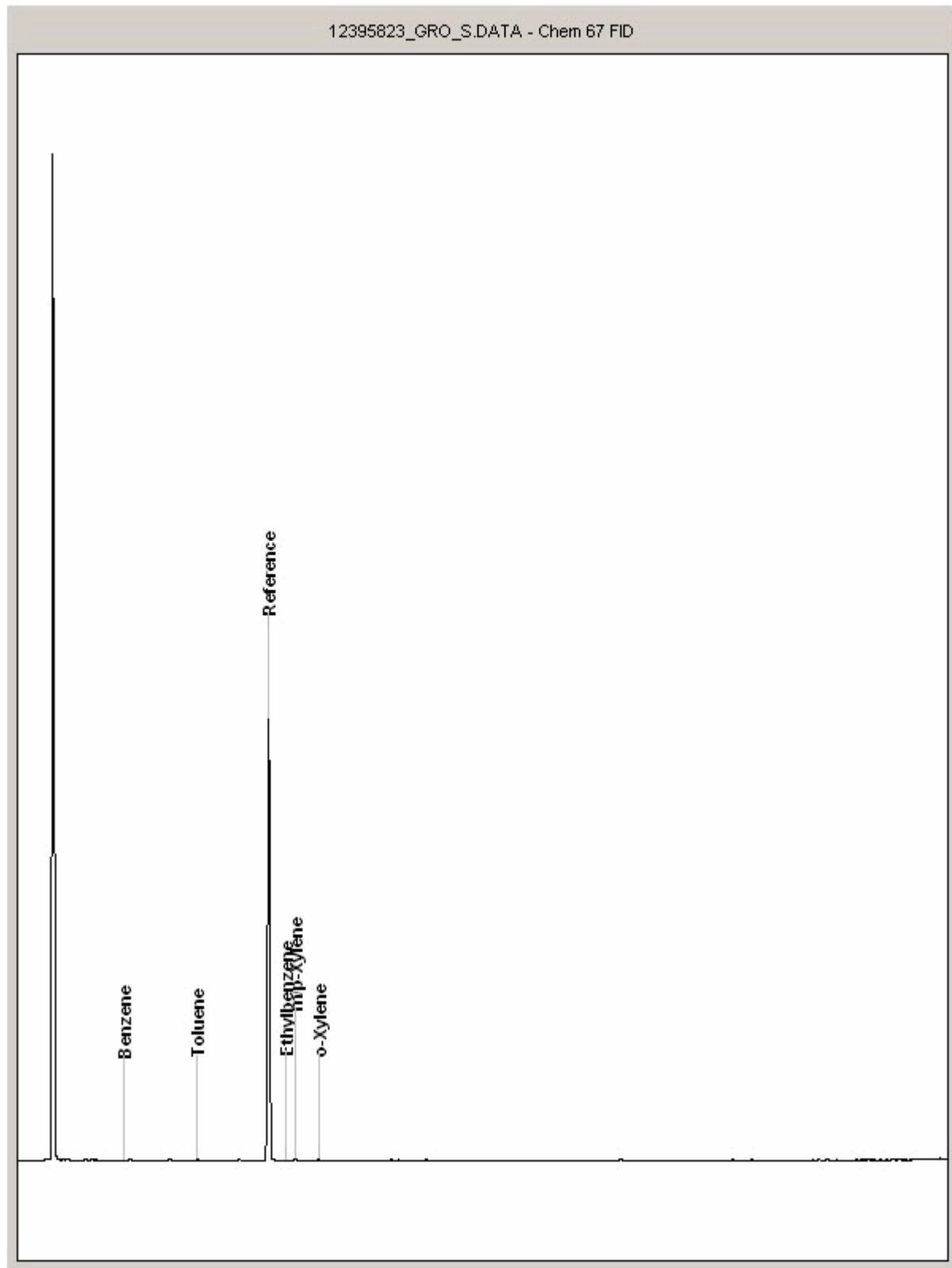
Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 12395823
Sample ID : WS01

Depth : 2.00





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

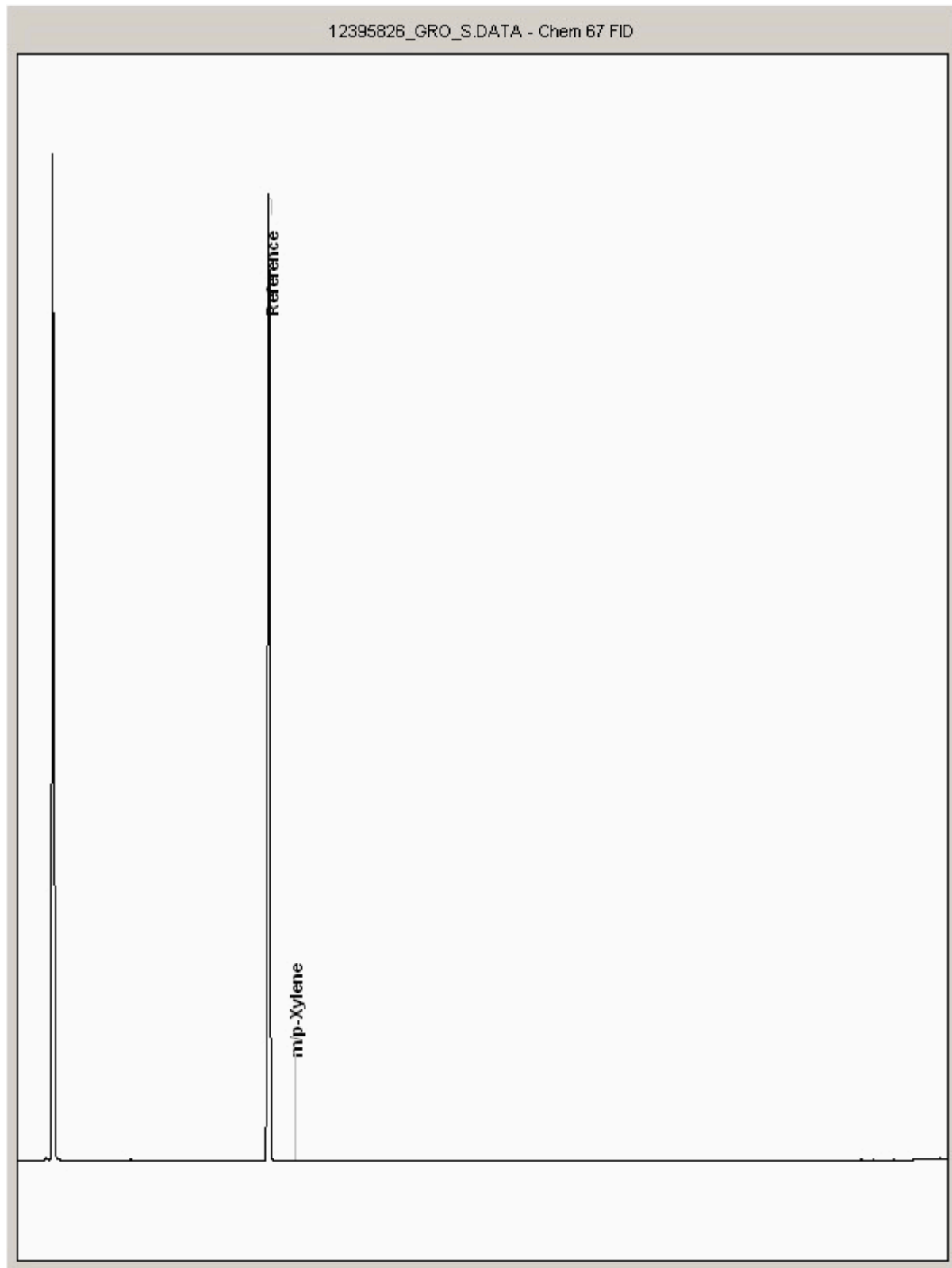
Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 12395826
Sample ID : WS03

Depth : 1.00





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

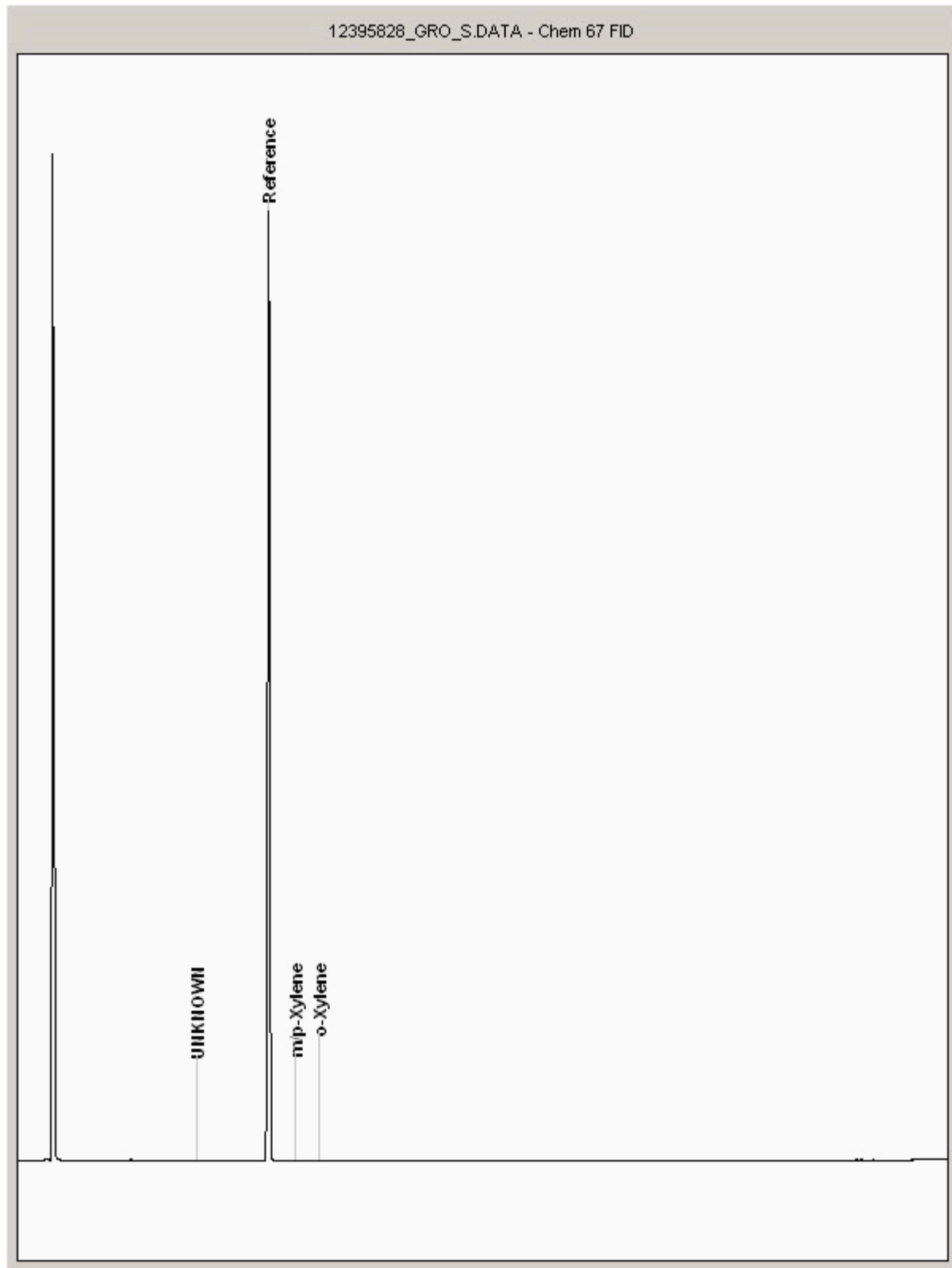
Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 12395828
Sample ID : WS02

Depth : 0.80





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

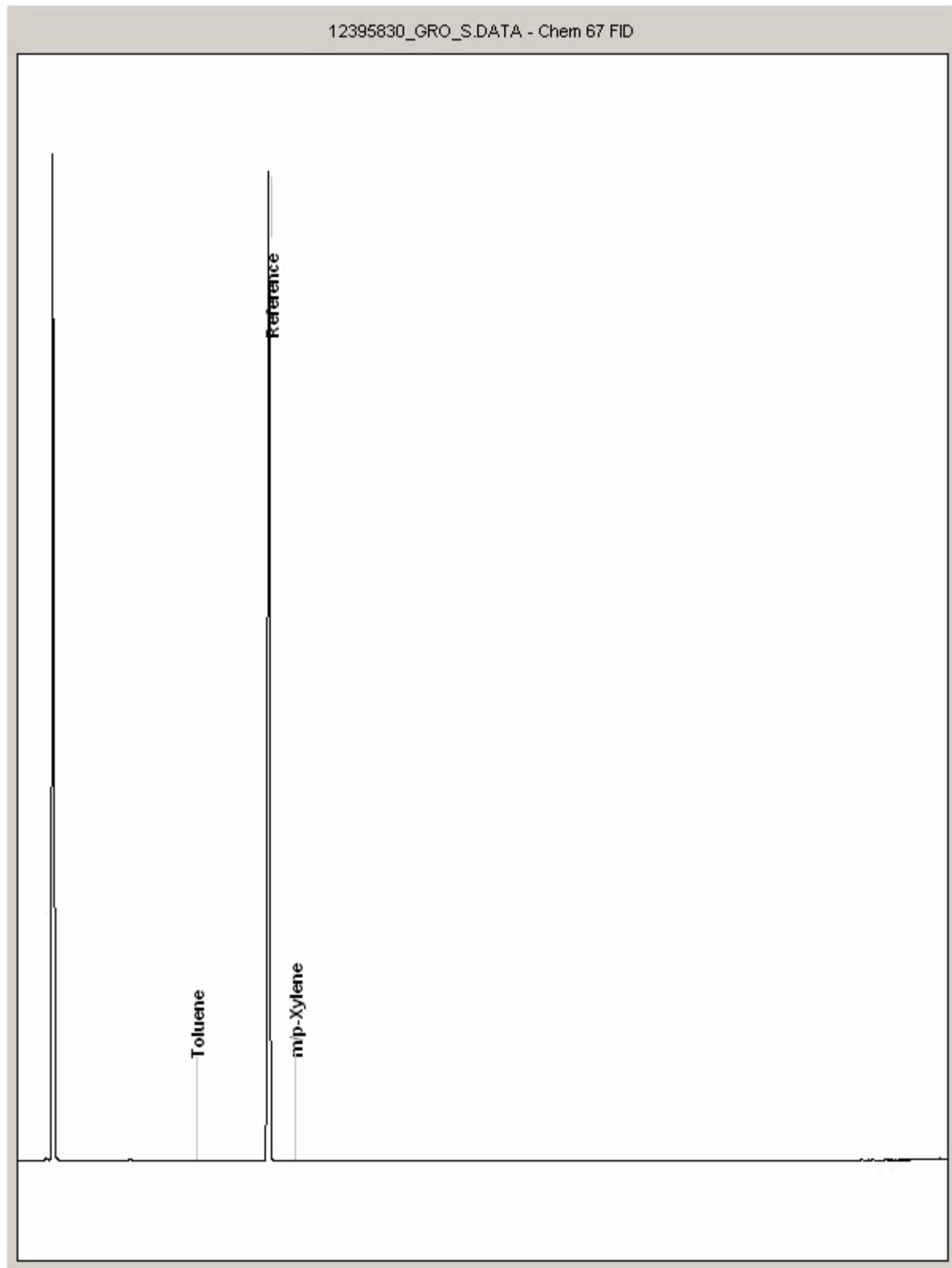
Order Number: 70010278
Report Number: 337982
Superseded Report:

Chromatogram

Analysis: GRO by GC-FID (S)

Sample No : 12395830
Sample ID : WS01

Depth : 2.75





SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH₄ by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C₄-C₁₀ range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOX THERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOX THERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOX THERM	HPLC
PHENOLS BY GC/MS	WET	DOM	SOX THERM	GC/MS
HERBICIDES	D&C	HBXANE ACETONE	SOX THERM	GC/MS
PESTICIDES	D&C	HBXANE ACETONE	SOX THERM	GC/MS
EPH (DRO)	D&C	HBXANE ACETONE	END OVER END	GC/FID
EPH (MIN OIL)	D&C	HBXANE ACETONE	END OVER END	GC/FID
EPH (CLEANED UP)	D&C	HBXANE ACETONE	END OVER END	GC/FID
EPH CAG BY GC	D&C	HBXANE ACETONE	END OVER END	GC/FID
POB TOT / POB CON	D&C	HBXANE ACETONE	END OVER END	GC/MS
POLYAROMATIC HYDROCARBONS (MS)	WET	HBXANE ACETONE	MICROWAVE TM218	GC/MS
C8-C40 (C8-C40) EZ FLASH	WET	HBXANE ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HBXANE ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM ACETONE	SONICATE	GC/MS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
EPH CAG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
POB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/MS
POB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/MS
SVOC	DOM	LIQUID/LIQUID SHAKE	GC/MS
FREESULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST CO/OPP	DOM	LIQUID/LIQUID SHAKE	GC/MS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GC/MS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GC/MS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC/MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-



SDG: 151106-84
Job: H_WSP_MAN-277
Client Reference: 70010278

Location: Jackson's Row
Customer: WSP Environmental
Attention: Robert Home

Order Number: 70010278
Report Number: 337982
Superseded Report:

Appendix General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill /made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before preservation was performed
\$	Sampled on date not provided
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than :
- Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



WSP Environmental
The Victoria
150-182 The Quays
Salford
Manchester
Lancashire
M50 3SP
Attention : Robert Home

CERTIFICATE OF ANALYSIS

Date:	04/12/2015 16:28		
Customer:	H_WSP_MAN		
Sample Delivery Group (SDG):	151126-71	Report No.:	340779
Your Reference:	70010278		
Location:	Jackson's Row		

We received 1 sample on Thursday November 26, 2015 and 1 of these samples were scheduled for analysis which was then completed on Friday December 04, 2015. Accredited laboratory tests are defined in the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with data sections alone.

All chemical testing (unless subcontracting) is performed at ALcontrol Hawarden Laboratories.

Approved By:

Sonia McWhan
Operations Manager



LIQUID

Component	LOD	Customer Sample Ref.		RT01-W					
		Depth (m)		12.5					
		Sample Type		LIQUID					
		Date Sampled		17/11/2015					
		Date Received		26/11/2015 07:00					
		SDG Ref		151126-71					
		Lab Sample No.(s)		12517729					
		AGS Reference							
		Units	Method						

MISC

Ammoniacal Nitrogen as NH4	<300	µg/l *	TM099	<300					
Arsenic (diss.filt)	<0.12	µg/l *	TM152	0.234					
Cadmium (diss.filt)	<0.1	µg/l *	TM152	<0.1					
Chromium (diss.filt)	<0.22	µg/l *	TM152	1.72					
Copper (diss.filt)	<0.85	µg/l *	TM152	4.22					
Lead (diss.filt)	<0.02	µg/l *	TM152	0.085					
Nickel (diss.filt)	<0.15	µg/l *	TM152	1.84					
Selenium (diss.filt)	<0.39	µg/l *	TM152	0.504					
Zinc (diss.filt)	<0.41	µg/l *	TM152	5.15					
Mercury (diss.filt)	<0.01	µg/l *	TM183	<0.01					
Sulphate	<2000	µg/l *	TM184	20700					
Chloride	<2000	µg/l *	TM184	7000					
pH	<1	pH Units *	TM256	7.58					
Low Level Hexavalent Chromium	<3	µg/l	TM331	<3					

TPH CWG (W)

GRO Surrogate % recovery**		%	TM245	76					
GRO >C5-C12	<50	µg/l *	TM245	<50					
Methyl tertiary butyl ether (MTBE)	<3	µg/l *	TM245	<3					
Benzene	<7	µg/l *	TM245	<7					
Toluene	<4	µg/l *	TM245	<4					
Ethylbenzene	<5	µg/l *	TM245	<5					
m,p-Xylene	<8	µg/l *	TM245	<8					
o-Xylene	<3	µg/l *	TM245	<3					
Sum of detected Xylenes	<11	µg/l	TM245	<11					
Sum of detected BTEX	<28	µg/l	TM245	<28					
Aliphatics >C5-C6	<10	µg/l	TM245	<10					
Aliphatics >C6-C8	<10	µg/l	TM245	<10					
Aliphatics >C8-C10	<10	µg/l	TM245	<10					
Aliphatics >C10-C12	<10	µg/l	TM245	<10					
Aliphatics >C12-C16 (aq)	<10	µg/l	TM174	19					
Aliphatics >C16-C21 (aq)	<10	µg/l	TM174	17					
Aliphatics >C21-C35 (aq)	<10	µg/l	TM174	74					
Total Aliphatics >C12-C35 (aq)	<10	µg/l	TM174	110					
Aromatics >EC5-EC7	<10	µg/l	TM245	<10					
Aromatics >EC7-EC8	<10	µg/l	TM245	<10					
Aromatics >EC8-EC10	<10	µg/l	TM245	<10					
Aromatics >EC10-EC12	<10	µg/l	TM245	<10					
Aromatics >EC12-EC16 (aq)	<10	µg/l	TM174	20					
Aromatics >EC16-EC21 (aq)	<10	µg/l	TM174	19					
Aromatics >EC21-EC35 (aq)	<10	µg/l	TM174	57					
Total Aromatics >EC12-EC35 (aq)	<10	µg/l	TM174	96					
Total Aliphatics & Aromatics >C5-35 (aq)	<10	µg/l	TM174	206					

VOC MS (W)

Dibromofluoromethane**		%	TM208	112					
Toluene-d8**		%	TM208	100					
4-Bromofluorobenzene**		%	TM208	100					
Dichlorodifluoromethane	<1	µg/l	TM208	<1					
Chloromethane	<1	µg/l *	TM208	<1					
Vinyl chloride	<1	µg/l *	TM208	<1					
Bromomethane	<1	µg/l *	TM208	<1					
Chloroethane	<1	µg/l *	TM208	<1					
Trichlorofluoromethane	<1	µg/l *	TM208	<1					
1,1-Dichloroethene	<1	µg/l *	TM208	<1					
Carbon disulphide	<1	µg/l *	TM208	<1					
Dichloromethane	<3	µg/l *	TM208	<3					
Methyl tertiary butyl ether (MTBE)	<1	µg/l *	TM208	<1					
trans-1,2-Dichloroethene	<1	µg/l *	TM208	<1					

LIQUID

		Customer Sample Ref.	RT01-W					
		Depth (m)	12.5					
		Sample Type	LIQUID					
		Date Sampled	17/11/2015					
		Date Received	26/11/2015 07:00					
		SDG Ref	151126-71					
		Lab Sample No.(s)	12517729					
		AGS Reference						
Component	LOD	Units	Method					
1,1-Dichloroethane	<1	µg/l *	TM208	<1				
cis-1,2-Dichloroethene	<1	µg/l *	TM208	<1				
2,2-Dichloropropane	<1	µg/l	TM208	<1				
Bromochloromethane	<1	µg/l *	TM208	<1				
Chloroform	<1	µg/l *	TM208	<1				
1,1,1-Trichloroethane	<1	µg/l *	TM208	<1				
1,1-Dichloropropene	<1	µg/l *	TM208	<1				
Carbontetrachloride	<1	µg/l *	TM208	<1				
1,2-Dichloroethane	<1	µg/l	TM208	<1				
Benzene	<1	µg/l *	TM208	<1				
Trichloroethene	<1	µg/l *	TM208	<1				
1,2-Dichloropropane	<1	µg/l *	TM208	<1				
Dibromomethane	<1	µg/l *	TM208	<1				
Bromodichloromethane	<1	µg/l *	TM208	<1				
cis-1,3-Dichloropropene	<1	µg/l *	TM208	<1				
Toluene	<1	µg/l *	TM208	<1				
trans-1,3-Dichloropropene	<1	µg/l *	TM208	<1				
1,1,2-Trichloroethane	<1	µg/l *	TM208	<1				
1,3-Dichloropropane	<1	µg/l *	TM208	<1				
Tetrachloroethene	<1	µg/l *	TM208	<1				
Dibromochloromethane	<1	µg/l *	TM208	<1				
1,2-Dibromoethane	<1	µg/l *	TM208	<1				
Chlorobenzene	<1	µg/l *	TM208	<1				
1,1,1,2-Tetrachloroethane	<1	µg/l *	TM208	<1				
Ethylbenzene	<1	µg/l *	TM208	<1				
m,p-Xylene	<1	µg/l *	TM208	<1				
o-Xylene	<1	µg/l *	TM208	<1				
Styrene	<1	µg/l *	TM208	<1				
Bromoform	<1	µg/l *	TM208	<1				
Isopropylbenzene	<1	µg/l *	TM208	<1				
1,1,2,2-Tetrachloroethane	<1	µg/l	TM208	<1				
1,2,3-Trichloropropane	<1	µg/l *	TM208	<1				
Bromobenzene	<1	µg/l *	TM208	<1				
Propylbenzene	<1	µg/l *	TM208	<1				
2-Chlorotoluene	<1	µg/l *	TM208	<1				
1,3,5-Trimethylbenzene	<1	µg/l *	TM208	<1				
4-Chlorotoluene	<1	µg/l *	TM208	<1				
tert-Butylbenzene	<1	µg/l *	TM208	<1				
1,2,4-Trimethylbenzene	<1	µg/l *	TM208	<1				
sec-Butylbenzene	<1	µg/l *	TM208	<1				
4-iso-Propyltoluene	<1	µg/l *	TM208	<1				
1,3-Dichlorobenzene	<1	µg/l *	TM208	<1				
1,4-Dichlorobenzene	<1	µg/l *	TM208	<1				
n-Butylbenzene	<1	µg/l *	TM208	<1				
1,2-Dichlorobenzene	<1	µg/l	TM208	<1				
1,2-Dibromo-3-chloropropane	<1	µg/l	TM208	<1				
1,2,4-Trichlorobenzene	<1	µg/l *	TM208	<1				
Hexachlorobutadiene	<1	µg/l *	TM208	<1				
tert-Amyl methyl ether (TAME)	<1	µg/l *	TM208	<1				
Naphthalene	<1	µg/l *	TM208	<1				
1,2,3-Trichlorobenzene	<1	µg/l *	TM208	<1				
1,3,5-Trichlorobenzene	<1	µg/l	TM208	<1				

Groundwater and Ground Gas Monitoring Form

VISIT 1



Site Name	Jackson's Row
Client	Zerum Consult Limited
Job No.	70010925
Date	10/11/2015
Start Time	10:00:00
End Time	11:00:00

Operator	RH
Pressure at Start mB	1015
Pressure at End mB	1015
Weather Conditions	Cloudy, windy, intermittent sunshine
Temperature oC	15

Equipment	Serial No.	Calibrated
Gas Analyser		
Dipmeter		
Interface Probe		
PID		

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Pressure (mB)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gasses (ppmV)			Depth to Water (m)	Depth to Base (m)	Thickness of product (mm)	Sampled? (Y/N)
	Top	Bottom	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO				
1	WS02	1.00	3.00	0.0	0.0	1007.00	0	0	0.5	0.6	19.5	19.7	0	0	0	Dry	3.00	
2	WS03	1.00	3.00	0.0	0.0	1008.00	0	0	0.1	0.2	20.4	20.3	0	0	0	Dry	2.90	
3	RT01	2.00	15.00	0.0	0.0	1007.00	0	0	0.5	0.2	19.7	20.0	0	0	0	12.3	14.70	No
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
COMMENTS & GROUND CONDITIONS: WS01 inaccessible due to vehicle parked over borehole cover																		

Groundwater and Ground Gas Monitoring Form



VISIT 2

Site Name	Jackson's Row
Client	Zerum Consult Limited
Job No.	70010925
Date	17/11/2015
Start Time	10.15.00
End Time	11.45.00

Operator	RH
Pressure at Start mB	998
Pressure at End mB	998
Weather Conditions	Cloudy with heavy showers
Temperature oC	10

Equipment	Serial No.	Calibrated
Gas Analyser		
Dipmeter		
Interface Probe		
PID		

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Pressure (mB)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gasses (ppmV)			Depth to Water (m)	Depth to Base (m)	Thickness of product (mm)	Sampled? (Y/N)
	Top	Bottom	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO				
1	WS02	1.00	3.00	0.0	0.0	991.00	0	0	0.1	0.1	19.4	20.2	0	0	0	Dry	3.00	
2	WS03	1.00	3.00	0.0	0.0	991.00	0	0	0.1	0.1	19.8	20.2	0	0	0	Dry	2.90	
3	RT01	2.00	15.00	0.0	0.0	991.00	0	0	0.1	0.1	19.9	20.2	0	0	0	12.16	14.70	Yes
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
COMMENTS & GROUND CONDITIONS: WS01 Not accessible due to car parked over borehole cover.																		

Groundwater and Ground Gas Monitoring Form

VISIT 3



Site Name	Jackson's Row
Client	Zerum Consult Limited
Job No.	70010925
Date	24/11/2015
Start Time	10:04:00
End Time	11:00:00

Operator	RH
Pressure at Start mB	1009
Pressure at End mB	1009
Weather Conditions	Rain
Temperature oC	8

Equipment	Serial No.	Calibrated
Gas Analyser		
Dipmeter		
Interface Probe		
PID		

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Pressure (mB)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gasses (ppmV)			Depth to Water (m)	Depth to Base (m)	Thickness of product (mm)	Sampled? (Y/N)
	Top	Bottom	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO				
1	WS02	1.00	3.00	0.0	0.0	1002.00	0	0	0.1	0.6	19.2	19.5	0	0	0	Dry	3.00	
2	WS03	1.00	3.00	0.0	0.0	1002.00	0	0	0.4	0.3	18.9	19.7	0	0	0	Dry	2.90	
3	RT01	2.00	15.00	0.0	0.0	1002.00	0	0	0.6	0.4	19.4	19.7	0	0	0	12.15	14.70	
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
COMMENTS & GROUND CONDITIONS: WS01 Not accessible due to car parked over borehole cover.																		

Groundwater and Ground Gas Monitoring Form

VISIT 4



Site Name	Jackson's Row
Client	Zerum Consult Limited
Job No.	70010925
Date	01/12/2015
Start Time	10:00:00
End Time	10:45:00

Operator	RH
Pressure at Start mB	101.7
Pressure at End mB	101.7
Weather Conditions	Cloudy
Temperature oC	11

Equipment	Serial No.	Calibrated
Gas Analyser		
Dipmeter		
Interface Probe		
PID		

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Pressure (mB)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gasses (ppmV)			Depth to Water (m)	Depth to Base (m)	Thickness of product (mm)	Sampled? (Y/N)
	Top	Bottom	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO				
1	WS02	1.00	3.00	0.0	0.0	1009.00	0	0	0.6	0.6	19.6	19.2	0	0	0	Dry	3.00	
2	WS03	1.00	3.00	0.0	0.0	1009.00	0	0	0.6	0.2	19.2	19.9	0	0	0	Dry	2.90	
3	RT01	2.00	15.00	0.0	0.0	1009.00	0	0	0.1	0.6	19.3	19.0	0	0	0	12.42	14.70	
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
COMMENTS & GROUND CONDITIONS: WS01 Not accessible due to car parked over borehole cover.																		

Groundwater and Ground Gas Monitoring Form



VISIT 5

Site Name	Jackson's Row
Client	Zerum Consult Limited
Job No.	70010925
Date	08/12/2015
Start Time	10:10:00
End Time	11:00:00

Operator	RH
Pressure at Start mB	1016
Pressure at End mB	1016
Weather Conditions	Cloudy, intermittent sunshine
Temperature oC	11

Equipment	Serial No.	Calibrated
Gas Analyser		
Dipmeter		
Interface Probe		
PID		

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Pressure (mB)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gasses (ppmV)			Depth to Water (m)	Depth to Base (m)	Thickness of product (mm)	Sampled? (Y/N)
	Top	Bottom	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO				
1	WS02	1.00	3.00	0.0	0.0	1009.00	0.0	0.0	0.4	0.6	19.4	19.0	0.0	0.0	Dry	2.98		
2	WS03	1.00	3.00	0.0	0.0	1009.00	0.0	0.0	0.2	0.6	19.0	19.9	0.0	0.0	Dry	2.62		
3	RT01	2.00	15.00	0.0	0.0	1009.00	0.0	0.0	0.5	0.3	19.6	19.9	0.0	0.0	12.08	14.70		
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COMMENTS & GROUND CONDITIONS: WS01 Not accessible due to car parked over borehole cover.																		

Groundwater and Ground Gas Monitoring Form

VISIT 6



Site Name	Jackson's Row
Client	Zerum Consult Limited
Job No.	70010925
Date	15/12/2015
Start Time	10:05:00
End Time	10:45:00

Operator	RH
Pressure at Start mB	101.3
Pressure at End mB	101.3
Weather Conditions	Cloudy
Temperature oC	9

Equipment	Serial No.	Calibrated
Gas Analyser		
Dipmeter		
Interface Probe		
PID		

Borehole	Response Zone (m)		Gas Flow (l/hr)		Borehole Pressure (mB)	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Other Gasses (ppmV)			Depth to Water (m)	Depth to Base (m)	Thickness of product (mm)	Sampled? (Y/N)
	Top	Bottom	Initial	Steady		Initial	Steady	Initial	Steady	Initial	Steady	PID	H2S	CO				
1	WS02	1.00	3.00	0.0	0.0	1008.00	0.0	0.0	0.5	0.5	19.2	19.8	0.0	0.0	0.0	Dry	2.98	
2	WS03	1.00	3.00	0.0	0.0	1007.00	0.0	0.0	0.5	0.2	19.6	20.0	0.0	0.0	0.0	Dry	2.62	
3	RT01	2.00	15.00	0.0	0.0	1008.00	0.0	0.0	0.2	0.5	19.3	19.1	0.0	0.0	0.0	12.01	14.70	
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COMMENTS & GROUND CONDITIONS: WS01 Not accessible due to car parked over borehole cover.																		