

Our ref: R1742d-L20200717

Your ref:

11 August 2020

Neil Whitton
Environmental Health Officer
Environmental Health and Licensing
Cherwell District Council

by e-mail: Neil.Whitton@cherwell-dc.gov.uk

Dear Neil

**Upper Heyford – Trenchard Circle (Planning Ref. 16/00196/F)
In-Situ Formation Soil Validation**

Smith Grant LLP (SGP) has been instructed to carry out verification of the formation soils across the parcel of land referred to as Trenchard Circle within the Heyford Park Development. Site investigation and remedial earthworks including building demolition, removal of hardstanding and remediation of hydrocarbon impacted soils associated with an oil pipeline have been carried out and reported by others. To comply with the recommendations outlined in the Remedial Completion Report (173042/RCR/001) and to satisfy that stipulated in the Remediation Strategy (R1742-R01), validation of the backfilled material and formation soils has been carried out.

A site location plan including the location of validation entries is provided within Drawing D01. SGP understand that redevelopment proposals for this phase is for residential use with private gardens, drives and areas of soft landscaping although a proposed layout has not been provided.

Background

A brief summary of the reporting undertaken within Trenchard Circle is made below.

AAe - Phase 2 Environmental Risk Assessment (ref. 163408/ERA/001)

The site was formerly occupied by 7-pairs of semi-detached residential properties with gardens, a pumping station in the northwest corner and substation in the southeast. An oil pipeline served all the houses provided heating oil with the pipeline buried at an approximate depth of 0.2m running along the north and west of the site. Demolition of the properties and removal of hardstanding were completed prior to the site investigation.

In November 2016 site investigation works were carried out by AAe utilising 7 machine excavated trial-pits (TP01-TP07), 30 verification pits (TP08-TP37) and the collection and submission of representative soil and water (perched) samples for laboratory analysis including metals, fractionated hydrocarbons, polyaromatic hydrocarbons and asbestos. Arisings were screened with a photo-ionisation detector (PID) to measure volatile organic compounds (VOCs) within soils.

Contamination indicators including staining and hydrocarbon odours were observed with a maximum PID reading of 132.3 ppm (TP18 0.9m bgl) and were associated with the oil pipe (consisting of 2 metal pipes) which remained in-situ. It was observed that the pipelines connected to the former properties via feeder lines. No contamination indicators were recorded outside the area of the oil pipeline.



H Fraser Consulting – Controlled Waters Risk Assessment

Six boreholes (BH01 – BH06) were drilled by rotary methods to depths of 10m bgl. Weathered limestone was recorded from the surface typically 1m bgl before rockhead was encountered. Groundwater was recorded at around 2m bgl in each of the boreholes with groundwater flow direction reported to the east.

Two rounds of groundwater monitoring were carried out in the 6 boreholes in February and March 2017, concentrations of hydrocarbons failed to exceed analytical detection limits (<10µg/l). The report confirmed the absence of a dissolved plume of contamination and that depleted oxygen concentrations suggested that active biodegradation is taking place.

The assessment derived Remedial Target Values (RTVs) for fractionated hydrocarbons for soil and shallow groundwater and recommended that remedial works included the removal of free product and that the derived RTVs be adopted for remedial verification criteria.

AAe Remedial Completion Report (ref. 173042/RCR/001)

Remedial works were carried out between October and November 2018 under the supervision of AAe, it is understood that Cherwell District Council were notified of the proposed scope and further assessment, however it is unknown whether the reports were formerly submitted or approved.

The relict pipework and grossly impacted soils were removed, and validation samples were collected, it is noted that no samples were collected from the base where bedrock was present. A series of rectangular validation excavations (VE1 – VE22) or remediation cells were excavated due to shallow groundwater ingress, groundwater in the excavations was pumped into a treatment plant before discharge to ground on the wider site. No information pertaining to the type of treatment or sampling of treated waters prior to discharge is provided. In addition to the validation excavations, 6 trial-pits were excavated outside the remedial excavations to confirm the absence of contamination.

During the remedial works, 2 previously unidentified 4,500 litre below ground oil tanks were encountered, these were removed, and the surrounding soils inspected and tested. No further detail was provided such as the contents of the tanks and their decontamination status prior to removal.

Removed impacted soils were reportedly relocated within the wider Heyford Park area for bio-piling or off-site disposal, it is uncertain whether treatment or disposal took place. If it was the latter no waste transfer tickets were provided in the report, similarly no detail as to storage of impacted soils for treated soil was provided. Metal pipework and tanks were reportedly disposed of off-site for recycling.

Following removal of visually impacted soils and collection of validation samples, ORC was placed in the base of the excavations and the voids were backfilled with suitable fill material. No information is provided on the source or origin of the material although it is stated that verification of backfill material used will be reported under a separate cover.

Validation samples were compared against the derived RTVs with 6 exceedances reported. Two of the exceedances (VS06 and VS12) were associated with residual impacted soils along the site boundary where further removal could not take place, whilst further excavation, removal and re-validation was proposed for VS27, VS44, VS56 and VS57.

Remedial works were constrained in the northeast corner due to site boundary fence and existing roadway (Trenchard Circle).

Following the completion of the supplementary remediation works, a round of groundwater sampling was carried out in the existing boreholes (BH1-BH6) with samples submitted for metals, hydrocarbons, PAH, cyanide and ammoniacal nitrogen. Concentrations of hydrocarbons and PAHs were below detection limits in all instances. The report concluded that remedial works have been completed as far



as is reasonably practicable with residual soils assessed as not posing a risk to human health or the environment but that a number of outstanding remedial measures are required during the construction stage, these are as follows:

- Validation testing of the backfill material.
- Provision of clean capping layer within areas of proposed soft landscaping.
- Ground gas (VOC) membrane within floor slabs or proposed properties. Membranes to be installed and certified in accordance with BS8485:2015 and CIRIA C735.
- Protection of structures and services (including barrier pipe for potable water supply). Test results to be provided to designer and statutory undertakers to determine are protection for structures and services from recorded ground conditions.

SGP Verification Report Review & GAP Analysis (ref. R1742d-L20190218)

SGP were provided with copies of the above reporting and carried out a review to ascertain any outstanding works which would be required to comply with the SGP Remediation Strategy. The report outlined 5 additional actions to be undertaken to ensure Strategy compliance, these were:

1. Validation of formation soils to determine acceptability to be retained within garden areas on a 35m grid spacing.
2. Validation of backfill material placed within remediation excavations.
3. Installation of building vapour protection as recommended within the AAe verification report. It is understood that this is based on the potential for hydrocarbon impacted bedrock to remain following remediation, however post-remediation vapour monitoring (as has been undertaken on other phases) may confirm that vapour protection measures are not required.
4. Installation of barrier pipe as recommended in the AAe verification report and/or completion of a Water Pipeline Risk Assessment (PRA) if required by the utility provider.
5. Assessment to determine aggressive ground conditions for concrete

This report has been produced to satisfy actions 1, 2 and 5. A separate report will be produced detailing the assessment of post-remediation vapour monitoring (3). It is understood that the developer will install barrier pipe in accordance with action 4.

In-Situ Formation Soil & Backfill Validation

It is a requirement under the Remediation Strategy that a 600mm cover of clean soils is placed over made ground in gardens, with a reduced thickness of 300mm in landscape areas. However, following remedial works, formation soils consisted of two types of material:

1. Natural undisturbed soils of a gravel of angular cobbles (weathered bedrock) within a light brown sandy clay soil, and.
2. Reworked natural sandy clay soil placed as backfill within the remediation excavation areas in the north and along the former pipeline route through the centre of the site.



No anthropogenic inclusions such as brick, ash, slag or clinker were observed. As the backfill material extended to the site surface, its verification was carried out as part of the formation soil validation with a number of entries targeted within the backfill areas.

SGP attended site on 24.06.20 to carry out validation of the formation soils. In-situ sampling of the formation level strata through sampling of the upper 400mm at a required testing frequency of 1 sample per 500m³, the residual 400mm depth equating to 1 sample per 1,250m² plan area of development.

Nine in-situ samples were collected from the exposed formation level soils across the site with depth validation photos showing the 0-400mm depth range appended to this report; a site location plan indicating the approximate location of in-situ validation entries is provided within Drawing D01. Assuming an approximate area of 11,250m², the total volume of validated soils is effectively 4,500m³. With 9 samples collected, the specified sampling rate of 1 sample per 500m³ has been achieved.

Five of the samples (TP1, TP2, TP3, TP & TP5) were collected from areas where re-worked natural backfill soils were present and the remainder from undisturbed natural strata.

Samples were collected by SGP and were placed in appropriate laboratory-provided containers and stored in cooled boxes. Samples submitted for chemical analysis were delivered to Element Laboratory within 12 hours of collection. SGP retains chain of custody documentation.

A copy of the laboratory certificate (20-8145) is attached to this report. Results are summarised in the table below and are compared to assessment criteria for cover soils in accordance with Table 6.2 of the Smith Grant Remediation Strategy.

Table 1. Analysis Summary for Formation Level Soils

Contaminant	Samples	Range of Concentrations (mg/kg unless stated)	Residential Use	
			Screening criteria (mg/kg unless stated)	Exceedances
SOM	9	<0.2-1.8	-	None
pH	9	8.33-9.39	WRAS <5>8	All
asbestos fibre	9	NFD	<0.001%	None
antimony	9	<1-1	550	None
arsenic	9	2.6-22.3	32	None
barium	9	16-127	1300	None
beryllium	9	<0.5-0.9	51	None
cadmium	9	<0.1	10	None
chromium	9	11.6-50	3000	None
chromium VI	9	<0.3	4.3	None
cobalt	9	1.7-12.9	240	None
copper	9	3-36	300	None
lead	9	<5-27	450	None
mercury	9	<0.1	1	None
molybdenum	9	0.5-2.3	670	None
nickel	9	3.9-19.4	130	None



Contaminant	Samples	Range of Concentrations (mg/kg unless stated)	Residential Use	
			Screening criteria (mg/kg unless stated)	Exceedances
selenium	9	<1	350	None
vanadium	9	9-60	75	None
water soluble boron	9	0.2-1.9	291	None
zinc	9	8-65	300	None
naphthalene	9	<0.04	1.5	None
acenaphthylene	9	<0.03-0.06	210	None
acenaphthene	9	<0.05	170	None
fluorene	9	<0.04	160	None
phenanthrene	9	<0.03-0.48	92	None
anthracene	9	<0.04-0.26	2300	None
fluoranthene	9	<0.03-1.49	260	None
pyrene	9	<0.03-1.43	560	None
benzo(a)anthracene	9	<0.06-0.89	3.1	None
chrysene	9	<0.02-0.88	6	None
benzo(b)fluoranthene	9	<0.05-1.27	5.6	None
benzo(k)fluoranthene	9	<0.02-0.49	8.5	None
benzo(a)pyrene	9	<0.04-0.99	0.83	None
indeno(123cd)pyrene	9	<0.04-0.71	3.2	None
dibenzo(ah)anthracene	9	<0.04-0.13	0.76	None
benzo(ghi)perylene	9	<0.04-0.75	44	None
aliphatic C5-C6	9	<0.1	30	None
aliphatic C6-C8	9	<0.1	73	None
aliphatic C8-C10	9	<0.1	19	None
aliphatic C10-C12	9	<0.2	93	None
aliphatic C12-C16	9	<4	740	None
aliphatic C16-C21	9	<7	1000	None
aliphatic C21-C35	9	<7-137	1000	None
aromatic C5-C7	9	<0.1	30	None
aromatic C7-C8	9	<0.1	120	None
aromatic C8-C10	9	<0.1	27	None
aromatic C10-C12	9	<0.2	69	None
aromatic C12-C16	9	<4	140	None
aromatic C16-C21	9	<7-12	250	None
aromatic C21-C35	9	<7-218	890	None
benzene	9	<0.005	0.08	None



Contaminant	Samples	Range of Concentrations (mg/kg unless stated)	Residential Use	
			Screening criteria (mg/kg unless stated)	Exceedances
toluene	9	<0.005	120	None
ethylbenzene	9	<0.005	65	None
o-xylene	9	<0.005	45	None
m-xylene	9	<0.005	44	None
p-xylene	9	<0.005	42	None
methyl tert butyl ether	9	<0.005	49	None

Elevated pH in excess of the former WRAS trigger pH value of >8 was reported within all nine samples with concentrations ranging between 8.33 and 9.39. Alkaline soil pH is likely to be attributed to the ubiquitous presence of carbonate limestone identified across the New Settlement Area (NSA) and is consistent with concentrations reported across the wider development area.

No further exceedances were reported.

Concrete Protection

Five samples of the foundation bearing strata (consisting of both natural and re-worked natural soils) were collected and submitted for pH and soluble sulphate analysis.

Soluble sulphate concentrations ranged between 10 to 240 mg/l and pH values ranging from 8.33 to 9.39. In accordance with BRE SD1, the mean of the highest 20% (0.24 mg/l) of soluble sulphate results has been used as the characteristic value as well as the mean of the lowest 20% of pH results (8.4). This corresponds to a Design Sulphate Class (DS) of DS1.

In terms of BRE Special Digest 1, the site is classified as 'brownfield' and the groundwater beneath the site is considered mobile. The results correspond to an Aggressive Chemical Environment for Concrete (ACEC) class of AC-1.

Conclusions

It is concluded that formation soils consist of natural granular soils (weathered limestone bedrock) and re-worked natural cohesive sandy clay soil placed as backfill during remedial works. No anthropogenic inclusions were observed, and the soils were absent from visual and olfactory contamination indicators.

Sampling of formation soils has been completed in accordance with the Remediation Strategy with no exceedances reported against the validation criteria. Formation soils are therefore considered suitable for retention within all garden and soft landscaping areas.

With respect to BRE Special Digest 1 'Concrete in Aggressive Ground' (2005), chemical tests correspond to a Design Sulphate Class of DS1 and Aggressive Chemical Environment for Concrete (ACEC) class AC-1.

Recommendations

Additional remedial works in relation to formation soils is not required and the developer is now required to place a minimum 150mm of topsoil within all garden and landscape areas.

Neil Whitton
Cherwell District Council



Soils placed within the garden / landscape areas must be verified in accordance of the approved Strategy with imported soils sampled at a frequency of 1 per 250m³ (minimum 3 samples per single source) and compliant with the criteria detailed in Table 6.2 of the Strategy.

In-situ vapour monitoring is currently on-going and will be reported separately regarding the requirement to install vapour protection measures.

Yours sincerely
for: Smith Grant LLP



D Wayland BSc MSc AssocCIWM MCIWEM CWEM

Neil Whitton
Cherwell District Council



DRAWING

Neil Whitton
Cherwell District Council



Appendix A

Site Photographs



02.06.20 – Eastern view across the northern part of the site



02.06.20 – Removed USTs as part of remedial works awaiting off-site removal for recycling



02.06.20 – Site surface occupied by light vegetation. Ecological fencing up during on-going survey work



02.06.20 – View across the site from access road



02.06.20 – Western view



02.06.20 – Southern view down access road

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Cherwell District Council



Appendix B

In-situ Formation Photographs



24.06.20 – TP1



24.06.20 – TP1



24.06.20 – TP2



24.06.20 – TP2



24.06.20 – TP3



24.06.20 – TP3



24.06.20 – TP4



24.06.20 – TP4



24.06.20 – TP5



24.06.20 – TP5



24.06.20 – TP6



24.06.20 – TP6



24.06.20 – TP7



24.06.20 – TP7



24.06.20 – TP8



24.06.20 – TP8



24.06.20 – TP9



24.06.20 – TP9

Neil Whitton
Cherwell District Council



Appendix C

Laboratory Certificate

Smith Grant LLP
Station House
Station Road
Ruabon
Wrexham
LL14 6DL



Attention : Dan Wayland
Date : 9th July, 2020
Your reference : R1742d
Our reference : Test Report 20/8145 Batch 1
Location : Hayford Park - Trenchard
Date samples received : 24th June, 2020
Status : Final report
Issue : 1

Nine samples were received for analysis on 24th June, 2020 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Smith Grant LLP
Reference: R1742d
Location: Hayford Park - Trenchard
Contact: Dan Wayland
EMT Job No: 20/8145

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-5	6-8	9-10	11-13	14-15	16-18	19-21	22-23				
Sample ID	TP1-S1	TP2-S1	TP3-S1	TP4-S1	TP5-S1	TP6-S1	TP7-S1	TP8-S1	TP9-S1				
Depth	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40				
COC No / misc													
Containers	V J T	V J	V J T	V J	V J T	V J	V J T	V J T	V J				
Sample Date	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020				
Sample Type	Clay	Clay	Clayey Loam	Clayey Loam	Clayey Loam	Clay	Clay	Clayey Loam	Clayey Loam				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020				
										LOD/LOR	Units	Method No.	
Antimony	1	<1	1	<1	1	<1	1	<1	<1	<1	mg/kg	TM30/PM15	
Arsenic ^{#M}	14.0	2.6	22.3	19.4	16.3	7.1	10.6	9.9	5.9	<0.5	mg/kg	TM30/PM15	
Barium ^{#M}	66	16	127	81	68	19	45	28	35	<1	mg/kg	TM30/PM15	
Beryllium	0.6	<0.5	0.9	0.7	0.9	<0.5	0.8	0.5	<0.5	<0.5	mg/kg	TM30/PM15	
Cadmium ^{#M}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15	
Chromium ^{#M}	27.6	11.6	49.5	47.9	50.0	15.2	35.0	19.2	15.5	<0.5	mg/kg	TM30/PM15	
Cobalt ^{#M}	5.6	1.7	12.9	7.0	11.1	3.9	8.0	4.2	2.7	<0.5	mg/kg	TM30/PM15	
Copper ^{#M}	11	3	36	13	10	6	12	8	6	<1	mg/kg	TM30/PM15	
Lead ^{#M}	17	<5	17	27	15	6	9	6	10	<5	mg/kg	TM30/PM15	
Mercury ^{#M}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15	
Molybdenum ^{#M}	1.3	0.7	2.3	1.6	2.3	1.1	1.5	0.8	0.5	<0.1	mg/kg	TM30/PM15	
Nickel ^{#M}	11.6	3.9	16.8	14.5	19.4	7.3	16.4	9.9	5.7	<0.7	mg/kg	TM30/PM15	
Selenium ^{#M}	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM30/PM15	
Vanadium	40	9	57	60	55	24	43	39	28	<1	mg/kg	TM30/PM15	
Water Soluble Boron ^{#M}	1.3	0.2	1.7	1.9	0.7	0.3	0.9	0.5	0.5	<0.1	mg/kg	TM74/PM32	
Zinc ^{#M}	45	8	43	65	43	13	32	19	21	<5	mg/kg	TM30/PM15	
PAH MS													
Naphthalene ^{#M}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8	
Acenaphthylene	<0.03	<0.03	<0.03	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8	
Acenaphthene ^{#M}	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8	
Fluorene ^{#M}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8	
Phenanthrene ^{#M}	0.27	<0.03	<0.03	0.48	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8	
Anthracene [#]	0.10	<0.04	<0.04	0.26	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8	
Fluoranthene ^{#M}	1.08	<0.03	<0.03	1.49	<0.03	<0.03	<0.03	<0.03	0.11	<0.03	mg/kg	TM4/PM8	
Pyrene [#]	0.97	<0.03	<0.03	1.43	<0.03	<0.03	<0.03	<0.03	0.11	<0.03	mg/kg	TM4/PM8	
Benzo(a)anthracene [#]	0.49	<0.06	<0.06	0.89	<0.06	<0.06	<0.06	<0.06	0.10	<0.06	mg/kg	TM4/PM8	
Chrysene ^{#M}	0.56	<0.02	<0.02	0.88	<0.02	<0.02	<0.02	<0.02	0.10	<0.02	mg/kg	TM4/PM8	
Benzo(k)fluoranthene ^{#M}	1.48	<0.07	<0.07	1.76	<0.07	<0.07	<0.07	<0.07	0.18	<0.07	mg/kg	TM4/PM8	
Benzo(a)pyrene [#]	0.81	<0.04	<0.04	0.99	<0.04	<0.04	<0.04	<0.04	0.09	<0.04	mg/kg	TM4/PM8	
Indeno(123cd)pyrene	0.65	<0.04	<0.04	0.71	<0.04	<0.04	<0.04	<0.04	0.08	<0.04	mg/kg	TM4/PM8	
Dibenzo(ah)anthracene [#]	0.10	<0.04	<0.04	0.13	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8	
Benzo(ghi)perylene [#]	0.59	<0.04	<0.04	0.75	<0.04	<0.04	<0.04	<0.04	0.07	<0.04	mg/kg	TM4/PM8	
PAH 16 Total	7.1	<0.6	<0.6	9.8	<0.6	<0.6	<0.6	<0.6	0.8	<0.6	mg/kg	TM4/PM8	
Benzo(b)fluoranthene	1.07	<0.05	<0.05	1.27	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	mg/kg	TM4/PM8	
Benzo(k)fluoranthene	0.41	<0.02	<0.02	0.49	<0.02	<0.02	<0.02	<0.02	0.05	<0.02	mg/kg	TM4/PM8	
PAH Surrogate % Recovery	93	95	96	98	96	94	96	100	97	<0	%	TM4/PM8	

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Smith Grant LLP
 Reference: R1742d
 Location: Hayford Park - Trenchard
 Contact: Dan Wayland
 EMT Job No: 20/8145

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-5	6-8	9-10	11-13	14-15	16-18	19-21	22-23			
Sample ID	TP1-S1	TP2-S1	TP3-S1	TP4-S1	TP5-S1	TP6-S1	TP7-S1	TP8-S1	TP9-S1			
Depth	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40	0.00-0.40			
COC No / misc												
Containers	V J T	V J	V J T	V J	V J T	V J	V J T	V J T	V J			
Sample Date	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020	23/06/2020			
Sample Type	Clay	Clay	Clayey Loam	Clayey Loam	Clayey Loam	Clay	Clay	Clayey Loam	Clayey Loam			
Batch Number	1	1	1	1	1	1	1	1	1			
Date of Receipt	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020	24/06/2020			
										LOD/LOR	Units	Method No.
TPH CWG												
Aliphatics												
>C5-C6 ^{#M}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 ^{#M}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 ^{#M}	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 ^{#M}	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 ^{#M}	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 ^{#M}	31	<7	<7	137	<7	<7	<7	<7	65	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	31	<19	<19	137	<19	<19	<19	<19	65	<19	mg/kg	TM5/PM8/PM16
Aromatics												
>C5-EC7 [#]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 [#]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 ^{#M}	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 [#]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 [#]	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 [#]	12	<7	<7	11	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 [#]	125	<7	<7	218	<7	<7	<7	<7	74	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 [#]	137	<19	<19	229	<19	<19	<19	<19	74	<19	mg/kg	TM5/PM8/PM16
Total aliphatics and aromatics(C5-35)	168	<38	<38	366	<38	<38	<38	<38	139	<38	mg/kg	TM5/PM8/PM16
MTBE [#]	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Benzene [#]	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Toluene [#]	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Ethylbenzene [#]	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
m/p-Xylene [#]	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
o-Xylene [#]	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/kg	TM36/PM12
Natural Moisture Content	12.0	14.2	18.8	12.4	14.9	14.4	13.1	9.9	14.5	<0.1	%	PM4/PM0
Hexavalent Chromium [#]	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) ^{#M}	0.0669	-	0.0060	0.2418	-	-	0.0156	-	0.0146	<0.0015	g/l	TM38/PM20
Organic Matter	1.0	<0.2	1.8	0.8	1.0	0.4	0.6	0.6	0.7	<0.2	%	TM21/PM24
Electrical Conductivity @25C (5:1 ext)	177	106	147	429	163	117	147	126	124	<100	uS/cm	TM76/PM58
pH ^{#M}	8.52	8.99	8.33	9.39	8.41	8.67	8.56	8.56	8.36	<0.01	pH units	TM73/PM11
Sample Type	Clay	Clay	Clayey Loam	Clayey Loam	Clayey Loam	Clay	Clay	Clayey Loam	Clayey Loam		None	PM13/PM0
Sample Colour	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown	Medium Brown		None	PM13/PM0
Other Items	stones, vegetation	stones	stones, vegetation	stones, sand, vegetation	stones, vegetation	stones, vegetation	stones, vegetation	stones, vegetation	stones, chalk, vegetation		None	PM13/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Smith Grant LLP
Reference: R1742d
Location: Hayford Park - Trenchard
Contact: Dan Wayland

Note:
 Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/8145	1	TP1-S1	0.00-0.40	3	07/07/2020	General Description (Bulk Analysis)	Soil/Stone
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP2-S1	0.00-0.40	5	07/07/2020	General Description (Bulk Analysis)	Soil/Stone
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP3-S1	0.00-0.40	8	07/07/2020	General Description (Bulk Analysis)	Soil/Stone
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP4-S1	0.00-0.40	10	07/07/2020	General Description (Bulk Analysis)	soil-stones
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP5-S1	0.00-0.40	13	07/07/2020	General Description (Bulk Analysis)	soil-stones
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP6-S1	0.00-0.40	15	07/07/2020	General Description (Bulk Analysis)	soil-stones
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP7-S1	0.00-0.40	18	07/07/2020	General Description (Bulk Analysis)	Soil/Stones
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD

Client Name: Smith Grant LLP
 Reference: R1742d
 Location: Hayford Park - Trenchard
 Contact: Dan Wayland

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/8145	1	TP7-S1	0.00-0.40	18	07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP8-S1	0.00-0.40	21	07/07/2020	General Description (Bulk Analysis)	Soil/Stones
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD
20/8145	1	TP9-S1	0.00-0.40	23	07/07/2020	General Description (Bulk Analysis)	Soil/Stones
					07/07/2020	Asbestos Fibres	NAD
					07/07/2020	Asbestos ACM	NAD
					07/07/2020	Asbestos Type	NAD
					07/07/2020	Asbestos Level Screen	NAD

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/8145

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

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REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/8145

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	No
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes

EMT Job No: 20/8145

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes	Yes	AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes	Yes	AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes	Yes	AD	Yes

