Phase II Geo-Environmental Assessment

21 Ramsey Road
Warboys
Huntingdon
PE28 2RW

Prepared for:

J L Daniels Discretionary Trust
Caldecote Manor Farm
Abbotsley
St Neots
Cambridgeshire
PE19 6XO

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21 RAMSEY ROAD, WARBOYS

NON-TECHNICAL CLIENT SUMMARY

This report presents the findings of a Phase II Geo-Environmental Assessment undertaken to determine if there are any unacceptable risks from contaminated land to future users or the water environment. Pertinent findings and conclusions may be summarised as follows:

- The site comprises the 21 Ramsey Road property to the east with a single-storey double garage and brick outhouse to the south. A pond is present in the centre of the site and grassland is to the west of the site. It is proposed to undergo residential development comprising up to 26 dwellings with gardens, landscaping and associated infrastructure. A previous Phase I Desk Study (by others) identified potential risks associated with two above ground heating oil tanks, previous phases of construction and demolition, as well as infilling on site; and an off-site fuel filling station.
- The ground investigation comprised the excavation of 8 trial pit holes to a maximum depth of 2.0m. Ground conditions comprised topsoil/made ground to a maximum depth of 0.8m, underlain by cohesive soils of the Oadby Member. Groundwater seepage was encountered across the site at depths ranging from 0.65m to 1.8m.
- Review of the results of environmental testing of soil samples and risk assessment indicates that the made ground materials present across the site are contaminated and a modest risk control measure will be needed in future garden areas, although the water environment is not considered at risk.
- To address the identified risks, a capping comprising at least **300mm** of clean, imported topsoil has been recommended in all proposed garden and soft landscaped areas to the east of the new development (area defined in this report). The design of this remedial measure may need to be refined to ensure damage to existing trees is avoided. Therefore, once final layouts are available a final Remedial Strategy & Implementation Plan should be prepared, taking account of input from the Arboriculturist to ensure remediation is sufficiently protective of future site users without causing harm to existing trees. Some precautionary measures have also been outlined to ensure safe development including the removal of the above ground storage tanks.
- It is recommended that a copy of this report be provided to Huntingdonshire District Council so that the information may be incorporated into their land quality records and used to satisfy all pre-commencement planning requirements relating to contamination on the current consent.

The above points represent a simplified summary of the findings of this assessment and should not form the basis for key decisions for the proposed development. A thorough review of the details is contained within the following report, or alternatively get in touch and we'll talk you through it.

Project Reference:	UK20.5220
Title:	Phase II Geo-Environmental Assessment – 21 Ramsey Road, Warboys
Client:	J L Daniels Discretionary Trust
Date:	16th February 2021
EPS Contact Details:	7B Caxton House Broad Street Cambourne Cambridge CB23 6JN [redacted] W: www.epstrategies.co.uk
Status:	Issue 2

Author:	**Reviewed:**	**Authorised:**
[redacted]		
Consultant	Associate Director	Associate Director

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Where ground investigations have been conducted, these have been limited to the level of detail required for the site in order to achieve the objectives of the investigation.

The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.

The National Planning Policy Framework 2019 requires a competent person to prepare site investigation information, which is defined as a person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation. EPS considers that it fulfils these criteria and would welcome any request for staff CVs or case studies to demonstrate it.

As stated within DEFRA's Contaminated Land Statutory Guidance (2012), with any complex risk assessment it is possible that different suitably qualified people may reach slightly different conclusions when interpreting the same information. EPS recognises this and considers the conclusions presented within this report to be robust and appropriate but input from the Local Authority and their judgement in line with this guidance would still be welcomed.

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1 INTRODUCTION

In November 2020, Environmental Protection Strategies Ltd (EPS) was commissioned by Carter Jonas on behalf of the J L Discretionary Trust to complete a Phase II Geo-Environmental Assessment Report at 21 Ramsey Road, Warboys, Huntingdon, PE28 2RW ('the site'); see Figure 1.

The work was commissioned in order to fulfil planning requirements relating to contamination for the *'erection of up to 26 residential dwellings, including affordable housing (Use Class C3) together with parking areas, landscaping and other associated infrastructure, following the demolition of no.21 Ramsey Road and associated outbuildings'* (Huntingdonshire District Council ref: 20/00308/OUT).

Selected site photographs are included as Appendix A and an indicative proposed development plan is included as Appendix B.

This report presents the findings, conclusions, and recommendations of the Phase II Geo-Environmental Assessment together with a summary of a previous Phase I Contamination Assessment.

1.1 Objectives

In accordance with the Environment Agency's *Land Contamination: Risk Management (2020)* and the *National Planning Policy Framework;* the objectives of this investigation were as follows:

a) Investigate potential contaminant linkages identified through the previously developed Conceptual Site Model (CSM) by means of investigating shallow soils.
b) Determine recommendations for further work that may be required and to ensure suitability for use and safe development.

1.2 Scope of Work

To perform an exploratory assessment of the site in accordance with the principles and requirements of DEFRAs '*Contaminated Land Statutory Guidance*' (2012), BS10175 –'*Investigation of Potentially Contaminated Sites*' and BS5930:2015 *'Code of practice for ground investigations'* the following tasks were undertaken:

<u>Intrusive Investigation:</u>

- Site walkover, inspection of any visual evidence of contamination at the site, obtaining photographic records.
- Health and safety briefing / site supervision.
- Completion of eight trial pits to a maximum depth of 2.0m below ground level (bgl).
- Recording of ground conditions including inspection of samples for visual and olfactory contamination, and laboratory analysis of selected representative samples.

Reporting:

- Data collection
- Interpretation of data including completion of Generic Quantitative Risk Assessment

The findings and conclusions of these investigations are presented in the following sections.

1.3 Previous Reports

A previous Phase I Contamination Assessment was produced by MLM during May 2019 for 21 Ramsey Road, Warboys, PE28 2RW, with two further revisions superseding the original report, which comprised the current study area. For background information it is recommended that the reader review the following report:

- *Phase I Contamination Assessment, 21 Ramsey Road, Warboys, PE28 2RW (10th January 2020)* Revision C03 – MLM Ref: JW/777154

The CSM and initial findings of these reports are summarised in Section 2.

1.4 Limitations and Constraints

The purpose of this report is to present the findings of a soil sampling investigation conducted at the location(s) specified. When examining the data collected from the investigations made during the assessment, Environmental Protection Strategies Ltd (EPS) makes the following statements:

No investigation method is capable of completely identifying all ground conditions that might be present in the soil or groundwater under a site. Where outlined in our report, we have examined the ground beneath a site by constructing a number of boreholes and / or trial pits to recover soil and / or groundwater samples. The locations of these excavations and sampling points are considered to be representative of the condition of the whole site subsurface however, ground conditions are naturally variable and it may be possible that the conditions encountered may differ to those found during the investigation.

Whilst it is recognised that information contained within this report may assist relevant and suitably qualified professionals, this report does not provide a geotechnical appraisal of ground conditions with respect to suitability of foundations or future structures, nor does it intend to identify a need for any associated geotechnical ground improvement works.

No visible evidence of Japanese Knotweed was identified during the site walkover. However, this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its' presence at certain times of the year. For this reason, EPS cannot confirm that Japanese Knotweed rhizomes do not exist and it is recommended that if it is suspected that this species, or other similarly invasive plants are present at the site, a specialist contractor should be commissioned to make a detailed assessment.

The investigation was carried out to assess the significance of contamination resulting from the use of the site as identified in this report. Unless EPS has otherwise indicated, no assessment of potential impact of any other previous uses has been made.

2 BACKGROUND & SUMMARY OF PREVIOUS REPORT

A summary of the information contained within the Phase I Contamination Assessment report, relating to the geo-environmental setting of the site, is presented in the following section.

2.1 Site & Location Description

Detail	Description
Location	The site is located to the west of Warboys, approximately 10km northeast of Huntingdon.
National Grid Reference	530183, 280142
Topography	Generally level with local topography indicating a downward slope towards the west, lying at approximately 30-32m Above Ordnance Datum (AOD)
Description of Site (MLM April 2019)	The 1.03-hectare site was noted by MLM to be irregular in shape and contain a residential property to the east and open land to the west. The site narrows to the east towards Ramsey Road and widens to a large rectangular field to the west measuring around 100m east to west and 60m north to south. A 1200l plastic heating oil above ground storage tank (AST) was located on the northern side of the house and contained a residual quantity of oil at the time of the walkover. A metal tank approximately 1000l in size which was mounted on bricks and assumed to be a former heating oil AST was also located in close proximity to the newer plastic AST (west). This AST was disconnected and disused although it could not be confirmed if it was empty. Staining was not observed on the ground beneath either tank. A brick outhouse partially boarded up, appeared to be in a poor state of repair, was located along the southern boundary to the south of the house, with possible asbestos containing materials in the form of roofing panels. A pond was located within the centre of the site, measuring up to 17m in diameter and at the time of the walkover the surface water level was approximately 1.0m below surrounding ground level which included mature trees and dense vegetation. An area of scrubby vegetation was present in the southeast of this area and could indicate an historic infilled pond. Drainage ditches were recorded along the northern and western boundaries, while another possible drainage ditch feature was located towards the southern boundary orientated east to west.
Description of Site (EPS December 2020)	EPS found the site to be a broadly similar state to MLM in 2019. The vegetation was more overgrown and the dwelling was partially boarded up.

Detail	Description
Surrounding Land Use	The site is bordered to the northwest by a field; to the north by a residential property; to the east by Ramsey Road beyond which are residential properties; to the south by a residential property; to the southwest by a caravan park; and to the west by an agricultural field.

2.2 Geo-Environmental Context

Detail	Description
Geology	Geological maps of the area show the site to lie on superficial Oadby Member (diamicton) underlain by bedrock of the West Walton and Ampthill Clay Formation (undifferentiated).
Radon	The MLM report states the site is not in an area likely to be affected by radon.
Hydrogeology	The underlying superficial deposits are classified as a Secondary Aquifer (undifferentiated) and the West Walton and Ampthill Clay Formation bedrock is classified as Unproductive Strata. The site was recorded as not lying within a source protection zone for groundwater abstraction. The MLM report did not list any groundwater abstractions within 2km radius.
Hydrology	MLM highlight the nearest surface water feature as an unnamed pond on site with drainage ditches located along the western and northern site boundaries. An unnamed inland river was also located approximately 39m northwest. No surface water abstractions were listed within 2km radius of the site.
Landfill & Waste	MLM reported six areas of potentially infilled land were mapped on site between 1887-1950, likely relating to on-site pond(s).
Summary of Site History	According to the Phase 1 assessment, the earliest mapping (1880s) showed buildings in the east of the site, while the western half remained undeveloped. A well was also indicated in the east. The surrounding area appeared predominantly residential to the north, east and south with undeveloped fields to the west. Several ponds were detailed within the surrounding 100m. Between the early 1920s and the late 1950s several structures had been demolished on site. Since the late 1970s, the previous structures had been demolished and replaced with two new buildings in the east. Many of the surrounding ponds are no longer present with a works shown 20m east, an electricity substation 70m north and a drain 70m northwest (MLM, 2019).

2.3 Findings and Conclusions

The Phase I Desk Study included a Conceptual Site Model which identified a small number of plausible contaminant linkages that have the potential to become active as a result of the presence of two above ground heating oil tanks, previous phases of construction and demolition, as well as infilling (of former ponds) on site; and an off-site fuel filling station or vehicles garage (80m south approximately). The contaminant linkages considered to carry the greatest potential risks comprised the following:

- Human health risks associated with interaction between site workers/future residents and potentially contaminated shallow soils.
- Volatilisation of organic compounds / migration to indoor air.
- Migration of ground gas to indoor air.
- Risks to controlled waters from site derived contaminants of concern.

It was therefore recommended that, initially, the identified plausible contaminant linkages should be further investigated by means of exploratory intrusive investigation, that targets potentially infilled features, ASTs and former buildings, as well as non-targeted site coverage in areas of future gardens and soft landscaping, with soils samples collected for laboratory analysis. The key contaminants of concern will include petroleum hydrocarbons, poly-aromatic hydrocarbons, metals and asbestos.

The report did recommend the installation of ground gas monitoring wells due to the risks identified from on-site sources (infilled ponds). EPS reviewed the available records and considered that if any such sources were identified then forensic sorting and Total Organic Carbon testing should be undertaken in accordance with BS 8485:2015 *'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'* (Annex E – The 'RB17' Approach).

3 SUMMARY OF INTRUSIVE INVESTIGATIONS

Intrusive ground investigations were undertaken on 9th December 2020 in accordance with EPS standard operating procedures, copies of which will be made available on request. A summary of all site activities is presented in the following sections:

3.1 Exploratory Hole Locations

Exploratory hole locations were selected through consideration of the potential contaminant linkages identified through the Phase I Desk Study, the proposed development layout, the location of below ground utilities as well as operational and health & safety considerations. For the RB17 method of assessing gas generation potential, the use of trial pits to retrieve large bulk samples and allow a thorough inspection of the source material is preferable to borehole drilling, hence that method of investigation was employed.

Eight trial pits (TP1-TP8a/b) were excavated to a maximum depth of 2.0m using a track-mounted mechanical digger.

The overall objective in terms of exploratory hole locations was to provide an appropriate lateral and vertical coverage of the soils underlying the site in order to offer information relating to their quality and nature. Further rationale for each sampling location is provided within the table below:

Location	Rationale
TP1	Provide information on the nature and quality of ground conditions in the area of the existing above ground oil tanks, in location which is as close as practical.
TP2, TP3 & TP5	Provide information on the nature and quality of ground conditions in the areas of potentially former infilled ponds. Also to provide bulk samples for forensic analysis (of gas generating potential) if necessary.
TP4, TP6-TP8a/b	To provide general coverage of the nature and quality of ground conditions across the site.

A trial pit location plan is presented as Figure 2.

3.2 In-Situ Testing & Soil Sampling

Each trial pit hole was logged for ground conditions encountered and inspected for any physical evidence of contamination, such as soil staining, odour and the presence of separate phase liquids on a precautionary basis. Trial pit logs are presented in Appendix C.

Where potentially volatile organic compounds are suspected, EPS carries a Photoionisation Detector (PID), which can be used to measure the relative concentrations of vapour associated with soil samples collected from different depths and locations at the site. In these circumstances, soil samples will be placed into plastic bags, sealed, shaken and then allowed to rest for a few minutes to allow time for volatile vapour to accumulate in the air trapped within the bag.

The PID probe will then be used to pierce the bag and sample the air above the soil to measure the concentration of volatile compounds that have accumulated. PID readings are only used to

provide EPS with a basic means to quantify areas of volatile organic compound in the field to help guide the investigation. As potentially volatile organic compounds, specifically including petroleum hydrocarbons, were identified in the conceptual site model, PID readings were collected during this intrusive investigation. These readings are included within trial pit logs presented as Appendix C and the results are discussed further in later sections.

3.3 Laboratory Testing

Samples obtained for analysis of identified contaminants of concern were submitted to Element Material Technology of Flintshire, who hold appropriate UKAS / MCERT accreditation for the required testing. Samples were transported in laboratory supplied containers and delivered to the laboratory by approved courier.

An environmental testing schedule is included as Table 1.

4 FINDINGS OF THE INVESTIGATION

This section of the report provides a summary of the findings of the various aspects of the ground investigation.

4.1 Ground Conditions

A total of eight trial pit holes were formed at the site and the ground conditions encountered, from surface level, were found to comprise:

- Topsoil
- Made Ground
- Oadby Member

Site specific trial pit logs are included as Appendix C and give descriptions and depths of strata encountered. A summary of the general strata encountered across the site is provided in the table below, with more detailed description given in the following sub sections.

Geological Strata	Maximum Depth to Base of Strata (m bgl)	Strata Thickness (m)
Topsoil	0.3	0.2-0.3
Made Ground	0.8	0.5-0.8
Oadby Member	>2.0 (not proven)	0.35m->1.6

4.1.1 Topsoil

Topsoil was encountered from surface at TP3-TP7, beneath the grass covering and was observed as a dark brown slightly clayey sand to a soft slightly sandy clay with rare flint and chalk gravels.

4.1.2 Made Ground

Made ground materials were recorded at TP1, TP2 and TP8a/b (nearest the 21 Ramsey Road property). At TP1 and TP2, this material consisted of a dark blackish brown gravelly slightly clayey sand with fine to coarse gravels including cobbles; with brick, ash, wood and rare plastic fragments noted at TP1, and tile and ceramic fragments noted at TP2. At TP8 (which extended across the grass verge (TP8a) and driveway (TP8b); a grass surface and an asphalt surface overlying subbase gravels to 0.25m, were both underlain by a brown gravelly sand and clay mix with building rubble/debris including bricks and concrete fragments.

4.1.3 Oadby Member

Materials interpreted as the Oadby Member were encountered at all trial pit locations. The strata was noted as a firm to stiff brownish grey/orangish brown with grey mottled slightly sandy gravelly clay including fine to medium flint and chalk at TP1, TP2 and TP8. At TP3-TP7, two distinct layers were identified comprising a soft to firm light yellowish brown slightly sandy slightly gravelly clay with fine chalk gravels; underlain by a firm to stiff grey and brown/orangish brown sandy gravelly clay with fine to medium chalk and flint gravels. Ferruginous staining noted.

4.2 Groundwater

Groundwater seepage was recorded at TP2 at 0.65m bgl, coinciding with a gravelly pocket of material at the base of the pit, the same as TP5 at 1.8m bgl; further seepages were recorded at TP7 at 1.4m bgl, and TP6 at 0.9m bgl, 1.5m bgl and 1.7m bgl.

4.3 Physical Evidence of Contamination

Despite the presence of a limited thickness of made ground, there was no palpable evidence of contamination, waste or putrefiable material encountered in any of the sampling locations during the investigation including any visual or olfactory evidence of hydrocarbon staining.

This was supported by headspace testing undertaken at regular intervals during the field works which did not identify any concentrations of organic vapours above instrument detection levels (<0.1ppmV).

4.4 Laboratory Analysis – Soil

A laboratory analysis testing schedule is presented as Table 1 and all environmental sample results obtained from the laboratory are included as Appendix D. The key results of laboratory testing on environmental soil samples are summarised below.

Contaminant	No. of Samples	No of Detections	Range of Detections (mg/kg)		Highest Location & Depth (m bgl)
			Min	Max	
Arsenic	8	8	7.7	22.1	TP1, 0.40
Cadmium	8	6	0.1	0.9	TP2, 0.30
Chromium	8	8	48.6	79.1	TP6, 0.50
Copper	8	8	18	77	TP1, 0.40
Lead	8	8	16	249	TP1, 0.40
Mercury	8	4	0.1	2.7	TP2, 0.30
Nickel	8	8	25.4	37.1	TP5, 0.50
Selenium	8	5	1	3	TP5, 0.50
Zinc	8	8	76	285	TP2, 0.30
Naphthalene	8	1	-	0.22	TP1, 0.40
Benzo[a]pyrene	8	4	0.06	2.57	TP1, 0.40
Dibenz(ah)anthracene	8	2	0.16	0.38	TP1, 0.40
Phenols	8	0	-	-	n/a
BTEX	4	0	-	-	n/a
TPH CWG	4	1	-	259	TP1, 0.40
Asbestos (%)	8	0	-	-	n/a

Notes: - Contaminant not found above laboratory detection limits BTEX Benzene, Toluene, Ethylbenzene, Xylenes
TPH CWG Total Petroleum Hydrocarbons (Criteria Working Group)

5 ENVIRONMENTAL APPRAISAL

The following section outlines the approach applied to assessing the risks posed to human health and controlled waters through a Generic Quantitative Risk Assessment, then identifies any sample results found by this investigation which warrant further consideration.

5.1 Human Health

5.1.1 Land Use Setting & Generic Screening

It is understood that development proposals for the '*erection of up to 26 residential dwellings, including affordable housing (Use Class C3) together with parking areas, landscaping and other associated infrastructure, following the demolition of no.21 Ramsey Road and associated outbuildings*. In order to screen laboratory data for concentrations of contaminants in soil with potential to cause harm to human health in soft landscaping and/or garden areas, relevant generic screening values most applicable to this land use have been utilised. A residential setting (with homegrown produce) has been adopted as it is considered the most representative.

The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows:

- *EA Science Reports* (SC050021/SR2, SC050021/SR3, and SC050021/SR7)
- *EA Soil Guideline Value Science Reports*
- *Suitable For Use Levels (S4ULs) for Human Health Risk Assessment* – LQM and CIEH (2015)
- *Soil Generic Assessment Criteria for Human Health Risk Assessment* - EIC/AGS/CL:AIRE (2010)

Category 4 Screening Levels (C4SLs) provide generic suitable for use screening values for common contaminants in a variety of land uses and are also utilised as appropriate generic screening criteria.

A summary of the screening criteria and the methodology used to derive them is included in Appendix E.

5.1.2 Assessment of Results- Human Health

The results of the screening process for on-site human receptors show that relevant generic screening criteria were exceeded within two samples (of 8) for heavy metals lead and mercury, and for dibenzo[ah]anthracene, as highlighted within the following table.

Contaminant	Screening Value (mg/kg)	Number of Exceedances	Range (mg/kg)	Location & Depth of Maximum Concentration
Lead	200	1	249	TP1 (0.40)
Mercury	1.2	1	2.7	TP2 (0.30)
Dibenzo(ah)anthracene	0.25	1	0.38	TP1 (0.40)

For the distribution of PAHs, it is considered reasonable to utilise recorded concentrations of Benzo(a)Pyrene (BaP) as a risk driver, or marker, representative of genotoxic PAHs (i.e. including Dibenzo[ah]anthracene) to further assess the data set. As the relevant screening value for benzo(a)pyrene was not exceeded, there are not considered to be any unacceptable risks to future site users from the recorded concentrations of PAH's in shallow soils.

A single concentration of lead has exceeded relevant generic screening criteria and was identified in TP1 (0.40) only. The level of this metal may represent unacceptable risks to human health, however the source of this heavy metal can likely be attributed to the made ground present to the east of the site in former developed areas.

Concentrations of total mercury were identified, however only the shallow soil sample collected from TP2 (0.30) exceeds the screening value for an individual form of mercury, the most stringent value being elemental mercury and it is a very marginal exceedance of the S4UL (2.4mg/kg compared to 1.2mg/kg). There were no identified specific sources of mercury contamination on the site and it is likely that a significant proportion of the mercury present is in its inorganic state. As such, the proportion of exceedance is considered less significant than the identified elevated result of lead, which has therefore been adopted as a driver for the risk assessment and design of remedial measure (cover system thickness).

Only one of a possible eight shallow soil samples collected by EPS contained elevated concentrations of lead. However, with reference to the CL:AIRE guidance, *'Comparing Soil Concentration Data with a Critical Concentration'* (2020), the available sample set is too small to undertake comprehensive statistical analysis. There does appear to be justification and evidence for splitting the dataset into two populations, as the soil type in the soil sample from TP1 is described as made ground with man-made materials such as building debris in the form of bricks were noted, likely from the demolition of historic structures, which from historical maps were encountered throughout the east of the site. The west of the site appears to have remained largely undeveloped.

Therefore, the most significant sample result (lead – 249mg/kg in TP1 0.4m) will be taken forward for the design of remedial measures on the basis that this contaminant (and source) is present within shallow made ground soils to the east of the site.

No significant volatile contamination (including BTEX compounds and petroleum hydrocarbons <EC16) were identified in the samples or through PID head-space screening on site, so further investigation of this linkage does not appear warranted. This information along with the widespread presence of cohesive, low permeability soils also suggests that the risk of onsite vapour migration from the relatively nearby garage or petrol filling station (80m south) is negligeable. In addition, no evidence of any significant infilling of former ponds was encountered and trial pits were undertaken in close proximity to the existing pond and in areas where historical ones were possible, based on available mapping. As such a plausible significant risk from ground gases does not appear to exist.

The lack of widespread petroleum hydrocarbons detected in the soil analysis also suggests that barrier drinking water pipes or specialist concrete to resist fuel in the ground are not needed.

Recommendations for control measures to reduce the risks to future site users associated with the concentrations of contaminants within shallow soils are presented within Section 5.4.

5.2 Controlled Waters

5.2.1 Generic Screening

In addition to screening the recorded concentrations of contaminants to pose risks to human health, EPS has also screened the results of soil analysis for potential to cause harm to water resources.

The criteria used for this process were derived by EPS using the following technical guidance

- *Environment Agency Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination.*

Resource Sensitivity of Area	Basis of Tier 1 Criteria
High Groundwater Resource Potential (HGwRP) - Principal Aquifers	UK Drinking Water Standards (UKDWS)
Low Groundwater Resource Potential (LGwRP) - Secondary Aquifers not being abstracted and Unproductive groundwater strata	UK Environmental Quality Standards (EQS)

Screening criteria for Low Groundwater Resource Potential (LGwRP) have been adopted for this site due to the underlying geology being classified as a Secondary Aquifer and the presence of nearby drains, but with no SPZ and no abstractions recorded within 2km.

5.2.2 Assessment of Soil Results

Relevant screening criteria protective controlled waters from concentrations of contaminants in soil were exceeded for Aromatic Petroleum Hydrocarbon Fractions EC16-EC21 and EC21-EC35. A summary of the exceedances is provided in the table below.

Contaminant	Screening Value (mg/kg)	Number of Exceedances	Exceedance (mg/kg), Sampling Location & Depth
TPH Aromatic EC16-EC21	17.4	1	33, TP1, 0.40m
TPH Aromatic EC21-EC35	138	1	184, TP1, 0.40m

The fact that some recorded values exceed those of the screening values does not necessarily indicate that an unacceptable risk to controlled waters exists. The generic screening values are by their very nature, extremely conservative and in the first instance an exceedance should lead to qualitative consideration of the risks that may be posed given the context of a specific site. It should also be noted that this aspect of the assessment is based on soil data, not soil leachate or

groundwater. As a result, any subsequent risk assessment of risks to controlled waters will always be highly conservative as assumptions are made about contaminant mobility which will, in reality, only be partially applicable, if at all.

The exceedance of petroleum hydrocarbons appears to be localised to TP1 only, which was located in close proximity to the metal Above ground oil Storage Tank (AST) to the west of the property (east of the site). The principal contaminants were speciated as mainly longer chain hydrocarbon fractions. The Extractable Petroleum Hydrocarbons (EPH) interpretation from the laboratory suggests the source of TPH to be PAH's and naturally occurring compounds, which are probably not evidence of any significant oil leak. The contaminants also do not appear to be migrating across the site, which is likely due to the low solubility and volatility of these compounds and the underlying cohesive strata.

A soil sample analysed from the underlying natural cohesive soils from TP1, did not detect any petroleum hydrocarbon fractions, this coupled with the above lines of evidence indicate that there are no unacceptable risks to controlled waters from the identified site derived contamination, or a need for further investigation/assessment. Nonetheless, all due care and consideration should be given when removing both of the above ground oil storage tanks to ensure that their contents do not leak or spill potentially contaminating both shallow soils and groundwater within the underlying Secondary Aquifer, for which a recommendation is made in Section 5.4.

The measures required to mitigate risks to human health will also likely necessitate some stripping of the shallow made ground soils shown to be contaminated with lead, and therefore may also provide the water environment some betterment.

5.3 Summary of Findings

Investigation and laboratory analysis of the made ground materials encountered to the east of the site has identified that they are slightly contaminated (in the form of elevated concentrations of lead). Therefore, shallow contamination does exist with the potential to cause harm to future residents and a remedial control measure is warranted to ensure future garden and soft landscaped areas are safe and suitable for use.

The soils located within close proximity to the above ground oil storage tanks were tested (as close as was practicable) and found to not contain any significant levels of fuel or oil derived contaminants, which confirms that a plausible risk does not exist in terms of future site users inhaling soil vapour or from the leaching of contaminants to controlled waters (groundwater within the underlying Secondary Aquifer) from this potential source. A recommendation has been made to safely remove the tanks and prevent any contamination.

In terms of risks from ground gas, EPS has reviewed the nature, distribution and origin of the identified contamination in the context of the site and it is considered that the shallow soils are not considered to represent an unacceptable risk and further control measures / remedial action is not considered necessary.

In the context of potentially unacceptable or acceptable risks as outlined within the Environment Agency's *Land Contamination: Risk Management guidance* (LC:RM, 2020), the risks identified by this

work will not require further assessment, providing the following control measures are implemented.

5.4 Recommendations

The most appropriate form of remedial action / control measure that will mitigate risks associated with the identified contamination in shallow made ground soils to acceptable levels is considered to be the implementation of a clean topsoil cover system in all areas of proposed domestic gardens and soft landscaping within the redline planning boundary, as per the BRE publication: *Cover Systems for Land Regeneration: Thickness Design of Cover Systems for Contaminated Land* (BRE, Mar 2004). The calculated thickness under this guidance is less than the recommended minimum (as calculated in Appendix F), so it is advised that at least **300mm** of clean imported topsoil is installed in these areas. The area considered affected where the cover system will be needed is shown as Figure 3, although the depth of the made ground is known to be variable, ranging between 0.5 to at least 0.8m bgl.

It should be noted that this recommendation is made only for areas of gardens and soft landscaping, and there is no such requirement for areas beneath any hard standing or building footprints. If levels do not significantly change it is recognised that some made ground material will need to be removed to achieve this cover thickness. Following the sufficient removal of the made ground (to allow for the recommended cover system thickness), the excavations should then be made up with clean imported soils accompanied by appropriate laboratory analysis to demonstrate its chemical suitability for use. A Cover Soils Checklist which details these requirements further is presented as Appendix G.

EPS are aware of root protection areas in certain areas which may limit the options for remedial design. In these areas, it is understood that only a reduced cover (of 150mm) or some other form of remediation such as permeable capping (e.g. resin bond gravel) would need to be designed. It is recommended that once final layouts are available, a final Remedial Strategy & Implementation Plan is prepared, taking account of input from the Arboriculturist to ensure a remedial approach is designed to be both sufficiently protectively of future site users without causing harm to existing trees.

These remedial works must be verified and EPS can assist in this process. All waste transfer documentation must be retained, with photographs of the excavations including any exposed clean natural soils and compiling the information outlined in the Cover Soils Checklist. If an established supplier such as British Sugar was used, then the soil is tested at source and no further analysis would typically be needed.

The following precautionary recommendations are also made in regards to safe development:

a) There does not appear to be a need for barrier drinking water pipes or specialist concrete, both of which would be resistant to petroleum hydrocarbons although consultation with Anglian Water is recommended.

b) All waste materials must be disposed of with the appropriate duty of care. For any waste soils, comprehensive waste classification and acceptance criteria testing will be needed to inform appropriate off-site soil disposal. EPS can assist in this process if requested.

c) Where wastes are generated which potentially contain asbestos, they must be disposed of in accordance with the Control of Asbestos Regulations (2012). If the ACM identified on-site is to be removed, care must be taken to avoid any sheets being broken and fragments being worked into the ground surface as that would render the existing Conceptual Site Model and risk assessment obsolete and need to be revisited by EPS.

   Although no visual asbestos was noted in the soils on site, ACMs were identified within the fabric of the brick outhouse in the walkover. It is possible that once the vegetation is cleared and site stripped that fragments are identified and this would not be uncommon for this type of site with former structures indicated. In these circumstance EPS should be notified and the risk assessment will need to be revisited.

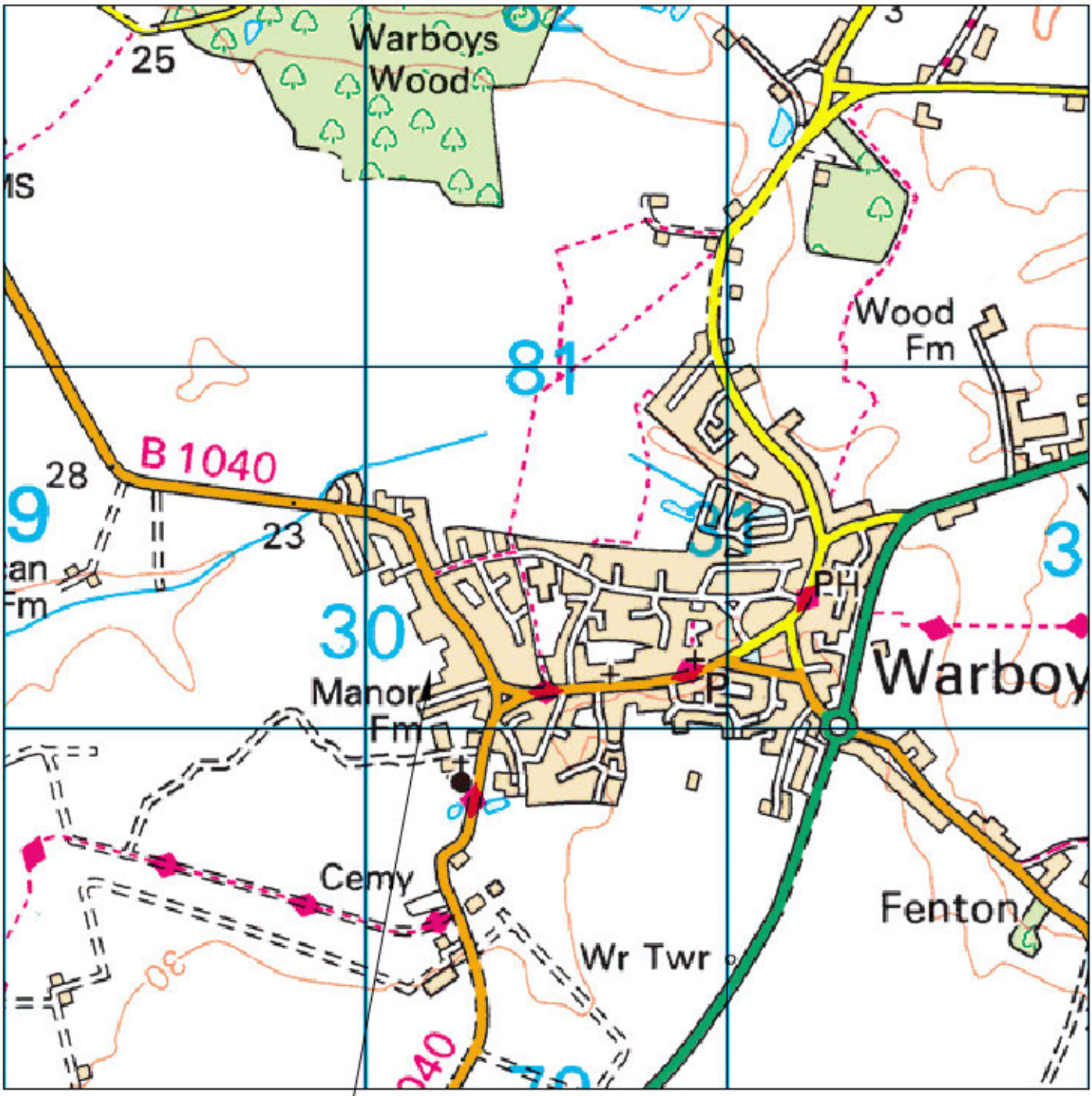
d) The likelihood of widespread contamination around the above ground oil tanks appears limited. However, the tanks were not externally bunded so they do represent a potential risk of leaking. They should be removed with attention paid to the ground for any evidence of leaks, such as odours, staining or damage to the feed pipe/filter/tank itself. Photographs of the process must be retained and EPS (or equivalent) should visit to inspect the exposed soils beneath the tank, and screen the soils with a PID instrument. A brief record of this process should be included in the Verification Report.

e) Should any evidence of any other unexpected contamination be encountered during the redevelopment work, it should be reported to EPS so that an inspection can be made and appropriate sampling and assessment work carried out, a method statement for this is provided as Appendix H.

f) All construction workers operating at the site should be advised of the potential for contact with made ground material within shallow soils, particularly beneath the existing buildings and hardstanding. Appropriate health and safety precautions should be adopted during any excavation works to avoid exposure to infilled soils. Reference should be made to relevant health & safety guidance including the following CIRIA document: *R132 Guide to Safe Working on Contaminated Sites*.

It is recommended that a copy of this report be provided to the Environmental Health Department of Huntingdonshire District Council so that the information may be incorporated into their land quality records and used to support the current planning application. This report should satisfy the pre-commencement requirements relating to contamination. It is assumed that the council will require a Verification Report covering the installation of the above remedial measures before discharging the pre-occupation aspects of the contamination condition.

FIGURES



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Title:	**Site Location Plan**
Project:	21 Ramsey Road, Warboys, Huntingdon, PE28 2RW
Fig No:	1
Scale:	NTS
Drawn By: CC	Approved By: MB
Job No:	UK20.5220
Dwg No:	Warboys/0121/01
Date:	January 2021



KEY:

Approximate Site Boundary

Approximate Trial Pit Locations

Fig No: 2

Title: Trial Pit Location Plan

Project: 21 Ramsey Road, Warboys

Scale:	NTS - For Illustration purposes only
Drawn By:	CC
Job No:	UK20.5220
Dwg No:	Warboys/0121/02
Date:	January 2021



N

KEY:

Approximate Site Boundary

Area Requiring Remediation

Fig No: 3

Title: Remediation Location Plan

Project: 21 Ramsey Road, Warboys

Scale:	NTS - For Illustration purposes only
Drawn By:	MB
Job No:	UK20.5220
Dwg No:	Warboys/0121/03
Date:	Feb 2021

TABLES

Table 1 – Laboratory Testing Schedule

Sample ID	Sample Depth (m bgl)	EPS Mini Suite	EPS TPH Suite
TP1	0.4	1	1
TP1	1.1	-	1
TP2	0.3	1	-
TP2	1.0	-	-
TP3	0.5	1	-
TP3	1.3	-	-
TP4	0.2	1	-
TP4	0.6	-	-
TP5	0.2	-	-
TP5	0.5	1	-
TP6	0.5	1	-
TP7	0.3	1	1
TP8	0.3	1	1
TP8	0.7	-	-

Notes:

mbgl	meters below ground level
1	Sample Taken
-	Sample Not Analysed
EPS Mini Suite	Organic Matter, Cyanide, Metals, PAH's, Phenols, Asbestos
EPS TPH Suite	Total Petroleum Hydrocarbons

APPENDICES

APPENDIX A

Selected Site Photographs



KEY:

Approximate Site Boundary

1 Approximate Photo Location

Fig No: A

Title: Photo Location Plan

Project: 21 Ramsey Road, Warboys

Scale:	NTS - For Illustration purposes only
Drawn By:	CC
Job No:	UK20.5220
Dwg No:	Warboys/0121/A
Date:	January 2021

Photo 1: Image showing 21 Ramsey Road property, facing northwest	Photo 2: Image showing single storey double garage to west of property, facing east
	
Photo 3: Image showing access gate to south of property with asphalt surfaced roadway, facing west	Photo 4: Image showing outhouse, facing southwest
	
Photo 5: Image showing metal above ground fuel storage tank, facing northeast	Photo 6: Image showing plastic above ground fuel storage tank, facing southwest
	

Photo 7: Image showing pond on site, facing west	Photo 8: Image of western grassland, facing west
	
Photo 9: Image showing TP6	Photo 10: Image showing TP8a/b
	

APPENDIX B

Proposed Development Plan



LEGEND

- Site boundary 1.03 Ha
- Private gardens
- Public Open space
- Parking bays
- Cul de sac shared surface
- Existing trees to be retained
- Proposed trees or hedges
- Water
- Roadside swale

Carter Jonas

PROJECT TITLE

JL DISCRETIONARY TRUST
RAMSEY ROAD, WARBOYS

DRAWING TITLE

CONCEPT MASTERPLAN FOR 26 DWELLINGS AND OPEN SPACE

ISSUED BY	London	T: 020 7016 0720	
DATE	07.09.20	**DRAWN**	NM
SCALE@A3	1:1000	**CHECKED**	GR
STATUS	Final	**APPROVED**	JC

DWG. NO. J0006880_002_REVH

No dimensions are to be scaled from this drawing.
All dimensions are to be checked on site.
Area measurements for indicative purposes only.

© Carter Jonas. Quality Assured to BS EN ISO 9001 : 2008

Source: Ordnance Survey

APPENDIX C

Site Specific Trial Pit Logs

Borehole Log

Borehole No. **TP1**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.40 0.40	ES PID	PID=0.00				MADE GROUND - dark blackish brown slightly clayey gravelly SAND. Gravel is fine to coarse including cobbles sub-angular to rounded brick, ash, wood, roots and rare plastic fragments.
								Land drain noted (broken from intrusive investigation).
					0.80			Firm brownish grey and light grey mottled slightly sandy gravelly CLAY. Gravel is fine to medium sub-rounded to rounded chalk and angular to sub-angular flint. Ferruginous staining noted.
		1.10 1.10	ES PID	PID=0.00				
					2.00			End of Borehole at 2.000m

1

2

Remarks

Borehole Log

Borehole No. **TP2**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.30 0.30	ES PID	PID=0.00				MADE GROUND - dark blackish brown slightly clayey gravelly SAND. Gravel is medium to coarse including cobbles sub-angular to sub-rounded ceramic fragments, flint and sandstone.
					0.50			Firm orangish brown slightly sandy gravelly CLAY. Gravel is fine to medium sub-rounded chalk and sub-angular flint.
	▼							*Gravelly pocket of material.*
		1.00 1.00	ES PID	PID=0.00				
	▼				1.80			End of Borehole at 1.800m

1

2

Remarks

Borehole Log

Borehole No. **TP3**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
								TOPSOIL - dark brown slightly clayey SAND with rare medium to coarse sub-rounded flint and chalk gravels.
					0.30			Firm light yellowish brown slightly sandy slightly gravelly CLAY. Gravel is fine sub-rounded chalk.
		0.50 0.50	ES PID	PID=0.00				
					0.80			Firm to stiff grey and brown slightly sandy gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded chalk and flint.
		1.30 1.30	ES PID	PID=0.00				
					1.80			End of Borehole at 1.800m

1

2

Remarks

Borehole Log

Borehole No. **TP4**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.20 0.20	ES PID	PID=0.00				TOPSOIL - dark brown slightly clayey SAND with rare medium to coarse sub-rounded flint and chalk gravels.
					0.30			Firm light yellowish brown slightly sandy slightly gravelly CLAY. Gravel is fine sub-rounded chalk.
		0.60 0.60	ES PID	PID=0.00				
					0.90			Firm to stiff grey and brown slightly sandy gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded chalk and flint.
					1.50			End of Borehole at 1.500m

1

2

Remarks

Borehole Log

Borehole No. **TP5**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
								TOPSOIL - soft dark brown slightly sandy CLAY.
		0.20 0.20	ES PID	PID=0.00	0.20			Firm light yellowish brown slightly sandy slightly gravelly CLAY. Gravel is fine sub-rounded chalk.
		0.50 0.50	ES PID	PID=0.00				
					1.00			Firm to stiff brown and grey with orange mottled slightly sandy gravelly CLAY. Gravel is fine to coarse sub-rounded to rounded chalk and angular to sub-angular flint.
	▼				1.80			End of Borehole at 1.800m

1

2

Remarks

Borehole Log

Borehole No. **TP6**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
								TOPSOIL - soft dark blackish brown slightly sandy CLAY.
					0.25			Soft to firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is fine sub-rounded chalk.
		0.50 0.50	ES PID	PID=0.00				
	▼				0.80			Firm to stiff orangish brown and orange and grey mottled slightly sandy gravelly CLAY. Gravel is fine to coarse including cobbles sub-angular to sub-rounded flint and chalk.
	▼							
	▼				1.80			End of Borehole at 1.800m

1

2

Remarks

Borehole Log

Borehole No. **TP7**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.30 0.30	ES PID	PID=0.00	0.30			TOPSOIL - soft dark brown slightly sandy CLAY.
					0.80			Soft to firm orangish brown slightly sandy CLAY.
	▼				1.60			Firm orangish brown and light grey mottled slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub-rounded to rounded chalk and sub-angular flint. Ferruginous staining and gravel pockets noted.
								End of Borehole at 1.600m

1

2

Remarks

Borehole Log

Borehole No. **TP8a**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
		0.30 0.30	ES PID	PID=0.00				MADE GROUND - brown gravelly SAND and CLAY. Gravel is fine to coarse in cobbles sub-rounded to sub-angular brick, concrete and general building debris rubble.
					0.55			
		0.70	ES					Firm to stiff orangish brown and grey mottled slightly sandy gravelly CLAY. Gravel is fine to coarse angular to sub-rounded flint and chalk.
					1.60			End of Borehole at 1.600m

1

2

Remarks

Borehole Log

Borehole No. **TP8b**

Sheet 1 of 1

Project Name: 21 Ramsey Road, Warboys	Project No. UK20.5220	Co-ords:	Hole Type TP
Location: 21 Ramsey Road, Warboys, PE28 2RW		Level:	Scale 1:10
Client:		Dates: 09/12/2020	Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	In Situ Results				
								MADE GROUND - asphalt surfacing.
								MADE GROUND (subbase) - black GRAVEL. Gravel is medium to coarse sub-rounded aggregate.
					0.25			
		0.30	PID	PID=0.00	0.25			Firm to stiff orangish brown and grey mottled slightly sandy gravelly CLAY. Gravel is fine to coarse angular to sub-rounded flint and chalk.
					1.60			End of Borehole at 1.600m

1

2

Remarks

APPENDIX D

Laboratory Results

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

[redacted]

W: www.element.com

EPS Ltd
7B Caxton House
Broad Street
Cambourne
Cambridgeshire
CB23 6JN

Attention :	[redacted]
Date :	22nd December, 2020
Your reference :	UK20.5220
Our reference :	Test Report 20/17715 Batch 1
Location :	21 Ramsey Road, Warboys
Date samples received :	12th December, 2020
Status :	Final report
Issue :	1

Fifteen samples were received for analysis on 12th December, 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.

[redacted]
Senior Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 10 Lower Grosvenor Place, London, SW1W 0EN
Company Registration No: 11371415

Client Name: EPS Ltd
Reference: UK20.5220
Location: 21 Ramsey Road, Warboys
Contact: [redacted]
EMT Job No: 20/17715

Report : Solid

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

EMT Sample No.	1-2	3-4	5-6	9-10	13-14	19-20	21-22	23-24	25-26		LOD/LOR	Units	Method No.
Sample ID	TP1	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8				
Depth	0.40	1.10	0.30	0.50	0.20	0.50	0.50	0.30	0.30				
COC No / misc										Please see attached notes for all abbreviations and acronyms			
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J				
Sample Date	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020				
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020				
Arsenic [M]	22.1	-	19.4	11.7	11.8	7.7	12.6	11.8	16.7		<0.5	mg/kg	TM30/PM15
Cadmium [M]	0.2	-	0.9	0.1	0.3	<0.1	<0.1	0.2	0.1		<0.1	mg/kg	TM30/PM15
Chromium [M]	56.6	-	60.1	66.6	56.7	48.6	79.1	57.0	61.5		<0.5	mg/kg	TM30/PM15
Copper [M]	77	-	51	18	27	18	18	24	32		<1	mg/kg	TM30/PM15
Lead [M]	249	-	168	19	56	16	29	81	64		<5	mg/kg	TM30/PM15
Mercury [M]	0.8	-	2.7	<0.1	<0.1	<0.1	<0.1	0.3	0.1		<0.1	mg/kg	TM30/PM15
Nickel [M]	29.8	-	32.3	28.7	27.1	37.1	31.2	25.4	25.4		<0.7	mg/kg	TM30/PM15
Selenium [M]	1	-	1	<1	<1	3	1	1	<1		<1	mg/kg	TM30/PM15
Total Sulphate as SO4 [M]	1431	-	820	544	1467	674	571	990	1499		<50	mg/kg	TM50/PM29
Zinc [M]	255	-	285	79	124	76	95	109	125		<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene [M]	0.22	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.29	-	0.04	<0.03	<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	mg/kg	TM4/PM8
Fluorene [M]	0.16	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Phenanthrene [M]	2.99	-	0.74	<0.03	0.18	<0.03	<0.03	<0.03	0.06		<0.03	mg/kg	TM4/PM8
Anthracene [#]	2.94	-	0.24	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Fluoranthene [M]	6.19	-	2.19	<0.03	0.37	<0.03	<0.03	0.08	0.15		<0.03	mg/kg	TM4/PM8
Pyrene [#]	5.05	-	1.80	<0.03	0.30	<0.03	<0.03	0.07	0.13		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene [#]	2.89	-	1.15	<0.06	0.26	<0.06	<0.06	<0.06	0.12		<0.06	mg/kg	TM4/PM8
Chrysene [M]	3.23	-	1.22	<0.02	0.19	<0.02	<0.02	0.05	0.10		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene [M]	5.39	-	2.30	<0.07	0.34	<0.07	<0.07	<0.07	0.17		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene [#]	2.57	-	1.29	<0.04	0.13	<0.04	<0.04	<0.04	0.06		<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	1.74	-	0.76	<0.04	0.10	<0.04	<0.04	<0.04	0.06		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene [#]	0.38	-	0.16	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene [#]	1.69	-	0.76	<0.04	0.10	<0.04	<0.04	<0.04	0.06		<0.04	mg/kg	TM4/PM8
PAH 16 Total	35.7	-	12.7	<0.6	2.0	<0.6	<0.6	<0.6	0.9		<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	3.88	-	1.66	<0.05	0.24	<0.05	<0.05	<0.05	0.12		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	1.51	-	0.64	<0.02	0.10	<0.02	<0.02	<0.02	0.05		<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	89	-	85	91	87	80	90	93	90		<0	%	TM4/PM8
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) [M]	<0.1 [SV]	<0.1	-	-	-	-	-	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) [M]	<0.1 [SV]	<0.1	-	-	-	-	-	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	3.7 [SV]	<0.1	-	-	-	-	-	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) [M]	<0.2	<0.2	-	-	-	-	-	<0.2	<0.2		<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) [M]	<4	<4	-	-	-	-	-	<4	<4		<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) [M]	<7	<7	-	-	-	-	-	<7	<7		<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) [M]	38	<7	-	-	-	-	-	<7	<7		<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	42	<19	-	-	-	-	-	<19	<19		<19	mg/kg	

Client Name: EPS Ltd
Reference: UK20.5220
Location: 21 Ramsey Road, Warboys
Contact: [redacted]
EMT Job No: 20/17715

Report : Solid

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

EMT Sample No.	1-2	3-4	5-6	9-10	13-14	19-20	21-22	23-24	25-26		LOD/LOR	Units	Method No.
Sample ID	TP1	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8				
Depth	0.40	1.10	0.30	0.50	0.20	0.50	0.50	0.30	0.30				
COC No / misc										Please see attached notes for all abbreviations and acronyms			
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J				
Sample Date	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020	09/12/2020				
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020	12/12/2020				
TPH CWG													
Aromatics													
>C5-EC7 (HS_1D_AR) [#]	<0.1 [SV]	<0.1	-	-	-	-	-	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) [#]	<0.1 [SV]	<0.1	-	-	-	-	-	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) [#M]	<0.1 [SV]	<0.1	-	-	-	-	-	<0.1	<0.1		<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) [#]	<0.2	<0.2	-	-	-	-	-	<0.2	<0.2		<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) [#]	<4	<4	-	-	-	-	-	<4	<4		<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) [#]	33	<7	-	-	-	-	-	<7	<7		<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) [#]	184	<7	-	-	-	-	-	<7	<7		<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR) [+]	217	<19	-	-	-	-	-	<19	<19		<19	mg/kg	
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_TWA)	259	<38	-	-	-	-	-	<38	<38		<38	mg/kg	
MTBE [#]	<5 [SV]	<5	-	-	-	-	-	<5	<5		<5	ug/kg	TM36/PM12
Benzene [#]	<5 [SV]	<5	-	-	-	-	-	<5	<5		<5	ug/kg	TM36/PM12
Toluene [#]	<5 [SV]	<5	-	-	-	-	-	<5	<5		<5	ug/kg	TM36/PM12
Ethylbenzene [#]	<5 [SV]	<5	-	-	-	-	-	<5	<5		<5	ug/kg	TM36/PM12
m/p-Xylene [#]	<5 [SV]	<5	-	-	-	-	-	<5	<5		<5	ug/kg	TM36/PM12
o-Xylene [#]	<5 [SV]	<5	-	-	-	-	-	<5	<5		<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15		<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	36.1	24.3	31.7	23.2	59.7	25.2	29.1	36.2	28.2		<0.1	%	PM4/PM0
Hexavalent Chromium [#]	<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]	0.2035	-	<0.0015	0.0450	0.0670	0.1249	0.0727	0.0079	0.0517		<0.0015	g/l	TM38/PM20
Chromium III	56.6	-	60.1	66.6	56.7	48.6	79.1	57.0	61.5		<0.5	mg/kg	NONE/NONE
Total Cyanide [#M]	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	mg/kg	TM89/PM45
Organic Matter	12.9	-	10.0	1.6	10.1	1.1	1.9	6.4	8.0		<0.2	%	TM21/PM24
pH [#M]	8.20	-	8.11	8.40	7.81	8.17	8.32	7.79	8.19		<0.01	pH units	TM73/PM11
Sample Type	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay			None	PM13/PM0
Sample Colour	Dark Brown	Light Brown	Dark Brown	Medium Brown	Dark Brown	Medium Brown	Medium Brown	Dark Brown	Dark Brown			None	PM13/PM0
Other Items	Stones, loam, roots	Stones, chalk	Stones, roots, brick	Stones	Stones, roots	Stones, chalk	Stones	Stones, roots	Stones, roots, vegetation			None	PM13/PM0

Client Name: EPS Ltd

Reference: UK20.5220

Location: 21 Ramsey Road, Warboys

Contact: [redacted]

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
20/17715	1	TP1	0.40	1-2	PAH's & Naturally Occurring Compounds
20/17715	1	TP1	1.10	3-4	No Interpretation Possible
20/17715	1	TP7	0.30	23-24	No Interpretation Possible
20/17715	1	TP8	0.30	25-26	No Interpretation Possible

Client Name: EPS Ltd
Reference: UK20.5220
Location: 21 Ramsey Road, Warboys
Contact: [redacted]

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
20/17715	1	TP1	0.40	2	17/12/2020	General Description (Bulk Analysis)	Soil/Stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD
					17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD
20/17715	1	TP2	0.30	6	17/12/2020	General Description (Bulk Analysis)	Soil/Stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD
					17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD
20/17715	1	TP3	0.50	10	17/12/2020	General Description (Bulk Analysis)	Soil/Stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD
					17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD
20/17715	1	TP4	0.20	14	17/12/2020	General Description (Bulk Analysis)	soil/stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD
					17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD
20/17715	1	TP5	0.50	20	17/12/2020	General Description (Bulk Analysis)	soil/stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD
					17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD
20/17715	1	TP6	0.50	22	17/12/2020	General Description (Bulk Analysis)	soil/stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD
					17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD
20/17715	1	TP7	0.30	24	17/12/2020	General Description (Bulk Analysis)	soil/stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD

Client Name: EPS Ltd
Reference: UK20.5220
Location: 21 Ramsey Road, Warboys
Contact: [redacted]

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/17715	1	TP7	0.30	24	17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD
20/17715	1	TP8	0.30	26	17/12/2020	General Description (Bulk Analysis)	soil/stones
					17/12/2020	Asbestos Fibres	NAD
					17/12/2020	Asbestos ACM	NAD
					17/12/2020	Asbestos Type	NAD
					17/12/2020	Asbestos Level Screen	NAD

Client Name: EPS Ltd
Reference: UK20.5220
Location: 21 Ramsey Road, Warboys
Contact: [redacted]

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/17715						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/17715

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 overesitimate 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.

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

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics extracted.
#2	EU_Total but with fatty acids extracted.
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 20/17715

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	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.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
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

EMT Job No: 20/17715

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	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 GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	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 GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	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 GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	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
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes	Yes	AD	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	

EMT Job No: 20/17715

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
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
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes	Yes	AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes

APPENDIX E

Generic Screening Criteria

EPS Generic Quantitative Risk Assessment - Residential Land Use

Contaminant	Soil Targets			Groundwater Targets	
	Human Health	Controlled Waters		Controlled Waters	
		LGwRP	HGwRP	LGwRP	HGwRP
Unit	mg/kg			ug/l	
Arsenic	See C4SL	n/c	n/c	50	10
Cadmium	See C4SL	n/c	n/c	5	5
Chromium III	910	n/c	n/c	250	50
Chromium VI	See C4SL	n/c	n/c	n/c	n/c
Copper	2400	n/c	n/c	28	28
Mercury (elemental)	1.2	n/c	n/c	1	1
Nickel	180	n/c	n/c	200	50
Lead	See C4SL	n/c	n/c	250	10
Selenium	250	n/c	n/c	10	10
Zinc	3700	n/c	n/c	500	500
Benzene	See C4SL	0.252	0.008	30	1
Toluene	130	1.17	1.17	50	50
Ethylbenzene	47	15.0	10.0	300	200
Xylene (para)	56	0.885	0.885	30	30
MTBE#	49	0.138	0.0276	75	15
Benzo(a)Pyrene	See C4SL	10	1.44	0.7	0.1
Naphthalene	2.3	0.934	0.02	10	0.1
Dibenz(ah)anthracene	0.24	n/c	n/c	n/c	n/c
Aliphatic C5-C6	42	5.27	1.05	50	10
Aliphatic C6-C8	100	23.2	4.64	50	10
Aliphatic C8-C10	27	175	35.1	50	10
Aliphatic C10-C12	130(48)*	1380	276	50	10
Aliphatic C12-C16	1100(8.48)**	27500	5490	50	10
Aliphatic C16-C35	65000 (8.48)**	3.46E+06	6.91E+05	50	10
Aromatic C8-C10	34	8.74	1.75	50	10
Aromatic C10-C12	74	13.8	2.76	50	10
Aromatic C12-C16	140	27.5	5.5	50	10
Aromatic C16-C21	260	86.9	17.4	50	10
Aromatic C21-C35	1100	690	138	50	10

Notes:
LGwRP - Low Groundwater Resource Potential HGwRP - High Groundwater Resource Potential
f = Oral, dermal and inhalation exposure compared with oral HCV N/C = Not Calculated
* = S4UL exceeds vapour saturation limit (in brackets) ** = S4UL exceeds solubility saturation limit (in brackets)

Soil Targets

Targets for Human Health have been taken from S4ULs 'Suitable For Use Levels for Human Health Risk Assessment' – LQM and CIEH (2014) derived using standard sandy loam soil with 1% SOM, except (#) = EIC/AGS/CL:AIRE GAC 'Soil Generic Assessment Criteria' (2010) . For sites where ground conditions differ significantly from sandy loam or site-specific SOM and pH are available, the generic human health targets may be revised.

Targets for Controlled waters have been derived using EA Remedial Targets Worksheet (v3.1) - using standard Sandy Loam ground conditions as described in Science Report SC050021/SR3, assuming no degradation for a 10m compliance distance with criteria of EQS or UKDWS for LGwRP and HGwRP respectively (see notes for GW targets).

Groundwater Targets

For LGwRP, targets have been taken as Freshwater EQS where available. For Ethylbenzene and BaP the WHO Health limit has been used and for MTBE and individual TPH fractions a 5 times multiplier of taste threshold and UKDWS has been taken repectively.
For HGwRP, targets have been taken as UKDWS where available, with the exception of Copper and Zinc where the EQS is lower than the DWS and therefore the EQS has been used as the groundwater target. For Ethlylbenzene the upper WHO ATO limit has been used. For Toluene and Xylene, the WHO ATO limit is higher than the EQS and so the lower value has been taken. For MTBE the taste threshold has been taken.

Work carried out to calculate generic screening criteria for concentrations of contaminant in groundwater with respect of risks to Human Health has generally found that criteria far exceed (by at least 2 orders of magnitude) those listed for the protection of either LGwRP and HGwRP receptors. On this basis, the above Groundwater criteria are also considered protective of human health and further evaluation of these risks should be considered alongside any detailed quantitative risk assessments carried out for groundwater on a site specific basis.

EPS Generic Quantitative Risk Assessment

Generic Screening Criteria (C4SLs) - All Land Uses

Contaminant	Soil Targets					
	Residential		Allotments	Commercial	Public Open Spaces	
	With Home Grown Produce	Without Home Grown Produce			Residential	Parks
Unit	mg/kg					
Arsenic	37	40	49	640	79	168
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)pyrene	5	5.3	5.7	76	10	21
Cadmium	26	149	4.9	410	220	880
Chromium (VI)	21	21	170	49	23	250
Lead	200	310	80	2330	630	1300

Notes:

Targets for Human Health have been taken from the publicly available Category 4 Screening Levels (C4SLs) for assessment of land affected by contamination issued by DEFRA in December 2013.

Within the modelling for C4SLs, a Soil Organic Matter content of 6% has been used. Reference to site-specific data should be made where possible. EPS have carried out a sensitvity analysis in-house and the contaminant benzene is the current C4SL most susceptable to changes in SOM and therefore any risk assessment for this compound must account for this aspect.

APPENDIX F

Cover System Calculations

Calculations based on mixed zone (M)	600	mm

Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground (Cg)	Contamination of Cover (Cc)	Target Guideline Value 1	Target Guideline Value 2	Soil / Target Guideline Value 1	Cover / Target Guideline Value 1	Soil / Target Guideline Value 2	Cover / Target Guideline Value 2	Target Guideline Value 1	Target Guideline Value 2
	Units		Units		Fraction				(mm)	
Lead	249	50	200		1.2	0.3	No TV	No TV	148	No TV

Summary		
	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	1	1
Number of contaminants **with no** thickness calculation	0	1
Breakdown - Number for which no TV specfied	0	1
Breakdown - Number for which no soil specified	0	0
Breakdown - Number for which no cover specified	0	0
Breakdown - Number for which cover > TV	0	0
Number of contaminants **with** thickness calculation	1	0
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	1	0

Overall thickness of cover required	**148**	**0**

APPENDIX G

Cover Soils Checklist

ADVISORY NOTE

SOILS FOR USE IN COVER SYSTEMS

This assessment has recommended a control measure in the form of a defined thickness of clean soil to be used in gardens and soft landscaped areas in order to reduce risks from underlying contamination (a 'cover system'). The thickness presented is what EPS consider sufficient provided the soil forming the cover system is good quality, as it is assumed that over time this soil will become intermixed with the underlying soils and therefore needs to have the necessary 'diluting' effect. The aim being that an acceptable reduction in exposure to contamination is achieved, rather than absolute prevention.

These simple cover systems are designed in general accordance with the BRE 2004 guidance *'Cover Systems for Land Regeneration, Thickness of Cover Systems for Contaminated Land'*. In many cases guidance from the relevant Local Planning Authority or NHBC/Approved Inspector may also apply and need to be taken into account. In most cases, to design the cover system EPS have to assume a certain quality of cover soils in advance. In these circumstances, we utilise what we consider to represent 'good quality soil' in that the soil could never be considered 'contaminated' but is also pragmatic and does not represent an unrealistic or unsustainable objective for much of the soils in the UK. In numerical terms, this standard typically equates to around 25% of the adopted screening value in the risk assessment.

For the cover system itself, EPS would usually carry out a verification process of your site to demonstrate the control measure has been implemented as intended to satisfy all interested parties such as planning authorities, the NHBC and the future property owner. To document this process, EPS will prepare a Verification Report. If you wish for EPS to do this, we will need the following points confirmed relating to the soils preferably before they are installed in gardens.

If there are any queries, please contact EPS before purchasing any soil.

EPS Contact Details:

[redacted]

Pre-Verification Cover System Checklist		Yes?
Soil Source	The soil must not be a waste. Please confirm that the soil is not a waste and has never been deemed as such in the past.	
	Has the source of the soil been provided?	
	Have all the delivery notes confirming the source, volume and type of soil been provided for all that is to be used?	
Soil Quality	The soils are free of invasive plant species such as Japanese Knotweed, and have not been sourced from an affected area?	
	Do the soils look clean and of a high quality? I.e. the soil must not have an odour or contain any visual evidence of contamination, including oils, asbestos, glass, plastic, rubble, metal, ash, tarmac/bitumen?	
	Testing to 'BS 3882:2015 *Specification for topsoil and requirements for use*' is preferable but generally not essential for public health regulation, provided you can confirm the soils comply with the above points, are suitable for their intended purpose and will provide an adequate growing medium?	
	Has the soil been chemically tested prior to it arriving at site? Any soil test results presented to EPS by a third party must be current and clearly relate to the soil used, i.e. the testing must generally be dated within 6 weeks of delivery. The quantity of testing will be dependent on how much confidence is generated in the quality of the material, as well any specific local regulatory requirements. If the soil is clean soil from an established source such as British Sugar, the testing they provide at source may be sufficient alone. For other soils, EPS can advise on the likely testing frequencies but as a rule of thumb, anticipate at least one sample per plot. The testing would usually comprise the following: Heavy Metals, Poly Aromatic Hydrocarbons, Asbestos and Total Petroleum Hydrocarbons at an accredited lab. If adequate testing has not been completed, then EPS will need to test it from stockpiles prior to installation.	
Cover Thickness	Are all excavations ready which will allow the necessary thickness of cover soils to be installed?	
	If yes, can you provide waste transfer documentation for any excavated soils?	

APPENDIX H

Method Statement for Encountering Unexpected Contamination

METHOD STATEMENT

ACTIONS TO BE TAKEN IN THE EVENT OF DISCOVERING UNEXPECTED CONTAMINATION DURING INTRUSIVE GROUNDWORKS

If at any point during intrusive groundworks at a site, evidence of unforeseen contamination is encountered in the form of significant noxious odours, discolouration, or instability within soils or sheen/ discolouration in groundwater, the following actions will be taken:

- Intrusive works in the immediate area of the impacted ground will be suspended and the continuation of work in other areas of the site will be considered within the context of the site specific health & safety plan.
- Environmental Protection Strategies Ltd (EPS) will be contacted and appraised of the situation so that arrangements can be made to characterise the impact and determine what action may be necessary in addition to the scheduled site works. Where possible / health & safety plan permits, digital photographs of the impacted ground will be taken and emailed to EPS at the address below to assist in the initial assessment
- It may well be necessary for EPS to attend site to undertake visual inspection and obtain samples for field and/or laboratory analysis, although the actions taken will be dependent on the nature of what is encountered
- In cases where EPS consider the unforeseen contamination likely to pose a significant risk of significant harm to adjacent site users or local environmental receptors, the local authority and the Environment Agency will be informed of the situation and the actions being taken
- Once appropriate action has been agreed and undertaken, a written summary will be produced by EPS for submission to the Local Authority, (and where relevant, the Environment Agency) in accordance with planning requirements. The submission will include details of work undertaken, analytical results of investigative and validation samples obtained and conclusions and recommendations for any further actions considered necessary
- Where regulatory bodies have been involved, site works should only recommence following their agreement and in all cases should only recommence when the site manager considers it safe to do so within the context of the site specific health & safety plan.

EPS Contact Details:

[redacted] Associate Director
Director
Director
[redacted]

Email: info@epstrategies.co.uk (Automatically forwarded to the above and office-based personnel)

7B Caxton House
Broad Street
Cambourne
Cambridge CB23 6JN

[redacted]

W www.epstrategies.co.uk

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