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18th May 2022

Subject: **UK19.4699b - Topsoil Verification – Hawthorn Bank, Spalding**

Dear Paul,

Environmental Protection Strategies Ltd. (EPS) is pleased to issue this letter report to present the results of verification activities recently undertaken at Hawthorn Bank, Spalding, Lincolnshire, PE11 1JJ ('the site').

This work was undertaken following completion of a new residential development, which includes the construction of eight residential properties with associated garden areas. A copy of the final development plan of the site is included as Appendix A.

The objective of this work is as follows:

- To provide independent verification that imported topsoil is of appropriate composition within proposed garden areas in order to break a plausible contaminant linkage associated with exposure of future site users to near surface soils.

This document is divided into three main sections which provide a background to the work, a summary of the validation activities and the findings of the validation exercise.

BACKGROUND & INTRODUCTION

EPS previously completed a Phase I & II Geo-Environmental Assessment and Verification Report at the site in August 2017 and September 2019 respectively. For background information it is recommended that the reader review the following reports:

- *Phase I &II Geo-Environmental Assessment – Hawthorn Bank, Spalding, Lincolnshire, PE11 1JJ* – August 2017 (EPS Report Ref: UK17.2773).
- *Verification Report – Hawthorn Bank, Spalding, Lincolnshire, PE11 1JJ* – September 2019 (EPS Report Ref: UK19.4699).

The Phase I & II Geo-Environmental Assessment identified concentrations of the metal lead in the shallow soils that exceeded relevant screening criteria representative of minimal risks to human health.

In order to break potential contaminant linkages associated with exposure to lead by future users, a permanent capping system such as asphalt or paving was recommended.

The subsequent Verification Report confirmed that permanent capping had been installed within all the areas where elevated concentrations of lead had been identified, reducing the risk to future site users to an acceptable level and therefore the site was considered suitable for use.

However, the approach to the original verification exercise was not approved by the local authority due to the presence of private garden areas elsewhere within the site (which had not been verified) and therefore requested testing within these gardens to confirm suitability for use.

VALIDATION WORKS

Following site clearance and construction of the new residential properties, EPS were commissioned to validate the quality of the imported topsoil. Further detail on this work is included within the sections below.

It should be noted however that due to the verification not occurring prior to occupation and subsequent anomalies through the planning process, this work has been undertaken approximately 2 years and 3 months after the houses were initially occupied.

Imported Material

To meet the remedial requirements of the site, it is understood that topsoil was imported to site and installed into garden / landscaped areas during the construction phase, although it should be noted that delivery notes are not available to confirm this. Therefore a need for soil analysis existed to prove the material is of suitable quality.

EPS attended site on 5th April 2022 in order to validate the quality of soil within the existing garden areas. Eight hand auger boreholes were formed across the site, with one in each of the main garden area and a soil sample was selected from each area. A drawing showing the location of the validation boreholes is included as Figure 1.

Subsequently, all eight samples were selected for laboratory analysis. All samples were analysed at an MCERTS accredited laboratory (Element of Flintshire) for heavy metals, Polycyclic Aromatic Hydrocarbons, and asbestos screen.

FINDINGS

Ground Conditions

Ground conditions across all sampling locations comprised a fairly homogenous topsoil in the form of a layer of brown, slightly silty, slightly sandy clay. This material was identified to be in excess of the 155mm cover thickness stipulated within EPS' previous recommendations for private garden areas in all locations.

Laboratory Analysis

The results of laboratory testing on samples of the topsoil are presented as Appendix B. The key results 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	13.5	22.0	HA106 (0.0-0.3)
Cadmium	8	8	0.1	0.8	HA102 (0.0-0.3)
Chromium	8	8	32.4	50.3	HA102 (0.0-0.3)
Copper	8	8	20	100	HA102 (0.0-0.3)
Lead	8	8	70	477	HA102 (0.0-0.3)
Mercury	8	8	0.3	0.8	HA102 (0.0-0.3)
Nickel	8	8	16.6	34.0	HA102 (0.0-0.3)
Selenium	8	2	1	2	HA101 (0.0-0.3)
Zinc	8	8	100	734	HA102 (0.0-0.3)
Naphthalene	8	1	0.37		HA102 (0.0-0.3)
Benzo[a]pyrene	8	8	0.29	5.42	HA102 (0.0-0.3)
Dibenz(ah)anthracene	8	5	0.05	0.65	HA102 (0.0-0.3)
PAH (16 Total)	8	8	3.9	62.4	HA102 (0.0-0.3)
Phenols	8	0	-		-
Cyanide	8	0	-		-
Asbestos (%)	8	2	<0.001	0.002	HA104 (0.0-0.4)

Notes: - Contaminant not found above laboratory detection limits PAH Polycyclic Aromatic Hydrocarbons

The results of this testing did not identify concentrations of contaminants to exceed generic screening criteria representative of risks to human health in six of the eight samples, however, concentrations of lead and the PAH compounds benzo(a)pyrene and dibenz(ah)anthracene were found to exceed screening criteria in the sample from HA102, whilst a concentration of 0.002% asbestos was encountered within HA104, all of which are considered to pose a potentially unacceptable risk to future site users in the context of the original risk assessment presented in the Phase I & II Geo-Environmental Assessment. During an initial screen, asbestos was also identified within HA105, although upon quantification was found to fall below method detection limits of 0.001%.

It should be noted that the soils tested though this verification exercise form part of a remedial cover system where they are required to intermix and dilute the known underlying contamination to a sufficient degree by intermixing with it over time. Therefore the cover soils themselves must be well below the adopted screening criteria, not just slightly below them (and certainly not above) so as to ensure the soils can have the necessary 'diluting effect'. For example, if the metal lead exists at concentrations above the screening level of 200mg/kg, then installing cover soils containing lead at between 70-477mg/kg above them will clearly not dilute the overall concentration to below 200mg/kg. Therefore reference to the previous risk assessment and associated screening criteria is slightly misleading in this context, as the quality threshold that these cover soils need to achieve is more stringent.

Validation Statement

The laboratory testing has identified that concentrations of contaminants have been identified within two garden areas (shown as HA2 and HA4 on the borehole location plan) which could potentially pose an unacceptable risk to future site users. Moreover, through visual assessment of the soils, it was not possible to distinguish any notable difference across the site which could suggest

HA2 or HA4 to be outliers in anyway and as such EPS has to deem the soils within all garden areas as one source and potentially unsuitable for use. Undertaking statistical analysis and identifying outliers or secondary populations does need to take account of the current statistical guidance from CL:AIRE (*Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration*, 2020). This guidance presents a very high threshold for analysing data and over a single averaging zone such as imported soil on a site of this nature, it would be difficult to justify that outliers are present without a very high quality dataset (i.e. high sampling density, use of sampling pattern, two-dimensional dataset using same-depth sampling).

On this basis, it is likely that one of the following two options will need to be employed to rectify the issue:

a) Soils within all garden areas should be stripped to a depth of 300mm and replaced with clean, chemically certified topsoil. A cover system checklist is included as Appendix C to aid in completing this appropriately. Ideally the soil would be sourced from a pre-certified supplier such as British Sugar and should be tested from an on-site stockpile prior to installation to ensure the current issue is not repeated.

or

b) The soils are removed and replaced within the plots in which samples HA102 and HA104 were obtained, whilst detailed further testing is undertaken within all other plots to determine their suitability for use. The testing should comprise 5 samples undertaken from each garden for analysis of heavy metals, PAH compounds and asbestos screen and sampled on an approximate stratified grid from the same depth at every location. It should be noted however, that whilst this method may potentially reduce the volume of material that will need removing/replacing, this additional testing may only confirm the findings of this investigation and subsequently still require point A to be required, after simply incurring further cost and delay. The data presented within this report would need to be included within that future dataset so it's more likely than not that further testing would just yield more of the same data as to what has been presented in this report.

However, it should be noted that whilst the results of the laboratory testing undertaken during this work indicate the soils are not considered suitable for use in a planning context (i.e. the National Planning Policy Framework), EPS acknowledges that the houses have now been lived in for over two years and an assessment of the results under Part 2a of the Environmental Protection Act 1990 may be more appropriate. Under this guidance, EPS would not consider the results to fall into category 1 or 2, which would warrant further investigation under the act as they could be considered capable of posing a significant possibility of significant harm. Although the test results exceed planning requirements, which are broadly accepted to reflect the boundary between category 3 and 4 (hence the use of 'category 4 screening levels' as a definition of suitability for use under planning), it is reasonable to conclude that the results would fall somewhere in category 3. The contamination is not severe enough to fall into category 1 or 2. On this basis, the local authority may consider the risks to be of an acceptable level under Part 2a, for which no further action may be required. However, this is down to their discretion and they would be entitled to require the site meet standards reflective of the planning process since that is how the issue is currently being regulated.

It is recommended that a copy of this report is provided to the Environmental Health Department of South Holland District Council so that it may be incorporated into their land quality records.

We trust this information is clear and suitable for your purposes at this time. Please do not hesitate to contact us should you have any queries.

Yours sincerely,

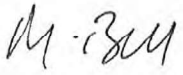
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