

## **VALIDATION REPORT**

### **Block C**

**5 to 9 Berkeley Avenue, Reading, Berkshire, RG1 6EL**

**Project Reference:**

CON01-READ-052

**Site Address:**

Block C  
5 to 9 Berkeley Avenue  
Reading  
Berkshire  
RG1 6EL

**Report Date:**

6 January 2020

**Version Number:**

Version 1

**Customer:**

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## DOCUMENT CONTROL

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## EXECUTIVE SUMMARY

Stansted Environmental Services Limited (SES) has been commissioned by Weston Homes plc to prepare a Validation Report for a multi-storey development at the former 'Lok 'n' Store' site at 5 to 9 Berkeley Avenue, Reading, RG1 6EL, comprising 112 residential units, with an undercroft car park and areas of communal soft landscaping. This report refers to Block C, forming the southernmost building of the three-block development.

The previous Construction Phase Remediation Plan for the site, completed by SES, specified that a validated clean 200mm break layer and 450mm topsoil cover be provided in areas of proposed soft landscaping at the development stage in order to break the contaminant pathways of direct contact, ingestion and dust inhalation to future site users. However, soft landscaped areas surrounding Block C are at podium level and do not come into contact with existing Made Ground beneath the site. Therefore, a minimum topsoil thickness is not required to provide a barrier between human health receptors and potential contaminants of concern within the Made Ground

The Construction Phase Remediation Plan for the site also specified that validation samples should be collected from the topsoil at a rate of one per 50m<sup>3</sup> and analysis for a broad range of organic and inorganic contaminants of concern (discussed in the section below). A 2000-gauge gas proof membrane was specified in the floor construction of structures where undercroft parking was not proposed, as per the recommendations of BS8485:2015: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, and sites corresponding to CIRIA Characteristic Situation 2 (CS2).

Based upon the observations made at the study site by SES, the results of the attached chemical analysis and a review of information supplied by the Client the following has been established:

- Site reconnaissance by SES indicates that topsoil and subsoil have been provided to soft landscaped podium level areas surrounding Block C;
- Laboratory analysis of topsoil and subsoil imported to the site did not record elevated concentrations of any of the potential contaminants tested; and
- Ground gas protection measures have been installed in accordance with the recommendations within the previous Remediation Method Statement. A Certificate of Conformity, confirming that appropriate gas protection measures have been installed correctly beneath Block C has been provided by Geo Shield Ltd and is appended to this document.

This Validation Report may be used to part discharge Condition 5(iv) of Planning Application 10/01567/EXT, for Block C, relating to the verification of remedial works.

## 1. INTRODUCTION

Stansted Environmental Services Limited (SES) has been commissioned by Weston Homes plc to prepare a Validation Report for a multi-storey development at the former 'Lok 'n' Store' site at 5 to 9 Berkeley Avenue, Reading, RG1 6EL, comprising 112 residential units, with an undercroft car park and areas of communal soft landscaping.

This report refers to Block C, forming the southernmost building of the three-block development.

### 1.1 Planning Status

The evidence compiled will be used to support Planning Application 10/01567/EXT (granted under appeal dated 4<sup>th</sup> October 2011) with conditions. Details of the specific planning conditions relating to contamination are shown below:

5. i) *No development shall take place until the method and extent of work for a detailed contaminated land phase II report (site investigation) has been agreed by the local planning authority in writing and carried out in accordance with the approved details by a competent person.*
- ii) *Following completion of the phase II report and before any construction above ground level, a remediation scheme to deal with any contaminants identified shall be submitted to and approved in writing by the local planning authority and carried out in accordance with the approved details. The scheme shall include an implementation timetable, monitoring proposals and a remediation verification methodology.*
- iii) *Should any unforeseen contamination be encountered during the development, the local planning authority shall be informed immediately. Any further investigation and remedial/protective works shall be carried out in accordance with timescales approved in writing by the local planning authority.*
- iv) *Construction of buildings shall not commence until an appropriately qualified person has provided a site completion report. This shall include details of the conclusions, actions taken and verification methodology at each stage of the works and shall include a sampling and analysis programme to confirm the adequacy of decontamination in accordance with the remediation scheme. Post remediation sampling and monitoring and future monitoring proposals and reporting shall also be detailed.*
- v) *If no contamination is encountered during the development, a letter confirming this fact shall be submitted to the local planning authority upon completion of the development.*

This Validation Report has been prepared as a response to part iv) of Condition 5 of the Planning Application.

### 1.2 National and Local Policy and Guidance

This Validation Report has been prepared in line with UK and Local guidance as evidence to discharge part iv) of Condition 5 of Planning Application 10/01567/EXT. The guidance includes;

- Model Procedures for the Management of Contaminated Land – Contaminated Land Report 11 (CLR11).

All validation work has been carried out in accordance with the Guidance document listed above and BS10175:2011 + A2:2017 (Code of Practice for the Investigation of Potentially Contaminated Sites) and BS5930:2015 (Code of Practice for Site Investigations).

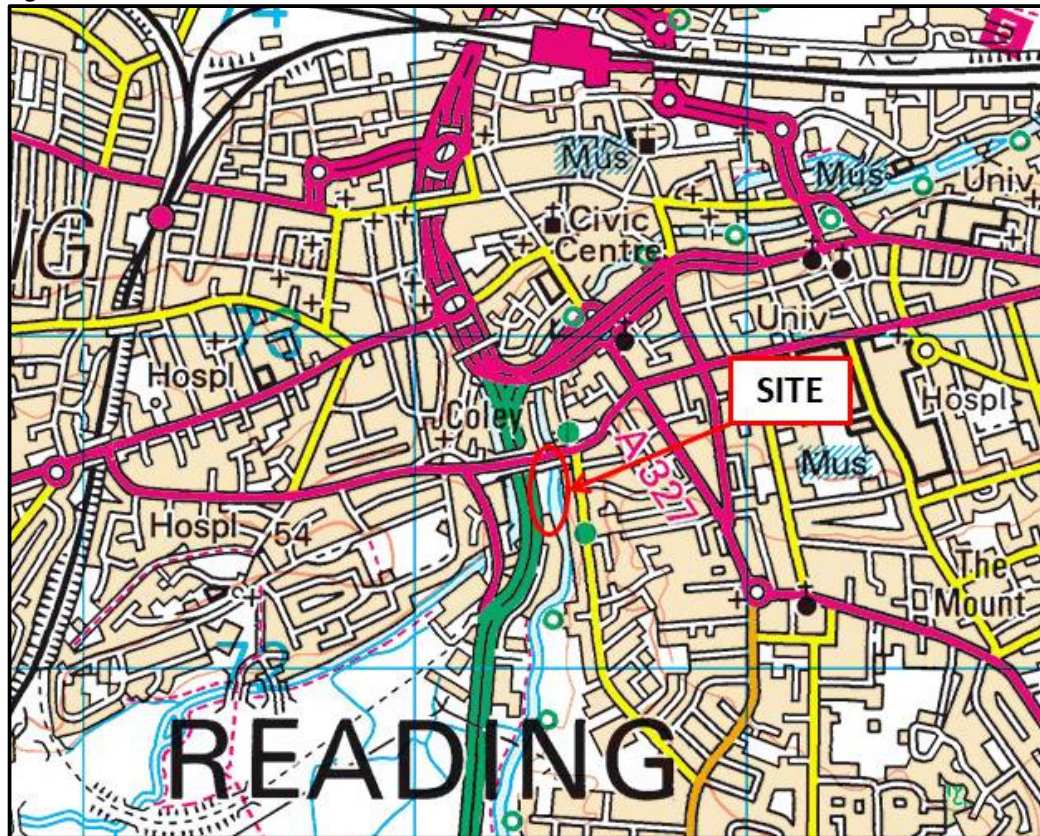
## 2. SITE SETTING

### 2.1 Site Location

### 2.2 Site Location

The site is located at the former 'Lok 'n' Store' site at 5 to 9 Berkeley Avenue, Reading, RG1 6EL, approximately 1km to the south of Reading Railway Station. The site is situated to the south of Berkeley Avenue, with the River Kennet forming its eastern boundary and the A33 trunk road forming the western boundary. To the south are industrial/commercial units associated with Rose Kiln Trading Estate. The site location is shown in Figure 1.

**Figure 1: Site Location**



### 2.2 Site Description

The site is roughly rectangular in shape, tapering towards its southern end and covers an area of approximately 0.50 hectares.

Prior to the development, the ground surface was lightly vegetated with some areas covered with building demolition rubble. Patches of weathered asphalt surfacing (possibly a former foot path or narrow road) followed the eastern boundary of the site. The site is lower than the adjacent A4 (Berkeley Avenue) road, at a similar elevation with the River Kennet located some 8m to 10m from the eastern boundary of the site. At the time of the verification works, several storeys of Block A had been constructed and landscaping completed on its northern, eastern and southern sides.

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### 2.3 Geological Setting

Details of the geology underlying the site have been obtained from the British Geological Survey website ([www.bgs.ac.uk](http://www.bgs.ac.uk)).

British Geological Survey mapping indicates the site to be underlain by superficial deposits comprising Alluvium (clays, silts sands and gravels with deposits of peat) and River Gravel (sand and gravels), overlying Bedrock, comprising the Seaford and Newhaven Chalk Formation (undifferentiated).

The Environment Agency has classified the Alluvium and River Gravels as Secondary A Aquifers and the underlying Seaford and Newhaven Chalk Formation as a Principal Aquifer. The site is not indicated to be within a Groundwater Source Protection Zone.

The nearest surface water feature is the River Kennet which is about 10m to the east of the site.

### 3. SUMMARY OF PHASED INVESTIGATION

A number of reports have been prepared for the site as detailed below:

- SOILS Limited: Report on Desk Study at Land between the A33 and Elgar Road, Reading, Berkshire for Lok 'n' Store (Ref. J8948, dated 21<sup>st</sup> July 2005);
- SOILS Limited: Report on Ground Investigation at 5-9 Berkeley Avenue, Reading, Berkshire, RG1 6EL for Lok 'n' Store (Ref. J10683, dated June 2008);
- SOILS Limited: Report on Remediation Strategy at 5-9 Berkeley Avenue, Reading, Berkshire, RG1 6EL for Lok 'n' Store (Ref. J10799/RS, dated August 2008);
- ST Consult: Additional Site Investigation Report for 5-9 Berkeley Avenue, Reading for Taylor Wimpey West London (Ref. J12451, dated December 2015);
- SES: Phase II Ground Investigation & Generic Risk Assessment Report for 5-9 Berkeley Avenue, Reading, Berkshire, RG1 6EL (Ref. CON01-READ-052, dated December 2017); and
- SES: Remediation Method Statement for 5-9 Berkeley Avenue, Reading, Berkshire, RG1 6EL (Ref. CON01-READ-052, dated May 2018).

Information from the reports listed above, relevant to the current assessment, are summarised below:

The Phase 1 assessment indicated that the site comprised open land between 1879 and 1914 with an embankment in the northern and eastern part of the site from 1912 until 1999. Between 1931 and 1932, the site was used as a Saw Mill and, subsequently, as a depot between 1958 and 1963. The site was in use as a case & pallet works between 1969 and 1972. Sometime in 1986, the site was occupied by a works of unspecified use until 1995 with no further indication of its use after this time. An unidentified tank was present in the northeastern corner of the site between 1972 and 1995.

The subsequent Phase 2 Site Investigation by SOILS Limited comprised four cable percussion boreholes to a maximum depth of 20m below ground level (bgl) and nine windowless sampler holes to a maximum depth of 3.60m bgl. Ground conditions encountered comprised Made Ground to depths ranging between 1.50m bgl and 3.60m bgl underlain by Alluvium to a maximum depth of 4.00m bgl which in turn is underlain by River Terrace Deposits to a maximum depth of 9.90m bgl. The River Terrace Deposits were underlain by the Seaford Chalk Formation.

Soil and groundwater samples were collected and scheduled for laboratory analysis for contaminants of concern including metals, polyaromatic hydrocarbons (PAH), volatile organic compounds (VOC), petroleum hydrocarbons (TPH) and asbestos.

The investigation identified elevated concentrations of TPH and PAH in samples collected from soil and groundwater beneath the site. The report suggested that there was a potential risk to human health and controlled waters from these contaminants.

A ground gas risk assessment was also undertaken which recommended that protection measures appropriate for CIRIA Characteristic Situation 2 (CS2) would be required for new dwellings on site.

Further investigation was undertaken by Card Geotechnics Limited (CGL) in 2011 following correspondence with the Environment Agency (EA), which confirmed that the discharge of Condition 4 of Planning Consent 07/00412/FUL was not recommended. The reasons given related to the remediation strategy proposed by SOILS Ltd assessing the site using the incorrect groundwater flow direction in the River Terrace Deposits and a suggestion by the EA that a plume of hydrocarbon contamination identified between boreholes WS9 and WS6 may be representative of two separate sources of contamination at approximately 3.00m bgl in the area to the south of WS6 and WS9. It was also recommended that groundwater quality data be provided for the central part of the site, in the area of BH3, before any demolition takes place. The location of tanks, stores and workshops were

also to be identified and included in a revised remediation strategy. Following the remediation of the site, further groundwater monitoring in the area of BH4 and BHA was requested to ensure that the source removal has been successful in protecting controlled waters.

In response, CGL reviewed the site history and environmental setting and drilled five additional window sampler boreholes with groundwater/gas monitoring installations, with associated chemical analysis of soil and groundwater samples. The borehole locations were agreed in advance with the EA.

The CGL investigation confirmed a groundwater flow direction towards the northeast. Elevated concentrations of lead, xylene, TPH and PAH were identified within the Made Ground and shallow alluvial deposits across the site. The most recent testing indicated that groundwater on the site was not impacted by hydrocarbon contamination, including the central area around BH3. No sources of gross contamination were found to be present in or to the south of WS6 and WS9.

Historic groundwater contamination was considered likely to be from either an off-site source, located up hydraulic gradient (e.g. the oil depot to the south) or due to fluctuations of the groundwater table causing leaching of contaminants from localised hydrocarbon impacted soils.

On this basis, no groundwater clean-up on the site was considered necessary.

Remediation of hotspots of leachable contaminants, known to exist in soils located around boreholes BH2, WS6 and, and likely to exist around boreholes BH3, BH4, WS3, CG02 and CG03 was recommended to mitigate against risks to groundwater, subject to a quantitative risk assessment to confirm remedial target levels.

Elevated concentrations of contaminants, including lead, xylenes, TPH and PAHs, in the soil were not considered to be a significant risk to long term human health as the proposed hardstanding across the site would break the contaminant pathway. Although limited soil gases were present, no specific remediation was considered to be required due to the ventilated car park to be constructed across the whole of the development footprint.

The investigation undertaken by ST Consult in 2015 generally agreed with the findings given in the earlier SOILS Ltd report.

- Elevated concentrations of lead in the Made Ground
- Elevated concentrations of mercury in the Made Ground
- Elevated concentrations of naphthalene in the Made Ground
- Elevated concentrations of TPH in the Made Ground
- Loose asbestos fibres within the Made Ground
- Dissolved phase TPH in the groundwater.

Both reports recommended that remedial works be undertaken.

The investigation undertaken by SES in 2017 generally confirmed the findings of the earlier reports. However, the data from all the reports was reassessed in light of the recently produced S4ULs for 'Public Open Space adjacent to residential areas'. This assumes that there are predominantly grassed/landscaped areas adjacent to high density residential developments. This use allows for informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting.

The results of the chemical analyses from all the investigations were processed in accordance with recommendations set out in the CIEH and CL:AIRE document 'Guidance on Comparing Soil Contamination Data with a Critical Concentration'. Where the concentrations determined on site are

at or below the respective Generic Assessment Criteria (GAC), they are considered not to pose a risk and are removed from further consideration, unless otherwise stated.

Those determinands which exceeded the relevant S4UL/C4SL are summarised in the table below:

**Table 1: Summary of Contaminants of Concern**

| Contaminant                                                                                                                                                                                                                                                                                                                            | Key statistics    |                       |                       |                       | S4UL*<br>(POS res) |                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------|-----------------------|-----------------------|--------------------|-------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                        | Number of detects | Min. Value<br>(mg/kg) | Max. Value<br>(mg/kg) | Mean Value<br>(mg/kg) | S4UL<br>(mg/kg)    | No. Samples exceeding assessment criteria |
| Lead <sup>#</sup>                                                                                                                                                                                                                                                                                                                      | 43                | 12                    | 4300                  | 566                   | 630                | 13                                        |
| Mercury                                                                                                                                                                                                                                                                                                                                | 35                | 0.30                  | 660                   | 31                    | 16                 | 6                                         |
| Benzo(a)anthracene                                                                                                                                                                                                                                                                                                                     | 39                | 0.20                  | 200                   | 12                    | 29                 | 5                                         |
| Chrysene                                                                                                                                                                                                                                                                                                                               | 39                | 0.20                  | 130                   | 10                    | 57                 | 2                                         |
| Benzo(b)fluoranthene                                                                                                                                                                                                                                                                                                                   | 38                | 0.30                  | 180                   | 10                    | 7.2                | 8                                         |
| Benzo(a)pyrene                                                                                                                                                                                                                                                                                                                         | 38                | 0.28                  | 140                   | 10                    | 5.7                | 9                                         |
| Indeno(123-cd)pyrene                                                                                                                                                                                                                                                                                                                   | 36                | 0.23                  | 120                   | 7.2                   | 82                 | 1                                         |
| Dibenzo(ah)anthracene                                                                                                                                                                                                                                                                                                                  | 21                | 0.10                  | 36                    | 2.8                   | 0.57               | 9                                         |
| TPH aromatic C <sub>21</sub> -C <sub>35</sub>                                                                                                                                                                                                                                                                                          | 27                | 3.0                   | 4400                  | 705                   | 3800               | 1                                         |
| <p><i>Notes to Table</i></p> <p>* Most appropriate screening values are Sustainable 4 Use Level (S4UL) for a public open space (adjacent to residential properties) end use, a sandy loam soil type, pH of 7 and a soil organic matter (SOM) of 2.5%.</p> <p># Category 4 Screening Level (2014) used in absence of suitable S4UL.</p> |                   |                       |                       |                       |                    |                                           |

Further statistical analysis was undertaken which demonstrated that exceedances for both indeno(123-cd)pyrene and the aromatic TPH C<sub>21</sub> to C<sub>35</sub> fraction were part of the same population and, therefore, did not represent a risk to human health.

Chrysene and lead contamination was determined to be widespread across the site, while the remaining determinands were hotspots.

Therefore, it was shown that there were pollutant linkages due to elevated lead, mercury and individual speciated PAHs within the Made Ground.

In addition, chrysotile asbestos fibres were present locally within the Made Ground.

Groundwater samples were also collected and analysed as part of the various phases of site work. The results were initially screened against Water Quality Standards (WQS) comprising the Water Supply (Water Quality) Regulations 2000, and, where no guidance is given in the Water Supply Regulations, the *freshwater* Environmental Quality Standards (EQS), or World Health Organisation (WHO) guidelines, have been used.

It should be noted that there is no TPH guideline parameter within the Water Supply Regulations 2000. As such, the level of 10µg/l within the Water Supply Regulations 1989, has been adopted as a conservative approach.

A number of determinands were found to be marginally in excess of the WQS during the various monitoring rounds. However, the nearest potable abstraction is approximately 1km to the northeast for groundwater and 1km to the north for surface water. Given, the distance of the abstraction

points and that the site does not overlay a Groundwater Source Protection Zone, it is considered that the risk to water supplies is very low. In addition, the site is underlain by at least 5m of putty chalk which would inhibit the downward and lateral migration of contamination. In addition, removal of the near surface soils (and therefore contaminated soils), for basement construction, would also limit the potential for contamination to migrate.

Gas monitoring was undertaken on six occasions during 2017 with the results detailed below:

**Table 2: Summary of Gas Monitoring (maximum values)**

| Sample Point | CH <sub>4</sub><br>% v/v |      | CO <sub>2</sub><br>% v/v |     | O <sub>2</sub><br>% v/v |      | Flow<br>l/hr |
|--------------|--------------------------|------|--------------------------|-----|-------------------------|------|--------------|
|              | Min                      | Max  | Min                      | Max | Min                     | Max  |              |
| BH01         | 0.04                     | 0.08 | 0.7                      | 4.6 | 15.9                    | 19.7 | 0.2          |
| BH02         | <0.01                    | 0.10 | 0.1                      | 4.9 | 15.1                    | 20.7 | 0.6          |
| BH03         | 0.09                     | 0.15 | 0.4                      | 6.6 | 5.6                     | 16.3 | 0.6          |

In accordance with the methodology published in CIRIA Document C665 the maximum recorded values were taken to calculate a Gas Screening Value for the site. The GSV calculated for methane is 0.0009l/hr. The GSV calculated for carbon dioxide is 0.0396l/hr. Although these values indicate the site to be CIRIA CS1, levels of carbon dioxide exceeded 5% and it was considered that protection measures consistent with CIRIA Characteristic Situation 2 should be adopted.

The Conceptual Model was produced to show the active pollution linkages and is presented in the table overleaf.

**Table 3: Post Intrusive Investigation Conceptual Site Model**

| Potential Source                         | Potential Contaminant              | Potential Migration Pathway                                                                                                                                                     | Potential Receptor                                                           | Probability | Consequence | Overall Risk Classification | Discussion                                                                                                                                                                                                             |
|------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------|-------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Onsite</b><br>Made Ground             | Lead<br>Mercury<br>PAHs<br>TPH     | Contact with or ingestion of contaminated soils<br>Inhalation of dust and vapours<br>Leaching and subsequent migration<br>Uptake of contaminants through soils, flora and fauna | Future Site Users<br>Construction Workers<br>Controlled Waters<br>Structures | Low         | Mild        | Low                         | No private gardens are envisaged. Remedial works for landscaped areas will ameliorate any such risk                                                                                                                    |
| <b>Onsite</b><br>Made Ground             | Asbestos                           | Contact with or ingestion of contaminated soils<br>Inhalation of dust                                                                                                           | Future Site Users<br>Construction Workers<br>Structures                      | Likely      | Severe      | High                        | No private gardens are envisaged. Remedial works for landscaped areas will ameliorate any such risk                                                                                                                    |
| <b>Onsite</b><br>Landfill Gas            | Ground Gases<br>(CO <sub>2</sub> ) | Inhalation<br>Migration into enclosed spaces leading to asphyxiation/explosion                                                                                                  | Future Site Users<br>Construction Workers<br>Structures                      | High        | Severe      | Very High                   | It is likely that ground gases are being produced from naturally occurring organic material onsite.<br><br>Gas membranes will be required where residential units and public access areas are present at ground level. |
| <b>Onsite and Offsite</b><br>Groundwater | TPH                                | Volatilisation                                                                                                                                                                  | Future Site Users<br>Construction Workers<br>Structures                      | Low         | Minor       | Very Low                    | The site is not within a Groundwater Source Protection Zone and the nearest abstraction points are 1km to the north & northeast                                                                                        |

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#### **4. PROPOSED REMEDIATION STRATEGY**

A Remediation Method Statement was produced by SES in May 2018 and is summarised below:

##### **4.1 Placement of Clean Capping**

- Soft landscaped areas surrounding Block C are at podium level and do not come into contact with existing Made Ground beneath the site. Therefore, a minimum topsoil thickness is not required to provide a barrier between human health receptors and potential contaminants of concern within the Made Ground;
- Whilst a certificate confirming contaminant concentrations for all imported soil should be obtained from the supplier prior to importation, independent chemical analysis of the material will also need to be undertaken once it is in place to confirm its quality and suitability for use in garden areas. All contaminant concentrations must be below published screening criteria for a residential end use with homegrown produce and the thickness of the imported layer will also need to be measured for validation purposes;
- Should any previously unidentified contamination or deleterious materials be encountered during ground works, further assessment will need to be undertaken;
- All waste material must be disposed of to an appropriately licensed site. The chemical testing and assessments previously carried out may be used to aid classification of any soil that is to be disposed of. However, further testing might be required by the tip prior to disposal. Copies of the waste consignment documentation should be kept for validation purposes; and
- A Validation Statement will need to be produced following completion of the remedial works, detailing the measures undertaken, including all relevant documentation, and confirming that the site is suitable for its proposed use.

##### **4.2 Ground Gas Protection Measures**

A minimum 2000-gauge gas-resistant membrane should be incorporated into ground-bearing or suspended floor slabs for the proposed development. Given the presence of undercroft car parking at ground level across much of the building footprint (which are open sided and offered a significant degree of ventilation), membranes would only be required beneath remaining enclosed ground floor areas (i.e. commercial units, stairwells, and maintenance areas).

## 5. VALIDATION

### 5.1 Soil Sampling

SES attended site on 31<sup>st</sup> October 2019 and 13<sup>th</sup> December 2019 in order to collect topsoil samples for chemical laboratory analysis. A trial pit location plan is provided as Appendix A and photographs of the thickness of topsoil placed as Appendix B.

The samples were forwarded to an UKAS/MCerts accredited laboratory on the day of collection in cool boxes and were scheduled for the following general suite of contaminants:

- A suite of metals comprising As, Cu, Cd, Cr, Cr VI, Hg, Pb, Ni, Se and Zn;
- Speciated Poly Aromatic Hydrocarbons (PAHs);
- Banded petroleum hydrocarbons (TPH CWG);
- Asbestos identification;
- Total monohydric phenols;
- Total cyanide;
- pH; and
- Total Organic Carbon (TOC).

The topsoil validation results are included as Appendix C of this report.

#### 5.1.1 Generic Human Health Risk Assessment

Attention is drawn to the fact that whilst every effort has been made to ensure the accuracy of the data supplied and any analysis derived from it, there are potential risks of variations in ground conditions and contamination between and beyond the specific locations investigated. No liability can be accepted for any such variations. Furthermore, any recommendations are specific to the client requirements and no liability will be accepted should these be used by third parties without prior consultation with SES.

In order to assess risks to future site users, concentrations of contaminants of concern have been compared to Suitable 4 Use Levels (S4UL) generic Assessment Criteria (AC) published by Land Quality Management: Chartered Institute of Environmental Health (LQM:CIEH) in 2015.

The assessment has been based upon a residential land use (public open space) based on the proposed redevelopment of the site as a residential and commercial complex.

Soil Organic Matter (SOM) content for samples collected from the topsoil and subsoil ranged from 3.10% to 6.40%, with an average of 4.30%. Concentrations of contaminants of concern have therefore been compared to the S4UL (3.00% SOM) values.

A notable exclusion from the S4ULs is lead. In the absence of a S4UL for lead, the Category 4 Screening Level (C4SL) has been selected, published by DEFRA in 2014. It is noted that the C4SL are based on the acceptance of a low level of toxicological concern, rather than the more conservative standard adopted in the derivation of S4ULs, which are based on a tolerable or minimal level of risk.

The potential risk posed to controlled waters from contaminants of concern within soils beneath the site is not addressed by these screening criteria.

A comparison of the results recorded by the analysis with the corresponding generic screening criteria is presented in the following table for those samples which recorded positive results:

**Table 4: Comparison of Analytical Data for Topsoil/Subsoil**

| Contaminant                                                                                                                                                                                                                                                                                                       | Key statistics       |                    |                    | S4UL*<br>(POS <sub>resi</sub> ) |                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------|--------------------|---------------------------------|-------------------------------------------|
|                                                                                                                                                                                                                                                                                                                   | Number of detections | Min. Value (mg/kg) | Max. Value (mg/kg) | S4UL (mg/kg)                    | No. Samples exceeding assessment criteria |
| Arsenic                                                                                                                                                                                                                                                                                                           | 4                    | 8.7                | 18                 | 79                              | 0                                         |
| Boron                                                                                                                                                                                                                                                                                                             | 4                    | 1.5                | 5.0                | 21000                           | 0                                         |
| Cadmium                                                                                                                                                                                                                                                                                                           | 4                    | 0.40               | 0.54               | 120                             | 0                                         |
| Chromium III                                                                                                                                                                                                                                                                                                      | 4                    | 18                 | 24                 | 1500                            | 0                                         |
| Copper                                                                                                                                                                                                                                                                                                            | 4                    | 32                 | 46                 | 12000                           | 0                                         |
| Lead <sup>#</sup>                                                                                                                                                                                                                                                                                                 | 4                    | 64                 | 170                | 630                             | 0                                         |
| Mercury                                                                                                                                                                                                                                                                                                           | 4                    | 0.29               | 0.44               | 120                             | 0                                         |
| Nickel                                                                                                                                                                                                                                                                                                            | 4                    | 13                 | 17                 | 230                             | 0                                         |
| Zinc                                                                                                                                                                                                                                                                                                              | 4                    | 84                 | 170                | 81000                           | 0                                         |
| Acenaphthylene                                                                                                                                                                                                                                                                                                    | 3                    | 0.29               | 0.51               | 15000                           | 0                                         |
| Acenaphthene                                                                                                                                                                                                                                                                                                      | 3                    | 0.37               | 0.78               | 15000                           | 0                                         |
| Fluorene                                                                                                                                                                                                                                                                                                          | 3                    | 0.16               | 0.20               | 9900                            | 0                                         |
| Phenanthrene                                                                                                                                                                                                                                                                                                      | 4                    | 1.3                | 2.9                | 3100                            | 0                                         |
| Anthracene                                                                                                                                                                                                                                                                                                        | 4                    | 0.18               | 0.44               | 74000                           | 0                                         |
| Fluoranthene                                                                                                                                                                                                                                                                                                      | 4                    | 1.8                | 3.0                | 3100                            | 0                                         |
| Pyrene                                                                                                                                                                                                                                                                                                            | 4                    | 1.7                | 2.8                | 7400                            | 0                                         |
| Benzo(a)anthracene                                                                                                                                                                                                                                                                                                | 1                    |                    | 2.0                | 29                              | 0                                         |
| Chrysene                                                                                                                                                                                                                                                                                                          | 1                    |                    | 1.8                | 57                              | 0                                         |
| Benzo(b)fluoranthene                                                                                                                                                                                                                                                                                              | 1                    |                    | 1.5                | 7.2                             | 0                                         |
| Benzo(k)fluoranthene                                                                                                                                                                                                                                                                                              | 1                    |                    | 0.71               | 190                             | 0                                         |
| Benzo(a)pyrene                                                                                                                                                                                                                                                                                                    | 1                    |                    | 1.2                | 5.7                             | 0                                         |
| Toluene                                                                                                                                                                                                                                                                                                           | 3                    | 1.5                | 4.3                | 56000                           | 0                                         |
| Ethylbenzene                                                                                                                                                                                                                                                                                                      | 1                    |                    | 2.2                | 24000                           | 0                                         |
| O-xylene                                                                                                                                                                                                                                                                                                          | 2                    | 2.9                | 3.4                | 42000                           | 0                                         |
| TPH (aliphatic C <sub>16</sub> – C <sub>21</sub> )                                                                                                                                                                                                                                                                | 2                    | 2.0                | 6.0                | 250000                          | 0                                         |
| TPH (aromatic C <sub>16</sub> – C <sub>21</sub> )                                                                                                                                                                                                                                                                 | 3                    | 5.9                | 21                 | 3800                            | 0                                         |
| TPH (aliphatic C <sub>21</sub> – C <sub>35</sub> )                                                                                                                                                                                                                                                                | 3                    | 18                 | 250                | 250000                          | 0                                         |
| TPH (aromatic C <sub>21</sub> – C <sub>35</sub> )                                                                                                                                                                                                                                                                 | 3                    | 59                 | 540                | 3800                            | 0                                         |
| <b>Notes to Table</b><br>* Most appropriate screening values are Sustainable 4 Use Level (S4UL) for a public open space adjacent to residential dwellings end use, a sandy loam soil type, pH of 7 and a soil organic matter (SOM) of 1%.<br># Category 4 Screening Level (2014) use in absence of suitable S4UL. |                      |                    |                    |                                 |                                           |

Contaminants of concern were not recorded in topsoil samples analysed at concentrations in excess of adopted screening criteria. Furthermore, Asbestos fibres were not recorded within samples of topsoil collected from soft landscaped areas around Block C.

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## 5.2 Ground Gas Protection Measures

A 2000-gauge gas proof membrane was installed beneath ground floor slabs in enclosed areas, not occupied by well ventilated undercroft car parking. A Certificate of Conformity, confirming that appropriate gas protection measures have been installed correctly beneath Block A has been provided by Geo Shield Ltd and is included as Appendix D of this report.

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## 6. SUMMARY & CONCLUSIONS

Based upon the observations made at the study site by SES, the results of the attached chemical analysis and a review of information supplied by the Client the following has been established:

- Laboratory analysis of topsoil and subsoil imported to the site did not record elevated concentrations of any of the potential contaminants tested; and
- Ground gas protection measures have been installed in accordance with the recommendations within the previous Remediation Method Statement. A Certificate of Conformity, confirming that appropriate gas protection measures have been installed correctly beneath Block C has been provided by Geo Shield Ltd and is appended to this document.

This Validation Report may be used to part discharge Condition 5(iv) of Planning Application 10/01567/EXT, for Block C, relating to the verification of remedial works.

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## **APPENDICES**

**A – PLANS & FIGURES**

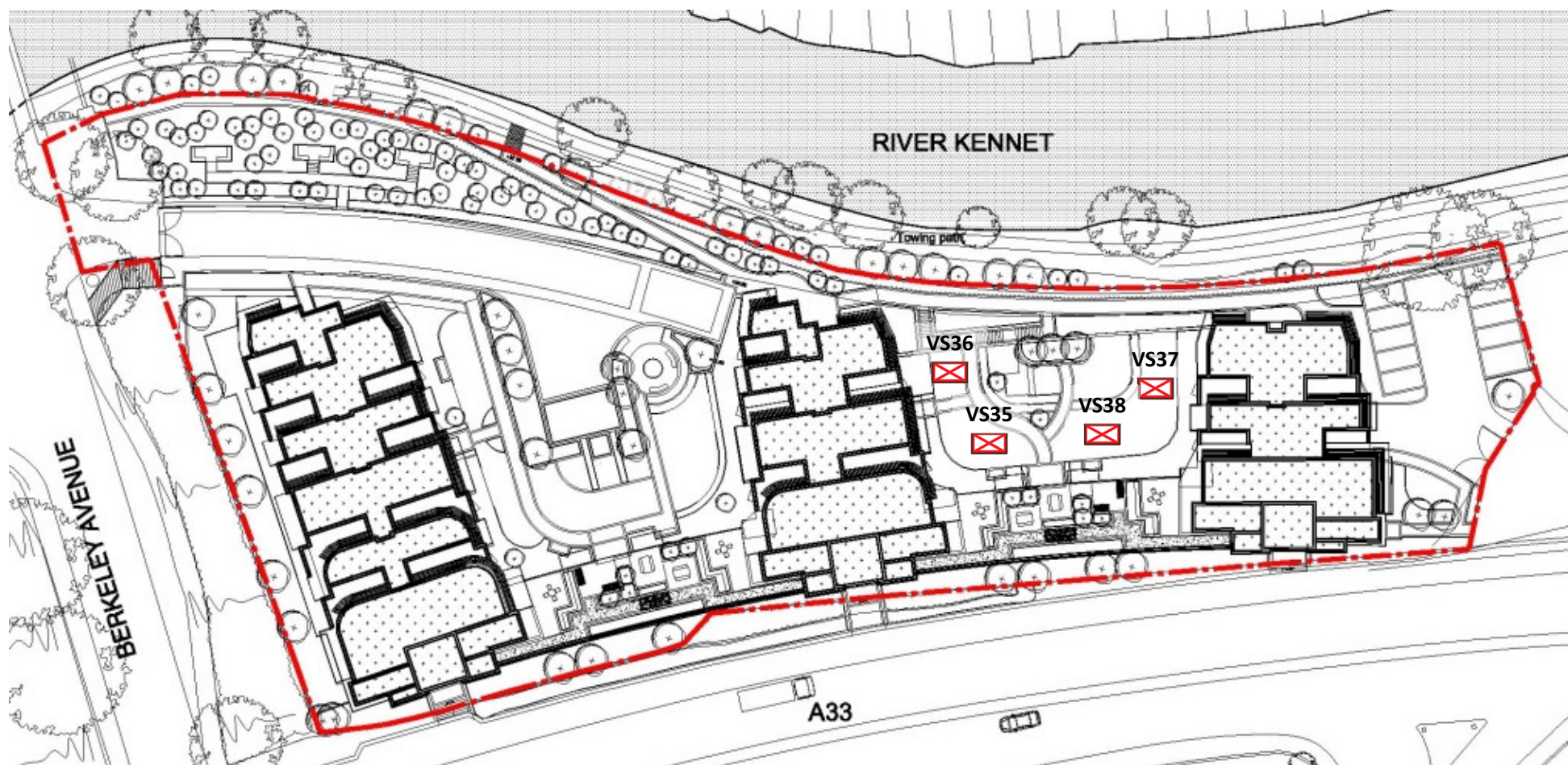
**B– PHOTOGRAPHS**

**C – RESULTS OF LABORATORY ANALYSIS**

**D – GROUND GAS MEMBRANE CERTIFICATE OF CONFORMITY**

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## **A. PLANS & FIGURES**



#### LEGEND

 Location of Topsoil/Subsoil Validation Sample

|                    |     |                                                    |                                                                                       |
|--------------------|-----|----------------------------------------------------|---------------------------------------------------------------------------------------|
| Originator         | WGG | <b>BERKELEY AVENUE, READING<br/>CON01-READ-052</b> |  |
| Checked & Approved | SP  | <b>VALIDATION SAMPLE LOCATIONS – BLOCK C</b>       |                                                                                       |

**B. PHOTOGRAPHS**



VS35



VS36

|                    |     |                                                                                         |                                                                                       |
|--------------------|-----|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Originator         | GB  | <b>BERKELEY AVENUE, READING</b><br><b>CON01-READ-052</b><br><br><b>SITE PHOTOGRAPHS</b> |  |
| Checked & Approved | WGG |                                                                                         |                                                                                       |



VS37



VS38

|                    |     |                                                                                         |                                                                                       |
|--------------------|-----|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Originator         | GB  | <b>BERKELEY AVENUE, READING</b><br><b>CON01-READ-052</b><br><br><b>SITE PHOTOGRAPHS</b> |  |
| Checked & Approved | WGG |                                                                                         |                                                                                       |

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## **C. RESULTS OF LABORATORY ANALYSIS**



2183

# Final Report

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**Report No.:** 19-41759-1

**Initial Date of Issue:** 03-Jan-2020

**Client** Stansted Environmental Services

**Client Address:** The Stansted Centre  
Parsonage Road  
Takeley  
Hertfordshire  
CM22 6PU

**Contact(s):** Gavin Greenwood

**Project** CON01-READ-052 Berkeley Avenue

**Quotation No.:** Q19-17925 **Date Received:** 13-Dec-2019

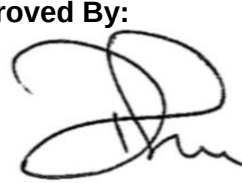
**Order No.:** WH186 **Date Instructed:** 13-Dec-2019

**No. of Samples:** 6

**Turnaround (Wkdays):** 5 **Results Due:** 19-Dec-2019

**Date Approved:** 03-Jan-2020

**Approved By:**



**Details:** Darrell Hall, Director

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## Results - Soil

| Client: Stansted Environmental Services         | Chemtest Job No.:    |      |       |       | 19-41759             | 19-41759             | 19-41759             | 19-41759             | 19-41759             | 19-41759             |
|-------------------------------------------------|----------------------|------|-------|-------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Quotation No.: Q19-17925                        | Chemtest Sample ID.: |      |       |       | 943096               | 943097               | 943098               | 943099               | 943100               | 943101               |
|                                                 | Sample Location:     |      |       |       | VS35                 | VS36                 | VS37                 | VS38                 | VS27                 | VS33                 |
|                                                 | Sample Type:         |      |       |       | SOIL                 | SOIL                 | SOIL                 | SOIL                 | SOIL                 | SOIL                 |
|                                                 | Top Depth (m):       |      |       |       | 0.15                 | 0.15                 | 0.15                 | 0.15                 | 0.15                 | 0.15                 |
|                                                 | Date Sampled:        |      |       |       | 13-Dec-2019          | 13-Dec-2019          | 13-Dec-2019          | 13-Dec-2019          | 13-Dec-2019          | 13-Dec-2019          |
|                                                 | Asbestos Lab:        |      |       |       | COVENTRY             | COVENTRY             | COVENTRY             | COVENTRY             | COVENTRY             | COVENTRY             |
| Determinand                                     | Accred.              | SOP  | Units | LOD   |                      |                      |                      |                      |                      |                      |
| ACM Type                                        | U                    | 2192 |       | N/A   | -                    | -                    | -                    | -                    | -                    | -                    |
| Asbestos Identification                         | U                    | 2192 | %     | 0.001 | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| ACM Detection Stage                             | U                    | 2192 |       | N/A   | -                    | -                    | -                    | -                    | -                    | -                    |
| Moisture                                        | N                    | 2030 | %     | 0.020 | 22                   | 26                   | 25                   | 24                   | 23                   | 24                   |
| pH                                              | U                    | 2010 |       | 4.0   | 8.5                  | 8.2                  | 8.1                  | 8.0                  | 8.1                  | 8.0                  |
| Boron (Hot Water Soluble)                       | U                    | 2120 | mg/kg | 0.40  | 1.5                  | 5.0                  | 2.9                  | 4.2                  | 1.8                  | 3.1                  |
| Sulphate (2:1 Water Soluble) as SO <sub>4</sub> | U                    | 2120 | g/l   | 0.010 | 0.40                 | 1.7                  | 1.5                  | 1.7                  | 1.0                  | 1.4                  |
| Cyanide (Total)                                 | U                    | 2300 | mg/kg | 0.50  | < 0.50               | < 0.50               | < 0.50               | < 0.50               | < 0.50               | < 0.50               |
| Arsenic                                         | U                    | 2450 | mg/kg | 1.0   | 8.7                  | 18                   | 15                   | 12                   | 12                   | 12                   |
| Cadmium                                         | U                    | 2450 | mg/kg | 0.10  | 0.40                 | 0.54                 | 0.43                 | 0.41                 | 0.29                 | 0.76                 |
| Chromium                                        | U                    | 2450 | mg/kg | 1.0   | 19                   | 24                   | 24                   | 18                   | 23                   | 22                   |
| Copper                                          | U                    | 2450 | mg/kg | 0.50  | 32                   | 46                   | 39                   | 34                   | 51                   | 65                   |
| Mercury                                         | U                    | 2450 | mg/kg | 0.10  | 0.31                 | 0.37                 | 0.44                 | 0.29                 | 0.25                 | 0.28                 |
| Nickel                                          | U                    | 2450 | mg/kg | 0.50  | 13                   | 17                   | 17                   | 13                   | 39                   | 19                   |
| Lead                                            | U                    | 2450 | mg/kg | 0.50  | 64                   | 160                  | 170                  | 120                  | 84                   | 110                  |
| Selenium                                        | U                    | 2450 | mg/kg | 0.20  | 0.30                 | 0.33                 | 0.39                 | 0.27                 | 0.25                 | < 0.20               |
| Zinc                                            | U                    | 2450 | mg/kg | 0.50  | 84                   | 160                  | 170                  | 150                  | 130                  | 140                  |
| Chromium (Hexavalent)                           | N                    | 2490 | mg/kg | 0.50  | < 0.50               | < 0.50               | < 0.50               | < 0.50               | < 0.50               | < 0.50               |
| Organic Matter                                  | U                    | 2625 | %     | 0.40  | 3.8                  | 3.1                  | 4.0                  | 6.4                  | 4.3                  | 4.3                  |
| Aliphatic TPH >C5-C6                            | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C6-C8                            | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C8-C10                           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C10-C12                          | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C12-C16                          | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C16-C21                          | U                    | 2680 | mg/kg | 1.0   | < 1.0                | 6.0                  | < 1.0                | 2.0                  | 2.2                  | 1.4                  |
| Aliphatic TPH >C21-C35                          | U                    | 2680 | mg/kg | 1.0   | < 1.0                | 250                  | 18                   | 250                  | < 1.0                | 41                   |
| Aliphatic TPH >C35-C44                          | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | 12                   | < 1.0                | < 1.0                |
| Total Aliphatic Hydrocarbons                    | N                    | 2680 | mg/kg | 5.0   | < 5.0                | 260                  | 18                   | 270                  | < 5.0                | 42                   |
| Aromatic TPH >C5-C7                             | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C7-C8                             | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C8-C10                            | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C10-C12                           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C12-C16                           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C16-C21                           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | 23                   | 5.9                  | 25                   | 3.9                  | 6.7                  |
| Aromatic TPH >C21-C35                           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | 540                  | 59                   | 410                  | 130                  | 44                   |
| Aromatic TPH >C35-C44                           | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Total Aromatic Hydrocarbons                     | N                    | 2680 | mg/kg | 5.0   | < 5.0                | 570                  | 65                   | 440                  | 130                  | 51                   |

## Results - Soil

|                                         |                      |      |       |      |             |             |             |             |             |             |
|-----------------------------------------|----------------------|------|-------|------|-------------|-------------|-------------|-------------|-------------|-------------|
| Client: Stansted Environmental Services | Chemtest Job No.:    |      |       |      | 19-41759    | 19-41759    | 19-41759    | 19-41759    | 19-41759    | 19-41759    |
| Quotation No.: Q19-17925                | Chemtest Sample ID.: |      |       |      | 943096      | 943097      | 943098      | 943099      | 943100      | 943101      |
|                                         | Sample Location:     |      |       |      | VS35        | VS36        | VS37        | VS38        | VS27        | VS33        |
|                                         | Sample Type:         |      |       |      | SOIL        | SOIL        | SOIL        | SOIL        | SOIL        | SOIL        |
|                                         | Top Depth (m):       |      |       |      | 0.15        | 0.15        | 0.15        | 0.15        | 0.15        | 0.15        |
|                                         | Date Sampled:        |      |       |      | 13-Dec-2019 | 13-Dec-2019 | 13-Dec-2019 | 13-Dec-2019 | 13-Dec-2019 | 13-Dec-2019 |
|                                         | Asbestos Lab:        |      |       |      | COVENTRY    | COVENTRY    | COVENTRY    | COVENTRY    | COVENTRY    | COVENTRY    |
| Determinand                             | Accred.              | SOP  | Units | LOD  |             |             |             |             |             |             |
| Total Petroleum Hydrocarbons            | N                    | 2680 | mg/kg | 10.0 | < 10        | 820         | 82          | 700         | 130         | 93          |
| Naphthalene                             | U                    | 2700 | mg/kg | 0.10 | < 0.10      | 0.20        | 0.37        | 0.30        | < 0.10      | < 0.10      |
| Acenaphthylene                          | U                    | 2700 | mg/kg | 0.10 | < 0.10      | 0.29        | 0.47        | 0.51        | < 0.10      | < 0.10      |
| Acenaphthene                            | U                    | 2700 | mg/kg | 0.10 | < 0.10      | 0.37        | 0.48        | 0.78        | < 0.10      | < 0.10      |
| Fluorene                                | U                    | 2700 | mg/kg | 0.10 | < 0.10      | 0.17        | 0.20        | 0.16        | < 0.10      | < 0.10      |
| Phenanthrene                            | U                    | 2700 | mg/kg | 0.10 | 2.8         | 1.8         | 2.9         | 1.3         | < 0.10      | 0.80        |
| Anthracene                              | U                    | 2700 | mg/kg | 0.10 | 0.39        | 0.38        | 0.44        | 0.18        | < 0.10      | 0.10        |
| Fluoranthene                            | U                    | 2700 | mg/kg | 0.10 | 3.0         | 1.8         | 2.8         | 2.2         | 1.1         | 1.7         |
| Pyrene                                  | U                    | 2700 | mg/kg | 0.10 | 2.8         | 1.8         | 2.2         | 1.7         | 1.3         | 1.5         |
| Benzo[a]anthracene                      | U                    | 2700 | mg/kg | 0.10 | 2.0         | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Chrysene                                | U                    | 2700 | mg/kg | 0.10 | 1.8         | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[b]fluoranthene                    | U                    | 2700 | mg/kg | 0.10 | 1.5         | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[k]fluoranthene                    | U                    | 2700 | mg/kg | 0.10 | 0.71        | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[a]pyrene                          | U                    | 2700 | mg/kg | 0.10 | 1.2         | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Indeno(1,2,3-c,d)Pyrene                 | U                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Dibenz(a,h)Anthracene                   | U                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[g,h,i]perylene                    | U                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Total Of 16 PAH's                       | U                    | 2700 | mg/kg | 2.0  | 16          | 6.8         | 9.9         | 7.1         | 2.4         | 4.1         |
| Benzene                                 | U                    | 2760 | µg/kg | 1.0  | < 1.0       | < 1.0       | < 1.0       | < 1.0       | < 1.0       | < 1.0       |
| Toluene                                 | U                    | 2760 | µg/kg | 1.0  | < 1.0       | 4.3         | 1.5         | 3.0         | < 1.0       | < 1.0       |
| Ethylbenzene                            | U                    | 2760 | µg/kg | 1.0  | < 1.0       | 2.2         | < 1.0       | < 1.0       | < 1.0       | < 1.0       |
| m & p-Xylene                            | U                    | 2760 | µg/kg | 1.0  | < 1.0       | < 1.0       | < 1.0       | < 1.0       | < 1.0       | < 1.0       |
| o-Xylene                                | U                    | 2760 | µg/kg | 1.0  | < 1.0       | 3.4         | < 1.0       | 2.9         | < 1.0       | < 1.0       |
| Methyl Tert-Butyl Ether                 | U                    | 2760 | µg/kg | 1.0  | < 1.0       | < 1.0       | < 1.0       | < 1.0       | < 1.0       | < 1.0       |
| Total Phenols                           | U                    | 2920 | mg/kg | 0.30 | < 0.30      | < 0.30      | < 0.30      | < 0.30      | < 0.30      | < 0.30      |

| SOP  | Title                                                               | Parameters included                                                                                                                                                                                                                                          | Method summary                                                                                                                                                                         |
|------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2010 | pH Value of Soils                                                   | pH                                                                                                                                                                                                                                                           | pH Meter                                                                                                                                                                               |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS)          | Moisture content                                                                                                                                                                                                                                             | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.                                                                                   |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium                 | Boron; Sulphate; Magnesium; Chromium                                                                                                                                                                                                                         | Aqueous extraction / ICP-OES                                                                                                                                                           |
| 2192 | Asbestos                                                            | Asbestos                                                                                                                                                                                                                                                     | Polarised light microscopy / Gravimetry                                                                                                                                                |
| 2300 | Cyanides & Thiocyanate in Soils                                     | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate                                                                                                                                                                              | Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.                                                                                    |
| 2450 | Acid Soluble Metals in Soils                                        | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc                                                                                                     | Acid digestion followed by determination of metals in extract by ICP-MS.                                                                                                               |
| 2490 | Hexavalent Chromium in Soils                                        | Chromium [VI]                                                                                                                                                                                                                                                | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide. |
| 2625 | Total Organic Carbon in Soils                                       | Total organic Carbon (TOC)                                                                                                                                                                                                                                   | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.                                                                                             |
| 2680 | TPH A/A Split                                                       | Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44                                                                                | Dichloromethane extraction / GCxGC FID detection                                                                                                                                       |
| 2700 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)                                                   |
| 2760 | Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS       | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule                                                                                                                         | Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.                             |
| 2920 | Phenols in Soils by HPLC                                            | Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.                                                                                                            | 60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.                                                                               |

## **Report Information**

### **Key**

---

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

**D. GROUND GAS MEMBRANE CERTIFICATE OF CONFORMITY**



# PRE-SIGN OFF



## CERTIFICATE OF CONFORMITY

PROJECT: READING RIVERSIDE DATE: 23/06/2018

PROJECT CONTACT: ANDREW ALFRED REPORT Nr 02

### INSPECTION & VALIDATION DETAILS:

RE - INSPECTION OF ALL CAPS.  
INSPECT BASE LAYER PRIOR TO CAGES

### AREA/GRID LINE/PLOT NUMBER SIGNED OFF

- |   |                       |   |  |
|---|-----------------------|---|--|
| 1 | <u>AA-RA X A1-A3</u>  | 4 |  |
| 2 | <u>MC-BC X M12-M5</u> | 5 |  |
| 3 | <u>BB-BF X B1-B3</u>  | 6 |  |

### OUTSTANDING REMEDIATIONS

- |   |             |
|---|-------------|
| 1 | <u>WONG</u> |
| 2 |             |

Signed on behalf of GeoShield: J. Turnbull J TURNBULL

Signed on behalf of Client: SAM ALFRED

WHEN REPORT INVOICE HAS BEEN PAYED THE FULL REPORT WILL BE ISSUED.  
ON SETTLEMENT OF FINAL ACCOUNT VERIFICATION CERTIFICATE WILL BE ISSUED



# PRE-SIGN OFF



## CERTIFICATE OF CONFORMITY

PROJECT: RIVERSIDE READING DATE: 25/06/18

PROJECT CONTACT: ANDREW ALFRED REPORT Nr 03

### INSPECTION & VALIDATION DETAILS:

SAT AM.

INSPECT WRAP ROUND BEFORE BACKFILL

### AREA/GRID LINE/PLOT NUMBER SIGNED OFF

|   |                      |   |  |
|---|----------------------|---|--|
| 1 | <u>AA-RA X A1-A3</u> | 4 |  |
| 2 |                      | 5 |  |
| 3 |                      | 6 |  |

### OUTSTANDING REMEDIATIONS

|   |             |
|---|-------------|
| 1 | <u>NONE</u> |
| 2 |             |

Signed on behalf of GeoShield: Andrew J. Turnbull

Signed on behalf of Client: [Signature] Simon C.

WHEN REPORT INVOICE HAS BEEN PAYED THE FULL REPORT WILL BE ISSUED.  
ON SETTLEMENT OF FINAL ACCOUNT VERIFICATION CERTIFICATE WILL BE ISSUED



# GEOSHIELD LTD

VERIFICATION PROGRAMS FOR  
GROUND GAS PROTECTION SYSTEMS

## PRE-SIGN OFF

CERTIFICATE OF CONFORMITY

PROJECT: RIVERSIDE APARTMENTS

DATE:

29/06/18

PROJECT CONTACT: ANDREW

REPORT Nr:

04

### INSPECTION & VALIDATION DETAILS:

Inspection of wrap round to Block B.  
Backfilled before inspection, unable  
to complete verification  
No further backfilling before  
inspection.

### AREA/GRID LINE/PLOT NUMBER SIGNED

1 ME - BC X M23 - M5

4

2

5

3

6

### OUTSTANDING REMEDIATIONS

1

2

Signed on behalf of Geoshield:

Amunball J. Thompson

Signed on behalf of Client:

SAM CHAFFORD

WHEN REPORT INVOICE HAS BEEN PAYED THE FULL REPORT WILL BE ISSUED.

ON SETTLEMENT OF FINAL ACCOUNT VERIFICATION CERIFICATE WILL BE ISSUED.