SLADEN ASSOCIATES

REPORT ON PHASE 2 GROUND INVESTIGATION
Former Prize Building Site
First Phase Building Area
Biddulph
Staffordshire

Prepared for

Mr James W Bostock

Date : September 2015 **Job No : 15 1472 - 2**

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Prepared for: **Mr James W Bostock**

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1 INTRODUCTION

BP Architecture, acting on behalf of Mr James W Bostock has instructed Sladen Associates to carry out a Phase 2 Ground Investigation for the initial phase development area of the site of a proposed residential development at the former Prize Buildings Site off Lorena Close in Biddulph.

The investigation included intrusive fieldwork using a mini-drilling rig and deep rotary probe boreholes as well as subsequent laboratory testing of samples and a monitoring programme.

A Phase 1 Geo-Environmental Study for the site has previously been undertaken and reported as follows:

Phase 1 Geo-Environmental Report. Former Prize Building Site, Biddulph, Staffordshire. Prepared for Mr James W Bostock by Sladen Associates. Report No 14 1472 - 1, July 2015.

That report (Phase 1 Report) should be read in conjunction with the present report. The Phase 1 report included a review of the site history and environmental setting and development of a preliminary conceptual model of potential pollution linkages and should be read in conjunction with the present report.

A Coal Mining Risk Assessment for the site has previously been undertaken by others and reported as follows:

Coal Mining Risk Assessment, Former Prize Building, Tunstall Road, Biddulph. Prepared for Mr James Bostock by Earth Environmental and Geotechnical Ltd. Report No A0743/15, February 2015.

That report (CMRA) should be read in conjunction with the present report.

The present report presents the factual results of the intrusive investigation together with recommendations for the geotechnical and geo-environmental aspects of site re-development.

2 THE SITE

The site, which has an overall area of about 0.14 Ha lies to the south west of Lorena Close, a little way to the west of Tunstall Road in Biddulph, some 12 km north of Stoke-on-Trent town centre at National Grid Reference 3882 3575, see Figure 1.

The surrounding land uses are primarily residential.

At the time of the recent field programme, the buildings that formerly occupied the site had recently been demolished and there were a number of heaps of building rubble. Ground levels in the area drop generally to the west.

It is proposed to re-develop the site for residential use with the construction of seven over 55's retirement bungalows and cottages in two short terraces, of three in the east and four in the west. The currently proposed layout is shown in Figure 2. It is proposed to develop the site in two stages with the eastern block of three properties to be constructed first. The Phase 1 and CMRA Reports addressed the complete former Prize Building site. The western block will be constructed at a later date.

3 FIELD AND LABORATORY PROGRAMME

3.1 FIELDWORK

The fieldwork comprised four boreholes put down in the eastern site area using window sample techniques with a mini-rig (BH1, BH1A, BH2 to BH3) and three deep rotary probe holes (R1 to R3) put down across the whole site area. In situ dynamic probe testing (DPSH Method) was undertaken adjacent to the mini-rig boreholes prior to drilling and in situ 'SPT' testing was undertaken at the base of boreholes BH1A, BH2 and BH3 during drilling. BH1A was put down some 3m to the west of BH1 as poor recovery was experienced in BH1 in the depth range 1 to 3 m. Note that at BH1A the ground level was about 1 m lower than at BH1 as BH1A was within the area of the previous building were some excavation had occurred to remove floor slabs and 'red ash' hardcore below the slab area. The borehole locations are shown on the site layout plan, Figure 2.

Samples were recovered from the mini-rig boreholes for the purposes of classification and laboratory testing. Soil samples were screened for potential VOC (Volatile Organic Compound) impaction using a hand held PID (Photo ionisation Detector) meter. Groundwater/gas level monitoring standpipes were installed in two of the boreholes during backfilling. The mini-rig fieldwork was undertaken on the 30th July 2015.

The deep rotary boreholes were put down using water flush in order to investigate the potential for shallow mine workings. The rotary boreholes were put down on 23rd July 2015.

Detailed logs of the boreholes are included in Appendix A. Reference should be made to the logs for details of ground conditions at these locations but a generalised summary is provided in Section Ground Conditions, below.

3.2 SAMPLE HANDLING

All soil samples recovered from the field for potential chemical laboratory testing were divided into two sub samples; one sealed 420 ml glass jar and one 1l plastic tub. The glass jars were placed in cool boxes on site and were subsequently stored in a refrigerator. Following a review of data and scheduling, the selected jar and tub samples were transported to the laboratory (glass jars in cool boxes). The glass jars are used by the laboratory for all analysis for potentially volatile determinands.

3.3 LABORATORY TESTING

Selected soil samples were tested for a variety of potential contaminants as well as sulphate and pH. Two samples of near surface cohesive soil were tested to determine plasticity characteristics. The detailed results of this work are included in Appendix B and chemical test results are summarised in Tables 1 to 4.

4 GROUND CONDITIONS

4.1 GENERAL

Generally ground conditions at the borehole locations were found to comprise made ground, overlying natural soils of glacial origin, which in turn overlay soils considered to be weathered Coal Measures bedrock, although the mini-rig boreholes were terminated in glacial strata and the bedrock only proved in the rotary boreholes.

4.2 MADE GROUND

Made ground was encountered in all the recent boreholes and ranged in thickness from 1.8 m (BH2) to 3.5 m (BH1). The variable thickness of made ground is considered most likely to be related to fill placed for ground levelling prior to development but may also be related to the history of mining in the area. The made ground was variable in nature and included both granular and cohesive elements. The cohesive made ground ranged in consistency from very soft to firm clay, with varying proportions of gravel. The granular units were typically loose or medium dense, locally clayey sands or sandy gravels, also with varying proportions of gravel. The gravel fraction of the made ground included, variously, burnt shale, sandstone, brick, crushed rock, carbonaceous mudstone, siltstone, coal and, locally near surface, asphalt.

A layer of old topsoil was noted at the base of the made ground in BH2.

4.3 GLACIAL STRATA

Soils considered to be of glacial origin were encountered immediately below the made ground at all the borehole locations and in the mini-rig boreholes proved to a maximum depth of 6.0 m at BH1. In the rotary boreholes the depth to bedrock was found to be in the range 11.5 to 16.0 m. Note however that it is not always possible with that drilling method to distinguish between overburden soils and highly weathered bedrock. The glacial strata were considered to predominantly of glaciolacustrine origin and were typically described as soft or firm, but locally very soft or soft to firm, faintly laminated clays, sometimes with rare to occasional gravel. However units of loose or medium dense sand, considered to be of fluvioglacial origin, were present as well as thin layers of firm or stiff sandy clay with varying proportions of gravel, considered to be clay till. BH1 and BH1A terminated in fluvioglacial sand.

4.4 COAL MEASURES BEDROCK

Coal measures bedrock was encountered below the surface deposits in all the rotary probe boreholes, at depth sin the range 11.5 m (R2) to 16 m (R3). The bedrock was found to be predominantly sandstone but also included some shale (fissile mudstone) units and shale bands. No evidence of coal or broken ground, soft drilling or voids, as may be indicative of old mine workings, was noted in R2 or R3 during drilling and full flush returns were maintained to full depth of those boreholes (36 and 39 m, respectively). In R1 full flush was maintained to 22 m depth but was lost below that depth and broken ground was encountered in the depth range 22 to 23 m. Below that solid drilling was encountered from 23 to 36 m depth.

A summary of the anticipated bedrock geology below the site was included in the Phase 1 report. Reference to that suggests that the broken ground in R1 most likely represents workings within the Bullhurst Coal Seam, which was expected to be present at up to 10 m below rockhead in the site area. Strata were expected to dip to the west and absence of coal or evidence of former mining in R2 and R3, which are both to the west of R1, suggests that this seam is likely below the depths of those boreholes at those

locations. The next shallowest coal seam of potential economic interest is the Winpenny Coal, expected to be some 15 m below the Bullhurst.

4.5 GROUNDWATER

Free groundwater was not encountered during drilling of the recent boreholes and monitoring of standpipes installed in BH1 and BH3 showed dry conditions, to depths of 3.5 m and 3.85 m, respectively, refer Table 5.

4.6 CONTAMINATION

Apart from some asphalt and burnt shale in the made ground, no visible or olfactory evidence of potentially significant ground contamination was noted during the recent fieldwork and PID screening showed no evidence of volatile organic compounds.

5 GEO-ENVIRONMENTAL ASSESSMENT

5.1 GEOTECHNICAL CONSIDERATIONS

5.1.1 FOUNDATION CONDITIONS

It is not recommended that foundations to support the new structures be founded in unimproved made ground. In view of the depth and locally soft or very soft nature of the made ground and locally soft or very soft nature of the underlying natural strata, consideration should be given to the use of some form of deep foundations, piles, to support structural loads. The advice of a specialist contractor should be sought concerning the most cost effective option and detailed design of piled foundations and ground improvement. Deeper 'shell and auger' boreholes will likely be required for final pile design.

If trees are to be planted or removed in the vicinity of foundations, consideration should be given to the potential effects of soil shrinkage and swelling. Based on visual classification and testing to determine index properties, with due allowance for coarse fraction, clay units present near surface within the made ground would be classified as being of 'low' shrinkage potential, according to the scheme developed by the NHBC.

5.1.2 MINING CONSIDERATIONS

The CMRA recommended an intrusive investigation with respect to potential shallow mine workings below the site.

The site has been undermined in the past and evidence of relatively shallow mining has been found at 22 m depth in the eastern site area. As deep foundations have been recommended to support structural loads consideration should be given to the potential need for drilling and grout stabilisation of workings within the Bullhurst Seam, where this will be present at a depth of less than about 8 to 10 m below the base of piled foundations. It is likely that drilling and grout stabilisation will therefore be required below the proposed eastern block on site, i.e. the proposed first phase of development, but this should be reviewed following final pile design. The design and specification of the treatment works should be undertaken by a suitably qualified engineer and agreed with the Coal Authority.

In view of the presence of old mine workings below the site, foundations for residential structures should be reinforced such that they can span 3 m or cantilever 1.5 m in plan distance without structural distress.

5.1.3 FLOOR SLABS

In view of the variable depth and nature of made ground present at the site, consideration should be given to the use of structurally supported floors.

5.1.4 BURIED CONCRETE

Tests to determine the water-soluble sulphate content of soils (Table 3) gave values in the range of less than 0.06 to 0.71 g/l. These can be compared to the level of 0.5 g/l suggested by BRE Special Digest 1 (2005 Revision) as the level above which special precautions to protect buried concrete from sulphate attack in natural ground may be appropriate. The measured pH values were in the range 7.0 to 8.9, indicating that acidic conditions are not generally present on site. It is considered that the site may be classified as exhibiting Class DS-2/AC-2 conditions as per BRE Special Digest 1.

5.2 ENVIRONMENTAL CONSIDERATIONS

5.2.1 SOIL CONTAMINATION ASSESSMENT

5.2.1.1 CONCEPTUAL MODEL

The Phase 1 report included development of a conceptual model of potential pollution linkages. With regard to human health considerations, the site preliminary conceptual model risk assessment concluded that there was likely to be a low risk to site users as there was some potential for metals and PAH compounds and possibly asbestos to be present in made ground at the site.

The local presence of some asphalt in the made ground could also introduce the potential for heavy TPH fractions to be present. No asbestos materials were observed in the made ground during the field programme and laboratory inspection showed no evidence of presence of asbestos.

There are no nearby off-site land uses that have been identified that would potentially be associated with any significant risk of contamination of the site soils.

5.2.1.2 HAZARD ASSESSMENT

It is appropriate to consider three broad groups of contaminants. Firstly those that are potentially toxic to humans, secondly ‘phytotoxins’, which are potentially toxic to plants but not normally to humans and thirdly, potentially aggressive substances that may attack building materials. The latter have been discussed in the Section ‘Buried Concrete’, above. Plants are discussed in the Section ‘Plants’, below. Human health considerations are discussed in the Section ‘Human Health Risk Assessment’.

In order to allow a more quantified definition of potential hazards, selected soil samples were tested for a wide range of potential contaminants. This included banded total petroleum hydrocarbons and speciated polyaromatic hydrocarbons (PAH’s) as well as presence of asbestos.

With respect to potential hydrocarbon contamination, the following sequence of observation and testing was undertaken:

- Odour, if detected, would be noted.
- Soil samples from the boreholes were screened for potential VOC impaction using a hand held PID meter, none was detected.
- The basic laboratory testing suite included speciated PAHs.

- TPH fractions were determined in accordance with the narrow banded ranges proposed by the TPH Criteria Working Group (Gustafson et al, 1997 'TPCWG') and the proportions of aliphatic and aromatic compounds were determined.
- Analysis was undertaken to determine the concentrations of BTEX compounds, which represent the most volatile aromatic TPH compounds.

5.2.1.3 HUMAN HEALTH RISK ASSESSMENT

5.2.1.3.1 Generic Quantitative Assessment

Measured levels of potential contaminants have been compared with preliminary generic assessment criteria. These were taken to be current 'CLEA' Soil Guideline Values, where these exist (see Tables 1A to C).

CLEA SGV's have not been published for some determinands and the guidance that formed the basis for some of the published SGV's has been withdrawn. Where no current guidance has been published, "suitable for use" levels (S4UL's), published by LQM 2015 (Publication S4UL3287) were adopted as GAC (Generic Assessment Criteria) levels. Published SGV's relate to soil organic matter (SOM) contents of 6 % and S4UL values have been published for SOM values of 1, 2.5 and 6 %. If necessary, for other values of SOM, GAC's are computed using the CLEA software with input parameters as per published SGV/S4UL values. A value of SOM of 6 % was adopted for preliminary screening, somewhat lower than the site measured average value (9.1 %). For lead, there is no current SGV or S4UL value and the screening value adopted is based on the recent 'Category 4', acceptable risk screening levels published by Defra. For these comparisons, the 95% upper confidence level (UCL) of the mean concentration of potential contaminants has been adopted but the maximum measured values are also included in the tables.

For initial screening, GAC values for residential usage with plant uptake have been adopted for the tables. These are considered to be conservative with respect to the proposed retirement residential usage as young receptors are unlikely to be subject to chronic exposure on site. With regard to this comparison, five PAH compounds showed elevated UCL values, although one of these was due to a statistical outlier. The UCL for arsenic was also elevated and this was also due to a statistical outlier. Further consideration is therefore warranted with respect to these substances. No further consideration or risk assessment is considered warranted with respect to protection of site users for other potential contaminants.

5.2.1.3.2 Further Consideration with Respect to PAH Compounds and Arsenic

The PAH compounds showing elevated UCL values and inorganic arsenic compounds are not volatile. As removal of all made ground is unlikely to be feasible and would not be a sustainable option, potential exposure pathways could be broken by provision of clean cover soils in soft landscaped areas. A thickness of clean cover of 600 mm is recommended for private garden areas where vegetables may be grown. 400 mm thickness is recommended for other soft landscaped areas.

5.2.1.4 CONSTRUCTION WORKERS

Construction workers could potentially be exposed to contact with site soils and dust inhalation. There is no reason to consider, however, that any special precautions would be required to protect construction workers.

5.2.1.5 PLANTS

The CLEA approach only considers risks to human health of site users. With regard to phytotoxins (potentially toxic to plants) the relevant former ICRCL threshold level was

'any uses where plants are to be grown'. The test results are summarised in Table 2. Based on these criteria no samples showed any elevated concentrations. In view of this and as clean cover soils have been recommended with respect to human health considerations, it is not considered that any special precautions are considered warranted with respect to plants.

5.2.1.6 GENERIC QUANTITATIVE RISK ASSESSMENT– GROUND AND SURFACE WATER

The only practical 'wider' environmental pathway whereby potential contaminants within the near surface soils on site could migrate from the site following development would be by leaching to the groundwater and thence eventual discharge to the surface water system or abstraction. In order to assess the potential for leaching of contaminants, the following procedure was used:

1. An initial screening was carried out where total measured levels of contamination were compared to a leachate trigger level. This was taken to be 1) a generic Level 1 target value derived using the Environment Agency's RTM methodology (see Appendix C for details of derivation), or 2) the lower threshold concentration as defined in former EA guidance on the disposal of contaminated soils or 3) for TPH, 500 mg/kg (the current value used to define 'inert' waste) and for PAH 100 mg/kg, see Table 4A. According to this screening, an elevated concentration of total arsenic was measured in one sample, somewhat elevated total sulphide, phenol and TPH in another and somewhat elevated total PAH in two samples.
2. The samples where measured levels exceeded the relevant screening level were tested to determine the leachable concentrations of the relevant determinands. Leachable concentrations of arsenic, phenol and sulphide were all found to be below the limit of detection. Leachable TPH was marginally above the former drinking water standard, used as a screening value in the absence of current guidance, and leachable total PAH was marginally above the DWS in one of the two samples showing elevated total concentrations.

A review of the TPH fractions and PAH compounds present, see Tables 1B and 1C, shows that the potentially most mobile fractions, such as BTEX and other light aromatic fractions and light PAH compounds are all either below the limit of detection or at very low concentration. Very little dilution would be required to bring measured leachable concentrations below screening levels. In view of these factors, it is not considered that the measured conditions pose any significant risk to controlled waters and no more detailed risk assessment or special precautions are therefore considered necessary.

5.2.2 GROUND GAS

The Phase 1 Report identified no nearby current or former landfills and given the absence of significant sources of significant volumes of bio-gas generation on or near the site, real risks associated with ground gas were judged to be very low to negligible.

No significant thickness of potentially putrescible material has been found on site. As a precaution gas monitoring standpipes were installed in two of the boreholes and a limited programme of ground gas monitoring was implemented (Table 5).

No methane was detected. Carbon dioxide concentrations were slightly above atmospheric levels, with a maximum measured concentration of 1.8 %. No measurable gas flows were recorded.

Using the terminology of CIRIA C659, these conditions would be consistent with Characteristic Situation 1. Accordingly, no special precautions are considered warranted with respect to ground gas.

5.3 SUMMARY OF REMEDIAL PRECAUTIONS WITH REGARD TO CONTAMINATION

5.3.1.1 SOIL CONTAMINATION WITH RESPCT TO SITE USERS

Clean cover soils should be provided in proposed garden and other soft landscaped areas, as detailed in the report. No other special precautions are considered warranted with respect to protection of site users.

5.3.1.2 GROUND GAS

No special precautions are considered necessary with respect to ground gas.

5.3.1.3 PLANTS

No special precautions are considered necessary with respect to plants.

5.3.1.4 WIDER ENVIRONMENT

No special precautions are considered necessary with respect to protection of controlled waters.

5.3.1.5 CONSTRUCTION WORKERS

No special precautions are considered warranted with respect to protection of construction workers.

5.3.1.6 LOCAL SITE AREAS

The potential exists on a site of this nature for local areas of contamination to be present that are not identified during the ground investigation. Should any local areas of visibly potentially contaminated material be observed the affected material should be segregated and either removed from site or tested for potential re-use as fill, subject if necessary to appropriate remedial treatment.

5.3.1.7 REMOVAL AND TREATMENT OF CONTAMINATED SOIL FROM SITE

Any contaminated soil excavated from site should either be removed and disposed of at a suitably licensed waste management facility, treated so that associated risks are below unacceptable levels or used in a less sensitive area of the site. Records should be kept on site of areas where contaminated soil has been removed, the assessed nature of the contamination, the volumes excavated and either the waste management facility to which it was transported or the treatment undertaken.

5.4 GENERAL

There is the potential for ground conditions to be present on site between exploration holes that are different from those encountered during a ground investigation. Should significantly different ground conditions be encountered the relevance of recommendations included in the present report should be reviewed in the light of any new information.

It is recommended that design details for the proposed development be discussed with the Local Authority Environmental Health Department and the authority that will be responsible for building control, and if appropriate warranty, prior to finalisation of design details. The appropriate utility providers should be consulted with regard to any special precautions that may be required to protect buried services.

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TABLES

TABLE 1A COMPARISON OF LEVELS OF MEASURED CONTAMINANTS WITH GENERIC SOIL GUIDELINE VALUES – PRELIMINARY HAZARD SCREENING – METALS, PHENOL AND CYANIDE

Determinand	Total No of Samples Tested	UCL	SGV/GAC	Maximum Value	Number of Outliers	Number of Samples Exceeding SGV/GAC
Arsenic	3	190	37	110	1	1
Boron	3	2.2	290	1.4	1	0
Cadmium	3	All BLD	11	<0.2	0	0
Hexavalent Chromium	3	1.1	6	0.74	0	0
Chromium (III)	3	25	910	19	0	0
Copper	3	37	2400	31	0	0
Lead	3	37	200	31	0	0
Mercury	3	All BLD	170	<0.6	0	0
Nickel	3	46	180	38	0	0
Selenium	3	2.1	350	1.5	1	0
Zinc	3	34	3700	30	0	0
Cyanide	3	All BLD	250	<1.1	0	0
Phenols	3	10	380	7.9	0	0

Key:

BLD	Below Limit of Detection
UCL	95% Upper Confidence Limit of Mean - See Table A

Notes:

1 Where value BLD - assumed equal to detection limit for calculation of mean values etc.
2 Where SGV not published by DEFRA,LQM S4UL (Pub No:S4UL3287) Value Used.
3 For Lead DEFRA C4SL Adopted.
4 All values are in mg/kg
5 Outliers included for UCL calculation
6 GAC Based on Sandy Loam and SOM = 6 %, Residential with Plant Uptake
7 SGV Based on Sandy Loam and SOM = 6 %, Residential with Plant Uptake

TABLE 1B COMPARISON OF LEVELS OF MEASURED CONTAMINANTS WITH GENERIC SOIL GUIDELINE VALUES – PRELIMINARY HAZARD SCREENING – TPH & BTEX

Determinand	Total No of Samples Tested	UCL	SGV/GAC	Maximum Value	Number of Outliers	Number of Samples Exceeding SGV/GAC
Benzene	3	0.032	0.37	0.023	1	0
Toluene	3	0.061	660	0.039	1	0
Ethylbenzene	3	All BLD	260	<0.011	0	0
m&p-Xylene	3	All BLD	310	<0.011	0	0
o-Xylene	3	All BLD	330	<0.011	0	0
Aliphatic VPH >C5 - C6	3	All BLD	160	<0.11	0	0
Aliphatic VPH >C6 - C8	3	All BLD	530	<0.11	0	0
Aliphatic VPH >C8 - C10	3	0.15	150	0.13	1	0
Aliphatic EPH >C10 - C12	3	15	760 sol (280)	8.6	1	0
Aliphatic EPH >C12 - C16	3	23	4300 sol (140)	18	0	0
Aliphatic EPH >C16 - C35	3	140	110000 sol (50)	89	0	0
Aliphatic EPH >C35 - C44	3	68	110000 sol (50)	52	0	0
Aromatic VPH >C8 - C10	3	All BLD	190	<0.11	0	0
Aromatic EPH >C10 - C12	3	14	380	11	0	0
Aromatic EPH >C12 - C16	3	43	660	35	0	0
Aromatic EPH >C16 - C21	3	250	930 sol (320)	200	0	0
Aromatic EPH >C21 - C35	3	1500	1700 sol (29)	880	1	0
Aromatic EPH >C35 - C44	3	540	1700 sol (0.44)	320	1	0

Key:

BLD	Below Limit of Detection
UCL	95% Upper Confidence Limit of Mean - See Table A

Notes:

1 Where value BLD - assumed equal to detection limit for calculation of mean values etc.
2 Where SGV not published by DEFRA,LQM S4UL (Pub No:S4UL3287) Value Used.
3 For Lead DEFRA C4SL Adopted.
4 All values are in mg/kg
5 Outliers included for UCL calculation
6 GAC Based on Sandy Loam and SOM = 6 %, Residential with Plant Uptake
7 sol = exceeds the solubility or vapour saturation limit, shown in brackets

TABLE 1C COMPARISON OF LEVELS OF MEASURED CONTAMINANTS WITH GENERIC SOIL GUIDELINE VALUES – PRELIMINARY HAZARD SCREENING – PAH COMPOUNDS

Determinand	Total No of Samples Tested	UCL	SGV/GAC	Maximum Value	Number of Outliers	Number of Samples Exceeding SGV/GAC
Naphthalene	3	1.4	13	1.1	0	0
Acenaphthylene	3	0.093	920 sol (510)	0.073	0	0
Acenaphthene	3	2.5	1100 sol (340)	1.9	0	0
Fluorene	3	2	850 sol (180)	1.6	0	0
Phenanthrene	3	26	440 sol (210)	21	0	0
Anthracene	3	10	11000 sol (7)	7.9	0	0
Fluoranthene	3	89	890 sol (110)	68	0	0
Pyrene	3	75	2000 sol (13)	57	0	0
Benzo(a)anthracene	3	36	13	26	0	2
Chrysene	3	28	27	20	0	0
Benzo(b)fluoranthene	3	38	3.7	27	0	2
Benzo(k)fluoranthene	3	18	100	13	0	0
Benzo(a)pyrene	3	36	3	25	0	2
Indeno(1,2,3-c,d)pyrene	3	27	41	18	0	0
Dibenz(a,h)anthracene	3	6.1	0.3	3.41	1	1
Benzo(g,h,i)perylene	3	21	350	15	0	0

Key:

BLD	Below Limit of Detection
UCL	95% Upper Confidence Limit of Mean - See Table A

Notes:

1 Where value BLD - assumed equal to detection limit for calculation of mean values etc.
2 Where SGV not published by DEFRA,LQM S4UL (Pub No:S4UL3287) Value Used.
3 For Lead DEFRA C4SL Adopted.
4 All values are in mg/kg
5 Outliers included for UCL calculation
6 GAC Based on Sandy Loam and SOM = 6 %, Residential with Plant Uptake
7 sol = exceeds the solubility saturation limit, shown in brackets

TABLE 2 COMPARISON OF LEVELS OF MEASURED CONTAMINANTS WITH FORMER ICRCL THRESHOLD TRIGGER VALUES – ALL AREAS WHERE PLANTS ARE TO BE GROWN

Determinand	Total Number of Samples Tested	Mean Result (note 1)	Range	Reference Standard (See Key Below)	Trigger Value	Number of Samples Exceeding Trigger Value
Boron	3	0.71	0.36 to 1.4	ICRCL-PLANTS	3	0
Copper	3	19	11 to 31	ICRCL-PLANTS	130	0
Nickel	3	21	9.3 to 38	ICRCL-PLANTS	70	0
Zinc	3	26	21 to 30	ICRCL-PLANTS	300	0

Key:
ICRCL-PLANTS ICRCL Threshold Concentration for all uses where plants are to be grown

Notes:
1 Where value below detection limit - assumed equal to detection limit for calculation of mean values etc.
2 No action limits specified for phytotoxins
3 All values are in mg/kg

TABLE 3 SOIL SULPHATE AND PH DATA

Determinand	Total Number of Samples Tested	Mean Result	Range
Sulphate (Total) %	3	0.072	0.031 to 0.12
pH	6	8.2	7 to 8.9
Sulphate (WS) g/l	6	0.28	<0.06 to 0.71

Notes:
1 Where value below detection limit - assumed equal to detection limit for calculation of mean values etc.

TABLE 4A COMPARISON OF LEVELS OF MEASURED CONTAMINANTS WITH RTM LEVEL 1 LEACHATE SCREENING TRIGGER VALUES

Determinand	Total Number of Samples Tested	Mean Result (note 1)	Range	Reference Standard (See Key Below)	Trigger Value	Number of Samples Exceeding Trigger Value
Arsenic	3	40	4.8 to 110	P20 Level 1	18 \ 90	1 \ 1
Boron	3	0.71	0.36 to 1.4	P20 Level 1	10 \ 20	0 \ 0
Cadmium	3	All BLD	-	P20 Level 1	13 \ 13	0 \ 0
Chromium (Total)	3	15	6.7 to 20	P20 Level 1	240 \ 96	0 \ 0
Copper	3	19	11 to 31	P20 Level 1	4200 \ 420	0 \ 0
Lead	3	18	9.9 to 31	P20 Level 1	900 \ 720	0 \ 0
Mercury	3	All BLD	-	P20 Level 1	7.5 \ 7.5	0 \ 0
Nickel	3	21	9.3 to 38	P20 Level 1	40 \ 80	0 \ 0
Selenium	3	1	0.75 to 1.5	P20 Level 1	3	0
Zinc	3	26	21 to 30	P20 Level 1	1300 \ 1000	0 \ 0
Cyanide	3	All BLD	-	EA	250	0
Phenols	3	3.5	0.55 to 7.9	EA	5	1
Sulphide	3	110	<3.1 to 290	EA	250	1
Sulphur	3	200	26 to 370	EA	5000	0
TPH (Total)	3	720	180 to 1600	IWAL	500	1
PAH (Total)	3	160	3.27 to 305	IWAL	100	2

Key:

P20 Level 1	Generic RTM Level 1 calculated target value based on comparison DWS/EQS(WAC)
EA	Interim Guidance on the Disposal of 'Contaminated Soils' - Lower Threshold Concentration
IWAL	Waste acceptance limit for 'inert waste'
BLD	Below Limit of Detection
TPH	Total Petroleum Hydrocarbons
PAH	Poly Aromatic Hydrocarbons

Notes:

1 Where value below detection limit - assumed equal to detection limit for calculation of mean values etc.

2 All values are in mg/kg

TABLE 4B COMPARISON OF LEVELS OF MEASURED CONTAMINANTS WITH LEACHATE QUALITY THRESHOLD VALUES - LEACHING TESTS

Determinand	Total Number of Samples Tested	Mean Result (see note 1)	Range	Reference Standard (See Key Below)	Trigger Value	Number of Samples exceeding trigger value
Arsenic	1	BLD	-	-	-	-
Phenol	1	BLD	-	-	-	-
Total TPH	1	0.011	-	Former DWS	0.01	1
Total PAH	2	0.00014	0.000042 – 0.00023	DWS	0.0002	1
Sulphide	1	BLD	-	-	-	-

Key:

EQS	Environmental Quality Standards
PAH	Polyaromatic Hydrocarbons
TPH	Total Petroleum Hydrocarbons
DWS	Drinking Water Standard
BLD	Below Limit of Detection

Notes:

1 Where value below detection limit – assumed equal to detection limit for calculation of mean values etc.

2 All values are in mg/l

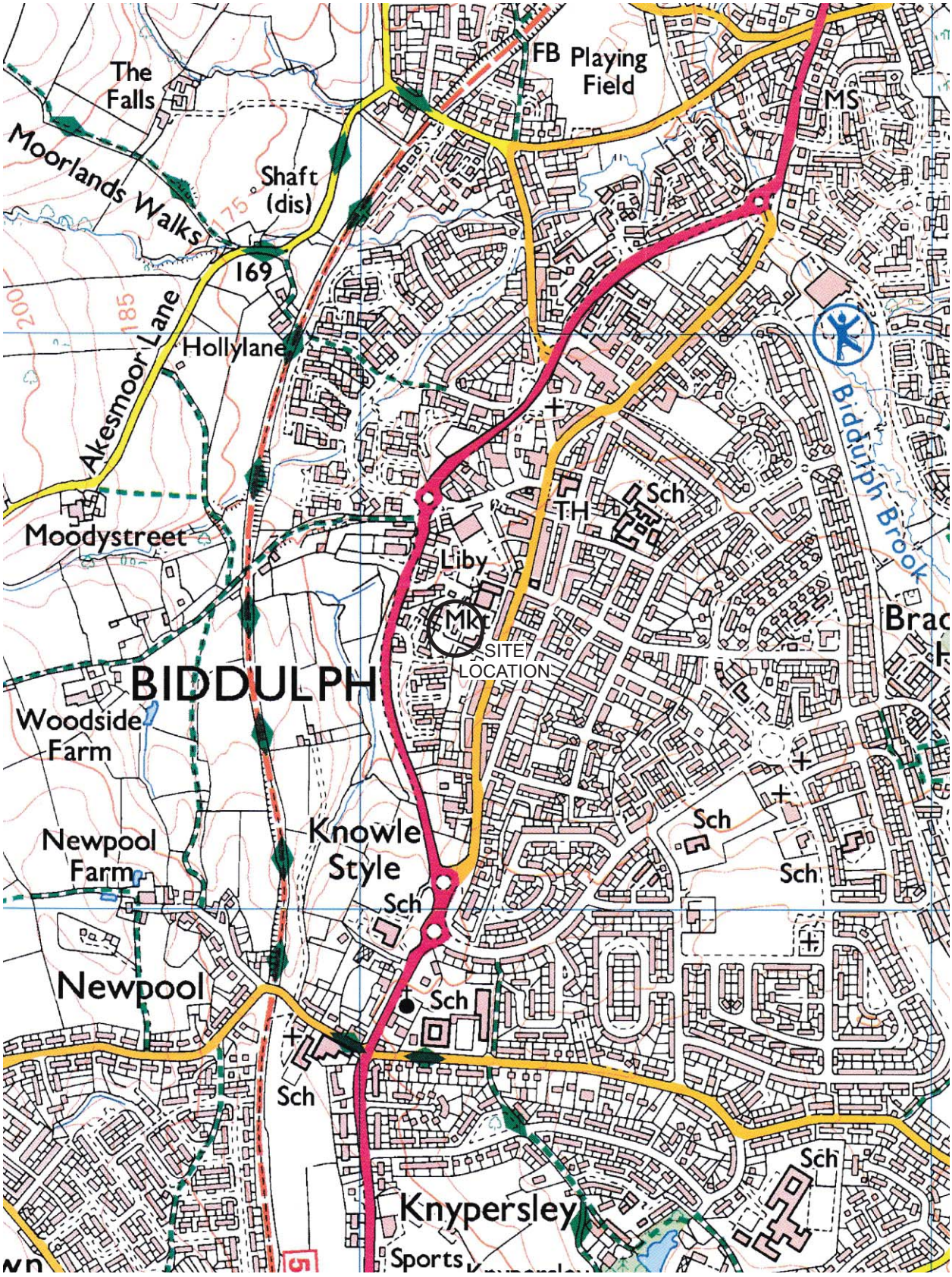
TABLE 5 GROUNDWATER AND GROUND GAS MONITORING

Date	BH	Atmospheric Pressure (bar)	CH_4 (%)	CO_2 (%)	O_2 (%)	Gas Flow Rate	Depth to Groundwater
06-08-15	1	988	0	0.6	19.6	None	Dry (3.50)
	3	rising	0	1.8	19.5	None	Dry (3.85)
12-08-15	1	1012	0	0.3	20.1	None	Dry
	3	falling	0	1.5	20.0	None	Dry

TABLE A – STATISTICAL SUMMARY OF DATA

Determinand	Shapiro-Wilk W	Normally Distributed	95% Upper Confidence Level of Mean Measured Concentration (mg/kg)	
			US95	One-Sided Chebychev
Arsenic	0.75	NO	140	190
Boron	0.76	NO	1.7	2.2
Cadmium	All Below Limit of Detection			
Hexavalent Chromium	0.87	YES	1.1	1.3
Chromium (III)	0.87	YES	25	31
Copper	0.89	YES	37	46
Lead	0.82	YES	37	47
Mercury	All Below Limit of Detection			
Nickel	0.91	YES	46	59
Selenium	0.75	NO	1.7	2.1
Zinc	0.91	YES	34	38
Cyanide	All Below Limit of Detection			
Phenols	0.89	YES	10	13
Sulphide	0.82	YES	370	510
Sulphur	1	YES	490	630
MTBE	All Below Limit of Detection			
Benzene	0.75	NO	0.027	0.032
Toluene	0.75	NO	0.048	0.061
Ethylbenzene	All Below Limit of Detection			
m&p-Xylene	All Below Limit of Detection			
o-Xylene	All Below Limit of Detection			
Aliphatic VPH >C5 - C6	All Below Limit of Detection			
Aliphatic VPH >C6 - C8	All Below Limit of Detection			
Aliphatic VPH >C8 - C10	0.75	NO	0.14	0.15
Aliphatic EPH >C10 - C12	0.75	NO	11	15
Aliphatic EPH >C12 - C16	0.95	YES	23	30
Aliphatic EPH >C16 - C35	0.82	YES	140	180
Aliphatic EPH >C35 - C44	0.98	YES	68	89
Aromatic VPH >C8 - C10	All Below Limit of Detection			
Aromatic EPH >C10 - C12	0.9	YES	14	18
Aromatic EPH >C12 - C16	0.99	YES	43	54
Aromatic EPH >C16 - C21	0.83	YES	250	330
Aromatic EPH >C21 - C35	0.77	NO	1100	1500
Aromatic EPH >C35 - C44	0.76	NO	400	540
Naphthalene	0.9	YES	1.4	1.9
Acenaphthylene	0.98	YES	0.093	0.11
Acenaphthene	0.97	YES	2.5	3.3
Fluorene	0.94	YES	2	2.6
Phenanthrene	0.94	YES	26	35
Anthracene	0.98	YES	10	14
Fluoranthene	1	YES	89	120
Pyrene	1	YES	75	98
Benzo(a)anthracene	1	YES	36	47
Chrysene	0.98	YES	28	37
Benzo(b)fluoranthene	0.95	YES	38	50
Benzo(k)fluoranthene	0.98	YES	18	23
Benzo(a)pyrene	0.96	YES	36	47
Indeno(1,2,3-c,d)pyrene	0.92	YES	27	35
Dibenz(a,h)anthracene	0.75	NO	4.5	6.1
Benzo(g,h,i)perylene	0.97	YES	21	27

FIGURES



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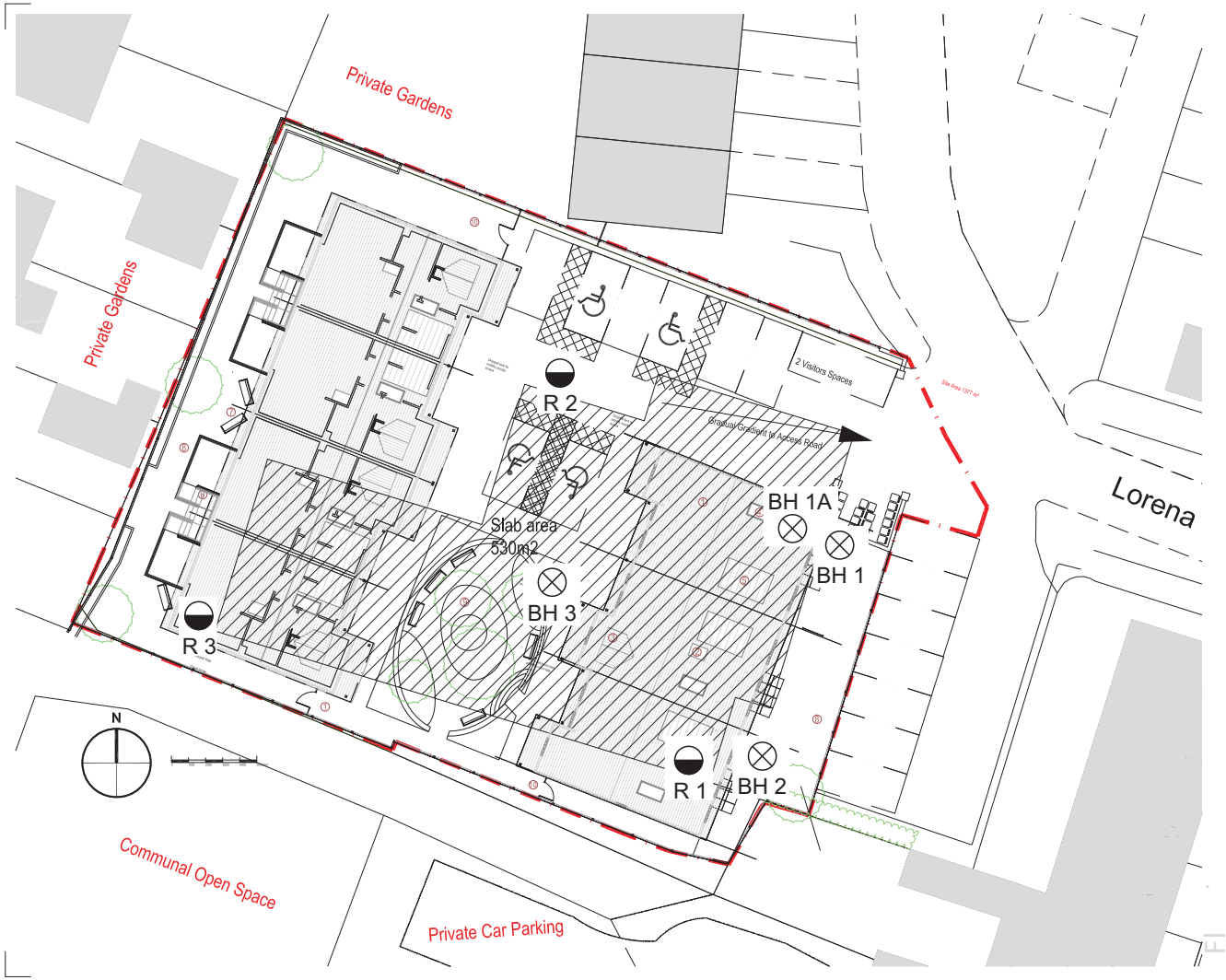
SITE LOCATION PLAN

SLADEN ASSOCIATES	Report No 15-1472-2	Project Prize Buildings Tunstall Road Biddulph	Figure **1**



KEY

⊗ Mini rig Borehole

◒ Rotary Borehole

SITE LAYOUT PLAN

SLADEN ASSOCIATES	Report No 15-1472-2	Project Prize Buildings, Tunstall Road, Biddulph	Figure **2**

APPENDIX A
BOREHOLE LOGS AND IN SITU TEST RESULTS

SLADEN ASSOCIATES

Unit 5, Netherton Workshops, Highley, Bridgnorth, Shropshire, WV16 6NN Tel:01746 860222 Fax:01746 862330

Borehole No: BH1

Equipment & Methods	Job No: 15-1472		
Mini Rig/Window Sampler	Project: Former Prize Building Site, Biddulph		
Carried out for	Ground Level	Coordinates	Date
Mr Jim Bostock	0	E N	30/07/2015

Descriptions	Legend	Depth	Reduced Level	Samples/Tests/Notes: Depth	Sample Type	Sample No.	Test	Field Records	Well
Asphalt over medium dense grey and reddish brown sandy angular GRAVEL. Gravel is burnt shale, asphalt and sandstone. (MADE GROUND)				0.00 to 1.00	U	1	PID	<0.1ppm	
				0.10 to 9.60	CPT	2	DPSH Test	see separate record	
		0.40	-0.40						
Firm brown very sandy CLAY with much angular gravel. Gravel is burnt shale, brick and crushed rock. (MADE GROUND)		0.55	-0.55						
		0.75	-0.75						
Medium dense dark grey and black slightly clayey SAND and angular GRAVEL. Gravel is burnt shale and crushed rock with occasional coal. (MADE GROUND)				1.00 to 2.00	U	3	PID	<0.1ppm	
Medium dense grey brown silty SAND with some angular to sub-rounded gravel. Gravel is very weak carbonaceous mudstone and crushed rock. Pockets of very sandy clay. (MADE GROUND)				2.00 to 2.50	B	4	PID	<0.1ppm	
		2.50	-2.50	2.50 to 3.50	B	5	PID	<0.1ppm	
Soft to firm, locally firm, grey mottled brown CLAY with occasional fine to coarse angular to sub-angular gravel. Gravel is siltstone, sandstone and coal. (MADE GROUND)				3.00 to 4.00	B	6	PID	<0.1ppm	
		3.50	-3.50	3.50 to 4.00	B	7	PID	<0.1ppm	
Firm, locally soft to firm, brown silty, locally slighthly sandy, locally faintly laminated, CLAY with occasional rounded to sub-rounded gravel. (GLACIOLACUSTRINE)				4.00 to 5.80	B	8	PID	<0.1ppm	
		5.80	-5.80	5.80 to 6.00	B	9	PID	<0.1ppm	
Medium dense light brown silty, clayey fine SAND with occasional fine to coarse gravel. (FLUVIOGLACIAL)		6.00	-6.00						
End of Borehole									

Additional Comments

Log based on limited returns due to sampling method - depths are approximate.
Continuous dynamic probe put down prior borehole - see separate record.
Groundwater: no free groundwater encountered. Poor recovery 1.0 - 3.0m.
50mm groundwater/gas monitoring standpipe installed 0.0m to 0.5m, plain pipe with bentonite seal 0.5m to 3.5m slotted pipe with gravel surround.

Logged by GLD

Figure

SLADEN ASSOCIATES

Unit 5, Netherton Workshops, Highley, Bridgnorth, Shropshire, WV16 6NN Tel:01746 860222 Fax:01746 862330

Borehole No: BH1A

Equipment & Methods	Job No: 15-1472			
Mini Rig/Window Sampler	Project: Former Prize Building Site, Biddulph			
Carried out for	Ground Level	Coordinates		Date
Mr Jim Bostock	0	E N		30/07/2015

Descriptions	Legend	Depth	Reduced Level	Samples/Tests/Notes Depth	Sample Type	Sample No.	Test	Field Records
Loose very sandy slightly clayey GRAVEL with pockets of very sandy clay. Gravel is sandstone, siltstone and crushed rock. (MADE GROUND)				0.00 to 1.00	U	1	PID	<0.1ppm
				0.10 to 7.00	CPT	2	DPSH Test	see separate record
				1.00 to 2.00	U	3	PID	<0.1ppm
Very soft grey silty very sandy CLAY with some fine to coarse angular to sub-rounded gravel. Gravel is mainly sandstone with occasional coal and crushed rock. (MADE GROUND)		1.40	-1.40					
				2.00 to 3.00	U	4	PID	<0.1ppm
		2.60	-2.60					
Loose light orange brown silty slightly clayey SAND with some sub-rounded gravel. (FLUVIOGLACIAL)		2.80	-2.80					
Firm to stiff brown silty slightly sandy CLAY with occasional fine to coarse gravel. (GLACIAL TILL)		3.00	-3.00	3.00 to 4.00	U	5	PID	<0.1ppm
Firm, locally soft to firm, brown becoming light reddish brown, faintly laminated CLAY with rare fine to coarse gravel. (GLACIOLACUSTRINE)								
				4.00 to 5.00	U	6	PID	<0.1ppm
		4.80	-4.80					
Medium dense light brown silty clayey fine SAND with occasional gravel. (FLUVIOGLACIAL)		5.00	-5.00	5.00 to 5.45	SPT	7	N=19	3,4,4,5,5,5
End of Borehole								

Additional Comments
Log based on limited returns due to sampling method - depths are approximate.
Continuous dynamic probe put down prior borehole - see separate record.
Groundwater: no free groundwater encpountered.

Logged by GLD

Figure

SLADEN ASSOCIATES

Unit 5, Netherton Workshops, Highley, Bridgnorth, Shropshire, WV16 6NN Tel:01746 860222 Fax:01746 862330

Borehole No: BH2

Equipment & Methods	Job No: 15-1472			
Mini Rig/Window Sampler	Project: Former Prize Building Site, Biddulph			
Carried out for	Ground Level	Coordinates		Date
Mr Jim Bostock	0	E N		30/07/2015

Descriptions	Legend	Depth	Reduced Level	Samples/Tests/Notes Depth	Sample Type	Sample No.	Test	Field Records
Loose dark grey sandy angular GRAVEL and occasional cobbles. Gravel is carbonaceous mudstone. (MADE GROUND)				0.00 to 1.00	U	1	PID	<0.1ppm
				0.10 to 6.40	CPT	2	DPSH Test	see separate record
				1.00 to 2.00	U	3	PID	<0.1ppm
		1.50	-1.50					
Very soft grey silty locally sandy CLAY with occasional gravel. Gravel is coal and carbonaceous mudstone. (MADE GROUND)		1.80	-1.80					
		1.90	-1.90					
Very soft light grey silty CLAY with numerous root casts. (OLD TOPSOIL)				2.00 to 3.00	U	4	PID	<0.1ppm
Soft silty light grey and light brown locally sandy CLAY with occasional gravel. (GLACIOLACUSTRINE)		2.45	-2.45					
Stiff light brown and light grey sandy CLAY with much gravel. (GLACIAL TILL)		2.65	-2.65					
Medium dense silty slightly clayey fine to medium SAND with occasional fine grabel. (FLUVIOGLACIAL)				3.00 to 4.00	U	5	PID	<0.1ppm
		3.40	-3.40					
Soft to firm, locally soft, brown silty faintly laminated CLAY. Firm becoming firm to stiff below 4.0m. (GLACIOLACUSTRINE)				4.00 to 5.00	U	6	PID	<0.1ppm
				5.00 to 5.45	SPT	7	N=28	5,5,7,7,7,7
End of Borehole		5.45	-5.45					

Additional Comments
Log based on limited returns due to sampling method - depths are approximate.
Continuous dynamic probe put down prior borehole - see separate record.
Groundwater: no free groundwater encountered.

Logged by GLD

Figure

SLADEN ASSOCIATES

Unit 5, Netherton Workshops, Highley, Bridgnorth, Shropshire, WV16 6NN Tel:01746 860222 Fax:01746 862330

Borehole No: BH3

Equipment & Methods	Job No: 15-1472			
Mini Rig/Window Sampler	Project: Former Prize Building Site, Biddulph			
Carried out for	Ground Level	Coordinates		Date
Mr Jim Bostock	0	E N		30/07/2015

Descriptions	Legend	Depth	Reduced Level	Samples/Tests/Notes Depth	Sample Type	Sample No.	Test	Field Records	Well
Loose dark grey sandy angular GRAVEL and occasional cobbles. Gravel is carbonaceous mudstone. (MADE GROUND)				0.00 to 1.00	U	1	PID	<0.1ppm	
				0.10 to 5.90	CPT	2	DPSH Test	see separate record	
		0.70	-0.70						
Softbrown silty very sandy CLAY with some angular and sub-angular gravel. Gravel is sandstone, siltstone, mudstone and occasional brick. (MADE GROUND)		0.80	-0.80						
				1.00 to 2.00	U	3	PID	<0.1ppm	
Very soft light brown silty CLAY with occasional angular gravel. (MADE GROUND)		1.50	-1.50						
Soft locally very soft dark becoming light grey silty CLAY with occasional gravel. Gravel is sandstone and coal. Poor recovery 2 to 2.9 m. (MADE GROUND)				2.00 to 3.00	U	4	PID	<0.1ppm	
		2.90	-2.90						
Soft locally very soft light grey and light brown locally sandy, locally faintly laminated, silty CLAY with rare gravel. (GLACIOLACUSTRINE)				3.00 to 4.00	U	5	PID	<0.1ppm	
				4.00 to 5.00	U	6	PID	<0.1ppm	
				5.00 to 5.50	U	7	PID	<0.1	
				5.50 to 5.95	SPT	8	N=	10,10,12,15,15,21	
		5.95	-5.95						
End of Borehole									

Additional Comments
Log based on limited returns due to sampling method - depths are approximate.
Continuous dynamic probe put down prior borehole - see separate record.
Groundwater: no free groundwater encountered.
50mm groundwater/gas monitoring standpipe installed 0.0m to 0.5m, plain pipe with bentonite seal 0.5m to 3.85m slotted pipe with gravel surround.

Logged by GLD

Figure

ROTARY BOREHOLE INVESTIGATION

FORMER PRIZE BUILDING SITE, BIDDULPH

ALL DEPTHS ARE GIVEN IN METRES (Driller's Description)

BOREHOLE 1

				Flush Return
GL	-	13.50	Drift	-
13.50	-	14.50	Weathered grey sandstone, firm drilling	100%
14.50	-	17.50	Sandstone/siltstone, very hard drilling	100%
17.50	-	22.00	Grey sandstone with shale bands, firm drilling	100%
22.00	-	23.00	Broken ground	0%
23.00	-	36.00	Solid, firm drilling	0%

Borehole cased to 9.0m
Water flush
Date drilled: 23/07/15
Backfilled with cement & arisings

BOREHOLE 2

				Flush Return
GL	-	11.50	Drift	-
11.50	-	16.00	Weathered grey sandstone, firm drilling	100%
16.00	-	17.00	Grey sandstone, firm drilling	100%
17.00	-	21.50	Grey sandstone/siltstone, very hard drilling	100%
21.50	-	24.00	Grey sandstone, firm drilling	100%
24.00	-	29.50	Grey sandstone with shale bands, firm drilling	100%
29.50	-	34.00	Dark grey shale, firm drilling	100%
34.00	-	36.00	Grey shale, firm drilling	100%

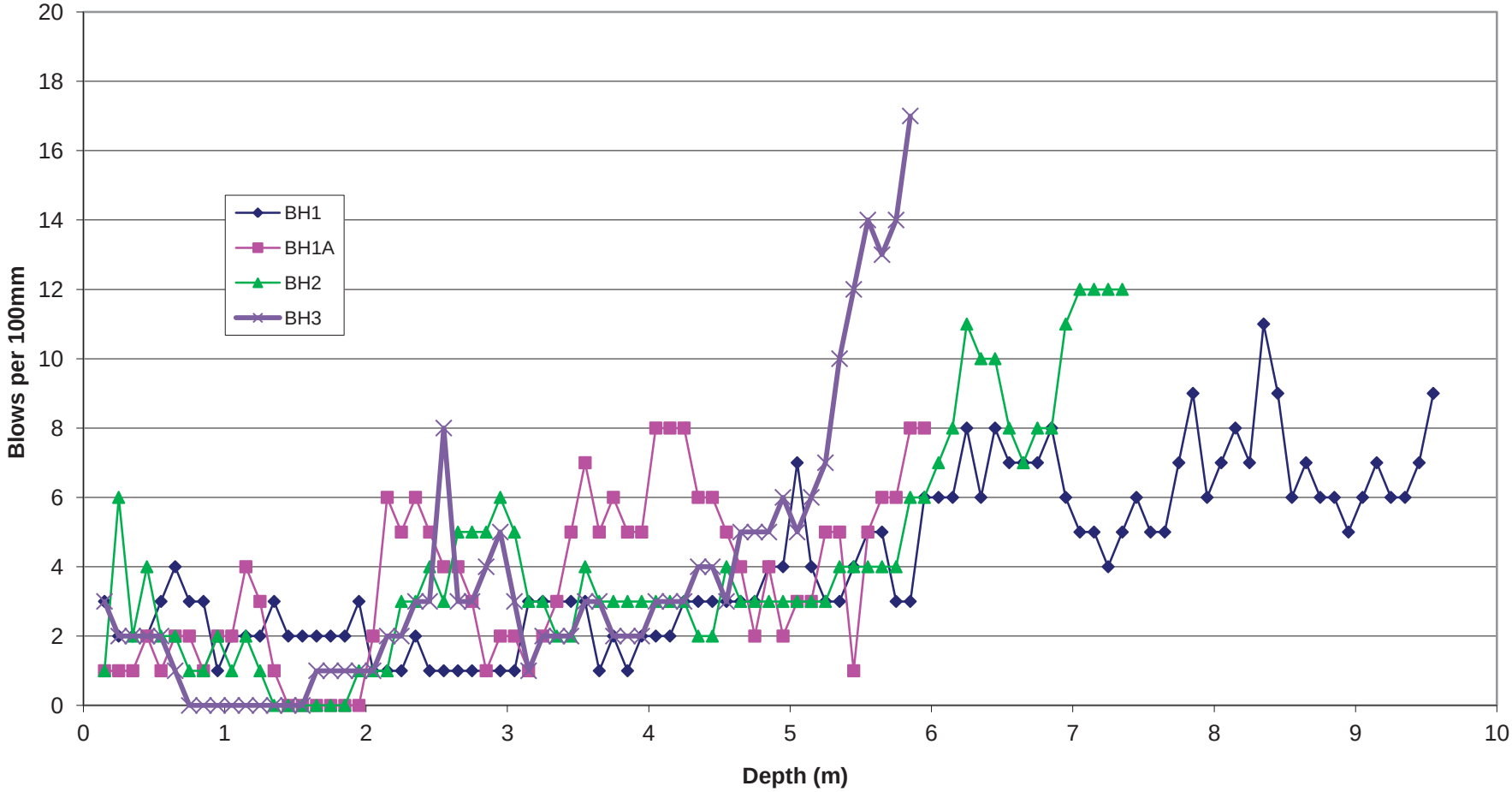
Borehole cased to 9.0m
Water flush
Date drilled: 23/07/15
Backfilled with cement & arisings

BOREHOLE 3

				Flush Return
GL	-	16.00	Drift	-
16.00	-	17.00	Weathered grey sandstone, firm drilling	100%
17.00	-	20.50	Grey sandstone with shale bands, firm drilling	100%
20.50	-	26.00	Grey sandstone, firm drilling	100%
26.00	-	34.00	Grey sandstone with shale bands, firm drilling	100%
34.00	-	35.00	Dark grey to black shale, firm drilling	100%
35.00	-	39.00	Grey shale, firm drilling	100%

Borehole cased to 9.0m
Water flush
Date drilled: 23/07/15
Backfilled with cement & arisings

15-1472 Former Prize Building, Biddulph
Dynamic Probe Test Results (DPSH Method) Sheet 1 of 1



APPENDIX B
LABORATORY TEST RESULTS

Report Summary

1314
0897
4409

Mr Graham Dorrell
Sladen Associates
Netherton Workshops
New Road
Highley
Bridgnorth
West Midlands
WV16 6NN

Date of Issue: **13 August 2015**

Report Number: **COV/1206293/2015** Issue **1**

Job Description: General Analysis

Job Location: 15-1472 Prize Building Biddulph

Number of Samples included in this report: **3**

Job Received: **31 July 2015**

Number of Test Results included in this report: **195**

Analysis Commenced: **03 August 2015**

Signed: A I Horobin

Name: **A. Horobin** Date: **13 August 2015**

Title: **Organic Operations Manager**

ALS Environmental Ltd was not responsible for sampling unless otherwise stated. Sampling is not covered by our UKAS accreditation.

Information on the methods of analysis and performance characteristics are available on request.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. The results relate only to the items tested.
Tests marked 'Not UKAS Accredited' in this Report/Certificate are not included in the UKAS Accreditation Schedule for our laboratory.

MCERTS accreditation refers to analysis carried out at our Coventry site only.
Analysis carried out on air-dried and ground test portion of the sample(s), unless otherwise stated. Air drying is carried out at not greater than 30 degrees C. Samples are not preserved on site, unless otherwise stated.
All results are reported on an air-dried basis following removal of stones.

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Certificate of Analysis

UKAS TESTING 1314 0897 4409

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

ALS Environmental

Matrix: **Soil - Sand**

Report Number: **COV/1206293/2015** Issue **1**

Laboratory Number: **14738130** Sample **1** of **3**

Sample Source: **Sladen Associates**

Sample Point Description: **Sladen**

Sample Description: **BH1A 0.00m - 0.60m**

Visual Description: **Brown sand with many clay, occasional gravel and some stones.**

Sample Date: **30 July 2015** Sample Time: Sample Received: **31 July 2015**

Test Description	Result	Units	Analysis Date	UoM%	Accreditation		Method
Stones Content >10mm NG	4.7	%	04/08/2015		N	Cov	Stones
Moisture content at 30C	12	%	04/08/2015		N	Cov	33A
Arsenic as As, dry weight	4.8	mg/kg	05/08/2015		Y	Cov	30/30C
Boron as B, hot water sol dw	0.37	mg/kg	06/08/2015		Y	Cov	6
Cadmium as Cd, dry weight	<0.20	mg/kg	05/08/2015		M	Cov	30
Hexavalent Chromium as dw	0.74	mg/kg	06/08/2015		N	Cov	30B
Chromium as Cr, dry weight	20	mg/kg	05/08/2015		M	Cov	30
Chromium (III)	19	mg/kg	06/08/2015		N	Cov	30
Copper as Cu, dry weight	15	mg/kg	05/08/2015		M	Cov	30
Lead as Pb, dry weight	12	mg/kg	05/08/2015		M	Cov	30
Mercury as Hg, dry weight	<0.60	mg/kg	05/08/2015		Y	Cov	30C
Nickel as Ni, dry weight	16	mg/kg	05/08/2015		M	Cov	30
Selenium as Se, dry weight	0.75	mg/kg	05/08/2015		Y	Cov	30C
Zinc as Zn, dry weight	30	mg/kg	05/08/2015		M	Cov	30
Cyanide, Total	<1.1	mg/kg	04/08/2015		M	Cov	14
Organic Matter	3.5	%	05/08/2015		Y	Cov	36
Mono Phenols, Total DW	2.0	mg/kg	05/08/2015		Y	Cov	40A
Sulphate, Total as SO4	0.12	%	04/08/2015		N	Cov	45
Sulphide	32	mg/kg	06/08/2015		M	Cov	47
pH	8.1	pH units	04/08/2015		M	Cov	39
Sulphur, Elemental	200	mg/kg	07/08/2015		M	Cov	51
MTBE (Methyl-tert-Butyl Ether)	<0.011	mg/kg	05/08/2015		M	Cov	304
Benzene	<0.011	mg/kg	05/08/2015		M	Cov	304
Toluene	<0.011	mg/kg	05/08/2015		M	Cov	304
Ethylbenzene	<0.011	mg/kg	05/08/2015		M	Cov	304
m&p-Xylene	<0.011	mg/kg	05/08/2015		M	Cov	304
o-Xylene	<0.011	mg/kg	05/08/2015		M	Cov	304
Aliphatic VPH >C5 - C6	<0.11	mg/kg	05/08/2015		M	Cov	304
Aliphatic VPH >C6 - C8	<0.11	mg/kg	05/08/2015		M	Cov	304
Aliphatic VPH >C8 - C10	<0.10	mg/kg	05/08/2015		Y	Cov	304
Aliphatic EPH >C10 - C12	<1.1	mg/kg	04/08/2015		M	Cov	317EPH
Aliphatic EPH >C12 - C16	<1.1	mg/kg	04/08/2015		M	Cov	317EPH
Aliphatic EPH >C16 - C35	<1.1	mg/kg	04/08/2015		M	Cov	317EPH
Aliphatic EPH >C35 - C44	<1.1	mg/kg	04/08/2015		M	Cov	317EPH
Aliphatic VPH/EPH >C5 - C44	<5.7	mg/kg	05/08/2015		N	Cov	304/317EPH
Aromatic VPH >C5 - C7	<0.011	mg/kg	05/08/2015		M	Cov	304
Aromatic VPH >C7 - C8	<0.011	mg/kg	05/08/2015		M	Cov	304

Certificate of Analysis

1314
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4409

Matrix: **Soil - Sand**

Report Number: **COV/1206293/2015** Issue **1**
Laboratory Number: **14738130** Sample **1** of **3**
Sample Source: **Sladen Associates**
Sample Point Description: **Sladen**
Sample Description: **BH1A 0.00m - 0.60m**
Visual Description: **Brown sand with many clay, occasional gravel and some stones.**
Sample Date: **30 July 2015** Sample Time: Sample Received: **31 July 2015**

Test Description	Result	Units	Analysis Date	UoM%	Accreditation	Method
Aromatic VPH >C8 - C10	<0.11	mg/kg	05/08/2015		M Cov	304
Aromatic EPH >C10 - C12	<1.1	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C12 - C16	8.8	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C16 - C21	26	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C21 - C35	110	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C35 - C44	42	mg/kg	04/08/2015		M Cov	317EPH
Aromatic VPH/EPH >C5 - C44	180	mg/kg	05/08/2015		N Cov	304/317EPH
VPH/EPH >C5 - C44	180	mg/kg	05/08/2015		M Cov	304/317EPH
Naphthalene	0.144	mg/kg	12/08/2015		N Cov	313
Acenaphthylene	0.054	mg/kg	12/08/2015		N Cov	313
Acenaphthene	0.670	mg/kg	12/08/2015		N Cov	313
Fluorene	0.517	mg/kg	12/08/2015		M Cov	313
Phenanthrene	6.29	mg/kg	12/08/2015		M Cov	313
Anthracene	3.04	mg/kg	12/08/2015		M Cov	313
Fluoranthene	29.8	mg/kg	12/08/2015		M Cov	313
Pyrene	25.8	mg/kg	12/08/2015		M Cov	313
Benzo(a)anthracene	14.0	mg/kg	12/08/2015		M Cov	313
Chrysene	12.7	mg/kg	12/08/2015		M Cov	313
Benzo(b)fluoranthene	18.9	mg/kg	12/08/2015		M Cov	313
Benzo(k)fluoranthene	7.97	mg/kg	12/08/2015		M Cov	313
Benzo(a)pyrene	17.3	mg/kg	12/08/2015		M Cov	313
Indeno(1,2,3-c,d)pyrene	13.9	mg/kg	12/08/2015		M Cov	313
Dibenz(a,h)anthracene	0.015	mg/kg	12/08/2015		M Cov	313
Benzo(g,h,i)perylene	9.56	mg/kg	12/08/2015		N Cov	313
PAH, Total of 16 EPA	163	mg/kg	12/08/2015		N Cov	313
Description of Sample	Analyst Comme	Text	04/08/2015		N Cov	70
Asbestos Identification	Analyst Comme	Text	04/08/2015		N Cov	70
Sulphate as SO4, Water Soluble	0.71	g/l	05/08/2015		N Cov	46

Analyst Comments for 14738130: PAH analysis carried out at ALS Prague laboratory and is not MCERTs accredited. PAH analysis 17025 accredited.
ASBESTOS COMMENTS Asbestos ID: Non Detected, Description of Sample: Soil

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

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Matrix: **Soil - Sand**

Report Number: **COV/1206293/2015** Issue **1**

Laboratory Number: **14738131** Sample **2** of **3**

Sample Source: **Sladen Associates**

Sample Point Description: **Sladen**

Sample Description: **BH2 0.00m - 0.60m**

Visual Description: **Dark brown/black loam with some organic matter and many stones.**

Sample Date: **30 July 2015** Sample Time: Sample Received: **31 July 2015**

Test Description	Result	Units	Analysis Date	UoM%	Accreditation	Method
Stones Content >10mm NG	4.3	%	04/08/2015		N Cov	Stones
Moisture content at 30C	6.1	%	04/08/2015		N Cov	33A
Arsenic as As, dry weight	110	mg/kg	05/08/2015		Y Cov	30/30C
Boron as B, hot water sol dw	0.36	mg/kg	06/08/2015		Y Cov	6
Cadmium as Cd, dry weight	<0.20	mg/kg	05/08/2015		M Cov	30
Hexavalent Chromium as dw	0.11	mg/kg	06/08/2015		N Cov	30B
Chromium as Cr, dry weight	6.7	mg/kg	05/08/2015		M Cov	30
Chromium (III)	6.6	mg/kg	06/08/2015		N Cov	30
Copper as Cu, dry weight	31	mg/kg	05/08/2015		M Cov	30
Lead as Pb, dry weight	31	mg/kg	05/08/2015		M Cov	30
Mercury as Hg, dry weight	<0.60	mg/kg	05/08/2015		Y Cov	30C
Nickel as Ni, dry weight	38	mg/kg	05/08/2015		M Cov	30
Selenium as Se, dry weight	1.5	mg/kg	05/08/2015		Y Cov	30C
Zinc as Zn, dry weight	28	mg/kg	05/08/2015		M Cov	30
Cyanide, Total	<1.1	mg/kg	04/08/2015		M Cov	14
Organic Matter	16	%	05/08/2015		Y Cov	36
Mono Phenols, Total DW	0.55	mg/kg	05/08/2015		Y Cov	40A
Sulphate, Total as SO4	0.031	%	04/08/2015		N Cov	45
Sulphide	<3.1	mg/kg	06/08/2015		M Cov	47
pH	8.0	pH units	04/08/2015		M Cov	39
Sulphur, Elemental	26	mg/kg	07/08/2015		M Cov	51
MTBE (Methyl-tert-Butyl Ether)	<0.011	mg/kg	05/08/2015		M Cov	304
Benzene	0.023	mg/kg	05/08/2015		M Cov	304
Toluene	0.039	mg/kg	05/08/2015		M Cov	304
Ethylbenzene	<0.011	mg/kg	05/08/2015		M Cov	304
m&p-Xylene	<0.011	mg/kg	05/08/2015		M Cov	304
o-Xylene	<0.011	mg/kg	05/08/2015		M Cov	304
Aliphatic VPH >C5 - C6	<0.11	mg/kg	05/08/2015		M Cov	304
Aliphatic VPH >C6 - C8	<0.11	mg/kg	05/08/2015		M Cov	304
Aliphatic VPH >C8 - C10	0.13	mg/kg	05/08/2015		Y Cov	304
Aliphatic EPH >C10 - C12	8.6	mg/kg	11/08/2015		M Cov	317EPH
Aliphatic EPH >C12 - C16	18	mg/kg	11/08/2015		M Cov	317EPH
Aliphatic EPH >C16 - C35	81	mg/kg	11/08/2015		M Cov	317EPH
Aliphatic EPH >C35 - C44	20	mg/kg	11/08/2015		M Cov	317EPH
Aliphatic VPH/EPH >C5 - C44	130	mg/kg	11/08/2015		N Cov	304/317EPH
Aromatic VPH >C5 - C7	0.023	mg/kg	05/08/2015		M Cov	304
Aromatic VPH >C7 - C8	0.039	mg/kg	05/08/2015		M Cov	304

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Matrix: **Soil - Sand**

Report Number: **COV/1206293/2015** Issue **1**
Laboratory Number: **14738131** Sample **2** of **3**
Sample Source: **Sladen Associates**
Sample Point Description: **Sladen**
Sample Description: **BH2 0.00m - 0.60m**
Visual Description: **Dark brown/black loam with some organic matter and many stones.**
Sample Date: **30 July 2015** Sample Time: Sample Received: **31 July 2015**

Test Description	Result	Units	Analysis Date	UoM%	Accreditation	Method
Aromatic VPH >C8 - C10	<0.11	mg/kg	05/08/2015		M Cov	304
Aromatic EPH >C10 - C12	11	mg/kg	11/08/2015		M Cov	317EPH
Aromatic EPH >C12 - C16	35	mg/kg	11/08/2015		M Cov	317EPH
Aromatic EPH >C16 - C21	44	mg/kg	11/08/2015		M Cov	317EPH
Aromatic EPH >C21 - C35	130	mg/kg	11/08/2015		M Cov	317EPH
Aromatic EPH >C35 - C44	47	mg/kg	11/08/2015		M Cov	317EPH
Aromatic VPH/EPH >C5 - C44	260	mg/kg	11/08/2015		N Cov	304/317EPH
VPH/EPH >C5 - C44	380	mg/kg	11/08/2015		M Cov	304/317EPH
Naphthalene	1.13	mg/kg	12/08/2015		N Cov	313
Acenaphthylene	0.023	mg/kg	12/08/2015		N Cov	313
Acenaphthene	0.021	mg/kg	12/08/2015		N Cov	313
Fluorene	0.112	mg/kg	12/08/2015		M Cov	313
Phenanthrene	0.794	mg/kg	12/08/2015		M Cov	313
Anthracene	0.086	mg/kg	12/08/2015		M Cov	313
Fluoranthene	0.176	mg/kg	12/08/2015		M Cov	313
Pyrene	0.201	mg/kg	12/08/2015		M Cov	313
Benzo(a)anthracene	0.142	mg/kg	12/08/2015		M Cov	313
Chrysene	0.153	mg/kg	12/08/2015		M Cov	313
Benzo(b)fluoranthene	0.124	mg/kg	12/08/2015		M Cov	313
Benzo(k)fluoranthene	0.055	mg/kg	12/08/2015		M Cov	313
Benzo(a)pyrene	0.111	mg/kg	12/08/2015		M Cov	313
Indeno(1,2,3-c,d)pyrene	0.038	mg/kg	12/08/2015		M Cov	313
Dibenz(a,h)anthracene	0.015	mg/kg	12/08/2015		M Cov	313
Benzo(g,h,i)perylene	0.091	mg/kg	12/08/2015		N Cov	313
PAH, Total of 16 EPA	3.27	mg/kg	12/08/2015		N Cov	313
Description of Sample	Analyst Comme	Text	04/08/2015		N Cov	70
Asbestos Identification	Analyst Comme	Text	04/08/2015		N Cov	70
Sulphate as SO4, Water Soluble	0.14	g/l	05/08/2015		N Cov	46

Analyst Comments for 14738131: PAH analysis carried out at ALS Prague laboratory and is not MCERTs accredited. PAH analysis 17025 accredited.
ASBESTOS COMMENTS Asbestos ID: Non Detected, Description of Sample: Soil

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

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Matrix: **Soil - Sand**

Report Number: **COV/1206293/2015** Issue **1**

Laboratory Number: **14738132** Sample **3** of **3**

Sample Source: **Sladen Associates**

Sample Point Description: **Sladen**

Sample Description: **BH3 0.00m - 0.60m**

Visual Description: **Brown loam with many stones.**

Sample Date: **30 July 2015** Sample Time: Sample Received: **31 July 2015**

Test Description	Result	Units	Analysis Date	UoM%	Accreditation	Method
Stones Content >10mm NG	4.3	%	04/08/2015		N Cov	Stones
Moisture content at 30C	10	%	04/08/2015		N Cov	33A
Arsenic as As, dry weight	5.4	mg/kg	05/08/2015		Y Cov	30/30C
Boron as B, hot water sol dw	1.4	mg/kg	06/08/2015		Y Cov	6
Cadmium as Cd, dry weight	<0.20	mg/kg	05/08/2015		M Cov	30
Hexavalent Chromium as dw	0.64	mg/kg	06/08/2015		N Cov	30B
Chromium as Cr, dry weight	17	mg/kg	05/08/2015		M Cov	30
Chromium (III)	17	mg/kg	06/08/2015		N Cov	30
Copper as Cu, dry weight	11	mg/kg	05/08/2015		M Cov	30
Lead as Pb, dry weight	9.9	mg/kg	05/08/2015		M Cov	30
Mercury as Hg, dry weight	<0.60	mg/kg	05/08/2015		Y Cov	30C
Nickel as Ni, dry weight	9.3	mg/kg	05/08/2015		M Cov	30
Selenium as Se, dry weight	0.75	mg/kg	05/08/2015		Y Cov	30C
Zinc as Zn, dry weight	21	mg/kg	05/08/2015		M Cov	30
Cyanide, Total	<1.1	mg/kg	04/08/2015		M Cov	14
Organic Matter	7.9	%	05/08/2015		Y Cov	36
Mono Phenols, Total DW	7.9	mg/kg	05/08/2015		Y Cov	40A
Sulphate, Total as SO4	0.066	%	04/08/2015		N Cov	45
Sulphide	290	mg/kg	06/08/2015		M Cov	47
pH	8.9	pH units	04/08/2015		M Cov	39
Sulphur, Elemental	370	mg/kg	07/08/2015		M Cov	51
MTBE (Methyl-tert-Butyl Ether)	<0.011	mg/kg	05/08/2015		M Cov	304
Benzene	<0.011	mg/kg	05/08/2015		M Cov	304
Toluene	<0.011	mg/kg	05/08/2015		M Cov	304
Ethylbenzene	<0.011	mg/kg	05/08/2015		M Cov	304
m&p-Xylene	<0.011	mg/kg	05/08/2015		M Cov	304
o-Xylene	<0.011	mg/kg	05/08/2015		M Cov	304
Aliphatic VPH >C5 - C6	<0.11	mg/kg	05/08/2015		M Cov	304
Aliphatic VPH >C6 - C8	<0.11	mg/kg	05/08/2015		M Cov	304
Aliphatic VPH >C8 - C10	<0.10	mg/kg	05/08/2015		Y Cov	304
Aliphatic EPH >C10 - C12	<1.1	mg/kg	04/08/2015		M Cov	317EPH
Aliphatic EPH >C12 - C16	6.1	mg/kg	04/08/2015		M Cov	317EPH
Aliphatic EPH >C16 - C35	89	mg/kg	04/08/2015		M Cov	317EPH
Aliphatic EPH >C35 - C44	52	mg/kg	04/08/2015		M Cov	317EPH
Aliphatic VPH/EPH >C5 - C44	140	mg/kg	05/08/2015		N Cov	304/317EPH
Aromatic VPH >C5 - C7	<0.011	mg/kg	05/08/2015		M Cov	304
Aromatic VPH >C7 - C8	<0.011	mg/kg	05/08/2015		M Cov	304

Certificate of Analysis

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Matrix: **Soil - Sand**

Report Number: **COV/1206293/2015** Issue **1**
Laboratory Number: **14738132** Sample **3** of **3**
Sample Source: **Sladen Associates**
Sample Point Description: **Sladen**
Sample Description: **BH3 0.00m - 0.60m**
Visual Description: **Brown loam with many stones.**
Sample Date: **30 July 2015** Sample Time: Sample Received: **31 July 2015**

Test Description	Result	Units	Analysis Date	UoM%	Accreditation	Method
Aromatic VPH >C8 - C10	<0.11	mg/kg	05/08/2015		M Cov	304
Aromatic EPH >C10 - C12	3.2	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C12 - C16	20	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C16 - C21	200	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C21 - C35	880	mg/kg	04/08/2015		M Cov	317EPH
Aromatic EPH >C35 - C44	320	mg/kg	04/08/2015		M Cov	317EPH
Aromatic VPH/EPH >C5 - C44	1400	mg/kg	05/08/2015		N Cov	304/317EPH
VPH/EPH >C5 - C44	1600	mg/kg	05/08/2015		M Cov	304/317EPH
Naphthalene	0.354	mg/kg	12/08/2015		N Cov	313
Acenaphthylene	0.073	mg/kg	12/08/2015		N Cov	313
Acenaphthene	1.92	mg/kg	12/08/2015		N Cov	313
Fluorene	1.58	mg/kg	12/08/2015		M Cov	313
Phenanthrene	20.6	mg/kg	12/08/2015		M Cov	313
Anthracene	7.95	mg/kg	12/08/2015		M Cov	313
Fluoranthene	67.5	mg/kg	12/08/2015		M Cov	313
Pyrene	56.5	mg/kg	12/08/2015		M Cov	313
Benzo(a)anthracene	26.4	mg/kg	12/08/2015		M Cov	313
Chrysene	20.4	mg/kg	12/08/2015		M Cov	313
Benzo(b)fluoranthene	26.9	mg/kg	12/08/2015		M Cov	313
Benzo(k)fluoranthene	13.0	mg/kg	12/08/2015		M Cov	313
Benzo(a)pyrene	25.4	mg/kg	12/08/2015		M Cov	313
Indeno(1,2,3-c,d)pyrene	18.4	mg/kg	12/08/2015		M Cov	313
Dibenz(a,h)anthracene	3.41	mg/kg	12/08/2015		M Cov	313
Benzo(g,h,i)perylene	14.7	mg/kg	12/08/2015		N Cov	313
PAH, Total of 16 EPA	305	mg/kg	12/08/2015		N Cov	313
Description of Sample	Analyst Comme	Text	04/08/2015		N Cov	70
Asbestos Identification	Analyst Comme	Text	04/08/2015		N Cov	70
Sulphate as SO4, Water Soluble	0.62	g/l	05/08/2015		N Cov	46

Analyst Comments for 14738132: PAH analysis carried out at ALS Prague laboratory and is not MCERTs accredited. PAH analysis 17025 accredited.
ASBESTOS COMMENTS Asbestos ID: Non Detected, Description of Sample: Soil

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Horobin** Date: **13 August 2015**

Title: **Organic Operations Manager**

METHOD COMMENTS FOR REPORT COV/1206293/2015 Issue 1

Date of Issue :**13 August 2015**

Method	Statement
14	The cyanides in the sample are determined in two stages. The free cyanide is liberated by heating with pH 4 buffer and the resulting gas collected in sodium hydroxide solution. Complex cyanide is liberated using phosphoric acid under the same conditions. the two portions of sodium hydroxide are then analysed for cyanide content using a discrete autoanalyser. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
30	Metals are extracted from land samples by boiling with hydrochloric/nitric acids (3:1 ratio). The measurement of metal concentrations is determined directly on an ICP-OES at defined wavelengths. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
30/30C	Metals are extracted from land samples by boiling with hydrochloric/nitric acids (3:1 ratio). For the measurement of metal concentrations is determined on an ICP-OES at defined wavelengths. Where a result is 25mg/kg or above results are obtained directly. Otherwise results are obtained via hydride generation. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
304	The method employs the use of Headspace extraction of the volatile hydrocarbons from as received soil samples using a commercial headspace sampler followed by gas chromatograph (GC). The effluent from the chromatographic column is split between a flame ionisation detector (FID) for the determination or total VPH and a mass selective detector (MSD) for the determination or aromatic volatile hydrocarbons.
304/317EPH	Headspace extraction of the compounds from the sample using a commercial headspace sampler followed by separation and quantitative determination of the compounds using gas chromatography with flame ionisation detection/Soil samples are extracted with hexane. The extracts are separated into aliphatic and aromatic fractions using silica solid phase extraction cartridges. The fractionated extracts are then analysed by capillary gas chromatography with flame ionisation detection (GC-FID). This analysis is carried out on an as received portion of sample.
30B	Hexavalent chromium is extracted from land samples using dilute hydrochloric acid. The extract is shaken and then filtered. The measurement of chromium in the filtrate is then determined directly by ICP-OES at a defined wavelength. This analysis is carried out on an air dried sample, ground to pass a 212um sieve.
30C	Metals are extracted from land samples by boiling with hydrochloric/nitric acid (3:1 ratio). The measurement of metal concentrations is determined by means of hydride generation / atomic vapour on an ICP-OES at defined wavelengths. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
313	PAHs are extracted from land samples using Dichloromethane, and sonication. An aliquot of the supernatant liquid is then transferred to a separate vial and analysed by GC-MS. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
317EPH	A known amount of soil, is shaken and sonicated in an extraction vial containing hexane and acetone. A portion of the resulting hexane layer is analysed by GC-FID. Fractionation is done by solid phase extraction using an unmodified silica column. This analysis is carried out on an as received portion of sample.
33A	Moisture Content is the weight difference between an as received sample and the air dried sample at 30 degrees C.
36	This method determines the percentage, by dry mass, of natural organic matter present in soil. This analysis is carried out on an air dried sample, ground to pass a 212um sieve.
39	The test is carried out by extraction using deionised water with agitation. The pH of this suspension is read directly from an electronic pH meter. This analysis is carried out on an air dried sample, ground to pass a 212um sieve.
40A	This method determines steam distillable phenolic compounds in land materials. Phenol is extracted from air dried soil using steam distillation. The pH adjusted distillate is measured colorimetrically at a defined wavelength. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
45	The sulphates are extracted from land samples using boiling hydrochloric acid solution. After cooling and filtration the determination of sulphate is obtained from an aliquot of solution, via a turbidimetric measurement. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
46	Water soluble sulphate is content of land samples is extracted by shaking with deionised water. The resultant solution is filtered and the determination of sulphate is obtained turbidimetrically from this filtrate via a reaction with barium chloride. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
47	The sulphide content of land samples is determined via extraction with dilute sulphuric acid and steam distillation into zinc acetate solution and sodium hydroxide. The distillate is then titrated against sodium thiosulphate solution using iodine indicator. This analysis is carried out on an air dried sample, ground to pass a 2mm sieve.
51	Sulphur is extracted from the soil matrix with dichloromethane, using microwave assisted solvent extraction. The extract is analysed by HPLC with UV wavelength detection.
6	Boron is extracted from land samples using boiling deionised water followed by vacuum filtration. The measurement of boron in the filtrate is then determined directly by ICP-OES at the defined wavelength. This analysis is carried out on an air-dried sample, ground to pass a 2mm sieve. For analysis by National Grid - Version 1.0, the samples are ground to pass a 212um sieve.
70	Representative fibres are mounted in appropriate Refractive Index (RI) liquids on slides and the different fibrous components are identified using PLM. If no asbestos is found then additional searches for small asbestos fibres on random sub-samples are undertaken using PLM.
Stones	The percentage weight of the stones that are naturally occurring and are greater than 10mm in diameter of the total weight of sample.

Report Summary

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ALS Environmental

Mr Graham Dorrell
Sladen Associates
Netherton Workshops
New Road
Highley
Bridgnorth
West Midlands
WV16 6NN

Date of Issue: **13 August 2015**

Report Number: **COV/1206293/2015** Issue **1**

Job Description: General Analysis

Job Location: 15-1472 Prize Building Biddulph

Number of Samples included in this report **3**

Job Received: **31 July 2015**

Number of Test Results included in this report **6**

Analysis Commenced: **03 August 2015**

Signed: A I Horobin

Name: **A. Horobin** Date: **13 August 2015**

Title: **Organic Operations Manager**

ALS Environmental Ltd was not responsible for sampling unless otherwise stated. Sampling is not covered by our UKAS accreditation.

Information on the methods of analysis and performance characteristics are available on request.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. The results relate only to the items tested.
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ALS Environmental

Report Number: **COV/1206293/2015** Issue **1**
Laboratory Number: **14738133** Sample **1** of **3**

Sample Source: **Sladen Associates**
Sample Point Description: **Sladen**
Sample Description: **BH1 2.00m - 2.50m**
Sample Matrix: **Soil**
Sample Date/Time: **30 July 2015**
Sample Received: **31 July 2015**
Analysis Complete: **13 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation		Method
pH	8.9	pH units	04/08/2015	Y	Cov	39
Sulphate as SO4, Water Soluble	0.10	g/l	05/08/2015	N	Cov	46

Analyst Comments for 14738133: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: A I Horobin

Name: **A. Horobin** Date: **13 August 2015**

Title: **Organic Operations Manager**

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Report Number: **COV/1206293/2015** Issue **1**

Laboratory Number: **14738134** Sample **2** of **3**

Sample Source: **Sladen Associates**
Sample Point Description: **Sladen**
Sample Description: **BH2 4.50m - 4.60m**
Sample Matrix: **Soil**
Sample Date/Time: **30 July 2015**
Sample Received: **31 July 2015**
Analysis Complete: **13 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation		Method
pH	8.3	pH units	04/08/2015	Y	Cov	39
Sulphate as SO4, Water Soluble	<0.060	g/l	05/08/2015	N	Cov	46

Analyst Comments for 14738134: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: A I Horobin

Name: **A. Horobin** Date: **13 August 2015**

Title: **Organic Operations Manager**

Certificate of Analysis

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Report Number: **COV/1206293/2015** Issue **1**

Laboratory Number: **14738135** Sample **3** of **3**

Sample Source: **Sladen Associates**
Sample Point Description: **Sladen**
Sample Description: **BH3 3.40m - 3.60m**
Sample Matrix: **Soil**
Sample Date/Time: **30 July 2015**
Sample Received: **31 July 2015**
Analysis Complete: **13 August 2015**

Test Description	Result	Units	Analysis Date	Accreditation		Method
pH	7.0	pH units	04/08/2015	Y	Cov	39
Sulphate as SO4, Water Soluble	<0.060	g/l	05/08/2015	N	Cov	46

Analyst Comments for 14738135: No Analyst Comment

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed).
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: A I Horobin

Name: **A. Horobin** Date: **13 August 2015**

Title: **Organic Operations Manager**

DETERMINAND COMMENTS FOR REPORT COV/1206293/2015 ISSUE 1

Date of Issue : 13 August 2015

Sample No	Description	Determinand	Comments
14738130	BH1A 0.00m - 0.60m	Asbestos Identification	{/*}Non Detected{*/}
14738130	BH1A 0.00m - 0.60m	Description of Sample	{/*}Soil{*/}
14738131	BH2 0.00m - 0.60m	Asbestos Identification	{/*}Non Detected{*/}
14738131	BH2 0.00m - 0.60m	Description of Sample	{/*}Soil{*/}
14738132	BH3 0.00m - 0.60m	Asbestos Identification	{/*}Non Detected{*/}
14738132	BH3 0.00m - 0.60m	Description of Sample	{/*}Soil{*/}

Signed: A I Horobin

Name: **A. Horobin** Date: **13 August 2015**

Title: **Organic Operations Manager**

Report Summary

Mr Graham Dorrell
Sladen Associates
Netherton Workshops
New Road
Highley
Bridgnorth
West Midlands
WV16 6NN

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ALS Environmental

Date of Issue: **19 August 2015**

Report Number: **COV/1209425/2015** Issue **1**

Number of Samples included in this report: **3**

Number of Test Results included in this report: **41**

Site Name: **15-1472 Prize Building, Biddulph**

Job Received: **13 August 2015**

Analysis Commenced: **14 August 2015**

Signed: A I Horobin

Name: **A. Horobin**

Title: **Organic Operations Manager**

Date: **19 August 2015**

ALS Environmental Ltd was not responsible for sampling unless otherwise stated. Sampling is not covered by our UKAS accreditation.

Information on the methods of analysis and performance characteristics are available on request.
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Report Number: **COV/1209425/2015** Issue **1**

Site Name: **15-1472 Prize Building, Biddulph**

Lab ID	Client ID	Sample Date	Matrix	Sulphide as S ug/l Cov WAS033	NRA Leachate Cov NRA Leachate	Phenols Mono (Phenol Index) mg/l Cov WAS019	EH >C6 - C40 ug/l Cov GEO35	Acenaphthene ug/l Cov GEO19	Acenaphthylene ug/l Cov GEO19	Anthracene ug/l Cov GEO19	Benzo (a) anthracene ug/l Cov GEO19	Benzo (g,h,i) perylene ug/l Cov GEO19	Benzo (a) pyrene ug/l Cov GEO19
14761398	BH 1A 0.00-0.60m	13/08/2015	Land Leachate	-	N Y	-	-	Y <0.01	Y <0.01	Y <0.01	Y 0.011	Y 0.045	Y 0.028
14761399	BH 2 0.00-0.60m	13/08/2015	Land Leachate	-	N Y	-	-	-	-	-	-	-	-
14761400	BH 3 0.00-0.60m	13/08/2015	Land Leachate	N <29.0	N Y	Y <0.10	N 11	Y <0.01	Y <0.01	Y <0.01	Y <0.01	Y 0.012	Y <0.01

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed). I/S=Insufficient sample. For soil/sludge samples: AR=As received, DW=Dry weight.

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Report Number: **COV/1209425/2015** Issue **1**

Site Name: **15-1472 Prize Building, Biddulph**

Lab ID	Client ID	Sample Date	Matrix	Benzo (b) fluoranthene ug/l Cov GEO19	Benzo (k) fluoranthene ug/l Cov GEO19	Chrysene ug/l Cov GEO19	Dibenz (a,h) anthracene ug/l Cov GEO19	Fluoranthene ug/l Cov GEO19	Fluorene ug/l Cov GEO19	Indeno (1,2,3) cd pyrene ug/l Cov GEO19	Naphthalene ug/l Cov GEO19	Phenanthrene ug/l Cov GEO19	Pyrene ug/l Cov GEO19
14761398	BH 1A 0.00-0.60m	13/08/2015	Land Leachate	Y 0.031	Y 0.014	Y 0.014	Y <0.01	Y 0.028	Y <0.01	Y 0.033	Y <0.01	Y <0.01	Y 0.027
14761400	BH 3 0.00-0.60m	13/08/2015	Land Leachate	Y <0.01	Y <0.01	Y <0.01	Y <0.01	Y 0.015	Y <0.01	Y <0.01	Y <0.01	Y <0.01	Y 0.014

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed). I/S=Insufficient sample. For soil/sludge samples: AR=As received, DW=Dry weight.

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Report Number: **COV/1209425/2015** Issue **1**
Site Name: **15-1472 Prize Building, Biddulph**

Lab ID	Client ID	Sample Date	Matrix	PAH, Total ug/l Cov GEO19		Arsenic, trace Filtered as As ug/l Cov WAS060	
14761398	BH 1A 0.00-0.60m	13/08/2015	Land Leachate	N	0.230		-
14761399	BH 2 0.00-0.60m	13/08/2015	Land Leachate		-	Y	<1.0
14761400	BH 3 0.00-0.60m	13/08/2015	Land Leachate	N	0.042		-

Signed: A I Horobin

Name: **A. Horobin** Date: **19 August 2015**

Title: **Organic Operations Manager**

Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: Cov = Coventry(CV4 9GU), Run = Runcorn(WA7 1SL), S = Subcontracted, Trb = Subcontracted to Trowbridge(BA14 0XD), Wak = Wakefield(WF5 9TG).
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. The LOD for the Legionella analysis will increase where the volume analysed is <1000g (1g is approximately equivalent to 1ml for sample volume analysed). I/S=Insufficient sample. For soil/sludge samples: AR=As received, DW=Dry weight.

ALS Environmental Ltd

Torrington Avenue, Coventry, CV4 9GU Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

ANALYST COMMENTS FOR REPORT COV/1209425/2015 Issue 1

Date of Issue: **19 August 2015**

Sample No	Analyst Comments
14761398	
14761399	
14761400	

Signed: A I Horobin

Name: **A. Horobin** Date: **19 August 2015**

Title: **Organic Operations Manager**

LABORATORY REPORT FOR INDEX PROPERTY AND CHEMICAL TESTING

Contract: Prize Building, Biddulph.

Customer: Sladen Associates
Unit 8, Netherton Workshops,
New Road,
Highley,
Shropshire.
WV16 6NN.

GIP Ltd. Ground Investigation & Piling Limited
Devonshire House, Ettingshall Road,
Wolverhampton. WV2 2JT
Phone 01902 459558, Fax 01902 459085, Email lab@gipuk.com

Job No:- L/8592 | Page No:- 1 of 1

Date Received:- 05.08.15 | Date Issued:- 17.08.15

SAMPLE DETAILS			TEST DATE	CLASSIFICATION					CHEMICAL					% PASSING BS SIEVE SIZE		SAMPLE DESCRIPTION	COMMENTS
					Index Properties												
SAMPLE No.	DEPTH m	SAMPLE TYPE		W %	W_L %	W_P %	I_P %	PD (Gas Jar) Mg/m³	*Total SO_4 %	Soluble SO_4 g/L	pH Value	*L.O.I. %	*ORG %	2.00 mm	0.425 mm		
BH1A	1.5-2.0	D	07.08.15	# 31	51	26	25								38	MADE GROUND: Soft dark grey brown slightly sandy gravelly CLAY. Gravel is siltstone, mudstone and brick.	
BH3	1.0-1.5	D	07.08.15	14	27	13	14								86	Firm brown slightly sandy slightly gravelly CLAY. Gravel is quartz.	

Sample type		Test abbreviations		Test methods - Unless otherwise stated.			
D	Disturbed	W	Moisture Content	W%	BS1377:Part 2:1990:3.2	Total SO_4	BS1377:Part 3:1990:5.5
B	Bulk disturbed	W_L	Liquid limit	W_L	BS1377:Part 2:1990:4.4	Sol SO_4	BS1377:Part 3:1990:5.5
U	Undisturbed	W_P	Plastic limit	W_P	BS1377:Part 2:1990:5.3	pH Value	BS1377:Part 3:1990:9
S	SPT split spoon	I_P	Index property	I_P	BS1377:Part 2:1990:5.4		
W	Ground water	PD	Particle Density	PD	BS1377:Part 3:1990:8.2		
T	Tub	L.O.I	Loss on ignition	L.O.I	BS1377:Part 3:1990:4		
		ORG	Organic content	ORG	BS1377:Part 3:1990:3		

Approved signatory:-

Paul Smart, Laboratory Manager……

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Tests marked * are not UKAS accredited.

The reported results relate only to samples received.

 # = Sample mass smaller than BS1377 requirements.

Opinions and interpretations are outside the scope of UKAS accreditation

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APPENDIX C
GENERIC RTM LEVEL 1 SCREENING VALUES

SLADEN ASSOCIATES

DERIVATION OF GENERIC PRELIMINARY LEVEL 1 SCREENING FOR LEACHABLE METALS

Development of Level 1 Remedial Targets in accordance with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006) for some metals can be undertaken in a generic manner.

For such potential contaminants, Table 5.1 of that document gives the following equation for Level 1 Soil Remedial Target (RTs (mg/kg)):

$RTs = Cs = Ct . [Kd + ((\theta w + \theta a . H) / \rho)]$

Where:

Kd = Soil water partition coefficient (l/kg)

θw = Water-filled soil porosity

θa = Air-filled soil porosity

H = Henry's Law constant (dimensionless)

ρ = bulk density (g/cm^3)

Ct = Target Concentration (mg/kg)

Cs = Total soil concentration (mg/kg)

Such materials are those where the ratio $(\theta w + \theta a . H) / \rho$ is small compared to Kd and may therefore be ignored such that:

$RTs = Cs = Ct . Kd$

Values of Kd have been suggested by Lijzen et al 2001 (RIVM Report 711701 023) or, for Boron (RIVM Report 715810 004, 1994). Ct is usually taken to be either the relevant drinking water standard (DWS) or Environmental Quality Standard (EQS) level. However, for the phytotoxins copper and zinc, the EQS results in unreasonably low screening values and the lower leaching limit Waste Acceptance Criteria (WAC) for inert waste have been used.

Contaminant	Kp	DWS Ct	Level 1 RTs	EQS/WAC Ct	Level 1 RTs
Arsenic	1800	0.01	18	0.05	90
Boron	10	1	10	2	20
Cadmium	2560	0.005	12.8	0.005	12.8
Chromium (Total)	4800	0.05	240	0.02	96
Lead	36000	0.025	900	0.02	720
Mercury	7500	0.001	7.5	0.001	7.5
Selenium	300	0.01	3	**	
Zinc	2600	5	13000	0.4	1040
Copper	2120	2	4240	0.2	424
Nickel	2000	0.02	40	0.04	80

Generally the lower of the above RTs levels has been used as a screening value for triggering leaching tests. Where possible, for samples where the total soil concentration exceeds the Level 1 RTs, testing is undertaken to measure the actual leachable concentration of the relevant potential contaminant in that sample.