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For the attention of Mr John Rose

Dear Sirs

LAND OFF MARSH LANE, NEW MILLS

REVIEW OF 2004 SITE INVESTIGATION AND RECOMMENDATIONS FOR FURTHER WORK

1 INTRODUCTION

In December 2010 CL Voelcker (CLV; formerly CL Associates) were instructed by John Rose Consulting to carry out a review of CL Associates Report 42062/1: Site Investigation and Contamination Assessment – Land Behind the Old Vicarage, Off Marsh Lane, New Mills, and to provide recommendations to bring the information in line with current UK practice and guidance requirements.

CLA Report No. 42062/1 Revision 1 dated September 2004 includes the following information pertaining the site:

- Desk Study
- Site Walkover (December 2002)
- Site Investigation (January 2003)
- Contamination Assessment
- Gas monitoring visits x 3 (January 2003)

In addition, a further site walkover and gas monitoring visit were undertaken in March 2009.

The present report comprises a review of existing information in line with current UK best practice as well as recommendations for additional work required to produce a comprehensive remedial strategy; this document should be read in conjunction with CLA Report No. 42062/1 Revision 1 dated September 2004. It is anticipated that the outstanding investigation works could be attached as a condition to any outline planning permission.

2 THE SITE

2.1 Site Setting

The site, which is approximately 1 ha in area, is situated on land behind the Old Vicarage, off Marsh Lane, New Mills (NGR SK 007 853) and is currently undeveloped. The site is irregular in shape and bound by a pathway to the east, terraced and semi-detached housing to the west and north west, and a poorly maintained wire fence with a coal yard beyond to the south. The site has previously been used for quarrying and has subsequently been infilled with unlicensed waste. There is no record of the type of waste tipped on site, however, site investigation works have indicated that the waste is likely to comprise mainly industrial waste soils and rubble, including asbestos. Fly tipped materials noted during the site walkover carried out in 2002 were no longer apparent during the walkover carried

out in March 2009.

At the time of the 2009 site walkover, the site remained relatively flat lying in the north western section and across the central section (along a north to south transect), and uneven in other areas. A large embankment (approximately 10 m above surrounding land height) was still present, running north – south along the eastern section of the site. The site was mainly covered by rough grassland, with more vegetated areas (heather and shrubbery) being associated with elevated areas across the site.

2.2 Proposed End Use

We understand that the proposed end use of the site remains the same as outlined in Report 42062/1, that is residential housing with gardens.

3 REVIEW OF WORK CARRIED OUT TO DATE

3.1 Fieldwork

The intrusive investigation carried out in 2003 (and reported in 2004) comprised twenty trial pits and two boreholes.

The trial pits were generally concentrated in the central and northern areas of the site; none were located in the north western corner of the site due to the ground conditions preventing access by the excavator. The trial pits were excavated to a maximum depth of 5.3 m bgl and in all cases the trial pits were terminated in Made Ground, ie natural ground wasn't reached.

The location of the boreholes was restricted to the suspected area of waste disposal in the central northern area of the site.

It is recommended that additional intrusive investigation is carried out to provide further spatial coverage of the site (see Section 5).

3.2 Contamination Assessment

3.2.1 Soil

Human health risk assessment for long term exposure is undertaken initially by comparing the maximum measured soil concentrations with Soil Guideline Values (SGVs) published by the EA. A review of the published SGVs was carried out in December 2006 which resulted in the SGVs being withdrawn from use. In 2009, the EA published a series of documents which updated the technical basis of the Contaminated Land Exposure (CLEA) model and reconsidered the rationale for the generic land use scenarios used to derive SGVs; revised SGVs for a number of determinands were also published at this time (EA, 2009a-n).

As revised SGVs are only available for a certain number of contaminants, generic assessment criteria (GAC) have been derived by CLV in line with the new CLEA guidance for substances without SGVs. The GAC have been derived using the CLEA 1.06 software with default generic receptors, exposure parameters and soil types appropriate for the site usage. Chemical data have been input into the model from peer reviewed sources, and EA data have been used where available. The GAC have been adjusted for soil organic matter (SOM) where appropriate in order to render them suitably conservative; the default SOM of 6% used in the derivation of SGVs is not considered to be sufficiently conservative for GACs for all sites. The CLEA model used for this risk assessment can be provided to regulators on request.

The recorded concentrations of contaminants in soil from the 2003 site investigation are compared with GAC for a residential end use (conservatively adjusted for 1.0% SOM) in Table 1.

Table 1: Comparison of Soil Analytical Results with Residential GAC

Determinand	Maximum Measured Concentration (mg/kg)	Generic Assessment Criterion (GAC) (mg/kg)	No. of results exceeding GAC (no. of tests in brackets)
Metals & semi- metals			
Arsenic	36	32	**1 (14)**
Boron	0.8	n/a	n/a
Cadmium	2	11	0 (14)
Chromium	61	3005	0 (14)
Copper	835	2327	0 (14)
Lead	1180	185	**6 (14)**
Mercury	3	169	0 (14)
Nickel	186	127	**1 (14)**
Selenium	0.93	350	0 (14)
Zinc	593	3745	0 (14)
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	22	205	0 (1)
Acenaphthylene	14	168	0 (1)
Anthracene	58	2257	0 (1)
Benzo(a)anthracene	57	4.5	**1 (1)**
Benzo(a)pyrene	44	0.83	**1 (1)**
Benzo(b)fluoranthene	46	7.8	**1 (1)**
Benzo(g,h,i)perylene	13	96	0 (1)
Benzo(k)fluoranthene	22	8.5	**1 (1)**
Chrysene	71	60	**1 (1)**
Dibenzo(a,h)anthracene	5	0.85	**1 (1)**
Fluoranthene	127	257	0 (1)
Fluorene	31	163	0 (1)
Indeno(1,2,3,c,d)pyrene	14	7.4	**1 (1)**
Naphthalene	68	6.3	**1 (1)**
Phenanthrene	183	92	**1 (1)**
Pyrene	123	563	0 (1)
PAH screen	245	n/a	n/a
Total Petroleum Hydrocarbons			
TPH	89	n/a	n/a
Other Compounds (including VOCs and SVOCs greater than LOD)			
Phenol Index	<0.5	184	0 (14)
Asbestos	Fibres detected	n/a	**4 (5)**
Cyanide (total)	2	3.4	0 (14)

As indicated in Table 1, the concentrations of arsenic, lead and nickel exceed the relevant GAC. Concentrations of arsenic and nickel exceed the GAC in Trial Pit TP9, whilst the concentration of lead exceeds the GAC in Trial Pits TP7, TP12A, TP13A (two samples), TP16 and TP18.

It should be noted that only total chromium has been analysed for. During any further intrusive investigation, the more toxic chromium VI should also be analysed for. Separate GACs have been derived for assessing chromium III and chromium VI.

It is not possible to assess the concentration of TPH in terms of risks to human health as only one sample has been tested and no speciation has been carried out. However, the hydrocarbon fingerprint for this sample indicates a dominance of heavier, and therefore less mobile fractions. GACs have been derived for each of the TPH carbon band ranges (separated into aliphatic and aromatic), but not for total TPH. Further sampling is required in order to obtain speciated TPH data for comparison to the GACs.

It is also not possible to fully assess the concentrations of PAH in terms of risks to human health as speciation has only been carried out on one sample. GACs have been derived for each of the 16 priority PAH compounds but not for total PAH. Further sampling is required in order to obtain speciated PAH data for comparison to the GACs. In the one sample that has been analysed for speciated PAH (Trial Pit TP8), concentrations of nine of the individual PAH species exceeded their relevant GAC. There is insufficient data to determine whether this represents a hotspot of contamination or is representative of general site conditions.

Asbestos has been detected in four trial pits; amosite was recorded in Trial Pits TP7 and TP14, whilst chrysotile was recorded in Trial Pits TP7, TP8, TP13 and TP14. As stated in the 2004 report, the extent of the waste disposal area has not yet been confirmed and further investigation will be required to determine the extent of the asbestos contamination.

In general, metals, PAH and asbestos do not pose a risk to human health via the vapour pathway and placing of a sufficient thickness of clean cover is sufficient to break the exposure pathway of direct contact and thereby mitigate the risk. One exception to this is the volatile PAH naphthalene which has been shown to exceed the GAC in the one sample where it has been analysed. Further analysis of speciated PAHs is required to determine whether clean cover (with removal of any naphthalene hotspots) is a viable remedial option.

It is also recommended that limited SVOC, VOC and PCB analysis is carried out during any future chemical testing in order to provide a broader coverage of contaminant testing.

3.2.2 Water

Perched water samples collected from Boreholes BH1 and BH2 during the 2003 site investigation were analysed for metals, cyanide and phenol. Insufficient water was present in the boreholes to enable analysis for TPH and PAH.

All of the determinands were recorded at concentrations less than the laboratory limit of detection (LOD) with the exception of selenium and zinc. The concentration of selenium in Borehole BH1 marginally exceeds the UKDWS (0.013 mg/l compared to 0.01 mg/l). However, due to the fact that the exceedance is only marginal, that the water sample was collected from perched groundwater rather than the aquifer and that the nearest groundwater abstraction is at least 500 m from the site, it is considered that selenium in groundwater does not pose a significant risk to drinking water. The concentration of zinc in both boreholes is less than the UKDWS; the EQS is dependent on water hardness (for which we do not have data) and it is therefore not possible to assess whether zinc presents a potential risk to surface water receptors, the nearest being located less than 250 m to the east of the site.

Due to the limited number of samples and the reduced suite of determinands, it is recommended that further groundwater sampling and analysis is carried out (see Section 5). A limited number of soil samples should also be tested for leachability of inorganic contaminants.

3.3 Ground Gases

The two boreholes constructed within the suspected area of waste disposal in 2003 (Boreholes BH1 and BH2) were installed with gas monitoring standpipes targeting the Made Ground. Three gas monitoring visits were carried out during January 2003 and a further monitoring visit was carried out during March 2009 (data appended), although Borehole BH2 could not be located at that time.

Current guidance on assessing ground gases is presented in CIRIA C665 (Assessing Risks Posed by Hazardous Ground Gases to Buildings). The guidance recommends that, for a proposed residential with gardens end use, a minimum of six to twelve gas monitoring visits should be performed in suitable conditions over a period of three to six months before any confident conclusions about gas regimes can be made. Therefore a minimum of two additional gas monitoring visits will be required for the existing boreholes (see Section 5).

Methane and hydrogen sulphide were not detected during any of the monitoring visits and a maximum carbon dioxide concentration of 1.0% v/v was recorded (BH1, 20 January 2003). Flow rates ranged from 0.1 l/hr and 15.3 l/hr, and three out of the four visits were carried out during periods of low atmospheric pressure (less than 1000 mb).

Based on the conditions measured to date, the worst case preliminary Gas Screening Value (GSV; in accordance with the calculation method stipulated in CIRIA C665) is calculated as 0.153 l/hr (from the maximum flow rate of 15.3 l/hr multiplied by the maximum recorded gas concentration of 1.0% v/v). This GSV would indicate Characteristic Situation 2 (CS2; gas screening value <0. 7 l/hr after CIRIA C665).

According to British Standard 8485: Code of Practice for the Characterization and Remediation from Ground Gas in Affected Developments (BS 8485, 2007), CS2 would require a gas protection score of 3 to be achieved for private housing. For full details of gas protection measures appropriate for CS2 refer to Table 3: Solution Scores in BS8485.

It is recommended that additional boreholes are constructed and installed with gas monitoring standpipes to provide further spatial coverage of the site; a minimum of six gas monitoring visits would be required for these new boreholes (see Section 5).

Two recommendations were made regarding ground gases in the 2004 report, both of which are still considered appropriate to the development. These are:

- Confined space procedures should be in place, the atmosphere tested and alarms fitted during man entry to deep excavations;
- Further gas monitoring is carried out following the installation of the cover layer to identify any change in gas generation and subsequent requirements for gas protection.

4 REMEDIAL STRATEGY

It is considered that the recommendations for remedial action presented in Section 13.2 of the 2004 report are still valid.

In general, the recommended remedial strategy comprises of placing clean cover with a visual barrier beneath and/or the removal of hotspots. The 2004 report recommends that, where asbestos contamination has been recorded, the depth of clean cover should be at least 2 m in private garden areas and as close as practically possible in other soft landscaped areas. Where asbestos is not present, the report concluded that a minimum depth of clean cover of 500 mm would be sufficient to mitigate risks from PAH and metal contamination.

More recently, developers and Environmental Health Officers have made reference to the BRE/NHBC document on Cover Systems for Land Regeneration and cover thicknesses of 600 mm have generally been accepted by regulators for other sites but this is dependent on the specific site conditions, level and type of contamination and the proposed end use. It may therefore be possible to reduce the recommended depth of clean cover from 2 m to 600 mm in some or all areas of the site. A detailed risk assessment should be carried out once the proposed further investigation has been carried out in

order to determine where a reduction in cover layer thickness would be appropriate. This may require a cost benefit analysis to be carried out for the removal of asbestos versus the savings made in terms of reduced cover thickness If the cover thickness is reduced, consideration will need to be given to providing clean service trenches where services need to be laid deeper than the cover depth. The current site investigation data suggests that groundwater rests at greater than 5m below ground level and therefore, the risk of mobilisation of contaminants at depth in to any cover layer or trench are low and cover layer/trench design need not incorporate a capillary break layer.

5 RECOMMENDED FURTHER WORK

Based on the above review, it is considered that the following items of additional work should be attached as a condition to any outline planning permission in order to fully assess the site and produce a robust remedial strategy:

1. Installation of three new boreholes with gas monitoring standpipes to provide further spatial coverage of the site for reassurance purposes. If Borehole BH2 cannot be located, a fourth new borehole should be constructed. All new and existing boreholes should be monitored on a minimum of six visits over a three month period (subject to agreement with the regulatory authorities). The gas monitoring data should be reassessed at the end of the monitoring period to confirm whether Characteristic Situation 2 in terms of gas protection measures is still appropriate.

2. Further intrusive investigation should be carried out in areas of the site where data has not yet been collected, particularly the north western, south western and south eastern corners of the site. The further investigation should also seek to confirm the extent of the waste disposal area. It is recommended that limited SVOC, VOC, chromium VI and PCB analysis is carried out during any future chemical testing in order to provide a broader coverage of contaminant testing. Any PAH and TPH analysis carried out should be speciated. A limited number of soil samples should also be tested for leachability of inorganic contaminants.

3. The extent of the potentially contaminated soils (asbestos, heavy metals and PAHs) should be further delineated by close grid intrusive sampling.

4. Groundwater samples should be collected from the new boreholes to be analysed for a suite of inorganic and organic determinands. Further samples should also be collected from the original boreholes to be analysed for speciated TPH and PAH. If possible, a water sample should be collected from the watercourse to the east of the site in order to analyse the water hardness and select the appropriate EQS value.

5. It is recommended that soakaway testing is carried out in order that an informed decision can be made regarding the best drainage solution for the site.

6. Once all of the recommended further investigation has been completed, a report should be submitted detailing the findings of the investigation and proposing a detailed methodology for the remediation works, prior to any development commencing.

Depending on the findings in relation to asbestos contamination, a cost benefit analysis of clean up/remedial options may be required in order to best address item 6.

We trust we have correctly interpreted your requirements. Do not hesitate to contact us if you have any further queries.

Yours faithfully
for **CL VOELCKER**

CHARLOTTE REEVE
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References

BRE, NHBC : 2004 : Cover Systems for Land Regeneration

EA : 2009a : Science Report SC050021/SR3. Updated technical background to the CLEA model. Environment Agency, Bristol.

EA : 2009b : Science Report SC050021/SR2. Human health toxicological assessment of contaminants in soils. Environment Agency, Bristol.

EA : 2009c : Science Report SC050021/SR7. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values. Environment Agency, Bristol.

EA : 2009d : Science Report SC050021. Soil Guideline Values for mercury in soil. Environment Agency, Bristol.

EA : 2009e : Science Report SC050021. Soil Guideline Values for selenium in soil. Environment Agency, Bristol.

EA : 2009f : Science Report SC050021. Soil Guideline Values for benzene in soil. Environment Agency, Bristol.

EA : 2009g : Science Report SC050021. Soil Guideline Values for toluene in soil. Environment Agency, Bristol.

EA : 2009h : Science Report SC050021. Soil Guideline Values for ethylbenzene in soil. Environment Agency, Bristol.

EA : 2009i: Science Report SC050021. Soil Guideline Values for xylene in soil. Environment Agency, Bristol.

EA : 2009j : Science Report SC050021. Soil Guideline Values for arsenic in soil. Environment Agency, Bristol.

EA : 2009k : Science Report SC050021. Soil Guideline Values for nickel in soil. Environment Agency, Bristol.

EA : 2009l : Science Report SC050021. Soil Guideline Values for cadmium in soil. Environment Agency, Bristol.

EA : 2009m : Science Report SC050021. Soil Guideline Values for phenol in soil. Environment Agency, Bristol.

EA : 2009n : Science Report SC050021. Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil. Environment Agency, Bristol.