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Our Ref: P9119/CRA-LR
Date: 20th December 2019

Bellway Homes (West Midlands)
1 Centurion Court
Centurion Way
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Tamworth
Staffordshire
B77 5PN

Attention of Damian Fanning

Dear Damian,

Re: Oakamoor Road, Cheadle – Contamination Risk Assessment Letter Report

GRM Development Solutions Limited (GRM) has been appointed by Bellway Homes (West Midlands) to undertake an updated contamination risk assessment to supplement the previous ground investigation works undertaken on land off Oakamoor Road (former Cecilly Mill) in Cheadle. This has been required following a review of the previous ground investigation reports and consideration of Staffordshire Moorlands District Council 'ground related' conditions, specifically Condition 8.

The ground investigation works detailed within this letter report relate to the southern half of the site area only, which comprises hardstanding and was the previous location of the now demolished Cecilly Mill / JCB factory buildings. The northern half of the site area comprised a field area, and it is considered that sufficient work has been undertaken here previously to not warrant any further assessment. The current phase of ground investigation works comprised a window sample borehole investigation, updated ground gas risk assessment with monitoring of standpipe installations, along with contamination soil testing and risk assessment. The report should be read in conjunction with GRM Standard Limitations of Reporting, which is presented in Appendix A.

The following reports have been used in the preparation of this document:

- Ground Investigation & Piling Limited (GIP) – Phase 1 & Phase 2 Ground Investigation Report for a Proposed Residential & Foodstore Development at the JCB Cecilly Mills Site, Cheadle (dated 2 Sept 2014; Ref: DAP/22187).
- Applied Geology – Report on Supplementary Ground Investigation at Cecilly Mill, Cheadle (dated Jan 2019; Ref: AG2939-18-AH11).
- GRM – Review of Previous GI Reports and Summary of Further Works Required (dated Nov 2019, Ref: GRM/P9119/Oakamoor Road, Cheadle).

The site is located within the north eastern outskirts of Cheadle in Staffordshire, approximately 500m from the town centre. A Site Location and Boundary Plan is provided in Appendix B.

The site covers approximately 3.82 Ha and can be roughly split into a northern half and a southern half. The northern half comprised an undeveloped open field bordered by mature trees and hedgerows. The southern half was previously occupied by the former JCB Cecilly Mills facility, but is now a vacant area of hardstanding / concrete floor slabs and stockpiles of demolition rubble following demolition of all the buildings. Cecilly Brook is present on the eastern boundary and flows within an open channel (this was partly covered by a building previously) towards the south.

Beyond the southern and western site boundaries are Oakamoor Road and Churchhill Road, respectively. An open field forms the north western site boundary, whilst a tributary of Cecilly Brook forms the north eastern site boundary. The site is largely bounded by residential housing, with some open fields present to the north of the site.

The proposed development comprises 120 residential properties (anticipated to be generally 2-storey houses) with associated gardens / soft landscaping and an area of public open space on the eastern side of Cecilly Brook. The latest development proposal layout provided by the Client is presented in Appendix C.

SUMMARY PHASE I DESK STUDY REVIEW

The earliest available OS map dated 1880 showed a single large building in the southern half of the site area identified as a 'silk manufactory'. Between 1899 and 1925, the former silk manufactory is identified as a cotton mill and later as 'Cecilly Mills (Silk & Cotton), with the mill building having expanded northwards and westwards. A well was shown adjacent to the northern end of the mill building but continued expansion between 1937 and 1957 saw the mill building expand northwards covering the well feature. Between 1970 and 1986, the mill building expanded eastwards over the existing watercourse (Cecilly Brook) which was shown partly culverted. It is believed that the site was taken over by JCB in 1982 and the OS maps between 1988 and 2014 show the former mill building as a works with parts of the building having been demolished. The JCB facility was demolished in 2017.

Across the northern half of the site area, where the open field is located, topsoil is present with no made ground. Made ground of variable thickness is present across the southern half of the site (existing hardstanding areas). Superficial deposits comprising Alluvium are present on the eastern site boundary, associated with Cecilly Brook. The majority of the site area (both northern and southern halves) is directly underlain by the Sherwood Sandstone Group, which comprises weathered sand and gravel deposits becoming interbedded sandstone and conglomerate. These strata unconformably overlie strata of the Pennine Lower Coal Measures Formation (clay grading into mudstone), which outcrop at surface across the southern end of the site.

The nearest surface water receptor is Cecilly Brook, which flows roughly north to south along the eastern site boundary. The eastern edge of the site area is within flood zones 2 & 3, and is potentially at risk from river flooding.

The Environment Agency has classified the alluvial superficial deposits and the Pennine Lower Coal Measures Formation as Secondary A Aquifers, whilst the underlying Sherwood Sandstone Group is classified as a Principal Aquifer. There are no recorded groundwater abstraction licenses within 1km of the site. The site is within a 'Groundwater Source Protection Zone III'. Likely groundwater flow is to the south and east, generally following the topography and towards Cecilly Brook.

GROUND INVESTIGATION

The ground investigation fieldwork was conducted on the 20th November 2019. In total, seven window sample boreholes (WS01-WS07 incl.) were drilled to a maximum depth of 4.0m begl, with representative soil samples taken.

The exploratory hole location plan is presented in Appendix D, whilst the window sample borehole logs are presented in Appendix E.

The following ground conditions were encountered during the investigation fieldwork:

- Made Ground
- Alluvium (Superficial Deposits)
- Pennine Lower Coal Measures
- Weathered Sherwood Sandstone Group

Made Ground
Made ground was encountered from the ground surface in all the window sample boreholes. The depth of made ground varied from 0.35m to 2.80m begl.

The made ground generally comprised:

- Concrete slab or tarmac / asphalt overlying…
- Dense, pink and grey, gravel (sub-base); gravel comprises mainly limestone as well as brick and tarmac.
- Red brick and concrete angular coarse gravel (only WS07).
- Loose to medium dense, reddish brown / brown, slightly gravelly fine to medium sand; gravel is fine to medium, subangular to subrounded of brick, quartzite and sandstone.
- Soft to firm, brown, sandy gravelly clay; gravel is fine to coarse, subangular to subrounded of brick, concrete, charcoal, clinker, pottery and quartzite.

Alluvium
Superficial deposits representative of Alluvium were encountered in WS07 only. These deposits comprised soft brown and grey organic CLAY.

Pennine Lower Coal Measures
These strata were encountered in WS06 and WS07 only. The full thickness of these strata was not proven.

These strata generally comprised:

- Firm, light grey mottled orange, slightly sandy slightly gravelly CLAY; gravel is fine to medium, subrounded mudstone.
- Stiff to hard, grey, slightly gravelly CLAY; gravel is fine to medium, subangular mudstone.

Weathered Sherwood Sandstone Group
Strata considered to represent weathered deposits of the Sherwood Sandstone Group were encountered in WS01 to WS05 inclusive.

These strata comprised medium dense to dense, light brown / orange brown / reddish brown, slightly gravelly to gravelly fine to medium SAND. Gravel is fine to medium, subangular to subrounded of quartzite and sandstone.

Groundwater
Groundwater was encountered during the investigation works in WS03, WS04, WS05 and WS07 only, as follows:

- WS03: damp strata at 1.5m begl.
- WS04: wet strata from 1.3m begl.
- WS05: wet strata between 1.3m and 2.6m begl.
- WS07: wet strata from 1.9m begl.

No groundwater was recorded in WS01, WS02 or WS06.

Standpipes were installed in WS01, WS03, WS04, WS05, WS06 and WS07 to monitor changes in groundwater level. Two monitoring visits have been undertaken at this stage, as follows:

- WS01: no groundwater detected.
- WS03: standing water level varies between 0.44m (27/11/19) and 0.51m begl (11/12/19).

- WS04: standing water level varies between 1.19m (27/11/19) and 1.21m begl (11/12/19).
- WS05: standing water level varies between 1.21m (27/11/19) and 1.23m begl (11/12/19).
- WS06: standing water level varies between 0.39m (11/12/19) and 0.41m begl (27/11/19). Potential accumulation in made ground from the surface.
- WS07: standing water level varies between 1.95m (11/12/19) and 1.97m begl (27/11/19).

Long term monitoring of groundwater levels has not been conducted as part of this investigation and interpreted levels are approximate and may be dependent on seasonal variations.

GROUND GAS RISK ASSESSMENT

As the proposed land use is classed as high sensitivity (residential with gardens), six gas/water monitoring standpipes have been installed by GRM across the southern half of the site where made ground has been identified. The 35mm diameter standpipes have been installed in the window sample boreholes (WS01 and WS03 to WS07 inclusive), with response zones targeted at either the natural strata (where only a limited thickness of made ground was encountered) or where deep made ground was recorded.

Based on 'BS8576:2013 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds', the gas hazard is considered to be low. The monitoring programme will comprise six visits over a three month period. To date, two visits have been conducted; therefore, only an initial assessment of the local gas regime has been undertaken at this stage and further visits will be required to complete the monitoring program. A separate gas addendum letter report will be issued following the completion of the full monitoring program.

In summary, the concentrations of ground gases recorded to date are presented in Appendix F and summarised below:

- Methane has not been detected.
- Carbon dioxide between 0.5%v/v and 4.1%v/v.
- Oxygen between 16.9%v/v and 21.2%v/v.

A maximum positive flow of 1.9l/hr was noted during the monitoring completed to date.

The primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates, which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Using the maximum positive flow rate of 1.9l/hr and the default maximum methane concentration of 0.1%v/v, a Q_{hg} of 0.0019l/hr has been calculated for methane. Using the same flow rate, the maximum steady state carbon dioxide concentration of 4.1%v/v equates to a Q_{hg} of 0.08l/hr. On this basis, the GSV for the site is determined as 0.08l/hr.

Although the maximum recorded concentration of methane is <1%v/v and the maximum recorded concentration of carbon dioxide is <5%v/v, as the GSV is 0.08l/hr then Characteristic Situation 2 needs to be applied as outlined in table 2 of BS8485:2015, for which gas protection measures are required.

Historical gas monitoring was undertaken by GIP in 2014, with 10 installations monitored over six visits. Two installations were located in the field area (northern half of site), where no made ground was present. No elevated methane or carbon dioxide concentrations were recorded. It is considered that Characteristic Situation 1 is appropriate for the northern half of the site and no gas protection measures will be required.

Eight installations were located in the former factory area (southern half of site), where made ground is present. Three installations recorded elevated carbon dioxide (>5%), of which two installations only recorded carbon dioxide concentrations of 5.0% and 5.1% respectively on one occasion, whilst one installation (southern edge of site) recorded elevated carbon dioxide concentrations on each visit ranging between 6.7% and 10.1%. The maximum flow rate recorded was 2.5l/hr. Using the maximum recorded steady state carbon dioxide concentration of 10.1%v/v and a maximum recorded flow rate of 2.5l/hr, a Q_{hg} of 0.25l/hr has been calculated for carbon dioxide. On this basis, the GSV for the site is determined as 0.25l/hr.

As a result, for the southern part of the site, Characteristic Situation 2 is applied. If the marginal one-off carbon dioxide concentrations of around 5% are ignored, then the area of the site requiring gas protection measures (appropriate for Characteristic Situation 2) should be limited to where deep made ground (greater than 1.0m in thickness) is present in the southern part of the site.

As GRM are currently in the process of undertaking a monitoring program, depending on the results of this new monitoring phase, the requirement for gas protection measures will be reviewed.

At this stage, prior to completion of the current gas monitoring program, gas protection measures for the southern part of the site (as shown on the Remediation Plan presented in Appendix I) appropriate for Characteristic Situation 2 will be required. If gas protection measures are required, a Gas Protection Measures Design and Verification Plan will be required.

It should also be noted that radon gas protection measures are not required.

CONTAMINATION RISK ASSESSMENT

Human Health

The proposed development comprises 120 residential properties with associated gardens / soft landscaping and an area of public open space on the south eastern side of Cecilly Brook.

The northern half of the site (field area) was covered by topsoil only, with no made ground. Testing of the topsoil as part of the previous investigations confirmed no presence of contamination. Therefore, no contamination risk to human health exists and no remediation is required.

However, the southern half of the site (former factory area) is covered by hardstanding / made ground, ranging between 0.35m and 2.80m thick. No obvious contamination (visual or olfactory) was identified during the various phases of investigation.

The material on site identified as being the most likely to be contaminated was the made ground (which includes ash, clinker and slag) in the southern half of the site area. A number of representative samples of made ground were tested during the previous investigations and also as part of GRM's most recent phase of investigation (these chemical analysis results are presented in Appendix G). A suite of contaminants were tested for including metals, non-metals, phenol, PAH, TPH and asbestos. The test results were compared against the GRM Tier 1 Acceptance Criteria / Remedial Targets for a residential with plant uptake end-use, presented in Appendix H.

The only contaminant of concern from the previous chemical testing undertaken was Lead. Two samples recorded elevated Lead concentrations above the screening value / remedial target of 200mg/kg. From GRM's most recent phase of investigation, five samples (out of eight) had elevated Lead concentrations above the screening value / remedial target of 200mg/kg. It can be concluded that elevated Lead concentrations, that pose a risk to human health, are pervasive throughout the made ground. In addition, one of the GRM samples recorded an elevated concentration of Benzo(a)pyrene (15mg/kg) above the screening value / remedial target of 5mg/kg. This is considered to represent a hotspot.

From the previous investigations, the potential for asbestos containing material was only screened for in a few samples tested. Asbestos fibres were identified in a couple of locations. As part of GRM's most recent phase of investigation, all samples were screened for asbestos. No asbestos

fibres were detected in any of the samples tested, and no visual evidence of asbestos fragments was observed during the investigation works.

No visual or olfactory evidence of petroleum hydrocarbon contamination was observed during any of the phases of investigation. As part of GRM's most recent phase of investigation, representative samples of the made ground were tested for banded TPHCWG. The sample analysis did not reveal elevated concentrations of either Aliphatic or Aromatic hydrocarbons in excess of the relevant screening values / remedial targets. Therefore, it is considered that petroleum hydrocarbon contamination does not pose a risk to end-users.

At this stage, remediation within the southern half of the site will be required where deep made ground is present (as shown on the Remediation Plan presented in Appendix I). However, there is a proposal to uplift levels across the area to be remediated and the soils used for this will need to be chemically tested to prove suitability. Where only a thin cover of made ground is present (sub-base material) below the hardstanding, this is not considered a contamination risk and is likely to be removed as part of the redevelopment works.

Controlled Waters
For controlled waters, the primary receptors for the site have been identified as follows:

- Cecilly Brook (surface water receptor), which flows roughly north to south along the eastern site boundary.
- Principal Aquifer of the Sherwood Sandstone Group. The site is within a 'Groundwater Source Protection Zone III'.
- Secondary A Aquifers of Alluvium and the Pennine Lower Coal Measures Formation.

The primary pathways of concern for the surface water receptor (Cecilly Brook) are leaching of contaminants and lateral migration to the watercourse. The primary pathways of concern for the aquifers are leaching of contaminants and vertical migration to the groundwater. Likely groundwater flow is to the south and east, generally following the topography and towards Cecilly Brook.

As part of GRM's most recent phase of investigation, three samples of water were obtained and tested. This included two samples of groundwater and one sample of surface water from Cecilly Brook (obtained from the bridge within the southern half of the site).

From the groundwater test results, the recorded concentrations of most of the analysed contaminants were below the relevant UKDWS or EQS threshold values. Only concentrations of copper (5µg/l in brook), iron (280µg/l in brook), phenol (2.24µg/l in groundwater) and benzo(a)pyrene (0.04-0.06µg/l in groundwater / brook) were elevated above either the UKDWS or EQS screening criteria, however none of these are considered likely to pose any significant risk to the quality of the groundwater.

No significantly elevated TPH concentrations have been recorded in the groundwater or the brook. As there is a general absence of TPH in the soils and a lack of an obvious source, it is considered unlikely that significant petroleum hydrocarbon contamination is present within the site area. However, a watching brief should be undertaken during development of the southern part of the site to further assess the made ground. Once the hardstanding within the southern part of the site has been removed, the near surface ground should be inspected for any potential contamination issues (such as oil staining etc).

At this stage, it is considered that the risk to the surface water receptor and groundwater beneath the site is negligible, and no remedial action is required.

Water Supply Pipes
No existing source, or visual / olfactory evidence, of petroleum hydrocarbons or solvents was identified during the investigation works.

It is considered that the concentrations of contaminants recorded to date, based on the UKWIR guidance, is such that standard water supply pipes (e.g. PE/Barrier Type water supply pipes) should be suitable for the site. However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

Phase II Conceptual Site Model
A Phase II conceptual site model illustrating the final pollutant linkages is presented in Appendix J.

REMEDIATION AND VALIDATION

Remedial Strategy for Human Health (Soil Contamination)
Remediation will only be required within the southern half of the site where deep made ground is present (as shown on the Remediation Plan presented in Appendix I). It is considered that the use of a soil capping system in the affected soft landscaped garden areas to break the source-pathway-receptor linkage would represent a suitable form of remediation.

The recommended remedial measures will comprise a 600mm thick capping layer of clean soil (e.g. combination of subsoil / topsoil) to be placed in the proposed soft landscaped garden areas. This will reduce any exposure pathways to end-users in respect of Lead and any isolated asbestos fibres (if present).

At this stage, it is assumed that the subsoil and topsoil to be used as the clean capping layer can be sourced from within the site area. The subsoil would comprise mainly natural granular soils from the foundation / service trench excavations and the topsoil from the northern half of the site within the field area. Both the subsoil and topsoil would still need to be chemically tested to prove suitability, and this can be done once these materials have been stockpiled during the construction works.

As part of the redevelopment works, it is currently proposed that the ground levels within some parts of the area to be remediated are to be increased by approximately 0.5m to 2.0m above the current ground surface. For some other parts of the area to be remediated, the ground surface will remain more or less unchanged. At this stage, the source of the soils to be used to raise the ground levels is unknown. As these soils will be placed in the garden areas, chemical validation of these soils will be required.

Where current ground levels are to be generally maintained then sufficient made ground should be removed to facilitate the capping layer. Any made ground removed to facilitate the capping layer should be sensibly re-used elsewhere under areas of hardstanding or disposed appropriately off-site.

There is the potential risk of double handling the contaminated made ground when it comes to foundation excavations. Both clean fill placed to raise proposed site levels and contaminated made ground below will be excavated during the digging for foundations. Both types of material will probably be stockpiled together, thus increasing the amount of contaminated made ground to deal with. An alternative to this would be the bulk excavation of all contaminated made ground as a form of remediation. This would also further mitigate any risk to controlled waters.

On the eastern side of Cecilly Brook, there is a proposed public open space area and a few proposed garden areas at the south eastern end of the site. Further shallow sampling and testing of soils in these areas will be required to confirm that no remedial works would be required in this part of the development.

Should the extent of the made ground be greater than expected or any additional material suspected of being significantly contaminated be encountered during the redevelopment of the site, GRM can be contacted to undertake additional investigation if necessary. The local Environmental Health Officer should be contacted and informed of any additional remedial work required.

Remedial Strategy for Human Health (Ground Gas)
It is considered that Characteristic Situation 1 is appropriate for the northern half of the site and no gas protection measures will be required.

GRM have installed six new gas installations across the southern part of the site and are currently in the process of undertaking a monitoring program. Depending on the results of this new monitoring phase, the requirement for gas protection measures will be reviewed.

At this stage, prior to the results of the current gas monitoring program, gas protection measures for the southern part of the site (as shown on the Remediation Plan presented in Appendix I) appropriate for Characteristic Situation 2 will be required.

The gas protection measures are likely to comprise the provision of a methane resistant membrane (such as Monarflex Reflex Super or Juta GP1), fully sealed at joints and service penetrations, with a beam and block floor slab. These would provide a score of 4.5 points under BS8545 and so will be suitable for the type of building proposed (Type A – private / residential).

If gas protection measures are required, a Gas Protection Measures Design and Verification Plan will be required.

Remedial Strategy for Site Workers
Although the risk to site workers from soil contamination is considered negligible, previous ground investigations have recorded occasion asbestos fibres within the made ground. The risk can be mitigated with the adoption of dust suppression measures, providing that appropriate health and safety procedures are adhered to during the construction phase. Any visible asbestos containing material (such as cemented asbestos sheeting) should be screened / separated from the made ground where reasonably practicable and disposed of separately.

The use of suitable PPE should be enforced during the ground works stage of construction and suitable precautions should be taken, especially when excavating any made ground materials.

In addition, depleted oxygen concentrations have been detected and therefore consideration should be given to avoiding work in confined spaces or deep excavations.

A site-specific risk assessment should be undertaken prior to the commencement of site works and any subsequent maintenance works.

Remedial Strategy for Controlled Waters
Considering the general absence of TPH in the soils and the lack of an obvious source, it is considered unlikely that significant petroleum hydrocarbon contamination is present within the site area. No significantly elevated TPH concentrations have been recorded in the groundwater or the brook. Further testing of the water in Cecilly Brook may be required.

To further mitigate any risk to controlled waters, it is recommended that a watching brief is undertaken during development of the southern part of the site to further assess the made ground. Once the hardstanding within the southern part of the site has been removed, GRM can inspect the near surface ground for any potential contamination issues (such as oil staining etc) previously unrecorded.

At this stage, it is considered that remediation to protect controlled waters is unnecessary.

Remedial Strategy for Construction Materials
It is considered that the concentrations of contaminants recorded to date, based on the UKWIR guidance, is such that standard water supply pipes (e.g. PE/Barrier Type water supply pipes) should be suitable for the site.

However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

Disposal and Classification
At this stage, it is anticipated that all excavated soils will remain on site.

Based on the Waste Classification Report (Appendix K), the made ground has generally been classified as Non-Hazardous Waste. However, one of sample of made ground has been classified as Hazardous Waste due to the zinc concentration recorded.

Although not identified during the site works, visible asbestos containing materials (ACMs) within soils will result in the soils being classified as Hazardous Waste. Visible ACMs should be removed, employing appropriate health and safety protocols and where possible, prior to disposal.

At this stage, as all the made ground will be excavated and stockpiled together, allowance should be made for the made ground to be assumed to be non- hazardous. Once all the made ground has been stockpiled, it is recommended that the made ground is re-tested to confirm its waste classification prior to any disposal.

It should be noted that early consultation with the relevant landfill sites over their particular acceptance criteria may produce additional cost savings. Reference should be made to the relevant notes presented in Appendix A (x).

The natural strata underlying the site is likely to be classified as Inert for disposal purposes, however, further testing will be required to confirm this. Due to the organic content within the alluvial deposits, these may be classified as non-hazardous. Further testing will be required to determine this and confirmed by the receiving landfill.

Natural soils may be suitable for re-use on-site as part of any capping layer and consideration should be given to retaining this material on-site. Care should be taken to keep natural arisings separate from the made ground and free from construction materials.

Where site-won materials (i.e. made ground or natural soils) are to be re-used on site, or materials are to be imported, it is recommended that this should be carried out under a Materials Management Plan produced in accordance with the CL:AIRE Definition of Waste Code of Practice. This document should be approved by a CL:AIRE-registered Qualified Person prior to excavation of materials, and be maintained throughout the duration of the project. A Verification Report should be produced on completion of the project in order to confirm the control and recording of material movements around or between sites in accordance with current waste management legislation and guidance.

Post Remediation Validation
A Remediation Method Statement will be required. Following your review of this document, we would recommend that a copy of it be forwarded to the Local Authority for comment and approval, prior to commencing development of the site. The Local Authority may choose to include other consultees as part of the planning process (such as the Environment Agency).

Remediation will only be required within the southern half of the site where deep made ground is present (as shown on the Remediation Plan presented in Appendix I).

The made ground in the proposed residential garden / soft landscaped areas should be removed to natural strata or 0.6m below finished ground levels whichever is shallower. Where natural strata are encountered before the full capping thickness, excavations can be stopped. Photographic evidence of the excavation surface will be required to confirm the presence of natural strata / absence of made ground.

The validation of the capping layer will include confirmation that it is of sufficient thickness. This will take the form of hand dug trial pits to determine the exact thickness of the soil capping layer; test pits will be excavated and photographic evidence of the layer thickness and nature of the capping

material will be collected for inclusion in the validation report. It is GRM policy that the depth validations will be carried out on every plot.

At this stage, it is assumed that the subsoil (natural granular soils from the foundation / service trench excavations) and topsoil (from field area) to be used as the clean capping layer can be sourced from within the site area. Both the subsoil and topsoil would still need to be chemically tested to prove suitability, and this can be done once these materials have been stockpiled during the construction works. Samples of these materials will need to be analysed for a suite of contaminants including metals, inorganics, speciated PAHs, speciated hydrocarbons and a screen for asbestos. The analysis results will be screened against GRMs Tier 1 Assessment Criteria / Remedial Targets (presented in Appendix H) for a residential with plant uptake end-use.

If a source of topsoil or subsoil is required off-site, then the number of samples that require analysis will depend on the volume and the source of the materials. Typically an analysis rate of one sample per $50m^3$ and one sample per $250m^3$ (minimum of three samples per source and material type) applies for generated and virgin soils respectively.

A Remediation Validation (Verification) Completion Report will be required by the Local Authority to confirm that the remedial strategy has been implemented appropriately. The report should include the following:

- Confirmation of the suitability of the on-site subsoil / topsoil material to be used for the clean capping layer, including chemical analysis results.
- Confirmation of the capping thickness placed to the required depth, along with a photographic record.
- Copies of site waste consignment / haulage notes, confirming the export of any excavated contaminated soils.

The validation report confirming all the above measures have been undertaken should be submitted to the relevant Local Authority and the NHBC / Warrantee provider.

We trust this is suitable for your current requirements, should you require any further information or need clarification of any of the points raised please do not hesitate to contact us.

Yours sincerely,
For GRM Development Solutions Ltd

Robert Crossland MSc FGS CGeol
Senior Engineering Geologist

Appendices

Appendix A: General Appraisal Comments and Standard Limitations
Appendix B: Site Location and Boundary Plan
Appendix C: Proposed Development Layout Plan
Appendix D: Exploratory Hole Location Plan
Appendix E: Window Sample Borehole Logs
Appendix F: Ground Gas Monitoring Sheets
Appendix G: Chemical Analysis Results
Appendix H: GRM Tier 1 Acceptance Criteria / Remedial Targets
Appendix I: Remediation Plan
Appendix J: Phase II Conceptual Site Model
Appendix K: Waste Classification Report Summary Sheet

APPENDIX A

GRM Development Solutions provides multi-disciplinary consultancy services, UK-wide:

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

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GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- BGS online viewer: http://www.bgs.ac.uk/data/mapViewers/home.html
- Environment Agency Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: http://www.environment-agency.gov.uk/
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2015), 'Radon: Guidance on protective measures for new buildings'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- Arsenic
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Copper
- Nickel
- Zinc
- Phenols
- cyanide (total)
- pH
- Water soluble sulphate
- PAH (polycyclic aromatic hydrocarbons)

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (BR211: 2015)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of

one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables.
For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values. Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.

- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects.

The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

APPENDIX B

GRM Development Solutions provides multi-disciplinary consultancy services, UK-wide:

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

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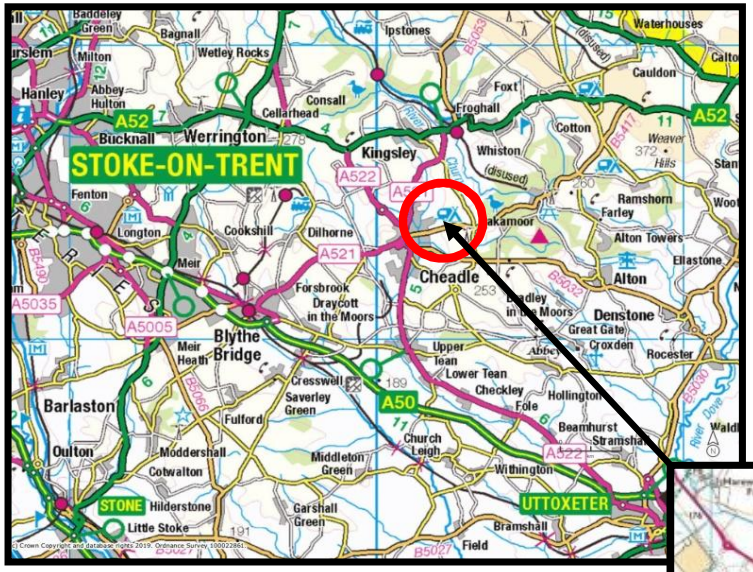





N

DO NOT SCALE

NOTES:

Approximate site location

Approximate site boundary

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CLIENT:

Bellway Homes West Midlands

PROJECT:

Land off Oakamoor Road, Cheadle

TITLE:

Site Location and Boundary Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
RHC	Dec 2019
PROJECT No:	DRAWING No:
P9119	Figure 1

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APPENDIX C

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CLIENT:

Bellway Homes West Midlands

PROJECT:

Land off Oakamoor Road, Cheadle

TITLE:

Proposed Development Layout Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN : RHC	DATE: Dec 2019
PROJECT No: P9119	DRAWING No: Figure 2

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NOTES: DO NOT SCALE

Window Sample Borehole Location (with standpipe)

Window Sample Borehole Location (without standpipe)

CLIENT: Bellway Homes West Midlands

PROJECT: Land off Oakamoor Road, Cheadle

TITLE: Exploratory Hole Location Plan

SCALE@SIZE: NTS	ISSUE: FINAL
DESIGN/DRAWN: RHC	DATE: Dec 2019
PROJECT No: P9119	DRAWING No: Figure 3

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Windowless Sample Borehole

Borehole No WS01
Sheet 1 of 1

Site Name: Oakamoor Road, Cheadle

Ground Level (mAOD)

Client: Bellway Homes West Midlands

GRM Project Ref: P9119

Coordinates 401222 E 343722 N

Installation/ Backfill	Water Strike	Samples/Tests Depth	Type	Result	Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
						0.40			Dense, pink and grey slightly sandy GRAVEL. Gravel is coarse, angular to subangular limestone subbase. MADE GROUND
						0.60			Soft to firm, brown, slightly gravelly sandy CLAY. Gravel is fine to medium, subangular to subrounded quartzite and charcoal. MADE GROUND
		0.80	ES						Medium dense, light brown very gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subrounded quartzite. WEATHERED SHERWOOD SANDSTONE GROUP
		1.00	S	N=16 (2,3/3,4,4,5)		1.15			
		1.60	ES						Medium dense to dense, reddish brown fine to medium grained SAND. WEATHERED SHERWOOD SANDSTONE GROUP
		2.00	S	50 (6,13/50 for 135mm)		2.40			End of Borehole at 2.400m

Crew: Dynamic Sampling UK Ltd. **Logger:** RDH **Weather:** Clear

Equipment: Premier Compact 110 Series

Reason for termination of borehole:

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started:	20/11/2019	**Hole Complete:**	20/11/2019	**Version:**	FINAL	**Scale:**	1:25

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Windowless Sample Borehole

Borehole No WS02
Sheet 1 of 1

Site Name: Oakamoor Road, Cheadle

Ground Level (mAOD)

Client: Bellway Homes West Midlands

GRM Project Ref: P9119

Coordinates 401297 E, 434714 N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	Result	Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
						0.24			Concrete slab. MADE GROUND
						0.35			Dense, pink and grey granular subbase GRAVEL. MADE GROUND
		0.60	ES			0.70			Medium dense, light brown, slightly clayey slightly gravelly fine to medium grained SAND. Gravel is fine to medium subrounded quartzite. WEATHERED SHERWOOD SANDSTONE GROUP
		0.90	ES						
		1.00	S	N=20 (2,5/5,5,5,5)		1.10			Medium dense, orangish brown, slightly gravelly fine to medium grained SAND. Gravel is fine to medium, subrounded quartzite. WEATHERED SHERWOOD SANDSTONE GROUP
		1.30	ES						
						1.60			Medium dense, orangish brown, gravelly fine to medium grained SAND. Gravel is fine to medium subangular to subrounded quartzite and sandstone. WEATHERED SHERWOOD SANDSTONE GROUP
		1.80	ES						
		2.00	S	N=5 (1,1/1,1,1,2)					Medium dense to dense, orangish brown locally light grey, fine to medium grained SAND. WEATHERED SHERWOOD SANDSTONE GROUP
		2.70	ES						
		3.00	S	50 (25 for 115mm/50 for 200mm)		3.00			End of Borehole at 3.000m

Crew: Dynamic Sampling UK Ltd. **Logger:** RDH **Weather:** Clear

Equipment: Premier Compact 110 Series

Reason for termination of borehole:

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started:	20/11/2019	**Hole Complete:**	20/11/2019	**Version:**	FINAL	**Scale:**	1:25

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Windowless Sample Borehole

Borehole No
WS03
Sheet 1 of 1

Site Name: Oakamoor Road, Cheadle

Ground Level (mAOD)

Client: Bellway Homes West Midlands

GRM Project Ref: P9119

Coordinates
401366 E
343704 N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	Result	Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
						0.21			Concrete slab. MADE GROUND
		0.40	ES			0.50			Dense, pink and grey, subangular GRAVEL subbase. Gravel includes limestone, brick and tarmac. MADE GROUND
		0.90	ES						Medium dense, reddish brown, slightly gravelly fine to medium grained SAND. Gravel is fine to medium, subrounded quartzite and sandstone. WEATHERED SHERWOOD SANDSTONE GROUP
		1.00	S	N=23 (2,3/5,6,6,6)		1.10			
	▼	1.70	ES						Medium dense, reddish brown, gravelly becoming very gravelly, fine to medium grained SAND. Gravel is fine to medium, subrounded quartzite and sandstone. WEATHERED SHERWOOD SANDSTONE GROUP *Subrounded quartzite cobble* *Subrounded quartzite cobble*
		2.00	S	N=47 (5,5/8,10,14,15)		2.30			End of Borehole at 2.300m

1
2
3
4

Crew: Dynamic Sampling UK Ltd. **Logger:** RDH **Weather:** Clear

Equipment: Premier Compact 110 Series

Reason for termination of borehole:

Groundwater Remarks:
Slightly damp strata at 1.5m begl.

General Remarks:

Hole Started: 20/11/2019 **Hole Complete:** 20/11/2019 **Version:** FINAL **Scale:** 1:25

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Windowless Sample Borehole

Borehole No WS04
Sheet 1 of 1

Site Name: Oakamoor Road, Cheadle

Ground Level (mAOD)

Client: Bellway Homes West Midlands

GRM Project Ref: P9119

Coordinates 401396 E 343678 N

Installation/ Backfill	Water Strike	Samples/Tests: Depth	Type	Result	Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
						0.23			Concrete slab. MADE GROUND
						0.65			Dense, grey limestone subbase GRAVEL. MADE GROUND
		0.80	ES						Soft to firm, dark brown slightly sandy gravelly CLAY. Gravel is fine to coarse, subangular to rounded brick, charcoal and clinker. MADE GROUND
		1.00	S	N=1 (1,0/0,0,1,0)		1.00			Firm, brown and greyish black, slightly gravelly CLAY. Gravel is fine to medium subangular brick and wood. MADE GROUND
	▼	1.30	ES						
						1.50			Medium dense, reddish brown fine to medium grained SAND. MADE GROUND
						1.60			Soft to firm, brown, slightly sandy gravelly CLAY. Gravel is fine to medium, subangular to subrounded quartzite, brick, clinker and pottery. MADE GROUND
		1.90	ES						
		2.00	S	N=2 (0,0/0,0,1,1)					
		2.50	ES						
						2.80			Medium dense to dense, reddish brown, slightly gravelly, fine to medium grained SAND. Gravel is fine to medium subrounded quartzite. WEATHERED SHERWOOD SANDSTONE GROUP
		2.90	ES						
		3.00	S	N=40 (6,6/10,10,10,10)		3.00			End of Borehole at 3.000m

Crew: Dynamic Sampling UK Ltd. **Logger:** RDH **Weather:** Clear

Equipment: Premier Compact 110 Series

Reason for termination of borehole:

Groundwater Remarks:
Wet from 1.3m begl.

General Remarks:

Hole Started: 20/11/2019 **Hole Complete:** 20/11/2019 **Version:** FINAL **Scale:** 1:25

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Windowless Sample Borehole

Borehole No WS05
Sheet 1 of 1

Site Name: Oakamoor Road, Cheadle

Ground Level (mAOD)

Client: Bellway Homes West Midlands

GRM Project Ref: P9119

Coordinates 401380 E 343641 N

Installation/ Backfill	Water Strike	Samples/Tests Depth	Type	Result	Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
						0.35			Concrete slab. MADE GROUND
						0.40			Dense, light grey granular limestone subbase GRAVEL. MADE GROUND
		0.70	ES						Medium dense, reddish brown and orangish brown, slightly gravelly fine to medium grained SAND. Gravel is fine, subrounded quartzite. MADE GROUND
		1.00	S	N=6 (1,1/3,1,1,1)					
						1.50			
		1.60	ES						Loose, brown, gravelly fine to medium grained SAND. Gravel is fine to medium subangular to subrounded, brick, quartzite and sandstone. MADE GROUND
		2.00	S	N=12 (3,2/3,3,3,3)					
						2.20			
		2.30	ES						Loose, saturated, light brown and orangish brown, fine to medium grained SAND. MADE GROUND
						2.60			
		2.80	ES						Dense to very dense, reddish brown slightly gravelly fine to medium grained SAND. Gravel is fine, subangular to subrounded quartzite and sandstone. WEATHERED SHERWOOD SANDSTONE GROUP
		3.00	S	N=50 (6,8/50 for 275mm)		3.00			End of Borehole at 3.000m

1 2 3 4

Crew: Dynamic Sampling UK Ltd. **Logger:** RDH **Weather:** Clear

Equipment: Premier Compact 110 Series

Reason for termination of borehole:

Groundwater Remarks:
Wet strata between 1.3m and 2.6m begl.

General Remarks:

Hole Started: 20/11/2019 **Hole Complete:** 20/11/2019 **Version:** FINAL **Scale:** 1:25

GRM Development Solutions Ltd
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Windowless Sample Borehole

Borehole No WS06
Sheet 1 of 1

Site Name: Oakamoor Road, Cheadle

Ground Level (mAOD)

Client: Bellway Homes West Midlands

GRM Project Ref: P9119

Coordinates 401351 E 343600 N

Installation/ Backfill	Water Strike	Samples/Tests Depth	Type	Result	Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
						0.10			Tarmac/asphalt. MADE GROUND
						0.30			Dense, concrete GRAVEL. MADE GROUND
						0.60			Dense, light grey limestone GRAVEL subbase. MADE GROUND
		0.80	ES						Firm, light grey mottled orange, slightly sandy, slightly gravelly silty CLAY. Sand is fine. Gravel is fine to medium subrounded mudstone. PENNINE LOWER COAL MEASURES
		1.00	S	N=18 (2,2/3,4,5,6)					
		1.70	ES			1.40			Stiff to hard, friable, dark grey mottled brown slightly gravelly silty CLAY. Gravel is fine to medium, subangular mudstone lithorelicts. PENNINE LOWER COAL MEASURES
		2.00	S	N=26 (6,6/7,7,6,6)					
						2.40			End of Borehole at 2.400m

1 2 3 4

Crew: Dynamic Sampling UK Ltd. **Logger:** RDH **Weather:** Clear

Equipment: Premier Compact 110 Series

Reason for termination of borehole:

Groundwater Remarks:
No groundwater encountered.

General Remarks:

Hole Started: 20/11/2019 **Hole Complete:** 20/11/2019 **Version:** FINAL **Scale:** 1:25

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Windowless Sample Borehole

Borehole No WS07
Sheet 1 of 1

Site Name: Oakamoor Road, Cheadle

Ground Level (mAOD)

Client: Bellway Homes West Midlands

GRM Project Ref: P9119

Coordinates 401381 E 343595 N

Installation/ Backfill	Water Strike	Samples/Tests Depth	Type	Result	Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description
						0.15			Tarmac/asphalt. MADE GROUND
						0.30			Dense, light grey granular limestone subbase GRAVEL. MADE GROUND
		0.45	ES						Firm, brown, sandy gravelly CLAY. Gravel is fine to coarse, angular to subangular brick, concrete and clinker. MADE GROUND
						0.80			Red brick and concrete coarse angular GRAVEL. MADE GROUND
		1.00	S	N=10 (2,1/1,2,5,2)					
						1.40			Firm, brown, sandy gravelly CLAY. Gravel is fine to coarse, angular to subangular brick, concrete and clinker. Becoming stiff from 2.0m. MADE GROUND
		1.60	ES						
	▼	2.00	S	N=22 (25 for 80mm/14,4,3,1)					
						2.70			Soft, brown and grey organic CLAY. ALLUVIUM
		2.80	ES						
		3.00	S	N=10 (1,1/2,2,3,3)					
						3.20			Stiff to hard, grey slightly gravelly CLAY. Gravel is fine, subangular mudstone. PENNINE LOWER COAL MEASURES
		3.60	ES						
		4.00	S	N=31 (5,6/6,8,8,9)		4.00			End of Borehole at 4.000m

Crew: Dynamic Sampling UK Ltd. **Logger:** RDH **Weather:** Clear

Equipment: Premier Compact 110 Series

Reason for termination of borehole:

Groundwater Remarks:
Wet strata from 1.9m begl.

General Remarks:

Hole Started: 20/11/2019 **Hole Complete:** 20/11/2019 **Version:** FINAL **Scale:** 1:25

APPENDIX F

GRM Development Solutions provides multi-disciplinary consultancy services, UK-wide:

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

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In-Situ Gas Monitoring Results

Project Name:	Oakamoor Road, Cheadle
Project Number:	P9119
Client:	Bellway Homes West Midlands
Date:	11/12/2019
Weather:	Partly Sunny
Atmospheric Pressure (mb):	983
Pressure Trend:	Steady
Equipment:	Gas Data LMSXi
Operator:	Bryan Burgh

Ground Gases														Ground Waters	
				Methane %v/v		CO2 %v/v		Oxygen %v/v		Gas Flow l/h		PID Reading ppm		Depth to Groundwater mbegl	Total Well Depth mbegl
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
WS01	0.60	2.40	NS	0.00	0.00	4.10	4.10	16.90	16.90	1.90	0.40	Not Recorded		Not Detected	2.40
WS03	0.70	2.30	NS	0.00	0.00	0.50	0.50	20.50	20.50	0.00	0.00	Not Recorded		0.51	2.29
WS04	0.50	2.70	MG	0.00	0.00	2.70	2.70	19.00	19.00	0.00	0.00	Not Recorded		1.21	2.70
WS05	0.50	2.00	MG	0.00	0.00	1.00	1.00	19.00	19.00	-1.60	-0.70	Not Recorded		1.23	2.15
WS06	0.70	2.40	NS	0.00	0.00	0.70	0.70	21.10	21.10	0.00	0.00	Not Recorded		0.39	2.40
WS07	0.50	3.00	MG	0.00	0.00	1.20	1.20	20.40	20.40	0.00	0.00	Not Recorded		1.95	2.94

Comments WS06 - bailed and recharged in approx 1 minute; WS03 bailed back to 0.65m after 20 minutes

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Highlighted cell for following conditions:

a	Methane =>1% v/v
b	Carbon Dioxide =>5% v/v
MG	Made Ground
NS	Natural Strata

Ground Material Key

MG	Made Ground
NS	Natural Statra

In-Situ Gas Monitoring Results

Project Name:	Oakamoor Road, Cheadle
Project Number:	P9119
Client:	Bellway Homes West Midlands
Date:	27/11/2019
Weather:	Dreary (Overcast)
Atmospheric Pressure (mb):	967
Pressure Trend:	Steady
Equipment:	Gas Data LMSXi
Operator:	Bryan Burgh

Ground Gases														Ground Waters	
				Methane %v/v		CO2 %v/v		Oxygen %v/v		Gas Flow l/h		PID Reading ppm		Depth to Groundwater mbegl	Total Well Depth mbegl
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady		
WS01	0.60	2.40	NS	0.00	0.00	3.20	3.20	18.50	18.50	0.80	0.80	Not Recorded		Not Detected	2.38
WS03	0.70	2.30	NS	0.00	0.00	0.50	0.50	20.10	20.10	0.00	0.00	Not Recorded		0.44	2.28
WS04	0.50	2.70	MG	0.00	0.00	3.10	3.10	19.10	19.10	0.00	0.00	Not Recorded		1.19	2.70
WS05	0.50	2.00	MG	0.00	0.00	0.80	0.80	18.90	18.90	0.00	0.00	Not Recorded		1.21	2.15
WS06	0.70	2.40	NS	0.00	0.00	0.70	0.70	21.20	21.20	0.00	0.00	Not Recorded		0.41	2.41
WS07	0.50	3.00	MG	0.00	0.00	1.60	1.60	20.30	20.30	-3.00	0.00	Not Recorded		1.97	2.96

Comments WS06 - could not bail quick enough; WS03 - left to recharge after bailing for 20mins

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)	Highlighted cell for following conditions:	
N.D.	Not Detected	a	Methane =>1% v/v
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

Ground Material Key

MG	Made Ground
NS	Natural Statra

APPENDIX G

GRM Development Solutions provides multi-disciplinary consultancy services, UK-wide:

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Burton Upon Trent
DE14 2WH

Analytical Test Report: L19/2701/GRM/001

Your Project Reference:	**Oakamoor Lane, Cheadle**	Samples Received on:	21/11/2019
Your Order Number:	P9119	Testing Instruction Received:	21/11/2019
Report Issue Number:	1	Sample Tested:	21/11 to 02/12/2019
Samples Analysed:	14 soil samples	Report issued:	02/12/2019

Signed

Peter Swanston
Environmental Laboratories Manager
Nicholls Colton Group

Notes:

General

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with NC method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with NC method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

With the exception of Sulphate which is crushed over the 2mm test sieve, concentrations are reported as a percentage mass of the dry soil passing the 10mm BS test sieve. As received samples have been corrected for moisture content but not stone content.

Samples were supplied by customer, results are representative of the material provided

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

Samples were received in suitable containers	**Yes**
A date and time of sampling was provided	**Yes**
Sample holding times were exceeded prior to analysis of determinants	**No**

Where samples do not meet one or more of the above criteria they will be classed as deviating, this means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue 24.01.2017
Owned by Emily Blissett - Customer Services Supervisor
Authorised by James Gane - Commercial Manager
J:\Public\Projects\2019\L19\GRM - GRM Development solutions\L19-2701-GRM P9119\[L19-2701-GRM-001.xlsx]Methodology

Nicholls Colton Group
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Leicester
LE1 4DH

L19/2701/GRM/001

Project Reference - Oakamoor Lane, Cheadle

Analytical Test Results - GRM Soil Suite

NC Reference			64094	64095	64097	64098	64099	64102	64103
Client Sample ID			-	-	-	-	-	-	-
Client Sample Location			WS01	WS02	WS03	WS04	WS04	WS05	WS05
Depth - Top (m)			0.80	0.60	0.40	0.80	1.30	0.70	1.60
Depth - Bottom (m)			0.80	0.60	0.40	0.80	1.30	0.70	1.60
Date of Sampling			20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019
Time of Sampling			Not provided	Not provided	Not provided	Not provided	Not provided	Not provided	Not provided
Sample Matrix			Sand	Sand	Sand	Sand	Clay	Sand	Sand
Determinant	**Units**	**Accreditation**							
Arsenic	(mg/kg)	MCERTS	< 10	< 10	< 10	33	18	< 10	< 10
Cadmium	(mg/kg)	MCERTS	0.6	0.8	2.5	2.3	1.3	0.6	0.6
Chromium (Total)	(mg/kg)	UKAS	11	15	22	22	20	15	14
Copper	(mg/kg)	MCERTS	17	15	56	250	110	20	52
Lead	(mg/kg)	MCERTS	13	14	260	450	260	16	270
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	17	21	20	41	27	7.5	9.1
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	72	52	2300	1000	230	22	130
Total Phenols	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	7.5	7.9	9.3	7.7	8.1	8.8	9.0
SOM	(%)	UKAS	< 1.7	< 1.7	1.7	12	4.6	< 1.7	< 1.7
Sulphate	(mg/l)	u	55	< 10	68	270	62	31	38
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	0.12	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02	< 0.02	0.06	0.17	< 0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.85	0.96	< 0.02	< 0.02	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	< 0.02	< 0.02	1.2	0.84	< 0.02	< 0.02	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	1.5	1.4	0.03	< 0.02	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.73	0.44	< 0.02	< 0.02	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.54	0.48	< 0.02	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.89	1.1	< 0.02	< 0.02	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.13	0.12	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	< 0.02	< 0.02	1.2	1.8	0.03	< 0.02	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	0.07	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.71	0.49	< 0.02	< 0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	0.03	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.09	0.97	0.03	< 0.02	< 0.02
Pyrene	(mg/kg)	MCERTS	< 0.02	< 0.02	1.4	1.6	0.03	< 0.02	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	< 0.32	< 0.32	9.4	11	0.40	< 0.32	< 0.32
Asbestos	-	UKAS	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

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L19/2701/GRM/001

Project Reference - Oakamoor Lane, Cheadle

Analytical Test Results - GRM Soil Suite

NC Reference			64106
Client Sample ID			-
Client Sample Location			WS07
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			20/11/2019
Time of Sampling			Not provided
Sample Matrix			Clay
Determinant	**Units**	**Accreditation**	
Arsenic	(mg/kg)	MCERTS	22
Cadmium	(mg/kg)	MCERTS	2.5
Chromium (Total)	(mg/kg)	UKAS	18
Copper	(mg/kg)	MCERTS	210
Lead	(mg/kg)	MCERTS	420
Mercury	(mg/kg)	UKAS	< 2.5
Nickel	(mg/kg)	MCERTS	29
Selenium	(mg/kg)	u	< 8.0
Zinc	(mg/kg)	MCERTS	360
Total Phenols	(mg/kg)	MCERTS	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0
pH	pH Units	MCERTS	8.6
SOM	(%)	UKAS	7.6
Sulphate	(mg/l)	u	22
Acenaphthene	(mg/kg)	MCERTS	4.4
Acenaphthylene	(mg/kg)	UKAS	0.28
Anthracene	(mg/kg)	UKAS	9.5
Benzo (a) anthracene	(mg/kg)	MCERTS	18
Benzo (a) pyrene	(mg/kg)	MCERTS	15
Benzo (b) fluoranthene	(mg/kg)	MCERTS	19
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	7.4
Benzo (k) fluoranthene	(mg/kg)	MCERTS	7.6
Chrysene	(mg/kg)	MCERTS	16
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	1.5
Fluoranthene	(mg/kg)	MCERTS	57
Fluorene	(mg/kg)	MCERTS	4.1
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	8.2
Naphthalene	(mg/kg)	MCERTS	0.27
Phenanthrene	(mg/kg)	MCERTS	44
Pyrene	(mg/kg)	MCERTS	42
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	250
Asbestos	-	UKAS	No asbestos detected

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L19/2701/GRM/001

Project Reference - Oakamoor Lane, Cheadle

Analytical Test Results - TPH CWG

NC Reference			64094	64095	64097	64098	64099	64102	64103
Client Sample ID			-	-	-	-	-	-	-
Client Sample Location			WS01	WS02	WS03	WS04	WS04	WS05	WS05
Depth - Top (m)			0.80	0.60	0.40	0.80	1.30	0.70	1.60
Depth - Bottom (m)			0.80	0.60	0.40	0.80	1.30	0.70	1.60
Date of Sampling			20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019
Time of Sampling			Not provided	Not provided	Not provided	Not provided	Not provided	Not provided	Not provided
Sample Matrix			Sand	Sand	Sand	Sand	Clay	Sand	Sand
Determinant	**Units**	**Accreditation**							
Aliphatics									
$>C_5$ to C_6	(mg/kg)	u	< 0.03	0.04	0.06	0.53	0.04	< 0.03	< 0.03
$>C_6$ to C_8	(mg/kg)	u	0.07	0.10	0.13	0.47	0.12	0.08	0.12
$>C_8$ to C_{10}	(mg/kg)	u	< 0.03	< 0.03	< 0.03	0.42	< 0.03	< 0.03	0.32
$>C_{10}$ to C_{12}	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10	< 10
$>C_{12}$ to C_{16}	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10	< 10
$>C_{16}$ to C_{21}	(mg/kg)	u	< 10	< 10	12	< 10	< 10	< 10	< 10
$>C_{21}$ to C_{35}	(mg/kg)	u	< 10	13	35	42	16	12	34
Aromatics									
$>C_5$ to C_7	(mg/kg)	u	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
$>C_7$ to C_8	(mg/kg)	u	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
$>C_8$ to C_{10}	(mg/kg)	u	< 0.03	< 0.03	< 0.03	0.17	< 0.03	< 0.03	< 0.03
$>C_{10}$ to C_{12}	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10	< 10
$>C_{12}$ to C_{16}	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10	< 10
$>C_{16}$ to C_{21}	(mg/kg)	u	< 10	< 10	18	17	< 10	< 10	< 10
$>C_{21}$ to C_{35}	(mg/kg)	u	< 10	< 10	110	60	14	< 10	19
Total									
$>C_5$ to C_{40}	(mg/kg)	u	< 50	< 50	190	120	< 50	< 50	53

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LE1 4DH

L19/2701/GRM/001

Project Reference - Oakamoor Lane, Cheadle

Analytical Test Results - TPH CWG

NC Reference			64106
Client Sample ID			-
Client Sample Location			WS07
Depth - Top (m)			0.50
Depth - Bottom (m)			0.50
Date of Sampling			20/11/2019
Time of Sampling			Not provided
Sample Matrix			Clay
Determinant	**Units**	**Accreditation**	
Aliphatics			
$>C_5$ to C_6	(mg/kg)	u	< 0.03
$>C_6$ to C_8	(mg/kg)	u	0.07
$>C_8$ to C_{10}	(mg/kg)	u	< 0.03
$>C_{10}$ to C_{12}	(mg/kg)	u	< 10
$>C_{12}$ to C_{16}	(mg/kg)	u	< 10
$>C_{16}$ to C_{21}	(mg/kg)	u	< 10
$>C_{21}$ to C_{35}	(mg/kg)	u	41
Aromatics			
$>C_5$ to C_7	(mg/kg)	u	< 0.03
$>C_7$ to C_8	(mg/kg)	u	< 0.03
$>C_8$ to C_{10}	(mg/kg)	u	< 0.03
$>C_{10}$ to C_{12}	(mg/kg)	u	< 10
$>C_{12}$ to C_{16}	(mg/kg)	u	18
$>C_{16}$ to C_{21}	(mg/kg)	u	100
$>C_{21}$ to C_{35}	(mg/kg)	u	290
Total			
$>C_5$ to C_{40}	(mg/kg)	u	480

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L19/2701/GRM/001

Project Reference - Oakamoor Lane, Cheadle

Analytical Test Results - BRE Suite

NC Reference			64096	64100	64101	64104	64105	64107
Client Sample ID			-	-	-	-	-	-
Client Sample Location			WS02	WS04	WS04	WS05	WS06	WS07
Depth - Top (m)			1.30	1.90	2.50	2.30	0.80	1.60
Depth - Bottom (m)			1.30	1.90	2.50	2.30	0.80	1.60
Date of Sampling			20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019
Time of Sampling			Not provided	Not provided	Not provided	Not provided	Not provided	Not provided
Sample Matrix			Sand	Clay	Clay	Sand	Clay	Clay
Determinant	**Units**	**Accreditation**						
Water soluble sulphate	(mg/l)	u	16	33	59	32	16	34
pH Value	pH Units	MCERTS	7.6	7.0	7.5	7.8	8.2	8.7

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Project Reference - Oakamoor Lane, Cheadle

Sample Descriptions

NC Reference	Client Sample ID	Client Sample Location	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
64094	-	WS01	Reddish brown gravelly sand	6.4	32	51
64095	-	WS02	Reddish brown gravelly sand	11	3.1	96
64096	-	WS02	Reddish brown gravelly sand	-	-	80
64097	-	WS03	Made Ground- mottled greyish brown gravelly sand with rare brick fragments	15	37	58
64098	-	WS04	Made Ground- dark brown gravelly clayey silty sand with rare brick fragments	27	13	88
64099	-	WS04	Made Ground- mottled greyish brown gravelly silty clay with rare brick fragments	18	49	96
64100	-	WS04	Dark brown slightly sandy slightly gravelly silty clay	-	-	75
64101	-	WS04	Made Ground- dark brown slightly sandy slightly gravelly silty clay with rare brick fragments	-	-	92
64102	-	WS05	Reddish brown gravelly sand	5.2	17	93
64103	-	WS05	Made Ground- reddish brown gravelly sand with frequent brick fragments	19	63	51
64104	-	WS05	Made Ground- dark brown gravelly sand with frequent brick fragments	-	-	40
64105	-	WS06	Mottled brownish grey slightly sandy silty clay	-	-	100
64106	-	WS07	Made Ground- brownish grey slightly silty slightly gravelly sandy clay with occasional brick fragments concrete	17	21	56
64107	-	WS07	Dark brown slightly sandy slightly gravelly silty clay	-	-	77

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Project Reference - Oakamoor Lane, Cheadle

Sample Comments

NC Reference	Client Sample ID	Client Sample Location	Comments
64094	-	WS01	VPH - Sample taken from container with headspace.
64095	-	WS02	VPH - Sample taken from container with headspace.
64103	-	WS05	VPH - Sample taken from container with headspace.
64106	-	WS07	VPH - Sample taken from container with headspace.

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Project Reference - Oakamoor Lane, Cheadle

Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Soil	Metals	Air Dried	In house method statement - MS - CL - ICP metals
Soil	PAH	As Received	In house method statement - MS - CL - PAH (As received)
Soil	Phenols	As Received	In house method statement - MS - CL - Phenols by Skalar
Soil	Chromium (hexavalent)	As Received	In house method statement - MS - CL - Hexavalent Chromium by Skalar
Soil	Cyanide	As Received	In house method statement - MS - CL - Cyanide by Skalar
Soil	pH	As Received	In house method statement - MS - CL - pH in soils (using a 1:3 soil to water extraction)
Soil	SOM	Air Dried	In house method statement - MS - CL - TOC Eltra
Soil	Sulphate (w/s)	Oven Dried	In house method statement - MS - CL - Anions by Aquakem
Soil	CWG	As Received	In house method statements - MS - CL - EPH in soil and MS - CL - VPH
Soil	Asbestos	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"

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GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L19/2753/GRM/001

Your Project Reference:	**Oakamoor Road Cheadle**	Samples Received on:	28/11/2019
Your Order Number:	P9119	Testing Instruction Received:	27/11/2019
Report Issue Number:	1	Sample Tested:	28/11 to 19/12/2019
Samples Analysed:	3 water samples	Report issued:	19/12/2019

Signed

Peter Swanston
Environmental Laboratories Manager
Nicholls Colton Group

Notes:

General

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Samples were supplied by customer, results are representative of the material provided

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue 24.01.2017
Owned by Emily Blissett - Customer Services Supervisor
Authorised by James Gane - Commercial Manager
J:\Public\Projects\2019\L19\GRM - GRM Development solutions\L19-2753-GRM P9119\[L19-2753-GRM-001.XLSX]Cover Sheet

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L19/2753/GRM/001

Project Reference - Oakamoor Road Cheadle

Analytical Test Results - GRM Water Suite

NC Reference			64640	64641	64642
Client Sample ID			RBH01	WS04	Brook
Client Sample Location			RBH01	WS04	Brook
Depth (m)			1.70	1.20	-
Date of Sampling			27/11/2019	27/11/2019	27/11/2019
Time of Sampling			11:00	11:30	11:30
Sample Matrix			Water	Water	Water
Determinant	**Units**	**Accreditation**			
Arsenic (dissolved)	(µg/l)	u	< 3	< 3	< 3
Cadmium (dissolved)	(µg/l)	u	< 3	< 3	< 3
Chromium (dissolved)	(µg/l)	u	< 3	< 3	< 3
Copper (dissolved)	(µg/l)	u	2	2	5
Iron (dissolved)	(µg/l)	u	< 10	< 10	280
Lead (dissolved)	(µg/l)	u	< 5	< 5	< 5
Mercury (dissolved)	(µg/l)	u	< 1	< 1	< 1
Nickel (dissolved)	(µg/l)	u	< 3	< 3	< 3
Selenium (dissolved)	(µg/l)	u	2	< 1	< 1
Zinc (dissolved)	(µg/l)	u	< 5	< 5	< 5
Phenol (Total)	(µg/l)	u	2.24	< 0.80	< 3.20
Cyanide (Total)	(mg/l)	u	< 0.5	< 0.5	< 0.5
pH	pH Units	u	7.5	7.6	7.6
Chloride	(mg/l)	u	61	51	16
Sulphate (as SO_4)	(mg/l)	u	68	48	33
Ammonical Nitrogen (as N)	(mg/l)	u	< 0.002	< 0.002	< 0.002
Hardness (as $CaCO_3$)	(mg/l)	u	250	190	110
Benzo (a) pyrene	(µg/l)	u	0.04	0.06	0.04
Benzo (b) fluoranthene	(µg/l)	u	0.08	0.09	0.06
Benzo (g, h, i) perylene	(µg/l)	u	0.05	0.06	0.06
Benzo (k) fluoranthene	(µg/l)	u	0.05	0.06	0.04
Indeno (1, 2, 3,-cd) pyrene	(µg/l)	u	0.05	0.05	0.06
Naphthalene	(µg/l)	u	3.02	1.41	0.61

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L19/2753/GRM/001

Project Reference - Oakamoor Road Cheadle

Analytical Test Results - TPH CWG Water Samples

NC Reference			64640	64641	64642
Client Sample ID			RBH01	WS04	Brook
Client Sample Location			RBH01	WS04	Brook
Depth (m)			1.70	1.20	-
Date of Sampling			27/11/2019	27/11/2019	27/11/2019
Time of Sampling			11:00	11:30	11:30
Sample Matrix			Water	Water	Water
Determinant	**Units**	**Accreditation**			
Aliphatics					
>C_5 to C_6	(µg/l)	u	3.42	5.66	2.98
>C_6 to C_8	(µg/l)	u	13.0	11.8	4.08
>C_8 to C_{10}	(µg/l)	u	< 0.10	< 0.10	< 0.10
>C_{10} to C_{12}	(µg/l)	u	< 5.00	< 5.00	< 5.00
>C_{12} to C_{16}	(µg/l)	u	< 10.00	< 10.00	< 10.00
>C_{16} to C_{21}	(µg/l)	u	< 10.00	< 10.00	< 10.00
>C_{21} to C_{35}	(µg/l)	u	< 15.00	< 15.00	< 15.00
Aromatics					
>C_5 to C_7	(µg/l)	u	< 0.10	< 0.10	< 0.10
>C_7 to C_8	(µg/l)	u	< 0.10	< 0.10	< 0.10
>C_8 to C_{10}	(µg/l)	u	< 0.10	1.18	< 0.10
>C_{10} to C_{12}	(µg/l)	u	< 5.00	< 5.00	< 5.00
>C_{12} to C_{16}	(µg/l)	u	< 10.00	< 10.00	< 10.00
>C_{16} to C_{21}	(µg/l)	u	< 10.00	< 10.00	< 10.00
>C_{21} to C_{35}	(µg/l)	u	< 15.00	< 15.00	< 15.00
Total					
>C_5 to C_{35}	(µg/l)	u	< 30	< 30	< 30

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L19/2753/GRM/001

Project Reference - Oakamoor Road Cheadle

Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Water	Metals	As Received	In house method statement - MS - CL - ICP Waters
Water	PAH	As Received	In house method statement - MS - CL - PAH in Waters
Water	Phenols	As Received	In house method statement - MS - CL - Phenol waters by HPLC
Water	pH	As Received	BS 1377, Part 3, 1990
Water	Cyanide	As Received	In house method statement - MS - CL - Cyanide
Water	Sulphate	As Received	In house method statement - MS - CL - Anions by Aquakem
Water	Chloride	As Received	In house method statement - MS - CL - Anions by Aquakem
Water	Hardness	As Received	In house method statement - MS - CL - ICP Waters
Water	Ammonical Nitrogen	As Received	In house method statement - MS - CL - Anions by Aquakem
Water	CWG	As Received	In house method statement - MS - CL - VPH and EPH Waters

APPENDIX H

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	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Residential with Plant Uptake		
CONTAMINANT	**1%**	**2.50%**	**6%**
[a] Arsenic	37	37	37
[a] Cadmium	22	22	22
[b] Chromium III	910	910	910
[a] Chromium VI	21	21	21
[a] Lead	200	200	200
[b/c] Mercury	40	40	40
[b] Selenium	250	250	250
[b] Nickel	180	180	180
[b] Phenols	280	550	1100
[b] Copper	2400	2400	2400
[b] Zinc	3700	3700	3700
[d] Cyanide	34	34	34
[a] Benzene	0.20	0.33	0.87
[b] Toluene	130	290	660
[b] Ethylbenzene	47	110	260
[b] *o* - xylene	60	140	330
[b] *m* - xylene	59	140	320
[b] *p* - xylene	56	130	310
Non Genotoxic PAHs			
[b] Acenaphthene	210	510	1100
[b] Acenaphthylene	170	420	920
[b] Anthracene	2400	5400	11000
[b] Fluoranthene	280	560	890
[b] Fluorene	170	400	860
[b] Naphthalene	2.3	5.6	13
[b] Phenanthrene	95	220	440
[b] Pyrene	620	1200	2000
Genotoxic PAHs			
[a/e] Benzo(a)pyrene	5	5	5
ALIPHATIC HYDROCARBONS			
[b] C5-C6	42	78	160
[b] C6-C8	100	230	530
[b] C8-C10	27	65	150
[b] C10-C12	130	330	760
[b] C12-C16	1100	2400	4300
[b] C16-35	65000	92000	110000
AROMATIC HYDROCARBONS			
[b] C5-7 (benzene)	70	140	300
[b] C7-8 (toluene)	130	290	660
[b] C8-C10	34	83	190
[b] C10-C12	74	180	380
[b] C12-C16	140	330	660
[b] C16-C21	260	540	930
[b] C21-C35	1100	1500	1700

Notes

a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07

b LQM/CIEH S4UL values (2015).

c S4UL for inorganic Hg used.

d Atkins ATRISKsoil Value

e Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)

GRM TAC 11-2016

GRM Controlled Waters Tier 1 Assessment Criteria

Table 1a

UKDWS			EQS freshwater (µg/l)*	EQS other surface water (µg/l)* (Including saline waters)
Parameter	**Concentration**	**Units**		
Acrylamide	0.1	µg/l	-	
Aluminium	200	µgAl/l	-	
Ammonium	0.5	mgNH4/l	0.2 as N	0.021 unionised as N
Antimony	5	µgSb/l	-	
Arsenic	10	µgAs/l	50 (dissolved)	25 (dissolved)
Benzene	1	µg/l	10	8
Boron	1	mgB/l	750[#]	-
Bromate	10	µgBrO3/l	-	-
Cadmium	5	µgCd/l	See Table 2b	0.2
Chromium	50	µgCr/l	-	-
Chromium (III)	-	µg/l	4.7	-
Chromium (VI)	-	µg/l	3.4	0.6
Chloride (i)	250	mgCl/l	188mg/l[#]	
Conductivity (i)	2500	µS/cm at 20°C	-	
Copper(ii)	2	mg/l	1	3.76 (where DOC <1mg/l)
Cyanide	50	µgCN/l	1	1
1, 2 dichloroethane	3	µg/l	10	
Dichloromethane	-	µg/l	20	20
Epichlorohydrin	0.1	µg/l	-	
Fluoride	1.5	mgF/l	1mg/l[#]	
Hydrogen ion	10	pH value	-	
Iron	200	µgFe/l	1000 (dissolved)	1000 (dissolved)
Lead (ii)	10	µgPb/l	1.2 (dissolved & bioavailable)	1.3
Manganese	50	µgMn/l	130 (bioavailable)	-
Mercury	1	µgHg/l	0.07 (dissolved)	0.07 (dissolved)
Mineral Oil (TPH)	10	µg/l	5000 (total) ****	5000 (total) ****
Nickel (ii)	20	µgNi/l	4 (dissolved & bioavailable)	8.6
Nitrate (iii)	50	mgNO3/l	-	-
Nitrite (iii)	0.5	mgNO2/l	-	-
Phenol	0.5	µg/l	7.7	7.7
Polycyclic Aromatic Hydrocarbons (vii) *	0.1	µg/l	-	-
Fluoranthene	-	µg/l	0.0063	0.0063
Naphthalene	-	µg/l	2	2
Benzo(a)pyrene	0.01	µg/l	0.00017	0.00017
Benzo(b)fluoranthene	-	µg/l	-	-
Benzo(k)fluoranthene	-	µg/l	-	-
Benzo(g,h,i)perylene	-	µg/l	-	-
Indeno(1,2,3-cd)pyrene	-	µg/l	-	-
Anthracene	-	µg/l	0.1	0.1
Selenium	10	µgSe/l	7.5	-
Sodium	200	mgNa/l	150mg/l[#]	-
Sulphate (i)	250	mgSO4/l	188mg/l[#]	-
Tetrachloroethene and Trichloroethene (viii)	10	µg/l	10	10
Tetrachloroethane	-	µg/l	140	-
Tetrachloromethane	3	µg/l	12	12
Toluene	700***	µg/l	74	74
Xylene	500***	µg/l	30[+]	30[+]
Ethylbenzene	300***	µg/l	20**	20**
1,1,1-Trichloroethane	-	µg/l	100[+]	100[+]
Trichlorobenzenes	-	µg/l	0.4	0.4
Trichloromethane	-	µg/l	2.5	2.5
Tributyltin	-	µg/l	0.0002	0.0002
Vinyl chloride	0.5	µg/l	-	-
Carbon Tetrachloride	-	µg/l	12	12
Zinc	5000	µg/l	10.9 (dissolved & bioavailable) + background concentration	6.8 (dissolved & bioavailable) + 1.1

Table 1b

Pesticides			EQS freshwater (µg/l)*	EQS other surface water (µg/l)* (Including saline waters)
Aldrin	0.03	µg/l	-	
Dieldrin	0.03	µg/l	-	-
Heptachlor	0.03	µg/l	-	-
Heptachlor epoxide	0.03	µg/l	-	-
other pesticides	0.1	µg/l	-	-
Cyclodiene pesticides: Sum of Aldrin, Dieldrin, Endrin & Isodrin	-	µg/l	0.01 (sum)	0.005
DDT total	-		0.025	0.025
Pesticides: Total (vi)	0.5	µg/l	-	-

Table 2

EQS for Hardness Related Substances*						
Substance	**EQS Type**	**EQS (µg/l) for hardness classes (mg/l $CaCO_3$)**				
		Class 1: <40	Class 2: 40-50	Class 3: 50-100	Class 4: 100-200	Class 5: >200
Cadmium (dissolved)	Annual average	<0.08	0.08	0.09	0.15	0.25

Reference

* The Water Framework Directive (Standards and Classification) Directions (England and Wales) Directions 2015

** Provisional EQS Value

*** WHO Drinking Water Standard

**** EA PPG3

[+] The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 - Now Withdrawn

[#] Groundwater Drinking Water Protected Zones Only

Ambient Background Concentrations for dissolved zinc in freshwaters in England and Wales (to be used in conjunction with Table 1a)	
Catchment/Group of catchments (ii)	*ABC (µg/l)*
Tyne	4.8
Tees	4.1
Ouse, Humber	2.9
Nene	4.0
Great Ouse	3.1
River Stour	3.0
Blackwater/Chelmer	3.6
Lee	3.3
Thames	2.0
Test	2.0
Avon/Hants	3.1
Exe	1.4
Dart	1.7
Clywd/Conwy	2.0
Dee	2.9
Eden	1.2
Anglesey	3.0
Tamar	2.9
Fal	5.8
Camel	7.1
Tone/Parrett	3.3
Frome, Bristol Avon	2.3
Wye	2.0
Usk	2.2
Taff	2.8
Neath	2.8
Loughar	3.9
Tywi	2.0
Teifi	2.5
Rheidol/Ystwyth	4.1
Dovey	3.2
Glaslyn	2.6
All other freshwaters not listed above	1.4

Contaminant Thresholds for Subsurface Water Pipes

Contaminant	**Thresholds** (mg/kg)
Corrosion	
Wrapped Steel	pH<7 Cond >400µS/cm
Wrapped Ductile Iron	pH<5 Cond >400µS/cm, he not neutral
Copper	pH<5 >8 and Eh +ve
Toxic Substances	
Chromium (total) (Cr)	Applies to above pipe materials
Organic Contaminants	
VOC's	0.5 PE/0.125 PVC
BTEX & MTBE	0.1 PE/0.03 PVC
SVOC	2 PE/1.4 PVC
Phenols	2 PE/0.4 PVC
Cresols & Chlorinated Phenols	2 PE/0.04 PVC
Mineral Oil C11-C20	10 PE
Mineral Oil C21 - C40	500
Ether/Ketone/Amines, Nitrobenzene/Aldehydes	0.5 PE/0.02-1 PVC

Notes.

It is not recommended that water pipes should be laid in sites where these substances are identified or suspected

Local Utility Companies should be consulted prior to pipe specifications being finalised.

Ref: Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. UKWIR Ref. No. 10/WM/03/21. 2010.

APPENDIX I

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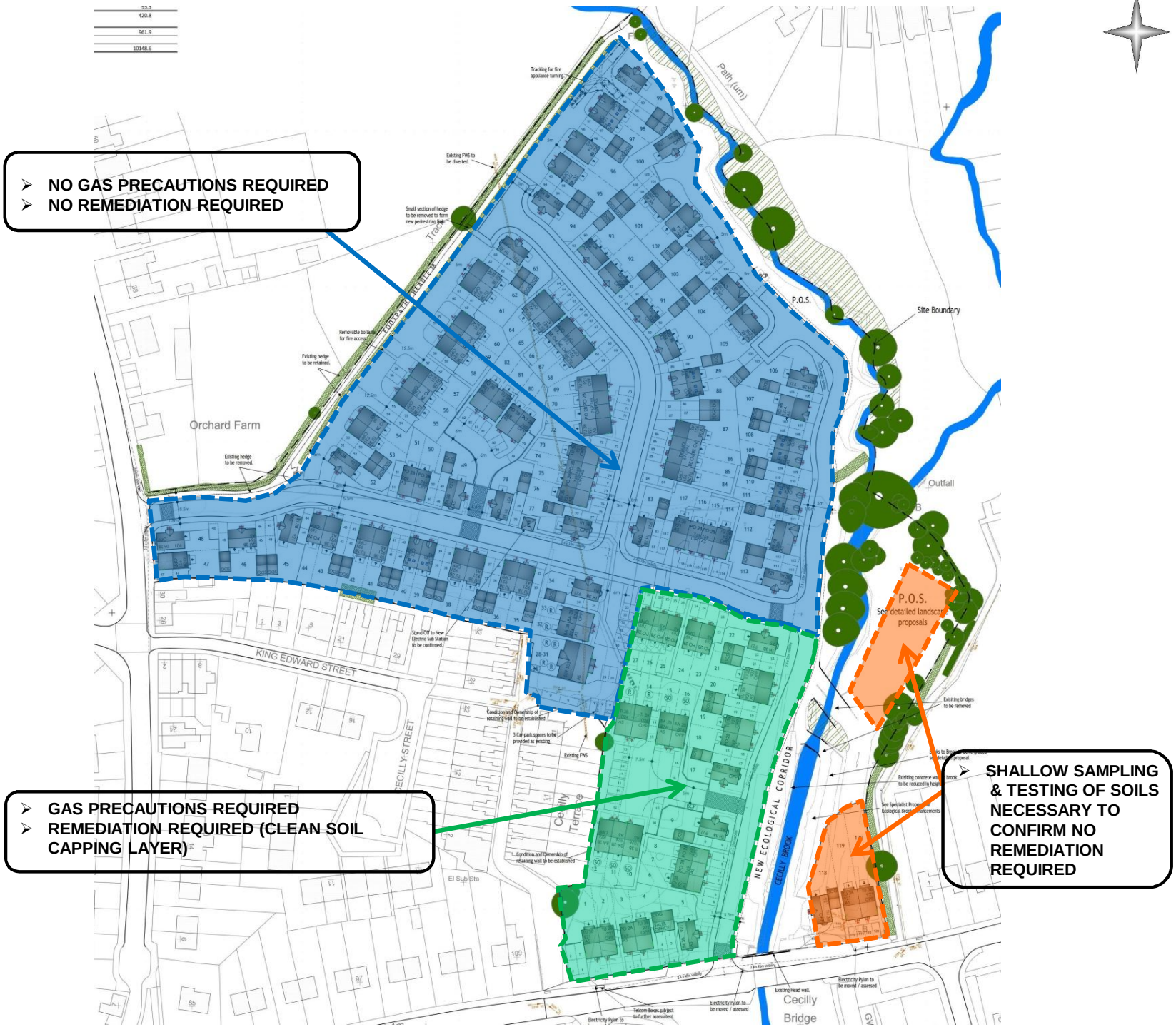

DO NOT SCALE

NOTES:

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CLIENT:
Bellway Homes West Midlands

PROJECT:
Land off Oakamoor Road, Cheadle

TITLE:
Remediation Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
RHC	Dec 2019
PROJECT No:	DRAWING No:
P9119	Figure 4

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APPENDIX J

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PHASE II CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	**Pathway**	**Receptor**	**Solution**
Southern half of site area only – Made Ground (contaminated with Lead and asbestos fibres).	Indoor and outdoor inhalation of soil dust; the ingestion of, and dermal contact with, contaminated soil and soil dust; ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users and construction workers.	Remediation required (clean soil capping layer in all garden areas).
		Construction workers.	Working method statements required to reduce risk from asbestos fibres to acceptable.
Southern half of site area only - Elevated ground gases (carbon dioxide) recorded.	Inhalation.	End users.	Gas precautions required (gas monitoring on-going).

CONTROLLED WATERS			
None.	Leaching of contaminants and vertical migration to the groundwater.	Principal Aquifer (Sherwood Sandstone Group).	No remediation required.
		Secondary A Aquifer (Alluvium / Pennine Upper Coal Measures Formation).	
None.	Leaching of contaminants and lateral migration to surface waters.	Cecilly Brook.	

CONSTRUCTION MATERIALS			
None.	Migration of contamination through leaks and joints, degradation of pipe materials.	Water supply pipes.	PE/Barrier Type water supply pipes and clean backfill required (to be confirmed by water supply company).

APPENDIX K

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Waste Classification Report

6PK2B-8A98Z-4XXES

Job name

P9119 - Oakamoor Road, Cheadle

Description/Comments

Assessment based upon chemical data from ground investigation.

Project

P9119

Site

Cheadle

Related Documents

#	Name	Description
None		

Waste Stream Template

GRM Standard Suite - incl TPH (NOT Petrol or Diesel)

Classified by

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Date:
04 Dec 2019 13:46 GMT
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Report

Created by: Charlotte Mortimer
Created date: 04 Dec 2019 13:46 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	WS01	0.8	Non Hazardous		3
2	WS02	0.6	Non Hazardous		5
3	WS03	0.4	Hazardous	HP 14	7
4	WS04	0.8	Non Hazardous		10
5	WS04[2]	1.3	Non Hazardous		13
6	WS05	0.7	Non Hazardous		15
7	WS05[2]	1.6	Non Hazardous		17
8	WS07	0.5	Non Hazardous		20

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