atkinson peck consulting engineers

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Copperleaf Ltd
Phase II Report – Site Investigation
Site at Carr Road
Buxton

CONTENTS

APPENDICES

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1.0 Purpose of Report

1.1 Copperleaf Ltd are proposing to develop the site on Carr Road, Buxton with new low rise 2/3 storey residential housing.

1.2 The adjacent land to the north of Carr Road has been remodelled in the past by Woodford Land for development by two house builders.

Discussion with representatives of Woodford Land's Consulting Engineers have been held, and the findings of this investigation are reviewed in Section 2 of this report.

1.3 A Phase I desktop study environmental report dated 3rd August 2012 has been prepared for Copperleaf Ltd by Ground Sure Screening. This report concluded: -

a) There are no potentially contaminative issues affecting the site itself.

b) Potentially contaminative historic and current land uses have been identified in proximity to the site. The principal potential current contaminative source relates to the existing garage and petrol filling station on the road adjacent to the site.

c) There are potentially vulnerable receptors, including the underlying Principal Aquifer located within the bedrock formation and lying within a Source Protection Zone 1.

d) No land fills have been identified within 250m affecting the site, but reference to historic maps indicate possible historic ground workings (lime) and unspecified heaps (filling) on the site and adjacent to the land to the north of Carr Road.

e) Soluble limestone bedrock has been identified beneath part of the site, which is considered to represent a high hazard, and it has been recommended that surface water drainage is not disposed of into the ground so as not to affect the Karst system or groundwater.

f) The site is in a radon effected area, and full radon protection measures are expected to be required.

1.4 A coal mining report has been prepared for Copperleaf Ltd dated 3rd August 2002. A copy of this report is included in Appendix A to this report. This coal mining report indicates that there are no coal mining issues affecting the site.

1.5 Accordingly a Phase II Site Investigation is recommended to investigate the site and to establish the presence of any site contaminants, in order that an assessment of any contaminative issues effecting the site can be made, and a remediation strategy developed. The investigation will also enable an assessment of the ground conditions to give recommendations for the proposed construction of the foundations for the redevelopment of the site.

1.6 This report is prepared on the instruction of Mr S Pote, Copperleaf Ltd.

2.0 Review of Recent Site History & Investigation

2.1 Drawings extracts from Woodford Land's Completion Report dated January 2004 are included in Appendix B to this report. These drawings present details of: -

a) Geophysical conductivity and magnetometer measurements of rock head to investigation solution voids in the bedrock (drawings W314/03 and 04).

b) Solid geology showing transition between limestone and shale (drawing W314/12).

c) Mining and solution features and investigation results of the solution features (drawings W314/39 and 42).

2.2 Further drawings included in Appendix B have also been received from Woodford Land comparing the original topographic survey contour in 1993 with the 2002 remediation contours following remodelling of the site, and the current ground levels in 2010. Site sections comparing the three contours are also included.

2.3 The above information has been reviewed, and a meeting held with Mr D Rix, WSP Remediation, Woodford Land's Consulting Engineers. A summary of this review is set out below: -

a) The original ground contours were not considered suitable for the original development, so Woodford Land stripped the ground to bedrock, 1-2m down and remodelled the site contours to the 2002 levels.

b) Associated with this relevelling and remodelling of the site, the site area now proposed for development, and the subject of this report were raised, and a stone faced 'porcupine type' retaining wall constructed around the protected trees in the centre of the site to support the filling and Carr Road.

c) The main site to the north of Carr Road was subsequently developed by two house builders, Miller Homes and Gleeson Homes. The latter developing the western portion of the site. Gleeson Homes also placed further material on the western portion of the site subject to this report as can be seen from the site section drawings. Little change from the 2002 remediated levels has occurred to the eastern portion of the site between Leek Road and the protected trees.

d) Woodford Land were also concerned regarding possible solution features effecting the bedrock, and possible past mining activity across the site. The Rushy Gutter noted on the geology maps being an unexplained feature. The geophysical conductive and magnetic surveys were conditioned, and the colour significance of these surveys is thus : -

Increasing Significance & Voids

Green
Yellow
Orange
Red
Purple

Interpretation of these surveys shows: -

i) Clear service routes identified for the existing foul and surface water public sewers crossing the site (and which have subsequently been rerouted along Carr Road).

ii) Clear service route for a 150mm cast iron water main which crossed the site (and has subsequently been diverted).

iii) The sinkhole feature in the adjacent field to the south of the site boundary of the site which is the subject of this report can be clearly seen.

iv) Other isolated surface features were noted across the main site, in particular an area described on the drawings as Feature 1.

v) No potential problems were noted in relation to the Rushy Gutter feature.

e) The features notes in iv) above were further investigated by probe drilling, and no significant voids were generally established.

f) The area designated Feature 1 was considered to be a deep sinkhole feature. As a precaution two layers of geogrid were placed just above rockhead and the area was retained as a public open space.

g) No grouting works were undertaken.

h) As the ground had been remodelled and filled, raft foundations were adopted for the houses. This foundation solution was also considered appropriate to deal with any possible bedrock features.

2.4 In relation to the development of the site which is the subject of this report, WSP remediation have also set out a foundation strategy proposal which has been discussed and agreed with the NHBC.

These proposals are included in the correspondence attached in Appendix C to this report. These confirm that foundations based on a semi-raft foundation designed on the basis of imposing a nett bearing pressure onto the ground of up to 50kN/m^2 would be acceptable to both NHBC Building Control and NHBC Warranty. The letters also confirm that the raft foundation proposals would also be suitable to deal with geotechnical aspects of the site, including the potential for any solution features, and depth and variation of filling materials.

3.0 Limitations of Study

3.1 When investigating or developing potentially contaminated land it is important to recognise that sub surface conditions may vary across the site and also over time. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of the study are our best interpretation of the data collected, within the scope of the work and agreed budget.

3.2 This investigation report is based upon the information gained at each borehole position and does not imply continuity of conditions between investigation locations. New information, revised practices or changes in legislation may necessitate the reinterpretation of this report, in whole or part. If differing conditions are encountered at intermediate positions, we would be pleased to provide further advice as required.

4.0 Site Investigation

4.1 The site comprises a linear site to the south of Carr Road, Buxton, with the site sloping steeply to the west following the gradient of the road. The site comprises three distinct zones: -

Area A

a) An eastern portion between Leek Road and an open feature of protected trees. This eastern portion has been raised up slightly and possesses a steeply sloping bank to the south boundary.

Area B

b) A central lower portion of ground with protected trees. The ground levels here corresponds to original ground level. The surrounding fill and Carr Road are supported with a stone faced 'porcupine type' retaining wall.

Area C

c) A western slightly narrower portion which has been filled as part of the remodelling carried out in 2002 and subsequently raised by a further amount. The ground level of this portion of the site is now significantly above the road level of Carr Road.

The site is covered with natural poor quality low grasses and natural vegetation, indicative of a thin/poor topsoil layer.

There is a public footpath which has been rerouted along the southern boundary, and is separated from the site with a post and wire fence. This footpath is signed "Ring of Trees – Buxton Civic Association" but the official status of the footpath is unknown.

The sinkhole feature in the adjacent field is clearly visible.

The existing public sewer manholes associated with the rerouting of the public sewer are clearly visible within the Leek Road/Carr Road corner of the eastern portion of the site.

4.2 The site investigation is proposed to investigate: -

a) The condition of the fill materials and the succession of filling.

b) The depth of bedrock.

c) Groundwater.

d) Visual evidence of any contamination, and the recovery of soil samples for contamination testing.

Owing to the potential for the fill materials to include boulders, concrete or other obstructions, an investigation utilising trial pitting techniques was considered to be the most appropriate investigation technique.

4.3 5 No. trial holes were excavated by Copperleaf Ltd using a JCB tracked backhoe excavator on 20th November 2012, under the supervision of Mr A J Peck of this practice.

The trial holes were excavated in the positions shown on the site investigation plan included in Appendix D to this report. The trial hole positions were based on the site layout plan for the development, and were positioned to allow assessment of the two separate eastern and western portions of the site. The trial holes to the latter portion were also positioned to position them within the potential back gardens to the development, in order that contaminative sampling would be able to compare contaminative levels with 'residential with plant uptake' usage.

Sampling was also taken at surface and mid depth (0.3m deep and 1.0m deep) levels to the eastern area to allow for any potential regrading or lowering of the site in this area. Where the ground levels have been more significantly raised to the western portion of the site sampling was taken at surface, mid depth and deeper levels (0.3m, 1.0m and 2.0m depth) to allow for any potential regrading or lowering of the site to this area.

4.4 Logs for the trial holes were as follows: -

4.5 <u>Trial Hole 1</u>

0-300mm	Thin very stony and clay TOPSOIL
300-800mm	Compact brown stony and clay FILL with fragments of stone and old pipe
800-2700mm	Compact brown sandy clay FILL with stone fragments up to 300mm size.
2700mm	LIMESTONE bedrock

No water encountered.

4.6 Trial Hole 2

0-300mm	Thin very stony clayey topsoil layer over compact very stony clay FILL
300-3300mm	Compact brown very stone sandy clay FILL with fragments of stone up to 300mm.
3300mm	Compact yellow very sandy CLAY (probably natural ground).

No ground water encountered.

4.5 Trial Hole 3

0-600mm	Very thin stony clay topsoil layer over compact brown very stony clay FILL with broken kerbstones and stone fragments, small amount of wire and occasional small pieces of wood.
600mm	Large pieces of tarmac remains and concrete slab 2m x 1.2m x 200m thick
600-2600mm	Compact firm to still brown/grey sandy stony clay FILL (original 2002 clay fill) with more concrete blocks.
2600mm-3400mm	Grey firm to stiff CLAY (probably nature ground).

Slight water ingress of surface water at 1.0m depth. Slight odours of hydrocarbons where old bitumen/tarmac exposed at 0.6m depth.

4.6 Trial Hole 4

0mm	No significant topsoil layer
0-900mm	Brown very stony moderately compact clay FILL with stone fragments and concrete blocks, including occasional small pieces of timber and plastic
900-1000mm	Brown extremely gravelly moderately compact clay FILL with bitumen and tarmac arisings from road constructions.
1000-2200mm	Lighter brown compact very stony clay FILL with stone and brick fragments. Becoming slightly greyer and slightly organic in colour at 2.2m depth
2200-2700mm	Compact brown very stony and sandy clay FILL with fragments of shale.

No ground water encountered.

4.7 Trial Hole 5

0mm	No significant topsoil layer.
0-1000m	Compact brown very stony clay FILL with fragments of stone and blocks and small pieces of timber. Concrete block obstruction at 450mm.
1000-1100mm	Further large concrete block and tarmac and road surfacing arisings FILL.
1100-2700mm	Compact lighter brown clay FILL (probably original clay fill placed in 2002).
2700-3200mm	Yellow/brown firm very stony CLAY becoming very sandy and gravelly.
3200mm	Fragmented SHALE bedrock.

No ground water encountered.

5.0 Soil & Contamination Testing

5.1 Soil samples were recovered from the trial holes for laboratory testing for soil parameters and contamination in accordance with the scope previously set out.

5.2 The results of this testing are included in Appendix E to this report, together with our Chemical Analysis Summary Sheets, with the results being compared against relevant guidelines, including the Environment Agency CLEA model (for industrial/commercial use) and LQM CIEH general assessment criteria for human health risk assessment.

5.3 From the chemical analysis summary sheets it can be seen that the ground has been established to not exceed the relevant tier 1 human health screening criteria for a residential development end use with plant uptake, except for measurements of Benzo(a)Pyrene established at depths of 2.2m and 1.1m in trial holes 4 and 5 respectively (to the western portion of the site) where readings are at or very slight exceed the relevant criteria.

These readings are considered to relate to road and tarmac materials encountered generally within the trial holes to the western area. The material at depth in trial hole 5 is not considered to represent any risk, as the pathway to effect human receptors or topsoil at surface level is considered unlikely.

In relation to trial holes 3 and 4 where road materials are present at a shallower depth, we would recommend that if the ground is to be lowered these road materials should be excavated as part of the lowering process. However if these road materials are to be left in tact within the ground, we would recommend that clean imported topsoil and subsoil including a capillary break layer should be incorporated to Area C – the western portion of this site.

6.0 Conclusions and Recommendations

6.1 The site has confirmed a succession of clay fill materials which exist in a compact state. We would therefore concur with the agreement previously made by Woodford Land's Consulting Engineers WSP Remediation with the NHBC (included in correspondence in Appendix C to this report) that the foundations should comprise a semi raft foundation designed on the basis of imposing a net bearing pressure onto the ground of up to 50kN/m^2.

6.2 Having reviewed the previous investigations we would also concur with Wooford Land's Consulting Engineers WSP Remediation, and as agreed with the NHBC (in correspondence included with Appendix C to this report) that this semi raft foundation will also be suitable to include for the potential for any solution features within the bedrock, and any depth or variation of the fill materials.

6.3 Based on a visual examination of the clay fill, which is extremely stony and gravelly clay material, we consider that the clay fill will have a low/medium shrinkage potential, and we would recommend that this is adopted in respect to the design of foundations in relation to existing and future trees.

6.4 The contamination testing has established that the level of contaminants is within the relevant tier 1 human health screening criteria for residential development end use with plant uptake, except for measurements of Benzo(a)Pyrene which is considered to relate to road and tarmac materials which were visually noted within a layer at varyring levels within trial holes 3-5.

As a remediation strategy we would recommend that if the ground levels are to be lowered in this area this material should be excavated as part of the ground lowering works, and removed off site. Following removal of this potential source no further action is considered necessary. However if this layer of road materials is to be left in tact within the ground we would recommend as a remediation strategy that a 600mm layer of clean imported topsoil and sub soil, including a capillary break layer is incorporated to Area C (the western portion of the site) to break the source-receptor pathway.

6.5 As given by the Phase 1 Desktop Study full radon protection measures should be incorporated to the houses.

6.6 During groundworks operations on site, should any visual or olfactory evidence of any contaminated material become apparent then further investigations should be carried out and appropriate measures undertaken.

6.7 Appropriate certification of imported materials including subsoil/topsoil should be carried out, including site photos. All exported materials should go to suitably licensed waste facilities, with records kept as part of the validation process.

6.8 This report is confined to the matters mentioned in Section 1 and no opinion is expressed or implied on matters not specifically mentioned.

A.J. PECK
B.Sc.,C.Eng.,F.I.Struct.E.,M.I.C.E.

APPENDICES

Appendix A – Coal Mining Report

Appendix B – Extracts for Woodford Land Completion Report January 2004 and Woodford Drawings

Appendix C – Correspondence with NHBC

Appendix D – Site Investigation Plan

Appendix E – Laboratory & Test Results

Appendix A
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Coal Mining Report

Issued by:
The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0845 762 6848 DX 716176 MANSFIELD 5

PROPERTY SEARCH GROUP
159 OLDHAM ROAD
ASHTON-UNDER-LYNE
LANCASHIRE
OL7 9AR

Our reference:	**51000124708001**
Your reference:	**TC/INNOVATION**
Date of your enquiry:	**03 August 2012**
Date we received your enquiry:	**03 August 2012**
Date of issue:	**03 August 2012**

This report is for the property described in the address below and the attached plan.

Non-Residential Coal Authority Mining Report

LAND ADJACENT TO, 1, CARR ROAD, BUXTON, DERBYSHIRE, SK17 6WF

This report is based on and limited to the records held by, the Coal Authority, and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Coal mining	See comments below
Brine Compensation District	No

Information from the Coal Authority

Underground coal mining

Past

According to the records in our possession, the property is not within the zone of likely physical influence on the surface from past underground workings.

Present

The property is not in the likely zone of influence of any present underground coal workings.

Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is not in an area for which a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area that is likely to be affected at the surface from any planned future workings.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

Coal mining geology

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

Opencast coal mining

Past

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

Present

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Future

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

Withdrawal of support

The property is not in an area for which a notice of entitlement to withdraw support has been published.

The property is not in an area for which a notice has been given under section 41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working facilities orders

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to owners of former copyhold land

The property is not in an area for which a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Information from the Cheshire Brine Subsidence Compensation Board

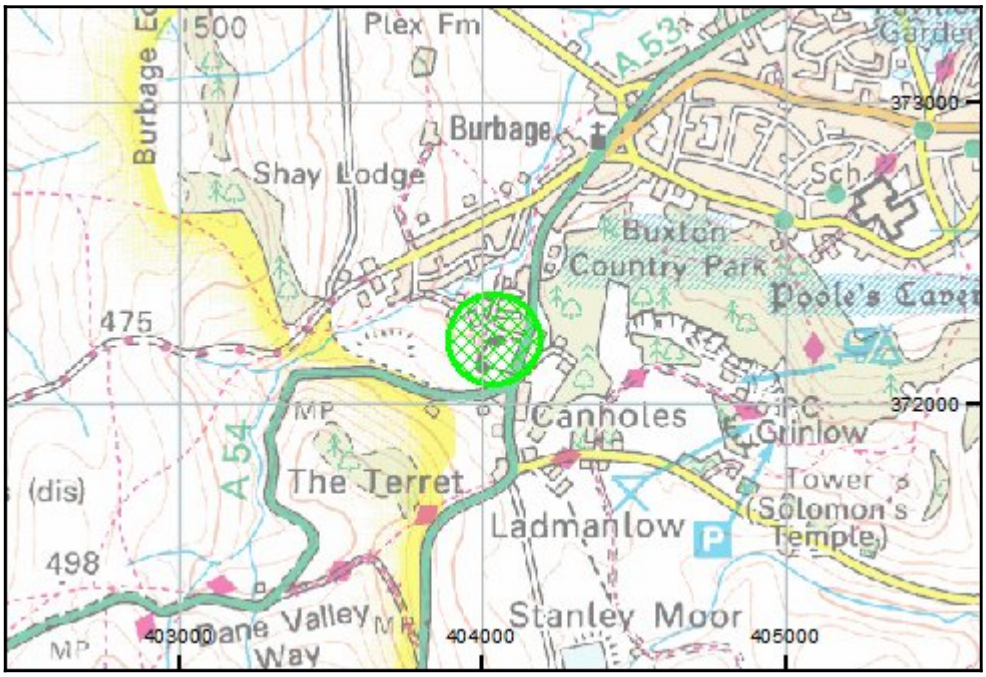
The property lies outside the Cheshire Brine Compensation District.

Additional Remarks

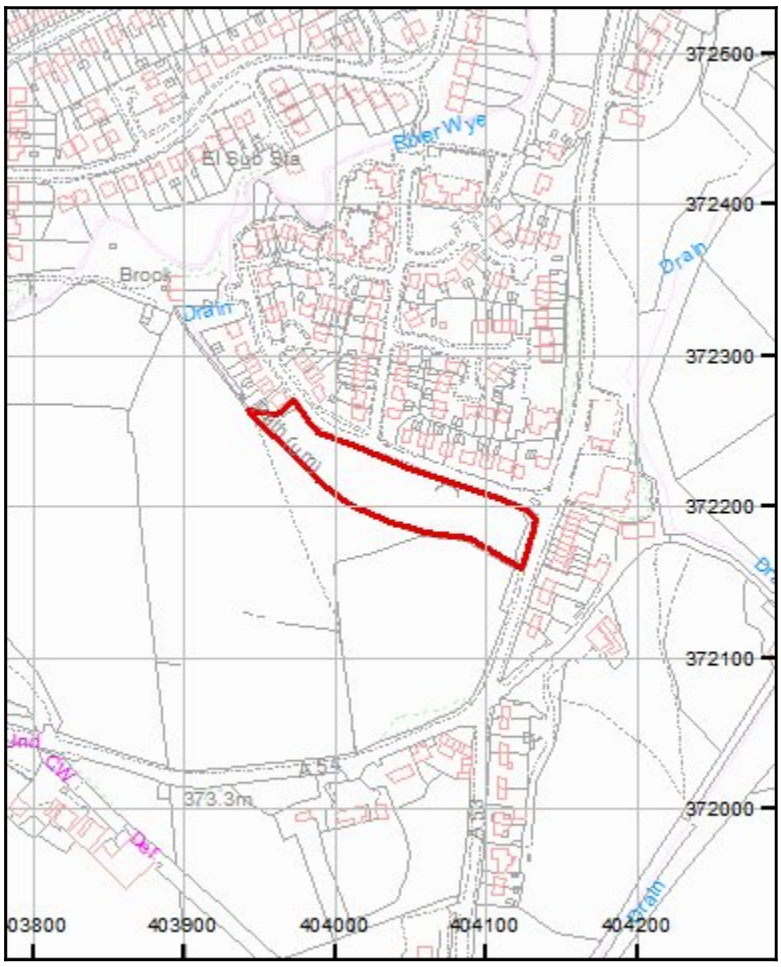
This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006.

Location map

Approximate position of property



Enquiry boundary



Key

Approximate position of enquiry boundary shown

Mapping sourced from Ordnance Survey