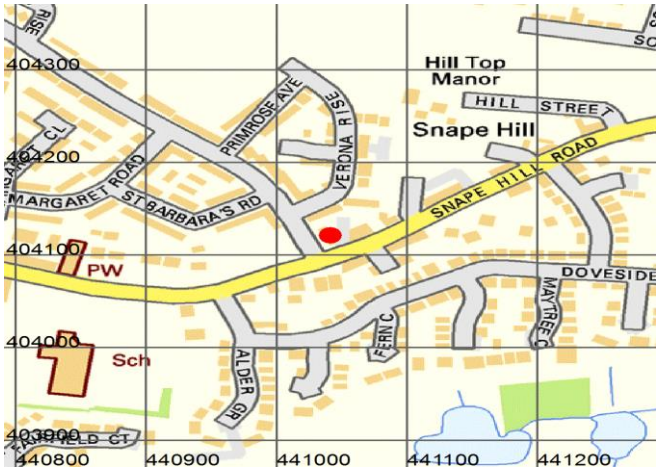
GROUND STABILITY REPORT & MINING RISK ASSESSMENT AT PROPOSED DEVLOPMENT SITE, UPPERWOOD ROAD DARFIELD, BARNSLEY, SOUTH YORKSHIRE, S73 9QR

REPORT ref: TH/RA/FORD/001 – 15th April 2015

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(i) TERMS OF REFERENCE

In April 2015, on the instructions of Mr Robert Agus (White Agus Partnership), acting on behalf of the client (Ford Properties Ltd), a pre-planning *Mining Risk Assessment* and *Ground Stability Appraisal* was requested on the proposed development site at 1 Upperwood Road, Darfield, Barnsley, S73 9QR.



The development proposals consist of a new build detached single storey retail unit (245m²), and a separate new build two storey mini-supermarket (249m²) with five residential apartments above, with associated access road, customer parking, and hard landscaping. The Local Planning Authority required further information regarding the suitability of the site for the construction of the proposed development, and further details of the history of the site by way of a mining risk assessment regarding past Coal Mining use/influence, ground stability and Radon protective measures. There are three recognised key stages to making an assessment of this type;

- Obtain detailed ground stability and coal mining information for the proposed development site.
- Identify what risk, if any, is present from ground instability, coal mining and/or the presence of Radon.
- Identify how ground instability, coal mining issues or Radon might influence the development, its design layout etc., and describe any mitigation required.

(ii) THE PARTIES

Property	1 Upperwood Road, Barnsley, S73 9QR
Client/Owner	Ford Properties Ltd
Architect/Designers	White Agus Partnership Contact: Mr Robert Agus E: info@whiteaguspartnership.co.uk T: 01226 208482
Geological Consultants	Earth-Tech Consulting Ltd Contact: Mr Tim Hyett E: timhyett@hotmail.co.uk T: 07790 581478

(iii) THE SITE

The site is located at the corner of Snape Hill Road and Upperwood Road in the district of Darfield in Barnsley. It is generally a level site with defined boundaries, and consists mainly of rubble fill, hard-core, tarmacadam surfacing, old concrete slabs/bases, and compacted hardstanding. It can be summarised as being general waste ground, and there is evidence of previous use and demolition in the past.

The proposed new build development works are described in the Planning Application being prepared by architects *White Agus Partnership*, to be submitted in accordance with the Town and Country Planning Act, 1990 and generally are as detailed on drawing No. 14-104 (02). A copy of the drawing is attached at Appendix A.

(iv) AVAILABLE INFORMATION

The following information was made available during the course of this appraisal;

a. Copies of the site plan & schematic showing the general site location and the proposed development of two commercial structures (Dwng No.14-104/02).
b. An Ordinance Drawing depicting the site and its environs.
c. Access to the site to carry out a walk over survey.

(v) TOPOGRAPHY & NEAR SURFACE GEOLOGY

The site was inspected and surveyed on 15th April 2015 by Mr T. M. Hyett M.Sc MCIOB MIEI (of Earth-Tech Consulting Ltd) - a Chartered Building Engineer and Consultant Engineering Geologist.

The site is presently unfenced, and is open to the public. There is evidence of sparse vegetation around the perimeter, and the main site has a general covering of rubble and hardstanding and there are no established trees or vegetation that might affect the proposals.



Fig 1 – Upperwood Rd site as viewed from east boundary looking (W) showing central HV pylon

There is a large overhead HV electricity pylon to the east and slightly south of the centre of the site. The overall site area is approximately 0.48a (c.2000m²) and is situated within an established residential area with road frontage to the south and east.

It is clear that the site has had a previous commercial and/or residential use (thought to have been a working men's club) and that old brick/stone buildings have now been demolished, with most of the waste removed leaving hardstanding and concrete bases.



Fig 2 – Upperwood Rd site as viewed from within the site looking (SE)



Fig 3 – Upperwood Rd site as viewed from within the site looking (E)

The purpose of the walkover survey was to generally identify the undisturbed near surface geology; comment on the general bearing capacity of the soils to be expected at foundation depth, and advise on the suitability of the ground generally for the construction of the proposed new development. From the limited observations, and from consulting *Geological Map Extracts* from the *British Geological Survey* (BGS), the general geology to be expected to be as follows :

"*MADE GROUND: grey clayey gravelly slightly organic fine to coarse SAND with some gravels. Gravel is angular to sub-rounded fine to coarse sandstone, occasional brick, ceramic, clinker*." (ARTIFICIAL DEPOSIT) overlying *"Firm to Stiff slightly sandy, silty, slightly gravelly CLAY. Gravel is angular tabular fine to medium mudstone litho-relics."* (ALLUVIUM / GLACIOFLUVIAL DEPOSITS) overlying "*Weathered, moderately strong Mudstone, Siltstone and Sandstone*" (PENNINE MIDDLE COAL MEASURES FORMATION).

Groundwater was not observable within the site or in any locations surrounding the site, but it can be assumed with some reliability that ground water level is below the zone of influence of the proposed foundations. From nominal past excavations still visible on the site there is no evidence of a perched water table and/or artesian pressure within the soil at shallow depth.

Vegetation on the site is sparse, and what does exist is focussed around the perimeter. There is a small amount of shrubbery around the northern boundary, where the site

meets gardens of residential houses, all of which is situated a more than adequate distance from the proposed works to be wholly unaffected, or to influence the structural integrity of the proposed building(s). Evidence suggests a mixed soil type with the primary soil type in the overall matrix comprising mainly sandy, gravelly COHESIVE SOILS overlying BEDROCK of the *Pennine Middle Coal Measures* formation. No problems are envisaged with swelling or shrinkage of soil due to the movement of groundwater and the propagation of trees, vegetation, flora and fauna.

Groundwater, whilst not observed, if present at deeper elevations can reliably be estimated from empirical data to be in the region of between pH 5.5 – 7.0 representing a *low risk* in terms of acidic ground and potential sulphate attack on existing concrete and cement mortars (if any risk at all).

The topography of the site is generally flat and there is no evidence of unstable slopes, subsidence, compressible soils, swelling soils or weak soils in the immediate proximity of the proposed development. No evidence was found on the site to suggest the site had any form of previous agricultural or industrial use that might give rise to the presence of contaminants in any concentrations. There were no visual indicators of the presence of, or high concentrations of *oils, lubricants, sulphates, asbestos (chrysotile, amosite, tremolite, actinolite or ferroactinolite), radon gas, methane, high concentrations of carbon monoxide, hydrogen sulphide* or *carbon dioxide*, and in my opinion there is no requirement to further investigate the site for contamination or contaminated soils.

A copy of the BGS Geo-Report: *Geological Map Extracts* (Report No. GR-211050/3) is attached at Appendix B.

PART 1 GROUND STABILITY & COAL MINING

1.1 BRITISH GEOLOGICAL SURVEY (BGS) - NATURAL GROUND STABILITY

A BGS Geo-Report was also commissioned to consider if there are any natural geological hazards (other than coal mining) in the vicinity of the site that could be contributing to ground instability in the area. The BGS Geo-Report: *Natural Ground Stability* (Report No. GR-211050/2) is attached at Appendix C.

The BGS report confirms on page 5 that;

Significant natural ground instability is possible in the area. On a scale of A to E (low to high) the level of hazard on the project site is C. There are natural geological hazards in the vicinity of the project site that might contribute to ground instability, and weak or unstable rocks could slip downhill on steep slopes. Very soft ground might compress and progressively sink under the weight of the building.

What does this mean?

This means that the project site is situated in a location where there is potential ground instability that may cause some properties to suffer subsidence damage.

It does not necessarily mean that the proposed buildings on the site will be unduly affected by subsidence, or indeed that the enclosed site itself is in any way affected by unstable soils or slopes - it is just that such conditions are known to exist in the general area around Upperwood Road and Snape Hill.

What it does mean for the proposals however, is that the site must be properly investigated post-planning, and suitable building foundations properly designed to take into account the critical geology prevalent across the site. A correctly designed foundation detail will mitigate and/or eliminate any potential risk of unstable soils, should they be found during the course of construction.

In particular, the site investigation should check for *plasticity of soils* (PI), and some consideration should be given to the *stability of excavations*, *surcharge loading* and *water content* changes during and after construction. The site investigation should also consider the potential for *dissolution problems*, and the potential for settlement during construction due to *compressible soils*. In addition, there exists a potential hazard for geological deposits collapsing when loaded and saturated. If *collapsible* (loessic) deposits are encountered, it is important that the building foundation loads do not exceed the *safe bearing capacity* of the soils during or after construction. An example of a typical foundation analysis is shown below;

Typical Soil Parameters (taken from the BGS Geo-Reports - to be confirmed from Site Investigation laboratory testing)

Bulk Density	1900 Kg/m³
Unit Weight (γ)	18.6 Kn/m³
Angle of Internal friction (∞)	35°
Cohesion	0 Kn/m² (taking the soil as entirely cohesionless)

Bearing Capacity Factors (Shallow Foundations) - (BS 8004: 1986)
Nc - 47
Nq - 35
Nγ - 40
Approximate Foundation width B – 0.6m
Approximate Foundation depth D – 0.5m
Approximation / Check on Bearing Capacity (after Terzaghi *et al*)
$qf = 0.5\gamma BN\gamma + cNc + \gamma DNq$
$qf = 0.5x18.6x0.6x40 + 0x47 + 18.6x0.5x35$
qf = 548.7Kn/m²

>> than the proposed loading for a typical two storey, detached commercial building c. 245m², and acceptable for conventional strip footings in buildings for conventional domestic usage – therefore O.K [*note – *the analysis should be repeated using accurate parameters determined by site investigation*].

1.2 THE COAL AUTHORITY – NON-RESIDENTIAL COAL MINING REPORT

A *Non-Residential Coal Mining Report* was commissioned from the Coal Authority to consider if the property is within an area that is in the likely zone of influence from past mine workings. The Report confirms the site is within the likely zone of influence from workings in 10 seams of coal at 170m to 660m, last worked in 1988. Any ground movement from these coal seams should have stopped now.

The site is in an area where the Coal Authority believes there is coal at or close to the surface. This coal may have been worked at some time in the past.

The Report also confirms that;

There is 1 mine entry within the site boundary, and this is shown on a plan provided and is recorded as being referenced as shaft No. 440404-004.

In addition, The Coal Authority has received 2 damage notices or claims for property within 50m of the site boundary, notably immediately adjacent and to the West of the site at *Ashgale*, separated from the site by *Low Valley View*. [*note - *this may influence the proposed new build detached single storey retail unit (245m²), however only in respect of foundation design (i.e. a piled raft)*].

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the site, and the property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

The Coal Authority Report – *Non-Residential Coal Authority Mining Report* (No. 51000843525001) is enclosed in Appendix D.

What does this mean?

For the purposes of the LA Planning Application, this is not necessarily indicative of any potential problems associated with the feasibility of the proposed development. From the walk-over topographical survey of the site carried out on the 15th April 2015, in my opinion it is unlikely that there are any historic buried, shallow mine workings or adits present that could affect the proposed development.

The records of the presence of a **mine entry**, however, is of greater concern and although the records indicate this may be present, there is no physical evidence of the entry at the surface on the site, suggesting it has been capped and/or filled at some time in the distant past. Equally, the site has previously been developed after its previous use and post-coal mining activity (i.e. as a working men's club) which was situated in the immediate vicinity of the proposed new build two storey mini-supermarket (249m²), the design of which has been specifically planned/arranged so as to over-lay the previous building's foundation footprint.

The mine entry (shaft No. 440404-004**)** as shown on the Coal Authority Drawing is closer to the proposed new build detached single storey retail unit (245m²), however at this location there is also a major HV pylon shown close to the historic mine entry, that has suffered no subsidence or ground movement whatsoever. Nonetheless, it necessary to search further information on the mine entry identified, and in particular determine the precise location so that it can be marked accurately on site.

1.3 THE COAL AUTHORITY – SHAFT PLAN (MINE ENTRY) & DATA SHEETS

An additional Coal Authority *Shaft Plan and Data Sheets* Report was commissioned from the Coal Authority to search for more accurate information on the mine entry (shaft No. 440404-004**)** as shown on the Coal Authority Drawing contained in the *Non-Residential Coal Authority Mining Report* (No. 51000843525001).

Unfortunately, this provided very little further information regarding the mine entry/shaft. This is not particularly uncommon for old, historic mine workings in the general area, and no information could be provided regarding the *colliery name, date it was abandoned, depth of superficial deposits, depth of the shaft, diameter of the shaft*, or any details as to the treatment of the mine entry i.e. whether it was backfilled, capped or treated by some other means.

However, the data sheet report does provide coordinates for the exact position of the shaft, which is recorded as E440973 and N404109.

The Coal Authority Report – *Shaft Plan and Data Sheets* (No. 51000839589001) is enclosed in Appendix E.

What does this mean?

For the purposes of LA Planning Application, this means the mine entry (shaft No. 440404-004**)** can be reasonably positioned at coordinates E440973 and N404109.

It is not normally possible for a developer to undertake any exploratory works in such a location to "prove" the existence of the mine entry (shaft No. 440404-004**)** as this would require the express permission of the owner i.e. The Coal Authority. It is generally not supported for a private developer/buider to be allowed to disturb, expose, enter or interfere with any disused mine entry without the permission of the owner, and where this is absolutely necessary, a special Coal Authority license is required.

In situations of this nature, it is usual practice for the developer to carry out specific borehole probe-drilling (to bedrock) in the location of his proposed buildings on the site, ideally on each corner of the two buildings and at the centre (for buildings of <350m²), to check the underlying strata for buried mine adits, surface workings, cavities and mine entries etc., thus reinforcing the reliability of the coordinates E440973 and N404109, and demonstrating that the mine entry does not encroach the development. It is usually acceptable for this to be cited as a condition of the planning approval, and carried out post-planning.

1.4 BRITISH GEOLOGICAL SURVEY (BGS) – RADON (ENGLAND & WALES)

A BGS Geo-Report – *Radon Report: England and Wales* was commissioned to consider the general ground conditions in the vicinity of the site and check whether the site is in a radon effected area and whether Radon protective measures are required for the new buildings.

The Report confirms that;

No Radon measures are required for the report area and the new buildings at the Upperwood Road development site

And,

The site is not located in a Radon affected area, with the estimated probability of the proposed property being above the Action Level for Radon being 0%-1% - Lower Probability

What does this mean?

This means that the project site is situated in a location where there is a negligible probability that Radon gas above actionable level will level be encountered, and no protective measures (such as *Radon barriers* etc.) will need to be incorporated into the design of the new buildings.

The BGS Geo-Report: *Radon Report: England and Wales* (Report No. GR-211050/1) is attached at Appendix F.

PART 2 RISK TO THE PROPOSED DEVELOPMENT & MITIGATION MEASURES

2.1 RECOMMENDATIONS

An historic mine entry (No. 440404-004) has been identified on the site, within the existing site boundary at co-ordinates. Built development should not generally take place within 20m of this position, however, the proposed structures have been designed and laid-out so as to be positioned an adequate distance from the feature.

In addition, the proposed mini-supermarket has been designed so as to take up a similar footprint to the former working men's club that occupied the site, and in the proximity of the smaller, detached retail unit, there is also a large HV pylon with substantial bases close to the supposed mine entry. The following mitigation measures are therefore recommended;

a. Position and mark-out the mine entry at E440973 and N404109 and fence-off an area 10m x 10m in this location during construction.

b. Carryout a program of probe-drilling to bedrock at the corner and centre of each of the proposed buildings on the site, and record the findings. [*note – the drilling should be supervised by a qualified geologist/engineering geologist, and at least 1 rotary core borehole should be drilled and recorded, with appropriate laboratory testing to enable the design of the foundations of the buildings. Soil classification and description should be to BS 5930, and soil sampling and laboratory testing as deemed appropriate.

c. Carryout a program of trial-hole excavations (min 4No.) across the whole site to identify/confirm near surface geology and further prove the potential for any near surface mine adits/features. Where required, extend the program of probe drilling to eliminate the potential for mine features.

d. In the event that any buried mine features are encountered, and/or the mine entry (No. 440404-004) is found to be in a different location, the site layout will need to be altered accordingly. This may require a re-submission of the detailed planning proposals to the Local Authority in accordance with the *Town and Country Planning Act, 1990*.

PART 3 INFLUENCE ON THE PROPOSED DEVELOPMENT

3.1 CONCLUSIONS

Notwithstanding the aforesaid, from my inspection of the site at 1 Upperwood Road, Barnsley, and from detailed consultation with information held by the Coal Authority and the British Geological Survey, I can confirm to Barnsley District Council Planning Authority (and any other third party), that the geological conditions on the site are adequate for carrying out the proposed development works as described on Drawing Number Ref: 14-104 Rev 02 produced by the architects *White Agus Partnership* subject to the provision of further detailed site investigation, mitigation measures to be adopted during construction, and additional foundation design as detailed above.

This report has been commissioned by and written for and on behalf of the Client in support of applications and submissions to the Local Authority and to other bodies at the Client's discretion only. It may not be used for any other purpose.

3.2 TESTIMONY OF INDEPENDENCE

I am a professionally qualified Chartered Building Engineer and Consultant Engineering Geologist. I am a Fellow of The Geological Society (FGS), Member of the Institute of Engineers Ireland (MIEI); Member of the Chartered Institute of Building (MCIOB) and a Member the British Tunnelling a Society (MBTS). I hold a post-graduate Masters degree in Engineering Geology (UOL1993), a Bachelor degree in Mathematics and Physics (MMU1989) and under-graduate qualifications in Civil Engineering (LU1986). I have more than 30 years of experience working in the sub-surface and mining industry and specialise in the fields of underground space engineering, tunnelling and foundations. I also work as a Court appointed Expert Witness in the (RCoJ), London. A detailed CV is available upon request.

I confirm that under para. 2.E.2 of Appendix 2E of *Planning Policy Guidance Note 14 (PPG14) – Development on Unstable Land, DoE, 1990* I am suitably qualified to make these statements, and I understand that my overriding duty is to present independent and impartial expert analysis, and I believe I have complied with that duty. The facts I have stated in this report are true and the opinions I have expressed are correct and they are entirely my own, based upon the evidence I have been shown and my own observations.

Signed



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Timothy M. Hyett M.Sc FGS MIEI MCIOB
Consultant Engineering Geologist
Earth-Tech Consulting Ltd
15th April 2015

Appendix A

Drawing No. 14-104 (02) – Site Layout

Appendix B

BGS Geo-Report: *Geological Map Extracts* (Report No. GR-211050/3)

Appendix C

BGS Geo-Report: *Natural Ground Stability*
(Report No. GR-211050/2)

Appendix D

Coal Authority *Non-Residential Coal Mining Report* (No. 51000843525001)

Appendix E

Coal Authority – *Shaft Plan and Data Sheets* (No. 51000839589001)

Appendix F

BGS Geo-Report: *Radon Report:* (Report No. GR-211050/1)