EXECUTIVE SUMMARY

WHITE LEE ROAD
BATLEY - PHASE 2

for

Jones Homes (Yorkshire) Limited

Report Number 3697

March 2017

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White Lee Road, Batley – Phase 2

THE SITE

The site covers an area of approximately 2.44 hectares and is located off White Lee Road, approximately 2 km west of the centre of Batley. The Ordnance Survey grid reference is SE 225 247. It lies between approximately 123 mAOD in the southwest, falling gently to around 114 mAOD in the northeast corner of the site.

The site is bounded by housing off Shibden Drive, Oakwell Avenue and Enfield Drive along the northwestern boundary. There is a steep slope down to the housing, which at its lowest point is roughly estimated to be 6m to 8m below site level. Extensive vegetation prevented inspection of this slope and its stability. There are fields beyond the southern boundary and part of the western boundary. There is also a play area also along part of the west boundary.

The site itself comprises grassland used mainly as a paddock. There are a few temporary agricultural buildings, such as sheds and a chicken run, and further trees along part of the site boundary.

SITE HISTORY

The earliest map of 1854 shows the site to be undeveloped land off White Lee Road, although a coal pit is shown close to the northwest of the site. A small pond lies in the southern part of the site. The map of 1907 shows Roche Colliery in the north of the site in the midst of the present housing. Over the years there has been no development of the site itself, although the surrounding area has been progressively developed with housing.

PUBLISHED GEOLOGY

Maps of the British Geological Survey (BGS), in particular 1:10,560 sheet 232SW and 1:50,000 sheet 77 show the site to be underlain predominantly by the Emley Rock, a prominent sandstone of the Carboniferous Middle Coal Measures. Undifferentiated mudstones and shales are shown under the southwestern corner of the site. There are no drift deposits shown on the geological maps, which also show the site to be free of faulting.

MINING

The geological maps show the Yard Coal seam (also known as the Adwalton Black Bed) outcropping along the northern boundary of the site and dipping below it at shallow depth. The geological memoir describes the seam as being of "*good quality*". Around White Lee Road it is reported as being 0.9m thick and therefore of economic value. The next shallowest coal seams are the Brown Metal Coals, but these lie approximately 32m below the Yard Coal, and as such are most probably sufficiently deep so as not to affect surface stability.

HYDROGEOLOGY

The aquifer within the bedrock deposits is designated as Secondary A. This is described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. There are however no licensed surface water or groundwater abstraction points within at least 890m of the site.

FLOODING

There are no open watercourses in the immediate vicinity of the site, and according to data supplied by the Environment Agency in the GroundSure Enviro-Insight report, the site is not at risk from flooding.

GROUND INVESTIGATION AND STRATA PROFILE

Trial pits and window sampling boreholes encountered varying thicknesses of topsoil across the site. This varied from approximately 150mm to 400mm in thickness, but was generally about 200mm to 300mm thick.

Over much of the site the topsoil was underlain by a stiff and very stiff silty clay with numerous gravel. This clay extended to between 1.5m depth and in excess of 2m depth, and had the appearance of Glacial Till (Boulder Clay). In window sample borehole WS4, suspected Made Ground was encountered in the near surface. The borehole appears to have intercepted collapsed mineworkings, such that below at around 3m depth, there was little resistance. One of the SPTs had an 'N' value of '0', meaning the test equipment sank under its own weight. Elsewhere along the northern part of the site, Made Ground was encountered upto 1.9m in depth.

It appears that the northern boundary has been infilled in places to create a more level plateau. It is suspected that this may have been associated with the tipping of colliery spoil generated by the former colliery to the north.

In the majority of the exploratory boreholes and trial pits, the Made Ground and Glacial Till is underlain by weathered mudstone, siltstone or sandstone bedrock. The sandstone was recovered as a sandy gravel becoming progressively less weathered with depth. The mudstone and siltstone was generally completely weathered but also became less weathered with depth.

MINEWORKINGS

Twenty six rotary openhole boreholes were sunk using an air flush technique to determine whether there are any shallow mineworkings beneath the site. These were offset at least 50m from any houses to avoid the risk of mine gases being displaced and entering the houses.

Backfilled or collapsed workings were found in sixteen of the twenty-seven boreholes, (which is about 60%) and were distributed across the site. The workings were generally

encountered as a soft ground or broken ground suggesting that most of the workings have wither already collapsed or were backstowed with spoil. Where encountered the soft or broken ground varied between 0.9m and 3.2m in thickness. The coal seam was found in 40% of the holes and to be between 0.5m to 1.0m thick. It is believed to be the Yard Coal. Based on the soft and broken ground, any void migration has varied between none and approximately 3 to 4 times the seam thickness.

The investigation has found that workings in the Yard Coal extend southwestward from the northern boundary, becoming gradually deeper as a result of the dip. Whilst workings were not found in all of the boreholes, it would be prudent to assume that they could exist across the site.

It is normal practice that the rock overburden should be ten times the height of any workings, to allow for potential collapse and void migration. The drilling has found the actual ratio to be no more than 4 times the seam thickness, and no voids were encountered. It would be prudent to assume a worst case scenario of 1.0m extraction. This would therefore require grouting to be carried out over most of the site. If during the drilling and grouting, conditions appear more favourable and extraction less than 1.0m has occurred, it may be possible to dispense with some grouting in the south of the site. However at this stage it should be assumed that the area investigated will need to be grouted.

In view of the surface subsidence, the local highway authority will require in all likelihood, grouting beneath roads also. Normally a wider grout hole spacing of 4m could be used for the roads, but in view of the surface collapse a minimum of a 3m grid may need to be used. Alternatively a geogrid could be used, but this would be less effective than grouting.

It should be note that due to the presence of a crown hole at the surface, it is also recommended that garden areas are also treated in some way, so as to prevent future crown holes appearing. This could be done by removing the Made Ground and natural ground to around 3m depth, installing a geogrid and recompacting in thin layers.

FOUNDATION DESIGN

In areas stabilised by grouting, it is normally recommended that all buildings be founded upon lightly reinforced raft foundations, with thickened edge beams. This will be to ensure that after grouting, foundations can span any minor undetected voids or broken ground, which might remain. Alternatively reinforced strip footings, designed to span 3m and cantilever 1.5m, could be considered, providing they are founded on natural bedrock and not on Made Ground.

Where competent mudstone or siltstone bedrock occurs at shallow depth, allowable bearing pressures of up to 200kN/m² can be utilised for normal reinforced strip footings sited at least 900mm below final groundlevels. Higher bearing pressures will be attained wherever underlying sandstone bedrock is encountered at shallow depths. For foundations on competent sandstone, an allowable bearing pressure of up to 300kN/m² can be adopted.

Deeper trench reinforced footings could be placed on the mudstone bedrock at depths where the thickness of Made Ground makes normal strip footings unsuitable, for example, around window sample borehole WS4.

SLOPE STABILITY

The steep slope down to the housing along the northern boundary of the site needs to be considered in relation to the proposed development. From the boreholes it appears that in places the slope comprises upto 3m of Made Ground. Survey information is not currently available and consequently it is not possible to assess its overall stability.

It is provisionally recommended that the slope is regraded to an angle of 1 vertical to 2 horizontal in bedrock. In addition to improving the stability the angle is such that maintenance can be carried out more practically. In addition it is also recommended that during regarding, any natural clay or Made Ground is regraded to an angle of 1 vertical to 3 horizontal.

LANDFILL AND RADON GAS

The site is not in an area where radon protection measures are required for new properties, and no elevated levels of ground, mine or landfill gases have been found on the site. Nevertheless in accordance with good practice and in the light of other factors it is recommended that basic gas protection measures are incorporated in the new houses. It is recommended that a layer of Visqueen 1200 gauge membrane or equivalent is laid over the raft/slab foundation and covered by a concrete screed.

CONTAMINATION

The laboratory testing to date has recorded no contamination and as such, no special precautions are considered necessary.

ROAD CONSTRUCTION

The new road should conform to the specifications of a Type A1 Road, up to 5.5m wide, in accordance with the former West Yorkshire County Council "Highways Design Guide," which continues to be implemented by the district council. It is assumed that grouting will have taken place in advance.

The subgrade will comprise Made Ground or weathered bedrock. The MEXE Cone Penetrometer tests recorded typical in-situ CBRs of 1½% to 5% for these materials. In places Made Ground will underlie the new carriageway. This should be dug out to a depth of 0.75m and replaced by suitable, non-frost susceptible materials, laid in properly compacted layers to formation level.

SUSTAINABLE SURFACE WATER DRAINAGE

Soakaway tests carried out were only successful locally. Due to a significant presence of clay and mudstone bedrock, only parts the site will be suitable for soakaways. It will therefore be necessary to be selective as to where soakaways are placed. Where present, the sandstone has a good permeability, although in places it contains bands of mudstone.

CEMENT AND BURIED CONCRETE
In accordance with the Building Research Establishment Special Digest No. 1 "Concrete in Aggressive Ground", a sulphate resisting cement in accordance with Group DS-2 Specifications should be used for all buried concrete, mortar, concrete piles, and pre-cast concrete pipes.

CONCLUSIONS
The site investigation works undertaken have demonstrated that the proposed development can be undertaken safely and successfully through the discharge of the normal planning conditions. Any geoenvironmental or geotechnical difficulties can be addressed as part of the normal construction process.

REDACTED

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March 2017