

### **IMPORTANT NOTICE**

The attached Independent Report has been added to our website to provide comfort and clarity to residents who are disturbed because of wrong and erroneous propaganda which has been made public on the National News.

Little Stanion has been farmland since 1964 until work commenced in 2007.

Part of the site did have ironstone extracted but was backfilled with the overlying strata of boulder clay. All this work was completed before the area was returned to agricultural arable farmland such as wheat growing in 1964.

Corby Steelworks was operational until 1980 some 16 years after Little Stanion had been returned to agricultural farmland.

We trust this report clearly confirms the true facts, so that harmful wrongdoing and any detrimental publicity can be eradicated, the effects of which devalues everyone's homes.

LSFMC



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**05-0422**

## **INTERPRETATIVE REPORT**

## **GEOTECHNICAL AND GEO- ENVIRONMENTAL INVESTIGATION**

**AT**

**SITE R8 (TWD SITE), CORBY**

**FOR**

**TAYLOR WOODROW DEVELOPMENTS LTD**

**JANUARY 2006**



## 1.0 INTRODUCTION

Taylor Woodrow Developments Limited (TWD) have acquired an approximately 36 hectare area of land, designated Site R8, located to the immediate west of Stanion, at Corby, Northamptonshire. TWD intend to develop a parcel of approximately 7 hectares in the north-west part (hereafter referred to as the site). TWD intend to sell the remainder of the land to other housing developers.

Rolton Group Ltd (RGL) was requested by TWD to carry out desk studies and a preliminary investigation of the entire R8 site and to prepare an interpretative report for the site to be developed by TWD. This document represents the interpretative report for the TWD development area; comments and recommendations are given with respect to foundations, ground floors, earthworks, infrastructure and contamination presence.

For details of the desk study and findings related to the overall R8 site, reference should be made to the separate RGL document *Factual Report Geotechnical and Geo-Environmental Investigation at Site R8, Corby, dated Jan 2006*.

## 1.1 SUMMARY

The site is an agricultural field bounded by woodland to the west and further farmland to the east. Long Croft Road forms the northern boundary.

The site was partially occupied by a dwelling and outbuildings called Stanion Lodge from the nineteenth century until the late 1960s. A small wood, tracks and a possible orchard were associated with Stanion Lodge. The rest of the site has a history of agricultural usage only; to the north, beyond Long Croft Road, and some 230m to the south east are former ironstone quarries.

There are no especially sensitive receptors in proximity to the site. A 450mm diameter culvert running from north-west to south-east bisects the site before discharging into an un-named ditch some 650m from the site. The nearest significant watercourses are located approximately 1000m to the north and to the south of the site.

The local geology map (British Geological Survey sheet 171, Kettering) shows the site is underlain by Boulder Clay over the Grantham Formation (sandstone, siltstone and mudstone) and the Northampton Sand Formation (ironstone). Trial pits carried out across the site encountered firm to stiff Head deposits over generally stiff Boulder Clay.

No made ground (fill) has been identified at site and the soils are considered suitable for the adoption of traditional high-level strip or trench fill foundations. Due to the moderate to high plasticity of the Head and Boulder Clay a minimum foundation depth of 1.0m below ground level should be employed. Foundation depths will need to be increased, in accordance with NHBC recommendations (including any necessary anti-heave precautions),



when in proximity to former, existing and proposed trees and shrubs in order to bear below soils liable to shrinkage and heave.

It is proposed to re-grade the site locally by up to 2m of infilling. Foundations should be deepened through this infill material to seal at least 600mm into undisturbed Boulder Clay.

Foundations constructed to such depths may be designed to a safe bearing pressure of 150kN/m<sup>2</sup>.

Buried mass concrete needs to comply with class DC-1 of Building Research Establishment Special Digest 1 *Concrete in aggressive ground*.

The head deposits and Boulder Clay are generally suitable for re-compaction, in accordance with the Dept of Transport *Specification for Highway Works*, provided unsuitable inclusions such boulders and silty sand are removed and moisture contents are carefully controlled.

Suspended precast ground floors employing full Radon protection measures are required for all houses and garages at the site.

X Chemical testing of soils identified no significant presence of contaminants at the site. Soil-gas testing revealed no detectable presence of landfill gas. Within the limitations of the intensity of the investigation therefore the site may be considered as uncontaminated. X

## 2.0 THE SITE

### 2.1 LOCATION AND DESCRIPTION

The area under investigation is currently owned by Taylor Woodrow Developments Ltd and comprises agricultural fields located approximately 1km to the west of Stanion, at Corby, Northamptonshire (Figure 1, Appendix A).

The centre of the site may be located by Ordnance Survey Grid Reference **SP 9010 8730**.

The site occupies an irregular roughly triangular shaped parcel of land and covers an area of approximately 7 hectares. The site surface may be described as rolling farmland (recently cropped wheat) with site levels falling from a maximum of around 110mAOD in the west to around 100mAOD in the east. A 450mm diameter buried concrete culvert pipe (depth to invert 0.80-1.20m) runs from north-west to south-east along a valley feature through the middle of the site. It is reported that a number of field drains run into this main pipe. For details of existing site features see Figure 3, Appendix A.

The site is bound by woodland to the west, farmland to the south and east and Long Croft Road forms part of the northern boundary. Stanion village lies east of Stamford road (A43) which runs roughly north-south and is around 1km to the east of the site. In between the A43 and the site is a parcel of farmland with New Grange Farm located next to the track



that currently provides access to the site. Much of this land is to be developed by others. Beyond South Wood, around 1km to the west of the site, is the Euro Hub rail terminal together with large warehouse buildings. A high voltage power line runs north-south to the immediate east of the site.

## 2.2 SITE HISTORY

An Envirocheck® Report was commissioned from Landmark Information Group Ltd to provide data from published sources and local agencies. For full details reference should be made to the RGL document *Factual Report Geotechnical and Geo-Environmental Investigation at Site R8, Corby, dated Jan 2006*.

The northern part of the site was partially occupied by a dwelling and outbuildings called Stanion Lodge, from the nineteenth century until the late 1960s. A small wood, tracks and a possible orchard were also associated with Stanion Lodge. The remainder of the site has a history of agricultural usage only.

The immediate surrounding area comprises woodland and agricultural fields with records indicating that an area approximately 350m to the east of the site was subject to extensive opencast ironstone quarrying, backfilled between 1952 and 1964. An associated mineral railway and sludge pit were present approximately 500m to the east and 200m to the south of the site, respectively. New Grange Farm has been built adjacent to the track that currently provides access to the site from the A43.

## 2.3 ENVIRONMENTAL SETTING

A review of environmental database information was undertaken within a 1,000 metre radius of the centre of the larger R8 site. For detailed information reference should be made to the RGL document *Factual Report Geotechnical and Geo-Environmental Investigation at Site R8, Corby dated Jan 2006*. The following summarises the findings as relevant to the TWD site.

Three Pollution Incidents to controlled waters have occurred in the vicinity. The closest relates to a Category 3 Minor Incident in March 1993 over 500m to the south of the site.

There are no Water Abstraction Licenses listed within 1km of the site.

There are no Contemporary Trade Directory Entries (of possible contaminative use) within 500m of the site.

Enquiries with Environment Agency have confirmed that there are no known registered landfills within a 1000m radius of the site.

BGS records indicate an area approximately 350m to the east of the site was subject to extensive opencast ironstone quarrying, backfilled between 1952 and 1964.



No areas of especially sensitive environmental land use are indicated within 1000m of the site.

The geological map (BGS Sheet 171 –solid & drift) for the area indicates the site to be underlain by Glacial Boulder Clay overlying the Grantham Formation (sandstone, siltstone and mudstone), Northampton Sand (Ironstone) and the Whitby Mudstone Formation, see Figure 2, Appendix A.

The Groundwater Vulnerability map for the area indicates the majority of the site to be classed as a non-aquifer. A swathe of Northamptonshire Sand present immediately beneath the boulder clay across the centre of the site is classified as a minor aquifer albeit that it is covered by Boulder Clay (which is indicated as being of Low Permeability).

The site does not fall within a groundwater source protection zone.

The Environment Agency Flood Map indicates that the site is located over 1000m away from watercourses liable to flooding.

Building Research Establishment Report 211 *Radon: guidance on positive measures for new dwellings*, inclusive of the NRPB Radon Atlas, indicates that the site falls in an area where more than 10-30% of homes exceed the Radon Action Level and so full radon protective measures are necessary.

### **3.0 GROUND INVESTIGATION WORKS**

#### **3.1 TRIAL PITS**

A total of thirty six machine-excavated trial holes were excavated on an approximately 50m x 50m grid across the site during November 2005. Holes were logged by a geotechnical engineer from RGL during excavation. An exploratory hole location plan is presented as Figure 4 in Appendix A.

The depths of samples, descriptions of strata encountered, and other comments are given in general accordance with BS 5930 (Ref. 8.2) and are presented on the trial hole logs in Appendix B.

#### **3.2 SOIL-GAS TESTING**

During the trial pitting exercise gas testing was carried out within spike holes formed at two locations within the site and at 10 other positions within the rest of the R8 site.

The testing was undertaken using a Gas Data Limited LMSx infra-red gas analyser which simultaneously recorded levels of explosive gases (generally methane), carbon dioxide, oxygen, and ambient atmospheric pressure. The results are presented in Appendix B.



### **3.3 LABORATORY TESTING**

The results of all physical and chemical laboratory testing are given in Appendix C.

Geotechnical laboratory tests were scheduled on selected soil samples by RGL, and testing was undertaken by Soil Mechanics Limited in accordance with BS1377 (Ref. 8.3).

Geotechnical tests included:

- Moisture Content tests
- Atterberg Limit tests (13 samples)
- 2.5kg Rammer Compaction tests (2 samples)
- California Bearing Ratio (CBR) testing (5 locations)

In addition testing was undertaken for soluble sulphate content and acidity on 4 samples.

Chemical analysis for a broad range of determinands was undertaken on a total of 6 soil samples recovered from 3 locations across the site. As well as typical inorganic and organic compounds, given the site's agricultural history, testing here included pesticides. Testing was carried out by Severn Trent Ltd, a UKAS (United Kingdom Accreditation Service) accredited laboratory.

## **4.0 GROUND CONDITIONS**

### **4.1 SUMMARY OF GROUND CONDITIONS**

The recent ground investigation works carried out at the site generally confirm the anticipated ground conditions indicated by the published geology and historical records. The succession comprises topsoil overlying Head deposits (0.20-0.90m in thickness), which in turn overlies Boulder Clay. The base of the Boulder Clay was not proven during these works however historical BGS borehole records (located within the southern part of the site) indicate that these deposits are in excess of 15m in thickness.

### **4.2 STRATA ENCOUNTERED**

#### **Topsoil**

Dark brown agricultural topsoil with some rootlets and occasional flint gravel was encountered within all trial pits to depths of 0.30-0.40m.

#### **Head Deposits**

Natural strata comprising head deposits (0.20-0.90m in thickness) were encountered across the site beneath the topsoil. The deposits typically comprise orange brown locally friable silty sandy clay with occasional fine to coarse gravel of flint and chalk.



In situ hand shear vane tests were undertaken within the head deposits, the shear strength results ranging between 60kN/m<sup>2</sup> and 120kN/m<sup>2</sup> which indicates a firm to stiff material.

The Atterberg Limit tests indicate that the material is predominantly inorganic clay of medium to high plasticity, in the range 30-31%.

Laboratory CBR tests on undisturbed recovered soil samples from between 0.50-0.60m depth recorded average values in the range of 2.3-3.5%.

#### **Boulder Clay**

Boulder Clay comprised a stiff dark grey and brown fissured silty sandy clay (becoming very stiff dark blue grey with depth) with some fine to coarse gravel and occasional cobbles of flint, chalk, sandstone and limestone. Locally, occasional boulders were encountered and there were also sand and chalk pockets present.

In situ hand shear vane tests were undertaken at 1.00-1.20m depth within the Boulder Clay giving shear strength results ranging between 95kN/m<sup>2</sup> and 130kN/m<sup>2</sup> which are indicative of a stiff material.

The Atterberg Limit tests indicate that the material is predominantly inorganic clay of medium to high plasticity, in the range 21-30%. The natural moisture content was found to be in the range 16-20%; in trial pits TP21 and TP68 some desiccation of the Boulder Clay was suspected to a depth of up to around 1.0m although these holes were not located near to any trees or shrubs. This may partly be due to the very stiff nature of the Boulder Clay locally.

Two compaction tests carried out on recovered samples of the Boulder Clay recorded a maximum dry density of 1.79Mg/m<sup>3</sup> at an optimum moisture content of 15.8 – 17.0%.

### **4.3 GROUNDWATER**

Groundwater was not encountered during the recent RGL ground investigation works on the site. Groundwater was recorded within boreholes installed within the remainder of the R8 site at 1.2-7.75m below ground level (approximately 84-87mAOD and therefore some 16-20m below the surface of the site considered here).

### **5.0 DEVELOPMENT PROPOSALS**

The proposed development is likely to consist of detached, semi-detached and terraced domestic dwellings with private gardens, perhaps with areas of affordable housing in the form of flats, and public open spaces and play areas. No detailed proposals were available however at the time of writing.



New access roads will be constructed, accessing the site from Long Croft Road to the north, and it is understood that a swale will be constructed, running north-west to south-east through the middle of the site, into which stormwater will be discharged. This will replace the current culvert pipe that crosses the site. Two large balancing ponds are likely to be required off-site to the south east (within the wider R8 site).

A degree of re-grading of surface levels will be required to facilitate development of the site, mainly comprising infilling of the shallow valley feature that runs through the middle of the site, by up to around 2m maximum. The extent of the likely infilling was indicated on a marked-up drawing supplied by the client (21 October 2005) and based on LDA Design drawing 1884/DCOD/SK2 showing suggested parcelisation.

## **6.0 ENGINEERING ASSESSMENT**

### **6.1 FOUNDATIONS**

Due to the firm to stiff nature of soils across the site it is considered that conventional strip or trench-fill foundations are suitable for use for the proposed housing development of 2-3 storey dwellings. As the head deposits and Boulder Clay are of medium to high shrinkability a minimum foundation depth of 1m below existing ground level should be employed.

Foundations in proximity to recently removed, existing or proposed trees or large shrubs must be designed in accordance with the recommendations of National House-Building Council Standards Part 4.2. Foundation depths will need to be increased in such circumstances assuming a medium shrinkage soil classification.

Close to existing trees, such as at the western boundaries and over the line of the hedgerow in the northern part of the site, where foundation depths are likely to exceed 1.5m, it will be necessary to consider anti-heave precautions such as use of compressible polystyrene board (claymaster) to foundation faces and increased voids beneath suspended precast floors.

A careful watch should be maintained during excavations for the foundations to ensure that they are taken below any rootlets and any obviously desiccated material (e.g. very dry, blocky fissured soil). Note, in this respect, signs of desiccation to founding depth were discovered in trial pits TP21 and TP 68 without trees being in proximity - if in doubt, it is advised that RGL are contacted in order for an engineer to inspect excavations and further assess potential deepening requirements.

A design bearing pressure of 150kN/m<sup>2</sup> may be used for strip and trench fill foundations constructed on the above basis in order to limit settlements to acceptable limits (around 25mm maximum). It should be noted that due to the variable nature of the Boulder Clay, formations may comprise mixed sand and clay conditions but both are suitable for bearing



and there will be little benefit in increasing foundation depths to attempt to entirely found any plot entirely on clay or sand.

In the area of intended upfilling (see section 5.0) it is not considered likely feasible to employ piled or raft foundations unless the depth or extent of proposed filling increases significantly from that indicated by the client. It is recommended that deepened trench fill foundations are employed, taken through all recompacted soils into firm undisturbed natural Boulder Clay by at least 600mm minimum. This will result in a maximum foundation depth of around 2.6m. It would be recommended to place all fill (except perhaps final topsoil) before excavating the foundations as to place the fill after commencing construction of foundations from lower level, would make control of the filling considerably more difficult.

## **6.2 GROUND FLOOR SLABS**

The site is located in an area for which full Radon prevention measures are required for all new dwellings in accordance with Building Research Establishment Report 211 *Radon: guidance on protective measures for new dwellings*.

In view of this, coupled with the presence of shrinkable subsoils, it is advised that ground floor slabs for all units (garages and houses) are of precast 'beam and pot' type over a ventilated void and employing a continuous polythene membrane barrier across the floor construction and carried across the external wall cavity to the outer face of the buildings all in accordance with BRE 211.



### 6.3 EXCAVATIONS/EARTHWORKS

The head deposits and Boulder Clay are locally very stiff but can generally be excavated by conventional plant equipment without difficulty and will generally be suitable for recompaction for use as structural fill provided the moisture content of the soils is controlled and suitable compaction plant is employed. Unsuitable material such as boulders, pockets of chalk and silty sand will need to be removed prior to placement if the filling is to support roads or hardstandings. It is envisaged that a 'sheepsfoot' roller will be suited to compacting the soils which should be regarded as a stony cohesive material. Compaction should be carried out in accordance with the Dept of Transport *Specification for Highway Works*.

All trial pits formed on site remained stable in the short term however unstable granular pockets or boulders may be encountered locally in the Boulder Clay requiring careful excavation and particular care if excavations are to be entered.

All excavations deeper than 1.2m below ground level requiring man access shall be provided with closed side support. Health and Safety Regulations with respect to excavations and entry into confined spaces shall be observed at all times (Refs. 8.7 and 8.8).

Excavations to depth are likely to encounter little or no groundwater except during periods of prolonged rainfall when minor perched seepages may be encountered or possibly old land drains when water will require disposal to prevent spoiling of formations. It is reported that a number of field drains run into the main culvert pipe that crosses the site. It should be noted that due to the Boulder Clay's mixed cohesive and granular nature it will be susceptible to softening when wet.

In the vicinity of the former Stanion Lodge it is possible that there may be unrecorded areas of fill (made ground), old footings, drains or the like. A careful watch should be maintained in this area and any such findings reported to RGL at once for further investigation and testing as necessary.

### 6.4 ROAD & HARDSTANDING DESIGN

For an inert granular sub-base material placed onto the natural soils (Head Deposits and/or Boulder Clay), a sub-grade CBR value of 2.0% may be adopted for preliminary design purposes. Five positions were tested for CBR values; it is recommended that further insitu CBR testing is undertaken at proposed subgrade level based on the final layout in order to confirm final design parameters. The adopting Local Authority may require further tests to give greater density of coverage across the site once the final layout is determined.

It would be acceptable to construct roads on fill provided such fill is strictly placed and compacted in accordance with the *Specification for Highway Works* as indicated above. Testing of the filling insitu would be required at interval to ensure adequate compaction has



been achieved. The specific proposals for filling and testing will need to be defined in a detailed specification document and agreed in advance with the adopting Local Authority. Formations will be liable to softening and deterioration in wet conditions and all soils on site should be considered as frost susceptible.

## 6.5 CHEMICAL ATTACK ON BURIED CONCRETE

The results of the chemical analysis on samples between 0.50-1.50m of surface indicate soluble sulphate concentrations (as  $\text{SO}_4$ ) of between 0.05g/l and 0.18g/l. The pH analyses for the same samples have returned values of between 7.7 and 8.1. It is therefore advised that buried concrete should be designed to Class DC-1 conditions for traditional foundations after BRE Special Digest 1: 2005 *Concrete in aggressive ground* (Ref. 8.6).

## 6.6 SOAKAWAYS

No infiltration testing was undertaken during the recent RGL investigations as it is understood that soakaways are not proposed for stormwater disposal. The soakaway potential of the subsoil is in any case likely to be severely restricted owing to the predominantly cohesive nature of soils across the site.

## 7.0 ASSESSMENT OF CONTAMINATION

### 7.1 SOIL DATA ASSESSMENT

Chemical testing was undertaken on six samples, three of which were topsoil and three of underlying natural deposits within 1.0m of ground level. The results of the chemical testing are given in Appendix C.

#### Topsoil

Of the three samples of topsoil tested, none was found to exceed the UK published CLEA Soil Guideline Values for 'residential sites with plant uptake' (ie those with private gardens - the most onerous condition). CLEA guidelines do not exist for all contaminants but none of the other contaminants, including hydrocarbons and pesticides, was detected at elevated level when compared against other guidelines frequently used for assessment purposes such as Dutch government guidelines and the now disused former Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL) guidelines (now superseded by CLEA).

#### Head/Boulder Clay

Of the three soil samples taken from around 500mm depth (around 200mm below the topsoil) only one isolated result was found to marginally exceed any recommended CLEA Soil Guideline Value (SGV): in trial pit TP22 Nickel gave a result of 52mg/kg compared to the SGV of 50mg/kg. Testing of the adjacent land, undertaken at the same time, found all test results for Nickel to fall below the CLEA SGV. Due to the marginality of this result and its position beneath clean topsoil, it is not considered significant either to human health or



to plants. Of the contaminants not currently included in CLEA guidance none was present at significant level in comparison with Dutch and former ICRCL guidelines.

## 7.2 GROUND GAS CONTAMINATION

During the RGL investigation of the site, and adjacent land, a gas spike survey was undertaken. Two of the twelve tests were located on site near trial pits TP22 & TP37 and these detected no significant levels of methane or carbon dioxide gas.

## 7.3 CLASSIFICATION OF SOILS FOR REMOVAL

Laboratory test results only highlighted the presence of one marginally elevated nickel result in the head deposits beneath the topsoil, therefore (given also the agricultural history of the site) it is anticipated that soils for removal are likely to be classified as inert for off-site disposal. However, final classification of soils is dependant upon the receiving landfill tip and confirmation will need to be received before disposal can take place.

It would likely be possible to use any surplus topsoil from the site on other sites but this should be confirmed as appropriate with the Local Authority and Environment Agency responsible for the intended receiving site.

## 7.4 RECOMMENDATIONS/CONCLUSIONS

From the above, and the known history of the site for agricultural usage only, soils may be considered as uncontaminated and there is no requirement to undertake any special measures on site to protect construction personnel, buried services, future householders or the environment generally.

The results of the chemical testing should however be provided to any licensed tip to be used for soil disposal.

Excess topsoil from the site is likely suitable for use elsewhere but the chemical test results will need to be provided to any regulatory body (Local Authority Environmental Health Dept and Environment Agency for example) controlling the intended site for reuse to ensure the topsoil's chemical and physical characteristics are acceptable.

A careful watch should be undertaken during any groundworks in the vicinity of the former Stanion Lodge to check for any possible buried wastes or similar. In the event of discovering any suspicious materials or soils (discoloured or strongly smelling for example) cease operations and contact RGL immediately for guidance.