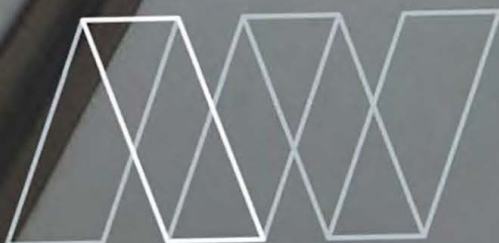


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31st May 2023

**Summary of Previous
Investigation, Proposed
Residential Development, Lincs
Lakes, Scunthorpe**

JS/SLR/AC/46069-TN002



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**TECHNICAL NOTE – SUMMARY OF PREVIOUS GROUND
INVESTIGATIONS**

For

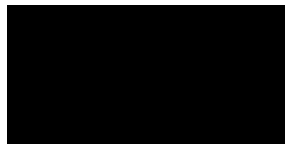
Keepmoat Homes Limited

Proposed Residential Development, Lincs Lakes, Scunthorpe

Prepared by: **A. Clark** *BSc (Hons) MSc FGS*



Approved by: **Jonathan Saunders** *BSc(Hons) MSc(Eng) CEng*
MIMMM FGS



Date: 31st May 2023

1.0 INTRODUCTION

- 1.1 Alan Wood & Partners were appointed by Keepmoat Homes (the 'Client') to undertake a review of all available previous Ground Investigations on the site.
- 1.2 This report provides geotechnical and geo-environmental information in relation to the proposed redevelopment of the site for residential development. Interpretation and recommendations should not be assumed valid for adjacent areas of land, or for alternative land uses. Should the proposed site usage change, the recommendations and conclusions presented in this report may need to be re-assessed.
- 1.3 This report presents factual and interpretative geotechnical and environmental information. The report has been prepared for the titled project and Alan Wood and Partners can accept no responsibility or liability for the consequences of the use of this document, wholly or in part, for any other purpose than that for which it was commissioned.
- 1.4 The conclusions and recommendations presented in this report are based on site-specific information obtained during the various phases of investigation to include the ground conditions encountered and subsequent laboratory analysis and are considered reasonable on the basis of available information at the time the assessment was carried out. They should not necessarily be relied upon to represent site conditions at a substantially later date.
- 1.5 The findings and opinions provided in this report are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described. Factual information has been obtained from a variety of sources. Alan Wood and Partners assumes that third party data is reliable but has not independently confirmed this. The validity and accuracy of this information is therefore outside the control of Alan Wood and Partners. Professional judgement and experience are however used to ensure that uncertainties are reduced to a level appropriate to the site conditions, the purpose of the investigation and the resources devoted to it by the Client.
- 1.6 Whilst every effort has been made to carry out an assessment that enables a realistic characterisation of the geotechnical parameters at the site, the possibility of significant spatial variation in actual ground, groundwater and environmental (gas and contamination) conditions existing between or beyond exploratory hole locations cannot be discounted. Where information or opinion is given, this is for guidance only. Further information, ground investigation, construction activities, change of site use or the passage of time may reveal conditions that were not indicated in the data and therefore could not have been considered in the preparation of this report. Where such information might impact upon stated opinions, Alan Wood and Partners cannot accept responsibility for conditions not encountered and reserves the right to modify or retract the opinions expressed in this report. Where opinions expressed are based on current available guidelines and legislation, no liability can be accepted by AWP for the effects of any future changes to such guidelines and legislation. New information of improved practices and changes in legislation may require reinterpretation of the report as a whole, or in part.

- 1.7 All ground investigation works and soil descriptions by Alan Wood and Partners were undertaken in general accordance with BS EN ISO 14688-1 'Geotechnical Investigation and Testing – Identification and Classification of Soil' (2018), BS10175 (2011), BS 5930 (2015) and/or BS EN 1997-1:2004 (Part 1, General Rules) and BS EN 1997-2:2007 (Part 2, Ground Investigation and Testing).

2.0 SITE DETAILS AND DESCRIPTION

2.1 Introduction

- 2.1.1 Published environmental, geological and historical data relating to the site area has been reviewed, in conjunction with a walkover survey undertaken on the 9th of September 2021, the findings of which are presented below.

2.2 Site Location and Description

- 2.2.1 The site is located off Burringham Road, Scunthorpe DN17 2AB and is centred at National Grid Reference (NGR) 486169mE, 408637mN.
- 2.2.2 The northern boundary is marked with a 1.5m tall hedgerow, beyond which is agricultural land. The eastern boundary is marked by a hedgerow along Carisbrooke Manor Lane, beyond which are residential properties. The southern boundary is marked by Burringham Road, beyond which is agricultural land. The western boundary is marked by a hedgerow along the M181, beyond which is agricultural land.
- 2.2.3 The site currently comprises an area of undeveloped land which has recently been used for agriculture. No crops were seeded at the time of works being undertaken. A drainage ditch crosses through the centre of the site with an approximately east to west orientation.
- 2.2.4 The site is relatively flat, which is consistent with the surrounding land.
- 2.2.5 The superficial deposits below the site are classed as a Secondary A Aquifer, with the mudstone bedrock classed as a Secondary B Aquifer.

3.0 PREVIOUS GROUND INVESTIGATION

3.1 Introduction

- 3.1.1 The following reports have been reviewed as part of this Technical Note and should be consulted for further information:
- Alan Wood and Partners, Phase I Geo-Environmental Appraisal, Land Northwest of Junction 3 of the M180, Linc Lakes, Scunthorpe, report ref. JS/SLR/AC/46069-Rp-002, dated 7th February 2023;
 - Alan Wood and Partners, Phase II Geo-Environmental Assessment Report, Land Northwest of Junction 3 of the M180, Scunthorpe, report ref. JS/AC/46069-Rp-001, dated 11th November 2021;

- FWS Geological and Geo-Environmental Consultants, Geo-Environmental Site Investigation on Land at Lincolnshire Lakes Area V2 and Lake 1, report ref. 19250R08, dated 25th November 2015.

4.0 GROUND CONDITIONS

4.1 The ground conditions encountered in the investigations across the site are summarised in the following tables, while discussion about each one is given in the following paragraphs.

Table 1 Summary of Ground Conditions Encountered in November 2015 (FWS)

Lithology	Exploration Location	Approximate proven depth (m) to base from existing ground level	Approximate Thickness (m)
Topsoil	TP01, TP02, TP03, TP04, TP05, BH01, BH02, BH03	0.20 - 0.65	0.15 – 0.50
Superficial Deposits - Sand	TP01, TP02, TP03, TP04, TP05, BH01, BH02, BH03	0.50 – 12.90	0.30 – 6.40
Superficial Deposits - Silt	TP03, TP04, BH02	1.30 – 7.00	0.50 – 0.90
Organic Clay	BH02	2.95	0.45
Peat	TP04, TP05, BH03	1.60 – 2.90	0.20 – 0.40
Superficial Deposits - Clay	BH01, BH02, BH03	1.00 – 9.00	0.40 - 1.50
Weathered Mudstone	BH01	14.40 - 17.00	1.50 - 4.55
Groundwater	TP01 – Seepage at 2.60m TP03 – Seepage at 2.30m TP04 – Seepage at 2.00m with inflow at 2.50m TP05 – Seepage at 2.90m BH01 – 2.50m and 8.20m		

Table 2 Summary of Ground Conditions Encountered in September 2021 (AWP)

Lithology	Exploration Location	Approximate proven depth (m) to base from existing ground level	Approximate Thickness (m)
Topsoil	All Locations	0.15 - 0.40	
Loose Orange Brown Sand	TP1 to TP25	0.40 – 2.70	0.20 – 1.10
Organic Silt	TP1	1.40	0.50
Organic Sand	TP2, TP3, TP7 to TP13, TP14, TP18, TP19, TP20, TP21	0.55 – 2.85	0.05 - 0.50
Peat Lenses within Sand	TP10 and TP23	2.70	0.30
Soft Brown Clay	TP14	0.90	0.15
Brown Sandy Clay	TP17	0.55m	0.20m
Medium Dense Pale Brown/Grey Sand	TP1 to TP14, and TP16 to TP25	1.60 - 3.50	0.65 – 2.30
Groundwater	Groundwater seepage was encountered in TP1 at 1.70m and 3.40m bgl, TP2 at 3.30m bgl, TP3 at 2.20m bgl, TP4 at 2.20m bgl, TP5 at 1.60m bgl, TP6 at 1.80m bgl, TP7 at 2.10m and 3.40m bgl, TP8 at 2.80m bgl, TP9 at 2.60m bgl, TP10 at 2.00m bgl, TP11 at 2.20m bgl, TP13 at 2.30m bgl, TP14 at 1.50m bgl, TP15 at 1.40m bgl, TP17 at 1.50m and 2.60m, TP18 at 3.20m, TP19 at 2.10m, TP20 at 2.00m, TP21 at 2.20m and 2.90m, TP22 at 1.60m, TP23 at 2.40m, TP24 at 2.40m, TP25 at 1.60m		

- 4.2 Within both investigations, by FWS and AWP, no odours or visual contamination was recorded during the intrusive works.
- 4.3 It should be noted that within both the FWS and AWP investigations, trial pits were unstable and were often terminated at shallow depths due to instability.

5.0 GEO-ENVIRONMENTAL INVESTIGATION

- 5.1 Soil samples submitted to the laboratory have not been found to contain elevated levels of contaminants of concern from either investigation.
- 5.2 Groundwater samples were obtained within the FWS investigation. All samples were below the assessment values with the exception of extractable petroleum hydrocarbons (EPH), manganese and zinc in all samples, cadmium and copper in BH 1, and mercury in BH 2.

- 5.3 A period of ground gas monitoring was undertaken by FWS, however results of all of the monitoring are not included within the Phase II report. AWP have not been provided with the full results of the ground gas monitoring. The results of the first two rounds show no methane to be present but slightly elevated Carbon Dioxide levels (5% steady state) were recorded. No flow has been recorded in the first two visits.

6.0 CONCLUSIONS AND RECOMMENDATIONS

- 6.1 Ground conditions are deemed to be suitable following engineered land raising for shallow foundations (reinforced strip or raft foundations subject to NHBC approval).
- 6.2 No evidence of contamination has been recorded within the previous investigations undertaken on the site, and risk to controlled waters is deemed to be very low.
- 6.2 The following additional investigation is recommended in order to inform the land raising and foundation solutions for the proposed residential development.
- 5 boreholes to be drilled to approximately 15mbgl using a Cable Percussive Drilling Rig. This will allow for collection of samples for geotechnical laboratory testing and allow for installation of ground gas and groundwater monitoring equipment.
 - 2 days with a CPT rig to complete a grid of probes to collect geotechnical information across the site (groundwater depths, coefficient of compressibility, undrained shear strength etc.) to inform settlement calculations. As part of this work, an interpretative report shall be produced by the CPT subcontractor.
 - 6 ground gas and groundwater monitoring visits on a fortnightly basis given the potential for hazardous ground gases associated with organic material within the superficial deposits.
 - Geo-environmental and geotechnical testing.
 - Production of a Phase II report detailing works undertaken and interpretation of results.
 - Production of a Hazardous Ground Gas Risk Assessment following completion of the required monitoring visits.
 - Production of detailed settlement calculations to assess placement of fill to facilitate the development, and the loading of reinforced strip foundations within the fill.

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