



RIDGE

FLOOD RISK STATEMENT

ONE HORTON HEATH- LOWER ACRE
OCTOBER 2022



FLOOD RISK STATEMENT
ONE HORTON HEATH- LOWER ACRE
OCTOBER 2022

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1. INTRODUCTION

1.1. Appointment and Brief

Eastleigh County Council has commissioned Ridge and Partners LLP to prepare a Flood Risk Statement. The purpose of the report is to outline any changes in the flood risk assessment that was previously issued by Odyssey (19-367 Flood Risk assessment and water management strategy and addendum 1 and 2).

1.2. Limitations

The purpose of this report is outlined in Section 1.1, together with those related matters specifically referred to therein and it is not intended to be used for any other purposes. The report is for the sole benefit and may only be relied upon by the addressee, to whom we will owe a duty of care. The report and any part of it are confidential to the addressee and should not be disclosed to any third party for any purpose, without the prior written consent of Ridge and Partners LLP as to the form and context of such disclosure. The granting of such consent shall not entitle the third party to place reliance on the report, nor shall it confer any third-party rights pursuant to the Contracts (Rights of Third Parties) Act. The report may not be assigned to any third party.

1.3. Reference Information

The following information has been obtained and interrogated as part of this study:

- 19-367 Flood Risk Assessment and Water Management Strategy Part 1 and 2 (Rev B)- Dec 2020
- 19-367 Flood Risk Assessment and Water Management Strategy (Addendum 1)- May 2021
- 19-367 Flood Risk Assessment and Water Management Strategy (Addendum 2)- Sept 2021
- Detailed Planning Application Upper Acre- Ground Investigation Report Dec 2020

2. PROJECT BACKGROUND

2.1. Site Location and Existing Land Use

The application site is located south of Horton Heath Village. The site is currently being used as an agricultural field and is bounded by Burnetts Lane on the eastern side. Refer to Appendix A for the Site Plan.

The Ordnance Survey (OS) grid reference for the application site is SU 49072 16324, approximately 449072E, 116324N and the nearest postcode is SO30 2HH. The total site boundary is circa 12.90hectares,



Figure 1 – Site Location Plan

2.2. Topography

The site predominantly slopes from south to north from an elevation of 25m to 21m with an approximate gradient of 1 in 97. The ground slopes from east to west from an elevation of 26m to 22m with an approximate gradient of 1 in 49.

2.3. Geology and Hydrogeology

British Geological Survey (BGS) online mapping indicates that the majority of the lower acre site is underlain by Wittering Formation- Sand, Silt and Clay. However, a small area of the site is made up of Earnley Sand Formation (sand, silt and clay).

There are no superficial deposits recorded within the Lower acre of the Horton Heath site.

Groundwater mapping published by the EA indicates that the site is not located within a groundwater source protection zone. Groundwater levels were recorded across the wider site as part of the ground investigation. BGS hydrogeology mapping shows that the site is located within the moderately productive aquifer.

The infiltration test result showed that the site is unsuitable for infiltration due to slow or no ingress of Water. The ground investigation report states that this is likely due to cohesive ground conditions. Refer to Appendix B the ground investigation report.

2.4. Hydrological Settings

Environmental Agency (EA) online maps indicate that the nearest main river Itchen is 4700m away from the site. The tributary of River Itchen runs north of the site.

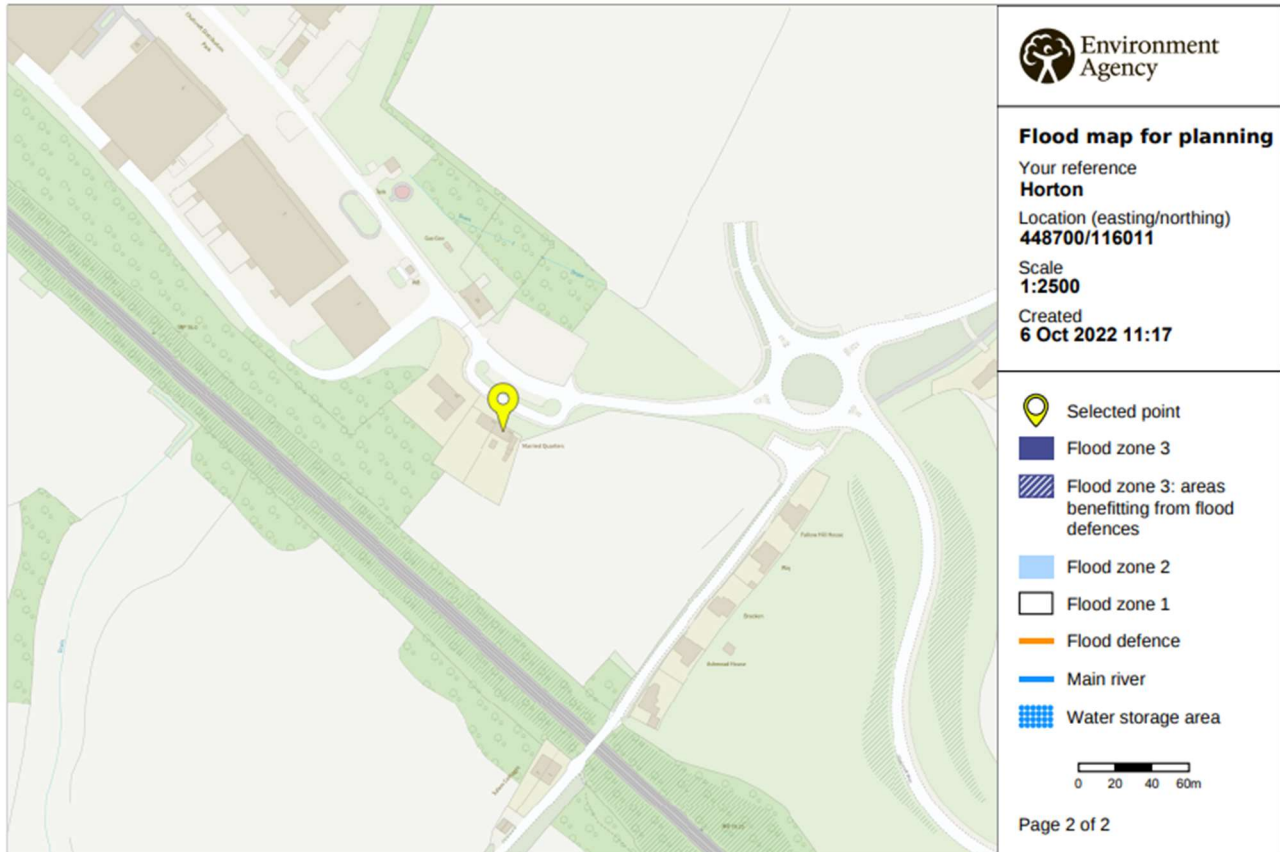


Figure 2 – Watercourse near the site

3. SOURCES OF FLOOD RISK

Fluvial Flooding

The development site still comes under Flood Zone 1 as suggested in the flood risk assessment prepared by Odyssey.



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Figure 3 – EA flood map

Canals and Artificial Water bodies.

There is no risk from canal flooding or there has been no change in the risk of flooding from artificial sources compared to the flood risk assessment report prepared by Odyssey was issued.

Tidal Flooding

The site does not pose any risk from tidal flooding. The nearest river, river Itchen is 2.5km away from the lower acre of Horton Heath site.

Ground Water Flooding

As per the ground investigation report issued by Geo-Environmental Services Limited in December 2020, the report suggests that there are areas where groundwater could be found. This will only affect the construction of conventional foundations where shallow groundwater is present. Refer to Appendix B, Pg 8 for further details.

However, there has been no record of groundwater flooding within the development site.

Reservoirs

Based upon EA mapping, the site lies within an area that does not pose any risk of flooding in the event of a significant breach (failure) of raised reservoir embankments.

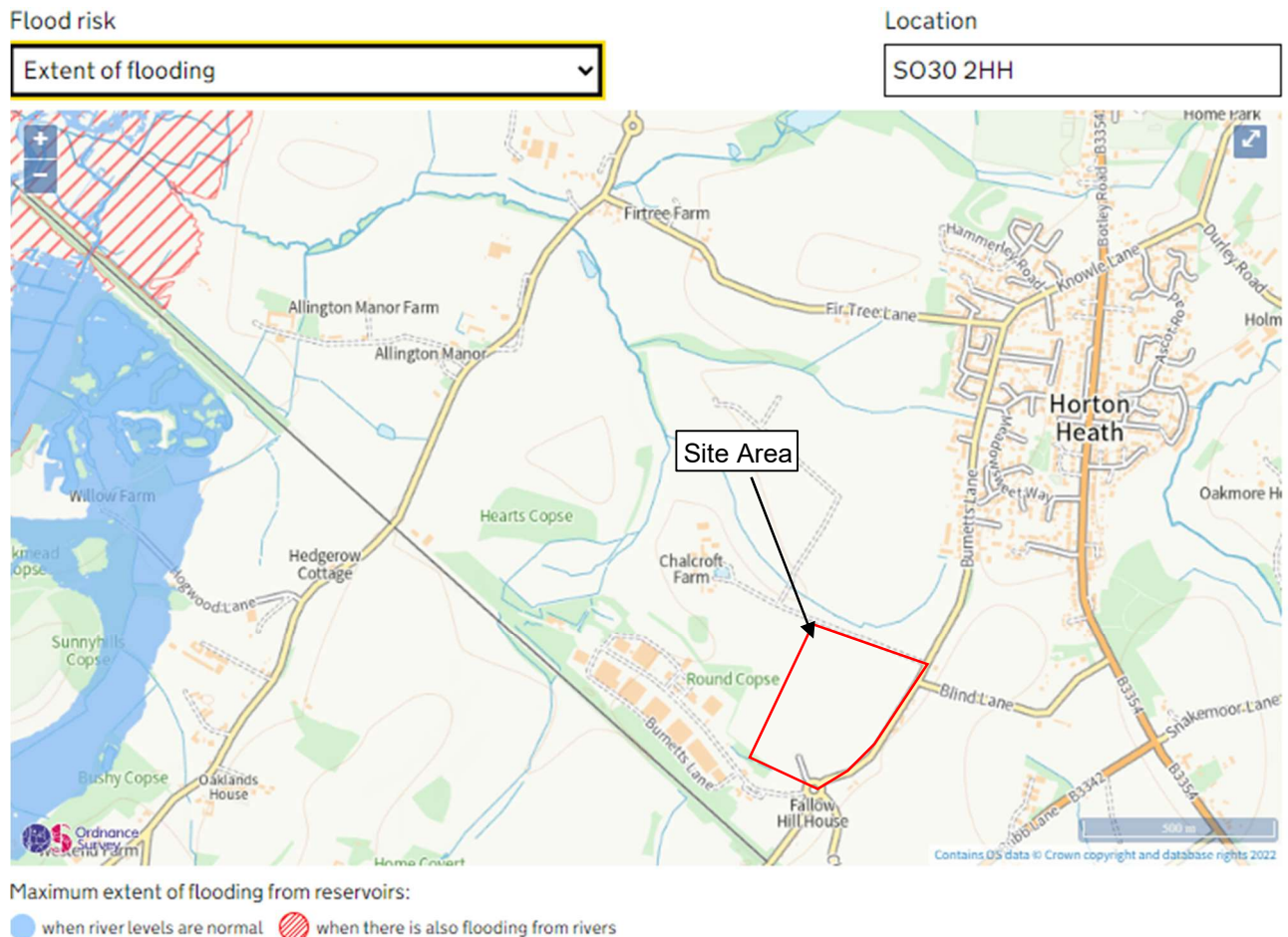


Figure 4 – Extent of Surface Water Flooding

Sewer Flooding

There is no sewer network within the development site. Hence, the risk of sewer flooding is minimum.

Failure (Breaching) of Flood Defences and Management Measures

Based upon EA mapping, the site does not benefit from, nor rely upon, the presence of formal raised flood defences and therefore, corresponding flood risk to the site due to defence failure (breach) is negligible.

Surface Water Flooding

The surface water flooding within the development site is significantly low as suggested in the flood risk assessment prepared by Odyssey.

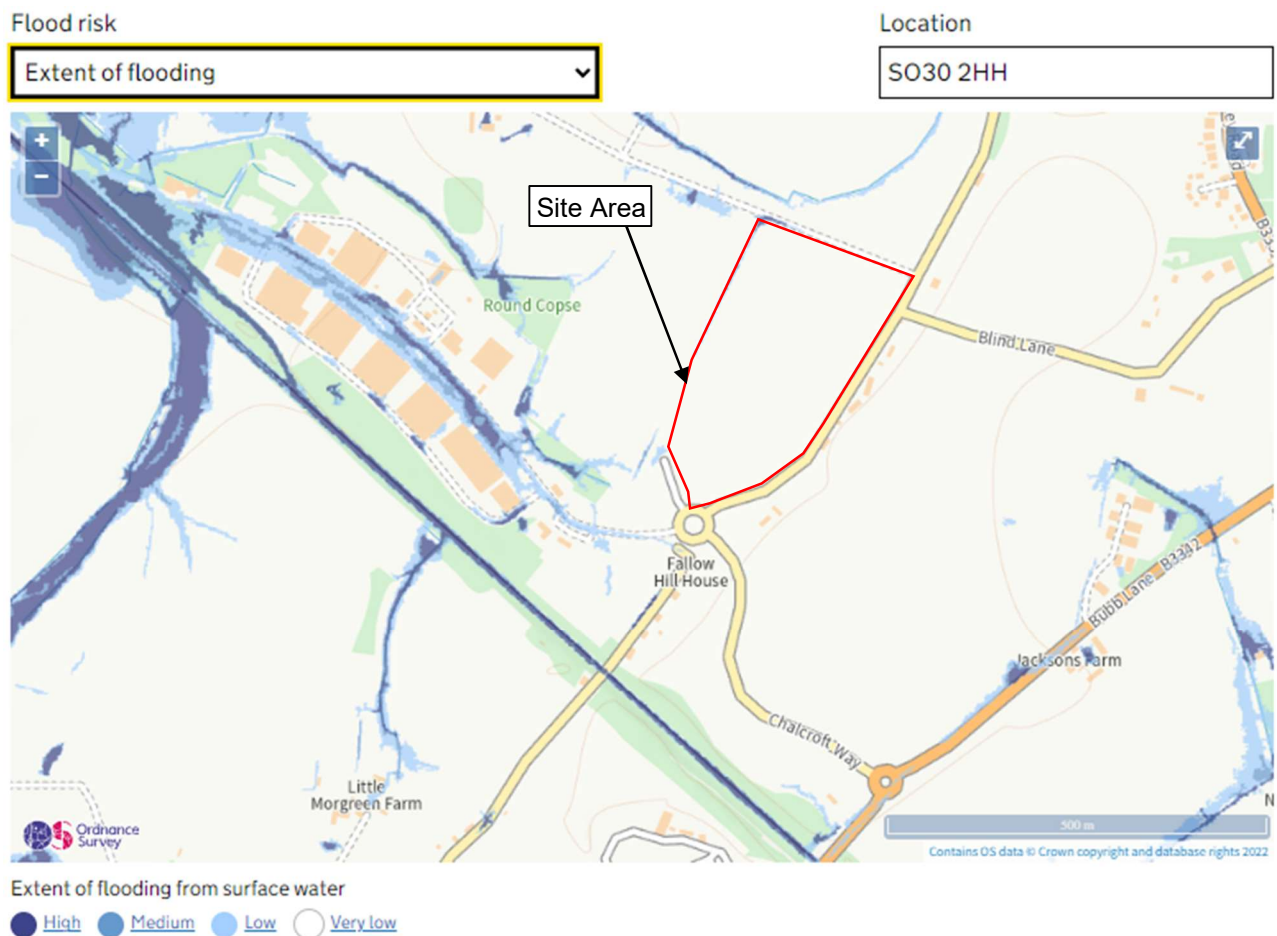


Figure 5 – Extent of Surface Water Flooding

Summary

There have been no changes in flooding risk in the development area compared to the report issued by Odyssey about flood risk assessment in December 2020.

4. CLIMATE CHANGE

The SuDS features have been designed to accommodate flows from the 1 in 100-year storm event plus 40% for climate change as per the Flood Risk Assessment prepared by Odyssey.

5. POLICY CONSTRAINTS AND IMPLICATIONS TO THE DEVELOPMENT

Sequential Test

No changes in flood zone area and flood-related risk. Therefore, the sequential test is not required as suggested in FRA by Odyssey.

Exception Test

No changes in the development footprint following the Odyssey FRA report. Therefore, the exception test is not required.

Flood Risk Vulnerability

PPG Table 2: Flood Risk Vulnerability Classification (summarised below), identifies that **residential dwellings** are considered as a **‘More Vulnerable’** category.

CLASSIFICATION	EXAMPLES OF USE
Essential Infrastructure	- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. - Essential utility infrastructure which has to be located within a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operation in times of flood. - Wind turbines.
Highly Vulnerable	- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings. - Caravans, mobile homes and park homes intended for permanent residential use. - Installations requiring hazardous substances consent.
More Vulnerable	- Hospitals. - Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and educational establishments. - Landfill and sites used for waste management facilities for hazardous waste. - Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	- Police, ambulance and fire stations which are not required to be operational during flooding. - Buildings used for shops, financial, professional and other services, restaurants, cafes and hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in the ‘more vulnerable’ class and assembly and leisure. - Land and buildings used for agriculture and forestry. - Waste treatment (excl. landfill and hazardous waste facilities). - Minerals working and processing (except for sand and gravel working). - Water treatment works which do not need to remain operation during times of flood. - Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-Compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Flood Zone Compatibility

PPG Table 3: Flood Risk Vulnerability and Flood Zone Compatibility (summarised below), confirms that the site is appropriate for **'More Vulnerable'** uses in the **Flood Zone 1**, with reference to the sequential test and without the need to apply the Exception Test.

FLOOD ZONE	ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER COMPATIBLE
Zone 1	Permitted	Permitted	Permitted	Permitted	Permitted
Zone 2	Permitted	Exception Test Required	Permitted	Permitted	Permitted
Zone 3A	Exception Test Required	Not Permitted	Exception Test Required	Permitted	Permitted
Zone 3B	Exception Test Required	Not Permitted	Not Permitted	Not Permitted	Permitted

Local Plan requirements

The policy stated in the report prepared by Odyssey has not changed since it's been issued.

6. CONCLUSIONS

- 6.1.1. The site currently comprises an area currently being used as agricultural land to the south of Horton Heath Village. Based on the topographical survey elevation generally falls east to west with an approximate gradient of 1 in 42 and south to north with a gradient of 1 in 97.
- 6.1.2. This document has highlighted all the changes that were carried out in the flood risk assessment by Odyssey.
- 6.1.3. The geotechnical assessment indicates that the majority of the lower acre site is underlain by Wittering Formation- Sand, silt, and clay. However, a small area of the site is made up of Earnley Sand Formation- Sand, silt, and clay. There are no superficial deposits recorded within the lower acre of the Horton Heath development site.
- 6.1.4. An ordinary watercourse flows north of the site, which subsequently discharges to the tributary of River Itchen. According to the report issued by Odyssey, the groundwater level recorded is 2.70m bgl. However, the ground investigation report carried out by Geo-environmental Service for lower acre is between 1.1m bgl and 3.3m bgl.
- 6.1.5. Based upon current information provided by the EA, the site is demonstrated to be a low probability of flooding (Flood Zone 1) from fluvial sources.
- 6.1.6. Current planning policy confirms that residential development is an appropriate use within Flood Zone 1. No Sequential Test and Exception Test is required.
- 6.1.7. Surface water generated from the proposed development will be managed in a sustainable manner and at source as outlined within the accompanying drainage strategy report.
- 6.1.8. There is no risk from the fluvial, surface, ground or other sources of flooding within the development area and the risk remains negligible and unchanged compared to the flood risk assessment issued by Odyssey.

APPENDIX A

PROPOSED SITE PLAN



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EXTERNAL REFERENCES:

THIS INFORMATION & RIDGE & PARTNERS LLP CIVIL 3D & ASSOCIATED 3D OUTPUTS ARE BASED UPON THE FOLLOWING INFORMATION FROM THE DESIGN TEAM ARCHITECT REFERENCE:

- AXIS MASON DRAWING No. Site BASE (DATED 04/10/2022)

SURVEY REFERENCE:

- SURVEY ONE No. ENCONG-144-153 (FEBRUARY 2021)

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THIS INFORMATION IS CURRENT PRIOR TO CONSTRUCTION

LEGEND

— SITE BOUNDARY

PO1	ISSUE FOR APPROVAL	14/10/2022	PO
REV	DESCRIPTION	DATE	DRAWN
ORIGINATOR			

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TEL: 01982 634401
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CLIENT:

EASTLEIGH
BOROUGH COUNCIL

IN ASSOCIATION WITH:

PROJECT:
PROPOSED RESIDENTIAL DEVELOPMENT
ONE HORTON HEATH
FIRST RESIDENTIAL PARCEL

TITLE:
SITE LOCATION PLAN

TECH:	CSE:	ICSE:	SCALE: N.T.S	@: A0
PO			INITIAL ISSUE	14/10/22

STATUS:
PRELIMINARY

DRAWING No:	PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
5015560	RDG	XX	ST	DR	C	0000	P01	

APPENDIX B

DETAILED PLANNING APPLICATION- GROUND INVESTIGATION REPORT

ONE HORTON HEATH



Detailed Planning Application Upper Acre Ground Investigation Report

December 2020



Investing in
our community



Geo-Environmental

GROUND INVESTIGATION REPORT

for the site at

ONE HORTON HEATH – FIRST RESIDENTIAL PARCEL,

LAND WEST OF HORTON HEATH,

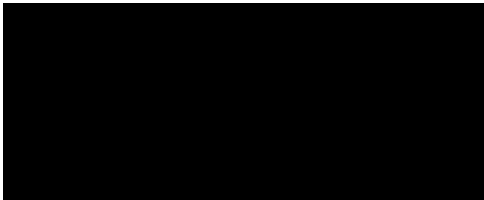
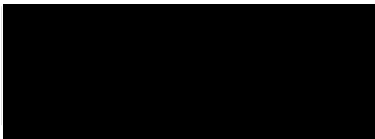
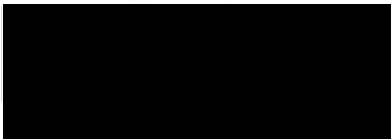
HORTON HEATH,

HAMPSHIRE, SO30 2HH

on behalf of

EASTLEIGH BOROUGH COUNCIL



Report:	GROUND INVESTIGATION REPORT
Site:	ONE HORTON HEATH – FIRST RESIDENTIAL PARCEL, LAND WEST OF HORTON HEATH, HORTON HEATH, HAMPSHIRE, SO30 2HH
Client:	EASTLEIGH BOROUGH COUNCIL
Date:	11/12/2020
Reference:	GE18771-GIRv3.0-DEC20
Version:	3.0
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AMENDMENT RECORD

Revision ref.	Date	Reasons for amendment	Author's initials	Reviewed by	Approved by
1.0	21/08/2020	First issue	FG	LL	SA
2.0	07/10/2020	Update to incorporate gas and groundwater monitoring results	FG	LL	SA
3.0	11/12/2020	Update to incorporate site layout changes and inclusion of 6-storey buildings	FG	LL	SA



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APPENDIX E	Soakage Testing Results
APPENDIX F	Gas and Groundwater Monitoring Results



EXECUTIVE SUMMARY		
Site Details	Site Address	One Horton Heath – First Residential Parcel, Land West of Horton Heath, Horton Heath, Hampshire, SO30 2HH
	National Grid Reference	448901, 116372
	Site Area	12.24Ha
	Form of Development	The site is understood to form the first parcel of residential development of c.393 dwellings with private garden areas, access roads, areas of soft landscaping and other associated development infrastructure.
Encountered Conditions	Scope of works	An intrusive investigation was required to confirm the ground and groundwater conditions and to support the development of geotechnical and geo-environmental assessments pertaining to the site in relation to the proposed development.
	Ground Conditions	The ground conditions encountered comprised a mantle of Topsoil overlying soils inferred to be clay and sand strata of the Wittering Formation. Within the larger eastern field, more sandy layers were encountered, and clay soils were noted to be predominantly sandy clay. Although sand and sandy clay was encountered within the central and western fields, these were encountered to a lesser extent than the eastern field. Made Ground was not encountered within any of the exploratory holes. Soils within the top 1.5m were consistently noted to show signs of desiccation
	Groundwater	Groundwater was encountered within the majority of investigation locations during the intrusive investigation works between depths of 1.1m and 4.4m bgl (23.06m and 19.76m AOD). Groundwater monitoring wells were installed within WS02, WS05, WS07, WS08, WS10 and WS15 to provide coverage across the site. To date six groundwater monitoring rounds have been completed in July through to the end of September with groundwater encountered between depths of 0.20m and 3.30m bgl (22.670m and 19.238m AOD). A period of winter groundwater depth monitoring is recommended.



EXECUTIVE SUMMARY		
Geotechnical Considerations	Foundations	Based on the ground and groundwater conditions encountered in the exploratory holes, it is considered that conventional shallow foundations may be suitable for the proposed low rise development across areas of the site, subject to considerations of groundwater levels and constructability. On the basis of the results of the Atterberg Limit tests in conjunction with the field observations it is considered that the cohesive soils of the Wittering Formation should be classified '<i>en-masse</i>' as high volume change potential, as defined by NHBC Standards, Chapter 4.2, for which a minimum founding depth of 1.0m bgl is required. However, it is also likely that localised deepening of foundations would be required where potential signs of desiccation have been identified and for foundations constructed within the zone of influence of trees (existing, recently felled or proposed). Based on the ground conditions encountered, a net allowable bearing capacity of 90kPa is recommended for the firm to stiff clay of the Wittering Formation. this being limited to reflect the presence of firm clay. Total settlements should remain within tolerable limits for this bearing capacity. Foundations terminating in, on or loading soft clay will not be suitable. Given the variability in ground conditions, it is recommended that reinforcement is included in foundations. The presence of water within excavations could significantly hinder, or potentially prevent construction of conventional foundations. Given the current proposals are to include 6-storey buildings located in close proximity to the new roundabout and access road in the south of the site, in the vicinity of BH01, based on both the ground conditions encountered and the proposed development a piled solution or alternative solution is recommended for these proposed buildings.
	Floor Slabs	Given the presence of shrinkable soils suspended floor slabs are recommended. The minimum void height should be determined in accordance with NHBC Standards and account for the volume change potential of the underlying soils. Preliminary assessment indicates a minimum void of 300mm but this should be verified during detailed design.
	Excavations	Due to the presence of running sands and shallow groundwater encountered during the intrusive investigation works mainly within trial pits located on the eastern field of the site, excavations are likely to be unstable and will therefore need to be adequately shored with appropriate retention systems and dewatering. The presence of water may also result in softening of the clays. In addition, contingency allowance should be made for encountering water within excavations and this could require a combination of dewatering/pumping and excavation support. Under no circumstances should personnel be permitted to enter excavations during construction or maintenance.



EXECUTIVE SUMMARY		
	Pavements	Based on the in-situ and laboratory results and the soils encountered on site a preliminary equilibrium CBR of 1% is recommended for the soils present at the anticipated formation depth. The shallow soils should be assumed to be frost susceptible thus requiring a minimum pavement thickness of 450mm. Any hard or soft spots in the formation level may induce reflective cracking in the pavement and allowance should be made for removing hard or soft spots that may be present.
	Buried Concrete	Buried concrete located within the Wittering Formation should be designed in accordance with class DS-1 as defined within the BRE Special Digest 1. The pH analysis indicates that the ACEC Class corresponds to AC-2z.
	Soakaways	The results from the shallow soakage testing undertaken to date indicate that it is likely to be possible to utilise permeable paving as part of the wider site drainage strategy. The results of the deeper soakage testing indicated that the use of soakaways would not be suitable and that on-site storage and attenuation, or alternative storm water disposal options will need to be considered. In addition, changes in groundwater levels, such as shallower groundwater during winter months, could reduce storage capacity and performance of soakaways. This might also adversely impact the ability of any ponds to drain via infiltration to the ground and thus attenuated discharge to ditches and surface water may be more appropriate under extension of existing riparian rights.
Environmental Considerations	Human Health	In the first instance the results of the sample analysis were compared to the Tier 1 screening criteria where available. All of the results were noted to be below the respective assessment criteria for a proposed end use with residential uptake, therefore further assessment was not considered necessary. In addition, samples were submitted for laboratory testing were also screened for asbestos. No asbestos was identified within any of the samples submitted for testing. As such it is considered that remedial action would not be warranted to protect end users of the proposed residential development.
	Groundwater	No pollutant linkages for groundwater have been identified in relation to the existing site condition, it is therefore considered that no risk mitigation measures are required.
	Radon Gas	No radon protection measures are required.
	Ground Gases	Spot monitoring undertaken in July through to the end of September 2020 has identified very low concentrations of ground gases on the site. In the absence of any specific potential source of ground gas it is considered that no gas or vapour protection measures are necessary for the proposed development.
	Built Environment	On the basis of the analytical results and subject to confirmation from the relevant water utility provider it is considered that specific protection measures are unlikely to be required for potable water supply on this site.
	Waste Disposal	Based on the initial waste categorisation testing undertaken from representative shallow soils samples across the site it is considered that the shallow soils from across the site would be considered as inert waste for the purpose of disposal.



EXECUTIVE SUMMARY

Further Action:

- Undertake winter groundwater depth monitoring over the winter months (October through to March);
- Provision of a Materials Management Plan and a Qualified Person Declaration under the Definition of Waste Code of Practice should it be proposed to re-use materials on the site or origin or to import other material to site from other development sites;
- A discovery strategy should be maintained during development such that any abnormal conditions (geotechnical or potential contamination) are identified and their potential impact on the proposed development assessed prior to determining any potential mitigation measures.

This Executive Summary is intended to provide a brief summary of the main findings and conclusions of the investigation. For detailed information, the reader is referred to the main report ref. GE18771-GIRv3.0-DEC20.



1.0 INTRODUCTION

1.1 General

Geo-Environmental Services Limited was instructed by Eastleigh Borough Council, to undertake an investigation of the geotechnical and geo-environmental factors pertaining to the proposed development at One Horton Heath – First Residential Parcel, Land West of Horton Heath, Horton Heath, Hampshire, SO30 2HH (herein referred to as ‘the site’). The site’s location is presented in Figure 1.

1.2 Form of Development

The proposed development is understood to form the first parcel of residential development of c.393 residential units with public open space, hard and soft landscape works, internal roads, footway/cycleways, associated parking spaces, substation, SuDS and associated infrastructure (This application is subject to Environmental Impact Assessment).

1.3 Objectives

The data from the intrusive investigation was to form the basis of an interpretation with respect to foundation design, concrete specification, pavements construction, and excavation stability and other pertinent construction issues and in order to clarify the site’s status with regards to soil contamination and any requirement for remedial action in relation to the current land use, proposed redevelopment, adjacent land uses and the wider environment, in the context of likely planning requirements, immediate liabilities under the Environmental Protection Act 1990 and risks posed to Controlled Waters under the Water Resources Act from the current status of the site and in line with the proposed redevelopment.

1.4 Standards and References

Where practicable, the ground investigation and subsequent geotechnical and environmental assessments were undertaken in accordance with the following documents and guidance.

- National Planning Policy Framework – March 2012
- Model Procedures for the Management of Contaminated Land, CLR11, DEFRA and Environment Agency 2004;
- Environment Agency Guidance on Requirements for Land Contamination Reports, Version 1 dated July 2005;
- BS10175:2011+A2:2017 - Investigation of Potentially Contaminated Sites - Code of Practice, BSI 2017;
- BS5930:2015+A1:2020 - Code of Practice for Site Investigations, BSI 2020;
- EN ISO 14688 Geotechnical Investigation and Testing Part 1-2002 and Part 2-2004;
- BS1377: 1990 - Soils for Civil Engineering Purposes, BSI1990;
- NHBC Standards Chapter 4.1 Land Quality - Managing Ground Conditions;
- NHBC Standards Chapter 4.2 Building Near Trees;
- CIRIA C665 – Assessing risks posed by hazardous ground gases to buildings (2007);
- NHBC 10627-R01(04)- Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present (2007);
- BS8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings;
- BS8002:2015 Code of practice for earth retaining structures.



1.5 Conditions

This report does not purport to be a “Geotechnical Design Report” as defined in Clause 2.8 of Eurocode 7 (Geotechnical Design BS EN 1997-1:2004) and some of the data used to support this preliminary geotechnical assessment may not be fully compliant with that design code. It is considered possible that further detailed ground investigations could be required to facilitate the detailed geotechnical design process and should be carried out on a structure specific basis if necessary.

The data collected from the investigations have been used to provide an interpretation of the geotechnical and/or environmental conditions pertaining to the site. The recommendations and opinions expressed in this report are based on the data obtained. Geo-Environmental takes no responsibility for conditions that either have not been revealed in the available records, or that occur between or under points of physical investigation. Whilst every effort has been made to interpret the conditions, such information is only indicative and liability cannot be accepted for its accuracy.

It should be noted that in particular the concentrations and levels of mobile liquid and gaseous materials are likely to vary with time. The results obtained may therefore only be representative of the conditions at the time of sampling. This report should not be taken as any guarantee that a site is free of hazardous or potentially contaminative materials.

Information contained in this report is intended for the use of the Client and Geo-Environmental can take no responsibility for the use of this information by any party for uses other than that described in this report. Geo-Environmental makes no warranty or representation whatsoever express or implied with respect to the use of this information by any third party. Geo-Environmental does not indemnify the Client or any third parties against any dispute or claim arising from any finding or other result of this investigation report or any consequential losses.

Assessment criteria or other parameters developed for the evaluation of contamination on this site are based on a number of assumptions regarding exposure and toxicology. Exposure to contaminants and levels of adverse effects may therefore vary. Whilst reasonable care and expertise has been employed in the development of such criteria, no liability is accepted in this respect. Other criteria or guidance on the development of assessment criteria may be published in the future and no liability is accepted in this respect.



2.0 DESK STUDY

The site forms part of a larger development scheme for which the whole site has been the subject to a Desk Study Report undertaken by a third party, Hydrock, ref. HHD-HYD-XX-XX-RP-GE-0001 dated February 2019.

A brief summary of the findings deemed relevant to this phase of investigation are presented below. It should be noted that this desk study was undertaken for the Land West of Horton Heath development site as a whole, not just for the area of the site comprising the first residential parcel which Geo-Environmental were instructed to investigate. It is assumed that the third party information is factually correct, and Eastleigh Borough Council has reliance on the data included within this report.

Geo-Environmental accepts no liability for errors or omissions within the third party report. For further information reference should be made to the completed Hydrock Desk Study Report, February 2019.

Comments made in the following sections regarding possible ground conditions on the site are based purely on the review of the desk study assessment undertaken by Hydrock, February 2019 and the site walkover undertaken by Geo-Environmental.

2.1 Site Description

A site walkover was undertaken on the 6th July 2020 at which time the First Residential Parcel area comprised three open fields used for the grazing of animals (cattle). The three fields were separated by a combination of hedgerow boundaries and barbed wire fencing. The fields were accessed via metal five-bar gates from an access road to the north of the fields located off Burnetts Lane. The eastern field was the largest of the three fields and rose towards the centre of the field, then fell away to the south. Road construction works were on going in the far south of this field, as part of a separate phase of development. The central of the three fields fell away to the south, however only the northern half of this field formed part of the investigation area, the southern portion comprising future commercial development land. An area of woodland was located immediately adjacent to the south of the western field and west of the central field. Overhead power lines ran east to west across all three fields, with additional lines running north south across the eastern field.

Adjacent land uses were noted to comprise farmland and a solar farm to the north, Chalcroft industrial estate to the south and west, and residential uses to the south and east. Figure 1 presents the site's location and Figure 2 presents the site plan.

Photographs obtained as part of the site walkover of the site area presented in Appendix A.

2.2 Geology

British Geological Survey (BGS) mapping indicated the site to be located on Wittering Formation, with the most westerly edge (outside of the First Residential Parcel) being underlain by River Terrace Deposits and Alluvium associated with a tributary of the River Itchen over Wittering Formation. A small parcel in the south east of the site was shown to be located on Earnley Sand Formation overlying Wittering Formation.

Alluvium is generally dominated by clays and silts, often organic-rich, with varying amounts of sand and gravel.

River Terrace Deposits are drifts typically dominated by sands and gravels with interbeds of clay. Locally may contain peat or organic-rich layers.

Wittering Formation is a greyish brown laminated clay; wavy- to lenticular-bedded sand interbedded with clay in equal proportions; and fine- to medium-grained sparsely glauconitic sand.

The only superficial deposits shown on the site from the geological mapping are three relatively narrow ribbons of



Alluvium in the northern, central and southwestern parts of the site and along most the western part of the site, together with River Terrace deposits along the extreme western edge of the site, superficial deposits. Elsewhere, no superficial deposits are shown.

The Earnley Sand Formation and Wittering formation are part of the Bracklesham Group, which overlie the London Clay and subsequently the Chalk at greater depth.

2.3 Hydrogeology

The soils underling the site are classified as a Secondary 'A' Aquifer.

Secondary A Aquifer – 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.

Groundwater is anticipated to be present at shallow depth within the Alluvium and River Terrace Deposits either side of the various streams identified within the wider development site. Groundwater within the Wittering Formation is anticipated to be a similar elevation to the streams or at a higher elevation and forming a hydraulic gradient down to the groundwater levels within the superficial deposits. Groundwater within the Superficial deposits and underlying solid geology are expected to be in hydraulic continuity

2.4 Hydrology

A number of unnamed streams and ponds were identified on the wider development site, however no surface water features were noted on the First Residential Parcel being considered herein.

2.5 Radon

The environmental data report obtained as part of the desk study undertaken by Hydrock, February 2019 indicated that the site was not located in a Radon Affected Area and radon protection measures are not required for new buildings at the site.

2.6 Historical Mapping

Historical mapping from 1868, presented within the desk study report for the wider development site shows that the entire development site area was shown to have been agricultural farmland throughout the mapping period, with farm buildings and barns being located at Firtree Farm and Chalcroft Farm (farm hubs) as shown on the earliest map, 1868, with Firtree Farm being extended in around 2002. However the farm hub areas were located within the wider development area and not with the first residential parcel under consideration herein. Chalcroft Farm is located c.100m north west of the First Residential Parcel area with Firtree Farm in excess of 1km north of the First Residential Parcel area.

Surrounding land uses were shown to comprise farms with farm buildings/ barns to the east of the site, Chalcroft business park and railway line was located to the south of the site with residential development to the north of the site.

2.7 Generic Contamination

The historical use of the subject site for agricultural activities could have resulted in contaminated soils and/or groundwater beneath the site. The First Residential Parcel is not located on or in close proximity to any of the identified 'farm hubs' (the nearest 'farm hub' is c.100 from the boundary of the First Residential Parcel), therefore the risks from current and historical agricultural activities is considered to be low and to primarily be associated with the use of pesticides, herbicides and the use of agrochemicals within the field network.



Off-site sources of potential contamination include Chalcroft Business Park and the railway line, possible organic and inorganic contaminants, hydrocarbon fuels, lubricants and solvents. However, due to the distance at which these off-site sources are located (c.250m) and that underlying ground conditions are expected to comprise clays of low permeability the risks from the migration of these potential contaminants are considered to be low. In addition the First Residential Parcel is located upgradient of Chalcroft Business Park and it is considered that shallow groundwater would flow in line with local topography, therefore shallow groundwater is presumed to flow in a south westerly direction, so migration via groundwater is considered to be unlikely.

In addition, it also remains possible that the land uses with the wider surrounding area may have resulted in the deposition of airborne contaminants on the surface and shallow soils on site including heavy metals, organic pollutants such as polycyclic aromatic hydrocarbons (PAH), petroleum hydrocarbons/oils, inorganic compounds within the shallow soils across the site.

2.8 Ground Gas Summary

Made Ground has been identified as possibly being present on the wider site. Most likely associated with the 'farm hub' areas across located within the wider development site area and outside the area being considered herein. If any identified Made Ground has an appreciable organic material content, then this may be a source of ground gas. In addition, ground conditions in the west of the site have been identified as possibly comprising Alluvium, which can be an organic rich material and a natural source of ground gas, although this area of the site does not form part of the first residential parcel.

Due to the limited potential for ground gas on the First Residential Parcel the risks from ground gas are considered to be low for this portion of the wider development scheme.



3.0 PRELIMINARY RISK ASSESSMENT

Based on the findings of the third party Hydrock February 2019 desk study, the following sections summarise the anticipated geotechnical and environmental factors likely to impact the site.

3.1 Preliminary Risk Assessment Summary

The Preliminary Risk Assessment (PRA) and Conceptual Site Model (CSM) developed from the information gathered as part of the third party Hydrock desk study (HHD-HYD-XX-XX-RP-GE-0001), February 2019, process identified plausible potential pollutant linkages that existed in relation to the proposed redevelopment of the wider site as a whole.

The potential pollutant linkages established within the third party Hydrock desk study were not considered to prevent development on the subject site, but could require investigation and assessment to support further characterisation, calibration of the CSM and where/if necessary to allow for a determination of a remedial strategy to reduce, remove or otherwise control any risk within the site to key receptors.

In order to progress the assessment in line with best practice guidance and to provide further characterisation of the site and refinement of the PRA and CSM, an intrusive investigation and associated testing was commissioned and included analysis of soil and groundwater (if encountered) samples for the range of potential contaminants identified within the desk study.

3.2 Geotechnical Constraints

The following factors that might impact the geotechnical condition of the site were identified as part of the third party desk study and site walkover:

- The presence of Made Ground and filled ground on site which may impact upon foundation design and construction.
- The presence of shallow groundwater and/or perched water beneath the site.
- The suitability of the shallow soils for the use of soakaways on the site as part of the proposed development.
- The presence of laterally and vertically variable strata and the impact these could have on further construction.
- Consideration of the volume change potential of cohesive soils underlying the site and the affect this could have on foundations.
- The suitability of shallow soils as bearing stratum for conventional foundations.
- The possible presence of aggressive ground conditions (sulphates) which may affect the foundation design and construction.
- The presence of trees and/or vegetation on site or adjacent land, which may have an impact on foundation design and construction if/where shrinkable soils are present.
- The presence of Tree Protection Orders (TPOs) which may affect the type of foundations permitted within certain areas of the site.

3.3 Investigation Strategy

The investigation strategy comprised locations across the First Development Parcel area to assess ground and groundwater conditions and to support the geotechnical and geo-environmental assessment. The investigation positions were agreed with the client and included:

- Construction of 1No. cable percussion boreholes to be advanced to a depth of up to 25.45m bgl (BH01), together with in-situ testing, and disturbed sampling.



- The excavation of 45No. trial pits, 5No. shallow pits to depths of up to 0.7m bgl for soakage testing and 40No. pits to depths of between 3m bgl and 3.5m bgl for general site coverage, six of which were also utilised for soakage testing.
- Attendance of a technician and 4x4 water bowser to supply water for trial pit soakage tests.
- Undertake trial pit soakage tests in general accordance with BRE Digest 365 within TP2-TP10.
- Construction of up to 16No. dynamic sampler boreholes (WS01-WS16) to depths 5m bgl.
- Dynamic probes at 2No. locations adjacent to boreholes DP4, DP5, DP13 and DP16 to 5.00m bgl.
- Installation of 6No. groundwater monitoring wells to a depth of 5m (WS02, WS05, WS07, WS08, WS10 and WS15) to facilitate return monitoring on six occasions. The wells were completed with a lockable upstanding cover set such that they stand above adjacent ground.
- Ground gas monitoring (spot monitoring) of well installations on 6 occasions at 2 week intervals. Wherever possible, the monitoring will target periods of low or rapidly falling atmospheric pressure.
- Geotechnical laboratory testing to inform assessment for foundations, roads (including soaked lab CBR tests) and buried concrete design.
- Geochemical laboratory testing for a suite of commonly occurring brownfield contaminants augmented with potential contaminants as identified in the contamination strategy (developed from previous assessment phases).
- Waste categorisation testing in soil samples to aid the assessment of likely waste classification of surplus soils.

3.4 Investigation Strategy

The positioning of exploratory holes was determined on site to provide general coverage and to target specific areas whilst working within access restrictions associated with site field boundaries. Table 3.1 sets out the investigation strategy adopted.

Area of Concern	Investigation	Positions
General ground conditions	Exploratory holes located across the site, coupled with sampling and laboratory analysis.	All
Potential contamination of near surface soils	Exploratory holes located to provide coverage of the site, coupled with sampling and laboratory analysis.	All
CBR testing of shallow soils	CBR testing comprising laboratory testing (soaked CBRs).	TP15, TP17, TP21, TP24, TP25, TP26, TP34
Strength testing of underlying soils	SPTs at regular intervals within the cable percussion boreholes and window sampler boreholes, and dynamic probing adjacent to a number of exploratory hole positions.	BH01, WS01-WS16, DP13 and DP16
General gassing regime and groundwater levels across site	Spot monitoring within wells located across the site.	WS02, WS05, WS07, WS08, WS10 and WS15
Permeability of underlying soils.	Soakage tests in general accordance with BRE Digest 365.	TP2-TP10

Table 3.1 Summary of the Investigation Strategy

Soil samples were collected and placed into amber jars and cool boxes on site for transit to the office, where they were stored under chilled conditions (<4°C) prior to final transportation in cool boxes to the laboratory by their in-house courier. Both the geotechnical and contamination testing were undertaken by UKAS accredited laboratories. Contamination testing of soil samples was also undertaken in accordance with accredited MCERTS protocols. Samples were stored in temperature controlled conditions from sampling until receipt at the laboratory from which time sample preparation and storage was determined by testing requirements and in line with laboratory's protocols.



4.0 GROUND CONDITIONS

A factual record of the conditions encountered during the physical investigation of the site is presented in the following sections.

For further details of the ground conditions, reference should be made to the exploratory hole logs and in situ testing presented in Appendix B, the geotechnical testing results in Appendix C, geochemical testing results in Appendix D, soakage testing results in Appendix E and ground gas monitoring results in Appendix F.

The physical ground investigation works were undertaken from the 6th July to 10th July 2020.

Unless stated otherwise, all depths are reported as metres below ground level (m bgl).

4.1 Soils

The ground conditions encountered during the investigation were broadly consistent with the anticipated published sequence of strata. In summary, ground conditions typically comprised a variable thickness of Topsoil overlying soils inferred to be clay and sand strata of the Wittering Formation. Within the larger eastern field, more sandy layers were encountered, and clay soils were noted to be predominantly sandy clay. Although sand and sandy clay was encountered within the central and western fields these were encountered to a lesser extent than the eastern field.

A summary of the encountered soil conditions is presented in Table 4.1.

Top (m bgl)	Base (m bgl)	Geology
0	0.15 – 0.30	TOPSOIL: Grass over dark brown silty slightly gravelly CLAY with frequent rootlets; grass over light brown slightly sandy CLAY possibly desiccated with frequent rootlets; grass over dark brown silty CLAY with frequent roots and rootlets.
0.15 - 0.30	25.49+	WITTERING FORMATION (COHESIVE): Stiff to very stiff light brown and orangish brown silty desiccated CLAY with varying proportions of sand and/or gravel; Firm to stiff light brown/orangish brown and grey mottled CLAY with varying proportions of sand; Firm to stiff dark grey/ blueish grey sandy CLAY; Firm to very stiff dark grey sandy CLAY; Firm to very stiff purplish grey CLAY.
0.50 – 3.90	5.00+	WITTERING FORMATION (GRANULAR): Blueish grey clayey fine SAND with bands of firm blueish grey CLAY; Purplish brown/ orangish brown/ blueish grey/ dark greyish brown mottled fine SAND with varying proportions of clay; Dark blueish grey clayey fine SAND very closely interbedded with black fine SAND; Light brown, orangish brown and blueish grey mottled clayey silty fine SAND.

Table 4.1 Summary of Ground Conditions

Made Ground was not encountered within any of the exploratory holes, but brick and concrete rubble was observed to have been deposited at ground surface in heavily trafficked access points into the fields, presumably due to very wet and soft conditions during wetter periods and winter months.

Soils within the top 1.5m were consistently noted to show signs of desiccation. Desiccation and signs of desiccation are discussed and assessed further within Section 5.1

For more detailed descriptions of the ground conditions at specific locations, reference should be made to the exploratory hole logs presented in Appendix B.

4.2 Groundwater

Groundwater was encountered within a number of exploratory holes during the intrusive investigation works as summarised in Tables 4.2 and 4.3 below.