KEEPMOAT HOMES

EAKRING ROAD, BILSTHORPE

GEO-ENVIRONMENTAL ASSESSMENT REPORT

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APPENDICES

DRAWINGS

1. INTRODUCTION

1.1 Introduction

1.1.1 This report has been prepared in accordance with instructions received from Mr Ben Douglas of Keepmoat Homes in an email dated 31 May 2019. The report has been prepared in accordance with proposals detailed within Travis Baker Geo-Environmental Ltd Letter 19017-LET-GE01 dated 3 April 2019.

1.1.2 This document has been compiled to provide an initial assessment of ground conditions and identify potential development constraints in respect of a proposed residential development at a parcel of land off Eakring Road, Bilsthorpe, Nottinghamshire. It is understood that development proposals for the site comprise low-rise residential housing with associated gardens, landscaping and infrastructure; a small area of the site is also to be developed for retail use.

1.1.3 This report is intended to provide an initial indication of the ground conditions to assist the client with identifying potential abnormal construction costs associated with potential geo-environmental issues which may be associated with the site. A Phase 1 Desk Study has previously been prepared for the site by Rodgers Leask Environmental (RLE) dated 17 March 2017. This report provides a brief summary of the Phase 1 Desk Study, plus the results of an intrusive site investigation undertaken by Travis Baker Geo-Environmental Ltd.

1.1.4 The information contained within this report describes the historical, geological and environmental setting of the site and immediate area. The report also describes the results of geotechnical and contamination assessments undertaken based on the findings of the desk study and site investigations. Recommendations are provided in respect of foundation options, contamination, ground gases, drainage and road construction, plus any additional potential development constraints and considerations identified.

1.1.5 This report has been compiled using readily available sources of information from local archives and relevant on-line data bases. A site specific Groundsure Report is included within the RLE Phase 1 Desk Study Report. A list of information sources used to prepare this report is included as Appendix 1.

1.1.6 Initial site investigations were undertaken at the Eakring Road site on the 29 July 2019, which comprised the drilling of six dynamic sampling boreholes, six TRL probes and eight machine excavated trial pits. The dynamic sampling boreholes and the TRL probes were completed by Exploration Ltd. The trial pits were undertaken by St. Clements Plant Ltd. Subsequent to the initial site investigation works, six soakaway tests were undertaken across the site. The investigations were completed under the direct supervision of Travis Baker Geo-Environmental Ltd. The locations of the exploratory holes are illustrated on Drawing No. 19017-GE01.

1.1.7 This investigation has generally been carried out in accordance with the guidance provided in the Environment Agency (EA) and National House Building Council (NHBC) publication 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2008) and the Investigation of Potentially Contaminated Sites – Code of Practice (BS10175 2011).

1.1.8 This report has been prepared for the sole use and reliance of Keepmoat Homes. This report shall not be relied upon or transferred to other parties without the written authorisation of Travis Baker Geo-Environmental Ltd (TBGE).

1.1.9 The findings of this report have been based on information provided from a number of different sources, TBGE have carried out all reasonable care in examining and interpreting this information to confirm its reliability, however, we cannot guarantee the authenticity of this information.

1.1.10 The findings of this report are based on the ground conditions identified at the individual exploratory holes and the associated laboratory testing. TBGE have used best skill and diligence in interpreting the conditions between the exploratory hole locations, however we do not accept any liability for conditions that are not revealed by the exploratory holes or test data. Our recommendations on the ground conditions between or beneath exploratory hole locations are therefore for general guidance only and should be confirmed at or prior to construction.

2. SITE SETTING

2.1 Site Description

2.1.1 The site is approximately 3.8 hectares in area and comprises a single grassed field. The site is located at the north eastern periphery of Bilsthorpe approximately 11km east of the centre of Mansfield. The site location is illustrated on Drawing 19017-GE01. The study area is approximately centred at National Grid Reference (NGR) 464960E, 361059N.

2.1.2 The site comprises a roughly rectangular enclosed grassed field. It is bound to the west by Eakring Road, beyond which is residential housing; a dismantled railway line to the north; an embankment with trees and hedgerows to the east and Wellspek Alloy Wheel Repairs to the south. Mature trees and hedgerows are present around the periphery of the site. A series of photographs identifying the site conditions at the time of the recent site investigation are included in Appendix 2.

2.1.3 The site is relatively flat lying with localised variations. The eastern boundary of the site is marked by a vegetated embankment. This embankment is understood to part of a colliery spoil mound to the former Bilsthorpe Colliery. A footpath trending north east to south west passes through the centre of the site.

2.1.4 The RLE Phase 1 Desk Study identified an infilled brick tunnel / bridge within the embankment at the north east corner of the site. This was not identified during the recent site investigations due to overgrowth of vegetation along the site boundaries.

2.1.5 There was no evidence of invasive weeds identified by our engineers during the site investigation. Confirmation as to the absence of Part IIA invasive weeds should be sought from an appropriate ecological / habitat survey.

2.2 Site History

2.2.1 The Groundsure report previously prepared for the site includes copies of Ordnance Survey County Series and National Grid topographical plans dating from 1886. The historical plans have been reviewed to determine the development history of the site and the immediate vicinity.

2.2.2 The site has remained relatively undeveloped since the first available edition of the mapping (1884) with the exception of North Field Lane trending north east south west through the northern part of the site until the 1950 mapping edition. The 1939 edition mapping shows a section of railway line at the north western corner of the site; this is shown until the 1989 edition. The 1971 edition of the mapping shows a footpath replacing North Field Lane which was shown on previous editions of the mapping.

2.2.3 The land within the general vicinity of the site remained relatively undeveloped until the 1950 mapping which shows the construction of the railway on the northern boundary of the site, the development of Bilsthorpe Colliery to the north east and residential development to the immediate west and south west. The 1971 partial mapping shows a mine marked approximately 750m to the north east of the site. The 1988 partial mapping shows the railway on the northern boundary of the site to be a Mineral Railway, there is also a slurry lagoon to the east of the site. The 2002 mapping shows Bilsthorpe Colliery to have been closed / demolished. No significant changes are noted on subsequent map editions.

3. GEOLOGY, HYDROGEOLOGY, MINING AND RADON

3.1 Recorded Geology

3.1.1 Reference to the British Geological Survey (BGS) online Geo-index has been undertaken to establish the recorded geological setting of the site and the surrounding area.

3.1.2 The published geological mapping shows the site to be free from made ground and superficial deposits.

3.1.3 The recorded geology varies across the site. In the west and central areas of the site, the Chester Formation is recorded comprising red brown pebbly and gravelly sandstone. In the eastern portion of the site, the Retford Member is recorded comprising green-grey mudstone and siltstone. The strata underlying the site are of Triassic age.

3.2 Hydrogeology

3.2.1 Defra's Magic Map application has been consulted in respect of the aquifer designation of the bedrock directly underlying the site. The Retford Member underlying the eastern area of the site is categorised as a Principal Aquifer, the Chester Formation is classified as a Secondary A Aquifer.

3.2.2 The site is within a Zone III Total Catchment Groundwater Protection Zone.

3.3 Mining

3.3.1 The proposed development site is within an area which may be affected by coal mining activities. A Coal Authority (CA) Mining Report has previously been obtained for the site and is included within the RLE Phase 1 Desk Study. The pertinent CA information is summarised in the following.

- The site is within an area which could be affected by past underground mining of two seams of coal at 430m and 670m depth which were last worked in 1966. Any ground movement due to coal mining activity should have ceased.
- The site is not within an area which could be affected by current underground coal mining.
- There are no mining entries on or within 20m of the site boundary.
- The site is not within 200m of the boundary of an opencast site from which coal has been removed.
- Reserves of coal exist within the area which have the potential to be worked in the future.
- There is one claim within 50m of the site boundary due to coal mining subsidence.
- The property is within an area where notices to withdraw support were given in 1981.

3.4 Radon

3.4.1 The Building Research Establishment (BRE) 'Guidance on Protective Measures for New Buildings' (BR 211) published in 2015 has been consulted. The report identifies areas of the country that are at risk from radon and may require radon protection. The BRE guidance document indicates that the site is not within an area where in new properties require radon protective measures.

4. ENVIRONMENTAL SETTING

4.1 Groundsure Report

4.1.1 Information from the Environment Agency (EA) was obtained via a site specific Groundsure Report included within the RLE Phase 1 Desk Study. The Groundsure Report provides environmental information covering a 1km buffer from the centre of the Eakring Road site. The report includes details of nearby sites that are recorded to hold abstraction or discharge consents, recorded pollution incidents, licensed waste sites, and sites that have, or historically have had, potentially contaminative issues. For ease of reference, a summary of the pertinent points are summarised in the following text.

4.2 Abstraction Licenses

4.2.1 There are two historical groundwater abstraction licences within 1km of the site boundary. They are both associated with Bilsthorpe Colliery approximately 420m to the north east. There are a further twelve historical groundwater abstraction licenses between 1.5km and 2km from the site.

4.2.2 There are five active surface water abstraction licences within 1.5km of the site boundary relating to spray irrigation using water from Rainworth Water.

4.2.3 There are five active potable water abstraction licences between 1.5km and 1.7km of the site boundary, all to the west of the site.

4.3 Discharge Consents

4.3.1 There are three records of historical/revoked discharge consents within 500m of the site. Two are associated with trade discharges at Bilsthorpe Colliery approximately 320m to the south east and one relates to sewage approximately 400m to the south east.

4.4 Pollution Incidents to Controlled Waters

4.4.1 There have been no recorded pollution incidents to controlled waters within 500m of the site.

4.5 Part A(1) and IPPC Authorised Activities

4.5.1 There are twelve records for Part A(1) and IPPC Authorised activities within 500m of the site. All records related to waste oil disposal, waste landfilling and associated processes approximately 350m to the south east at Bilsthorpe Oil Treatment Plant and Bilsthorpe Landfill site. Two of the twelve records are currently active.

4.6 Part A(2) and Part B Activities

4.6.1 There is one record for Part A(2) and Part B activities within 500m of the site associated with Bilsthorpe Colliery. The record is associated with the processing of coal/gypsum/carbon.

4.7 Historical Landfill Sites, Recorded Landfill Sites and Registered Landfill Sites

4.7.1 There is one active recorded landfill site approximately 530m to the south east of the site. Records indicate that the site is likely to accept 10 tonnes per day excluding inert waste.

4.7.2 Two records for a historic landfill site exist approximately 700m to the south east of the site. The site is recorded to have accepted inert, industrial, commercial, household, special and liquid sludge wastes.

4.7.3 Twenty five records exist for EA licensed waste sites between 345m and 735m to the south east of the site including a physico-chemical treatment facility, special waste transfer station, household waste amenity site, vehicle dismantler, co-disposal landfill and end of life vehicles facility.

4.8 Registered Waste Treatment or Disposal Sites

4.8.1 There are three records for planning applications within 500m of the site. One is for a waste to energy site approximately 300m to the north east of the site at the former Bilsthorpe Colliery.

4.8.2 Approximately 350m to the south east of the site, there are two historic planning applications for a waste transfer station and a recycling centre at Oakwood Fuels. The planning applications were granted by Newark and Sherwood District Council.

4.9 Control of Major Accident Hazard Sites (COMAH)

4.9.1 There are no registered Control of Major Accidents Hazard Sites within 1km of the site.

4.10 Fuel Station Entries

4.10.1 There is one obsolete fuel station entry recorded within 1km of the site. The obsolete station is approximately 400m to the south of the site associated with B F L garage on Kirklington Road.

4.11 Industrial Land Use Sites

4.11.1 There are nine records of historic potentially contaminative land uses for the site. These include railway sidings, a colliery and a telecom exchange.

4.11.2 Within 250m of the site, there are records for refuse heaps, an unspecified factory, a slurry lagoon, a fire station, unspecified tanks and an electricity substation.

5. PRELIMINARY CONCEPTUAL SITE MODEL AND RISK ASESSMENT

5.1 Initial Conceptual Site Model

5.1.1 This conceptual site model (CSM) represents the environmental characteristics of the Eakring Road site and illustrates the relationships between the identified contaminants, pathways and receptors. The CSM identifies the potential contaminant linkages, which may exist at the site. The aim of the CSM is to provide a qualitative assessment of risk posed to both human health and environmental receptors from possible on and off-site contamination sources and to inform the design of the intrusive site investigation works. In order for a contaminant linkage to exist, each of the three elements need to be present i.e. the source (contaminant), pathway and receptor. These elements are defined as:

- Source - Substance that can cause harm;
- Pathway - A credible pollutant linkage between the source and target;
- Target - A receptor, which could be harmed.

5.2 Sources

5.2.1 The initial CSM has been based on the findings of the background information described within Sections 1 to 4 of this report.

5.2.2 Desk study researches has identified the potential for limited sources of contamination to be present on-site. The potential sources of contamination are considered to be associated with adjacent land uses and the possible use of pesticides and insecticides on the site. A summary of potential sources and associated contaminants that may be hazardous to receptors identified in Section 5.4.1 is presented below.

Table 1 – Potential Contamination Sources

	Source	**Potential Contaminant**
1.	Made ground associated with railway sidings in the north of the site and former road.	Metals, metalloids, cyanide, phenol, sulphate, polyaromatic hydrocarbons, asbestos, pH.
2.	Made ground associated with railway sidings in the north of the site and former road.	Ground gases (carbon dioxide, methane)
3.	Pesticides and insecticides from the former land use as an agricultural field	Organophosphorus and organochlorine insecticides
4.	Potential made ground including putrescible waste and organic rich deposits from the landfill to the south east of the site	Ground gases (carbon dioxide and methane)
5.	Former colliery and spoil mounds, windblown contaminants.	Polyaromatic hydrocarbons, metals.

5.3 Pathways

5.3.1 The list below summarises possible pathways, which could allow potential receptors to be exposed to any contamination present at the site:

- Dermal contact, ingestion or inhalation of soil contaminants by site users;
- Ingestion of contaminated soil;
- Inhalation of contaminated dust;

- Migration of soil borne gases and vapour into new buildings;
- Migration of contaminants via service routes and foundations;
- Leaching of contaminants and migration through strata;
- Groundwater including perched groundwater;
- Surface water run-off;
- Direct contact between contaminated soils and building substructures.

5.4 Targets

5.4.1 Potential receptors to any contamination identified at the site include:

- Humans – during construction phase and subsequent site users;
- Flora and fauna on the site (dependent upon final site design);
- Principal and Secondary A aquifers underlying the site;
- Local water courses;
- Buildings and buildings sub-structures;
- Adjacent sites.

5.5 Preliminary Risk Assessment

5.5.1 The methodology used in this assessment is broadly analogous with that presented in the EA/NHBC document R&D Publication 66 "Guidance for the Safe Development of Housing on Land Affected by Contamination" (2008) and has been used to evaluate a level of risk for each contaminant linkage identified in the conceptual model. This is a qualitative approach based upon the classification of the probability of occurrence and the potential consequence (severity).

5.5.2 We have used the risk classification system described in R&D Publication 66 in this appraisal, the degree of risk is based on an assessment of consequence of an event occurring and the probability of a pollutant linkage. Table 2 below is the Categorisation of Risk table from the document, in which the likelihood of each pollutant linkage being realised is compared with the severity of the consequence. This provides a qualitative assessment of potentially unacceptable risks.

Table 2 – Categorisation of Risk

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability of Pollutant Linkage	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate to Low Risk
	Likely	High Risk	Moderate Risk	Moderate to Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate to Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate to Low Risk	Low Risk	Very Low Risk	Very Low Risk

5.5.3 The definitions of the risk terms used in describing the risk levels in Table 3 above are based on those provided in CIRIA 552, Contaminated Land Risk Assessment, a guide to Good Practice 2001a.

- Very High Risk - There is a probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action.
- High Risk - Harm is likely to arise to the designated receptor from an identified hazard at the site without appropriate action.
- Moderate Risk - It is possible that without appropriate remediation action harm could arise to the designated receptor. It is relatively unlikely that such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.
- Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst, if any harm were realised, any effects would be mild.
- Very Low Risk - The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

5.5.4 We understand that development proposals for the Eakring Road Site comprises residential housing, gardens, landscaping, public open space and associated infrastructure plus a retail unit within the south west of the site.

5.5.5 This assessment of the potential harm to either human health or the local environment is based on our experience and judgement.

5.6 Pollution Linkages

5.6.1 On the basis of the sources, pathways and targets described previously we have summarised the identified pollutant linkages within our Conceptual Site Model and Qualitative Risk Assessment included within Appendix 5.

5.6.2 Based on the proposed end use, the site is generally considered to represent a low risk to human health and low risk to controlled waters. This risk has been investigated by means of site investigation works detailed within Section 6 of this report. The locations of the exploratory boreholes are shown on Drawing 19017-GE01.

5.7 Groundwater

5.7.1 Based on the on the previous land use of the site and the identified pollutant linkages it is considered that the site represents a low risk to controlled waters. The risk to groundwater is not considered further as part of this geo-environmental assessment.

5.8 Contaminants of Concern

5.8.1 Based on the identified potential contamination sources and development proposals the following contaminants of concern have been identified:

- metals and metalloids including arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc;
- pH;
- sulphate (total and water soluble), sulphide and sulphur;
- speciated polycyclic aromatic hydrocarbons;
- Pesticides / insecticides.

5.8.2 The main risk of contamination identified in this preliminary risk assessment is associated with the potential historic use of agrochemicals on the site and made ground associated with the railway to the north of the site.

5.9 Site Investigation Strategy

5.9.1 Against the background of the CSM and preliminary risk assessment, a site investigation has been designed and implemented. Table 3 (below) summarises the site investigation strategy for the site. Boreholes have been positioned to provide a general coverage of the site to obtain geochemical and geotechnical data and to target areas of potential contamination.

Table 3 – Site Investigation Strategy

Exploratory Hole	Objective
Dynamic sampling Boreholes	To determine ground and groundwater conditions across the site, including: - nature and depth of any made ground; - nature of near surface natural materials; - obtain soil samples for laboratory chemical and geotechnical testing; - carry out in-situ geotechnical testing (SPTs); - obtain data for foundation design; - install standpipes for ground gas and groundwater monitoring.
Machine Excavated Trial Pits	To determine ground and groundwater conditions across the site, including: - nature and depth of any made ground; - nature of near surface deposits; - obtain soil samples for laboratory chemical and geotechnical testing; - carry out in-situ geotechnical testing (hand vane); - assess suitability for shallow foundations;
(TRL) Cone Penetrometer Tests	To provide preliminary CBR data for highways design.
Laboratory Testing - Contamination	Analysis of soil samples to provide data for human health risk assessments.
Laboratory Testing - Geotechnical	Analysis of soil samples to assist with foundation and infrastructure design.
Monitoring	Ground gas / groundwater monitoring to confirm groundwater levels and gas concentrations for ground gas assessments.

6.0 SITE INVESTIGATION RESULTS

6.1 Site Works

6.1.1 The ground investigation was undertaken by Travis Baker Geo-Environmental Ltd on 29 July and 19 to 21 August 2019. Exploration Ltd undertook the dynamic sampling drilling and cone penetrometer tests, St. Clements Plant Ltd completed the machine excavated trial pits and Triple H Contractors undertook the on-site soakaway testing. All works were supervised by Travis Baker Geo-Environmental Ltd on a full-time basis. The dynamic sampling borehole logs and the trial pit / soakaway test pit logs are included as Appendices 4 and 5 respectively. The results of the TRL testing and site monitoring (gas and groundwater) are included as Appendices 8 and 9 respectively.

6.1.2 Given the absence of any specific contamination sources to target, the exploratory hole locations were positioned to provide a general site coverage and characterise the ground conditions. The investigation was as far as possible undertaken in accordance with BS10175:2011 + A2:2017 Investigation of Potentially Contaminated Sites; BS5930:2015 Code of Practice for Site Investigation and BS EN ISO 14688-2:2018 – Geotechnical Investigation and Testing.

6.1.3 Representative soil samples of each soil type encountered were taken from the boreholes. Soil samples were collected for geochemical analysis and placed into appropriate sampling containers (plastic tubs or amber jars, as appropriate). The samples were then placed in cool boxes together with ice packs. These were collected and tested by an approved accredited laboratory, Concept Life Sciences (CLS). The results of the laboratory testing are included within Appendix 7

6.1.4 Bulk soil samples were obtained from selected trial pit and borehole locations and sent for geotechnical testing to assist with foundation assessment, infrastructure design and identify the engineering properties of the soils. The results of the laboratory geotechnical testing are included within Appendix 6.

6.1.5 The site investigation comprised the following works:

- Six dynamic sampling boreholes with in-situ standard penetration tests (SPTs) at 1m intervals - DS01 to DS06
- Eight machine excavated trial pits – TP01 to TP08.
- In-situ hand shear vein tests where appropriate.
- Six cone penetrometer tests – TRLDCP1 to TRLDCP6.
- Six in-situ soakaway tests.
- Laboratory geotechnical testing of soil samples.
- Laboratory chemical analysis of soil samples.
- Ground gas and groundwater monitoring.

Instrumentation and Monitoring

6.1.6 A total of four 50mm diameter gas / groundwater monitoring standpipes were installed within selected boreholes (DS1, DS3, DS5 and DS6) in order to monitor the groundwater levels and concentrations of soil-borne gases. Installation details are shown on the exploratory hole logs included in Appendix 4. A total of four monitoring visits have been carried out to date between the 1 August 2019 and 13 September 2019 during varying barometric conditions. Concentrations of oxygen, methane and carbon dioxide, together with groundwater levels, barometric pressure and gas flow rates have been recorded within each of the installations. The results of the monitoring are presented within Appendix 9.

Testing

6.1.7 A programme of geotechnical laboratory testing was undertaken in accordance with BS1377:1990. The testing included following:-

- Natural moisture content determination (6 samples),
- Plasticity Index (6 samples).
- Particle size distribution test (1 sample).

6.1.8 A total of 31 soil samples were scheduled for contamination testing as summarised in Table 4.

Table 4 – List of Determinants Tested – Soil Samples

Test	Topsoil / Subsoil	Weathered Chester Formation	Weathered Retford Member
Travis Baker Greenfield Suite	14	6	-
Speciated Polyaromatic Hydrocarbons (USEPA 16 PAH)	9	-	-
Organophosphorus Insecticides	3	-	-
Organochlorine Insecticides	3	-	-
BRE SD1	-	5	3

◊: Travis Baker Greenfield Suite includes:- arsenic, boron, cadmium, total chromium, copper, lead, mercury, nickel, selenium, zinc, sulphate (soluble), pH

#: USEPA16 PAH includes:- naphthalene, acenaphthylene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(123-cd)pyrene, benzo(ghi)perylene and dibenzo(a,h)anthracene.

6.2 Ground Conditions

Top Soil

6.2.1 Topsoil was encountered within each of the boreholes across the site. These materials generally range to depths of between 0.3m and 0.45m. The topsoil varied across the site dependent on the underlying geology. At exploratory hole locations where the underlying geology was the Chester Formation (i.e. western and central areas), the topsoil material generally comprises slightly clayey slightly gravelly (quartzite) sand with fine rootlets. Where the underlying geology is recorded as the Retford Member, the topsoil material generally comprised sandy slightly gravelly (quartzite) clay with fine rootlets.

6.2.2 No extensive deposits of made ground were observed during the site works. Rare brick fragments were identified at DS04 and DS06 within topsoil.

Natural Superficial Deposits

6.3.1 No natural superficial deposits were encountered within the exploratory hole locations which is consistent with the recorded geology of the site and surrounding area.

Solid Geology

6.4.1 The site is recorded to be directly underlain by strata of the Chester Formation (central and western area) and Retford Member (eastern area). This was generally confirmed within the exploratory boreholes and trial pits as described in the following.

6.4.2 Within exploratory holes DS03, DS06, TP05 and TP07, stiff and very stiff light grey and orange sandy, silty, gravelly clay was encountered. The gravel comprised tabular sandstone and siltstone

with observed lithorelicts. At the base of the aforementioned locations, fragments of extremely weak green-grey siltstone were encountered. These materials are considered to be representative of weathered strata of the Retford Member which is recorded to underlie the eastern part of the site. Drilling at DS03 and DS06 refused between 1.52m and 2.00m below ground level.

6.4.3 At the remaining exploratory hole locations, medium dense to very dense red brown gravelly (occasionally silty and clayey) sands were encountered. The gravel typically comprises fine to coarse rounded quartzite. TP01 identified a band of sandy gravelly clay between 1.1m and 2.25m. At the base of TP06, extremely weak grey brown sandstone as encountered. Boreholes refused between 1.93m and 3.0m below ground level within the central and western areas of the site. These deposits are considered to be representative of the Chester Formation.

6.3 In-Situ Testing

Standard Penetration Tests (SPTs)

6.3.1 A total of 12 Standard penetration tests (SPTs) have been undertaken within the dynamic sampling boreholes. The SPT 'N' values obtained from the 12 tests undertaken within the weathered Retford Member ranged between 9 and greater than 50 (i.e. firm clay to refusal). The SPT 'N' values obtained within the weathered Chester Formation ranged between 9 and greater than 50 (i.e. loose sand top refusal). The results are included on the individual borehole logs. For ease of reference, a summary of the SPT results against depth is presented within Table 5.

Table 5 - SPT Summary

Borehole Ref.	SPT 'N' Value	
	1m	2m
DS01	14	>50
DS02	9	>50
DS03	>50	>50
DS04	15	>50
DS05	11	>50
DS06	9	>50

Weathered Chester Member
Weathered Retford Formation

Hand Shear Vane Tests (HSV)

6.3.2 Where possible, hand Shear vane tests (HSV) were completed within cohesive material within trial pits. The results are included on the individual trial pit logs. However, for ease of reference, a summary of the SPT results against depth is presented within Table 6.

Table 6 - HSV Summary

Trial Pit Ref.	Depth (m)	Shear Strength (kPa)				
		Test 1	Test 2	Test 3	Average	Consistency
TP01	1.2	140	130	98	122.67	Stiff
TP05	0.9	110	90	92	97.33	Stiff
TP06	1.2	130	112	140	127.33	Stiff
TP08	1.0	128	130	140	132.67	Stiff

Weathered Retford Member
Weathered Chester Formation

6.4 Groundwater

6.4.1 Groundwater was not encountered within any of the boreholes or trial pits at the time of the intrusive site investigations.

6.4.2 Groundwater monitoring has been undertaken on four occasions within standpipes installed within boreholes DS01, DS03, DS05 and DS06. The majority of the boreholes remained dry during the monitoring period. Groundwater levels of 1.36m to 1.43m below ground level were recorded at DS06 located within the southern area of the site adjacent to the eastern boundary.

6.4.3 It should be noted that groundwater levels fluctuate throughout the year and between years due to the dynamic balance between groundwater recharge, storage and discharge. Factors affecting groundwater levels include seasonal/climatic variation and groundwater abstraction.

6.5 Trial Pit Stability

6.5.1 All of the dynamic sampling boreholes and trial pits undertaken across the proposed development areas remained stable during the works. It should be noted that the exploratory holes were only open for a short period to allow for logging and sampling. Trenches may be less stable if left open for a longer period of time. Based on the conditions encountered, services trenches / footings to depths of say 2.5m should remain stable within the weathered Retford Member in the east of the site. Support may be required within the granular materials of the weathered Chester Formation, for excavations say >2.0m.

6.6 Laboratory Geotechnical Testing

Plasticity Index

6.6.1 A total of six plasticity index tests have been scheduled on samples obtained from the boreholes and trial pits located across the proposed development area. The tests carried out identified varied volume potential across the proposed development site. The weathered Retford Formation is indicated to range from low to medium volume change potential. The weathered Chester Formation test results vary from not shrinkable (<10%) to a low volume change potential.

Table 6 – Summary of Laboratory Plasticity Index Test Results

Location	Depth (m)	Material Type	Plasticity Index (Ip)	Modified Plasticity Index (I'p)	Volume Change Potential
DS06	0.7-1.0	Weathered Retford Member	15	14.8	Low
TP01	1.3-1.5	Weathered Chester Formation	17	13.7	Low
TP03	0.9-1.1	Weathered Chester Formation	9	8.7	Not Shrinkable
TP05	0.9-1.1	Weathered Retford Member	26	25.7	Medium
TP05	1.4-1.7	Weathered Retford Member	18	17.8	Low
TP07	1.2-1.3	Weathered Retford Member	18	17.8	Low

6.6.2 NHBC guidance indicates that highest modified plasticity index should be used when assessing tree influence and there is a range of results. It is therefore recommended that a low volume change potential is used to assess founding depths in relation to trees when founding in material of the weathered Chester Formation, and a medium volume change potential when founding in material of the weathered Retford Member.

6.6.3 A copy of the geotechnical test results are included as Appendix 6.

6.7 TRL Dynamic Cone Penetrometer Tests

6.7.1 Six TRL DCP tests were carried out within the proposed road locations across the site. The results indicate approximate CBR values of between 0.68% and 2.37% within the top 1m. Approximate CBR values increase with depth, with typical values of 1.8% to 2.2% recorded at a depth of 0.5m. A copy of the TRL results are included as Appendix 8.

6.8 Concrete Classification

6.8.1 Excluding the topsoil, pH and water soluble sulphate (SO_4) tests were undertaken on 18 samples of natural soils. The results indicated SO_4 values of <0.05g/l to 0.1g/l, however the majority of samples presented <0.05g/l of water soluble sulphate. Recorded pH values ranged from 7.0 to 8.8.

6.8.2 The results of the chemical analysis have been compared to BRE Special Digest 1 (Concrete in Aggressive Ground). Based on the results of the chemical testing the Design Sulphate Class for the superficial clay has been determined as DS1 and the Aggressive Chemical Environment for Concrete class is AC-1s.

6.9 Soakaway Potential

6.9.1 In-situ soakaway testing was undertaken at six locations across the proposed development area (i.e. SA1 to SA6) as shown on Drawing 19017-GE01. The results of the soakaway testing are included within Appendix 10.

6.9.2 To calculate the soil infiltration rate in accordance with BRE Digest 365, it is necessary to monitor the time taken for the water level to reduce from 25% to 75% of the effective depth of the pit. To fully assess the permeability of the soils the pit should be allowed to fully drain three times on the same or consecutive days.

6.9.3 To provide an approximation of the soil infiltration rate for the natural materials for each location we have plotted the results on a graph to determine the times that the water levels reached 25% and 75% of the effective depth. In accordance with BRE 365, we have used the following formula to determine the approximate permeability rate:

$$f = \frac{vp75\text{-}25}{ap50 \times tp75\text{-}25} \; ms^{-1}$$

Where:
f = soil infiltration rate
vp75-25 = effective storage volume of water in the trial pit between 75% and 25% effective depth
ap50 = the internal surface area of the trial pit up to 50% effective depth including the base area
tp75-25 = time for the water level to fall from 75% to 25% effective depth (in seconds)

6.9.4 The records of the six soakaway tests are attached as Appendix 10 for reference which include the pit dimensions, and the depth of water throughout the test period. The calculation summary sheet, also attached as Appendix 10, provides the calculations of the surface area and effective depths along with the recorded water depths for each trial. For ease of reference we have summarised the calculated infiltration rates in Table 7 (overleaf). The graphs used to calculate the soil infiltration rates are included in Appendix 10.

6.9.5 Test location SA1 collapsed during the initial test, therefore a second test pit was excavated adjacent to it. Due to the slow infiltration rates on each location the water level did not drop below the 25% full depth on the majority of the tests (see test graphs in Appendix 10). To calculate the estimated soil infiltration rates the time / depth graphs were extrapolated to estimate the time taken for the pit to drain between 75% full and 25% full. The estimated soil infiltration rates are included in Table 7 below.

Table 7 - Summary of Calculated Soil Infiltration Rates

Test Location	Depth (m)	Trial Number	Approximate Infiltration Rate◇	Comments
SA1	2.50	1	Soakaway side wall collapsed - abandoned	
SA1A	2.60	1	6.13×10^{-6} ms^{-1}	Extrapolated result – did not extend to 25% full ED
		2	**4.98×10^{-6} ms^{-1}**	Extrapolated result – did not extend to 25% full ED
SA2	2.30	1	3.69×10^{-6} ms^{-1}	Extrapolated result – just reached 25% full ED
		2	4.00×10^{-6} ms^{-1}	Extrapolated result – did not extend to 25% full ED
		3	**3.24×10^{-6} ms^{-1}**	Extrapolated result – just reached 25% full ED
SA3	2.40	1	8.38×10^{-6} ms^{-1}	Extrapolated result – just short of 75% full ED
		2	**4.61×10^{-6} ms^{-1}**	Extrapolated result – just short of 75% full ED
		3	5.41×10^{-6} ms^{-1}	Extrapolated result – just short of 75% full ED
SA4	2.60	1	5.91×10^{-6} ms^{-1}	Extrapolated result – just reached 25% full ED
		2	3.92×10^{-6} ms^{-1}	Extrapolated result – just short of 50% full ED
		3	**3.53×10^{-6} ms^{-1}**	Extrapolated result – just reached 25% full ED
SA5	2.04	1	3.79×10^{-6} ms^{-1}	Extrapolated result – just reached 25% full ED
		2	3.30×10^{-6} ms^{-1}	Extrapolated result – just reached 25% full ED
		3	**2.96×10^{-6} ms^{-1}**	Extrapolated result – just reached 25% full ED
SA6	2.60	1	**5.40×10^{-6} ms^{-1}**	Extrapolated result – just reached 25% full ED
		2	7.94×10^{-6} ms^{-1}	Extrapolated result – just short of 25% full ED
		3	5.63×10^{-6} ms^{-1}	Extrapolated result – just reached 50% full ED

ED – Effective Depth

◇ - Based on extrapolated time / depth graphs

6.9.5 BRE 365 indicates that the lowest soil infiltration rate should be used to assess the suitability of the soils, these are identified in bold.

6.9.6 With the exception of SA1, three tests were completed at each location between 19 August 2019 and 22 August 2019 within the natural weathered materials of the Chester Formation. Based on the results of the soakaway testing estimated infiltration rates of between 2.96×10^{-6} ms^{-1} and 8.38×10^{-6} ms^{1} have been calculated. The tests were generally undertaken in accordance with BRE Digest 365, however, due to the slow infiltration rates the time between 75% full and 25% full effective depths had to be estimated from the graphs.

6.9.7 Based on the results of soakaway testing and associated assessments it is considered that the granular materials of the weathered Chester Formation underlying most of the site exhibit poor soil infiltration rates in respect of potential soakaway drainage. These materials are unlikely to be considered suitable for soakaway drainage.

6.10 Hard Strata

6.10.1 Hard strata (i.e. bedrock) was encountered within several of the exploratory hole locations between 1.5m and 2.85m below ground level.

6.10.2 TP05, TP07, DS03 and DS05 encountered extremely weak grey-green siltstone at the base of the trial pits and boreholes. Hard digging was recorded within the aforementioned trial pits and drilling progress refused within siltstone. These materials are considered to be representative of Retford Member strata.

6.10.3 TP01, TP02 and TP06 recorded hard digging at the base of the excavations. The material encountered was extremely weak pale grey brown sandstone representative of the Chester Formation.

6.10.4 The locations and depth to hard strata encountered during the recent site investigation works is illustrated on Drawing 19017-GE02.

6.11 Founding Horizon

6.11.1 The in-situ SPTs and laboratory geotechnical test results indicate that material of the weathered Retford Member and weathered Chester Formation would generally provide suitable founding strata for the proposed 2 to 3 storey residential housing. These materials are generally considered suitable for the construction of traditional strip and trench fill foundations at a minimum depth of 0.75m below existing ground level within the Chester Formation (low volume change potential) and 0.9m below existing ground level within the Retford Member (medium volume change potential). For preliminary design purposes it is recommended that a net allowable bearing pressure of 100kN/m^2 will be appropriate for the uppermost weathered component of the Chester Formation and 125kN/m^2 for the weathered Retford Member materials. The proposed net allowable bearing pressures would be suitable for a traditional strip or trench fill foundation up to 1m wide; settlements would be restricted to less than 25mm for such a foundation. If greater bearing pressures are required foundations could be deepened, a net allowable bearing pressure of 150kN/m^2 would be applicable for foundations in the order of 2.0m below existing ground level.

6.11.2 The cohesive materials of the Retford Member have been classified as having medium volume change potential; the localised cohesive materials of the Chester Formation have been classified as having a low volume change potential and are therefore susceptible to shrinkage / heave within influencing distance of trees. Foundations are required to be deepened for plots located within the influencing distance of trees. Heave protection measures may also be required to be installed within localised plots located within close proximity to existing trees or hedgerows.

6.11.3 Given the general absence of cohesive (clay based) materials and made ground across most of the site, plus low concentrations of ground gas, ground bearing floor slabs may be acceptable across majority of the proposed development area. However suspended / beam and block floor slabs will be required in areas of identified tree influence.

6.11.4 Foundation considerations are discussed in further detail within Section 8 of this report.

6.12 Ground Gases

6.12.1 Due to the potential for ground gases to be produced from the adjacent made ground to the north of the site and the landfill to the south east, four standpipes have been installed within boreholes DS01, DS03, DS05 and DS06 to assess the gas regime at the site. The standpipes were monitored on four occasions between 01 August and 13 September 2019. The results of the monitoring visits are included as Appendix 9

6.12.2 Methane has not been encountered at the site. Concentrations of carbon dioxide ranged from 0.7% to 6.0% and showed a general decrease during the monitoring period. Detectable flow rates were not recorded within any of the monitoring wells

6.12.3 A ground gas assessment has been undertaken on the results of the recent monitoring and is included within Section 8.

7. PRELIMINARY CONTAMINATION ASSESSMENT

7.1 Human Health Risk Assessment

7.1.1 Data obtained from the site investigation has been used to assess the contamination status of the site. We have utilised the current technical guidance published by the Environment Agency (EA) i.e. their Contaminated Land Exposure Assessment (CLEA) model. The Chartered Institute of Environmental Health (CIEH) and Land Quality Management (LQM) published updated Suitable for Use Levels (S4ULs) in January 2015 for a number of potential contaminants of concern (COC). These include those with previously published soil guidance values (SGVs) available from the EA. The published S4ULs are designed to be used as generic screening values. The S4ULs have been produced to incorporate updates to toxicological data, where available, together with adaptations to the exposure modelling originally proposed by Defra in the production of Category 4 Screening Levels (C4SL). However, unlike the C4SLs, the S4ULs are still based on the concept of minimal risk and are considered appropriate for use in generic quantitative risk assessment (GQRA). The S4UL have been used in accordance with following:-

7.1.2 Where available, Generic Assessment Criteria (GAC) values published by the Environmental Industry Commission (EIC) have been used for substances with no published S4UL. There are a number of additional potential Contaminants of Concern (COC) where there is currently no available guidance based on minimal risk and/or it is not considered appropriate to derive in-house GAC values using the CLEA model. The initial screening of geochemical results for these contaminants has therefore been undertaken in accordance with the following principles:

7.1.3 Screening values have been derived to assess the potential significance of low levels of two organochlorine based insecticides, dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyltrichloroethane (DDT). The CLEA model (v1.071) has been used to provide initial assessment criteria based on a standard clay soil with a conservative soil organic matter (SOM) content of 1% for a residential land use with gardens ('residential with produce'). The default CLEA exposure parameters have been amended in accordance with Tables 1 to 3 of the LQM/CIEH S4ULs for Human Health Risk Assessment document, dated 2015 and are comparable to the published S4ULs. Toxicological and physio-chemical parameters from the Risk Assessment Information System (RAIS) from the University of Tennessee have been used within the CLEA model. The RAIS system utilises a United States Environmental Protection Agency (US EPA) hierarchy to select relevant data for the required parameters. The assessment is therefore based on the following parameters:

- An excess lifetime cancer risk (ELCR) of 1 in 100,000 has been used based on 'minimal risk'.
- A 70kg adult breathes 20m^3 of air per day.
- The most conservative route (oral or inhalation) has been assumed, as appropriate.
- Dermal exposure routes have been compared with oral health criteria values; a conservative estimate using oral and inhalation exposures have been combined to derive the assessment criteria.

7.1.4 With regard to lead the former SGV for residential land uses of 450mg/kg (now withdrawn) was formally recognised guidance in the UK as representing a level of minimal risk. However, review of toxicological research has indicated that lead may affect IQ in children even at low exposures; the value of 450mg/kg is therefore not considered suitably protective. The Category 4 Screening Level (C4SL) for lead, published by Defra in March 2014, related to the revised Part 2A statutory guidance

based on a low level of toxicological concern (opposed to minimal risk) is 200mg/kg for the standard residential with homegrown produce land use. This level is considered conservative and appropriate as an initial screening value for the site.

7.1.4 It is understood that proposals for the Eakring Road site comprise residential housing, gardens, landscaping and associated infrastructure plus a retail unit. For the purposes of this initial assessment published screening criteria for a 'residential with plant uptake' land use has therefore been used in this assessment to assess the most sensitive potential end use for the site.

7.1.5 Assessment criteria for organic contaminants vary dependent on the soil organic matter (SOM) content of the material. A conservative value of 1.0% SOM has been applied to all soils for the purposes of this initial assessment.

7.1.6 In accordance with current best practice outlined within 'guidance on Comparing Soil Contamination Data with a Critical Concentration' (May 2008) published by CL:AIRE we have reviewed the borehole and trial pit logs to determine any differences within the soil types encountered at the site. Two main material types have been identified i.e. top soil and weathered bedrock, as described in the following text. To provide an assessment of the geochemical nature of the near surface materials selected samples were scheduled for laboratory analysis as summarised in Table 7.

Table 7 - Laboratory Testing Summary

Test	Topsoil / Subsoil	Weathered Chester Formation	Weathered Retford Member
Travis Baker Greenfield Suite	14	6	-
Speciated Polyaromatic Hydrocarbons (PAHs)	9	-	-
Organophosphorus Insecticides	3	-	-
Organochlorine Insecticides	3	-	-
BRE SD1	-	5	3

TB Suite: Travis Baker Greenfield Suite – commonly occurring UK contaminants (metals and metalloids including arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc).

7.1.7 A copy of the laboratory testing results is included within Appendix 7. An initial assessment of the data has been undertaken by directly comparing the laboratory test results to the relevant published screening values. For ease of reference, the guidance values applied for our assessment and a summary of the results of the assessment are also included in Appendix 7. Based on this initial assessment slightly elevated levels of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene were identified within the topsoil materials at two locations, to determine the significance of these elevated values we have undertaken a statistical assessment on the data.

7.1.8 Initially each data set has been investigated using 'Grubbs Test' to determine whether there are any statistical outliers within the data set. Where outliers have been identified we have revisited the trial pit and borehole logs to determine whether there are any obvious sources for the elevated value(s). If the logs indicate a clear material difference between the soil sample containing the outlier and the remaining soils then the data for that sample can be removed and assessed independently. Where there is no clear cause for the outlier we have assumed that the selected values are representative of the population. The outliers have therefore been retained within the data set for subsequent statistical analysis.

7.1.9 Following the removal of outliers, where applicable, both a Shapiro-Wilk Normality Test and a visual check are undertaken to determine whether the data set has a 'normal' or 'non normal' distribution. For data with a 'normal' distribution the 'one sample T Test' is used to calculate the 95th percentile confidence level. Where the data set forms a 'non-normal' distribution the Chebychev Theorem is used to determine the 95th percentile confidence level. This 95th percentile value is then compared with the relevant critical concentration (i.e. S4UL / C4SL / EA CLEA) guidance value.

7.1.10 The results of the statistical analysis for the elevated determinands are detailed in the following sections. The logs for the boreholes and trial pits do not identify any significant sources of contamination therefore as an initial assessment, no samples have been removed from the datasets.

7.2 Topsoil

7.2.1 Nine samples of topsoil were tested for a suite of contaminants commonly found on UK greenfield sites (including heavy metals and metalloids) and a suite (USEPA16) of polyaromatic hydrocarbons (PAHs). A further three samples were tested for suites of organophosphorus and organochlorine insecticides. The majority of the determinands tested were below their relevant guidance values (i.e. Suitable for Use Levels or Category 4 Screening Level in the case of lead) for the samples of topsoil. Elevations of PAH were encountered at two locations within the eastern area of the site:

- TP03 (0.1m to 0.2m) – slightly elevated levels of benzo(a)pyrene (3.6mg/kg), benzo(b)fluoranthene (2.8mg/kg) and dibenzo(ah)anthracene (0.5mg/kg);
- TP07 (0.2m to 0.3m) – slightly elevated levels of benzo(a)pyrene (7.6mg/kg), benzo(b)fluoranthene (6.2mg/kg) and dibenzo(ah)anthracene (1.6mg/kg).

7.2.2 We have reviewed the trial pit logs to determine whether there are any noticeable differences between the top soil identified at TP03 and TP07 and top soil in the remaining samples tested. There is no discernible difference in the soil descriptions, on this basis we have carried out statistical analysis on the full data sets. The 95th percentile values of the aforementioned determinands are shown in Table 8 below.

Table 8 – Top Soil - 95th Percentile Values of Elevated Determinands

Determinand	Guidance Value (mg/kg)	95th Percentile (mg/kg)	Times Above Guidance Value
Benzo(a)pyrene	2.2	5.16	2.3
Benzo(b)fluoranthene	2.6	4.17	1.6
Dibenzo(ah)anthracene	0.24	1.04	4.3

7.2.3 The 95th percentile values for benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene are all above their relevant guidance values therefore some form of remediation will be required to protect the human health of future site users form the elevated concentrations of PAH identified locally at the site.

7.2.4 Although no obvious visual difference was observed within the topsoil sampled at TP03 and TP07 to the remainder of the site. Further consideration to the presence of anomalous PAH contamination at TP03 and TP07 will be required (see section 8.6).

7.2.4 Three samples of topsoil were tested for organophosphorus insecticides and organochlorine insecticides. The levels of DDD and DDT tested are below the calculated guidance values. The

levels of remaining determinands tested were at or below the detection limit of the analysis (0.01mg/kg).

7.3 Undisturbed Near Surface Weathered Rock

7.3.1 Six samples of undisturbed natural soils were tested for a suite of contaminants commonly found on UK greenfield sites (including heavy metals and metalloids). The determinands tested were below their relevant guidance values (i.e. Suitable for Use Levels or Category 4 Screening Level in the case of lead) for undisturbed natural weathered rock materials.

7.3.2 Based on the results of the chemical analysis, the weathered rock comprising sand and clay materials are considered suitable for re-use within the proposed development.

7.4 Controlled Waters

7.4.1 Based on the results of the soil contamination testing, the risk posed to controlled waters i.e. the underlying Principal Aquifer and Secondary Aquifer from the proposed development is considered to be low.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Potential Development Constraints

8.1.1 Based on the results of the background researches and site investigations it is considered that the following ground related issues and potential development constraints would need to be addressed prior to the proposed development of the Eakring Road, Bilsthorpe site:

- The presence of near surface cohesive (clay) materials which have a low to medium volume potential (i.e. the potential to heave and shrink due to tree influence);
- The presence of mature and semi-mature trees and hedgerows at the periphery and within influencing distance of the site;
- The presence of hard strata at shallow depth locally within the development area;
- The presence of a slightly elevated levels of benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene in topsoil materials present within the eastern area of the site;
- Underlying soils of low permeability which are likely to be unsuitable for an appropriate soakaway drainage design;
- The presence of a recorded water main beneath the centre of the site trending north east south west;
- The presence of an underground electricity cable in the north east corner of the site.

8.2 Foundations

8.2.1 The boreholes have identified 0.3m to 0.7m of topsoil and subsoil materials across the site. Given the limited depth of these soils any future foundations will extend below this horizon. Other than topsoil, the exploratory holes have not recorded any made ground across the site. Based on the desk based researches and site investigations, no significant deposits of made ground are anticipated.

Weathered Retford Member

8.2.2 Underlying the top soil materials within the eastern extent of the site, the boreholes generally identified grey and orange gravelly, sandy, silty clays. It is considered that these shallow clay materials represent weathered strata of the Retford Member which are recorded to underlie the site.

8.2.3 The in-situ testing (SPT / HSV) and site observations indicate that the near surface weathered Retford Member materials typically display stiff grading to very stiff strength consistencies with depth. It is considered that these soils will generally provide a suitable founding horizon for two and three storey housing utilising traditional strip or trench fill foundations. For the uppermost weathered component of the Retford member materials a net allowable bearing pressure of 125kN/m^2 is considered appropriate for preliminary foundation designs. The proposed net allowable bearing pressures would be suitable for a traditional strip or trench fill foundation up to 1m wide; on this basis settlements would be restricted to less than 25mm for such foundations. If greater bearing pressures are required foundations could be deepened, a net allowable bearing pressure of 150kN/m^2 would be applicable for foundations in the order of 2.0m below existing ground level.

Weathered Chester Formation

8.2.5 Underlying the topsoil materials across the remainder of the site (i.e. western and central areas), red brown and brown gravelly (occasionally silty and clayey) sands were encountered. It is considered that these granular materials represent the upper weathered extent of Chester Formation strata recorded to directly underlie to majority of the site.

8.2.6 The in-situ testing (SPTs) and site observations indicate that the granular materials typically display medium dense, grading to dense and very dense strength consistencies with depth. It is considered that these soils will generally provide a suitable founding horizon for two and three storey housing on traditional strip and trench fill foundations. Within the uppermost weathered zone of the Chester Formation, a net allowable bearing pressure of 100kN/m^2 is considered appropriate for preliminary design purposes for strip foundations up to 1m wide, this will limit total settlements to less than 25mm. The strength characteristics of these materials increase with depth; if greater bearing pressures are required, it is considered that a net allowable bearing pressure of 150k/Nm^2 would be achievable at a depth of 2.0m below existing site levels.

General

8.2.9 All strip and trench fill foundations should extend through any topsoil and made ground (if encountered) to a minimum depth of 0.75m (Chester Formation) or 0.90m (Retford Member) below original ground level or proposed ground level, whichever the deeper. Future foundations should extend a minimum of 0.15m into competent undisturbed natural soils (i.e. medium dense to dense sand or stiff to very stiff clay). If any loose sand or soft clay is encountered at the proposed founding level, the footing should be extended into the underlying competent natural material below. Alternatively, any materials deemed unsuitable for founding should be removed and replaced lean mix concrete or granular soils compacted in layers.

8.2.10 There are a number of trees and hedgerows around the periphery of the site. Shallow clay based soils have been identified locally, particularly within the eastern area of the site which is underlain by weathered Retford Member materials. Clay based soils have the potential to shrink or swell when moisture contents are influenced by tree root action. Geotechnical testing has confirmed that the clay based deposits at the Eakring Road site have a low (Chester Formation) to medium (Retford Member) volume change potential. Subsequently, potential founding depths will need to be extended where the proposed house plots are within the influencing distance of proposed or existing trees and/or hedgerows. Chapter 4.2 of the NHBC Standards provides advice in this regard.

8.2.11 To confirm the depths of proposed foundations a tree survey will be required to verify the species and heights of the trees within the site and around the periphery.

8.3 Floor Slabs

8.3.1 Ground bearing floor slabs could potentially be used on site where plots are outside the influence of any trees and where competent (non-desiccated) undisturbed soils are identified within 600mm of the underside of floor slab construction. Allowances should be made for suspended floor slabs for all plots that are influenced by trees. It may be possible to adopt ground bearing slabs for much of the site, but only on those plots where levels are not being raised significantly and where there is no evidence of desiccation of the near surface soils.

8.4 Concrete Conditions

8.4.1 Sulphate and pH chemical analysis results have been compared to BRE Special Digest 1 (Concrete in Aggressive Ground). Based on the results of the chemical analysis the Design Sulphate class for

the superficial clays has been determined as DS-1 and the Aggressive Chemical Environment for Concrete Class is AC-1s.

8.5 Hard Strata

8.5.1 The exploratory boreholes achieved depths of between 1.52m and 3.0m. Bedrock (extremely weak sandstone) was encountered locally within the northern and southern areas of the site at depths of 2.0m to 2.5m below ground level. In addition, siltstone has been encountered along the eastern boundary of the site at depths of 1.4m to 1.94m. It is anticipated that excavations to say 2.5m should be achievable with standard construction excavation plant and equipment across the majority of the site. However, breaking out of hard strata may be required locally.

8.6 Contamination

8.6.1 Representative samples of topsoil and weathered bedrock materials from across the site have been analysed for a series of contaminants of concern identified in the conceptual site model presented within Section 6. Laboratory testing included metals, non-metals, polyaromatic hydrocarbons, organophosphorus and organochlorine insecticides. The chemical test results relating to the topsoil and underlying undisturbed natural soils have identified typically low contaminant concentrations which do not generally exceed the respective target values (i.e. acceptable levels) for residential gardens and associated landscape areas.

8.6.2 The majority of topsoil analysis identified low contaminant concentrations which are considered typical of natural reworked topsoil. However, at two locations within the eastern extent of the site, elevated concentrations of polyaromatic hydrocarbons (PAH) were encountered as summarised in the following:

- TP03 (0.1m to 0.2m) – slightly elevated levels of benzo(a)pyrene (3.6mg/kg), benzo(b)fluoranthene (2.8mg/kg) and dibenzo(ah)anthracene (0.5mg/kg)g);
- TP07 (0.2m to 0.3m) – slightly elevated levels of benzo(a)pyrene (7.6mg/kg), benzo(b)fluoranthene (6.2mg/kg) and dibenzo(ah)anthracene (1.6mg/kg).

8.6.3 No statistical outliers were identified within the data set relating to the topsoil PAH analysis, therefore all results have been initially included within the statistical analysis undertaken to determine the significance of the identified contamination. The 95th percentile for benzo(a)pyrene (5.16mg/kg), benzo(b)fluoranthene (4.17mg/kg) and dibenzo(ah)anthracene (1.04mg/kg) all exceed their relevant guidance values (2.2mg/kg, 2.6mg/kg and 0.24mg/kg respectively). There is no obvious visual difference was between the topsoil sampled at TP03 and TP07 to samples obtained from the remainder of the site.

8.6.4 Given greenfield nature of the site and that the top soil materials generally appear to be naturally occurring, the source of the PAH contamination is not immediately obvious. It is possible that the source could be windblown deposits from the former Bilsthorpe Colliery and associated spoil heaps that bound the site to the north and east.

8.6.5 To further assess the significance of the PAH contamination identified at TP03 and TP07 it is recommended that additional sampling and testing be undertaken to establish the extent of the PAH impacted soils and also to increase the size of the data set relating to topsoil materials in general to undertake additional statistical analysis if required.

8.6.6 Once the extent of the contaminated topsoil has been established, to protect future site users from the PAH impacted soil, these materials will require some form of remediation. The available data suggests that the materials could be placed below a suitable clean cover capping layer at a depth 550mm (garden areas) or 400mm (public open space). Alternatively, the PAH impacted topsoil materials could be stripped and removed from the site.

8.6.7 All determinands tested within the underlying weathered materials of the Chester Formation and the Retford Member were below their relevant guidance values. These materials are therefore considered suitable for reuse within the proposed development site.

8.6.8 The results of this human health risk assessment should be provided to the Local Authority Environmental Health Officer for their comments.

8.7 Contamination – Controlled Waters

8.7.1 Chemical testing has indicated that the contaminant levels across the site are generally low. Based on the results of the soil contamination testing, the risk posed to controlled waters (i.e. underlying aquifer and local surface waters) from the proposed development area is considered to be low.

8.8 Ground Gases

8.8.1 Desk study researches did not indicate any significant sources of ground gases on or within the immediate vicinity of the site. In addition, no deep made ground or organic rich materials were encountered at the site during the course of the intrusive site investigation works.

8.8.2 Gas and groundwater monitoring standpipes were installed within four of the dynamic sampling boreholes on request. The standpipes have been monitored on four occasions to date. Measurement of the concentrations of oxygen, carbon dioxide, methane and associated gas flow rates were undertaken to assess the geo-gas regime of the site.

8.8.3 The monitoring undertaken at the site has identified carbon dioxide concentrations of 0.7% to 6.0%. Typical carbon dioxide values were <5%. Methane has not been encountered at the site. Detectable gas flow rates have not been recorded within any of the boreholes installed across the site.

8.8.4 To evaluate the gas regime at the site and assess the requirements for gas precautionary measures with respect to ground gases within the proposed development, reference has been made to the CIRIA Document C665: Assessing Risks Posed by Hazardous Ground Gases to Buildings, 2007. CIRIA C665 proposes a "traffic light" classification system adopted by the National House Building Council (NHBC) based on the typical maximum gas concentrations and the flow rates. It also details an alternative method of assessment i.e. the 'Modified Wilson and Card classification' which introduces 'Characteristic Situations 1 to 6' to define the gas regime.

8.8.5 In accordance with the two classification systems outlined above, a site specific Gas Screening Value (GSV) has been calculated based on a 'worst case' scenario in order to establish whether protection measures will be required for the proposed development. The calculated GSV is used to characterise the site using the traffic light system and appropriate protection measures summarised from CIRIA C665.

8.8.6 We have undertaken an initial assessment based on the available data. Based on the maximum carbon dioxide and applied flow rate of 6.0% and 0.1l/hr, respectively, the GSV for carbon dioxide is 0.006l/hr. On this basis the site would be classified as 'Green' in accordance with the NHBC

classification or 'Characteristic Situation 1' in accordance with the Modified Wilson and Card Method. These classifications indicate a negligible gas regime and consequently site specific gas protection measures would not generally be considered necessary. Slightly elevated concentrations of carbon dioxide (>5%) were identified on a single occasion. Given the very flow rates such levels are not considered significant. Furthermore, the site is not located within an area that requires radon protective measures.

8.8.7 The results of the ground gas risk assessment should be provided to the Local Authority and NHBC for comment and review.

8.9 Groundwater / Excavation Stability

8.9.1 All of the boreholes and trial pits remained dry during site investigations. During the monitoring period, groundwater was encountered at one location (DS06) at depths of 1.36m bgl and 1.43m bgl. Given that shallow groundwater was generally absent during the site investigation and that the exploratory holes remained open, significant dewatering and excavation support are unlikely to be required for the majority of the site. However, groundwater levels can vary significantly throughout the year depending on seasonal variations etc. At certain times of the year the groundwater levels may be shallower than those identified in the boreholes during the site investigation works.

8.9.2 All of the exploratory hole locations remained stable during the works. It should be noted that the exploratory holes were only open for a short period therefore trenches may be less stable if left open for a longer period of time. Based on the conditions encountered it is considered that shallow services trenches and footings should remain stable within the weathered Retford Member within the eastern area of the site. However, localised trench support may be required within the granular materials of the weathered Chester Formation.

8.10 Soakaway Drainage

8.10.1 Soakaway testing was completed within the granular material of the weathered Chester Formation at six locations across the proposed development site, the results are described in Section 6. Based on the results of the in-situ testing undertaken over a three day period, the materials underlying the site are not considered suitable for soakaway drainage.

8.11 Existing Services

8.11.1 Consideration will need to be given to the location of existing services on and within close proximity to the proposed development including the presence of the underground water main (trending north east-south west) and underground electricity cable in the north east corner of the site.

APPENDICES

APPENDIX 1

List of Information Sources

APPENDIX 1

LIST OF INFORMATION SOURCES – EAKRING ROAD, BILSTHORPE

The following principal sources of information have been consulted in the preparation of this report:

- Coal Authority on-line data base;
- Environment Agency – Online data base;
- Ordnance Survey County Series and National Grid Mapping;
- British Geological Survey – Online data base & Interactive mapping;
- BS5930 Code of Practice for Site Investigation (2015);
- BS10175:2011 + A2:2017 British Standards Institution (2011) Investigation of Potentially Contaminated Sites;
- BS1377-2:1990 Methods of test for soils for civil engineering purposes
- BS EN ISO 14688-2:2018 – Geotechnical Investigation and Testing. Principles for Classification.
- EA R&D Publication 66 : 2008 Guidance for the Safe Development of Housing on Land Affected by Contamination Volume 1 and 2
- CIRIA publications including C665 Assessing risks posed by hazardous ground gases to Building;
- Contaminated Land Report 11 - Model Procedures for the Management of Land Contamination (DEFRA 2004);
- Chartered Institute of Environmental Health (CIEH) and Land Quality Management (LQM) S4ULs for Human Health Risk Assessment (2015) – Publication Number S4UL3689
- Environmental Protection Act 1990, Part 2A, Section 78 (as amended by Environment Act 1995);
- Contaminated Land Statutory Guidance (April 2012), DEFRA
- Environment Agency (2000) Technical Aspects of Guidance of Site Investigation (2 volumes) R&D Technical Report P5-065;
- Environment Agency (2000) Secondary Model Procedures for the development of Appropriate Soil Sampling Strategies for Land Contamination, R&D Technical Report P5-066;
- BRE (2005) Concrete in aggressive ground, Special Digest 1;
- BRE (2015) Radon Guidance on protective measures for new buildings, BR 211;
- BRE (2004) Clean Cover Systems for Land Regeneration Thickness Design of Cover Systems for Contaminated Land.
- MAGIC Website - magic.defra.gov.uk
- Information provided to Travis Baker Geo-Environmental:
    - Planning Layout Reference P-01 Revision D
    - Topographical Survey – Oakes Surveys Ltd dated 25/01/2017
    - Preliminary Utilities Appraisal – Rodgers Leask dated May 2017
    - Phase 1 Desk Study – Rodgers Leask Environmental dated 17 March 2017
    - Desktop Services Search – Site Vision Surveys dated 26/06/2019

APPENDIX 2

Site Photographs

EAKRING ROAD, BILSTHORPE

APPENDIX 2 - SELECTION OF SITE PHOTOGRAPHS

Looking west at site access

Looking north along western boundary

Looking north west at north western corner

Looking south at eastern boundary and bank

Raised bank in south east of the site

Looking west at south western corner

Spoil heap of TP07 showing siltstone of the Retford Member encountered at base

Spoil heap of TP01 showing weathered sands of the Chester Formation

APPENDIX 3

Conceptual Site Model and Qualitative Risk Assessment

Eakring Road, Bilsthorpe
Appendix 3
Conceptual Site Model and Qualitative Risk Assessment

Conceptual Model			Qualitative Risk		
Source	**Pathway**	**Target**	**Consequence**	**Probability**	**Risk**
Made Ground – including disturbed topsoil / localised infilling (metals, metalloids, sulphate, polyaromatic hydrocarbons, petroleum hydrocarbons, pH, pesticides, asbestos)	Inhalation	Residents of site and public	Severe	Low	Moderate
		Construction worker	Severe	Low	Moderate
	Dermal contact	Residents of site and public	Medium	Low	Moderate / Low
		Construction worker	Medium	Low	Moderate / Low
	Ingestion of soil	Residents of site and public	Severe	Low	Moderate
		Construction worker	Severe	Unlikely	Moderate / Low
	Direct contact	Drinking water pipes	Medium	Unlikely	Low
	Ingestion via home grown vegetables	Residents of site	Severe	Low	Moderate
	Uptake via flora and fauna	Plants, pets and wildlife	Medium	Unlikely	Low
	Migration of contaminants via groundwater	Controlled waters	Medium	Unlikely	Low
	Direct contact	Foundations and other buried structures	Medium	Unlikely	Low
Localised made ground associated with the railway and landfill (leading to production of carbon dioxide and methane)	Inhalation of noxious gases	Residents of site	Severe	Unlikely	Moderate/Low
		Construction worker	Severe	Unlikely	Moderate/Low
	Migration and collection of methane in confined spaces	Residents of site	Severe	Unlikely	Moderate/Low
		Construction worker	Severe	Unlikely	Moderate/Low
Agrochemicals – including the historic agricultural application of insecticides (organochlorine and organophosphorus insecticides) and the possible current use on adjacent land	Dermal contact	Residents of site and public	Medium	Low	Moderate/Low
		Construction worker	Medium	Low	Moderate/Low
	Ingestion of soil	Residents of site and public	Severe	Low	Moderate
		Construction worker	Severe	Unlikely	Moderate/Low
	Direct contact	Drinking water pipes	Medium	Unlikely	Low

Eakring Road, Bilsthorpe
Appendix 3
Conceptual Site Model and Qualitative Risk Assessment

Conceptual Model			Qualitative Risk		
Source	**Pathway**	**Target**	**Consequence**	**Probability**	**Risk**
(Continued) Agrochemicals – including the historic agricultural application of insecticides (organochlorine and organophosphorus insecticides) and the possible current use on adjacent land	Inhalation of vapours	Residents of site and public	Severe	Low	Moderate
	Inhalation of vapours Uptake via flora and fauna	Construction worker	Severe	Low	Moderate
		Plants, pets and wildlife	Medium	Unlikely	Low
	Migration of contaminants via groundwater	Controlled waters	Medium	Unlikely	Low
	Direct contact	Foundations and other buried structures	Medium	Unlikely	Low
	Ingestion via home grown vegetables	Residents of site	Medium	Low	Moderate / Low

APPENDIX 4

Dynamic Sampling Borehole Logs

Travis Baker Geo-Environmental Ltd

Site	Number
Eakring Road, Bilsthorpe	DS01

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.10	D				(0.35) 0.35	Grass onto brown slightly clayey slightly gravelly sand with roots and rootlets. TOPSOIL			
0.45-0.55	D				(0.10) 0.45	Light brown slight clayey slightly gravelly sand with rare rootlets. Gravel is fine to coarse subrounded quartzite. SUBSOIL			
0.70-0.80	D				(0.10) 0.55	Firm to stiff brown with localised light grey mottling very sandy gravelly CLAY. Gravel is fine to coarse rounded quartzite.			
1.00-1.45	SPT N=14		2,2/3,3,3,5		(0.45) 1.00	Brown slightly red slightly gravelly SAND. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)			
					(1.00)	Medium dense red brown slightly gravelly medium grained SAND with gravelly pockets. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)			
2.00-2.36	SPT 50/205		10,15/16,18,16		2.00	Terminated at 2.36m			

Remarks
Refusal at 2.36m
Monitoring standpipe installed

Scale (approx)	Logged By
1:25	L Glover

Figure No. 19017.DS01

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Number** DS02
Excavation Method Drive-in Windowless Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.10	D				(0.30) 0.30	Grass onto brown slightly clayey slightly gravelly sand. Gravel is fine to coarse rounded quartzite. TOPSOIL		
0.40-0.50	D				(0.35) 0.65	Brown slightly red very gravelly SAND. Gravel is fine to coarse rounded quartzite and 1 broken cobble of quartzite. (Weathered Chester Formation)		
0.80-0.90	D					Red brown loose becoming very dense from 2m SAND with rare gravel of coarse rounded quartzite and pockets of pale red yellow sand at 0.8m and 1.9m (Weathered Chester Formation)		
1.00-1.45	SPT N=9		2,2/2,2,3,3,2		(1.28)			
1.90-1.93	SPT 25*/15 50/15		25/50		1.93	Terminated at 1.93m		

Remarks
Refusal at 1.93m

Scale (approx)	Logged By
1:25	L Glover

Figure No. 19017.DS02

Travis Baker Geo-Environmental Ltd

Site	Number
Eakring Road, Bilsthorpe	DS03

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.10	D				(0.10) 0.10	Grass onto firm brown sandy slightly gravelly clay with rootlets. TOPSOIL			
0.10-0.20	D				(0.20) 0.30	Stiff brown very sandy clay with rare gravel of fine to medium subrounded quartzite. SUBSOIL			
0.40-0.50	D					Very stiff light grey and orange mottled slightly sandy slightly silty CLAY with siltstone lithorelicts from 1m. (Weathered Retford Member)			
0.60-1.00	B				(0.90)				
1.00-1.45	SPT N=50		2,2/5,5,10,30		1.20				
					(0.20) 1.40	Very dense light grey slightly clayey SAND. (Weathered Retford Member)			
1.50-1.52	SPT 25*/10 50/10		25/50		(0.12) 1.52	Recovered as gravel of extremely weak grey SILTSTONE. (Weathered Retford Member)			
						Terminated at 1.52m			

Remarks
Monitoring standpipe installed
Refusal at 1.52m

Scale (approx)	Logged By
1:25	L Glover

Figure No. 19017.DS03

Travis Baker Geo-Environmental Ltd

Site	Number
Eakring Road, Bilsthorpe	DS04

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.10	D				(0.45)	Grass onto firm brown sandy slightly gravelly clay. Gravel is fine to coarse subrounded quartzite and rare brick fragments. TOPSOIL		
					0.45			
0.50-0.60	D				(0.25)	Stiff brown very sandy slightly gravelly clay. Gravel is fine to coarse rounded quartzite. SUBSOIL		
					0.70			
0.80-0.90	D							
1.00-1.45	SPT N=15		3,4/4,4,3,4		(0.80)	Firm grey brown gravelly sandy CLAY. Gravel is fine to coarse rounded quartzite, broken quartzite cobble and rare chert. (Weathered Chester Formation)		
					1.50			
					(0.20)	Medium dense brown slightly clayey gravelly SAND. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
					1.70			
2.00-2.37	SPT 50/220		11,12/13,16,21		(0.67)	Very dense red brown slightly gravelly medium grained SAND. (Weathered Chester Formation)		
					2.37			
						Terminated at 2.37m		

Remarks
Refusal at 2.37m.

Scale (approx)	Logged By
1:50	L Glover

Figure No. 19017.DS04

Travis Baker Geo-Environmental Ltd

Site	Number
Eakring Road, Bilsthorpe	DS05

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.10	D				(0.30)	Grass onto darnk brown slightly gravelly slightly clayey sand. Gravel is fine to coarse rounded quartzite. TOPSOIL			
0.30-0.40	D				0.30 (0.20)	Light brown slightly gravelly sand. SUBSOIL			
1.00-1.45	SPT N=11		2,2/2,3,3,3		0.50 (0.70)	Medium dense brown slightly red SAND with rare gravel of coarse rounded quartzite. (Weathered Chester Formation)			
1.10-1.20	D				1.20 (0.99)	Very dense red brown slightly gravelly SAND. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)			
2.00-2.19	SPT 25*/75 50/115		25/32,18		2.19	Terminated at 2.19m			

Remarks
Refusal at 2.19m
Monitoring standpipe installed

Scale (approx)	Logged By
1:25	L Glover

Figure No. 19017.DS05

Travis Baker Geo-Environmental Ltd

Site	Number
Eakring Road, Bilsthorpe	DS06

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.10	D				(0.20)	Grass onto firm brown sandy clay with rare gravel of fine to medium rounded quartzite with frequent rootlets. TOPSOIL			
0.20-0.30	D				0.20 (0.15)	Firm to stiff brown very sandy slightly gravelly clay with rare rootlets. Gravel is fine to medium rounded quartzite, sandstone, rare black flecks of coal and rare brick fragments. SUBSOIL			
					0.35 (0.20)				
0.70-1.00	B				0.55	Grey and orange mottled very clayey slightly gravel medium grained SAND. Gravel is fine to coarse subrounded quartzite. (Weathered Retford Member)			
1.00-1.45	SPT N=9		1,2/2,2,3,3,2		(0.95)	Firm grey with localised orange mottling sandy slightly gravelly CLAY. Gravel is fine to medium rounded quartzite. (Weathered Retford Member)			
1.10-1.20	D								
					1.50 (0.10)	Loose grey and orange damp clayey SAND. (Weathered Retford Member)			
					1.60 (0.10)				
					1.70 (0.08)	Stiff red very sandy CLAY with light brown coarse grained sandy pockets and rare siltstone lithorelicts. (Weathered Retford Member)			
1.80-1.94	SPT 25*/70 50/65		25/50		1.78 (0.16)				
					1.94	Very stiff grey and orange laminated sandy silty CLAY. Orange laminations are very sandy clay, grey laminations are very silty. (Weathered Retford Member)			
						Recovered as gravel of extremely weak SILTSTONE. (Weathered Retford Member)			
						Terminated at 1.94m			

Remarks
Monitoring standpipe installed.
Refusal at 1.935m

Scale (approx)	Logged By
1:25	L Glover

Figure No. 19017.DS06

APPENDIX 5

Trial Pit and Soakway Pit Logs

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP01
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.20	D				(0.30) 0.30	Grass onto dark brown silty slightly clayey slightly gravelly sand with fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
0.70-0.80	D				(0.80) 1.10	Brown (medium dense) slightly silty fine and medium grain gravelly SAND. Gravel is fine to coarse rounded quartzite with occasional quartzite cobbles and sand and gravel pockets (Weathered Chester Formation)		
1.20	HSV 122.67kPa		140,130,98/Av. 122.67		(0.40) 1.50	Stiff red brown friable sandy CLAY with occasional grey mottling and occasional red brown and pale brown silty clay banding. (Weathered Chester Formation)		
1.30-1.50	B							
1.40-1.50	D				(0.75) 2.25	Stiff red brown silty slightly sandy CLAY with occasional sand partings and mudstone lithorelicts. (Weathered Chester Formation)		
					(0.30) 2.55	Brown, orange brown and red brown (medium dense) very gravelly SAND. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
					(0.25) 2.80	Extremely weak pale red brown SANDSTONE (hard digging). Recovered as fine to coarse gravel of sandstone and rounded quartzite in sand matrix. (Weathered Chester Formation)		
						Complete at 2.80m		

Plan

Remarks

Excavation remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP01

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP02
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35) 0.35	Grass onto dark brown silty slightly clayey slightly gravelly sand with fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
0.50-0.60	D				(0.65) 1.00	Brown (medium dense) very gravelly, silty, slightly clayey SAND. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
1.30-1.60	B				(0.60) 1.60	Red brown (medium dense) gravelly, silty, slightly clayey SAND. Gravel is fine to coarse rounded quartzite with occasional stiff red brown sandy clay. (Weathered Chester Formation)		
1.60-1.70	D				(0.90) 2.50	Red brown (medium dense) fine and medium grain silty slightly gravelly SAND locally weakly cemented. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
					(0.35) 2.85	Extremely weak pale red brown SANDSTONE (hard digging). Recovered as fine to coarse gravel of sandstone and rounded quartzite in sand matrix. (Weathered Chester Formation)		
						Complete at 2.85m		

Plan

Remarks

Excavation remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP02

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP03
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.20	D				(0.30) 0.30	Grass onto dark brown clayey gravelly sand with fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
0.40-0.50	D				(0.30) 0.60	Stiff red brown friable very sandy slightly gravelly CLAY. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
					(0.75) 1.35	Firm pale brown slightly sandy SILT. Locally clayey with occasional sand partings. (Weathered Chester Formation)		
					(0.55) 1.90	Red brown (medium dense) silty gravelly SAND. Gravel is fine to coarse rounded quartzite and extremely weak sandstone. (Weathered Chester Formation)		
1.90-2.00	D				(1.10) 3.00	Red brown (dense) mottled pale grey silty fine and medium grain gravelly SAND. Gravel is fine to coarse extremely weak sandstone and occasional quartzite. (Weathered Chester Formation)		
						Complete at 3.00m		

Plan

Remarks

Excavation remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP03

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP04
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35) 0.35	Grass onto dark brown silty slightly clayey slightly gravelly sand with fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
					(1.05)	Brown becoming red brown below 0.9m (medium dense) slightly silty fine and medium grain very gravelly SAND. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
					1.40 (0.60) 2.00	Red brown (dense) silty fine and medium grain SAND, locally weakly cemented. (Weathered Chester Formation)		
					(0.40) 2.40	Red brown (dense) silty fine and medium grain gravelly SAND, becoming slightly cobbley with depth (hard digging). Gravel and cobbles comprise extremely weak sandstone. (Weathered Chester Formation)		
						Complete at 2.40m		

Plan

Remarks

Excavation remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP04

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP05
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.30	D				(0.30) 0.30	Grass onto dark grey brown sandy slightly gravelly clay with occasional fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
0.50-0.60	D							
0.90	HSV 97.33kPa		110,90,92/Av. 97.33		(0.90)	Stiff pale grey green mottled orange brown slightly sandy CLAY with occasional red brown sand partings. (Weathered Retford Member)		
0.90-1.00	B							
0.90-1.00	D				1.20			
1.40-1.70	B				(0.30) 1.50	Very stiff red brown mottled grey silty slightly sandy CLAY with occasional fine and medium gravel of tabular sandstone and siltstone plus lithorelicts. (Weathered Retford Member)		
					(0.30) 1.80	Extremely weak and weak pale grey green SILTSTONE and stiff friable clay (hard digging) (Weathered Retford Member)		
						Complete at 1.80m		

Plan

Remarks

Excavation remained dry and stable
Relic land drain (infilled with soil) encountered at 0.6m depth

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP05

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP06
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.20	D				(0.35) 0.35	Grass onto dark grey brown clayey slightly gravelly sand with occasional fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
0.80-0.90	D				(0.75) 1.10	Pale brown (dense) silty slightly clayey fine and medium grain SAND with occasuional orange brown mottling. (Weathered Chester Formation)		
1.20	HSV 127.33kPa		130, 112, 140/Av. 127.33		(0.65) 1.75	Very stiff pale grey green and red brown silty slightly gravelly CLAY. Gravel is fine and medium tabular sandstone and siltstone. (Weathered Chester Formation)		
					(0.80) 2.55	Red brown and grey green (dense) slightly gravelly silty SAND. Gravel is fine to coasre rounded quartzite. (Weathered Chester Formation)		
					(0.15) 2.70	Pale grey brown extremely weak SANDSTONE, recovered as very gravelly sand. (Weathered Chester Formation)		
						Complete at 2.70m		

Plan

Remarks

Excavation remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP06

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP07
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.30	D				(0.30) 0.30 (0.30) 0.60	Grass onto dark grey brown sandy slightly gravelly clay with occasional fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL. Stiff pale brown and pale grey green silty slightly gravelly CLAY. Gravel is fine to coarse rounded quartzite. (Weathered Retford Member)		
1.20-1.30	B				(1.00) 1.60	Stiff pale grey green silty slightly sandy CLAY with occasional brown mottling. (Weathered Retford Member)		
1.80-1.90	D				(0.40) 2.00	Extremely weak pale grey green SILTSTONE. Recovered as fine to coarse tabular gravel in silty sand matrix. (Weathered Retford Member) Complete at 2.00m		

Plan

Remarks

Excavation remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP07

Travis Baker Geo-Environmental Ltd

Site Eakring Road, Bilsthorpe			**Trial Pit Number** TP08
Machine : JCB 3cx **Method :** Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Keepmoat Homes	**Job Number** 19017
	Location (Handheld GPS) Refer to plan	**Dates** 29/07/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.20	D				(0.30) 0.30	Grass onto dark grey brown sandy slightly gravelly clay with occasional fine rootlets. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
					(0.30) 0.60	Pale brown (medium dense) very clayey sightly gravelly SAND. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
1.00	HSV		128, 130, 140		(0.30) 0.90	Pale brown (medium dense) very clayey SAND with occasional sandy clay pocket. (Weathered Chester Formation)		
1.40-1.50 1.50-1.70	D B				1.20	Stiff red brown mottled grey sandy slightly gravelly CLAY. Gravel is fine to coarse rounded quartzite. (Weathered Chester Formation)		
					(1.50)	Brown and red brown (dense) SAND AND GRAVEL. Gravel is fine and medium rounded quartzite and occasional extremely weak sandstone. (Weathered Chester Formation)		
					2.70	Complete at 2.70m		

Plan

Remarks

Excavation remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	M Lane	19017.TP08

Travis Baker Geo-Environmental Ltd

Site	Trial Pit Number
Eakring Road, Bilsthorpe	SA1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 19/08/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	Grass onto brown slightly gravelly sand with roots and rootlets. Gravel is coarse rounded quartzite. TOPSOIL		
					(2.10)	Red brown locally white gravelly medium grained SAND with rare clayey sand pockets. Gravel is fine to coarse rounded quartzite with some cobbles.		
					2.50	Complete at 2.50m		

Plan

Remarks

Trial pit side wall collapse during soakaway test 1
Trial pit remained dry

Scale (approx)	Logged By	Figure No.
1:50	LHG	19017.SA1

Travis Baker Geo-Environmental Ltd

Site	Trial Pit Number
Eakring Road, Bilsthorpe	SA1A

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 21/08/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	Grass onto brown slightly clayey gravelly sand. Gravel is fine to coarse rounded quartzite. TOPSOIL		
					(0.30) 0.70	Light brown clayey very gravelly sand. SUBSOIL.		
					(0.30) 1.00	Firm light grey very sandy gravelly CLAY with some sand pockets. Gravel is fine to coarse rounded quartzite.		
					(1.00) 2.00	Firm to stiff red brown very sandy slightly silty very gravelly CLAY with some sand pockets. Gravel is fine to coarse rounded quartzite.		
					(0.90) 2.90	Red brown slightly clayey very gravelly SAND with rare sandy clay pockets,		
						Complete at 2.90m		

Plan

Remarks

Trial pit remained dry and stable.

Scale (approx)	Logged By	Figure No.
1:50	LHG	19017.SA1A

Travis Baker Geo-Environmental Ltd

Site	Trial Pit Number
Eakring Road, Bilsthorpe	SA2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 19/08/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.50) 0.50	Grass onto dark brown black gravelly slightly clayey sand. Gravel is coarse rounded quartzite with rare brick cobble. TOPSOIL		
					(0.20) 0.70	Firm grey brown very sandy slightly gravelly CLAY.		
					(1.00) 1.70	Firm red brown very sandy gravelly CLAY with some sand pockets. Gravel is fine to coasre rounded quartzite.		
					(0.60) 2.30	Red brown and orange brown slightly clayey gravelly SAND. Gravel is fine to coarse rounded quartizite with some cobbles.		
						Complete at 2.30m		

Plan

Remarks

Trial pit remained dry and stable.

Scale (approx)	Logged By	Figure No.
1:50	LHG	19017.SA2

Travis Baker Geo-Environmental Ltd

Site	Trial Pit Number
Eakring Road, Bilsthorpe	SA3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 19/08/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	Grass onto brown black gravelly slightly clayey sand. Gravel is fine to coarse rounded quartzite. TOPSOIL		
					(0.70) 1.10	Firm and stiff grey brown very sandy gravelly CLAY. Gravel is fine to coarse rounded quartzite.		
					(1.40) 2.50	Red brown slightly silty gravelly SAND with grey sand pockets. Gravel is fine to coarse rounded quartzite.		
						Complete at 2.50m		

Plan

Remarks

Trial pit remained dry and stable

Scale (approx)	Logged By	Figure No.
1:50	LHG	19017.SA3

Travis Baker Geo-Environmental Ltd

Site	Trial Pit Number
Eakring Road, Bilsthorpe	SA4

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 19/08/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	Grass onto black brown gravelly slightly clayey sand. Gravel is fine to coarse rounded quartzite. TOPSOIL		
					(0.70) 1.10	Firm light grey sandy silty gravelly CLAY with some sand pockets.		
					(1.50) 2.60	Brown & red brown gravelly slightly silty SAND with rare sandy clay pockets. Very gravelly from 2m.		
						Complete at 2.60m		

Plan

Remarks

Trial pit remained dry and stable.

Scale (approx)	Logged By	Figure No.
1:50	LHG	19017.SA4

Travis Baker Geo-Environmental Ltd

Site	Trial Pit Number
Eakring Road, Bilsthorpe	SA5

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 19/08/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	Grass onto black brown gravelly slightly clayey sand. Gravel is fine to coarse rounded quartzite. TOPSOIL		
					(0.20) 0.60	Light brown gravelly sand. SUBSOIL.		
					(0.40) 1.00	SAND and GRAVEL of rounded coarse quartzite.		
					(1.00) 2.00	Red brown and brown gravelly slightly clayey SAND. Gravel is fine to coarse rounded quartzite.		
					2.10	Recovered as gravel of weakly cemented grey SANDSTONE.		
						Complete at 2.10m		

Plan

Remarks

Refusal at 2.1m
Trial pit remained dry and stable.

Scale (approx)	Logged By	Figure No.
1:50	LHG	19017.SA5

Travis Baker Geo-Environmental Ltd

Site	Trial Pit Number
Eakring Road, Bilsthorpe	SA6

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Keepmoat Homes	19017
	Location (Handheld GPS) Refer to plan	**Dates** 19/08/2019	**Engineer** Travis Baker Geo-Environmental	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30) 0.30	Grass onto black brown gravelly clayey sand. Gravel is fine to coarse rounded quartzite. TOPSOIL.		
					(0.70) 1.00	Pale grey brown gravelly slightly silty SAND with rare sandy clay pockets.		
					(0.50) 1.50	Stiff pale grey with orange mottling sandy CLAY.		
					(0.50) 2.00	Very stiff red brown sandy gravelly CLAY with sandstone lithorelicts		
					(0.60) 2.60	Red brown gravelly slightly clayey SAND with sandstone lithorelicts		
						Complete at 2.60m		

Plan

Remarks

Trial pit remained dry and stable.

Scale (approx)	Logged By	Figure No.
1:50	LHG	19017.SA6

APPENDIX 6

Laboratory Geotechnical Results

LABORATORY REPORT FOR INDEX PROPERTY AND CHEMICAL TESTING

Contract: Eakring Road, Bilsthorpe.
1259G

Customer: Travis Baker Geo-Environmental Limited,
Trinity Point,
New Road,
Halesowen,
West Midlands,
B63 3HY.

GIP Ltd. Ground Investigation & Piling Limited
Devonshire House, Ettingshall Road,
Wolverhampton. WV2 2JT
Phone 01902 459558, Fax 01902 459085, Email lab@gipuk.com

Job No:- L/9623 | Page No:- 1 of 1

Date Received:- 30.07.19 | Date Issued:- 21.08.19

SAMPLE DETAILS			TEST DATE	CLASSIFICATION						CHEMICAL				% PASSING BS SIEVE SIZE		SAMPLE DESCRIPTION	COMMENTS
					Index Properties												
SAMPLE No.	DEPTH m	SAMPLE TYPE		W %	W_L %	W_P %	I_P %	PD (Gas Jar) Mg/m³	WC %	Soluble SO_4 g/L	pH Value	*L.O.I. %	*Total SO_4 %	2.00 mm	0.425 mm		
DS06	0.7-1.0	B	02.08.19	24	36	21	15								99	Soft slightly silty grey CLAY.	
TP01	1.3-1.5	B	02.08.19	15	33	16	17								81	Soft to firm sandy pale brown red CLAY.	
TP03	0.9-1.1	B	02.08.19	17	26	17	9								97	Soft sandy grey brown clayey SILT.	
TP05	0.9-1.1	B	02.08.19	23	49	23	26								99	Firm silty grey CLAY.	
TP05	1.4-1.7	B	02.08.19	23	40	22	18								99	Firm to stiff brown CLAY.	
TP07	1.2-1.3	B	02.08.19	24	39	21	18								99	Soft silty light grey CLAY.	

Sample type		Test abbreviations		Test methods - Unless otherwise stated.	
D	Disturbed	W	Moisture Content	W%	BS1377:Part 2:1990:3.2
B	Bulk disturbed	W_L	Liquid limit	W_L	BS1377:Part 2:1990:4.4
U	Undisturbed	W_P	Plastic limit	W_P	BS1377:Part 2:1990:5.3
S	SPT split spoon	I_P	Index property	I_P	BS1377:Part 2:1990:5.4
W	Ground water	PD	Particle Density	PD	BS1377:Part 3:1990:8.2
T	Tub	L.O.I	Loss on ignition	L.O.I	BS1377:Part 3:1990:4
		WC	Water Content	WC%	BS EN ISO 17892-1:2014

Sol SO_4	BS1377:Part 3:1990:5.5
pH Value	BS1377:Part 3:1990:9
Total SO_4	BS1377:Part 3:1990:5.5

Approved signatory:-

Paul Smart, Laboratory Manager……

ilac-MRA UKAS TESTING 1897

Tests marked * are not UKAS accredited.

The reported results relate only to samples received.

 # = Sample mass smaller than BS1377 requirements.

Opinions and interpretations are outside the scope of UKAS accreditation

C:\excel\invoice\000.xls

GROUND INVESTIGATION & PILING LIMITED
TEST REPORT FOR PARTICLE SIZE DISTRIBUTION

Job No:- L/9623
Received:- 31.07.19
Tested:- 02.08.19
Report:- 08.08.19

Site:- Eakring Road, Bilsthorpe.
Customer:- Travis Baker Geo-Environmental Ltd,
Trinity Point, New Road,
Halesowen, West Midlands, B63 3HY.

TP:- 08
Depth:- 1.5-1.7m
Page 1 of 1

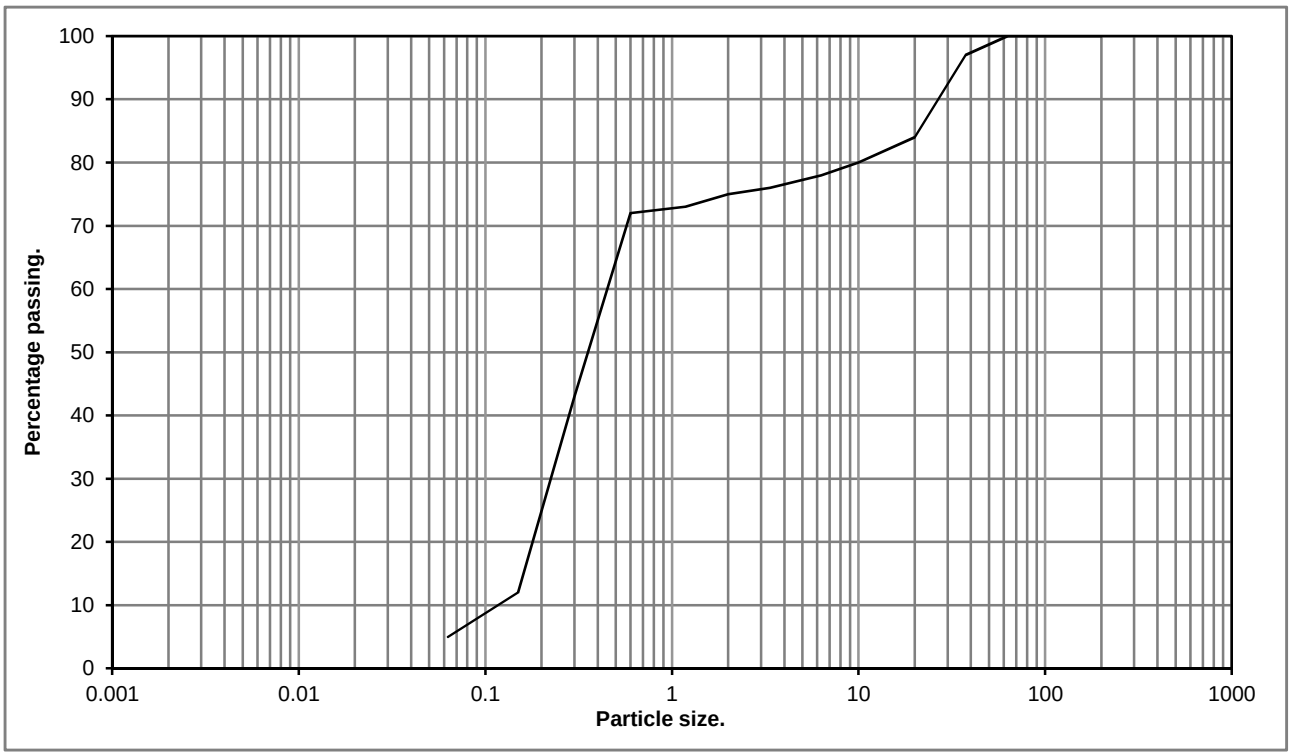
TEST METHODS:-
Particle Size Distribution:-
BS 1377: Part 2: 1990
Clause 9.2 & 9.3

Sedimentation:-
BS 1377: Part 2: 1990
Clause 9.4

Sample Description: Brown slightly silty gravelly SAND.

TEST METHODS:-
Sample Preparation:
BS1377:Part1:2016:
Clause 8.3.4, 8.3.5, 8.4.5

Authorized by P.R.Smart
Laboratory Manager



	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		
CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS

Sieve Size mm	% Passing	Sieve Size mm	% Passing
200	100	3.35	76
150	100	2	75
125	100	1.18	73
90	100	0.6	72
75	100	0.3	43
63	100	0.15	12
37.5	97	0.063	5
20	84		
10	80		
6.3	78		

% Clay & Silt	5
% Sand	70
% Gravel	25
% Cobbles	0

Sample mass < BS1377 requirements

1897

The reported results relate only to samples received

APPENDIX 7

Laboratory Chemical Test Results and Summary Table

EAKRING ROAD, BILSTHORPE

Appendix 7 – Chemical Summary Table

Substance	Target Value (mg/kg)	Travis Baker, All Materials (2019)		
		No. of Samples	Result - Range (mg/kg)	No. Samples Above Guidance
Mercury	1.2 [a]	21	<1.0	0
Selenium	250 [a]	21	<3.0	0
Arsenic	37 [a]	21	3 - 24	0
Nickel	180 [a]	21	6 - 27	0
Cadmium	11 [a]	21	<1.0	0
Boron (water-soluble)	290 [a]	21	<1.0	0
Chromium	910 [a]	21	7 - 26	0
Copper	2,400 [a]	21	10 - 71	0
Lead	200 [b]	21	1 - 70	0
Zinc	3,700 [a]	21	11 - 91	0
Acenaphthene	210 [*a]	9	<0.1 - 0.8	0
Acenaphthylene	170 [a]	9	<0.1 - 0.4	0
Anthracene	2,400 [a]	9	<0.1 - 3	0
Benzo(a)anthracene	7.2 [a]	9	<0.1 - 7.2	0
Benzo(a)pyrene	2.2 [a]	9	<0.1 - 7.6	2 TP03 0.1-0.2 TP07 0.2-0.3
Benzo(b)fluoranthene	2.6 [a]	9	<0.1 - 6.2	2 TP03 0.1-0.2 TP07 0.2-0.3
Benzo(k)fluoranthene	77 [a]	9	<0.1 - 6.4	0
Benzo(ghi)perylene	320 [a]	9	<0.1 - 3.8	0
Chrysene	15 [a]	9	<0.1 - 7.4	0
Dibenzo(ah)anthracene	0.24 [a]	9	<0.1 - 1.6	2 TP03 0.1-0.2 TP07 0.2-0.3
Fluoranthene	280 [a]	9	<0.1 - 16	0
Fluorene	170 [a]	9	<0.1 - 0.8	0
Indeno(123-cd)pyrene	27 [a]	9	<0.1 - 3.5	0
Naphthalene	2.3 [a]	9	<0.1 - 0.2	0
Phenanthrene	95 [a]	9	<0.1 - 8.3	0
Pyrene	620 [a]	9	<0.1 - 15	0
DDT	2.7[#]	3	<0.01	0
DDD	3.2[#]	3	<0.01	0

Notes

[a] CIEH/LQM - Suitable for Use Level (S4UL) published by the Chartered Institute of Environmental Health (CIEH) and Land Quality Management (LQM) dated January 2015. Based on 1% SOM, where appropriate.

[b] C4SL - Category 4 Screening Levels published by DEFRA in 2014

[c] EA CLEA - Soil Guidance Value (SGV) published by the EA calculated using Contaminated Land Exposure Assessment (CLEA) model (version 1.06)

\# - The CLEA model (v1.071) has been used to provide initial assessment criteria for DDD and DDT based on a standard clay soil with a conservative soil organic matter (SOM) content of 1% for a residential land use with gardens ('residential with produce').

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Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 837692-1

Date of Report: 14-Aug-2019

Customer: Travis Baker Geo-Environmental Ltd.
Trinity Point
New Road
Halesowen
West Midlands
B63 3HY

Customer Contact: Ms Lisa Glover

Customer Job Reference: 19017
Customer Purchase Order: 1260G
Customer Site Reference: Eakring Road, Bilsthorpe
Date Job Received at Concept: 31-Jul-2019
Date Analysis Started: 02-Aug-2019
Date Analysis Completed: 14-Aug-2019

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Customers are responsible for information provided where, if incorrect, it could affect the validity of the results.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with QMSection 15 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked
and authorised by :
Toni Morris
Customer Service Advisor

Issued by :
Toni Morris
Customer Service Advisor

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**837692 002**	**837692 003**	**837692 004**	**837692 006**	**837692 008**
				Customer Sample Reference	**TP01**	**TP01**	**TP02**	**TP03**	**TP03**
				Bottom Depth	**0.8**	**1.5**	**0.6**	**0.2**	**2.0**
				Top Depth	**0.7**	**1.4**	**0.5**	**0.1**	**1.9**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Topsoil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Moisture @105C	T162	AR	0.1	%	**7.9**	**14**	**8.8**	**13**	**10**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**837692 009**	**837692 010**	**837692 013**	**837692 014**	**837692 016**
				Customer Sample Reference	**TP05**	**TP05**	**TP06**	**TP07**	**TP08**
				Bottom Depth	**0.3**	**0.6**	**0.9**	**0.3**	**0.2**
				Top Depth	**0.2**	**0.5**	**0.8**	**0.2**	**0.1**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Moisture @105C	T162	AR	0.1	%	**16**	**6.7**	**14**	**15**	**8.6**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**837692 017**	**837692 018**	**837692 019**	**837692 022**	**837692 024**
				Customer Sample Reference	**TP08**	**DS06**	**DS06**	**DS03**	**DS01**
				Bottom Depth	**1.5**	**0.1**	**0.3**	**0.2**	**0.1**
				Top Depth	**1.4**	**0.0**	**0.2**	**0.1**	**0.0**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Topsoil**	**Topsoil**	**Topsoil**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Moisture @105C	T162	AR	0.1	%	**10**	**19**	**14**	**16**	**13**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	**837692 025**	**837692 027**	**837692 028**	**837692 031**	**837692 033**
				Customer Sample Reference	**DS01**	**DS02**	**DS02**	**DS04**	**DS05**
				Bottom Depth	**0.55**	**0.1**	**0.5**	**0.6**	**0.1**
				Top Depth	**0.45**	**0.0**	**0.4**	**0.5**	**0.0**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Topsoil**	**Sandy Soil**	**Clay**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Moisture @105C	T162	AR	0.1	%	**9.1**	**12**	**5.2**	**12**	**12**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
MCERTS Preparation

Concept Reference	**837692 034**
Customer Sample Reference	**DS05**
Bottom Depth	**0.4**
Top Depth	**`0.3**
Date Sampled	**29-JUL-2019**
Matrix Class	**Sandy Soil**

Determinand	Method	Test Sample	LOD	Units	
Moisture @105C	T162	AR	0.1	%	**7.0**
Retained on 10mm sieve	T2	M40	0.1	%	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
% Stones

Concept Reference					**837692 002**	**837692 003**	**837692 004**	**837692 006**	**837692 008**
Customer Sample Reference					**TP01**	**TP01**	**TP02**	**TP03**	**TP03**
Bottom Depth					**0.8**	**1.5**	**0.6**	**0.2**	**2.0**
Top Depth					**0.7**	**1.4**	**0.5**	**0.1**	**1.9**
Date Sampled					**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
Matrix Class					**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Topsoil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Retained on 20mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1
Retained on 2mm	T2	A40	0.1	%	**12.5**	**19.7**	**25.7**	**39.0**	**8.4**
Retained on 50mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
% Stones

Concept Reference					**837692 009**	**837692 010**	**837692 013**	**837692 014**	**837692 016**
Customer Sample Reference					**TP05**	**TP05**	**TP06**	**TP07**	**TP08**
Bottom Depth					**0.3**	**0.6**	**0.9**	**0.3**	**0.2**
Top Depth					**0.2**	**0.5**	**0.8**	**0.2**	**0.1**
Date Sampled					**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
Matrix Class					**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Retained on 20mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1
Retained on 2mm	T2	A40	0.1	%	**36.5**	**51.0**	**3.6**	**52.9**	**12.2**
Retained on 50mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
% Stones

				Concept Reference	**837692 017**	**837692 018**	**837692 019**	**837692 022**	**837692 024**
				Customer Sample Reference	**TP08**	**DS06**	**DS06**	**DS03**	**DS01**
				Bottom Depth	**1.5**	**0.1**	**0.3**	**0.2**	**0.1**
				Top Depth	**1.4**	**0.0**	**0.2**	**0.1**	**0.0**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Topsoil**	**Topsoil**	**Topsoil**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Retained on 20mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1
Retained on 2mm	T2	A40	0.1	%	**13.2**	**12.3**	**16.4**	**38.3**	**16.2**
Retained on 50mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
% Stones

				Concept Reference	**837692 025**	**837692 027**	**837692 028**	**837692 031**	**837692 033**
				Customer Sample Reference	**DS01**	**DS02**	**DS02**	**DS04**	**DS05**
				Bottom Depth	**0.55**	**0.1**	**0.5**	**0.6**	**0.1**
				Top Depth	**0.45**	**0.0**	**0.4**	**0.5**	**0.0**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Topsoil**	**Sandy Soil**	**Clay**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Retained on 20mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1
Retained on 2mm	T2	A40	0.1	%	**20.6**	**23.3**	**33.1**	**9.6**	**14.6**
Retained on 50mm	T2	AR	0.1	%	<0.1	<0.1	<0.1	<0.1	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
% Stones

				Concept Reference	**837692 034**
				Customer Sample Reference	**DS05**
				Bottom Depth	**0.4**
				Top Depth	**`0.3**
				Date Sampled	**29-JUL-2019**
				Matrix Class	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**	
Retained on 20mm	T2	AR	0.1	%	<0.1
Retained on 2mm	T2	A40	0.1	%	**15.7**
Retained on 50mm	T2	AR	0.1	%	<0.1

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
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				Concept Reference	**837692 002**	**837692 003**	**837692 004**	**837692 006**	**837692 008**
				Customer Sample Reference	**TP01**	**TP01**	**TP02**	**TP03**	**TP03**
				Bottom Depth	**0.8**	**1.5**	**0.6**	**0.2**	**2.0**
				Top Depth	**0.7**	**1.4**	**0.5**	**0.1**	**1.9**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Sandy Soil**	**Sandy Soil**	**Topsoil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	M40	2	mg/kg	**3**	**7**	**6**	**9**	**5**
Boron (water-soluble)	T6	A40	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**10**	**24**	**17**	**16**	**7**
Copper	T6	M40	1	mg/kg	**13**	**30**	**25**	**27**	**14**
Lead	T6	M40	1	mg/kg	**10**	**6**	**13**	**37**	**1**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	**10**	**21**	**16**	**14**	**7**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	**29**	**36**	**44**	**53**	**11**
pH	T7	A40			**7.8**	**7.5**	**7.5**	**7.3**	**7.8**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	<0.05	<0.05	<0.05	<0.05	<0.05

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
Travis Baker Greenfield Suite

				Concept Reference	**837692 009**	**837692 010**	**837692 013**	**837692 014**	**837692 016**
				Customer Sample Reference	**TP05**	**TP05**	**TP06**	**TP07**	**TP08**
				Bottom Depth	**0.3**	**0.6**	**0.9**	**0.3**	**0.2**
				Top Depth	**0.2**	**0.5**	**0.8**	**0.2**	**0.1**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Clay**	**Sandy Soil**	**Sandy Soil**	**Clay**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	M40	2	mg/kg	**17**	**4**	**24**	**22**	**14**
Boron (water-soluble)	T6	A40	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**23**	**8**	**20**	**23**	**21**
Copper	T6	M40	1	mg/kg	**48**	**10**	**71**	**56**	**39**
Lead	T6	M40	1	mg/kg	**56**	**6**	**17**	**70**	**47**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	**23**	**8**	**27**	**24**	**19**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	**81**	**21**	**46**	**91**	**75**
pH	T7	A40			**7.3**	**7.5**	**7.5**	**7.5**	**7.2**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	<0.05	<0.05	<0.05	<0.05	<0.05

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
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				Concept Reference	**837692 017**	**837692 018**	**837692 019**	**837692 022**	**837692 024**
				Customer Sample Reference	**TP08**	**DS06**	**DS06**	**DS03**	**DS01**
				Bottom Depth	**1.5**	**0.1**	**0.3**	**0.2**	**0.1**
				Top Depth	**1.4**	**0.0**	**0.2**	**0.1**	**0.0**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Topsoil**	**Topsoil**	**Topsoil**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	M40	2	mg/kg	**11**	**16**	**14**	**19**	**7**
Boron (water-soluble)	T6	A40	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**8**	**23**	**21**	**23**	**12**
Copper	T6	M40	1	mg/kg	**40**	**47**	**40**	**54**	**24**
Lead	T6	M40	1	mg/kg	**4**	**57**	**50**	**63**	**33**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	**16**	**22**	**20**	**24**	**10**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	**21**	**88**	**70**	**85**	**49**
pH	T7	A40			**7.8**	**7.0**	**7.7**	**7.4**	**7.3**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	<0.05	<0.05	<0.05	<0.05	<0.05

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
Travis Baker Greenfield Suite

				Concept Reference	**837692 025**	**837692 027**	**837692 028**	**837692 031**	**837692 033**
				Customer Sample Reference	**DS01**	**DS02**	**DS02**	**DS04**	**DS05**
				Bottom Depth	**0.55**	**0.1**	**0.5**	**0.6**	**0.1**
				Top Depth	**0.45**	**0.0**	**0.4**	**0.5**	**0.0**
				Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
				Matrix Class	**Sandy Soil**	**Topsoil**	**Sandy Soil**	**Clay**	**Topsoil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**					
Arsenic	T6	M40	2	mg/kg	**5**	**7**	**3**	**15**	**10**
Boron (water-soluble)	T6	A40	1	mg/kg	<1	<1	<1	<1	<1
Cadmium	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Chromium	T6	M40	1	mg/kg	**22**	**11**	**8**	**26**	**14**
Copper	T6	M40	1	mg/kg	**70**	**17**	**10**	**54**	**26**
Lead	T6	M40	1	mg/kg	**6**	**28**	**5**	**32**	**46**
Mercury	T6	M40	1	mg/kg	<1	<1	<1	<1	<1
Nickel	T6	M40	1	mg/kg	**22**	**8**	**6**	**26**	**13**
Selenium	T6	M40	3	mg/kg	<3	<3	<3	<3	<3
Zinc	T6	M40	1	mg/kg	**43**	**45**	**19**	**71**	**77**
pH	T7	A40			**7.4**	**7.1**	**7.9**	**7.6**	**7.2**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	<0.05	<0.05	<0.05	<0.05	<0.05

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
Travis Baker Greenfield Suite

Concept Reference	**837692 034**
Customer Sample Reference	**DS05**
Bottom Depth	**0.4**
Top Depth	**`0.3**
Date Sampled	**29-JUL-2019**
Matrix Class	**Sandy Soil**

Determinand	Method	Test Sample	LOD	Units	
Arsenic	T6	M40	2	mg/kg	**8**
Boron (water-soluble)	T6	A40	1	mg/kg	<1
Cadmium	T6	M40	1	mg/kg	<1
Chromium	T6	M40	1	mg/kg	**12**
Copper	T6	M40	1	mg/kg	**21**
Lead	T6	M40	1	mg/kg	**14**
Mercury	T6	M40	1	mg/kg	<1
Nickel	T6	M40	1	mg/kg	**14**
Selenium	T6	M40	3	mg/kg	<3
Zinc	T6	M40	1	mg/kg	**35**
pH	T7	A40			**7.5**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	<0.05

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
BRE SD1

Concept Reference	**837692 005**	**837692 008**	**837692 011**	**837692 015**	**837692 020**
Customer Sample Reference	**TP02**	**TP03**	**TP05**	**TP07**	**DS06**
Bottom Depth	**1.7**	**2.0**	**1.0**	**1.9**	**1.2**
Top Depth	**1.6**	**1.9**	**0.9**	**1.8**	**1.1**
Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
Matrix Class		**Sandy Soil**			

Determinand	Method	Test Sample	LOD	Units					
pH	T7	A40			**7.9**	**7.8**	**7.8**	**8.8**	**8.5**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	<0.05	<0.05	<0.05	<0.05	**0.10**
(Acid Soluble) SO4	T192	A40	0.02	%	<0.02	<0.02	**0.04**	<0.02	**0.50**
Sulphur (total)	T6	A40	0.01	%	<0.01	<0.01	**0.01**	<0.01	**0.03**
(Water soluble) Mg	T251	A40	1	mg/l	<1	<1	**2**	**1**	<1
(Water soluble) Cl-	T710	A40	0.01	g/l	<0.01	<0.01	<0.01	<0.01	<0.01
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01	<0.01	<0.01	<0.01	<0.01
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	<0.01	<0.01	<0.01	<0.01	<0.01

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
BRE SD1

	Concept Reference	837692 026	837692 032	837692 035
	Customer Sample Reference	DS01	DS04	DS05
	Bottom Depth	0.8	0.9	1.2
	Top Depth	0.7	0.8	1.1
	Date Sampled	29-JUL-2019	29-JUL-2019	29-JUL-2019
	Matrix Class			

Determinand	Method	Test Sample	LOD	Units			
pH	T7	A40			7.4	7.7	7.5
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	<0.05	<0.05	<0.05
(Acid Soluble) SO4	T192	A40	0.02	%	<0.02	<0.02	<0.02
Sulphur (total)	T6	A40	0.01	%	<0.01	<0.01	<0.01
(Water soluble) Mg	T251	A40	1	mg/l	<1	<1	<1
(Water soluble) Cl-	T710	A40	0.01	g/l	<0.01	<0.01	<0.01
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01	<0.01	<0.01
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	<0.01	<0.01	<0.01

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
PAH USEPA16 MCERTS

	Concept Reference	837692 006	837692 009	837692 014	837692 016	837692 018
	Customer Sample Reference	TP03	TP05	TP07	TP08	DS06
	Bottom Depth	0.2	0.3	0.3	0.2	0.1
	Top Depth	0.1	0.2	0.2	0.1	0.0
	Date Sampled	29-JUL-2019	29-JUL-2019	29-JUL-2019	29-JUL-2019	29-JUL-2019
	Matrix Class	Topsoil	Clay	Clay	Topsoil	Topsoil

Determinand	Method	Test Sample	LOD	Units					
Naphthalene	T207	M105	0.1	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	0.3	<0.1	0.4	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	0.8	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	0.3	<0.1	0.8	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	4.2	0.7	8.3	<0.1	<0.1
Anthracene	T207	M105	0.1	mg/kg	0.9	0.2	3.0	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	8.9	1.7	16	0.1	0.2
Pyrene	T207	M105	0.1	mg/kg	7.6	1.5	15	<0.1	0.2
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	3.7	0.7	7.2	<0.1	<0.1
Chrysene	T207	M105	0.1	mg/kg	4.1	0.8	7.4	<0.1	<0.1
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	2.8	0.5	6.2	<0.1	<0.1
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	3.4(68)	0.6(68)	6.4(68)	<0.1(68)	<0.1(68)
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	3.6	0.7	7.6	<0.1	<0.1
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	1.7	0.3	3.5	<0.1	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	0.5	<0.1	1.6	<0.1	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	2.0	0.4	3.8	<0.1	<0.1
PAH(total)	T207	M105	0.1	mg/kg	44	8.1	88	0.1	0.3

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
PAH USEPA16 MCERTS

Concept Reference	**837692 022**	**837692 024**	**837692 027**	**837692 033**
Customer Sample Reference	**DS03**	**DS01**	**DS02**	**DS05**
Bottom Depth	**0.2**	**0.1**	**0.1**	**0.1**
Top Depth	**0.1**	**0.0**	**0.0**	**0.0**
Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**
Matrix Class	**Topsoil**	**Topsoil**	**Topsoil**	**Topsoil**

Determinand	Method	Test Sample	LOD	Units				
Naphthalene	T207	M105	0.1	mg/kg	<0.1	**0.1**	<0.1	<0.1
Acenaphthylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	**0.1**
Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T207	M105	0.1	mg/kg	<0.1	**0.1**	**0.2**	**0.3**
Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	**0.2**	**0.3**
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	**0.1**
Chrysene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	**0.2**
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	**0.1**
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	<0.1(68)	<0.1(68)	<0.1(68)	**0.1(68)**
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	**0.1**
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	<0.1	<0.1	<0.1	**0.1**
PAH(total)	T207	M105	0.1	mg/kg	<0.1	**0.2**	**0.3**	**1.5**

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
Organochlorine insecticides

Concept Reference	**837692 001**	**837692 012**	**837692 030**
Customer Sample Reference	**TP01**	**TP06**	**DS04**
Bottom Depth	**0.2**	**0.2**	**0.1**
Top Depth	**0.1**	**0.1**	**0.0**
Date Sampled	**29-JUL-2019**	**29-JUL-2019**	**29-JUL-2019**

Determinand	Method	Test Sample	LOD	Units			
Hexachlorocyclohexane (sum of alpha, beta and gamma)	T16	AR	0.01	mg/kg	**0.01**	**0.01**	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Heptachlor	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
DDE	T16	AR	0.01	mg/kg	**0.01**	**0.01**	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
DDT	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01

Concept Reference: 837692
Project Site: Eakring Road, Bilsthorpe
Customer Reference: 19017

Soil Analysed as Soil
Organophosphorous insecticides

	Concept Reference	837692 001	837692 012	837692 030
	Customer Sample Reference	TP01	TP06	DS04
	Bottom Depth	0.2	0.2	0.1
	Top Depth	0.1	0.1	0.0
	Date Sampled	29-JUL-2019	29-JUL-2019	29-JUL-2019

Determinand	Method	Test Sample	LOD	Units			
Dichlorvos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Mevinphos	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Dimethoate	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Diazinon	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Pirimiphos methyl	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Malathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Fenitrothion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Parathion	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg	<0.01	<0.01	<0.01

Index to symbols used in 837692-1

Value	Description
AR	As Received
A40	Assisted dried < 40C
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
68	Outside scope of UKAS accreditation
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

PAH's were analysed at our Braintree Laboratory.

Method Index

Value	Description
T6	ICP/OES
T7	Probe
T207	GC/MS (MCERTS)
T242	2:1 Extraction/ICP/OES (TRL 447 T1)
T2	Grav
T16	GC/MS
T251	2:1 Extraction/ICP/OES
T1	GC/MS (HR)
T710	2:1 Extraction / Discrete Analyser
T162	Grav (1 Dec) (105 C)
T192	HCl Extraction/ICP/OES (TRL 447 T2)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Naphthalene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Acenaphthylene	T207	M105	0.1	mg/kg	U	006,009,014,016,018,022,024,027,033
Acenaphthene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Fluorene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Phenanthrene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Anthracene	T207	M105	0.1	mg/kg	U	006,009,014,016,018,022,024,027,033

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Fluoranthene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Pyrene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Benzo(a)Anthracene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Chrysene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Benzo(b)fluoranthene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Benzo(k)fluoranthene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Benzo(a)Pyrene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Indeno(123-cd)Pyrene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Dibenzo(ah)Anthracene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
Benzo(ghi)Perylene	T207	M105	0.1	mg/kg	M	006,009,014,016,018,022,024,027,033
PAH(total)	T207	M105	0.1	mg/kg	U	006,009,014,016,018,022,024,027,033
Arsenic	T6	M40	2	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Boron (water-soluble)	T6	A40	1	mg/kg	N	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Cadmium	T6	M40	1	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Chromium	T6	M40	1	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Copper	T6	M40	1	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Lead	T6	M40	1	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Mercury	T6	M40	1	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Nickel	T6	M40	1	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Selenium	T6	M40	3	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Zinc	T6	M40	1	mg/kg	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
pH	T7	A40			M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	M	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Retained on 20mm	T2	AR	0.1	%	N	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Retained on 2mm	T2	A40	0.1	%	N	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Retained on 50mm	T2	AR	0.1	%	N	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
pH	T7	A40			U	005,008,011,015,020,026,032,035
(Water Soluble) SO4 expressed as SO4	T242	A40	0.05	g/l	U	005,008,011,015,020,026,032,035
(Acid Soluble) SO4	T192	A40	0.02	%	U	005,008,011,015,020,026,032,035
Sulphur (total)	T6	A40	0.01	%	U	005,008,011,015,020,026,032,035
(Water soluble) Mg	T251	A40	1	mg/l	N	005,008,011,015,020,026,032,035
(Water soluble) Cl-	T710	A40	0.01	g/l	N	005,008,011,015,020,026,032,035
(Water soluble) NO3	T710	A40	0.01	g/l	N	005,008,011,015,020,026,032,035
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	005,008,011,015,020,026,032,035
Dichlorvos	T16	AR	0.01	mg/kg	U	001,012,030
Mevinphos	T16	AR	0.01	mg/kg	U	001,012,030
Dimethoate	T16	AR	0.01	mg/kg	U	001,012,030
Diazinon	T16	AR	0.01	mg/kg	U	001,012,030
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	001,012,030
Malathion	T16	AR	0.01	mg/kg	U	001,012,030
Fenitrothion	T16	AR	0.01	mg/kg	U	001,012,030
Parathion	T16	AR	0.01	mg/kg	U	001,012,030
Azinphos methyl	T16	AR	0.01	mg/kg	U	001,012,030
Moisture @105C	T162	AR	0.1	%	N	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Retained on 10mm sieve	T2	M40	0.1	%	N	002-004,006,008-010,013-014,016-019,022,024-025,027-028,031,033-034
Hexachlorocyclohexane (sum of alpha, beta and gamma)	T16	AR	0.01	mg/kg	U	001,012,030
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	001,012,030
Heptachlor	T16	AR	0.01	mg/kg	U	001,012,030
Aldrin	T16	AR	0.01	mg/kg	U	001,012,030
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	001,012,030
Chlordane	T16	AR	0.01	mg/kg	U	001,012,030
Endosulphan	T16	AR	0.01	mg/kg	U	001,012,030
DDE	T16	AR	0.01	mg/kg	U	001,012,030
Dieldrin	T16	AR	0.01	mg/kg	U	001,012,030
Endrin	T16	AR	0.01	mg/kg	U	001,012,030
DDD	T16	AR	0.01	mg/kg	U	001,012,030
DDT	T16	AR	0.01	mg/kg	U	001,012,030

APPENDIX 8

TRL DCP Results and Estimated CBR values

Appendix 8 - TRL Summary
Eakring Road, Bilsthorpe

TRLDCP 1					
Blows	**Depth (mm/bgl)**	**Total Blows**	**Depth of Penetration (mm)**	**mm/blow**	**CBR%**
2	100	2	100	50.0	0.68
3	200	5	100	20.0	1.10
5	300	10	100	10.0	1.42
13	400	23	100	4.3	1.81
16	500	39	100	2.6	2.05
8	600	47	100	2.1	2.13
10	700	57	100	1.8	2.22
9	800	66	100	1.5	2.29
8	900	74	100	1.4	2.34
5	1000	79	100	1.3	2.37

TRLDCP 2					
Blows	**Depth (mm/bgl)**	**Total Blows**	**Depth of Penetration (mm)**	**mm/blow**	**CBR%**
3	100	3	100	33.3	0.87
6	200	9	100	11.1	1.37
7	300	16	100	6.3	1.64
13	400	29	100	3.4	1.91
8	500	37	100	2.7	2.02
3	600	40	100	2.5	2.06
3	700	43	100	2.3	2.09
4	800	47	100	2.1	2.13
5	900	52	100	1.9	2.18
6	1000	58	100	1.7	2.23

TRLDCP 3					
Blows	**Depth (mm/bgl)**	**Total Blows**	**Depth of Penetration (mm)**	**mm/blow**	**CBR%**
2	100	2	100	50.0	0.68
3	200	5	100	20.0	1.10
6	300	11	100	9.1	1.47
6	400	17	100	5.9	1.67
9	500	26	100	3.8	1.86
5	600	31	100	3.2	1.94
4	700	35	100	2.9	2.00
4	800	39	100	2.6	2.05
5	900	44	100	2.3	2.10
9	1000	53	100	1.9	2.19

Appendix 8 - TRL Summary
Eakring Road, Bilsthorpe

TRLDCP 4					
Blows	**Depth (mm/bgl)**	**Total Blows**	**Depth of Penetration (mm)**	**mm/blow**	**CBR%**
2	100	2	100	50.0	0.68
3	200	5	100	20.0	1.10
5	300	10	100	10.0	1.42
7	400	17	100	5.9	1.67
7	500	24	100	4.2	1.82
7	600	31	100	3.2	1.94
5	700	36	100	2.8	2.01
7	800	43	100	2.3	2.09
11	900	54	100	1.9	2.20
17	1000	71	100	1.4	2.32

TRLDCP 5					
Blows	**Depth (mm/bgl)**	**Total Blows**	**Depth of Penetration (mm)**	**mm/blow**	**CBR%**
2	100	2	100	50.0	0.68
5	200	7	100	14.3	1.26
3	300	10	100	10.0	1.42
5	400	15	100	6.7	1.61
5	500	20	100	5.0	1.74
7	600	27	100	3.7	1.88
7	700	34	100	2.9	1.98
4	800	38	100	2.6	2.04
3	900	41	100	2.4	2.07
5	1000	46	100	2.2	2.12

TRLDCP 6					
Blows	**Depth (mm/bgl)**	**Total Blows**	**Depth of Penetration (mm)**	**mm/blow**	**CBR%**
2	100	2	100	50.0	0.68
4	200	6	100	16.7	1.19
4	300	10	100	10.0	1.42
7	400	17	100	5.9	1.67
6	500	23	100	4.3	1.81
4	600	27	100	3.7	1.88
4	700	31	100	3.2	1.94
4	800	35	100	2.9	2.00
4	900	39	100	2.6	2.05
4	1000	43	100	2.3	2.09

APPENDIX 9

Gas and Groundwater Monitoring Results

RECORD OF MEASUREMENTS FOR GAS MONITORING BOREHOLES

Client Name: Keepmoat Homes
Site Name: Eakring Road, Bilsthorpe

Date of Sampling: 01/08/2019
Job Number: 19017

Borehole Reference	Borehole Flow (l/hr)	Methane (% by volume)	Carbon Dioxide (% by volume)	Oxygen (% by volume)	Balance (% by volume)	Sample Type	Borehole Pressure (mb)	Depth (m bgl)	
								Borehole	Water
DS1	0.0	0.0	3.9	15.7	80.4	Accumulated	-0.03	2.07	Dry
DS3	0.0	0.0	4.9	9.0	86.1	Accumulated	0.02	1.52	Dry
DS5	0.0	0.0	4.5	16.2	79.4	Accumulated	0.0	2.10	Dry
DS6	0.0	0.0	6.0	7.9	86.1	Accumulated	0.02	1.82	1.43

Atmospheric Pressure: 1011mb	Instrument Type: GA5000	Notes:
Pressure Trend: Rising	Sample Type: As indicated above	
Weather: Sunny intervals	Operator: T Darby	

RECORD OF MEASUREMENTS FOR GAS MONITORING BOREHOLES

Client Name: Keepmoat Homes
Site Name: Eakring Road, Bilsthorpe

Date of Sampling: 09/08/2019
Job Number: 19017

Borehole Reference	Borehole Flow (l/hr)	Methane (% by volume)	Carbon Dioxide (% by volume)	Oxygen (% by volume)	Balance (% by volume)	Sample Type	Borehole Pressure (mb)	Depth (m bgl)	
								Borehole	Water
DS1	0.0	0.0	5.2	14.9	79.9	Accumulated	-1.92	2.07	Dry
DS3	0.0	0.0	4.2	12.8	83.0	Accumulated	0.40	1.52	Dry
DS5	0.0	0.0	3.7	16.6	79.7	Accumulated	-0.03	2.10	Dry
DS6	0.0	0.0	4.3	15.5	80.2	Accumulated	0.31	1.82	1.36

Atmospheric Pressure: 990mb	Instrument Type: GA5000	Notes:
Pressure Trend: Rising	Sample Type: As indicated above	
Weather: Sunny intervals	Operator: T Darby	

RECORD OF MEASUREMENTS FOR GAS MONITORING BOREHOLES

Client Name: Keepmoat Homes
Site Name: Eakring Road, Bilsthorpe

Date of Sampling: 20/08/2019
Job Number: 19017

Borehole Reference	Borehole Flow (l/hr)	Methane (% by volume)	Carbon Dioxide (% by volume)	Oxygen (% by volume)	Balance (% by volume)	Sample Type	Borehole Pressure (mb)	Depth (m bgl)	
								Borehole	Water
DS1	0.0	0.0	4.0	17.4	78.6	Accumulated	1.10	2.07	Dry
DS3	0.0	0.0	3.1	16.6	80.3	Accumulated	-0.27	1.52	Dry
DS5	0.0	0.0	2.2	19.1	78.7	Accumulated	-0.48	2.10	Dry
DS6	0.0	0.0	4.2	17.7	78.2	Accumulated	-0.53	1.82	1.38

Atmospheric Pressure: 1011mb	Instrument Type: GA5000	Notes:
Pressure Trend: ---	Sample Type: As indicated above	
Weather: Sunny intervals	Operator: T Darby	

RECORD OF MEASUREMENTS FOR GAS MONITORING BOREHOLES

Client Name: Keepmoat Homes
Site Name: Eakring Road, Bilsthorpe

Date of Sampling: 13/09/2019
Job Number: 19017

Borehole Reference	Borehole Flow (l/hr)	Methane (% by volume)	Carbon Dioxide (% by volume)	Oxygen (% by volume)	Balance (% by volume)	Sample Type	Borehole Pressure (mb)	Depth (m bgl)	
								Borehole	Water
DS1	0.0	0.0	0.9	20.4	78.8	Accumulated	-0.58	2.07	Dry
DS3	0.0	0.0	2.1	18.1	79.0	Accumulated	-1.15	1.52	Dry
DS5	0.0	0.0	0.7	20.3	79.0	Accumulated	-0.27	2.10	Dry
DS6								1.82	Dry

Atmospheric Pressure: 1028mb	Instrument Type: GA5000	Notes:
Pressure Trend: ---	Sample Type: As indicated above	
Weather: Sunny	Operator: T Darby	

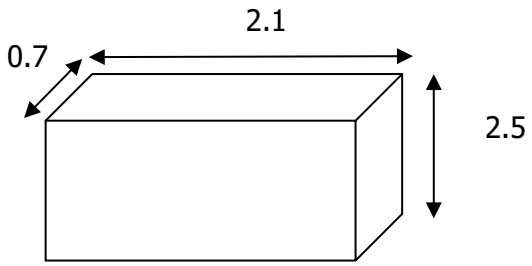
APPENDIX 10

Soakaway Test Results

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	19/08/19
Weather:	Cloudy with showers
Soakaway Reference:	SA1
Test Number at Location:	1
Groundwater Level at Start:	1.52m
Filled with stone?	No

Trial Pit Dimensions (m):



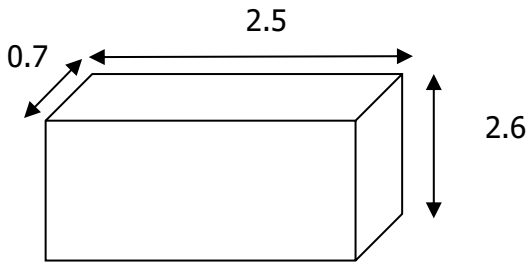
Time in mins	Water Level (m)
1	1.57
2	1.58
3	1.59
4	1.6
5	1.61
6	1.62
7	1.63
8	1.64
9	1.645
10	1.65
11	1.66
12	1.67
13	1.68
14	1.68
15	1.685
17	1.695
21	1.71
24	1.72
27	1.74
31	1.74
41	1.77
51	1.67
62	1.71

Time in mins	Water Level (m)
73	1.74
78	1.755
92	1.79
107	1.82
127	1.88
150	1.92
168	1.96
208	2.04

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	21/08/19
Weather:	
Soakaway Reference:	SA1A
Test Number at Location:	1
Groundwater Level at Start:	1.8m
Filled with stone?	No

Trial Pit Dimensions (m):



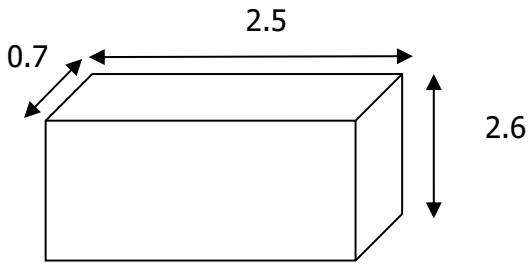
Time in mins	Water Level (m)
1	1.8
2	1.82
3	1.83
4	1.83
5	1.84
6	1.85
7	1.855
8	1.86
9	1.86
10	1.87
11	1.88
12	1.885
13	1.89
15	1.91
17	1.92
19	1.92
21	1.92
31	1.94
36	1.96
38	1.96
67	2.01
86	2.06
123	2.07

Time in mins	Water Level (m)
148	2.09
170	2.11
218	2.15
264	2.19
305	2.22
329	2.25

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	22/08/19
Weather:	
Soakaway Reference:	SA1A
Test Number at Location:	2
Groundwater Level at Start:	1.6m
Filled with stone?	No

Trial Pit Dimensions (m):



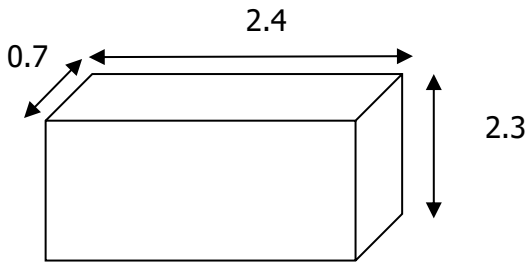
Time in mins	Water Level (m)
1	1.61
2	1.62
3	1.62
4	1.63
5	1.62
6	1.63
7	1.63
8	1.63
9	1.63
10	1.64
15	1.65
27	1.63
34	1.64
40	1.64
62	1.68
82	1.71
106	1.75
124	1.77
152	1.81
187	1.84
211	1.86
251	1.9
291	1.93

Time in mins	Water Level (m)
329	1.96

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	19/08/19
Weather:	
Soakaway Reference:	SA2
Test Number at Location:	1
Groundwater Level at Start:	1.48m
Filled with stone?	No

Trial Pit Dimensions (m):



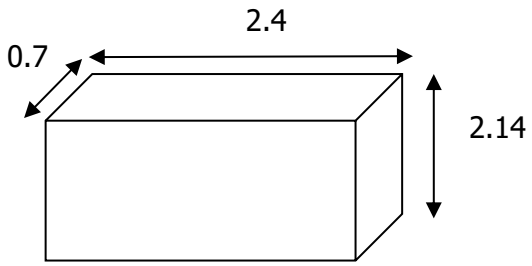
Time in mins	Water Level (m)
1	1.485
2	1.49
3	1.5
4	1.5
5	1.5
6	1.5
7	1.505
8	1.505
9	1.51
10	1.51
11	1.51
12	1.52
13	1.52
14	1.52
15	1.52
16	1.52
17	1.52
18	1.525
19	1.525
20	1.53
22	1.54
24	1.54
26	1.545

Time in mins	Water Level (m)
28	1.55
30	1.56
35	1.56
40	1.565
54	1.59
59	1.6
73	1.61
85	1.62
115	1.66
132	1.66
153	1.68
190	1.7
238	1.74
248	1.74
287	1.77
311	1.77

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	21/08/19
Weather:	
Soakaway Reference:	SA2
Test Number at Location:	2
Groundwater Level at Start:	1.14
Filled with stone?	No

Trial Pit Dimensions (m):



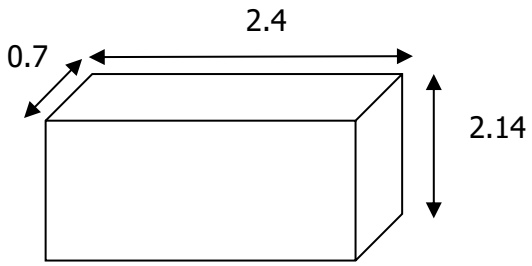
Time in mins	Water Level (m)
1	1.1
2	1.13
3	1.13
4	1.14
5	1.15
6	1.15
7	1.155
8	1.16
9	1.17
10	1.17
16	1.18
20	1.2
24	1.21
28	1.21
30	1.21
32	1.21
34	1.21
36	1.21
38	1.21
40	1.22
59	1.3
99	1.35
124	1.4

Time in mins	Water Level (m)
145	1.43
170	1.46
188	1.46
213	1.48
227	1.54
250	1.55
272	1.53
320	1.55
366	1.6
408	1.62
437	1.63

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	22/08/19
Weather:	
Soakaway Reference:	SA2
Test Number at Location:	3
Groundwater Level at Start:	1.14m
Filled with stone?	No

Trial Pit Dimensions (m):



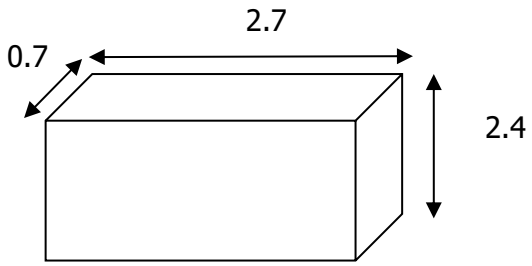
Time in mins	Water Level (m)
1	1.14
2	1.16
3	1.17
4	1.17
5	1.17
6	1.17
7	1.17
8	1.17
9	1.18
10	1.18
16	1.18
22	1.19
44	1.23
64	1.25
88	1.29
106	1.31
134	1.33
168	1.38
206	1.4
246	1.44
283	1.45

Time in mins	Water Level (m)

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	19/08/19
Weather:	
Soakaway Reference:	SA3
Test Number at Location:	1
Groundwater Level at Start:	1.5
Filled with stone?	No

Trial Pit Dimensions (m):



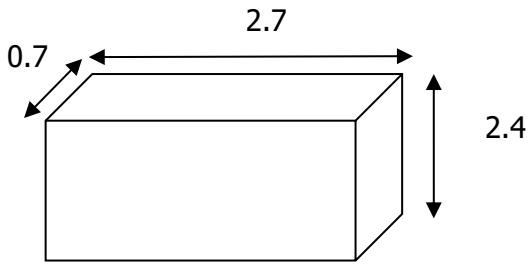
Time in mins	Water Level (m)
1	1.5
2	1.53
3	1.55
4	1.56
5	1.575
6	1.59
7	1.6
8	1.6
9	1.605
10	1.62
11	1.625
12	1.64
13	1.65
14	1.655
15	1.67
16	1.67
17	1.67
18	1.675
19	1.68
20	1.68
22	1.69
24	1.7
26	1.7

Time in mins	Water Level (m)
28	1.71
30	1.72
35	1.735
40	1.745
54	1.78
76	1.83
92	1.85
123	1.9
156	1.94
167	1.96
174	1.98
201	2.01
211	2.01
222	2.03
268	2.07
306	2.1

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	21/08/19
Weather:	
Soakaway Reference:	SA3
Test Number at Location:	2
Groundwater Level at Start:	1.4m
Filled with stone?	No

Trial Pit Dimensions (m):



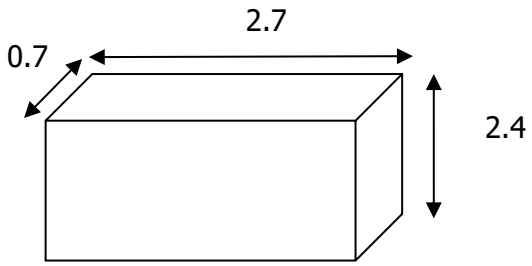
Time in mins	Water Level (m)
1	1.43
2	1.44
3	1.46
4	1.46
5	1.47
6	1.47
7	1.48
8	1.49
9	1.49
10	1.49
12	1.49
14	1.5
18	1.51
20	1.52
22	1.53
24	1.54
26	1.55
30	1.55
34	1.56
38	1.57
42	1.58
63	1.63
72	1.65

Time in mins	Water Level (m)
116	1.72
144	1.77
167	1.79
189	1.82
208	1.83
228	1.87
250	1.89
272	1.93
320	1.98
366	2
397	2.02
410	2.03
436	2.04

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	22/08/19
Weather:	
Soakaway Reference:	SA3
Test Number at Location:	3
Groundwater Level at Start:	1.4m
Filled with stone?	No

Trial Pit Dimensions (m):



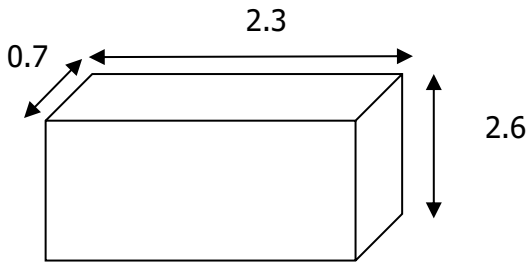
Time in mins	Water Level (m)
1	1.41
2	1.42
3	1.43
4	1.43
5	1.43
6	1.44
7	1.44
8	1.45
9	1.45
10	1.46
13	1.47
16	1.47
40	1.55
58	1.58
64	1.59
71	1.6
112	1.67
138	1.73
160	1.73
182	1.75
217	1.8
255	1.82
293	1.86

Time in mins	Water Level (m)
333	1.92
378	1.95

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	19/08/19
Weather:	
Soakaway Reference:	SA4
Test Number at Location:	1
Groundwater Level at Start:	1.5m
Filled with stone?	No

Trial Pit Dimensions (m):



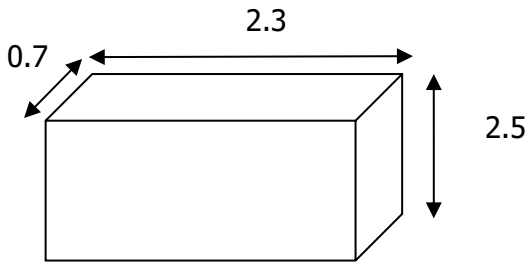
Time in mins	Water Level (m)
1	1.53
2	1.54
3	1.54
4	1.55
5	1.55
6	1.56
7	1.57
8	1.57
9	1.57
10	1.58
12	1.59
14	1.6
16	1.6
18	1.62
20	1.65
25	1.67
30	1.67
35	1.7
38	1.71
53	1.75
58	1.75
67	1.76
72	1.77

Time in mins	Water Level (m)
92	1.8
98	1.81
121	1.85
131	1.87
140	1.88

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	21/08/19
Weather:	
Soakaway Reference:	SA4
Test Number at Location:	2
Groundwater Level at Start:	1.5m
Filled with stone?	No

Trial Pit Dimensions (m):



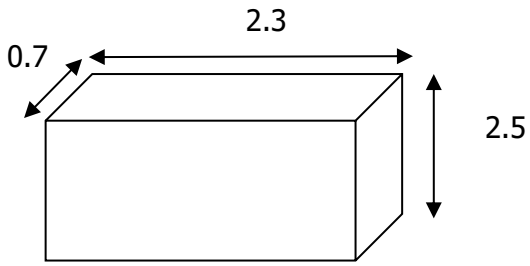
Time in mins	Water Level (m)
1	1.51
2	1.52
3	1.53
4	1.53
5	1.54
6	1.54
7	1.55
8	1.55
9	1.55
10	1.555
11	1.56
12	1.56
14	1.57
16	1.59
18	1.6
20	1.6
22	1.6
24	1.6
26	1.6
28	1.6
30	1.6
32	1.61
34	1.61

Time in mins	Water Level (m)
36	1.61
38	1.62
40	1.62
42	1.63
83	1.7
107	1.75
128	1.77
153	1.79
172	1.8
196	1.82
212	1.83
233	1.85
255	1.88
303	1.91
349	1.93
392	1.94
417	1.96

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	22/08/19
Weather:	
Soakaway Reference:	SA4
Test Number at Location:	3
Groundwater Level at Start:	1.5m
Filled with stone?	No

Trial Pit Dimensions (m):



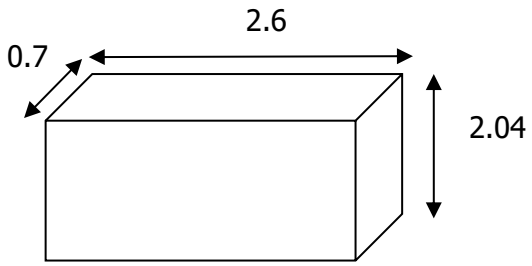
Time in mins	Water Level (m)
0	1.5
1	1.5
2	1.5
3	1.5
4	1.5
5	1.5
6	1.51
7	1.5
8	1.51
9	1.52
10	1.52
38	1.57
63	1.63
87	1.65
107	1.68
142	1.72
167	1.75
205	1.8
245	1.81
291	1.85

Time in mins	Water Level (m)

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	19/08/19
Weather:	
Soakaway Reference:	SA5
Test Number at Location:	1
Groundwater Level at Start:	1.5m
Filled with stone?	No

Trial Pit Dimensions (m):



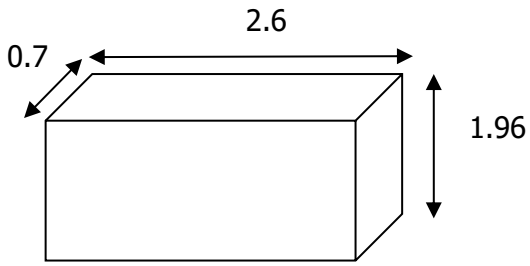
Time in mins	Water Level (m)
1	1.02
2	1.025
3	1.03
4	1.035
5	1.04
6	1.045
7	1.05
11	1.06
12	1.065
13	1.07
14	1.075
32	1.12
48	1.15
59	1.15
74	1.17
84	1.195
103	1.22
122	1.25
160	1.27
189	1.3

Time in mins	Water Level (m)

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	21/08/19
Weather:	
Soakaway Reference:	SA5
Test Number at Location:	2
Groundwater Level at Start:	0.93
Filled with stone?	No

Trial Pit Dimensions (m):



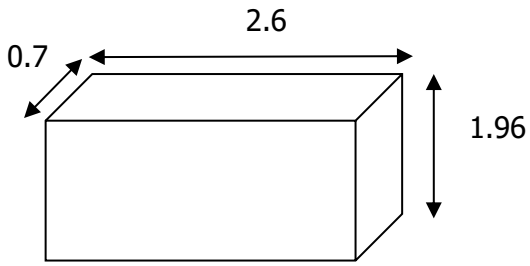
Time in mins	Water Level (m)
1	0.93
2	0.94
3	0.945
4	0.96
5	0.96
6	0.965
7	0.97
8	0.98
10	0.98
12	0.99
14	0.99
16	0.99
18	1
21	1.08
24	1.12
26	1.1
28	1.03
30	1.05
32	1.06
34	1.08
48	1.07
65	1.11
101	1.15

Time in mins	Water Level (m)
122	1.12
143	1.13
162	1.18
178	1.2
229	1.23
273	1.25
316	1.31
362	1.33
388	1.35

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	22/08/19
Weather:	
Soakaway Reference:	SA5
Test Number at Location:	3
Groundwater Level at Start:	1.0m
Filled with stone?	No

Trial Pit Dimensions (m):



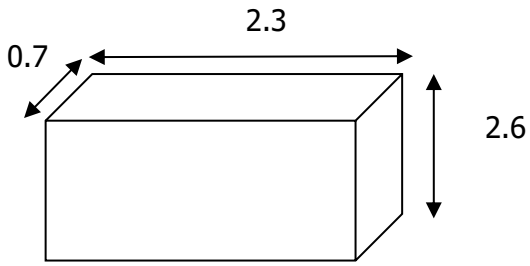
Time in mins	Water Level (m)
1	0.96
2	0.96
3	0.97
4	0.98
5	0.98
6	0.98
7	0.99
8	1
9	1
10	0.99
27	1.02
50	1.04
83	1.07
111	1.16
130	1.14
167	1.17
208	1.2
253	1.26

Time in mins	Water Level (m)

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	19/08/19
Weather:	
Soakaway Reference:	SA6
Test Number at Location:	1
Groundwater Level at Start:	1.34m
Filled with stone?	No

Trial Pit Dimensions (m):



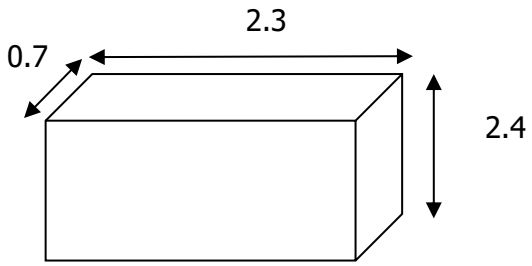
Time in mins	Water Level (m)
1	1.29
2	1.3
3	1.315
4	1.325
5	1.33
6	1.34
7	1.35
8	1.355
11	1.375
18	1.425
21	1.44
33	1.49
48	1.53
62	1.57
81	1.61
116	1.67
145	1.72
154	1.74

Time in mins	Water Level (m)

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	21/08/19
Weather:	
Soakaway Reference:	SA6
Test Number at Location:	2
Groundwater Level at Start:	1.4m
Filled with stone?	No

Trial Pit Dimensions (m):



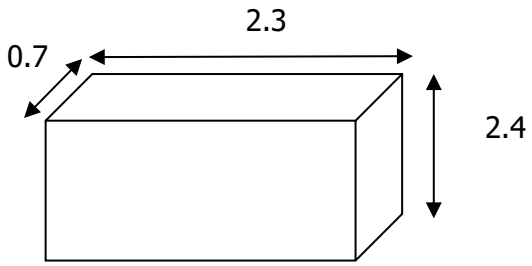
Time in mins	Water Level (m)
1	1.41
2	1.42
3	1.43
4	1.44
5	1.45
6	1.455
7	1.46
8	1.47
10	1.48
12	1.49
14	1.5
16	1.51
18	1.52
20	1.53
22	1.55
24	1.55
26	1.56
28	1.57
30	1.58
32	1.58
34	1.59
36	1.6
38	1.6

Time in mins	Water Level (m)
40	1.61
42	1.62
44	1.64
62	1.67
80	1.71
115	1.79
136	1.83
154	1.87
175	1.9
193	1.91
216	1.95
242	2.01
286	2.01
330	2.06
375	2.09
399	2.12

Soakaway Record

Site Name:	Eakring Road, Bilsthorpe
Job Number:	19017
Date:	22/08/19
Weather:	
Soakaway Reference:	SA6
Test Number at Location:	3
Groundwater Level at Start:	1.33m
Filled with stone?	No

Trial Pit Dimensions (m):



Time in mins	Water Level (m)
1	1.34
2	1.35
3	1.36
4	1.37
5	1.38
6	1.39
7	1.39
8	1.4
9	1.41
10	1.41
20	1.48
46	1.55
71	1.62
103	1.67
132	1.74
151	1.75
187	1.82
218	1.86
264	1.9

Time in mins	Water Level (m)

Soakaway SA1A Test 1

Width (m):	0.70
Length (m):	2.50
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.80
Effective depth (m)	0.80
Vp25 (m)	0.200
Depth (mbgl) at Vp25	2.400
Vp75 (m)	0.600
Depth (mbgl) at Vp75	2.000
Vp50 (m)	0.40
Vp75/Vp25 (m^3)	0.700
Effective volume * 0.3	0.210
a50 (m^2)	4.31
t between vp75 to vp25(secs)	26500
Soil Infiltration (m/s)	6.13E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.8
2	120	1.82
3	180	1.83
4	240	1.83
5	300	1.84
6	360	1.85
7	420	1.855
8	480	1.86
9	540	1.86
10	600	1.87
11	660	1.88
12	720	1.885
13	780	1.89
15	900	1.91
17	1020	1.92
19	1140	1.92
21	1260	1.92
31	1860	1.94
36	2160	1.96
38	2280	1.96
67	4020	2.01
86	5160	2.06
123	7380	2.07
148	8880	2.09
170	10200	2.11
218	13080	2.15
264	15840	2.19
305	18300	2.22
329	19740	2.25

Soakaway SA1A Test 2

Width (m):	0.70
Length (m):	2.50
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.60
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.350
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.850
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.875
Effective volume * 0.3	0.263
a50 (m^2)	4.95
t between vp75 to vp25(secs)	35500
Soil Infiltration (m/s)	4.98E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.61
2	120	1.62
3	180	1.62
4	240	1.63
5	300	1.62
6	360	1.63
7	420	1.63
8	480	1.63
9	540	1.63
10	600	1.64
15	900	1.65
27	1620	1.63
34	2040	1.64
40	2400	1.64
62	3720	1.68
82	4920	1.71
106	6360	1.75
124	7440	1.77
152	9120	1.81
187	11220	1.84
211	12660	1.86
251	15060	1.9
291	17460	1.93
329	19740	1.96

Soakaway SA1A Test 3

Width (m):	0.00
Length (m):	0.00
Depth (m):	0.00
Natural depth (m):	0.00
Depth (m) of Water at T = 0	0.00
Effective depth (m)	0.00
Vp25 (m)	0.000
Depth (mbgl) at Vp25	0.000
Vp75 (m)	0.000
Depth (mbgl) at Vp75	0.000
Vp50 (m)	0.00
Vp75/Vp25 (m^3)	0.000
Effective volume * 0.3	0.000
a50 (m^2)	0.00
t between vp75 to vp25(secs)	0
Soil Infiltration (m/s)	#DIV/0!

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)

Soakaway SA2 Test 1

Width (m):	0.70
Length (m):	2.40
Depth (m):	2.30
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.48
Effective depth (m)	0.82
Vp25 (m)	0.205
Depth (mbgl) at Vp25	2.095
Vp75 (m)	0.615
Depth (mbgl) at Vp75	1.685
Vp50 (m)	0.41
Vp75/Vp25 (m^3)	0.689
Effective volume * 0.3	0.000
a50 (m^2)	4.22
t between vp75 to vp25(secs)	44183
Soil Infiltration (m/s)	3.69E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.485
2	120	1.49
3	180	1.5
4	240	1.5
5	300	1.5
6	360	1.5
7	420	1.505
8	480	1.505
9	540	1.51
10	600	1.51
11	660	1.51
12	720	1.52
13	780	1.52
14	840	1.52
15	900	1.52
16	960	1.52
17	1020	1.52
18	1080	1.525
19	1140	1.525
20	1200	1.53
22	1320	1.54
24	1440	1.54
26	1560	1.545
28	1680	1.55
30	1800	1.56
35	2100	1.56
40	2400	1.565
54	3240	1.59
59	3540	1.6
73	4380	1.61
85	5100	1.62
115	6900	1.66
132	7920	1.66
153	9180	1.68
190	11400	1.7
238	14280	1.74
248	14880	1.74
287	17220	1.77
311	18660	1.77

Soakaway SA2 Test 2

Width (m):	0.70
Length (m):	2.40
Depth (m):	2.14
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.10
Effective depth (m)	1.04
Vp25 (m)	0.260
Depth (mbgl) at Vp25	1.880
Vp75 (m)	0.780
Depth (mbgl) at Vp75	1.360
Vp50 (m)	0.52
Vp75/Vp25 (m^3)	0.874
Effective volume * 0.3	
a50 (m^2)	4.90
t between vp75 to vp25(secs)	44500
Soil Infiltration (m/s)	4.00E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.1
2	120	1.13
3	180	1.13
4	240	1.14
5	300	1.15
6	360	1.15
7	420	1.155
8	480	1.16
9	540	1.17
10	600	1.17
16	960	1.18
20	1200	1.2
24	1440	1.21
28	1680	1.21
30	1800	1.21
32	1920	1.21
34	2040	1.21
36	2160	1.21
38	2280	1.21
40	2400	1.22
59	3540	1.3
99	5940	1.35
124	7440	1.4
145	8700	1.43
170	10200	1.46
188	11280	1.46
213	12780	1.48
227	13620	1.54
250	15000	1.55
272	16320	1.53
320	19200	1.55
366	21960	1.6
408	24480	1.62
437	26220	1.63
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA2 Test 3

Width (m):	0.70
Length (m):	2.40
Depth (m):	2.14
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.14
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	1.890
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.390
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.840
Effective volume * 0.3	
a50 (m^2)	4.78
t between vp75 to vp25(secs)	54166
Soil Infiltration (m/s)	3.24E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	1.14
1	60	1.14
2	120	1.16
3	180	1.17
4	240	1.17
5	300	1.17
6	360	1.17
7	420	1.17
8	480	1.17
9	540	1.18
10	600	1.18
16	960	1.18
22	1320	1.19
44	2640	1.23
64	3840	1.25
88	5280	1.29
106	6360	1.31
134	8040	1.33
168	10080	1.38
206	12360	1.4
246	14760	1.44
283	16980	1.45
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA3 Test 1

Width (m):	0.70
Length (m):	2.70
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	0.90
Vp25 (m)	0.225
Depth (mbgl) at Vp25	2.175
Vp75 (m)	0.675
Depth (mbgl) at Vp75	1.725
Vp50 (m)	0.45
Vp75/Vp25 (m^3)	0.851
Effective volume * 0.3	0.255
a50 (m^2)	4.95
t between vp75 to vp25(secs)	20500
Soil Infiltration (m/s)	8.38E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.5
2	120	1.53
3	180	1.55
4	240	1.56
5	300	1.575
6	360	1.59
7	420	1.6
8	480	1.6
9	540	1.605
10	600	1.62
11	660	1.625
12	720	1.64
13	780	1.65
14	840	1.655
15	900	1.67
16	960	1.67
17	1020	1.67
18	1080	1.675
19	1140	1.68
20	1200	1.68
22	1320	1.69
24	1440	1.7
26	1560	1.7
28	1680	1.71
30	1800	1.72
35	2100	1.735
40	2400	1.745
54	3240	1.78
76	4560	1.83
92	5520	1.85
123	7380	1.9
156	9360	1.94
167	10020	1.96
174	10440	1.98
201	12060	2.01
211	12660	2.01
222	13320	2.03
268	16080	2.07
306	18360	2.1

Soakaway SA3 Test 2

Width (m):	0.70
Length (m):	2.70
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.40
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.150
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.650
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.945
Effective volume * 0.3	0.284
a50 (m^2)	5.29
t between vp75 to vp25(secs)	38750
Soil Infiltration (m/s)	4.61E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.43
2	120	1.44
3	180	1.46
4	240	1.46
5	300	1.47
6	360	1.47
7	420	1.48
8	480	1.49
9	540	1.49
10	600	1.49
12	720	1.49
14	840	1.5
18	1080	1.51
20	1200	1.52
22	1320	1.53
24	1440	1.54
26	1560	1.55
30	1800	1.55
34	2040	1.56
38	2280	1.57
42	2520	1.58
63	3780	1.63
72	4320	1.65
116	6960	1.72
144	8640	1.77
167	10020	1.79
189	11340	1.82
208	12480	1.83
228	13680	1.87
250	15000	1.89
272	16320	1.93
320	19200	1.98
366	21960	2
397	23820	2.02
410	24600	2.03
436	26160	2.04
0	0	0
0	0	0
0	0	0

Soakaway SA3 Test 3

Width (m):	0.70
Length (m):	2.70
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.40
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.150
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.650
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.945
Effective volume * 0.3	0.284
a50 (m^2)	5.29
t between vp75 to vp25(secs)	33000
Soil Infiltration (m/s)	5.41E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	1.4
1	60	1.41
2	120	1.42
3	180	1.43
4	240	1.43
5	300	1.43
6	360	1.44
7	420	1.44
8	480	1.45
9	540	1.45
10	600	1.46
13	780	1.47
16	960	1.47
40	2400	1.55
58	3480	1.58
64	3840	1.59
71	4260	1.6
112	6720	1.67
138	8280	1.73
160	9600	1.73
182	10920	1.75
217	13020	1.8
255	15300	1.82
293	17580	1.86
333	19980	1.92
378	22680	1.95
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA4 Test 1

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	1.10
Vp25 (m)	0.275
Depth (mbgl) at Vp25	2.325
Vp75 (m)	0.825
Depth (mbgl) at Vp75	1.775
Vp50 (m)	0.55
Vp75/Vp25 (m^3)	0.886
Effective volume * 0.3	0.266
a50 (m^2)	4.91
t between vp75 to vp25(secs)	30500
Soil Infiltration (m/s)	5.91E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.53
2	120	1.54
3	180	1.54
4	240	1.55
5	300	1.55
6	360	1.56
7	420	1.57
8	480	1.57
9	540	1.57
10	600	1.58
12	720	1.59
14	840	1.6
16	960	1.6
18	1080	1.62
20	1200	1.65
25	1500	1.67
30	1800	1.67
35	2100	1.7
38	2280	1.71
53	3180	1.75
58	3480	1.75
67	4020	1.76
72	4320	1.77
92	5520	1.8
98	5880	1.81
121	7260	1.85
131	7860	1.87
140	8400	1.88
	0	
	0	
	0	
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	

Soakaway SA4 Test 2

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.50
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.250
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.750
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.805
Effective volume * 0.3	0.242
a50 (m^2)	4.61
t between vp75 to vp25(secs)	44500
Soil Infiltration (m/s)	3.92E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.51
2	120	1.52
3	180	1.53
4	240	1.53
5	300	1.54
6	360	1.54
7	420	1.55
8	480	1.55
9	540	1.55
10	600	1.555
11	660	1.56
12	720	1.56
14	840	1.57
16	960	1.59
18	1080	1.6
20	1200	1.6
22	1320	1.6
24	1440	1.6
26	1560	1.6
28	1680	1.6
30	1800	1.6
32	1920	1.61
34	2040	1.61
36	2160	1.61
38	2280	1.62
40	2400	1.62
42	2520	1.63
83	4980	1.7
107	6420	1.75
128	7680	1.77
153	9180	1.79
172	10320	1.8
196	11760	1.82
212	12720	1.83
233	13980	1.85
255	15300	1.88
303	18180	1.91
349	20940	1.93
392	23520	1.94
417	25020	1.96

Soakaway SA4 Test 3

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.50
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.250
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.750
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.805
Effective volume * 0.3	0.242
a50 (m^2)	4.61
t between vp75 to vp25(secs)	49500
Soil Infiltration (m/s)	3.53E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	1.5
1	60	1.5
2	120	1.5
3	180	1.5
4	240	1.5
5	300	1.5
6	360	1.51
7	420	1.5
8	480	1.51
9	540	1.52
10	600	1.52
38	2280	1.57
63	3780	1.63
87	5220	1.65
107	6420	1.68
142	8520	1.72
167	10020	1.75
205	12300	1.8
245	14700	1.81
291	17460	1.85
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA5 Test 1

Width (m):	0.70
Length (m):	2.60
Depth (m):	2.04
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.00
Effective depth (m)	1.04
Vp25 (m)	0.260
Depth (mbgl) at Vp25	1.780
Vp75 (m)	0.780
Depth (mbgl) at Vp75	1.260
Vp50 (m)	0.52
Vp75/Vp25 (m^3)	0.946
Effective volume * 0.3	0.284
a50 (m^2)	5.25
t between vp75 to vp25(secs)	47500
Soil Infiltration (m/s)	3.79E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.02
2	120	1.025
3	180	1.03
4	240	1.035
5	300	1.04
6	360	1.045
7	420	1.05
11	660	1.06
12	720	1.065
13	780	1.07
14	840	1.075
32	1920	1.12
48	2880	1.15
59	3540	1.15
74	4440	1.17
84	5040	1.195
103	6180	1.22
122	7320	1.25
160	9600	1.27
189	11340	1.3
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
0	0	0

Soakaway SA5 Test 2

Width (m):	0.70
Length (m):	2.60
Depth (m):	1.96
Natural depth (m):	0.00
Depth (m) of Water at T = 0	0.93
Effective depth (m)	1.03
Vp25 (m)	0.258
Depth (mbgl) at Vp25	1.703
Vp75 (m)	0.773
Depth (mbgl) at Vp75	1.188
Vp50 (m)	0.52
Vp75/Vp25 (m^3)	0.937
Effective volume * 0.3	0.281
a50 (m^2)	5.22
t between vp75 to vp25(secs)	54500
Soil Infiltration (m/s)	3.30E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	0.93
2	120	0.94
3	180	0.945
4	240	0.96
5	300	0.96
6	360	0.965
7	420	0.97
8	480	0.98
10	600	0.98
12	720	0.99
14	840	0.99
16	960	0.99
18	1080	1
21	1260	1.08
24	1440	1.12
26	1560	1.1
28	1680	1.03
30	1800	1.05
32	1920	1.06
34	2040	1.08
48	2880	1.07
65	3900	1.11
101	6060	1.15
122	7320	1.12
143	8580	1.13
162	9720	1.18
178	10680	1.2
229	13740	1.23
273	16380	1.25
316	18960	1.31
362	21720	1.33
388	23280	1.35

Soakaway SA5 Test 3

Width (m):	0.70
Length (m):	2.60
Depth (m):	1.96
Natural depth (m):	0.00
Depth (m) of Water at T = 0	0.96
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	1.710
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.210
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.910
Effective volume * 0.3	0.273
a50 (m^2)	5.12
t between vp75 to vp25(secs)	60000
Soil Infiltration (m/s)	2.96E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	0.96
1	60	0.96
2	120	0.96
3	180	0.97
4	240	0.98
5	300	0.98
6	360	0.98
7	420	0.99
8	480	1
9	540	1
10	600	0.99
27	1620	1.02
50	3000	1.04
83	4980	1.07
111	6660	1.16
130	7800	1.14
167	10020	1.17
208	12480	1.2
253	15180	1.26
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA6 Test 1

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.26
Effective depth (m)	1.34
Vp25 (m)	0.335
Depth (mbgl) at Vp25	2.265
Vp75 (m)	1.005
Depth (mbgl) at Vp75	1.595
Vp50 (m)	0.67
Vp75/Vp25 (m^3)	1.079
Effective volume * 0.3	0.324
a50 (m^2)	5.63
t between vp75 to vp25(secs)	35500
Soil Infiltration (m/s)	5.40E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.29
2	120	1.3
3	180	1.315
4	240	1.325
5	300	1.33
6	360	1.34
7	420	1.35
8	480	1.355
11	660	1.375
18	1080	1.425
21	1260	1.44
33	1980	1.49
48	2880	1.53
62	3720	1.57
81	4860	1.61
116	6960	1.67
145	8700	1.72
154	9240	1.74

Soakaway SA6 Test 2

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.40
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.150
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.650
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.805
Effective volume * 0.3	0.242
a50 (m^2)	4.61
t between vp75 to vp25(secs)	22000
Soil Infiltration (m/s)	7.94E-06

Trial 2

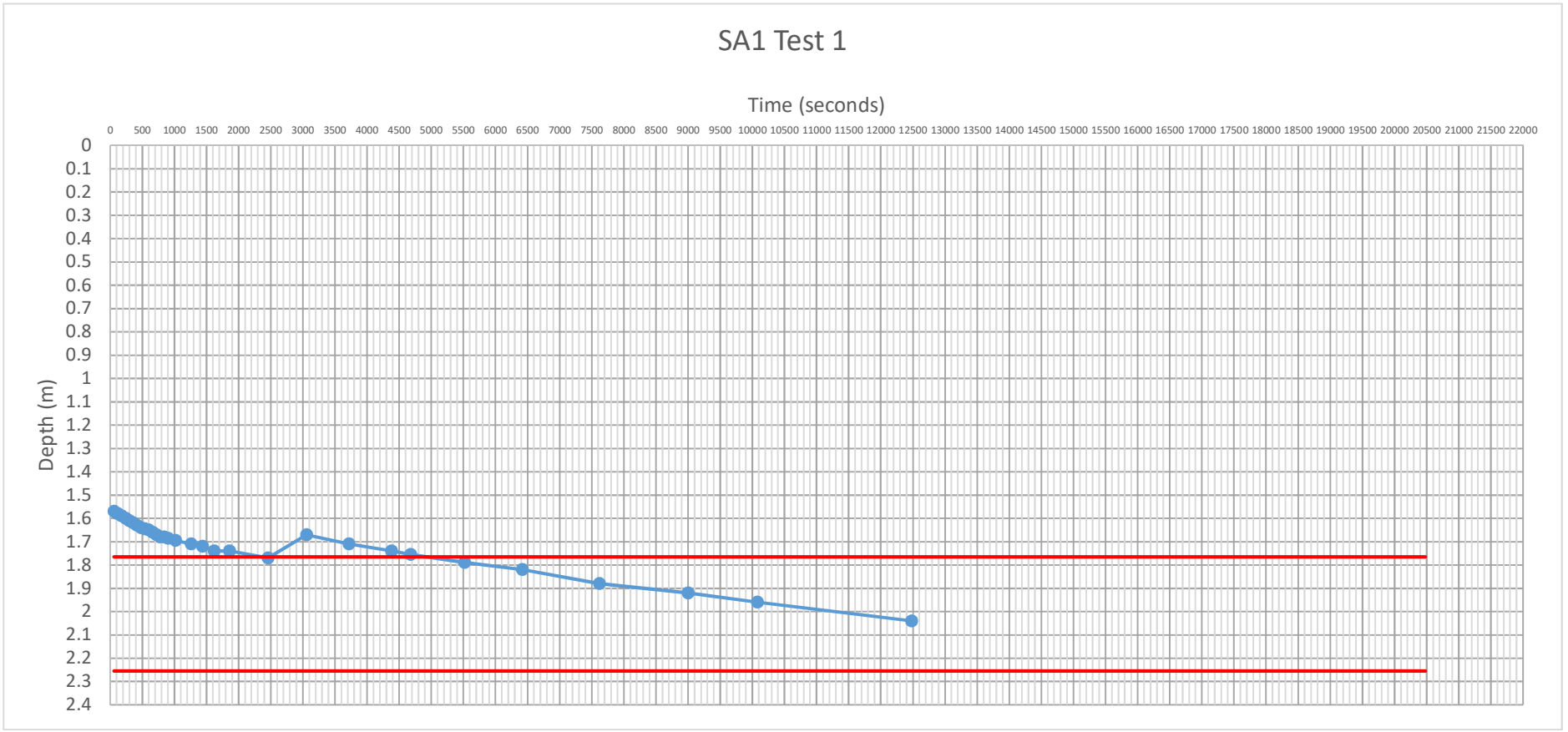
Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.41
2	120	1.42
3	180	1.43
4	240	1.44
5	300	1.45
6	360	1.455
7	420	1.46
8	480	1.47
10	600	1.48
12	720	1.49
14	840	1.5
16	960	1.51
18	1080	1.52
20	1200	1.53
22	1320	1.55
24	1440	1.55
26	1560	1.56
28	1680	1.57
30	1800	1.58
32	1920	1.58
34	2040	1.59
36	2160	1.6
38	2280	1.6
40	2400	1.61
42	2520	1.62
44	2640	1.64
62	3720	1.67
80	4800	1.71
115	6900	1.79
136	8160	1.83
154	9240	1.87
175	10500	1.9
193	11580	1.91
216	12960	1.95
242	14520	2.01
286	17160	2.01
330	19800	2.06
375	22500	2.09
399	23940	2.12

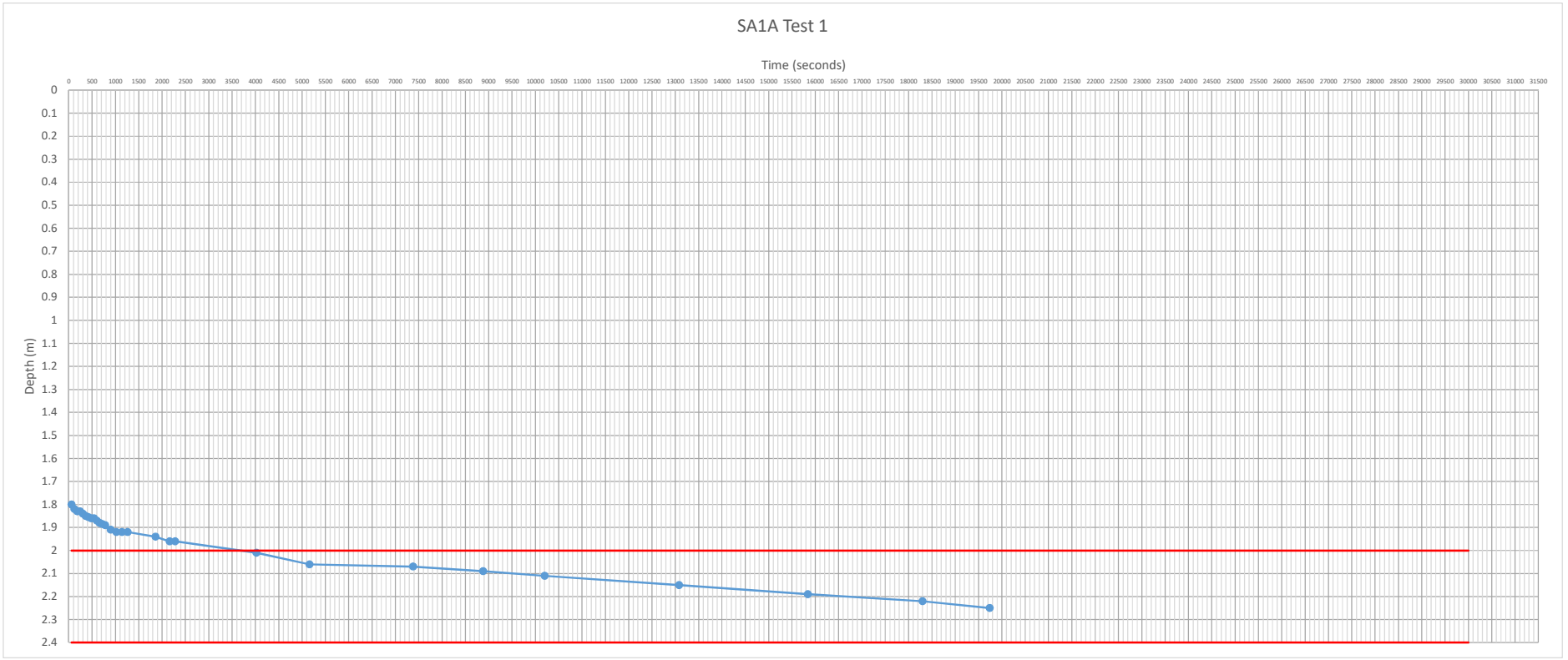
Soakaway SA6 Test 3

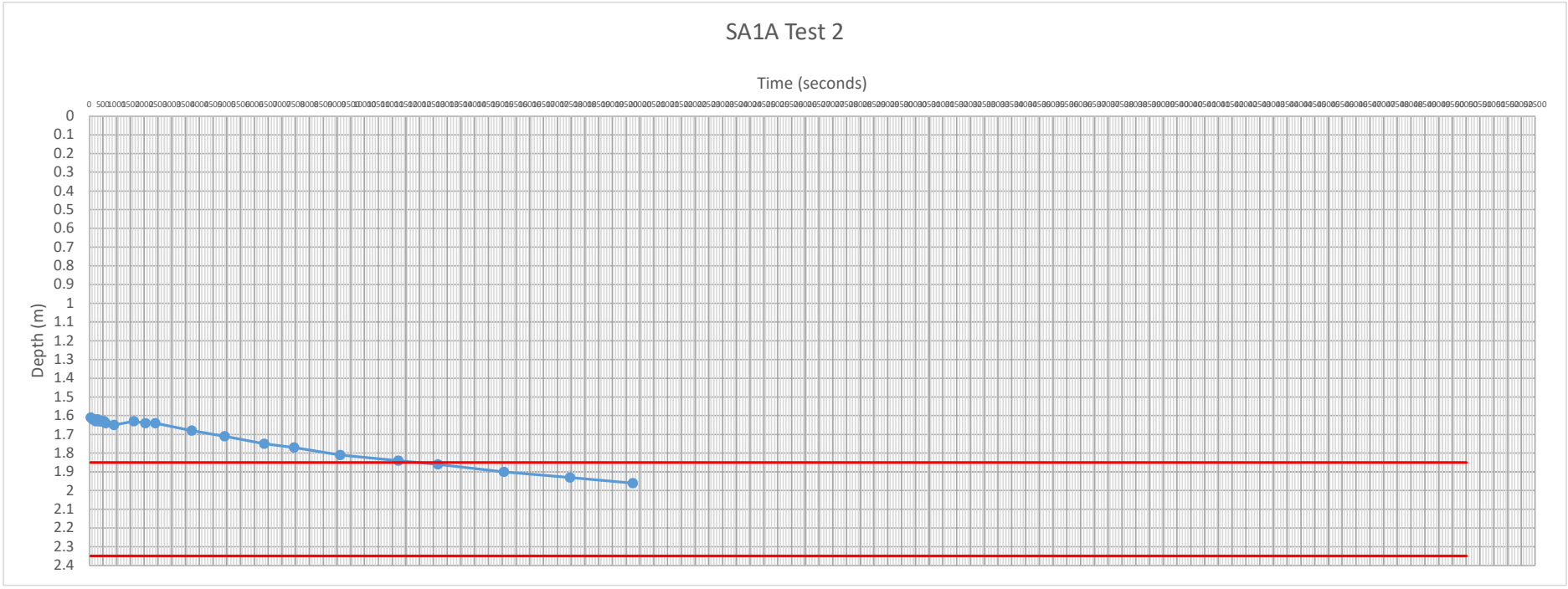
Width (m):	0.70
Length (m):	2.30
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.33
Effective depth (m)	1.07
Vp25 (m)	0.268
Depth (mbgl) at Vp25	2.133
Vp75 (m)	0.803
Depth (mbgl) at Vp75	1.598
Vp50 (m)	0.54
Vp75/Vp25 (m^3)	0.861
Effective volume * 0.3	0.258
a50 (m^2)	4.82
t between vp75 to vp25(secs)	31750
Soil Infiltration (m/s)	5.63E-06

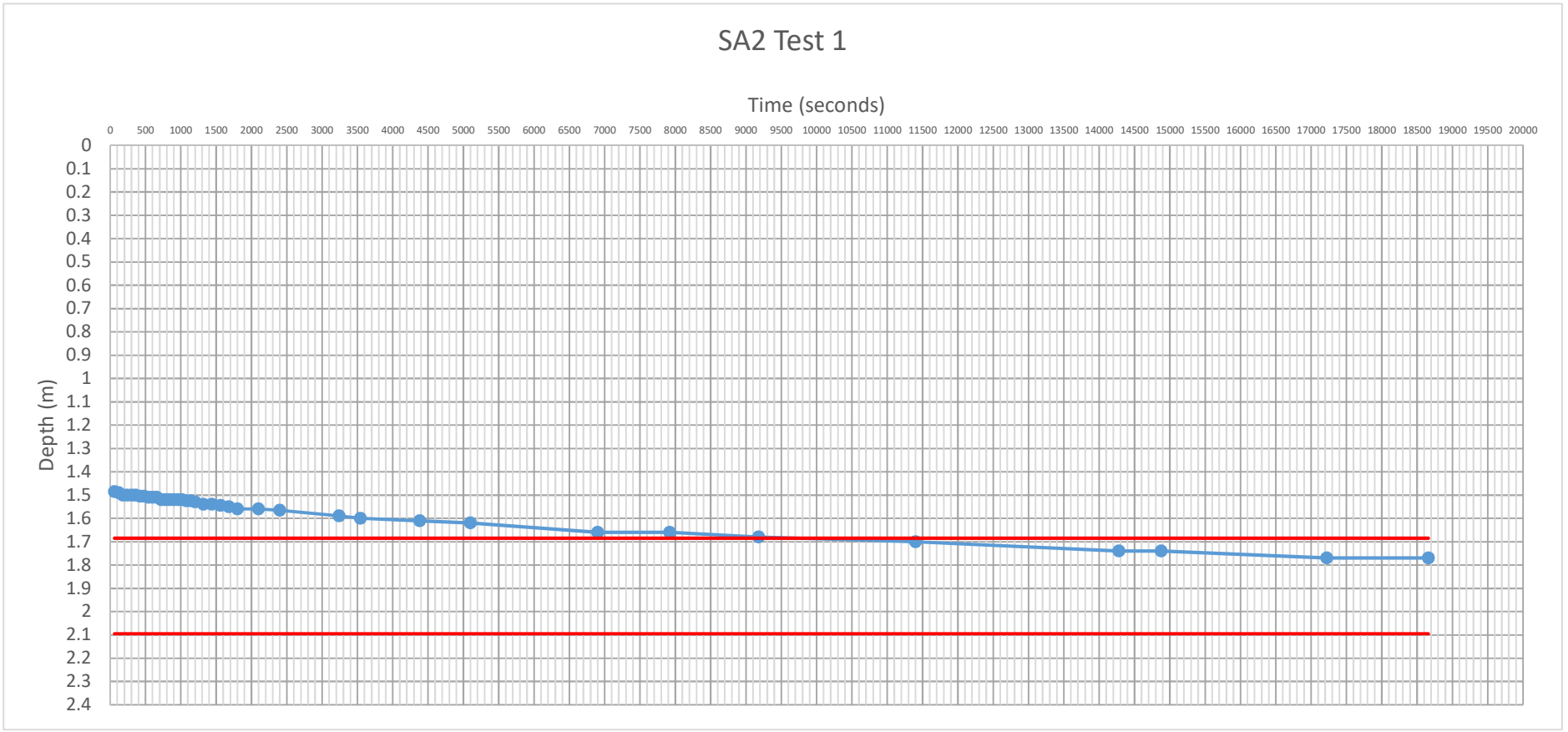
Trial 3

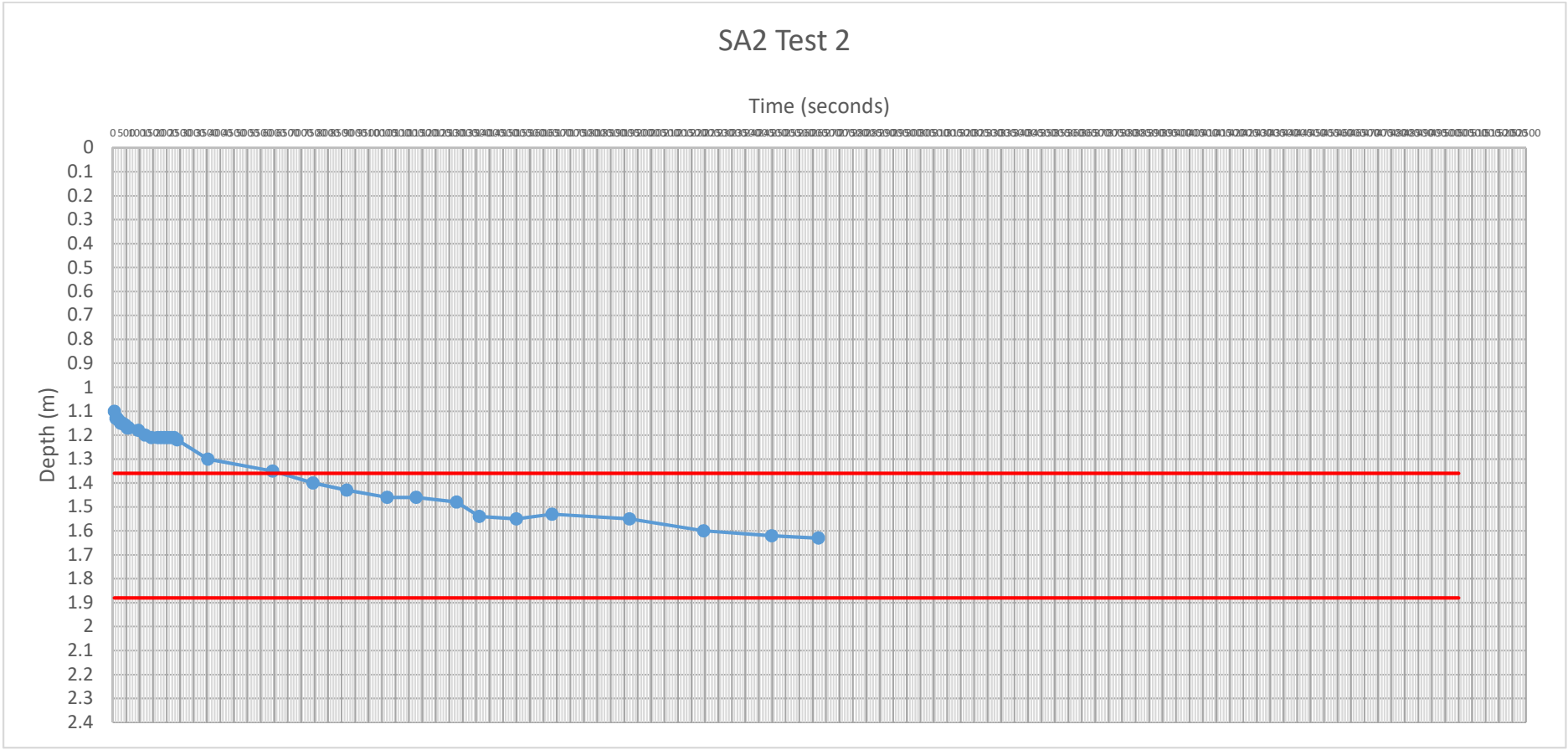
Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.34
2	120	1.35
3	180	1.36
4	240	1.37
5	300	1.38
6	360	1.39
7	420	1.39
8	480	1.4
9	540	1.41
10	600	1.41
20	1200	1.48
46	2760	1.55
71	4260	1.62
103	6180	1.67
132	7920	1.74
151	9060	1.75
187	11220	1.82
218	13080	1.86
264	15840	1.9

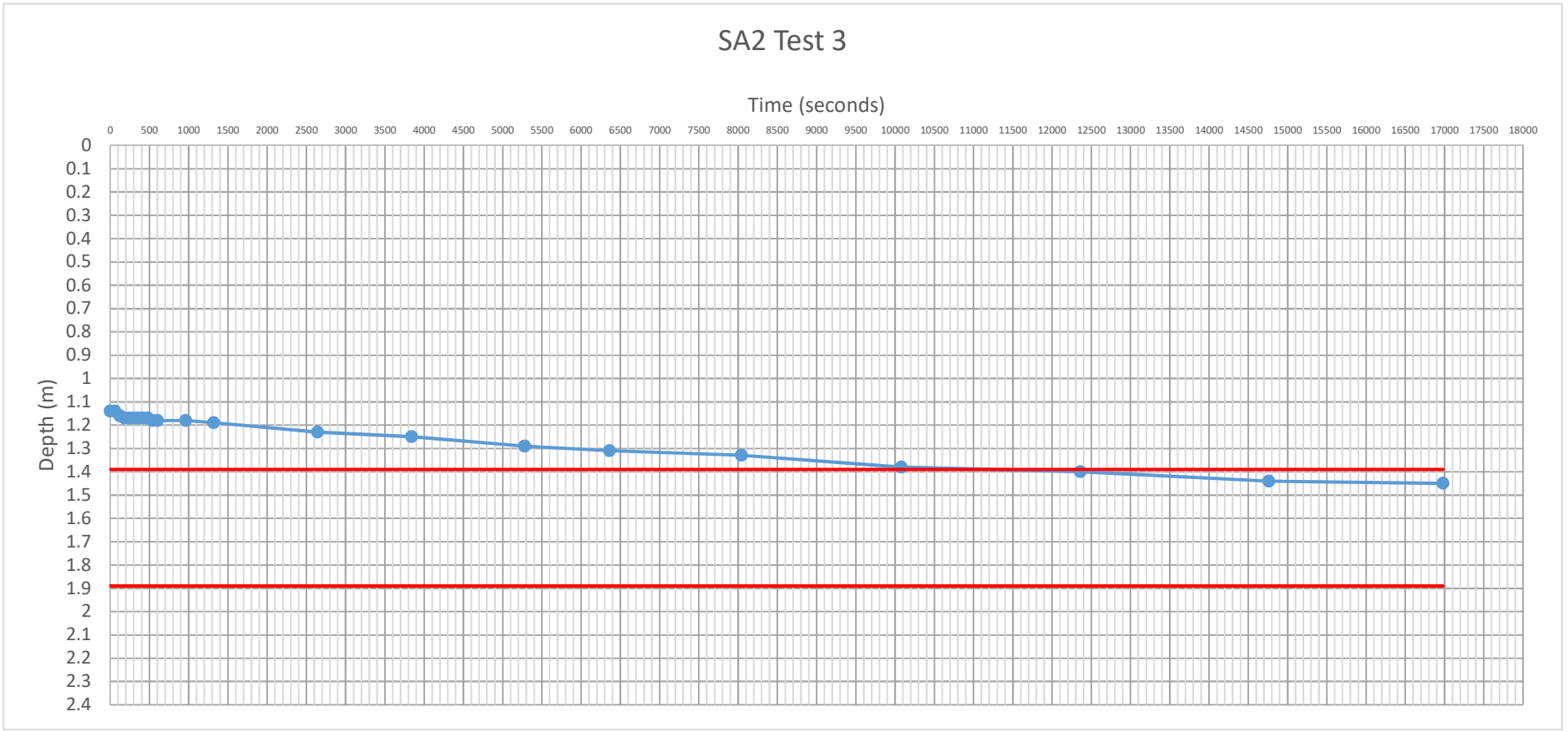

SA1 Test 1
Time (seconds)
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000 12500 13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000 18500 19000 19500 20000 20500 21000 21500 22000
Depth (m)
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2 2.3 2.4

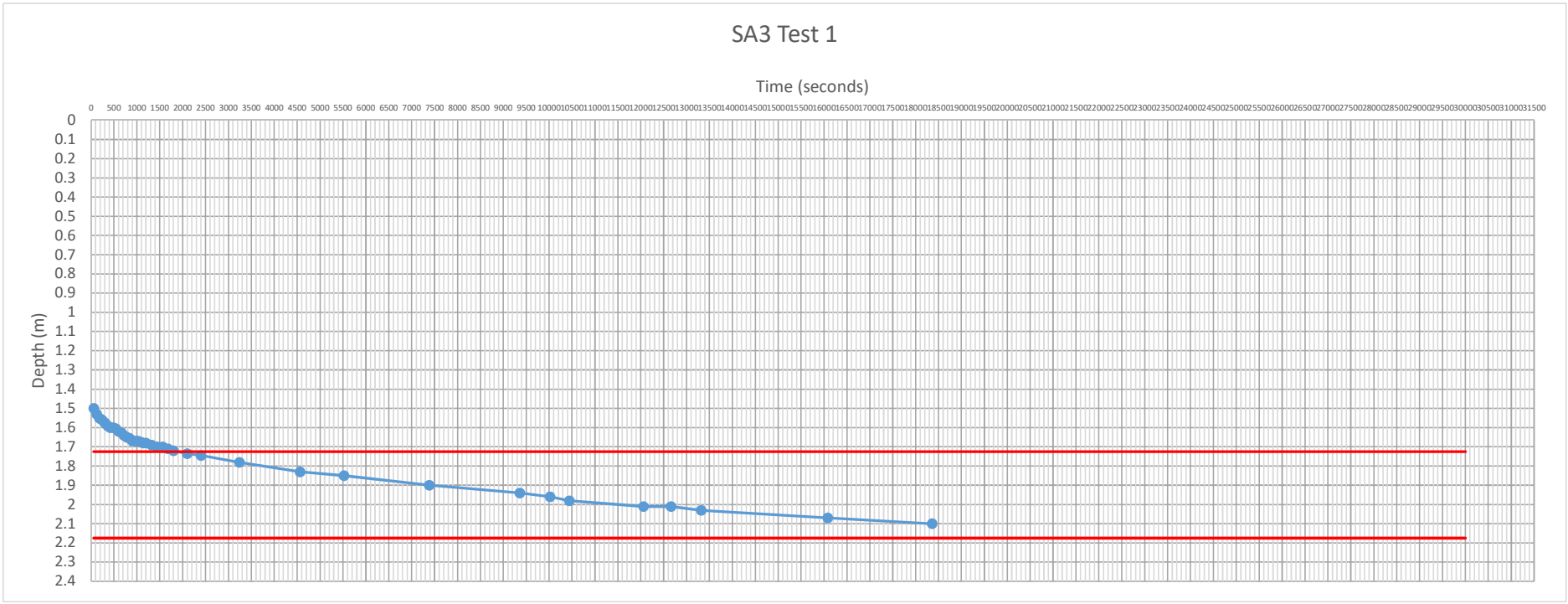

SA1A Test 1
Time (seconds)
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000 12500 13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000 18500 19000 19500 20000 20500 21000 21500 22000 22500 23000 23500 24000 24500 25000 25500 26000 26500 27000 27500 28000 28500 29000 29500 30000 30500 31000 31500
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4

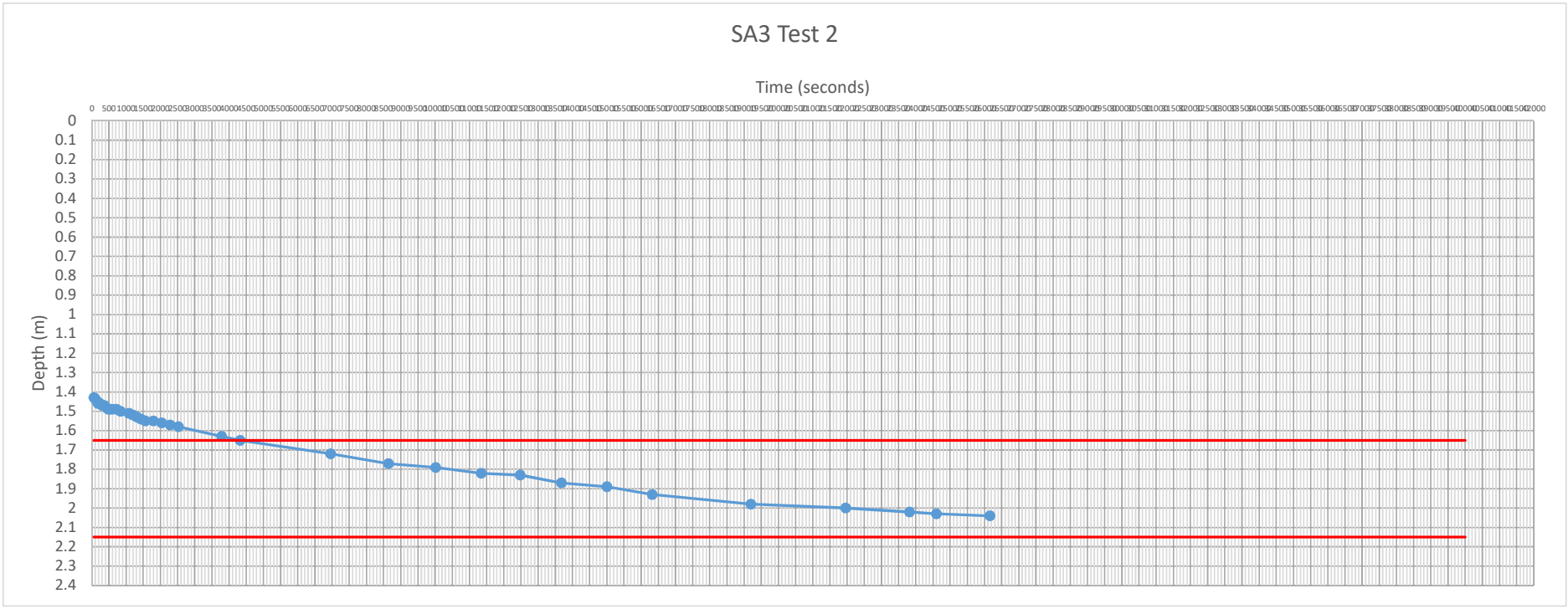

SA1A Test 2
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4

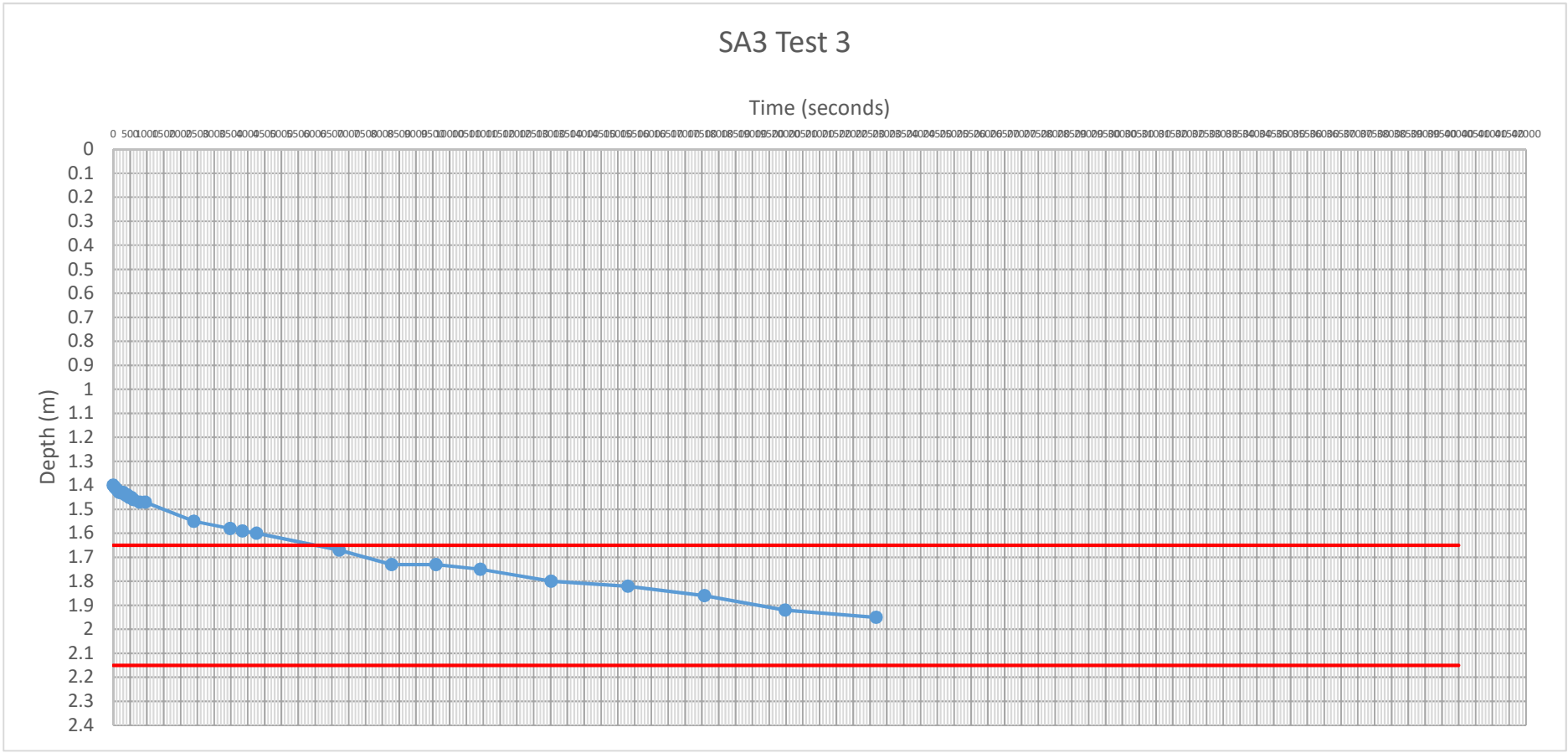

SA2 Test 1
Time (seconds)
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000 12500 13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000 18500 19000 19500 20000
Depth (m)
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2 2.3 2.4

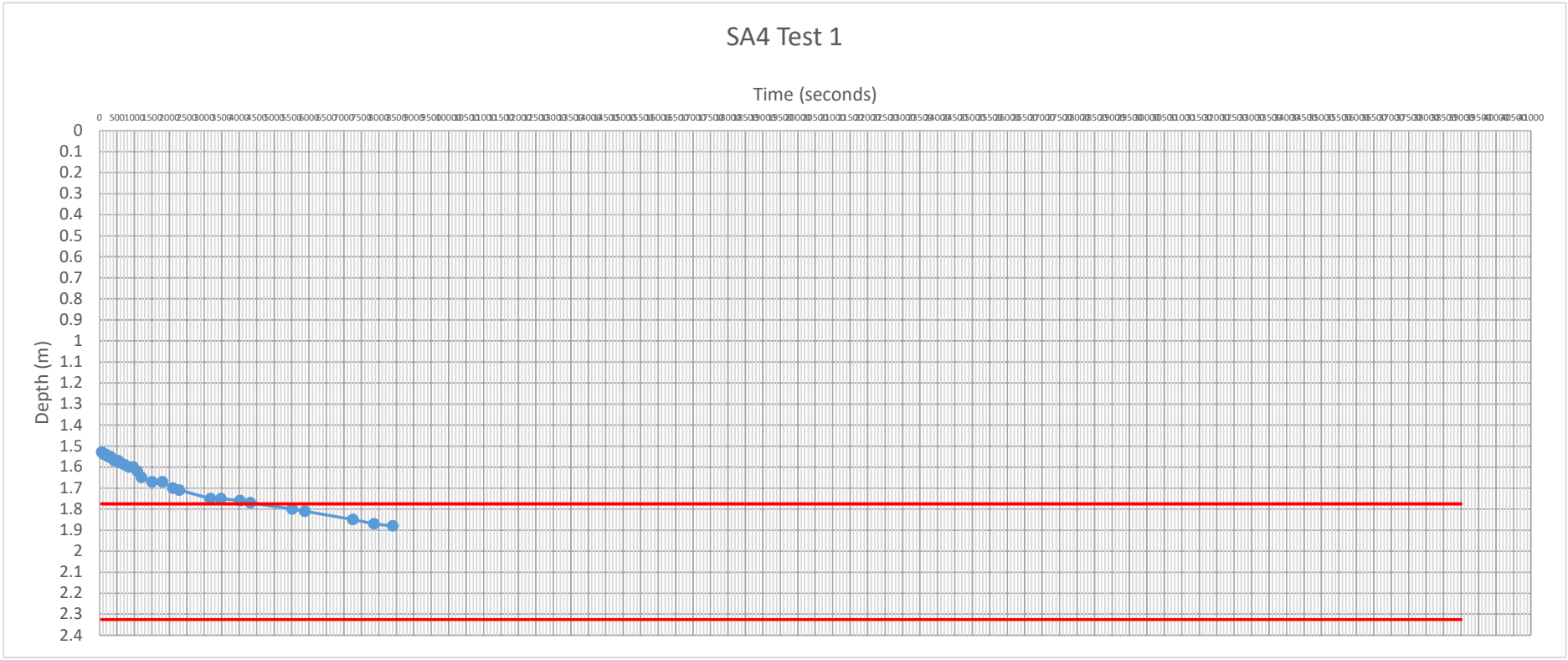

SA2 Test 2
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4

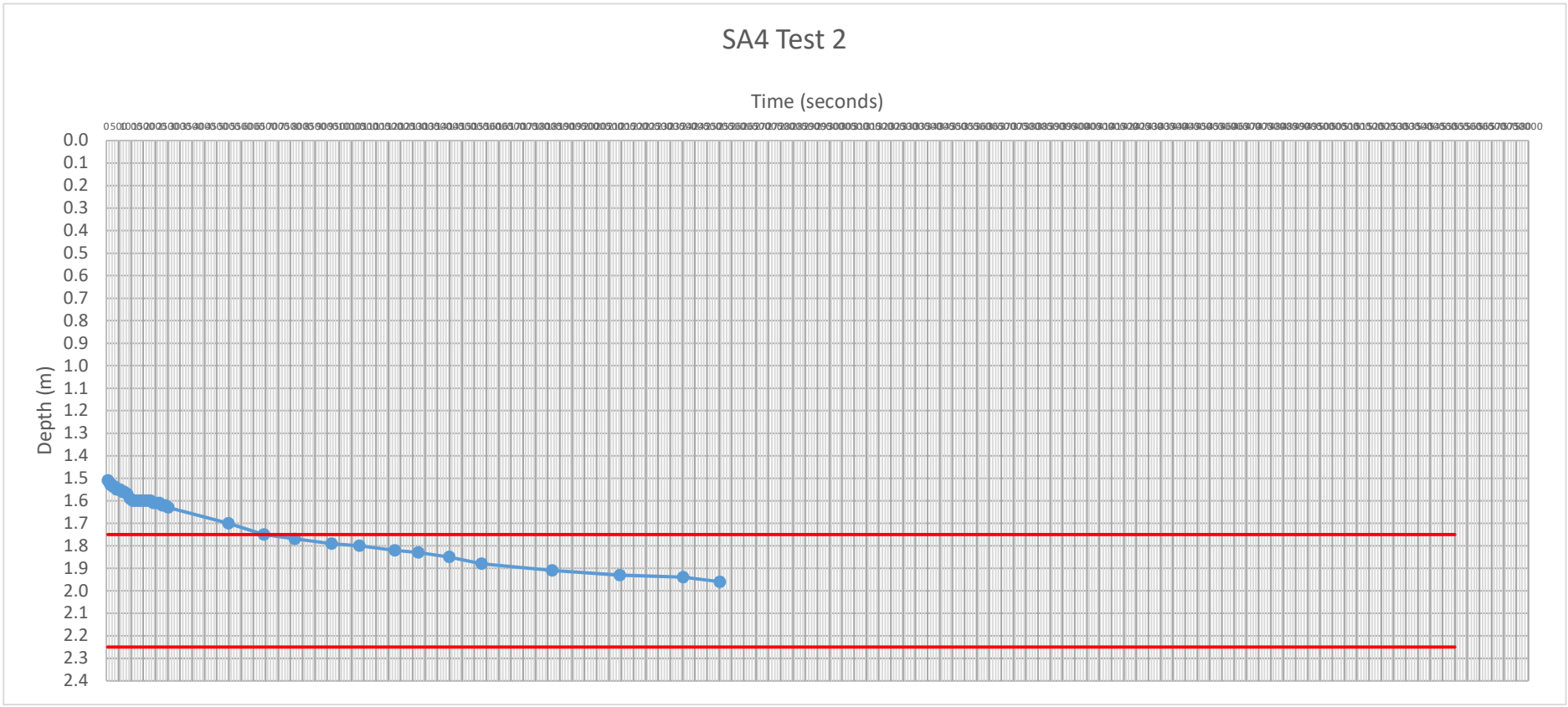

SA2 Test 3
Time (seconds)
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000 12500 13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000
Depth (m)
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2 2.3 2.4

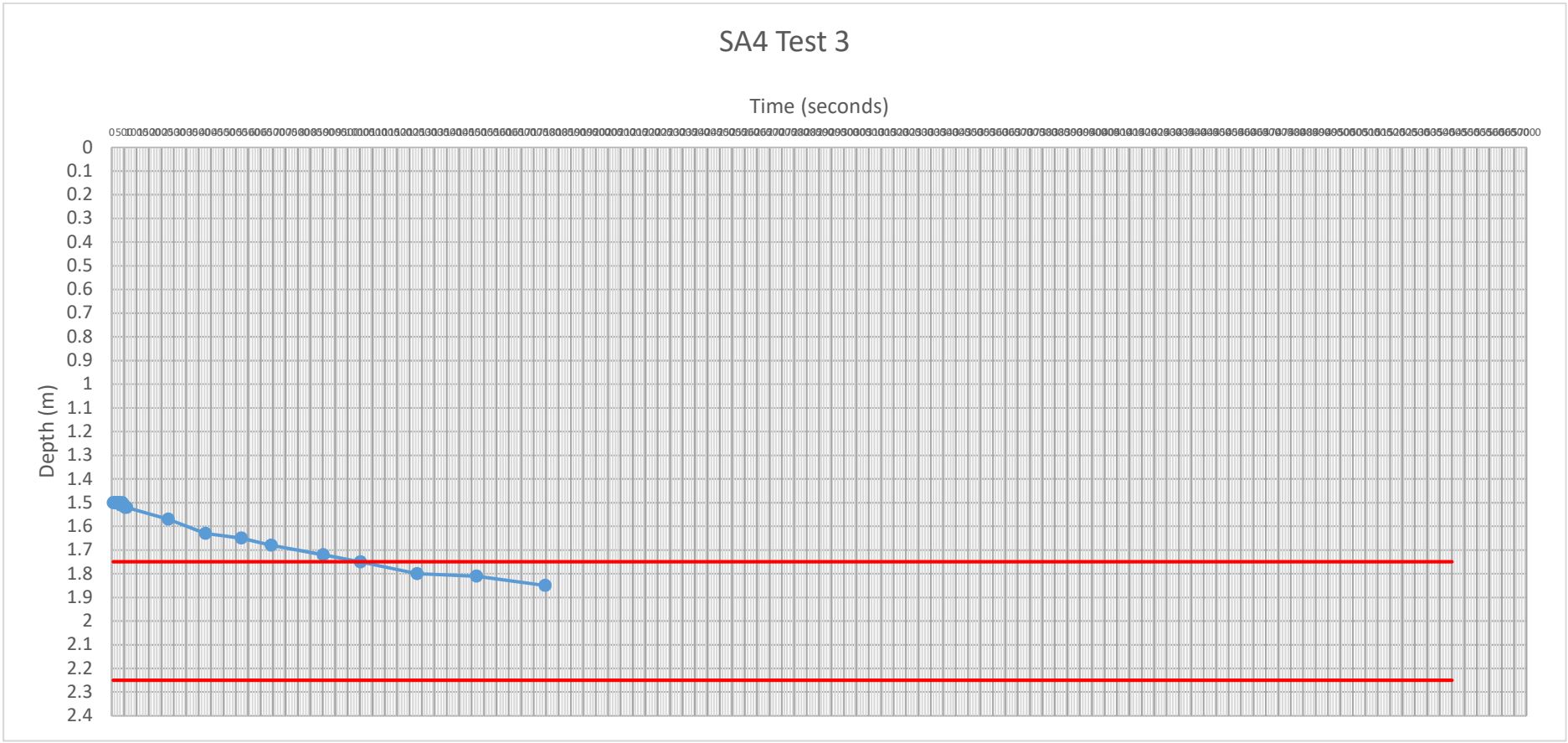

SA3 Test 1
Time (seconds)
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000 12500 13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000 18500 19000 19500 20000 20500 21000 21500 22000 22500 23000 23500 24000 24500 25000 25500 26000 26500 27000 27500 28000 28500 29000 29500 30000 30500 31000 31500
Depth (m)
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2 2.3 2.4

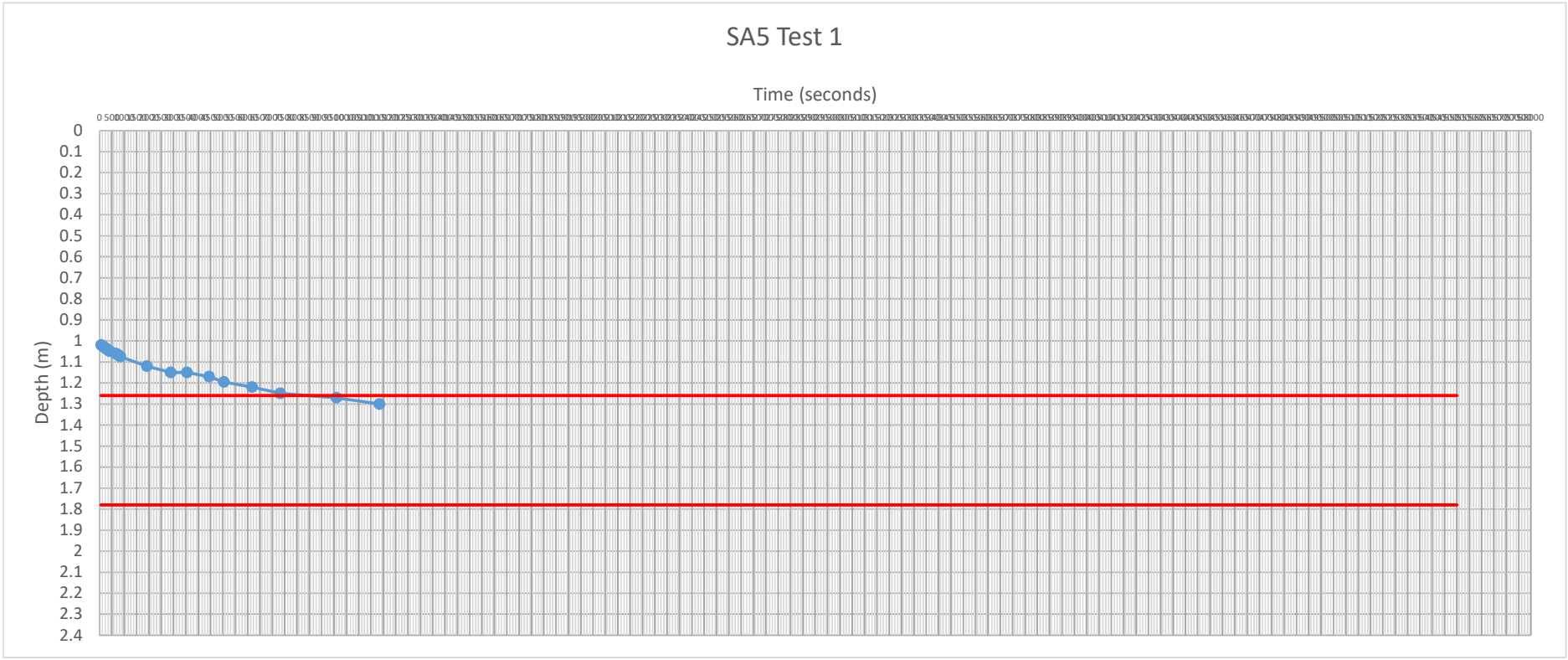

SA3 Test 2
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA3 Test 3
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA4 Test 1
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA4 Test 2
Time (seconds)
Depth (m)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4


SA4 Test 3
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA5 Test 1
Time (seconds)
Depth (m)
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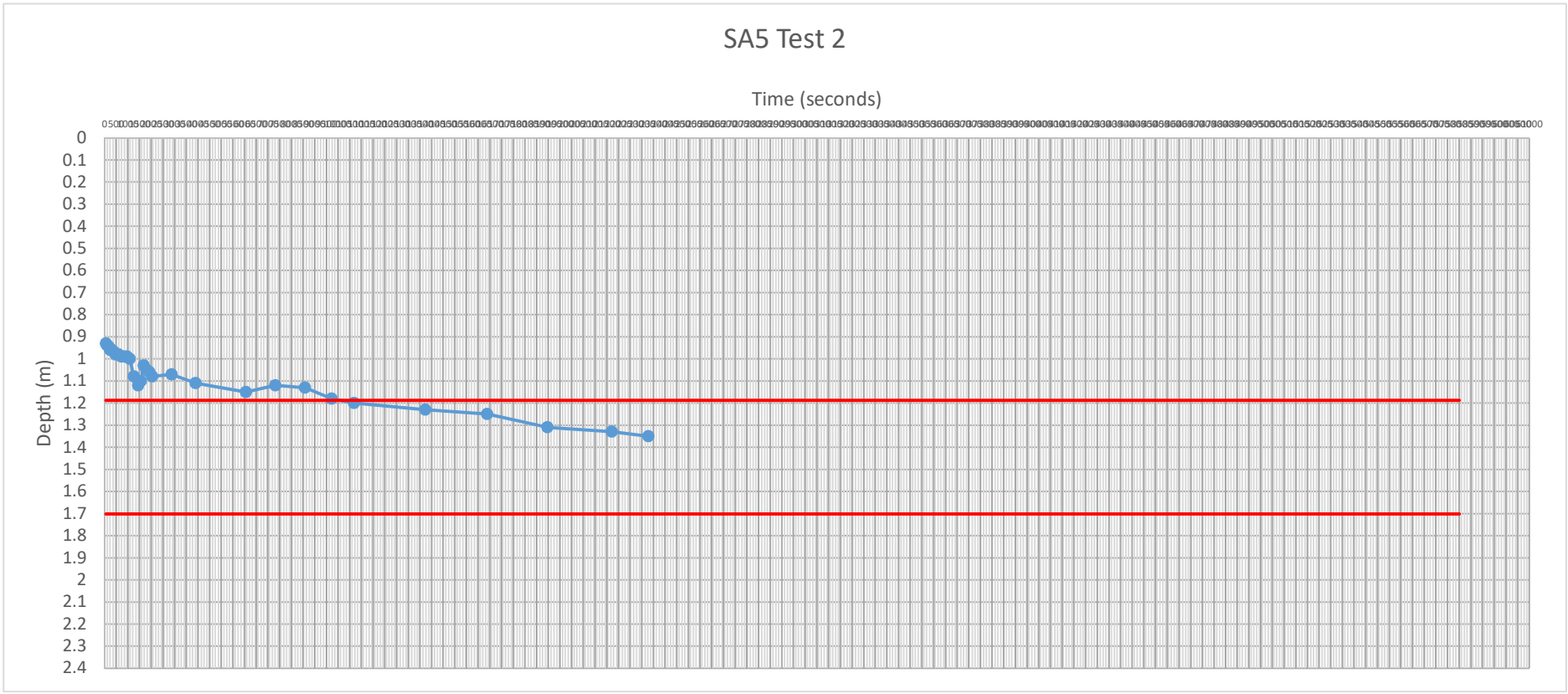
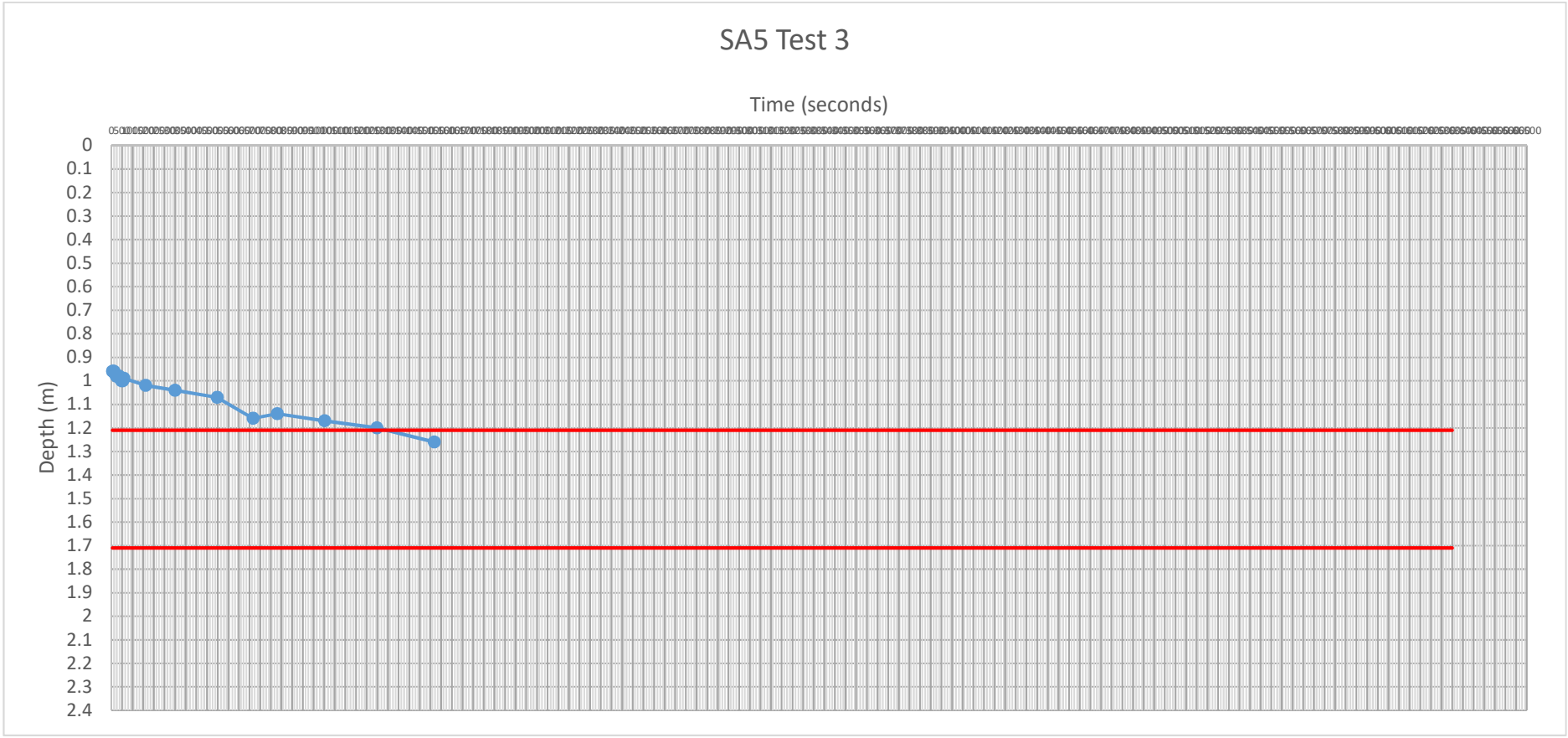
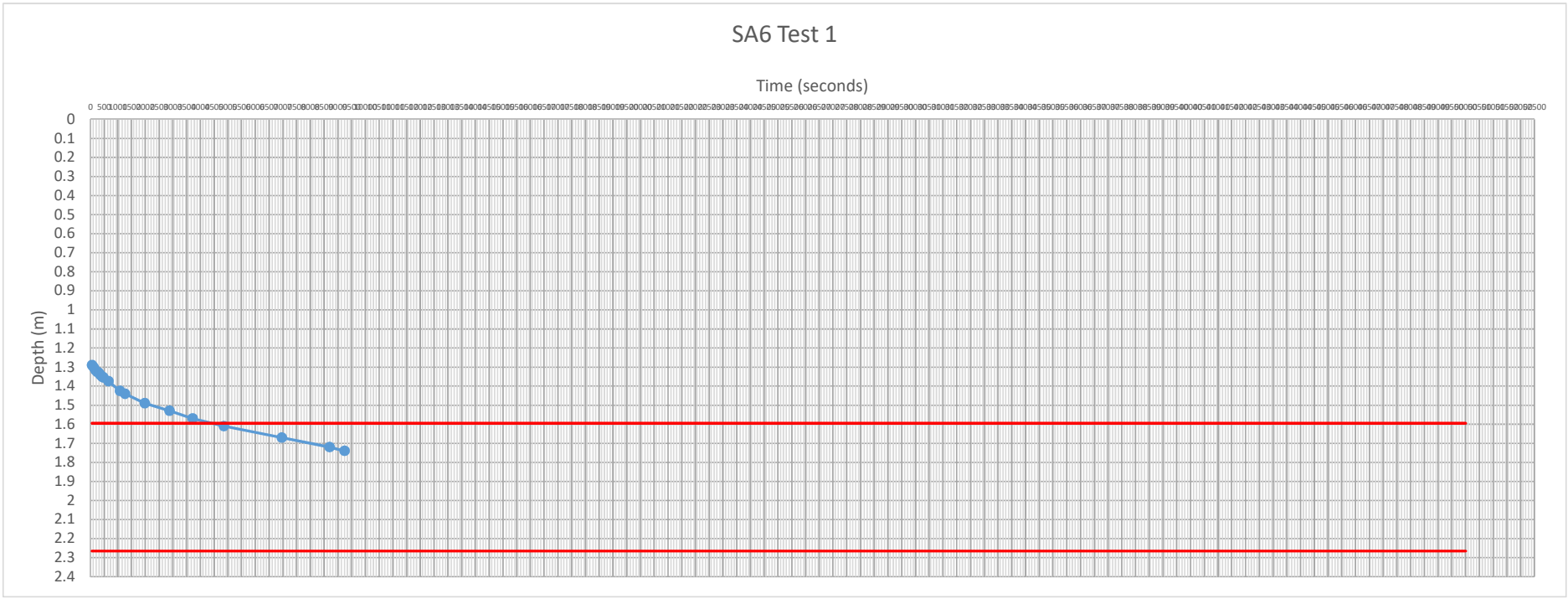
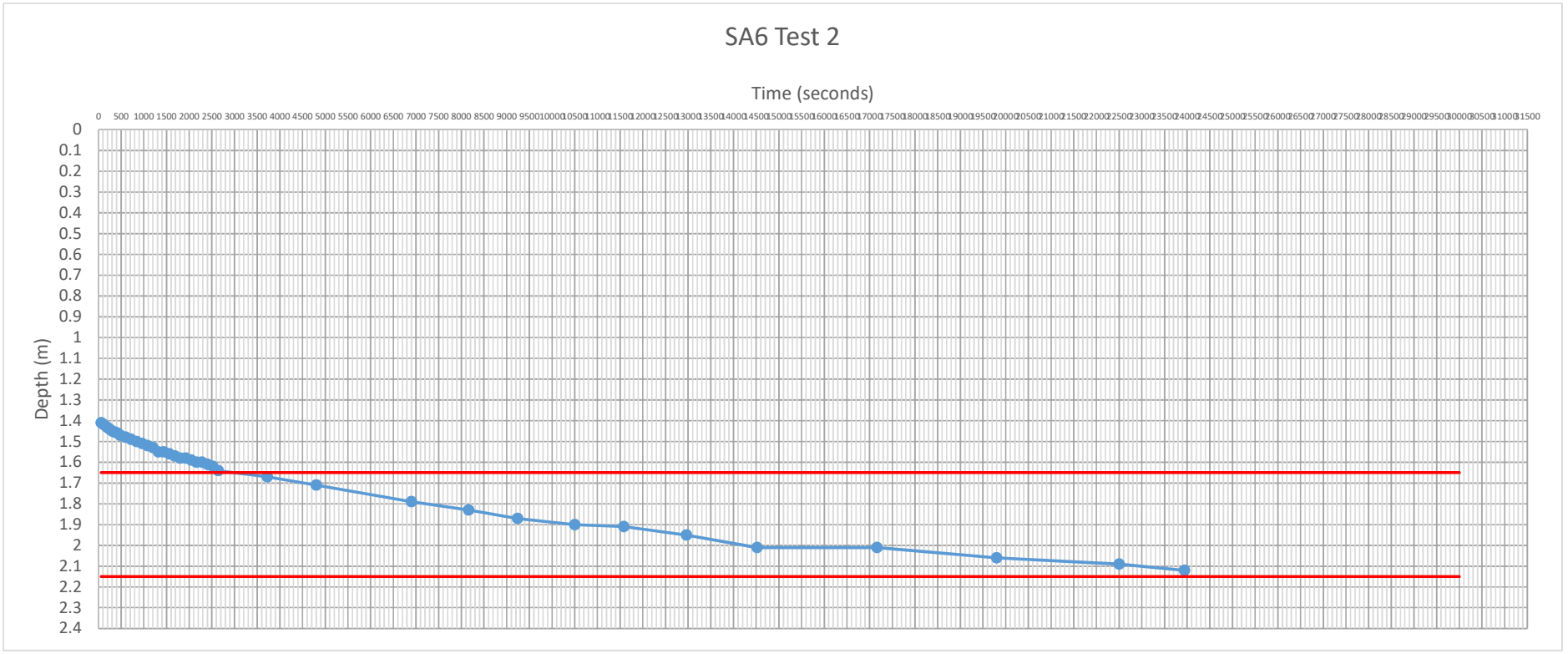
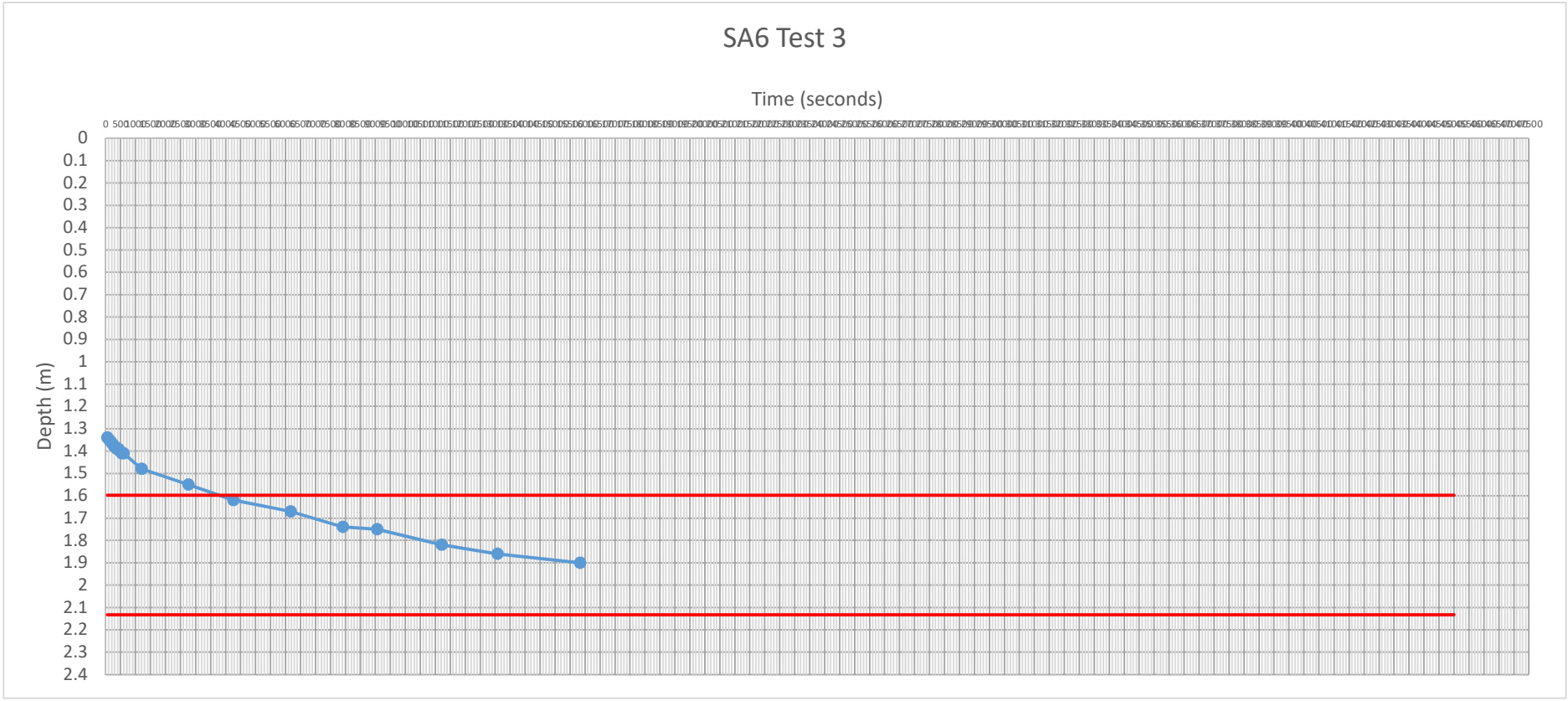
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA5 Test 2
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4

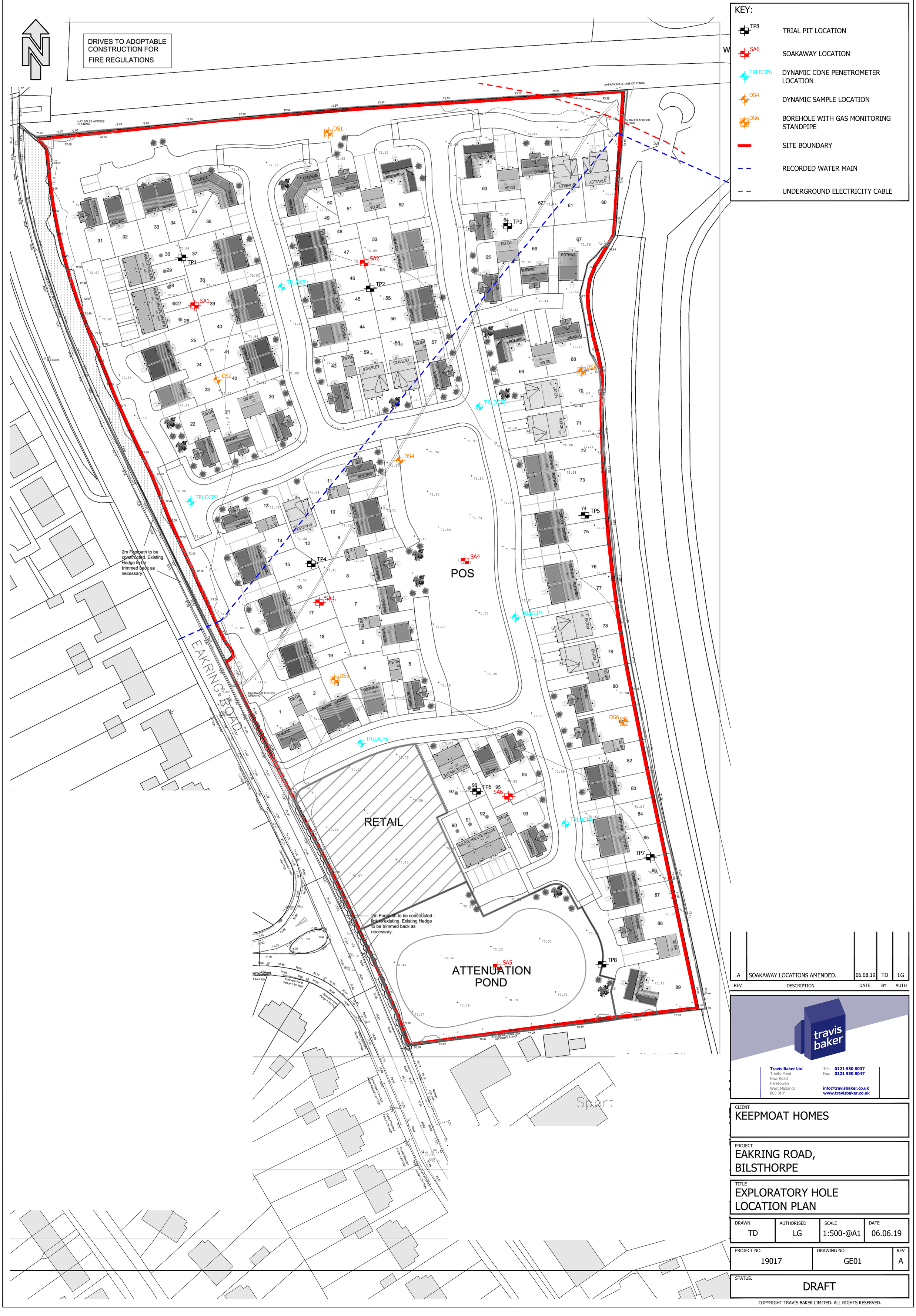

SA5 Test 3
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA6 Test 1
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA6 Test 2
Time (seconds)
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 10500 11000 11500 12000 12500 13000 13500 14000 14500 15000 15500 16000 16500 17000 17500 18000 18500 19000 19500 20000 20500 21000 21500 22000 22500 23000 23500 24000 24500 25000 25500 26000 26500 27000 27500 28000 28500 29000 29500 30000 30500 31000 31500
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4


SA6 Test 3
Time (seconds)
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4

DRAWINGS



REV	DESCRIPTION	DATE	BY	AUTH
A	SOAKAWAY LOCATIONS AMENDED.	06.08.19	TD	LG

travis baker

Travis Baker Ltd
Trinity Point
New Road
Halesowen
West Midlands
B63 3HY

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Fax: 0121 550 8047

info@travisbaker.co.uk
www.travisbaker.co.uk

CLIENT
KEEPMOAT HOMES

PROJECT
EAKRING ROAD,
BILSTHORPE

TITLE
EXPLORATORY HOLE
LOCATION PLAN

DRAWN	AUTHORISED	SCALE	DATE
TD	LG	1:500-@A1	06.06.19

PROJECT NO.	DRAWING NO.	REV
19017	GE01	A

STATUS.
DRAFT

DRIVES TO ADOPTABLE CONSTRUCTION FOR FIRE REGULATIONS

HAY BALES ACROSS OPENING

2.0m HIGH CHAIN LINK SECURITY FENCE

APPROXIMATE LINE OF FENCE

DS1
2.36m
BOREHOLE REFUSAL

TP1
2.55m
SANDSTONE

SA1

TRLDCP1

SA2

TP2
2.50m
SANDSTONE

TP3

DS2
1.93m
BOREHOLE REFUSAL

DS3
1.52m
SILTSTONE

TRLDCP3

DS4
2.37m
BOREHOLE REFUSAL

TRLDCP2

TP4

SA4

POS

SA3

TRLDCP4

TP5
1.50m
SILTSTONE

2m Footpath to be constructed. Existing Hedge to be trimmed back as necessary

EAKRING ROAD

DS5
2.19m
BOREHOLE REFUSAL

TRLDCP5

DS6
1.78m
SILTSTONE

TP6
2.55m
SANDSTONE

SA6

TRLDCP6

TP7
1.60m
SILTSTONE

RETAIL

SA5
2.0m
SANDSTONE

ATTENUATION POND

TP8

2m Footpath to be constructed - in grass existing. Existing Hedge to be trimmed back as necessary.

Sport

KEY:

TP8	TRIAL PIT LOCATION
SA6	SOAKAWAY LOCATION
TRLDCP6	DYNAMIC CONE PENETROMETER LOCATION
DS4	DYNAMIC SAMPLE LOCATION
DS6	BOREHOLE WITH GAS MONITORING STANDPIPE
2.50m	DEPTH TO HARD STRATA
SANDSTONE	TYPE OF STRATA
	SITE BOUNDARY

REV	DESCRIPTION	DATE	BY	AUTH

travis baker

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Halesowen
West Midlands
B63 3HY

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Fax: 0121 550 8047

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www.travisbaker.co.uk

CLIENT
KEEPMOAT HOMES

PROJECT
EAKRING ROAD, BILSTHORPE

TITLE
DEPTH TO HARD STRATA

DRAWN	AUTHORISED	SCALE	DATE
TD	LG	1:500-@A1	07.10.19

PROJECT NO.	DRAWING NO.	REV
19017	GE02	-

STATUS.
-