



the journey is the reward

**AREA 2 - BEREWOOD**

**WATERLOOVILLE, HAMPSHIRE**

**GENERIC QUANTITATIVE RISK  
ASSESSMENT**

**FEBRUARY 2013**

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|                      |                                      |
|----------------------|--------------------------------------|
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**AREA 2 - BEREWOOD  
GENERIC QUANTITATIVE RISK ASSESSMENT**

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## 0. EXECUTIVE SUMMARY

|                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brief                                                                                                                                                                                                                                                                                                        | The brief was to undertake a site investigation and assessment to confirm that the ground contamination assessment undertaken for the wider development site was applicable to the specific development area. This report provides an assessment of the identified and potential ground conditions of the site, with regard to the proposed works.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Current Site Status                                                                                                                                                                                                                                                                                          | The site, Berewood – Area 2, is in Waterlooville, located to the immediate west of the A3 (London Road) and to the south of Milk Lane access road. The site is located in a mixed rural and residential area with residential areas to the south & south-east of the site and also to the east, across the A3, of the site. The site is currently in agricultural use with the land to the south-west, west and north also currently in agricultural use, with some additional woodland areas                                                                                                                                                                                                                                                                                                                 |
| Geology                                                                                                                                                                                                                                                                                                      | Reference to the British Geological Survey (BGS) Map (Sheet 316, Fareham, Scale 1:50,000) indicate the site to overlie units of the Wittering Formation (sand, silt and clay) over the London Clay Formation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Hydrogeology                                                                                                                                                                                                                                                                                                 | The Environment Agency Groundwater Vulnerability Map (Sheet 52, Southern Hampshire, Scale 1:100,000) indicate the site to be overlying a Secondary A aquifer, interpreted as the Wittering Formation, which in turn overlies an Unproductive stratum, interpreted as the London Clay Formation. The site is not located within a Groundwater Source Protection Zone.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Hydrology                                                                                                                                                                                                                                                                                                    | The nearest identified surface water feature are some drains located approximately 50m to the west and north-west of the site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Ground Investigation                                                                                                                                                                                                                                                                                         | Site investigation works were undertaken by Mayer Brown Ltd between the 21st and 25th January 2013. The fieldworks for the ground investigation comprised:<br><br>27no. window sample boreholes to a maximum depth of 4.0mbgl, with 13no. gas / water standpipe installations. All investigation locations were scanned for the presence of unexploded ordnance.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Ground Conditions                                                                                                                                                                                                                                                                                            | The ground conditions at the site comprise:<br>Topsoil overlying units of the Wittering Formation to the full depth of the ground investigation.<br><br>As part of the ground investigation, thirteen groundwater and ground gas monitoring standpipes were installed in selected boreholes across the site. Subsequent monitoring visits, undertaken on the 1 <sup>st</sup> and 7 <sup>th</sup> February 2013, have shown groundwater to be present at shallow depth (between 1.30mbgl and ground level) across the site. Furthermore, initial rising head tests were carried out in selected monitoring wells (WS111, WS116 and WS122). The tests showed rapid re-ingress & rise of groundwater in the wells to between 0.13mbgl and 0.58mbgl, indicating the presence of a high groundwater table in area. |
| Ground Contamination Assessment and Recommendations                                                                                                                                                                                                                                                          | The outline conceptual model, formed from the results of the preliminary risk assessment, did not identify any specific potential contaminant sources relating to the past and present uses of the site except for slightly elevated background concentrations of arsenic in the soil and naturally occurring carbon dioxide ground gas. The results of the site investigation and chemical result screening have confirmed that neither of these sources of contamination are present on the site and no additional sources of contamination have been identified from this investigation.                                                                                                                                                                                                                   |
| <i>This sheet is intended to provide a summary only of the initial indicative assessment study of the site in relation to ground contamination. It does not provide a definitive engineering analysis for the purposes of costing or construction, and is subject to the limitation of the agreed brief.</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## **1. INTRODUCTION**

### **1.1 INSTRUCTION**

Mayer Brown Ltd. was commissioned by Grainger Plc. in January 2013 to undertake a Ground Investigation and Generic Quantitative Risk Assessment for Area 2 of the Berewood development, Waterlooville, Hampshire, with regard to the proposed construction of new residential properties and associated access roads.

The brief was to undertake a site investigation and assessment to confirm that the ground contamination assessment undertaken for the wider development site was applicable to the development area. This report provides an assessment of the identified and potential ground conditions of the site, with regard to the proposed works in accordance with the Model Procedures for the Management of Land Contamination (CLR 11), published by the Environment Agency.

This report is prepared in line with the agreed brief and is subject to the report conditions shown in Appendix A.

### **1.2 LEGAL CONTEXT**

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a regime for the control of specific threats to health or the environment from land contamination. In accordance with the Act and the statutory guidance document 'The Contaminated Land (England) Regulations 2000', the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only "contaminated land" where it appears to the Regulatory Authority, by reason of substances within or under the land, that:

- Significant harm is being caused, or there is a significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused."

Inherent in this definition is the requirement for contamination risk assessment to be undertaken on a site specific basis, as the potential for harm is determined by the site's end use and its specific environmental setting.

The guidance defines “risk” as the combination of:

- The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

### 1.3 METHODOLOGY

This report has been prepared in accordance with published Environment Agency guidance (‘Model Procedures for the Management of Land Contamination – Contaminated Land Report (CLR) 11’). CLR 11 provides the technical framework for structured decision making about land contamination and builds on previous work carried out under the Contaminated Land Research Programme (of the former Department of the Environment). CLR 11 has adopted and refined the well recognised methodology and terminology that has been used in contaminated land risk assessment for a number of years.

#### 1.3.1. Pollutant linkage concept

In the context of land contamination, there are three essential elements to any risk:

- A **contaminant source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.
- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a pollutant linkage.

#### 1.3.2. Conceptual model

An important thread throughout the overall process of risk assessment is the need to formulate and develop a **conceptual model** for the site, which supports the identification and assessment of pollutant linkages. A conceptual model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

### 1.3.3. Risk assessment

CLR 11 advocates a phased approach to risk assessment comprising the following in order, as necessary:

**Preliminary Risk Assessment** – a desk study consisting of a review of documentary, anecdotal and site walk over evidence.

**Generic Quantitative Risk Assessment (GQRA)** - comparison of contaminant concentrations obtained from site investigation with generic assessment criteria.

**Detailed Quantitative Risk Assessment (DQRA)** - comparison of contaminant concentrations obtained from site investigation with site-specific assessment criteria.

This document constitutes a Preliminary and Generic Quantitative Risk Assessment.

## 1.4 PROPOSED USE

It is currently understood that the Berewood Area 2 development of the wider West of Waterloo development area will be comprised of residential properties and access roads. Sustainable drainage features will also be constructed in association with the roads.

A change in site use may result in the need for re-assessment of risk criteria and the conclusions and recommendations resulting from the risk assessment could therefore significantly change.

## 1.5 REPORT SCOPE AND LIMITATIONS

This report is based upon a review of readily available historical and current information, previous site investigations and assessments undertaken since 2004 and the recent site investigation data detailed herein.

The report presents an interpretation of the borehole and laboratory data provided by the Mayer Brown Site Investigation undertaken between the 21<sup>st</sup> and 25<sup>th</sup> January 2013. In addition, this report outlines the basic ground conditions encountered in the exploratory holes and the results of any monitoring of ground installations.

This information has been collated, processed and used to provide an interpretation of the ground conditions, with recommendations on potential ground contamination risks for the proposed development.

The recommendations and opinions expressed in this report are based on the strata observed in the exploratory holes, the results of the site and laboratory tests, and information obtained as part of the desk study or provided by others. Mayer Brown take no responsibility for conditions that have not been revealed by the exploratory holes, or which occur between them. Whilst every effort has been made to interpret the conditions between investigation locations, such information is only indicative and liability cannot be accepted for its accuracy. Information provided from other sources is taken in good faith and Mayer Brown cannot guarantee its accuracy.

The information contained in this report is intended for the use of Grainger Plc. Mayer Brown can take no responsibility for the use of this information by any other party or for uses other than that described in this report.

## **2. PRELIMINARY RISK ASSESSMENT**

### **2.1 SITE LOCATION AND DESCRIPTION**

The site is in Waterloooville, located to the immediate west of the A3 (London Road) and to the south of Milk Lane access road. The site is located in a mixed rural and residential area with residential areas to the south & south-east of the site and also to the east, across the A3, of the site. The site is currently in agricultural use with the land to the south-west, west and north also currently in agricultural use, with some additional woodland areas.

### **2.2 SITE HISTORY**

According to the Ordnance Survey maps provided and reviewed from 1870 to 2012 (scales 1:2,500, 1:10,000, 1:1,250, 1:10,560) the site has not been developed in modern times and has mainly been in agricultural & rural use until present day. The residential development located to the south & south-east and east of the site, is shown to have commenced around the 1920's – 1930's and continued until present day. The gas valve compound, associated with the main gas pipeline, located to the south of the site is first shown on the 1982 map extract.

### **2.3 PREVIOUS REPORTS**

Various reports have been prepared for the wider West of Waterloooville development area, over 200ha, since 2004 and include desk top studies, ground investigations, unexploded ordnance assessments, historical buildings reports and archaeological reports. The geotechnical and geo-environmental assessments have been undertaken by Card Geotechnics, Soil Mechanics, Hydrock and Mayer Brown. Some of these assessments relate to the wider development area and others relate to specific areas of interest within the wider development, such as Plant Farm, sites for a proposed cemetery and an area that was previously intended to be the first phase of development.

Details of all of these reports and the most recent of these previous investigations are presented in the Site Assessment Report produced by Card Geotechnics in October 2010 for Grainger Plc. The Card Geotechnics Site Assessment Report concluded that the only potentially significant contamination on the wider site was associated with localised deposits of Made Ground in the vicinity of Plant Farm but that these were not likely to require significant remediation.

The report also identified the potential for significant ground gas to be present in localised areas of the site while site wide low-moderate concentrations of carbon dioxide were identified (up to 5.1% by volume).

Concentrations of arsenic and several other contaminants were also identified at concentrations that exceed the Water Regulations Advisory Scheme (WRAS) for plastic water pipes in the soil.

The report goes on to state: “As development plans are finalised, there will be a requirement for development specific investigation to validate the findings of the previous generic ground investigations. Such investigation should also include appropriate geotechnical investigation and assessment to support design of the foundations for the proposed types of development.”

These conclusions have also been used to help determine the scope of the Mayer Brown site investigation for Area 2 - Berewood that is reported in the following sections of this document.

## 2.4 DOCUMENTATED GROUND CONDITIONS

Ground conditions recorded in readily available sources are summarised below.

### 2.4.1. Geology

Reference to the British Geological Survey (BGS) Map (Sheet 316, Fareham, Scale 1:50,000) indicate the site to overlie units of the Wittering Formation (sand, silt and clay) over the London Clay Formation.

### 2.4.2. Hydrogeology

The Environment Agency Groundwater Vulnerability Map (Sheet 52, Southern Hampshire, Scale 1:100,000) indicate the site to be overlying a Secondary A aquifer, interpreted as the Wittering Formation, which in turn overlies an Unproductive stratum, interpreted as the London Clay Formation.

The site is not located within a Groundwater Source Protection Zone.

### 2.4.3. Hydrology

The nearest identified surface water feature are some drains located approximately 50m to the west and north-west of the site.

#### 2.4.4. Radon

Radon is a naturally occurring radioactive gas which may be harmful to human health. Radon is generally released into the atmosphere in areas underlain by granite and limestone. Harmful concentrations of radon may build up if it becomes trapped in an enclosed space such as a building. National Radiological Protection Board data presented within the Landmark Envirocheck Report indicates that the percentage of houses exceeding the Action Levels for Radon in this area is less than 1%. Therefore the British Geological Survey recommends that radon protection measures are not necessary in new dwellings or extensions.

#### 2.5 ENVIRONMENTAL DATA SEARCH

A search of an environmental database was undertaken together with information from various other organisations as part of the desk study and is summarised in the following sections. The following summary is generally limited to locations within 250m of the site boundaries unless it is considered that installations or activities beyond that range could potentially have an impact on the site or be affected by the redevelopment of the site.

**Table 2.1 Data search results**

|                     |                                                                            |
|---------------------|----------------------------------------------------------------------------|
| Discharge consents  | There are no recorded discharge consents located within 250m of the site.  |
| Pollution incidents | There are recorded pollution incidents within 250m of the site.            |
| Water abstractions  | There are no recorded water abstractions located within 250m of the site.  |
| Fuel Stations       | There are no recorded fuel stations within 250m of the site.               |
| Landfill Sites      | There are no historical or current landfill sites within 250m of the site. |

The site is located in an area which is not affected by coal mining. The following ground hazards were identified:

Compressible ground stability hazards – No hazard

Collapsible ground stability hazards – Very Low hazard

Ground dissolution stability hazards – No hazard

Landslide ground stability hazard – Very low hazard

Shrinking or swelling clay ground stability hazard – Moderate hazard

Running sand ground stability hazards – Very low hazard

## 2.6 DEPARTMENT OF ENVIRONMENT – INDUSTRY PROFILES

The Department of the Environment Industry Profiles are not available or applicable for the current or past uses of the site.

## 2.7 OUTLINE CONCEPTUAL SITE MODEL

On the basis of the above, a number of possible pollutant linkages have been identified at the Site, which are summarised in Table 2.2.

**Table 2.2 Outline conceptual model**

| Source                                                           | Pathway                                                                                    | Receptor                                                                        |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Ground-gas potentially originating from underlying natural soils | Vertical migration of ground gas leading to accumulation in confined spaces and inhalation | Buildings on-site and future construction workers & occupiers/users of the Site |
| Naturally elevated metal concentrations in underlying soils      | Direct contact                                                                             | Buried services                                                                 |

## 2.8 CONCLUSIONS OF PRELIMINARY RISK ASSESSMENT (PRA)

The preliminary risk assessment identified a number of possible pollutant linkages that required further investigation and assessment. Consequently, a generic quantitative risk assessment was undertaken, incorporating a geo-environmental and geotechnical site investigation designed to address the potential pollutant linkages identified in the outline conceptual model and compare the chemical analysis results with generic assessment criteria.

### 3. FIELDWORK SUMMARY OF SCOPE AND RATIONALE

#### 3.1 RATIONALE AND SUMMARY OF SCOPE

Site investigation works were undertaken by Mayer Brown Ltd between the 21<sup>st</sup> and 26<sup>th</sup> January 2013. The scope and rationale of the ground investigation are presented below.

- 27no. window sample boreholes (WS) to a maximum depth of 4.0mbgl.
- Scanning of all investigation locations for unexploded ordnance
- Collection of representative samples to undergo geotechnical and chemical laboratory testing as detailed in later sections of this report.
- Installation of 13no. gas / water monitoring standpipes/wells.

The rationale for the investigation is presented below in Table 3.1.

**Table 3.1 Exploratory hole location rationale**

| Location                                                          | Rational                                                                                                                                                                                                                                                                                                                                                   | Max Depth (mbgl) |
|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| WS101-107                                                         | 7no. windowless sample boreholes to assess the nature and stratigraphy of the subsurface materials along the line of the proposed access road and allow the collection of representative samples for geotechnical analysis.                                                                                                                                | 4.00             |
| WS108-110,<br>WS113-115,<br>WS117-121,<br>WS123-124,<br>WS126-127 | 15no. windowless sample boreholes to assess the nature and stratigraphy of the subsurface materials across the proposed residential development areas and allow the collection of representative samples for geotechnical and chemical analysis. Installation of ground gas and water monitoring standpipes with particular focus on assessing ground gas. | 4.00             |
| WS111,<br>WS112,<br>WS116,<br>WS122<br>and<br>WS125               | 5no. windowless sample boreholes to assess the nature and stratigraphy of the subsurface materials at the proposed locations of drainage features. Installation of water monitoring standpipes.                                                                                                                                                            | 4.00             |

The layout of the exploratory positions is presented in Figure 2.

### 3.2 SAMPLING

Prior to the investigation it was determined that the primary receptors that would potentially be at risk on this site would be the future site users. It was therefore considered appropriate to target the near surface soil, at a depth representative of the material that is likely to remain following site clearance, for chemical analysis as this is the material most likely to be encountered by the receptor following the development of the site.

No evidence of contamination was encountered during the investigation to indicate that analysis of any additional samples was appropriate.

### 3.3 MONITORING

Due to the conditions encountered (high groundwater levels), two monitoring return visits to the site were considered appropriate to provide sufficient data for this assessment. These two visits were undertaken on the 1<sup>st</sup> and 7<sup>th</sup> February 2013.

No groundwater sampling was undertaken.

### 3.4 SITE INVESTIGATION STANDARDS

Methods employed during the investigation were generally undertaken in accordance with BS10175 and BS5930.

## 4. GROUND CONDITIONS ENCOUNTERED

### 4.1 SOIL CONDITIONS

Ground conditions encountered during the recent ground investigation were broadly consistent with those identified in the published literature and in summary comprised Topsoil overlying Wittering Formation to the full depth of the investigation.

Variations in strata thicknesses are summarised in Table 4.1 below, engineering logs are presented in Appendix B.

**Table 4.1 Summary of encountered ground conditions**

| Location | Topsoil     |           | Wittering Formation |           |
|----------|-------------|-----------|---------------------|-----------|
|          | From (mbgl) | To (mbgl) | From (mbgl)         | To (mbgl) |
| WS101    | 0.0         | 0.8       | 0.8                 | 4.0       |
| WS102    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS103    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS104    | 0.0         | 0.8       | 0.8                 | 4.0       |
| WS105    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS106    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS107    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS108    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS109    | 0.0         | 0.6       | 0.6                 | 4.0       |
| WS110    | 0.0         | 0.4       | 0.4                 | 4.0       |
| WS111    | 0.0         | 0.4       | 0.4                 | 4.0       |
| WS112    | 0.0         | 0.4       | 0.4                 | 4.0       |
| WS113    | 0.0         | 0.5       | 0.5                 | 1.5       |
| WS114    | 0.0         | 0.5       | 0.5                 | 1.5       |
| WS115    | 0.0         | 0.3       | 0.3                 | 2.0       |
| WS116    | 0.0         | 0.5       | 0.5                 | 4.0       |
| WS117    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS118    | 0.0         | 0.3       | 0.3                 | 1.5       |
| WS119    | 0.0         | 0.3       | 0.3                 | 1.5       |
| WS120    | 0.0         | 0.3       | 0.3                 | 1.5       |
| WS121    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS122    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS123    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS124    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS125    | 0.0         | 0.3       | 0.3                 | 4.0       |
| WS126    | 0.0         | 0.3       | 0.3                 | 1.5       |
| WS127    | 0.0         | 0.3       | 0.3                 | 4.0       |

#### 4.1.1. Topsoil

Topsoil was encountered at all investigative positions to depths between 0.3 and 0.5m and comprised in generally dark brown silty clayey sand with flint gravel.

#### 4.1.2. Wittering Formation

Units of the Wittering Formation were encountered immediately below the Topsoil at all borehole locations. The encountered Wittering Formation units generally comprised orange brown slightly silty slightly clayey fine sand.

#### 4.2 OBSTRUCTIONS

No obstructions were encountered during the drilling of the boreholes on this site.

#### 4.3 GROUNDWATER CONDITIONS

As part of the ground investigation, thirteen groundwater and ground gas monitoring standpipes were installed in selected boreholes across the site. Subsequent monitoring visits, undertaken on the 1st and 7<sup>th</sup> February 2013, have shown groundwater to be present at shallow depth (between 1.30mbgl and ground level) across the site.

Furthermore, initial rising head tests were carried out in selected monitoring wells (WS111, WS116 and WS122). The tests showed rapid re-ingress & rise of groundwater in the wells to between 0.13mbgl and 0.58mbgl, indicating the presence of a high groundwater table in area.

#### 4.4 VISUAL / OLFACTORY EVIDENCE OF CONTAMINATION

No visual or olfactory evidence of contamination was noted in any of the boreholes during the investigation.

#### 4.5 GROUND GAS

A preliminary ground gas assessment for the site is presented in this document, based on one round of ground gas monitoring of the installed wells within the residential development area, undertaken in accordance with the recommendations of CIRIA C665.

## **5. GENERIC RISK ASSESSEMNT**

### **5.1 CONTAMINATION ASSESSMENT METHODOLOGY**

In order to assess the human health and environmental risks posed by potential contaminants within the underlying soils and groundwater, Mayer Brown undertook an initial screen of the laboratory results using generic assessment criteria. Generic assessment criteria (GAC) are contaminant concentration values used for comparison purposes to assess the risk associated with contaminant concentrations found on site and are derived using non-site-specific information.

#### **5.1.1. Soils**

In order to assess the soil analyses results with regard to potential human health risks, Mayer Brown have adopted generic assessment criteria derived in accordance with the UK framework set out in the most recent CLR (Contaminated Land Report) documents. Ongoing research by the EA is being undertaken to produce toxicology reports (TOX series) for each of the contaminants identified within the CLR framework and then to produce published Soil Guideline Values (SGVs) using the Contaminated Land Exposure Assessment (CLEA) Model.

To date, SGVs have been published for only a limited suite of contaminants, with SGVs derived for each contaminant for three different land use scenarios namely:

- residential;
- allotments; and
- commercial and industrial.

Where available, published Soil Guideline Values (SGV) have been adopted. Where SGVs are not available, Mayer brown has adopted the generic assessment criteria published by LQM/CIEH (second edition) and EIC/AGS/CL:AIRE, generated using the CLEA v1.06 software and associated handbook. As further guidance is developed, it would be appropriate to review the Tier 1 screening process.

A full list of the GACs together with an indication of the method used for their derivation is provided in Appendix C. GACs applicable to residential end use have been used for the assessment of the site. Contaminant concentrations below the GACs are considered not to warrant further risk assessment. However, concentrations of contaminants above the GACs may require further consideration through statistical analysis, if appropriate, or further detailed assessment using site specific data.

### Assessment framework

In regards to human health, the CLEA model states that, 'the contamination is assumed to be at or within 1m of the surface' (CLR10 pg10). It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway. Therefore, for the purposes of statistical analysis, data from the top 1.0 to 1.5m is used for assessment of risks to human health via direct contact pathways in accordance with the CLEA model, dependant on proposed future site levels.

### Statistical analysis

The CLEA guidelines state that for each contaminant, the upper 95th percentile confidence limit on the mean measured concentration (95%UCL) should be calculated and this value should be compared to the GAC. Maximum value tests should also be performed in accordance with the method outlined in Annex 1 of CLR7.

The objective of these tests is to decide whether the maximum concentration observed should be treated as an outlier or whether it can reasonably be considered to come from the same underlying population as the other samples.

Annex 1 of CLR 7 describes a simplistic method for calculation of the 95%UCL value based on the arithmetic mean of the sample distribution, assuming the contaminant concentrations fall within a normal distribution. However, it is known that contaminant concentrations often tend towards other distribution forms.

Therefore, in order to calculate what are considered to be more representative 95%UCL values, the contaminant concentrations have first been assessed to determine if each contaminant distribution is closer to a normal or another distribution. If a dataset was found to be normally distributed, the arithmetic mean was used to calculate the 95%UCL using the 'One sample t-test' as described in CLR 7. If the distribution was determined to be significantly removed from normal, the one-sided Chebychev Theorem was used to calculate the 95%UCL. Constituent non-detects were assigned a value equal to the reported analytical laboratory limit of detection, considered reasonably conservative in accordance with CLR principles. Any identified outliers are excluded from the datasets used in calculation of the 95%UCL value, with justification.

### 5.1.2. Ground gas

The criteria used to assess the ground gas monitoring results, where monitored, have been taken from the following guidance documents:

- Assessing risks posed by ground gases to buildings, CIRIA Report C665, 2007
- Code of practice for the characterisation and remediation from ground gas in affected developments, British Standard BS 8485, 2007

The values recorded at the site have been compared to guideline values given in CIRIA Report C665, (2007) 'Assessing risks posed by ground gases to buildings'.

The frequency and period of monitoring is assessed based on the gas generation potential of the source material and the sensitivity of the development, in accordance with Table 5.5 of CIRIA C665.

These typical monitoring recommendations vary between four sets of readings over a one month period for a commercial development and a very low generation potential source to 24 rounds over 24 months for a residential property and a very high generation potential source. However, these are recognised as typical recommendations that may require fewer or additional readings depending on site specific circumstances.

Where possible, monitoring rounds are undertaken during a range of atmospheric conditions to enable their influence on gas conditions to be assessed. As monitoring over the recommended periods is frequently impractical on development sites, the monitoring rounds undertaken are usually conducted during the worst case conditions (e.g. low and falling atmospheric pressure) during the time available, as far as reasonably practicable, in order to limit the level of uncertainty resulting from the reduced monitoring period.

The Characteristic Situation for a monitoring location is determined using the worst case gas screening value for methane or carbon dioxide from all of the monitoring rounds at that location. Following the precautionary principal, the most stringent of the Characteristic Situations for the monitoring locations within the site is generally used to classify the site as a whole.

## 5.2 SOIL ASSESSMENT

### 5.2.1. General

A total of 23no. near surface soil samples collected during the site investigation were submitted to a UKAS accredited laboratory for analysis for a suite of heavy metals, phytotoxic metals (harmful to plants), phenols, speciated polyaromatic hydrocarbons (PAHs), fractionated total petroleum hydrocarbons (TPH), BTEX compounds and several inorganic parameters. The results of the laboratory analyses are summarised in Appendix D, in which they are compared to the relevant generic assessment criteria. A full set of all the laboratory test certificates is presented as Appendix E.

The range of potentially hazardous contaminants present on the site can be wide and varied and the suite has been chosen to reflect both commonly found contaminants and others indicated by research to have a significant risk of being present. It is, however, possible that others may exist for which analyses have not been carried out or which were outside the scope of completed exploratory holes.

The decision to recommend acceptability or a requirement for remediation is based on the evaluation of a number of factors which when combined present a statutory or non-statutory risk that may require remedial action.

### 5.2.2. Analysis Results

All of the heavy metal, hydrocarbon and inorganic contaminants of concern included in the analysis of the samples from the area of the proposed development were identified at concentrations well below the relevant GACs and below the Water Regulations Advisory Scheme material selection threshold levels for buried services. Therefore heavy metals, hydrocarbons and inorganic compounds, including asbestos, are not considered to represent a significant source of contamination with regard to human health, buried services or environmental receptors.

Arsenic was identified at concentrations slightly above the Water Regulations Advisory Scheme material selection threshold levels for buried services in 8no. of the 14no. samples across the site. This indicates that arsenic is present at slightly elevated background levels in the area. Arsenic is therefore considered to potentially represent a significant source of contamination with regard to buried services.

## 5.3 STATISTICAL ANALYSIS

Statistical analysis was not considered appropriate for the samples from this site.

## 5.4 GROUND-GAS ASSESSMENT

The presence and concentrations of ground gases in the installed monitoring wells were monitored in accordance with CIRIA C665 on one occasion to provide preliminary data on the ground gas conditions at the site. The monitoring results are presented in Appendix F.

During the gas monitoring round, the only well with a response zone that was not completely submerged was WS127, which had 0.11m of un-submerged response zone available to monitor. The steady state flow rates of <0.1l/hr were recorded in all wells. A slightly elevated concentration of carbon dioxide was detected in WS127 of 1.4% by volume and flammable gas as methane at a steady state of <0.1% by volume. No measureable concentrations of carbon dioxide or flammable gas as methane were detected in any of the other wells.

The recorded concentrations and flow rates indicate a preliminary classification of Characteristic Situation 1 (very low risk) or NHBC "Green" for the site is an appropriate classification, based on the data available. This characterisation is based on the concentrations of both carbon dioxide and flammable gas as methane falling well below the recommended additional factors/typical maximum concentrations in CIRIA C665 and the Gas Screening Values (GSVs) falling well below the boundary between Characteristic 1 and 2 (NHBC Green and Amber 1) at WS127. However, due to the ground conditions at this site, the most relevant basis for this assessment is considered to be the lack of any notable ground gas generating material within the soil beneath the site.

It should be noted that the preliminary monitoring round was undertaken during a period of low and falling atmospheric pressure. These atmospheric pressure conditions are considered most likely to produce the highest ground gas flow rates.

The high groundwater levels in the wells and the resultant submerged response zones means that the ground gas data gathered is not representative of a significant portion of the underlying soils and it was considered that further monitoring would not provide any more reliable or significant data for the assessment. This assessment has therefore been based primarily on a risk based assessment approach, as per BS 8485, involving professional judgement, rather than strictly complying to the approach presented in CIRIA C665.

## **6. CONCEPTUAL SITE MODEL**

It is currently understood that the Berewood Area 2 development of the wider West of Waterlooville development area will be comprised of residential properties, access roads and drainage features.

### **6.1 SOURCES**

The outline conceptual model, formed from the results of the preliminary risk assessment, did not identify any specific potential contaminant sources relating to the past and present uses of the site except for slightly elevated background concentrations of arsenic in the soil and naturally occurring carbon dioxide ground gas. The results of the site investigation and chemical result screening have confirmed that neither of these sources of contamination are present on the site and no additional sources of contamination have been identified from this investigation.

### **6.2 PATHWAYS AND RECEPTORS**

As no significant sources of contamination have been identified, further discussion of pathways and receptor is not considered appropriate.

## 7. CONCLUSIONS AND RECOMMENDATIONS

The outline conceptual model, formed from the results of the preliminary risk assessment, did not identify any specific potential contaminant sources relating to the past and present uses of the site except for slightly elevated background concentrations of arsenic in the soil and naturally occurring carbon dioxide ground gas. The results of the site investigation and chemical result screening have confirmed that neither of these sources of contamination are present on the site and no additional sources of contamination have been identified from this investigation.

In order to mitigate the generic risks associated with development on potentially contamination land the following mitigation measures are recommended:

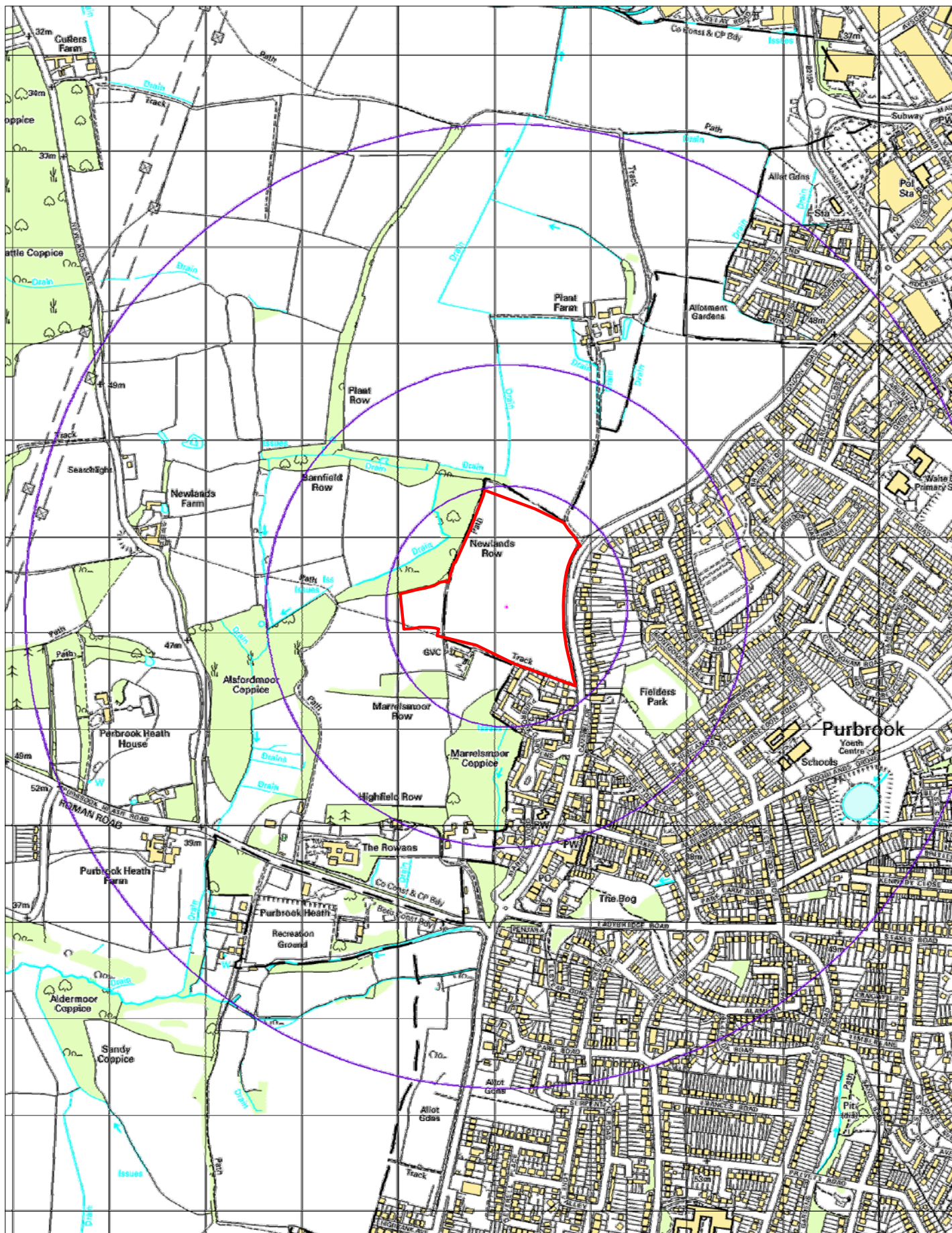
- Compliance with relevant Health and Safety procedures during construction works.
- Contractors on site should wear appropriate PPE to mitigate the risks from the chemical and physical impacts to the Made Ground at the site. Care should also be taken when entering excavations on site due to the potential presence of ground gas.
- The local authority should be informed if any sources of contamination are identified during the development that have not been assessed in this report. These sources should then be assessed and dealt with appropriately, with the agreement of the local authority.

These mitigation measures, as with any such mitigation or remedial measures, are subject to agreement with the regulatory authority, be it the Local Authority for human health related issues or the Environment Agency for environmental issues.

It is recommended that any removal and disposal of sub-soil arisings and/or groundwater from the site should be undertaken in a controlled manner to a licensed facility, with due regard to Duty of Care responsibilities. In addition, an appropriate degree of health and safety provision should be incorporated to protect both the site workers and the general public alike.

During any ground works, it is recommended that skin contact with soils is kept to a minimum in accordance with good working practice / specific control measures and the HSE guidance document 'Protection of Workers and the General Public During the Development of Contaminated Land', 1991.

**FIGURE 1: SITE LOCATION PLAN**



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client  
GRANGER PLC

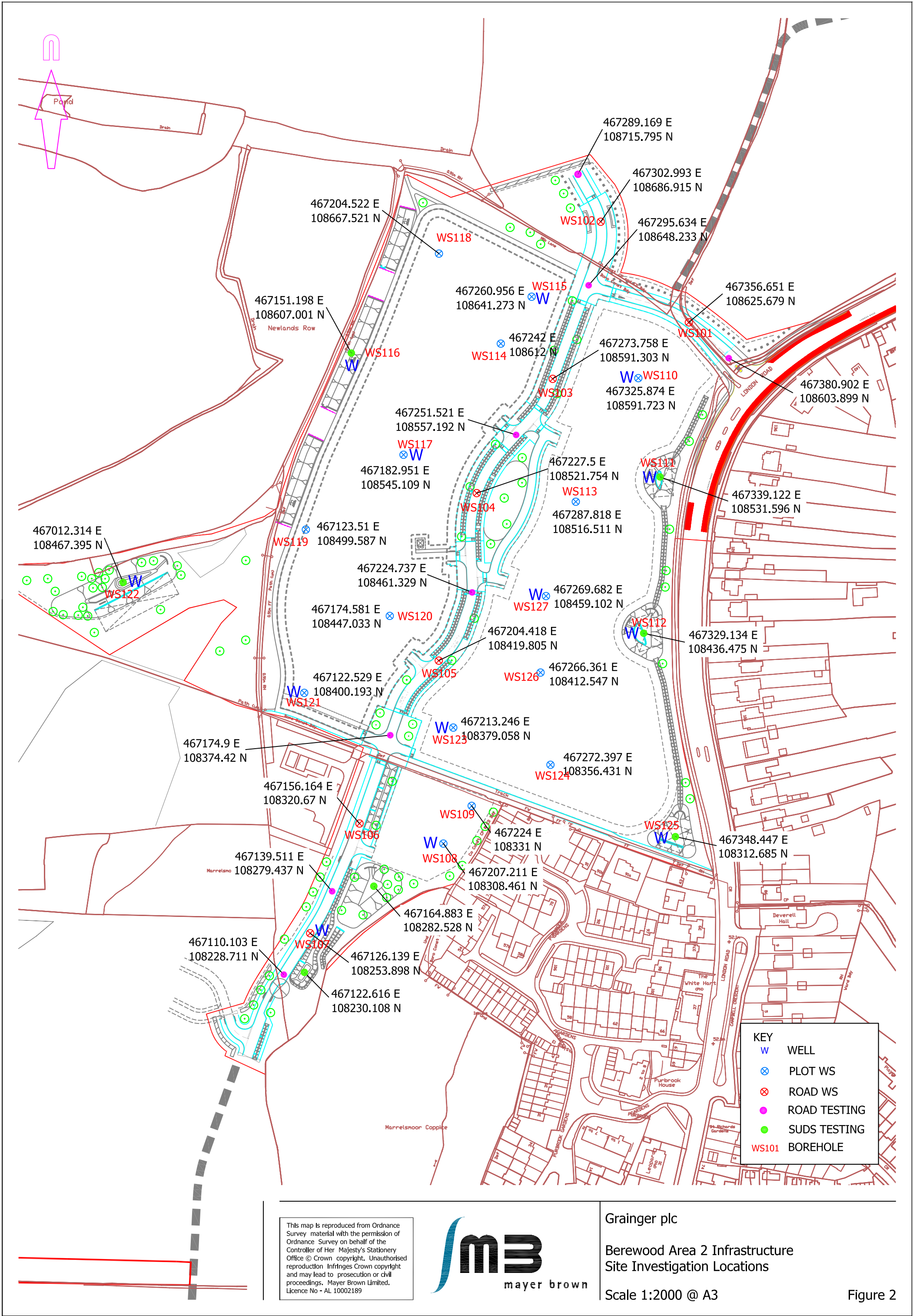
title  
AREA 2 - BEREWOOD, WATERLOOVILLE  
SITE LOCATION PLAN

scale NTS@A4 drawn by AP checked by RP

date NOVEMBER 2012 cad file

drawing number  
FIGURE 1  
rev.  
0

**FIGURE 2: INVESTIGATION LOCATION PLAN**



## **APPENDIX A: REPORT CONDITIONS**

*This report is produced solely for the benefit of **Granger Plc.** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.*

*This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.*

*This report is based on a visual site inspection, study of readily accessible referenced historical records, information supplied by those parties noted in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.*

*Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categorical assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Mayer Brown Ltd. In time improved practices or amended legislation may necessitate a re-assessment.*

*The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off site intrusive investigations and monitoring.*

## **APPENDIX B: ENGINEERING LOGS**

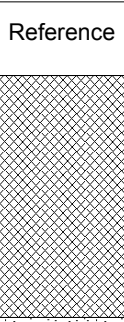
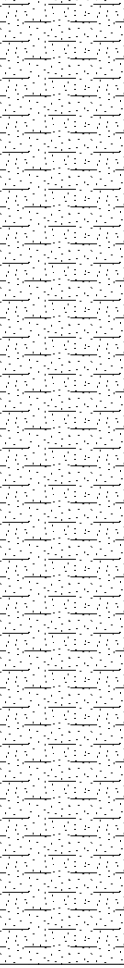


# Borehole Log

Borehole No  
**WS101**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467356.00 - 108625.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 21-01-2013 - |                                | Logged By<br>AP  |

| Well                                                                              | Water Strikes | Samples and In Situ Testing |      |               | Depth (m) | Level (m AOD)                                                                      | Reference                                                                                                                                                         | Stratum Description                                                                  |  |
|-----------------------------------------------------------------------------------|---------------|-----------------------------|------|---------------|-----------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--|
|                                                                                   |               | Depth (m)                   | Type | Results       |           |                                                                                    |                                                                                                                                                                   |                                                                                      |  |
|  |               | 0.80-1.00                   | D    |               | 0.80      |  | MADE GROUND (Brown medium to coarse rounded fling GRAVEL with geotextile membrane at 0.5mbgl and 0.8mbgl. Becoming orange brown and slightly sandy from 0.5mbgl.) |  |  |
|                                                                                   |               | 1.00                        | C    | 2,4,4,5,5,6   |           |                                                                                    | Orange brown fine to medium slightly clayey to clayey laminated SAND                                                                                              |                                                                                      |  |
|                                                                                   |               | 2.00                        | C    | 1,2,2,2,2,2   |           |                                                                                    |                                                                                                                                                                   |                                                                                      |  |
|                                                                                   |               | 2.50-3.00                   | C    |               |           |                                                                                    |                                                                                                                                                                   |                                                                                      |  |
|                                                                                   |               | 3.00                        | C    | 1,1,1,2,3,3   |           |                                                                                    |                                                                                                                                                                   |                                                                                      |  |
|                                                                                   |               | 4.00                        | C    | 1,1=150,1,2,3 | 4.00      |                                                                                    |                                                                                |                                                                                      |  |
|                                                                                   |               |                             |      |               |           |                                                                                    |                                                                                                                                                                   |                                                                                      |  |

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| Remarks: |  |
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# Borehole Log

Borehole No

**WS102**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467302.00 - 108686.00

Hole Type

WLS

Location: Waterlooville

Level: m AOD

Scale

1:25

Client: Granger PLC

Dates: 21-01-2013 -

Logged By

AP

| Well | Water Strikes | Samples and In Situ Testing |        |             | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                  |   |
|------|---------------|-----------------------------|--------|-------------|-----------|---------------|-----------|----------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type   | Results     |           |               |           |                                                                      |   |
|      |               | 0.40-1.00                   | C      |             | 0.30      |               |           | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|      |               | 1.00                        | C      | 3,3,3,3,4,4 |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND | 1 |
|      |               | 2.00<br>2.00-3.00           | C<br>C | 2,3,3,3,4,5 |           |               |           |                                                                      | 2 |
|      |               | 3.00                        | C      | 2,3,3,2,3,4 |           |               |           |                                                                      | 3 |
|      |               | 4.00                        | C      | 4,4,4,3,5,6 | 4.00      |               |           |                                                                      | 4 |
|      |               |                             |        |             |           |               |           |                                                                      | 5 |

Remarks:



# Borehole Log

Borehole No  
**WS103**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467273.00 - 108591.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 21-01-2013 - |                                | Logged By<br>AP  |

| Well | Water Strikes | Samples and In Situ Testing |        |             | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                  |   |
|------|---------------|-----------------------------|--------|-------------|-----------|---------------|-----------|----------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type   | Results     |           |               |           |                                                                      |   |
|      |               |                             |        |             | 0.30      |               |           | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|      |               | 0.50                        | D      |             |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND |   |
|      |               | 1.00<br>1.00-2.00           | C<br>C | 2,4,4,4,5,5 |           |               |           |                                                                      | 1 |
|      |               | 2.00                        | C      | 3,4,5,5,5,5 |           |               |           |                                                                      | 2 |
|      |               | 3.00                        | C      | 2,1,5,6,6,6 |           |               |           |                                                                      | 3 |
|      |               | 4.00                        | C      | 2,2,2,3,3,3 | 4.00      |               |           |                                                                      | 4 |
|      |               |                             |        |             |           |               |           |                                                                      | 5 |

|          |  |
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| Remarks: |  |
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# Borehole Log

Borehole No  
**WS104**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467227.00 - 108521.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 21-01-2013 - |                                | Logged By<br>AP  |

| Well | Water Strikes | Samples and In Situ Testing |      |             | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                  |   |
|------|---------------|-----------------------------|------|-------------|-----------|---------------|-----------|----------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results     |           |               |           |                                                                      |   |
|      |               | 0.30-1.00                   | C    |             | 0.30      |               |           | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|      |               | 1.00                        | C    | 2,5,4,6,6,7 |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND | 1 |
|      |               | 1.50-2.00                   | C    |             |           |               |           |                                                                      |   |
|      |               | 2.00                        | C    | 3,5,4,4,4,5 |           |               |           |                                                                      | 2 |
|      |               | 3.00                        | C    | 3,3,6,6,5,6 |           |               |           |                                                                      | 3 |
|      |               | 4.00                        | C    | 2,2,5,5,6,6 | 4.00      |               |           |                                                                      | 4 |
|      |               |                             |      |             |           |               |           |                                                                      | 5 |

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| Remarks: |  |
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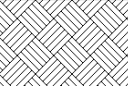
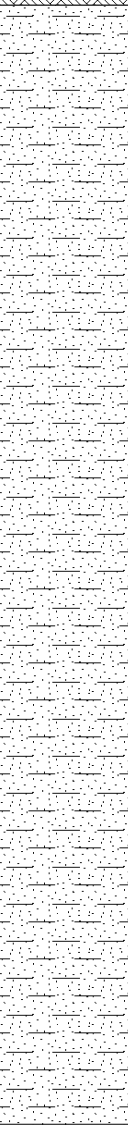


# Borehole Log

Borehole No  
**WS105**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467204.00 - 108419.00 | Hole Type<br>WLS |
| Location: Waterloooville        | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 21-01-2013 - |                                | Logged By<br>AP  |

| Well                                                                              | Water Strikes | Samples and In Situ Testing |      |                | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                  |   |
|-----------------------------------------------------------------------------------|---------------|-----------------------------|------|----------------|-----------|---------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|
|                                                                                   |               | Depth (m)                   | Type | Results        |           |               |                                                                                     |                                                                      |   |
|  |               |                             |      |                | 0.30      |               |   | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|                                                                                   |               | 1.00                        | C    | 2,2,3,3,3,4    |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND | 1 |
|                                                                                   |               | 2.00                        | C    | 5,5,5,7,7,9    |           |               |                                                                                     |                                                                      | 2 |
|                                                                                   |               | 3.00                        | C    | 1,1,2,3,8,14   |           |               |                                                                                     |                                                                      | 3 |
|                                                                                   |               | 4.00                        | C    | 4,6,8,10,14,15 | 4.00      |               |                                                                                     |                                                                      | 4 |
|                                                                                   |               |                             |      |                |           |               |                                                                                     |                                                                      | 5 |

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| Remarks: |  |
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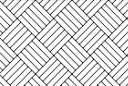
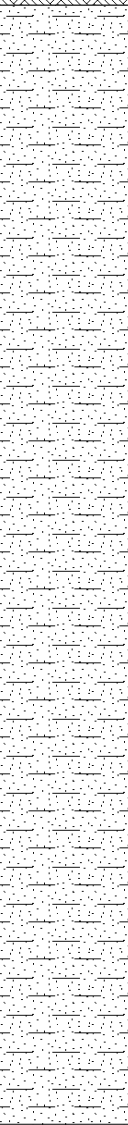


# Borehole Log

Borehole No  
**WS106**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467156.00 - 108320.00 | Hole Type<br>WLS |
| Location: Waterloooville        | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 22-01-2013 - |                                | Logged By<br>SS  |

| Well                                                                              | Water Strikes | Samples and In Situ Testing |      |              | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                  |   |
|-----------------------------------------------------------------------------------|---------------|-----------------------------|------|--------------|-----------|---------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|
|                                                                                   |               | Depth (m)                   | Type | Results      |           |               |                                                                                     |                                                                      |   |
|  |               |                             |      |              | 0.30      |               |   | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|                                                                                   |               |                             |      |              |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND |   |
|                                                                                   |               | 1.00                        | C    | 2,3,3,5,5,6  |           |               |                                                                                     |                                                                      | 1 |
|                                                                                   |               | 2.00                        | C    | 1,3,5,5,5,6  |           |               |                                                                                     |                                                                      | 2 |
|                                                                                   |               | 3.00                        | C    | 2,2,5,7,8,10 |           |               |                                                                                     |                                                                      | 3 |
|                                                                                   |               | 4.00                        | C    | 3,4,6,6,8,10 | 4.00      |               |                                                                                     |                                                                      | 4 |
|                                                                                   |               |                             |      |              |           |               |                                                                                     |                                                                      | 5 |

|          |  |
|----------|--|
| Remarks: |  |
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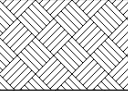
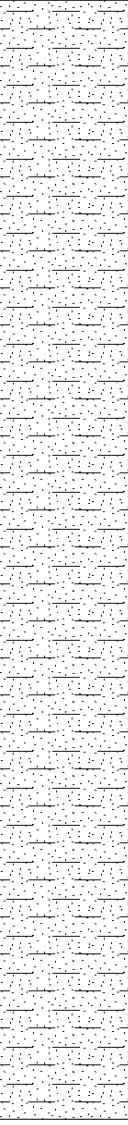


# Borehole Log

Borehole No  
**WS107**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467126.00 - 108253.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 22-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |             | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|------|-------------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results     |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 0.30-1.00                   | C    |             | 0.30      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 1.00                        | C    | 3,5,5,7,7,7 |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1 |
|      |               | 1.50-2.00                   | C    |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 2.00                        | C    | 3,4,6,5,5,5 |           |               |                                                                                     |                                                                                                                 | 2 |
|      |               | 2.50-3.00                   | C    |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 3.00                        | C    | 2,4,5,5,5,5 |           |               |                                                                                     |                                                                                                                 | 3 |
|      |               | 3.50-4.00                   | D    |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 4.00                        | C    | 1,2,5,5,7,7 | 4.00      |               |                                                                                     |                                                                                                                 | 4 |
|      |               |                             |      |             |           |               |                                                                                     |                                                                                                                 | 5 |

|                              |  |
|------------------------------|--|
| Remarks: Collapse to 2.5mbgl |  |
|------------------------------|--|

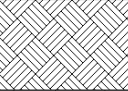
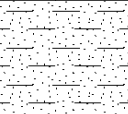
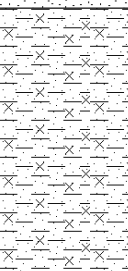
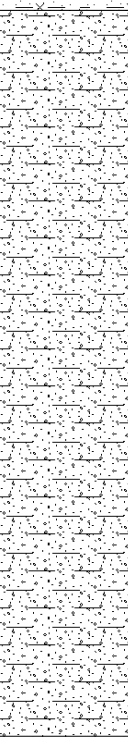


# Borehole Log

Borehole No  
**WS108**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467207.00 - 108308.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 22-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |             | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                                                     |   |
|------|---------------|-----------------------------|------|-------------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results     |           |               |                                                                                     |                                                                                                                                         |   |
|      |               |                             |      |             |           |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.)                         |   |
|      |               | 0.50                        | ES   |             | 0.30      |               |   | Orange brown fine to medium slightly clayey to clayey laminated SAND                                                                    |   |
|      |               |                             |      |             | 0.70      |               |   | Soft to firm light brown mottled grey slightly silty sandy CLAY                                                                         | 1 |
|      |               | 1.60-2.00                   | D    |             | 1.60      |               |  | Orange brown mottled grey slightly clayey slightly gravelly fine to medium SAND. Gravel is fine to medium sub-angular to rounded flint. | 2 |
|      |               | 2.00                        | C    | 2,2,3,3,5,5 |           |               |                                                                                     |                                                                                                                                         |   |
|      |               | 2.50-3.00                   | D    |             |           |               |                                                                                     |                                                                                                                                         |   |
|      |               | 3.00                        | C    | 2,3,3,3,4,4 |           |               |                                                                                     |                                                                                                                                         | 3 |
|      |               | 3.50-4.00                   | C    |             |           |               |                                                                                     |                                                                                                                                         |   |
|      |               | 4.00                        | C    | 1,2,6,5,4,4 | 4.00      |               |                                                                                     |                                                                                                                                         | 4 |
|      |               |                             |      |             |           |               |                                                                                     |                                                                                                                                         | 5 |

|          |  |
|----------|--|
| Remarks: |  |
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# Borehole Log

Borehole No  
**WS109**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467224.00 - 108331.00 | Hole Type<br>WLS |
| Location: Waterloooville        | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 22-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |             | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|------|-------------|-----------|---------------|-----------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results     |           |               |           |                                                                                                                 |   |
|      |               | 0.50                        | ES   |             | 0.60      |               |           | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) | 1 |
|      |               | 1.00                        | C    | 3,5,6,7,9,8 |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            |   |
|      |               | 1.50                        | ES   |             |           |               |           |                                                                                                                 |   |
|      |               | 2.00                        | C    | 3,3,3,4,4,4 |           |               |           |                                                                                                                 |   |
|      |               | 3.00                        | C    | 3,4,4,4,6,5 |           |               |           |                                                                                                                 |   |
|      |               | 4.00                        | C    | 2,3,3,4,4,4 | 4.00      |               |           | 4                                                                                                               |   |
|      |               |                             |      |             |           |               |           |                                                                                                                 | 5 |

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| Remarks: |  |
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# Borehole Log

Borehole No

**WS110**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467325.00 - 108591.00

Hole Type

WLS

Location: Waterlooville

Level: m AOD

Scale

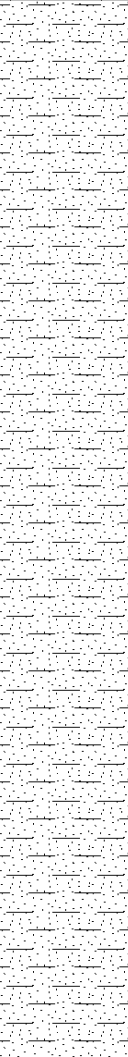
1:25

Client: Granger PLC

Dates: 23-01-2013 -

Logged By

SS

| Well | Water Strikes | Samples and In Situ Testing |         |             | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|---------|-------------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type    | Results     |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 0.50<br>0.50-1.00           | ES<br>C |             | 0.50      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 1.00                        | C       | 2,2,3,4,5,5 |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1 |
|      |               | 1.50-2.00                   | C       |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 2.00                        | C       | 2,2,3,4,4,4 |           |               |                                                                                     |                                                                                                                 | 2 |
|      |               | 2.50-3.00                   | C       |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 3.00                        | C       | 2,2,2,3,2,2 |           |               |                                                                                     |                                                                                                                 | 3 |
|      |               | 3.50-4.00                   | D       |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 4.00                        | C       | 2,2,2,2,2,2 | 4.00      |               |                                                                                     |                                                                                                                 | 4 |
|      |               |                             |         |             |           |               |                                                                                     |                                                                                                                 | 5 |

Remarks:



# Borehole Log

Borehole No

**WS111**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467339.00 - 108531.00

Hole Type

WLS

Location: Waterlooville

Level: m AOD

Scale

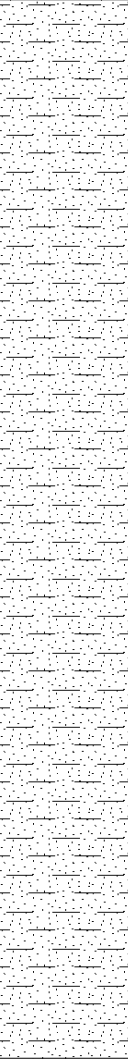
1:25

Client: Granger PLC

Dates: 23-01-2013 -

Logged By

SS

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |                       |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------|
|      |               | Depth (m)                   | Type | Results |           |               |                                                                                     |                                                                                                                 |                       |
|      |               |                             |      |         | 0.50      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |                       |
|      |               |                             |      |         |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1<br>2<br>3<br>4<br>5 |

Remarks:



# Borehole Log

Borehole No

**WS112**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467329.00 - 108436.00

Hole Type

WLS

Location: Waterlooville

Level: m AOD

Scale

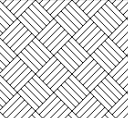
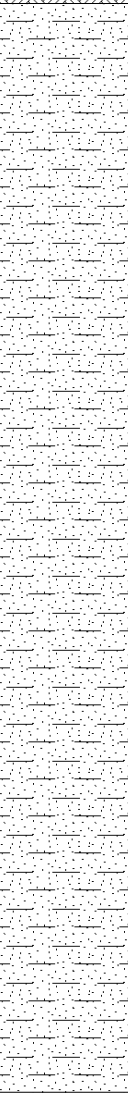
1:25

Client: Granger PLC

Dates: 23-01-2013 -

Logged By

SS

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |                       |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------|
|      |               | Depth (m)                   | Type | Results |           |               |                                                                                     |                                                                                                                 |                       |
|      |               |                             |      |         | 0.40      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |                       |
|      |               |                             |      |         |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1<br>2<br>3<br>4<br>5 |
|      |               |                             |      |         | 4.00      |               |                                                                                     |                                                                                                                 |                       |

Remarks:



# Borehole Log

Borehole No

**WS113**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467287.00 - 108516.00

Hole Type

WLS

Location: Waterloooville

Level: m AOD

Scale

1:25

Client: Granger PLC

Dates: 23-01-2013 -

Logged By

SS

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-----------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results |           |               |           |                                                                                                                 |   |
|      |               | 0.50                        | ES   |         | 0.50      |               |           | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 1.50                        | ES   |         | 2.00      |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 2 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 3 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 4 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 5 |

Remarks:



# Borehole Log

Borehole No  
**WS114**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467242.00 - 108612.00 | Hole Type<br>WLS |
| Location: Waterloooville        | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 23-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-----------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results |           |               |           |                                                                                                                 |   |
|      |               | 0.50                        | ES   |         | 0.50      |               |           | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 1.50                        | ES   |         | 2.00      |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 2 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 3 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 4 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 5 |

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| Remarks: |  |
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# Borehole Log

Borehole No

**WS115**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467260.00 - 108641.00

Hole Type

WLS

Location: Waterlooville

Level: m AOD

Scale

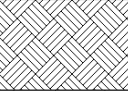
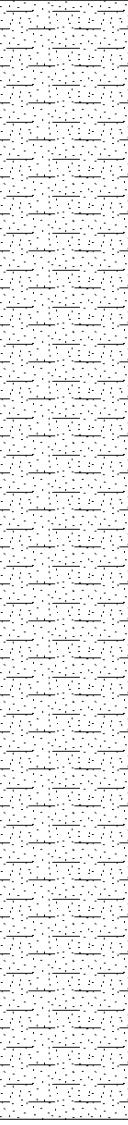
1:25

Client: Granger PLC

Dates: 23-01-2013 -

Logged By

SS

| Well | Water Strikes | Samples and In Situ Testing |         |             | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                  |   |
|------|---------------|-----------------------------|---------|-------------|-----------|---------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type    | Results     |           |               |                                                                                     |                                                                      |   |
|      |               |                             |         |             | 0.30      |               |   | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|      |               | 0.50<br>0.50-1.00           | ES<br>D |             |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND |   |
|      |               | 1.00                        | C       | 3,3,4,4,4,4 |           |               |                                                                                     |                                                                      | 1 |
|      |               | 1.50-2.00                   | C       |             |           |               |                                                                                     |                                                                      |   |
|      |               | 2.00                        | C       | 1,2,3,3,3,4 |           |               |                                                                                     |                                                                      | 2 |
|      |               | 3.00                        | C       | 3,2,3,3,4,3 |           |               |                                                                                     |                                                                      | 3 |
|      |               | 4.00                        | C       | 2,2,2,2,2,3 | 4.00      |               |                                                                                     |                                                                      | 4 |
|      |               |                             |         |             |           |               |                                                                                     |                                                                      | 5 |

Remarks:



# Borehole Log

Borehole No

**WS116**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467151.00 - 108607.00

Hole Type

WLS

Location: Waterlooille

Level: m AOD

Scale

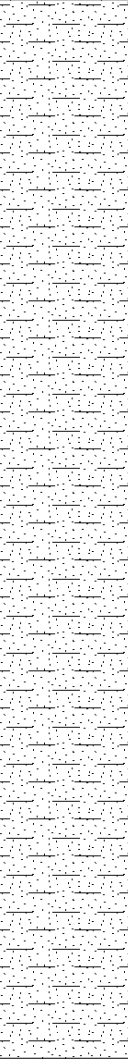
1:25

Client: Granger PLC

Dates: 23-01-2013 -

Logged By

SS

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |                       |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------|
|      |               | Depth (m)                   | Type | Results |           |               |                                                                                     |                                                                                                                 |                       |
|      |               |                             |      |         | 0.50      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |                       |
|      |               |                             |      |         |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1<br>2<br>3<br>4<br>5 |

Remarks:

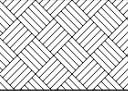
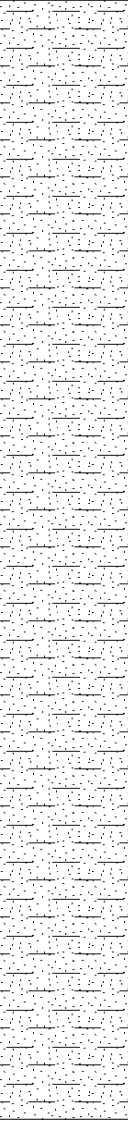


# Borehole Log

Borehole No  
**WS117**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467182.00 - 108545.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 23-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |         |             | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|---------|-------------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type    | Results     |           |               |                                                                                     |                                                                                                                 |   |
|      |               |                             |         |             | 0.30      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 0.50<br>0.50-1.00           | ES<br>C |             |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            |   |
|      |               | 1.00                        | C       | 1,1,1,1,4,4 |           |               |                                                                                     |                                                                                                                 | 1 |
|      |               | 1.50-2.00                   | D       |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 2.00                        | C       | 3,3,3,2,3,3 |           |               |                                                                                     |                                                                                                                 | 2 |
|      |               | 2.50-3.00                   | C       |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 3.00                        | C       | 2,2,3,3,2,4 |           |               |                                                                                     |                                                                                                                 | 3 |
|      |               | 3.40-3.90                   | C       |             |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 4.00                        | C       | 3,3,4,4,4,5 | 4.00      |               |                                                                                     |                                                                                                                 | 4 |
|      |               |                             |         |             |           |               |                                                                                     |                                                                                                                 | 5 |

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| Remarks: |  |
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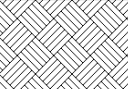
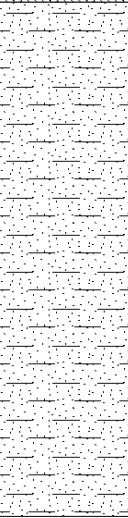


# Borehole Log

Borehole No  
**WS118**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467204.00 - 108667.00 | Hole Type<br>WLS |
| Location: Waterloooville        |                     | Level: m AOD                   | Scale<br>1:25    |
| Client: Granger PLC             |                     | Dates: 24-01-2013 -            | Logged By<br>SS  |

| Well                                                                               | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                  |   |
|------------------------------------------------------------------------------------|---------------|-----------------------------|------|---------|-----------|---------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|
|                                                                                    |               | Depth (m)                   | Type | Results |           |               |                                                                                     |                                                                      |   |
|   |               | 0.50                        | ES   |         | 0.30      |               |   | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|                                                                                    |               | 1.50                        | ES   |         |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND | 1 |
|  |               |                             |      |         | 2.00      |               |                                                                                     |                                                                      | 2 |
|                                                                                    |               |                             |      |         |           |               |                                                                                     |                                                                      | 3 |
|                                                                                    |               |                             |      |         |           |               |                                                                                     |                                                                      | 4 |
|                                                                                    |               |                             |      |         |           |               |                                                                                     |                                                                      | 5 |

Remarks:



# Borehole Log

Borehole No  
**WS119**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467123.00 - 108499.00 | Hole Type<br>WLS |
| Location: Waterloooville        |                     | Level: m AOD                   | Scale<br>1:25    |
| Client: Granger PLC             |                     | Dates: 24-01-2013 -            | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                  |   |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-----------|----------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results |           |               |           |                                                                      |   |
|      |               | 0.50                        | ES   |         | 0.30      |               |           | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|      |               | 1.50                        | ES   |         |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND | 1 |
|      |               |                             |      |         | 2.00      |               |           |                                                                      | 2 |
|      |               |                             |      |         |           |               |           |                                                                      | 3 |
|      |               |                             |      |         |           |               |           |                                                                      | 4 |
|      |               |                             |      |         |           |               |           |                                                                      | 5 |

|          |  |
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| Remarks: |  |
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# Borehole Log

Borehole No  
**WS120**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467174.00 - 108447.00 | Hole Type<br>WLS |
| Location: Waterloooville        |                     | Level: m AOD                   | Scale<br>1:25    |
| Client: Granger PLC             |                     | Dates: 24-01-2013 -            | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-----------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results |           |               |           |                                                                                                                 |   |
|      |               | 0.50                        | ES   |         | 0.30      |               |           | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 1.50                        | ES   |         |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 1 |
|      |               |                             |      |         | 2.00      |               |           |                                                                                                                 | 2 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 3 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 4 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 5 |

|          |  |
|----------|--|
| Remarks: |  |
|----------|--|

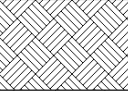
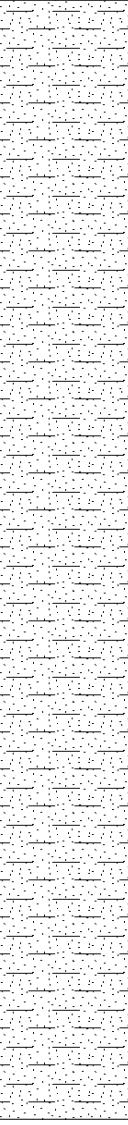


# Borehole Log

Borehole No  
**WS121**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467122.00 - 108400.00 | Hole Type<br>WLS |
| Location: Waterlooville         |                     | Level: m AOD                   | Scale<br>1:25    |
| Client: Granger PLC             |                     | Dates: 24-01-2013 -            | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |         |                   | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|---------|-------------------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type    | Results           |           |               |                                                                                     |                                                                                                                 |   |
|      |               |                             |         |                   | 0.30      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 0.50<br>0.50-1.00           | ES<br>C |                   |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            |   |
|      |               | 1.00                        | C       | 5,5,8,10,10,10    |           |               |                                                                                     |                                                                                                                 | 1 |
|      |               | 1.50-2.00                   | C       |                   |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 2.00                        | C       | 4,5,6,7,6,8       |           |               |                                                                                     |                                                                                                                 | 2 |
|      |               | 2.50-3.00                   | C       |                   |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 3.00                        | C       | 4,4,6,6,6,8       |           |               |                                                                                     |                                                                                                                 | 3 |
|      |               | 3.50-4.00                   | C       |                   |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 4.00                        | C       | 14,11,13,13,13,14 | 4.00      |               |                                                                                     |                                                                                                                 | 4 |
|      |               |                             |         |                   |           |               |                                                                                     |                                                                                                                 | 5 |

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# Borehole Log

Borehole No

**WS122**

Sheet 1 of 1

Project Name

Berewood Area 2

Project No

16054

Co-ords: 467012.00 - 108467.00

Hole Type

WLS

Location: Waterloooville

Level: m AOD

Scale

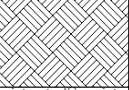
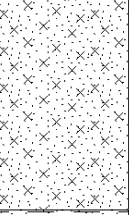
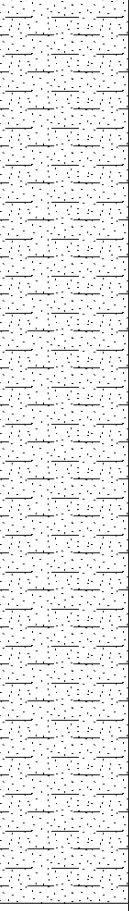
1:25

Client: Granger PLC

Dates: 24-01-2013 -

Logged By

SS

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results |           |               |                                                                                     |                                                                                                                 |   |
|      |               |                             |      |         | 0.30      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               |                             |      |         | 1.00      |               |   | Dark brown silty fine to medium SAND                                                                            | 1 |
|      |               |                             |      |         |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            | 2 |
|      |               |                             |      |         | 4.00      |               |                                                                                     |                                                                                                                 | 3 |
|      |               |                             |      |         |           |               |                                                                                     |                                                                                                                 | 4 |
|      |               |                             |      |         |           |               |                                                                                     |                                                                                                                 | 5 |

Remarks: Collapsed to 3.0mbgl

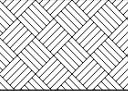
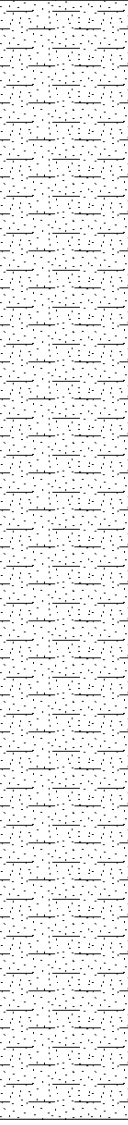


# Borehole Log

Borehole No  
**WS123**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467213.00 - 108379.00 | Hole Type<br>WLS |
| Location: Waterloooville        |                     | Level: m AOD                   | Scale<br>1:25    |
| Client: Granger PLC             |                     | Dates: 24-01-2013 -            | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                  |   |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results |           |               |                                                                                     |                                                                      |   |
|      |               |                             |      |         | 0.30      |               |   | TOPSOIL (Dark brown slightly silty fine SAND)                        |   |
|      |               | 0.50                        | ES   |         |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND | 1 |
|      |               | 1.50                        | ES   |         |           |               |                                                                                     |                                                                      | 2 |
|      |               |                             |      |         | 4.00      |               |                                                                                     |                                                                      | 3 |
|      |               |                             |      |         |           |               |                                                                                     |                                                                      | 4 |
|      |               |                             |      |         |           |               |                                                                                     |                                                                      | 5 |

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| Remarks: Collapsed to 3.0mbgl |  |
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# Borehole Log

Borehole No  
**WS124**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467272.00 - 108356.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 24-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |         |               | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|---------|---------------|-----------|---------------|-----------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type    | Results       |           |               |           |                                                                                                                 |   |
|      |               |                             |         |               | 0.30      |               |           | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 0.50<br>0.50-1.00           | ES<br>C |               |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            |   |
|      |               | 1.00                        | C       | 3,4,5,5,5,5   |           |               |           |                                                                                                                 | 1 |
|      |               | 1.50-2.00                   | C       |               |           |               |           |                                                                                                                 |   |
|      |               | 2.00                        | C       | 5,8,8,9,13,13 |           |               |           |                                                                                                                 | 2 |
|      |               | 2.50-3.00                   | C       |               |           |               |           |                                                                                                                 |   |
|      |               | 3.00                        | C       | 6,5,6,8,7,7   |           |               |           |                                                                                                                 | 3 |
|      |               | 4.00                        | C       | 5,7,9,9,10,11 | 4.00      |               |           |                                                                                                                 | 4 |
|      |               |                             |         |               |           |               |           |                                                                                                                 | 5 |

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| Remarks: |  |
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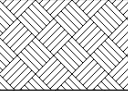
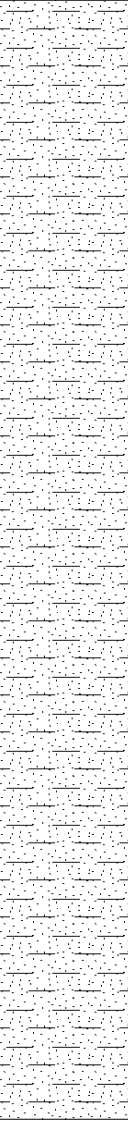


# Borehole Log

Borehole No  
**WS125**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467348.00 - 108312.00 | Hole Type<br>WLS |
| Location: Waterloooville        | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 25-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                  |  |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|--|
|      |               | Depth (m)                   | Type | Results |           |               |                                                                                     |                                                                      |  |
|      |               |                             |      |         | 0.30      |               |   | TOPSOIL (Dark brown slightly silty fine SAND)                        |  |
|      |               |                             |      |         |           |               |  | Orange brown fine to medium slightly clayey to clayey laminated SAND |  |
|      |               |                             |      |         | 4.00      |               |                                                                                     |                                                                      |  |

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| Remarks: |  |
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# Borehole Log

Borehole No  
**WS126**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467266.00 - 108412.00 | Hole Type<br>WLS |
| Location: Waterloooville        | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 25-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |      |         | Depth (m) | Level (m AOD) | Reference | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|------|---------|-----------|---------------|-----------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type | Results |           |               |           |                                                                                                                 |   |
|      |               | 0.30                        | ES   |         | 0.30      |               |           | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 0.50                        |      |         |           |               |           | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            |   |
|      |               | 1.50                        | ES   |         | 2.00      |               |           |                                                                                                                 | 1 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 2 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 3 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 4 |
|      |               |                             |      |         |           |               |           |                                                                                                                 | 5 |
|      |               |                             |      |         |           |               |           |                                                                                                                 |   |

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| Remarks: |  |
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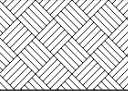
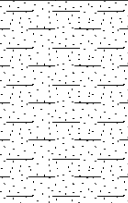
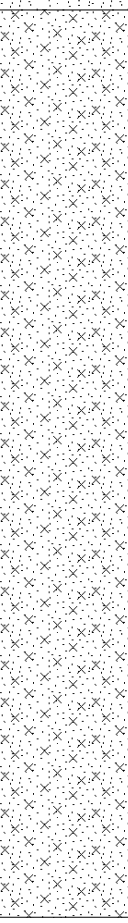


# Borehole Log

Borehole No  
**WS127**

Sheet 1 of 1

|                                 |                     |                                |                  |
|---------------------------------|---------------------|--------------------------------|------------------|
| Project Name<br>Berewood Area 2 | Project No<br>16054 | Co-ords: 467269.00 - 108459.00 | Hole Type<br>WLS |
| Location: Waterlooville         | Level: m AOD        |                                | Scale<br>1:25    |
| Client: Granger PLC             | Dates: 25-01-2013 - |                                | Logged By<br>SS  |

| Well | Water Strikes | Samples and In Situ Testing |         |                  | Depth (m) | Level (m AOD) | Reference                                                                           | Stratum Description                                                                                             |   |
|------|---------------|-----------------------------|---------|------------------|-----------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---|
|      |               | Depth (m)                   | Type    | Results          |           |               |                                                                                     |                                                                                                                 |   |
|      |               |                             |         |                  | 0.30      |               |   | TOPSOIL (Dark brown silty, slightly gravelly fine to medium SAND. Gravel is fine sub-angular to rounded flint.) |   |
|      |               | 0.50<br>0.50-1.00           | ES<br>C |                  |           |               |   | Orange brown fine to medium slightly clayey to clayey laminated SAND                                            |   |
|      |               | 1.00                        | C       | 4,5,5,6,5,6      | 1.00      |               |  | Orange brown mottled grey slightly silty fine to medium SAND                                                    | 1 |
|      |               | 1.50-2.00                   | C       |                  |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 2.00                        | C       | 8,12,16,16,17,18 |           |               |                                                                                     |                                                                                                                 | 2 |
|      |               | 2.50-3.00                   | D       |                  |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 3.00                        | C       | 9,10,13,11,13,13 |           |               |                                                                                     |                                                                                                                 | 3 |
|      |               | 3.50-4.00                   | C       |                  |           |               |                                                                                     |                                                                                                                 |   |
|      |               | 4.00                        | C       | 8,7,7,8,7,8      | 4.00      |               |                                                                                     |                                                                                                                 | 4 |
|      |               |                             |         |                  |           |               |                                                                                     |                                                                                                                 | 5 |

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| Remarks: Collapsed to 3.0mbgl |  |
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