



# **Flood Risk Assessment & Drainage Strategy**

Bartons Road, Havant

24-097-002 Rev -  
July 2025



Charles & Associates

# Document Control Sheet

|                 |                                           |
|-----------------|-------------------------------------------|
| Project Name:   | Bartons Road, Havant                      |
| Project Number: | 24-097                                    |
| Report Title:   | Flood Risk Assessment & Drainage Strategy |
| Report Number:  | 002                                       |

| Rev | Issue Purpose          | Author | Checked | Reviewed | Approved | Date        |
|-----|------------------------|--------|---------|----------|----------|-------------|
| -   | DRAFT                  | MT/SAC | GAC     | SAC      | GAC      | 25/07/ 2025 |
| A   | PLANNING<br>SUBMISSION | MT/SAC | GAC     | SAC      | GAC      | 30/7/2025   |
|     |                        |        |         |          |          |             |
|     |                        |        |         |          |          |             |
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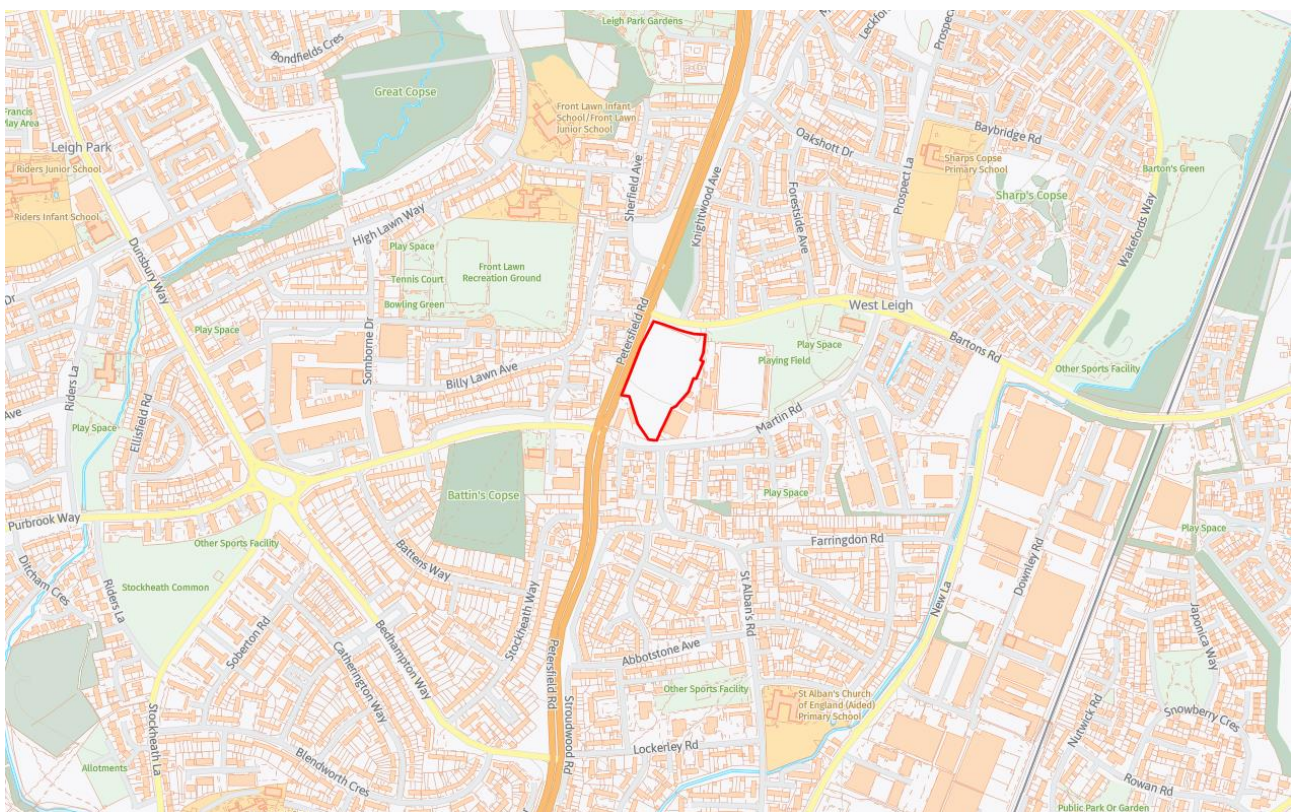
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# 1 Introduction & Existing Site

## 1.1 Introduction

- 1.1.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Charles & Associates (C&A) on behalf of Stonebond Properties (Guildford) Ltd in support of a detailed planning application for the development of 90 dwellings with associated landscaping, parking and improved access.
- 1.1.2 The site is located as shown in Figure 1.1 below, herein referred to as “the site”. The Local Planning Authority (LPA) is Havant Borough Council (HBC), and the Lead Local Flood Authority (LLFA) is Hampshire County Council (HCC). The site’s National Grid Reference is SU721080.

**Figure 1-1: Location Map**



## 1.2 Purpose

- 1.2.1 This FRA has been prepared to demonstrate that flooding and drainage issues will not constrain the development of the site. It also confirms that the site will conform to the recently published national standards for sustainable drainage (SuDS) and the local requirements set out by HCC as LLFA and also HBC.

- 1.2.2 In terms of surface water drainage and potential for flooding, it examines the site's suitability in planning policy terms and physical characteristics to allow suggested solutions to deal with drainage in the developed state, thus ensuring the site is drained in a sustainable manner whilst not adversely impacting on the surrounding area.
- 1.2.3 The provisions of the National Planning Policy Framework (NPPF, revised in December 2024) have been considered in preparing the Flood Risk Assessment, together with The Flood & Water Management Act 2010. In addition, attention has also been paid to the National Planning Practice Guidance (NPPG) and policies within the Local Plan. This FRA also follows the guidance provided by Hampshire County Council (HCC) as the LLFA on the preparation of a surface water drainage strategy.

### **1.3 Report Limitations**

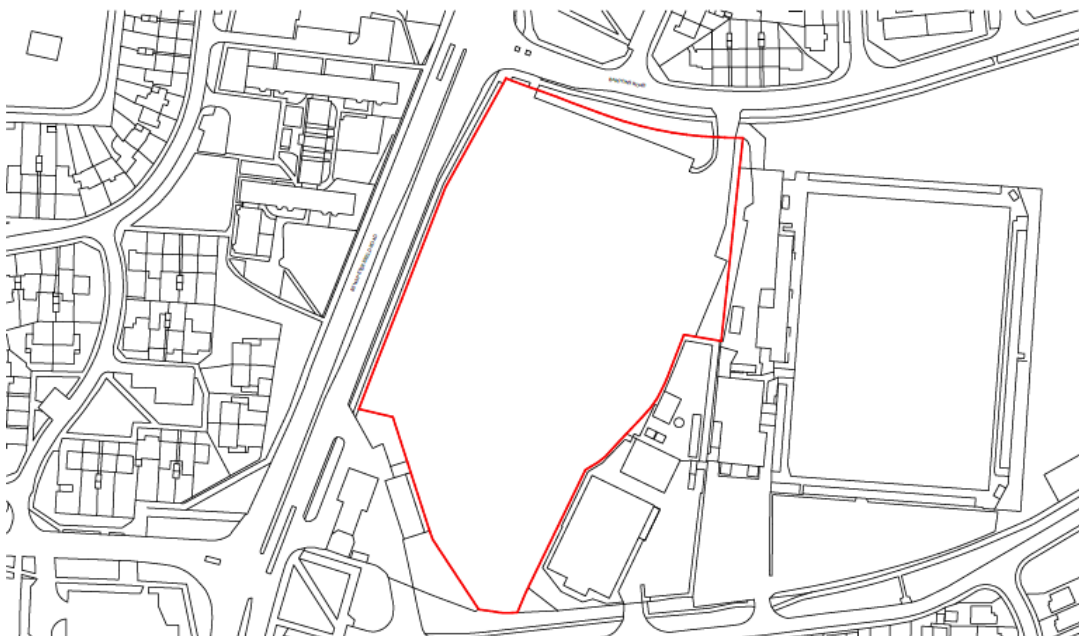
- 1.3.1 The findings, recommendations and conclusions of this report are based on information obtained from a variety of external sources which are understood to be reputable. However, C&A Consulting Engineers cannot guarantee the authenticity or reliability of any data and/or records provided by third parties.

## 2 Site Description & Environmental Setting

### 2.1 Location

- 2.1.1 The site is located off Bartons Road, in the town of Havant in the southeast corner of Hampshire. The town is located approximately 8km northeast of Portsmouth and along the South Coast. The site is surrounded by Bartons Road to the north, the B2149 (Petersfield Road to the east, a Used Car and Service Centre in the southwest and Martin Road to the South. To the east of the site there is a small industrial area and beyond this Westleigh Park which is home to Havant & Waterlooville Football Club. The site is in a built up and residential area approximately 2km from Havant Town Centre.

**Figure 2-1 Site Location**

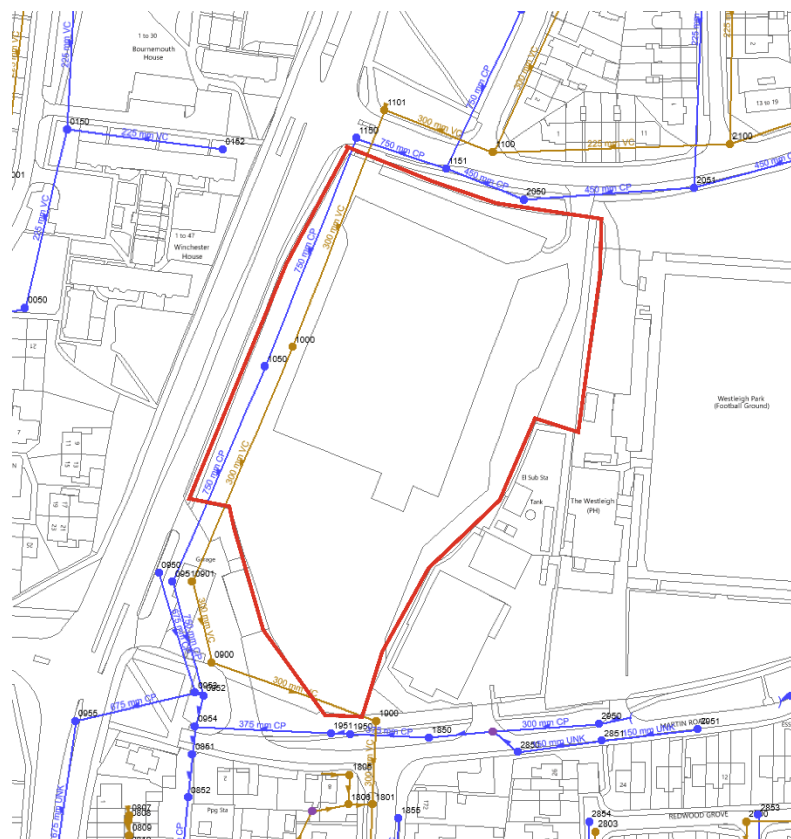


### 2.2 Topography and Existing Drainage

- 2.2.1 The Topographic Survey by Encompass Surveys, (See **Appendix A**) shows that the site slopes generally from the north to the south, with a stockpile of hardcore in the middle of the site. Excluding the stockpile of hardcore currently on the site, the highest point on the site is 22.09m AOD (metres above Ordnance Datum) in the northeast corner by the site access. The lowest point on the site is southern part of the site at 18.51m AOD.
- 2.2.2 The site is currently brownfield and previously housed the SSE regional headquarters, including associated infrastructure. The buildings were demolished under prior approval (reference: APP/16/00940) in 2016, and the site has since been cleared.
- 2.2.3 Prior to demolition it is most likely that the majority of the site would have been impermeable.

- 2.2.4 There is an existing 750mm dia surface water sewer and a 300mm dia foul sewer running north/south within the Site close to the western boundary with the B2149 Petersfield Road. The foul sewer then flows east just inside the southern boundary of the Site before turning south across Martin Road.
- 2.2.5 A 375mm dia surface water sewer runs in a westerly direction within the northern verge of Martin Road, just to the south of the Site. This discharges to the 750mm dia sewer referenced above, see Figure 2.2. Full sewer records are included in **Appendix B**.

**Figure 2.2 Sewer Records Extract**



## 2.3 Geology

- 2.3.1 A review of the British Geological Society's (BGS) records confirms that the site is predominantly underlain by the Bognor Sand Member – Sand, with no superficial deposits within the proposed site boundary, see Figures 2.2 and 2.3 below.

Figure 2-2 Bedrock Geology from BGS

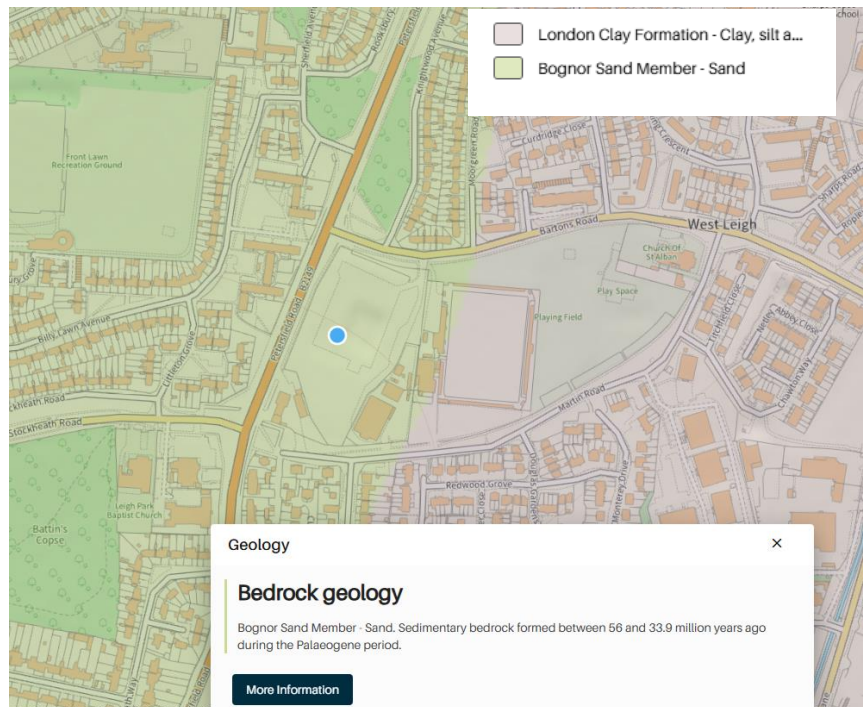


Figure 2-3 Superficial Geology



- 2.3.2 A review of the Department for Environment, Food & Rural Affairs (DEFRA) “Magic Map” confirms that the site is within a Groundwater Source Protection Zone. The site is within Zone 1 – Subsurface Activity which means the site is around an abstraction point for domestic supply or for food production purposes. Activities below the surface, such as underground storage of hazardous substances, deep drilling, or excavations, can create pathways for pollutants to enter the groundwater. The Site is also underlain by a Secondary A Aquifer in Bedrock but is not underlain by a Superficial Drift deposit but there are Head Deposits along the eastern boundary of the site. Refer to Figures 2-4 to 2-6.

**Figure 2-4: Bedrock Aquifer Map**



**Figure 2-5 Superficial Aquifer Map**

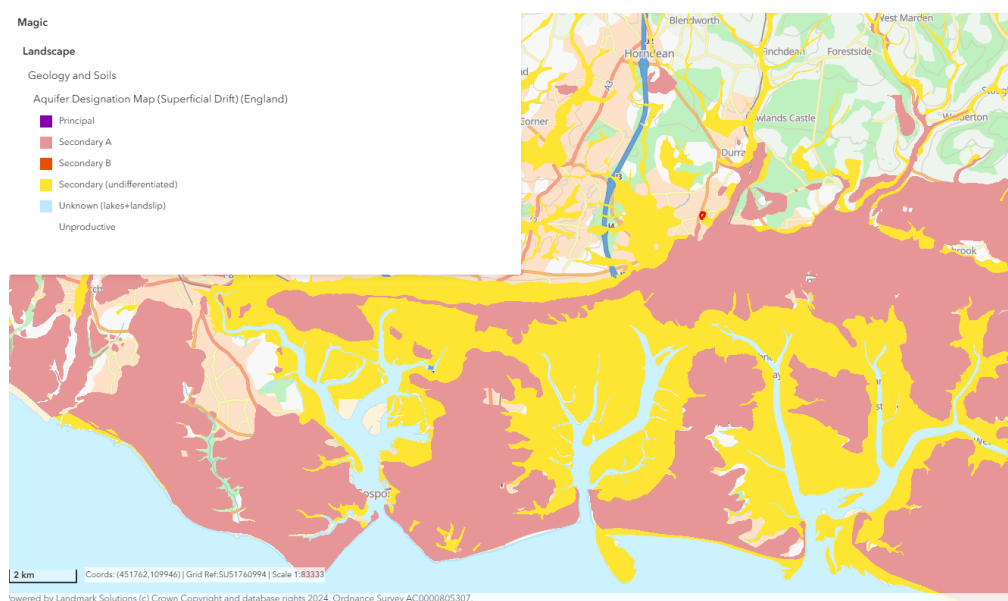
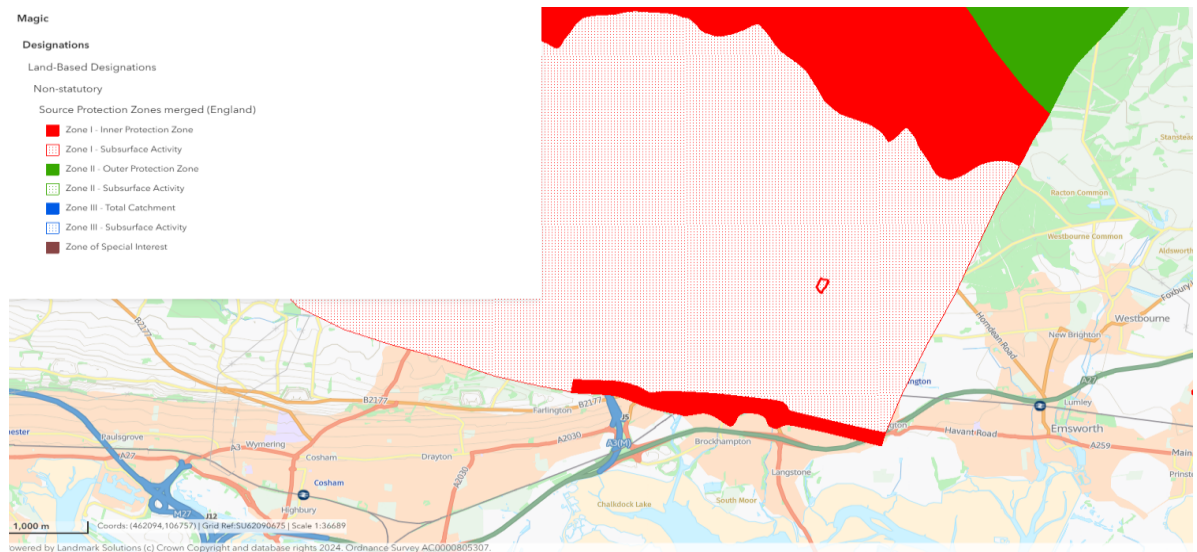


Figure 2-6 Magic Maps Ground Water Protection Zone



- 2.3.3 A Geo- Environmental Assessment was undertaken by BRD Environmental Limited in April 2025 which is shown in **Appendix C** of this report. As part of this assessment soil logs and infiltration testing were undertaken. The soil logs demonstrate the presence of Made Ground followed by a layer of alluvium then Head deposits in some trial pits then Bognor Sand Member at the bottom of each trial pit.
- 2.3.4 There were three Trial Pits undertaken across the site, on all three of the trail pits there was a slow pace of infiltration. The Trail pits were dug to 1.8m to 2.1 below ground level. The infiltration testing of the three trail pits were in accordance with BRE 365. No groundwater seepages were encountered in any of trail pits formed during the latest investigation. Therefore, the report summarises that infiltration is unlikely to be a viable option on site due to the slow infiltration rates received for the surface water drainage strategy. Refer to **Appendix C** for the full report and Table 1 below for Soil Infiltration Rates and Stratum encountered.

Table 1 Soil Infiltration Rate

| TRIAL PIT | TEST   | SOIL INFILTRATION RATE    | STRATUM TESTED                                                                                                                                            |
|-----------|--------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| TP301     | Test 1 | $2.52 \times 10^{-5}$ m/s | 0.20m-1.00m bgl: Sandy coarse subangular GRAVEL (Made Ground)                                                                                             |
|           | Test 2 | $2.18 \times 10^{-5}$ m/s | 1.00m-1.80m bgl: Silty fine SAND (Bognor Sand Member)                                                                                                     |
|           | Test 3 | $2.13 \times 10^{-5}$ m/s |                                                                                                                                                           |
| TP302     | Test 1 | $2.37 \times 10^{-6}$ m/s | 1.00m-1.30m bgl: Slightly sandy slightly organic CLAY (Alluvium)                                                                                          |
|           | Test 2 | $2.30 \times 10^{-6}$ m/s | 1.30m-1.90m bgl: Clayey sandy medium to coarse sub-rounded to sub-angular GRAVEL (Head Deposits)<br>1.90m-2.10m bgl: Silty fine SAND (Bognor Sand Member) |
| TP303     | Test 1 | $2.36 \times 10^{-6}$ m/s | 0.30m-1.00m bgl: Slightly gravelly slightly sandy CLAY (Head Deposits)                                                                                    |
|           | Test 2 | $2.06 \times 10^{-6}$ m/s | 1.30m-1.70m bgl: Sandy very clayey medium to coarse sub-rounded GRAVEL (Head Deposits)<br>1.70m-2.10m bgl: Silty fine SAND (Bognor Sand Member)           |

### 3 Development Proposals

- 3.1.1 This FRA has been prepared in support of a detailed planning application in relation to the construction of 90 residential units.
- 3.1.2 A Site masterplan illustrating the site layout of the development and parking provision has been prepared by Edgingtons on behalf of Stonebond Properties (Guildford) Ltd. and is provided within **Appendix D** of this report.
- 3.1.3 The site is allocated in the 2014 Havant Borough Adopted Local Plan, Reference L145. It is currently included within the emerging “Draft Building a Better Future Plan” which has recently been consulted on.
- 3.1.4 The Allocation Reference 18 within the emerging plan describes the Site as;

*This site was formerly occupied by the Electricity Board which included a large three storey office building. The site was cleared following the demolition under prior approval (reference APP/16/00940) in 2016. The site is located in a prominent position on the corner of Petersfield Road and Bartons Road and to the west of Havant and Waterlooville Football Club.*

## 4 National Policy, Local Planning Policy & SuDS Guidance

### 4.1 National Planning Policy

4.1.1 The National Planning Policy Framework (NPPF) NPPF sets out a robust approach to the Sequential Test and is intended to provide a rigorous understanding of flood risk. Its aim is to steer new development to areas at the lowest probability of flooding (i.e. Flood Zone 1).

4.1.2 The information related to Sequential test is included within section 172 of the National Planning Policy Framework (NPPF, revised in Dec 2024). This states.

*All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:*

*a) applying the sequential test and then, if necessary, the exception test as set out below;*

*b) safeguarding land from development that is required, or likely to be required, for current or future flood management;*

*c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and*

*d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.*

4.1.3 In addition, section 175 of the National Planning Policy Framework (NPPF, revised in Dec 2024) states that;

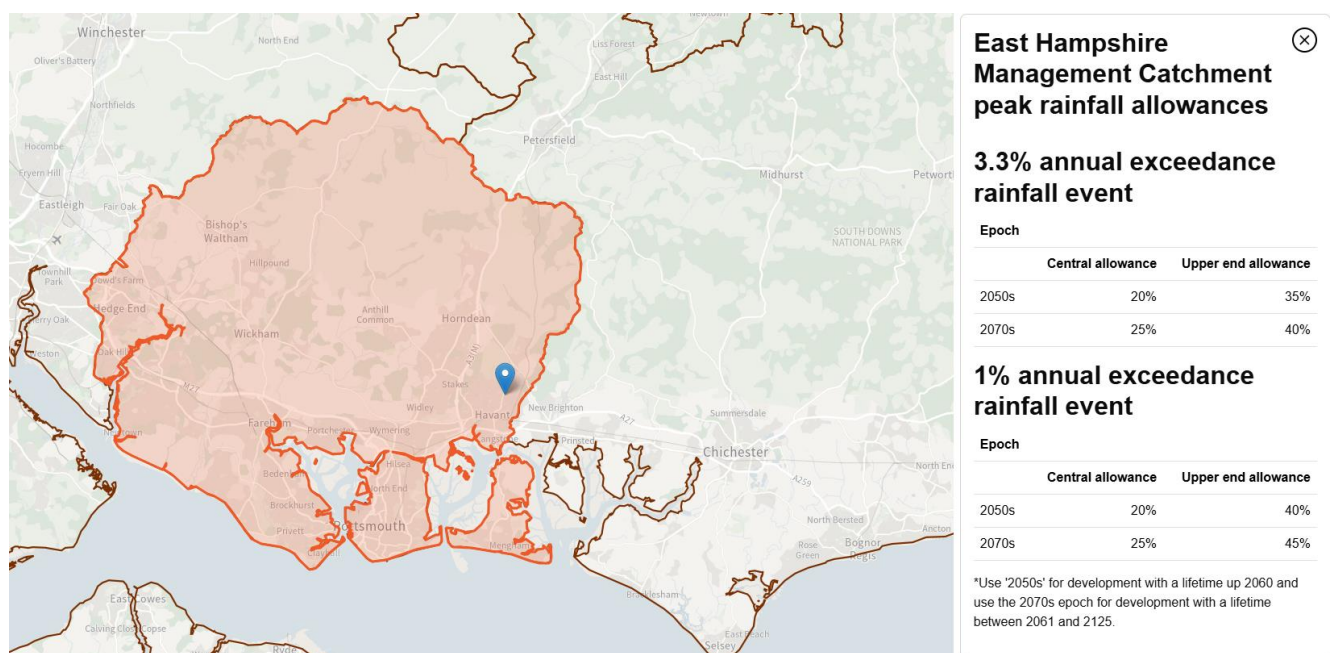
*The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).*

- 4.1.4 The NPPF is supported by Planning Practice Guidance (PPG), the latest PPG flood risk update being published in February 2024. This guidance provides further information on the requirements for flood risk assessments including sustainable drainage systems (SuDS) which should be included in FRAs. The PPG advises on flood risk vulnerability, flood zone compatibility and operation and maintenance of SuDS systems.

## 4.2 Climate Change

- 4.2.1 Based on the most recent advice on climate change reported in NPPG, peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future. It is recommended that considerations for future climate change are included in Flood Risk Assessments for proposed developments.
- 4.2.2 The Department for Environment and Rural Affairs has produced a Climate Change Allowance map for the country. The map provides information on the peak rainfall allowance depending on the Management Catchment the site relates to.
- 4.2.3 Having reviewed the Climate Change Allowance map the site lies within the East Hampshire Management Catchment. Figure 4-1 below summarises climate change allowances within this catchment. The surface water drainage strategy will be designed to 100 year plus 45% climate change.

**Figure i-1 Climate Change Allowances**



## 4.3 Regional Policy

4.3.1 As the Lead Local Flood Authority (LLFA), Hampshire County Council produced a Local Flood Risk Management Strategy in 2013. The main objective of this document was to set out a strategy to cover their statutory roles along with our aspirations and their believe to be morally right with regard to flood and water management in Hampshire. This document provides the platform for a broad-based approach and is part of a family of documents that together set out the County Council's strategy and policy for flood risk and water management in its widest sense. The main aim of the document is to protect people, homes, businesses and key infrastructure by:

- *Avoiding risks and managing water resources through effective planning and design;*
- *Preventing future flooding by reducing or removing existing risks;*
- *Adapting to flood risk in order to minimise the impact and enable normal life to return as soon as possible.*

4.3.2 The document sets out seven policies in which practical steps Hampshire County Council will undertake in order to achieve its vision for flood risk management in Hampshire. Each of these principles recognises the ongoing effects of climate change and new building development.

*Policy 1. To ensure collaboration and successful flood risk management Hampshire County Council will undertake effective partnership working:*

*A number of different bodies, from central government to local councils, have a role in flood risk management and working in partnership is essential to achieving effective action.*

*Policy 2. To better understand the risks associated with the movement of water Hampshire County Council will develop a catchment approach to flood and water management:*

*A catchment approach based on geographic river catchment boundaries will be adopted. Ensure measure to reduce flood risk in the catchments by using natural flood risk management.*

*Policy 3. To help protect communities that are most vulnerable to flooding, Hampshire County Council will continue to identify risks and develop clear priorities.*

*Policy 4. To ensure successful and sustainable growth Hampshire County Council will support the planning process by encouraging resilient development:*

*Development of new housing, jobs and infrastructure is vital to improve the prosperity of the county and enhance the standard of living for our residents. The Lead Local Flood Authority is a key consultee in the planning process. In order to guide Local Planning Authorities to approving development which will not increase flood risk, Hampshire County Council will implement the following actions:*

*4A. Encourage the development of robust flood risk management policies within the Local Planning Authorities' Local Plans.*

*4B. Require developments to utilise Sustainable Drainage Systems (SuDS) and the drainage hierarchy based on current best practice and industry standards for water quality and quantity.*

*4C. Encourage development which demonstrates an understanding of environmental sensitivity and provides appropriate mitigation.*

*4D. Require development to demonstrate a net environmental gain in local flood risk management*

*4E. Ensure that works to Ordinary Watercourses are only consented where there is no increased flood risk and enforce against unconsented works where appropriate.*

*4F. Work with the Environment Agency, local planning authorities and other partners to develop the planning skills and capabilities to advise developers on how adaptive approaches should inform strategic local plans, and enable climate resilient places.*

*Policy 5. To increase knowledge and understanding of flood events Hampshire County Council will record, prioritise and investigate instances of flooding:*

*Policy 6. To reduce flood risk in vulnerable areas Hampshire County Council will work with Multi-Agency Groups to develop Flood Alleviation Schemes:*

*Policy 7. To improve adaptation to and recovery from flood events Hampshire County Council will encourage and support community resilience.*

## **South Hampshire Strategic Flood Risk Assessment – Part 4 Havant Borough Council**

- 4.3.3 AECOM were commissioned by Portsmouth City Council on behalf of the ten planning authorities in South Hampshire to prepare an updated Level 1 Strategic Flood Risk Assessment, this included the Havant Borough. The report was published in June 2024. The report sets out the sources of flood risk and the risk of them occurring, effects of climate change, management measures, opportunities to reduce the cause and impact of flooding whilst addressing flood risk in development.
- 4.3.4 The Level 1 SFRA states that:
- “New developments will need to manage drainage so that there is no net increase in flood risk.”
- “Surface Water Management systems ensure all runoff is restricted to greenfield runoff rates, with preference to greenfield runoff rates with brownfield sites, in accordance with best practice and industry standard for water quality and quantity.”
- “All new development should utilise SuDS where applicable.”
- 4.3.5 The flood risk and drainage talked about above have been addressed by this in the FRA, particularly the surface water attenuation and the surface water management of the drainage ensuring greenfield runoff and water quality.

## **4.4 Local Policy**

### **Havant Borough Core Strategy – Local Development Framework.**

- 4.4.1 Havant Brough Council created a Core Strategy, adopted in 2011, which describes the council’s long-term vision and objectives for what the borough will be like in 2026.
- 4.4.2 The Council was working on a new local plan to replace the Core Strategy and Allocations plan. This went through multiple stages of consultation, but an independent inspector raised a number of concerns, leading to the plan being withdrawn in 2021.
- 4.4.3 In the Core Strategy Policy CS15 Flood and Coastal Erosion Risk states what developments need to achieve and require in terms of flood risk and drainage:

*Development in areas at risk of flooding now and in the future as identified on the latest Environment Agency flood risk maps and Strategic Flood Risk Assessment climate change maps will only be permitted where:*

- 1. It meets the sequential and exception test (where required) in relation to PPS25.*
- 2. The site is located in a low hazard area as defined in the Strategic Flood Risk Assessment.*

- 3. A site-specific flood risk assessment demonstrates that the development will be safe, including the access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
- 4. The scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site.*
- 5. Appropriate flood warning and evacuation plans are in place.*
- 6. New site drainage systems are designed taking account of events which exceed the normal design standard.*

*All development will be required to ensure that there is no net increase in surface water runoff. Priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it is proven that SuDS are not appropriate. Where SuDS are provided arrangements must be put in place for their whole life management and maintenance.*

## **Havant Borough Council - Draft Building a Better Future Plan 2025**

- 4.4.4 Havant Borough Council's emerging local plan "Building a Better Future" (January 2025) includes the following draft Policies relating to flooding and drainage

### **Policy 26**

a) Planning permission in areas at risk of flooding now, or in the future taking into account climate change, will be granted where:

- i. The proposal passes the sequential and exception tests as set out in the NPPF, the PPG and relevant local guidance;
- ii. The development will be safe over its lifetime without increasing flood risk elsewhere;
- iii. Any proposed flood protection, resilience and resistance measures address the specific requirements of the site, and are appropriate to the character, residential amenity and biodiversity of the site and the area;
- iv. Opportunities have been explored and incorporated into the design which reduce flood risk;
- v. Where necessary, appropriate flood warning and evacuation plans are in place; and
- vi. Where necessary, a contribution has been made towards any identified flood alleviation or defence scheme(s).

### **Policy 27**

#### **Surface Water Management in all new Development**

Planning permission will be granted where current and future drainage needs, including for the expected climate change scenario, have been fully considered and:

- a) The drainage needs of the site are met in full over the lifetime of the development and flood risk is not increased elsewhere;
- b) The drainage strategy incorporates SuDS, unless there is clear evidence that this would be inappropriate, and is in line with the hierarchy of drainage options; and
- c) Adequate arrangements are in place for the lifetime maintenance of the surface water management systems.

### **Major Development**

In addition to criteria (a).- (c) above, on major development, planning permission will be granted only where

d) The surface water management system ensures that the post development rate of flow is:

- i. on greenfield sites: restricted to the greenfield run-off rate;
- ii. on brownfield sites outside of identified Priority Areas: restricted to below the pre-development rate of flow; and
- iii. on brownfield sites in identified Priority Areas: produce a 50% betterment on the pre-development rate of flow.

## 5 Evaluation of Potential Sources of Flooding

### 5.1 Definition of the Flood Hazard

- 5.1.1 Flood Zones are defined in Table 1 of NPPF – Technical Guidance Document. The Flood Zones refer to the probability of flooding from rivers, the sea and tidal sources and ignore the presence of existing defences, as these can be breached, overtopped and may not be in existence for the lifetime of the development.

### 5.2 Sources of Flooding

- 5.2.1 NPPF identifies six potential sources of flooding that require investigation:

- Flooding from sea or tidal flooding;
- Flooding from the rivers or fluvial flooding;
- Flooding from land;
- Flooding from groundwater;
- Flooding from sewers;
- Flooding from reservoirs, canals, and other artificial sources.

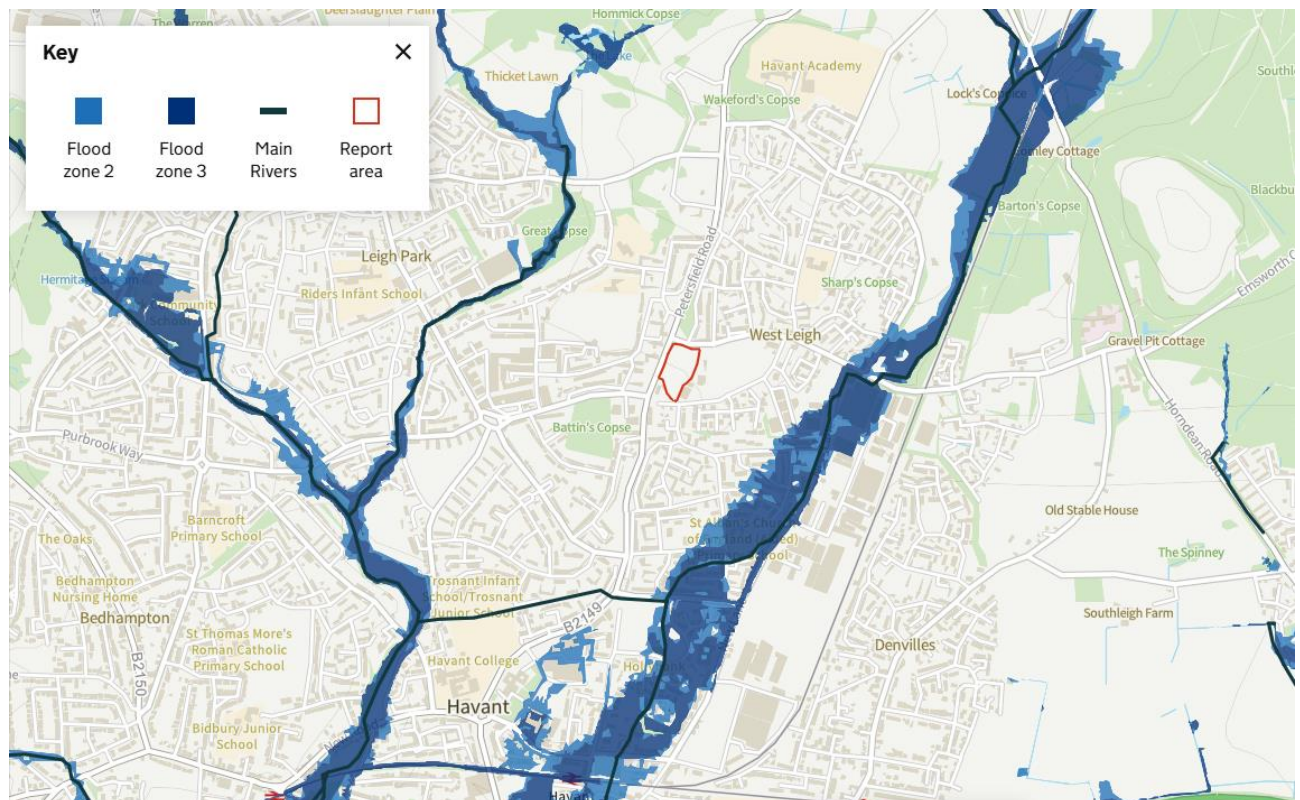
### 5.3 Flooding from Rivers of Tidal Flooding

- 5.3.1 Tidal flooding in general happens when there are exceptionally high tides due to storm surges. Storm surges are generally associated with increases in water levels due to the changes in atmospheric pressure and wind generated by storms.
- 5.3.2 The site has an elevation of 22.10m AOD and 18.50m AOD and is therefore not at any risk from sea or tidal flooding

### 5.4 Flooding from Rivers (Fluvial Flooding)

- 5.4.1 A fluvial, or river flood, occurs when the water flowing in the channel overflows its banks and spreads out onto the surrounding land. Heavy rainfalls, long periods of rain, impermeable rock, steep slopes are some of the issues generally associated with an increase of river levels causing river flooding.
- 5.4.2 The Site is located in Flood Zone 1, the lowest level of flood risk. This means that in any year the Site has a less than 0.1% (1 in 100 year) chance of flooding from rivers or the sea. Refer to Figure 5.1 below. Therefore, the site is to be considered at a low-risk fluvial flooding.

Figure 5-1 Flood Map for Planning



## 5.5 Flooding from Land (Pluvial Flooding)

- 5.5.1 Intense rainfall, often of short duration, which is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. Increased run-off from developed areas consisting of impermeable surfaces can increase overland flows. If the flow paths of these overland flows are not carefully considered during the detail design and planning stages, flooding from overland flows could occur.
- 5.5.2 Surface water flood maps were obtained from the Government website. Refer to Figures 5.2 and 5.3 below for 1 in 30 year (high risk) and 1 in 100 year (medium risk). These Surface Water flood risk maps show there is some surface water flood risk on the site.

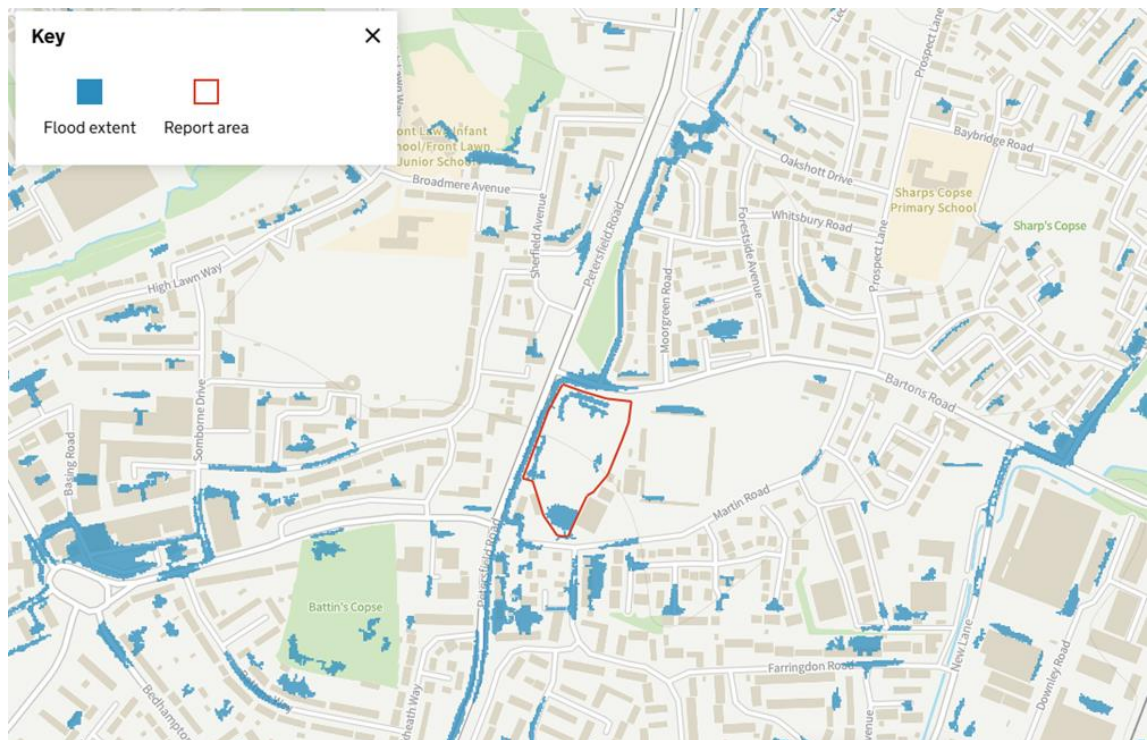


Figure 5-2 Surface Water Flood Risk 1 in 30 year (high risk)

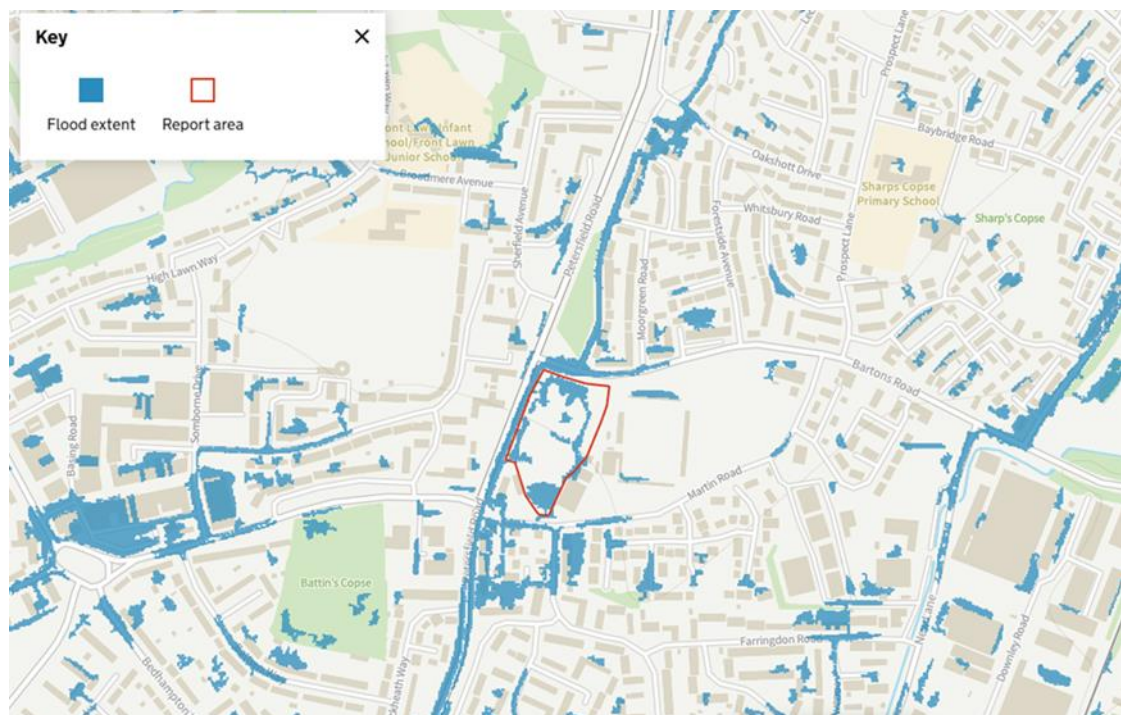


Figure 5-3 Surface Water Flood Risk 1 in 100 year (medium risk)

5.5.3 These risks fall into two categories

- (i) a surface water flow path running north/south through the site along the western boundary.
- (ii) Localised ponding within the Site

### Flow Path Through the Site

5.5.4 This flow path is shown on the EA's mapping (see Figures below) to enter the Site from north of Barton Road and flow south along the western boundary with Petersfield Road exiting the Site to the south.

5.5.5 No built development other than parking areas will be located within the path of this flood route which will be allowed to pass through the Site. Mapping from the Government website shows that the yearly chance of flooding up to 2060 will result in less than 30cm flood depth across the Site, see Figure 5.4

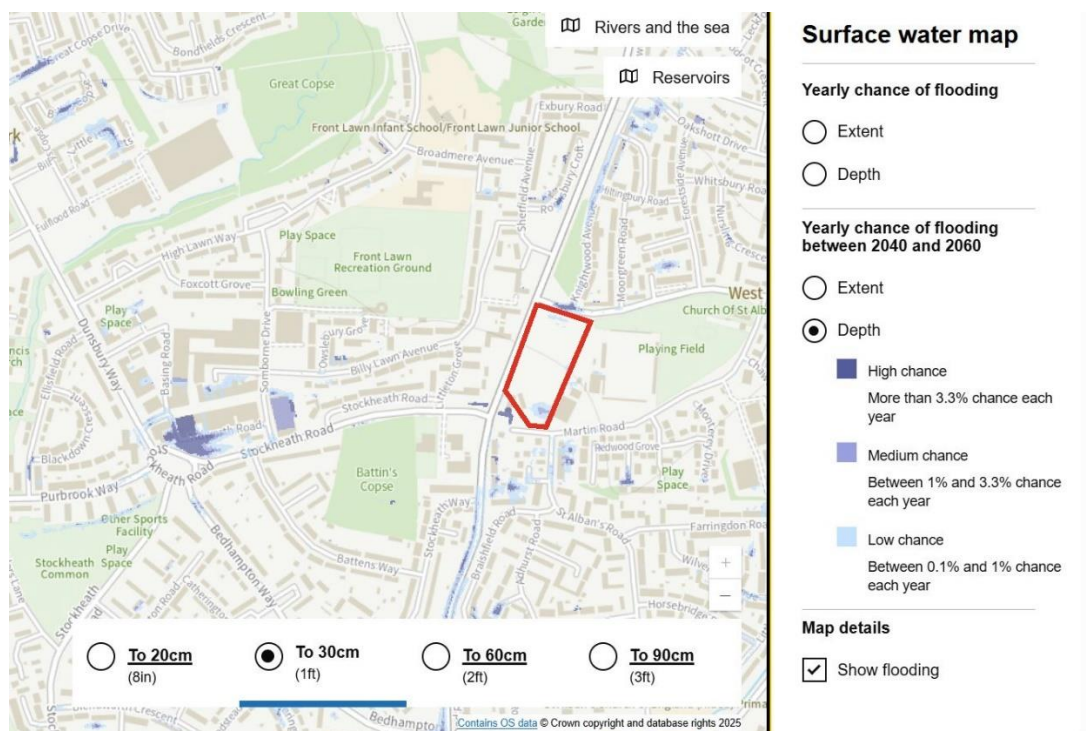


**Figure 5-4 Surface Water Flood Depths to 2060**

5.5.6 There are a number of areas of ponding shown on the site due to depressions in the natural topography before the ground rises again to the boundaries so water ponds in extreme rainfall events. As Figure 5.4 shows however these areas are relatively shallow, less than 30cm deep.

- 5.5.7 A new surface water drainage regime, in the form of a SuDS and surface water strategy, will be implemented on the development which will provide dedicated attenuation for surface water runoff from the site. This is described in **Sections 6 and 7**. The risk to the site from surface water flooding is therefore considered to be very low.

## **5.6 Flooding from Sewers**

- 5.6.1 Local urban drainage should be considered, as every drainage system has a design capacity, which at some point can be exceeded. Sewer and surface water flooding generally results in localised short-term flooding caused by intense rainfall events which overload the capacity of sewers or runs off adjacent land as sheet flow. Flooding can also occur as a result of blockage, poor maintenance, or structural failure.
- 5.6.2 The Level 1 SFRA includes a plan showing sewer flooding events recorded by Southern Water. None of these are close to the Site therefore, the risk of flooding from sewers is very low.

## **5.7 Flooding from Groundwater**

- 5.7.1 Groundwater flooding generally occurs when water levels in the ground rise above surface elevations. Severe storm events could cause groundwater levels to rise above ground level. Underlying geology is the principal factor that effects groundwater flooding. Groundwater flooding most commonly occurs in low lying areas which are underlain by permeable rocks or aquifers.
- 5.7.2 The Level 1 SFRA provides mapping on susceptibility of Groundwater Flooding. The Site has a “Limited potential for groundwater flooding to occur”. Furthermore, from the site infiltration testing done by BRD Environmental there was no groundwater seepage in the three trial pits which were dug. Therefore, the risk of groundwater flooding is very low.

## **5.8 Flooding from Reservoirs, Canal, and other Artificial Sources**

- 5.8.1 The main cause for flooding from a reservoir would be a structural failure in the walls of the reservoir or some form of accident-causing significant damage to the structure of the reservoir. This is highly unlikely.
- 5.8.2 Reservoir flood maps are available from the government website and in this case show the site is clear of the maximum extent of flooding from reservoirs. Therefore, the site is considered to be at very low risk from flooding from artificial sources.

## 5.9 Sequential Test

- 5.9.1 The proposed development is located in Flood Zone 1 (little to no risk of flooding) and although there is some surface water flooding on the Site this will be accommodated within the proposed drainage strategy as noted above. Therefore, a Sequential Test is not required. This has been confirmed by the LPA in an email dated 30<sup>th</sup> June 2025, see **Appendix E**.
- 5.9.2 The proposed development is a residential scheme, and therefore, can be classified as 'More Vulnerable' to risk of flooding. It is consistent with the appropriate uses, as outlined in the NPPF.

## 6 Hierarchy of Surface Water Disposal

6.1.1 In line with the NPPG and Building Regulations Part H, the following hierarchy of surface water disposal should be adhered to, in decreasing order of preference:

- Discharge to ground.
- Discharge to a surface water body.
- Discharge to a surface water sewer.
- Discharge to a combined sewer.

### 6.2 Discharge to Ground

6.2.1 The most effective way to reduce surface water runoff is through infiltration into the subsoil which reduces the total volume of runoff, rather than simply reducing peak flows. This can include features such as infiltration trenches, soakaways, detention basins, and permeable paving.

6.2.2 Infiltration testing, as described in Section 2.3 and shown in Table 1, has been undertaken. The results of which have shown that the infiltration rates are not conducive for the use of infiltrating SuDS features to be used effectively across the site. Therefore, infiltration has not been considered as a method of surface water disposal.

### 6.3 Discharge to a Surface Water Body

6.3.1 Due to the location of the site in a built up area surrounding by residential areas there are no watercourses within the vicinity therefore, discharging to a surface water body is not a viable option.

### 6.4 Discharge to a Surface Water Sewer

6.4.1 The site is surrounded by surface water sewers as shown in **Appendix B**. Therefore, a gravity fed system can be achieved into the Southern Water surface water sewer in Martin Road connection into Manhole Reference number S1951.

## 7 Surface Water Management Proposal

### 7.1 Existing Surface Water Run Off

7.1.1 The existing site was formerly occupied by a large office block which has recently been demolished. In its developed state the site would have been virtually fully impermeable and surface water run off would have discharged uncontrolled to the local surface water drainage network.

7.1.2 In order to assess the current discharge from the site, the Modified Rational Method has been used to predict the current surface water discharge rate from the site for a range of storm events using the following formula, assuming 80% of the original site area was impermeable.

$Q = 2.78 * C * i * A$  Where:

Q = Peak Discharge (l/s)

i = Rainfall Intensity (mm/hr) (50.8 mm/hr for 1yr, 5 min storm TRRL Report 595)

A = Impermeable Area (ha)

C = Runoff Coefficient

7.1.3 Using the above formula peak run off rates from the existing site were calculated for a series of storm events and are summarised in Table 7.1 below

**Table 7.1 Estimated Pre Development Uncontrolled Run Off**

| Storm Event | 1 in 1 year | 1 in 30 Year | 1 in 100 year |
|-------------|-------------|--------------|---------------|
| Run off l/s | 183.55      | 408.45       | 520.05        |

### 7.2 Proposed Surface Water Run Off

7.2.1 Greenfield run off rate calculations have been carried out using the Wallingford Method as presented in the uksuds.com Greenfield Estimation Tool.

7.2.2 The greenfield run-off rates for varying return periods are shown in Table 7.2 below: Greenfield runoff calculations are included within **Appendix F**.

**Table 7.2 Greenfield Run Off Rates**

| Return Period (Years) | Total Calculated Existing Greenfield Site Discharge rate (l/s) |
|-----------------------|----------------------------------------------------------------|
| $Q_{BAR}$             | 7.2.                                                           |
| 1 in 1 year           | 6.12                                                           |
| 1 in 30 year          | 16.5                                                           |
| 1 in 100 year         | 22.9                                                           |
| 1 in 200 year         | 26.8                                                           |

### 7.3 Proposed Surface Water Drainage Strategy

- 7.3.1 A comprehensive sustainable drainage system will be implemented to prevent runoff from this development increasing flood risk to other areas. This will be fully detailed at the detail drainage design stage of the proposed development, although an indicative strategy to demonstrate that a satisfactory SuDS solution can be delivered is described below.
- 7.3.2 The proposed development will be designed to current best practice for both piped drainage (Part H of the Building Regulations) and Sustainable Drainage (CIRIA C753 – The SuDS Manual).
- 7.3.3 As noted above following the result of infiltration tests on the Site the use of infiltration as a means of surface water disposal is not considered viable. It is therefore proposed to discharge surface water run off from the Development to the existing public surface water sewer network.

### 7.4 Sustainable Drainage Systems

- 7.4.1 Planning Practice Guidance advises that sustainable drainage systems (or SuDS) should be designed to control surface water runoff close to where it falls combining a mixture of built and nature based techniques to mimic natural drainage as closely as possible and accounting for the predicted impacts of climate change. They provide benefits for water quality, biodiversity and amenity. Sustainable drainage systems provide opportunities to;
- reduce the causes and impacts of flooding,
  - remove pollutants from the urban runoff at source,
  - combine water management and green space with benefits for amenity, recreation and wildlife.

## 7.5 Surface Water Drainage Strategy

7.5.1 In view of the requirements of the NPPF, PPG, the LLFA and design parameters and constraints associated with redeveloping this site, a surface water drainage strategy has been devised and hydraulically modelled to demonstrate that a scheme can be suitably implemented in compliance with current standards and practice without increasing the level of flood risk, when the surface water drainage systems experience run off generated by rainfall equivalent to the 1:100 year rainfall event, including a climate change allowance.

7.5.2 The surface water drainage scheme has been designed to ensure:

- Post development run off for peak storm events does not exceed predevelopment levels
- Sustainable Urban Drainage systems are wholly incorporated within the scheme,
- Consideration is given for the improvement of water quality within the design,
- The designed drainage scheme can satisfactorily retain a critical 1 in 100 year storm event with a 45% climate change allowance.

7.5.3 Due to the constrained nature of the site the range of possible viable attenuation devices is limited. A mixture of surface water attenuation measures (non-infiltration) are proposed as the principal method of surface water attenuation for this development. These will include permeable paving with no infiltration to ground and underground geocellular attenuation crates. This is described further below.

7.5.4 Based on the proposed development layout in **Appendix D** potential areas for SuDS attenuation were identified. A breakdown of the proposed methods for disposal of surface water run-off from the different elements within the site is as follows.

- Water run-off from the roof surfaces of the proposed dwellings will be collected using traditional rainwater pipes, discharging locally to underground pipes which will discharge via permeable paved areas/ underground piped network to geocellular attenuation crates underneath parking areas, prior to discharging to the off site sewer.
- Runoff from the main access/internal road areas will drain via trapped road gullies to an underground piped network and into the underground attenuation areas.
- Runoff from parking/driveways will drain via permeable paving discharging to the underground piped network/attenuation crates.
- Patios and footpaths of private dwellings will drain to lawns and soft landscaped areas.

- 7.5.5 Refer to **Appendix H** for the proposed Surface Water Drainage Strategy drawings. These show that run-off will discharge from the Development, at greenfield run-off rates (Qbar) to a Southern Water surface water sewer in Martin Road. The strategy is further explained below.

## 7.6 Surface Water Network and SuDS

- 7.6.1 The surface water network and SuDS will collect all the surface water runoff from the highways, private drives and roofs of garages, houses and apartment blocks. The surface water will initially be collected by either permeable paving or a piped network depending on where the water falls. All surface water runoff from the main road will be collected by the piped network and all surface water runoff on roofs, private drives and shared surfaces will be collected by the permeable paving and then stored within the paving or in tanks which will then discharge into the piped network.
- 7.6.2 To balance the flows within the drainage network discharge from the northern section of the site will be restricted to 4.0l/s. This will be controlled by a hydrodynamic flow control device (Hydrobrake or similar) prior to discharging through the southern network where another control device will restrict discharge to 7.2l/s (QBar for the site) prior to discharging to the Southern Water surface water sewer in Martin Road.
- 7.6.3 The connection to this sewer will be via a new manhole which will be carried out under a Section 106 Agreement of the Water Industry Act 1991.
- 7.6.4 During pre development discussions with Southern Water in respect of capacity within this network, they responded to say that there wasn't sufficient capacity within the network to accept this anticipated level of run off, see their letter of 30<sup>th</sup> April 2025 in **Appendix I**.
- 7.6.5 They suggest in their letter that in developing the site we incorporate SuDS within the drainage networks to mitigate potential for flooding. As demonstrated in this report the introduction of the sustainable drainage system being proposed will provide a significant reduction in run-off from that of the current site.
- 7.6.6 It is therefore considered that this design complies with the requirements of NPPF and the LLFA in respect of a suitable sustainable drainage solution and should be acceptable to Southern Water.

## 7.7 Flow Storage Calculations

- 7.7.1 SuDS guidance (CIRIA C753) recommends an inclusion of additional 10% to account for potential future development (Urban Creep), which has been added to the calculations. The site layout in **Appendix D** was used to assess the impermeable area of the developed site.

- 7.7.2 For the purpose of modelling and sizing the attenuation requirement for proposed SuDS areas, a 45% increase in rainfall intensity has been added to the calculations in accordance with National Guidance on climate change allowances, see **Figure 4.1**. This SuDS strategy will ensure that surface water runoff from the future development will be attenuated and discharged as described above and shown on drawings in **Appendix H**.
- 7.7.3 The surface water drainage system has been modelled against return periods of 1 year, 30 years plus 40% climate change, 100 year and 100 year plus 45% climate change. The calculations demonstrate that the permeable paving, the piped network and underground tanks can attenuate all the surface water runoff from the development whilst discharging at greenfield run-off into a Southern Water surface water sewer. Surface Water calculations are shown in **Appendix G**.
- 7.7.4 The preliminary SuDS system for the development has been designed to accord with current National, Regional and Local Policy and guidance. This guidance will be followed should the site gain planning permission, when full final design details will be developed to release planning conditions and enable construction, including any potential updates resulting from changes to the masterplan.

## 7.8 Water Quality

- 7.8.1 It is important to address issues with regards to water quality when considering surface water management. A SuDS Management Train in accordance with the recommendations of the SuDS Manual (CIRIA 753) and as required by the LLFA has been developed for this site.
- 7.8.2 Chapter 26 of the SuDS Manual provides guidance on methods which should be used to design SuDS to meet water quality design criteria and good practice design standards.
- 7.8.3 Chapter 4 of the SuDS Manual sets out design objectives for maintaining and improving water quality and provides design criteria that should be followed to deliver this objective. **Table 7.3** below, (taken from Table 4.3 of the SuDS Manual) sets out minimum water quality management requirements for discharges to receiving surface waters for the proposed land uses on this Development.

**Table 7.3 Water Quality Management Requirements- SuDS Manual**

| Table 4.3 Extracts                                                                                                                                                                                                                |                        |                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------------------------|
| Land Use                                                                                                                                                                                                                          | Pollution Hazard Level | Requirements for discharge to surface waters |
| Residential Roofs                                                                                                                                                                                                                 | Very Low               | Removal of grass solids and sediments only   |
| Individual property driveways roofs (except residential) residential car parks, low traffic roads (e.g. cul de sacs, home zones, general access roads) non-residential car parking with infrequent change (e.g. schools, offices) | Low                    | Simple index approach <sup>1</sup>           |

<sup>1</sup> The application of the simple index approach should follow the approach outlined in Section 26.7.1

- 7.8.4 Chapter 26 of the SuDS Manual provides guidance on the simple index approach to be used to design SuDS to meet water quality design criteria and good practice design standards. **Table 7.4** (extracts from SuDS manual Table 26.2) provides typical pollution hazards for land use categories on this development.

**Table 7.4 Pollution Hazard Indices – SuDS Manual**

| Table 26.2 Extracts                                                                                                                                                                                                                                      |                        |                              |        |              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------------|--------|--------------|
| Land Use                                                                                                                                                                                                                                                 | Pollution Hazard Level | Total suspended solids (TSS) | Metals | Hydrocarbons |
| Residential roofs                                                                                                                                                                                                                                        | Very low               | 0.2                          | 0.2    | 0.05         |
| Individual property driveways, residential car parks, low traffic roads (e.g. cul-de sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices )i.e.. Less than 300 vehicle movements/day | Low                    | 0.5                          | 0.4    | 0.4          |

- 7.8.5 The indicative SuDS mitigation indices for discharge to surface waters for those features proposed on this development are summarised in **Table 7.5** below (reproduced from appropriate extracts from table 26.3 of the SuDS Manual C753).

**Table 7.5 Mitigation Indices – SuDS Manual**

| TABLE 26.3 Extract |                              |        |              |
|--------------------|------------------------------|--------|--------------|
| Component          | Total Suspended Solids (TSS) | Metals | Hydrocarbons |
| Permeable Pavement | 0.7                          | 0.6    | 0.7          |

- 7.8.6 The run off from this development will be from roof run off, low traffic roads, residential driveways, parking areas etc. and will therefore come within the Low/Very Low hazard classification as noted in **Table 7.3** above.
- 7.8.7 The proposed drainage strategy incorporates a SuDS treatment train for these areas which includes permeable paving with attenuation crates as noted on the drainage strategy drawing in **Appendix H**.
- 7.8.8 From the above Tables the mitigation indices for the permeable paving, 0.7/0.6/0.7 will be greater than the respective maximum hazard indices, 0.5/0.4/0.4 thus providing sufficient mitigation prior to discharging to the off site surface water sewer.
- 7.8.9 The SuDS mitigation indices for the development meet the pollution hazard indices as required by CIRIA SuDS Manual for required pollutants (Total Suspended Solids (TSS), metals and hydrocarbons) for the low-risk classification of this site.

## 7.9 Operation and Maintenance

- 7.9.1 The PPG sets out the requirement for developers to consider the operation, management and maintenance of all SuDS features. The on-Site drainage networks and SuDS will either be adopted by Southern Water or be privately managed and maintained for the lifetime of the development, ensuring that they remain fit for purpose and function satisfactorily.
- 7.9.2 Maintenance and repairs of SuDS features will be undertaken in line with guidance provided within the CIRIA SuDS Manual.
- 7.9.3 **Table 7.4** sets out an indicative maintenance schedule of the anticipated maintenance and repairs, in line with guidance from the CIRIA SuDS Manual

**Table 7.6 Sustainable Drainage Maintenance Regime**

| <b>Suds Feature/Task</b>                                                                                                                                                  | <b>Frequency</b>                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>Underground Attenuation</b><br><br>Inspection of silt traps and removal of any sediment/debris<br><br>Jetting of main structure to remove any sediment build up        | Quarterly or as required<br><br>Annually or as required                                            |
| <b>Permeable Pavements</b><br><br>Inspection and clearing of debris, leaves etc.<br><br>Sweeping and removal of silt and other sediments to maintain infiltration quality | Monthly or as required<br><br>Annually or as required                                              |
| <b>Discharge Control (Hydrobrake)</b><br><br>Removal of sediment<br><br>Inspect for damage and blockages                                                                  | As required<br><br>Monthly for first three months after installation then at six monthly intervals |

## 8 Foul Water Drainage

- 8.1.1 The Sewerage Undertaker for the area is Southern Water Services Ltd. As noted in Section 2.0 above there are foul sewers within the Site, along the western and southern boundaries. Existing records of Southern Water's network within the area are included within **Appendix B** of this report.
- 8.1.2 A foul water drainage strategy for the site has been proposed and is shown on drawing 24-097-004 in **Appendix H** of this report. This shows that it is possible to drain the entire site via gravity to a connection point into the 300mm dia Southern Water foul water sewer in the south eastern corner of the Site. This connection would be carried out under the terms of a Section 106 Agreement in accordance with the Water Industry Act 1991.
- 8.1.3 During pre development correspondence with Southern Water, see **Appendix I** they noted that there is limited capacity within their adjacent networks and that they, as the incumbent sewerage undertaker have a duty to provide sufficient capacity at a suitable connection point, i.e. point of equivalent or larger pipe diameter, such as it proposed.
- 8.1.4 Any upgrades will be funded by New Infrastructure Charges payable to Southern Water by the Developer.

## 9 Flood Risk Management Measures

- 9.1.1 NPPG requires that the safety of people and the proposed development be considered against each source of flooding identified in **Section 5**.
- 9.1.2 A preliminary surface water drainage strategy incorporating SuDS has been proposed to manage the increase in run-off from the site over the lifetime of the development, such that it will not place properties on or off site at increased risk of surface water flooding.
- 9.1.3 The SuDS system including the piped network, permeable paving and geocellular attenuation tanks will be offered to Southern Water for adoption, or maintained by a suitably qualified Management Company for the lifetime of the development, such that it will not place properties either on the site or elsewhere at an increased risk of flooding.
- 9.1.4 The flood risk to the proposed surrounding areas, as a consequence of the development is therefore considered to be low, and no specific flood risk management measures will be required.

## 10 Off Site Impacts

### 10.1 Flood risk elsewhere

- 10.1.1 The proposed site is located in Flood Zone 1 and the surrounding areas are also included in Flood Zone 1. Therefore, the risk of flooding to areas close to the site remains low.

### 10.2 Surface Water Management

- 10.2.1 NPPG states.

*“Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.”*

- 10.2.2 The development proposals, within the indicative surface water drainage strategy, presented in **Section 7** above, confirms that the site can be drained in a sustainable manner.
- 10.2.3 Run-off from the developed site will be significantly reduced from that of the undeveloped site, the majority of which is impermeable with uncontrolled run off, by the implementation of sustainable drainage methods and controlled discharge to greenfield rates.

## 11 Residual Risks

### 11.1 Residual Flood Risk

- 11.1.1 As the site is in Flood Zone 1, there will not be any risk of fluvial flooding, even allowing for future climate change.
- 11.1.2 Extreme rainfall events are generally predictable, but by their nature predictions are based on probability and thus subject to uncertainty. Therefore, a quantifiable residual risk remains that events exceeding those predicted may occur, notably through the surcharging or blocking of sewers or drainage features e.g. gullies.
- 11.1.3 If the drainage system is overwhelmed, either by a storm event with a magnitude greater than that designed for or due to a blockage, the design of the finished site levels will direct flows away from the dwellings and ensure that there is no risk of floodwaters ponding to any significant depth. In addition, the overland flows will be directed towards open spaces areas away from the habitable properties. These are shown on the exceedance flow route plan in **Appendix E**.

### 11.2 Long Term Management

- 11.2.1 For all of the SuDS elements of the scheme HCC, as the Lead Local Flood Authority, will approve the systems in detail. The surface water drainage network, including SuDs will either be adopted by Southern Water or a discrete management Company will be employed to maintain the SuDS elements of the system in accordance with the requirements as set out in the SuDS manual and identified in **Table 7.6** above.

## 12 Conclusions and Recommendations

### 12.1 Overview

- 12.1.1 This report has been commissioned to assess the risk to, and the impact of, a proposed development of the Land at Bartons Road, Havant. It is proposed to provide up to 90 residential dwellings with associated access, parking and landscaping.

### 12.2 Probability of Flooding

- 12.2.1 The site lies within Flood Zone 1, and this means has a very low risk from rivers or the sea. All potential sources of flood risk to and from the site, as listed in NPPF, have been assessed and the risks of flooding occurring have been assessed as **low**. In assessing the flood risk the impacts of climate change have been considered for the lifetime of the proposed development and are also considered acceptable. Surface Water runoff will be dealt with via the use of SuDS to reduce both flood risk both on and off the site.

### 12.3 Sequential and Exception Tests

- 12.3.1 The proposed built development is located in Flood Zone 1 (little to no risk of flooding). Some surface water flooding is present on the Site but this will be managed as part of the proposed drainage strategy to be implemented within the Development. A Sequential Test is therefore not required and this has been confirmed by the LPA.

### 12.4 Flood Risk Management

- 12.4.1 As the development evolves post planning the detailed levels design should consider the routing of exceedance flows around the development to avoid flooding of existing and proposed residential dwellings. A preliminary exceedance plan is included in **Appendix H**.

### 12.5 Offsite Impacts

- 12.5.1 The Surface Water Drainage Strategy set out in this assessment proposes management of surface water run-off from the development through the use of sustainable drainage techniques which will provide an improved surface water drainage regime and flood risk profile.
- 12.5.2 Consequently, this will reduce surface water run-off flows from the site, for storm return periods up to 1 in 100 years plus an allowance for climate change. The proposed development will not increase the risk of flooding elsewhere. The implementation of the SuDS scheme as proposed will reduce any existing risk of downstream flooding.

## 12.6 Foul Drainage

- 12.6.1 Foul run off from the Development will be collected via a piped network and drain to an existing public foul sewer within the south east corner of the Site. Any upgrades will be funded by Southern Water using the New Infrastructure Charges mechanisms.

### Recommendations

## 12.7

- 12.7.1 Due to the positive outcomes of these assessments, there is no reason why the site should not continue through the planning process and be approved for residential development in respect of flood risk surface water and foul drainage.

## Appendices

## Appendix A Topographical Survey

**Drainage:**  
Drainage Covers are fitted where possible and all drainage invert information has been obtained through visual inspection only, with the exception of manholes which are surveyed. The location of drains is not guaranteed. Where drainage is of critical importance we suggest the services of a specialist drainage expert be used.

**Trees:**  
Every effort has been made to identify and detail all trees on site. However, the level of detail of the information we suggest the use of a specialist such as an arborist. Tree spread and heights are indicative.

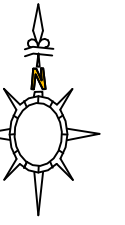
**Survey:**  
Detail is relative to the time and date of survey. GPS levels and grids are obtained using industry standard guidelines and can vary slightly from the actual ground level. The survey is carried out in accordance with British standards, surveys are Scale Factor 1 and Horizontal and Vertical Datum are established from a central site and British Ordnance Survey datum using a GPS control station.

**Survey notes:**  
Survey information is linked to the original purpose of the survey and is not intended to be used for any other purpose only.

**Survey:**  
Survey is accurate within limitations of site conditions at the time of survey. It is an aerial photograph to be used as a reference, lines of sight or dense vegetation, critical dimensions and positions should be confirmed by a certified professional surveyor.

**Survey:**  
Survey detail obtained and shown is relative to the plotting scale.

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### LEGEND

### OVERALL TREE SPECIES INFORMATION

|                |     |                 |     |
|----------------|-----|-----------------|-----|
| ALDER          | ALD | LONDON PLANE    | LPM |
| ASH            | ASH | MAGNOLIA        | MAG |
| ASPEN          | ASP | MAPLE           | MPL |
| BEECH          | BCH | OAK             | OAK |
| CHERRY         | CHY | PINE            | PNE |
| ELM            | ELM | POPULAR         | POP |
| FIR            | FIR | RHOODENDRONS    | RDN |
| FRUIT          | FRF | ROWAN           | RWN |
| HAWTHORN       | HAW | SILVER BIRCH    | SBH |
| HAZE           | HAZ | SWEET CHESTNUT  | SCN |
| HOLLY          | HOL | WALNUT          | WLN |
| HORSE CHESTNUT | HCH | WILLOW          | WLV |
| LIME           | LYM | YEW             | YEW |
| LOCUST         | LOC | SPECIES UNKNOWN | SPU |
|                |     | COPPOD          | COP |

**TREE ANNOTATIONS:** Tree Species / Tree Bole Size / No of Boles

| FENCE INFORMATION       |     | LEVEL INFORMATION |     |
|-------------------------|-----|-------------------|-----|
| BARBED WIRE FENCE       | BWF | BED LEVEL         | BL  |
| CHAIN LINK FENCE        | CLF | COVER LEVEL       | CL  |
| CHESTNUT PALING FENCE   | CPF | FLOOR LEVEL       | FL  |
| CLOZE BOARD FENCE       | CBF | INVERT LEVEL      | IL  |
| CONCRETE SLAT FENCE     | COF | OUTFALL LEVEL     | OL  |
| CONFIGURATED IRON FENCE | CIF | THRESHOLD LEVEL   | THL |
| CRASH BARRIER           | CBA | TOOL WATER        | FW  |
| HANDRAIL                | HCL | SURFACE WATER     | SW  |
| IRON RAILINGS           | IRF | UNABLE TO LIFT    | UTL |

CELLANEUS FENCE

|                      |     |                |       |
|----------------------|-----|----------------|-------|
| PLASTIC FENCE        | PPF | CONCRETE       | Cc    |
| POST AND CHAIN FENCE | PCF | BROCK FENCING  | BP    |
| POST AND RAIL FENCE  | PRF | FLOWERBED      | FB    |
| POST AND WIRE FENCE  | PWF | PAVING SLABS   | PS    |
| SECURITY FENCE       | SOF | RETAINING WALL | RWall |
| STOCK WIRE FENCE     | SWF | SCALPINGS      | Scalp |
| TRELLIS FENCING      | TUF | TACTILE PAVING | Tac   |
| WIRE MESH FENCE      | WMF |                |       |

#### FEATURE INFORMATION

|                       |      |                       |      |
|-----------------------|------|-----------------------|------|
| HOLLAND               | BO   | NAME PLATE            | NP   |
| TELEPHONE IC          | ITFC | NOTICE BOARD          | NPB  |
| BUS STOP              | BS   | PAINT                 | P    |
| CABLE TELEVISION IC   | CATV | RAIN WATER PIPE       | RWP  |
| EARTHING ROD          | ER   | ROAD SIGN             | RS   |
| ELECTRICITY CABLE PIT | ELCP | ROOFSIDE EYE          | RE   |
| ELECTRICITY POLE      | EP   | SERVICE HANDBOOK POST | SHBP |
| FLUE INSULANT         | FI   | SOIL VENT PIPE        | SVP  |
| FLAG POLE             | FP   | STOP VALVE            | SV   |
| GUIDE POST            | GP   | TELEGRAPH POLE        | TP   |
| INSPECTION COVER      | IC   | TRAFFIC SIGNAL TS     | TS   |
| LEAF POST             | LP   | TRAFFIC SIGNALS IC    | TSIC |
| LAMP SOCKET           | LS   | WATCH DOG             | WD   |
| NEED OULET            | NO   | WATER METER           | WM   |

## REVISIONS

Level Datum:

Levels are related to client supplied drawing ref: 21095\_F

Grid:

Grid is related to client supplied drawing ref: 21095\_F



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Website: [encompass-surveys.co.uk](http://encompass-surveys.co.uk)

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Client: Stonebond

|                  |                                 |
|------------------|---------------------------------|
| Survey Location: | Former SSE Depot<br>Barton Road |
|------------------|---------------------------------|

Havant, PO9 5HP

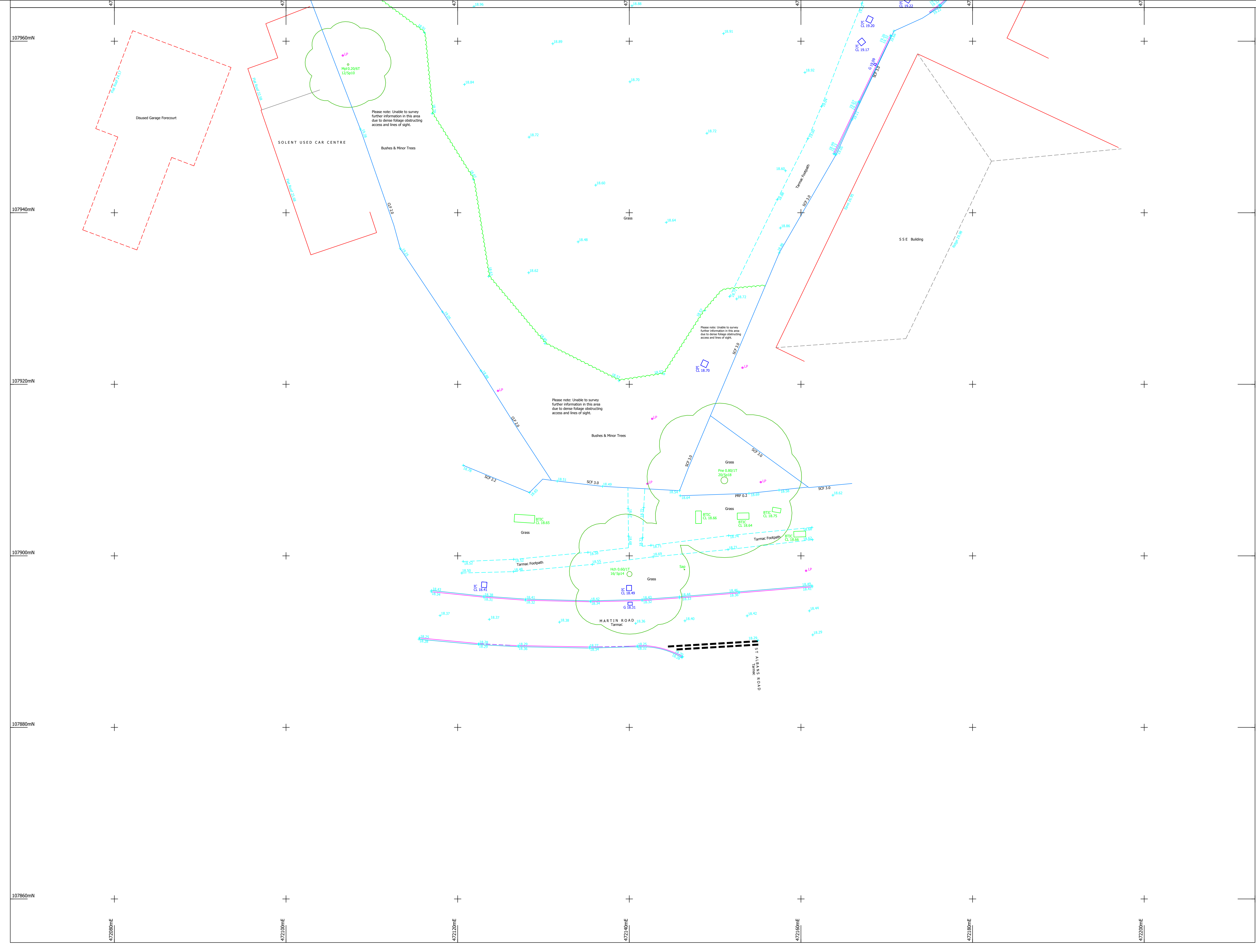
|              |               |        |          |
|--------------|---------------|--------|----------|
| Survey type: | Topographical | Scale: | 1:200@A0 |
|--------------|---------------|--------|----------|

|              |                    |       |           |
|--------------|--------------------|-------|-----------|
| Drawing ref: | FNC/220724/3484 S1 | Date: | July 2024 |
|--------------|--------------------|-------|-----------|

|                                                                      |                                                                      |                                                                      |                                                                      |
|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|
| $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ | $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ | $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ | $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ |
| $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ | $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ | $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ | $\frac{1}{2} \left( \frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2}$ |

|           |       |          |        |
|-----------|-------|----------|--------|
| Drawn/QA: | CH/BF | Page No. | 1 of 2 |
|-----------|-------|----------|--------|

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**NOTES:**

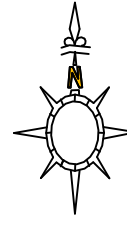
**Drainage:**  
Inspection Covers are lifted where possible and all drainage invert information has been obtained through visual inspection only, with no entry into manholes. Therefore the complete accuracy cannot be guaranteed. Where drainage is of critical importance we suggest the services of a specialist drainage expert be used.

**Trees:**  
Every effort has been made to identify and detail all trees on site but where trees are of critical importance we suggest the use of a specialist such as an arborist. Tree spread and heights are indicative.

**GPS:**  
GPS detail is relative to the time and date of survey. GPS levels and grid are obtained using industry standard guidelines and can vary according to the quality of the GPS network at the time of survey. Unless stated otherwise, surveys are Scale factor 1 and Horizontal and Vertical Datums are established from a central site fix and baseline orientation station utilising GNSS correction data.

**Survey notes:**  
Survey specification is linked to the original purpose of the survey commissioned at source and is to be used for this purpose only. Survey is accurate within limitations of site conditions at the time of survey. In areas difficult to survey due to restricted access, lines of sight or dense vegetation, critical dimensions and positions should be verified following suitable clearance. Survey detail obtained and shown is relative to the plotting scale.

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## LEGEND

### OVERALL TREE SPECIES INFORMATION

|                |     |                 |     |
|----------------|-----|-----------------|-----|
| ALDER          | ALD | LONDON PLANE    | LPN |
| ASH            | ASH | MAGNOLIA        | MAG |
| ASPEN          | ASP | MAPLE           | MPL |
| BEECH          | BCH | OAK             | OAK |
| CHERRY         | CHY | PINE            | PNE |
| ELM            | ELM | POPLAR          | POP |
| FIR            | FIR | RHODODENDRONS   | RON |
| FRUIT          | FRU | ROWAN           | ROW |
| HAWTHORN       | HAW | SILVER BIRCH    | SIB |
| HAZEL          | HAZ | SWEET CHESTNUT  | SCH |
| HOLLY          | HOL | WALNUT          | WNT |
| HORSE CHESTNUT | HCH | WILLOW          | WLW |
| LIME           | LIM | YEW             | YEW |
| LOCUST         | LOC | SPECIES UNKNOWN | SNU |
|                |     | CORPSE          | COP |

**TREE ANNOTATIONS:** Tree Species / Tree Boles Size / No of Boles  
Tree Height / Tree Canopy Spread

### FENCE INFORMATION

|                       |     |                 |      |
|-----------------------|-----|-----------------|------|
| BARBED WIRE FENCE     | BWF | BED LEVEL       | BL   |
| CHAIN LINK FENCE      | CLF | COVER LEVEL     | CL   |
| CHESTNUT PALING FENCE | CPF | FLOOR LEVEL     | FL   |
| CLOSE BOARD FENCE     | CBF | INVERT LEVEL    | IL   |
| CONCRETE SLAT FENCE   | CSF | OUTFALL LEVEL   | OL   |
| CORRUGATED IRON FENCE | CIF | THRESHOLD LEVEL | THL  |
| CRASH BARRIER         | CBR | FOUL WATER      | FW   |
| HANDRAIL              | HDL | SURFACE WATER   | SW   |
| IRON RAILINGS         | IRF | UNABLE TO LIFT  | UTL  |
| LARCH LAP FENCE       | LLF | WATER LEVEL     | WL   |
| MISCELLANEOUS FENCE   | MSF |                 |      |
| PALISADE FENCE        | PSF |                 |      |
| PICKET FENCE          | PKF |                 |      |
| POST AND CHAIN FENCE  | PCF | CONCRETE        | Cc   |
| POST AND RAIL FENCE   | PRF | BRICK PAVING    | BP   |
| POST AND WIRE FENCE   | PWF | FLOWERBED       | FB   |
| SECURITY FENCE        | SCF | PAVING SLABS    | PS   |
| STOCK WIRE FENCE      | SWF | RETAINING WALL  | RW   |
| TRELLIS FENCING       | TLF | SCALPINGS       | Scap |
| WIRE MESH FENCE       | WMF | TACTILE PAVING  | Tac  |

### LEVEL INFORMATION

### SURFACE INFORMATION

### FEATURE INFORMATION

|                       |      |                      |      |
|-----------------------|------|----------------------|------|
| BOLLARD               | BO   | NAME PLATE           | NP   |
| TELECOMS IC           | BTIC | NOTICE BOARD         | NB   |
| BUS STOP              | BS   | POST                 | P    |
| CABLE TELEVISION IC   | CAV  | RAIN WATER PIPE      | RWP  |
| BATHING ROO           | BR   | ROAD SIGN            | RS   |
| ELECTRICITY CABLE PIT | ELCP | RODDING EYE          | RE   |
| ELECTRICITY POLE      | EP   | SERVICE MANHOLE POST | SMP  |
| FIRE HYDRANT          | FH   | SOIL VENT PIPE       | SVP  |
| FLAG POLE             | FP   | STOP VALVE           | SV   |
| GUIDE POST            | GP   | TELEGRAPH POLE       | TP   |
| INSPECTION COVER      | IC   | TRAFFIC SIGNAL       | TS   |
| LAMP POST             | LP   | TRAFFIC SIGNALS IC   | TSIC |
| LETTER BOX            | LB   | WASH OUT             | WO   |
| KERB OUTLET           | KO   | WATER METER          | WM   |

### REVISIONS

Level Datum:  
Levels are related to client supplied drawing ref: 21095\_F

Grid:  
Grid is related to client supplied drawing ref: 21095\_F

Northpoint:



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encompass-surveys.co.uk

|                  |                                                     |        |           |
|------------------|-----------------------------------------------------|--------|-----------|
| Client:          | Stonebond                                           |        |           |
| Survey Location: | Former SSE depot<br>Bartons Road<br>Havant, PO9 5HP |        |           |
| Survey type:     | Topographical                                       | Scale: | 1:200@A1  |
| Drawing ref:     | ENC/220724/3484 S1                                  | Date:  | July 2024 |
| Drawn/QA:        | CH/BF                                               | Plot:  | 2 of 2    |

## Appendix B Southern Water Sewer Records



| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|-------------------|-------------|-------------|--------------|-----------------|
| 0001              | F           | 20.85       | 19.25        |                 |
| 0101              | F           | 22.76       | 21.01        |                 |
| 0200              | F           | 24.70       | 21.80        |                 |
| 0201              | F           | 25.49       | 23.05        |                 |
| 0202              | F           | 25.52       | 23.64        |                 |
| 0301              | F           | 26.81       | 24.32        |                 |
| 0703              | F           | 0.00        | 0.00         |                 |
| 0704              | F           | 0.00        | 0.00         |                 |
| 0705              | F           | 0.00        | 0.00         |                 |
| 0706              | F           | 0.00        | 0.00         |                 |
| 0707              | F           | 0.00        | 0.00         |                 |
| 0708              | F           | 0.00        | 0.00         |                 |
| 0709              | F           | 0.00        | 0.00         |                 |
| 0710              | F           | 0.00        | 0.00         |                 |
| 0711              | F           | 0.00        | 0.00         |                 |
| 0802              | F           | 0.00        | 0.00         |                 |
| 0803              | F           | 0.00        | 0.00         |                 |
| 0807              | F           | 0.00        | 0.00         |                 |
| 0808              | F           | 0.00        | 0.00         |                 |
| 0809              | F           | 0.00        | 0.00         |                 |
| 0810              | F           | 0.00        | 0.00         |                 |
| 0811              | F           | 0.00        | 0.00         |                 |
| 0812              | F           | 0.00        | 0.00         |                 |
| 0813              | F           | 0.00        | 0.00         |                 |
| 0814              | F           | 0.00        | 0.00         |                 |
| 0815              | F           | 0.00        | 0.00         |                 |
| 0900              | F           | 19.09       | 16.96        |                 |
| 0901              | F           | 19.43       | 17.16        |                 |
| 1000              | F           | 20.24       | 17.92        |                 |
| 1100              | F           | 21.47       | 19.42        |                 |
| 1101              | F           | 21.82       | 18.91        |                 |
| 1102              | F           | 23.86       | 22.22        |                 |
| 1700              | F           | 18.43       | 15.42        |                 |
| 1701              | F           | 0.00        | 0.00         |                 |
| 1702              | F           | 0.00        | 0.00         |                 |
| 1703              | F           | 0.00        | 0.00         |                 |
| 1704              | F           | 0.00        | 0.00         |                 |
| 1800              | F           | 17.90       | 0.00         |                 |
| 1801              | F           | 0.00        | 0.00         |                 |
| 1802              | F           | 0.00        | 0.00         |                 |
| 1803              | F           | 0.00        | 0.00         |                 |
| 1805              | F           | 0.00        | 0.00         |                 |
| 1806              | F           | 0.00        | 0.00         |                 |
| 1807              | F           | 0.00        | 0.00         |                 |
| 1808              | F           | 0.00        | 0.00         |                 |
| 1900              | F           | 18.63       | 0.00         |                 |
| 2100              | F           | 22.09       | 20.39        |                 |
| 2101              | F           | 23.15       | 20.97        |                 |
| 2102              | F           | 0.00        | 0.00         |                 |
| 2200              | F           | 25.17       | 21.63        |                 |
| 2201              | F           | 25.39       | 22.77        |                 |
| 2300              | F           | 24.44       | 22.09        |                 |
| 2301              | F           | 0.00        | 0.00         |                 |
| 2302              | F           | 0.00        | 0.00         |                 |
| 2303              | F           | 0.00        | 0.00         |                 |
| 2304              | F           | 0.00        | 0.00         |                 |
| 2305              | F           | 0.00        | 0.00         |                 |
| 2700              | F           | 18.72       | 17.25        |                 |
| 2701              | F           | 19.09       | 16.95        |                 |
| 2702              | F           | 0.00        | 0.00         |                 |
| 2800              | F           | 19.56       | 0.00         |                 |
| 2801              | F           | 19.00       | 16.75        |                 |
| 2802              | F           | 19.19       | 16.20        |                 |
| 2803              | F           | 18.83       | 16.73        |                 |
| 2804              | F           | 18.94       | 16.54        |                 |
| 2805              | F           | 19.11       | 16.37        |                 |
| 2806              | F           | 0.00        | 0.00         |                 |
| 2807              | F           | 0.00        | 0.00         |                 |
| 2808              | F           | 0.00        | 0.00         |                 |
| 2809              | F           | 0.00        | 0.00         |                 |
| 3100              | F           | 23.96       | 21.56        |                 |
| 3101              | F           | 0.00        | 0.00         |                 |
| 3102              | F           | 0.00        | 0.00         |                 |
| 3103              | F           | 0.00        | 0.00         |                 |
| 3104              | F           | 0.00        | 0.00         |                 |
| 3200              | F           | 27.09       | 25.15        |                 |
| 3301              | F           | 28.33       | 26.30        |                 |
| 3302              | F           | 27.95       | 26.01        |                 |
| 3700              | F           | 18.87       | 16.37        |                 |
| 3800              | F           | 19.84       | 17.22        |                 |
| 3801              | F           | 20.79       | 18.96        |                 |
| 3802              | F           | 20.46       | 18.06        |                 |
| 3803              | F           | 0.00        | 0.00         |                 |
| 3901              | F           | 0.00        | 0.00         |                 |
| 3902              | F           | 0.00        | 0.00         |                 |
| 4100              | F           | 27.64       | 25.06        |                 |
| 4101              | F           | 25.50       | 23.17        |                 |
| 4200              | F           | 28.09       | 26.20        |                 |
| 4201              | F           | 28.56       | 26.57        |                 |
| 4202              | F           | 26.30       | 24.25        |                 |
| 4203              | F           | 0.00        | 0.00         |                 |
| 4204              | F           | 0.00        | 0.00         |                 |
| 4205              | F           | 0.00        | 0.00         |                 |
| 4206              | F           | 0.00        | 0.00         |                 |
| 4207              | F           | 0.00        | 0.00         |                 |
| 4208              | F           | 0.00        | 0.00         |                 |
| 4301              | F           | 29.21       | 27.09        |                 |
| 4302              | F           | 31.68       | 30.10        |                 |
| 4303              | F           | 0.00        | 0.00         |                 |
| 4304              | F           | 0.00        | 0.00         |                 |
| 4700              | F           | 16.17       | 14.37        |                 |
| 4701              | F           | 17.43       | 15.18        |                 |
| 4800              | F           | 21.35       | 18.90        |                 |
| 4801              | F           | 20.24       | 17.89        |                 |
| 4802              | F           | 19.66       | 17.73        |                 |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|-------------------|-------------|-------------|--------------|-----------------|
| 4803              | F           | 0.00        | 0.00         |                 |
| 5100              | F           | 26.62       | 24.08        |                 |
| 5101              | F           | 27.65       | 25.91        |                 |
| 5102              | F           | 28.86       | 25.60        |                 |
| 5103              | F           | 26.85       | 25.74        |                 |
| 5200              | F           | 30.34       | 27.14        |                 |
| 5201              | F           | 30.06       | 27.46        |                 |
| 5202              | F           | 0.00        | 0.00         |                 |
| 5302              | F           | 34.88       | 32.92        |                 |
| 5303              | F           | 0.00        | 0.00         |                 |
| 5304              | F           | 0.00        | 0.00         |                 |
| 5305              | F           | 0.00        | 0.00         |                 |
| 5700              | F           | 16.03       | 14.17        |                 |
| 6000              | F           | 22.07       | 20.28        |                 |
| 6001              | F           | 0.00        | 0.00         |                 |
| 6100              | F           | 24.97       | 22.34        |                 |
| 6101              | F           | 0.00        | 0.00         |                 |
| 6200              | F           | 27.95       | 25.48        |                 |
| 6201              | F           | 0.00        | 0.00         |                 |
| 6202              | F           | 0.00        | 0.00         |                 |
| 6203              | F           | 0.00        | 0.00         |                 |
| 6204              | F           | 0.00        | 0.00         |                 |
| 6700              | F           | 16.21       | 12.92        |                 |
| 6701              | F           | 16.37       | 13.77        |                 |
| 6702              | F           | 16.78       | 14.22        |                 |
| 6703              | F           | 15.95       | 13.36        |                 |
| 6800              | F           | 16.71       | 13.30        |                 |
| 6801              | F           | 17.17       | 13.50        |                 |
| 6900              | F           | 17.70       | 15.22        |                 |
| 6901              | F           | 17.83       | 15.25        |                 |
| 7000              | F           | 19.07       | 15.57        |                 |
| 7001              | F           | 19.49       | 17.19        |                 |
| 7002              | F           | 17.24       | 15.93        |                 |
| 7003              | F           | 0.00        | 0.00         |                 |
| 7004              | F           | 0.00        | 0.00         |                 |
| 7005              | F           | 0.00        | 0.00         |                 |
| 7100              | F           | 23.15       | 19.95        |                 |
| 7101              | F           | 21.95       | 19.88        |                 |
| 7104              | F           | 0.00        | 0.00         |                 |
| 7105              | F           | 0.00        | 0.00         |                 |
| 7200              | F           | 26.78       | 23.18        |                 |
| 7201              | F           | 24.93       | 22.45        |                 |
| 7202              | F           | 30.30       | 29.08        |                 |
| 7203              | F           | 28.11       | 26.57        |                 |
| 7204              | F           | 30.46       | 28.81        |                 |
| 7205              | F           | 0.00        | 0.00         |                 |
| 7207              | F           | 0.00        | 0.00         |                 |
| 7301              | F           | 21.59       | 20.15        |                 |
| 7700              | F           | 16.11       | 14.41        |                 |
| 7700              | F           | 17.95       | 14.10        |                 |
| 7701              | F           | 18.07       | 16.70        |                 |
| 7800              | F           | 16.80       | 15.40        |                 |
| 7800              | F           | 17.51       | 14.90        |                 |
| 7802              | F           | 16.69       | 15.26        |                 |
| 8000              | F           | 18.08       | 16.85        |                 |
| 8001              | F           | 18.71       | 16.92        |                 |
| 8301              | F           | 21.88       | 20.51        |                 |
| 8302              | F           | 21.82       | 19.80        |                 |
| 8303              | F           | 21.92       | 20.66        |                 |
| 8900              | F           | 16.78       | 15.04        |                 |
| 8901              | F           | 0.00        | 0.00         |                 |
| 9000              | F           | 18.82       | 16.87        |                 |
| 9002              | F           | 19.76       | 18.03        |                 |
| 9003              | F           | 18.15       | 16.40        |                 |
| 9005              | F           | 0.00        | 0.00         |                 |
| 9304              | F           | 0.00        | 0.00         |                 |
| 9700              | F           | 16.85       | 15.45        |                 |
| 9800              | F           | 17.51       | 16.02        |                 |
| 9900              | F           | 17.99       | 16.35        |                 |
| 9901              | F           | 18.39       | 0.00         |                 |
| 9902              | F           | 18.60       | 0.00         |                 |
| 9903              | F           | 18.00       | 16.16        |                 |
| 0050              | S           | 20.37       | 18.40        |                 |
| 0150              | S           | 21.45       | 19.60        |                 |
| 0151              | S           | 22.83       | 20.66        |                 |
| 0152              | S           | 21.64       | 20.11        |                 |
| 0250              | S           | 24.64       | 21.90        |                 |
| 0750              | S           | 16.80       | 15.50        |                 |
| 0751              | S           | 16.82       | 15.47        |                 |
| 0752              | S           | 16.96       | 15.54        |                 |
| 0753              | S           | 16.92       | 15.49        |                 |
| 0754              | S           | 16.66       | 14.57        |                 |
| 0755              | S           | 17.24       | 16.05        |                 |
| 0756              | S           | 16.91       | 14.98        |                 |
| 0757              | S           | 17.48       | 15.15        |                 |
| 0758              | S           | 17.11       | 15.40        |                 |
| 0850              | S           | 17.46       | 15.56        |                 |
| 0851              | S           | 18.70       | 0.00         |                 |
| 0852              | S           | 0.00        | 0.00         |                 |
| 0853              | S           | 0.00        | 0.00         |                 |
| 0854              | S           | 0.00        | 0.00         |                 |
| 0855              | S           | 17.35       | 16.39        |                 |
| 0950              | S           | 18.96       | 16.44        |                 |
| 0951              | S           | 19.31       | 17.81        |                 |
| 0952              | S           | 18.93       | 17.62        |                 |
| 0953              | S           | 18.91       | 0.00         |                 |
| 0954              | S           | 18.65       | 0.00         |                 |
| 0955              | S           | 18.37       | 0.00         |                 |
| 1050              | S           | 20.04       | 18.45        |                 |
| 1150              | S           | 21.49       | 19.09        |                 |
| 1151              | S           | 21.74       | 19.49        |                 |
| 1250              | S           | 25.62       | 23.96        |                 |
| 1251              | S           | 24.96       | 23.53        |                 |
| 1252              | S           | 24.29       | 22.69        |                 |
| 1253              | S           | 24.89       | 23.16        |                 |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|-------------------|-------------|-------------|--------------|-----------------|
| 1254              | S           | 23.93       | 22.13        |                 |
| 1255              | S           | 24.09       | 22.69        |                 |
| 1350              | S           | 27.38       | 25.66        |                 |
| 1351              | S           | 24.60       | 23.14        |                 |
| 1750              | S           | 18.00       | 16.28        |                 |
| 1850              | S           | 18.47       | 17.79        |                 |
| 1852              | S           | 18.03       | 16.65        |                 |
| 1853              | S           | 18.08       | 17.32        |                 |
| 1854              | S           | 17.98       | 0.00         |                 |
| 1855              | S           | 18.21       | 17.29        |                 |
| 1856              | S           | 0.00        | 0.00         |                 |
| 1857              | S           | 0.00        | 0.00         |                 |
| 1858              | S           | 0.00        | 0.00         |                 |
| 1859              | S           | 0.00        | 0.00         |                 |
| 1860              | S           | 0.00        | 0.00         |                 |
| 1950              | S           | 0.00        | 0.00         |                 |
| 1951              | S           | 0.00        | 0.00         |                 |
| 2050              | S           | 21.95       | 19.91        |                 |
| 2051              | S           | 22.31       | 20.26        |                 |
| 2150              | S           | 22.86       | 20.45        |                 |
| 2250              | S           | 25.27       | 22.27        |                 |
| 2251              | S           | 24.26       | 21.34        |                 |
| 2252              | S           | 24.02       | 21.90        |                 |
| 2350              | S           | 25.69       | 23.51        |                 |
| 2351              | S           | 26.89       | 24.69        |                 |
| 2750              | S           | 18.89       | 16.51        |                 |
| 2850              | S           | 18.63       | 18.08        |                 |
| 2851              | S           | 18.75       | 18.24        |                 |
| 2852              | S           | 19.05       | 17.18        |                 |
| 2853              | S           | 19.55       | 17.85        |                 |
| 2854              | S           | 18.80       | 17.19        |                 |
| 2855              | S           | 18.92       | 17.09        |                 |
| 2856              | S           | 19.07       | 16.99        |                 |
| 2857              | S           | 19.16       | 16.73        |                 |
| 2858              | S           | 0.00        | 0.00         |                 |
| 2950              | S           | 18.67       | 0.00         |                 |
| 2951              | S           | 18.92       | 18.40        |                 |
| 3150              | S           | 22.86       | 20.73        |                 |
| 3151              | S           | 23.68       | 21.88        |                 |
| 3250              | S           | 25.36       | 24.16        |                 |
| 3251              | S           | 26.20       | 0.00         |                 |
| 3350              | S           | 26.83       | 25.37        |                 |
| 3353              | S           | 28.05       | 26.50        |                 |
| 3354              | S           | 28.28       | 26.82        |                 |
| 3750              | S           | 18.91       | 16.14        |                 |
| 3751              | S           | 19.08       | 16.82        |                 |
| 3850              | S           | 20.79       | 19.27        |                 |
| 3851              | S           | 20.46       | 18.33        |                 |
| 3852              | S           | 20.09       | 18.13        |                 |
| 3853              | S           | 19.98       | 18.04        |                 |
| 3854              | S           | 19.82       | 17.68        |                 |
| 3950              | S           | 22.01       | 21.17        |                 |
| 3951              | S           | 20.17       | 19.20        |                 |
| 3952              | S           | 19.23       | 18.67        |                 |
| 3953              | S           | 22.52       | 21.86        |                 |
| 3954              | S           | 20.05       | 18.62        |                 |
| 4050              | S           | 24.13       | 23.70        |                 |
| 4150              | S           | 26.09       | 0.00         |                 |
| 4151              | S           | 24.84       | 0.00         |                 |
| 4250              | S           | 28.41       | 26.80        |                 |
| 4251              | S           | 30.26       | 29.01        |                 |
| 4252              | S           | 30.00       | 28.20        |                 |
| 4350              | S           | 29.53       | 27.42        |                 |
| 4351              | S           | 30.38       | 28.48        |                 |
| 4352              | S           | 0.00        | 0.00         |                 |
| 4750              | S           | 16.07       | 15.10        |                 |
| 4850              | S           | 21.39       | 19.78        |                 |
| 4851              | S           | 20.26       | 18.77        |                 |
| 4852              | S           | 19.63       | 17.98        |                 |
| 4853              | S           | 21.31       | 19.86        |                 |
| 4950              | S           | 22.75       | 21.23        |                 |
| 4951              | S           | 21.82       | 20.30        |                 |
| 5150              | S           | 22.47       | 20.05        |                 |
| 5151              | S           | 25.38       | 22.85        |                 |
| 5152              | S           | 23.31       | 21.42        |                 |
| 5153              | S           | 23.77       | 21.07        |                 |
| 5154              | S           | 25.74       | 23.41        |                 |
| 5250              | S           | 27.57       | 25.24        |                 |
| 5251              | S           | 26.35       | 24.03        |                 |
| 5252              | S           | 27.21       | 24.82        |                 |
| 5351              | S           | 29.95       | 27.39        |                 |
| 5352              | S           | 30.29       | 28.19        |                 |
| 5355              | S           | 29.27       | 27.46        |                 |
| 5356              | S           | 30.04       | 27.65        |                 |
| 5357              | S           | 0.00        | 0.00         |                 |
| 5750              | S           | 16.08       | 14.78        |                 |
| 5751              | S           | 15.90       | 14.87        |                 |
| 6050              | S           | 19.30       | 17.54        |                 |
| 6051              | S           | 17.31       | 15.71        |                 |
| 6150              | S           | 21.17       | 19.68        |                 |
| 6151              | S           | 20.51       | 18.20        |                 |
| 6250              | S           | 24.73       | 21.19        |                 |
| 6750              | S           | 16.31       | 15.21        |                 |
| 7050              | S           | 18.16       | 0.00         |                 |
| 7050              | S           | 16.77       | 15.29        |                 |
| 7051              | S           | 16.56       | 14.69        |                 |
| 7052              | S           | 15.23       | 13.53        |                 |
| 7053              | S           | 17.27       | 15.45        |                 |
| 7053              | S           | 15.43       | 13.97        |                 |
| 7054              | S           | 15.19       | 13.99        |                 |
| 7150              | S           | 18.76       | 17.10        |                 |
| 7151              | S           | 18.09       | 16.21        |                 |
| 7152              | S           | 19.21       | 16.78        |                 |
| 7153              | S           | 16.81       | 15.41        |                 |
| 7154              | S           | 17.70       | 15.93        |                 |

## Appendix C BRD Infiltration Report



Report  
Title:

# Soakage Investigation

Project  
Name:

## Bartons Road, Havant



Report  
Reference:

**BRD4469-OR3-A**

Date:

**April 2025**

### **BRD Environmental Ltd**

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# REPORT CONTROL SHEET

|              |                       |
|--------------|-----------------------|
| REPORT TITLE | SOAKAGE INVESTIGATION |
| PROJECT      | BARTONS ROAD, HAVANT  |
| CLIENT       | STONEBOND             |

| REPORT REFERENCE | ISSUE DETAIL | DATE       | PREPARED BY   | CHECKED BY  |
|------------------|--------------|------------|---------------|-------------|
| BRD4469-OR3-A    | First Issue  | 10/04/2025 | L Chippington | J Brockwell |

## BRD Environmental Limited

Geotechnical and Environmental Services

- Ground Investigation
- Japanese Knotweed Removal
- Soil, Water and Gas Testing
- Contamination Assessment
- Geotechnical Advice
- Remediation Solutions

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Soakage Investigation  
Bartons Road, Havant  
BRD4469-OR3-A Havant Soakage

# REPORT LAYOUT

This report is divided into the following three sections: Technical Report, Supporting Information and Appendices.

## TECHNICAL REPORT

The main report section is intended to provide the technical detail of the investigation and is intended to provide the level of information required by current guidance documents and practice. The Technical Report is written in a language that, in part, assumes knowledge of subject matter so that it can be written in as concise a form as possible. Its intended audience is peers, regulators and other professionals in related disciplines.

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## REFERENCES

## SUPPORTING INFORMATION

This section of the report provides background details of a generic nature together with specific technical approaches adopted by BRD and details of the guidance documents that are commonly referenced in the report. The section also includes explanations of technical terms to assist non-specialist readers in understanding the Technical Report. It should be noted that not all the information within this section is necessarily applicable to this specific report.

## APPENDICES

The final section of the report presents the factual data collected and employed as part of the investigation.

### APPENDIX 1      SITE PLANS

|                    |                    |
|--------------------|--------------------|
| Site Location Plan | Ref. BRD4469-OP2-A |
|--------------------|--------------------|

|                                |                    |
|--------------------------------|--------------------|
| Exploratory Hole Location Plan | Ref. BRD4469-OD1-B |
|--------------------------------|--------------------|

### APPENDIX 2      EXPLORATORY HOLE RECORDS

|                     |                  |
|---------------------|------------------|
| Logs of trial pits. | Ref. TP301-TP303 |
|---------------------|------------------|

|                                     |                    |
|-------------------------------------|--------------------|
| Photographic records of trial pits. | Ref. BRD4469-OP8-A |
|-------------------------------------|--------------------|

|                              |                 |
|------------------------------|-----------------|
| BRE365 soakage test records. | 7No. x A4 pages |
|------------------------------|-----------------|

# 1. INTRODUCTION TO TECHNICAL REPORT

## 1.1. CONTRACT DETAILS

|                          |                                                                                                                                                                |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CLIENT</b>            | Stonebond Properties (Guildford) Limited trading as Stonebond.                                                                                                 |
| <b>SITE</b>              | Land situated off Bartons Road at the former SSE Office, in the town of Havant.                                                                                |
| <b>CLIENT'S ADVISORS</b> | BRD Environmental Limited (BRD) has been commissioned directly by the Client.                                                                                  |
| <b>REPORT CONTEXT</b>    | It is understood that the Client intends to purchase the site and develop it for residential housing.                                                          |
| <b>REPORT TYPE</b>       | Soakage investigation.                                                                                                                                         |
| <b>REPORT OBJECTIVES</b> | The purpose of this report is to present the findings of a soakage investigation to determine the suitability for using soakaways at the proposed development. |

## 1.2. SCOPE OF WORKS

The agreed scope of works was:

- Mobilisation to site and production of health and safety documentation.
- Delivery of 20mm granular material to site for backfilling the pits and supply of 75-100mm diameter perforated pipes for the inspection well in each soakage test pit.
- One day of trial pitting using a mechanical excavator to provide 3No. trial pits to a nominal depth of 2m-3m, ground conditions permitting.
- Performance of soakage tests based upon BRE Digest 365 in each of the trial pit locations. Supply of water to site via a water bowser unit on up to three consecutive days for the repeat filling of each test pit. A Geo-Environmental Technician will monitor the soakage tests.
- Removal of pipework at the end of the soakage tests and restoration of trial pit surface with spoil. The surplus soil from excavating the pits will be neatly stockpiled on site. The disposal of this surplus soil has not been allowed for.
- All exploratory points will be logged and sampled in general accordance with BS5930:2015+A1:2020 by supervising Geo-Environmental Consultant.
- Determination of the accurate location and level of exploratory points by topographical grade GPS unit.
- Provision of a soakage investigation report to include all exploratory point records, monitoring and soakage test results, together with commentary on the soakage rates attained and the feasibility for adopting surface water infiltration devices on the site.

### 1.3. REPORT LIMITATIONS

Any site boundary lines depicted on plans included within this report are approximate only and do not imply legal ownership of land. Any observations of tree species, asbestos containing materials within structures or invasive weeds, does not constitute a formal survey of such features. The identification of such features is therefore tentative only. In the case of Japanese Knotweed, BRD can undertake separate surveys for this plant undertaken by a Property Care Association qualified surveyor.

The report does not consider whether sensitive ecology or archaeology is present as these require consideration by professionals specialising in these matters. It should be recognised that the collection of desk study information may not be exhaustive and that other information pertinent to the site may be available.

The recommendations, interpretations and conclusions of this report are based solely on the ground conditions found at the exploratory holes. Due to the variability in the nature of ground, conditions between exploratory holes can only be interpreted and not defined. The description of the site and the ground conditions is accurate only for the dates of the field works. In particular, groundwater levels can vary due to seasonal and other effects.

This report is restricted to the provision of soakage advice only and does not include any form of contamination or further geotechnical assessment.

## 2. SITE CHARACTERISTICS

### 2.1. SITE SETTING

|                                   |                                                    |
|-----------------------------------|----------------------------------------------------|
| <b>SITE ADDRESS AND POST CODE</b> | Former SSE Offices, Bartons Road, Havant, PO9 5TH. |
| <b>NATIONAL GRID REFERENCE</b>    | Approximate centre of the site - 472160, 108010.   |

### 2.2. SITE DESCRIPTION

| <b>SUBJECT</b>                  | <b>COMMENTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CURRENT SITE DESCRIPTION</b> | <p>All previous buildings on the site have been demolished and the site is awaiting development. There is a large stockpile of crushed demolition waste in the central northern area and much of the site has a surface formed by demolition rubble. However, the surface of the southern part and areas close to the boundaries are formed by soft landscape.</p> <p>There is an approximately 1.0m high retaining wall close to the northern boundary, with the ground level close to the northern boundary approximately 1.0m below the ground levels to the north. The site generally slopes gently towards the south, however following re-grading associated with the previous history of development and demolition, the slope is steeper, with a 'step down' in the central southern area.</p> <p>The areas of soft landscaping have some immature trees and other low vegetation across them.</p> |
| <b>SURROUNDING LAND USE</b>     | <p>The site is located in a mixed residential and commercial area. To the north and west are Bartons Road and Petersfield Road, respectively, with residential houses beyond. Beyond the northern and central parts of the eastern boundary is a football club and beyond the southern part an electricity substation and office building. Beyond the eastern part of the southern boundary is Martin Road, with a car sales and servicing workshop beyond the central and western parts of the southern boundary.</p>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>PROPOSED DEVELOPMENT</b>     | <p>The proposed end use of the site is a residential development comprising fifty-nine houses and one apartment block.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>HISTORICAL SUMMARY</b>       | <p>The earliest available map from 1867 shows the site as agricultural. Up to 1957 a stream was shown in the eastern and southern areas of the site, however, this stream was not shown on any of the later maps. By 1972 office buildings had been constructed on site, a petrol station to the southwest and an electricity substation to the east. By 1991 the offices had been extended, but between 2016 and 2019 they were demolished, with the crushed arisings remaining on site.</p>                                                                                                                                                                                                                                                                                                                                                                                                              |

| SUBJECT                  | COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PUBLISHED GEOLOGY</b> | <p>No superficial deposits are indicated to be present, however, Head Deposits and River Terrace Deposits are shown close to the east and south respectively. All of these deposits can be composed of clay, silt, sand or gravel.</p> <p>The shallowest bedrock is shown to be the Bognor Sand Member, which typically comprises fine and medium-grained sand. The London Clay Formation underlies the Bognor Sand Member and typically comprises silty clay.</p>                                                                                                                                |
| <b>HYDROGEOLOGY</b>      | <p>The Bognor Sand Member is classified as a bedrock Secondary A Aquifer.</p> <p>The site is shown to lie within a Zone 1c Source Protection Zone, which means the associated aquifer is at depth and is only likely to be affected by subsurface activities, such as deep drilling.</p> <p>Based on the BGS maps for the area, it is considered the SPZ1c relates to a deep Chalk aquifer, which forms a drinking water resource. At this site, the chalk is likely to be present at a significant depth and confined by the overlying fine-grained Lambeth Group and London Clay Formation.</p> |
| <b>HYDROLOGY</b>         | <p>The closest surface water feature to the site is a small stream located approximately 311m to the east.</p> <p>The site is outside of areas classified at risk from Extreme Flooding from Rivers or Seas without Defences.</p>                                                                                                                                                                                                                                                                                                                                                                 |

## 2.3. PREVIOUS INVESTIGATIONS

Prior to BRD's involvement, the site had been subject to two ground investigations. The first was completed prior to the demolition of the on-site buildings and the second was completed following the demolition. These are referenced as follows:

- 'Ground Investigation Report', Soiltechnics, ref. STM3168D-GD1 and dated May 2016.
- 'Interpretive Site Investigation and Remedial Strategy Report', Forge Environmental Management Ltd, ref. HAV164.D/SI/002, rev. 1 and dated March 2020.

These two investigation reports were reviewed within the BRD desk study, referenced as:

- 'Phase 1 Environmental Desk Study - Bartons Road, Havant', BRD Environmental Ltd, report ref. BRD4469-OR1-A and dated August 2024.

Following the desk study BRD carried out a Phase 2 Geo-Environmental Investigation, referenced as:

- 'Phase 2 Geo-Environmental Investigation - Bartons Road, Havant,' BRD Environmental Ltd, report ref. BRD4469-OR2-B and dated October 2024.

Salient information from these four previous investigations relevant to this latest soakaway investigation are summarised below, however the reports should be referred to for full details.



The ground conditions generally comprised a layer of crushed demolition waste across the northern and central areas, extending down to a typical depth of 0.4m below ground level (bgl). From near surface in the southern area and beneath the demolition waste across the rest of the site, variable Made Ground soils were encountered, extending down to depths typically ranging from 0.4m to 1.4m bgl, but locally down to 2.3m bgl. The nature of the Made Ground ranged from slightly gravelly slightly sandy clay through to clayey sandy gravel, with the gravel including concrete, brick, plastic, metal, glass and ceramics. Some whole bricks and cobble sized fragments of concrete were encountered within the Made Ground.

The natural strata beneath the Made Ground generally comprised superficial Head Deposits, which varied from clayey sandy gravel to slightly gravelly slightly sandy clay, with the gravel generally comprising flint. In addition, in the central area some Alluvial clay, likely associated with an old ditch, was encountered between the Made Ground and Head Deposits. These superficial soils were collectively encountered down to depths between 0.7m and 2.6m bgl, and were then underlain by bedrock of the Bognor Sand Member, which extended down to the base of the investigation points, at depths down to 4.0m bgl. The Bognor Sand Member generally comprised slightly clayey fine sand.

Throughout the various phases of investigation, groundwater was recorded at depths ranging between 1.1m and 2.4m bgl depth.

As part of the Forge Environmental Management's investigation, soakage testing was undertaken in 4No. trial pits, ranging in depth from 0.36m to 1.90m. All the soakage tests were undertaken in natural soils, with three being terminated in clay soils and one in sand soils. The soakage tests were run for four to six hours and none of them reached even 25% empty. Therefore, the rate of soakage was too slow for calculation of infiltration rates to be made.

Following on from BRD's investigation work in October 2024, a programme of groundwater monitoring has been undertaken over the 2024/2025 winter period. This monitoring shows the groundwater levels across the site to be as shallow as 1.0m to 1.5m bgl over the wetter months of December 2024 and January 2025, albeit does return to levels of between 1.5m and 3.0m bgl by the beginning of April 2025.

### 3. GROUND INVESTIGATION

#### 3.1. INVESTIGATION DESIGN

|                                   |                                                                                                                                                                                                                                                                       |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>METHODOLOGY</b>                | Trial pits were selected as they allowed for the formation of the soakage tests. These trial pits were backfilled with 20mm coarse 'no fines' gravel to allow for repeat tests without the trial pit walls collapsing. This methodology is in compliance with BRE365. |
| <b>DATES OF SITE WORKS</b>        | The field works were undertaken on the 1 <sup>st</sup> April 2025, with the soakaway testing being carried out from the 1 <sup>st</sup> to the 3 <sup>rd</sup> April 2025.                                                                                            |
| <b>EXPLORATORY HOLE LOCATIONS</b> | To provide general information for the ground conditions on site and to inform the proposed drainage strategy, the soakage test pits were positioned at three locations pre-agreed with the Client.                                                                   |

#### 3.2. BRD FIELDWORK

| TRIAL PITS           |                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>REFERENCES</b>    | TP301 to TP303.                                                                                                                                                                                                                                                                                                                                             |
| <b>DEPTH RANGE</b>   | From 1.80m to 2.10m bgl.                                                                                                                                                                                                                                                                                                                                    |
| <b>EXCAVATOR</b>     | JCB-3CX backhoe excavator.                                                                                                                                                                                                                                                                                                                                  |
| <b>BACKFILL</b>      | All of the trial pits from this investigation were completed as soakage test pits and were installed with 90mm slotted monitoring well / filling pipe and backfilled with 20mm natural gravel aggregate.                                                                                                                                                    |
| <b>SOAKAGE TESTS</b> | Soakage tests in accordance with BRE365 were carried out in all three test locations. Water was supplied via a 4WD vehicle with a water bowser. The water was obtained via a hydrant supply from the Portsmouth Water infrastructure using a hydrant supplied by them. Repeat soakage tests were performed, as dictated by the site conditions encountered. |

## **4. GROUND CONDITIONS**

### **4.1. OVERVIEW**

The ground conditions encountered were generally consistent with the published geological maps and previous investigations, with a surface cover of Made Ground generally overlying superficial Head Deposits onto bedrock of the Bognor Sand Member. At TP302, Alluvium was encountered beneath the Made Ground and above the Head Deposits, and at TP301, no superficial deposits were encountered with the Made Ground extending to a greater depth and directly overlying the Bognor Sand Member.

Details of the various stratigraphic units are given in the following sections.

### **4.2. MADE GROUND**

Made Ground was encountered at each test location from ground level down to depths between 0.3m and 1.0m bgl. It generally comprised grey brown sandy coarse sub-angular gravel of concrete and brick, and at one location in the southern area, TP303, included whole bricks.

### **4.3. SUPERFICIAL DEPOSITS**

#### **4.3.1. Alluvium**

The Alluvium was encountered at one location in the central western area, TP302, beneath the Made Ground from 1.0m depth down to 1.3m bgl depth. It comprised firm dark grey slightly sandy slightly organic clay.

#### **4.3.2. Head Deposits**

The Head Deposits were encountered beneath the Made Ground or Alluvium at two locations, TP302 and TP303, extending down to depths of 1.9m and 1.7m bgl, respectively. These soils generally comprised medium dense grey brown clayey sandy medium to coarse sub-rounded to sub-angular gravel of flint, quartzite and sandstone. However, at TP303, between 0.3m and 1.0m bgl depth, it comprised firm grey brown slightly gravelly slightly sandy clay, with the gravel consisting of quartzite.

### **4.4. BEDROCK**

#### **4.4.1. Bognor Sand Member**

Strata of the Bognor Sand Member were encountered at each test location beneath the Made Ground or Head Deposits. These deposits generally comprised medium dense grey brown silty fine sand and extended down to the base of the trial pits, with a maximum proven depth of 2.1m bgl.

### **4.5. GROUNDWATER BEHAVIOUR**

No groundwater seepages were encountered in any of the trial pits formed during this latest investigation.

## 5. SOAKAWAYS

### 5.1. SOIL INFILTRATION RATE

Soakage tests in general accordance with BRE365 were undertaken in TP301, TP302 and TP303. Each of the test pits were gravel filled, with three repeat tests run at TP301 and two at TP302 and TP303, due to time constraints and the slow pace of the infiltration.

The records of the soakage tests are presented in Appendix 2. The detailed calculation of the infiltration rate is provided on these records, however, a summary of the results is presented in the table below:

| TRIAL PIT | TEST   | SOIL INFILTRATION RATE    | STRATUM TESTED                                                                                                                                                                                                                |
|-----------|--------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TP301     | Test 1 | $2.52 \times 10^{-5}$ m/s | 0.20m-1.00m bgl: Sandy coarse subangular GRAVEL (Made Ground)<br>1.00m-1.80m bgl: Silty fine SAND (Bognor Sand Member)                                                                                                        |
|           | Test 2 | $2.18 \times 10^{-5}$ m/s |                                                                                                                                                                                                                               |
|           | Test 3 | $2.13 \times 10^{-5}$ m/s |                                                                                                                                                                                                                               |
| TP302     | Test 1 | $2.37 \times 10^{-6}$ m/s | 1.00m-1.30m bgl: Slightly sandy slightly organic CLAY (Alluvium)<br>1.30m-1.90m bgl: Clayey sandy medium to coarse sub-rounded to sub-angular GRAVEL (Head Deposits)<br>1.90m-2.10m bgl: Silty fine SAND (Bognor Sand Member) |
|           | Test 2 | $2.30 \times 10^{-6}$ m/s |                                                                                                                                                                                                                               |
| TP303     | Test 1 | $2.36 \times 10^{-6}$ m/s | 0.30m-1.00m bgl: Slightly gravelly slightly sandy CLAY (Head Deposits)<br>1.30m-1.70m bgl: Sandy very clayey medium to coarse sub-rounded GRAVEL (Head Deposits)<br>1.70m-2.10m bgl: Silty fine SAND (Bognor Sand Member)     |
|           | Test 2 | $2.06 \times 10^{-6}$ m/s |                                                                                                                                                                                                                               |

It should be noted that although the infiltration rates were slow, the soakage tests undertaken within TP302 and TP303 were still compliant with the guidance contained within BRE365 as both tests had soaked to over 50% of the effective soakage depth within 24 hours. As each test took nearly two days to complete, a third test was not attempted as part of these site works, due to time and budget constraints. Whilst a third test was not undertaken at TP302 or TP303, the nature of the ground conditions and repeatability of the first two test results would indicate that a third test is likely to give infiltration rates at similar orders of magnitude.

### 5.2. SOAKAWAY DESIGN ADVICE

All of the soakage tests from this latest phase of investigation were taken to depths from 1.8m to 2.1m bgl and targeted the silty fine sand of the Bognor Sand Member. The soakage testing from this investigation has recorded infiltration rates between  $2.04 \times 10^{-6}$  m/s and  $2.51 \times 10^{-5}$  m/s, with good repeatability at each test location.

The difference in infiltration between TP301 and TP302 / TP303 is an order of magnitude and does emphasise the difficulty in adopting a representative design value as the soils being tested appeared visually similar. However, the fact that viable infiltration has been confirmed at each test location does indicate that soakaway type drainage or infiltration basins may be possible, depending on design requirements and groundwater levels. Such infiltration does require the

soakage device to penetrate through any surface cover of Head Deposits and fully intercept the deeper silty sands of the Bognor Sand Member. On this basis the lower end of the infiltration rates (i.e.  $2 \times 10^{-6}$  m/s) would therefore be applicable for design purposes.

It should be noted that the previous soakage tests, carried out by Forge Environmental Management, had indicated the soils tested would not be suitable for soakaway drainage. However, three of their four tests were undertaken in clay soils of the Head Deposits and this may explain the apparent lack of infiltration. The one test undertaken within what is assumed to be the Bognor Sand Member (Forge's TP1), did record some infiltration but the rate was too slow to calculate as the test was not run overnight. It may therefore have been that this test would have returned similar infiltration rates to TP302 or TP303 if it was left for 2 days to run.

However, whilst the soakage tests show that infiltration is technically feasible, the groundwater monitoring carried out over the winter months indicates shallow groundwater levels beneath the site during periods of wetter weather. The Environment Agency will object to the use of infiltration devices that lead to the direct input to groundwater and seek that in excess of a 1m thick unsaturated zone is present between the base of the infiltration device and the seasonal high maximum groundwater level. Given the groundwater levels can be as shallow as 1.0m bgl and that the Bognor Sand Member is typically not encountered until deeper depths, this would unsaturated thickness would not be achievable and would further suggest that infiltration devices are not suitable in practise for this site.

Should traditional soakaways be considered for whatever reason, they should be located at least 5m away from any foundations. Infiltration devices that do not lead to concentrated water inflows, such as permeable pavements, can be located closer than this offset distance subject to careful design and construction.

## REPORT SPECIFIC REFERENCES

- British Geological Survey sheet 316 “Fareham” Solid and Drift edition (1:50,000) published 1972.
- ‘Ground Investigation Report’, Soiltechnics, ref. STM3168D-GD1, dated May 2016.
- ‘Interpretive Site Investigation and Remedial Strategy Report’, Forge Environmental Management Ltd, ref. HAV164.D/SI/002, rev. 1, Dated March 2020.
- ‘Phase 1 Environmental Desk Study - Bartons Road, Havant’, BRD Environmental Ltd, report ref. BRD4469-OR1-A, dated August 2024.
- ‘Phase 2 Geo-Environmental Investigation - Bartons Road, Havant,’ BRD Environmental Ltd, report ref. BRD4469-OR2-B, dated October 2024.

# **SUPPORTING INFORMATION**

## **SITE CHARACTERISTICS**

*The site characteristics are collated from various information sources, including but not limited to Ordnance Survey, British Geological Survey (BGS), Environment Agency (EA) and local authorities.*

*BRD generally commission the Landmark Information Group to produce an Envirocheck Report for study sites and where employed this is included in the Appendices. It should be noted that some of the data provided in the Envirocheck report is not considered within BRD's interpretation for the site characteristics as part of a geotechnical assessment.*

## **HISTORY**

### *Mapped History*

*The site history summarises the changes in use or layout of the site over time and is largely developed from a study of available Ordnance Survey maps. It should be noted that changes to the site may have occurred between the editions of the maps employed to assess the history of the site. Historical information of relevance within the 250m surrounding the site is also discussed in a separate section. The historical plans referred to in the text are generally included in an Appendix.*

### *Aerial photography*

*As a minimum, current and historical aerial images of the site and surrounding areas are studied from the Google Earth program. Where additional historic aerial photographs have been purchased then these are referenced within the technical report.*

### *Internet Searches*

*A simple search of the internet for relevant material relating to the use or history of the site is made. Information obtained from internet searches has been accepted as fact without validation by BRD except for ensuring the source is reputable. It should be recognised that due to programme and budgetary constraints the search conducted may not have revealed all the information available.*

## **GEOLOGY**

*The geology of the site is assessed by reference to the relevant British Geological Survey (BGS) 1:50,000 scale sheet in Bedrock and Superficial (historically Solid and Drift) edition. Many of these geological maps are relatively old with superseded terminology and descriptions. BRD therefore employ the BGS Open Geoscience website to determine current nomenclature of strata and to assist in determining geological boundaries against current topographic features. BRD also employ BGS Regional Geology Guides to assist in understanding the geological context of the site.*

### *Ground Stability Hazards*

*Ground stability hazards caused by mining, ground dissolution, landslide potential, collapsible ground and natural cavities are identified by the Envirocheck database search of records held by The Coal Authority, British Geological Survey and studies completed by Ove Arup and Peter Brett Associates.*

*The Envirocheck database ground stability hazard entries for compressible ground, running sands and shrinking or swelling clays are not discussed directly. This is because these hazards are very common and are considered within the preliminary geotechnical assessment where necessary.*

### Radon

*Radon is a naturally occurring colourless and odourless gas that is radioactive. It is formed by the radioactive decay of radium which in turn is derived from the radioactive decay of uranium, both of which are minerals that can be found in many soil types. Whilst it is recognised that the air inside every house contains radon, some houses built in certain defined areas of the country might have unacceptably high concentrations and require special precautions to be taken during construction to reduce this risk.*

*Radon can move through cracks and fissures in the soil into the atmosphere or into buildings via basements and/or underfloor voids. If radon enters the living space of buildings its concentration can potentially increase and provide a risk to human health as the inhalation of the radioactive decay products of radon gas can increase the risk of developing lung cancer.*

*The maps contained within ‘Radon: Guidance on protective measures for new buildings’ (2015) identify areas where no radon protection measures are necessary or where higher concentrations are present that either basic or full radon protection measures are required to be fitted to all new buildings together with supplementary advice concerning extensions, conversions and refurbishments. However, some local authorities have local bylaws, that BRD may not be aware of, that insist on radon protection to all new dwellings within their area regardless of the recommendations of the ‘Radon: Guidance on protective measures for new buildings’ (2015) report.*

*Basic radon protection measures comprise incorporation of a continuous gas resistant membrane sealed at joints and around service entries into the floor construction and extended across the cavity tray.*

*Full radon protection measures comprise incorporating a continuous gas resistant membrane into the floor construction together with a ventilated sub-floor void through either the use of suspended floor construction or a ‘radon sump’. The membrane is sealed at joints and around service entries into the floor and extended across the cavity tray.*

*‘Radon: Guidance on protective measures for new buildings’ (2015) should be referred to for detail on the construction of the protective measures.*

# GROUND INVESTIGATION

Exploratory holes are logged by an experienced Geo-Environmental Consultant in general accordance with 'Code of practice for site investigations' BS5930:2015, British Standards Institution, 2015. Soil samples for chemical and geotechnical analysis are taken from the exploratory holes at intervals dictated by the nature of the soils and the objectives of the investigation.

Where stated on the logs of inspection pits, trial pits or boreholes (where insitu testing has not been undertaken), the relative density of coarse (sand and gravel) soils is tentative only. Such assessments of density are on the basis of visual inspection only taking into consideration such factors as drilling rates, stability of pit side walls, appearance and behaviour under excavation.

Where Chalk strata is encountered it is logged and graded in general accordance with CIRIA guidance 'C574 - Engineering in Chalk'. It should be recognised that where percussive drilling methods are employed, the structure of the Chalk is destroyed and therefore the grading stated on such logs is either tentative or absent where it is not possible to assess the grade.

## Hand Dug Inspection Pits

Hand tools are used to forward shallow inspection pits as a cost effective method of describing and sampling near surface soils. The technique is also used where exposure of existing footings is required. The depth reached by such techniques is a function of the nature of the ground and generally does not exceed 1.5m

## Trial Pits

Mechanically excavated trial pits allow detailed inspection of near surface ground due to the large volume of soil exposed. A wheeled backhoe loader is the usual machine for digging trial pits that are typically 3 to 4.5m deep, 0.5m wide and 3m long.

## Windowless Sampling Boreholes

This type of borehole is formed by a small tracked dynamic percussion drilling rig with samples retrieved in thin plastic liners within the narrow diameter steel sampling tubes. Borehole depths of up to 5m are typical, but in exceptional circumstances up to 15m depth can be achieved. This is the smallest type of rig that is capable of undertaking Standard Penetration Tests (SPTs).

## Hand Held Window Sampling

Hand held window sampling is a useful method of drilling narrow diameter boreholes particularly where access is difficult. Hand held mechanical percussive hammers are used to drive the sampling tube into the ground. The soil samples are collected within the hollow metal sampling tubes and inspected via the open window along one side. Window sampling boreholes can be forwarded to depths of 3m to 6m depending upon ground conditions.

## Cable Percussive Boreholes

This form of drilling involves repetitive dropping of a tube into the soil under its own weight from a tripod support. The sample is obtained from the clay cutter head in fine soils or a bailer for wet granular soils. As the borehole progresses SPTs can be undertaken and relatively undisturbed samples can be obtained. Typically these boreholes are 15 to 25m deep, but depths of double that can be achieved in soils, but only thin weak rock layers can be penetrated.

## Rotary Boreholes

Where competent rock is required to be drilled then rotary drilling techniques are required. The drilling rigs can vary in size from small tracked units to larger units mounted on four wheel drive trucks. Rotary open hole drilling techniques break the rock into small fragments and so recovery of any samples is limited. In contrast, rotary coring retrieves excellent samples. Some rigs also allow windowless sampling to be undertaken through soil layers. There are no practical limits to the depths that this drilling method can achieve.

## Dynamic Probing

Dynamic probing comprises a sectional rod with a sacrificial cone at the base of slightly larger diameter than the rod. The rod is driven into the ground by a constant mass falling through a set distance. The number of blows required to forward the rod per 100mm is then recorded and presented in a graph of  $N_{10}$  values. The standard applicable to dynamic probing is "BS EN ISO 22476-2:2005 Incorporating corrigendum no. 1, Geotechnical investigation and testing – Field testing – Part 2: Dynamic probing" BSi, February 2007.

## Static Cone Penetration Tests

Cone Penetration Tests (CPT) consist of pushing a conical 60° cone into the ground at a constant rate and recording the force required to do this. Sensors in the cone record other information and this data can be correlated to a number of different geotechnical parameters.

## Dynamic Penetrometer

The Transport Research Laboratory Dynamic Cone Penetrometer (TRL DCP) uses an 8 kg hammer dropping through a height of 575mm to drive a 60° cone of 20mm maximum diameter into the ground. The depth driven either per blow or per several blows is recorded. The strength of each of the soil layer encountered is then calculated by converting the penetration rate (mm per blow) into an approximate California Bearing Ratio (CBR) value employing the correlation proposed by TRL.

## Gas Monitoring

Gas monitoring is undertaken with a portable gas monitor for oxygen, Methane, Carbon Dioxide, Hydrogen Sulphide and Carbon Monoxide together with recording of atmospheric pressure and any flow rate.

## Vapour Monitoring

Headspace tests and monitoring for Volatile Organic Compounds (VOC) or Semi Volatile Organic Compounds (SVOC) is undertaken using a Photo Ionisation Detector (PID). The MiniRAE models used have a 10.6 eV lamp calibrated for isobutylene. The PID is useful tool to indicate the presence of a wide range of volatile compounds, but only provides semi-quantitative data as different compounds provide a different response and thus the reading is not a true reflection of the actual concentration present.

Low PID readings can be recorded in natural uncontaminated organic soils or even as a result of atmospheric pollution. It is generally accepted by consultants and regulators that recorded values in excess 50 parts per million (ppm) represents the presence of organic compound pollutants and in excess of 100 ppm such contamination may be significant.

The headspace test procedure involves the collection of a sample of suspected contaminated soils and placing within a sample bag. A tight seal to the bag is formed with a similar volume of air trapped to that of the soil and the sample is left for fifteen minutes to allow volatilisation of any contaminants. The bag is then pierced by, and sealed around, the sample probe of the PID and a reading taken.

Borehole well monitoring is undertaken by connecting the PID directly to the gas tap on the monitoring well installation.

#### Groundwater Level Monitoring

Groundwater levels are recorded with an electronic dip meter that has a detector end that is lowered into the borehole well. An audible signal is made when water is reached and the depth recorded from the graduated tape used to lower the detector. Where there is potential for a separate Light Non Aqueous Phase Liquid (LNAPL) to be present floating on the groundwater an oil/water interface meter is used in preference to a conventional dip meter so that any such floating product can be detected.

#### Geotechnical Sampling

BRD schedule a range of geotechnical testing as appropriate to the identified ground conditions, available budget and the proposed development. Different types of soil samples are obtained as appropriate to the ground conditions and planned testing.

| <b>SAMPLE TYPE</b> | <b>SYMBOL USED ON LOGS</b> | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Disturbed</i>   | <i>D</i>                   | <i>Small disturbed soil samples of about 1 to 2 kg are collected in plastic bags.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <i>Bulk</i>        | <i>B</i>                   | <i>Large disturbed bulk samples up to about 20 to 30 kg are collected in plastic bags</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <i>Undisturbed</i> | <i>U</i>                   | <i>‘Undisturbed’ samples generally collected in plastic or metal tubes within cable percussive boreholes of 100mm diameter for samples of fine soils of firm to stiff consistency. Can also be representative of samples taken by cutting plastic sample liners from windowless sampling drilling methods. It is recognised that such samples do not generally meet Eurocode sample quality requirements for the tests commonly employed. However, given the wealth of experience with these sampling methods this continues to be common in United Kingdom practice particularly for less sensitive developments where more expensive sampling techniques are not economically justifiable.</i> |
| <i>Undisturbed</i> | <i>UT</i>                  | <i>A thin walled steel sampler developed by Archway Engineering called a UT100 in an attempt to gain better quality samples of soft to firm fine soils when using cable percussive drilling methods.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### Contamination Sampling

BRD schedule contamination testing as appropriate to the ground conditions, available budget, potential contaminants and the proposed development. Samples are collected in single use laboratory supplied containers.

Soil samples are retrieved in plastic containers and/or amber glass jars with a lined plastic cap. Contamination samples are indicated by a 'J' on exploratory hole logs.

Water samples are collected in plastic bottles and/or amber glass jars with a lined plastic cap then placed in cool boxes together with freezer packs. Water samples are indicated by a 'W' on exploratory hole records, but generally such samples are not tested as testing from dedicated monitoring wells is preferred for sample quality reasons.

Samples retrieved from the exploratory holes are dispatched to the laboratory by overnight courier. Where samples cannot be transported directly from site they are temporarily stored in the BRD dedicated sample storage facility which includes refrigeration where necessary. The individual accreditation of the test methods is detailed in the laboratory test report.

## **GEOTECHNICAL ASSESSMENT**

Under Eurocode 7 (EC7) the following risk ranking is applied to geotechnical projects:

| <b>GEOTECHNICAL CATEGORY</b> | <b>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>                     | <i>Small and relatively simple structures for which it is possible to ensure that the fundamental requirements will be satisfied on the basis of experience and qualitative geotechnical investigations with negligible risk. For example, straightforward ground conditions, local experience, no excavation below the water table unless this will be straight forward.</i>                                                   |
| <b>2</b>                     | <i>Conventional types of structures and foundations. No difficult soil or loading conditions. Quantitative geotechnical data and laboratory testing. Routine procedures for field and laboratory testing. Conventional structures and no exceptional geotechnical risk. For example, spread, raft and piled foundations, retaining walls, bridge piers and abutments, embankments, ground anchors, tunnels and excavations.</i> |
| <b>3</b>                     | <i>Those structures not in Categories 1 and 2 such as very large or unusual structures, structures involving abnormal risks, or unusual or exceptionally difficult ground or loading conditions. Structures in highly seismic areas. Structures in areas of probable site instability or persistent ground movements that require separate investigation or special measures.</i>                                               |

## GEOTECHNICAL PARAMETERS

### Soakage Tests

Soakage tests comprise the filling of a test pit with water and recording the time taken for the water to drain away. The tests are undertaken in general accordance with 'Digest DG 365: Soakaway design' BRE, Revised 2016. The test pits are usually gravel filled for safety with a slotted vertical pipe through which water observations are made. Water is generally supplied by a tanker to allow fast filling of the pits with water. Compliant tests are filled and allowed to drain near empty three times.

### Standard Penetration Tests

The standard penetration test (SPT) determines the resistance of soils at the base of a borehole to the dynamic penetration of a split barrel sampler and the recovering of disturbed samples for identification purposes. In gravelly soils and some soft rocks a solid cone is used in preference to the sampler.

The basis of the test consists in driving a sampler by dropping a hammer of 63.5 kg mass on from a height of 760 mm. The number of blows (N value) necessary to achieve a penetration of the sampler of 300 mm is recorded. The test is described in 'Geotechnical investigation and testing – Field testing – Part 3: Standard penetration test - BS EN ISO 22476-3:2005 Incorporating corrigendum no. 1', BSi, 2007.

The uncorrected N values of the SPT tests are recorded upon the borehole logs together with a record of blows for each 75mm test portion including the seating blows. Where the full test depth cannot be achieved due to refusal on hard stratum, the number of blows and the distance achieved is recorded and the N value given as >50. The abbreviation SPT(c) is used upon the logs indicates that the test was performed with a solid cone rather than a split spoon sampler.

It is necessary to apply a correction to the N values to account for the effects of energy delivery using the equation:  $N_{60} = \frac{E_r}{60} N$  where  $E_r$  is the energy ratio of the specific test equipment.

In the case of tests in sand, for the effects of overburden and rod length the equation is modified to  $N_{60} = \frac{E_r}{60} \times \lambda \times C_N \times N$  where  $\lambda$  is the correction factor for energy losses due to the rod length and  $C_N$  is the correction factor for vertical stress due to overburden of the soil.

### Sulphate

In order to compare the laboratory soil test results with 'Concrete in aggressive ground. BRE Special Digest 1: 2005' (BRE, 2005) laboratory results are converted to  $SO_4$  mg/l. Laboratory results expressed as  $SO_3$  g/l and are multiplied by a factor of 1200 to express the results as  $SO_4$  mg/l.

### Index Property Tests

In accordance with National House Building Council (NHBC) Standards Chapter 4.2 - Building near trees, the laboratory plasticity indexes are assessed against their volume change potential. The Modified Plasticity Index is defined as the Plasticity Index of the soil multiplied by the percentage of particles with a nominal diameter of less than  $425\mu\text{m}$ . Whilst the NHBC Standards were developed for residential buildings, the advice is equally applicable to a large number of other types of low rise structures.

### Hand Shear Vane

The undrained shear strength of the fine (i.e. clay) soils at the site can be established using hand shear vane apparatus. Usually three readings are taken at every depth tested and the uncorrected results recorded on the exploratory point log. Shear vane readings from depths below 1.2m depth in trial pits are from tests performed on excavated soil. In accordance with Eurocode 7 – Geotechnical design – Part 2: Ground investigation and testing EN 1997-2:2007 the results should be corrected. BRD employ only simple correction methods as the more complex correction methodologies imply undue accuracy to a test that has distinct disadvantages and limitations.

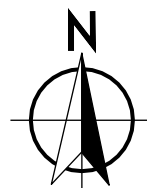
### Pocket Penetrometers

The Pocket Penetrometer is a lightweight instrument for use by field personnel to check visual classification of soils. It is a simple test and there is inherent uncertainty related to the small volume of soil being tested and so the results should be used with appropriate caution. Pocket penetrometers are calibrated in terms of unconfined compressive strength and once converted to undrained shear strength (divide by two) the results are further reduced by a factor of 1.5 - 2.0 as the device tends to overestimate strengths.

| <i>Instrument Reading<br/>(uncompressive<br/>strength in kg/cm<sup>2</sup>)</i> | <i>Indicative Undrained<br/>Shear Strength (kN/m<sup>2</sup>)</i> | <i>Indicative<br/>Consistency</i> | <i>Indicative strength</i> |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------|----------------------------|
| 1.0                                                                             | 25 - 33                                                           | Soft                              | Low                        |
| 1.5                                                                             | 38 - 50                                                           | Soft to firm                      | Low to medium              |
| 2.0                                                                             | 50 - 67                                                           | Firm                              | Medium                     |
| 2.5                                                                             | 63 - 83                                                           | Firm to stiff                     | Medium to high             |
| 3.5                                                                             | 88 - 116                                                          | Stiff                             | High                       |
| 4.5                                                                             | 113 - 150                                                         | Stiff to very stiff               | High to very high          |

## **APPENDIX 1**

# Site Location Plan

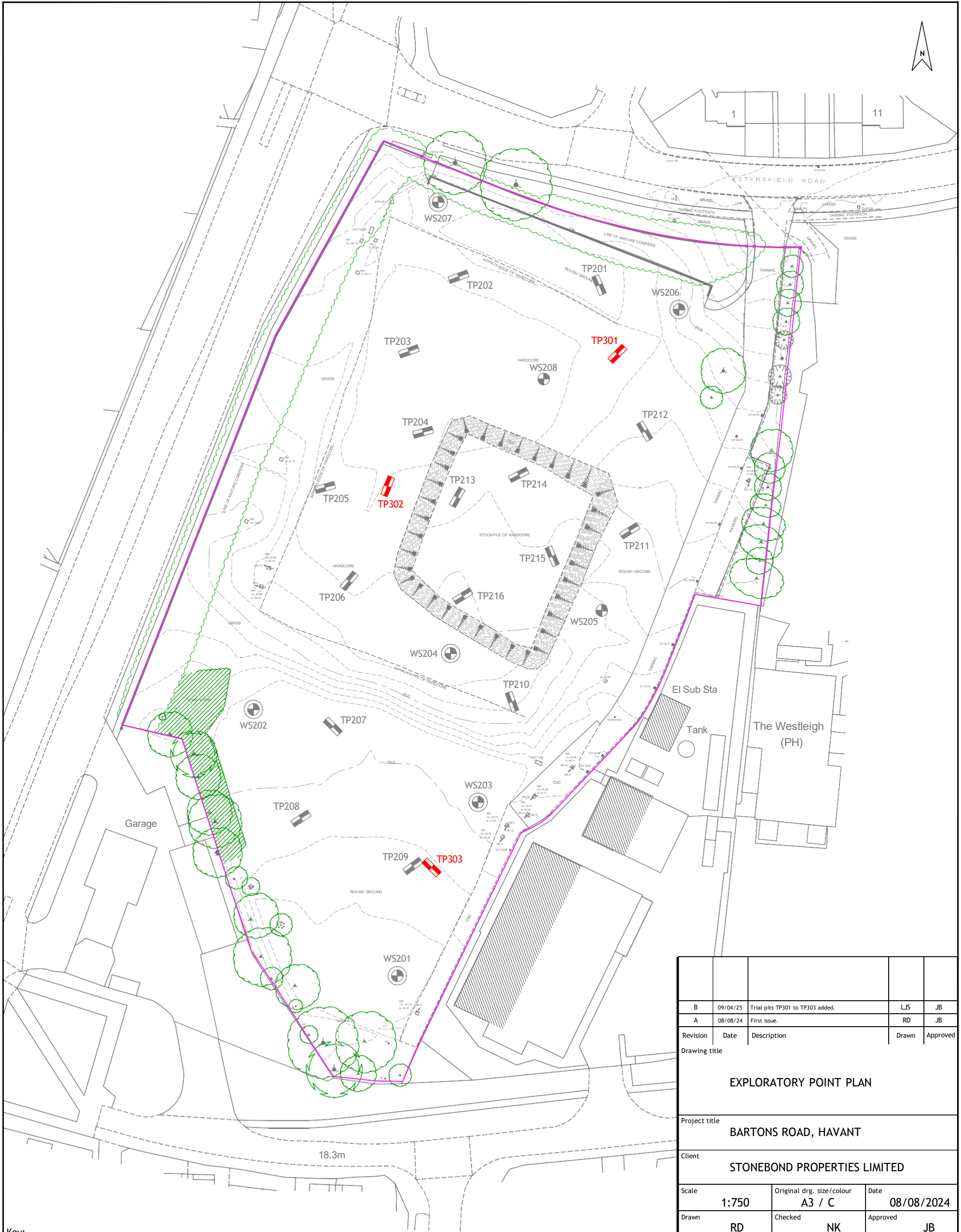


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Not to scale.

Project Title: Bartons Road, Havant  
Client: Stonebond  
BRD Reference: BRD4469-OP2-A  
Date Issued: July 2024

  
01295 272244  
info@brduk.com



- Key:
- Previous BRD Windowless Sample Borehole with Monitoring Well Installed
  - Previous BRD Windowless Sample Borehole with no Monitoring Well
  - BRD Trial Pit (April 2025)
  - Previous BRD Trial Pit
  - Site Boundary (Approximate Position)

Notes:

All BRD exploratory points located using topographical GPS.

Drawing reproduced from 'Topographical Survey - Land At Petersfield Road, Havant', Land Development Services Ltd, drawing ref: LDS/15748-TP1, dated: 11/11/2019.

|                                                                                                                                       |          |                                  |        |            |
|---------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------|--------|------------|
|                                                                                                                                       |          |                                  |        |            |
| B                                                                                                                                     | 09/04/25 | Trial pits TP301 to TP303 added. | LJS    | JB         |
| A                                                                                                                                     | 08/08/24 | First issue.                     | RD     | JB         |
| Revision                                                                                                                              | Date     | Description                      | Drawn  | Approved   |
| Drawing title                                                                                                                         |          |                                  |        |            |
| EXPLORATORY POINT PLAN                                                                                                                |          |                                  |        |            |
| Project title                                                                                                                         |          |                                  |        |            |
| BARTONS ROAD, HAVANT                                                                                                                  |          |                                  |        |            |
| Client                                                                                                                                |          |                                  |        |            |
| STONEBOND PROPERTIES LIMITED                                                                                                          |          |                                  |        |            |
| Scale                                                                                                                                 | 1:750    | Original drg. size / colour      | A3 / C | Date       |
|                                                                                                                                       |          |                                  |        | 08/08/2024 |
| Drawn                                                                                                                                 | RD       | Checked                          | NK     | Approved   |
|                                                                                                                                       |          |                                  |        | JB         |
| Drawing Number                                                                                                                        |          |                                  |        | Rev        |
| BRD4469-OD1                                                                                                                           |          |                                  |        | B          |
| BRD Environmental Ltd                                                                                                                 |          |                                  |        |            |
|  01295 272244<br>info@brduk.com<br>www.brduk.com |          |                                  |        |            |

## **APPENDIX 2**

# TRIAL PIT RECORD

| <b>Client:</b> Stonebond<br><b>Project Title:</b> Bartons Road, Havant<br><b>Project No:</b> BRD4469<br><b>Logged By:</b> L Chippington<br><b>Date Completed:</b> 01/04/2025<br><b>Method Used:</b> 180° Backhoe excavator (JCB 3CX type) |           |       |                                                                                                                                                                     | Trial Pit No.<br><h2>TP301</h2> |                                         |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------|--------|
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                     | <b>Sheet 1 of 1</b>             |                                         |        |
| Samples & Tests                                                                                                                                                                                                                           |           |       | Description of Strata                                                                                                                                               | Depth / (Level)                 | Geology                                 | Legend |
| Depth                                                                                                                                                                                                                                     | Type & No | Value |                                                                                                                                                                     |                                 |                                         |        |
| 1.50                                                                                                                                                                                                                                      | D1        |       | MADE GROUND: Grey, sandy, coarse, subangular gravel of concrete.                                                                                                    | 0.20<br>(20.50)                 | MADE GROUND                             |        |
|                                                                                                                                                                                                                                           |           |       | MADE GROUND: Grey brown, sandy, coarse, subangular gravel of concrete and occasional brick, with some cobbles and boulders up to 0.75m diameter.                    |                                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       | Medium dense, grey and brown, silty fine SAND.                                                                                                                      | 1.00<br>(19.70)                 | BOGNOR SAND                             |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                     | 1.80<br>(18.90)                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                     | 2                               |                                         |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                     | 3                               |                                         |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                     | 4                               |                                         |        |
| <b>Pit Stability:</b> Generally stable throughout<br><b>Groundwater:</b> Not encountered                                                                                                                                                  |           |       |                                                                                                                                                                     |                                 | Surface Elevation Level:<br>20.700 mAOD |        |
| <b>Plan of Trial Pit:</b><br>                                                                                                                                                                                                             |           |       | <b>General Remarks:</b><br>Trial pit terminated at 1.80m bgl for soakage testing.<br>Roots down to 0.6m depth.<br>Relative density based on visual assessment only. |                                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       | All dimensions in metres<br>Log Scale 1:25<br><br>Telephone: 01295 272244<br>Email: info@brduk.com                                                                  |                                 |                                         |        |

# TRIAL PIT RECORD

| <b>Client:</b> Stonebond<br><b>Project Title:</b> Bartons Road, Havant<br><b>Project No:</b> BRD4469<br><b>Logged By:</b> L Chippington<br><b>Date Completed:</b> 01/04/2025<br><b>Method Used:</b> 180° Backhoe excavator (JCB 3CX type) |           |       |                                                                                                                                                                 | Trial Pit No.<br><h2>TP302</h2>         |                                                      |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------------|--------|
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                 | <b>Sheet 1 of 1</b>                     |                                                      |        |
| Samples & Tests                                                                                                                                                                                                                           |           |       | Description of Strata                                                                                                                                           | Depth / (Level)                         | Geology                                              | Legend |
| Depth                                                                                                                                                                                                                                     | Type & No | Value |                                                                                                                                                                 |                                         |                                                      |        |
| 2.00                                                                                                                                                                                                                                      | D1        |       | MADE GROUND: Grey brown, sandy, coarse, subangular gravel of concrete and brick.                                                                                | 0.30<br>(20.50)                         | MADE GROUND                                          |        |
|                                                                                                                                                                                                                                           |           |       | MADE GROUND: Brown, slightly gravelly, slightly sandy CLAY. Gravel is fine to coarse, subrounded to subangular flint, brick and concrete.                       |                                         |                                                      |        |
|                                                                                                                                                                                                                                           |           |       | 0.80 m: Becoming clayey.                                                                                                                                        | 1.00<br>(19.80)                         | ALLU                                                 |        |
|                                                                                                                                                                                                                                           |           |       | Firm, dark grey, slightly sandy, slightly organic CLAY.                                                                                                         | 1.30<br>(19.50)                         |                                                      |        |
|                                                                                                                                                                                                                                           |           |       | Medium dense grey brown, clayey, sandy, medium to coarse, subrounded to subangular GRAVEL of flint.                                                             | 1.90<br>(18.90)                         | HEAD                                                 |        |
|                                                                                                                                                                                                                                           |           |       | Medium dense, grey and brown, silty fine SAND.                                                                                                                  | 2.10<br>(18.70)                         |                                                      |        |
|                                                                                                                                                                                                                                           |           |       | 3                                                                                                                                                               | BSM                                     |                                                      |        |
|                                                                                                                                                                                                                                           |           |       | 4                                                                                                                                                               |                                         |                                                      |        |
| <b>Pit Stability:</b> Generally stable throughout<br><b>Groundwater:</b> Not encountered                                                                                                                                                  |           |       |                                                                                                                                                                 | Surface Elevation Level:<br>20.800 mAOD |                                                      |        |
| <b>Plan of Trial Pit:</b><br>                                                                                                                                                                                                             |           |       | <b>General Remarks:</b><br>Trial pit terminated at 2.10m bgl for soakage testing.<br>No roots encountered.<br>Relative density based on visual assessment only. |                                         | All dimensions in metres<br>Log Scale 1:25           |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                 |                                         | <br>Telephone: 01295 272244<br>Email: info@brduk.com |        |

# TRIAL PIT RECORD

| <b>Client:</b> Stonebond<br><b>Project Title:</b> Bartons Road, Havant<br><b>Project No:</b> BRD4469<br><b>Logged By:</b> L Chippington<br><b>Date Completed:</b> 01/04/2025<br><b>Method Used:</b> 180° Backhoe excavator (JCB 3CX type) |           |       |                                                                                                                                                                      | Trial Pit No.<br><h2>TP303</h2> |                                         |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------|--------|
| <b>Sheet 1 of 1</b>                                                                                                                                                                                                                       |           |       |                                                                                                                                                                      |                                 |                                         |        |
| Samples & Tests                                                                                                                                                                                                                           |           |       | Description of Strata                                                                                                                                                | Depth / (Level)                 | Geology                                 | Legend |
| Depth                                                                                                                                                                                                                                     | Type & No | Value |                                                                                                                                                                      |                                 |                                         |        |
| 1.80                                                                                                                                                                                                                                      | D1        |       | MADE GROUND: Brown, sandy, coarse, subangular gravel of brick, concrete and flint. Includes whole bricks.                                                            | 0.30<br>(18.50)                 | MG                                      |        |
|                                                                                                                                                                                                                                           |           |       | Firm, grey brown, slightly gravelly, slightly sandy CLAY. Gravel is coarse, subrounded quartzite.                                                                    | 1.00<br>(17.80)                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       | Medium dense, grey brown, sandy, very clayey, medium to coarse subrounded GRAVEL of quartzite and sandstone.                                                         | 1.70<br>(17.10)                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       | Medium dense, grey silty, fine SAND.                                                                                                                                 | 2.10<br>(16.70)                 | BSM                                     |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                      |                                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                      | 3                               |                                         |        |
|                                                                                                                                                                                                                                           |           |       |                                                                                                                                                                      | 4                               |                                         |        |
| <b>Pit Stability:</b> Generally stable throughout<br><b>Groundwater:</b> Not encountered                                                                                                                                                  |           |       |                                                                                                                                                                      |                                 | Surface Elevation Level:<br>18.800 mAOD |        |
| <b>Plan of Trial Pit:</b><br>                                                                                                                                                                                                             |           |       | <b>General Remarks:</b><br>Trial pit terminated at 2.10m bgl for soakage testing.<br>Roots down to 0.30m depth.<br>Relative density based on visual assessment only. |                                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       | All dimensions in metres<br>Log Scale 1:25<br>                                                                                                                       |                                 |                                         |        |
|                                                                                                                                                                                                                                           |           |       | Telephone: 01295 272244<br>Email: info@brduk.com                                                                                                                     |                                 |                                         |        |

# Trial Pit Photographs

TP301



Project Title: Bartons Road, Havant  
Client: Stonebond  
BRD Reference: BRD4469-OP8-A  
Date Issued: April 2025



01295 272244  
info@brduk.com

# Trial Pit Photographs

TP302

No Photographs of TP302

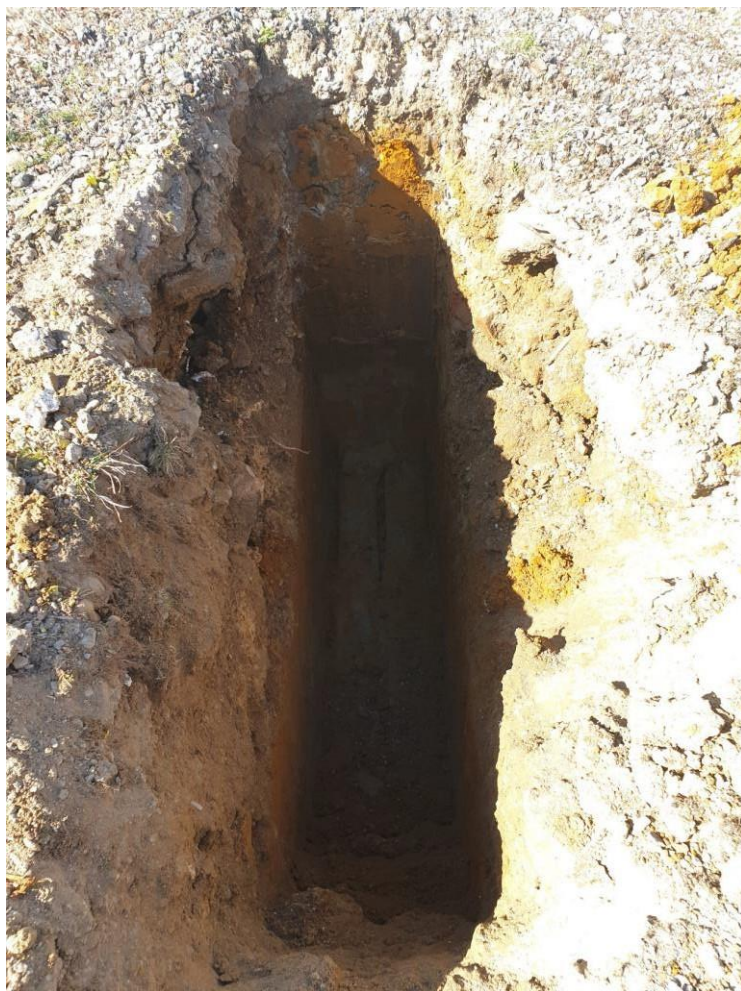
Project Title: Bartons Road, Havant  
Client: Stonebond  
BRD Reference: BRD4469-OP8-A  
Date Issued: April 2025



01295 272244  
info@brduk.com

# Trial Pit Photographs

TP303



Project Title: Bartons Road, Havant  
Client: Stonebond  
BRD Reference: BRD4469-OP8-A  
Date Issued: April 2025



01295 272244  
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## SOIL INFILTRATION RATE

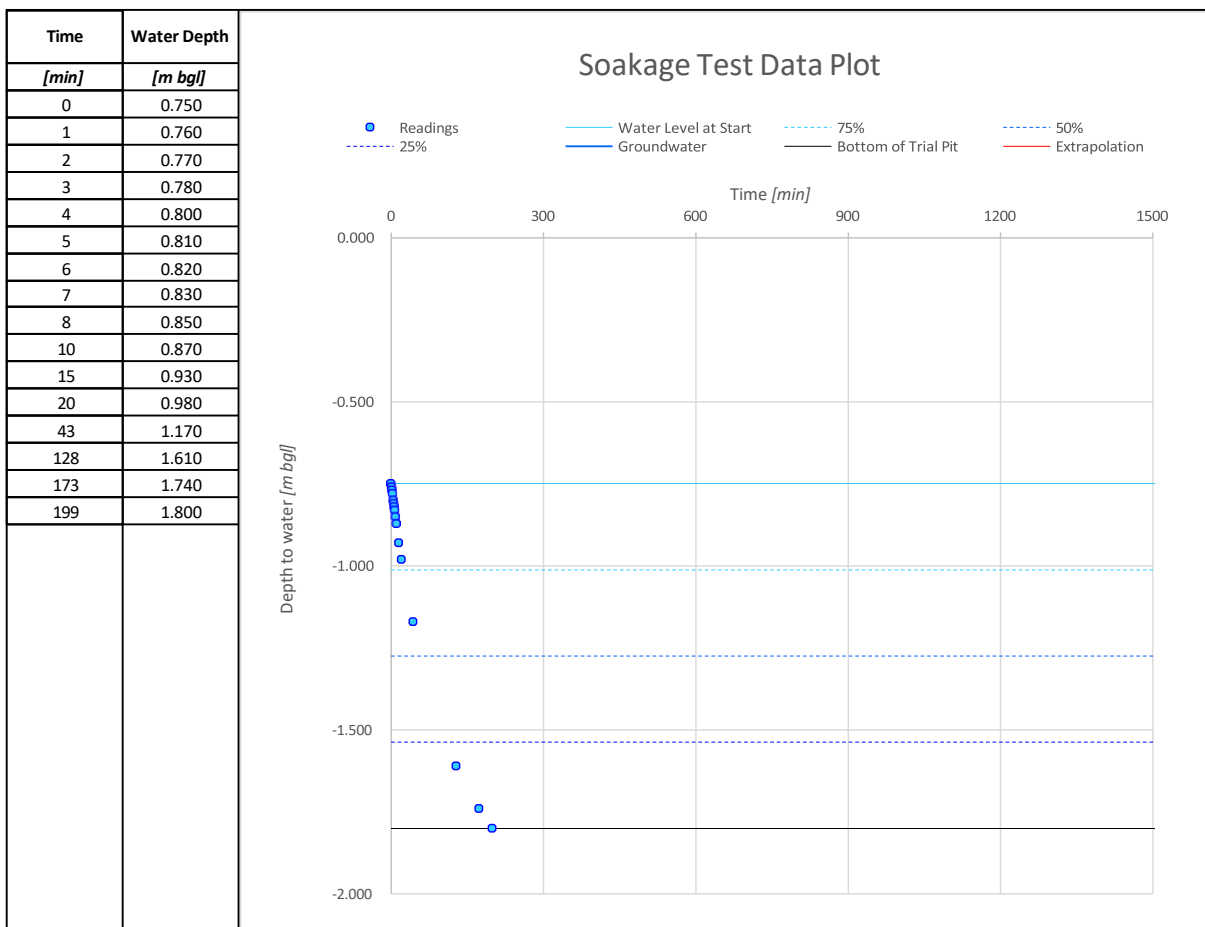
In accordance with BRE Digest 365:2016 - Soakaway Design

Client: Stonebond  
Project Title: Bartons Road, Havant  
Project No: BRD4469

Trial Pit No: TP301  
Test No: 1  
Date: 01/04/2025  
Logged by: SW

Length [m]: 2.00  
Depth [m]: 1.80  
Width [m]: 0.45  
Groundwater [m bgl]: Dry

| Ground | Conditions | from - to [m bgl] |      | Description                                                                        |
|--------|------------|-------------------|------|------------------------------------------------------------------------------------|
|        |            |                   |      |                                                                                    |
|        |            | 0.20              | 1.00 | Sandy coarse sub-angular GRAVEL, including some cobbles and boulders (Made Ground) |
|        |            | 1.00              | 1.80 | Silty fine SAND (Bognor Sand Member)                                               |



Soil Infiltration Rate [m/s]: 
$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

with:

$V_{p75-25}$  as Effective Storage Volume of water between 75% and 25% effective storage depth [m<sup>3</sup>] **0.47**

$a_{s50}$  as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area [m<sup>2</sup>] **3.47**

$t_{p75-25}$  as Time for the water level to fall from 75% to 25% effective storage depth [s] **5.4.E+03**

Soil Infiltration Rate [m/s] : **2.52E-05**

Remarks:



## SOIL INFILTRATION RATE

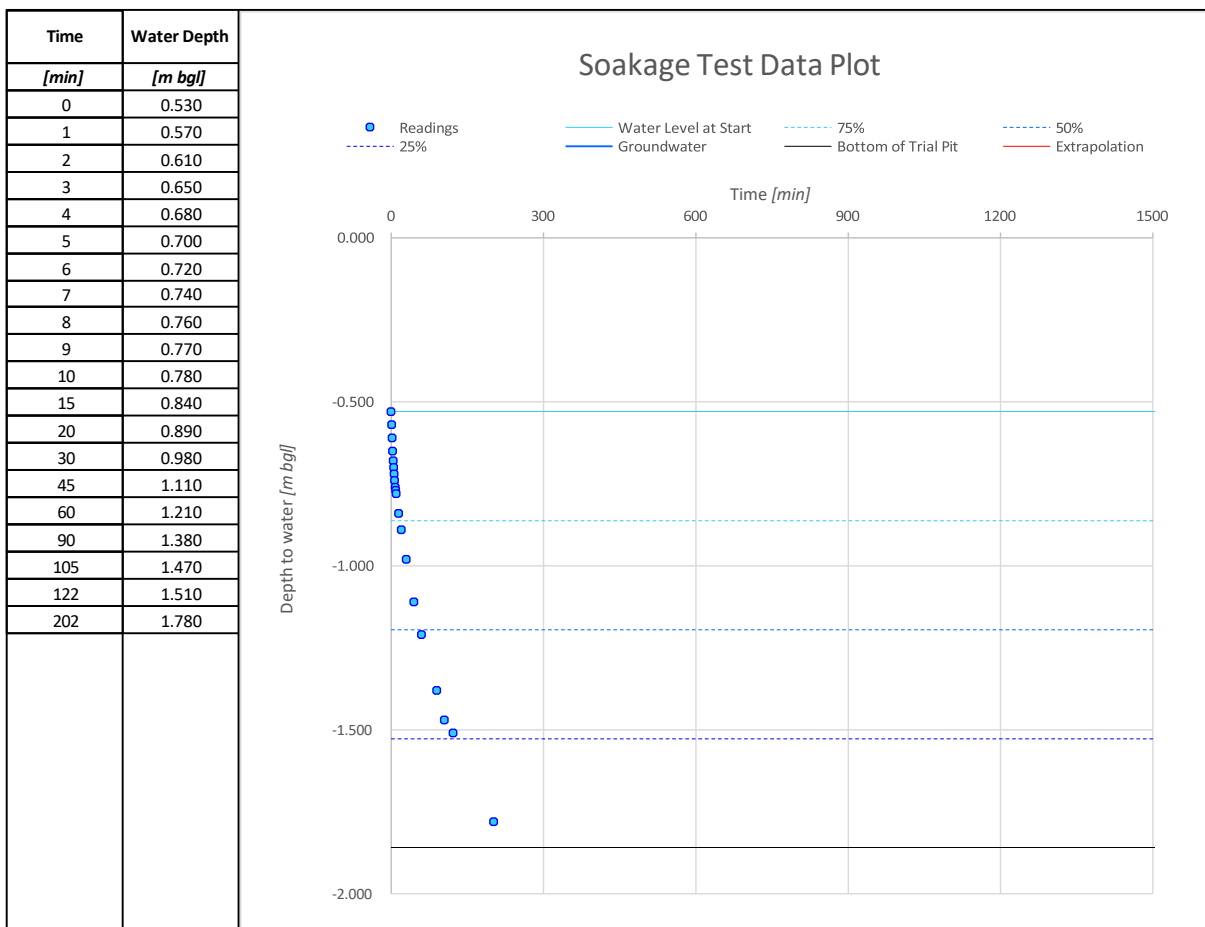
In accordance with BRE Digest 365:2016 - Soakaway Design

Client: Stonebond  
Project Title: Bartons Road, Havant  
Project No: BRD4469

Trial Pit No: TP301  
Test No: 2  
Date: 01/04/2025  
Logged by: SW

Length [m]: 2.00  
Depth [m]: 1.86  
Width [m]: 0.45  
Groundwater [m bgl]: Dry

| Ground | Conditions | from - to [m bgl] |      | Description                                                                        |
|--------|------------|-------------------|------|------------------------------------------------------------------------------------|
|        |            |                   |      |                                                                                    |
|        |            | 0.20              | 1.00 | Sandy coarse sub-angular GRAVEL, including some cobbles and boulders (Made Ground) |
|        |            | 1.00              | 1.80 | Silty fine SAND (Bognor Sand Member)                                               |



Soil Infiltration Rate [m/s]: 
$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

with:

$V_{p75-25}$  as Effective Storage Volume of water between 75% and 25% effective storage depth [m<sup>3</sup>] **0.60**

$a_{s50}$  as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area [m<sup>2</sup>] **4.16**

$t_{p75-25}$  as Time for the water level to fall from 75% to 25% effective storage depth [s] **6.6.E+03**

Soil Infiltration Rate [m/s] : **2.18E-05**

Remarks:



## SOIL INFILTRATION RATE

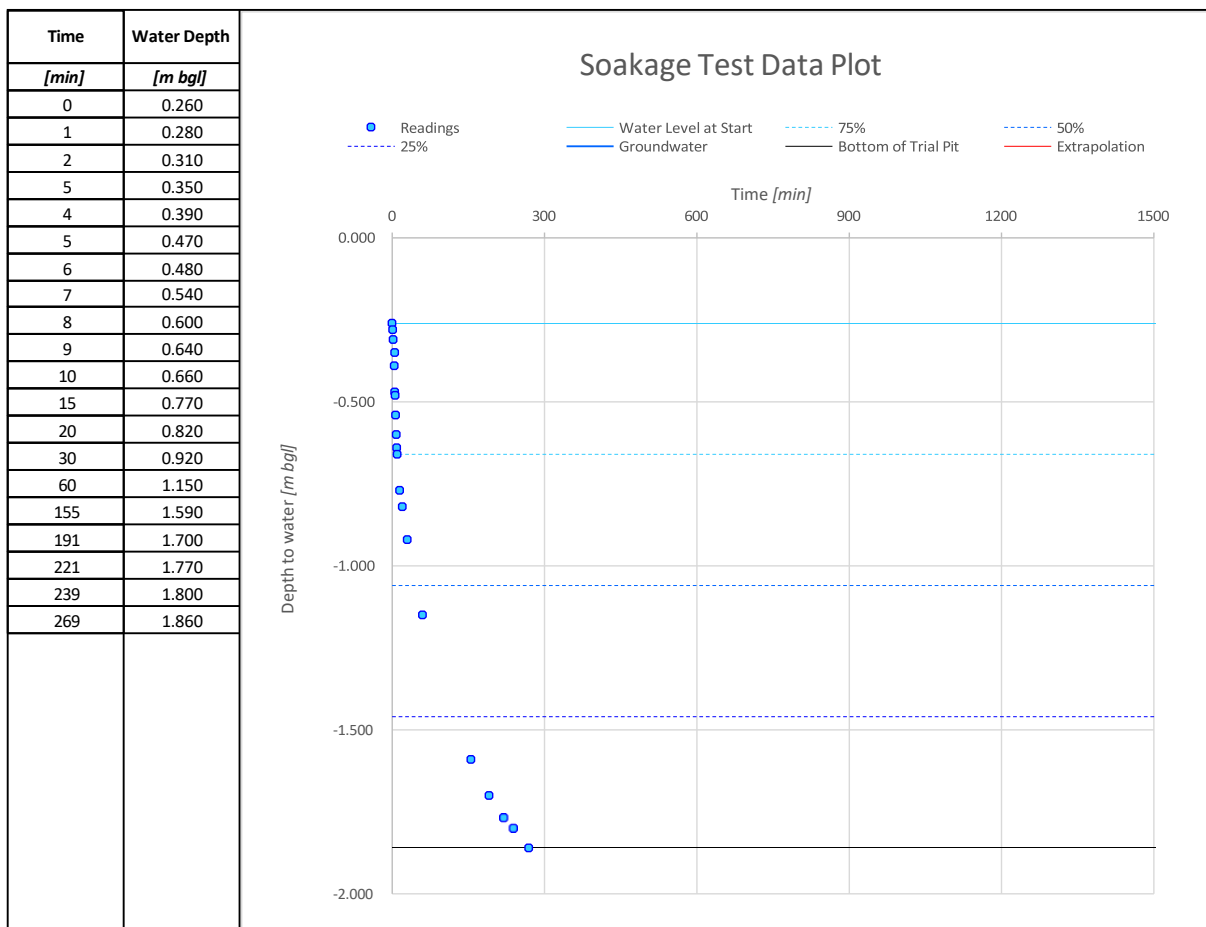
In accordance with BRE Digest 365:2016 - Soakaway Design

Client: Stonebond  
Project Title: Bartons Road, Havant  
Project No: BRD4469

Trial Pit No: TP301  
Test No: 3  
Date: 02/04/2025  
Logged by: SW

Length [m]: 2.00  
Depth [m]: 1.86  
Width [m]: 0.45  
Groundwater [m bgl]: Dry

| Ground | Conditions | from - to [m bgl] |      | Description                                                                        |
|--------|------------|-------------------|------|------------------------------------------------------------------------------------|
|        |            |                   |      |                                                                                    |
|        |            | 0.20              | 1.00 | Sandy coarse sub-angular GRAVEL, including some cobbles and boulders (Made Ground) |
|        |            | 1.00              | 1.80 | Silty fine SAND (Bognor Sand Member)                                               |



Soil Infiltration Rate [m/s]: 
$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

with:

$V_{p75-25}$  as Effective Storage Volume of water between 75% and 25% effective storage depth [m<sup>3</sup>] **0.72**

$a_{s50}$  as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area [m<sup>2</sup>] **4.82**

$t_{p75-25}$  as Time for the water level to fall from 75% to 25% effective storage depth [s] **7.0.E+03**

Soil Infiltration Rate [m/s] : **2.13E-05**

Remarks:



## SOIL INFILTRATION RATE

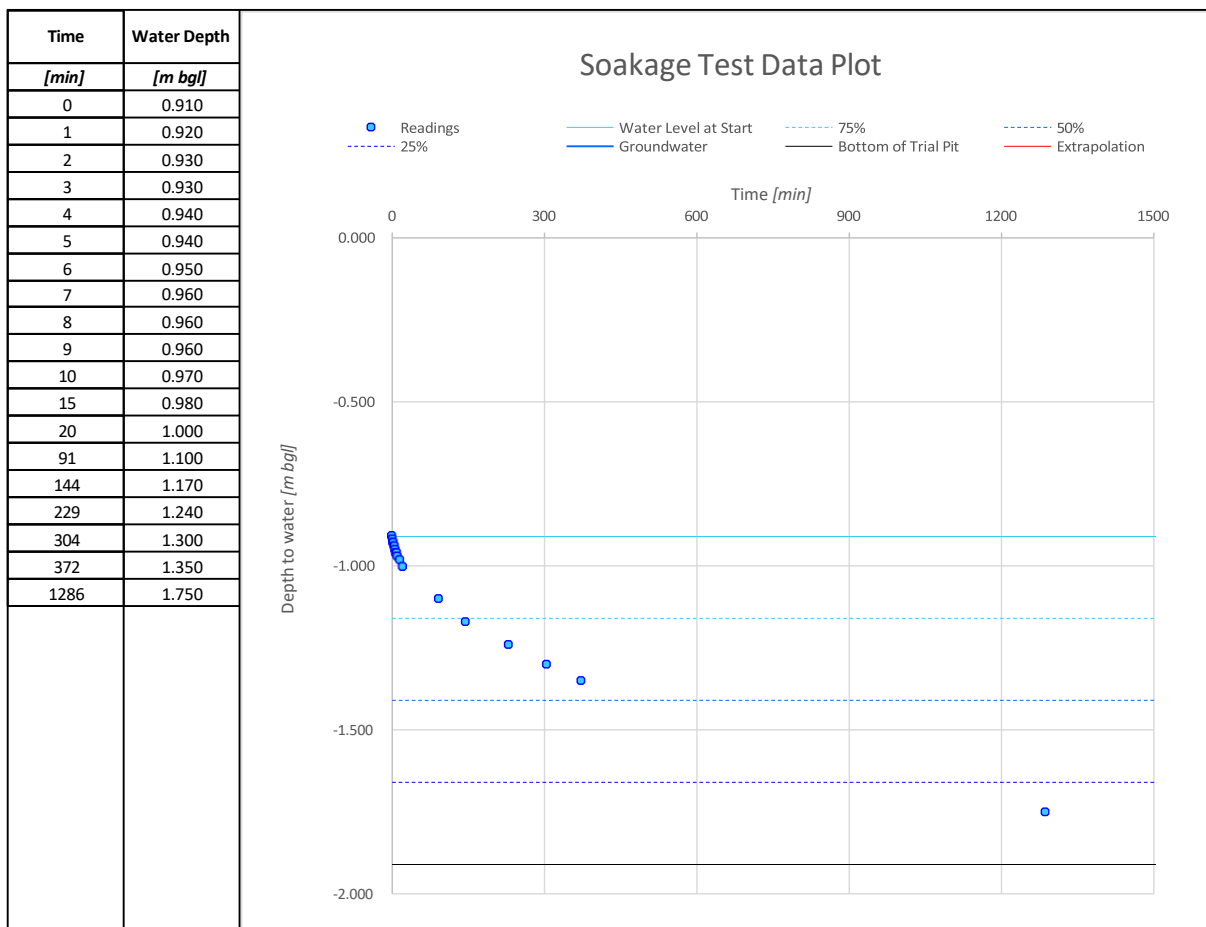
In accordance with BRE Digest 365:2016 - Soakaway Design

Client: Stonebond  
Project Title: Bartons Road, Havant  
Project No: BRD4469

Trial Pit No: TP302  
Test No: 1  
Date: 01 & 02/04/2025  
Logged by: SW

Length [m]: 2.00  
Depth [m]: 1.91  
Width [m]: 0.45  
Groundwater [m bgl]: Dry

| Ground | Conditions | from - to [m bgl] |      | Description                                                            |
|--------|------------|-------------------|------|------------------------------------------------------------------------|
|        |            |                   |      |                                                                        |
|        |            | 1.00              | 1.30 | Slightly sandy slightly organic CLAY (Alluvium)                        |
|        |            | 1.30              | 1.90 | Clayey sandy medium to coarse sub-rounded to sub-angular GRAVEL (Head) |
|        |            | 1.90              | 2.10 | Silty fine SAND (Bognor Sand Member)                                   |



Soil Infiltration Rate [m/s]:  $f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$

with:

$V_{p75-25}$  as Effective Storage Volume of water between 75% and 25% effective storage depth [m<sup>3</sup>] **0.45**

$a_{s50}$  as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area [m<sup>2</sup>] **3.35**

$t_{p75-25}$  as Time for the water level to fall from 75% to 25% effective storage depth [s] **5.7.E+04**

**Soil Infiltration Rate [m/s] : 2.37E-06**

Remarks:



## SOIL INFILTRATION RATE

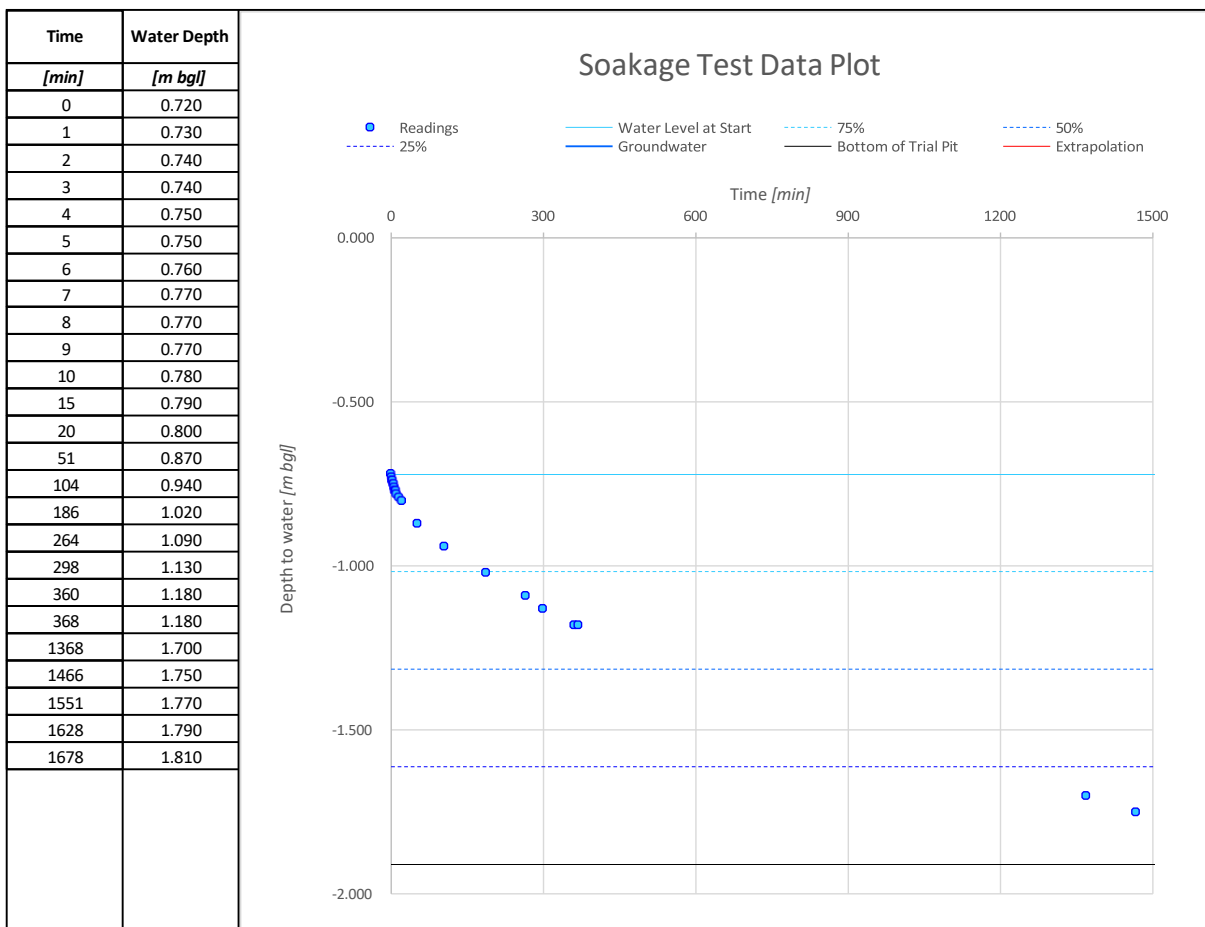
In accordance with BRE Digest 365:2016 - Soakaway Design

Client: Stonebond  
Project Title: Bartons Road, Havant  
Project No: BRD4469

Trial Pit No: TP302  
Test No: 2  
Date: 02 & 03/04/2025  
Logged by: SW

Length [m]: 2.00  
Depth [m]: 1.91  
Width [m]: 0.45  
Groundwater [m bgl]: Dry

| Ground | Conditions | from - to [m bgl] |      | Description                                                            |
|--------|------------|-------------------|------|------------------------------------------------------------------------|
|        |            |                   |      |                                                                        |
|        |            | 1.00              | 1.30 | Slightly sandy slightly organic CLAY (Alluvium)                        |
|        |            | 1.30              | 1.90 | Clayey sandy medium to coarse sub-rounded to sub-angular GRAVEL (Head) |
|        |            | 1.90              | 2.10 | Silty fine SAND (Bognor Sand Member)                                   |



Soil Infiltration Rate [m/s]: 
$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

with:

$V_{p75-25}$  as Effective Storage Volume of water between 75% and 25% effective storage depth [m<sup>3</sup>] **0.54**

$a_{s50}$  as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area [m<sup>2</sup>] **3.82**

$t_{p75-25}$  as Time for the water level to fall from 75% to 25% effective storage depth [s] **6.1.E+04**

**Soil Infiltration Rate [m/s] : 2.30E-06**

Remarks:



## SOIL INFILTRATION RATE

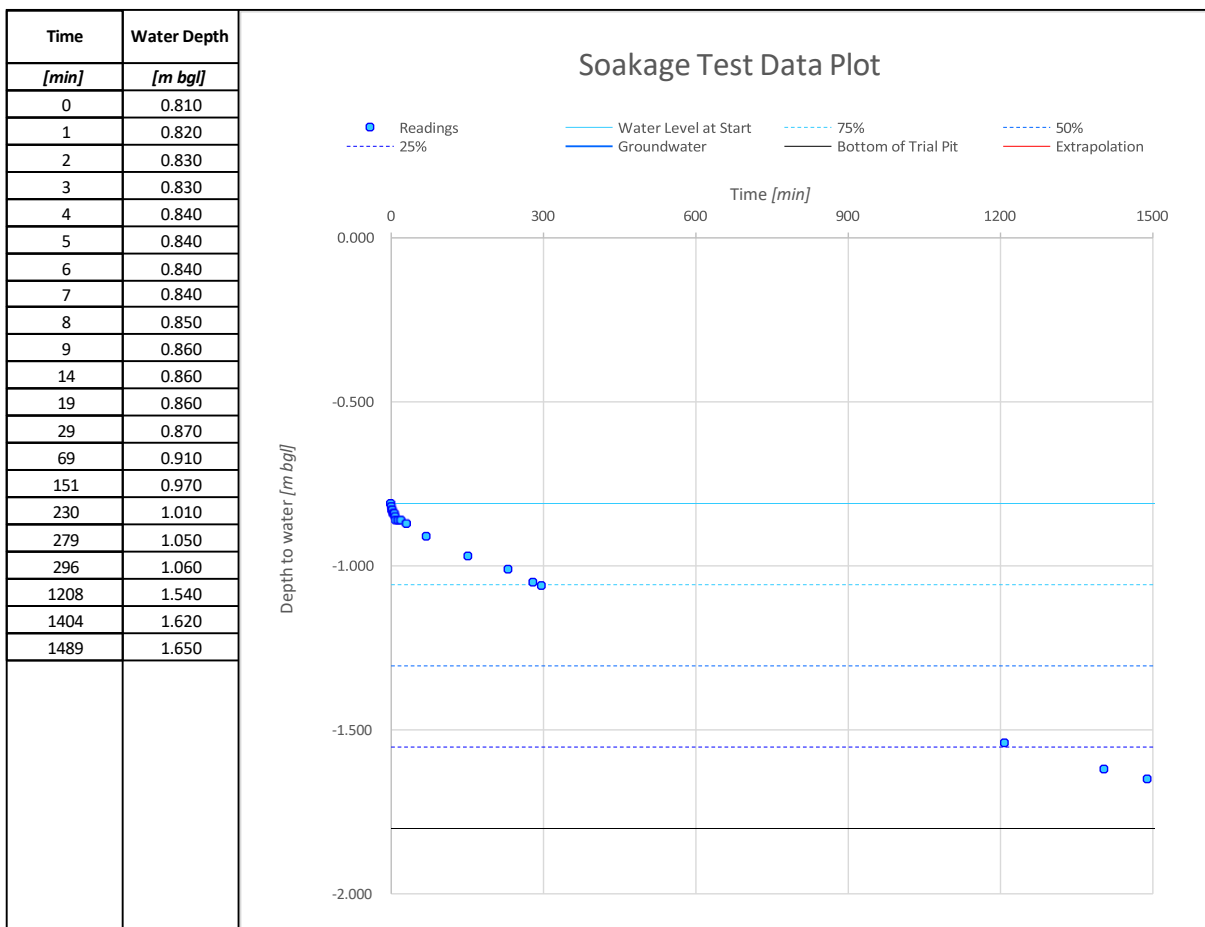
In accordance with BRE Digest 365:2016 - Soakaway Design

Client: Stonebond  
Project Title: Bartons Road, Havant  
Project No: BRD4469

Trial Pit No: TP303  
Test No: 1  
Date: 01 & 02/04/2025  
Logged by: SW

Length [m]: 2.00  
Depth [m]: 1.80  
Width [m]: 0.45  
Groundwater [m bgl]: Dry

| Ground | Conditions | from - to [m bgl] |      | Description                                                           |
|--------|------------|-------------------|------|-----------------------------------------------------------------------|
|        |            |                   |      |                                                                       |
|        |            | 0.30              | 1.00 | Slightly gravelly slightly sandy CLAY (Head Deposits)                 |
|        |            | 1.00              | 1.70 | Sandy very clayey medium to coarse sub-rounded GRAVEL (Head Deposits) |
|        |            | 1.70              | 2.10 | Silty fine SAND (Bognor Sand Member)                                  |



Soil Infiltration Rate [m/s]: 
$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

with:

$V_{p75-25}$  as Effective Storage Volume of water between 75% and 25% effective storage depth [m<sup>3</sup>] **0.45**

$a_{s50}$  as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area [m<sup>2</sup>] **3.33**

$t_{p75-25}$  as Time for the water level to fall from 75% to 25% effective storage depth [s] **5.7.E+04**

Soil Infiltration Rate [m/s] : **2.36E-06**

Remarks:



## SOIL INFILTRATION RATE

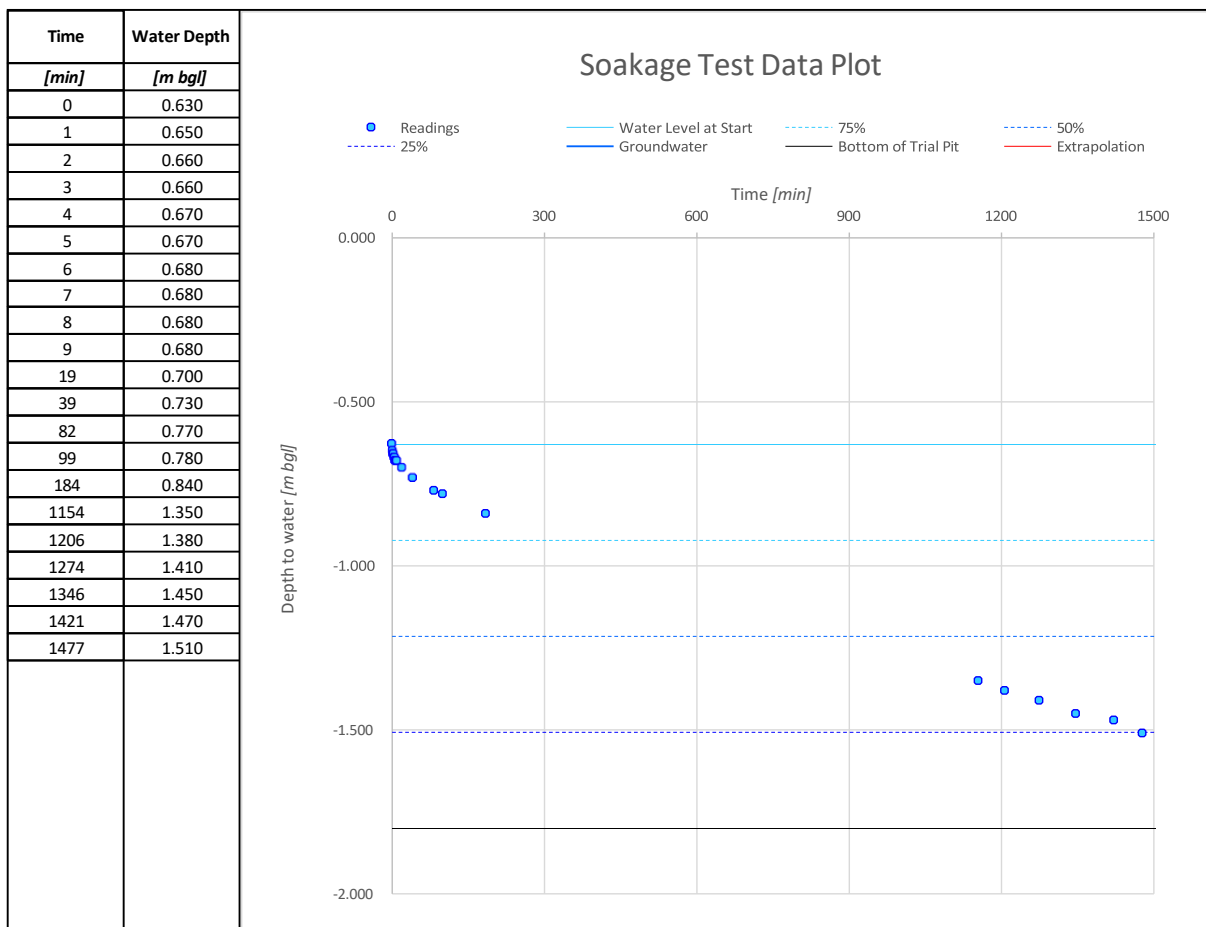
In accordance with BRE Digest 365:2016 - Soakaway Design

Client: Stonebond  
Project Title: Bartons Road, Havant  
Project No: BRD4469

Trial Pit No: TP303  
Test No: 2  
Date: 02 & 03/04/2025  
Logged by: SW

Length [m]: 2.00  
Depth [m]: 1.80  
Width [m]: 0.45  
Groundwater [m bgl]: Dry

| Ground | Conditions | from - to [m bgl] |      | Description                                                           |
|--------|------------|-------------------|------|-----------------------------------------------------------------------|
|        |            |                   |      |                                                                       |
|        |            | 0.30              | 1.00 | Slightly gravelly slightly sandy CLAY (Head Deposits)                 |
|        |            | 1.00              | 1.70 | Sandy very clayey medium to coarse sub-rounded GRAVEL (Head Deposits) |
|        |            | 1.70              | 2.10 | Silty fine SAND (Bognor Sand Member)                                  |



Soil Infiltration Rate [m/s]: 
$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

with:

$V_{p75-25}$  as Effective Storage Volume of water between 75% and 25% effective storage depth [m<sup>3</sup>] **0.53**

$a_{s50}$  as Internal Surface Area of the soakage trial pit up to 50% storage depth including the base area [m<sup>2</sup>] **3.77**

$t_{p75-25}$  as Time for the water level to fall from 75% to 25% effective storage depth [s] **6.8.E+04**

Soil Infiltration Rate [m/s] : **2.06E-06**

Remarks: