Surface Water Strategy

For the Approved new dwelling on land at

10 Richmond Close, Fleet, Hampshire, GU52 7UJ

Prepared by

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Contents

Appendix

List of Figures

List of Tables

Disclaimer

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Scope

Note: this report can only be assessed under the scope it is intended for as set out below:

Town and Country Planning Act 1990

The scope of this report includes the provision of supplementary information in relation to a planning application set under the provision of this Act and is intended to meet the requirements for "particulars" under Section 62; (3) & (4 A) of same.

The Town and Country Planning (Development Management Procedure) (England) Order 2015

The scope of this report includes the provision of supplementary information in relation to any related planning Condition set under the provision of this Order and is intended to meet the requirements for "particulars" under Section 27(b) of same.

Building Act 1984

Building Regulations 2010 and Statute control

This report **is not** provided in support of any application made under the Building Act 1984 or related Regulations.

Statement of conformity

While this report cannot therefore be lawfully assessed by any persons, in any capacity, for compliance with the above Building Regulations all drainage on this private site, both foul and SW will be subject to full compliance with Part H of the Building Regulations 2010 (as amended 2013).

Hence all construction details, SW runs, pipe diameters etc. as detailed in this report are designed to comply in full with the "Adequate provision" Requirement of Part H and are to be checked, inspected, tested and approved by the Building Control Body of the clients choice at the time of detailed design and construction.

SuDS design additional standards

All SuDS (Sustainable drainage system) on site will also be designed and installed in accordance with CIRIA 753 & CIRIA 768, para 169 of the NPPF, its supporting technical guidance and the DEFRA Non-Statutory Technical standards for sustainable drainage systems (2015).

1 Executive Summary

A All surface water arising can be managed on site.

B All surface water arising from new roofed areas is controlled by direct infiltration through soakaways.

C Water butts will reduce potable water demand provide additional SuDS on site.

D All areas of hard standing on the site will be constructed using a permeable medium.

E There is no design exceedance outfall away from the site.

F All SuDS on site will be installed with full consideration to long term maintenance.

G The use of SuDS techniques on site will mitigate and treat the run-off volumes.

2 Introduction

2.1 Site location

The approved development is at 10 Richmond Close,Fleet,Hampshire, GU52 7UJ, (see Figure 1).

Figure 1: Site location, is indicated

2.2 Development description

The Approval (22/02554/FUL) is for the "Demolition of an existing garage and erection of a 3 bedroom detached bungalow".

All plans as per those approved.

2.2.1 Planning Condition 3

> "No works relating to the construction of the dwelling, driveway or parking areas shall begin until a surface water drainage scheme for the site, based on sustainable drainage principles and an assessment of the hydrological and hydro-geological context of the development, has been submitted to and approved in writing by the local planning authority. The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.
>
> The scheme shall include:

1) Where infiltration is proposed, full infiltration tests in accordance with BRE 365 including groundwater strikes.

2) Detailed drawings of the proposed drainage system including details as to where surface water is being discharged to.

3) Calculations confirming that the proposed drainage system has been sized to contain the 1 in 30 storm event without flooding and any flooding in the 1 in 100 plus climate change storm event will be safely contained on site.

4) Calculations showing the existing runoff rates and discharged volumes for the 1 in 1, 1 in 30 and 1 in 100 storm events and calculations for the proposed runoff rates and discharged volumes for the 1 in 1, 1 in 30 and 1 in 100 plus climate change storm events. To be acceptable proposed runoff rates and discharge volumes must be no higher than existing.

5) Provision of a Maintenance plan setting out what maintenance will be needed on the drainage system and who will maintain this system going forward."

2.3 Geology

Refer to Geo-insight report at Appendix A.

2.4 Infiltration rates

Infiltration rates for the site based on infiltration testing undertaken on site by the client, is found to be 2.0 x10^{-5} ms^{-1} in the worst case.

Refer to data at Appendix B.

2.4.1 Water table

Ground water was not encountered in the trial holes.

2.5 Existing surface water drainage

The site currently drains surface water to a network drain. The existing garages on site do not utilise SuDS.

The curtilage of the entire site encloses an area of approximately 1000m^2 of which, pre-development, 0m^2 is classed as being impermeable. The new development increases the impermeable area from 0m^2 to 95m^2 (95m^2 roof area).

However, for the purposes of this assessment the area covered by the development is considered greenfield with all rainwater draining via natural process.

2.6 Greenfield estimation of peak rate of run-off

2.6.1 Methodology

The following greenfield run-off rate calculations have been carried out in accordance with the IH Report 124 'Flood estimation for small catchments'[1]. The pro rata method on the size of catchment has been used.

2.6.2 Formula

For catchments less than 50ha:

$$Q_{BAR50ha} = 1.08\,(50/100)^{0.89} * SAAR^{1.17} * SPR^{2.17} \tag{1}$$

$$Q_{BAR} = Q_{BAR50ha} * \frac{A}{50} \tag{2}$$

$$Q_{1yr} = Q_{BAR} * 0.85 \tag{3}$$

$$Q_{100yr} = Q_{BAR} * GC_{100} \tag{4}$$

2.6.3 Variables

Qbar/Qmed =0.85

SAAR = 710mm

Hydrological Region 6

Growth curve factors: 30 yr = 2.3; 100 yr = 3.19

SPR = 0.47

Note: Area reflects positively drained areas only. I.e. Whole site area minus areas of significant open space.

2.6.4 Calculations

$$\begin{aligned} Q_{BAR50ha} &= 1.08 * 0.5^{0.89} * 710^{1.17} * 0.47^{2.17} \\ &= 0.58 * 2167.57 * 0.19 \\ &= 245.43 \end{aligned}$$

Using Equation 2:

$$\begin{aligned} Q_{BAR} &= \frac{245.43 * 0.10}{50} \\ &= 0.49 ls^{-1} \end{aligned}$$

Using Equation 3:

$$\begin{aligned} Q_{1} &= 0.49 * 0.85 \\ &= 0.42 ls^{-1} \end{aligned}$$

Using Equation 4:

$$\begin{aligned} Q_{100} &= 0.49 * 3.19 \\ &= 1.57 ls^{-1} \end{aligned}$$

2.6.5 Peak green field run-off rates

For the 1 year Return Period event the peak runoff calculates to 0.42 ls^{-1}
For the 30 year Return Period event the peak runoff calculates to 1.13 ls^{-1}
For the 100 year Return Period event the peak runoff calculates to 1.57 ls^{-1}

3 SuDS Principles

In line with the SuDS management train, the following hierarchy has been considered in applying the use of SuDS into the proposed development scheme.

3.1 SuDS design philosophy

The CIRIA SuDS[2] manual provides the design philosophy:

> "SuDS design should, as much as possible, be based around the following:
>
> - using surface water runoff as a resource
> - managing rainwater close to where it falls
> - managing runoff at the surface
> - allowing rainwater to soak into the ground
> - promoting evapotranspiration
> - slowing and storing run-off to mimic natural runoff characteristics
> - reducing contamination of runoff through pollution prevention and controlling the runoff at source
> - treating runoff to reduce the risk of urban contaminants causing environmental pollution."

3.2 Source control

- Sedum roofing.
- Infiltration devices. Typically soakaways.
- Rainwater harvesting.
- Bio-retention planting, rain gardens.
- Permeable paving, porous asphalt. These provide both infiltration and short term storage volumes thus reducing overall un-mitigated run-off volumes.

3.3 “End of pipe” solutions

To be considered only after implementation of the above options.

- Retention tanks with outfall controlled by hydraulic means to limiting discharge rates and volumes to discharge to existing SW flow pathways.

Sections 4.2 to 4.7 consider the viability of a range of these SuDS devices.

4 Appraisal of SuDS options

The primary aim is to meet the requirements of the Local Plan core policies and the SuDS hierarchy so as to manage SW on site.

4.1 Site constraints impacting on SuDS

- Approved site layout.
- Approved pitched roof design.
- No access to a watercourse.

4.2 Infiltration devices

With reference to Section 3.1, soakaways promote the following SuDS design criteria:

- manages rainwater close to where it falls
- allows rainwater to soak into the ground
- slows and stores run-off to mimic natural run-off characteristics
- treats run-off to reduce the risk of urban contaminants causing environmental pollution.

Given the infiltration rates calculated on site infiltration devices appear suited for this site and can be designed to accommodate design rainfall events (designed in line with BRE365 and Part H of the Building Regulations and at least 5m away from any structure).

4.3 Expansive planting

With reference to Section 3.1, expansive planting promotes the following SuDS design criteria:

- manages rainwater close to where it falls
- slows and stores run-off to mimic natural run-off characteristics
- treats run-off to reduce the risk of urban contaminants causing environmental pollution.

4.4 Permeable hard standing

With reference to Section 3.1, permeable paving promotes the following SuDS design criteria:

- manages rainwater close to where it falls
- manages runoff at the surface
- allows rainwater to soak into the ground
- slows and stores run-off to mimic natural runoff characteristics
- treats runoff to reduce the risk of urban contaminants causing environmental pollution.

4.4.1 Permeable paving

A 30% void ratio is assumed through a 350mm sub-base. This is appropriate for a DOT Type 3 Sub-base hence the storage capacity equates to circa 105mm per $1m^2$ therefore based on a M6 100hr + cc storm of 87mm rainfall the paving offers, without any allowance for infiltration, a circa 1:1.2 drained volume:storage volume capacity. Hence there is no anticipated exceedance flow from the areas of permeable paving.

TSS 0.7, Metals 0.6, Hydrocarbons 0.7 = suitable for trafficked areas

All permeable paving offers sufficient storage volume to accommodate the 5mm event.

4.5 Rainwater harvesting

With reference to Section 3.1, Rainwater harvesting promotes the following SuDS design criteria:

- uses surface water runoff as a resource
- manages rainwater close to where it falls

and:

- stores rainwater for later use

4.5.1 For external use

Rain water harvesting / water butts: These provide additional, "off line[1]" SuDS, and are deemed a suitable SuDS component for small plots[2], extract at Figure 2. The image shows a water butt in "off-line" configuration using a standard diverter.

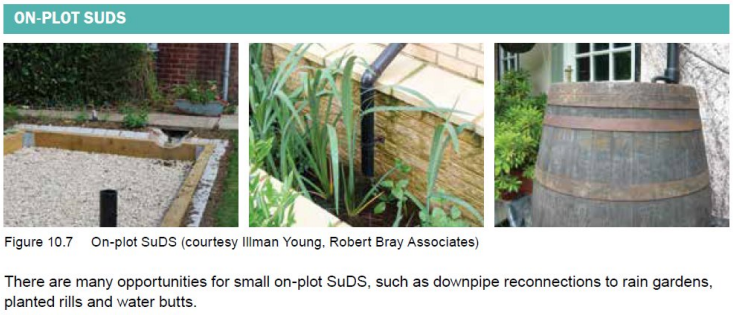


Figure 2: Use of water butts as provided in the SuDS manual

The collection and re-use of water can reduce run off volumes arising from roofs. The collected water, via readily available diverters (e.g. Web link: Standard diverter example, as per Figure 3), being used for external uses.

Figure 3: Standard rainwater diverter

Rainwater butts can, in part, accommodate the 5mm event dependent on manual drawdown and evaporation.

[1]The term "off-line" refers to the fact that a water butt is a harvesting device that is not "in-line" in the same manner that a pipe is in-line. Water is collected (harvested) until the water butt is full. When full, the rainwater continues down the rainwater pipe. Outflow from the tank is not "automatic" since this would negate the reason to harvest rainwater. Instead, manual drawdown occurs with the harvested water being used for external uses. Since a water butt may be full, the useful volume is not accounted for in storage and run-off calculations.

4.6 Sedum/green roofs.

Not required.

4.7 “End of pipe” solutions

Not required.

5 Proposed surface water disposal strategy

The following sections consider the strategy for water arising from the roof areas, driveways and hard standing and areas of landscaping.

5.1 Soakaways

With Reference to Table 26.2 of the SuDS Manual, pollution hazard indices for:

Domestic Roofs are 0.2 (TSS), 0.2 Metals & 0.05 Hydrocarbons.

Mitigation provided = 0.3, 0.3 & 0.3 hence satisfactory mitigation provided for roof water.

All surface water arising from the area of new roofing is controlled by direct infiltration through soakaways. Notes:

- For this report the drained area to the soakaway(s) arises from the area of new roofing plus a 1.1 allowance for urban creep.
- The soakaways are designed for all events up to and including the M100 6hr event.
- An allowance of x1.4 is made for climate change in line with current best practice.
- FEH22 point rainfall data used.

Designed to CIRIA C753, and to accommodate all surface water arising from a drained area of 95m^2 requires 2 , 95% void ratio soakaways 2m wide x 2.5m long with a 0.8m effective depth. See Table 1.

Permeability	9.10E-06	ms^{-1}
Urban Creep	1.1	
Drained area	95	m^2
Designed drained area	104.5	m^2
Return Period	100	yr
% voids	95	%
Climate change	1.4	
Factor of Safety	1.5	

Design Width, m	2
Design Length, m	2.5
Design $Depth_{eff}$, m	0.8
Design Qty	2

Duration, mins	5	10	15	30	60	120	240	360	600	1440
Duration, hrs	0.08	0.17	0.25	0.5	1	2	4	6	10	24
Intensity, mm/hr	150.0	149.4	149.6	99.2	62.4	35.6	20.3	14.6	9.6	4.7
H max, m	0.13	0.27	0.40	0.53	0.65	0.71	0.74	0.73	0.67	0.43

Max depth, m	0.74
Crit Duration, mins	255
Empty to 50%, hrs	8.11

Table 1: CIRIA C753 Calculation results

The maximum design head with respect to the critical storm duration is shown in Figure 4.

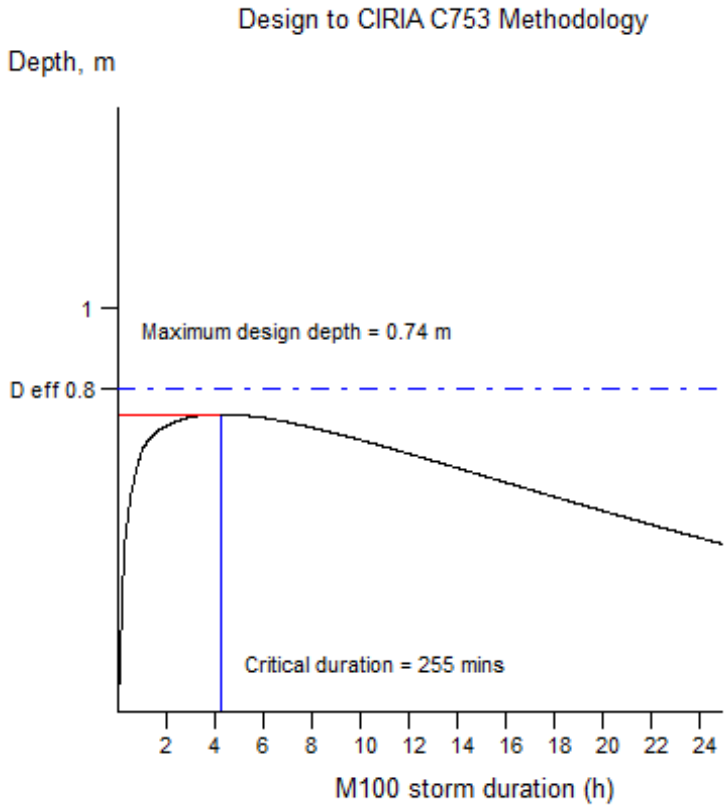


Figure 4: Critical storm duration and max design depth

5.1.1 Sedimentation risk

Generally, roofing carries a very low sediment loading. Worst case 216 $kg.ha^{-1}yr^{-1}$ - so for this site that equates to circa 2.1$kg.yr^{-1}$ in the worst case. Generally this would reduce the attenuation capacity by circa 2% over 50yrs (all data from the SuDS maunual). The design allows for this amount with extra capacity provided to a 100yr design life. The CIRIA C753 method acknowledges this sedimentation and hence the use of a saftey factor of 1.5 is used in the calculations.

5.1.2 Minimising sedimentation risk

The developer will fit accessible sumped rainwater gulleys at the base of all RWP's so as to reduce the amount of any sediment entering the soakaway.

The developer will also fit clip-in leaf guards to all roof gutters so as to remove gross solids.

5.1.3 Soakaway detail

The soakaways are designed to use open crates offering a circa 95% void ratio, encased within a geotextile membrane and provided with circa 400mm minimum cover. A typical detail is shown in Figure 5.

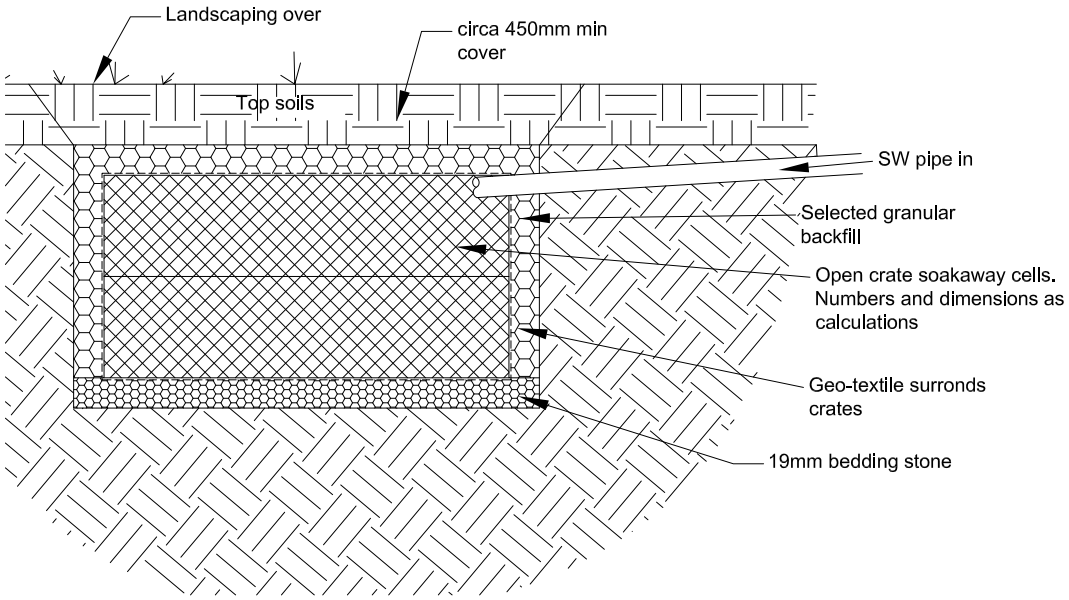


Figure 5: Typical soakaway details

5.1.4 Drainage run capacity check

Flow will be conveyed to the soakaways via 100mm diameter drainage runs laid at no less than 1:80 falls giving a maximum design capacity of 6.6ls^{-1}(Part H design chart, Figure 6).

1 in 100yr max mean intensity storm = 107mmhr^{-1}

Drained area to one pipe = 48m^2

Required pipe capacity = 48 x 0.1068 / 3.6 = 1.4 ls^{-1}

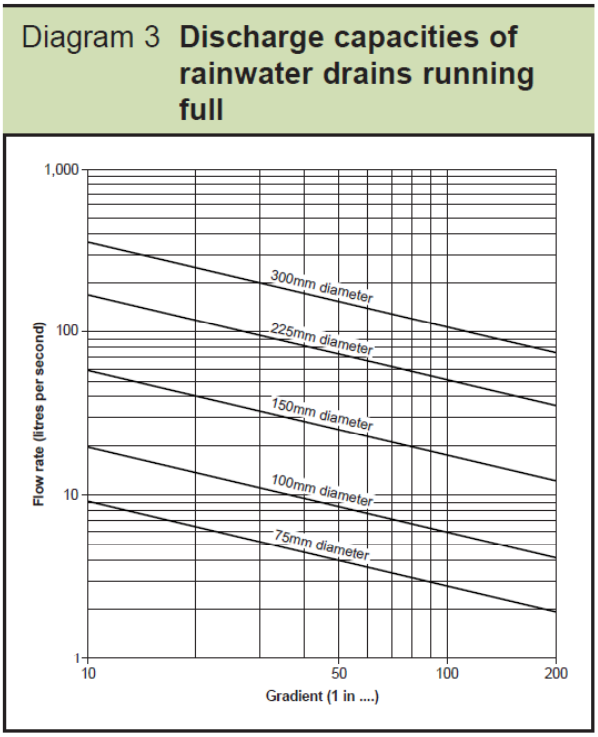


Figure 6: Part H drainage design chart

5.2 Rainwater Harvesting

The project team have detailed a "off line" rainwater butts to collect water for external use primarily to reduce potable water demand. These also serve as an additional SuDS feature. Since these are in off-line configuration any exceedance flows are automatically directed back to the downpipes.

5.3 Hard standing

All new areas of hard standing on the site will be constructed using a permeable medium on a DOT/MOT 3 sub-base of a minimum 350mm depth (refer to Section 4.4).

Note: The depth requirement above satisfies hydraulic criteria only. Structural loading may require greater hardcore depths.

The perimeter of these areas will be considered for expansive planting to accommodate any exceedance flows.

For a check on the capacity of the permeable paving to function an infiltration rate of 5mm.hr^{-1} has been used below. Infiltration rates, at sub base depth, on the site have

been found to be 6.8 x 10^{-6} ms^{-1} (in the worst case) which equals circa 25mm.hr^{-1}hence the rate of 5mm.hr^{-1} is considered conservative being five times lower. A nominal 100m^2 is checked here (so as to provide meaningful results given the small drained areas) but the results can be scaled up or down pro rata.

Over 100m^2 plan area, 5mm.hr^{-1} equates to a total outflow rate of 0.138ls^{-1}

Designed to accomodate all surface water arising from a design drained area of 100m^2 requires a minimum attenuation volume of 6 m^3. This can be achieved using an overall storage volume of 35.0 m^3 formed within a 100m^2 x 0.35m deep 30% void ratio sub-base. See Table 2.

Drained area	$100m^2$	
Urban Creep	1	
Designed drained area	$100m^2$	
Return periods considered	1yr, 30yr, 100yr	
Storm profiles used	50% Summer	75% Winter
Storm coeffs	a = 0.1, b = 0.815	a = 0.06, b = 1.026
Storm range, storm increments	From 5 minutes duration in further 2 min. intervals until critical storm reached	
M5-60	20mm	
r	0.4	
Rainfall model	FEH 2022	
Critical design storm	195 mins, Summer	
Climate change	1.4	
Storm mean intensity	$17.1mm.hr^{-1}$	
Design mean intensity	$24.0mm.hr^{-1}$	
Storm peak intensity	$86.3mm.hr^{-1}$	
Design peak intensity	$120.8mm.hr^{-1}$	
Design maximum head	0.25m	
Calculated maximum head	0.20m	
Minimum attenuation volume required	$6.00m^3$	
Void ratio	30%	
Design attenuation volume	$8m^3$	(0.3 x $100m^2$ x 0.25m)
Provided attenuation volume	$11m^3$	(0.3 x $100m^2$ x 0.35m)
Factor of Safety	1.40	
1 in 1yr maximum outfall rate	$0.1ls^{-1}$	(See Figure 7.)
1 in 30yr maximum outfall rate	$0.1ls^{-1}$	(See Figure 8.)
1 in 100yr maximum outfall rate	$0.1ls^{-1}$	(See Figure 9.)
1 in 100yr Time to peak	194 mins	
1 in 100yr Max head: Time to drop to 50%	6.04 hrs	
Outfall control method	Nominal GF outflow	

Table 2: Storage volume design summary

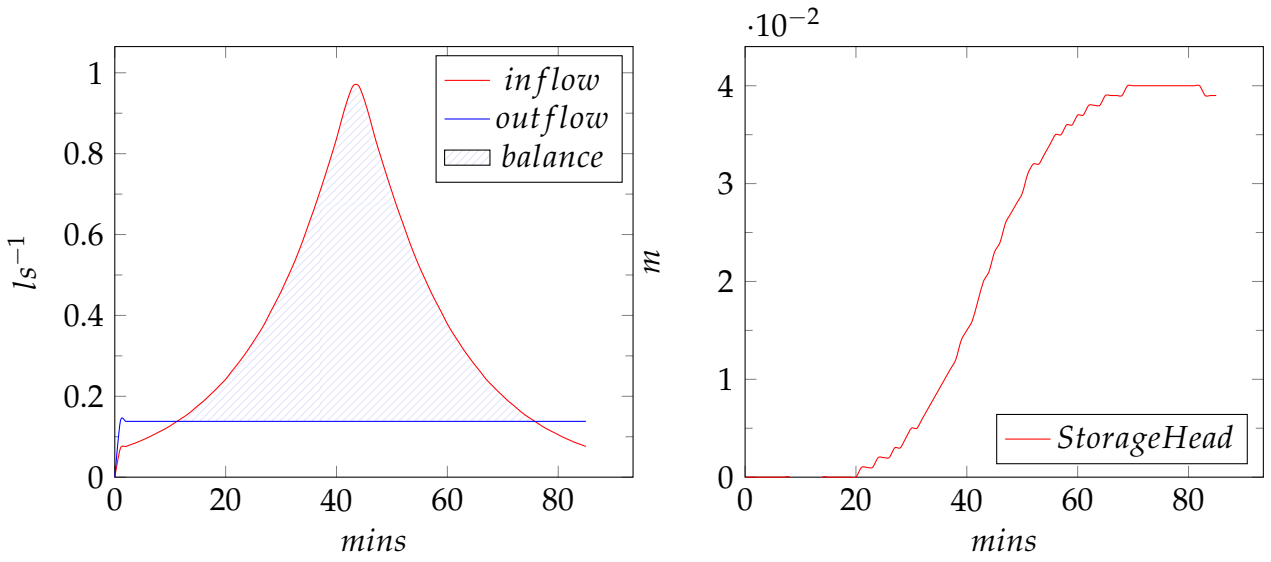


Figure 7: 1 in 1 year critical storm event

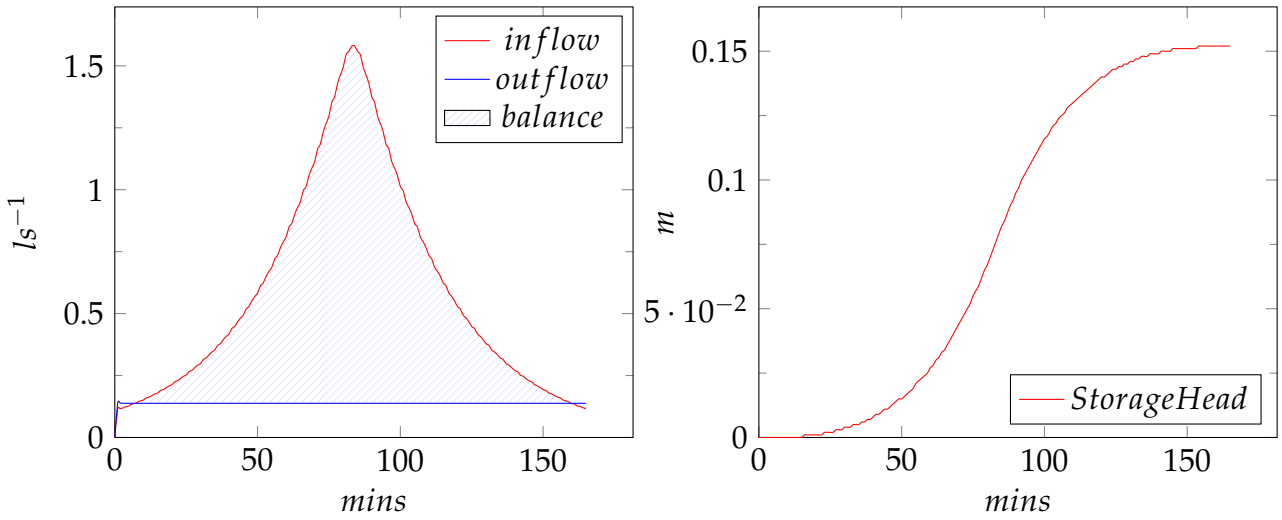


Figure 8: 1 in 30 year critical storm event

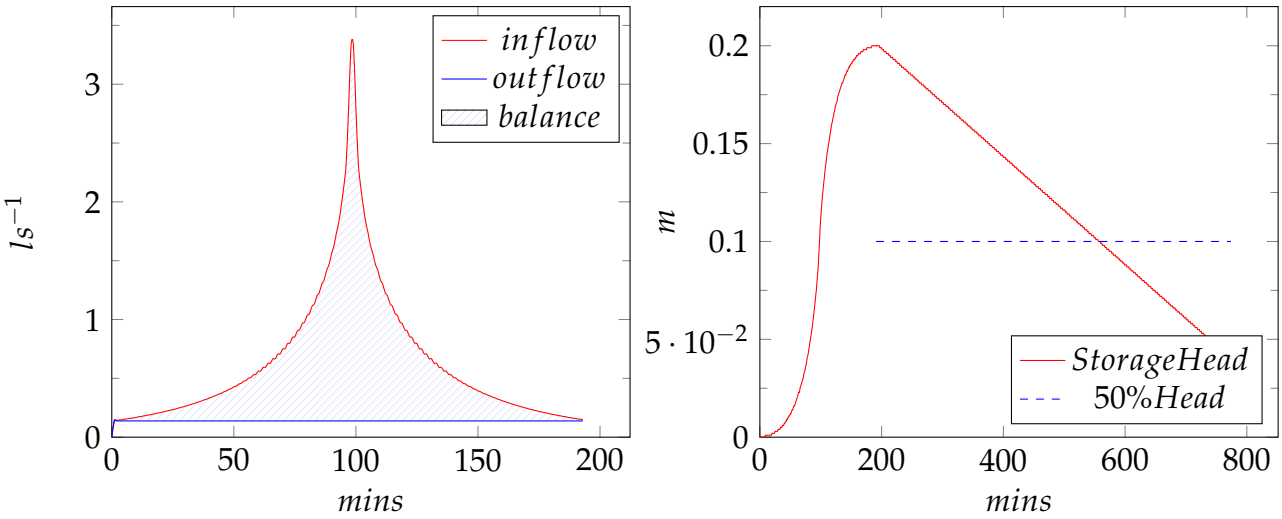


Figure 9: 1 in 100 year critical storm event

The areas of permeable paving are primarily disconnected from the proposed SW network on site, i.e. they are not primarily designed to drain to the soakaways. Surface water retained in the sub-base matrix is lost through evaporation and infiltration at or greater than 6.8 x 10^{-6} ms^{-1}, at shallow depths, into the surrounding naturally fissured sub-soils (due to action of freeze-thaw, roots, earthworms and the proposed local re-grading following any site clearance). In doing so it mimics as close as possible the natural hydrological process of water falling onto the ground and finding natural flow paths for dispersion.

A suitable option is provided at Appendix C.

5.4 Landscaped areas

Typical domestic planting.

5.5 Drainage layout

Please refer to the drainage layout showing SuDS features at Appendix D.

5.6 Timetable for implementation

5.6.1 Demolition phase

During the demolition phase (of the garage), rainwater will be managed in line with the requirements under the CDM regulations using existing SW gullies with measures in place to prevent contaminants entering the network (sand bag bunding).

5.6.2 Construction phase

Soakaways will be installed early in the project under the remit of the ground-works operations.

Areas of landscaping and boundary planting will be undertaken as the project nears completion.

Any permeable paving will only be installed when all construction activities are either complete, or near completion so as to minimise blockage of the surface.

5.6.3 Post construction phase

Water butts will be installed prior to final completion as part of the final landscaping.

Inspection chambers pumped and cleaned out.

6 Maintenance of SuDS

Ultimate responsibility for the long term maintenance with SuDS in this environment lay with the owner of each dwelling (as yet unknown).

The site SW drainage will remain private.

All SuDS on site will be installed with full consideration to long term maintenance. The following guidance applies:

6.1 Soakaways (and pre treatment sediment sumps)

Figure 10[2] provides details maintenance operations required for a soakaway system.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Figure 10: Maintenance operations for soakaway

6.2 Permeable pavements

The maintenance plan for permeable pavements will include:

- Monthly litter removal;
- Bi-Annual jet wash and sweeping.
- Annual inspection and repairs as/if required.

6.3 Water butts

A maintenance plan for water butts should include:

- Regular inspection of silt traps and filters.
- Removal of sediments and debris as required.

6.4 Vegetation expansion

The maintenance plan for any garden planting will include:

- Monthly inspections until vegetation is established;
- Six monthly inspections after the vegetation has become established;
- Monthly litter removal.

7 Summary

All surface water arising can be managed on site. All surface water arising from roofed areas is controlled by direct infiltration through a pair of soakaways. Water butts will reduce potable water demand provide additional SuDS on site. All new areas of hard standing on the site will be constructed using a permeable medium.

There is no design exceedance outfall away from the site. Exceedance flows and flows arising from system failure can be accommodated on site within areas of landscape planting, soakaway crates and the sub-base to the hard standing.

The use of SuDS techniques on site, as detailed above and when installed in line with best practice (I.e. CIRIA 753 & CIRIA 768), will reduce and treat the run-off volumes in line with the core policies.

Signed: 

Dr Robin Saunders CEng, C. Build E, MCABE, BEng(Hons), PhD

Drainage and Building Engineer

Date: 24th July, 2023

References

[1] DCW Marshall & AC Bayliss. Flood estimation for small catchments. Technical Report No. 124, Institute of Hydrology, June 1994.

[2] CIRIA. The SUDS manual. Technical report, CIRIA, 2015.

A Geo-Insight report

Groundsure LOCATION INTELLIGENCE

Geo Insight

10, RICHMOND CLOSE, FLEET, GU52 7UJ

Order Details

Date: 23/07/2023

Your ref: 232350

Our Ref: GS-7HM-OFV-OW3-W7N

Site Details

Location: 480846 152844

Area: 0.1 ha

Authority: Hart District Council ↗

Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Summary of findings

Page	Section	Geology 1:10,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
11 >	1.1 >	10k Availability >	Identified (within 500m)				
12	1.2	Artificial and made ground (10k)	0	0	0	0	-
13	1.3	Superficial geology (10k)	0	0	0	0	-
13	1.4	Landslip (10k)	0	0	0	0	-
14	1.5	Bedrock geology (10k)	0	0	0	0	-
14	1.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
15 >	2.1 >	50k Availability >	Identified (within 500m)				
16	2.2	Artificial and made ground (50k)	0	0	0	0	-
16	2.3	Artificial ground permeability (50k)	0	0	-	-	-
17 >	2.4 >	Superficial geology (50k) >	0	0	2	0	-
18	2.5	Superficial permeability (50k)	None (within 50m)				
18	2.6	Landslip (50k)	0	0	0	0	-
18	2.7	Landslip permeability (50k)	None (within 50m)				
19 >	2.8 >	Bedrock geology (50k) >	1	1	0	0	-
20 >	2.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
20	2.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
21	3.1	BGS Boreholes	0	0	0	-	-
Page	Section	Natural ground subsidence >					
22 >	4.1 >	Shrink swell clays >	Very low (within 50m)				
23 >	4.2 >	Running sands >	Low (within 50m)				
25 >	4.3 >	Compressible deposits >	Negligible (within 50m)				
26 >	4.4 >	Collapsible deposits >	Very low (within 50m)				
27 >	4.5 >	Landslides >	Very low (within 50m)				
28 >	4.6 >	Ground dissolution of soluble rocks >	Negligible (within 50m)				

Page	Section	Mining and ground workings >	On site	0-50m	50-250m	250-500m	500-2000m
30	5.1	BritPits	0	0	0	0	-
31 >	5.2 >	Surface ground workings >	0	0	9	-	-
31	5.3	Underground workings	0	0	0	0	0
31	5.4	Underground mining extents	0	0	0	0	-
32	5.5	Historical Mineral Planning Areas	0	0	0	0	-
32	5.6	Non-coal mining	0	0	0	0	0
32	5.7	JPB mining areas	None (within 0m)				
32	5.8	The Coal Authority non-coal mining	0	0	0	0	-
33	5.9	Researched mining	0	0	0	0	-
33	5.10	Mining record office plans	0	0	0	0	-
33	5.11	BGS mine plans	0	0	0	0	-
33	5.12	Coal mining	None (within 0m)				
33	5.13	Brine areas	None (within 0m)				
34	5.14	Gypsum areas	None (within 0m)				
34	5.15	Tin mining	None (within 0m)				
34	5.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes	On site	0-50m	50-250m	250-500m	500-2000m
35	6.1	Natural cavities	0	0	0	0	-
35	6.2	Mining cavities	0	0	0	0	0
35	6.3	Reported recent incidents	0	0	0	0	-
35	6.4	Historical incidents	0	0	0	0	-
36	6.5	National karst database	0	0	0	0	-
Page	Section	Radon >					
37 >	7.1 >	Radon >	Less than 1% (within 0m)				
Page	Section	Soil chemistry >	On site	0-50m	50-250m	250-500m	500-2000m
39 >	8.1 >	BGS Estimated Background Soil Chemistry >	1	1	-	-	-
39	8.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
39	8.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
40	9.1	Underground railways (London)	0	0	0	-	-
40	9.2	Underground railways (Non-London)	0	0	0	-	-
40	9.3	Railway tunnels	0	0	0	-	-
40	9.4	Historical railway and tunnel features	0	0	0	-	-
40	9.5	Royal Mail tunnels	0	0	0	-	-
41	9.6	Historical railways	0	0	0	-	-
41	9.7	Railways	0	0	0	-	-
41	9.8	Crossrail 1	0	0	0	0	-
41	9.9	Crossrail 2	0	0	0	0	-
41	9.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 23/04/2021

Site Area: 0.1ha

Recent site history - 2018 aerial photograph

Capture Date: 20/04/2018

Site Area: 0.1ha

Recent site history - 2005 aerial photograph

Capture Date: 19/06/2005

Site Area: 0.1ha

Recent site history - 2004 aerial photograph

Capture Date: 09/09/2004

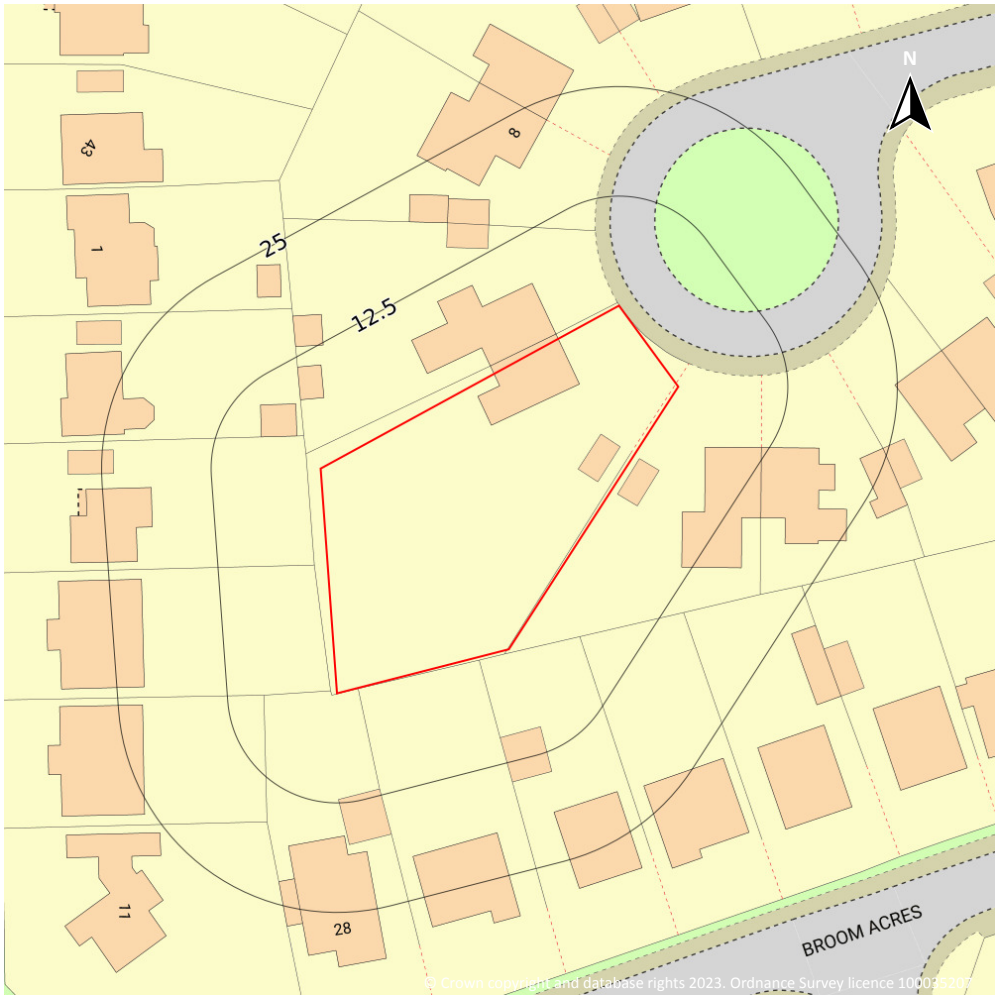
Site Area: 0.1ha

Recent site history - 1999 aerial photograph

Capture Date: 04/09/1999

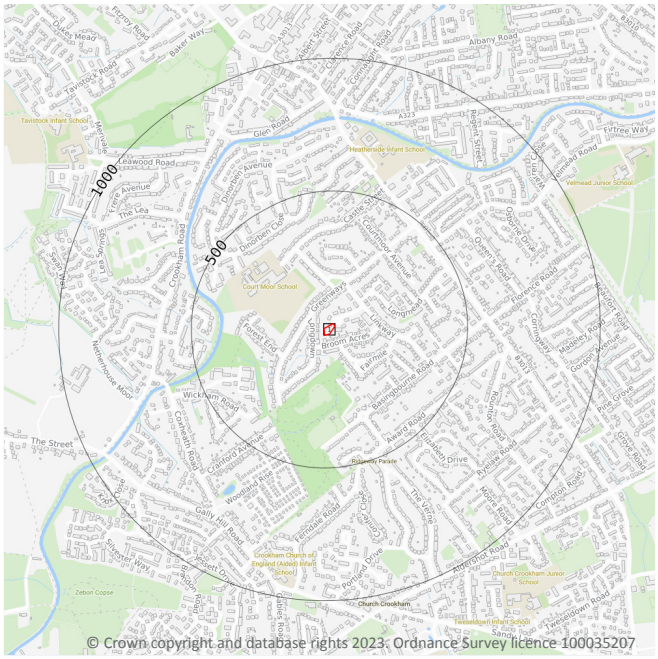
Site Area: 0.1ha

OS MasterMap site plan



Site Area: 0.1ha

1 Geology 1:10,000 scale - Availability



Site Outline

Search buffers in metres (m)

Full coverage

Partial coverage

No coverage

1.1 10k Availability

Records within 500m	1

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 11 >**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**No coverage**	**No coverage**	**No coverage**	**NoCov**

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground

1.2 Artificial and made ground (10k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial

1.3 Superficial geology (10k)

Records within 500m	0

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

This data is sourced from the British Geological Survey.

1.4 Landslip (10k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock

1.5 Bedrock geology (10k)

Records within 500m	0

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

This data is sourced from the British Geological Survey.

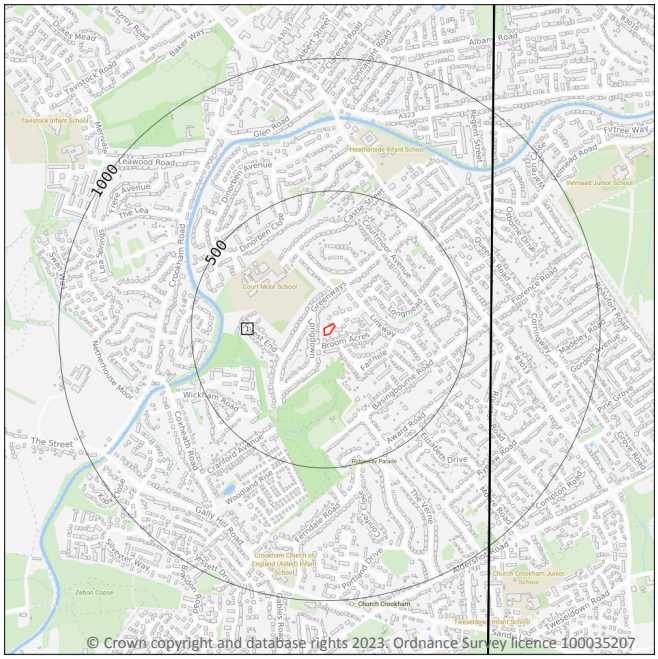
1.6 Bedrock faults and other linear features (10k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

2 Geology 1:50,000 scale - Availability



Site Outline

Search buffers in metres (m)

Geological map tile

2.1 50k Availability

Records within 500m	1

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 15 >**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	No coverage	EW284_basingstoke_v4

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground

2.2 Artificial and made ground (50k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

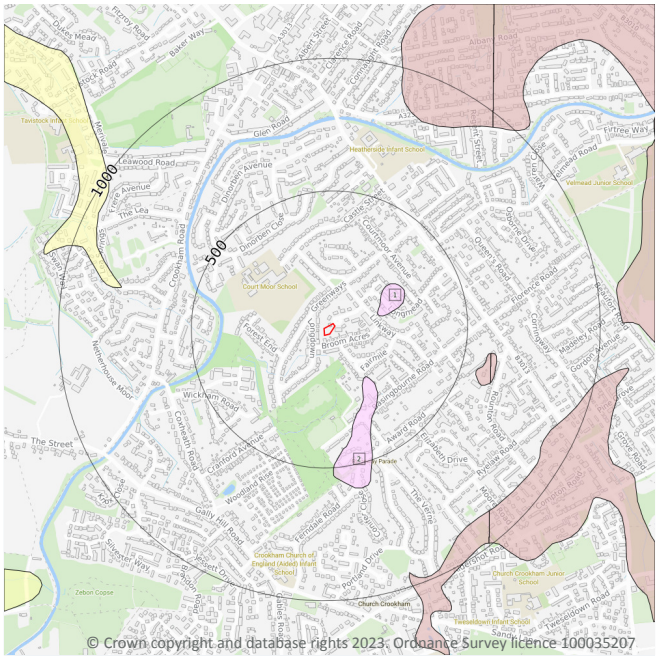
2.3 Artificial ground permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

2.4 Superficial geology (50k)

Records within 500m	2

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 17 >**

ID	Location	LEX Code	Description	Rock description
1	167m E	SUHG-XSV	SURREY HILL GRAVEL MEMBER	SAND AND GRAVEL
2	210m SE	SUHG-XSV	SURREY HILL GRAVEL MEMBER	SAND AND GRAVEL

This data is sourced from the British Geological Survey.

2.5 Superficial permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

2.6 Landslip (50k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

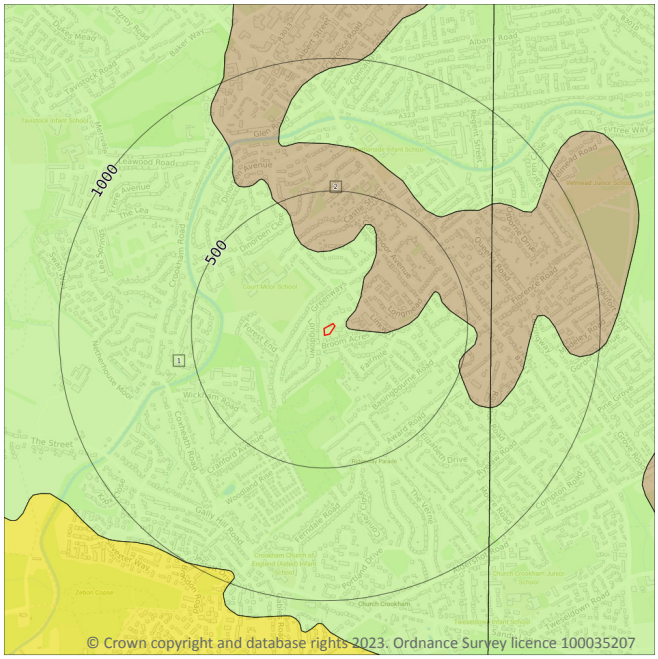
2.7 Landslip permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

2.8 Bedrock geology (50k)

Records within 500m	2

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 19 >**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**WIDS-XSZC**	**WINDLESHAM FORMATION - SAND, SILT AND CLAY**	**-**
2	43m E	CMBS-S	CAMBERLEY SAND FORMATION - SAND	LUTETIAN

This data is sourced from the British Geological Survey.

2.9 Bedrock permeability (50k)

Records within 50m	2

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Intergranular**	**High**	**Low**
43m E	Intergranular	High	High

This data is sourced from the British Geological Survey.

2.10 Bedrock faults and other linear features (50k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

3 Boreholes

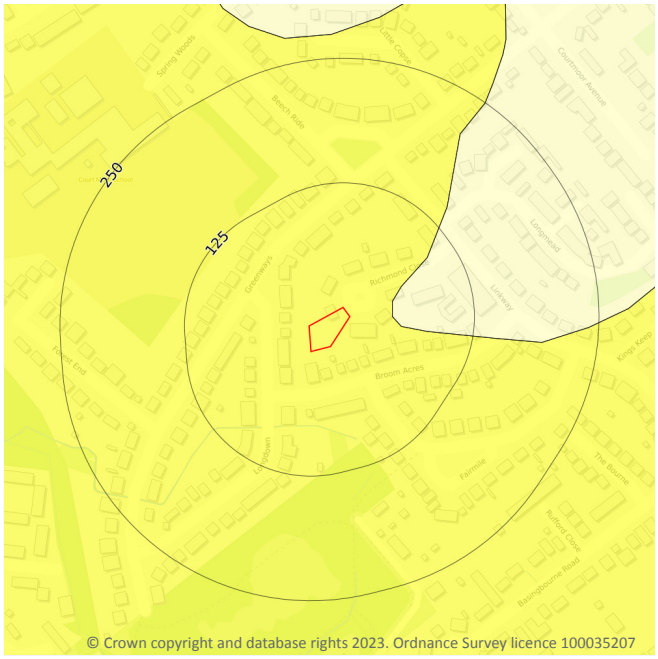
3.1 BGS Boreholes

Records within 250m	0

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

This data is sourced from the British Geological Survey.

4 Natural ground subsidence - Shrink swell clays



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

4.1 Shrink swell clays

Records within 50m	2

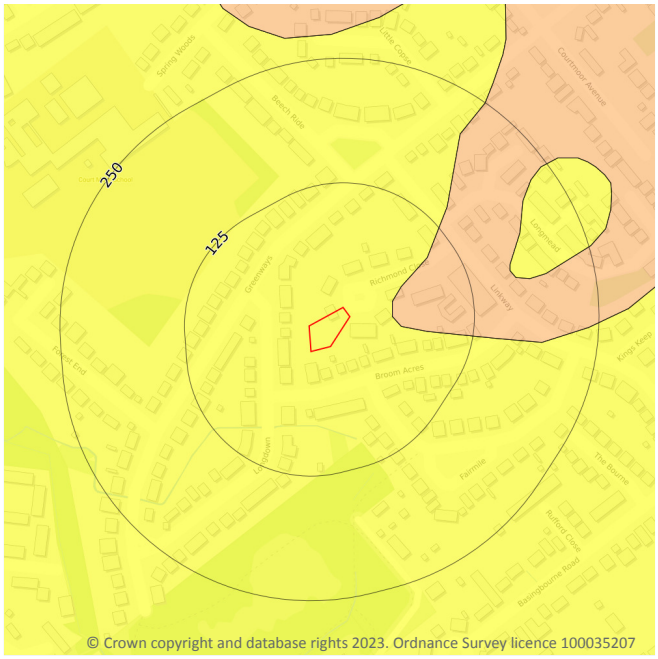
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 22 >**

Location	Hazard rating	Details
On site	**Very low**	**Ground conditions predominantly low plasticity.**
43m E	Negligible	Ground conditions predominantly non-plastic.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

4.2 Running sands

Records within 50m	2

The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

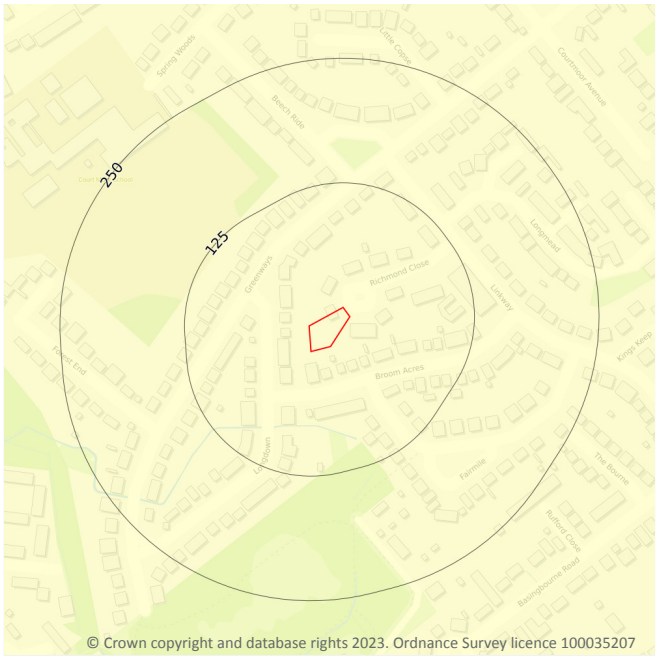
Features are displayed on the Natural ground subsidence - Running sands map on **page 23 >**

Location	Hazard rating	Details
On site	**Very low**	**Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.**

Location	Hazard rating	Details
43m E	Low	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

4.3 Compressible deposits

Records within 50m	1

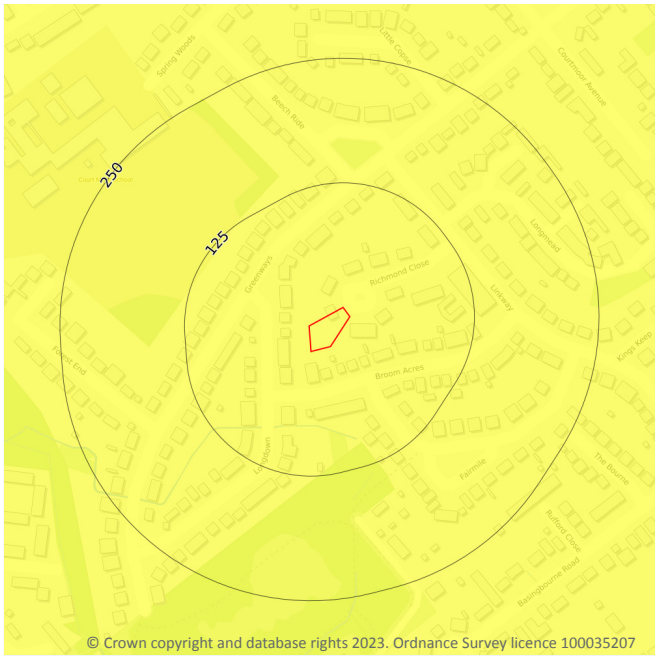
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 25 >**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

4.4 Collapsible deposits

Records within 50m	1

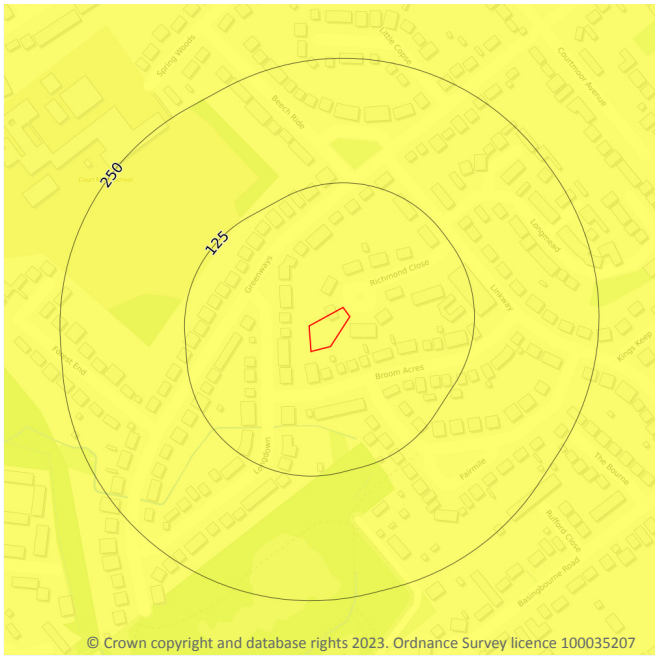
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 26 >**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

4.5 Landslides

Records within 50m	1

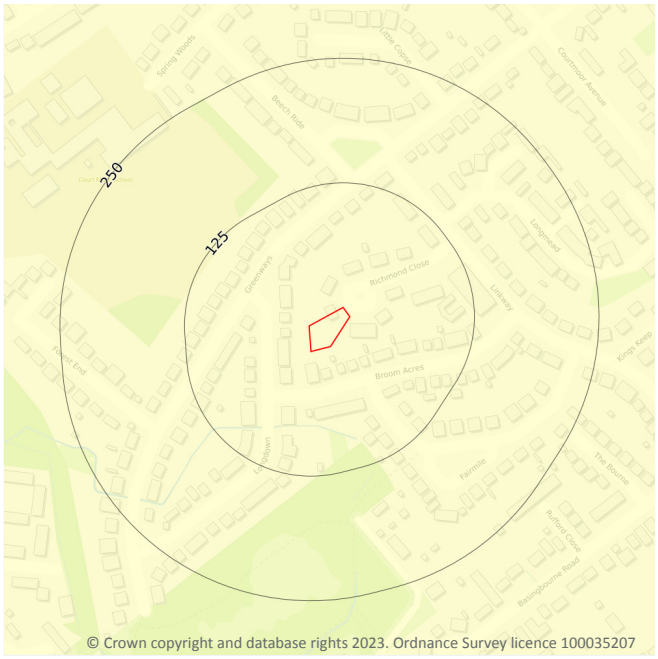
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 27 >**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

4.6 Ground dissolution of soluble rocks

Records within 50m	1

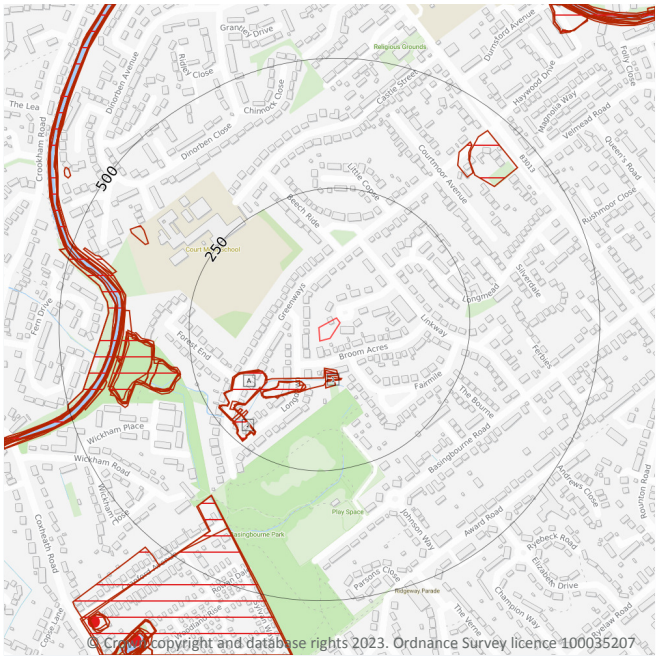
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 28 >**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

5 Mining and ground workings



5.1 BritPits

Records within 500m	0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.

5.2 Surface ground workings

Records within 250m	9

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining and ground workings map on **page 30 >**

ID	Location	Land Use	Year of mapping	Mapping scale
A	53m S	Fish Ponds	1961	1:10560
1	57m S	Pond	1909	1:10560
A	86m SW	Fish Ponds	1909	1:10560
A	86m SW	Fish Ponds	1938	1:10560
A	86m SW	Fish Ponds	1930	1:10560
A	123m SW	Fish Ponds	1909	1:10560
A	125m SW	Fish Ponds	1938	1:10560
A	125m SW	Fish Ponds	1930	1:10560
2	194m SW	Fish Ponds	1909	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

5.3 Underground workings

Records within 1000m	0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.

5.4 Underground mining extents

Records within 500m	0

This data identifies underground mine workings that could present a potential risk, including adits and seam workings. These features have been identified from BGS Geological mapping and mine plans sourced from the BGS and various collections and sources.

This data is sourced from Groundsure.

5.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

5.6 Non-coal mining

Records within 1000m	0

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

This data is sourced from the British Geological Survey.

5.7 JPB mining areas

Records on site	0

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

This data is sourced from Johnson Poole and Bloomer.

5.8 The Coal Authority non-coal mining

Records within 500m	0

This data provides an indication of the potential zone of influence of recorded underground non-coal mining workings. Any and all analysis and interpretation of Coal Authority Data in this report is made by Groundsure, and is in no way supported, endorsed or authorised by the Coal Authority. The use of the data is restricted to the terms and provisions contained in this report. Data reproduced in this report may be the copyright of the Coal Authority and permission should be sought from Groundsure prior to any re-use.

This data is sourced from The Coal Authority.

5.9 Researched mining

Records within 500m	0

This data indicates areas of potential mining identified from alternative or archival sources, including; BGS Geological paper maps, Lidar data, aerial photographs (from World War II onwards), archaeological data services, websites, Tithe maps, and various text/plans from collected books and reports. Some of this data is approximate and Groundsure have interpreted the resultant risk area and, where possible, specific areas of risk have been captured.

This data is sourced from Groundsure.

5.10 Mining record office plans

Records within 500m	0

This dataset is representative of Mining Record Office and/or plan extents held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

5.11 BGS mine plans

Records within 500m	0

This dataset is representative of BGS mine plans held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

5.12 Coal mining

Records on site	0

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

5.13 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

5.14 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

5.15 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

5.16 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

6 Ground cavities and sinkholes

6.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

6.2 Mining cavities

Records within 1000m	0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Stantec UK Ltd.

6.3 Reported recent incidents

Records within 500m	0

This data identifies sinkhole information gathered from media reports and Groundsure's own records. This data goes back to 2014 and includes relative accuracy ratings for each event and links to the original data sources. The data is updated on a regular basis and should not be considered a comprehensive catalogue of all sinkhole events. The absence of data in this database does not mean a sinkhole definitely has not occurred during this time.

This data is sourced from Groundsure.

6.4 Historical incidents

Records within 500m	0

This dataset comprises an extract of 1:10,560, 1:10,000, 1:2,500 and 1:1,250 scale historical Ordnance Survey maps held by Groundsure, dating back to the 1840s. It shows shakeholes, deneholes and other 'holes' as noted on these maps. Dene holes are medieval chalk extraction pits, usually comprising a narrow shaft with a number of chambers at the base of the shaft. Shakeholes are an alternative name for suffusion sinkholes, most commonly found in the limestone landscapes of North Yorkshire but also extensively noted around the Brecon Beacons National Park.

Not all 'holes' noted on Ordnance Survey mapping will necessarily be present within this dataset.

This data is sourced from Groundsure.

6.5 National karst database

Records within 500m	0

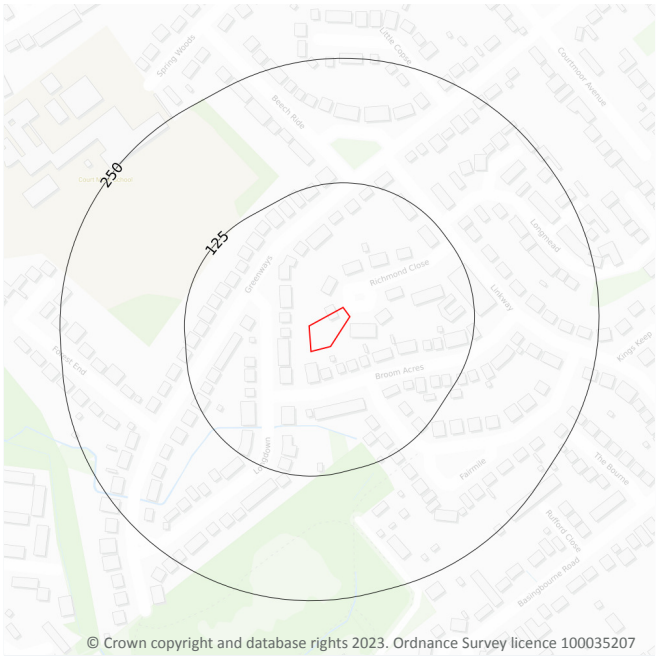
This is a comprehensive database of national karst information gathered from a wide range of sources. BGS have collected data on five main types of karst feature: Sinkholes, stream links, caves, springs, and incidences of associated damage to buildings, roads, bridges and other engineered works.

Since the database was set up in 2002 data covering most of the evaporite karst areas of the UK have now been added, along with data covering about 60% of the Chalk, and 35% of the Carboniferous Limestone outcrops. Many of the classic upland karst areas have yet to be included. Recorded so far are: Over 800 caves, 1300 stream sinks, 5600 springs, 10,000 sinkholes.

The database is not yet complete, and not all records have been verified. The absence of data does not mean that karst features are not present at a site. A reliability rating is included with each record.

This data is sourced from the British Geological Survey.

7 Radon



Site Outline

Search buffers in metres (m)

- Greater than 30%
- Between 10% and 30%
- Between 5% and 10%
- Between 3% and 5%
- Between 1% and 3%
- Less than 1%

7.1 Radon

Records on site	1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on **page 37 >**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None**

This data is sourced from the British Geological Survey and UK Health Security Agency.

8 Soil chemistry

8.1 BGS Estimated Background Soil Chemistry

Records within 50m	2

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 mg/kg**	**No data**	**100 mg/kg**	**60 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**15 - 30 mg/kg**
43m E	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg

This data is sourced from the British Geological Survey.

8.2 BGS Estimated Urban Soil Chemistry

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

8.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

9 Railway infrastructure and projects

9.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

9.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

9.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

9.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

9.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

9.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

9.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

9.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

9.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

9.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference ↗.

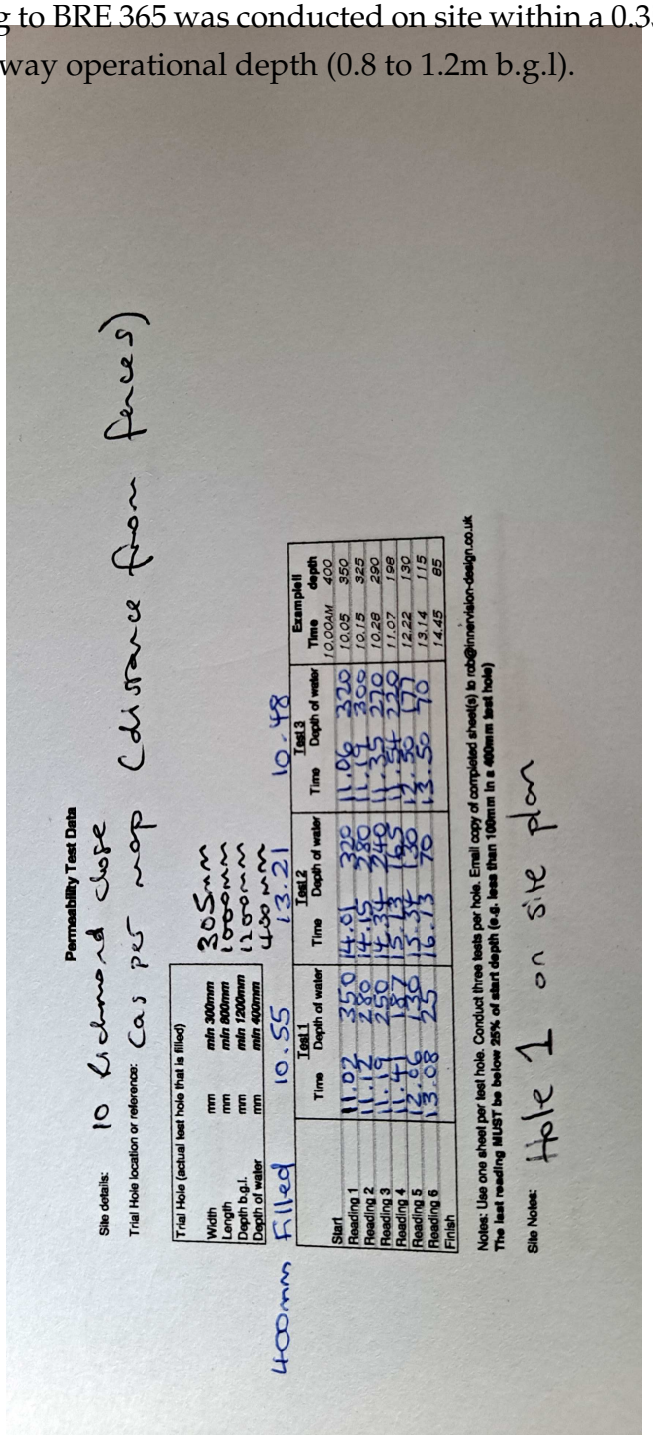
Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: https://www.groundsure.com/terms-and-conditions-april-2023/ ↗.

B Site Investigation

B.1 Test hole 1 - soakaway depth

Infiltration testing to BRE 365 was conducted on site within a 0.35m x 1.0m x 0.4m deep test hole at soakaway operational depth (0.8 to 1.2m b.g.l).



Permeability Test Data

Site details: 10 Richmond Close

Trial Hole location or reference: Cas pcs map (distance from fences)

Trial Hole (actual test hole that is filled)		
Width	mm	min 300mm
Length	mm	min 800mm
Depth b.g.l.	mm	min 1200mm
Depth of water	mm	min 400mm

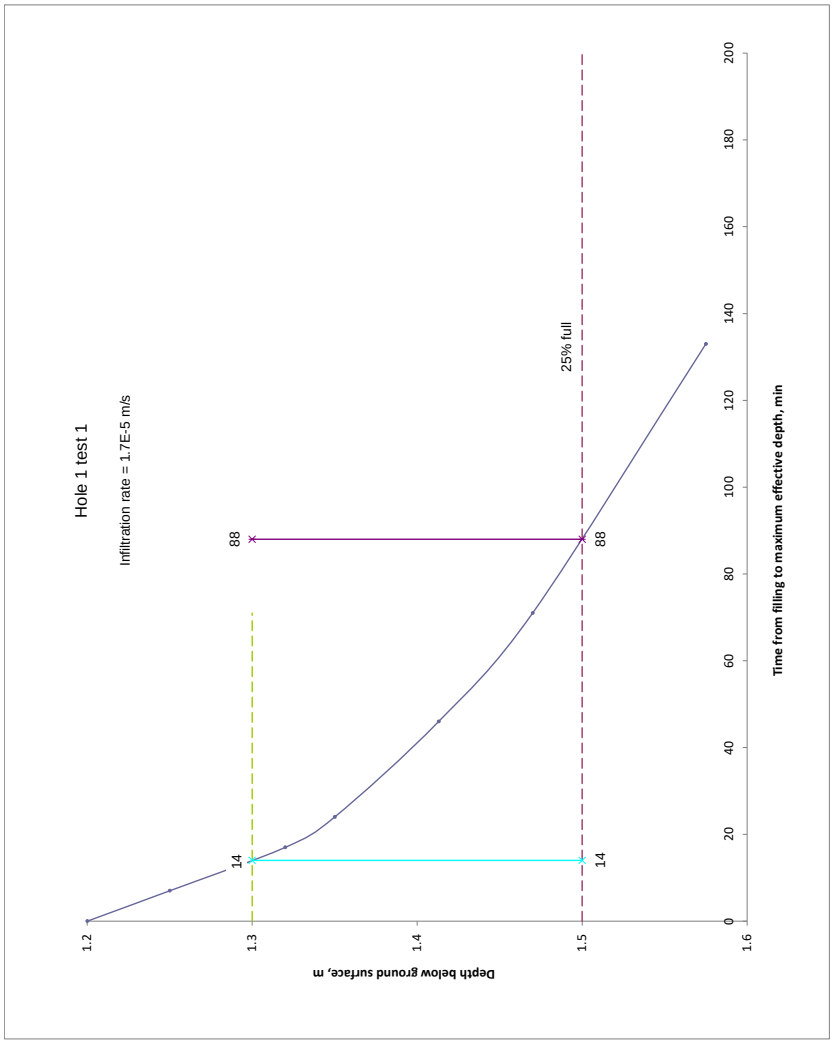
305mm
1000mm
1200mm
400mm

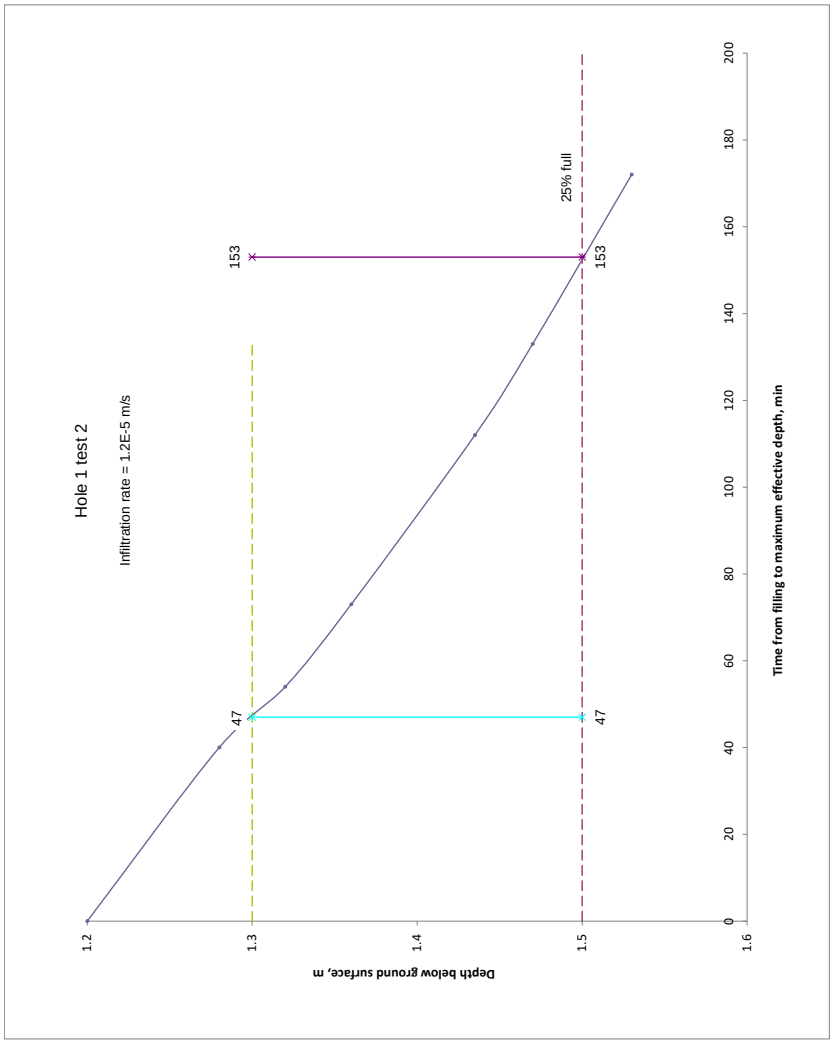
400mm Filled 10.55 13.21 10.48

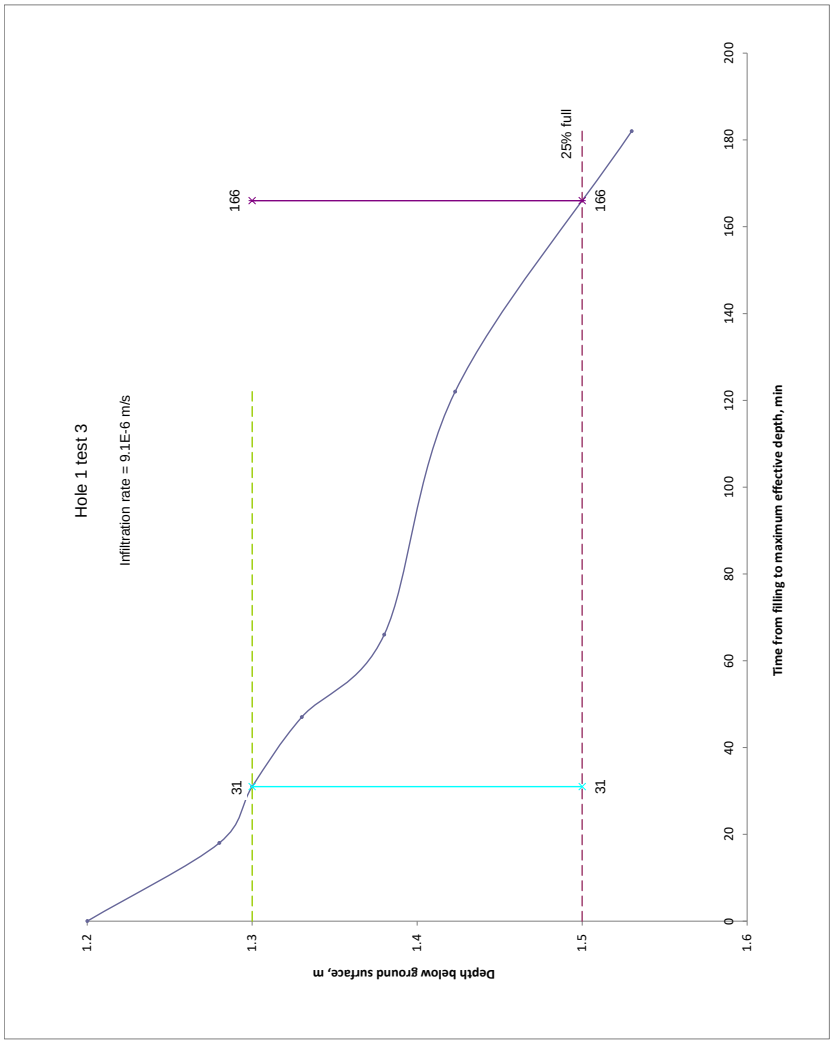
	Test 1		Test 2		Test 3		Example	
	Time	Depth of water	Time	Depth of water	Time	Depth of water	Time	depth
Start	11.02	350	14.01	320	11.06	320	10.00AM	400
Reading 1	11.12	280	14.15	280	11.19	300	10.05	350
Reading 2	11.19	250	14.34	240	11.35	270	10.15	325
Reading 3	11.41	200	15.13	195	11.54	220	10.28	290
Reading 4	12.06	170	15.34	170	12.30	177	11.07	198
Reading 5	13.08	130	16.13	70	13.50	70	12.22	130
Reading 6							13.14	115
Finish							14.45	85

Notes: Use one sheet per test hole. Conduct three tests per hole. Email copy of completed sheet(s) to rob@innervision-design.co.uk
The test reading MUST be below 25% of start depth (e.g. less than 100mm in a 400mm test hole)

Site Notes: Hole 1 on site plan

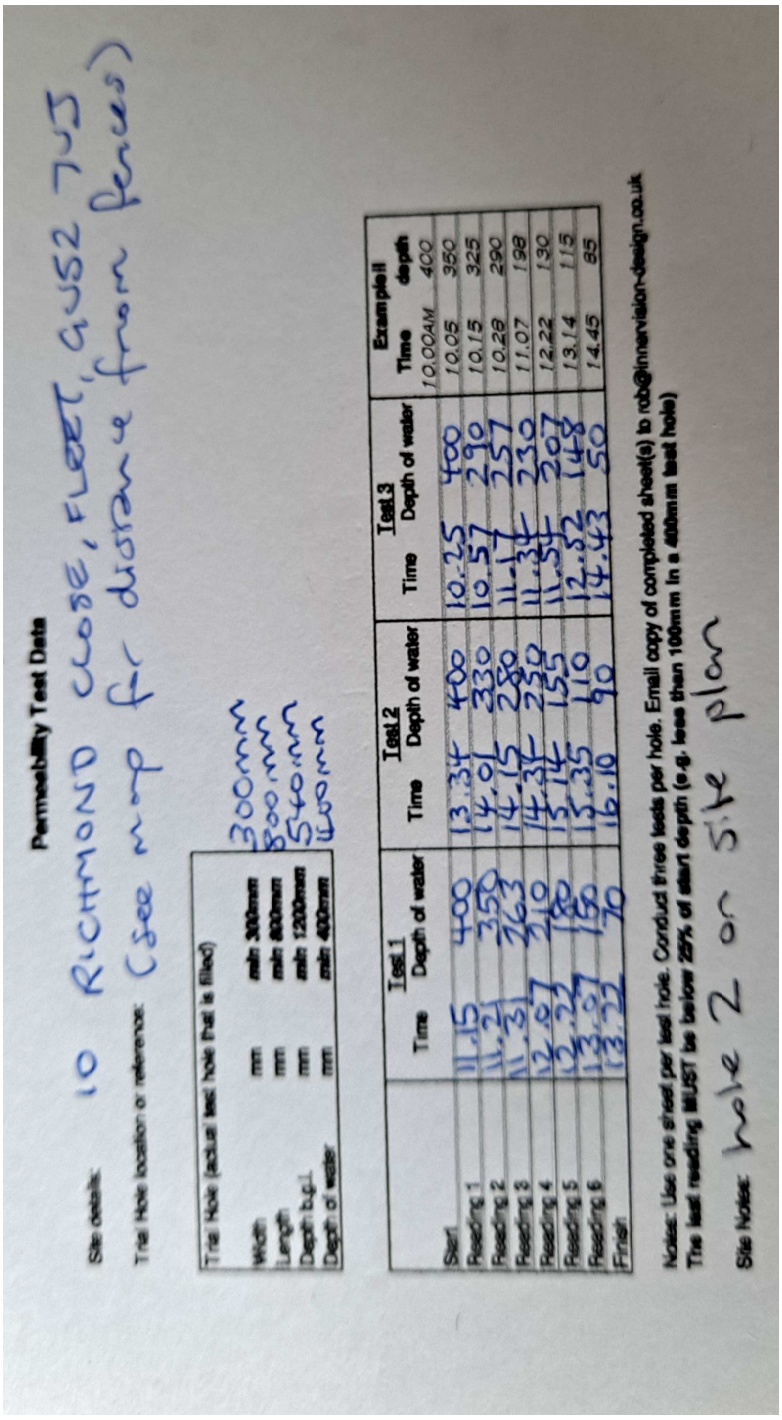

Hole 1 test 1
Infiltration rate = 1.7E-5 m/s
25% full
88
88
14
14
Depth below ground surface, m
Time from filling to maximum effective depth, min
1.2
1.3
1.4
1.5
1.6
0
20
40
60
80
100
120
140
160
180
200


Hole 1 test 2
Infiltration rate = 1.2E-5 m/s
25% full
153
153
47
47
Depth below ground surface, m
Time from filling to maximum effective depth, min
1.2
1.3
1.4
1.5
1.6
0
20
40
60
80
100
120
140
160
180
200


Hole 1 test 3
Infiltration rate = 9.1E-6 m/s
25% full
166
166
31
31
Depth below ground surface, m
Time from filling to maximum effective depth, min
1.2
1.3
1.4
1.5
1.6
0
20
40
60
80
100
120
140
160
180
200

B.2 Test hole 1 - sub-base depth

Infiltration testing to BRE 365 was conducted on site within a 0.3m x 0.8m x 0.4m deep test hole at hardstanding sub-base depth (0.14m to 0.54m b.g.l).



Permeability Test Data

Site details: 10 RICHMOND CLOSE, FLEET, GU52 7US

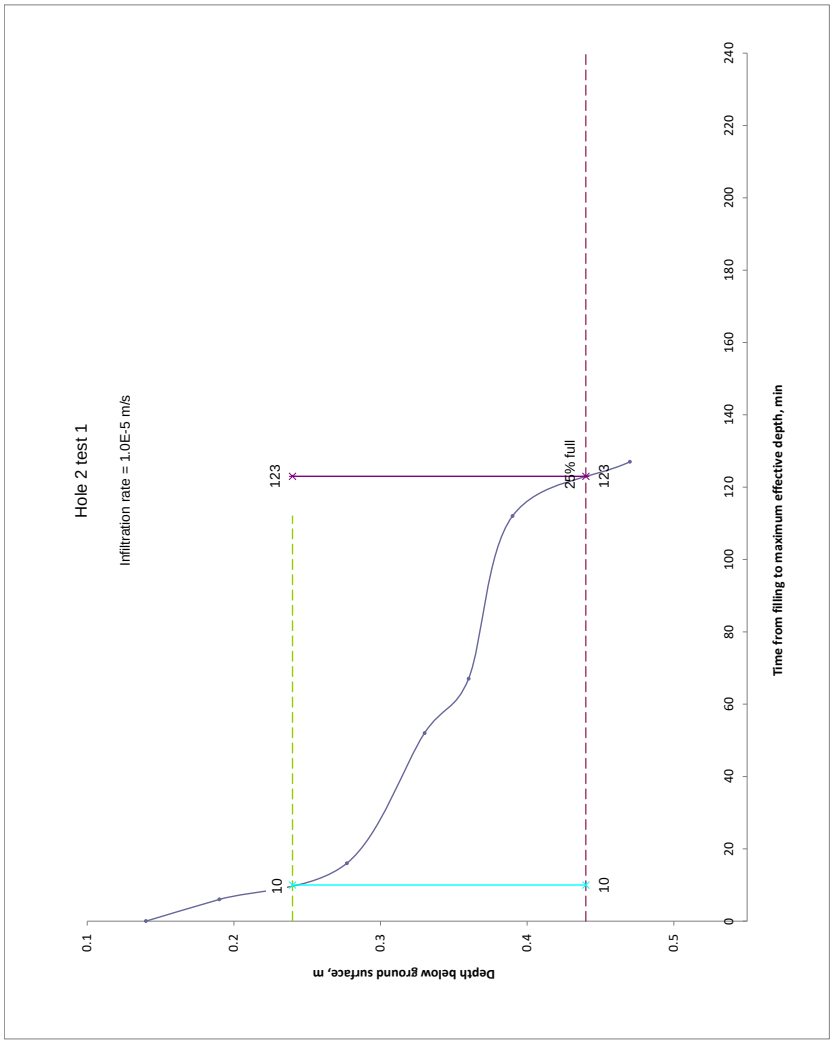
Trial Hole location or reference: (See map for distance from fences)

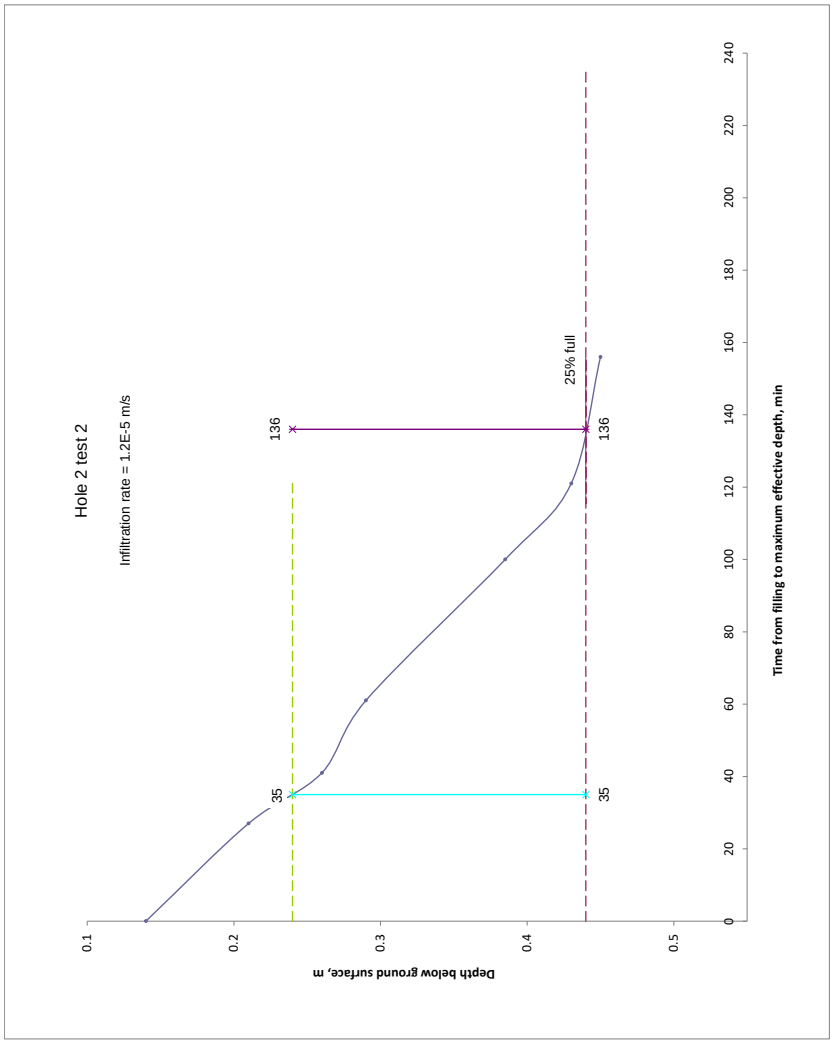
Trial Hole (actual test hole that is filled)		
Width	mm	min 300mm — 300mm
Length	mm	min 800mm — 800mm
Depth b.g.l.	mm	min 1200mm — 540mm
Depth of water	mm	min 400mm — 400mm

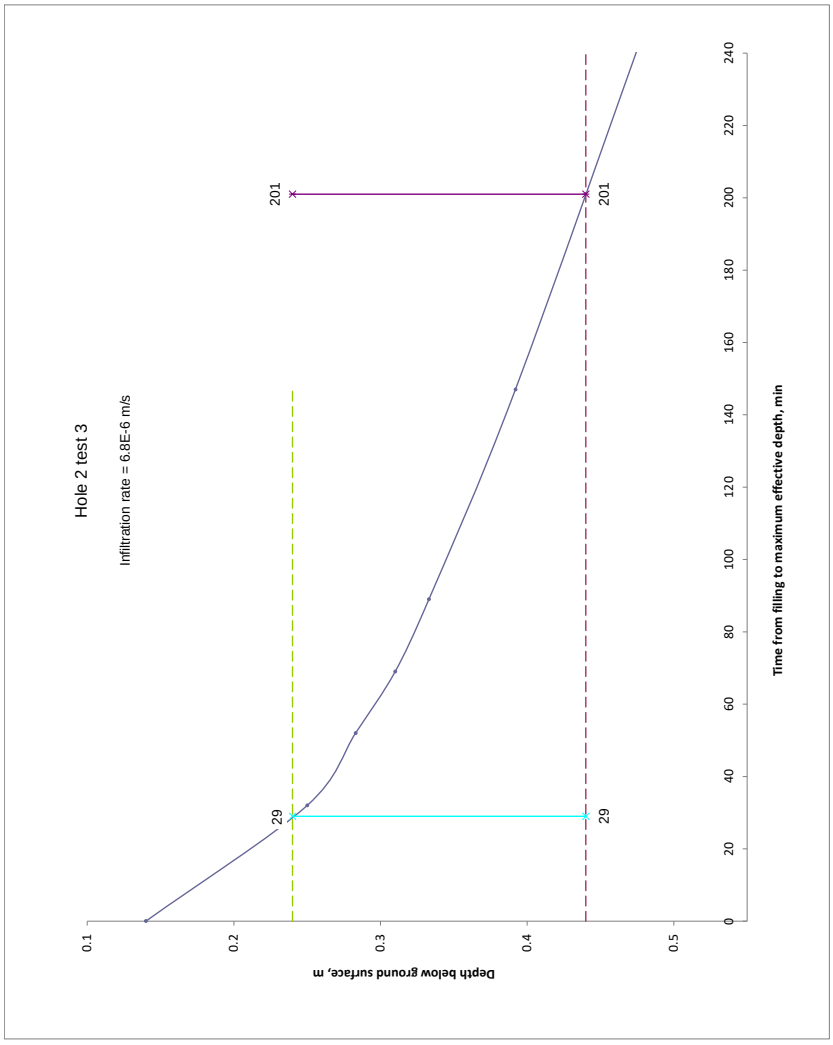
	Test 1		Test 2		Test 3		Example II	
	Time	Depth of water	Time	Depth of water	Time	Depth of water	Time	depth
Start							10.00AM	400
Reading 1	11.15	400	13.34	400	10.25	400	10.05	350
Reading 2	11.21	350	14.01	330	10.57	290	10.15	325
Reading 3	11.31	263	14.15	280	11.17	257	10.28	290
Reading 4	12.07	210	14.37	230	11.37	230	11.07	198
Reading 5	13.27	188	15.14	155	11.57	207	12.22	130
Reading 6	13.37	150	15.35	110	12.52	148	13.14	115
Finish	13.55	70	16.10	90	14.43	50	14.45	85

Notes: Use one sheet per test hole. Conduct three tests per hole. Email copy of completed sheet(s) to rob@innervision-design.co.uk
The last reading MUST be below 25% of start depth (e.g. less than 100mm in a 400mm test hole)

Site Notes: hole 2 on site plan


Hole 2 test 1
Infiltration rate = 1.0E-5 m/s
Depth below ground surface, m
Time from filling to maximum effective depth, min
0.1
0.2
0.3
0.4
0.5
0
20
40
60
80
100
120
140
160
180
200
220
240
123
123
26% full
10
10


Hole 2 test 2
Infiltration rate = 1.2E-5 m/s
25% full
136
136
35
35
Depth below ground surface, m
Time from filling to maximum effective depth, min
0.1
0.2
0.3
0.4
0.5
0
20
40
60
80
100
120
140
160
180
200
220
240


Hole 2 test 3
Infiltration rate = 6.8E-6 m/s
Depth below ground surface, m
Time from filling to maximum effective depth, min
0.1
0.2
0.3
0.4
0.5
0
20
40
60
80
100
120
140
160
180
200
220
240
201
201
29
29

C Pervious surface option

TOBERMORE CONCRETE PRODUCTS
INFILTRATION DESIGN
LOADING CATEGORY B 5% CBR

Disclaimer:

- These design cross-sections and suggested build-ups are provided for illustration only and are intended to depict an idealised situation.
- In all instances, local design solutions are preferred and should be checked to ensure suitability with ground conditions and planned traffic usage.
- Refer to BS 7533 Part 13 for depths of capping layers.
- All references are to latest edition of BS 7533. Tobermore can provide a project specific solution if required.

D Proposed drainage layout