# Drainage Strategy

## 14-16 Farncombe Road BN11 2BB

**Reference: U0532 -Rev - V2**

Date: Jan-25


**1 Introduction**

**2 Site Characteristics**

**3 Discharge Arrangement**

**4 Peak Runoff**

**5 Proposed Sustainable Drainage**

**6 Maintenance and Management Plan**


**Appendices**


**A** Distribution Existing and Proposed Areas

**B** Site Characteristics

**C** Drainage Calculations

**D** Drainage System General Arrangement



**London Office**
5th Floor, 167, 169 Great Portland St,
London W1W 5PF

**Oxford Office**
Oxford Innospace, Old Music Hall, 106-108
Cowley Road, Oxford, OX4 1JE

info@urban-water.co.uk



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## Purpose of this report

1.1 The purpose of this statement is to accompany the technical drawings and details showing the proposed Surface Water drainage system as part of the planning application for this development.

## Site Characteristics

2.1 The site background is clearly identified through answers to the questions in table 1 below.

Table 1: Site Characteristics . See appendix B for support documentation

| TOPIC | QUESTION | ANSWER |
|---|---|---|
| **Protected species or habitat** | Is the site near to designated sites and priority habitats? | No |
| **Flood Plain** | Is the site located in the flood plain? | No |
| **Soils and Geology** | Soil permeability? - See appendix B for results | Yes |
| **Space constraints** | Space for SuDS components? | Yes |
| **Topography** | Sited on a flat site? | Yes |
| | Sited on a steep slope (5-15%) | No |
| | Sited on a very steep slope (>15%) | No |
| **Groundwater** | Is the site at groundwater flood risk? | No |
| **Contaminated land** | Are there contaminated soils on site? | Unknown |
| **Source Protection Zone** | Is the site within a SPZ 3? | No |
| **Runoff characteristics** | Is the development in a high risk flooding area? | No |

## Existing and Proposed Site

2.2 The distribution of catchment areas for existing and proposed site is as per table 2 below. See appendix A for details

Table 2 : Existing and Proposed catchment areas in hectares

| Description | | Existing Site | Proposed Site |
|---|---|---|---|
| Impermeable Areas | | 0.000 | 0.019 |
| Permeable Areas | Connected to Drainage | 0.078 | 0.000 |
| | Self Draining Areas | 0.000 | 0.064 |
| Areas Draining Away from drainage System | | 0.056 | 0.051 |
| | **Total Development Area** | 0.134 | 0.134 |

2.3 It has been assumed that the positively drained areas will have different runoff coefficients depending on the type of surface as follow:

| | |
|---|---|
| Impermeable Surface | 1.0 |
| Permeable Surfaces | 0.5 |
| Grass Areas | 0.3 |

## Evaluation of Discharge Point

3.1 The SuDS design takes into account Building Regulations Section H3 and the National Planning Practice Guidance. The aim is to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;
4. to a combined sewer.

3.2 The discharge point has been evaluated following the NPPG and Building regulations. The findings are in table 3 below.

Table 3: Drainage Hierarchy evaluation

| | |
|---|---|
| Superficial geology classification | The British Geological Society records show that the superficial deposits are River Terrace Deposits (Undifferentiated) - Sand, Silt and Clay. |
| Bedrock geology classification | The British Geological Society records of the site show that it is located within the Lewes Nodular Chalk Formation - Chalk. |
| Landis Top Soil Infiltration | The SOILSCAPE's records of the site show that it is located within an area of freely draining soils. |
| Groundwater | The British Geological Survey's flood risk susceptibility maps show that the development has limited susceptibility to ground water flooding. The risk from groundwater flood to the site is considered very low. |
| **Is infiltration feasible?** | The site has potential for infiltration. The assumed infiltration rate for the site is 0.000117647058823529m/s or 0.4235m/hr. It is recommended that a soakaway BRE365 is undertaken to confirm the infiltration rate. |
| **Is a discharge to a watercourse possible?** | There are no watercourses in the proximity to the site. |
| **Is a discharge to a surface water sewer possible?** | There is no surface water sewer in the proximity to the site. |
| **Is a discharge to a combined sewer possible?** | There is no combined water sewers in the proximity to the site. |

## Existing and Proposed Peak Run-off Calculations

4.1 The current site is a Brownfield. The peak runoff rate for the existing site was calculated as per table 4 and discharge rates as per table 5.

Table 4: Peak run-off rate calculation method for existing site

| Method Used | Calculation Method |
|---|---|
| | Report 124 Flood Estimation for Small Catchments method has been used to estimate the site peak flow rates |
| X | This is a brownfield site, runoff rates are calculated in accordance with best practice simulation modelling and using the modified rational method |
| | This is a brownfield site where the pre-development drainage isn't known. The runoff rates are calculated using the Greenfield model with soil type 5 |

4.2 The runoff flow produced by the development will be controlled as per table 5.

Table 5: Runoff discharge rate control

| Control Used | Description of runoff discharge |
|---|---|
| X | Water will be discharged into the ground via a SuDS as described in table 6 below |
| | The peak discharge rate has been reduced to Greenfield Qbar flow |
| | The peak discharge rate has been taken as 0.7 l/s as it is not possible to reduce it to the Greenfield Qbar rate |
| | The peak discharge rate has been reduced to Brownfield pre-development 1 in 1 flow |
| | The peak discharge rate has been reduced by 60% from the existing Brownfield pre-development 1 in 2 flow rate |

## Run-off flows

4.3 The size of the SuDS has been calculated for all events up to the 1 in 100 including an allowance for climate change of 45%. As per tables above, it is proposed to infiltrate all the flows. See table 6 for values and appendix C for calculations.

Table 6: Peak discharge rates for SuDS

| Return Period Event | Discharge Rate (l/s) | | | Infiltration Rate (m/hr) |
|---|---|---|---|---|
| | Existing Greenfield | Existing Brownfield | Proposed | |
| Qbar | 0.30 | N/A | N/A | 0.4235 |
| 1 in 2 | 0.20 | 1.30 | 0.0 | 0.4235 |
| 1 in 30 | 0.60 | 3.40 | 0.0 | 0.4235 |
| 1 in 30 + CC | N/A | N/A | 0.0 | 0.4235 |
| 1 in 100 | 0.80 | 4.20 | 0.0 | 0.4235 |
| 1 in 100 + CC | N/A | N/A | 0.0 | 0.4235 |

## Proposed Sustainable Drainage System

5.1 The following sustainable drainage systems have been used for this site. The drainage design uses these drainage system through out the site. See table 7 for details.

Table 7: Proposed Drainage System

| SuDS Proposed | Feasible | Proposed |
|---|---|---|
| Use of green roofs | No | No |
| Store rainwater for later use | No | No |
| Use infiltration techniques, for instance soakaways, permeable surfaces | Yes | Yes |
| Attenuate rainwater in ponds or open water features for gradual release | No | No |
| Attenuate rainwater by storing in tanks or sealed water features for gradual release | No | No |
| **Discharge Point Proposed** | | |
| Discharge rainwater direct to a watercourse | No | No |
| Discharge rainwater to a surface water sewer/drain | No | No |
| Discharge rainwater to the combined sewer | No | No |

5.2 The location and details of the SuDS can be seen drainage layouts in appendix D. Calculations are in appendix C.

5.3 The drainage calculations demonstrate:
- No flooding occurs for the 1 in 30 storm events.
- Any flooding for the 1 in 100 year + 45% climate change event can be safely contained on site

5.4 The proposed drainage strategy presents one possible solution to demonstrate that the development can be sustainably drained, to comply with the requirements of the NPPF. Other solutions may be feasible and may prove to be better suited to the site. These will become apparent during the detailed design stage. The strategy above should not therefore be interpreted as the definitive scheme solution.

## Management of Exceedance Flows

5.5 The drainage network has been designed to attenuate surface runoff for all events up to and including the 1% AEP + CC(1 in 100 years). However consideration has been given to what may happen when the design capacity of the surface water drainage network is exceeded. Surface water will flow to the lowest points within the site. The flood risk to the buildings would therefore remain low. See appendix D.

## Maintenance and Management plan responsibility

6.1 The SuDS will be maintained by The Owner the property

## Maintenance and Management plan for proposed SuDS

6.2 The maintenance and Management Plan Guidance from the SuDS Manual, CIRIA C753 (CIRIA, 2015) is to be followed for the effective maintenance of the proposed SuDS techniques outlined above. The maintenance for SuDS structures are as follow:

| INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS | |
|---|---|
| **Regular Maintenance** | **Frequency** |
| **Inlets, outlets and surface control structures** | |
| Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage. | Monthly |
| Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris | Monthly |
| **Inspection chambers and below ground control chambers** | |
| Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn | Annually |
| **Occasional Maintenance** | |
| Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage | As necessary |
| **Remedial work** | **Frequency** |
| Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary. | As required |
| Repair physical damage if necessary. | As required |

**Operation and maintenance requirements for soakaways**

| 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 |

| Operation and maintenance requirements for pervious pavements | | |
|---|---|---|
| **Maintenance schedule** | **Required action** | **Typical frequency** |
| Regular maintenance | Brushing and vacuuming (standard cosmetic sweep over whole surface) | Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment |
| Occasional maintenance | Stabilise and mow contributing and adjacent areas | As required |
| | Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying | As required – once per year on less frequently used pavements |
| Remedial Actions | Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving | As required |
| | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material | As required |
| | Rehabilitation of surface and upper substructure by remedial sweeping | Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging) |
| Monitoring | Initial inspection | Monthly for three months after installation |
| | Inspect for evidence of poor operation and/or weed growth – if required, take remedial action | Three-monthly, 48 h after large storms in first six months |
| | Inspect silt accumulation rates and establish appropriate brushing frequencies | Annually |
| | Monitor inspection chambers | Annually |

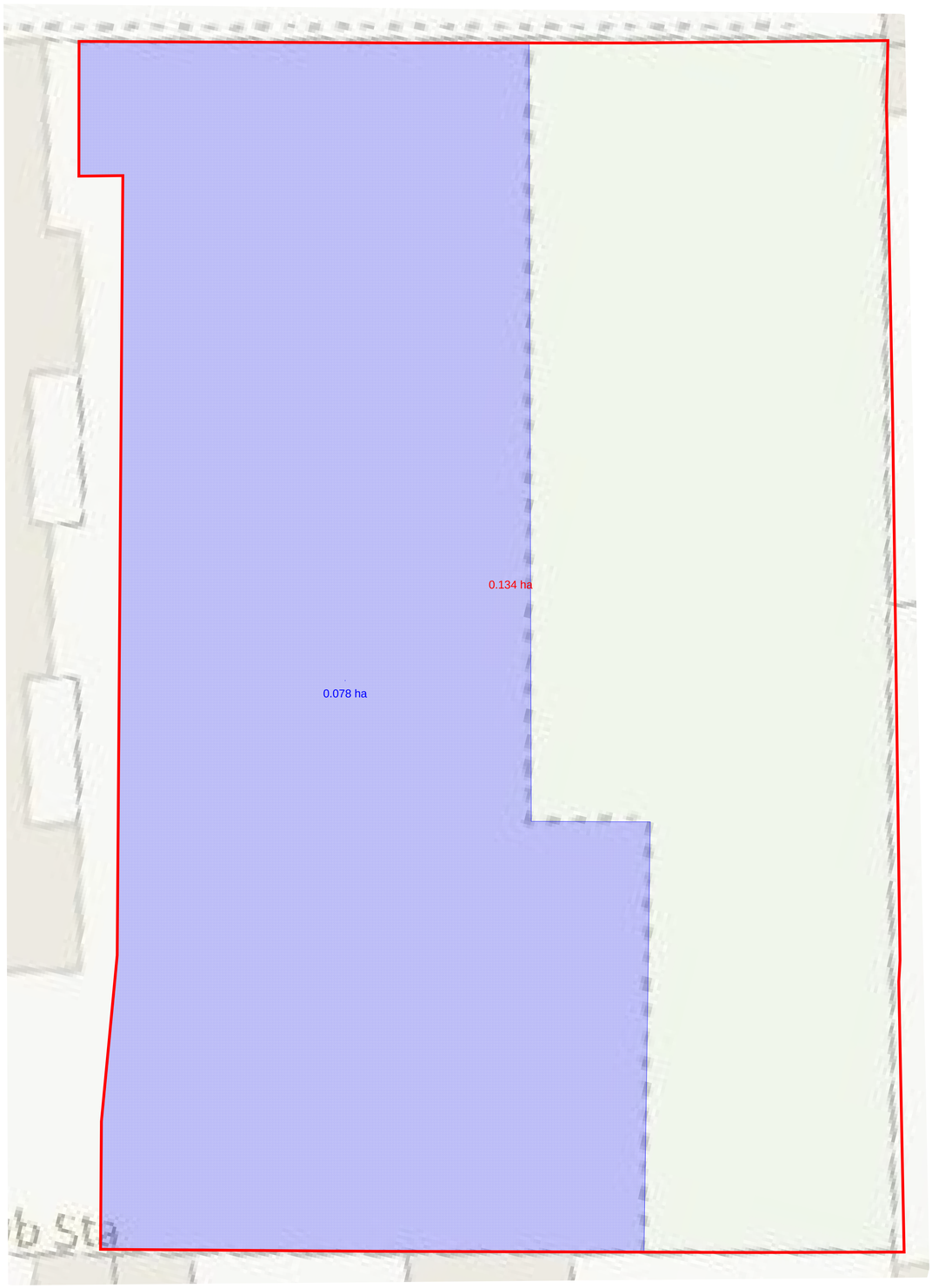
# Appendix A

Do not scale from this drawing. Refer to figured dimensions only. RIDA Reports Ltd registered in England and Wales No. 10590566. This drawing is copyright of RIDA Reports Ltd.

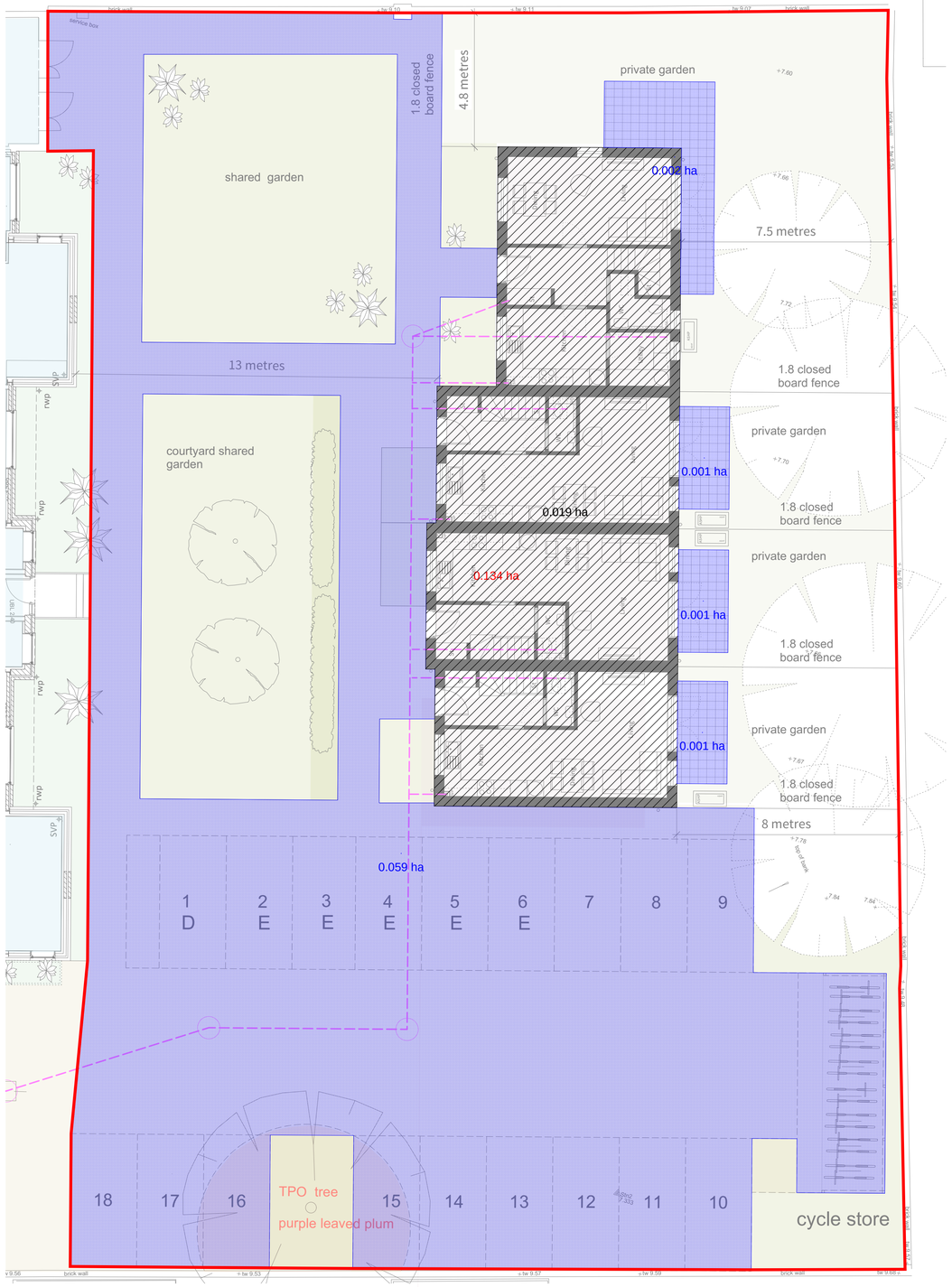
Drawing Scale Bar

| Drawing scale | Line length | Drawing scale | Line length |
|---|---|---|---|
| 1:5 = | 0.25 metres | 1:200 = | 10.0 metres |
| 1:10 = | 0.5 metres | 1:250 = | 12.5 metres |
| 1:20 = | 1.0 metres | 1:500 = | 25.0 metres |
| 1:25 = | 1.25 metres | 1:1000 = | 50.0 metres |
| 1:50 = | 2.5 metres | 1:1250 = | 62.5 metres |
| 1:100 = | 5.0 metres | 1:2500 = | 125 metres |

Measure length of line above for checking of scale




EXISTING SITE 1:100




PROPOSED SITE 1:100

GENERAL NOTES

KEY

PERMEABLE AREAS

IMPERMEABLE AREAS

STUDY AREA

| Rev | Details | Date | By | Ch'd |
|---|---|---|---|---|

Drawing Status:

PRELIMINARY

URBANWATER

Client:

Project:

14-16 Farncombe Road BN11 2BB

Drawing:

Existing and Proposed Areas
Permeable and Impermeable

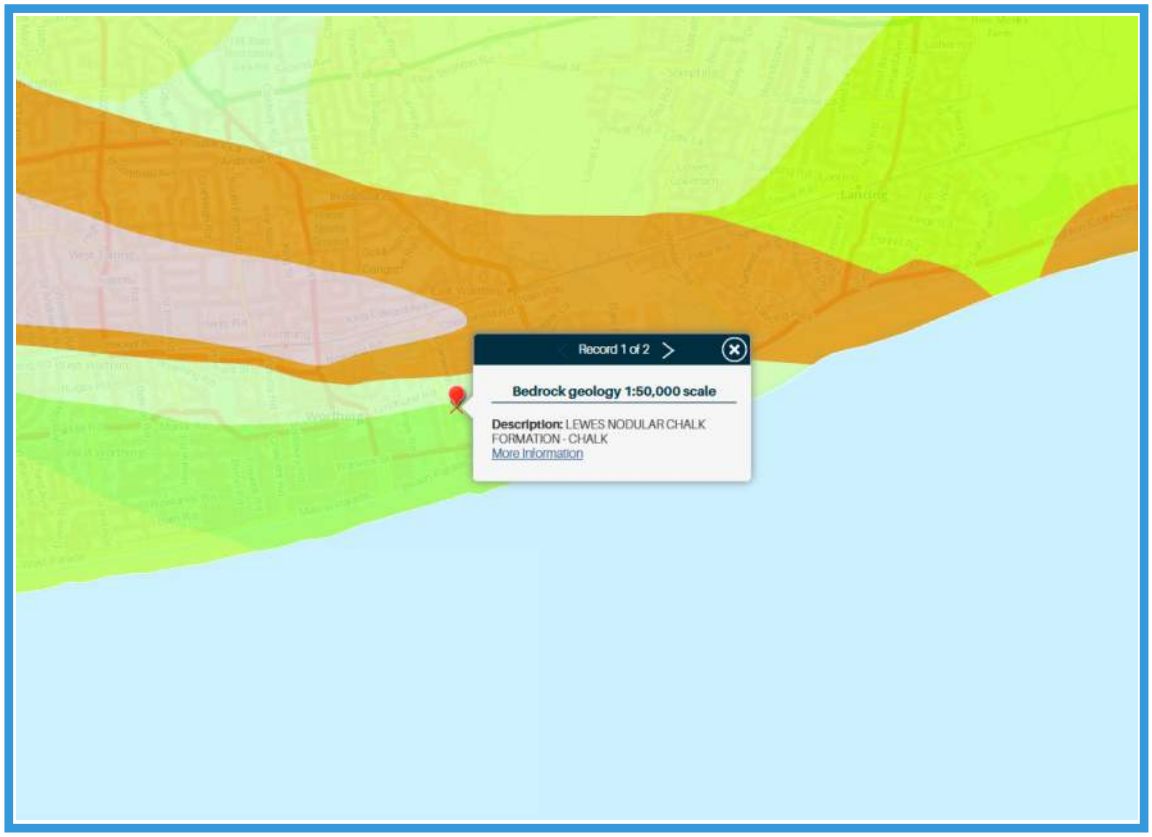
| Print Size: | Project No: | Drawing No: | Revision: |
|---|---|---|---|
| A1 | U0532 | 002 | P1 |

# Appendix B

# SITE GEOLOGY

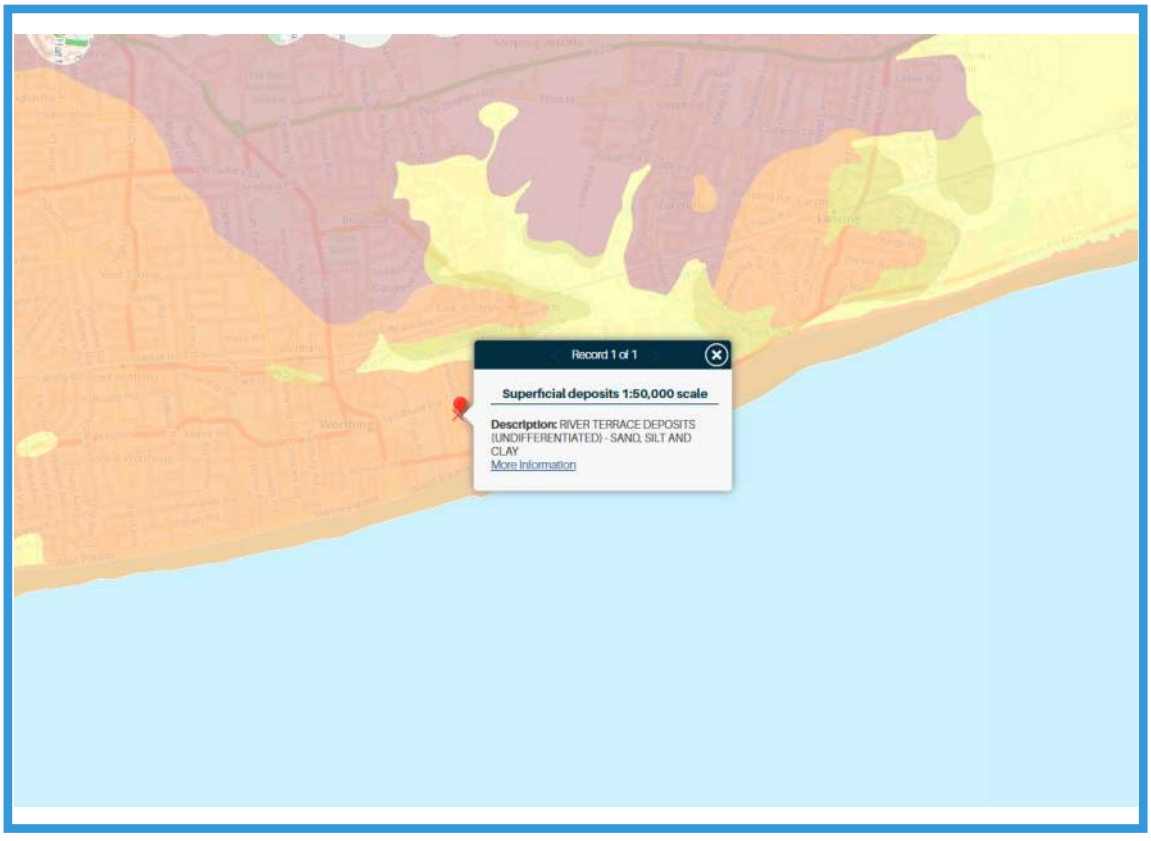
GEOINDEX ONSHORE

GEOLOGY - BEDROCK - LEWES NODULAR CHALK FORMATION - CHALK



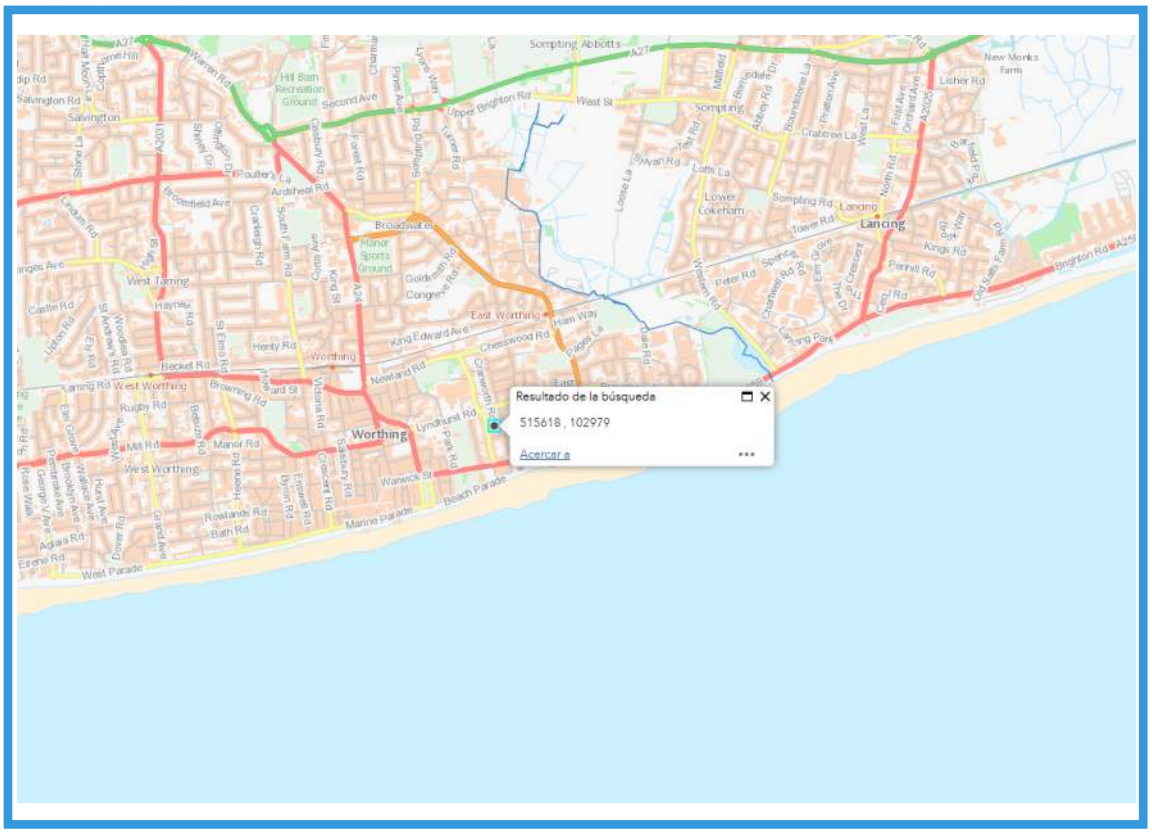

GEOINDEX ONSHORE

GEOLOGY - SUPERFICIAL DEPOSITS - RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND, SILT AND CLAY



# SITE HYDROGEOLOGY

## Main River Map







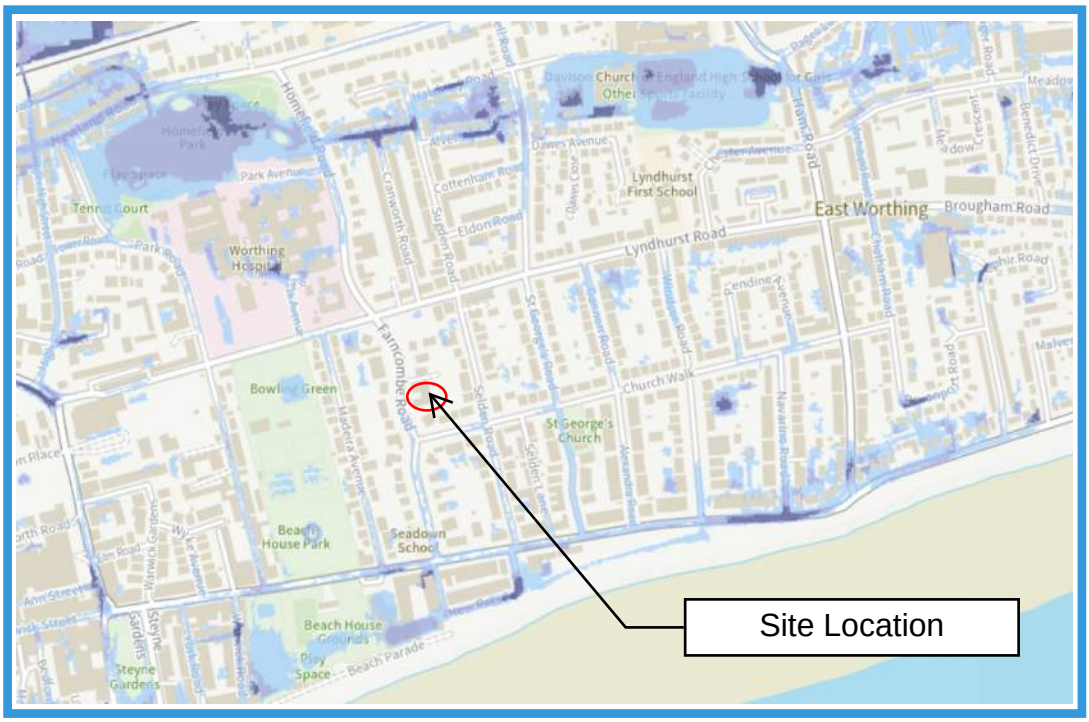


# SITE SURFACE WATER FLOOD RISK

Flood risk from surface water

Extent of flooding

High risk means a chance of flooding greater than 3.3% (1:30)
Medium risk means a chance of flooding of btw 1% (1:100) and 3.3%
Low risk means  a chance of flooding of btw 0.1% (1:1000) and 1%
Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding




High risk
More than 3.3% chance each year

Medium risk
Between 1% and 3.3% chance each year

Low risk
Between 0.1% and 1% chance each year




Above 90cm

30cm to 90cm

Below 30cm

# MAGIC RESULTS




**Site Check Results**

Site Check Report Report generated on Tue Oct 08 2024
**You selected the location:** Centroid Grid Ref: TQ15600297
The following features have been found in your search area:

**Aquifer Designation Map (Bedrock) (England)**

| | |
|---|---|
| **Typology** | Principal |

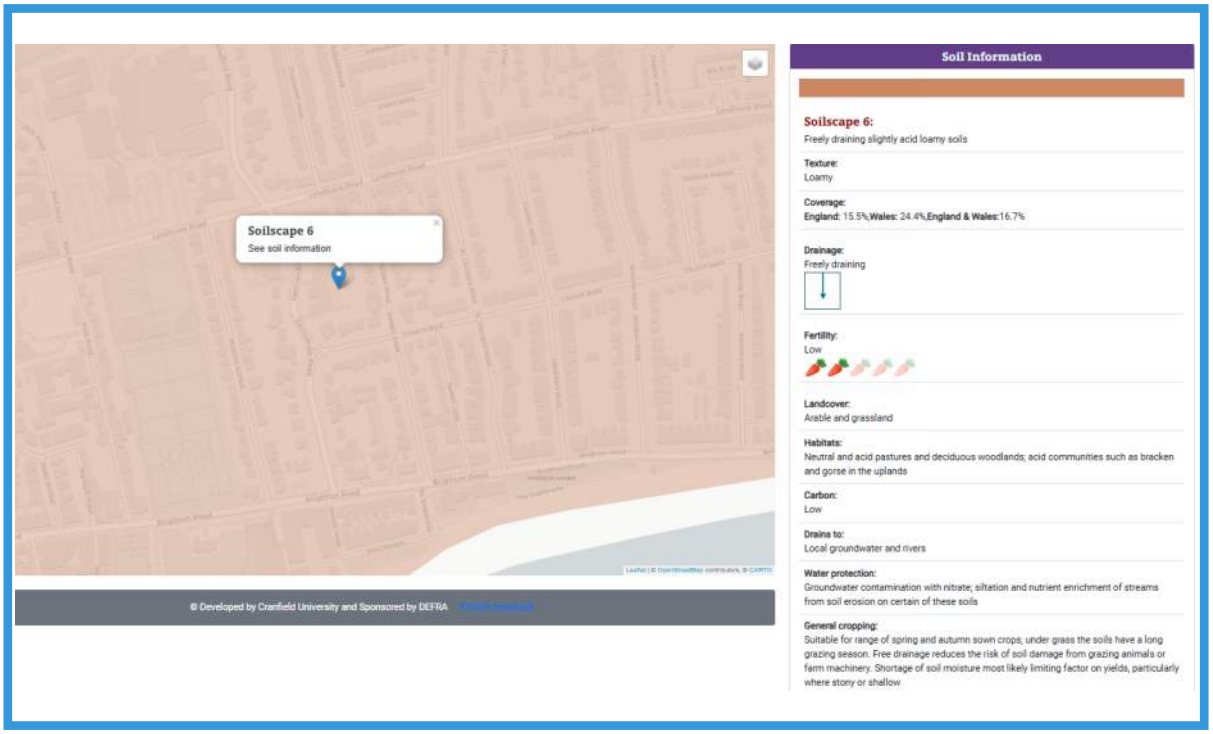
**Aquifer Designation Map (Superficial Drift) (England)**

| | |
|---|---|
| **Typology** | Secondary B |

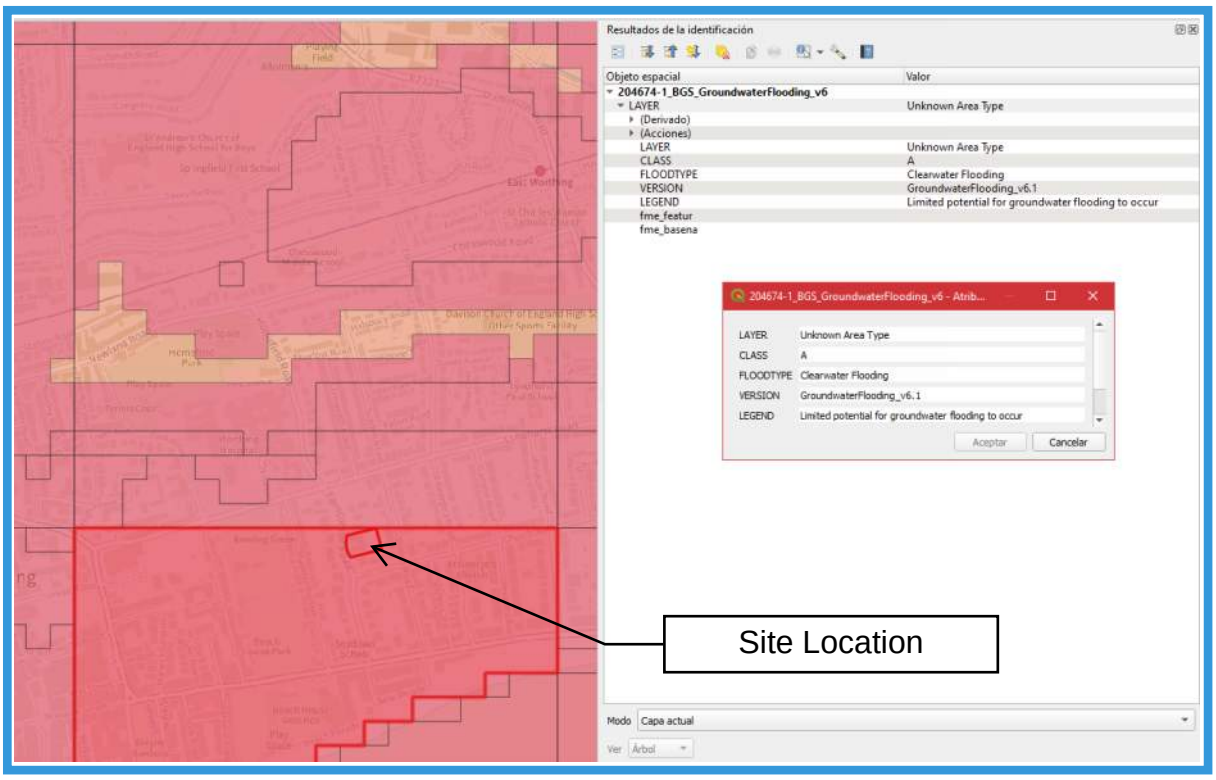
**Source Protection Zones merged (England)**
No Features found

OK | Cancel | Export to CSV | Print

# SOILSCAPES MAP




# GROUND WATER FLOOD RISK



# Flood map for planning

| Your reference | Location (easting/northing) | Created |
|---|---|---|
| **<Unspecified>** | **515599/102969** | **8 Oct 2024 9:16** |

**Your selected location is in flood zone 1, an area with a low probability of flooding.**

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

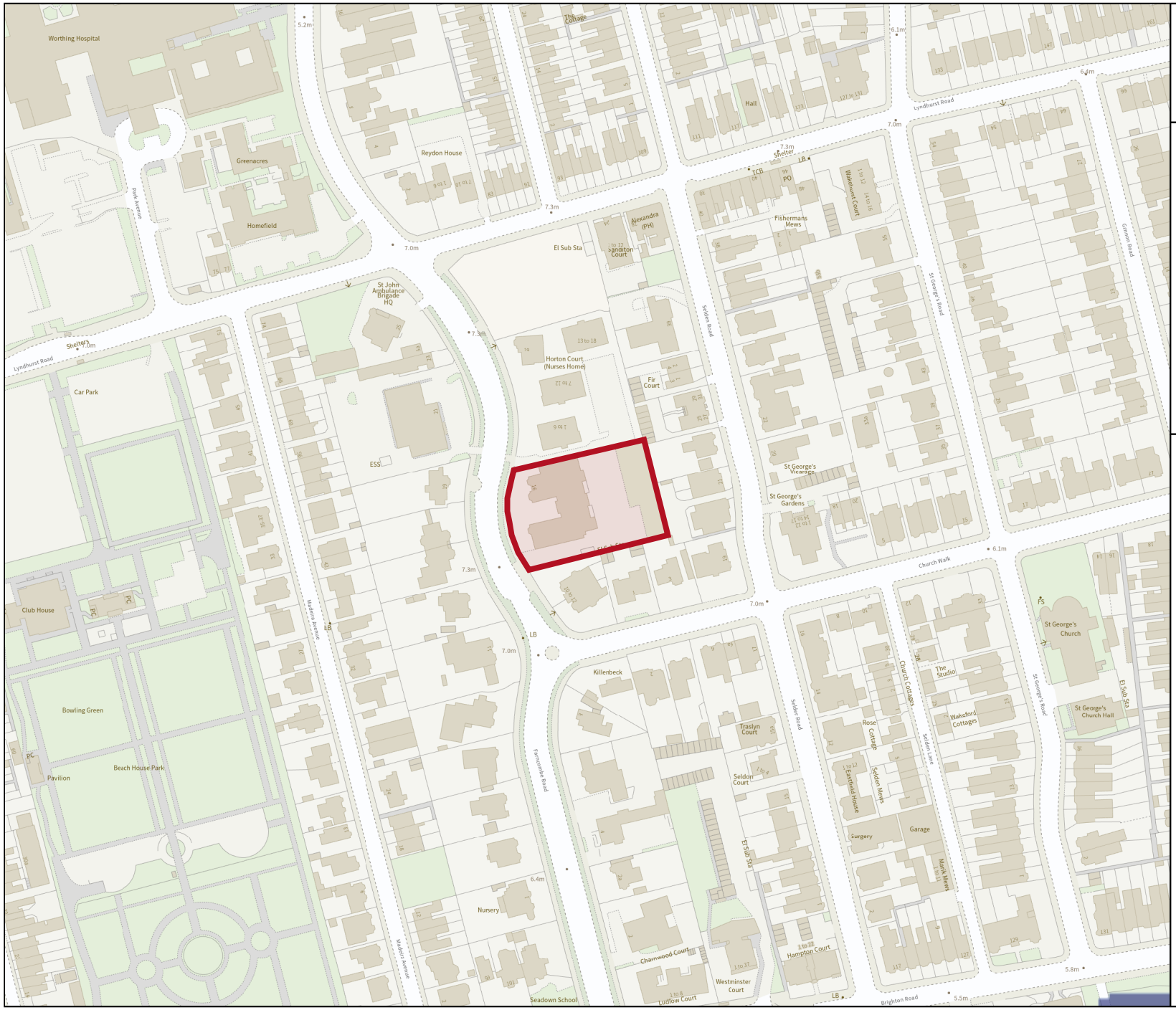
**Notes**

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

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Environment Agency

# Flood map for planning

Your reference
**<Unspecified>**

Location (easting/northing)
**515599/102969**

Scale
**1:2500**

Created
**8 Oct 2024 9:16**

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m



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Site Check Report Report generated on Tue Oct 08 2024
**You selected the location:** Centroid Grid Ref: TQ15600297
The following features have been found in your search area:

**SSSI Impact Risk Zones - for LPAs to determine likely impacts on terrestrial SSSIs and when to consult Natural England**

| | |
|---|---|
| **GUIDANCE (How to use the Impact Risk Zones)** | /Metadata_for_magic/SSSI IRZ User Guidance MAGIC.pdf |
| **HYPERLINK** | http://irz.geodata.org.uk/IRZ/step2.html?irzcode=0303000500000¬es=&location=514313,103699 (IRZ polygon centre) |

**Aquifer Designation Map (Bedrock) (England)**

| | |
|---|---|
| **Typology** | Principal |

**Aquifer Designation Map (Superficial Drift) (England)**

| | |
|---|---|
| **Typology** | Secondary B |

**Soilscape (England)**

| | |
|---|---|
| **Reference** | 6 |
| **Name** | FREELY DRAINING SLIGHTLY ACID LOAMY SOILS |
| **Main Surface Texture Class** | LOAMY |
| **Natural Drainage Type** | FREELY DRAINING |
| **Natural Fertility** | LOW |
| **Characteristic Semi-natural Habitats** | NEUTRAL AND ACID PASTURES AND DECIDUOUS WOODLANDS; ACID COMMUNITIES SUCH AS BRACKEN AND GORSE IN THE UPLANDS |
| **Main Land Cover** | ARABLE AND GRASSLAND |
| **Hyperlink** | /Metadata_for_magic/soilscape_summary.pdf |

**Areas of Outstanding Natural Beauty (England)**
No Features found

**Limestone Pavement Orders (England)**
No Features found

**Local Nature Reserves (England) - points**
No Features found

**Local Nature Reserves (England)**
No Features found

**Moorland Line (England)**
No Features found

**National Nature Reserves (England) - points**
No Features found

**National Nature Reserves (England)**
No Features found

**National Parks (England)**
No Features found

**Ramsar Sites (England) - points**
No Features found

**Ramsar Sites (England)**
No Features found

**Proposed Ramsar Sites (England) - points**
No Features found

**Proposed Ramsar Sites (England)**
No Features found

**Sites of Special Scientific Interest Units (England) - points**
No Features found

**Sites of Special Scientific Interest Units (England)**
No Features found

**Sites of Special Scientific Interest (England) - points**
No Features found

**Sites of Special Scientific Interest (England)**
No Features found

**Special Areas of Conservation (England) - points**
No Features found

**Special Areas of Conservation (England)**
No Features found

**Possible Special Areas of Conservation (England) - points**
No Features found

**Possible Special Areas of Conservation (England)**
No Features found

**Special Protection Areas (England) - points**
No Features found

**Special Protection Areas (England)**
No Features found

**Potential Special Protection Areas (England) - points**
No Features found

**Potential Special Protection Areas (England)**
No Features found

**Biosphere Reserves (England) - points**
No Features found

**Biosphere Reserves (England)**
No Features found

**Less Favoured Areas (England)**
No Features found

**Nitrate Vulnerable Zones 2017 Designations (England)**
No Features found

**Wild Bird General Licence Protected Sites Condition Zone (England)**
No Features found

**Source Protection Zones merged (England)**
No Features found




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Drawing Scale Bar

| Drawing scale | Line length | Drawing scale | Line length |
|---|---|---|---|
| 1:5 | = 0.25 metres | 1:200 | = 10.0 metres |
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| 1:25 | = 1.25 metres | 1:1000 | = 50.0 metres |
| 1:50 | = 2.5 metres | 1:1250 | = 62.5 metres |
| 1:100 | = 5.0 metres | 1:2500 | = 125 metres |

Measure length of line above for checking of scale

## GENERAL NOTES

**1. All dimensions are in millimetres and levels in m AOD unless stated otherwise.**

**2. Do not scale. If in any doubt, consult Engineer.**

**3. Read in conjunction with the architects and engineers schedule drawings.**

**4. Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.**

**5. The location of services is shown as indicative. This drawing should be read in conjunction with the utilities drawings. No warranty to their accuracy can be given. The contractor shall take all necessary measures to satisfy himself as to the location of the existing services and connection points. Excavation should be undertaken in compliance with HSG47.**

| Rev | Details | Date | By | Ch'd |
|---|---|---|---|---|

Drawing Status:

**PRELIMINARY**

URBANWATER

Client:

Project:

**14-16 Farncombe Road BN11 2BB**

Drawing:

Soakaway Test Location

| Print Size: | Scale: | Project No: | Drawing No: | Revision: |
|---|---|---|---|---|
| **A1** | **1:100** | **U0532** | - | **P1** |

www.urban-water.co.uk
Tel: 020 3488 8687
167, 169 Great Portland Street, London, W1W 5PE

# SOAKAWAY TEST TO BRE365 STANDARD

**PROCESS See video in following link:** How to complete a soakaway test BRE365 - YouTube

**1. Locate site of proposed soakaway**

See enclosed drawing showing location of soakaway

**2. Excavate hole to dimensions given**

See drawing and figure opposite which shows the dimension of the hole. Excavation should be done using a machine.

**3. Record Size**

Measure actual size of excavated hole

**4. Pour in min 1m3 of water (Instantaneously)**

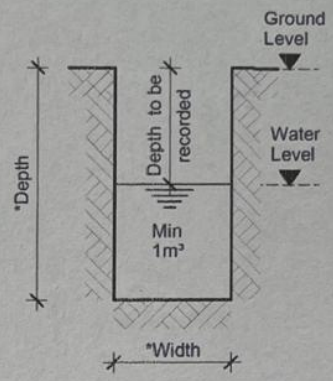
Use Water bowser, with a large outlet pipe, or excavator scoop or large container.

**5. Record Time & Depth using the tables below**

Give dimension from water level to ground level at regular intervals Keep hole covered when unattended.

**6. Repeat test three times**

When hole is empty repeat test, on same day or consecutive days depending on flow.




**TEST MUST BE COMPLETE THREE TIMES OR IT IS INVALID**

## RESULTS

**Groundwater Level** NOT FOUND m (distance from ground level)

**Description of excavated soil** (circle as required) Sand Gravel Clay Mudstone Cornbrush

**Dimension of excavated hole (m)** Length: 1.00m Width: 1.00m Depth: 1.50m

| Test 1 | Minutes | Water Depth |
|---|---|---|
| | 0 | 1.20 |
| | 15 | 1.00 |
| | 30 | 0.70 |
| | 45 | 0.30 |
| | 50 | EMPTY |

| Test 2 | Minutes | Water Depth |
|---|---|---|
| | 0 | 1.20 |
| | 15 | 1.05 |
| | 30 | 0.80 |
| | 45 | 0.40 |
| | 55 | EMPTY |

| Test 3 | Minutes | Water Depth |
|---|---|---|
| | 0 | 1.20 |
| | 15 | 1.10 |
| | 30 | 0.90 |
| | 45 | 0.50 |
| | 60 | EMPTY |

| | |
|---|---|
| Project: | [U0532] 14-16 Farncombe Road BN11 2BB |
| Calculation By: | SA |
| Title : | Soakaway Calculation |
| Date: | 03/01/2025 |

# SOAKAWAY TRIAL PIT 1

## TEST 1

**Pit Dimensions:**

| | | |
|---|---|---|
| L: | 1000 | mm |
| W: | 1000 | mm |
| D: | 1500 | mm |

**Key**

| | |
|---|---|
| | Input |
| | Calculation |

| Time Since Start | Water Level from GL | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 300 | 1200 |
| 15 | 500 | 1000 |
| 30 | 800 | 700 |
| 45 | 1200 | 300 |
| 50 | 1500 | 0 |

| | | |
|---|---|---|
| Mean Surface Area | 3.40 | m2 |
| Depth of water | 1200 | mm |
| Time at 25% or at | 300 | mm of water |

Interpolating Values

| Time | Water Depth |
|---|---|
| 45 | 300 |
| 50 | 0 |

t: 45 min. From interpolating values

| | | |
|---|---|---|
| Time at 75% or at | 900 | mm of water |

Interpolating Values

| Time | Water Depth |
|---|---|
| 15 | 1000 |
| 30 | 700 |

t: 20 min. From interpolating values

| | | | |
|---|---|---|---|
| Volume of test Pit between 25% and 75% of water depth: | 0.6 | m3 | |
| Time Taken to drain between 25% and 75% of water depth: | 25 | min or | 0.417 hr |

**Test 1 - Soil Infiltration rate:**

| | |
|---|---|
| 1.18E-04 | m/s |
| 0.4235 | m/hr |

# SOAKAWAY TRIAL PIT 1

## TEST 2

**Pit Dimensions:**

| | | |
|---|---|---|
| L: | 1000 | mm |
| W: | 1000 | mm |
| D: | 1500 | mm |

**Key**

| | |
|---|---|
| | Input |
| | Calculation |

| Time Since Start | Water Level from GL | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 300 | 1200 |
| 15 | 450 | 1050 |
| 30 | 700 | 800 |
| 45 | 1100 | 400 |
| 55 | 1500 | 0 |

Mean Surface Area: 3.40 m2

Depth of water: 1200 mm

Time at 25% or at: 300 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 45 | 400 |
| 55 | 0 |

t: 47.5 min. From interpolating values

Time at 75% or at: 900 mm of water

Interpolating Values

| Time | Water Depth |
|---|---|
| 15 | 1050 |
| 30 | 800 |

t: 24 min. From interpolating values

Volume of test Pit between 25% and 75% of water depth: 0.6 m3

Time Taken to drain between 25% and 75% of water depth: 23.5 min or 0.392 hr

**Test 2 - Soil Infiltration rate:** 1.25E-04 m/s

0.4506 m/hr

# SOAKAWAY TRIAL PIT 1

## TEST 3

**Pit Dimensions:**

| | | |
|---|---|---|
| L: | 1000 | mm |
| W: | 1000 | mm |
| D: | 1500 | mm |

**Key**

| | |
|---|---|
| | Input |
| | Calculation |

| Time Since Start | Water Level from GL | Depth of water |
|---|---|---|
| min | mm | mm |
| 0 | 300 | 1200 |
| 15 | 400 | 1100 |
| 30 | 500 | 1000 |
| 45 | 1000 | 500 |
| 60 | 1500 | 0 |

| | | |
|---|---|---|
| Mean Surface Area | 3.40 | m2 |
| Depth of water | 1200 | mm |
| Time at 25% or at | 300 | mm of water |

Interpolating Values

| Time | Water Depth |
|---|---|
| 45 | 500 |
| 60 | 0 |

t: 51 min. From interpolating values

| | | |
|---|---|---|
| Time at 75% or at | 900 | mm of water |

Interpolating Values

| Time | Water Depth |
|---|---|
| 30 | 1000 |
| 45 | 500 |

t: 33 min. From interpolating values

| | | | |
|---|---|---|---|
| Volume of test Pit between 25% and 75% of water depth: | 0.6 | m3 | |
| Time Taken to drain between 25% and 75% of water depth: | 18 | min or | 0.300 hr |

**Test 3 - Soil Infiltration rate:** 1.63E-04 m/s

0.5882 m/hr

**SOAKAWAY TRIAL PIT 1 INFILTRATION RATE** 1.18E-04 m/s

0.4235 m/hr

# Appendix C

## Simulation Settings

| | | | | | |
|---|---|---|---|---|---|
| Rainfall Methodology | FEH-13 | Drain Down Time (mins) | 240 | 30 year (l/s) | 0.7 |
| Summer CV | 1.000 | Additional Storage (m³/ha) | 0.0 | 100 year (l/s) | 1.0 |
| Analysis Speed | Normal | Check Discharge Rate(s) | ✓ | Check Discharge Volume | x |
| Skip Steady State | x | 2 year (l/s) | 0.3 | | |

### Storm Durations

| 15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 |
|---|---|---|---|---|---|---|---|---|---|---|---|

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|---|---|---|---|
| 2 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 |
| 30 | 45 | 0 | 0 |
| 100 | 0 | 0 | 0 |
| 100 | 45 | 0 | 0 |

## Pre-development Discharge Rate

| | | | |
|---|---|---|---|
| Site Makeup | Greenfield | Growth Factor 30 year | 2.30 |
| Greenfield Method | IH124 | Growth Factor 100 year | 3.19 |
| Positively Drained Area (ha) | 0.134 | Betterment (%) | 0 |
| SAAR (mm) | 692 | QBar | 0.2 |
| Soil Index | 2 | Q 1 year (l/s) | 0.2 |
| SPR | 0.30 | Q 2 year (l/s) | 0.2 |
| Region | 7 | Q 30 year (l/s) | 0.6 |
| Growth Factor 1 year | 0.85 | Q 100 year (l/s) | 0.8 |
| Growth Factor 2 year | 0.88 | | |

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## Design Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FEH-13 | Minimum Velocity (m/s) | 1.00 |
| Return Period (years) | 2 | Connection Type | Level Inverts |
| Additional Flow (%) | 0 | Minimum Backdrop Height (m) | 0.200 |
| CV | 1.000 | Preferred Cover Depth (m) | 1.200 |
| Time of Entry (mins) | 6.00 | Include Intermediate Ground | ✓ |
| Maximum Time of Concentration (mins) | 30.00 | Enforce best practice design rules | ✓ |
| Maximum Rainfall (mm/hr) | 50.0 | | |

## Nodes

| Name | Area (ha) | T of E (mins) | Cover Level (m) | Diameter (mm) | Easting (m) | Northing (m) | Depth (m) |
|---|---|---|---|---|---|---|---|
| Development | 0.021 | 6.00 | 7.400 | 450 | -0.094 | 0.051 | 1.000 |
| Soawakay | | | 7.300 | | 39.876 | 0.051 | 1.500 |

## Links

| Name | US Node | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | Development | Soawakay | 40.000 | 0.600 | 6.400 | 5.800 | 0.600 | 66.7 | 150 | 6.54 | 49.9 |

| Name | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1.233 | 21.8 | 3.8 | 0.850 | 1.350 | 0.021 | 0.0 | 42 | 0.930 |

## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) | DS CL (m) | DS IL (m) | DS Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 40.000 | 66.7 | 150 | Circular | 7.400 | 6.400 | 0.850 | 7.300 | 5.800 | 1.350 |

| Link | US Node | Dia (mm) | Node Type | MH Type | DS Node | Node Type |
|---|---|---|---|---|---|---|
| 1.000 | Development | 450 | Manhole | Adoptable | Soawakay | Junction |

## Manhole Schedule

| Node | Easting (m) | Northing (m) | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|---|---|
| Development | -0.094 | 0.051 | 7.400 | 1.000 | 450 | <br>0 | 1.000 | 6.400 | 150 |
| Soawakay | 39.876 | 0.051 | 7.300 | 1.500 | | 1<br> | 1.000 | 5.800 | 150 |

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## Simulation Settings

| | | | | | |
|---|---|---|---|---|---|
| Rainfall Methodology | FEH-13 | Drain Down Time (mins) | 240 | 2 year (l/s) | 1.3 |
| Summer CV | 1.000 | Additional Storage (m³/ha) | 0.0 | 30 year (l/s) | 3.4 |
| Analysis Speed | Normal | Check Discharge Rate(s) | ✓ | 100 year (l/s) | 4.2 |
| Skip Steady State | x | 1 year (l/s) | 0.0 | Check Discharge Volume | x |

### Storm Durations

| 15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 |
|---|---|---|---|---|---|---|---|---|---|---|---|

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|---|---|---|---|
| 2 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 |
| 30 | 45 | 0 | 0 |
| 100 | 0 | 0 | 0 |
| 100 | 45 | 0 | 0 |

## Pre-development Discharge Rate

| | | | |
|---|---|---|---|
| Site Makeup | Brownfield | Betterment (%) | 0 |
| Brownfield Method | MRM | Q 1 year (l/s) | |
| Contributing Area (ha) | 0.134 | Q 2 year (l/s) | 1.3 |
| PIMP (%) | 58 | Q 30 year (l/s) | 3.4 |
| CV | 0.750 | Q 100 year (l/s) | 4.2 |
| Time of Concentration (mins) | 8.00 | | |

## Node Soawakay Soakaway Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m) | 5.800 | Depth (m) | 0.800 |
| Side Inf Coefficient (m/hr) | 0.42350 | Time to half empty (mins) | 285 | Inf Depth (m) | 0.800 |
| Safety Factor | 2.0 | Pit Width (m) | 4.500 | Number Required | 1 |
| Porosity | 0.95 | Pit Length (m) | 4.000 | | |

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**Results for 2 year Critical Storm Duration. Lowest mass balance: 98.69%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 10 | 6.442 | 0.042 | 3.4 | 0.0067 | 0.0000 | OK |
| 480 minute summer | Soawakay | 312 | 6.002 | 0.202 | 0.8 | 3.4560 | 0.0000 | OK |

| Link Event (Velocity) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 1.000 | Soawakay | 3.5 | 1.132 | 0.161 | 0.2145 |
| 480 minute summer | Soawakay | Infiltration | | 0.2 | | | |

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**Results for 30 year Critical Storm Duration. Lowest mass balance: 98.69%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 11 | 6.468 | 0.068 | 9.3 | 0.0109 | 0.0000 | OK |
| 240 minute summer | Soawakay | 180 | 6.235 | 0.435 | 3.0 | 7.4339 | 0.0000 | OK |

| Link Event (Velocity) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 1.000 | Soawakay | 9.3 | 1.242 | 0.427 | 0.4995 |
| 240 minute summer | Soawakay | Infiltration | | 0.4 | | | |

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**Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 98.69%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 11 | 6.485 | 0.085 | 13.5 | 0.0136 | 0.0000 | OK |
| 240 minute summer | Soawakay | 180 | 6.428 | 0.628 | 4.3 | 10.7340 | 0.0000 | OK |

| Link Event (Velocity) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 1.000 | Soawakay | 13.5 | 1.258 | 0.619 | 0.5587 |
| 240 minute summer | Soawakay | Infiltration | | 0.6 | | | |

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**Results for 100 year Critical Storm Duration. Lowest mass balance: 98.69%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 11 | 6.478 | 0.078 | 11.8 | 0.0125 | 0.0000 | OK |
| 240 minute summer | Soawakay | 184 | 6.343 | 0.543 | 3.7 | 9.2910 | 0.0000 | OK |

| Link Event (Velocity) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 1.000 | Soawakay | 11.8 | 1.254 | 0.541 | 0.5381 |
| 240 minute summer | Soawakay | Infiltration | | 0.5 | | | |

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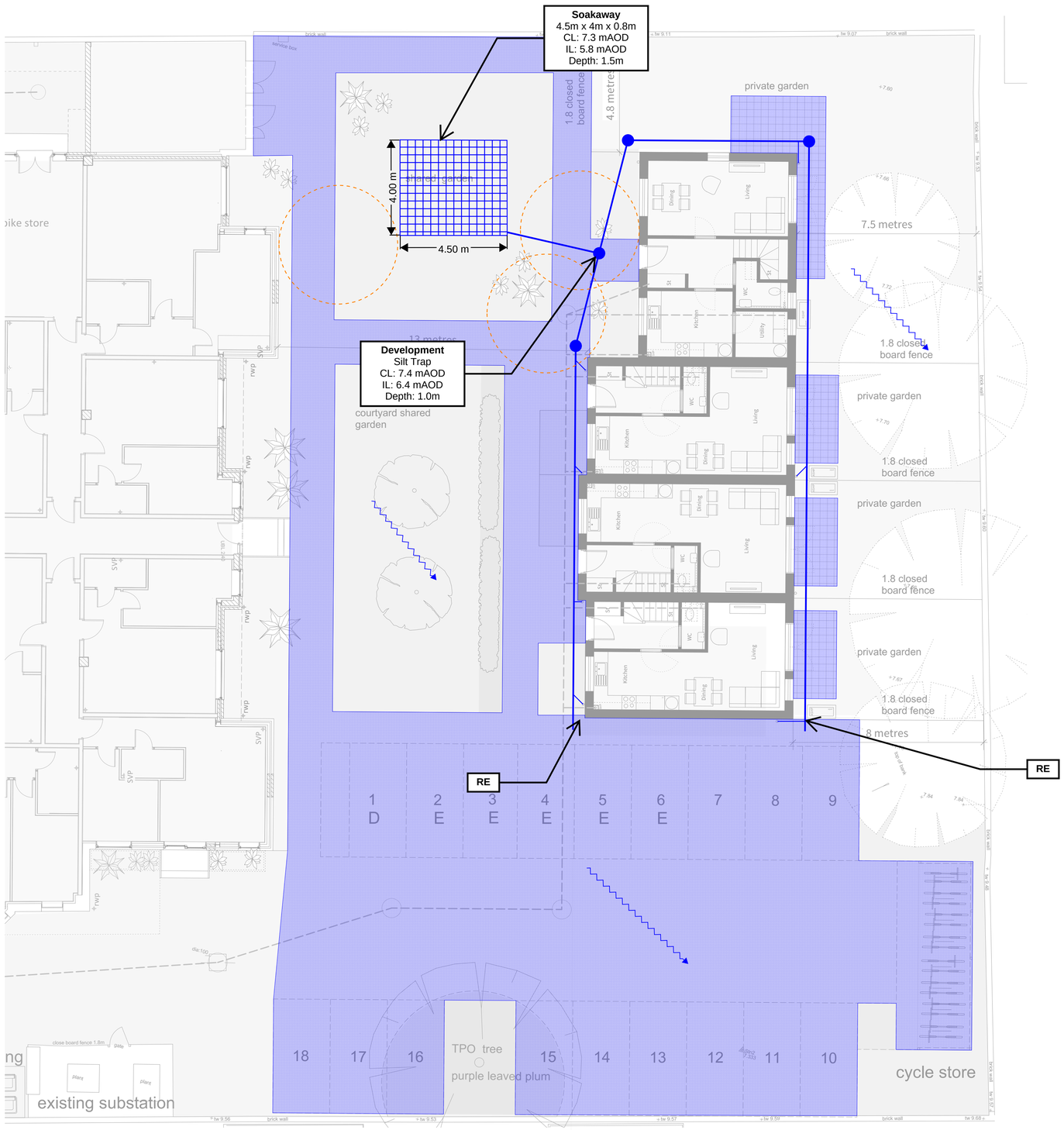
**Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.69%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 240 minute summer | Development | 184 | 6.575 | 0.175 | 5.4 | 0.0278 | 0.0000 | SURCHARGED |
| 240 minute summer | Soawakay | 184 | 6.574 | 0.774 | 5.4 | 13.2378 | 0.0000 | OK |

| Link Event (Velocity) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|---|---|---|---|---|---|---|---|
| 15 minute summer | Development | 1.000 | Soawakay | 17.0 | 1.270 | 0.780 | 0.5998 |
| 240 minute summer | Soawakay | Infiltration | | 0.8 | | | |

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# Appendix D




Do not scale from this drawing. Refer to figured dimensions only. RIDA Reports Ltd registered in England and Wales No. 10590566. This drawing is copyright of RIDA Reports Ltd.

Drawing Scale Bar

| Drawing scale | Line length | Drawing scale | Line length |
|---|---|---|---|
| 1:5 | = 0.25 metres | 1:200 | = 10.0 metres |
| 1:10 | = 0.5 metres | 1:250 | = 12.5 metres |
| 1:20 | = 1.0 metres | 1:500 | = 25.0 metres |
| 1:25 | = 1.25 metres | 1:1000 | = 50.0 metres |
| 1:50 | = 2.5 metres | 1:1250 | = 62.5 metres |
| 1:100 | = 5.0 metres | 1:2500 | = 125 metres |

Measure length of line above for checking of scale

## GENERAL NOTES

**1. All dimensions are in millimetres and levels in m AOD unless stated otherwise.**

**2. Do not scale. If in any doubt, consult Engineer.**

**3. Read in conjunction with the architects and engineers schedule drawings.**

**4. Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.**

**5. The location of services is shown as indicative. This drawing should be read in conjunction with the utilities drawings. No warranty to their accuracy can be given. The contractor shall take all necessary measures to satisfy himself as to the location of the existing services and connection points. Excavation should be undertaken in compliance with HSG47.**

## KEY

- Proposed Surface Water Sewer Pipe
- Exceedance Flows
- Permeable Surface as per architect's details Sub-base 350mm Type 3
- Silt Trap

| Rev | Details | Date | By | Chd |
|---|---|---|---|---|

Drawing Status:

**PRELIMINARY**

URBANWATER

Client:

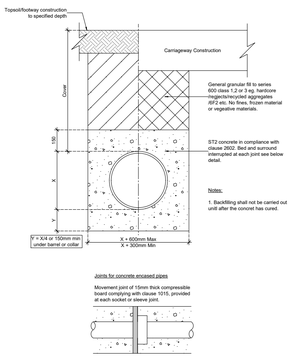
Project:

**14-16 Farncombe Road BN11 2BB**

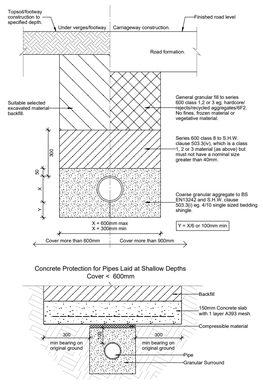
Drawing:

Proposed Drainage Strategy

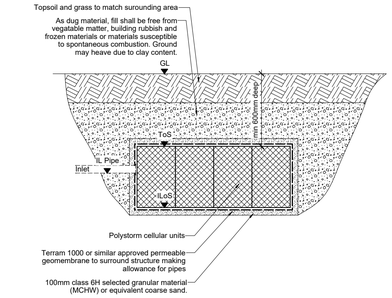
| Print Size: | Scale: | Project No: | Drawing No: | Revision: |
|---|---|---|---|---|
| A1 | 1:100 | U0532 | 003 | P1 |




**Pipe Bedding Detail Type Z**




**Pipe Bedding Detail Type S**




NOTES:

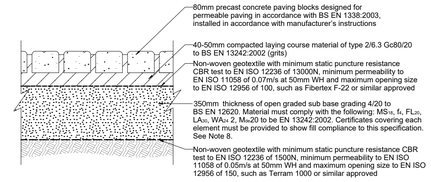
1. Permeable modular storage cell with 95% minimum void ratio. Maximum load 20 tonnes/m².

2. Installation of units as per supplier recommendations.

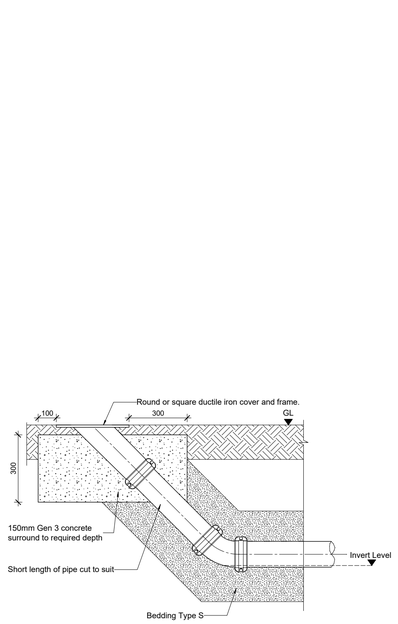
3. Ground may heave due to clay content in the as dug material. Contractor to level ground where required.

4. The area of the infiltration unit and the minimum total storage volume should be as per approved by the local planning authority documents.

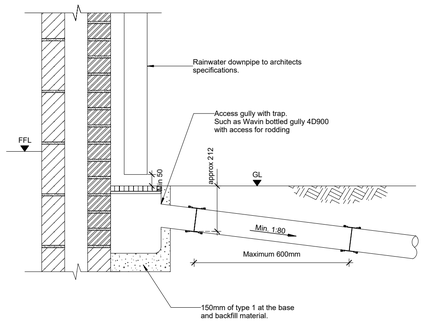
**Cellular Infiltration System - Landscape Area**




**Permeable Paving - Infiltration**




**External Rodding Eye Detail**

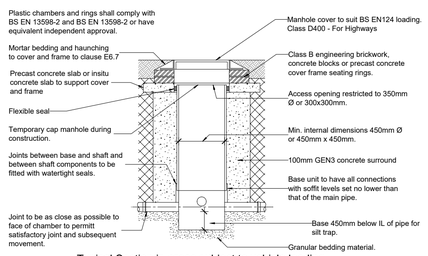



NOTES:

1. This details shows the standard generic arrangement.

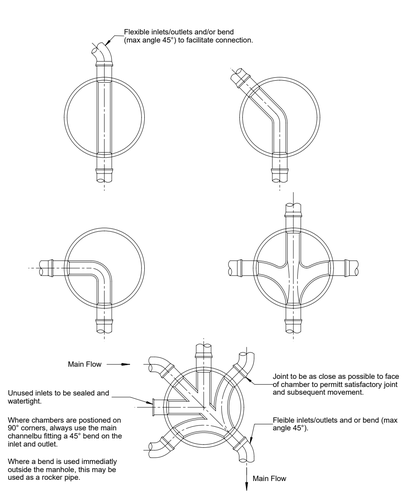
2. The pipe and connector details will be different for each manufacturer of the components. They are to be in installed in accordance with the manufacturers recommendations.

**8250 - External Rainwater (High Level)**




**Notes:**
1. Refer to drawing 8193 for base layouts.

**Silt Trap Plastic**




**Chamber Type 3 Base Layouts**

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Drawing Scale Bar

| Drawing scale | Line length | Drawing scale | Line length |
|---|---|---|---|
| 1:5 | = 0.25 metres | 1:200 | = 10.0 metres |
| 1:10 | = 0.5 metres | 1:250 | = 12.5 metres |
| 1:20 | = 1.0 metres | 1:500 | = 25.0 metres |
| 1:25 | = 1.25 metres | 1:1000 | = 50.0 metres |
| 1:50 | = 2.5 metres | 1:1250 | = 62.5 metres |
| 1:100 | = 5.0 metres | 1:2500 | = 125 metres |

Measure length of line above for checking of scale

GENERAL NOTES

| Rev | Details | Date | By | Ctrd |
|---|---|---|---|---|

Drawing Status:

**PRELIMINARY**

URBANWATER

Client:

Project:

**14-16 Farncombe Road BN11 2BB**

Drawing:

Standard Details

| Print Size: | Scale: | Project No: | Drawing No: | Revision: |
|---|---|---|---|---|
| A1 | NTS | U0532 | 006 | P1 |