



## Drainage Strategy

57 Queensway , Bognor Regis, PO21 1QW

Reference: 560 -Rev - V1

Date: Jun-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

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## Drainage Strategy

57 Queensway , Bognor Regis, PO21 1QW

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### Report Limitations

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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.

## **Scope**

- 1.2 This Sustainable Drainage Strategy (SDS) outlines the key drainage principles and requirements for the proposed development at 57 Queensway , Bognor Regis, PO21 1QW. It provides a summary of the sustainable drainage system (SuDS) design, based on the specific site conditions and relevant guidelines, including Building Regulations Approved Document Part H and CIRIA C753: The SuDS Manual 2015. As the project progresses and new information becomes available, this strategy will be updated to reflect ongoing changes and the development of the detailed design.

## 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
<b>Protected species or habitat</b>	Is the site near to designated sites and priority habitats?	No
<b>Flood Plain</b>	Is the site located in the flood plain?	No
<b>Soils and Geology</b>	Soil permeability? - See appendix B for results	No
<b>Space constraints</b>	Space for SuDS components?	No
<b>Topography</b>	Sited on a flat site?	Yes
	Sited on a steep slope (5-15%)	No
	Sited on a very steep slope (>15%)	No
<b>Groundwater</b>	Is the site at groundwater flood risk?	No
<b>Contaminated land</b>	Are there contaminated soils on site?	Yes, refer to GE22978/RSVP
<b>Source Protection Zone</b>	Is the site within a SPZ 3?	No
<b>Runoff characteristics</b>	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	0.028	0.038
Permeable Areas	Connected to Drainage	0.000
	Self Draining Areas	0.013
Areas Draining Away from drainage System	0.047	0.024
<b>Total Development Area</b>	<b>0.075</b>	<b>0.075</b>

- 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 London Clay Formation - Clay, Silt and Sand.
Landis Top Soil Infiltration	The SOILSCAPE's records of the site show that it is located within an area of naturally wet soils.
Groundwater	The British Geological Survey's flood risk susceptibility maps show that the development has potential for groundwater flooding below ground level. Groundwater levels would tend to vary seasonally and are influenced by ground and meteorological conditions and proximity to water features.
Is infiltration feasible?	Infiltration is not possible on this site due to lack of space for SuDS components
Is a discharge to a watercourse feasible?	There is no watercourse near the site.
Is a discharge to a surface water sewer feasible?	There is a surface water sewer in the proximity to the site. It is possible to connect to the surface water sewer, and it is proposed to discharge into this surface water sewer.
Is a discharge to a combined sewer feasible?	There is a combined water sewer in the proximity to the site. It is possible to connect to the combined water sewer. It is not proposed to discharge into the combined water sewer.

## 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
	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
X	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 discharge at a rate of 2.4 l/s. 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	0.50	N/A	N/A	0.0000
1 in 1	0.40	4.70	0.7	0.0000
1 in 2	0.40	6.00	0.8	0.0000
1 in 30	0.90	11.00	1.1	0.0000
1 in 30 + CC	N/A	N/A	1.4	0.0000
1 in 100	1.20	13.90	1.3	0.0000
1 in 100 + CC	N/A	N/A	1.9	0.0000

## 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: Evaluation of SuDS and Proposed Drainage System

<i>Most Sustainable</i>	SuDS Technique	Feasible	Proposed	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	<b>Living Roofs</b>					
	Green Roof	No	No	X	X	X
	Green Blue Roof	No	No	X	X	X
	<b>Basins and Ponds</b>					
	Rainwater Gardens	No	No	X	X	X
	Rainwater Planters	No	No	X	X	X
	Constructed Wetlands	No	No	X	X	X
	Balancing Pond	No	No	X	X	X
	Detention Basins	No	No	X	X	X
	Retention Ponds	No	No	X	X	X
	<b>Filters and Swales</b>					
	Filter Strips	No	No	X	X	X
	Swales	No	No	X	X	X
	<b>Infiltration Devices</b>					
	Soakaways Crates	No	No	X	X	X
	Deep Boreholes	No	No	X	X	X
	Infiltration Trenches	No	No	X	X	X
	Infiltration Basin	No	No	X	X	X
	<b>Permeable Surfaces</b>					
	Permeable Surfaces	Yes	Yes	X	X	
	Filter Drains	No	No	X	X	
	<b>Tanked System</b>					
	Storage Crates	Yes	Yes	X		
	Oversized Tanks	Yes	No	X		
	Oversized Pipes	Yes	No	X		
	Blue Roof	No	No	X		
	Water Harvesting	Yes	Yes	X		
	<i>Least Sustainable</i>					

- 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 surcharge occurs for the 1 in 30 year + 45% climate change 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.

## Water Quality Assessment

5.6 The pollution hazard indices for this development has been taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2. The tables below shows the mitigation measure for the highest pollution hazard indices presented in the development.

Table 8: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home zones and general access roads) and non-residential car	Low	0.5	0.4	0.4
Residential roofs	Very low	0.2	0.2	0.05
0				
0				
<b>TOTAL</b>		0.7	0.6	0.45

Table 9: SuDS Mitigation Indices for worst case\*\*

Type of SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.7
0			
0			
0			
<b>TOTAL</b>	0.7	0.6	0.7

\*\* Values already reduced as per CIRIA C753

5.7 It is demonstrated that the proposed sustainable systems exceeds the required pollution indices and provides sufficient treatment as part of the surface water management train in accordance with the 2015 SuDS Manual (CIRIA C753)

## 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
<b>Inlets, outlets and surface control structures</b>	
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
<b>Inspection chambers and below ground control chambers</b>	
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
<b>Occasional Maintenance</b>	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As necessary
<b>Remedial work</b>	<b>Frequency</b>
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 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 glyphosate 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

Operation and maintenance requirements for attenuation storage tanks		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

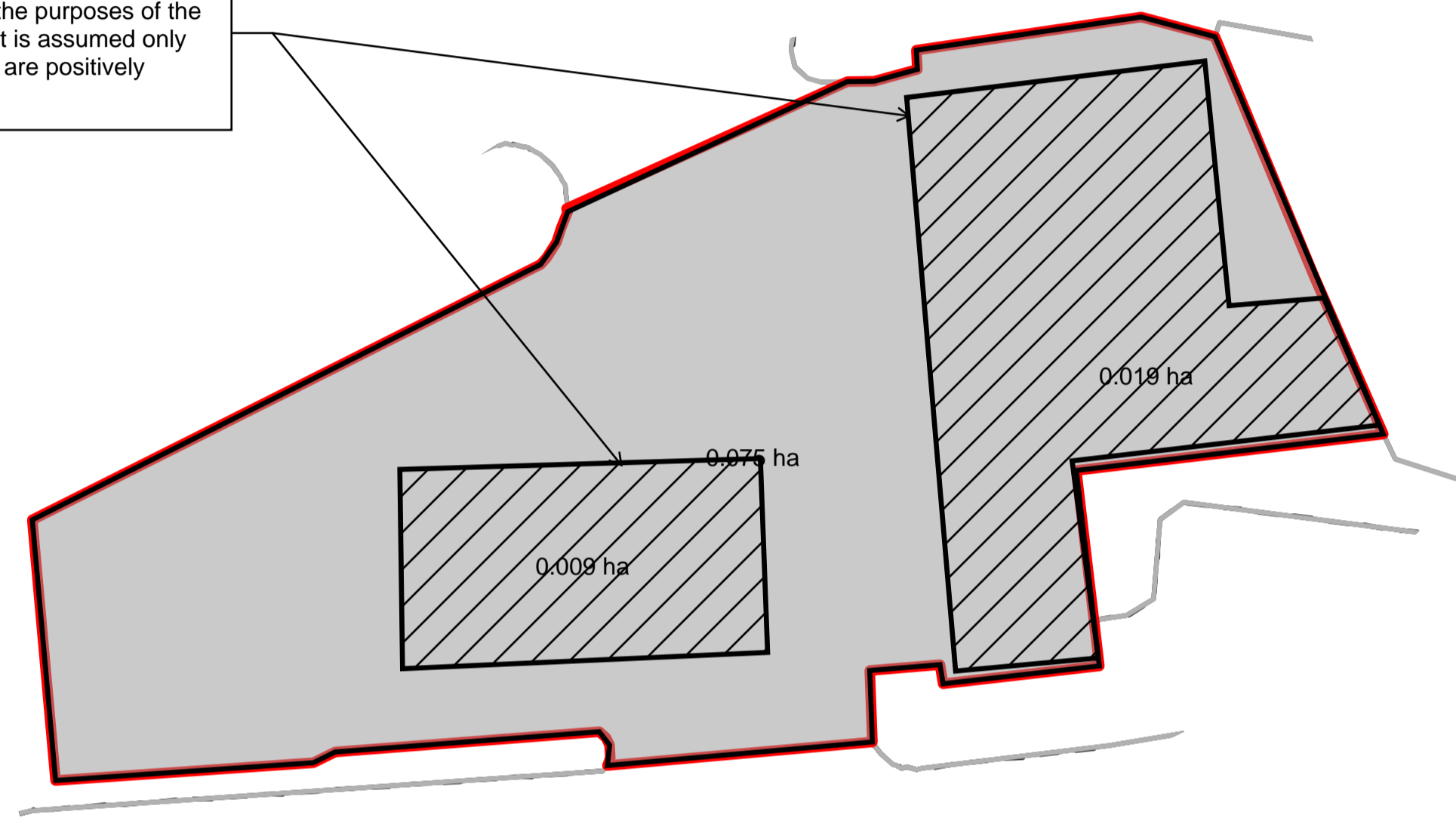
Operation and maintenance requirements for RWH systems		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

# Appendix A

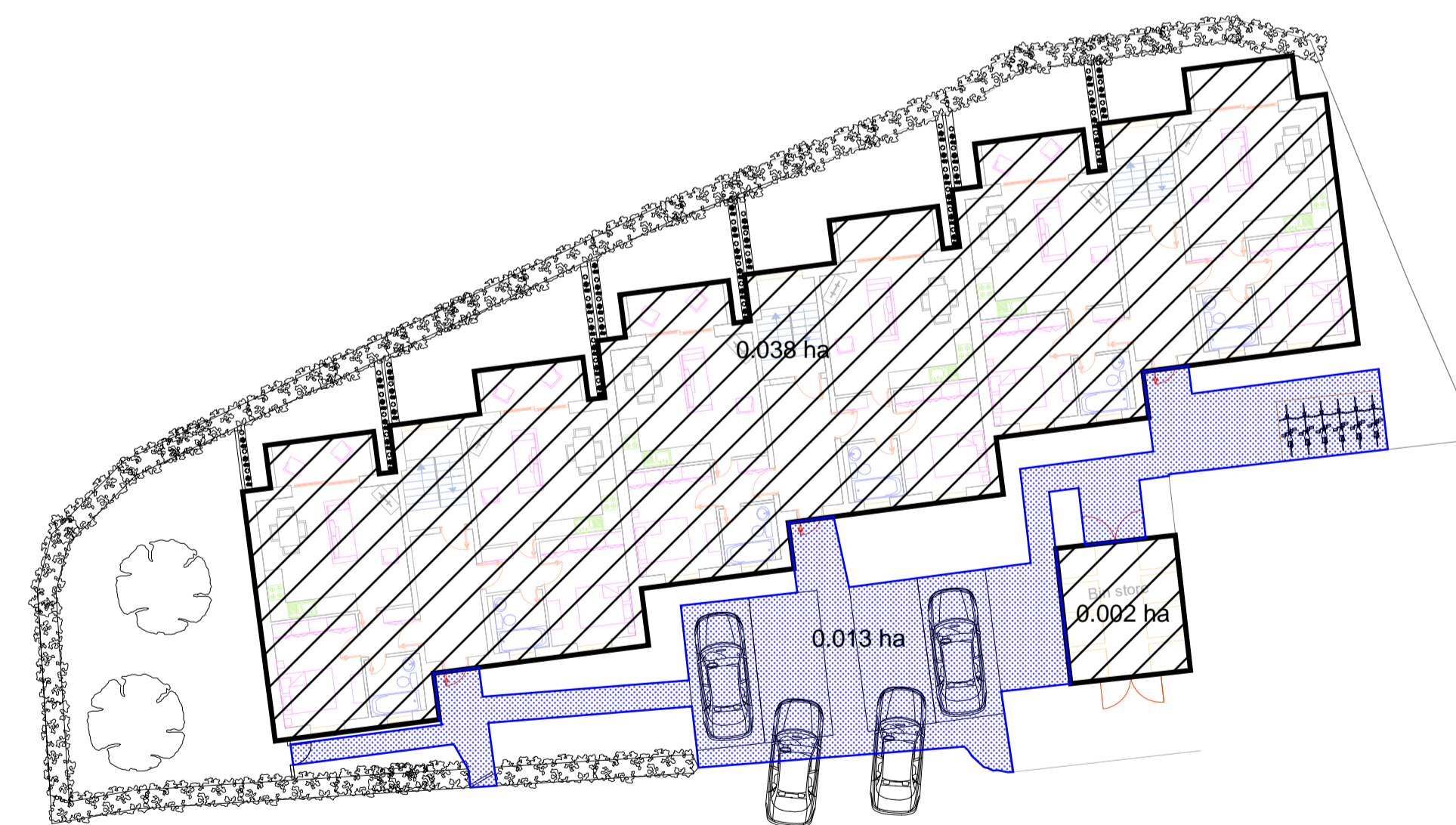
Drawing scale	Line length	Drawing scale	Line length
1:5 = 0.25 metres	1:200 = 10.0 metres	1:250 = 12.5 metres	1:500 = 25.0 metres
1:10 = 0.5 metres	1:250 = 12.5 metres	1:1000 = 50.0 metres	1:500 = 25.0 metres
1:20 = 1.0 metres	1:500 = 25.0 metres	1:1250 = 62.5 metres	1:100 = 5.0 metres
1:25 = 1.25 metres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

The whole area within the red line boundary is impermeable, however for the purposes of the calculations it is assumed only the buildings are positively drained






EXISTING SITE  
1:200



PROPOSED SITE  
1:200

GENERAL NOTES

KEY

-  PERMEABLE SELF DRAINING
-  IMPERMEABLE
-  STUDY AREA

Rev	Details	Date	By	Chd

Drawing Status: **PRELIMINARY**



Client:

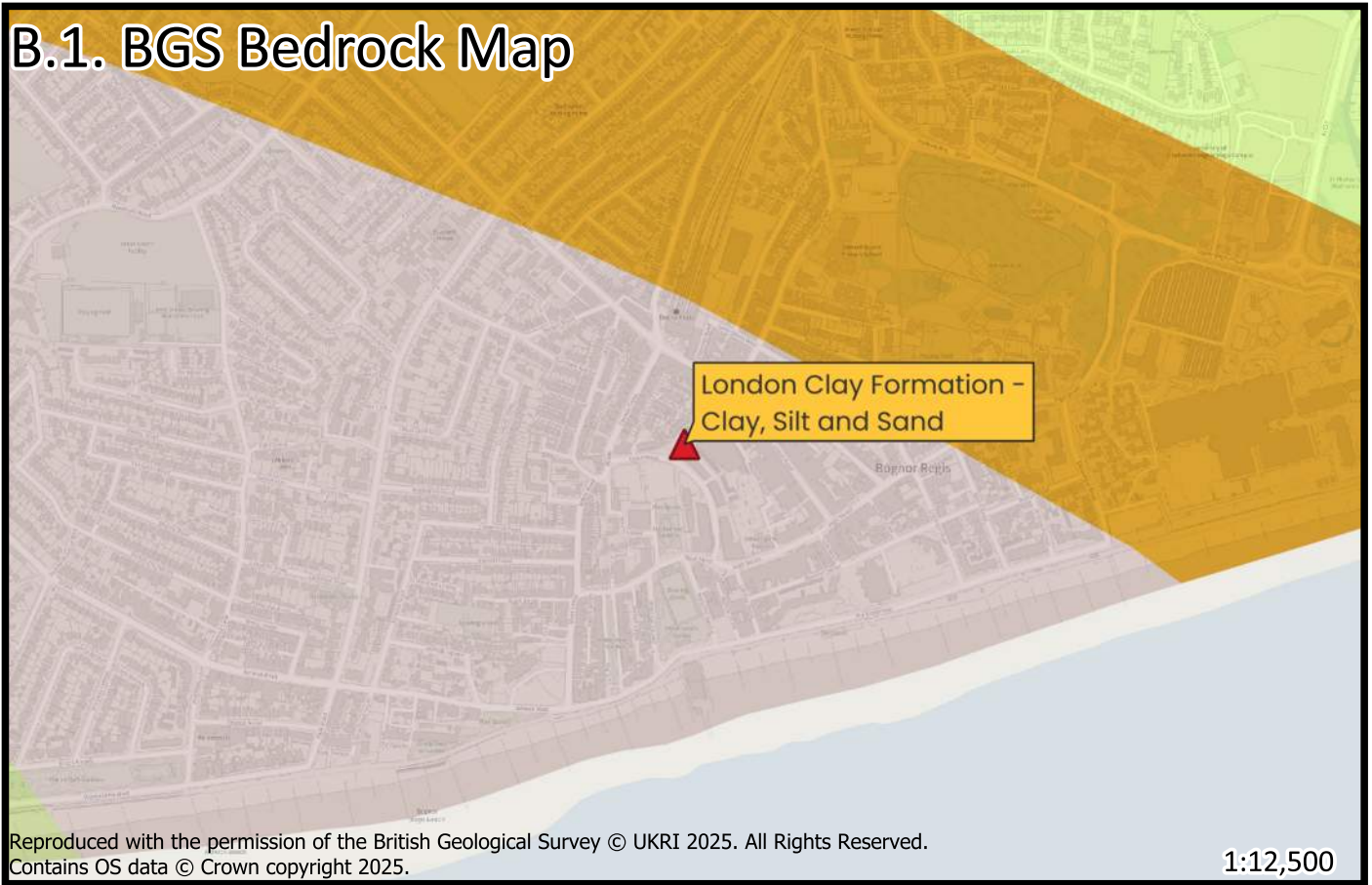
Project:

57 Queensway , Bognor Regis, PO21 1QW

Drawing:  
Existing and Proposed Areas  
Permeable and Impermeable

# Appendix B

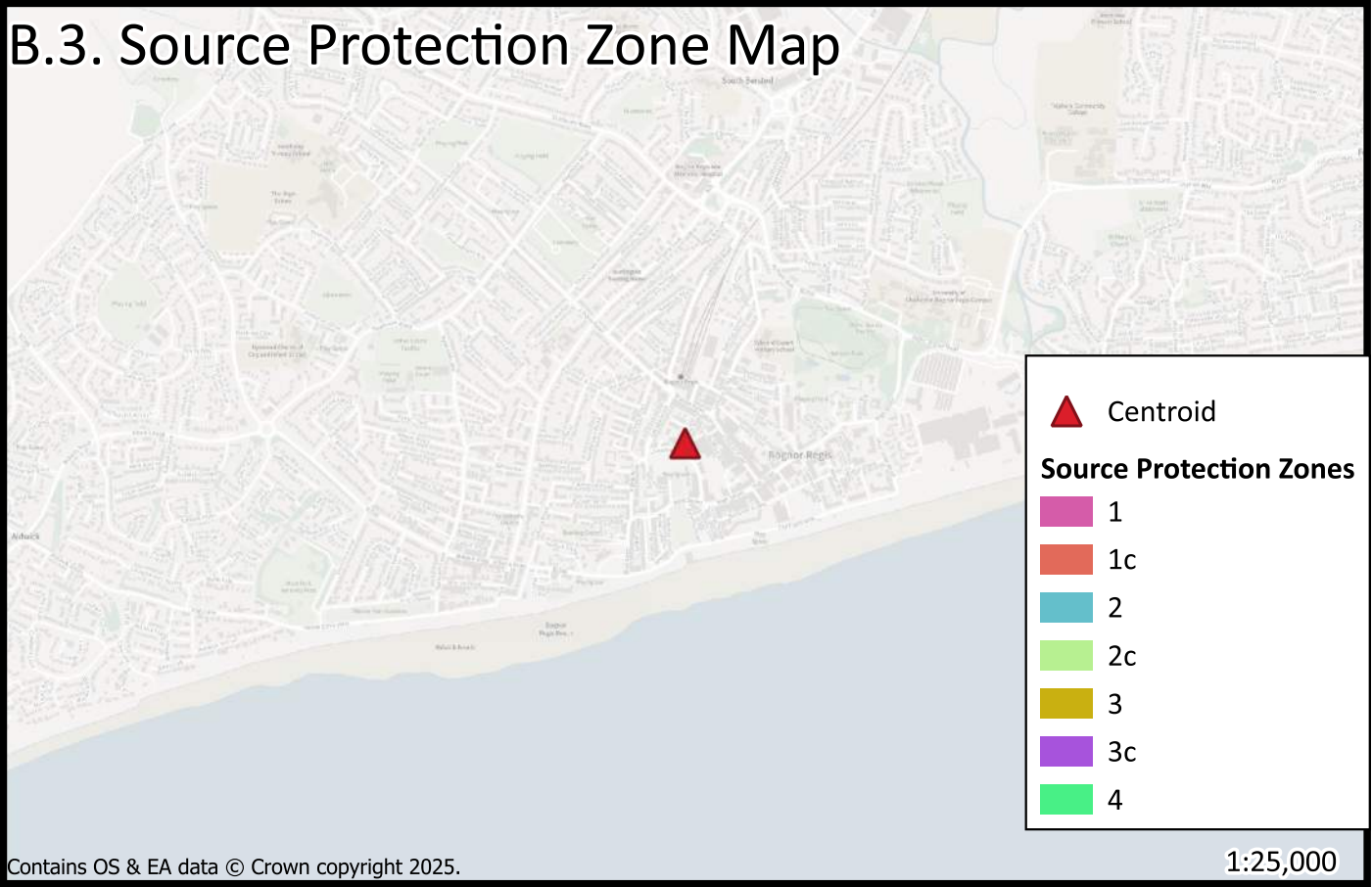
## B.1. BGS Bedrock Map



## B.2. BGS Superficial Deposits Map



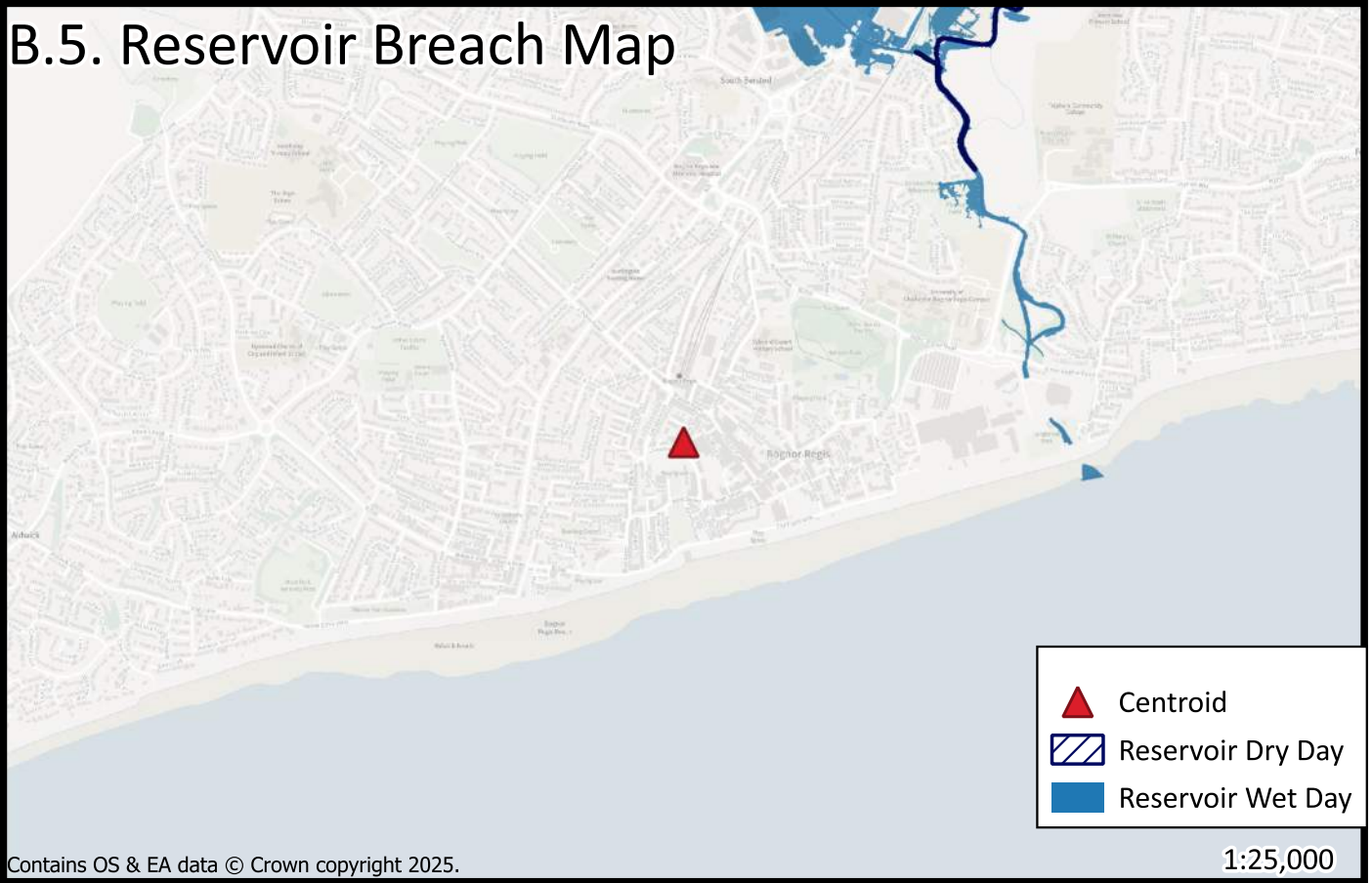
### B.3. Source Protection Zone Map



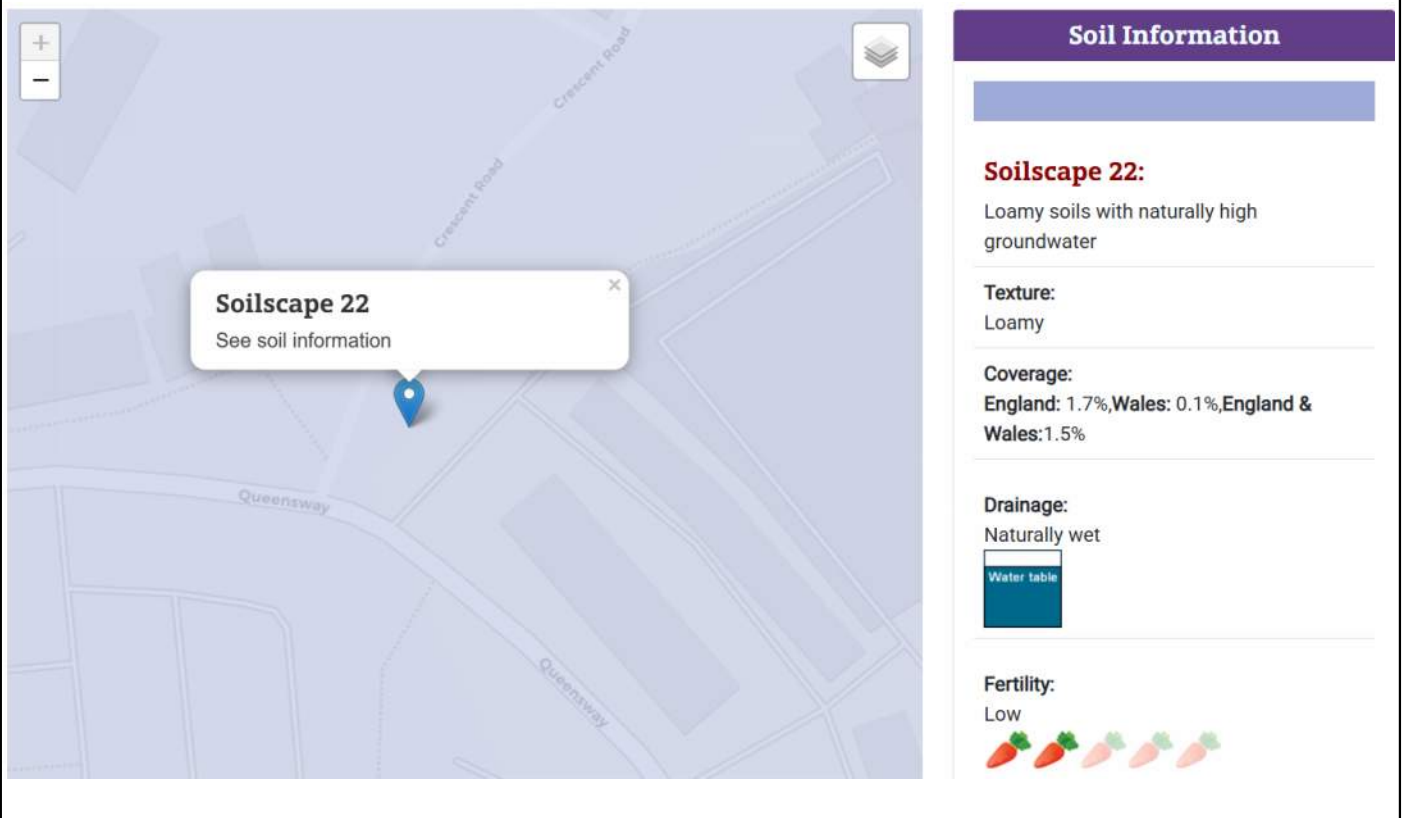
### B.4. Nearby Waterbodies Map



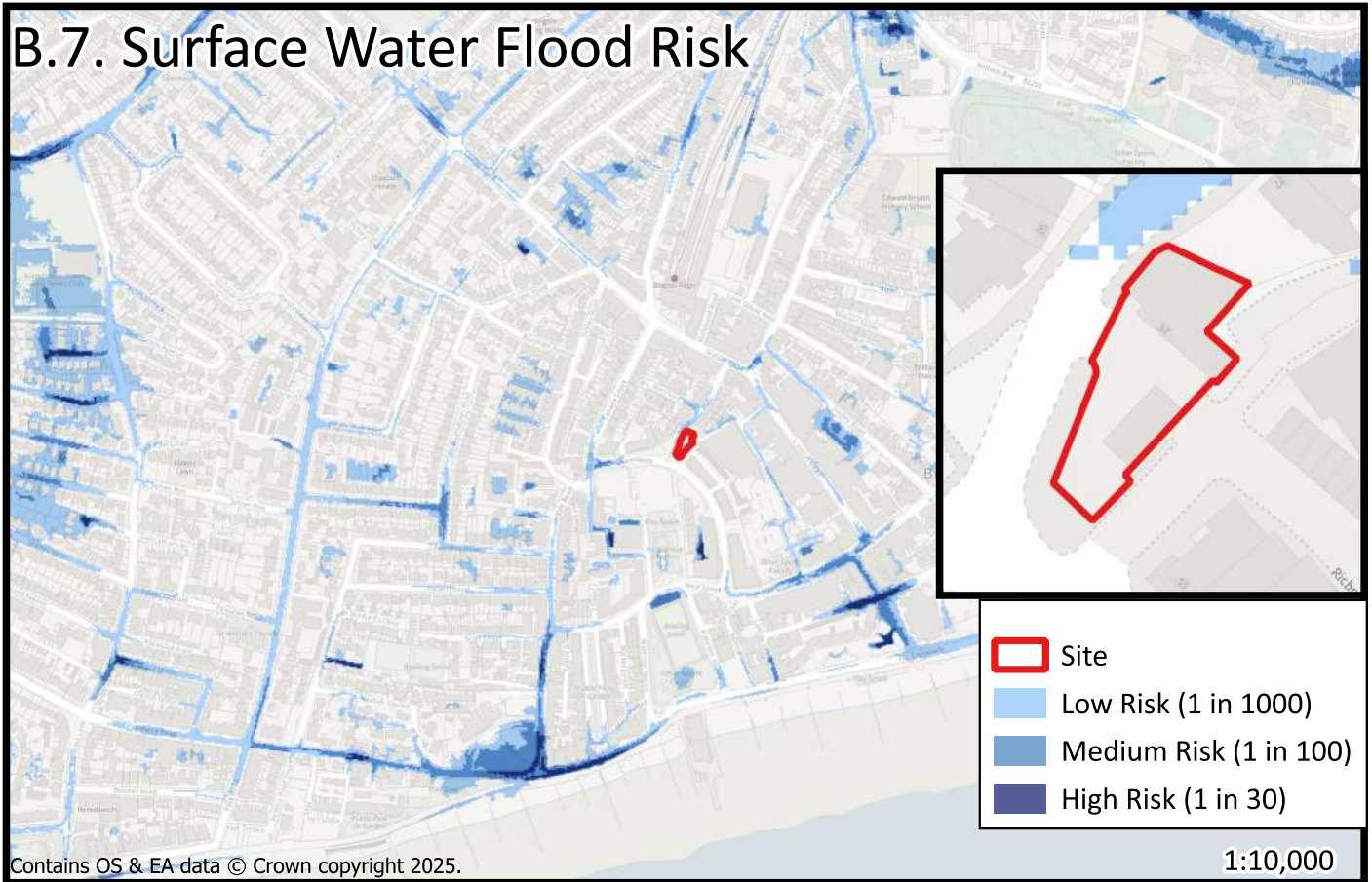
## B.5. Reservoir Breach Map



## B.6. Soilscapes Map



## B.7. Surface Water Flood Risk





#### Aquifer Designation Map (Bedrock) (England)

Typology Unproductive

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

Typology Secondary A

#### 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  
HYPERLINK

[/Metadata\\_for\\_magic/SSSI IRZ User Guidance MAGIC.pdf](#)  
[https://irz.geodata.org.uk/IRZ/step2.html?irzcode=0303000211100-es=11401&location=492999,99012%20\(IRZ%20polygon%20centre\)](https://irz.geodata.org.uk/IRZ/step2.html?irzcode=0303000211100-es=11401&location=492999,99012%20(IRZ%20polygon%20centre))

#### Areas of Outstanding Natural Beauty (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

#### Ramsar Sites (England) - points

No Features found

#### Ramsar Sites (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

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**Nitrate Vulnerable Zones 2017 Designations (England)**

No Features found

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**Wild Bird General Licence Protected Sites Condition Zone (England)**

No Features found

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**Green Belt (England)**

No Features found

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**National Forest (England)**

No Features found

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**Source Protection Zones merged (England)**

No Features found

## B.10. BGS Groundwater Susceptibility Map



# Flood map for planning

Your reference  
**U0560**

Location (easting/northing)  
**493419/99195**

Created  
**30 Jan 2025 10:18**

**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 than 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/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2024 OS AC0000807064. <https://flood-map-for-planning.service.gov.uk/os-terms>





## Flood map for planning

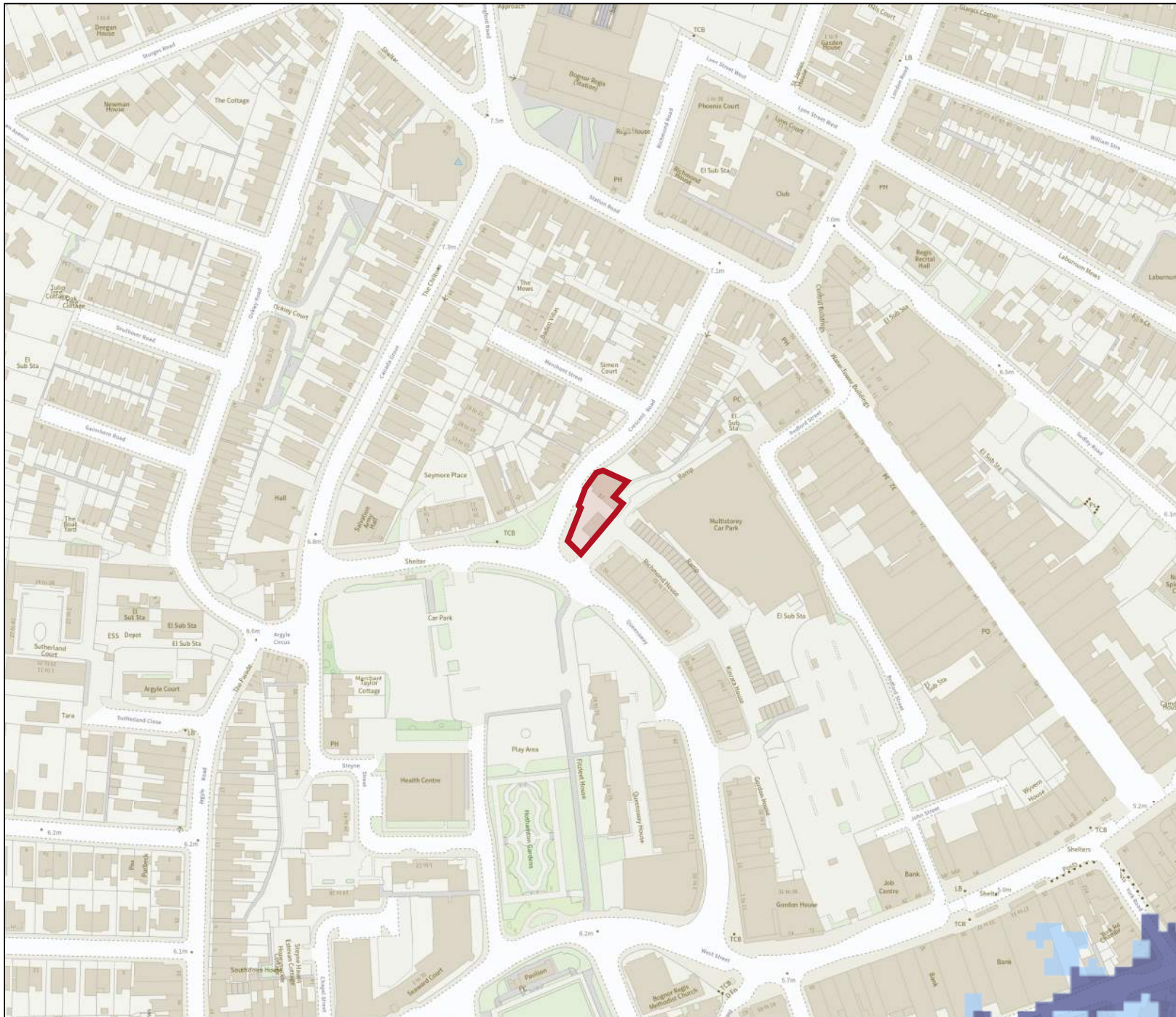
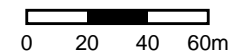
Your reference  
**U0560**

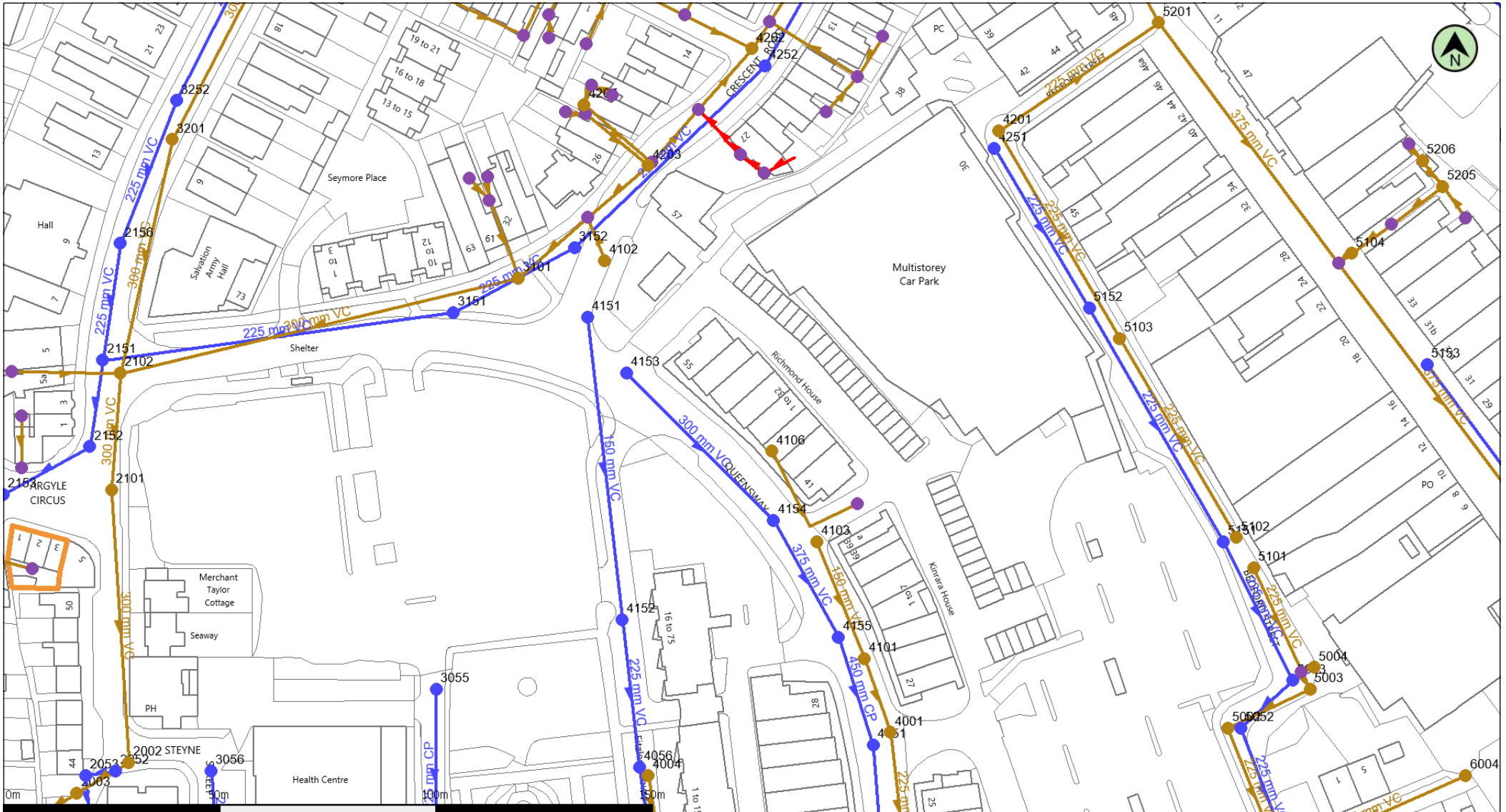
Location (easting/northing)  
**493419/99195**

Scale  
**1:2500**

Created  
**30 Jan 2025 10:18**

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

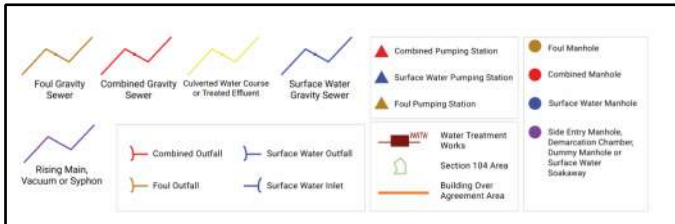




(c) Crown copyright and database rights 2025 Ordnance Survey AC0000808122    Date: 29/01/25    Scale: 1:1250    Map Centre: 493439,99159    Data updated: 21/01/25    Our Ref: 1674175 - 1    Wastewater Plan A4  
 Powered by digdat

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2025 Ordnance Survey AC0000808122. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.  
 WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



arge@rida-reports.co.uk

U560





# Appendix C



**Design Settings**

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

**Simulation Settings**

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.0
Summer CV	1.000	2 year (l/s)	0.0
Winter CV	1.000	30 year (l/s)	0.0
Analysis Speed	Normal	100 year (l/s)	0.0
Skip Steady State	x	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 %)
1	0	0	0
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	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.075	Betterment (%)	0
SAAR (mm)	704	QBar	0.5
Soil Index	5	Q 1 year (l/s)	0.4
SPR	0.53	Q 2 year (l/s)	0.4
Region	7	Q 30 year (l/s)	0.9
Growth Factor 1 year	0.85	Q 100 year (l/s)	1.2
Growth Factor 2 year	0.88		



**Design Settings**

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**Simulation Settings**

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	4.7
Summer CV	1.000	2 year (l/s)	6.0
Winter CV	1.000	30 year (l/s)	11.0
Analysis Speed	Normal	100 year (l/s)	13.9
Skip Steady State	x	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 %)
1	0	0	0
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)	4.7
Contributing Area (ha)	0.030	Q 2 year (l/s)	6.0
PIMP (%)	100	Q 30 year (l/s)	11.0
CV	1.000	Q 100 year (l/s)	13.9
Time of Concentration (mins)	6.00		



**Design Settings**

Rainfall Methodology	FEH-22	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		

**Adoptable Manhole Type**

<b>Max Width (mm)</b>	<b>Diameter (mm)</b>	<b>Max Width (mm)</b>	<b>Diameter (mm)</b>
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

<b>Max Depth (m)</b>	<b>Diameter (mm)</b>	<b>Max Depth (m)</b>	<b>Diameter (mm)</b>
1.500	1050	99.999	1200

**Circular Link Type**

Template	Freeform Carrier	Auto Increment (mm)	75
Shape	Circular	Follow Ground	x
Barrels	1		

**Available Diameters (mm)**

100 | 150

**Nodes**

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
North	0.022	6.00	6.700	450	70.755	76.426	0.500
South	0.022	6.00	6.700	450	7.730	75.246	0.500
Tank			6.700		37.556	48.573	1.500
Outfall - MH4153			6.700	450	28.074	17.862	1.700

**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	South	Tank	40.000	0.600	6.200	5.200	1.000	40.0	225	6.32	50.0
2.000	North	Tank	40.000	0.600	6.200	5.200	1.000	40.0	225	6.32	50.0
1.001	Tank	Outfall - MH4153	15.000	0.600	5.200	5.000	0.200	75.0	150	6.54	50.0





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	2.074	82.5	4.0	0.275	1.275	0.022	0.0	34	1.087
2.000	2.074	82.5	4.0	0.275	1.275	0.022	0.0	34	1.087
1.001	1.162	20.5	8.0	1.350	1.550	0.044	0.0	65	1.089

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	40.0	225	Circular	6.700	6.200	0.275	6.700	5.200	1.275
2.000	40.000	40.0	225	Circular	6.700	6.200	0.275	6.700	5.200	1.275
1.001	15.000	75.0	150	Circular	6.700	5.200	1.350	6.700	5.000	1.550

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	South	450	Manhole	Adoptable	Tank		Junction	
2.000	North	450	Manhole	Adoptable	Tank		Junction	
1.001	Tank		Junction		Outfall - MH4153	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
North	70.755	76.426	6.700	0.500	450				
						0	2.000	6.200	225
South	7.730	75.246	6.700	0.500	450				
						0	1.000	6.200	225
Tank	37.556	48.573	6.700	1.500					
						1	2.000	5.200	225
						2	1.000	5.200	225
Outfall - MH4153	28.074	17.862	6.700	1.700	450				
						0	1.001	5.200	150
						1	1.001	5.000	150

Node Tank Online Orifice Control

Flap Valve	x	Design Depth (m)	1.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	2.4		
Invert Level (m)	5.200	Diameter (m)	0.030		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	136

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	24.5	0.0	0.400	24.5	0.0	0.800	24.5	0.0	0.801	0.0	0.0

Approval Settings

Node Size	x	Coordinates	x	Full Bore Velocity	x	Time to Half Empty	✓
Node Losses	x	Crossings	x	Proportional Velocity	x	Return Period (years)	10
Link Size	x	Cover Depth	x	Surcharged Depth	x	Discharge Rates	x
Link Length	x	Backdrops	x	Flooding	x	Discharge Volume	x

**Rainfall**

<b>Event</b>	<b>Peak Intensity (mm/hr)</b>	<b>Average Intensity (mm/hr)</b>	<b>Event</b>	<b>Peak Intensity (mm/hr)</b>	<b>Average Intensity (mm/hr)</b>
2 year 15 minute summer	115.915	32.800	30 year +45% CC 60 minute summer	186.085	49.177
2 year 15 minute winter	81.344	32.800	30 year +45% CC 60 minute winter	123.631	49.177
2 year 30 minute summer	75.628	21.400	30 year +45% CC 120 minute summer	113.391	29.966
2 year 30 minute winter	53.072	21.400	30 year +45% CC 120 minute winter	75.335	29.966
2 year 60 minute summer	50.459	13.335	30 year +45% CC 180 minute summer	86.124	22.163
2 year 60 minute winter	33.524	13.335	30 year +45% CC 180 minute winter	55.983	22.163
2 year 120 minute summer	34.689	9.167	30 year +45% CC 240 minute summer	67.284	17.781
2 year 120 minute winter	23.047	9.167	30 year +45% CC 240 minute winter	44.702	17.781
2 year 180 minute summer	27.696	7.127	30 year +45% CC 360 minute summer	50.140	12.903
2 year 180 minute winter	18.003	7.127	30 year +45% CC 360 minute winter	32.593	12.903
2 year 240 minute summer	22.264	5.884	30 year +45% CC 480 minute summer	38.675	10.221
2 year 240 minute winter	14.792	5.884	30 year +45% CC 480 minute winter	25.695	10.221
2 year 360 minute summer	17.132	4.409	30 year +45% CC 600 minute summer	31.118	8.511
2 year 360 minute winter	11.136	4.409	30 year +45% CC 600 minute winter	21.261	8.511
2 year 480 minute summer	13.434	3.550	30 year +45% CC 720 minute summer	27.314	7.320
2 year 480 minute winter	8.925	3.550	30 year +45% CC 720 minute winter	18.357	7.320
2 year 600 minute summer	10.937	2.992	30 year +45% CC 960 minute summer	21.878	5.761
2 year 600 minute winter	7.473	2.992	30 year +45% CC 960 minute winter	14.493	5.761
2 year 720 minute summer	9.692	2.597	30 year +45% CC 1440 minute summer	15.339	4.111
2 year 720 minute winter	6.513	2.597	30 year +45% CC 1440 minute winter	10.309	4.111
2 year 960 minute summer	7.898	2.080	100 year 15 minute summer	361.326	102.243
2 year 960 minute winter	5.232	2.080	100 year 15 minute winter	253.562	102.243
2 year 1440 minute summer	5.670	1.520	100 year 30 minute summer	240.858	68.155
2 year 1440 minute winter	3.810	1.520	100 year 30 minute winter	169.023	68.155
30 year 15 minute summer	288.456	81.623	100 year 60 minute summer	164.008	43.343
30 year 15 minute winter	202.425	81.623	100 year 60 minute winter	108.963	43.343
30 year 30 minute summer	189.899	53.735	100 year 120 minute summer	98.086	25.921
30 year 30 minute winter	133.263	53.735	100 year 120 minute winter	65.166	25.921
30 year 60 minute summer	128.335	33.915	100 year 180 minute summer	74.092	19.066
30 year 60 minute winter	85.263	33.915	100 year 180 minute winter	48.162	19.066
30 year 120 minute summer	78.201	20.666	100 year 240 minute summer	57.805	15.276
30 year 120 minute winter	51.955	20.666	100 year 240 minute winter	38.404	15.276
30 year 180 minute summer	59.396	15.285	100 year 360 minute summer	43.150	11.104
30 year 180 minute winter	38.609	15.285	100 year 360 minute winter	28.048	11.104
30 year 240 minute summer	46.403	12.263	100 year 480 minute summer	33.349	8.813
30 year 240 minute winter	30.829	12.263	100 year 480 minute winter	22.156	8.813
30 year 360 minute summer	34.580	8.898	100 year 600 minute summer	26.874	7.351
30 year 360 minute winter	22.478	8.898	100 year 600 minute winter	18.362	7.351
30 year 480 minute summer	26.672	7.049	100 year 720 minute summer	23.618	6.330
30 year 480 minute winter	17.721	7.049	100 year 720 minute winter	15.873	6.330
30 year 600 minute summer	21.460	5.870	100 year 960 minute summer	18.949	4.990
30 year 600 minute winter	14.663	5.870	100 year 960 minute winter	12.552	4.990
30 year 720 minute summer	18.837	5.049	100 year 1440 minute summer	13.255	3.552
30 year 720 minute winter	12.660	5.049	100 year 1440 minute winter	8.908	3.552
30 year 960 minute summer	15.088	3.973	100 year +45% CC 15 minute summer	523.923	148.252
30 year 960 minute winter	9.995	3.973	100 year +45% CC 15 minute winter	367.665	148.252
30 year 1440 minute summer	10.579	2.835	100 year +45% CC 30 minute summer	349.245	98.824
30 year 1440 minute winter	7.109	2.835	100 year +45% CC 30 minute winter	245.084	98.824
30 year +45% CC 15 minute summer	418.261	118.353	100 year +45% CC 60 minute summer	237.812	62.847
30 year +45% CC 15 minute winter	293.516	118.353	100 year +45% CC 60 minute winter	157.997	62.847
30 year +45% CC 30 minute summer	275.354	77.916	100 year +45% CC 120 minute summer	142.225	37.586
30 year +45% CC 30 minute winter	193.231	77.916	100 year +45% CC 120 minute winter	94.491	37.586

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +45% CC 180 minute summer	107.433	27.646	100 year +45% CC 600 minute summer	38.968	10.659
100 year +45% CC 180 minute winter	69.834	27.646	100 year +45% CC 600 minute winter	26.625	10.659
100 year +45% CC 240 minute summer	83.818	22.151	100 year +45% CC 720 minute summer	34.246	9.178
100 year +45% CC 240 minute winter	55.686	22.151	100 year +45% CC 720 minute winter	23.015	9.178
100 year +45% CC 360 minute summer	62.567	16.101	100 year +45% CC 960 minute summer	27.476	7.235
100 year +45% CC 360 minute winter	40.670	16.101	100 year +45% CC 960 minute winter	18.201	7.235
100 year +45% CC 480 minute summer	48.356	12.779	100 year +45% CC 1440 minute summer	19.220	5.151
100 year +45% CC 480 minute winter	32.126	12.779	100 year +45% CC 1440 minute winter	12.917	5.151

**Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	North	11	6.232	0.032	3.7	0.0051	0.0000	OK
15 minute summer	South	11	6.232	0.032	3.7	0.0051	0.0000	OK
180 minute summer	Tank	124	5.380	0.180	3.2	4.1937	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	5.000	0.000	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	North	2.000	Tank	3.7	1.040	0.045	0.3961	
15 minute summer	South	1.000	Tank	3.7	1.040	0.045	0.3961	
180 minute summer	Tank	Orifice	Outfall - MH4153	0.8				9.3

**Results for 30 year Critical Storm Duration. Lowest mass balance: 99.64%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	North	11	6.251	0.051	9.2	0.0080	0.0000	OK
15 minute summer	South	11	6.251	0.051	9.2	0.0080	0.0000	OK
180 minute summer	Tank	132	5.646	0.446	6.8	10.3917	0.0000	<b>SURCHARGED</b>
15 minute summer	Outfall - MH4153	1	5.000	0.000	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	North	2.000	Tank	9.2	1.116	0.112	0.8896	
15 minute summer	South	1.000	Tank	9.2	1.116	0.112	0.8896	
180 minute summer	Tank	Orifice	Outfall - MH4153	1.2				18.9

**Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 99.28%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	North	11	6.261	0.061	13.3	0.0097	0.0000	OK
15 minute summer	South	11	6.261	0.061	13.3	0.0097	0.0000	OK
180 minute summer	Tank	136	5.889	0.689	9.8	16.0398	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	5.000	0.000	1.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	North	2.000	Tank	13.3	1.211	0.161	0.9630	
15 minute summer	South	1.000	Tank	13.3	1.211	0.161	0.9630	
180 minute summer	Tank	Orifice	Outfall - MH4153	1.5				25.5

**Results for 100 year Critical Storm Duration. Lowest mass balance: 99.39%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	North	11	6.257	0.057	11.5	0.0090	0.0000	OK
15 minute summer	South	11	6.257	0.057	11.5	0.0090	0.0000	OK
180 minute summer	Tank	132	5.780	0.580	8.4	13.4967	0.0000	SURCHARGED
15 minute summer	Outfall - MH4153	1	5.000	0.000	1.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	North	2.000	Tank	11.5	1.161	0.139	0.9457	
15 minute summer	South	1.000	Tank	11.5	1.161	0.139	0.9457	
180 minute summer	Tank	Orifice	Outfall - MH4153	1.4				22.7

**Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.02%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
180 minute summer	North	136	6.310	0.110	6.1	0.0176	0.0000	OK
180 minute summer	South	136	6.310	0.110	6.1	0.0176	0.0000	OK
180 minute winter	Tank	140	6.311	1.111	8.4	18.6316	0.0000	<b>SURCHARGED</b>
15 minute summer	Outfall - MH4153	1	5.000	0.000	1.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
180 minute summer	North	2.000	Tank	6.1	0.843	0.074	1.1827	
180 minute summer	South	1.000	Tank	6.1	0.843	0.074	1.1827	
180 minute winter	Tank	Orifice	Outfall - MH4153	2.0				30.6

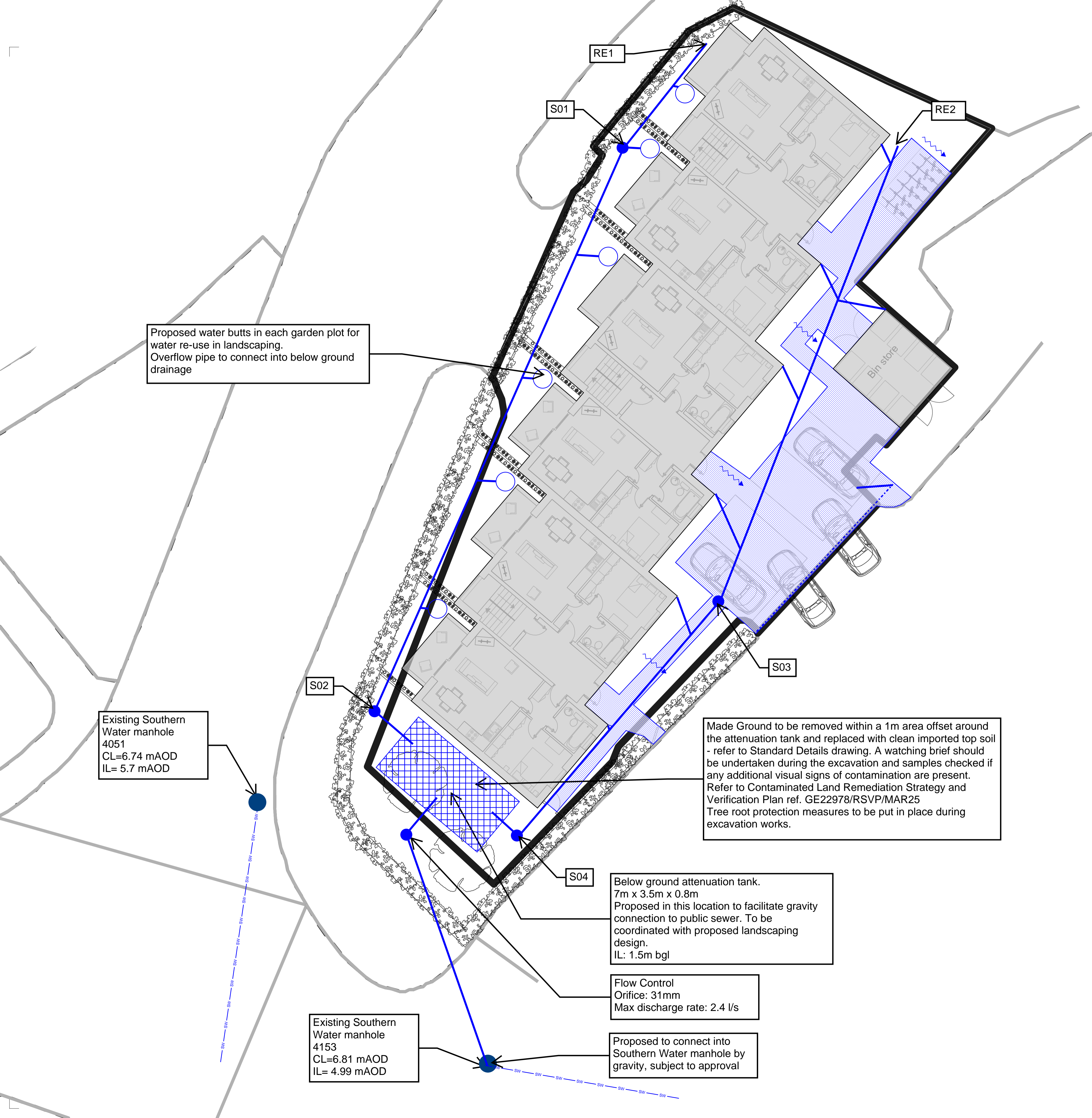
# Appendix D

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**

- All dimensions are in millimetres and levels in m AOD unless stated otherwise.
- Do not scale. If in any doubt, consult Engineer.
- Read in conjunction with the architects and engineers schedule drawings.
- Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.
- 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.
- All existing below ground drainage within the site boundary is to be surveyed, abandoned and removed prior to construction of the building.



Proposed water butts in each garden plot for water re-use in landscaping. Overflow pipe to connect into below ground drainage

Existing Southern Water manhole 4051  
CL=6.74 mAOD  
IL= 5.7 mAOD

Made Ground to be removed within a 1m area offset around the attenuation tank and replaced with clean imported top soil - refer to Standard Details drawing. A watching brief should be undertaken during the excavation and samples checked if any additional visual signs of contamination are present. Refer to Contaminated Land Remediation Strategy and Verification Plan ref. GE22978/RSVP/MAR25  
Tree root protection measures to be put in place during excavation works.

Below ground attenuation tank.  
7m x 3.5m x 0.8m  
Proposed in this location to facilitate gravity connection to public sewer. To be coordinated with proposed landscaping design.  
IL: 1.5m bgl

Flow Control  
Orifice: 31mm  
Max discharge rate: 2.4 l/s

Proposed to connect into Southern Water manhole by gravity, subject to approval

Existing Southern Water manhole 4153  
CL=6.81 mAOD  
IL= 4.99 mAOD

**KEY**

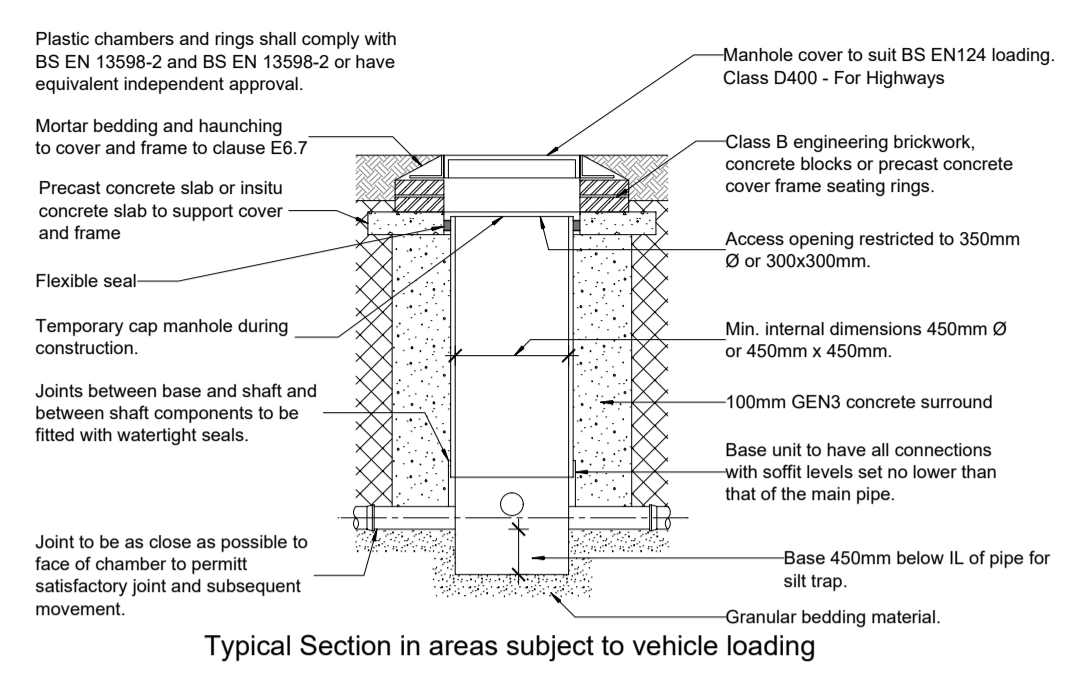
- Proposed Surface Water Sewer Pipe
- Exceedance Flows
- Permeable Surface
- Silt Trap
- Rainwater butt / harvester
- Existing Surface Water Sewer Pipe

Rev	Details	Date	By	Chd

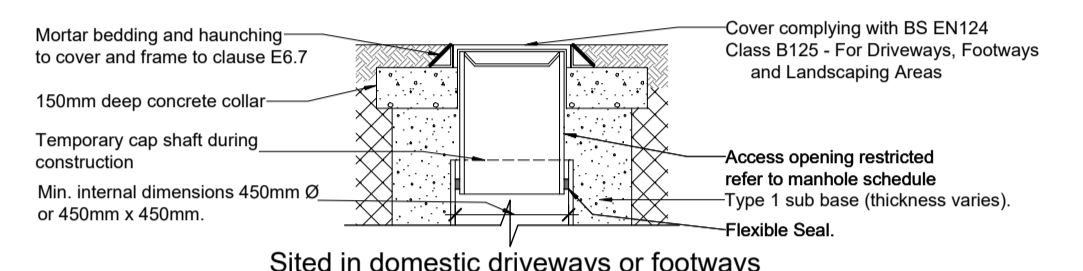
Drawing Status: **PRELIMINARY**



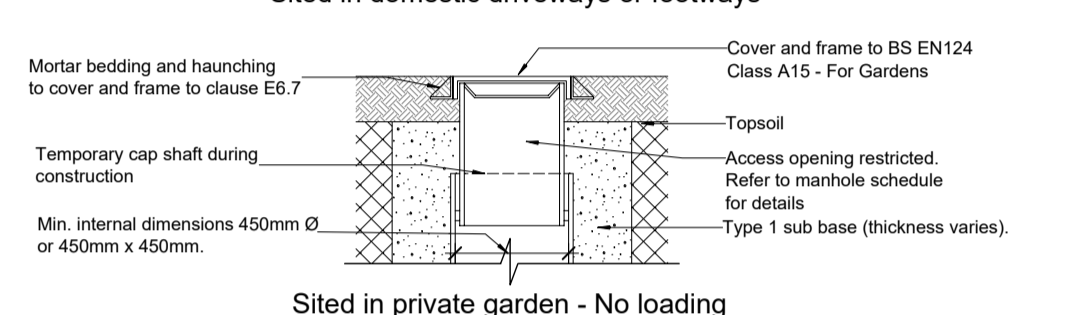
Client:  
Project:  
57 Queensway, Bognor Regis, PO21 1QW  
Drawing:  
Proposed Drainage Strategy



Typical Section in areas subject to vehicle loading



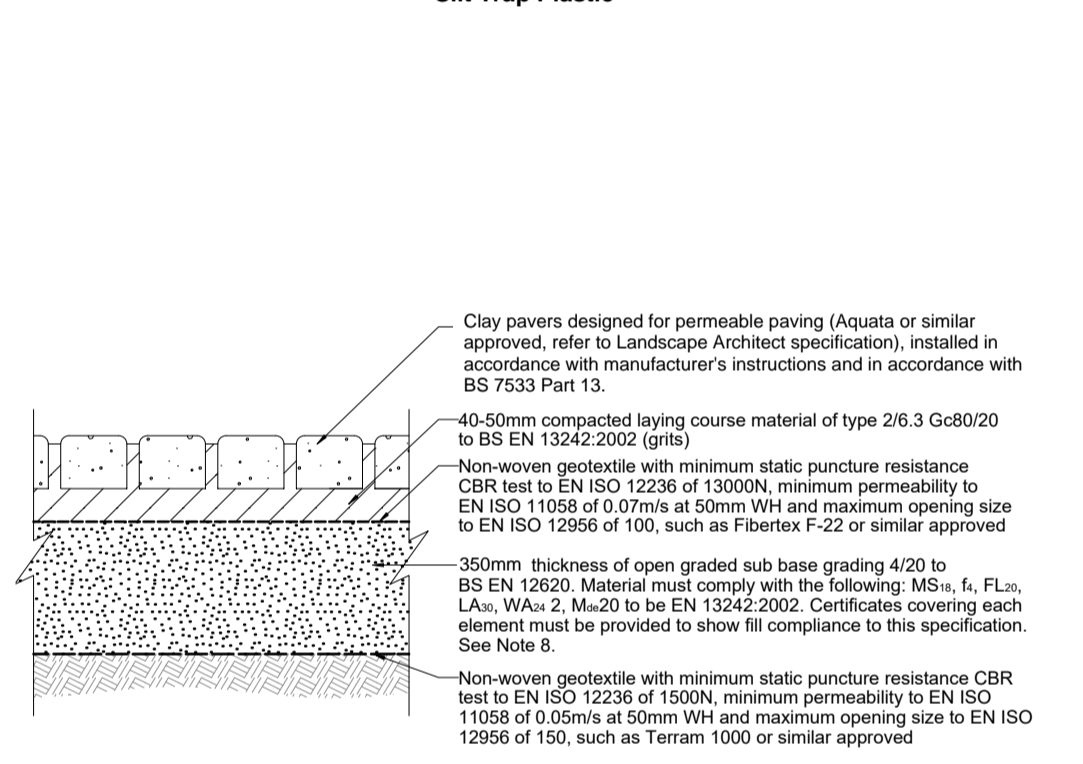
Sited in domestic driveways or footways



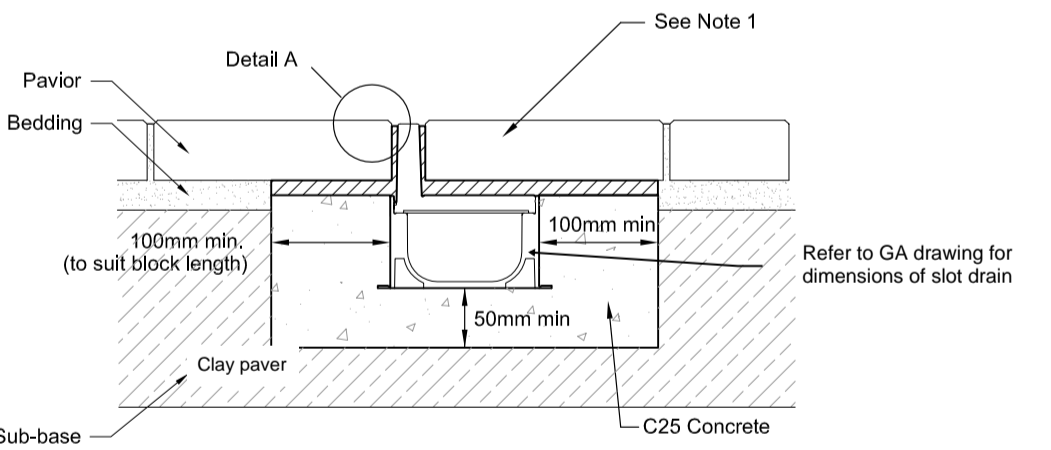
Sited in private garden - No loading

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

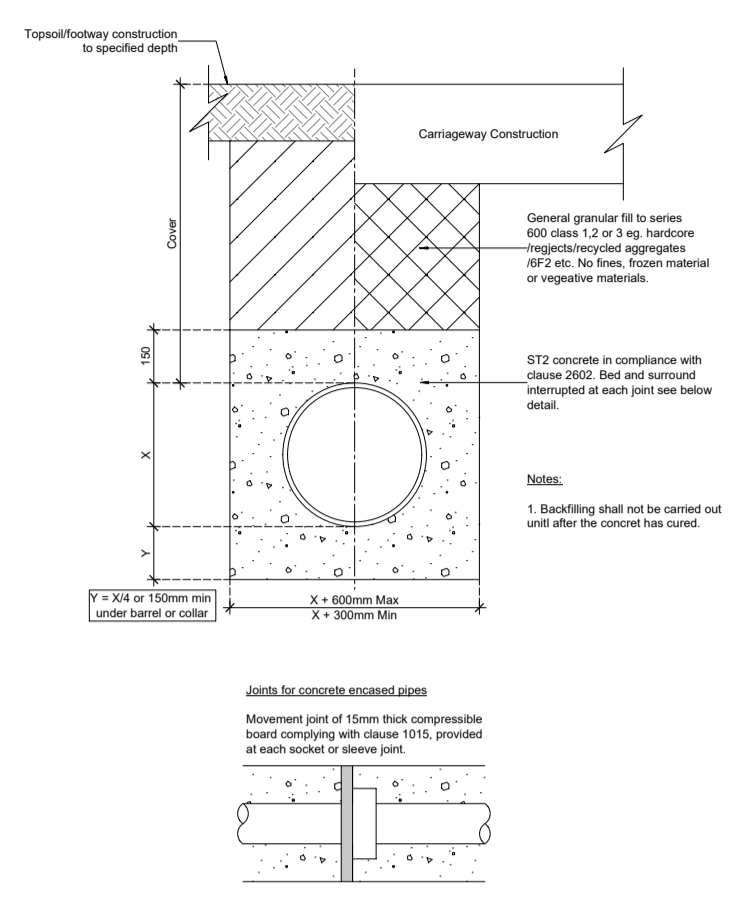
**Silt Trap Plastic**



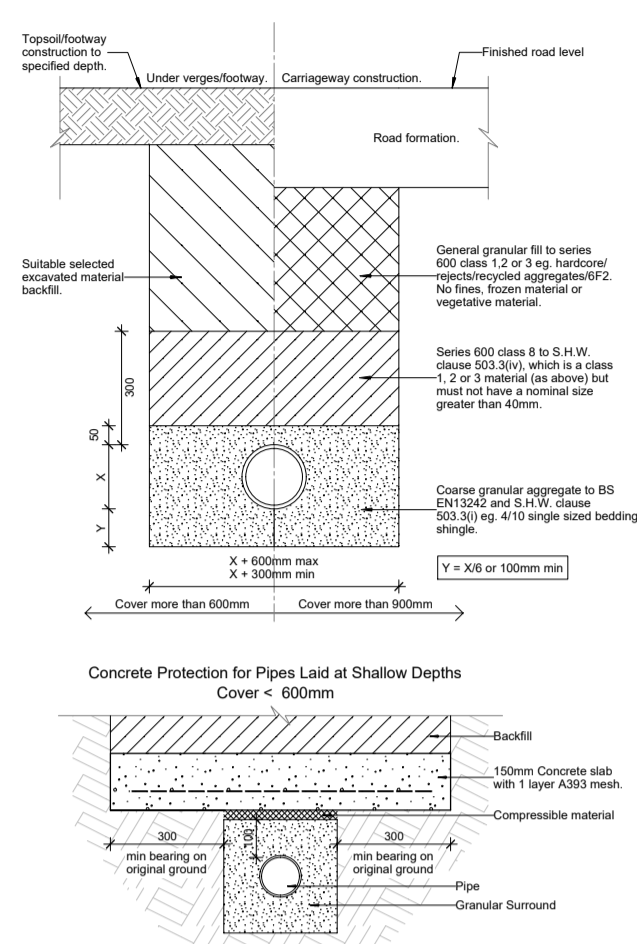
**Permeable Paving - Infiltration**



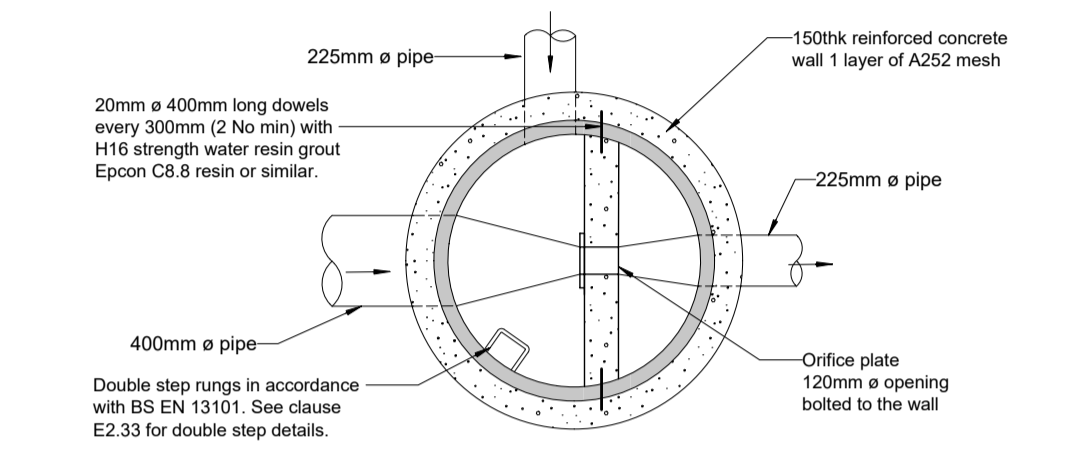
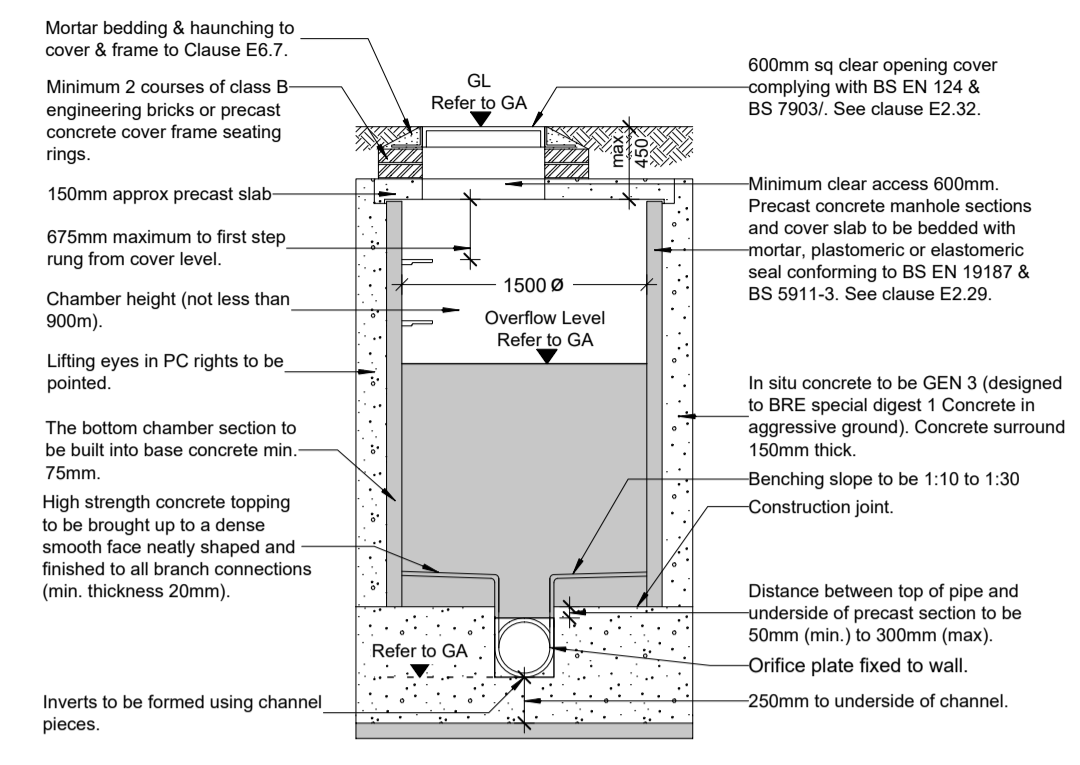
**Slot Drainage Channel**



**Pipe Bedding Detail Type Z**

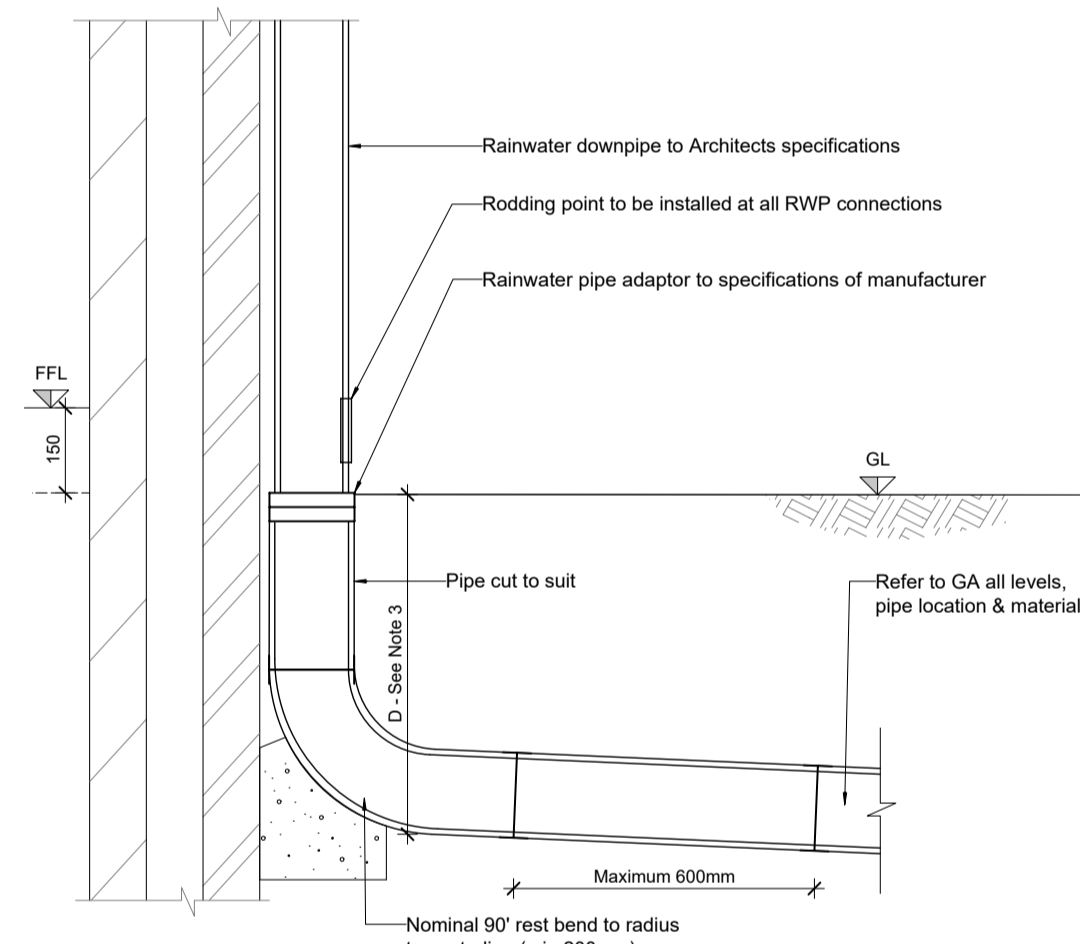


**Pipe Bedding Detail Type S**

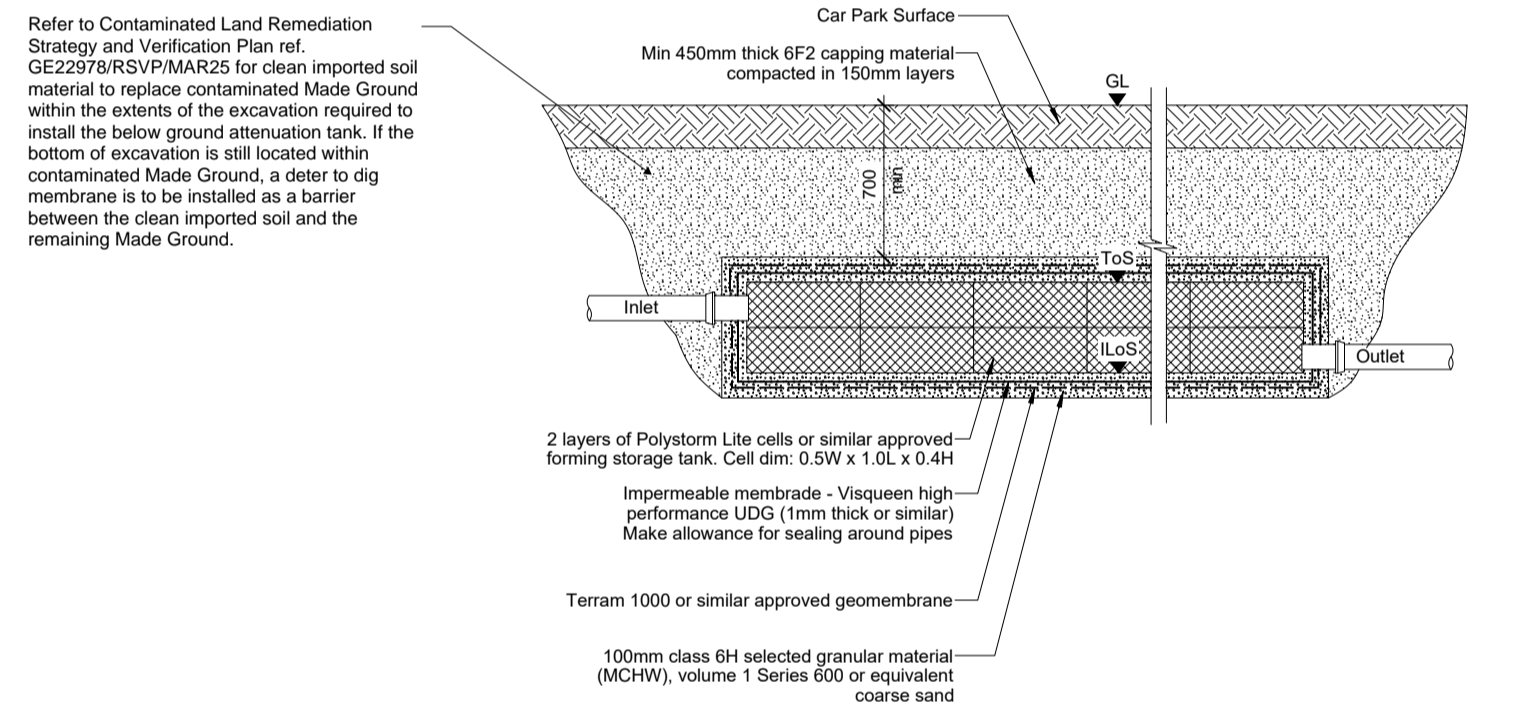


**Notes**  
1. Refer to 8187 Rocker Pipe details.  
2. The precast concrete rings and weir could be replaced for HDPE chambers such as SEL-1.5m diameter chamber. See www.sel.co.uk or e-mail sales@selenvironmental.com for further details.

**Flow Control - Orifice Plate**

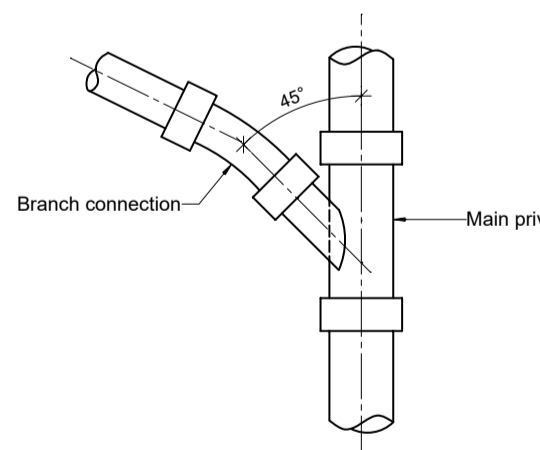


**8251 - External Rainwater Pipe Connection Detail**

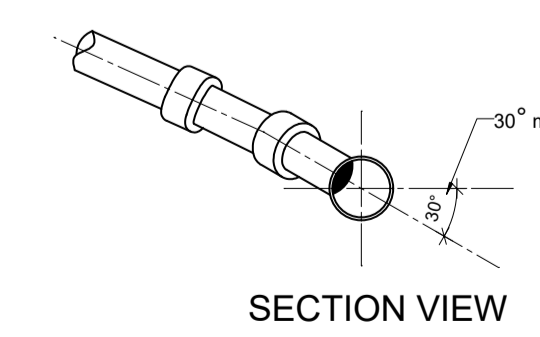


**NOTES:**  
1. Permeable modular storage cell with 95% minimum void ratio. Ultimate compressive strength of 400kN/m<sup>2</sup> minimum. Resistant to chemicals likely to be found in rain water and durability of a minimum of 40 years.  
2. Dimensions as applicable to the manufacturers recommendations for given storage requirement UNO.  
3. Air Vents should be provided as per suppliers recommendations  
4. See GA digs for pipe sizes and layout and IL, I.L.S, T.O.S, GL levels.

**Cellular Attenuation System - Landscape Area**

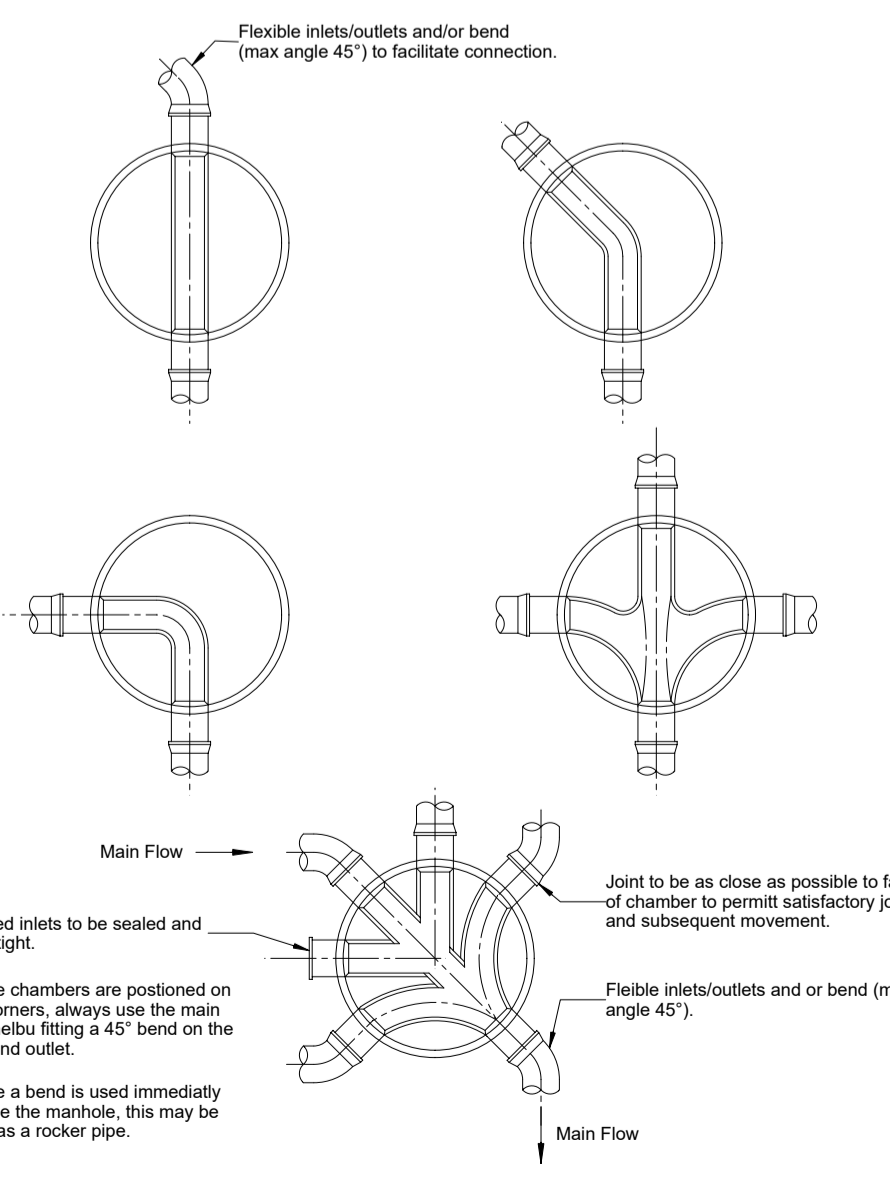


**Lateral Connection to private sewer**

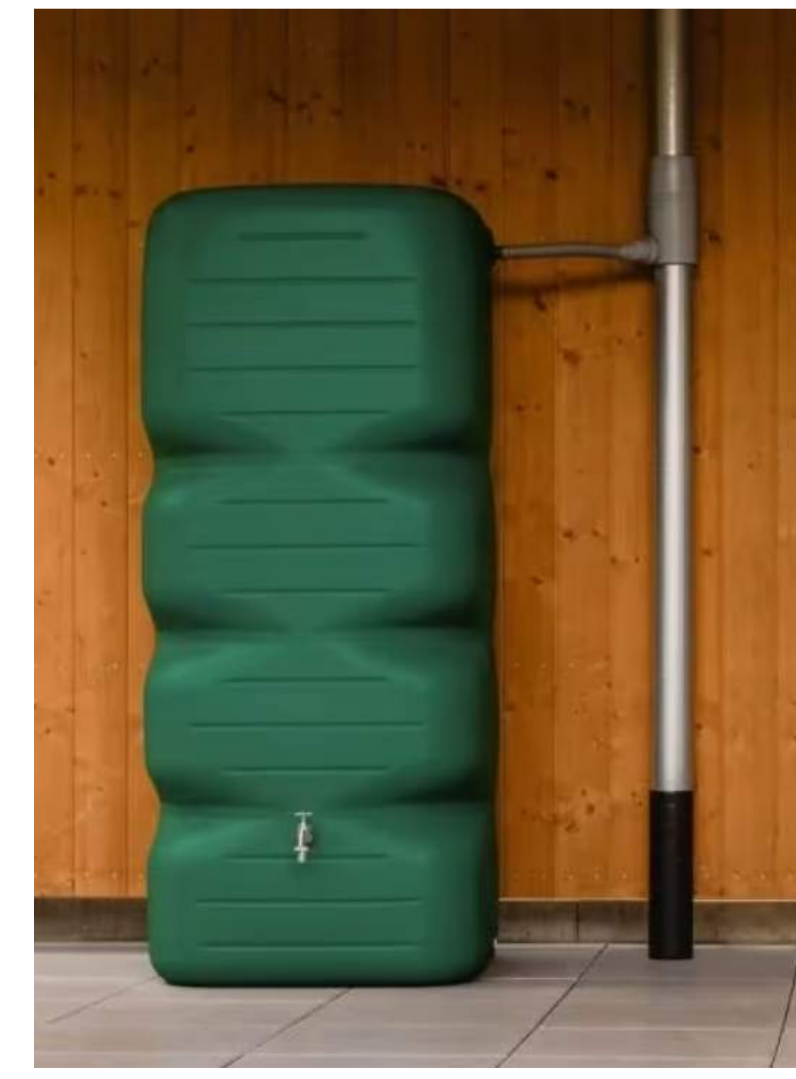


**Chamber Type 3 Base Layouts**

**NOTES:**  
1. The vertical angle between the connecting pipe and the horizontal should be greater than 0° and not more than 60°.  
2. Where the connection is being made to a sewer with a nominal internal diameter of 300 mm or less, connections should be made using 45° angle, or 90° angle, curved square junctions.  
3. Connections made with junction fittings should be made by cutting the existing pipe, inserting the junction fitting and joining with flexible repair couplings or slip couplings.



**Chamber Type 3 Base Layouts**



**Rainwater Butt**

**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	Chd

Drawing Status: **PRELIMINARY**



Client: \_\_\_\_\_

Project: \_\_\_\_\_

[U0560] 57 Queensway, Bognor Regis, PO21 1QW

Drawing: **Standard Details**