

6 Earl Walk , Manchester, M12 4PX

Reference: 453 -Rev - V1

Dec-22

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Detailed Drainage Design

Rev 1	Produced by: ARD	079 721 44579	arge@rida-reports.co.uk
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Purpose of this report

- 1.1 The purpose of this statement is to accompany the detailed technical drawings and details showing the proposed Surface Water drainage system.

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	No
Space constraints	Space for SuDS components?	No
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	0.023	0.006
Permeable Areas		
Connected to Drainage	0.000	0.010
Self Draining Areas	0.000	0.000
Areas Draining Away from drainage System	0.000	0.007
Total Development Area	0.023	0.023

- 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 Till, Devensian - Diamicton.
Bedrock geology classification	The British Geological Society records of the site show that it is located within the Chester Formation - Sandstone.
Landis Top Soil Infiltration	The SOILSCAPE's records of the site show that it is located within an area of impeded drainage 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?	Infiltration is not possible on this site due to the findings on groundwater and soils within the site.
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. It is possible to connect to the surface water sewer.
Is a discharge to a combined sewer possible?	There is a combined water sewer in the proximity to the site. It is not possible to connect to the surface 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
✗	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
✗	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 40%. As per tables above, it is proposed to discharge at a rate of 1.36 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	0.10	N/A	N/A	0.0000
1 in 1	0.10	2.70	0.5	0.0000
1 in 2	0.10	3.40	0.5	0.0000
1 in 30	0.20	6.30	0.8	0.0000
1 in 30 + CC	N/A	N/A	0.8	0.0000
1 in 100	0.30	8.00	0.8	0.0000
1 in 100 + CC	N/A	N/A	1.36	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: 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	No	No
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	Yes	Yes
Discharge Point Proposed		
Discharge rainwater direct to a watercourse	No	No
Discharge rainwater to a surface water sewer/drain	Unknown	Yes
Discharge rainwater to the combined sewer	Yes	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 + 40% climate change event can be safely contained on site
- 5.4 The proposed drainage design demonstrates that the development can be sustainably drained to comply with the requirements of the NPPF.

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
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day	Low	0.5	0.4	0.4
TOTAL		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
TOTAL	0.7	0.6	0.7

- 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:

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

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. Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly 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

Appendix A

Drawing Scale Bar		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

- KEY
- PERMEABLE AREAS
 - IMPERMEABLE AREAS
 - STUDY AREA

Rev	Details	Date	By	Chd
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Drawing Status:
PRELIMINARY



RIDA
FLOOD RISK ASSESSMENT & DRAINAGE STRATEGIES

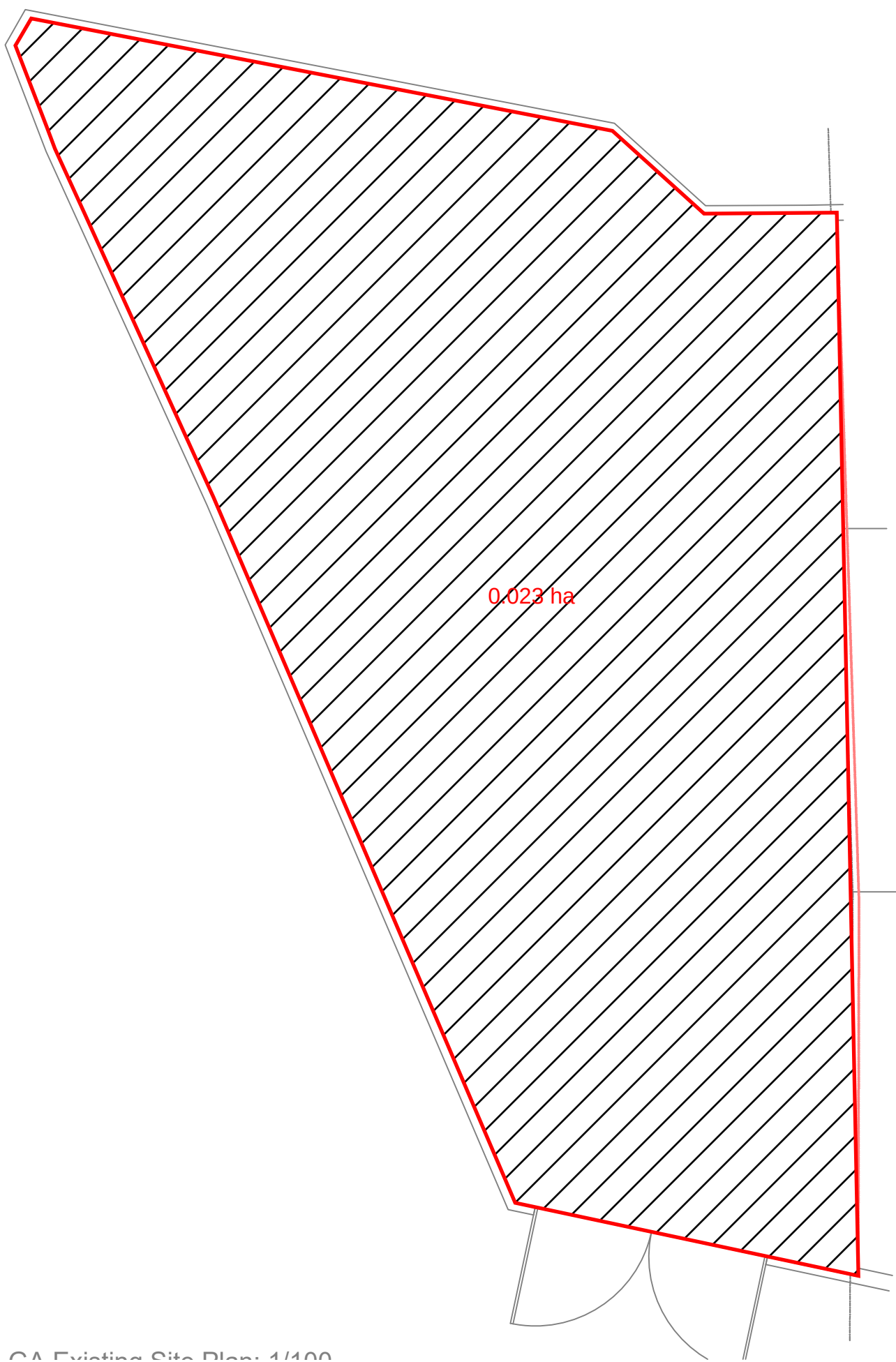
4 Bean Acre Road, Hook Norton, Banbury, Oxfordshire
e: info@rida-reports.co.uk
t: 01608 510 121
www.rida-reports.co.uk

Client:

Project:
6 Earl Walk , Manchester, M12 4PX

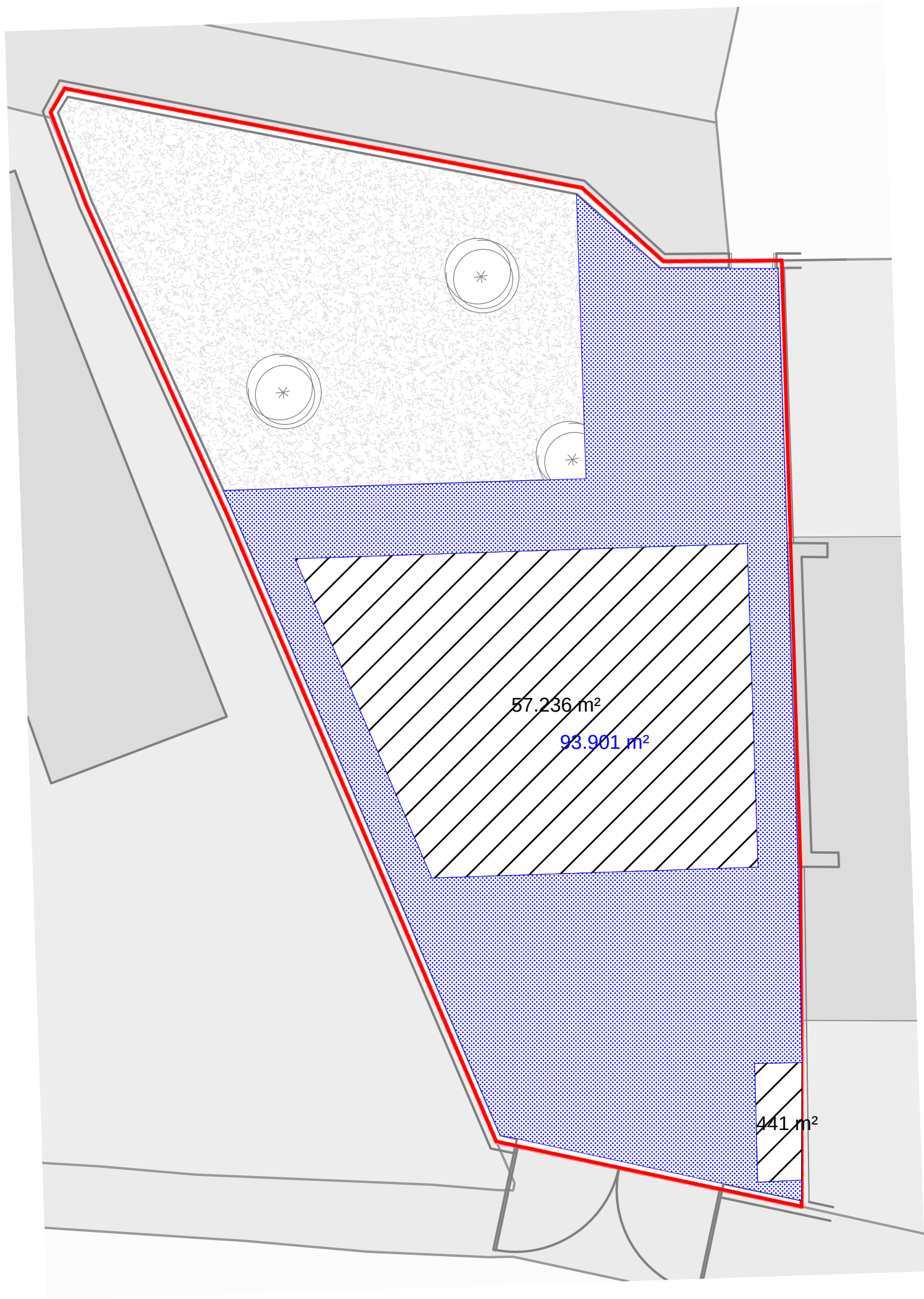
Drawing:
**Existing and Proposed Areas
Permeable and Impermeable**

Print Size	Project No	Drawing No	Revision
A1	0453	002	P1



04 Existing Site Plan 1/100

EXISTING SITE 1:100

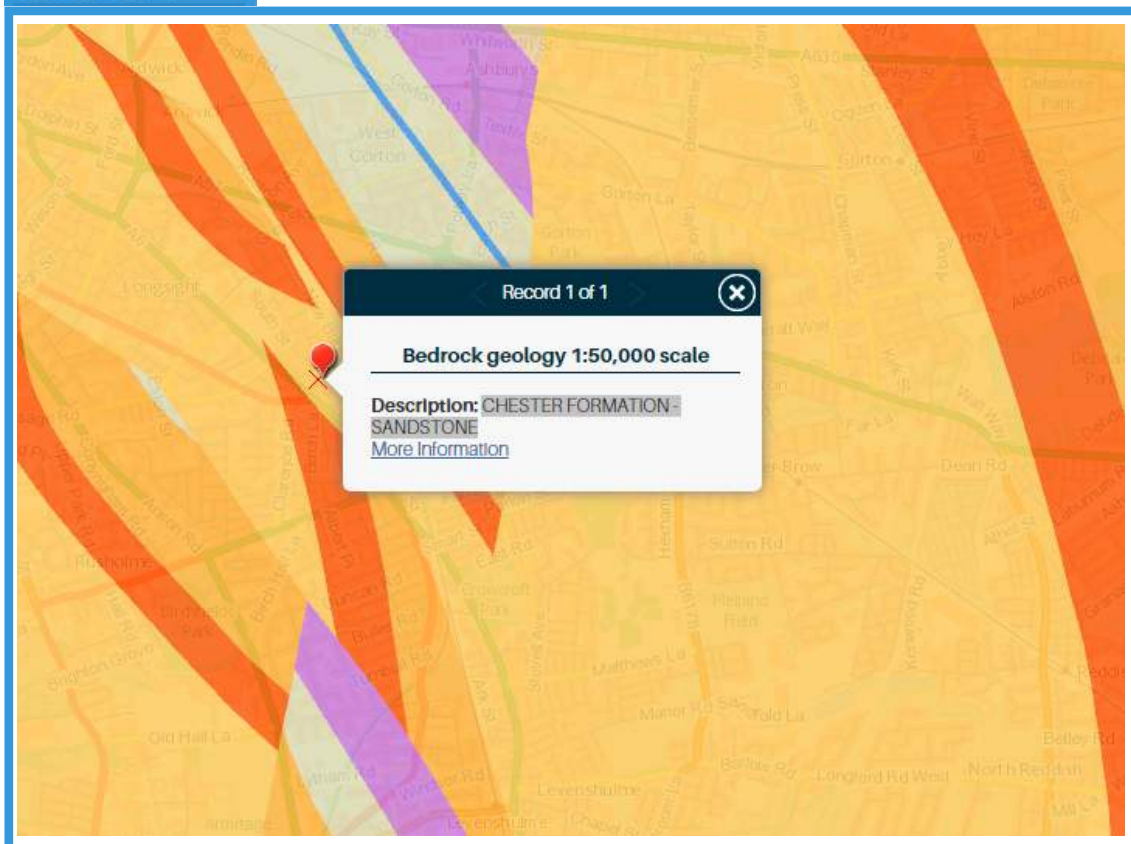


PROPOSED SITE 1:100

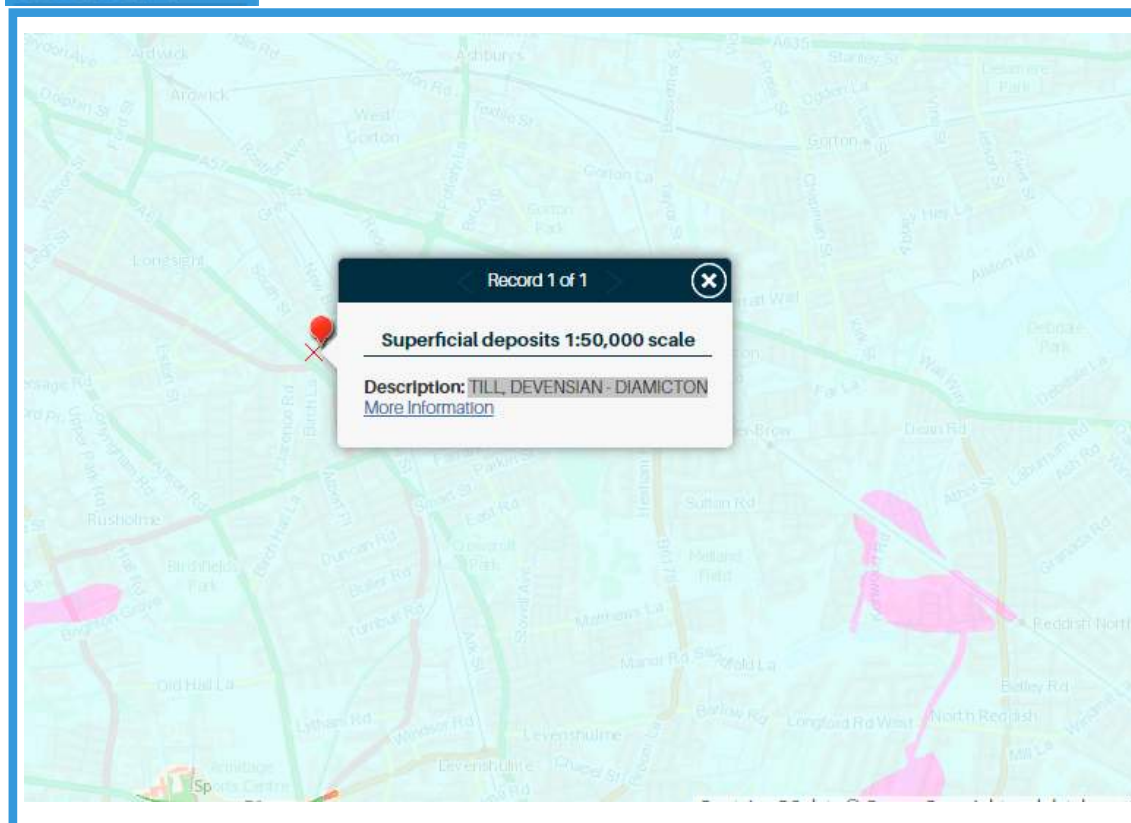
Appendix B



GEOLOGY - BEDROCK - CHESTER FORMATION - SANDSTONE

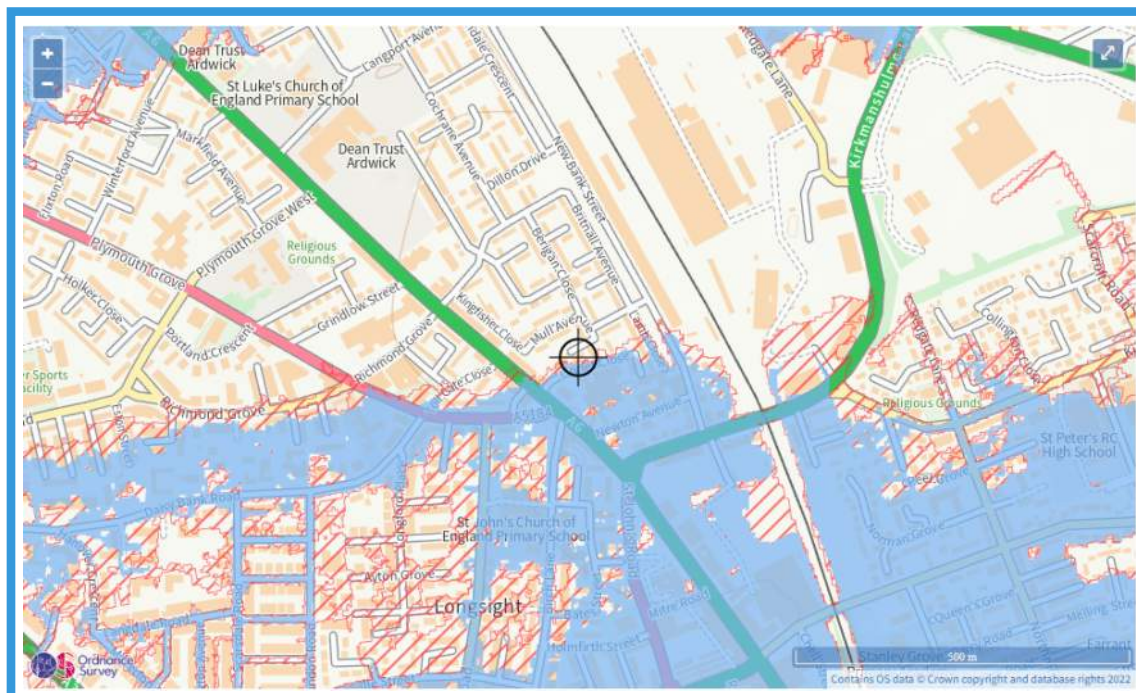
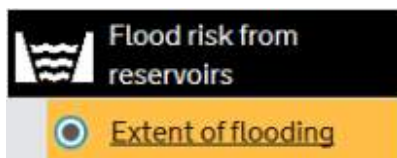
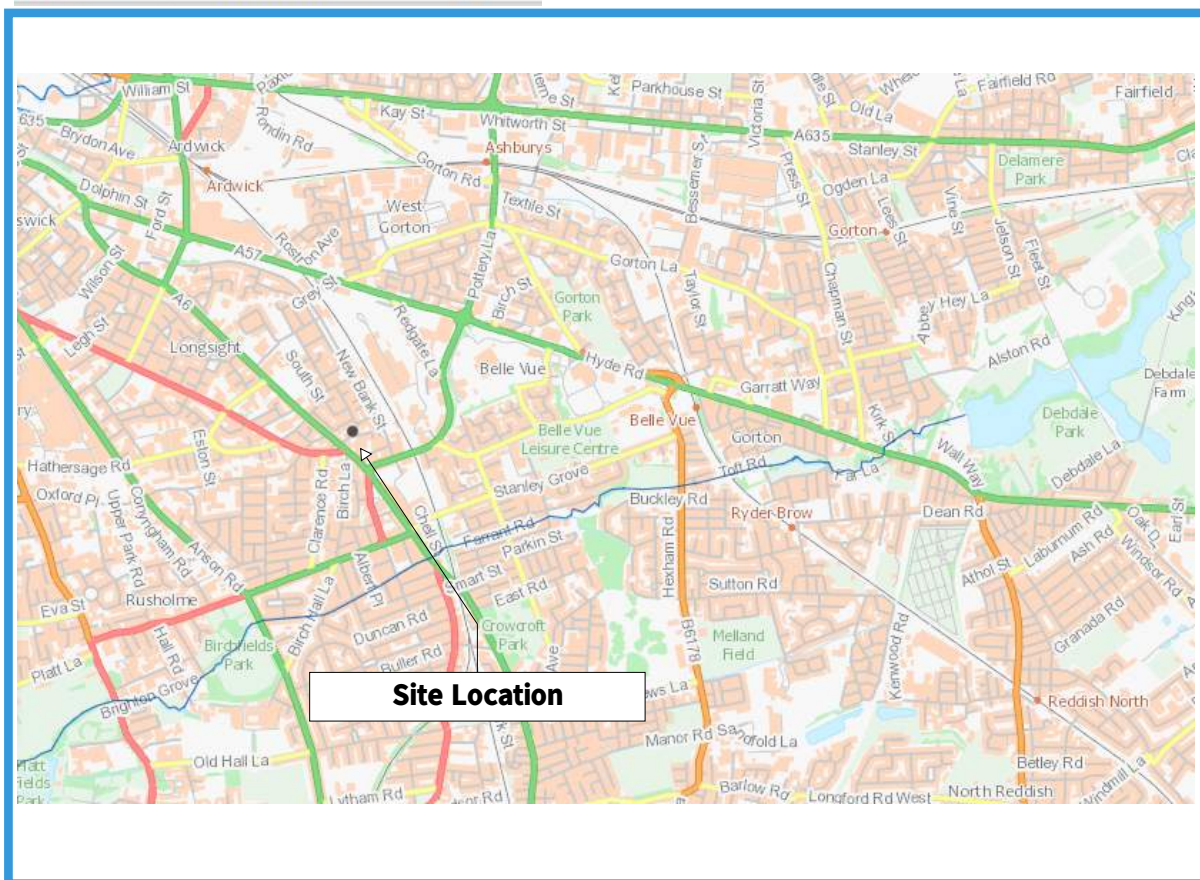


GEOLOGY - SUPERFICIAL DEPOSITS - TILL, DEVENSIAN - DIAMICTON





Main River Map

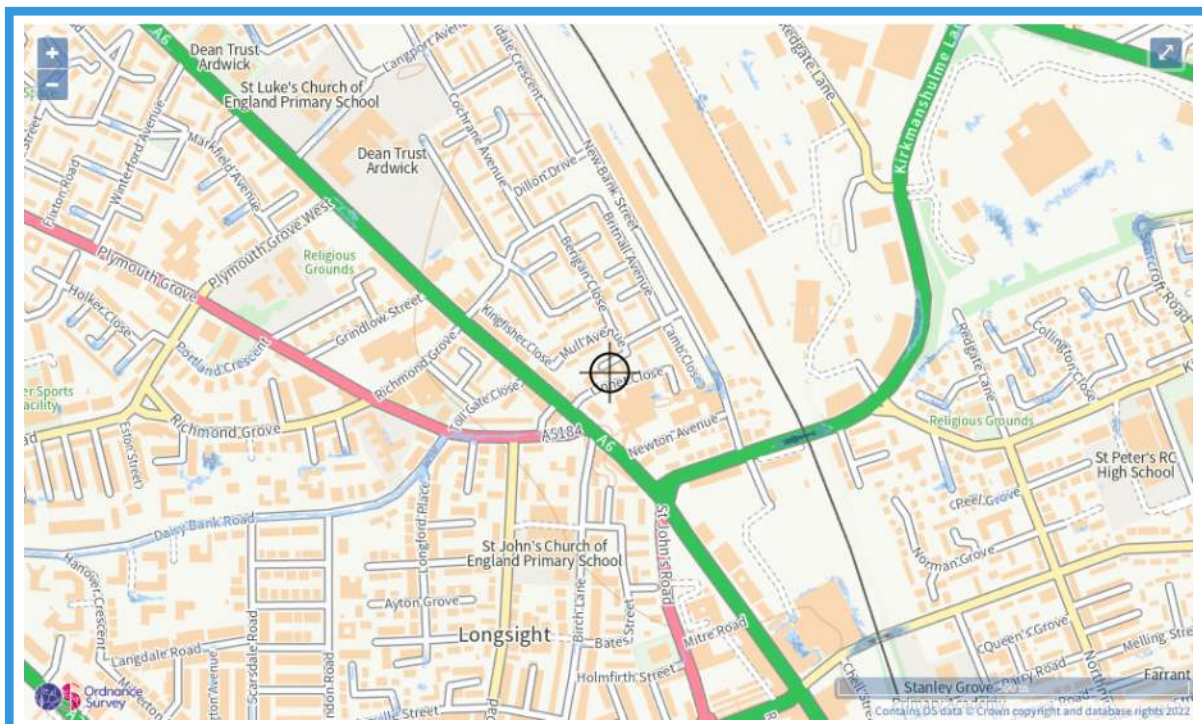
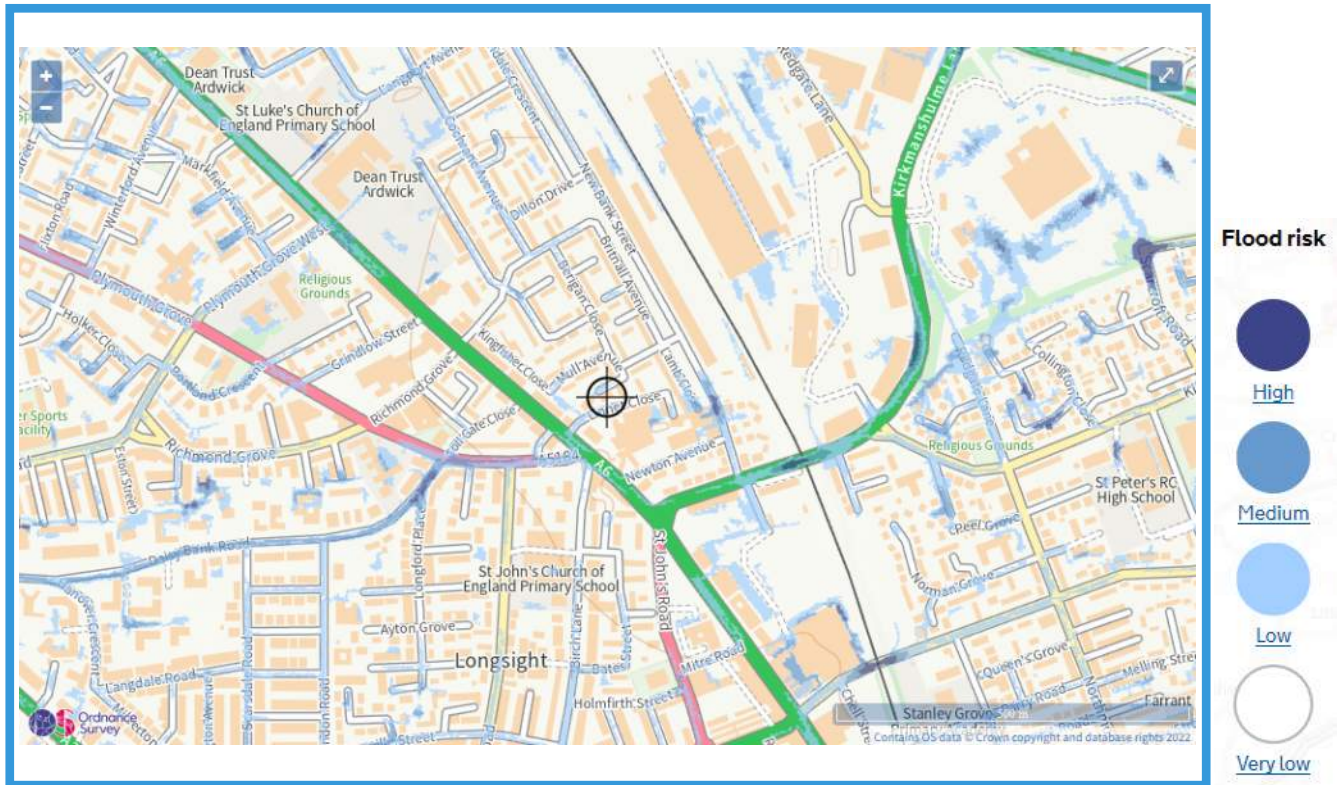


SITE FLOOD RISK

 **Flood risk from surface water**

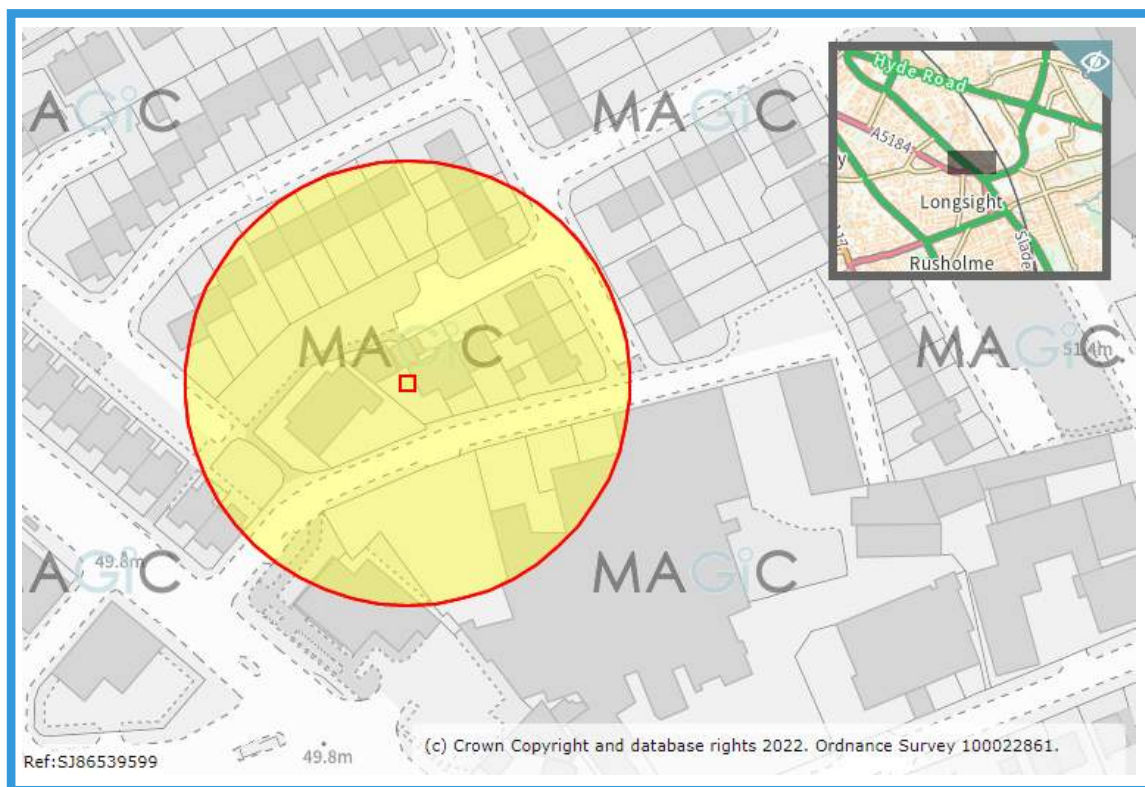
 **Extent of flooding**

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



Over 900mm 300 to 900mm Below 300mm

MAGIC RESULTS



Site Check Results

Site Check Report Report generated on Mon Nov 21 2022

You selected the location: Centroid Grid Ref: SJ86539599

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 (undifferentiated)

Source Protection Zones merged (England)

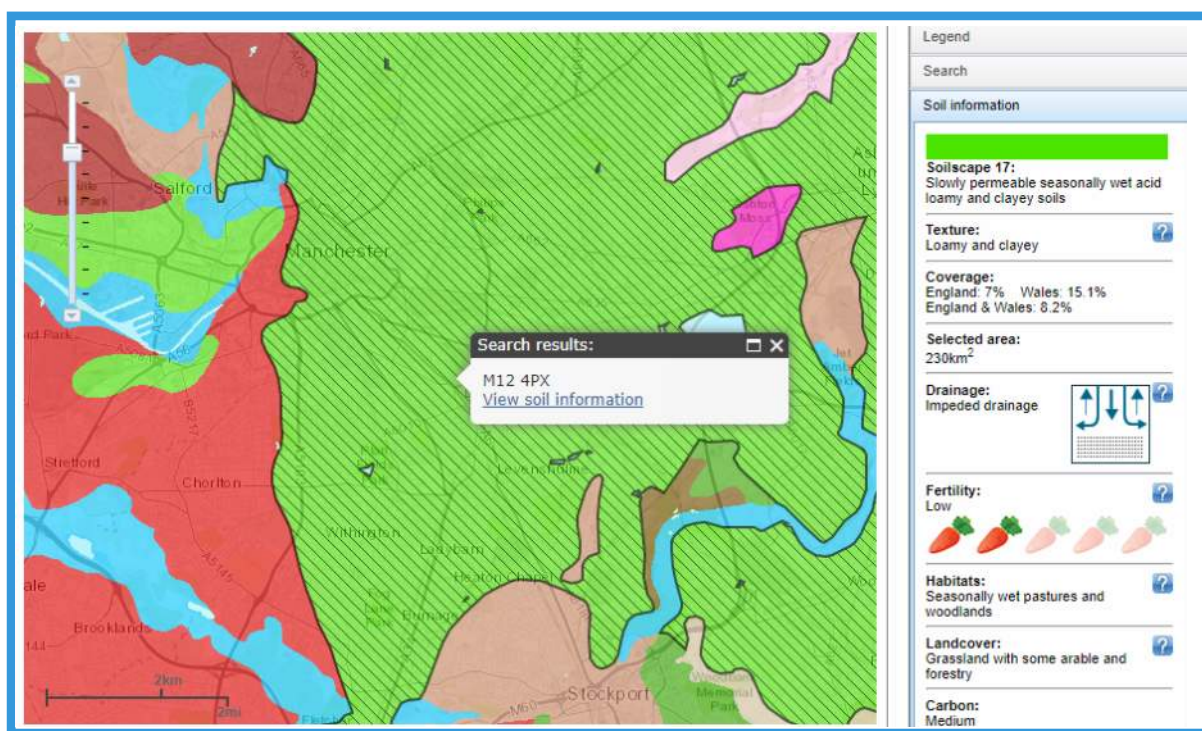
No Features found

OK

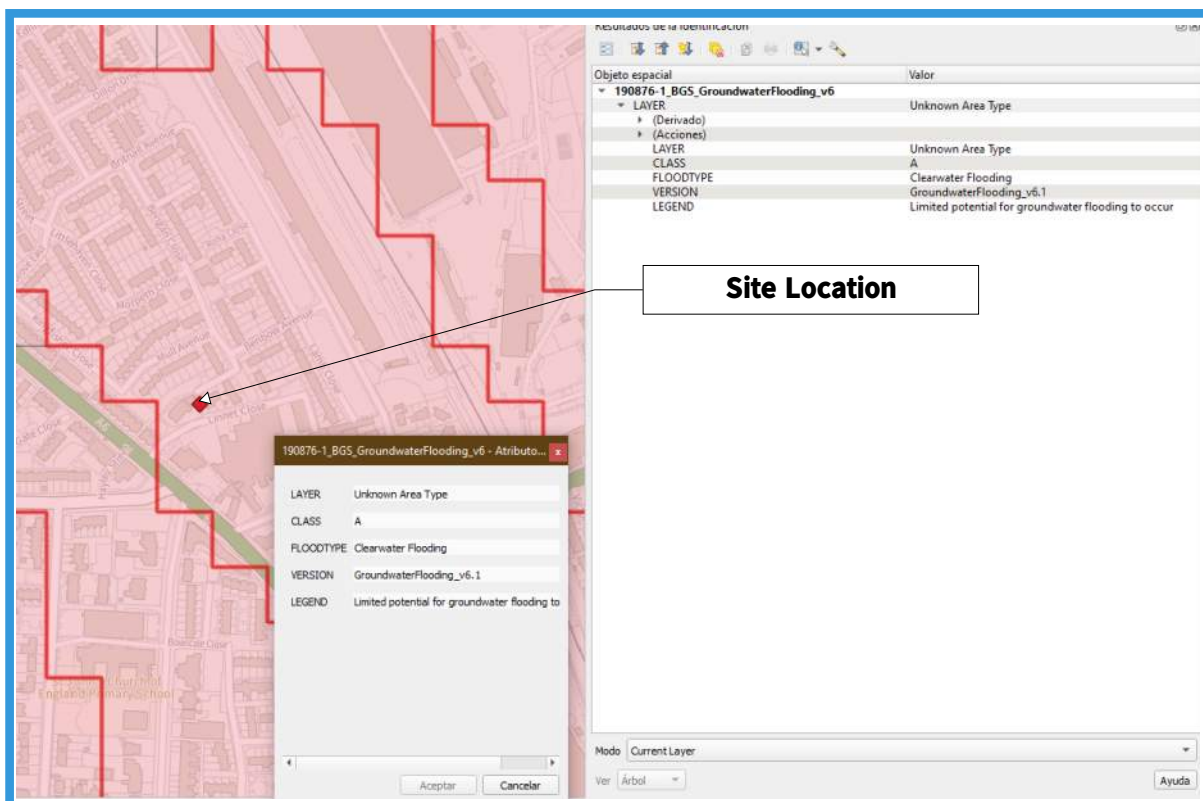
Cancel

Export to CSV

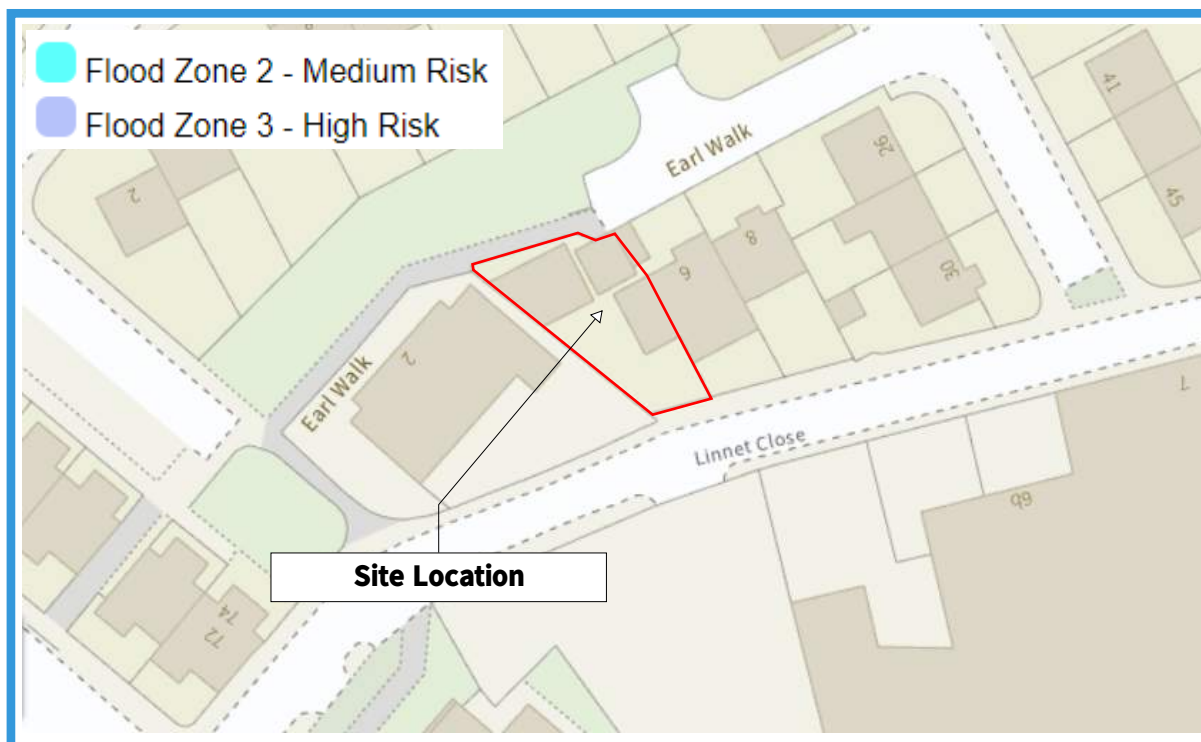
Print



GROUND WATER FLOOD RISK



Flood Risk Rivers and Sea



SSSI Impact Risk Zones - to assess planning applications for likely impacts on SSSIs/SACs/SPAs & Ramsar sites (England)

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF THE CATEGORIES BELOW?
2. IF YES, CHECK THE CORRESPONDING DESCRIPTION(S) BELOW. LPA SHOULD CONSULT NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:

All Planning Applications

Infrastructure

Wind & Solar Energy

Minerals, Oil & Gas

Rural Non Residential

Residential

Rural Residential

Air Pollution

Combustion

Livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 4000m².
General combustion processes >50MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.

Waste

Composting

Discharges

Water Supply

Notes 1

Notes 2

GUIDANCE - How to use the Impact Risk Zones

[/Metadata_for_magic/SSSI IRZ User Guidance MAGIC.pdf](#)

Aquifer Designation Map (Bedrock) (England)

Typology

Principal

Aquifer Designation Map (Superficial Drift) (England)

Typology

Secondary (undifferentiated)

Soilscape (England)

Reference

17

Name

SLOWLY PERMEABLE SEASONALLY WET ACID LOAMY AND CLAYEY SOILS

Main Surface Texture Class

LOAMY

Natural Drainage Type

IMPEDED DRAINAGE

Natural Fertility

LOW

Characteristic Semi-natural Habitats

SEASONALLY WET PASTURES AND WOODLANDS MAINLY, BUT NOT EXCLUSIVELY, ON THE UPLAND FRINGE

Main Land Cover

GRASSLAND WITH SOME ARABLE AND FORESTRY

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

Rida Reports

4
Beanacre Road,
Hook Norton,
OX15 5UA

FAO:

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Your Ref: [0453] 6 Earl Walk , Manchester, M12 4PX
Our Ref: UUPS-ORD-449205
Date: 24/11/2022

Dear Sirs

Location: 6 EARL WALK, MANCHESTER, M12 4PX

I acknowledge with thanks your request dated 23/11/2022 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



Karen McCormack
Property Searches Manager

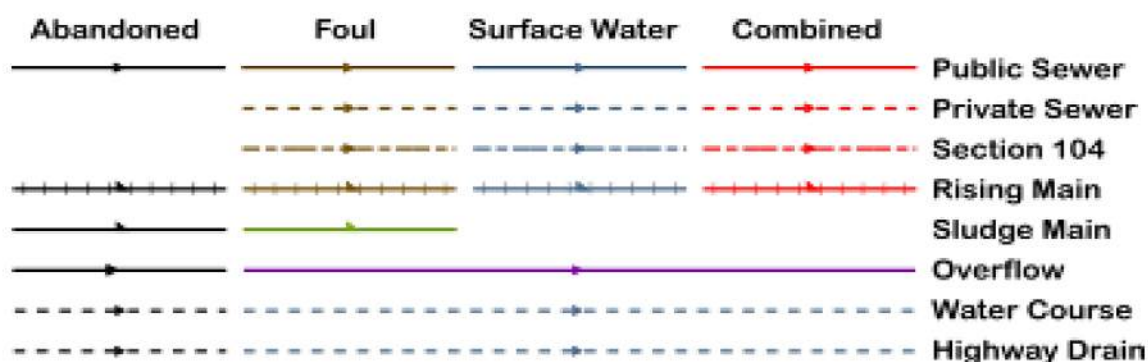
TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

Wastewater Symbolology



All point assets follow the standard colour convention:

red – combined	brown - foul
blue – surface water	purple - overflow

- | | |
|----------------------|--------------------------|
| Manhole | Side Entry Manhole |
| HS Head of System | Outfall |
| ES Extent of Survey | Screen Chamber |
| RE Rodding Eye | IC Inspection Chamber |
| IN Inlet | Bifurcation Chamber |
| DP Discharge Point | LH Lamp Hole |
| VV Vortex | T Junction / Saddle |
| PE Penstock | Catchpit |
| WO Washout Chamber | Valve Chamber |
| VA Valve | Vent Column |
| AV Air Valve | Vortex Chamber |
| NRV Non Return Valve | Penstock Chamber |
| SO Soakaway | Network Storage Tank |
| GU Gully | Sewer Overflow |
| CA Cascade | Ww Treatment Works |
| FM Flow Meter | Ww Pumping Station |
| HA Hatch Box | Septic Tank |
| OI Oil Interceptor | Control Kiosk |
| SM Summit | |
| DS Drop Shaft | Change of Characteristic |
| OP Orifice Plate | |



Water for the North West

SEWER RECORDS

Address or Site Reference

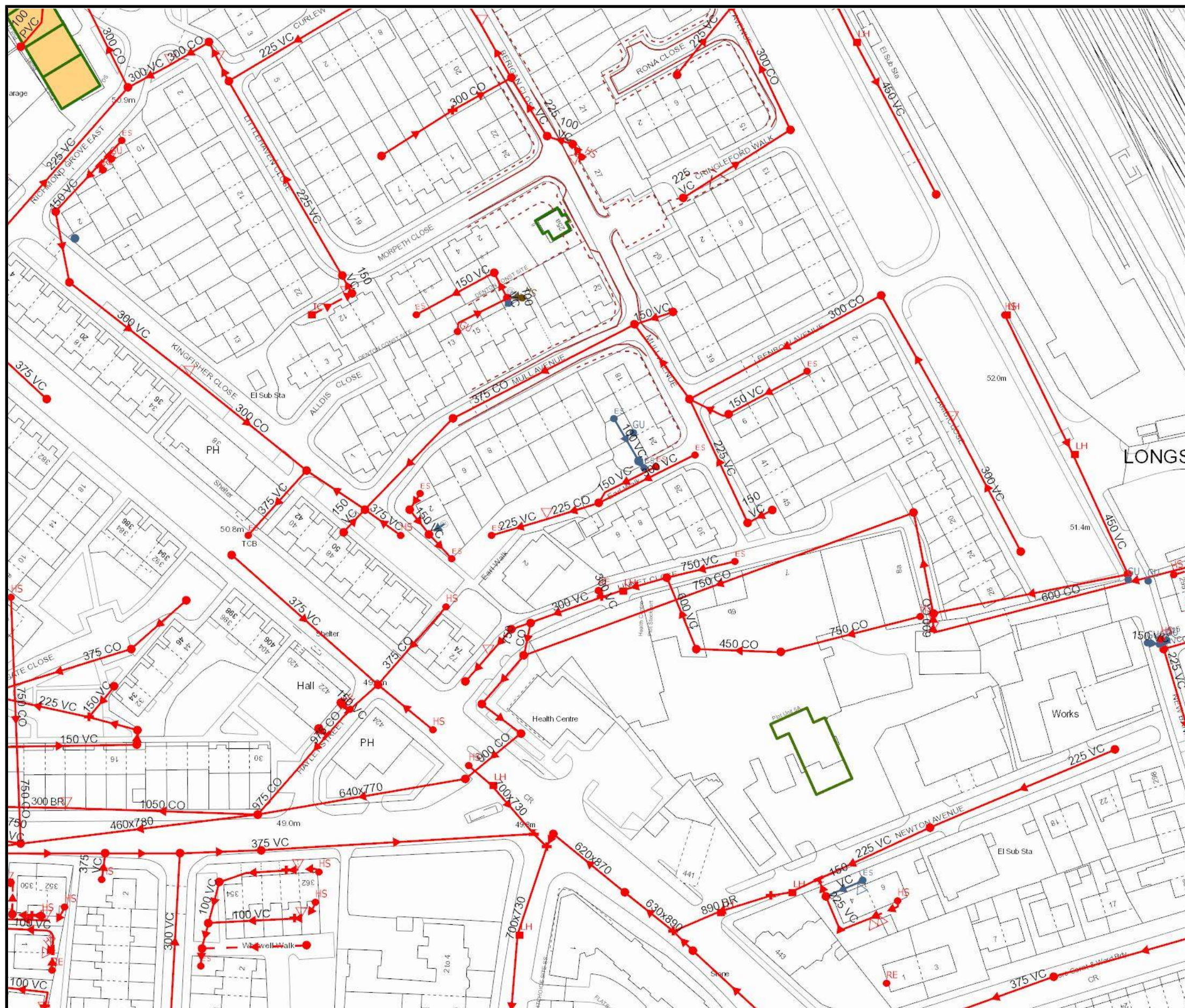
6 EARL WALK,
MANCHESTER,
M12 4PX

Scale: 1:1250
Date: 24/11/2022

Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Appendix C

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.1
Summer CV	0.750	2 year (l/s)	0.1
Winter CV	0.840	30 year (l/s)	0.2
Analysis Speed	Normal	100 year (l/s)	0.3
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	40	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.70
Greenfield Method	IH124	Growth Factor 100 year	2.08
Positively Drained Area (ha)	0.023	Betterment (%)	0
SAAR (mm)	886	QBar	0.1
Soil Index	4	Q 1 year (l/s)	0.1
SPR	0.47	Q 2 year (l/s)	0.1
Region	10	Q 30 year (l/s)	0.2
Growth Factor 1 year	0.87	Q 100 year (l/s)	0.3
Growth Factor 2 year	0.93		

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.1
Summer CV	0.750	2 year (l/s)	0.1
Winter CV	0.840	30 year (l/s)	0.2
Analysis Speed	Normal	100 year (l/s)	0.3
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	40	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Betterment (%)	0
Brownfield Method	MRM	Q 1 year (l/s)	2.7
Contributing Area (ha)	0.023	Q 2 year (l/s)	3.4
PIMP (%)	100	Q 30 year (l/s)	6.3
CV	0.750	Q 100 year (l/s)	8.0
Time of Concentration (mins)	6.00		

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	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

Circular Link Type

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

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE1	0.003	6.00	51.192	450	0.011	8.901	0.800
Permeable Surface	0.005	6.00	51.029		-3.906	-2.539	0.500
S01			51.029	450	0.048	0.118	0.721
RE2	0.002	6.00	51.435	450	8.988	9.174	0.800
S03	0.002	6.00	51.692	450	9.036	0.058	1.136
S02			51.237	450	5.296	0.053	0.973
S04			51.023	450	5.183	-3.186	0.792
Outfall			50.373	450	5.168	-6.735	0.204

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	RE1	S01	8.395	0.600	50.392	50.308	0.084	100.0	100	6.18	50.0
2.000	Permeable Surface	S01	5.000	0.600	50.529	50.308	0.221	22.6	100	6.05	50.0
1.001	S01	S02	4.375	0.600	50.308	50.264	0.044	100.0	100	6.28	50.0
3.000	RE2	S03	7.926	0.600	50.635	50.556	0.079	100.0	100	6.17	50.0
3.001	S03	S02	3.227	0.600	50.556	50.524	0.032	100.0	100	6.24	50.0
1.002	S02	S04	3.280	0.600	50.264	50.231	0.033	100.0	100	6.35	50.0
1.003	S04	Outfall	6.221	0.600	50.231	50.169	0.062	100.0	100	6.48	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	0.769	6.0	0.4	0.700	0.621	0.003	0.0	18	0.432
2.000	1.630	12.8	0.7	0.400	0.621	0.005	0.0	16	0.870
1.001	0.769	6.0	1.1	0.621	0.873	0.008	0.0	29	0.579
3.000	0.769	6.0	0.3	0.700	1.036	0.002	0.0	14	0.381
3.001	0.769	6.0	0.5	1.036	0.613	0.004	0.0	21	0.479
1.002	0.769	6.0	1.6	0.873	0.692	0.012	0.0	36	0.653
1.003	0.769	6.0	1.6	0.692	0.104	0.012	0.0	36	0.653

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	8.395	100.0	100	Circular	51.192	50.392	0.700	51.029	50.308	0.621
2.000	5.000	22.6	100	Circular	51.029	50.529	0.400	51.029	50.308	0.621
1.001	4.375	100.0	100	Circular	51.029	50.308	0.621	51.237	50.264	0.873
3.000	7.926	100.0	100	Circular	51.435	50.635	0.700	51.692	50.556	1.036
3.001	3.227	100.0	100	Circular	51.692	50.556	1.036	51.237	50.524	0.613
1.002	3.280	100.0	100	Circular	51.237	50.264	0.873	51.023	50.231	0.692
1.003	6.221	100.0	100	Circular	51.023	50.231	0.692	50.373	50.169	0.104

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1	450	Manhole	Adoptable	S01	450	Manhole	Adoptable
2.000	Permeable Surface		Junction		S01	450	Manhole	Adoptable
1.001	S01	450	Manhole	Adoptable	S02	450	Manhole	Adoptable
3.000	RE2	450	Manhole	Adoptable	S03	450	Manhole	Adoptable
3.001	S03	450	Manhole	Adoptable	S02	450	Manhole	Adoptable
1.002	S02	450	Manhole	Adoptable	S04	450	Manhole	Adoptable
1.003	S04	450	Manhole	Adoptable	Outfall	450	Manhole	Adoptable

Node S04 Online Orifice Control

Flap Valve	x	Invert Level (m)	50.231	Diameter (m)	0.027
Downstream Link	1.003	Design Depth (m)	0.800	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.4		

Node Permeable Surface Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	50.529	Slope (1:X)	400.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	26	Depth (m)	0.350
Safety Factor	2.0	Width (m)	9.400	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.521	26.180	1 year 600 minute winter	5.249	2.101
1 year 15 minute winter	64.927	26.180	1 year 720 minute summer	6.859	1.838
1 year 30 minute summer	60.022	16.984	1 year 720 minute winter	4.609	1.838
1 year 30 minute winter	42.121	16.984	1 year 960 minute summer	5.653	1.489
1 year 60 minute summer	40.398	10.676	1 year 960 minute winter	3.745	1.489
1 year 60 minute winter	26.839	10.676	1 year 1440 minute summer	4.127	1.106
1 year 120 minute summer	24.980	6.602	1 year 1440 minute winter	2.773	1.106
1 year 120 minute winter	16.596	6.602	2 year 15 minute summer	119.760	33.888
1 year 180 minute summer	19.271	4.959	2 year 15 minute winter	84.042	33.888
1 year 180 minute winter	12.527	4.959	2 year 30 minute summer	77.518	21.935
1 year 240 minute summer	15.301	4.043	2 year 30 minute winter	54.399	21.935
1 year 240 minute winter	10.165	4.043	2 year 60 minute summer	51.720	13.668
1 year 360 minute summer	11.775	3.030	2 year 60 minute winter	34.361	13.668
1 year 360 minute winter	7.654	3.030	2 year 120 minute summer	31.549	8.338
1 year 480 minute summer	9.342	2.469	2 year 120 minute winter	20.961	8.338
1 year 480 minute winter	6.207	2.469	2 year 180 minute summer	24.133	6.210
1 year 600 minute summer	7.682	2.101	2 year 180 minute winter	15.687	6.210

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 240 minute summer	19.039	5.032	30 year +40% CC 480 minute summer	29.374	7.763
2 year 240 minute winter	12.649	5.032	30 year +40% CC 480 minute winter	19.515	7.763
2 year 360 minute summer	14.516	3.735	30 year +40% CC 600 minute summer	23.854	6.525
2 year 360 minute winter	9.436	3.735	30 year +40% CC 600 minute winter	16.299	6.525
2 year 480 minute summer	11.436	3.022	30 year +40% CC 720 minute summer	21.130	5.663
2 year 480 minute winter	7.598	3.022	30 year +40% CC 720 minute winter	14.201	5.663
2 year 600 minute summer	9.363	2.561	30 year +40% CC 960 minute summer	17.189	4.526
2 year 600 minute winter	6.398	2.561	30 year +40% CC 960 minute winter	11.387	4.526
2 year 720 minute summer	8.339	2.235	30 year +40% CC 1440 minute summer	12.303	3.297
2 year 720 minute winter	5.605	2.235	30 year +40% CC 1440 minute winter	8.269	3.297
2 year 960 minute summer	6.846	1.803	100 year 15 minute summer	291.766	82.560
2 year 960 minute winter	4.535	1.803	100 year 15 minute winter	204.748	82.560
2 year 1440 minute summer	4.967	1.331	100 year 30 minute summer	191.982	54.324
2 year 1440 minute winter	3.338	1.331	100 year 30 minute winter	134.724	54.324
30 year 15 minute summer	226.195	64.005	100 year 60 minute summer	129.253	34.158
30 year 15 minute winter	158.733	64.005	100 year 60 minute winter	85.873	34.158
30 year 30 minute summer	147.452	41.724	100 year 120 minute summer	78.836	20.834
30 year 30 minute winter	103.475	41.724	100 year 120 minute winter	52.377	20.834
30 year 60 minute summer	98.615	26.061	100 year 180 minute summer	59.966	15.431
30 year 60 minute winter	65.517	26.061	100 year 180 minute winter	38.980	15.431
30 year 120 minute summer	59.946	15.842	100 year 240 minute summer	46.975	12.414
30 year 120 minute winter	39.827	15.842	100 year 240 minute winter	31.209	12.414
30 year 180 minute summer	45.598	11.734	100 year 360 minute summer	35.264	9.075
30 year 180 minute winter	29.640	11.734	100 year 360 minute winter	22.923	9.075
30 year 240 minute summer	35.759	9.450	100 year 480 minute summer	27.350	7.228
30 year 240 minute winter	23.758	9.450	100 year 480 minute winter	18.171	7.228
30 year 360 minute summer	26.939	6.932	100 year 600 minute summer	22.137	6.055
30 year 360 minute winter	17.511	6.932	100 year 600 minute winter	15.126	6.055
30 year 480 minute summer	20.981	5.545	100 year 720 minute summer	19.562	5.243
30 year 480 minute winter	13.940	5.545	100 year 720 minute winter	13.147	5.243
30 year 600 minute summer	17.039	4.661	100 year 960 minute summer	15.851	4.174
30 year 600 minute winter	11.642	4.661	100 year 960 minute winter	10.500	4.174
30 year 720 minute summer	15.093	4.045	100 year 1440 minute summer	11.278	3.023
30 year 720 minute winter	10.143	4.045	100 year 1440 minute winter	7.579	3.023
30 year 960 minute summer	12.278	3.233	100 year +40% CC 15 minute summer	408.473	115.584
30 year 960 minute winter	8.133	3.233	100 year +40% CC 15 minute winter	286.647	115.584
30 year 1440 minute summer	8.788	2.355	100 year +40% CC 30 minute summer	268.775	76.054
30 year 1440 minute winter	5.906	2.355	100 year +40% CC 30 minute winter	188.614	76.054
30 year +40% CC 15 minute summer	316.673	89.607	100 year +40% CC 60 minute summer	180.954	47.821
30 year +40% CC 15 minute winter	222.226	89.607	100 year +40% CC 60 minute winter	120.222	47.821
30 year +40% CC 30 minute summer	206.433	58.413	100 year +40% CC 120 minute summer	110.370	29.168
30 year +40% CC 30 minute winter	144.865	58.413	100 year +40% CC 120 minute winter	73.327	29.168
30 year +40% CC 60 minute summer	138.061	36.485	100 year +40% CC 180 minute summer	83.953	21.604
30 year +40% CC 60 minute winter	91.724	36.485	100 year +40% CC 180 minute winter	54.572	21.604
30 year +40% CC 120 minute summer	83.924	22.179	100 year +40% CC 240 minute summer	65.765	17.380
30 year +40% CC 120 minute winter	55.757	22.179	100 year +40% CC 240 minute winter	43.693	17.380
30 year +40% CC 180 minute summer	63.837	16.427	100 year +40% CC 360 minute summer	49.370	12.705
30 year +40% CC 180 minute winter	41.495	16.427	100 year +40% CC 360 minute winter	32.092	12.705
30 year +40% CC 240 minute summer	50.063	13.230	100 year +40% CC 480 minute summer	38.291	10.119
30 year +40% CC 240 minute winter	33.261	13.230	100 year +40% CC 480 minute winter	25.439	10.119
30 year +40% CC 360 minute summer	37.715	9.705	100 year +40% CC 600 minute summer	30.992	8.477
30 year +40% CC 360 minute winter	24.516	9.705	100 year +40% CC 600 minute winter	21.176	8.477

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 720 minute summer	27.387	7.340	100 year +40% CC 960 minute winter	14.700	5.844
100 year +40% CC 720 minute winter	18.406	7.340	100 year +40% CC 1440 minute summer	15.789	4.232
100 year +40% CC 960 minute summer	22.191	5.844	100 year +40% CC 1440 minute winter	10.611	4.232

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1	12	50.407	0.015	0.3	0.0035	0.0000	OK
15 minute winter	Permeable Surface	13	50.541	0.012	0.5	0.0886	0.0000	OK
30 minute winter	S01	27	50.356	0.048	0.6	0.0077	0.0000	OK
15 minute winter	RE2	13	50.648	0.013	0.2	0.0026	0.0000	OK
15 minute winter	S03	13	50.574	0.018	0.4	0.0035	0.0000	OK
30 minute winter	S02	26	50.357	0.093	1.0	0.0148	0.0000	OK
30 minute winter	S04	26	50.357	0.126	0.9	0.0200	0.0000	SURCHARGED
15 minute summer	Outfall	1	50.169	0.000	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE1	1.000	S01	0.3	0.316	0.050	0.0152	
15 minute winter	Permeable Surface	2.000	S01	0.4	0.434	0.032	0.0092	
30 minute winter	S01	1.001	S02	0.6	0.392	0.104	0.0248	
15 minute winter	RE2	3.000	S03	0.2	0.267	0.033	0.0061	
15 minute winter	S03	3.001	S02	0.4	0.425	0.066	0.0030	
30 minute winter	S02	1.002	S04	0.9	0.447	0.141	0.0253	
30 minute winter	S04	Orifice	Outfall	0.5				0.8

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 (m³)	Flood (m³)	Status
15 minute summer	RE1	12	50.409	0.017	0.4	0.0041	0.0000	OK
15 minute winter	Permeable Surface	13	50.543	0.014	0.7	0.1131	0.0000	OK
30 minute winter	S01	27	50.395	0.087	0.8	0.0138	0.0000	OK
15 minute winter	RE2	12	50.650	0.015	0.3	0.0032	0.0000	OK
15 minute winter	S03	12	50.578	0.022	0.6	0.0043	0.0000	OK
30 minute winter	S02	27	50.395	0.131	1.1	0.0208	0.0000	SURCHARGED
30 minute winter	S04	27	50.394	0.163	0.9	0.0259	0.0000	SURCHARGED
15 minute summer	Outfall	1	50.169	0.000	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S01	0.4	0.360	0.066	0.0236	
15 minute winter	Permeable Surface	2.000	S01	0.5	0.473	0.041	0.0181	
30 minute winter	S01	1.001	S02	0.7	0.392	0.109	0.0329	
15 minute winter	RE2	3.000	S03	0.3	0.297	0.050	0.0081	
15 minute winter	S03	3.001	S02	0.6	0.476	0.099	0.0041	
30 minute winter	S02	1.002	S04	0.9	0.447	0.141	0.0257	
30 minute winter	S04	Orifice	Outfall	0.6				1.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	RE1	27	50.543	0.151	0.7	0.0353	0.0000	SURCHARGED
15 minute winter	Permeable Surface	13	50.548	0.019	1.3	0.2122	0.0000	OK
30 minute winter	S01	27	50.543	0.235	1.5	0.0373	0.0000	SURCHARGED
15 minute winter	RE2	12	50.654	0.019	0.5	0.0041	0.0000	OK
15 minute winter	S03	12	50.585	0.029	1.0	0.0057	0.0000	OK
30 minute winter	S02	28	50.542	0.278	1.6	0.0443	0.0000	SURCHARGED
30 minute winter	S04	28	50.542	0.311	1.1	0.0494	0.0000	SURCHARGED
15 minute summer	Outfall	1	50.169	0.000	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	RE1	1.000	S01	0.7	0.338	0.110	0.0657	
15 minute winter	Permeable Surface	2.000	S01	1.0	0.467	0.080	0.0222	
30 minute winter	S01	1.001	S02	0.8	0.369	0.136	0.0342	
15 minute winter	RE2	3.000	S03	0.5	0.341	0.083	0.0118	
15 minute winter	S03	3.001	S02	1.0	0.547	0.166	0.0059	
30 minute winter	S02	1.002	S04	1.1	0.461	0.183	0.0257	
30 minute winter	S04	Orifice	Outfall	0.8				2.1

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1	14	50.566	0.174	1.4	0.0406	0.0000	SURCHARGED
30 minute winter	Permeable Surface	27	50.565	0.036	2.4	0.6578	0.0000	OK
30 minute winter	S01	28	50.565	0.257	1.6	0.0408	0.0000	SURCHARGED
15 minute winter	RE2	12	50.658	0.023	0.7	0.0048	0.0000	OK
15 minute winter	S03	12	50.591	0.035	1.4	0.0068	0.0000	OK
15 minute winter	S02	14	50.565	0.301	2.3	0.0478	0.0000	SURCHARGED
15 minute winter	S04	14	50.565	0.334	1.5	0.0531	0.0000	SURCHARGED
15 minute summer	Outfall	1	50.169	0.000	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE1	1.000	S01	1.1	0.431	0.177	0.0657	
30 minute winter	Permeable Surface	2.000	S01	1.3	0.473	0.101	0.0258	
30 minute winter	S01	1.001	S02	0.9	0.382	0.148	0.0342	
15 minute winter	RE2	3.000	S03	0.7	0.371	0.116	0.0151	
15 minute winter	S03	3.001	S02	1.4	0.597	0.232	0.0079	
15 minute winter	S02	1.002	S04	1.5	0.525	0.245	0.0257	
15 minute winter	S04	Orifice	Outfall	0.9				2.2

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	RE1	27	50.561	0.169	1.0	0.0396	0.0000	SURCHARGED
30 minute winter	Permeable Surface	27	50.561	0.032	1.9	0.5593	0.0000	OK
30 minute winter	S01	27	50.561	0.253	1.6	0.0402	0.0000	SURCHARGED
15 minute winter	RE2	11	50.658	0.023	0.7	0.0048	0.0000	OK
15 minute winter	S03	11	50.591	0.035	1.4	0.0068	0.0000	OK
30 minute winter	S02	27	50.561	0.297	2.0	0.0472	0.0000	SURCHARGED
30 minute winter	S04	27	50.560	0.329	1.4	0.0523	0.0000	SURCHARGED
15 minute summer	Outfall	1	50.169	0.000	0.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	RE1	1.000	S01	0.8	0.364	0.127	0.0657	
30 minute winter	Permeable Surface	2.000	S01	1.2	0.438	0.094	0.0250	
30 minute winter	S01	1.001	S02	1.0	0.376	0.166	0.0342	
15 minute winter	RE2	3.000	S03	0.7	0.371	0.116	0.0150	
15 minute winter	S03	3.001	S02	1.4	0.596	0.230	0.0075	
30 minute winter	S02	1.002	S04	1.4	0.464	0.234	0.0257	
30 minute winter	S04	Orifice	Outfall	0.9				2.8

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	RE1	49	50.589	0.197	0.8	0.0462	0.0000	SURCHARGED
60 minute winter	Permeable Surface	48	50.590	0.061	2.3	1.3685	0.0000	OK
60 minute winter	S01	48	50.589	0.281	1.4	0.0447	0.0000	SURCHARGED
15 minute winter	RE2	11	50.663	0.028	1.0	0.0058	0.0000	OK
15 minute winter	S03	11	50.599	0.043	2.0	0.0083	0.0000	OK
60 minute winter	S02	47	50.589	0.325	1.8	0.0516	0.0000	SURCHARGED
60 minute winter	S04	47	50.588	0.357	1.3	0.0567	0.0000	SURCHARGED
15 minute summer	Outfall	1	50.169	0.000	0.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	RE1	1.000	S01	0.8	0.304	0.137	0.0657	
60 minute winter	Permeable Surface	2.000	S01	1.1	0.431	0.084	0.0320	
60 minute winter	S01	1.001	S02	0.8	0.324	0.136	0.0342	
15 minute winter	RE2	3.000	S03	1.0	0.406	0.165	0.0197	
15 minute winter	S03	3.001	S02	2.0	0.654	0.330	0.0115	
60 minute winter	S02	1.002	S04	1.3	0.461	0.218	0.0257	
60 minute winter	S04	Orifice	Outfall	0.9				4.8

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

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.

6. Concrete structures design sulphate class and ACEC concrete class unknown.

7. Pipework to be 110mm Thermoplastics U-PVC (Polypipe or similar) installed at levels marked on this drawing. Pipe bedding should be class Z in pipes within 1.5m of the building or shallower than 700mm below ground level. For all other areas the pipe bedding should be class S.

8. Joints and fittings for gravity sewers shall comply with the relevant provisions of BS EN 1401-1, BS EN 1852 and BS EN 12666-1. Pipes shall have a limit of 6% deformation. Pipes shall be SN8 ring stiffness and stamped accordingly. Pipe sections shall not be longer than 3m.

9. Plastic chambers and rings, including demarcation chambers, shall comply with BS EN 3598-1 or BS EN 13598-2 as appropriate.

10. Inspection chamber covers and frames shall comply with the relevant provisions of BS EN 124 and should be double sealed.

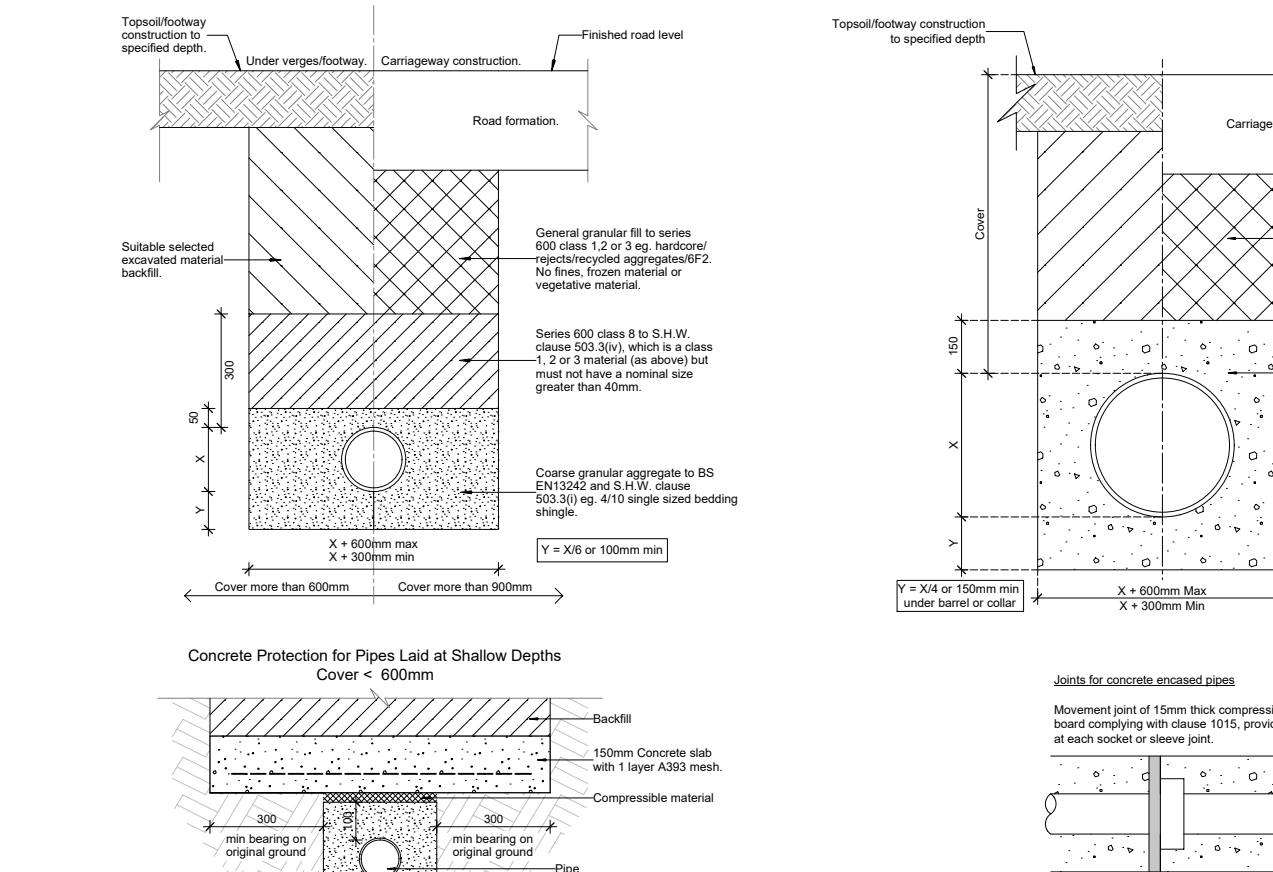
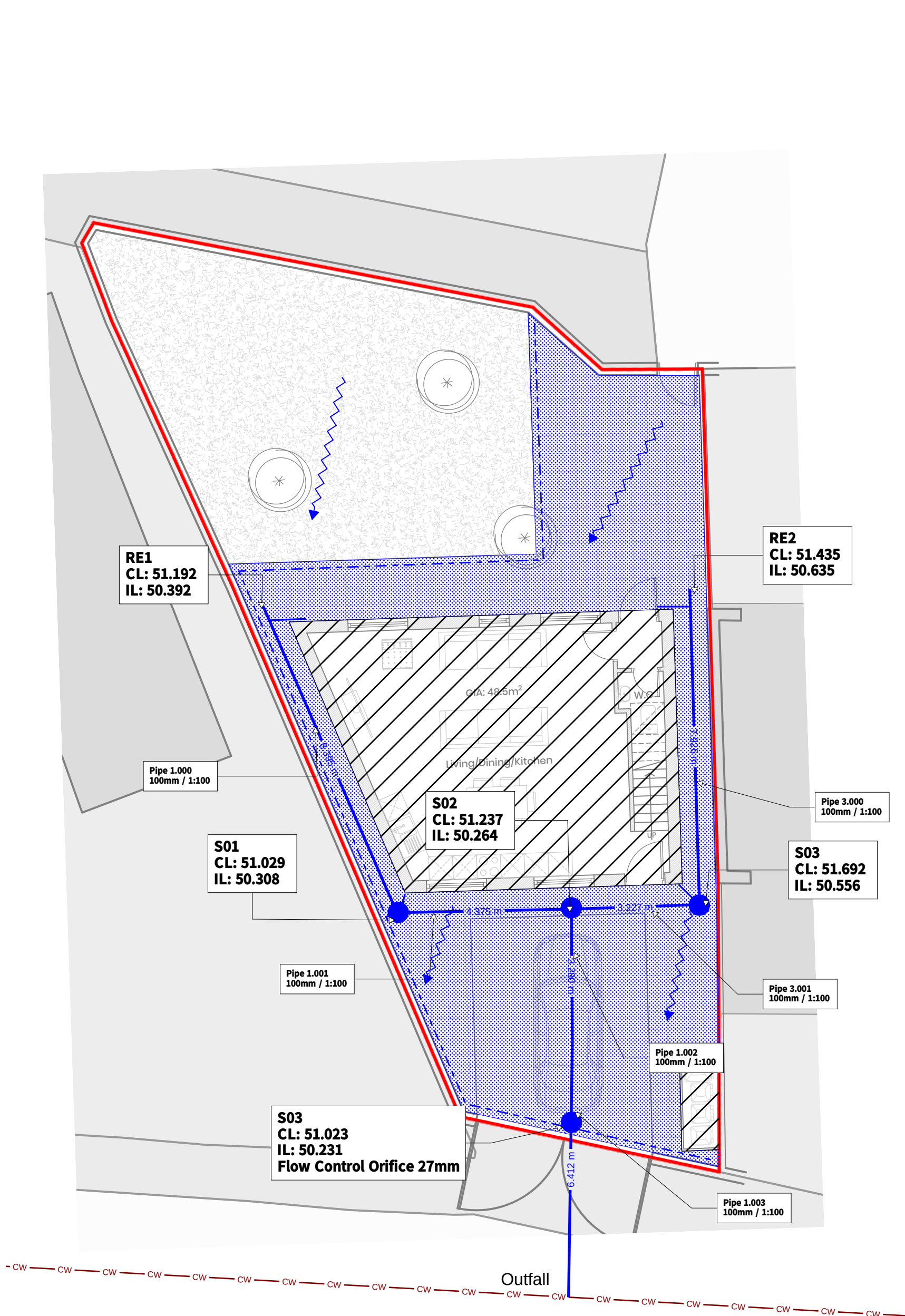
11. All inspection chamber covers shall be the non-ventilating type and shall have closed keyways.

12. Testing of pipelines should be as follows:

Gravity Pipework: Air pipe testing. Pipework should withstand a pressure of 100mm water gauge and this should not fall by more than 25mm in a 5 minute period. However where traps or gullies are connected they should withstand a pressure of 50mm water gauge and this should not fall by more than 12mm in a 5 minute period. It is recommended that pipework installations are tested in sections rather than waiting to complete in one operation.

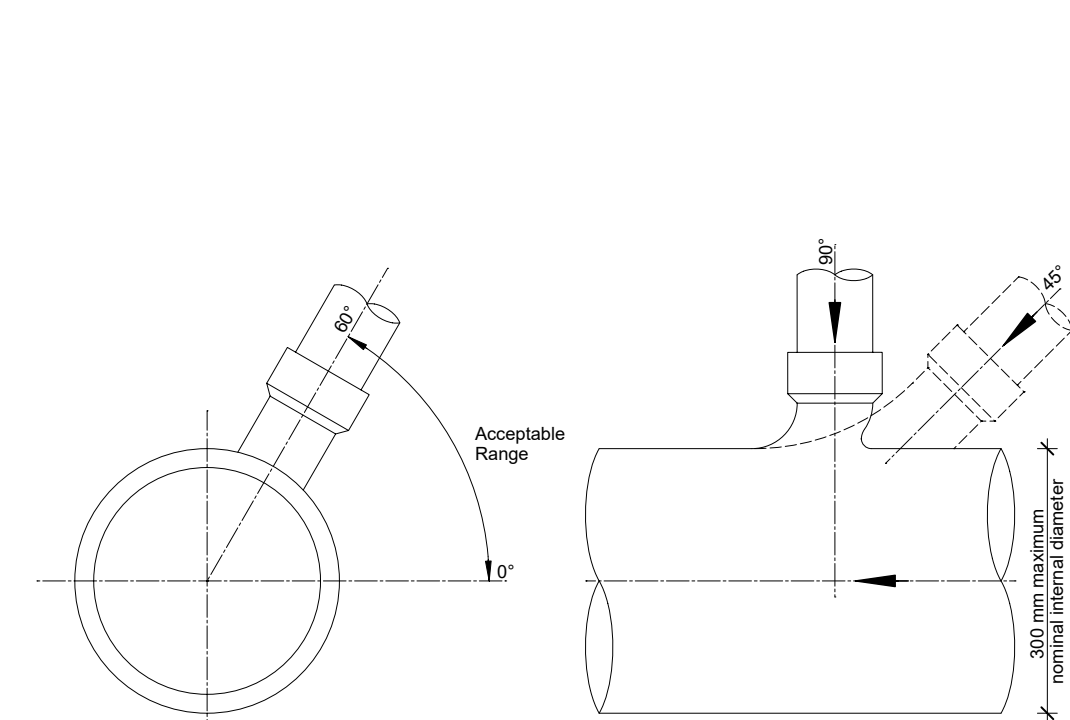
13. Manhole covers to be set square to the building. Covers of existing manholes to be adjusted to match final ground levels.

14. Granular Bedding for pipes shall be constructed by spreading and compacting granular bedding material over the full width of the pipe trench. After the pipes have been laid, additional granular material shall, if required, be placed and compacted equally on each side of the pipes and, where practicable, this shall be done in sequence with the removal of the trench supports.



Pipe Bedding Detail Type S

Pipe Bedding Detail Type Z



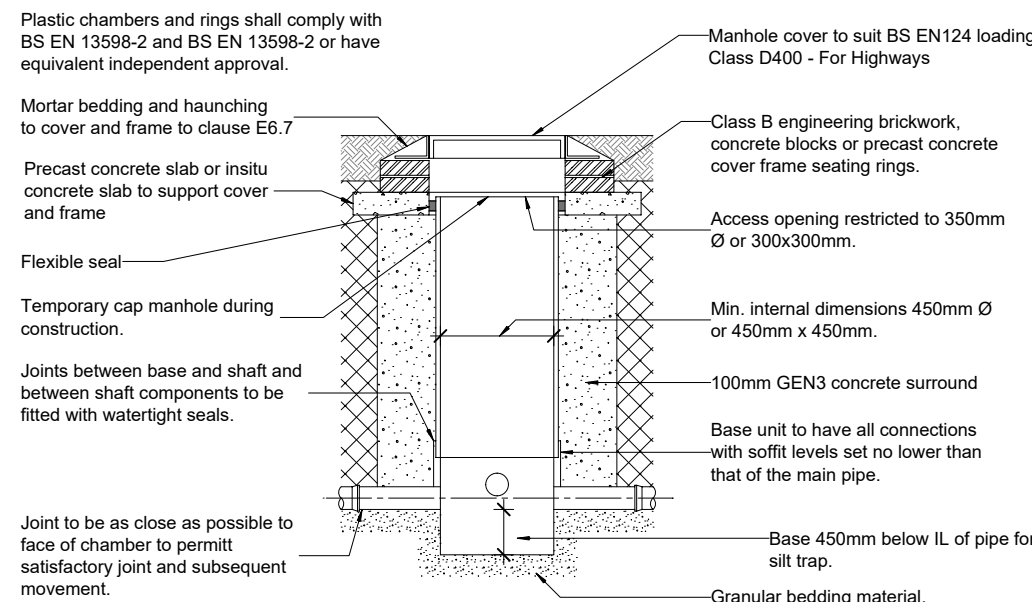
Cross-Sectional View of Sewer

Plan View of Sewer

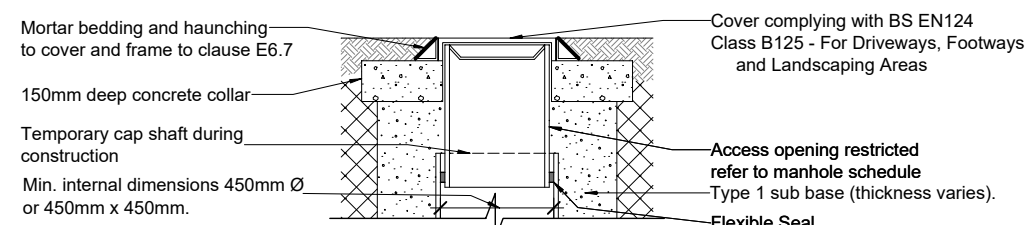
NOTES:

- The vertical angle between the connecting pipe and the horizontal should be greater than 0° and not more than 60°.
- 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.
- 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 couplers.
- Where the connection is being made to a sewer with a nominal internal diameter greater than 300 mm:
 - Where the diameter of the connecting pipe is greater than half the diameter of the sewer, the connection of an access point should be constructed;
 - Where the diameter of the connecting pipe is less than or equal to half the diameter of the sewer, then the connection should be made using a preformed saddle fitting.

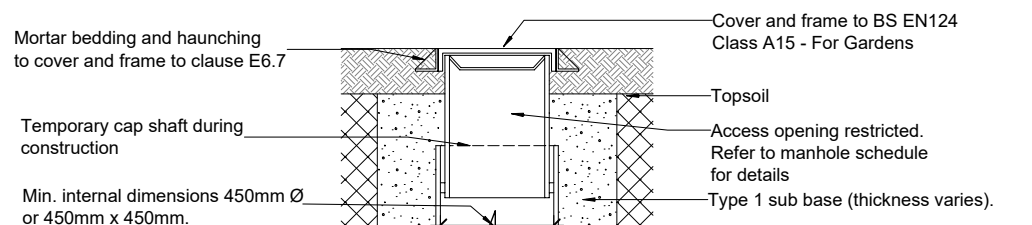
Lateral Connection to public sewer



Typical Section in areas subject to vehicle loading



Sited in domestic driveways or footways

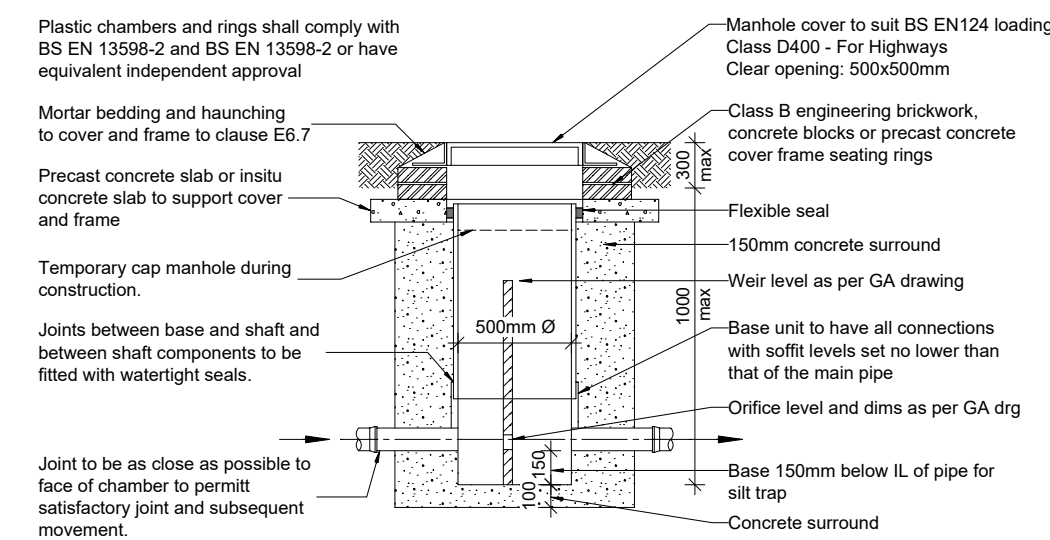


Sited in private garden - No loading

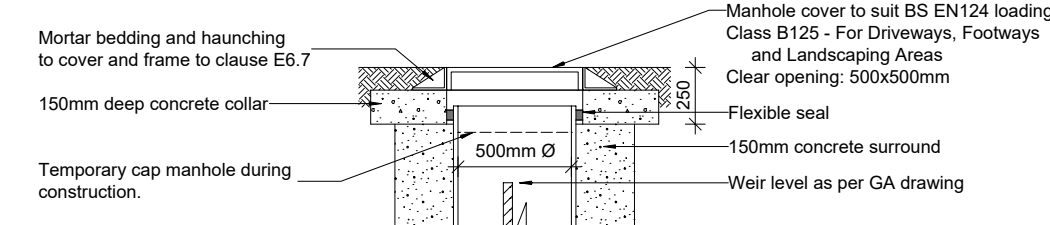
NOTES:

- Refer to drawing 8193 for base layouts.

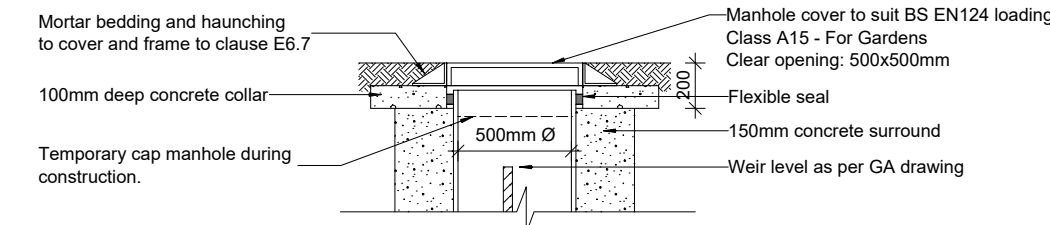
Silt Trap Plastic



Typical Section in areas subject to vehicle loading



Sited in domestic driveways or footways



Sited in soft landscaped areas

NOTES:

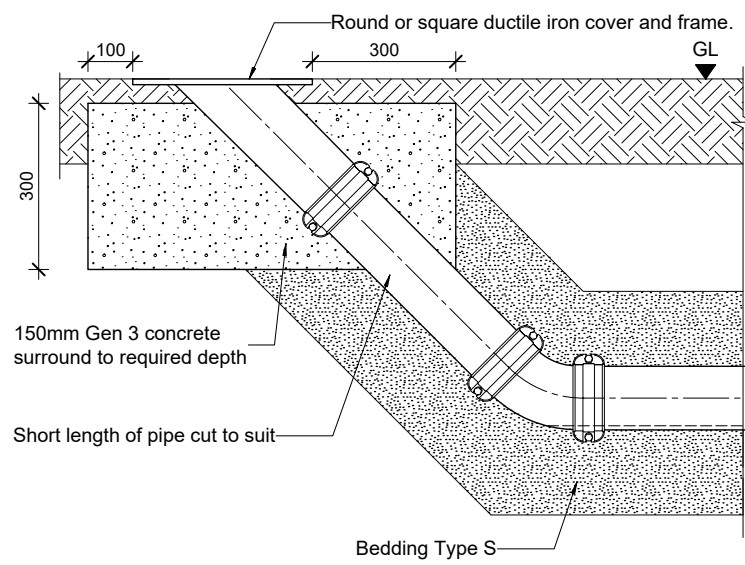
- Refer to GA grid for pipe layout.
- Chamber can be fabricated by Selet Environmental UK.

Flow Control - Orifice Plate - Plastic - Type 3

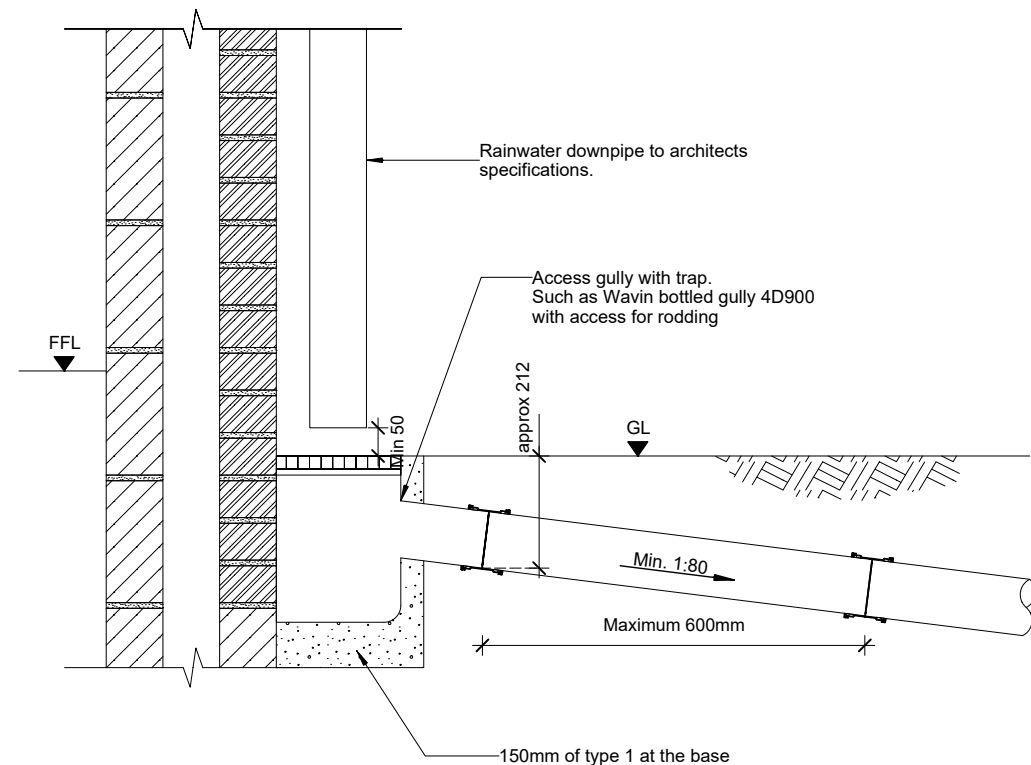
KEY

- Proposed Surface Water Sewer Pipe
- Exceedance Flows
- Permeable Paving
60mm Block Paving
50mm Grids
350mm Type 3
- Silt Trap
- Perforated Pipe
- Public Sewer

Scale 1:100



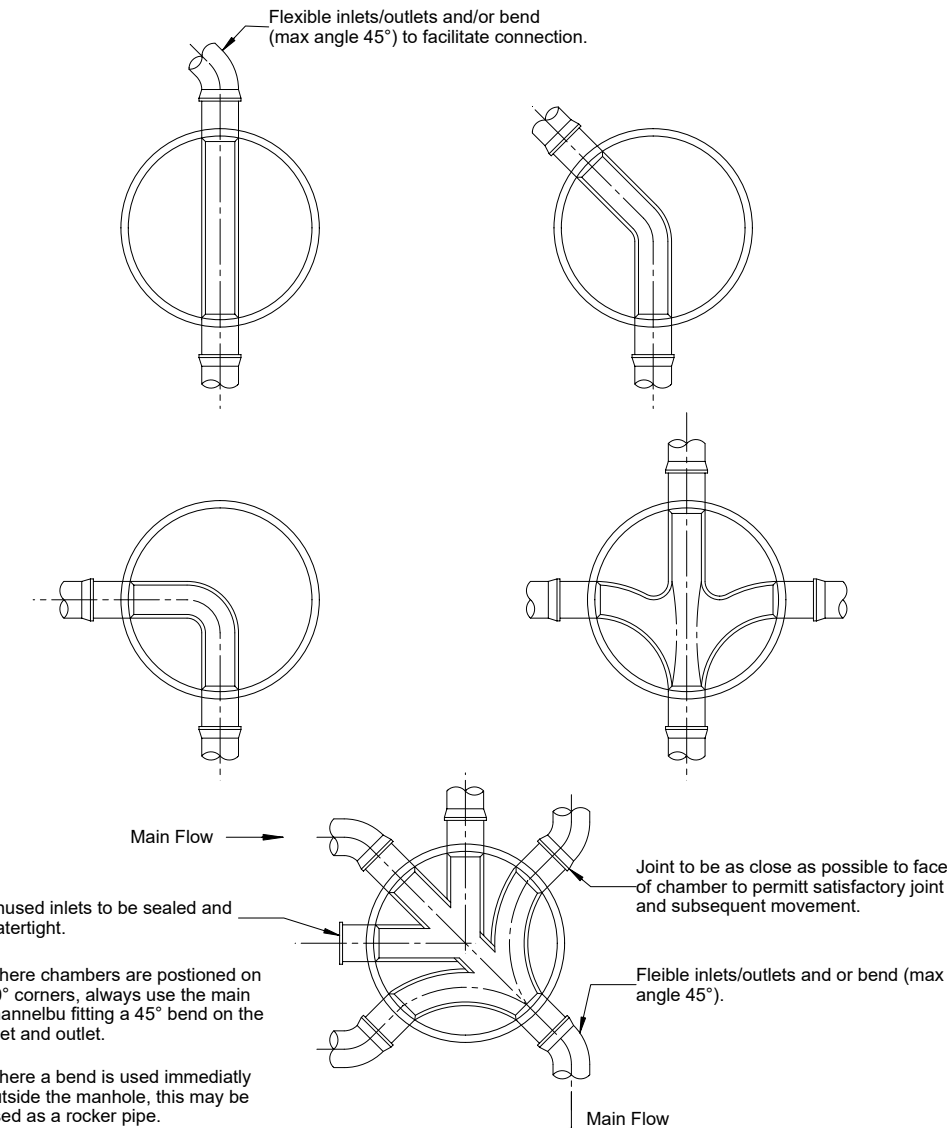
External Rodding Eye Detail



NOTES:

- This details shows the standard generic arrangement.
- The pipe and connector details will be different for each manufacturer of the components. They are to be installed in accordance with the manufacturers recommendations.

8250 - External Rainwater (High Level)



Chamber Type 3 Base Layouts

Rev	Details	Date	By	Chd
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Drawing Status: **PRELIMINARY**



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Drawing:

Proposed Drainage Strategy