

DRAINAGE STRATEGY REPORT

FOR

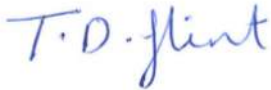
James Durrans, Thurlstone

ON BEHALF OF



Document Control Sheet

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Issue Record

Issue No.	Description	Date
1	First Issue	11.01.21

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1. INTRODUCTION

HBPW LLP has been commissioned by MCS Projects Ltd, on behalf of the Client James Durrans and Sons Ltd to prepare a Drainage Strategy Report in relation to the proposed new warehouse building on their existing site in Thurlstone, South Yorkshire.

The report has been prepared using the following documents for guidance:-

- Building Regulations Part H –Drainage and waste disposal
- BS EN 752:2017
- Ciria (C753) – The SuDS Manual
- HBPW Ground Investigation Report (Dated July 2018)
- Barnsley Lead Local Flood Authority “Local Plan” (Adopted January 2019)

This Drainage Strategy has been prepared in support of the planning application for this site. This report presents the assessment of the existing drainage for the site and forms the basis of a drainage strategy for the proposed development.

1.1. Site Location

The Site is located to the north west of the main offices of James Durrans & Sons at Phoenix Works, Saville Lane, Thurlstone. The Site is approximately 0.1 hectares in size and is centred at National Grid Reference SE 230 033, postcode S36 9RE.

Figure 1 below shows the extent of the site; due north is to the top of the Figure 1: -

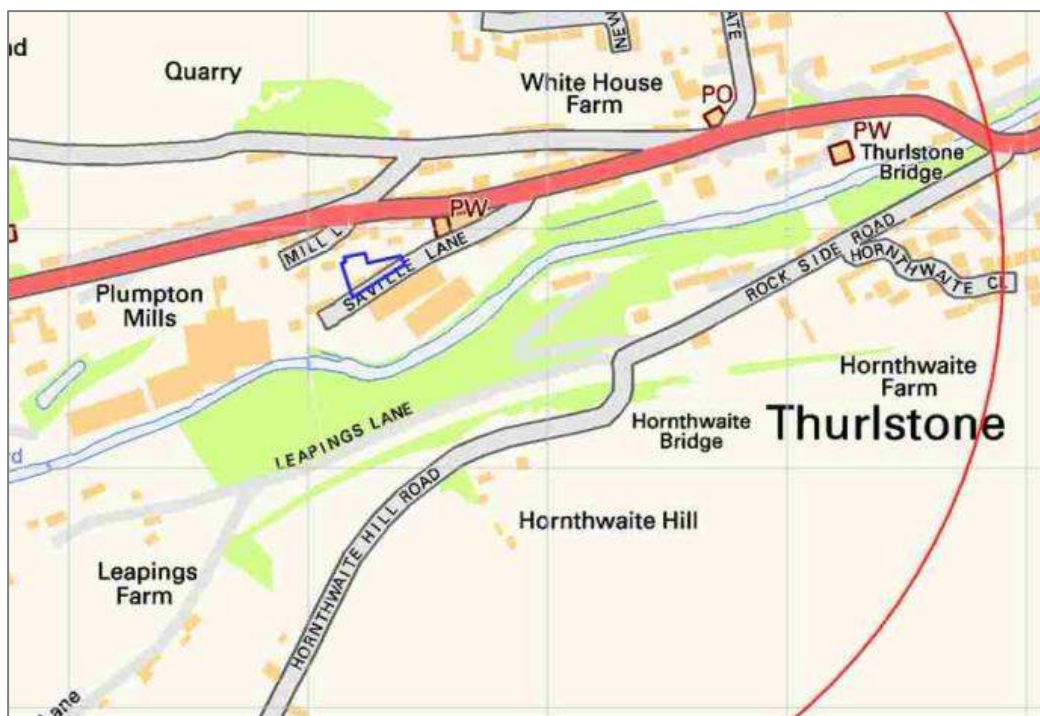


Figure 1 - Site Location Plan

1.2. Site Description

The site is irregularly shaped and bordered on the north, east and western edges by stone walls. Beyond the stone walls are gardens of residential properties. The southern edge of the site is bordered by Saville Lane.

Historically, the site contained two stone mill buildings located close to the southern boundary. These building have recently been demolished.

The remainder of the site, from the buildings to the stone wall boundaries was surfaced with grass and low level vegetation.

The site slopes steeply downwards from the northern boundary towards Saville Lane, with a maximum level difference of approximately 5m.

Refer to Appendix B for the topographical survey drawing.

2. GROUND CONDITIONS

An Intrusive Investigation was carried out on the site by Dynamic Sampling Limited in February 2018. The ground conditions can be summarised as follows in Table 1: -

Table 1 - Ground Model		
Strata	Typical Description	Typical Depths
Made Ground	Surface soils comprised topsoil/ made ground typically described as a very dark brown sandy loam with rootlets and occasional gravel. Made Ground/ Potential made ground was present in all exploratory holes ranging in thickness between 0.35 and 3.20 m. Made ground was typically described as sandy lay with fragments of brick, sandstone and coal with rootlets with whole and half bricks and mortar encountered locally. Made ground appeared to be deepest around Buildings 1 and 2.	GL -0.3/3.2 m
Weathered Mudstone/ reworked Ground	Made ground was underlain by cohesive deposits within all exploratory holes extending to between 0.9 m and in excess of 5.0m. The base of the cohesive deposits was not encountered in WS1, which extended beyond the maximum depth of 5.0 m. WS2 encountered an obstruction at 1.40 m, suspected to be a sandstone cobble. Deposits were typically described as gravelly silty clay with fragments of mudstone and sandstone.	0.3/3.2 -0.9/>5.0 m
PLCMF Bedrock	Deposits considered representative of Pennine Lower Coal Measures Formation (PLCMF) were encountered beneath cohesive deposits and extended beyond the maximum depth of investigation of 10.0 m bgl. Deposits were typically described as weak grey sandstone. Weak grey mudstone was encountered in BH2 – BH5 beneath the sandstone at depths of between approximately 5.50 m and 8.50 m. During drilling, no voids, coal or broken ground were encountered.	0.9/3.0 ->10.0 m

2.1. Hydrogeology

Bedrock deposits beneath the Site are recorded as a Secondary A Aquifer (formerly classified as minor aquifers) and described as rock with permeable layers which can provide water supply at a local scale rather than at a strategic scale, and in some cases forming an important source of base flows to rivers.

Soils beneath the site are categorised as 'High Leaching Potential' (H3) and described as coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.

There is a risk of groundwater flooding present at surface.

The Site is not located within a Source Protection Zone (SPZ).

2.2. Hydrology

The nearest recorded surface water feature was the River Don located approximately 50m to the south of the site.

No biological or chemical river data was available within 250 m of the Site.

3. EXISTING DRAINAGE

3.1. Private

The existing site consists of 0.1 hectares, 0.025 hectares of which was occupied by mill buildings. The building roofs were drained by a series of gutters and down pipes. Foul water from the buildings was separately collected in underground pipes. These drainage systems connected to the combined public sewer located in Saville Lane

The undeveloped portion of the site does not appear to have a positive drainage system in place. Surface water from the steeply sloping site runs on to Saville Lane, which falls from east to west away from the site. No gullies or channel drains are present to intercept these flows.

3.2. Public

A Yorkshire Water asset search shows a 150mm diameter combined sewer falling east to west along Saville Lane. The redundant mill building drainage (surface water and foul) connects in to this sewer.

4. PROPOSED DEVELOPMENT

The proposed development will consist of the construction of a new warehouse building with a vehicle parking bay along the western elevation. Due to the steeply sloping site, a retaining wall will be constructed to allow the site to be levelled. The building will have a roof area of approximately 0.06 hectares which will house a workshop, staff toilets and kitchen. The parking spaces and hardstanding to the front face of the proposed building will cover approximately 0.01 hectares.

5. FLOOD RISK

5.1. Fluvial Flooding

A search on the EA Flood map for planning reveals that the site is in a Flood Zone 1 (Figure 2). Flood Zone 1 defined as land having a less than a 1 in 1000 annual probability of river and sea flooding.

As the site is a less than 1 hectare in size and is in a Flood Zone 1, a flood risk assessment is not required.



Figure 2 - EA Flood Map

5.2. Pluvial Flooding

A check for flood risk from surface water, using the Flood Warning Information Service, reveals that the site is in a very low risk area (Figure 3).



Figure 3 - Surface Water Flood Risk Map

5.3. Flood Risk from Reservoirs

A check for flood risk from reservoirs, using the Flood Warning Information Service, reveals that the site is at risk (Figure 4). The source of the risk is identified as Winscar reservoir, located to the west of the site and operated by Yorkshire Water.

Although the probability of a catastrophic dam failure is considered to be extremely low, the consequence of such an event would be severe. The reservoirs are inspected regularly in accordance with the requirements of the Reservoirs Act 1975 and therefore it is considered that the risk of a reservoir failure is low.

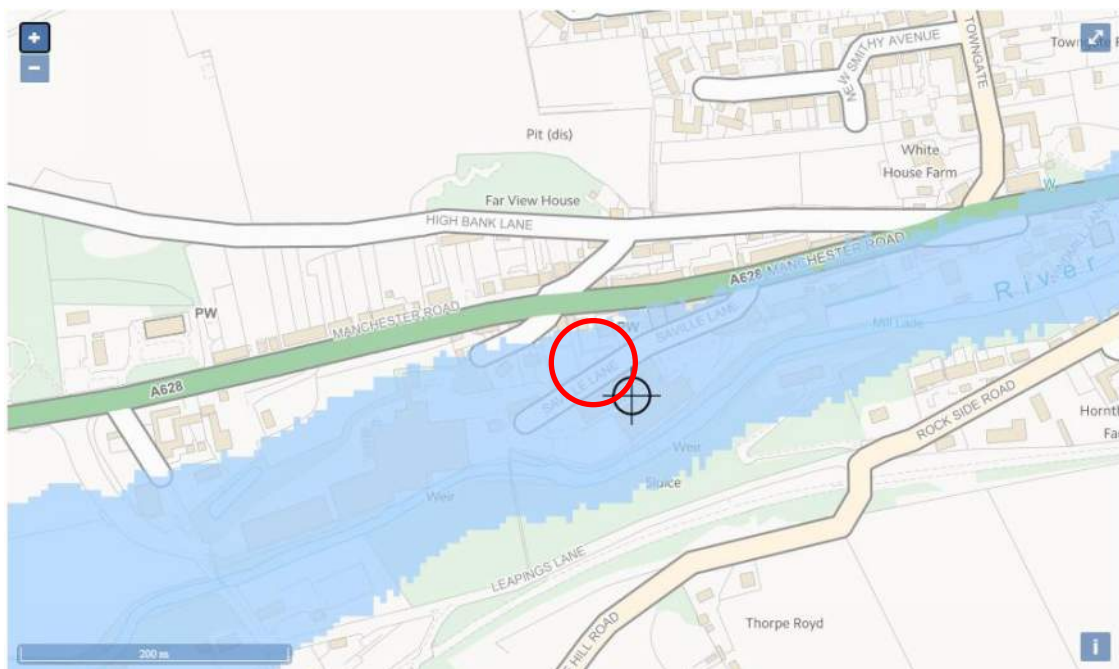


Figure 4 - Reservoir Flood Risk Map

5.4. Finished Floor Level

A finished floor level of +211.300m is proposed for the building structure. The ground levels to the rear of the structure will be retained as existing to provide support to the gardens to the North.

On the southern boundary, external levels will be a minimum of 150mm below the finished floor level.

6. PROPOSED SURFACE WATER STRATEGY

6.1. Design Philosophy

Surface water run off generated by a development site should, as far as possible be managed in a sustainable manner to mimic the surface water flows arising from the undeveloped site. This will be achieved by taking into account the local topography, ground conditions and providing integrated facilities to control quantity and quality of run-off. In line with guidance from the CIRIA SuDS Guidance SuDS Manual C753 all surface water should be appropriately treated prior to discharge.

6.2. Disposal Method

The Building Act 2000 Clause H3.3 recommends that connections to a public water sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being:

1. Disposal by Soakaway
2. Disposal to Watercourse
3. Disposal to Sewer.

Based on the above, the preferred method for disposal of surface water from the new development is via infiltration drainage. It is not proposed to dispose of surface water using this method, due to the findings of the geotechnical investigation which state:

'Whilst soakage tests were not within the scope of the ground investigation, it is considered that the disposal of collected surface water to soakaways will not be feasible at this site. This is due to the cohesive nature and therefore anticipated low permeability of the underlying soils.'

The nearest watercourse is located a minimum of 50m from the site. A connection to this watercourse would require installation of drainage runs in adjacent sites which would be disruptive. Therefore, it is not proposed to discharge to a watercourse.

It is proposed that the surface water should discharge into the public sewer located in Saville Lane, adjacent to the site.

6.3. Discharge Rates

The Barnsley Lead Local Flood Authority 'Local Plan' (adopted January 2019) states that new developments on brownfield sites are expected to reduce surface water run-off by at least 30%. Synthetic rainfall data applicable to the location has been used to determine peak surface water flows for both the existing and proposed site for a range of annual probabilities for the critical storm duration of various durations from 15 minutes up to 24 hours. A summary of the runoff rates is given below:

Table 2 – Run-off rates			
	1 in 1 year (l/s)	1 in 30 year (l/s)	1 in 100 year (l/s)
Pre-Development (Brownfield runoff)	1.9	4.7	6.1
Post-Development (Brownfield runoff with 30% reduction)	1.3	3.3	4.3

It is therefore proposed to limit surface water run-off from the new development into the public sewer to 1.31 l/s for the 1 in 1 year event increasing to maximum 4.3 l/s for events up to the 1 in 100 year event.

It is proposed to limit flows using a hydrobrake flow control device along with a underground cellular storage system. This will ensure that the downstream public sewer drainage system is not adversely affected by the proposal.

6.4. Underground Private Drainage Design

Underground surface water drainage will be designed to meet the following criteria:

- No surcharge for the 1 in 1 year return period storm event with a 10% allowance for urban creep
- No surface flooding for the 1 in 30 year return period storm event with a 10% allowance for urban creep
- No building, third party land or access road flooding for the 1 in 100 year return period event with a 30% allowance for climate change and a 10% allowance for urban creep

Drains will achieve a self-cleansing using the following criteria:

- Drains less than 300mm diameter in size achieve a minimum gradient of 1:DN. (BS EN 752.2008 9.6.3.1)
- Drains 300mm in diameter or larger to achieve a velocity of 1.0m/s in pipe full conditions. (BS EN 752.2008 NA.11.3.3)

6.5. SUDS Features

To ensure the quality of run off leaving the site is treated to a suitable level a number of SuDS features are incorporated into the development in line with CIRIA C753. The following treatments shall be incorporated into the development: -

- **Trapped drainage channels and gullies.** Sediment sumps are to be installed on all rainwater pipes, these will reduce flow velocities and allow larger particulates to settle out by gravitational separation.
- **Attenuation storage tanks.** Attenuation storage tanks will be used to create a below-ground void space for the temporary storage of surface water before controlled release.
- **Catchpits.** Catchpits will be used to prevent particulates from entering the attenuation storage tanks and ultimately the Yorkshire Water sewer system.

The above SuDS features shall ensure that surface water run-off is treated to a suitable level in accordance with Ciria C753.

6.6. Oil Separator

The proposed development includes a two parking spaces and tie-in hardstanding to the front of the building covering 118m².

In accordance with "Use and Design of Oil Separators in Surface Water Drainage Systems - PPG 3", separators are not considered necessary for less than 50 parking spaces, or areas smaller than 800m².

Properly maintained gully pots are considered to provide adequate protection.

6.7. Attenuation Structure

It is proposed to use a proprietary geocellular crate system for the attenuation structure. A manhole with a catchment pit acting as a silt trap, will be installed upstream to the attenuation structure. The silt traps will capture and prevent silt from entering the storage unit. The geotextile wrapped around the tank will prevent silt from directly entering the storage from the surrounding ground and also retain water within the tank. In addition to this, manholes are provided either side of the attenuation storage to allow access to clean the perforated pipe running through the attenuation tanks. The silt traps and perforated pipe will be cleaned as part of the regular surface water drainage maintenance schedule (see Figure 5). These measures will ensure the proposed SDS GEOLight attenuation units remain free from silt build-ups.

TABLE 21.3 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	

Figure 5 – Extract from SUDS manual

7. PROPOSED FOUL WATER STRATEGY

7.1. Design Philosophy

Underground foul water drainage has been designed using the Discharge Unit method of design on the probability theory to estimate maximum peak flows from appliances. The drainage system will accommodate flows generated using a typical frequency factor (k_{DU}) of 0.5 (intermittent use). The drainage pipes have been designed with a surface roughness factor k_s of 1.5mm.

This accumulates in a total of 4.9 discharge units and a discharge rate of 1.1/s arising from the proposed building only.

The foul water discharge flows by gravity from FWMH01 to combine with the proposed combined water sewer network in Saville Lane.

7.2. Disposal method

The proposed foul water drainage from the building will connect to the existing public sewer in Saville Lane.

Yorkshire Water will need to be consulted with regards to the capacity of the public sewer to accommodate the proposed flows.

7.3. Underground private drainage design

Drains to achieve the following minimum recommended gradients for pipe diameters less than 150mm (BS EN 752:2008):

Table NA.19 — Minimum recommended gradients for foul drains

Peak flow [l/s] ⁽¹⁾	Pipe size [mm]	Minimum gradient ⁽²⁾⁽³⁾⁽⁴⁾
< 1	75 100	1 in 40 1 in 40
> 1	75 100 150	1 in 80 1 in 80 ⁽⁵⁾ 1 in 150 ⁽⁶⁾⁽⁷⁾

¹⁾ Peak flows should be based on probability flow calculation methods.
²⁾ These gradients have been empirically demonstrated on the basis of 6 l WC flush volumes. Further research is necessary to evaluate the recommended gradients for use in system with very low WC flush volumes.
³⁾ Exceptionally, where the length of drain or sewer serving a small number of properties is very long, steeper gradients can be required.
⁴⁾ Where ground settlement is expected, steeper gradients are recommended.
⁵⁾ Minimum of one WC connected.
⁶⁾ Minimum of five WCs connected.
⁷⁾ Exceptionally, where a 150 mm diameter pipe is used to carry flows from less than five WCs, the minimum gradient should be 1 in 60.

Figure 6 - Pipe gradients from BS EN 752:2008

8. APPENDICES

Appendix A - Calculations

Client:	MCS PROJECTS	Job No.	SL05821
		Date:	January 2021
Project:	Saville Lane, Thurlstone, S36 9RE	Written by	T.Stevens
		Checked by	T.Flint
Title:	Drainage Design Calculations		

DRAINAGE DESIGN CALCULATIONS

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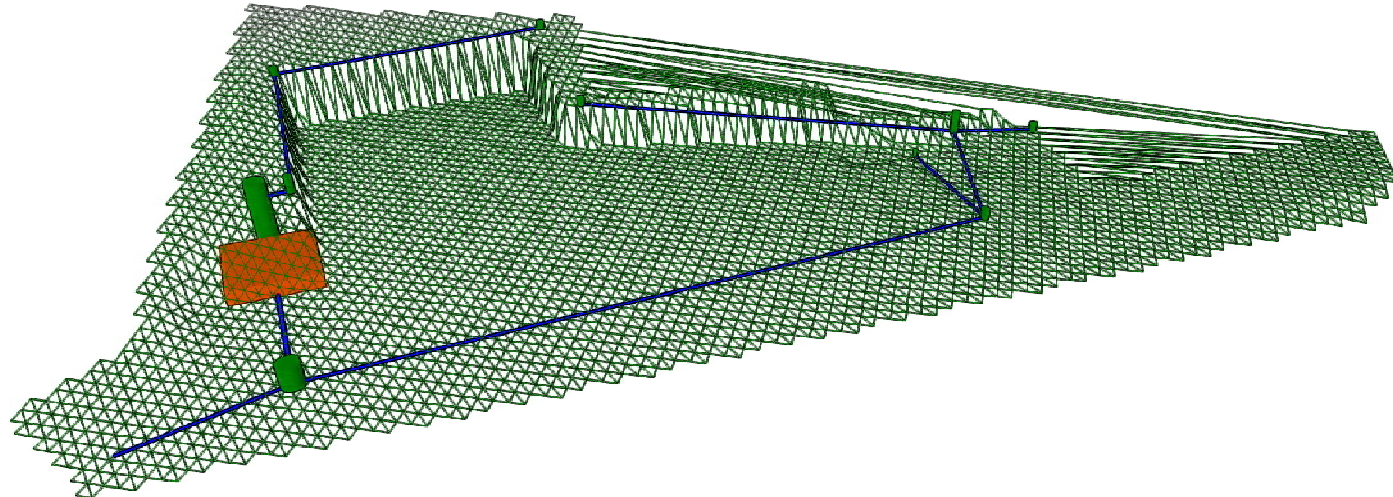
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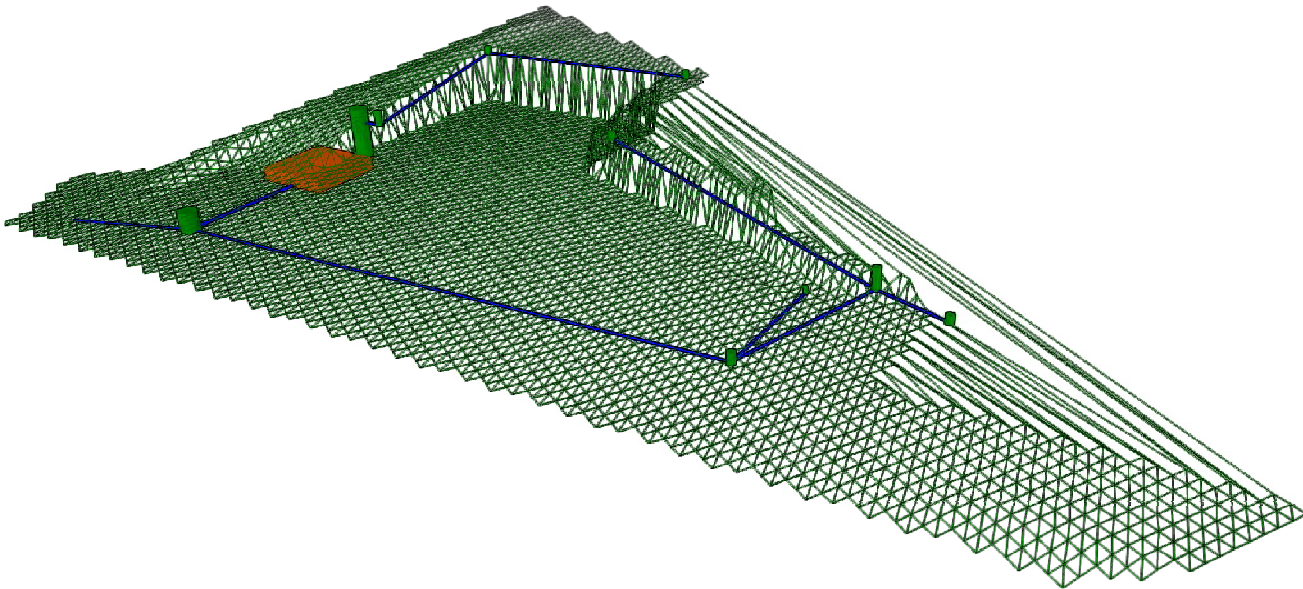
BS EN 752:2008 - Drain and sewer systems outside buildings

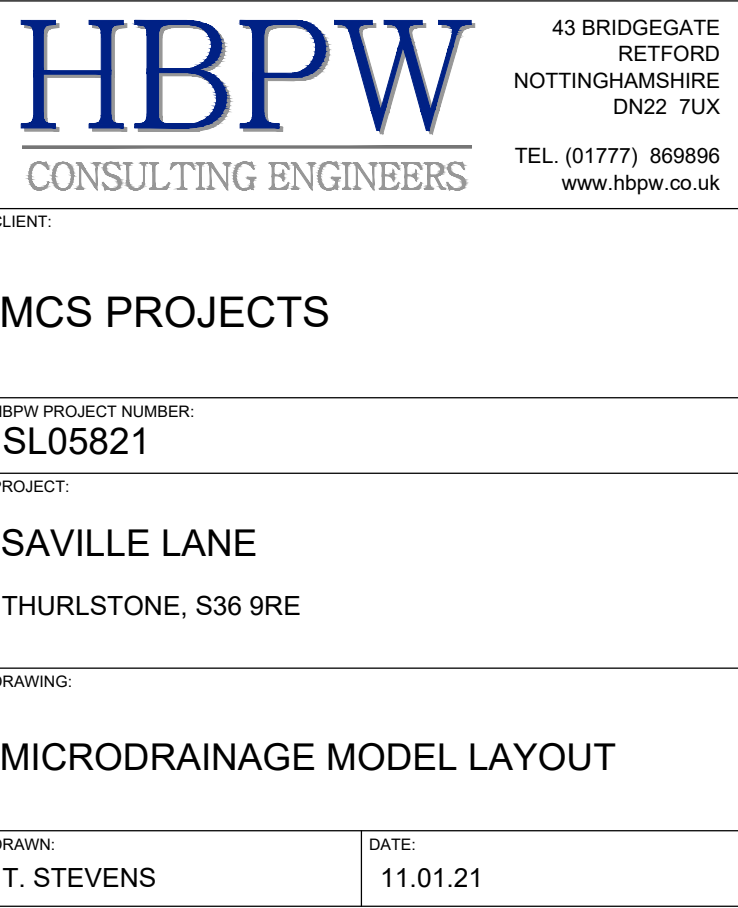
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Issue	Description	Written By	Approved by	Date
1	First issue	TS	TF	11/01/2021

Client:	MCS PROJECTS	Job No.	SL05821
		Date:	January 2021
Project:	Saville Lane, Thurlstone, S36 9RE	Written by	T.Stevens
		Checked by	T.Flint
Title:	Drainage Design Calculations		

SECTION A: OVERALL DRAINAGE LAYOUT

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Project:	Saville Lane, Thurlstone, S36 9RE	Written by	T.Stevens
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SECTION B: SURFACE WATER DRAINAGE

Client:	MCS PROJECTS	Job No.	SL05821
		Date:	January 2021
Project:	Saville Lane, Thurlstone, S36 9RE	Written by	T.Stevens
		Checked by	T.Flint
Title:	Drainage Design Calculations		

Surface Water drainage design assumptions:

Design Flows

Underground surface water drainage has been designed to meet the following criteria:

- No surcharge for the 1 in 2 year return period storm event with a 10% allowance for urban creep (not including drainage runs attached to attenuation).
- No site flooding for the 1 in 30 year return period storm event with a 10% allowance for urban creep.
- No off-site flooding for the 1 in 100 year return period event with a 10% allowance for urban creep and a 30% allowance for climate change.

Flow Velocities

Drains to achieve a self-cleansing using the following criteria:

- Drains less than 300mm diameter in size achieve a minimum gradient of 1:DN. (BS EN 752.2008 9.6.3.1).
- Drains 300mm in diameter or larger to achieve a velocity of 1.0m/s in pipe full conditions. (BS EN 752.2008 NA.11.3.3).

Modelled design instances

Summer storm events have not been modelled, as these are less severe than winter events.

The following is the list of modelled events:

- 1 in 2 year storm event (winter)
- 1 in 30 year storm event (winter)
- 1 in 100 year storm event (winter) + 40% CC
- The above storm events have all been modelled to the following storm durations:
 - 15 minutes
 - 30 minutes
 - 60 minutes
 - 120 minutes
 - 240 minutes
 - 360 minutes
 - 480 minutes
 - 960 minutes
 - 1440 minutes

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<u>STORM SEWER DESIGN by the Modified Rational Method</u>												
<u>Network Design Table for Storm</u>												
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
S1.000	8.043	0.054	150.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit		
S2.000	23.003	2.415	9.5	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit		
S3.000	4.959	0.040	124.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit		
S2.001	9.968	0.555	18.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		
S1.001	37.316	1.040	35.9	0.048	0.00	0.0	0.600	o	150	Pipe/Conduit		
S4.000	16.878	0.435	38.8	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit		
S4.001	11.468	2.515	4.6	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit		
S4.002	1.806	0.145	12.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S4.003	4.200	0.019	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S4.004	10.435	0.046	226.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
S1.002	8.039	0.050	160.8	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit		
<u>Network Results Table</u>												
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)		
S1.000	46.61	5.16	210.675	0.000	0.0	0.0	0.0	0.82	14.5	0.0		
S2.000	46.79	5.12	213.590	0.000	0.0	0.0	0.0	3.28	58.0	0.0		
S3.000	46.88	5.09	211.215	0.000	0.0	0.0	0.0	0.90	15.9	0.0		
S2.001	46.53	5.19	211.175	0.000	0.0	0.0	0.0	2.39	42.2	0.0		
S1.001	45.20	5.56	210.620	0.048	0.0	0.0	0.0	1.69	29.8	5.9		
S4.000	46.57	5.17	215.300	0.000	0.0	0.0	0.0	1.62	28.6	0.0		
S4.001	46.42	5.21	214.865	0.012	0.0	0.0	0.0	4.75	84.0	1.5		
S4.002	46.39	5.22	212.350	0.012	0.0	0.0	0.0	3.73	148.2	1.5		
S4.003	46.10	5.30	209.645	0.012	0.0	0.0	0.0	0.87	34.5	1.5		
S4.004	45.38	5.50	209.626	0.012	0.0	0.0	0.0	0.86	34.4	1.5		
S1.002	44.62	5.72	209.580	0.072	0.0	0.0	0.0	0.79	14.0	8.7		
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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.000	0.000	0.000
1.001	Classification	Roof	100	0.048	0.048	0.048
4.000	-	-	100	0.000	0.000	0.000
4.001	Classification	Roof	100	0.012	0.012	0.012
4.002	-	-	100	0.000	0.000	0.000
4.003	-	-	100	0.000	0.000	0.000
4.004	-	-	100	0.000	0.000	0.000
1.002	Classification	Vehicle yard	100	0.012	0.012	0.012
				Total	Total	Total
				0.072	0.072	0.072

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S9, DS/PN: S1.002, Volume (m³): 2.7

Unit Reference	MD-SHE-0061-1300-0500-1300
Design Head (m)	0.500
Design Flow (l/s)	1.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	209.580
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	1.3
Flush-Flo™	0.147	1.3
Kick-Flo®	0.334	1.1
Mean Flow over Head Range	-	1.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	1.200	1.9	3.000	2.9	7.000	4.4
0.200	1.3	1.400	2.1	3.500	3.2	7.500	4.6
0.300	1.2	1.600	2.2	4.000	3.4	8.000	4.7
0.400	1.2	1.800	2.3	4.500	3.5	8.500	4.9
0.500	1.3	2.000	2.4	5.000	3.7	9.000	5.0
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.1
0.800	1.6	2.400	2.6	6.000	4.1		
1.000	1.8	2.600	2.7	6.500	4.2		

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Summary Wizard of 15 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.671	-0.099	0.043		7.2	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.881	-0.134	0.004		1.8	OK	
S4.002	S7	213.549	212.377	-0.198	0.005		1.8	OK	
S4.003	S8	213.520	209.785	-0.085	0.153		1.7	OK	
S4.004	SAttenuation	212.458	209.785	-0.066	3.858	35	1.1	OK*	
S1.002	S9	211.059	209.851	0.121	0.789		1.3	SURCHARGED	

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Summary Wizard of 30 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.667	-0.103	0.039		6.2	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.880	-0.135	0.004		1.6	OK	
S4.002	S7	213.549	212.375	-0.200	0.004		1.6	OK	
S4.003	S8	213.520	209.824	-0.046	0.197		1.3	OK	
S4.004	SAttenuation	212.458	209.824	-0.027	4.820	42	1.1	OK*	
S1.002	S9	211.059	209.852	0.122	0.791		1.3	SURCHARGED	

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Summary Wizard of 60 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.660	-0.110	0.032		4.5	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.876	-0.139	0.002		1.1	OK	
S4.002	S7	213.549	212.372	-0.203	0.004		1.1	OK	
S4.003	S8	213.520	209.842	-0.028	0.218		0.9	OK	
S4.004	SAttenuation	212.458	209.842	-0.009	5.264	48	1.1	OK*	
S1.002	S9	211.059	209.842	0.112	0.768		1.3	SURCHARGED	

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Summary Wizard of 120 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.652	-0.118	0.025		3.0	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.872	-0.143	0.001		0.7	OK	
S4.002	S7	213.549	212.365	-0.210	0.002		0.7	OK	
S4.003	S8	213.520	209.838	-0.032	0.212		0.6	OK	
S4.004	SAttenuation	212.458	209.838	-0.013	5.151	61	1.1	OK*	
S1.002	S9	211.059	209.837	0.107	0.757		1.3	SURCHARGED	

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Summary Wizard of 240 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.675	-0.150	0.000			0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000			0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000			0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000			0.0	OK	
S1.001	S4	211.375	210.645	-0.125	0.019			1.9	OK	
S4.000	S5	215.898	215.300	-0.150	0.000			0.0	OK	
S4.001	S6	215.520	214.869	-0.146	0.000			0.5	OK	
S4.002	S7	213.549	212.359	-0.216	0.001			0.5	OK	
S4.003	S8	213.520	209.796	-0.074	0.166			0.4	OK	
S4.004	SAttenuation	212.458	209.796	-0.055	4.139		68	1.1	OK*	
S1.002	S9	211.059	209.796	0.066	0.659			1.3	SURCHARGED	

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Summary Wizard of 360 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.641	-0.129	0.015		1.4	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.868	-0.147	0.000		0.4	OK	
S4.002	S7	213.549	212.357	-0.218	0.000		0.4	OK	
S4.003	S8	213.520	209.752	-0.118	0.116		0.3	OK	
S4.004	SAttenuation	212.458	209.752	-0.099	3.056	61	0.8	OK*	
S1.002	S9	211.059	209.752	0.022	0.506		1.3	SURCHARGED	

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Summary Wizard of 480 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	210.639	-0.131	0.013		1.2	OK
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.868	-0.147	0.000		0.3	OK
S4.002	S7	213.549	212.356	-0.219	0.000		0.3	OK
S4.003	S8	213.520	209.717	-0.153	0.075		0.3	OK
S4.004	SAttenuation	212.458	209.716	-0.135	2.185	59	0.7	OK*
S1.002	S9	211.059	209.716	-0.014	0.370		1.3	OK

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Summary Wizard of 960 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	210.636	-0.134	0.010		0.7	OK
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.867	-0.148	0.000		0.2	OK
S4.002	S7	213.549	212.354	-0.221	0.000		0.2	OK
S4.003	S8	213.520	209.656	-0.214	0.007		0.2	OK
S4.004	SAttenuation	212.458	209.650	-0.201	0.572	99	0.2	OK*
S1.002	S9	211.059	209.648	-0.082	0.159		1.1	OK

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Summary Wizard of 1440 minute 2 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	210.634	-0.136	0.008		0.6	OK
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.866	-0.149	0.000		0.1	OK
S4.002	S7	213.549	212.353	-0.222	0.000		0.1	OK
S4.003	S8	213.520	209.651	-0.219	0.001		0.1	OK
S4.004	SAttenuation	212.458	209.638	-0.213	0.289	151	0.1	OK*
S1.002	S9	211.059	209.633	-0.097	0.121		0.8	OK

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Summary Wizard of 15 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.704	-0.121	0.002			0.0		OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0		OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0		OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0		OK
S1.001	S4	211.375	210.704	-0.066	0.073			17.2		OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0		OK
S4.001	S6	215.520	214.888	-0.127	0.007			4.3		OK
S4.002	S7	213.549	212.392	-0.183	0.008			4.3		OK
S4.003	S8	213.520	209.980	0.110	0.373			3.2		SURCHARGED
S4.004	SAttenuation	212.458	209.980	0.129	8.557		71	1.1		SURCHARGED*
S1.002	S9	211.059	209.980	0.250	1.037			1.3		SURCHARGED

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Summary Wizard of 30 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.692	-0.133	0.001			0.0		OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0		OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0		OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0		OK
S1.001	S4	211.375	210.692	-0.078	0.062			13.1		OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0		OK
S4.001	S6	215.520	214.885	-0.130	0.006			3.3		OK
S4.002	S7	213.549	212.386	-0.189	0.007			3.3		OK
S4.003	S8	213.520	210.084	0.214	0.491			2.5		SURCHARGED
S4.004	SAttenuation	212.458	210.084	0.233	11.041		90	1.2		SURCHARGED*
S1.002	S9	211.059	210.084	0.354	1.220			1.3		SURCHARGED

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Summary Wizard of 60 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.677	-0.148	0.000			0.0		OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0		OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0		OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0		OK
S1.001	S4	211.375	210.677	-0.093	0.049			8.9		OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0		OK
S4.001	S6	215.520	214.882	-0.133	0.005			2.2		OK
S4.002	S7	213.549	212.379	-0.196	0.005			2.2		OK
S4.003	S8	213.520	210.166	0.296	0.584			1.7		SURCHARGED
S4.004	SAttenuation	212.458	210.166	0.315	12.985		102	1.3		SURCHARGED*
S1.002	S9	211.059	210.166	0.436	1.361			1.4		SURCHARGED

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Summary Wizard of 120 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.675	-0.150	0.000			0.0		OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0		OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0		OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0		OK
S1.001	S4	211.375	210.665	-0.105	0.037			5.7		OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0		OK
S4.001	S6	215.520	214.878	-0.137	0.003			1.4		OK
S4.002	S7	213.549	212.374	-0.201	0.004			1.4		OK
S4.003	S8	213.520	210.193	0.323	0.614			1.1		SURCHARGED
S4.004	SAttenuation	212.458	210.193	0.342	13.624		111	1.3		SURCHARGED*
S1.002	S9	211.059	210.192	0.462	1.407			1.4		SURCHARGED

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Summary Wizard of 240 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.655	-0.115	0.027		3.5	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.873	-0.142	0.001		0.9	OK	
S4.002	S7	213.549	212.367	-0.208	0.003		0.9	OK	
S4.003	S8	213.520	210.166	0.296	0.584		0.7	SURCHARGED	
S4.004	SAttenuation	212.458	210.166	0.315	12.985	141	1.2	SURCHARGED*	
S1.002	S9	211.059	210.165	0.435	1.361		1.4	SURCHARGED	

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Summary Wizard of 360 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	210.650	-0.120	0.023		2.6	OK
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.871	-0.144	0.000		0.6	OK
S4.002	S7	213.549	212.363	-0.212	0.002		0.6	OK
S4.003	S8	213.520	210.116	0.246	0.527		0.5	SURCHARGED
S4.004	SAttenuation	212.458	210.116	0.265	11.798	152	1.1	SURCHARGED*
S1.002	S9	211.059	210.116	0.386	1.274		1.3	SURCHARGED

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Summary Wizard of 480 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.647	-0.123	0.020		2.1	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.870	-0.145	0.000		0.5	OK	
S4.002	S7	213.549	212.360	-0.215	0.001		0.5	OK	
S4.003	S8	213.520	210.063	0.193	0.467		0.4	SURCHARGED	
S4.004	SAttenuation	212.458	210.063	0.212	10.540	162	1.2	SURCHARGED*	
S1.002	S9	211.059	210.063	0.333	1.182		1.3	SURCHARGED	

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Summary Wizard of 960 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.330
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status ON
 Inertia Status ON

Profile(s) Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 10, 10, 40

			Water	Surcharged			Half Drain	Pipe	
	US/MH	US/CL	Level	Depth	Maximum		Time	Flow	
PN	Name	(m)	(m)	(m)	Vol (m³)		(mins)	(l/s)	Status
S1.000	SRE1	211.238	210.675	-0.150	0.000			0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0	OK
S1.001	S4	211.375	210.640	-0.130	0.014			1.3	OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0	OK
S4.001	S6	215.520	214.868	-0.147	0.000			0.3	OK
S4.002	S7	213.549	212.356	-0.219	0.000			0.3	OK
S4.003	S8	213.520	209.828	-0.042	0.202			0.3	OK
S4.004	SAttenuation	212.458	209.828	-0.023	4.921		116	0.8	OK*
S1.002	S9	211.059	209.828	0.098	0.734			1.3	SURCHARGED

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Summary Wizard of 1440 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	210.638	-0.132	0.012		0.9	OK
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.867	-0.148	0.000		0.2	OK
S4.002	S7	213.549	212.355	-0.220	0.000		0.2	OK
S4.003	S8	213.520	209.694	-0.176	0.050		0.2	OK
S4.004	SAttenuation	212.458	209.694	-0.157	1.640	105	0.4	OK*
S1.002	S9	211.059	209.694	-0.036	0.285		1.2	OK

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Summary Wizard of 15 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.846	0.021	0.012			0.1	SURCHARGED	
S2.000	S1	214.191	213.590	-0.150	0.000			0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000			0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000			0.0	OK	
S1.001	S4	211.375	210.847	0.077	0.223			25.5	SURCHARGED	
S4.000	S5	215.898	215.300	-0.150	0.000			0.0	OK	
S4.001	S6	215.520	214.896	-0.119	0.010			7.1	OK	
S4.002	S7	213.549	212.404	-0.171	0.011			7.1	OK	
S4.003	S8	213.520	210.242	0.372	0.670			5.5	SURCHARGED	
S4.004	SAttenuation	212.458	210.242	0.391	14.798		110	1.4	SURCHARGED*	
S1.002	S9	211.059	210.243	0.513	1.497			1.5	SURCHARGED	

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Summary Wizard of 30 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.719	-0.106	0.003			0.0		OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0		OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0		OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0		OK
S1.001	S4	211.375	210.719	-0.051	0.088			21.8		OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0		OK
S4.001	S6	215.520	214.892	-0.123	0.009			5.5		OK
S4.002	S7	213.549	212.398	-0.177	0.009			5.5		OK
S4.003	S8	213.520	210.441	0.571	0.895			4.1		SURCHARGED
S4.004	SAttenuation	212.458	210.441	0.590	19.533		129	1.5		SURCHARGED*
S1.002	S9	211.059	210.441	0.711	1.844			1.7		SURCHARGED

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Summary Wizard of 60 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.697	-0.128	0.001			0.0		OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0		OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0		OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0		OK
S1.001	S4	211.375	210.697	-0.073	0.067			14.9		OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0		OK
S4.001	S6	215.520	214.886	-0.129	0.007			3.7		OK
S4.002	S7	213.549	212.389	-0.186	0.007			3.7		OK
S4.003	S8	213.520	210.621	0.751	1.098			2.8		SURCHARGED
S4.004	SAttenuation	212.458	210.621	0.770	23.816		145	1.7		SURCHARGED*
S1.002	S9	211.059	210.621	0.891	2.150			1.8		SURCHARGED

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Summary Wizard of 120 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	211.055	0.230	0.026		0.0	FLOOD RISK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	211.055	0.285	0.327		9.5	SURCHARGED
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.882	-0.133	0.005		2.4	OK
S4.002	S7	213.549	212.380	-0.195	0.006		2.4	OK
S4.003	S8	213.520	211.046	1.176	1.579		1.8	SURCHARGED
S4.004	SAttenuation	212.458	210.626	0.775	24.343	167	1.7	SURCHARGED*
S1.002	S9	211.059	211.045	1.315	2.687		2.1	FLOOD RISK

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Summary Wizard of 240 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.985	0.160	0.022		0.0	FLOOD RISK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.985	0.215	0.292		5.8	SURCHARGED	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.879	-0.136	0.003		1.4	OK	
S4.002	S7	213.549	212.374	-0.201	0.004		1.4	OK	
S4.003	S8	213.520	210.976	1.106	1.500		1.1	SURCHARGED	
S4.004	SAttenuation	212.458	210.626	0.775	24.273	201	1.7	SURCHARGED*	
S1.002	S9	211.059	210.976	1.246	2.608		2.1	FLOOD RISK	

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Summary Wizard of 360 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	210.772	-0.053	0.006		0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	210.772	0.002	0.149		4.3	SURCHARGED
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.875	-0.140	0.002		1.1	OK
S4.002	S7	213.549	212.371	-0.204	0.004		1.1	OK
S4.003	S8	213.520	210.764	0.894	1.260		0.9	SURCHARGED
S4.004	SAttenuation	212.458	210.626	0.775	24.060	211	1.6	SURCHARGED*
S1.002	S9	211.059	210.763	1.033	2.360		1.9	FLOOD RISK

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Summary Wizard of 480 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Maximum Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK
S1.001	S4	211.375	210.654	-0.116	0.027		3.5	OK
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK
S4.001	S6	215.520	214.873	-0.142	0.001		0.9	OK
S4.002	S7	213.549	212.367	-0.208	0.003		0.9	OK
S4.003	S8	213.520	210.598	0.728	1.072		0.7	SURCHARGED
S4.004	SAttenuation	212.458	210.598	0.747	23.262	218	1.5	SURCHARGED*
S1.002	S9	211.059	210.597	0.867	2.115		1.8	SURCHARGED

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Summary Wizard of 960 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain Pipe		Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Pipe Flow (l/s)		
S1.000	SRE1	211.238	210.675	-0.150	0.000		0.0	OK	
S2.000	S1	214.191	213.590	-0.150	0.000		0.0	OK	
S3.000	S2	211.824	211.215	-0.150	0.000		0.0	OK	
S2.001	S3	212.741	211.175	-0.150	0.000		0.0	OK	
S1.001	S4	211.375	210.646	-0.124	0.020		2.0	OK	
S4.000	S5	215.898	215.300	-0.150	0.000		0.0	OK	
S4.001	S6	215.520	214.870	-0.145	0.000		0.5	OK	
S4.002	S7	213.549	212.360	-0.215	0.001		0.5	OK	
S4.003	S8	213.520	210.353	0.483	0.796		0.4	SURCHARGED	
S4.004	SAttenuation	212.458	210.353	0.502	17.448	258	1.1	SURCHARGED*	
S1.002	S9	211.059	210.353	0.623	1.689		1.6	SURCHARGED	

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Summary Wizard of 1440 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.330
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	10, 10, 40

PN	US/MH Name	US/CL (m)	Water		Surcharged		Half Drain		Pipe	Status
			Level (m)	Depth (m)	Maximum Vol (m³)	Time (mins)	Flow (l/s)			
S1.000	SRE1	211.238	210.675	-0.150	0.000			0.0		OK
S2.000	S1	214.191	213.590	-0.150	0.000			0.0		OK
S3.000	S2	211.824	211.215	-0.150	0.000			0.0		OK
S2.001	S3	212.741	211.175	-0.150	0.000			0.0		OK
S1.001	S4	211.375	210.642	-0.128	0.016			1.5		OK
S4.000	S5	215.898	215.300	-0.150	0.000			0.0		OK
S4.001	S6	215.520	214.868	-0.147	0.000			0.4		OK
S4.002	S7	213.549	212.357	-0.218	0.001			0.4		OK
S4.003	S8	213.520	210.152	0.282	0.568			0.3		SURCHARGED
S4.004	SAttenuation	212.458	210.152	0.301	12.647		248	0.9		SURCHARGED*
S1.002	S9	211.059	210.151	0.421	1.336			1.4		SURCHARGED

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Client:	MCS PROJECTS	Job No.	SL05821
		Date:	January 2021
Project:	Saville Lane, Thurlstone, S36 9RE	Written by	T.Stevens
		Checked by	T.Flint
Title:	Drainage Design Calculations		

SECTION C: FOUL WATER DRAINAGE

Client:	MCS PROJECTS	Job No.	SL05821
		Date:	January 2021
Project:	Saville Lane, Thurlstone, S36 9RE	Written by	T.Stevens
		Checked by	T.Flint
Title:	Drainage Design Calculations		

Foul Water drainage design assumptions:

Design Flows

Underground foul water drainage has been designed using the Discharge Unit method of design on the probability theory to estimate maximum peak flows from appliances.

The drainage system will accommodate flows generated using a typical frequency factor (k_{DU}) of 0.5 (intermittent use).

The drainage pipes have been designed with a surface roughness factor k_s of 1.5mm.

Flow Velocities

Drains to achieve the following minimum recommended gradients for pipe diameters less 150mm (BS EN 752.2008):

Table NA.19 — Minimum recommended gradients for foul drains

Peak flow [l/s] ⁽¹⁾	Pipe size [mm]	Minimum gradient ⁽²⁾⁽³⁾⁽⁴⁾
< 1	75 100	1 in 40 1 in 40
> 1	75 100 150	1 in 80 1 in 80 ⁽⁵⁾ 1 in 150 ⁽⁶⁾⁽⁷⁾
¹⁾ Peak flows should be based on probability flow calculation methods. ²⁾ These gradients have been empirically demonstrated on the basis of 6 l WC flush volumes. Further research is necessary to evaluate the recommended gradients for use in system with very low WC flush volumes. ³⁾ Exceptionally, where the length of drain or sewer serving a small number of properties is very long, steeper gradients can be required. ⁴⁾ Where ground settlement is expected, steeper gradients are recommended. ⁵⁾ Minimum of one WC connected. ⁶⁾ Minimum of five WCs connected. ⁷⁾ Exceptionally, where a 150 mm diameter pipe is used to carry flows from less than five WCs, the minimum gradient should be 1 in 60.		

Foul Water Flow Discharge Unit Calculations

Frequency Factor, k_{DU}	0.5
Kinematic viscosity, ν	1.31E-06
K Factor	1.5
Surface Roughness, k_s	1.5

[illegible]

(Calculations based upon the Colebrook-White Equation & BS 752)

HBPW LLP		Page 1
43 Bridgegate Retford DN22 7UX	SL05821 Saville Lane Thurlstone, S36 9RE	
Date 11/01/2021 File SL05821_rev 2.MDX	Designed by T.Stevens Checked by T.Flint	
XP Solutions	Network 2020.1	

FOUL SEWERAGE DESIGN

Network Design Table for Foul - Unit

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	4.801	0.120	40.0	0.000	4.9	0.0	1.500	o	100	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	210.620	0.000	0.0	4.9	0.0	25	0.72	1.05	8.3	1.1

Appendix B - Proposed Drainage Drawings

CONCRETE ST4 CAST IN-SITU RAISING PIECE
REBATED AS NECESSARY AND FINISHED
SMOOTH AND EVEN. PORTLAND CEMENT IS TO
BE USED WHEN THE AMBIENT TEMPERATURE
CAN BE EXPECTED TO FALL BELOW 5°C WITHIN
7 DAYS OF CASTING.

ILLUSTRATIVE CHANNEL KERB, KERB
TO SIT ON CONCRETE RASING PIECE.

PIN HINGED GULLY COVER AND FRAME TO BE INSTALLED IN
ACCORDANCE WITH BS EN 124. SEE TABLE 4 FOR MANHOLE
GLASS REQUIRED DEPENDING ON GULLY LOCATION.

10mm RECESS REQUIRED BETWEEN
GULLY COVER AND GL SURFACING.

GULLY FRAME TO BE BEDDED ON
10-20mm POLYESTER RESIN MORTAR.

NOMINAL FALL
TOWARDS GULLY

12mm THK. COMPRESSIBLE FILLER
BOARD, OR PRE-FORMED JOINT
FILLER FOR FULL THICKNESS OF
CONCRETE BED AND SURROUND.

GALVANISED METAL CHAIN
AND CONCRETE STOPPER.

OUTLET PIPE
150mmØ OUTLET
WITH 600mm LONG
ROCKER PIPE.

150mm Ø OUTLET PIPE
SURROUNDED WITH 150mm
ST4 (C16/20) CONCRETE DOWN
TO A DEPTH OF COVER:
1. CARRIAGeways 1200mm
2. FOOTWAYS/SERVE
900mm

150mm INSITU CONCRETE BED &
SURROUND, MIN. GRADE ST4
(C16/20) TO GULLY POT.

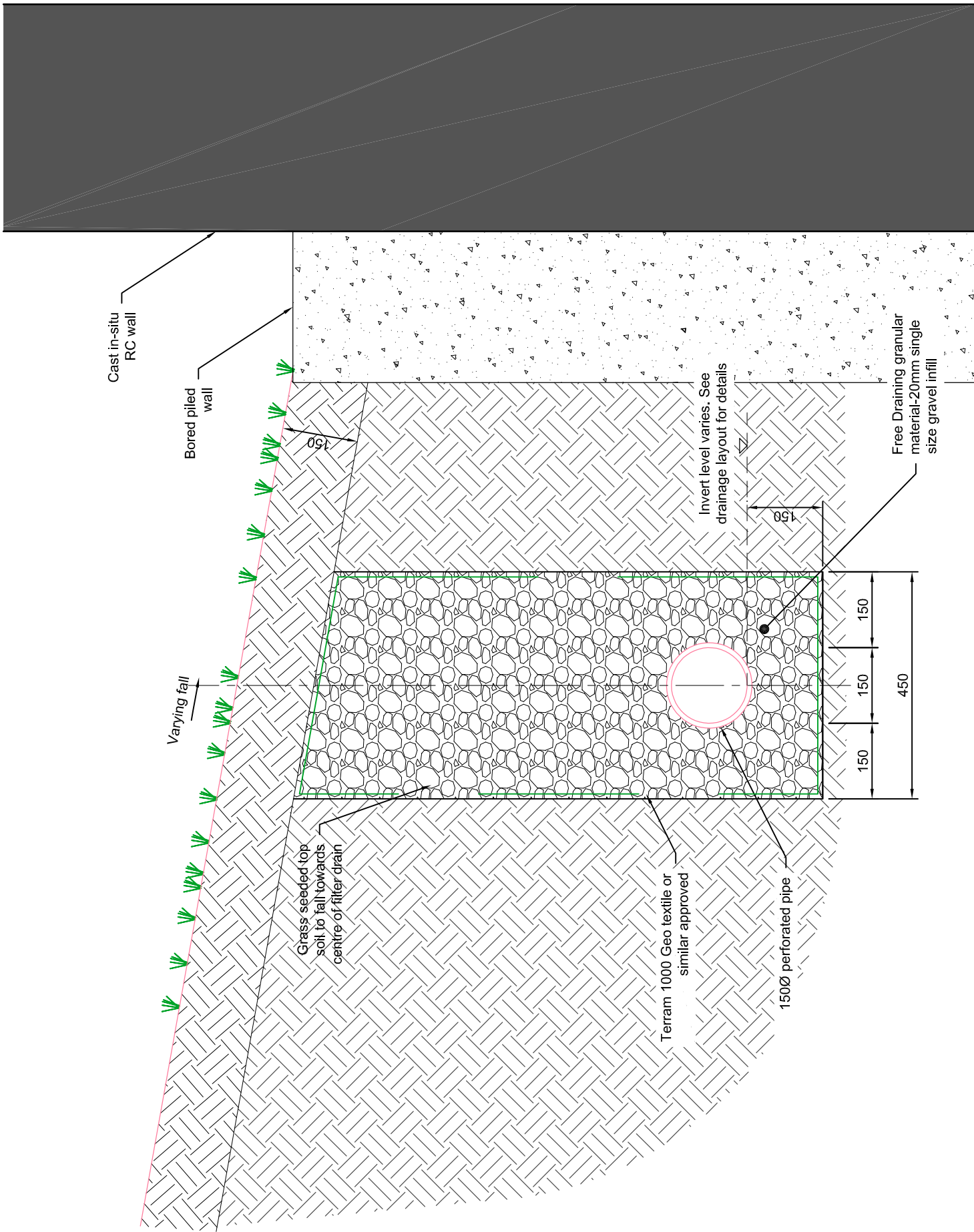
MIN. 900x450mm PRECAST CONCRETE
POT GULLY POT. MIN. SIZES TO BE
SPECIFIED BY THE DESIGNER.

GULLY DETAIL

SCALE 1:10

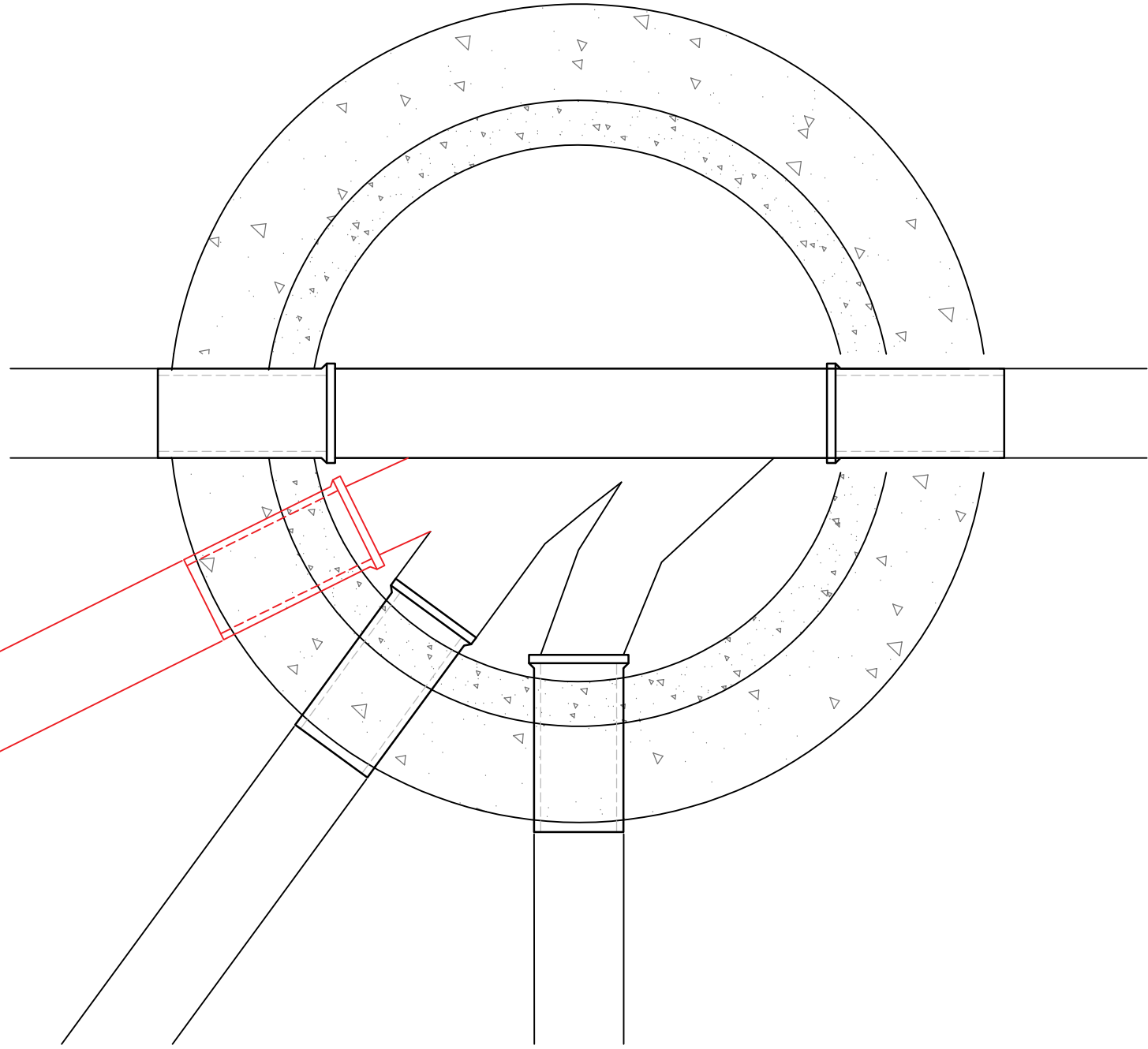
SECTION THROUGH FILTER DRAIN

Scale 1:10



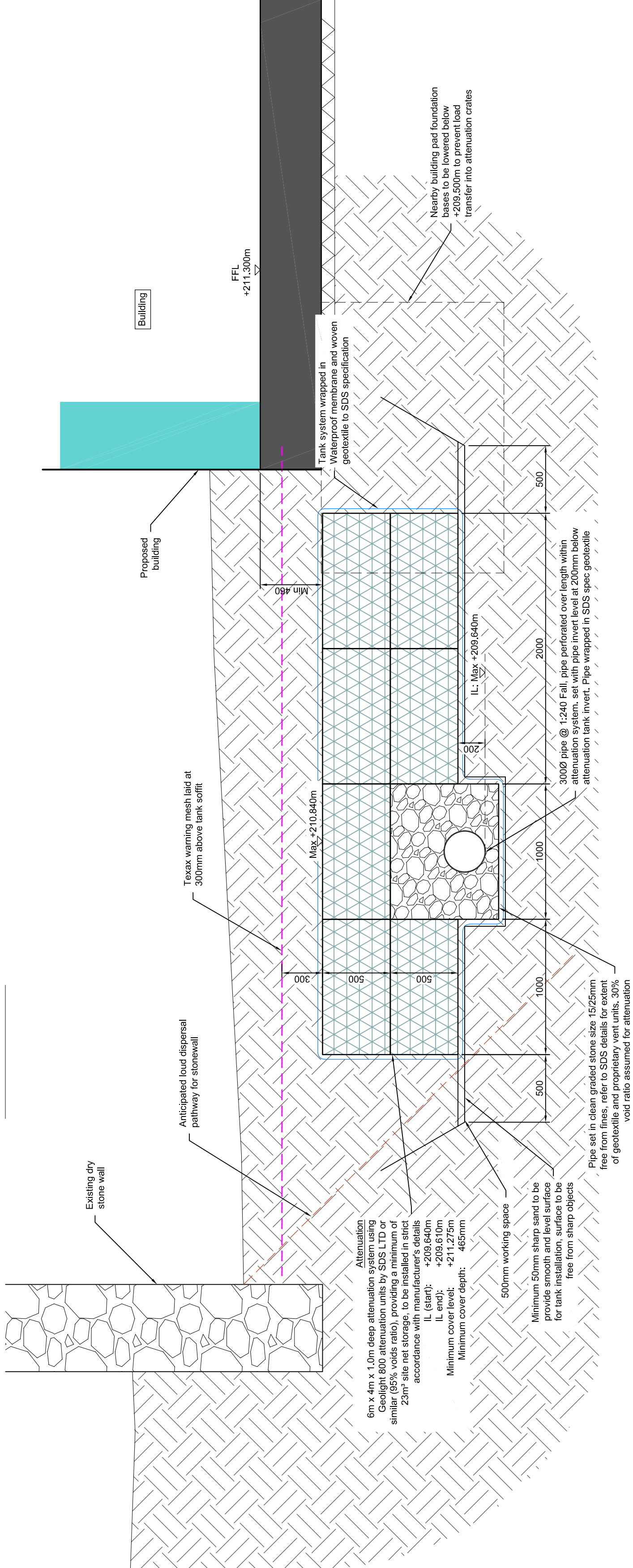
New connection to existing manhole,
benching to be modified to suit exact entry
position.

Rocker pipe to be provided if rigid pipe is
selected.



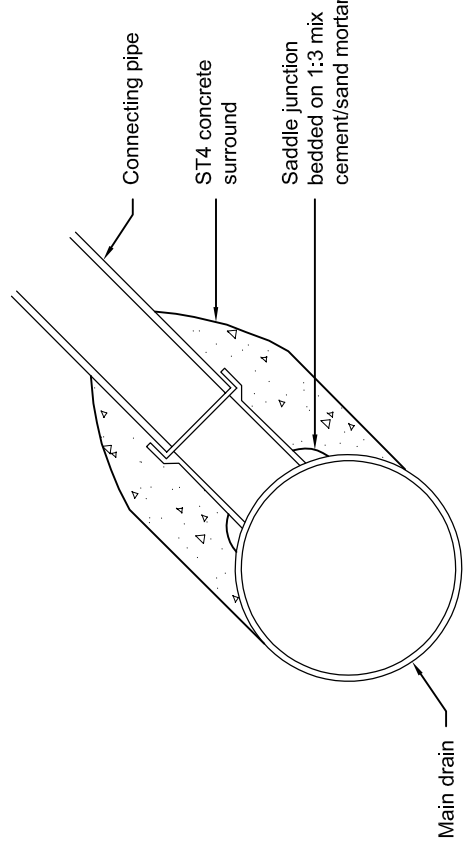
CONNECTION DETAIL TO EXISTING MH04

SCALE 1:10



SECTION A-A THROUGH ATTENUATION

Scale 1:25



SADDLE CONNECTION

Scale 1:10

NOTES

- DO NOT SCALE OFF THIS DRAWING.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS THE ENGINEER SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- ALL DRAWINGS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EXECUTE THE WORKS AT ALL TIMES IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE HEALTH AND SAFETY AT WORK ACT 1974 AND CDM REGULATIONS 2015.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS.
- ALL DRAINAGE IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING REGULATIONS.
- DRAINAGE ON SITE IS CONSIDERED AS PRIVATE, AND IS NOT SUBJECT TO BEING ADOPTED.
- ALL MANHOLE COVER LEVELS ARE APPROXIMATE.
- ALL RAINWATER DOWNPIPES TO BE FITTED WITH A RODDING FACILITY LOCATED ABOVE GROUND LEVEL.
- SURFACE WATER DRAINAGE HAS BEEN DESIGNED TO SATISFY THE FOLLOWING CRITERIA:
 - NO SURCHARGE DURING A 1 IN 2 YEAR STORM + 10% URBAN CREEP (NOT INCLUDING DRAINAGE RUNS ATTACHED TO ATTENUATION)
 - NO SITE FLOODING DURING A 1 IN 30 YEAR STORM + 10% URBAN CREEP
 - NO OFF-SITE OR BUILDING FLOODING DURING A 1 IN 100 YEAR STORM + 10% URBAN CREEP + 30% CC
 - ALL OF THE ABOVE HAVE BEEN CHECKED UNDER THE STORM DURATIONS:
 - FOLLOWING 15 MINUTES, 30 MINUTES, 60 MINUTES, 120 MINUTES, 240 MINUTES, 360 MINUTES, 480 MINUTES, 960 MINUTE AND 1440 MINUTES.

SAFETY, HEALTH AND ENVIRONMENTAL

IN ADDITION TO THE HAZARDS OR RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, THE FOLLOWING ADDITIONAL RESIDUAL RISKS SHOULD BE NOTED.

CONSTRUCTION:

MAINTENANCE, CLEANING AND OPERATION :

DECOMMISSIONING OR DEMOLITION :

PRELIMINARY

A	ATTENUATION TANK UPDATED	TS	TF	TF	11/01/21
-	FIRST ISSUE	TS	TF	TF	27/11/20
REV	DESCRIPTION	BY	CHK	APP	DATE
REVISION TABLE					
HBPW CONSULTING ENGINEERS					
43 BRIDGEGATE NOTTINGHAMSHIRE DN2 7UX TEL: (01777) 889888 www.hbpw.co.uk					

CLIENT:

MCS GROUP LTD

TBPW PROJECT NUMBER:

SL05821

PROJECT:

SAVILLE LANE

THURLSTONE, S36 9RE

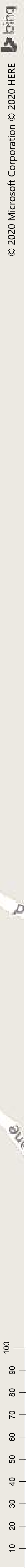
DRAWING:

DRAINAGE DETAILS SHEET 2

PROJECT ENGINEER:	DRAWN:		
T.STEVENS	T.STEVENS		
CHECKED:	APPROVED:		
T.FLINT	T.FLINT		
DATE:	SCALE:	SIZE:	SUITABILITY: REVISION:
27.11.2020	1:100	A1	S0 A
DOCUMENT REFERENCE NUMBER:			

SL05821.502

Appendix C - Existing Site & Asset Location Drawings



1. DO NOT SCALE OFF THIS DRAWING.
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PRELIMINARY

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NOTTINGHAMSHIRE
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MCS PROJECTS

SL05821

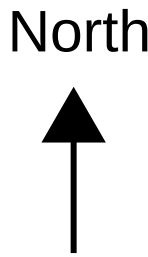
SAVILLE LANE
THURLSTONE, S36 9

SITE LOCATION PLAN

PROJECT ENGINEER:
T.STEVENS

CHECKED:
T.FLINT

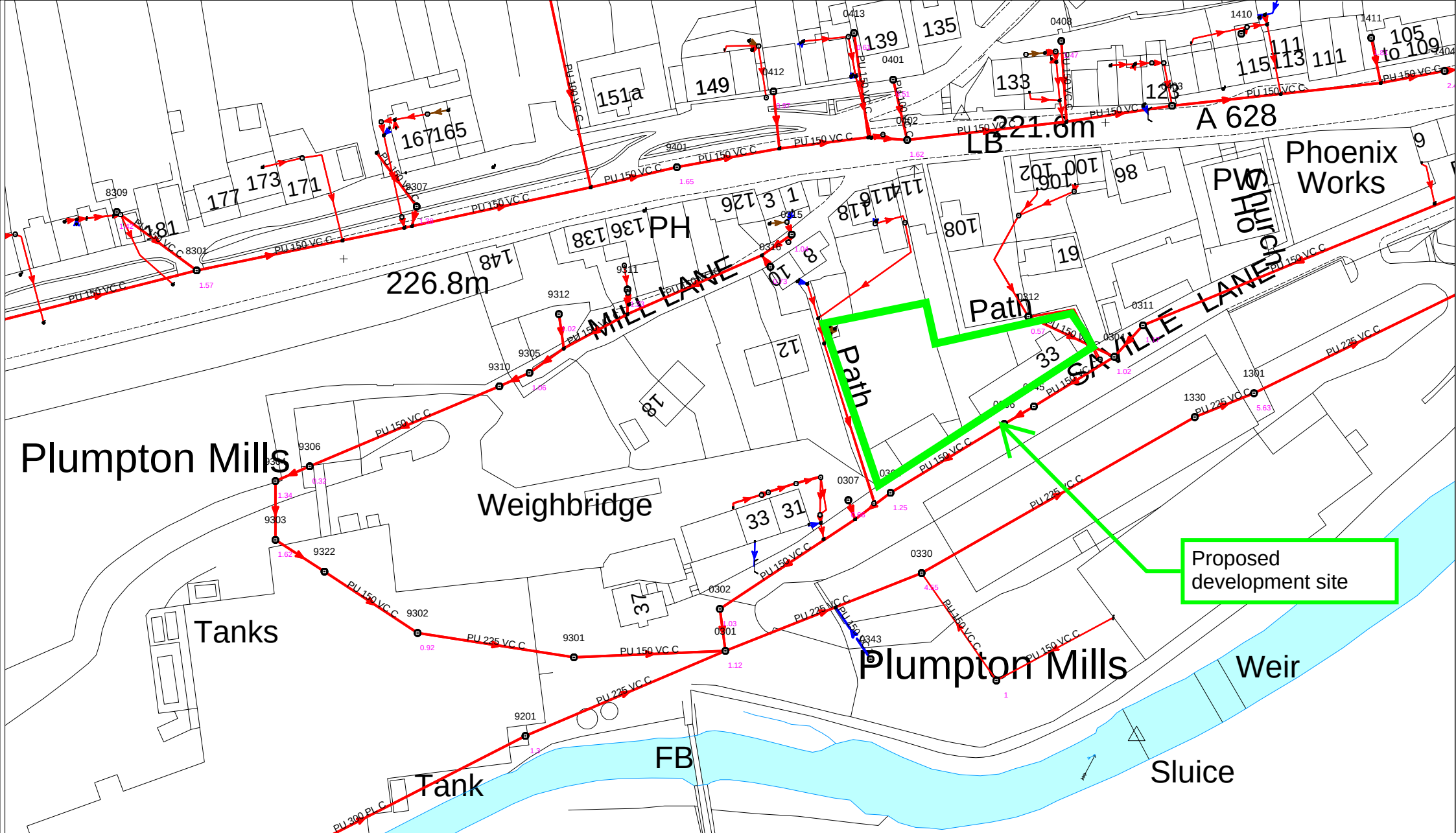
R:	SL05821.900
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EXISTING
SITE
EXTENTS



EXISTING TOPOGRAPHIC SURVEY



	422871 : 403278	Map Name : SE2203SE	Title	Partial Key Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS	This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.
	 Yorkshire Water PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582		Notes		
			(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2014. All rights reserved Ordnance Survey Licence number 100022432		
			Date Req : 16/12/2020, 13:59:34		
Source : Sewer Network Enquiry					

Appendix D - Proprietary Cellular Storage System Literature

SDS

Water
Infrastructure
Systems

INNOVATORS IN
WATER TECHNOLOGY

SDS GEOLight®

Stormwater Management System



SDS GEOLight® is an ultra lightweight honeycombed modular structure, made from recycled PVC, that provides an underground storage facility for the application of stormwater attenuation or infiltration.

SDS
Water
Infrastructure
Systems

Stormwater Management

The Environment Agency is keen to promote the wider use of sustainable drainage systems, which reduce the impact of surface water runoff. There are two main ways of storing surface water for stormwater management:

- Stormwater attenuation tanks
- Soakaway infiltration systems

Stormwater Attenuation Systems

This consists of underground water storage facilities that hold excess water during periods of peak rainfall.

The stored water is gradually released in a controlled manner into the surface water drainage system or directly into watercourses, reducing the risk of upstream and downstream flooding.

Soakaway Infiltration Systems

Soakaways are designed to store surface water runoff until it can be gradually absorbed by the surrounding ground.

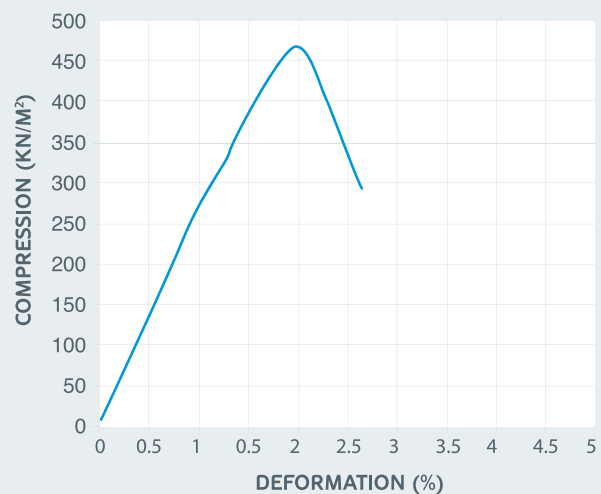
SDS GEOLight® – an efficient and economic solution for stormwater management.

SDS GEOLight® Attenuation

SDS GEOLight® has been specifically designed to form underground water storage reservoirs in stormwater management schemes. Its honeycombed structure gives it certain unique characteristics that make it ideal for this purpose:

- The high void rate (95%) of GEOLight® means that the maximum volume of water is stored in the minimum volume of storage unit.
- High compressive strength. GEOLight® is available in two strengths as standard: 200 and 400kN/m². Note: Higher compressive strengths available from 600 to 1000 kN/m². The graph on the right shows the results of a compression test, where samples of GEOLight® 400 were compressed at the rate of 1mm per minute. The deformation at 400kN/m² is about 1.6%.

RESULTS OF COMPRESSION TEST ON SDS GEOLIGHT® 400



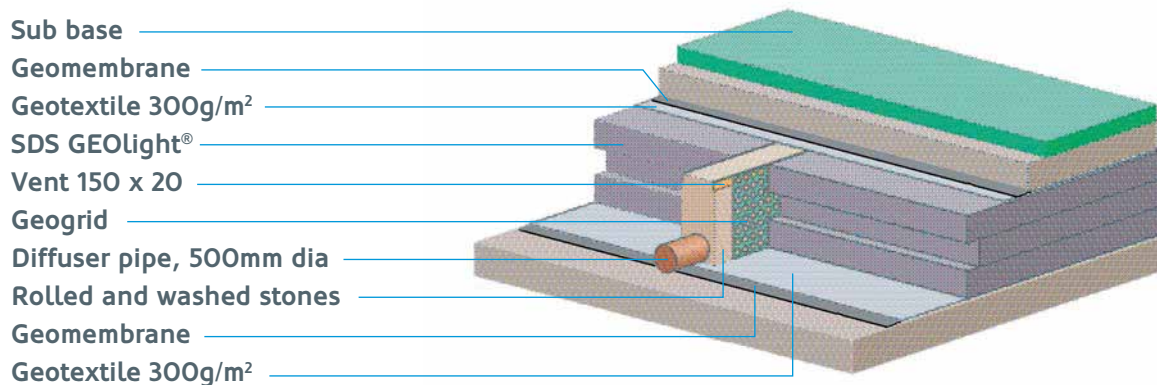
The GEOLight® Stormwater Attenuation System consists of two manholes (inspection chambers) connected by a length of perforated distribution pipe which feeds the stormwater storage reservoirs on either side formed from GEOLight®.

The distribution pipe is normally from 225mm up to 500mm diameter, generally covered in a trench that is filled with draining material such as 15/25 clean graded stone, free from fines.

The reservoirs and distribution pipe are wrapped in a waterproof membrane, such as butyl, to prevent seepage of water into the surrounding ground. The top of each GEOLight® reservoir has a vent which is connected back to the upstream manhole.

A geotextile or 10mm mesh geogrid is laid between the distribution pipe and GEOLight® to prevent the GEOLight® units being clogged by the draining materials.

SDS GEOLight® Attenuation



How does it work?

- 1. In normal conditions, water enters a back drop manhole. This is the upstream manhole and any silt or sediment will collect in the bottom of the chamber. The water then flows along the distribution pipe into the downstream manhole. The upstream pipework is sized to cope with normal flow conditions. The distribution pipe and attenuation tank are sized to cope with storm conditions. The outflow pipe is sized to cope with the permissible discharge.
- 2. In storm conditions the flow restrictor (vortex flow control or orifice plate) in the downstream manhole limits the amount of water flowing out of the manhole. This causes the water level in the distribution pipe to rise and water to spill into the GEOLight® reservoirs on either side. As the water level rises in the reservoirs, air is forced out of the high level vents into the upstream manhole.

- 3. Once the storm has passed, the water level in the GEOLight® reservoirs gradually falls as water passes through the flow restrictor in the downstream manhole. The vents now allow air to return into the GEOLight® reservoirs. Gradually the reservoirs empty. The flow restrictor prevents excess surges of flood water to pass downstream and uses the storage reservoirs to store the water for the period of the storm.

Calculating the storage capacity

The storage capacity of the GEOLight® reservoirs is determined by the maximum outflow permitted, (set by the water company or Environment Agency), the impermeable area of the site and the rainfall return period – normally 1 in 30 years, but again can be dictated by the water company. A full design service, including calculations, can be supplied via a third party consultant.

Please contact SDS for details.

Other uses

The water storage ability of SDS GEOLight® lends itself to a number of other uses:

- Water recycling combines with irrigation systems – this is increasingly popular: GEOLight® is used to retain stormwater which is then pumped as required to a network of standpipes for irrigation.
- Drainage channels – the natural permeability of GEOLight® lends itself for use as an underground drainage channel that collects and drains away groundwater.
- Pollution control – improved water runoff quality. When used in combination with oil / petrol separators, GEOLight® can replenish groundwater without the risk of contamination from oil, chemicals or suspended solids.
- To form lightweight embankments (slope stabilisation) – GEOLight® can be used to quickly form the base of embankments that only weigh a fraction of earth embankments.

Stormwater Attenuation System

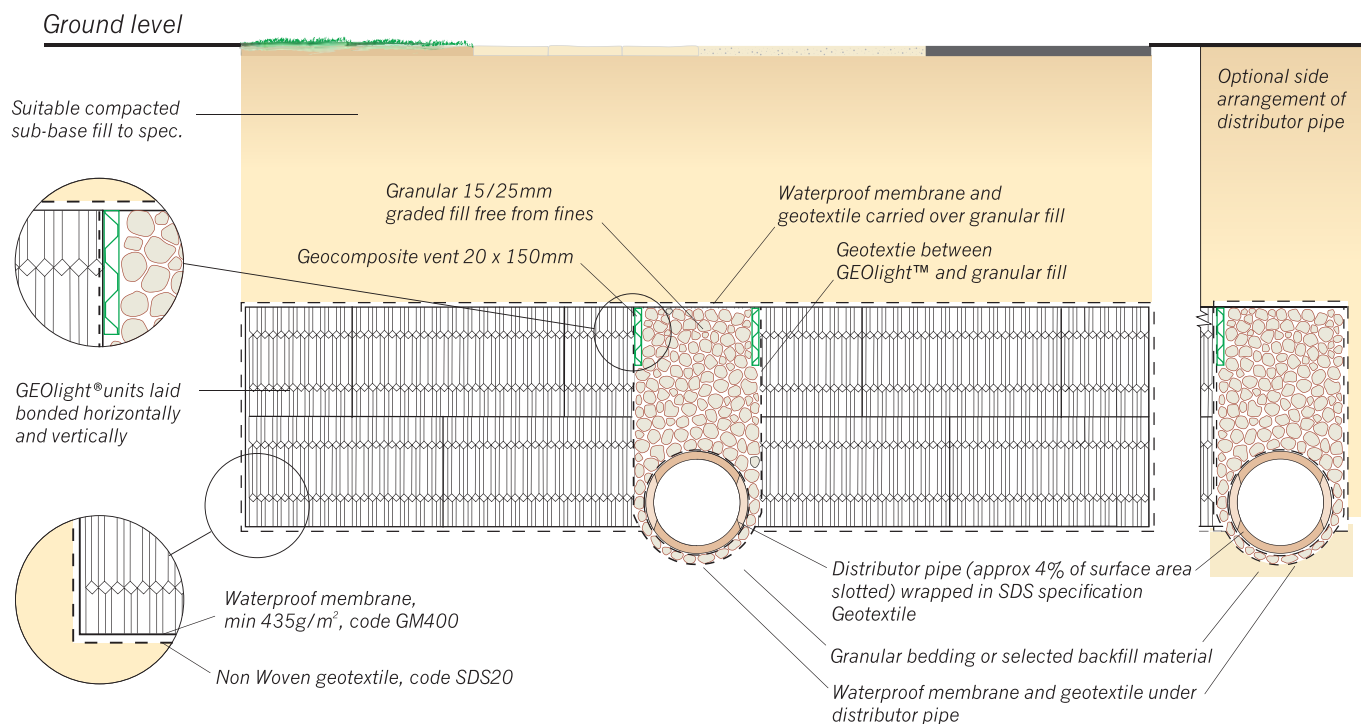
Design Details

The details on these two pages illustrate the construction of a typical SDS GEOLight® Stormwater Attenuation System. The length and height of the GEOLight® reservoirs is determined by the quantity of water to be stored.

The layout of each scheme is specifically designed to suit the characteristics and limitation of the site. Typically the distributor pipe would be arranged in the centre of the reservoir, but can alternatively be placed at the side where topographical constraints dictate.

The high performance waterproof membrane should be sealed continuously to encapsulate the GEOLight® reservoirs, distributor pipe and granular fill. It is protected by a heavyweight needle punched, non woven geotextile. To help with maintenance a high flow geotextile is placed between the granular fill and GEOLight® attenuation units to prevent silt and particles being washed into the reservoir. GEOLight® can be used under a range of surfaces e.g. grass, porous paving, standard paving block, tarmac and concrete.

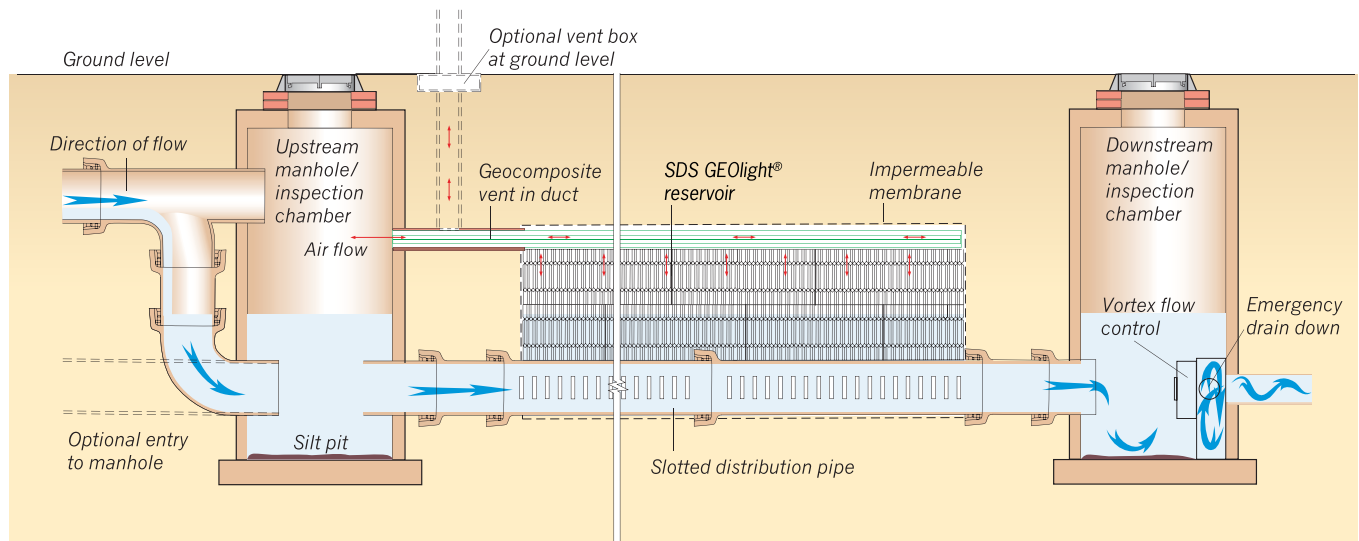
Cross Section



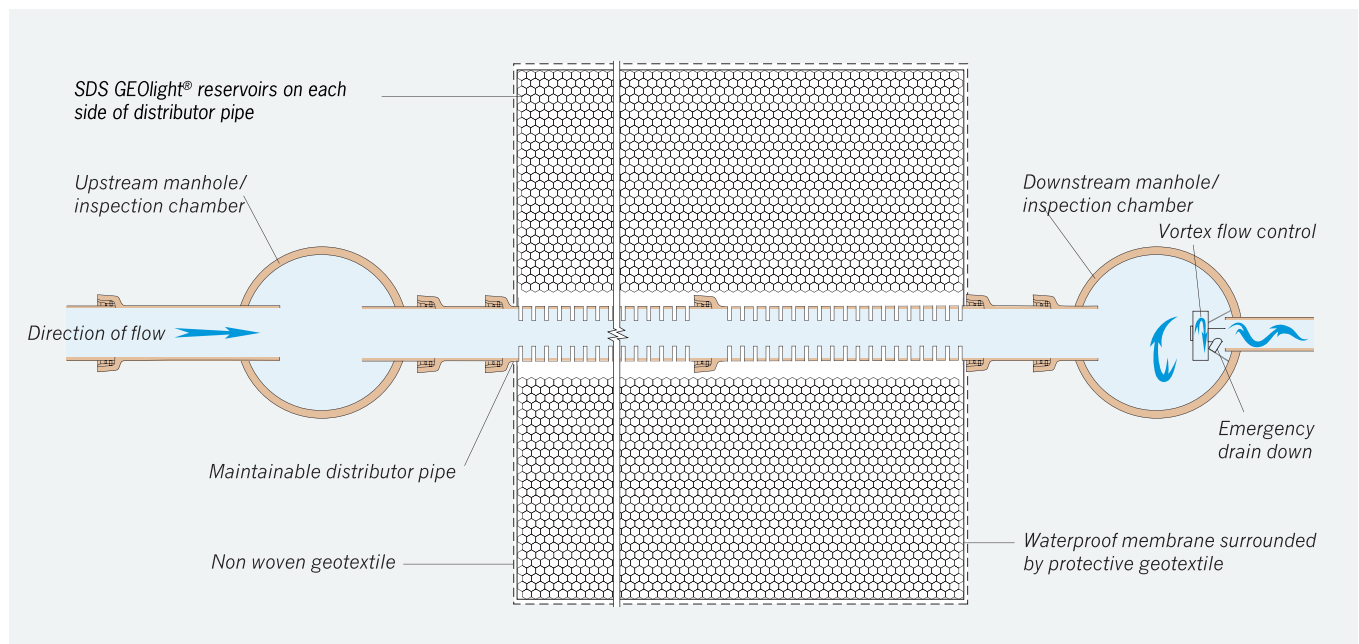
Stormwater Attenuation System

Design Details

Long Section



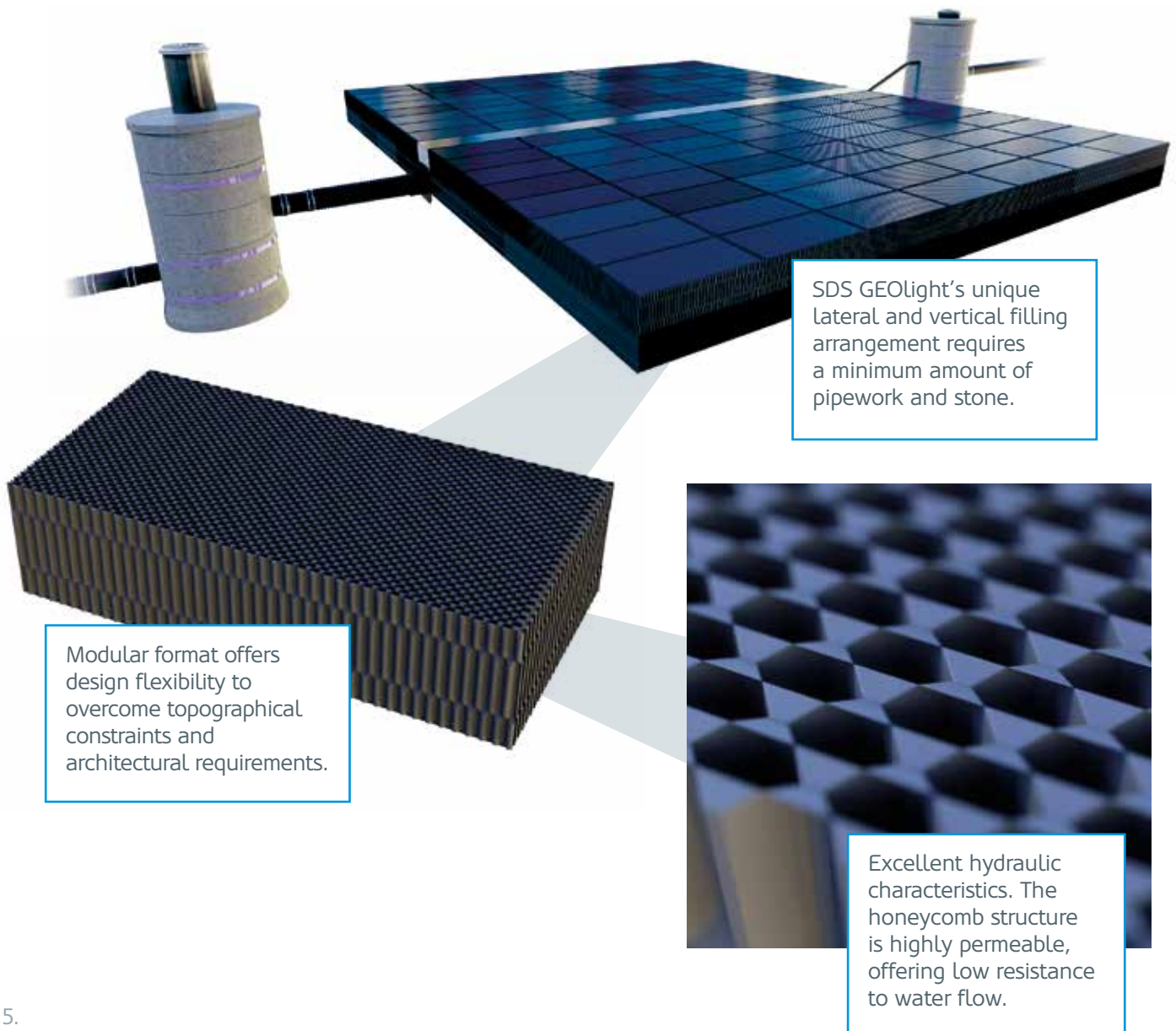
Plan



Benefits

- High compressive strength – can be located under all roads, car parks and amenity area surfaces.
- Reduced excavation costs – the very high void rate (95%) minimises the required volume of earthworks.
- Speed of installation – 1000m³ reservoir, completed in one week.
- Light and easy to handle.
- Depth of tank invert reduced by using patented lateral supply.
- Simplified distribution pipe network, easy maintenance – dispensing with costly and complicated pipework configurations.
- Greatly reduces the risk of flooding when used as stormwater storage.
- Can also be used for water recycling and combining with irrigation systems.
- Can virtually eliminate pollution when used in combination with specialist petrol / oil separators.
- Design service available, including calculations.

GEOLight® block



COSHH and Handling Information

1. COMPOSITION/INFORMATION ON INGREDIENTS:

Hazardous ingredients:

None as finished goods or products.

Types of materials:

Polyvinyl chloride (PVC)
MEK

2. HAZARDS IDENTIFICATION

Nature of hazard:

There are no health risks from the products during normal use. The products may contain various pigment colours and stabilisers that may be toxic. The chemicals are, however, bound within the product material and not easily extracted.

3. FIRST-AID MEASURES

Eye contact:

Plastic materials may cause physical irritation in the eyes. Wash out with large amounts of water. If irritation persists, seek medical advice.

Skin contact:

Not applicable.

Inhalation:

Not applicable.

Ingestion:

Not expected to have any toxic effects.

4. FIRE-FIGHTING MEASURES

Extinguishing media:

On small fires use any hand-held extinguisher type.
On large fires use water.

Fire and explosion hazards:

Melting plastics may flow and spread in a large fire.
Products of fire will be thick black toxic smoke.

Material characteristics:

PVC products will burn in the presence of a flame but are classed as self-extinguishing.

Protective equipment:

Wear self-contained breathing apparatus and protective clothing.

5. HANDLING AND STORAGE

Handling:

There are no hazards associated with the finished products. However, when cutting SDS GEOLight®, we recommend that the correct tools are used e.g. Handsaw or Alligator saw. When cutting, dust may be created; avoid inhaling these dusts. Take care of heat build-up within materials during cutting etc. The pallets of SDS GEOLight® units should be placed on level ground and should not be stacked on site. The maximum weight of the pallet of SDS GEOLight® units as delivered to site is 650kg (700kg on one copy), including packaging. Machines used to lift the pallet should be able to lift this weight safely. Loose individual units should not be stored more than three units high. SDS GEOLight® units are lightweight ranging from 23kg to 55kg and can be easily handled – one or two person lift.

Storage:

SDS GEOLight® units will resist the effects of UV light for up to six months; however, prolonged storage in direct sunlight should be avoided. SDS GEOLight® units should not be stored near to any fuel storage areas or any other solvents. SDS GEOLight® units are very robust and resistant to damage during normal handling; however, they should be secured in areas where impacts from vehicles or construction plant will be avoided.

Material characteristics:

PVC products will burn in the presence of a flame but are classed as self-extinguishing.

Protective equipment:

Wear self-contained breathing apparatus and protective clothing.

6. EXPOSURE CONTROLS / PERSONAL PROTECTION

Respiratory protection:

Not required under normal conditions of use. Where cutting etc. creates dust, wear a disposable half-mask to the standard FFP2S.

Hand protection:

Wear impervious strong gloves to prevent cuts to the hands while handling, cutting etc.

Eye protection:

Wear safety glasses when cutting etc.

Skin protection:

Wear overalls.

7. SITE HAZARDS

Other hazards for consideration:

Working in excavations and trenches – SDS GEOLight® may be designed with a shallow invert for infiltration (soakaway) or attenuation (storage) system. This negates the need for deep excavations or trenches, excavation near services e.g. gas, electricity or contaminated soil areas. N.B. All risk assessments should be undertaken by the main contractor for forklift, access to and working in excavations and trench support.

8. STABILITY AND REACTIVITY

Decomposition products:

Major thermal decomposition products are oxides of carbon. Relevant differences are (in addition): PVC may produce amounts of Hydrogen Chloride.

Stability:

These materials are stable at temperatures up to normal operating limits (moulding parameters).

9. ECOLOGICAL INFORMATION

Biodegradability:

Plastic products are not readily biodegradable but are not detrimental to terrestrial wildlife.

Aquatic toxicity:

Non-toxic to marine life.

10. DISPOSAL CONSIDERATIONS

Method:

The preferred method of disposal is collection and recycling. Plastics can safely be placed with regular industrial or household wastes where recycling is not available.

11. OTHER INFORMATION

As the handling, storage, use and disposal of the product are beyond our control SDS disclaims all liability for loss, damage, injury or expense in any way connected with such activities and further makes no warranties, expressed or implied, as to the suitability of the product for any particular use.

The preferred method of disposal is collection and recycling. Plastics can safely be placed with regular industrial or household wastes where recycling is not available.

SDS

Water
Infrastructure
Systems

INNOVATORS IN WATER TECHNOLOGY

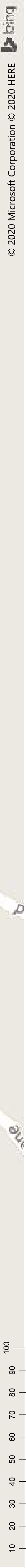


SDS Limited
Clearwater House
Castlemills
Biddisham
Somerset
BS26 2RE

T +44 (0)1934 751303
E info@sdslimited.com



sdslimited.com



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PRELIMINARY

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CONSULTING ENGINEERS

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MCS PROJECTS

SL05821

SAVILLE LANE
THURLSTONE, S36 9

SITE LOCATION PLAN

PROJECT ENGINEER:

SL05821.900