PRICE & MYERS

Plot 5 & 6, Central Somers Town, London, NW1 1DN

Planning Condition Statement

This statement has been produced in order to discharge condition 29 of planning application ref.: 2022/2855/P for Plot 5 and Plot 6 of the Central Somers Town development in the London Borough of Camden.

The decision notice references the below documents previously issued by Price & Myers.

- Polygon Residential, Plot 5 – SuDS Drainage Statement version 1 (prepared by Price & Myers) 20.11.15
- Polygon Residential, Plot 6 – SuDS Drainage Statement version 1 (prepared by Price & Myers) 20.11.15

This statement should therefore be read in conjunction with the abovementioned reports.

Planning History

The original planning application reference was 2015/2740/P, in which these documents were first submitted in support of. They were referenced in this planning approval decision notice. Following this there was a submission made to the London Borough of Camden, ref.: 2018/2856/P which refers to the discharge of conditions relating to Plots 1 and 4. In 2022 a submission, ref.: 2022/2855/P, was made for variation or removal of conditions to Section 106 legal agreement relating to Plots 5 and 6. It is condition 29 of this decision notice that this statement has been compiled in order to discharge.

Condition 29

"SuDS

Plot 1 - The SuDS shall be built in line with the details approved under planning reference 2018/2856/P dated 25 August 2020 and shall remain in accordance thereafter.

Other plots - Prior to commencement of the relevant part of the development details of a sustainable urban drainage system shall be submitted to and approved by the local planning authority in writing. Such details shall include details of the following features:

- *Permeable surfacing to all hard standing areas, with a minimum 250mm sub-base, totalling 390m^3 attenuation discharging to the public sewer at a reduced rate.*
- *Details of any weirs required within the sub-base to ensure that the full storage volume is utilised and to avoid lower areas becoming overwhelmed.*

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- *Details of how rainfall falling on impermeable pathways or roads is shed and attenuated in adjacent grassed or planted areas to include swales or bio-retention / rain gardens and details of how these are connected to the sub-base of the paving areas to provide an even greater storage volume.*
- *A network of perforated pipes collecting the filtered runoff and conveying it to the public sewer.*
- *Details of permeable surfacing to all play areas.*
- *Full details of wetland areas.*

SuDS will be implemented prior to the opening of the relevant parts of the development.

Reason: To reduce the rate of surface water run-off from the buildings and limit the impact on the storm-water drainage system in accordance with policy CC1 of the Camden Local Plan 2017."

Approved SuDS Strategy

The two SuDS Drainage Statements referred to in the decision notice, were produced by Price & Myers for the original planning application submission back in 2015 for Plots 5 and 6.

These statements set out the following drainage strategies:

- Surface water system designed for 1 in 100 year + 30% climate change.
- Infiltration is not feasible on site due to the site being underlain by London Clay.
- Each plot will discharge at 5 l/s (total 10 l/s), the minimum that can be achieved due to the risk of blockages, via new direct connections to the public sewer in Purchese Street.
- Plot 5 requires a 16m^3 attenuation tank.
- Plot 6 requires a 16m^3 attenuation tank.

These strategies were approved as part of the planning application approval.

Final SuDS Strategy

The design was developed in accordance with the above approved strategy.

Due to discoveries on site it was found that Plot 5 and Plot 6 could combine prior to their final discharge point to the public sewer. This reduced the requirement for two new direct connections to one single direct connection. In making the S106 application to Thames Water the proposed discharge rate of 10 l/s was questioned, and it was requested for this to be reduced as much as possible. It was therefore agreed that each site would discharge at 2.5 l/s, with a total surface water discharge of 5 l/s from the entire development site.

This resulted in an increased in the attenuation tank sizes. Plot 5's attenuation tank increased from 16m^3 to 19.5m^3, and Plot 6's tank increased from 16m^3 to 27.5m^3.

The Plots also utilise permeable paving, bound gravel, in the external areas. The Landscape Architects drawing should be referred to for the proposed surface finishes locations. As shown on the drainage layout drawings, perforated pipes are to be constructed within the sub-base of the permeable paving in order to drain the surface water from these areas that is not able to infiltrate into the ground. There is no requirement for weirs within the sub-base of the permeable paving based on the proposed levels and gradients across the site.

Gullies are proposed within the lightwells which are set at a lower level. Where permeable paving is not proposed in the external ground floor areas, slot drains have been proposed. Small hardstanding paths which are adjacent to soft landscaping areas, can drain directly into the soft landscaping.

Refer to the proposed drainage layout drawings appended to the rear of this document. The below ground drainage network was modelled in MicroDrainage, the calculations of which have been appended to this document.

Play Areas

There are no play areas within Plot 5 or 6 of this development.

Appendices

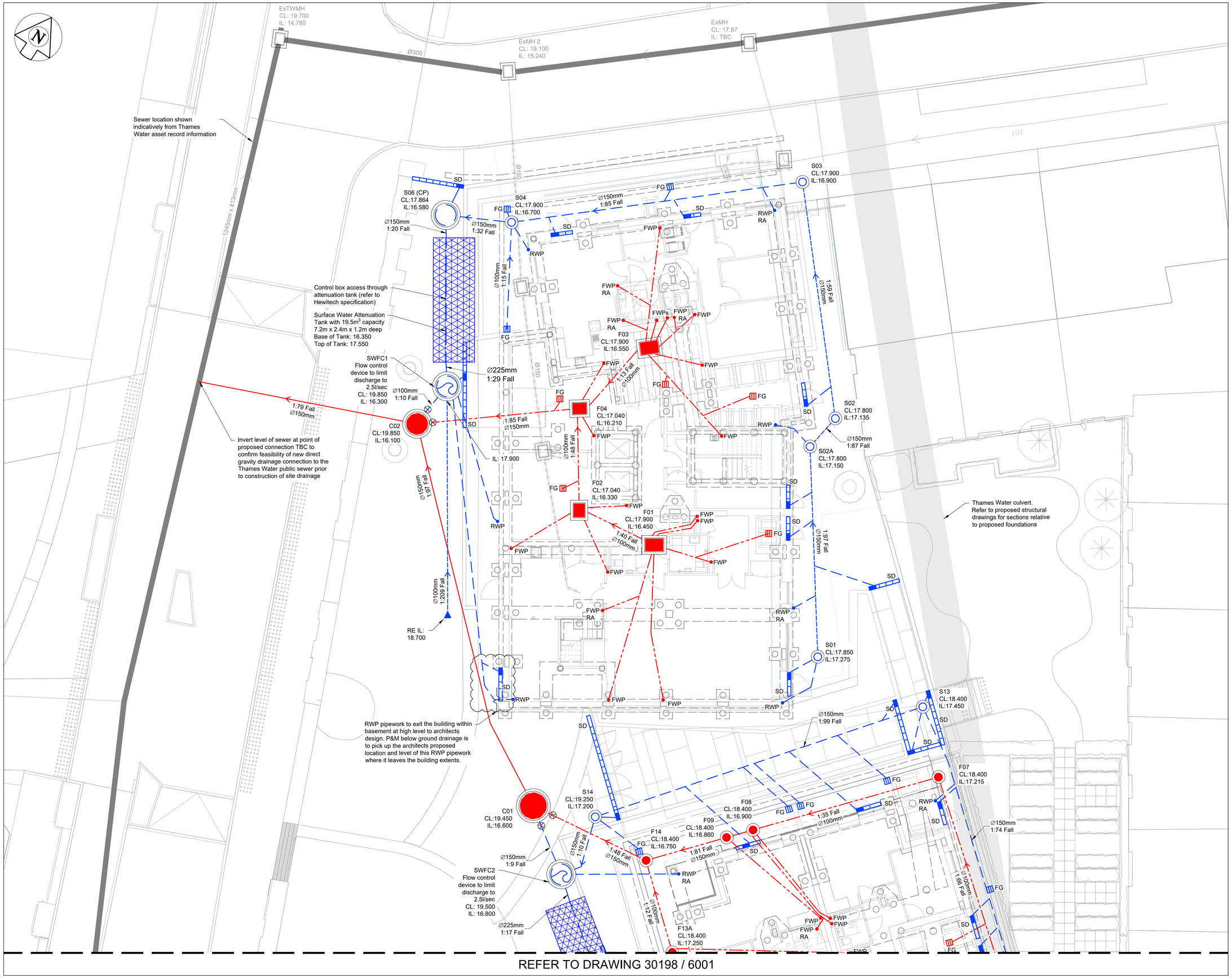
P&M Drawings:

- TM54A008-PAM-Z5-ZZ-DR-C-6000 - Below Ground Drainage Layout - Plot 5
- TM54A008-PAM-Z6-ZZ-DR-C-6001 - Below Ground Drainage Layout - Plot 6
- TM54A008-PAM-ZZ-ZZ-DR-C-6100 - Below Ground Drainage Details - Sheet 1
- TM54A008-PAM-ZZ-ZZ-DR-C-6101 - Below Ground Drainage Details - Sheet 2
- TM54A008-PAM-ZZ-ZZ-DR-C-6102 - Below Ground Drainage Details - Sheet 3
- TM54A008-PAM-ZZ-ZZ-DR-C-6103 - Below Ground Drainage Details - Sheet 4
- TM54A008-PAM-ZZ-ZZ-SH-C-6200 - Manhole Schedule

Calculations:

- 30198_CST_Plot 5_MD_Calculations
- 30198_CST_Plot 6_MD_Calculations

Prepared by:	Kirsty Burwood MEng CEng MICE MCIHT
Job Number:	30198
Date:	28.03.2024
Version:	2



NOTES :

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3. Health & Safety :
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4. Setting out of all drain point positions to be provided by M&E Engineer and Architect.
5. Refer to general notes drawing 30198/05/0001.

DRAINAGE LEGEND

- Existing Combined Sewer
- New FW Drain
- New SW Drain
- Perforated Pipework
- New Combined Drain
- Existing Drainage to be Demolished

DRAINAGE KEY

RWP	Rainwater Down Pipe
FWP	Foul Waste Pipe
S1	Surface Water Manhole Chamber
F1	Foul Water Manhole Chamber
FCMH1	Flow Control Chamber (SW only)
	Non-return flap valve
	Attenuation Cells
FG	Floor Gully
SD	Slot Drain with Sump Unit
RE	Rodding Eye

ABBREVIATIONS

IL	- Invert Level
CL	- Cover Level
RA	- Above Ground Rodding Access
CP	- Catch Pit Manhole

Rev	Date	Drawn	Eng	Amendment
C04	21.09.23	FG	JL	Issued for Construction
C03	25.08.23	DLa	JL	Issued for Construction
C02	21.07.23	SE	JL	Issued for Construction
C01	12.07.23	SE	JL	Issued for Construction
P03	11.05.23	FG	JL	issued for Information
P02	21.04.23	FG	JL	Stage 4 - Issued for DT Review
P01	28.10.22	TP	JL	Issued for Stage 3

CENTRAL SOMERS TOWN PLOT 5 & 6

BELOW GROUND DRAINAGE LAYOUT

Status
FOR CONSTRUCTION

Drawn	TP	Eng	JL
Scales	1:100 at A1		1:200 at A3
Drawing No	30198/6000	Rev	C04
Doc Ref.	TM54A008-PAM-Z5-ZZ-DR-C-6000		

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REFER TO DRAWING 30198 / 6000

RWP pipework to exit the building within basement at high level to architects design. P&M below ground drainage is to pick up the architects proposed location and level of this RWP pipework where it leaves the building extents.

SWFC2
Flow control device to limit discharge to 2.5l/sec
CL: 19.500
IL: 16.800

Surface Water Attenuation Tank with 27.5m³ capacity
12m x 2.4m x 1m deep
Base of Tank: 16.850
Top of Tank: 17.850

Control box access through attenuation tank (refer to Hewitech specification)

Thames Water culvert. Refer to proposed structural drawings for sections relative to proposed foundations

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New SW Drain	
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CENTRAL SOMERS TOWN PLOT 5 & 6

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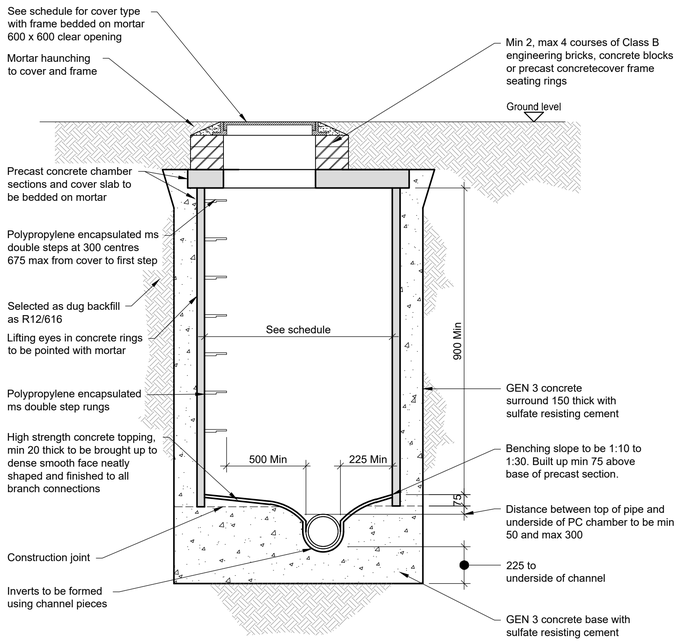
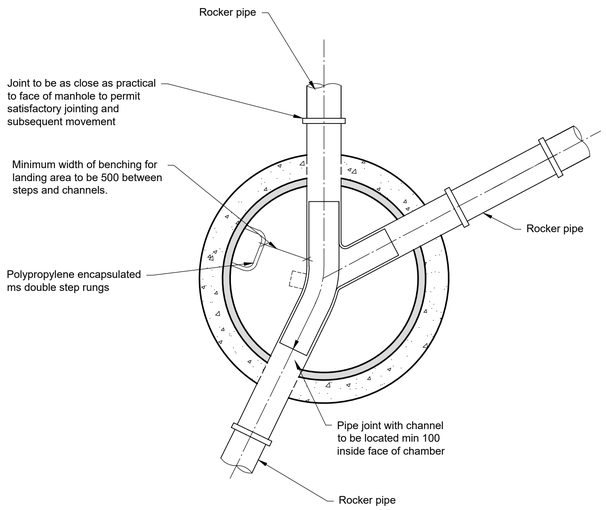


TYPE 2 MANHOLE - SECTION
Sewers for Adoption 7

TYPE B MANHOLE - SECTION
Sewers for Adoption 6

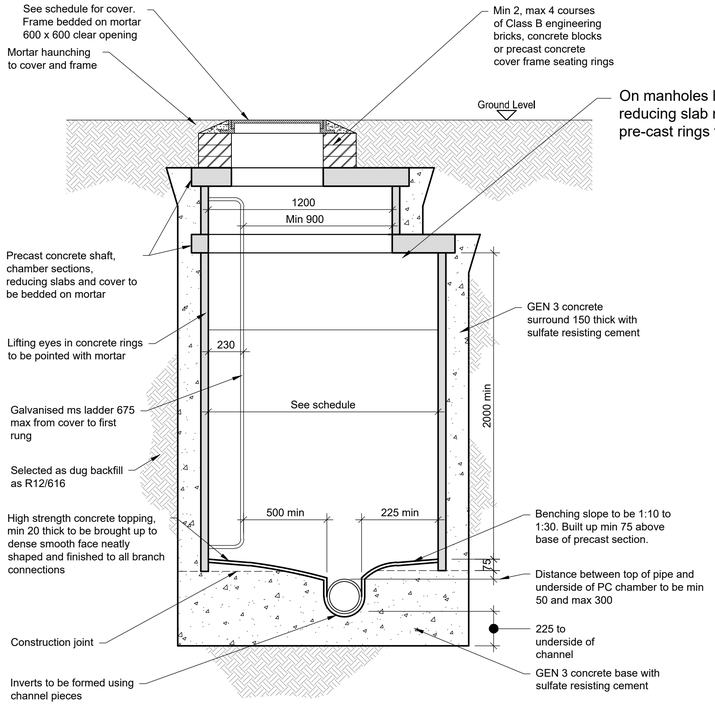


TYPE 2 MANHOLE - PLAN
Sewers for Adoption 7

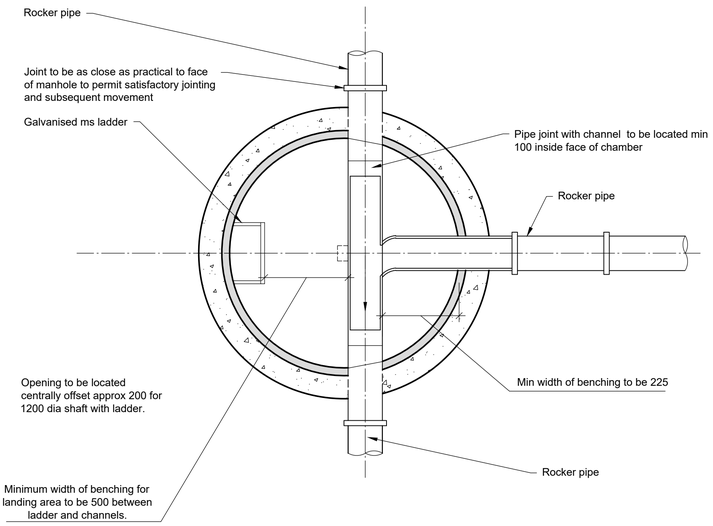
TYPE B MANHOLE - PLAN
Sewers for Adoption 6

DEPTH TO SOFFIT: 1.35m to 3.0m

TYPICAL DETAIL. SEE SCHEDULE FOR DIMENSIONS AND GA FOR NUMBER OF CONNECTING PIPES.



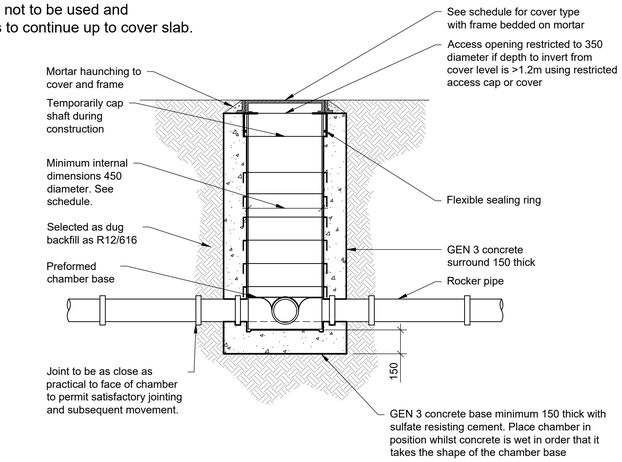
TYPE 1 MANHOLE - SECTION



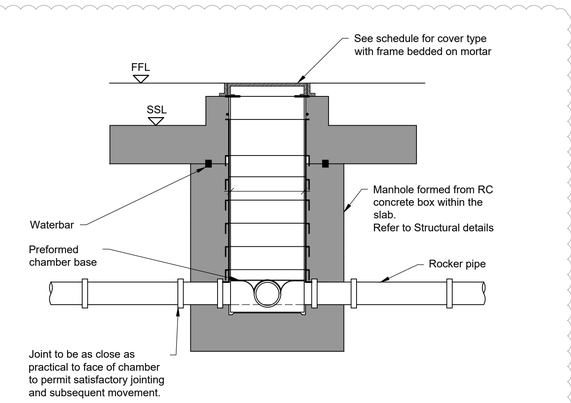
TYPE 1 MANHOLE - PLAN
Sewers for Adoption 7

DEPTH TO SOFFIT: 3.0m to 6.0m

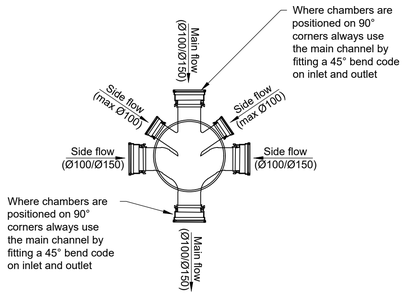
TYPICAL DETAIL. SEE SCHEDULE FOR DIMENSIONS AND GA FOR NUMBER OF CONNECTING PIPES.



PLASTIC INSPECTION CHAMBER - EXTERNAL



PLASTIC INSPECTION CHAMBER - INTERNAL



Ø450 WAVIN PPIC PLAN

Ø150 MAIN CHANNEL, MAX 2 NO. (Ø100 & Ø150)
SIDE CONNECTIONS ON EACH SIDE
(50mm step height for all branch connections)

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C02	25.08.23	TP	JL	Issued for Construction
C01	05.07.23	TP	JL	Issued for Construction
P03	11.05.23	FG	JL	Issued for Information
P02	21.04.23	FG	JL	Stage 4 - Issued for DT Review
P01	28.10.22	TP	JL	Issued for Stage 3

CENTRAL SOMERS TOWN
PLOT 5 & 6

BELOW GROUND DRAINAGE DETAILS SHEET 1

Status
FOR CONSTRUCTION

Drawn TP	Eng JL
Scales 1:20 at A1	1:40 at A3
Drawing No 30198/6100	Rev C02
Doc Ref. TM54A008-PAM-ZZ-ZZ-DR-C-6100	

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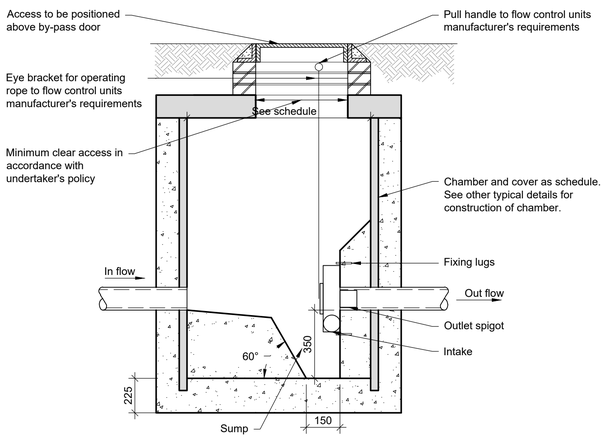
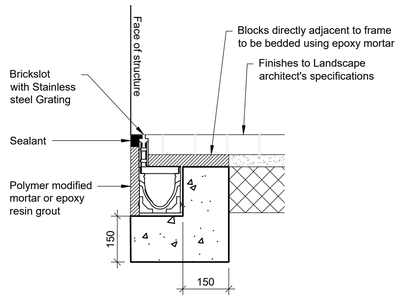
SCALE 1:10



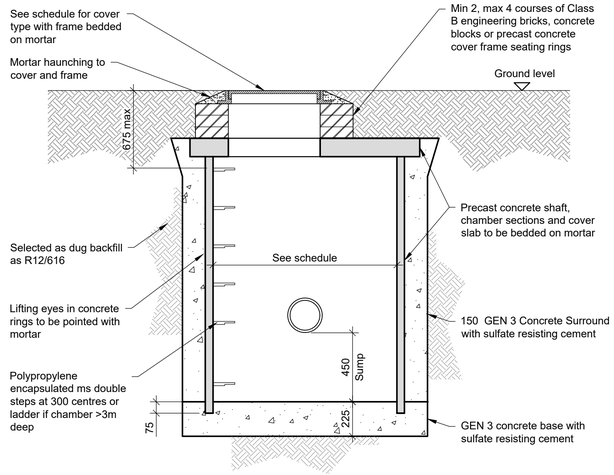
VORTEX FLOW CONTROL CHAMBER - SECTION A-A

Hydro International Unit Ref : SHE-0070-2500-1400-2500

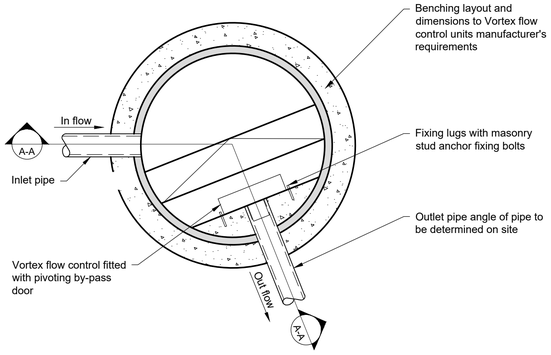


LINEAR SLOT DRAIN AT THRESHOLD DETAIL

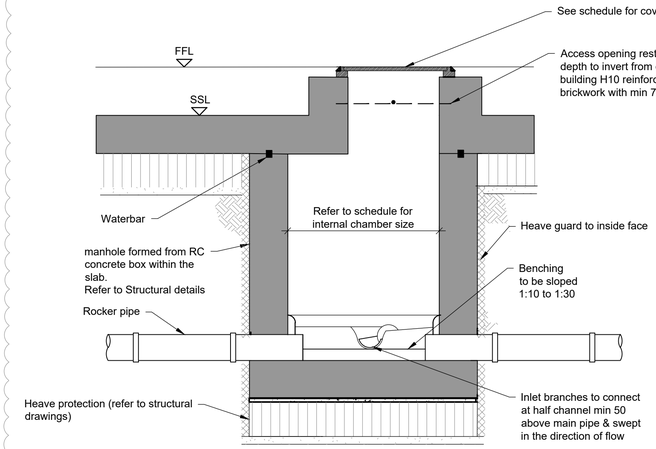
SCALE 1:10



PRECAST CONCRETE CATCHPIT DETAIL

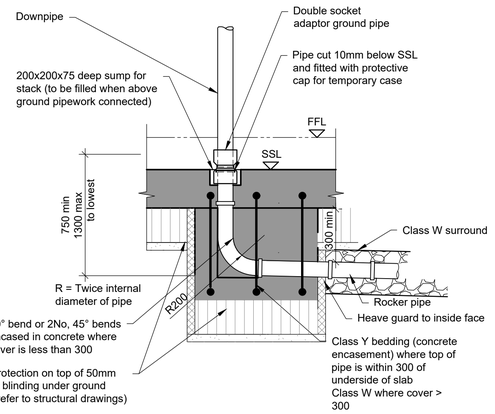


VORTEX FLOW CONTROL CHAMBER - PLAN VIEW

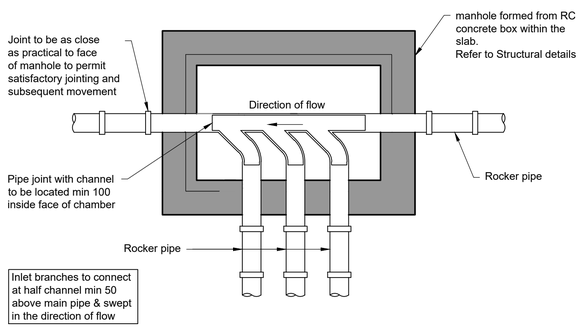


INTERNAL FOUL WATER CHAMBER

(Refer to Manhole Schedule for Size & Invert)

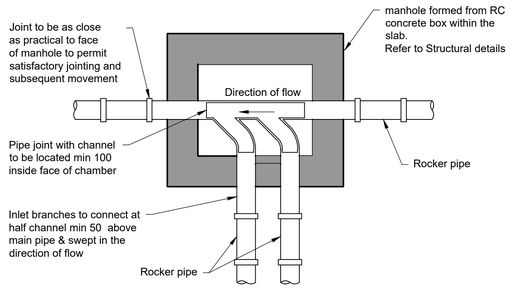


FOUL OR RAINWATER STACK DETAIL



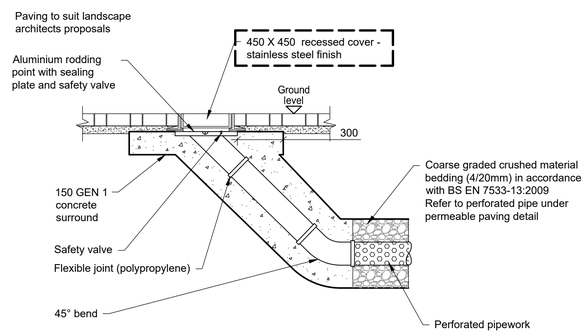
INTERNAL RECTANGULAR INSPECTION CHAMBER - PLAN

DETAIL SHOWN INDICATIVELY ON 1000 x 675



INTERNAL RECTANGULAR INSPECTION CHAMBER - PLAN

DETAIL SHOWN INDICATIVELY ON 750 x 600



RECESSED RODDING EYE

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C03	25.08.23	SE	JL	Issued for Construction
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P02	21.04.23	FG	JL	Stage 4 - Issued for DT Review
P01	28.10.22	TP	JL	Issued for Stage 3

CENTRAL SOMERS TOWN
PLOT 5 & 6

BELOW GROUND DRAINAGE DETAILS SHEET 2

Status
FOR CONSTRUCTION

Drawn TP	Eng JL
Scales 1:20 at A1	1:40 at A3
Drawing No 30198/6101	Rev C03
Doc Ref. TM54A008-PAM-ZZ-ZZ-DR-C-6101	

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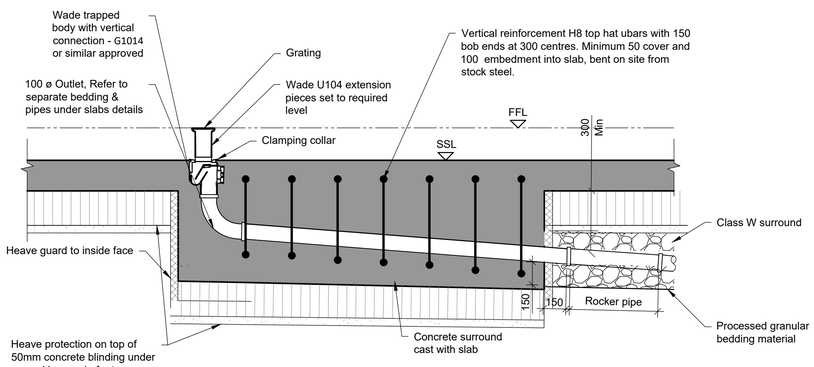
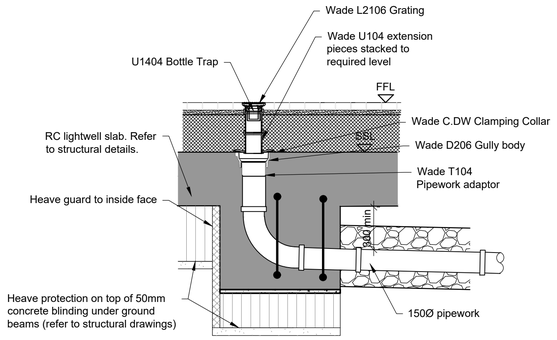
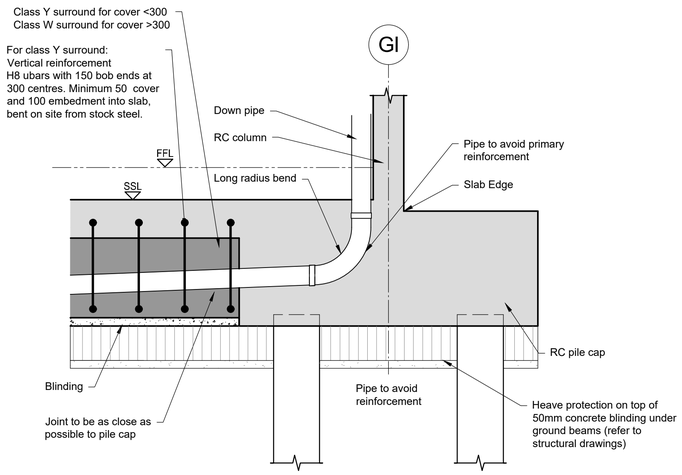


INTERNAL FLOOR GULLY



EXTERNAL LIGHTWELL FLOOR GULLY



PIPE THROUGH PILE CAP DETAIL

NOTES :

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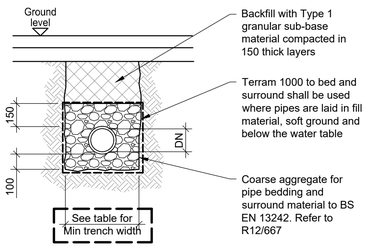
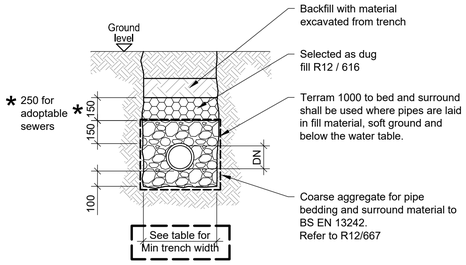


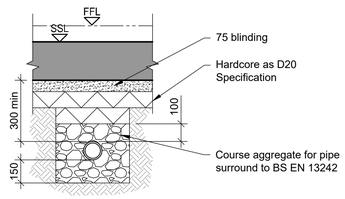
CLASS S SURROUND

GRANULAR SURROUND & BACKFILL FOR AREAS SUBJECT TO VEHICLE LOADING



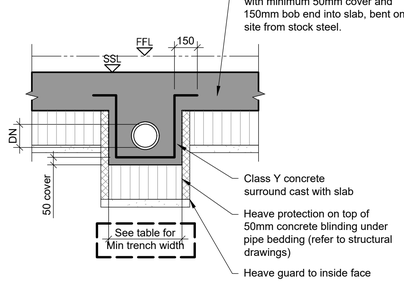
CLASS S SURROUND

GRANULAR SURROUND & BACKFILL FOR SOFT OR HARD LANDSCAPING AREAS NOT SUBJECT TO VEHICLE LOADING



CLASS W SURROUND

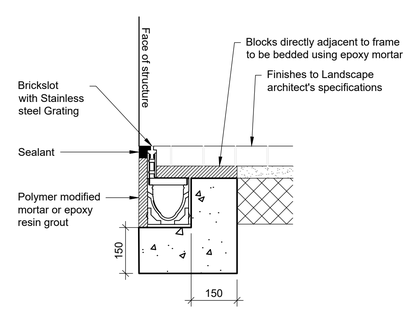
FOR PIPES WITH CROWN >300 UNDER BUILDING



CLASS Y SURROUND

FOR PIPES WITH CROWN < 300 UNDER BUILDING

For plastic pipes care is to be taken in placing concrete to avoid deformation or displacement of pipe.



LINEAR SLOT DRAIN AT THRESHOLD DETAIL

SCALE 1:10

TABLE 1

DN	Minimum trench width (OD + x)		
	Supported trench	Unsupported trench	
		# > 60°	# < 60°
less 225	600	600	600
225 to 350	800	800	800
350 to 700	OD + 700	OD + 700	OD + 400
700 to 1200	OD + 850	OD + 850	
greater 1200	OD + 1000	OD + 1000	OD + 400

In the values OD + x, x/2 equals the minimum working space between the pipe and the trench wall or support, where:
OD is external diameter.
is angle of unsupported trench side measured to the horizontal.

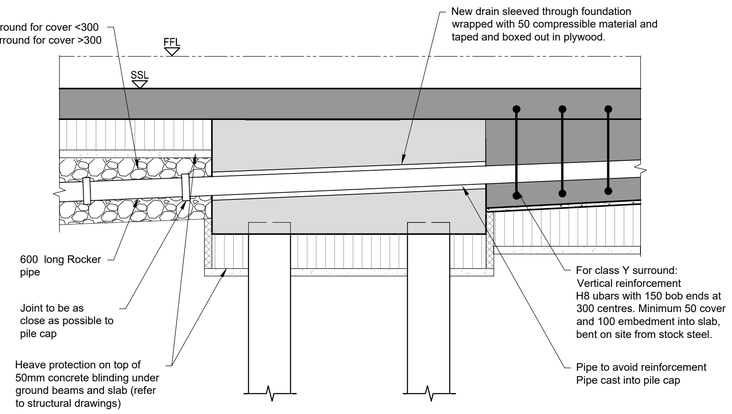
MINIMUM TRENCH WIDTH IN RELATION TO NORMAL SIZE DN

TABLE 2

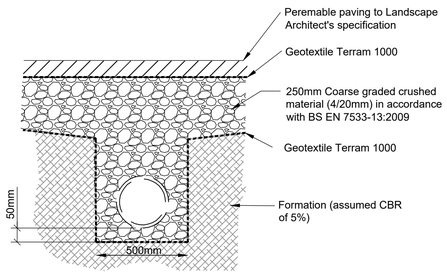
Trench depth	Minimum trench width
less 1000	As Table 1
1000 to 1750	800
1750 to 4000	900
greater 4000	1000

The minimum trench width shall be the greater of the values taken from tables 1 & 2.

MINIMUM TRENCH WIDTH IN RELATION TO TRENCH DEPTH



PIPE SLEEVED THROUGH FOUNDATION DETAIL



PERFORATED PIPE UNDER PERMEABLE PAVING DETAIL

Rev	Date	Drawn	Eng	Amendment
C02	21.07.23	TP	JL	Issued for Construction
C01	05.07.23	TP	JL	Issued for Construction
P03	11.05.23	FG	JL	Issued for Information
P02	21.04.23	FG	JL	Stage 4 - Issued for DT Review
P01	28.10.22	TP	JL	Issued for Stage 3

CENTRAL SOMERS TOWN
PLOT 5 & 6

BELOW GROUND DRAINAGE DETAILS SHEET 3

Status
FOR CONSTRUCTION

Drawn TP	Eng JL
Scales 1:20 at A1	1:40 at A3
Drawing No 30198/6102	Rev C02
Doc Ref. TM54A008-PAM-ZZ-ZZ-DR-C-6102	

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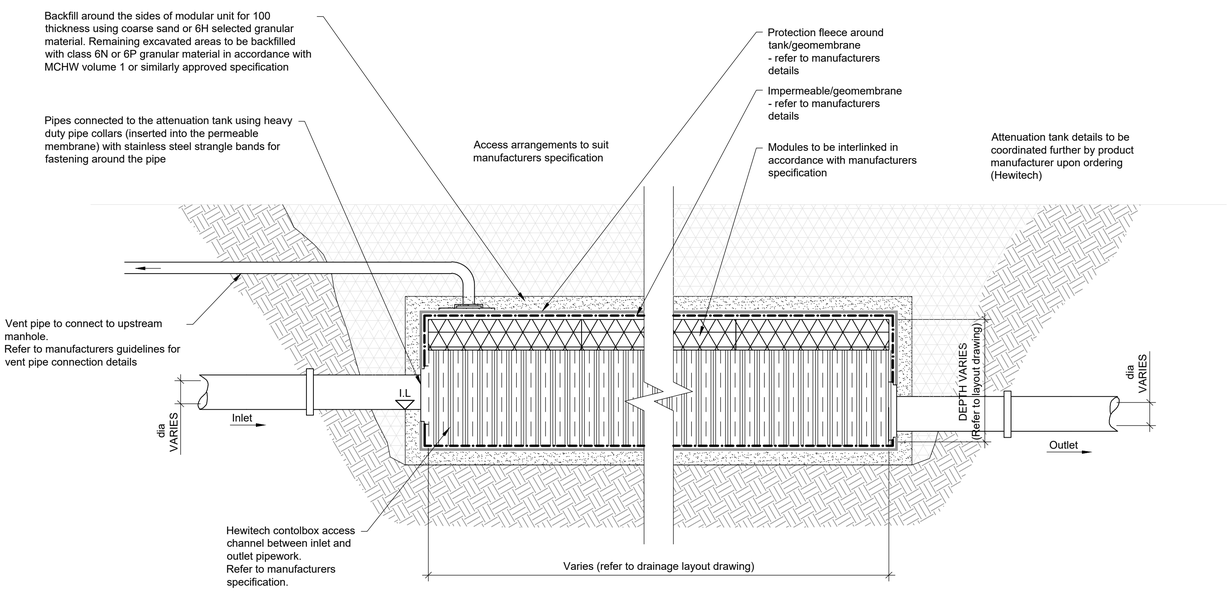

MODULAR ATTENUATION TANK DETAILS

(Hewitech Variobox)

NOTES :

1. This drawing is to be read in conjunction with all relevant Architect's, Engineer's and specialists' drawings and specifications.
2. Do not scale from this drawing in either paper or digital form. Use written dimensions only. To check that this drawing has been printed to the intended scale this bar should be 50mm long @ A1 or 25mm long @ A3.
3. Health & Safety :
   All specific drawing notes are to be read in conjunction with the project "Information Pack" and "Site Rules".

Rev	Date	Drawn	Eng	Amendment
C01	25.08.23	TP	JL	Issued for Stage 3

CENTRAL SOMERS TOWN
PLOT 5 & 6

BELOW GROUND
DRAINAGE DETAILS
SHEET 4

Status
FOR CONSTRUCTION

Drawn TP	Eng JL
Scales 1:20 at A1	1:40 at A3
Drawing No 30198/6103	Rev C01
Doc Ref. TM54A008-PAM-ZZ-ZZ-DR-C-6102	

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Manhole / IC	Cover Level m	Invert Level m	Chamber Type	Chamber depth (m)	Internal Chamber Size	Cover Clear Opening and Cover Grade	Notes To Building Regulations Part H unless noted
F01	17.900	16.450	PC	1.450	750x600 Rectangular	600x600 cover with 300x300 clear opening	Reduced access inspection chamber
			RAIC		Precast Concrete Blocks	BS EN 124 CLASS B125	Recessed cover finish to match adjacent
							Double sealed and bolted cover
F02	17.040	16.330	PC	0.710	750x600 Rectangular	750x600 Rectangular	
			IC		Precast Concrete Blocks	BS EN 124 CLASS B125	Recessed cover finish to match adjacent
							Double sealed and bolted cover
F03	17.900	16.550	PC	1.350	1000x675 Rectangular	600x600 cover with 300x300 clear opening	Reduced access inspection chamber
			RAIC		Precast Concrete Blocks	BS EN 124 CLASS B125	Recessed cover finish to match adjacent
							Double sealed and bolted cover
F04	17.040	16.210	PC	0.830	750x600 Rectangular	750x600 Rectangular	
			IC		Precast Concrete Blocks	BS EN 124 CLASS B125	Recessed cover finish to match adjacent
							Double sealed and bolted cover
F05	18.410	17.500	Plastic	0.910	450mm Polypropylene	600x600 cover	
			IC		Ring	BS EN 124 CLASS B125	Recessed cover finish to match adjacent
							Double sealed and bolted cover
F06	18.400	17.450	Plastic	0.950	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F07	18.400	17.215	Plastic	1.185	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F08	18.400	16.900	Plastic	1.500	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F09	18.400	16.860	Plastic	1.540	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F10	19.400	17.600	Plastic	1.800	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F11	19.400	17.500	Plastic	1.900	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F12	18.400	17.350	Plastic	1.050	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F13	18.400	17.300	Plastic	1.100	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F13A	18.400	17.250	Plastic	1.150	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
F14	18.400	16.750	Plastic	1.650	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
C01	19.450	16.600	TYPE 2	2.850	1200 diameter precast	600x600 eccentric	Steps Required
			Manhole		concrete rings	BS EN 124 CLASS D400	Recessed cover finish to match adjacent
C02	19.850	16.100	TYPE 1	3.750	1200 diameter precast	600x600 eccentric	Ladder required
			Manhole		concrete rings	BS EN 124 CLASS D400	Recessed cover finish to match adjacent

FOUL WATER ACCESS CHAMBER SCHEDULE

Manhole / IC	Cover Level m	Invert Level m	ChamberType	Chamber depth (m)	Internal Chamber Size	Cover Clear Opening and Cover Grade	Notes To Building Regulations Part H unless noted
S01	17.850	17.275	Plastic	0.575	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S02A	17.800	17.150	Plastic	0.650	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S02	17.800	17.135	Plastic	0.665	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S03	17.900	16.900	Plastic	1.000	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S04	17.900	16.700	Plastic	1.200	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S05	**OMITTED**						
S06	19.775	16.580	CATCHPIT	3.645	1200 Diameter Precast	600x600 eccentric	Ladder required
			CHAMBER		Concrete Rings	BS EN 124 CLASS B125	Recessed cover finish to match adjacent
							450mm Deep sump catch pit
S08	18.400	17.410	Plastic	0.990	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S09	18.400	17.310	Plastic	1.090	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S10	19.350	17.230	Plastic	2.120	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S11	19.350	17.130	CATCHPIT	2.670	1200 Diameter Precast	600x600 eccentric	Steps Required
			CHAMBER		Concrete Rings	BS EN 124 CLASS B125	Recessed cover finish to match adjacent
							450mm Deep sump catch pit
S12	18.400	17.700	Plastic	0.700	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S13	18.400	17.450	Plastic	0.950	450mm Polypropylene	450 diameter	
			IC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
S14	19.250	17.200	Plastic	2.500	450mm Polypropylene	350 diameter restrictor	Reduced access inspection chamber
			RAIC		Ring	OSMA 4D945 Square Recessed	Recessed cover finish to match adjacent
							450mm Deep sump catch pit

SURFACE WATER ACCESS CHAMBER SCHEDULE

Notes :

1. This drawing is to be read in conjunction with all relevant Architect's, Engineer's and specialists' drawings and specifications.
2. Do not scale from this drawing in either paper or digital form. Use written dimensions only. To check that this drawing has been printed to the intended scale this bar should be 50mm long @ A1 or 25mm long @ A3.
3. Health & Safety :
   All specific drawing notes are to be read in conjunction with the project "Information Pack" and "Site Rules".
4. All internal manholes and manholes in hard paved areas to have recessed covers. Cover levels shown on the schedule are indicative. Final cover levels to match landscape architects levels proposals.
5. For general notes refer to drawing 30198/05/0001

Ver	Date	Drawn	Eng	Amendment
C04	25.08.23	JL	JL	Issued for Construction
C03	19.07.23	JL	JL	Issued for Construction
C02	12.07.23	TP	JL	Issued for Construction
C01	05.07.23	TP	JL	Issued for Construction
P03	11.05.23	JL	JL	Issued for Information
P02	28.10.22	JL	JL	Stage 4 - Issued for DT Review
P01	28.10.22	JL	JL	Issued for Stage 3

CENTRAL SOMERS TOWN
PLOTS 5 & 6

MANHOLE SCHEDULE

Status
FOR CONSTRUCTION

Drawn JL | Eng JL

Scales N/A

Drawing No 30198/6200 | Ver C04

Doc Ref. TM54A008-PAM-ZZ-ZZ-SH-C-6200

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100	Volumetric Runoff Coeff.	0.750
		PIMP (%)	100
FEH Rainfall Version	2013	Add Flow / Climate Change (%)	0
Site Location	GB 530511 182470 TQ 30511 82470	Minimum Backdrop Height (m)	0.200
Data Type	Point	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

- Indicates pipe length does not match coordinates
^ - Indicates Time of Concentration is too low and the pipe is not sized using the rainfall

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

Network Results Table

Network Design Table for Storm

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)

Network Design Table for Storm

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	12.261	0.125	98.1	0.014	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	1.332	0.015	88.8	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	14.153	0.235	60.2	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	15.777	0.200	78.9	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	4.239	0.100	42.4	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	4.129	0.071	57.8	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	0.500#	0.050	10.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	10.230	0.051	200.0	0.004	4.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

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	0.00	4.20^	17.275	0.014	0.0	0.0	0.0	1.01	17.9	0.0
S1.001	0.00	4.22^	17.150	0.026	0.0	0.0	0.0	1.07	18.9	0.0
S1.002	0.00	4.40^	17.135	0.031	0.0	0.0	0.0	1.30	22.9	0.0
S1.003	0.00	4.64^	16.900	0.036	0.0	0.0	0.0	1.13	20.0	0.0
S1.004	0.00	4.68^	16.700	0.039	0.0	0.0	0.0	1.55	27.4	0.0
S1.005	0.00	4.73^	16.580	0.042	0.0	0.0	0.0	1.33	23.4	0.0
S1.006	0.00	4.74^	16.350	0.042	0.0	0.0	0.0	3.20	56.6	0.0
S2.000	0.00	4.32^	18.700	0.004	0.0	0.0	0.0	0.54	4.2	0.0

Network Design Table for Storm

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
S1.007	5.853	0.117	50.0	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

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)
S1.007	0.00	4.80^	16.300	0.062	0.0	0.0	0.0	1.43	25.2	0.0

PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	17.850	17.275	0.425	Open Manhole	1200
S1.001	o	150	S2	17.850	17.150	0.550	Open Manhole	1200
S1.002	o	150	S3	17.900	17.135	0.615	Open Manhole	1200
S1.003	o	150	S3	17.900	16.900	0.850	Open Manhole	1200
S1.004	o	150	S4	17.900	16.700	1.050	Open Manhole	1200
S1.005	o	150	S5	19.600	16.580	2.870	Open Manhole	1200
S1.006	o	150	S7	19.600	16.350	3.100	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	12.261	98.1	S2	17.850	17.150	0.550	Open Manhole	1200
S1.001	1.332	88.8	S3	17.900	17.135	0.615	Open Manhole	1200
S1.002	14.153	60.2	S3	17.900	16.900	0.850	Open Manhole	1200
S1.003	15.777	78.9	S4	17.900	16.700	1.050	Open Manhole	1200
S1.004	4.239	42.4	S5	19.600	16.600	2.850	Open Manhole	1200
S1.005	4.129	57.8	S7	19.600	16.509	2.941	Open Manhole	1200
S1.006	0.500#	10.0	S9	19.600	16.300	3.150	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S2.000	o	100	S9	19.600	18.700	0.800	Open Manhole	1200
S1.007	o	150	S9	19.600	16.300	3.150	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S2.000	10.230	200.0	S9	19.600	18.649	0.851	Open Manhole	1200
S1.007	5.853	50.0	S	19.600	16.183	3.267	Open Manhole	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 530511 182470 TQ 30511 82470	Cv (Winter)	0.840
Data Type	Point	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S9, DS/PN: S1.007, Volume (m³): 3.8

Unit Reference	MD-SHE-0070-2500-1400-2500	Sump Available	Yes
Design Head (m)	1.400	Diameter (mm)	70
Design Flow (l/s)	2.5	Invert Level (m)	16.300
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	2.5	Kick-Flo®	0.621	1.7
Flush-Flo™	0.307	2.1	Mean Flow over Head Range	-	2.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	0.600	1.8	1.600	2.7	2.600	3.3	5.000	4.5	7.500	5.4
0.200	2.1	0.800	1.9	1.800	2.8	3.000	3.5	5.500	4.7	8.000	5.6
0.300	2.1	1.000	2.1	2.000	2.9	3.500	3.8	6.000	4.9	8.500	5.8
0.400	2.1	1.200	2.3	2.200	3.1	4.000	4.1	6.500	5.1	9.000	5.9
0.500	2.0	1.400	2.5	2.400	3.2	4.500	4.3	7.000	5.3	9.500	6.1

Storage Structures for Storm

Porous Car Park Manhole: S3, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00360	Porosity	0.30	Slope (1:X)	0.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	17.450	Depression Storage (mm)	5
Max Percolation (l/s)	28.2	Width (m)	3.5	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	29.0	Cap Volume Depth (m)	0.250

Cellular Storage Manhole: S7, DS/PN: S1.006

Invert Level (m)	16.350	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000			Safety Factor	2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	16.6	16.0	1.200	16.6	35.7	1.201	0.0	35.7

Porous Car Park Manhole: S9, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00360	Porosity	0.30	Slope (1:X)	60.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	19.300	Depression Storage (mm)	5
Max Percolation (l/s)	20.8	Width (m)	6.5	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	11.5	Membrane Depth (mm)	0

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FEH	Data Type Point
FEH Rainfall Version		2013	Cv (Summer) 0.750
Site Location	GB 530511 182470 TQ 30511 82470	Cv	(Winter) 0.840

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	2.5 Second Increment (Extended)	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	15 Winter	30	+0%	100/15 Summer				17.341	-0.084	0.000	0.39		6.3	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Level Exceeded
S1.000	S1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.001	S2	15 Winter	30	+0%	30/15 Summer				17.314	0.014	0.000	1.04		11.3
S1.002	S3	15 Summer	30	+0%	100/15 Summer				17.223	-0.062	0.000	0.63		13.3
S1.003	S3	15 Winter	30	+0%	100/15 Summer				17.006	-0.044	0.000	0.83		15.4
S1.004	S4	120 Winter	30	+0%	30/15 Winter				17.000	0.150	0.000	0.27		5.4
S1.005	S5	120 Winter	30	+0%	30/15 Summer				16.998	0.268	0.000	0.33		5.5
S1.006	S7	120 Winter	30	+0%	30/15 Summer				16.996	0.496	0.000	0.15		2.1
S2.000	S9	15 Summer	30	+0%					18.752	-0.048	0.000	0.47		1.9
S1.007	S9	120 Winter	30	+0%	30/15 Summer				16.996	0.546	0.000	0.10		2.1

PN	US/MH Name	Status	Level Exceeded
S1.001	S2	SURCHARGED	
S1.002	S3	OK	
S1.003	S3	OK	
S1.004	S4	SURCHARGED	
S1.005	S5	SURCHARGED	
S1.006	S7	SURCHARGED	
S2.000	S9	OK	
S1.007	S9	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FEH	Data Type Point
FEH Rainfall Version		2013	Cv (Summer) 0.750
Site Location	GB 530511 182470 TQ 30511 82470		Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)		0.0	DVD Status OFF
Analysis Timestep	2.5 Second Increment (Extended)		Inertia Status OFF
DTS Status		ON	

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.000	S1 180	Winter	100	+40%	100/15 Summer				17.598	0.173	0.000	0.17		2.7

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
S1.000	S1	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.001	S2	180 Winter	100	+40%	30/15 Summer				17.596	0.296	0.000	0.48		5.2
S1.002	S3	180 Winter	100	+40%	100/15 Summer				17.595	0.310	0.000	0.29		6.2
S1.003	S3	180 Winter	100	+40%	100/15 Summer				17.590	0.540	0.000	0.34		6.4
S1.004	S4	180 Winter	100	+40%	30/15 Winter				17.584	0.734	0.000	0.31		6.2
S1.005	S5	180 Winter	100	+40%	30/15 Summer				17.582	0.852	0.000	0.38		6.3
S1.006	S7	180 Winter	100	+40%	30/15 Summer				17.579	1.079	0.000	0.20		2.8
S2.000	S9	15 Summer	100	+40%					18.779	-0.021	0.000	0.97		3.8
S1.007	S9	180 Winter	100	+40%	30/15 Summer				17.579	1.129	0.000	0.11		2.4

PN	US/MH Name	Status	Level Exceeded
S1.001	S2	SURCHARGED	
S1.002	S3	SURCHARGED	
S1.003	S3	SURCHARGED	
S1.004	S4	SURCHARGED	
S1.005	S5	SURCHARGED	
S1.006	S7	SURCHARGED	
S2.000	S9	OK	
S1.007	S9	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100	Volumetric Runoff Coeff.	0.750
		PIMP (%)	100
FEH Rainfall Version	2013	Add Flow / Climate Change (%)	0
Site Location	GB 530511 182470 TQ 30511 82470	Minimum Backdrop Height (m)	0.200
Data Type	Point	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

^ - Indicates Time of Concentration is too low and the pipe is not sized using the rainfall

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

Network Results Table

Network Design Table for Storm

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)

Network Design Table for Storm

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	10.882	0.100	108.8	0.008	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	7.359	0.080	92.0	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	4.496	0.055	82.0	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	6.662	0.044	150.2	0.002	4.00	0.0	0.600	o	100	Pipe/Conduit	
S1.003	3.226	0.038	84.9	0.010	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	11.370	0.050	227.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	18.190	0.250	72.8	0.006	4.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

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	0.00	4.19^	17.410	0.008	0.0	0.0	0.0	0.96	17.0	0.0
S1.001	0.00	4.31^	17.310	0.016	0.0	0.0	0.0	1.05	18.5	0.0
S1.002	0.00	4.37^	17.230	0.027	0.0	0.0	0.0	1.11	19.6	0.0
S2.000	0.00	4.18^	18.600	0.002	0.0	0.0	0.0	0.63	4.9	0.0
S1.003	0.00	4.41^	17.130	0.039	0.0	0.0	0.0	1.42	56.5	0.0
S1.004	0.00	4.70^	16.850	0.039	0.0	0.0	0.0	0.66	11.7	0.0
S3.000	0.00	4.26^	17.700	0.006	0.0	0.0	0.0	1.18	20.9	0.0

Network Design Table for Storm

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
S3.001	20.624	0.250	82.5	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.002	3.781	0.084	45.0	0.009	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	4.919	0.080	61.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

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)
S3.001	0.00	4.57^	17.450	0.024	0.0	0.0	0.0	1.11	19.6	0.0
S3.002	0.00	4.61^	17.200	0.033	0.0	0.0	0.0	1.50	26.6	0.0
S1.005	0.00	4.76^	16.800	0.072	0.0	0.0	0.0	1.28	22.7	0.0

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	18.400	17.410	0.840	Open Manhole	1200
S1.001	o	150	S2	19.200	17.310	1.740	Open Manhole	1200
S1.002	o	150	S3	19.400	17.230	2.020	Open Manhole	1200
S2.000	o	100	S4	19.200	18.600	0.500	Open Manhole	1200
S1.003	o	225	S4	19.400	17.130	2.045	Open Manhole	1200
S1.004	o	150	S5	19.400	16.850	2.400	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	10.882	108.8	S2	19.200	17.310	1.740	Open Manhole	1200
S1.001	7.359	92.0	S3	19.400	17.230	2.020	Open Manhole	1200
S1.002	4.496	82.0	S4	19.400	17.175	2.075	Open Manhole	1200
S2.000	6.662	150.2	S4	19.400	18.556	0.744	Open Manhole	1200
S1.003	3.226	84.9	S5	19.400	17.092	2.083	Open Manhole	1200
S1.004	11.370	227.4	S6	19.550	16.800	2.600	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	o	150	S6	18.400	17.700	0.550	Open Manhole	1200
S3.001	o	150	S7	18.400	17.450	0.800	Open Manhole	1200
S3.002	o	150	S8	19.400	17.200	2.050	Open Manhole	1200
S1.005	o	150	S6	19.550	16.800	2.600	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	18.190	72.8	S7	18.400	17.450	0.800	Open Manhole	1200
S3.001	20.624	82.5	S8	19.400	17.200	2.050	Open Manhole	1200
S3.002	3.781	45.0	S6	19.550	17.116	2.284	Open Manhole	1200
S1.005	4.919	61.5	S	19.400	16.720	2.530	Open Manhole	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	100	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 530511 182470 TQ 30511 82470	Cv (Winter)	0.840
Data Type	Point	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S6, DS/PN: S1.005, Volume (m³): 3.3

Unit Reference	MD-SHE-0070-2500-1400-2500	Sump Available	Yes
Design Head (m)	1.400	Diameter (mm)	70
Design Flow (l/s)	2.5	Invert Level (m)	16.800
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	2.5	Kick-Flo®	0.621	1.7
Flush-Flo™	0.307	2.1	Mean Flow over Head Range	-	2.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	0.600	1.8	1.600	2.7	2.600	3.3	5.000	4.5	7.500	5.4
0.200	2.1	0.800	1.9	1.800	2.8	3.000	3.5	5.500	4.7	8.000	5.6
0.300	2.1	1.000	2.1	2.000	2.9	3.500	3.8	6.000	4.9	8.500	5.8
0.400	2.1	1.200	2.3	2.200	3.1	4.000	4.1	6.500	5.1	9.000	5.9
0.500	2.0	1.400	2.5	2.400	3.2	4.500	4.3	7.000	5.3	9.500	6.1

Storage Structures for Storm

Porous Car Park Manhole: S4, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	50.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	18.850	Depression Storage (mm)	5
Max Percolation (l/s)	28.8	Width (m)	4.5	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	23.0	Membrane Depth (mm)	0

Cellular Storage Manhole: S5, DS/PN: S1.004

Invert Level (m)	16.850	Infiltration Coefficient Side (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	29.0	24.0	1.000	29.0	52.0	1.001	0.0	52.0

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 530511 182470 TQ 30511 82470	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	0.0	DVD Status	OFF
Analysis Timestep	2.5 Second Increment (Extended)	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	15 Summer	30	+0%	100/15 Winter				17.461	-0.099	0.000	0.25		3.8	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Level Exceeded
S1.000	S1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.001	S2	15 Summer	30	+0%	100/15 Summer				17.381	-0.079	0.000	0.46		7.3
S1.002	S3	120 Winter	30	+0%	100/15 Summer				17.367	-0.013	0.000	0.25		3.7
S2.000	S4	120 Winter	30	+0%					18.616	-0.084	0.000	0.06		0.3
S1.003	S4	120 Winter	30	+0%	30/120 Winter				17.366	0.011	0.000	0.17		5.1
S1.004	S5	120 Winter	30	+0%	30/15 Summer				17.365	0.365	0.000	0.19		2.0
S3.000	S6	15 Winter	30	+0%	100/120 Winter				17.737	-0.113	0.000	0.14		2.7
S3.001	S7	15 Winter	30	+0%	100/15 Summer				17.535	-0.065	0.000	0.61		11.2
S3.002	S8	120 Winter	30	+0%	30/120 Winter				17.363	0.013	0.000	0.25		4.6
S1.005	S6	120 Winter	30	+0%	30/15 Summer				17.367	0.417	0.000	0.12		2.1

PN	US/MH Name	Status	Level Exceeded
S1.001	S2	OK	
S1.002	S3	OK	
S2.000	S4	OK	
S1.003	S4	SURCHARGED	
S1.004	S5	SURCHARGED	
S3.000	S6	OK	
S3.001	S7	OK	
S3.002	S8	SURCHARGED	
S1.005	S6	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FEH	Data Type Point
FEH Rainfall Version		2013	Cv (Summer) 0.750
Site Location	GB 530511 182470 TQ 30511 82470		Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)		0.0	DVD Status OFF
Analysis Timestep	2.5 Second Increment (Extended)		Inertia Status OFF
DTS Status		ON	

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.000	S1 180	Winter	100	+40%	100/15 Winter				18.250	0.690	0.000	0.10		1.6

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded
S1.000	S1	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.001	S2	180 Winter	100	+40%	100/15 Summer				18.249	0.789	0.000	0.18		2.8
S1.002	S3	180 Winter	100	+40%	100/15 Summer				18.248	0.868	0.000	0.31		4.5
S2.000	S4	15 Winter	100	+40%					18.642	-0.058	0.000	0.31		1.4
S1.003	S4	180 Winter	100	+40%	30/120 Winter				18.246	0.891	0.000	0.20		6.1
S1.004	S5	180 Winter	100	+40%	30/15 Summer				18.245	1.245	0.000	0.18		1.9
S3.000	S6	180 Winter	100	+40%	100/120 Winter				18.247	0.397	0.000	0.06		1.2
S3.001	S7	180 Winter	100	+40%	100/15 Summer				18.246	0.646	0.000	0.26		4.8
S3.002	S8	180 Winter	100	+40%	30/120 Winter				18.242	0.892	0.000	0.31		5.7
S1.005	S6	180 Winter	100	+40%	30/15 Summer				18.240	1.290	0.000	0.14		2.5

PN	US/MH Name	Status	Level Exceeded
S1.001	S2	SURCHARGED	
S1.002	S3	SURCHARGED	
S2.000	S4	OK	
S1.003	S4	SURCHARGED	
S1.004	S5	SURCHARGED	
S3.000	S6	SURCHARGED	
S3.001	S7	SURCHARGED	
S3.002	S8	SURCHARGED	
S1.005	S6	SURCHARGED	