Project Title

Report to Discharge Drainage Related Planning Condition

At

Land at Buckley Street

Lees

Oldham

OL4 5AS

For

Bentley Living

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Paul Graveney Consulting Ltd

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1.0 Introduction

1.1 In November 2020 a planning application was submitted to Oldham Council for the Erection of four no. residential houses with associated parking and landscaping on land at Buckley Street, Lees, Oldham, OL4 5AS.

1.2 Planning approval, ref FUL/345895/20 was granted in June 2021 that included a planning condition relating to the drainage of the development.

1.3 This report has been prepared to remove this condition; Number 5.

2.0 Drainage Strategy

2.1 Existing Drainage

2.1.1 A review of the United Utilities adopted sewer records has identified no public sewers passing through the site.

2.1.2 Within Buckley Street to the west of the site there is a 450mm diameter combined water sewer at 2.8m depth flowing north into West Street. Refer to Figure 1 below.

2.1.3 No accessible surface water sewers have been identified in close proximity.

2.1.4 The site itself is unmade with no positive drainage.

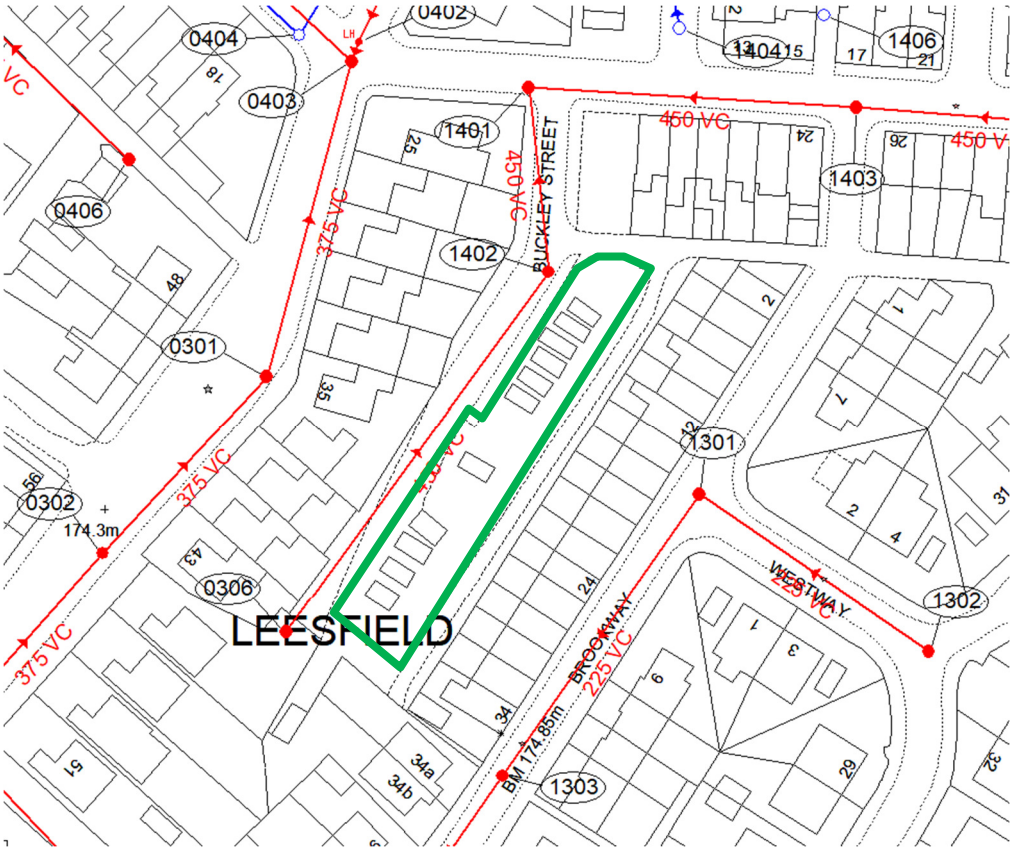


Figure 1: United Utility Sewer Records

2.2 Existing Runoff

2.2.1 The site area is currently unmade and so is considered to be greenfield for drainage purposes. The greenfield rates have been calculated in the table below.

	Area (m^2)	1 year	Qbar	30 year	100 year
Greenfield Runoff Rates	920	0.6 l/s	0.7 l/s	1.1 l/s	1.4 l/s

Figure 2: Existing Greenfield Runoff Rates

2.2.3 Based on the findings above, the greenfield flow rate is too low and thus a peak flow rate not exceeding 5l/s will be applied in line with UU guidance.

2.3 Existing Geology

2.3.1 A review of the British Geological Survey (BGS) desk-based data would indicate the superficial geology to encompass Till, Devensian – silts and clay. This is supported by a local BGS borehole.

2.3.1 Due to the depth of identified clay, it has been concluded that infiltration is not a viable method for surface water management.

2.4 Hydrological Assessment

2.4.1 The closest identified watercourse is the River Medlock, located some 160m west of the site beyond 3rd party land.

2.4.2 Due to this distance, need to cross 3rd party land and to pump, this option has been discounted.

2.5 SuDS Hierarchal Approach

2.5.1 Based on the existing drainage configuration, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in detail below:

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Investigations have confirmed the underlying ground to encompass clays to depth. In light of these findings infiltration is not considered to be suitable.
Connection to Watercourse	No	No watercourse in close proximity.
Connection to Surface Water Sewer	No	No surface water sewer in close proximity
Connection to Combined Water Sewer	Yes	New connection to combined water sewer immediately to the north west of the site.

Figure 3: SuDS Hierarchal Approach

2.6 Surface Water Drainage Strategy

2.6.1 The general principal of the surface water drainage strategy is to collect the runoff from the roof of the new residential building, and direct it to a number of RWPs. These will then drop down to a new private surface water network that will flow north along the rear elevations and outfall to the existing 450mm combined sewer manhole to the north west of the site. The flows will be restricted to 5l/s by the inclusion of a hydrobrake flow control within the last chamber. Due to this restriction, attenuation will take the form of a small online geocellular tank.

2.6.2 A hydraulic model has been simulated within the Microdrainage design software and confirms that no flooding will occur up the extreme 100 year + 45% CC storm event. The drainage GA can be found in Appendix A with the calculations in Appendix B. The post development peak runoff rates from the model can be identified in Figure 4 below.

	1 year	30 year	100 year + 45% CC
Post Development Peak Runoff Rates	3.0 l/s	5.0 l/s	5.0 l/s

Figure 4: Post Development Peak Runoff Rates

2.7 Foul Flows

2.7.1 Foul flows generated by the new development will discharge via a new below ground foul drainage network and outfall to the same combined sewer.

2.8 Maintenance

2.8.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints. The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

2.8.2 There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – '*basic tasks undertaken on a frequent and predictable schedule' including vegetation management, litter and debris removal, and inspections*.'
- Occasional Maintenance – *'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example.'*
- Remedial Maintenance – *'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.*'

2.8.3 Specific maintenance needs should be monitored, and maintenance schedules adjusted to suit the location and condition of the drainage feature in question.

Operation and Maintenance Activity	SuDS Component		
	Piped Network / Inspection Chambers	Flow Controls	Attenuation Storage Tanks
Regular Maintenance			
Inspection	■	■	■
Litter and debris removal	■	■	
Occasional Maintenance			
Sediment management[1]	■	■	■
Remedial Maintenance			
Structure rehabilitation / repair	□	□	□

■ Will be required □ May be required.
[1] Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

Figure 5: Extract from The SuDS Manual Table 32.1: Typical key SuDS components operation and maintenance activities.

2.8.4 Piped Networks, Inspection, Manhole and Catchpit Chambers

The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained where required.

Pipes are proprietary products, and the materials can vary across the site and as such where used the manufacture's recommendations should be followed.

Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers and manholes.

Regular inspection and maintenance are important to identify areas which may have been obstructed / clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required, take remedial action	Monthly for three months, then six monthly
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

Figure 6: Operation and Maintenance Requirements of Piped Networks and Inspection Chambers

2.8.5 Flow Control Units

The flow control units are intended for flood control and flow restriction.

The flow control is specified as an orifice plate and is a proprietary product; therefore, manufacturer's recommendations should also be taken into consideration.

Access for maintenance has been provided by locating within manhole chambers.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre- treatment structures and flow control chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets.	As required.

Figure 7: Operation and Maintenance Requirements for Flow Controls

2.8.6 Attenuation storage tanks

Attenuation storage tanks are used to create a below ground void space for the temporary storage of surface water before controlled release. The flexibility in size and shape of the tanks mean that they can be tailored to suit the specific characteristics of any site. The main benefits are their high storage volume and the potential for installation beneath roads and car parks.

Attenuation Storage Tanks should be designed to prevent or minimise the risk of sediment ingress into the tank systems. An off-line storage system will be used on this scheme as they are less prone to sedimentation, a sediment sump will also be included immediately upstream of the tank.

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly	Monthly for 3 months, then annually
	Remove debris from the catchment surface	Monthly
	Inspect inlets, outlets and overflow for blockages, and clear if required	Monthly
Occasional Maintenance	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
	Survey inside of tank for sediment build-up and remove if necessary	As required

Figure 8: Operation and Maintenance Requirements for Attenuation Storage Tanks

3.0 Drainage Related Planning Condition and Responses

3.1 Planning Conditions

3.1.1 The detailed planning conditions are listed below in *italics* with the PG Consulting response in Blue below.

Condition 5

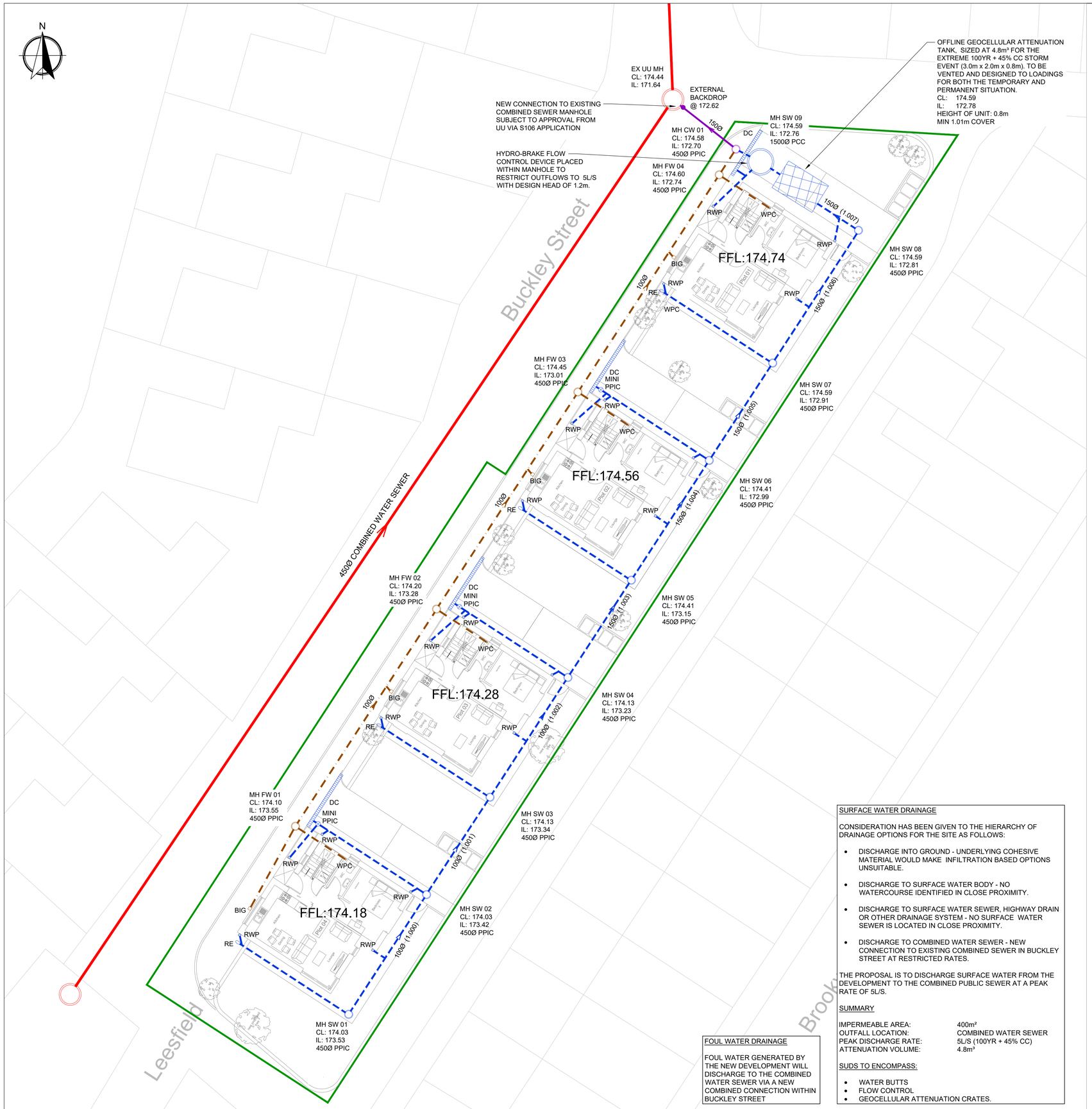
Prior to the commencement of any part of the development hereby approved, details of the method of surface water and foul water drainage from the site shall be submitted to and approved in writing by the Local Planning Authority. The approved details shall be implemented in full prior to first occupation of the approved development and shall be maintained thereafter.

Refer to the drainage GA in Appendix A and the hydraulic calculations in Appendix B. No overland flooding has been indicated from the hydraulic modelling.

A peak discharge rate of 5l/s will be applied. This is considered the minimum rate to prevent blockage. The Drainage GA indicates the attenuation location, with the volume defined in the calculations.

Appendix A – PG Consulting Drawing

PGC 788-C-001: Drainage GA



DRAINAGE NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR THE CONFIRMATION OF ALL POSITIONS AND LEVELS OF EXISTING DRAINS, SEWERS AND MANHOLES PRIOR TO THE COMMENCEMENT OF THE PROPOSED WORKS AND ANY DISCREPANCIES REPORTED IMMEDIATELY TO PGC.
2. ALL PRIVATE DRAINAGE WITHIN THE SITE IS TO COMPLY WITH THE REQUIREMENTS OF BS EN 752 AND BUILDING REGULATIONS PART H.
3. NO DEVIATION FROM THE CONTENT OF THIS DRAWING IS ALLOWED WITHOUT PERMISSION OF PGC.
4. FOR DETAILS OF WORKMANSHIP AND MATERIALS REFER TO THE SPECIFICATION, BUILDING REGULATIONS AND BRITISH STANDARDS CURRENT AT THE TIME OF THE WORK.
5. ADEQUATE PROTECTION IS TO BE PROVIDED TO MAINTAIN INTEGRITY OF THE EXISTING SERVICES AND PROPOSED WORKS DURING CONSTRUCTION.
6. COVER LEVELS ARE PROVISIONAL AND THE FINAL LEVEL SHOULD BE ADJUSTED AND SET TO SUIT THE PROPOSED FINISHED LEVELS AS CONFIRMED BY THE ARCHITECT.
7. CONCRETE SURROUND IS TO BE PROVIDED TO ALL DRAINS WITH A COVER OF LESS THAN 1.2m OF THE FINISHED GROUND LEVEL IN HIGHWAY AREAS OR WITHIN 0.6m IF WITHIN LANDSCAPED AREAS. AN EXPANSION JOINT IS TO BE PROVIDED AT EACH AND EVERY PIPE JOINT.
8. ANY GRADIENTS OF DRAINS INDICATED ARE INDICATIVE ONLY AND THE CONTRACTOR SHALL INSTALL THE DRAINS TO THE SPECIFIED LEVELS SHOWN FOR EACH MANHOLE (U.O.N). CATCHPIT INVERT LEVELS ARE FOR THE OUTGOING PIPE WITH THE SUMP LEVEL SPECIFIED SEPARATELY.
9. ALL PIPEWORK WITHIN MANHOLES ARE TO BE LAID SOFFIT TO SOFFIT (U.O.N). ALL CHAMBER INVERT LEVELS ARE FOR THE OUTGOING PIPE LEVELS. BACKDROP PIPEWORK SHALL BE CONNECTED AT SOFFIT TO SOFFIT WITH THE RODDING ACCESS LEVEL SPECIFIED.
10. ALL INVERT LEVELS PROVIDED FOR 475mm PPIC CHAMBER ARE TO THE LOWEST PIPE WITHIN THE BENCHING ARRANGEMENT.
11. MANHOLE COVERS AND FRAMES ARE TO BE IN ACCORDANCE WITH BS EN 124 AND THE FOLLOWING:
    - VEHICULAR AREAS: CLASS D400 (E600 IN SERVICE YARD LOCATIONS), DOUBLE TRIANGULAR, 150mm DEEP DUCTILE IRON COVER AND FRAME WITH THREE POINT COVER SEATING, (NON-ROCK DESIGN) BADGED FW OR SW FOR FOUL OR SURFACE WATER DRAINAGE.
    - PEDESTRIAN AREAS: CLASS B125, 100mm DEEP, BADGED FW OR SW FOR FOUL OR SURFACE WATER DRAINAGE.
    - IF COVERS ARE REQUIRED TO BE RECESSED A HOWE GREEN 1050 HEAVY DUTY, STAINLESS STEEL EDGE, EXTERNAL USE, 100mm RECESS OR SIMILAR APPROVED SHALL BE USED.
12. REFER TO ARCHITECT'S DRAWING FOR RWP'S/WPC'S POP UP SIZES. ALL REST BENDS ARE ASSUMED TO BE 100Ø,SET 600mm BELOW SSL, UNLESS OTHER SPECIFIED. THE CONTRACTOR SHALL ALLOW FOR SUITABLE VIKING JOHNSON ADAPTORS/COUPLINGS FOR JOINTING THE DIFFERENT PIPE MATERIALS/PIPE SIZES.
13. ALL BRICKWORK IN CONNECTION WITH DRAINAGE IS BE SOLID ENGINEERING BRICK CLASS B TO BS 3921.
14. ALL INSITU CONCRETE TO BE GEN3 UNLESS SPECIFIED OTHERWISE.
15. DRAINAGE CHANNELS ARE TO BE ACO MD SYSTEM C/W 'HEELGUARD' GRATES OR 'BRICKSLOT' TO LANDSCAPE ARCHITECT APPROVAL.
16. ALL PRECAST CONCRETE PIPES, CHAMBER PRODUCTS AND ROAD GULLIES SHALL BE TO BS 5911 AND BE KITEMARKED.
17. VITRIFIED CLAY PIPES TO CONFORM TO BS EN 295 MANUFACTURER: HEPWORTH SUPERSLEEVE;
    - 100/150mmØ -40 kN/m
    - 225mmØ -45 kN/m
    - 300mmØ -72 kN/m

    AND BE SUPPLIED WITH EPDM SEALING RINGS AS STANDARD.
18. PLASTIC PIPEWORK IS ACCEPTABLE AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS
19. UPON COMPLETION OF THE WORKS, ALL THE DRAINS SHALL BE CLEANED BY JETTING, REMOVING ALL DEBRIS FROM SITE. NO DEBRIS SHALL BE PERMITTED TO ENTER THE EXISTING DRAINAGE SYSTEM.
20. UPON COMPLETION OF THE WORKS THE CONTRACTOR SHALL SURVEY THE WORKS AND PROVIDE A SUITABLY 'MARKED-UP' DRAWINGS FOR ' RECORD' PURPOSES'.

GENERAL NOTES

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. DETAILS OF EXISTING SEWERS SHALL BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY. THE CONTRACTOR SHOULD CHECK THE LEVELS OF ALL NEW OUT FALLS IN RELATION TO EXISTING SEWERS PRIOR TO ANY CONSTRUCTION TO ENSURE THE PROPOSED DESIGN CAN BE ACHIEVED.
4. DO NOT SCALE FROM THIS DRAWN, WORK TO DIMENSIONS OR COORDINATES PROVIDED. ALL LEVELS ARE IN MILLIMETRES. UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.

KEY

- EXISTING COMBINED WATER PUBLIC SEWER
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED COMBINED WATER DRAINAGE
- SITE BOUNDARY

RWP	RAINWATER PIPE
WPC	WASTE POINT CONNECTION (FOUL)
DC	DRAINAGE CHANNEL
BIG	BACK INLET GULLY

NOTE ALL RWP AND SVP LOCATIONS TO BE CONFIRMED BY OTHERS

ALL PIPEWORK TO BE 100Ø UNLESS NOTED OTHERWISE

FOUL WATER DRAINAGE

FOUL WATER GENERATED BY THE NEW DEVELOPMENT WILL DISCHARGE TO THE COMBINED WATER SEWER VIA A NEW COMBINED CONNECTION WITHIN BUCKLEY STREET

SURFACE WATER DRAINAGE

CONSIDERATION HAS BEEN GIVEN TO THE HIERARCHY OF DRAINAGE OPTIONS FOR THE SITE AS FOLLOWS:

- DISCHARGE INTO GROUND - UNDERLYING COHESIVE MATERIAL WOULD MAKE INFILTRATION BASED OPTIONS UNSUITABLE.
- DISCHARGE TO SURFACE WATER BODY - NO WATERCOURSE IDENTIFIED IN CLOSE PROXIMITY.
- DISCHARGE TO SURFACE WATER SEWER, HIGHWAY DRAIN OR OTHER DRAINAGE SYSTEM - NO SURFACE WATER SEWER IS LOCATED IN CLOSE PROXIMITY.
- DISCHARGE TO COMBINED WATER SEWER - NEW CONNECTION TO EXISTING COMBINED SEWER IN BUCKLEY STREET AT RESTRICTED RATES.

THE PROPOSAL IS TO DISCHARGE SURFACE WATER FROM THE DEVELOPMENT TO THE COMBINED PUBLIC SEWER AT A PEAK RATE OF 5L/S.

SUMMARY

IMPERMEABLE AREA:	400m²
OUTFALL LOCATION:	COMBINED WATER SEWER
PEAK DISCHARGE RATE:	5L/S (100YR + 45% CC)
ATTENUATION VOLUME:	4.8m³

SUDS TO ENCOMPASS:

- WATER BUTTS
- FLOW CONTROL
- GEOCELLULAR ATTENUATION CRATES.

REV	DATE	DRAWN	REV'D ENG.	NOTES
P2	30.10.23	PG	PG	SITE PLAN UPDATED
P1	08.06.23	PG	PG	PRELIMINARY ISSUE

CLIENT: BENTLEY LIVING

PROJECT: BUCKLEY STREET, LEES, OLDHAM

DRAWING TITLE: DRAINAGE GA PLAN

DRAWING STATUS: INFORMATION

SCALE	DRAWN BY	ENGINEER	SHEET
1:125	PG	PG	A1

DRAWING No: PGC788-C-001

REVISION: P2

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Appendix B – Hydraulic Calculations

	Buckley Street Surface Water Network V2 30.10.23	
Date 30/10/2023 File Buckley Street - SW Net...	Designed by paulg Checked by	
Innovyze	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.900	Add Flow / Climate Change (%)	0
Ratio R	0.301	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.033	4-8	0.007

Total Area Contributing (ha) = 0.040

Total Pipe Volume (m³) = 0.834

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
1.000	9.000	0.110	81.8	0.003	4.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	7.000	0.080	87.5	0.007	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	9.000	0.110	81.8	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.003	7.000	0.080	87.5	0.007	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.004	9.000	0.110	81.8	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.005	7.000	0.080	87.5	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	10.000	0.100	100.0	0.003	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)
1.000	50.00	4.18	173.530	0.003	0.0	0.0	0.0	0.85	6.7	0.4
1.001	50.00	4.32	173.420	0.010	0.0	0.0	0.0	0.82	6.5	1.4
1.002	50.00	4.49	173.340	0.013	0.0	0.0	0.0	0.85	6.7	1.8
1.003	50.00	4.64	173.230	0.020	0.0	0.0	0.0	0.82	6.5	2.7
1.004	50.00	4.81	173.150	0.023	0.0	0.0	0.0	0.85	6.7	3.1
1.005	50.00	4.92	172.990	0.030	0.0	0.0	0.0	1.08	19.0	4.1
1.006	50.00	5.09	172.910	0.033	0.0	0.0	0.0	1.00	17.8	4.5

	Buckley Street Surface Water Network V2 30.10.23	
Date 30/10/2023 File Buckley Street - SW Net...	Designed by paulg Checked by	
Innovyze	Network 2017.1.2	

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
1.007	3.000	0.030	100.0	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.008	2.000	0.020	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.009	2.000	0.020	100.0	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.010	5.000	0.080	62.5	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)
1.007	50.00	5.14	172.810	0.037	0.0	0.0	0.0	1.00	17.8	5.0
1.008	50.00	5.17	172.780	0.037	0.0	0.0	0.0	1.00	17.8	5.0
1.009	50.00	5.20	172.760	0.040	0.0	0.0	0.0	1.00	17.8	5.4
1.010	50.00	5.27	172.740	0.040	0.0	0.0	0.0	1.27	22.5	5.4

	Buckley Street Surface Water Network V2 30.10.23	
Date 30/10/2023 File Buckley Street - SW Net...	Designed by paulg Checked by	
Innovyze	Network 2017.1.2	

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)
1.000	o	100	SW01	174.030	173.530	0.400	Open Manhole	450
1.001	o	100	SW02	174.030	173.420	0.510	Open Manhole	450
1.002	o	100	SW03	174.130	173.340	0.690	Open Manhole	450
1.003	o	100	SW04	174.130	173.230	0.800	Open Manhole	450
1.004	o	100	SW05	174.410	173.150	1.160	Open Manhole	450
1.005	o	150	SW06	174.410	172.990	1.270	Open Manhole	450
1.006	o	150	SW07	174.590	172.910	1.530	Open Manhole	450
1.007	o	150	SW08	174.540	172.810	1.580	Open Manhole	450
1.008	o	150	TANK	174.590	172.780	1.660	Open Manhole	100
1.009	o	150	SW09	174.590	172.760	1.680	Open Manhole	1200
1.010	o	150	CW01	174.540	172.740	1.650	Open Manhole	450

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)
1.000	9.000	81.8	SW02	174.030	173.420	0.510	Open Manhole	450
1.001	7.000	87.5	SW03	174.130	173.340	0.690	Open Manhole	450
1.002	9.000	81.8	SW04	174.130	173.230	0.800	Open Manhole	450
1.003	7.000	87.5	SW05	174.410	173.150	1.160	Open Manhole	450
1.004	9.000	81.8	SW06	174.410	173.040	1.270	Open Manhole	450
1.005	7.000	87.5	SW07	174.590	172.910	1.530	Open Manhole	450
1.006	10.000	100.0	SW08	174.540	172.810	1.580	Open Manhole	450
1.007	3.000	100.0	TANK	174.590	172.780	1.660	Open Manhole	100
1.008	2.000	100.0	SW09	174.590	172.760	1.680	Open Manhole	1200
1.009	2.000	100.0	CW01	174.540	172.740	1.650	Open Manhole	450
1.010	5.000	62.5	sewer	174.440	172.660	1.630	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010	sewer	174.440	172.660	171.640	0	0

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Simulation Criteria for Storm

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

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	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.900	Storm Duration (mins)	30
Ratio R	0.301		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW09, DS/PN: 1.009, Volume (m³): 2.1

Unit Reference	MD-SHE-0103-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	172.760
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0
Flush-Flo™	0.354	5.0
Kick-Flo®	0.745	4.0
Mean Flow over Head Range	-	4.4

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	3.4	1.200	5.0	3.000	7.7	7.000	11.5
0.200	4.7	1.400	5.4	3.500	8.3	7.500	11.8
0.300	5.0	1.600	5.7	4.000	8.8	8.000	12.2
0.400	5.0	1.800	6.0	4.500	9.3	8.500	12.6
0.500	4.9	2.000	6.3	5.000	9.8	9.000	12.9
0.600	4.7	2.200	6.6	5.500	10.2	9.500	13.3
0.800	4.1	2.400	6.9	6.000	10.7		
1.000	4.6	2.600	7.2	6.500	11.1		

Storage Structures for Storm

Cellular Storage Manhole: TANK, DS/PN: 1.008

Invert Level (m) 172.780 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	6.0	6.0	5.200	0.0	13.8
0.400	6.0	9.9	5.600	0.0	13.8
0.800	6.0	13.8	6.000	0.0	13.8
0.801	0.0	13.8	6.400	0.0	13.8
1.600	0.0	13.8	6.800	0.0	13.8
2.000	0.0	13.8	7.200	0.0	13.8
2.400	0.0	13.8	7.600	0.0	13.8
2.800	0.0	13.8	8.000	0.0	13.8
3.200	0.0	13.8	8.400	0.0	13.8
3.600	0.0	13.8	8.800	0.0	13.8
4.000	0.0	13.8	9.200	0.0	13.8
4.400	0.0	13.8	9.600	0.0	13.8
4.800	0.0	13.8	10.000	0.0	13.8

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) 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 Coeffiecient	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	0.301
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.900	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)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW01	15 Winter	1	+0%	100/15 Summer				173.546
1.001	SW02	15 Winter	1	+0%	100/15 Summer				173.449
1.002	SW03	15 Winter	1	+0%	100/15 Summer				173.372
1.003	SW04	15 Winter	1	+0%	30/15 Summer				173.272
1.004	SW05	15 Winter	1	+0%	30/15 Summer				173.193
1.005	SW06	15 Winter	1	+0%	100/15 Summer				173.035
1.006	SW07	15 Winter	1	+0%	30/15 Summer				172.957
1.007	SW08	15 Winter	1	+0%	30/15 Summer				172.876
1.008	TANK	15 Winter	1	+0%	30/15 Summer				172.872
1.009	SW09	15 Winter	1	+0%	30/15 Summer				172.869
1.010	CW01	15 Winter	1	+0%					172.781

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	-0.084	0.000	0.06		0.4	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW02	-0.071	0.000	0.19		1.1	OK	
1.002	SW03	-0.068	0.000	0.22		1.4	OK	
1.003	SW04	-0.058	0.000	0.36		2.1	OK	
1.004	SW05	-0.057	0.000	0.39		2.4	OK	
1.005	SW06	-0.105	0.000	0.19		3.1	OK	
1.006	SW07	-0.103	0.000	0.22		3.4	OK	
1.007	SW08	-0.084	0.000	0.35		3.8	OK	
1.008	TANK	-0.058	0.000	0.26		2.8	OK	
1.009	SW09	-0.041	0.000	0.28		3.0	OK	
1.010	CW01	-0.109	0.000	0.17		3.0	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) 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 Coeffiecient	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 0.301
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.900	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)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW01	15 Winter	30	+0%	100/15 Summer				173.556
1.001	SW02	15 Summer	30	+0%	100/15 Summer				173.472
1.002	SW03	15 Winter	30	+0%	100/15 Summer				173.406
1.003	SW04	15 Winter	30	+0%	30/15 Summer				173.362
1.004	SW05	15 Winter	30	+0%	30/15 Summer				173.276
1.005	SW06	30 Winter	30	+0%	100/15 Summer				173.137
1.006	SW07	30 Winter	30	+0%	30/15 Summer				173.127
1.007	SW08	30 Winter	30	+0%	30/15 Summer				173.112
1.008	TANK	30 Winter	30	+0%	30/15 Summer				173.106
1.009	SW09	30 Winter	30	+0%	30/15 Summer				173.101
1.010	CW01	30 Winter	30	+0%					172.794

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	-0.074	0.000	0.15		0.9	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW02	-0.048	0.000	0.54		3.1	OK	
1.002	SW03	-0.034	0.000	0.65		4.0	OK	
1.003	SW04	0.032	0.000	1.02		6.0	SURCHARGED	
1.004	SW05	0.026	0.000	1.11		6.9	SURCHARGED	
1.005	SW06	-0.003	0.000	0.44		7.2	OK	
1.006	SW07	0.067	0.000	0.47		7.5	SURCHARGED	
1.007	SW08	0.152	0.000	0.74		8.0	SURCHARGED	
1.008	TANK	0.176	0.000	0.44		4.8	SURCHARGED	
1.009	SW09	0.191	0.000	0.46		5.0	SURCHARGED	
1.010	CW01	-0.096	0.000	0.28		5.0	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) 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 Coeffiecient	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 0.301
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.900	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)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW01	15 Winter	100	+45%	100/15 Summer				173.986
1.001	SW02	15 Winter	100	+45%	100/15 Summer				173.978
1.002	SW03	15 Winter	100	+45%	100/15 Summer				173.941
1.003	SW04	30 Winter	100	+45%	30/15 Summer				173.874
1.004	SW05	30 Winter	100	+45%	30/15 Summer				173.858
1.005	SW06	30 Winter	100	+45%	100/15 Summer				173.840
1.006	SW07	30 Winter	100	+45%	30/15 Summer				173.831
1.007	SW08	30 Winter	100	+45%	30/15 Summer				173.818
1.008	TANK	30 Winter	100	+45%	30/15 Summer				173.812
1.009	SW09	30 Winter	100	+45%	30/15 Summer				173.809
1.010	CW01	180 Summer	100	+45%					172.794

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	0.356	0.000	0.23		1.4	FLOOD RISK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW02	0.458	0.000	0.68		4.0	FLOOD RISK	
1.002	SW03	0.501	0.000	0.84		5.2	FLOOD RISK	
1.003	SW04	0.544	0.000	1.17		6.9	FLOOD RISK	
1.004	SW05	0.608	0.000	1.27		7.9	SURCHARGED	
1.005	SW06	0.700	0.000	0.65		10.5	SURCHARGED	
1.006	SW07	0.771	0.000	0.73		11.6	SURCHARGED	
1.007	SW08	0.858	0.000	1.21		13.1	SURCHARGED	
1.008	TANK	0.882	0.000	0.67		7.3	SURCHARGED	
1.009	SW09	0.899	0.000	0.46		5.0	SURCHARGED	
1.010	CW01	-0.096	0.000	0.28		5.0	OK	