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Consulting Structural & Civil Engineers

Barton Buildings, Uxbridge Industrial Estate Drainage Strategy

Rev B – 26th February 2021

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B	Revised to suit comments. Issued for Planning	26.02.21	PK
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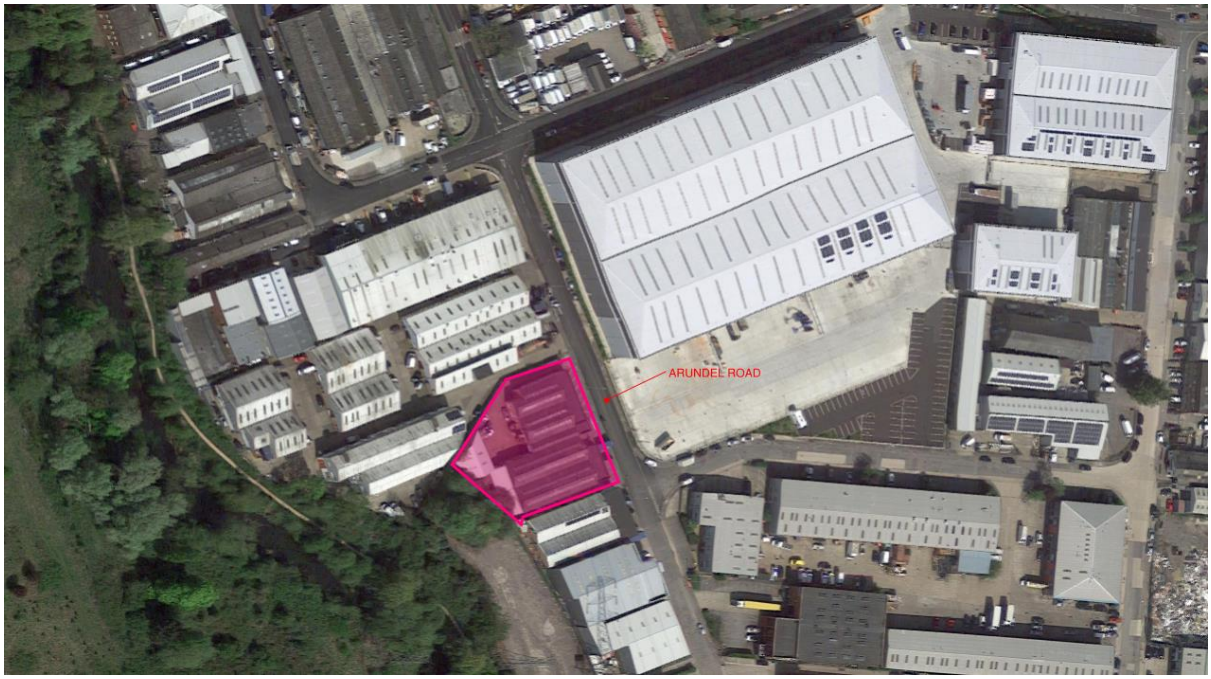
1 Site Location and Setting

The proposed development site is centred at approximate National Grid Reference TQ047830 (E 504707, N 183047). The site is irregular in shape and occupies an area of approximately 0.234ha.



The site is located at Unit C, Bartons Building Arundel Rd, Uxbridge UB8 2RR and is currently occupied by a number of small business in the units. The units form a U-shape around a small yard on the north of the site. An access road runs along the north edge of the site from Arundel road. The northwest boundary borders the adjacent access road to the Chiltern Business Village. The rear of the site is bounded by a chain link fence and vegetation. The boundary along Arundel road is undefined and the southern elevation of the building forms the southern boundary.

The site is not set within a Conservation Area and the Environment Agency show that the entire site is located in Flood Zone 1albeit that the adjacent Arundel Road is shown to tbe within Flood Zone 2.

The site is occupied approximately 64.0% by building footprint, 36.0% by hardstanding and 0.0% by soft landscaping.

The topographical site survey carried out by Laser Surveys November 2019 indicates the existing building on site sits at approximately 30.100mAOD. The existing car parking and service yard areas are graded to fall towards gullies and channels. The site as a whole is generally flat with levels around the building approximately 100mm lower than the slab. There is a slight fall from the front of the building to the curtilage with Arundel Road.

British Geological Survey (BGS) online mapping (1:50,000 scale) indicates the site to overlie a bedrock geology of London Clay with superficial deposits of Alluvium consisting of Silt, Sand And Gravel are listed overlying. An intrusive ground investigation was carried out in September 202o by GO Contaminated Land Solutions. Their investigation undertook 4 boreholes across the site with the following findings:

Stratum	BH1	BH2	BH3	BH4
Tarmac/Concrete	FGL – 0.03m	FGL – 0.04m	FGL – 0.06m	FGL – 0.22m
Sand and Gravel Fill	0.03m – 0.25m	0.04m 0 0.30m	-	-
Clayey Made Ground	0.25m – 1.00m	0.30m – 1.30m	0.06m – 0.80m	0.22m – 1.30m
Silty Clayey Gravel	-	1.30m – 2.30m	0.80m – 2.20m	130m – 3.40m
Sandy Clayey Gravel	1.00m – 4.00m	2.30m – 4.000	2.20m – 4.00m	3.40m – 9.30m

The site is shown to be unproductive for Bedrock aquifers and within a secondary A designation for Superficial aquifers. The site is not shown to be located within a groundwater Source Protection Zone (SPZ).

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2 Proposed Development

The project involves a demolition of the existing building and construction a large industrial building divided into two units along with associated parking and hard and soft landscaping. External areas are to be hard surfaced with a planting strip along the west and north boundary. Access to the rear will be gained via a dedicated access from Arundel Road. The existing sub station of site will be relocated.

3 Temporary Drainage During Construction

Temporary drainage methods will be coordinated with the contractor during the construction phasing and if required a Construction Surface Water Management Plan (CSWMP) will be completed.. Once demolition has taken place all existing hardstanding areas along with the majority of the private below ground drainage will have been removed. Surface and foul water connections to the public sewer will be maintained for temporary connections. Should any dewatering of the site be required, the contractor will apply for a temporary groundwater discharge licence.

4 Hierarchy of Surface Water Disposal

When developing or redeveloping a site, the control and dispersion of surface water falling on the site's catchment always must be considered. Wherever possible runoff from developments should be managed on the surface. This enables their performance to be more easily inspected and managed with pollution incidents and potential flood risk being visible. But due to the nature of some developments this is not always possible.

If surface water is to be discharged from the site Planning Practice Guidelines state "Generally, the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable:

1. Into the ground (infiltration)
2. To a surface water body.
3. To a surface water sewer, highway drain or another drainage system.
4. To a combined sewer."

It is recommended to manage surface water as close to the source i.e., where the rain falls. The effective of control and management of surface water runoff will need to be addressed through the application of the above drainage hierarchy.

4.1 Discharge to Ground (Infiltration)

The underlying superficial strata shows that the ground is suitable for infiltration. A BRE365 soakage test was carried out (March 2020 by Fastrack) in the south western corner of the site with good infiltration rates shown within the sands and gravels of 17.63×10^{-4}m/s.

However, the intrusive survey carried out by Go Contaminated Land Solutions stuck groundwater in all four of their boreholes at variable depths between 2.2m and 5.2m below ground level. The proximity of the River Colne (50m to the south west of the site) is possible effecting the groundwater levels on the site.

The depth of the made ground shown across the site, the proximity of the river and the groundwater levels and the site layout in relation to adjacent buildings does not lend itself to allowing infiltration drainage.

4.2 Discharge to a Surface Water Body

Reference to OS Mapping indicates that the nearest surface water feature is the river Colne approximately 50m to the east of the site with the Grand Union Canal lying 250m away also to the east of the siste. The distance from the site means that discharging to the to a surface water body will not be possible.

4.3 Discharge to a Surface Water Sewer

It is our intention to discharge the surface water from the site into a below ground gravity drainage (albeit with a restricted and attenuated discharge rate) and allow the flows to outfall to the existing public surface water sewer in Abbey Road. As set out in the Non-Statutory Technical Standards for Sustainable Drainage the flow rate should be a close as practically possible to matching the 1:1yr and 1:100yr greenfield runoff rate but not exceed the discharge from the previous development. Refer to section 6 for details.

In order to keep the volume of the attenuation down to a minimum a variable flow rate discharge unit (complex outfall) would be used. This means that the corresponding restriction can be applied to the 1:1yr, 1:30yr and 1:100yr rather than restricting the flow to only one of the return periods. Using only one return period could lead to potentially discharging too great a flow for the more frequent storms, or over designing the attenuation for the less frequent.

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4.4 Discharge to a Combined Sewer

This option is not applicable as there are no combined sewers in the vicinity.

5 Surface Water Runoff Rates

The discharge from the site must not impact the flood risk of the surrounding developments both upstream and downstream of the site.

As the site has been previously developed it can be classed as a Brownfield Development. The peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100-year rainfall event should be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

In addition to this, the runoff volume for the 1 in 100-year, 6-hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event. However, where it is not reasonably practicable to constrain the volume the runoff volume must be discharged at a rate that does not adversely affect flood risk.

Hillingdon Councils Surface Water Management Plan does not show the site to be located in a Critical Drainage Area (CDA). Under Section 4.3.1 it states:

"It should be acknowledged that the CDAs only account for a small portion of the areas that could be affected by surface water flooding. The CDAs are the areas where the impact of surface water flooding is expected to be greatest, but it is recommended that the Council implement policies which will reduce the flood risk from surface water flooding throughout the borough and promote Best Management Practises to the implementations of SuDS and the reduction of runoff volumes."

Thames Water are the water authority that serve the site. They are known to require that only when it can be proven that soakage into the ground or a connection into an adjacent watercourse is not possible would they consider a restricted discharge into the public surface water sewer network.

They normally encourage techniques such as green roofs and/or permeable paving that restricts surface water discharge from the site.

The catchment areas for the existing site drainage layout have been taken from the topographical survey drawings and are broken down as follows:

		Area (m²)	Runoff Coefficien	Factored Area (m²)	Total (m²)	Total Factored
Existing D'velpmnt	Roof	1499	0.95	1424.05	2341	2139.75
	Green Roof	0	0.4	0		
	Hardstanding	842	0.85	715.7		
	Soft Landscaping	0	0.2	0		

5.1 Greenfield Runoff Rate Calculation

Using the ICP SUDS Rural Runoff Calculator within Microdrainage the following values have been calculated for the 0.234ha development site catchments. As the site is has previously been developed (brownfield) and approx. 100% impermeable an urban factor of 0.7 has been applied. The results of the calculation are shown below:

ICP SUDS Mean Annual Flood

Input

Return Period (years)	30	SAAR (mm)	700	Urban	0.700
Area (ha)	0.234	Soil	0.325	Region Number	Region 6

Results	l/s
QBAR Rural	0.5
QBAR Urban	1.5
Q30 years	2.6
Q1 year	1.3
Q30 years	2.6
Q100 years	3.1

$Qbar_{urban}$ for the site is shown to be 1.3l/s therefore a restriction of flows from the site will be set to match the $Qbar_{urban}$ value of 1.5l/s for the 1yr storm, 2.6l/s for the Q30 and 3.1l/s for the 1:100yr flows from the proposed development site.

5.2 Climate Change

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Referencing the gov.uk website we have used table 2 to set our climate change values.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

The proposed development is for industrial units which is considered to have a lifetime of 50 years. The range of climate change allowances to be considered for the proposed development are 20% to 40%.

6 Analysis of Sustainable Drainage Systems (SuDS)

Sustainable drainage is a departure from the traditional approach to draining sites. There are some key principles that influence the planning and design process enabling SuDS to mimic natural drainage by:

- Storing runoff and releasing it slowly (attenuation)
- Harvesting and using the rain close to where it falls
- Allowing water to soak into the ground (infiltration)
- Slowly transporting (conveying) water on the surface
- Filtering out pollutants
- Allowing sediments to settle out by controlling the flow of the water

To fall in line with the recommendations of The Flood and Water Management Act which requires that *"developers are to put SUDS in place in new developments wherever practicable.",* we have reviewed the main SuDS components in line with the suitability for the proposed development.

SuDS components are a physical part of the drainage system and can be categorised as follows:.

SuDS Component		Description	Suitability for Development
Green Roof		*A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.*	Due to the roof construction and use of PV units a green roof is not suitable. **Unfeasible**
Rainwater Harvesting		*Rainwater is collected from the roof of a building or from other paved surfaces and stored in an over ground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.*	Due to site constraints, there is no room to include rainwater harvesting **Unfeasible**
Soakaway		*A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.*	Due to the underlying geology groundwater levels, site layout and made ground infiltration is not suitable. **Unfeasible**

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Filter Strip		*Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.*	Due to the size of the site and limited external landscaped space in the proposed scheme, the incorporation of filter strips are not feasible at the site. **Unfeasible**
Permeable Paving		*Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.*	Due to the frequent slow moving and manoeuvring HGV traffic the use of open graded asphalt or porous block paving is not suitable. **Unfeasible**
Bioretention Area		*A vegetated area with gravel and sand layers below designed to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.*	Due to the size of the site and limited external landscaped space in the proposed scheme, the incorporation of bio-retention area are not feasible at the site **Unfeasible**
Swales		*Swales are vegetated shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.*	Due to the size of the site and limited external landscaped space in the proposed scheme, the incorporation of swales are not feasible at the site. **Unfeasible**
Pond/Basin		*Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.*	Due to the size of the site and limited external landscaped space in the proposed scheme, the incorporation of attenuation basins are not feasible at the site. **Unfeasible**
Wetland		*Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.*	Due to the size of the site and limited external landscaped space in the proposed scheme, the incorporation of wetlands are not feasible at the site. **Unfeasible**
Underground Storage		*Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.*	Proposed for attenuation features **Feasible**

7 Design of Drainage Infrastructure

The below ground drainage will be designed to ensure:

- No surcharging for the 1:1yr storm
- No flooding for all storms up to and including the critical 1:30yr storm.
- Any flooding experienced for all storms in excess of 1:30yr and up to and including the 1:100yr storm will need to be contained on site posing no risk to the building or affecting safe egress from site.
- The design will be checked for the impact of climate change on the 1:100yr storm.

The catchment areas for the proposed site drainage layout are broken down as follows:

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		Area (m²)	Runoff Coefficien	Factored Area (m²)	Total (m²)	Total Factored
Proposed D'velpmnt	Roof	1240	0.95	1178	2105	1856.05
	Green Roof	0	0.4	0		
	Hardstanding	777	0.85	660.45		
	Soft Landscaping	88	0.2	17.6		

Following redevelopment, the site will be occupied approximately 52.9% by building footprint, 33.1% by hardstanding and 14.0% by soft landscaping.

7.1 Attenuation Volume

In order to restrict the flows to match the existing greenfield runoff rate and ensure that no flooding occurs for the 1:100yr + 40% climate change event at 3.1/s, 119m³ of storage will be required. This will be stored below ground within attenuation crates.

Refer to Appendix A for MicroDrainage Calculations and Appendix B for the drainage layout.

8 Surface Water Management Proposal

Whilst the site will be privately owned it will be possible to offer some of the drainage system for adoption.

On the 25th of October 2019, the documentation submitted by Water UK concerning sewerage was approved by Ofwat. It is designed to guide water companies and developers when planning, designing, and constructing foul and surface water drainage systems which are intended for adoption, as per the Section 104 agreement under the Water Industry Act 1991. The documents provide updated guidance for all standards and specifications required when designing new water or drainage infrastructure and aim to accelerate the uptake of sustainable drainage (SuDS), by smoothing out the transfer of ownership, responsibility and ensure the assets are effectively managed and maintained. They will also allow English water and sewerage companies to adopt a wider range of drainage types, including those with sustainable elements.

Practically and in terms of SuDS, the basic criteria that need to be achieved for a surface water drainage system to be “adoptable” or “not adoptable”, will mainly require the following.

Adoptable	Non-Adoptable
It is constructed for the drainage of buildings and yards appurtenant to buildings	Watercourses as defined in law (these included rivers, streams and can include some ditches)
It has a channel (a depression between banks or ridges with a definite boundary)	Components build primarily for the drainage of surface water from streets or the drainage of land
It conveys and returns flows to a sewer or to a surface water body or to groundwater	Components built to manage groundwater
It has an effective point of discharge, which must have lawful authority to discharge into a watercourse or other water body or into land. As with conventional piped systems, this right to discharge must be secured by the developer and transferred to the sewerage company on adoption	Components which are part of the structure of a building or yard (e.g., green roof, pervious driveway or guttering and rainwater pipes attached to the building)
	Components which are an integral part of the structure of a street (e.g., a pervious street or channel formed by kerb of a conventional road or channel formed by a depression in the centre of a street

Using the above criteria, it will not be possible to offer any part of the system for adoption.

On completion of the construction, an operation and maintenance manual will be written setting out the maintenance regime for the surface water and the foul water drainage system. The party responsible for undertaking the aforementioned maintenance will be determined by the detailed provisions of the lease, which are yet to be confirmed. The O&M manual will recommend the following:

8.1 Maintenance for non-adoptable drainage elements

The entire drainage system should be monitored monthly by lifting the covers to the manholes and chambers to monitor debris build-up. If required, these are to be cleaned at the earliest opportunity to prevent blockages.

Every six months, the drainage system should be inspected to identify areas that are not operating as required and any remedial works identified should be carried out at the earliest opportunity.

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The system should be cleaned out at 12 monthly intervals and includes the removal of sediment from all structures that have capacity to accommodate sediment storage.

Debris removed from the catch pits should be removed by a suitably qualified and accredited contractor and an appropriate waste transfer or waste disposal certificate should be kept as record.

A full CCTV survey of the surface water drainage system should also be carried out at 10 yearly intervals to assess the condition of the drainage system.

9 Foul Drainage

The foul flow from the development will be collected in a below ground drainage system from the building and discharge to the existing public foul water sewer in Arundel Rd. Refer to Appendix B for drainage layout.

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Appendix A Microdrainage Calculations

- Greenfield Runoff Rate
- 1:100yr + 40% Storage Sizing

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ICP SUDS Mean Annual Flood

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Return Period (years)	30	SAAR (mm)	700	Urban	0.700
Area (ha)	0.234	Soil	0.325	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.5
QBAR Urban	1.5
Q30 years	2.6
Q1 year	1.3
Q30 years	2.6
Q100 years	3.1

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Existing Network Details 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
1.000	30.419	0.310	98.1	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit
2.000	6.130	0.060	102.2	0.024	5.00	0.0	0.600	o	150	Pipe/Conduit
1.001	7.100	0.060	118.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
1.002	34.205	0.000	0.0	0.037	0.00	0.0	0.600	[]	-15	Pipe/Conduit
3.000	5.183	0.050	103.7	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit
4.000	30.419	0.305	99.7	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit
1.003	2.969	0.025	118.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
1.004	3.845	0.030	128.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	29.500	0.044	0.0	1.01	17.9
2.000	29.250	0.024	0.0	0.99	17.6
1.001	29.210	0.068	0.0	1.20	47.7
1.002	28.700	0.105	0.0	0.00	0.0
3.000	28.750	0.050	0.0	0.99	17.4
4.000	29.500	0.044	0.0	1.01	17.8
1.003	28.700	0.199	0.0	0.92	16.3
1.004	28.675	0.199	0.0	0.89	15.7

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
PICS1	30.150	0.650	Open Manhole	1050	1.000	29.500	150				
MHS1	30.000	0.750	Open Manhole	1050	2.000	29.250	150				
MHS2	30.150	0.960	Open Manhole	1200	1.001	29.210	225	1.000	29.190	150	
								2.000	29.190	150	
MHS3	30.150	1.450	Open Manhole	1200	1.002	28.700	-15	1.001	29.150	225	674
MHS4	30.000	1.250	Open Manhole	1050	3.000	28.750	150				
PICS4	30.150	0.650	Open Manhole	1050	4.000	29.500	150				
MHS5	30.000	1.300	Open Manhole	1500	1.003	28.700	150	1.002	28.700	-15	
								3.000	28.700	150	
								4.000	29.195	150	495
MHS6	30.000	1.325	Open Manhole	1050	1.004	28.675	150	1.003	28.675	150	
	30.000	1.355	Open Manhole	0		OUTFALL		1.004	28.645	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
PICS1	504694.269	183008.653	504694.269	183008.653	Required	
MHS1	504679.060	183029.073	504679.060	183029.073	Required	
MHS2	504679.404	183035.193	504679.404	183035.193	Required	
MHS3	504685.598	183038.663	504685.598	183038.663	Required	
MHS4	504712.908	183059.900	504712.908	183059.900	Required	
PICS4	504730.306	183028.838	504730.306	183028.838	Required	
MHS5	504715.441	183055.378	504715.441	183055.378	Required	
MHS6	504718.031	183056.829	504718.031	183056.829	Required	
	504721.386	183058.708			No Entry	

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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	150	PICS1	30.150	29.500	0.500	Open Manhole	1050
2.000	o	150	MHS1	30.000	29.250	0.600	Open Manhole	1050
1.001	o	225	MHS2	30.150	29.210	0.715	Open Manhole	1200
1.002	[]	-15	MHS3	30.150	28.700	1.449	Open Manhole	1200
3.000	o	150	MHS4	30.000	28.750	1.100	Open Manhole	1050
4.000	o	150	PICS4	30.150	29.500	0.500	Open Manhole	1050
1.003	o	150	MHS5	30.000	28.700	1.150	Open Manhole	1500
1.004	o	150	MHS6	30.000	28.675	1.175	Open Manhole	1050

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	30.419	98.1	MHS2	30.150	29.190	0.810	Open Manhole	1200
2.000	6.130	102.2	MHS2	30.150	29.190	0.810	Open Manhole	1200
1.001	7.100	118.3	MHS3	30.150	29.150	0.775	Open Manhole	1200
1.002	34.205	0.0	MHS5	30.000	28.700	1.299	Open Manhole	1500
3.000	5.183	103.7	MHS5	30.000	28.700	1.150	Open Manhole	1500
4.000	30.419	99.7	MHS5	30.000	29.195	0.655	Open Manhole	1500
1.003	2.969	118.8	MHS6	30.000	28.675	1.175	Open Manhole	1050
1.004	3.845	128.2		30.000	28.645	1.205	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)
1.004		30.000	28.645	28.645	0	0

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

Synthetic Rainfall Details

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Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.407		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: MHS5, DS/PN: 1.003, Volume (m³): 131.0

Unit Reference	MD-SHE-0088-3100-0686-3100
Design Head (m)	0.686
Design Flow (l/s)	3.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	88
Invert Level (m)	28.700
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.686	3.1	Kick-Flo®	0.458	2.6
Flush-Flo™	0.205	3.1	Mean Flow over Head Range	-	2.7

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	2.7	1.200	4.0	3.000	6.1	7.000	9.2
0.200	3.1	1.400	4.3	3.500	6.6	7.500	9.5
0.300	3.0	1.600	4.6	4.000	7.0	8.000	9.8
0.400	2.9	1.800	4.8	4.500	7.4	8.500	10.1
0.500	2.7	2.000	5.1	5.000	7.8	9.000	10.4
0.600	2.9	2.200	5.3	5.500	8.2	9.500	10.7
0.800	3.3	2.400	5.5	6.000	8.5		
1.000	3.7	2.600	5.7	6.500	8.9		

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 1.000
Region England and Wales Ratio R 0.404 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 0

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)
1.000	PICS1	15 Summer	100	+0%	100/15 Summer				29.931	0.281
2.000	MHS1	15 Summer	100	+0%	100/15 Summer				29.442	0.042
1.001	MHS2	15 Summer	100	+0%					29.397	-0.038
1.002	MHS3	180 Winter	100	+0%					29.192	-0.194
3.000	MHS4	180 Winter	100	+0%	100/15 Summer				29.194	0.294
4.000	PICS4	15 Summer	100	+0%	100/15 Summer				29.893	0.243
1.003	MHS5	180 Winter	100	+0%	100/15 Summer				29.192	0.342
1.004	MHS6	360 Summer	100	+0%					28.729	-0.096

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	PICS1	0.000	1.29		22.2	FLOOD RISK	
2.000	MHS1	0.000	0.89		13.2	SURCHARGED	
1.001	MHS2	0.000	1.00		34.5	OK	
1.002	MHS3	0.000	0.00		12.9	OK	
3.000	MHS4	0.000	0.43		6.0	SURCHARGED	
4.000	PICS4	0.000	1.34		22.8	FLOOD RISK	
1.003	MHS5	0.000	0.29		3.1	SURCHARGED	
1.004	MHS6	0.000	0.29		3.1	OK	

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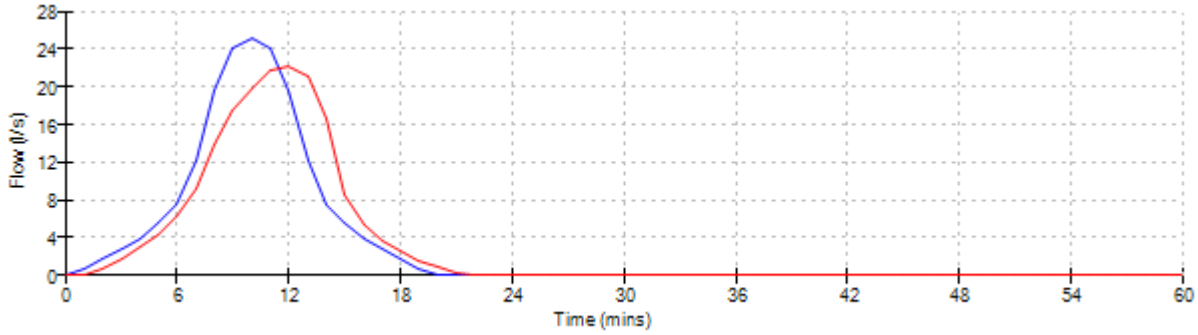
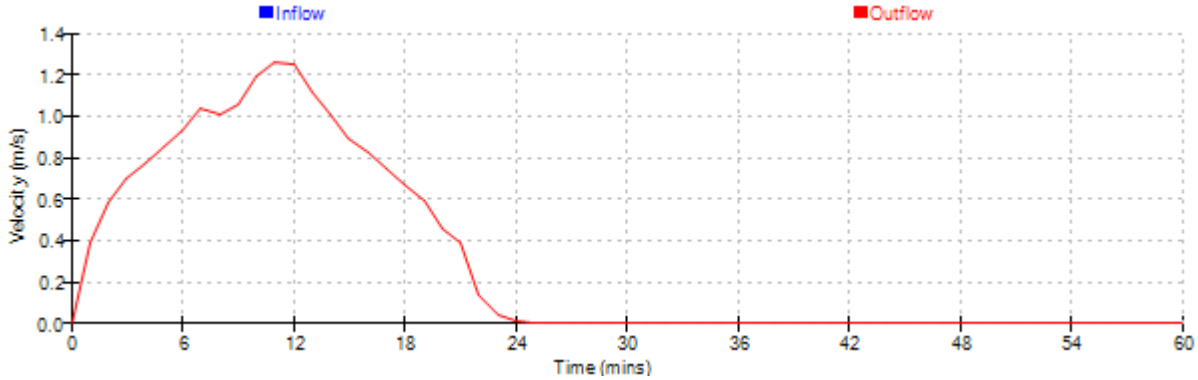
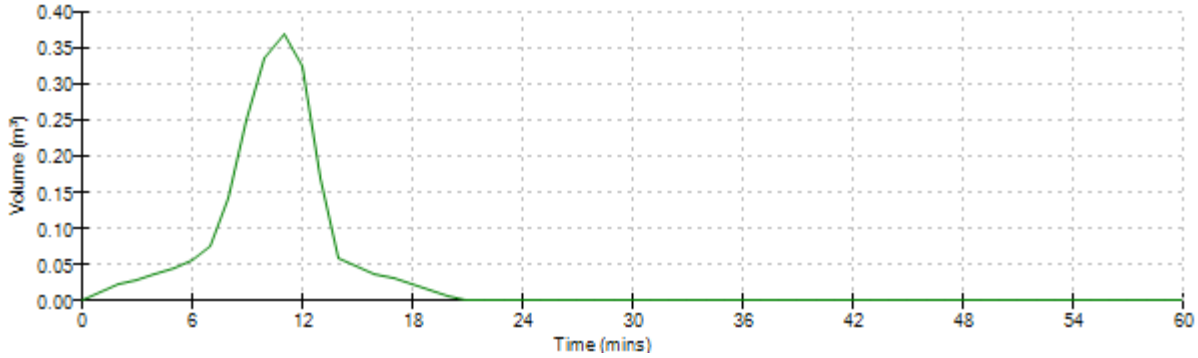
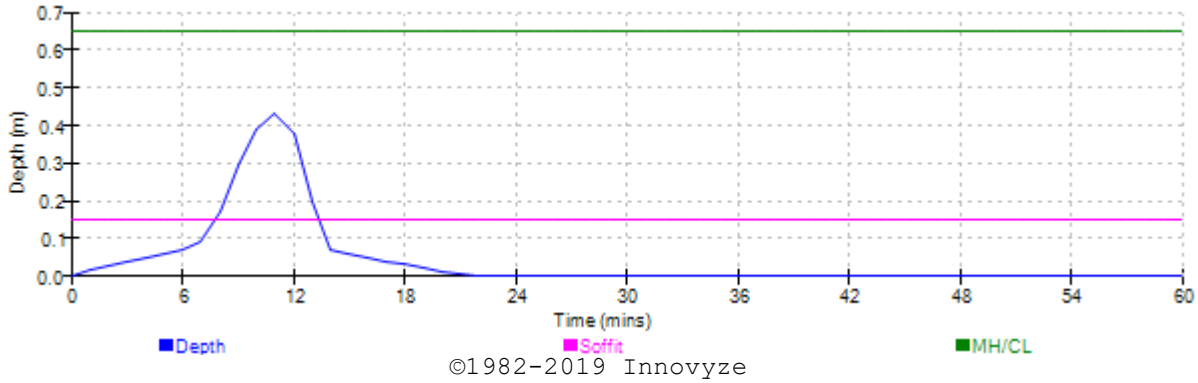
Graphs for Pipe 1.000 US/MH PICS1 (Storm)
15 minute 100 year Summer I+0%
Status: FLOOD RISK









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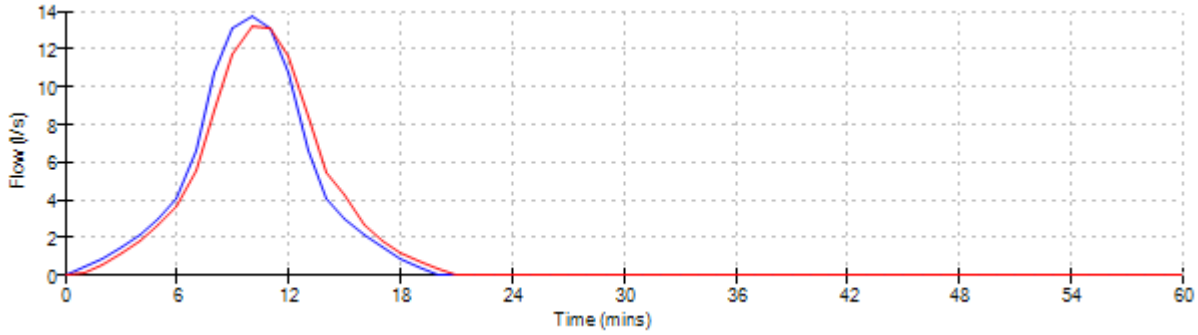
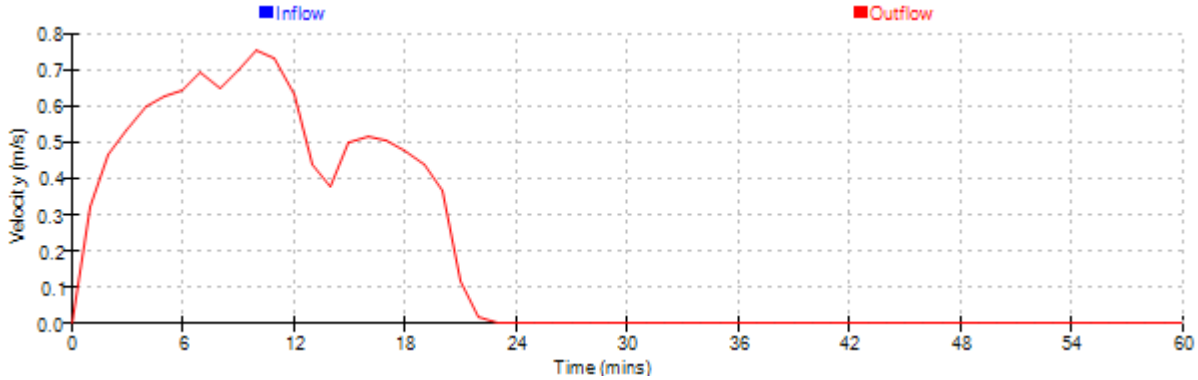
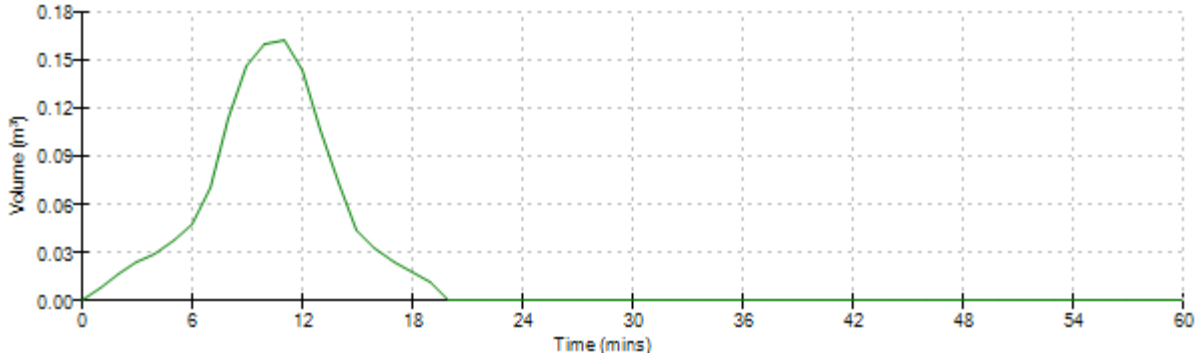
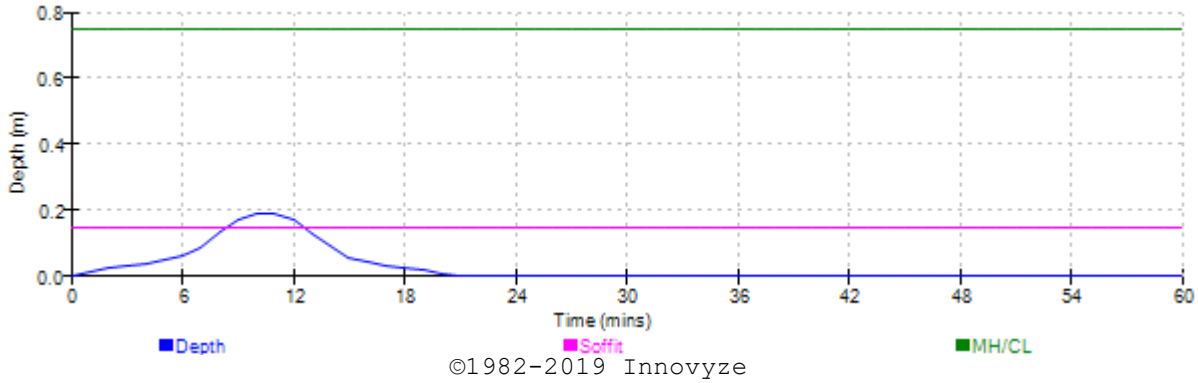
Graphs for Pipe 2.000 US/MH MHS1 (Storm)
15 minute 100 year Summer I+0%
Status: SURCHARGED









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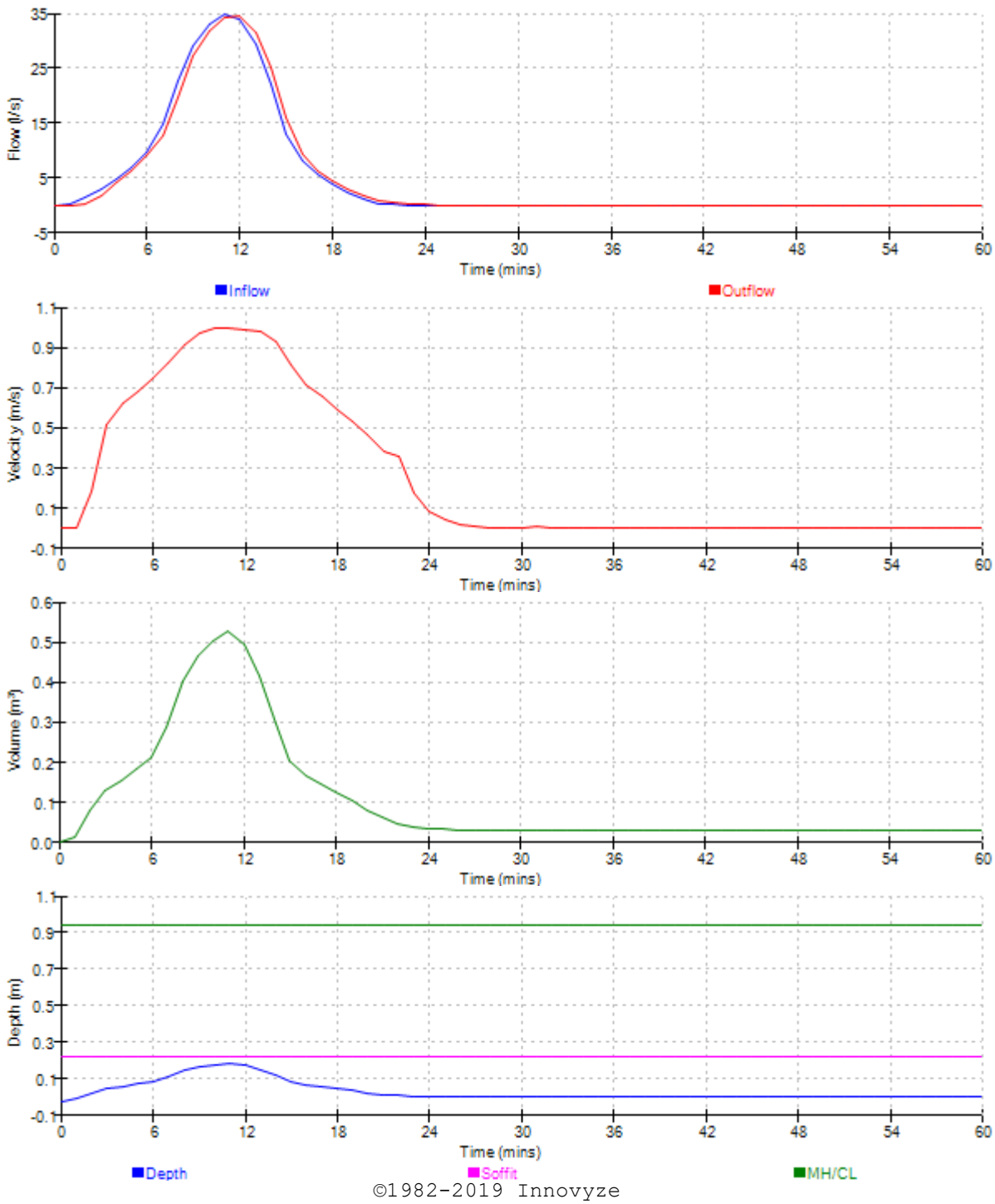
Graphs for Pipe 1.001 US/MH MHS2 (Storm)
15 minute 100 year Summer I+0%
Status: OK



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Graphs for Pipe 1.002 US/MH MHS3 (Storm)
180 minute 100 year Winter I+0%
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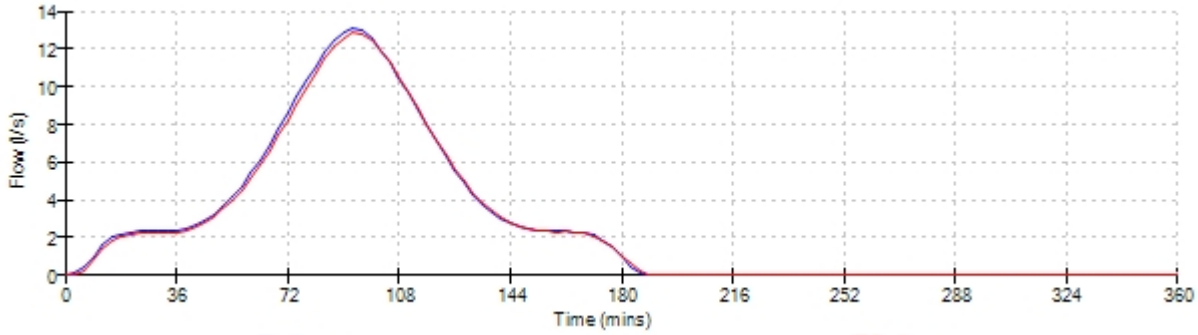

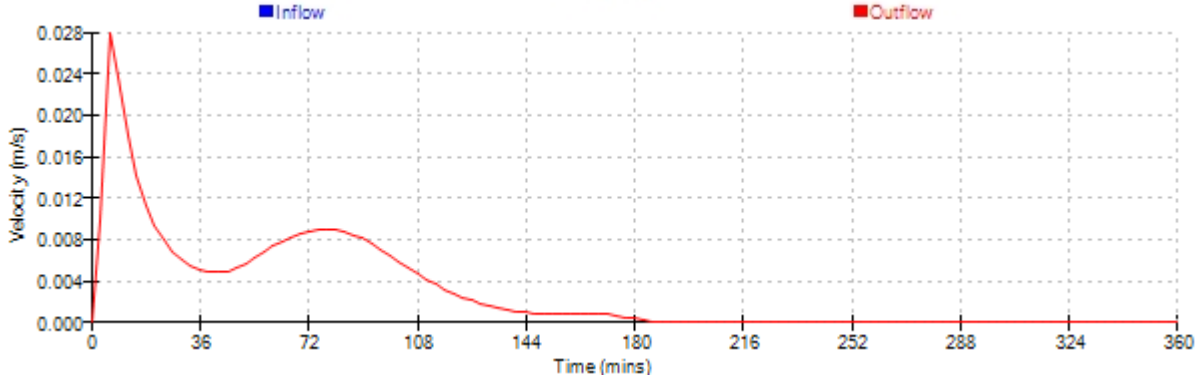

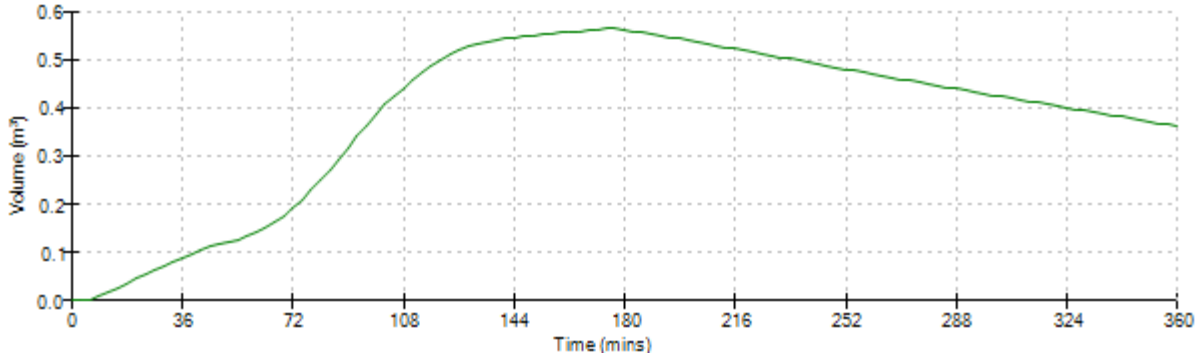

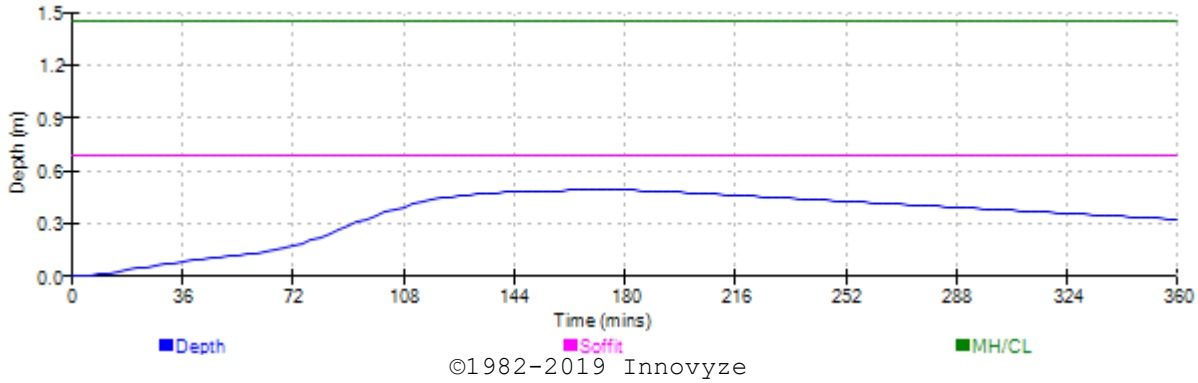

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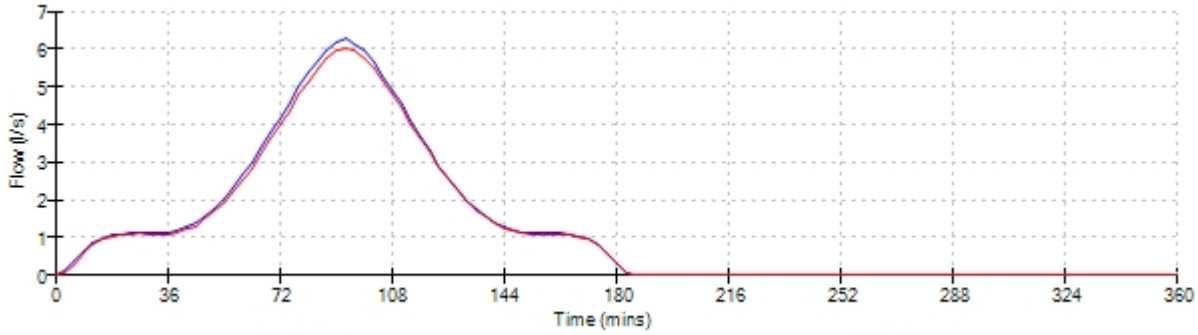
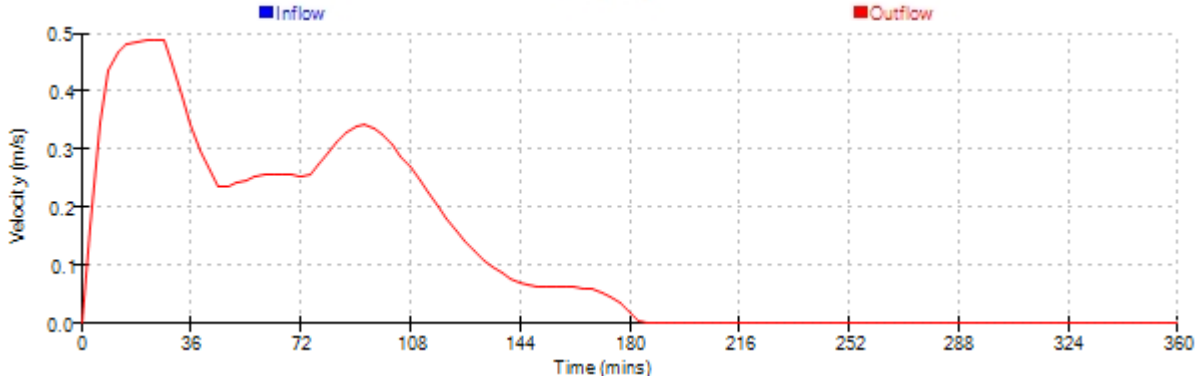
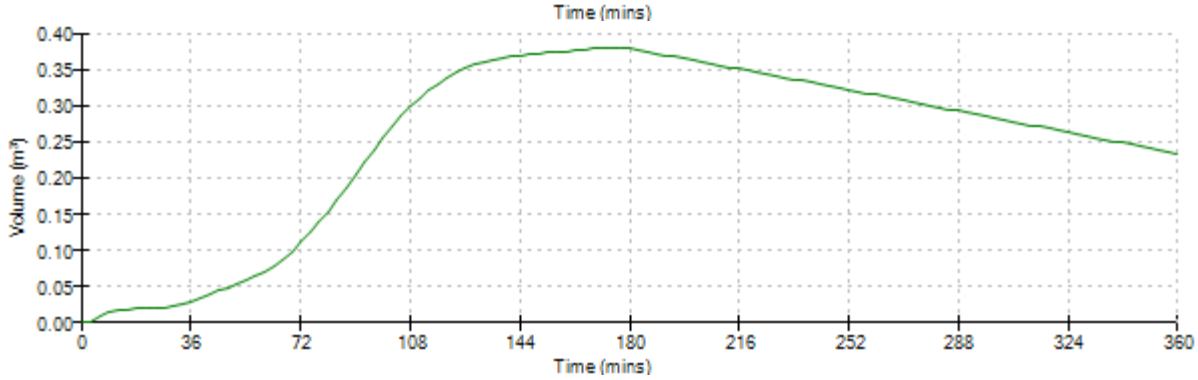
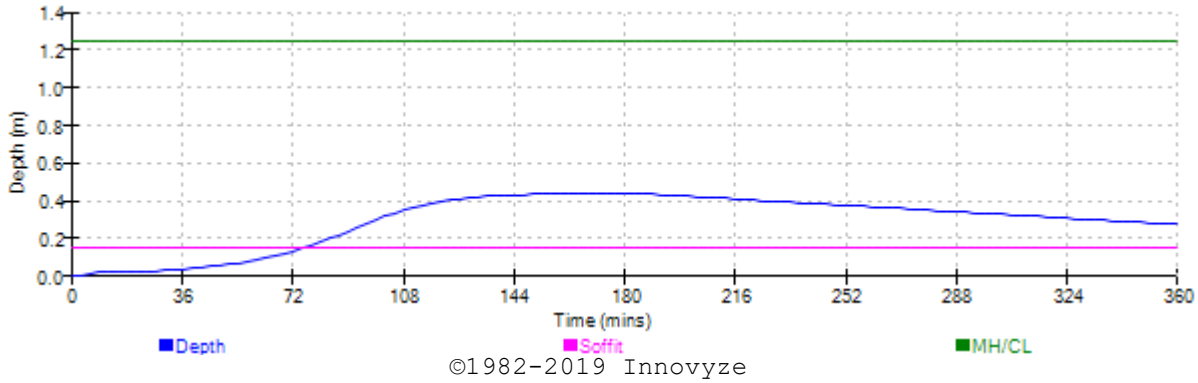
Graphs for Pipe 3.000 US/MH MHS4 (Storm)
180 minute 100 year Winter I+0%
Status: SURCHARGED









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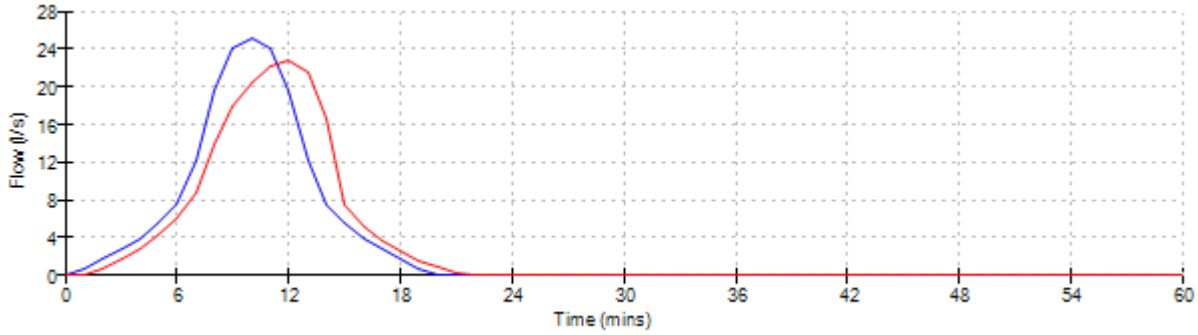
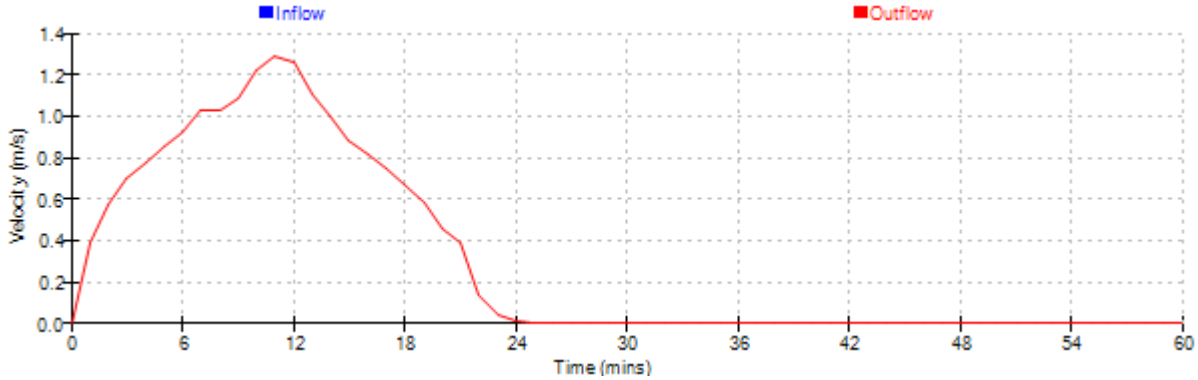
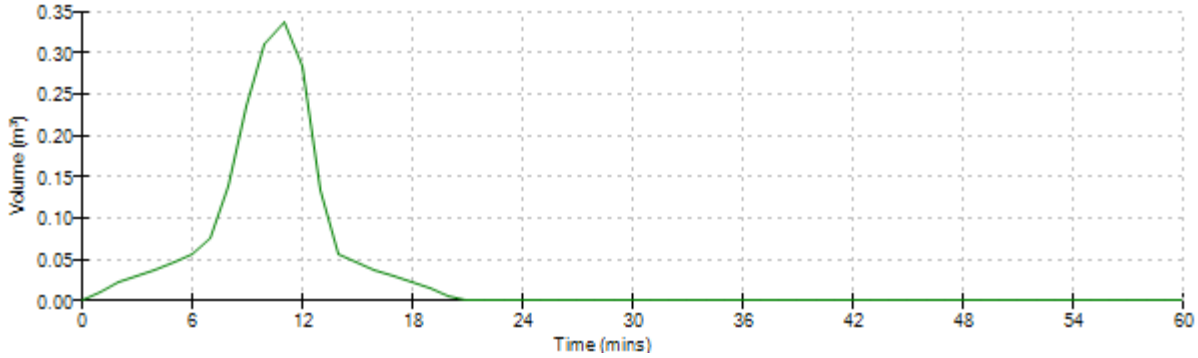
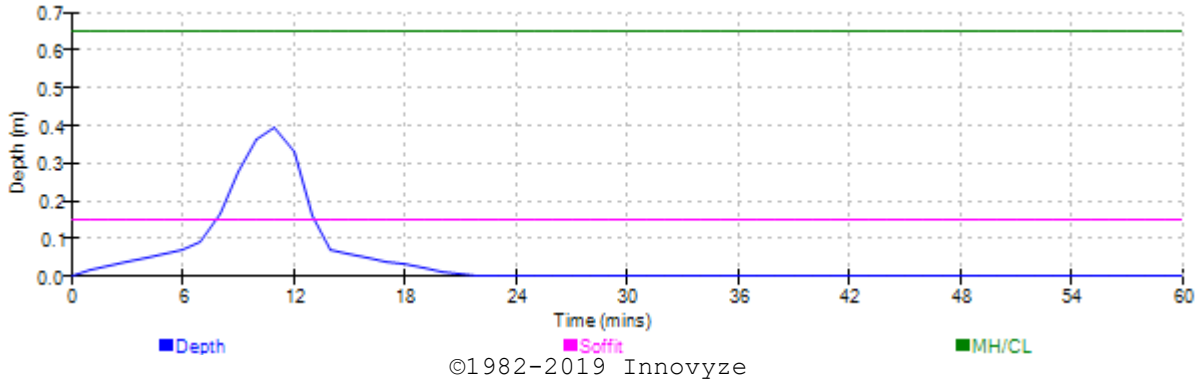
Graphs for Pipe 4.000 US/MH PICS4 (Storm)
15 minute 100 year Summer I+0%
Status: FLOOD RISK









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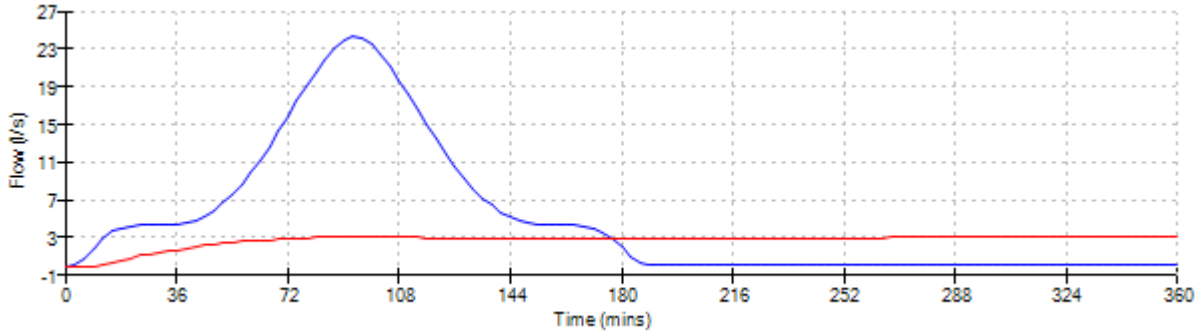
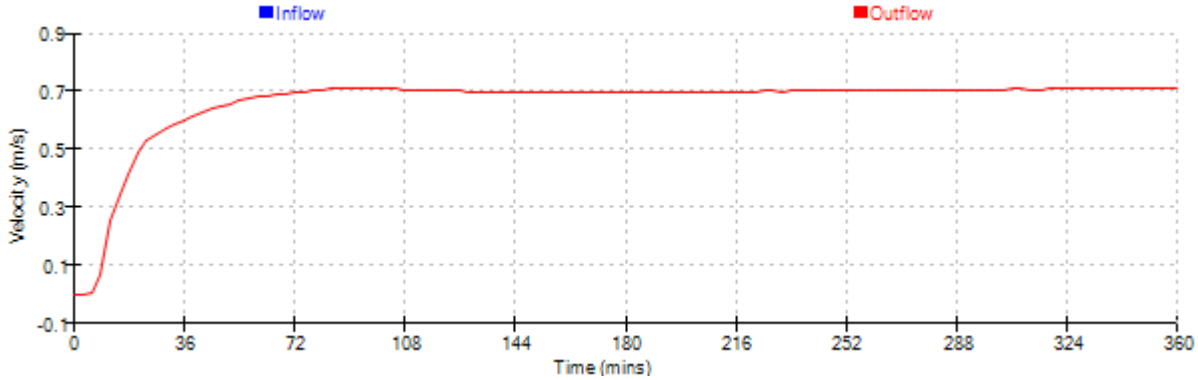
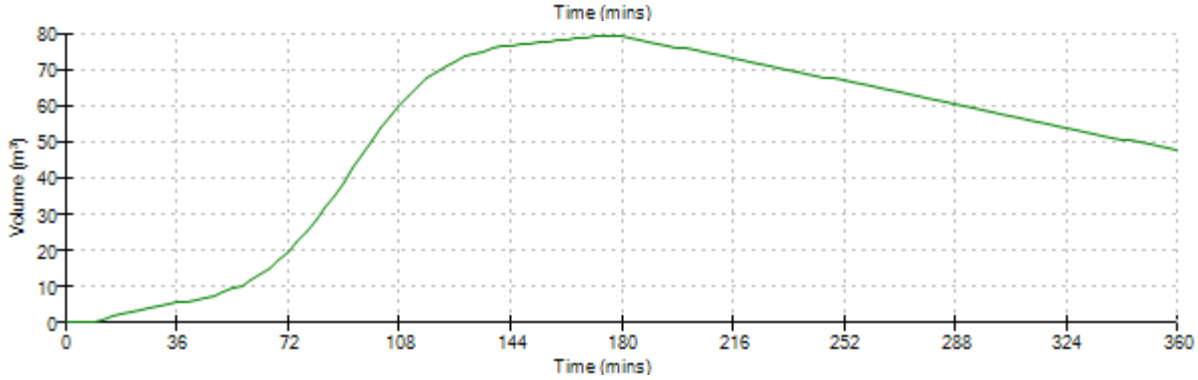
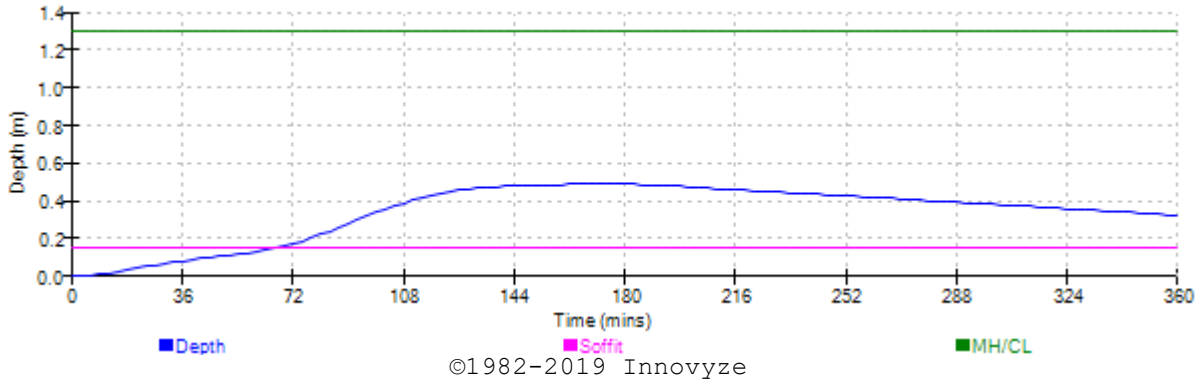
Graphs for Pipe 1.003 US/MH MHS5 (Storm)
180 minute 100 year Winter I+0%
Status: SURCHARGED









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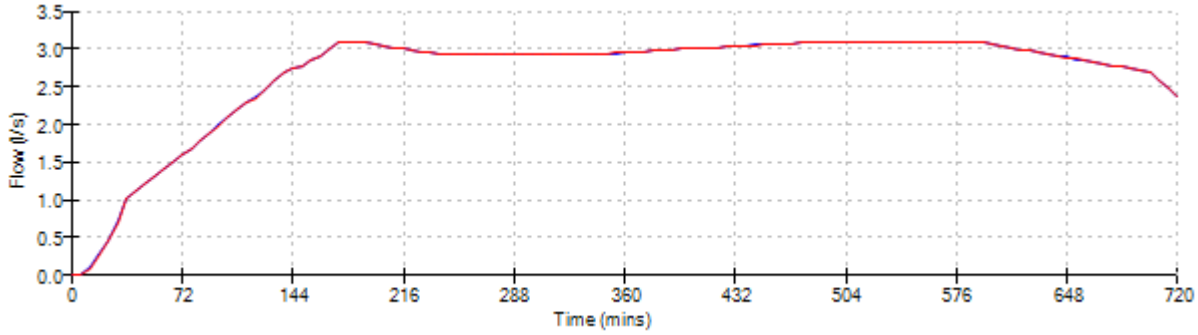
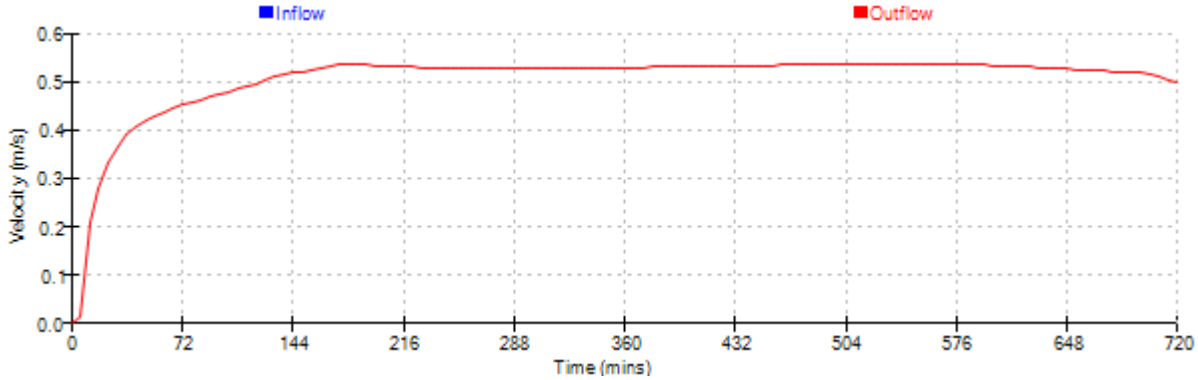
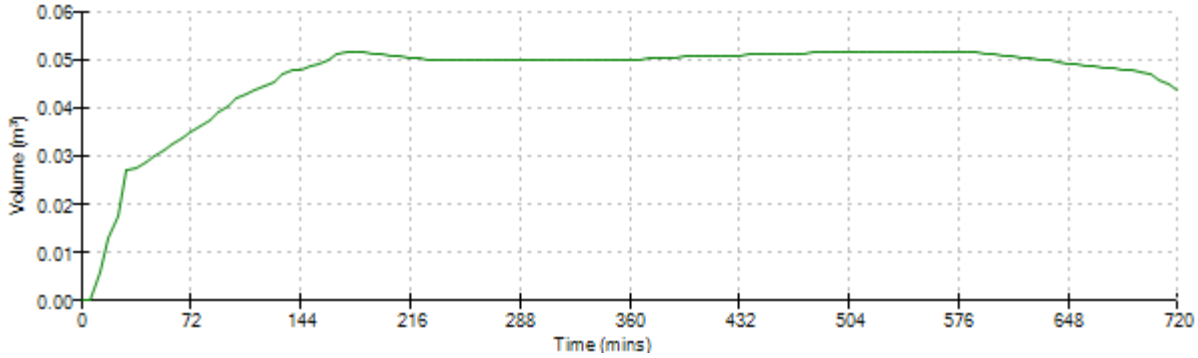
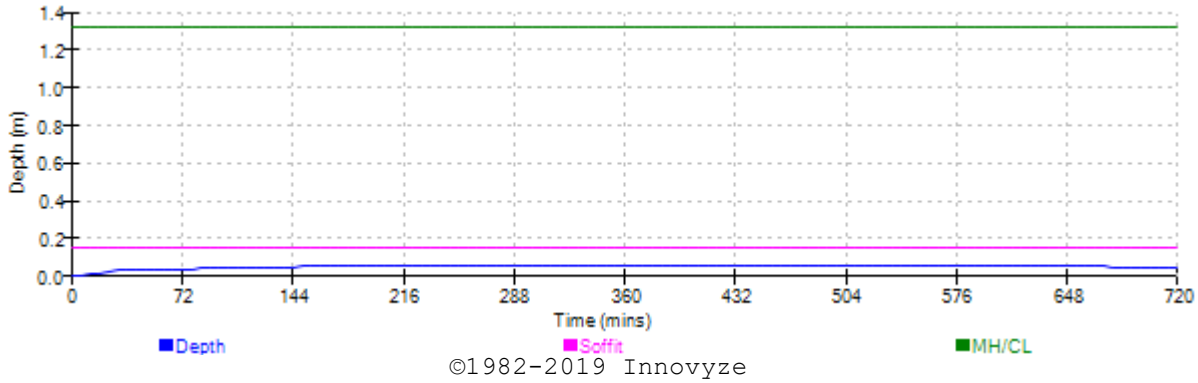
Graphs for Pipe 1.004 US/MH MHS6 (Storm)
360 minute 100 year Summer I+0%
Status: OK









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Appendix B Drainage General Arrangement

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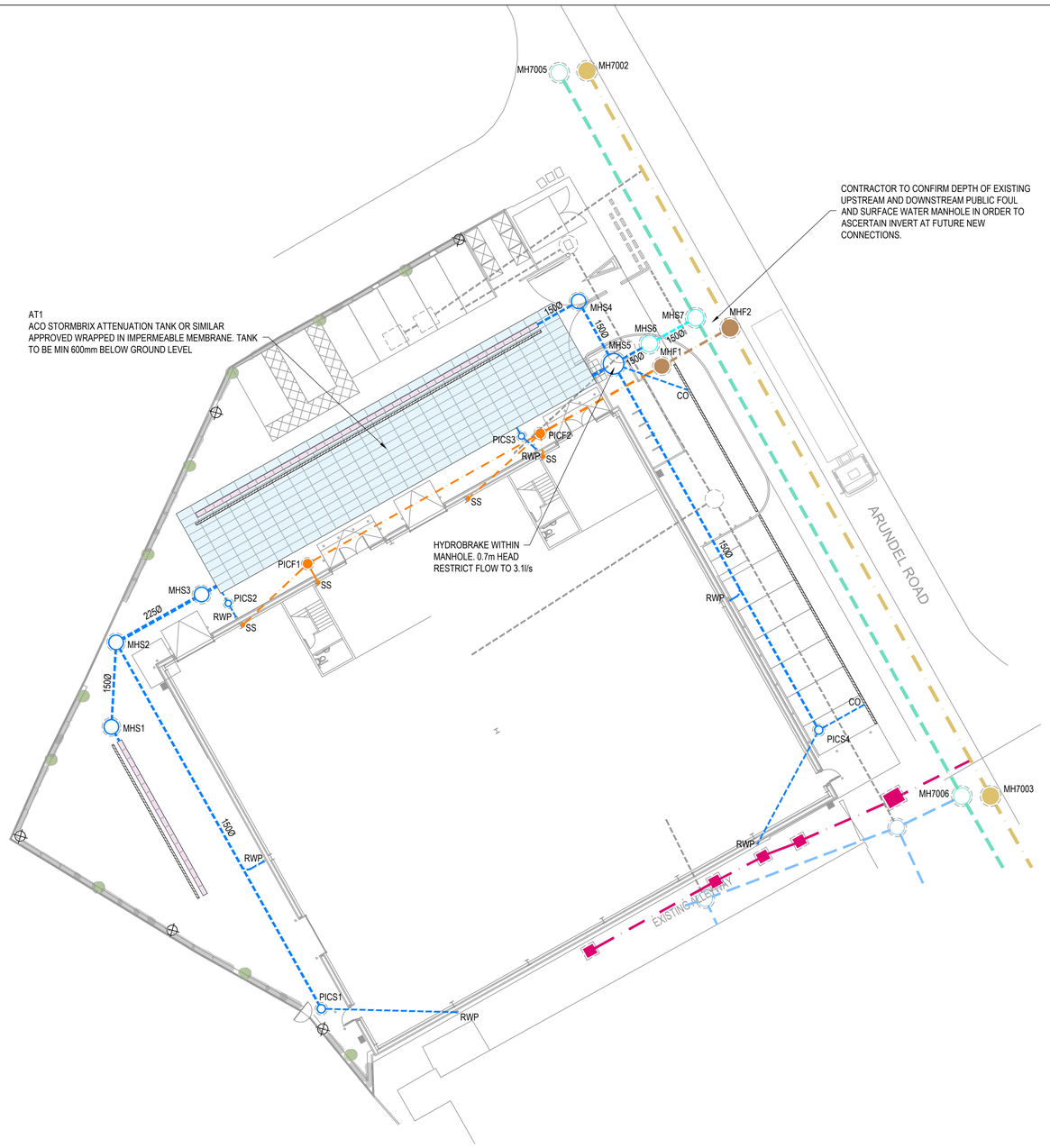
www.evolveuk.biz
info@evolveuk.biz



PROPOSED PRIVATE SURFACE WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL OF INCOMING PIPE	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
PIC	S1	MDPE INSPECTION	30.150	29.500	150Ø	0.650	600Ø	600x600	C250	-	-	
MH	S1	PCC RING	30.000	29.250	150Ø	0.750	1050Ø	600x600	D400	-	-	
MH	S2	PCC RING	30.150	29.210	225Ø	0.940	1200Ø	600x600	D400	-	-	
MH	S3	PCC RING	30.150	28.700	150Ø	1.450	1200Ø	600x600	D400	-	-	500mm SUMP
PIC	S2	MDPE INSPECTION	30.150	29.400	150Ø	0.750	45Ø	600x600	C250	-	-	
PIC	S3	MDPE INSPECTION	30.150	29.400	150Ø	0.750	45Ø	600x600	C250			
MH	S4	PCC RING	30.000	28.750	150Ø	1.250	1050Ø	600x600	D400			500mm SUMP
PIC	S4	MDPE INSPECTION	30.150	29.500	150Ø	0.650	600Ø	600x600	C250			
MH	S5	PCC RING	30.000	28.700	150Ø	1.300	1500Ø	600x600	D400			HYDROBRAKE CHAMBER

PROPOSED PUBLIC SURFACE WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL OF INCOMING PIPE	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
MH	S6	PCC RING	30.000	28.675	150Ø	1.325	1050Ø	600x600	D400	-	-	DEMARCATION CHAMBER
MH	S7	PCC RING	30.000	28.645	150Ø	1.355	1050Ø	600x600	D400	-	-	NEW MANHOLE OVER EXISTING SEWER

ATTENUATION TANK SCHEDULE

TANK REFERENCE	TANK SPECIFICATION	APPROX. COVER LVL	INVERT LVL OF TANK	LENGTH OF TANK (m)	WIDTH OF TANK (m)	TANK DEPTH (m)	VOID RATIO	AVAILABLE STORAGE VOLUME (m^3)	APPROX. COVER TO TANK
AT1	ACO STORMBRIX HD	30.0000	28.7000	31.200	6.600	0.610	0.950	119.331	0.690

PROPOSED PRIVATE FOUL WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL OF INCOMING PIPE	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
PIC	F1	MDPE INSPECTION	30.150	29.400	100Ø	0.750	600Ø	600x600	C250	-	-	
PIC	F2	MDPE INSPECTION	30.150	28.950	150Ø	1.200	600Ø	600x600	C250	-	-	

PROPOSED PUBLIC FOUL WATER MANHOLE SCHEDULE

MANHOLE REF		MANHOLE TYPE	APPROX. COVER LVL	INVERT LVL OF INCOMING PIPE	DIAMETER OF LARGEST PIPE	APPROX. DEPTH	INTERNAL SIZE	COVER TYPE CLEAR OPENING	LOAD CLASS	SETTING OUT COORDS		REMARKS
										Easting	Northing	
MH	F1	PCC RING	30.000	28.800	150Ø	1.200	1050Ø	600x600	D400	-	-	DEMARCATION CHAMBER
MH	F2	PCC RING	30.000	TBC	150Ø	TBC	1050Ø	600x600	D400	-	-	NEW MANHOLE OVER EXISTING SEWER

1. ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
2. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
3. ALL PROPOSED SERVICES TO BE COORDINATED WITH PROPOSED UNDERGROUND DRAINAGE.
4. POSITIONS AND INVERTS OF PUBLIC SEWERS HAVE BEEN ESTIMATED FROM THAMES WATER ASSET DRAWINGS. CONTRACTOR TO CONFIRM EXACT LOCATION SIZE OF PIPE AND INVERT LEVEL OF THE UPSTREAM AND DOWNSTREAM MANHOLES ADJACENT TO THE PROPOSED CONNECTIONS BEFORE COMMENCEMENT OF WORKS. THE CONTRACTOR IS TO SURVEY AND RELAY TO EVOLVE THE INVERT LEVEL OF THE EXISTING PUBLIC SEWER IN ORDER TO CONFIRM THAT THERE IS NO CHANGE TO THE SYSTEM. NO WORKS ARE TO COMMENCE UNTIL CONSENT TO CONNECT IS RECEIVED FROM THAMES WATER.
5. FOR DRAINAGE DETAILS REFER TO EVOLVE DRAWING 3121-510&511
6. EXISTING SEWER LOCATIONS WHERE THE PROPOSED DRAINAGE IS TO CONNECT, ARE TO BE SURVEYED AND EXACT LEVELS CONFIRMED AND PROVIDED TO ENGINEER PRIOR TO COMMENCEMENT OF WORKS.
7. ALL EXISTING DRAINS TO BE ABANDONED SHALL BE EITHER REMOVED OR GROUTED UP IF NOT POSSIBLE. GROUTING TO BE PERFORMED BY CAPPING ALL ENDS / CONNECTIONS AND FILLING THE RETAINING VOID WITH GROUT, IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION (CESWI) 7TH EDITION.
8. ALL SOFT SPOTS TO BE REMOVED FROM BOTTOM OF EXCAVATIONS AND TO BE REFILLED TO FORMATION LEVEL IN ACCORDANCE WITH GROUNDWORKS SPECIFICATIONS.RAISED GROUND MUST BE FILLED IN ACCORDANCE WITH GROUNDWORKS SPECIFICATIONS AND CONSOLIDATED BEFORE ANY SEWER WORKS ARE CARRIED OUT.
9. FOUNDATIONS ADJACENT TO DRAIN RUNS ARE TO BE CONSTRUCTED SO THAT THE DIFFERENCE BETWEEN THE FORMATION LEVEL OF THE FOUNDATION AND INVERT LEVEL OF ANY DRAIN MUST NOT EXCEED THE HORIZONTAL DISTANCE MINUS 500MM.
10. WHERE DRAIN RUNS ARE TO BE CAST INTO FOUNDATIONS, A MINIMUM OF 75MM OF CONCRETE IS TO BE MAINTAINED BETWEEN THE OUTSIDE OF THE PIPE AND THE TOP OR BOTTOM REINFORCEMENT OF THE FOUNDATION.
11. ALL EXTERNAL DRAINAGE SHOWN ON THIS DRAWING HAS BEEN BASED UPON VITRIFIED CLAY TO BS 65 AND BS EN 295 FLEXIBLY JOINTED
12. ALL DRAIN RUNS BELOW STRUCTURAL SLAB ARE TO BE CAST IRON TIMESAVER BY ST-GOBAIN OR SIMILAR APPROVED. ROCKER PIPES TO BE FITTED TO ALL CAST IRON DRAINAGE AT THE POINT WHERE THE PIPE EMERGES FROM BENEATH THE SLAB
13. ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION", BS EN 752 2017 'DRAIN AND SEWER SYSTEMS OUTSIDE BUILDINGS' AND THE BUILDING REGULATIONS APPROVED 'DOCUMENT H'.
14. ALL PRIVATE DRAINAGE PIPES WITH A COVER OF LESS THAN 900mm IN NON-TRAFFICKED AREAS AND LESS THAN 1200mm IN TRAFFICKED AREAS TO BE BEDDED AND SURROUNDED IN CONCRETE (CLASS Z). COMPRESSIBLE MATERIAL SHALL BE PROVIDED AT EVERY PIPE JOINT. WHERE COVER EXCEEDS THIS DEPTH, PIPES ARE TYPICALLY BEDDED AND SURROUNDED IN CLASS S. REFER TO DRAINAGE DETAILS DRAWING FOR SPECIFIC TYPES.
15. BACKFILL TO DRAINAGE TRENCHES UNDER HARDSTANDING AREAS TO BE TYPE 1 SUB BASE MATERIAL, ELSEWHERE BACKFILL TO BE FREE DRAINING READILY COMPATIBLE MATERIAL FREE FROM DETRITUS, ORGANIC MATTER, FROZEN SOIL CLAY LUMPS AND LARGE STONES. TO BE COMPACTED IN LAYERS NOT EXCEEDING 150mm THICK.
16. BEDDING AND BACKFILL MATERIALS TO CONFORM TO THE REQUIREMENTS OF WIS 4-08-02 (TABLE A2).
17. WHERE FOUL AND SURFACE WATER SEWERS CROSS AND THERE IS LESS THAN 100MM CLEARANCE SHORT LENGTHS OF BOTH RUNS ARE TO BE ENCASED IN CONCRETE.
18. THE FIRST PIPE OUT OF MANHOLES TO BE AS SHORT AS PRACTICABLE SO AS TO PROVIDE A FLEXIBLE JOINT AS CLOSE AS POSSIBLE TO THE OUTSIDE FACE OF THE CONCRETE SURROUND AND CONNECTED TO A
19. LENGTH OF ROCKER PIPE.
20. ALL CONNECTIONS PASSING THROUGH BASES OR EDGE BEAMS TO BE IN SEALED SLEEVES. ALTERNATIVELY CONNECTIONS MAY BE CAST-IN WITH FLEXIBLE JOINTS NOT GREATER THAN 150MM FROM FACE OF CONCRETE.
21. WHERE DRAINAGE PIPES ARE LESS THAN 300mm BELOW THE UNDERSIDE OF THE GROUND FLOOR SLAB, CONCRETE ENCASEMENT IS REQUIRED (CLASS Z). COMPRESSIBLE JOINTS ARE TO BE PROVIDED AT EVERY PIPE JOINT WITHIN THE CONCRETE. WHERE PIPES ARE MORE THAN 300mm BELOW THE UNDERSIDE OF THE SLAB, CLASS S BEDDING IS ACCEPTABLE.
22. SEWER PIPES TO BE LAID IN MAXIMUM 3 METRE LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER LENGTHS.
23. PLASTIC CHANNEL SECTIONS WILL NOT BE PERMITTED WITHIN MANHOLE CHAMBERS. CLAYWARE CHANNELS SHALL BE USED WITHIN MANHOLES FOR PIPE SIZES UP TO AND INCLUDING 300mm DIAMETER.
24. ALL INTERNAL DRAINAGE POSITIONS ARE ASSUMED. ARCHITECT TO CONFIRM NUMBER AND POSITION.
25. ALL UNDERGROUND FOUL DRAINAGE SHOULD BE SUITABLY VENTED AT OR NEAR TO THE HEAD OF RUNS.
26. ALL ACCESS FITTINGS, STACKS, RWP'S AND GULLIES TO BE RODDABLE. ALL TO HAVE LOW LEVEL RODDING ACCESS PLATES UNLESS AN ALTERNATIVE MEANS OF ACCESS IS AGREED. ACCESS POINT TO BE ABOVE ANY GROUND FLOOR CONNECTED APPLIANCE SPILL LEVEL.
27. ALL GULLY AND CHANNEL DRAIN OUTLETS AND TERMINATION POINTS TO BE TRAPPED AND RODDABLE.
28. ALL BRANCH CONNECTIONS TO BE MADE WITH SWEPT BENDS IN THE DIRECTION OF FLOW IN THE MAIN SEWER.
29. WHERE NO WC'S ARE CONNECTED UPSTREAM, UNDERSLAB FW DRAINAGE TO BE LAID AT 1:40 MIN. AFTER THE CONNECTION OF AT LEAST 1NO WC, A FALL OF 1:80 APPLIES.
30. WHERE INVERT LEVELS ARE SPECIFIED FOR INTERNAL DRAIN CONNECTIONS, PIPES ARE TO BE LAID TO MATCH THESE INVERTS. OTHERWISE PIPES ARE TO BE LAID TO THE GRADIENTS SHOWN BELOW:

    INTERNAL FOUL PIPES
    100Ø = GRADIENT 1:40
    150Ø = GRADIENT 1:80
31. ALL FOUL MANHOLES & INSPECTION CHAMBERS, TO HAVE DOUBLE SEALED COVERS.
32. HYDROBRAKE ASSOCIATED CHAMBER TO BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS DETAILS.
33. ATTENUATION UNITS TO BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS DETAILS.
34. COVER LEVELS, GULLY POSITIONS, AND BUILDING LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/LANDSCAPE ARCHITECT. CONTRACTOR TO ALLOW FOR ADJUSTMENT TO SUIT AGREED POSITIONS AND FINISHED LEVELS, AND CONFIRM ALL COVER LEVELS ON SITE.
35. NO PRIVATE DRAINAGE SHALL DRAIN ONTO THE HIGHWAY. ADEQUATE PROVISION (I.E. GULLIES, CHANNEL DRAINS), SHALL BE MADE ON THE PRIVATE SITES TO PREVENT THIS.

DRAINAGE KEY

	PROPOSED PRIVATE SURFACE WATER SEWER
	EXISTING PUBLIC SURFACE WATER SEWER
	PROPOSED PUBLIC SURFACE WATER SEWER
	EXISTING PRIVATE FOUL WATER SEWER
	PROPOSED PRIVATE FOUL WATER SEWER
	EXISTING PUBLIC FOUL WATER SEWER
	PROPOSED PUBLIC FOUL WATER SEWER
	EXISTING PRIVATE COMBINED WATER SEWER
	ABANDONED DRAINAGE
MH	PROPOSED PRIVATE SURFACE WATER PRECAST CONCRETE RING MANHOLE
PIC	PROPOSED PRIVATE SURFACE WATER MDPE INSPECTION CHAMBER
MH	EXISTING PUBLIC SURFACE WATER MANHOLE
MH	PROPOSED PUBLIC SURFACE WATER PRECAST CONCRETE RING MANHOLE
MH	PROPOSED PRIVATE FOUL WATER PRECAST CONCRETE RING MANHOLE
PIC	PROPOSED PRIVATE FOUL WATER MDPE INSPECTION CHAMBER
MH	EXISTING PRIVATE FOUL WATER MANHOLE
MH	EXISTING PUBLIC FOUL WATER MANHOLE
MH	PROPOSED PUBLIC FOUL WATER PRECAST CONCRETE RING MANHOLE
MH	EXISTING PRIVATE COMBINED WATER MANHOLE
	PROPOSED CHANNEL DRAIN
	PERMACHANNELS. OUTLET FROM CHANNEL EVERY METER TO ADJACENT BIOMAT UNITS FOR HYDROCARBON INTERCEPTION. POSITIVE CONNECTION TO BELOW GROUND DRAINAGE FROM END OF UNITS.
CO	CHANNEL OUTLET
RTCO	RODDABLE TRAPPED CHANNEL OUTLET
SS	STUB STACK
SVP	SOIL VENT PIPE
PIC	POLYPROPYLENE INSPECTION CHAMBER
MH	MANHOLE
BD	BACKDROP

GENERAL NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE EVOLVE DESIGN STATEMENT.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES & SPECIALIST MANUFACTURERS DETAILS, DRAWINGS AND SPECIFICATIONS.

3. DO NOT SCALE THIS DRAWING. IF IN DOUBT ASK. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL DIMENSIONS TO EXISTING ELEMENTS ARE TO BE CHECKED AND CONFIRMED ON SITE BY CONTRACTOR.

NOTES

THE CONTRACTOR SHALL COMPLY WITH THE FOLLOWING:-
(I). ALL OPERATIONS SHOULD BE CARRIED OUT IN ACCORDANCE WITH THE GENERAL HEALTH AND SAFETY POLICY OF THE DEVELOPER AS REQUIRED BY SECTIONS 2 OF THE HEALTH AND SAFETY AT WORK ACT 1974 AND IN PARTICULAR THE CONSTRUCTION (GENERAL PROVISIONS) REGULATIONS.
(II). THE LOCAL AUTHORITY AND UTILITIES COMPANIES ARE TO BE NOTIFIED PRIOR TO COMMENCEMENT OF WORK ON SITE.
(III). PRIOR TO CONSTRUCTION THE ACTUAL POSITIONS AND DEPTHS OF SERVICES LIKELY TO BE AFFECTED BY THE WORKS SHOULD BE ESTABLISHED BY MEANS OF HAND DIG IN CLOSE LIAISON WITH THE UTILITY COMPANIES. THE CONTRACTOR SHALL IMMEDIATELY ADVISE THE ENGINEER OF ANY SERVICES EXPOSED WHICH MAY AFFECT THE DESIGN.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT PIPES ARE ADEQUATELY PROTECTED FROM CONCENTRATED LOADING BY CONSTRUCTION TRAFFIC DURING THE CONSTRUCTION PERIOD. EVOLVE ARE RESPONSIBLE FOR PERMANENT WORKS ONLY, ANY TEMPORARY BUILD UPS ARE TO BE PROPOSED AND APPROVED BY THE CONTRACTOR PRIOR TO INSTALLATION.

THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT, AND TEMPORARY AND PERMANENT DIVERSION WORKS, AS NECESSARY TO ALL EXISTING SERVICES.

THE CONTRACTOR SHALL ALLOW FOR KEEPING TRENCHES AND EXCAVATIONS AS DRY AS PRACTICABLE BY PUMPING FROM TEMPORARY SUMPS AND DE-WATERING AS APPROPRIATE. THE POINT AND METHOD OF DISCHARGE TO BE AGREED WITH THE DRAINAGE AUTHORITY, LLFA AND ENVIRONMENT AGENCY.

IT IS ADVISED THAT DRAINAGE WORKS ARE TO BE CONSTRUCTED FROM THE OUTFALL TOWARDS THE HEAD OF RUN TO ENSURE THE OUTFALL CAN BE ACHIEVED.

ALL DRAINS TO BE CCTV SURVEYED ON COMPLETION OF THE WORKS.

Rev.	Date	Revision	By	Chk
A	07.08.20	ISSUED FOR TENDER	PW	PK

TENDER

Client
PJN PROPERTIES LTD

Project
BARTON BULDINGS
UXBRIDGE INDUSTRIAL ESTATE

Drawing Title
PROPOSED DRAINAGE
GENERAL ARRANGEMENT

Drawn by	Checked by	Scale @ A1
PW	PK	1:200

Drawing No.	Revision
3121-500	A

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