



DRAINAGE IMPACT ASSESSMENT

FOR

PROPOSED TRADE COUNTER

AT

TWIBELL STREET,

BARNSELEY

FOR



Project Ref: 28343

Issue: 01

Date 1st Issue: 25th July 2019

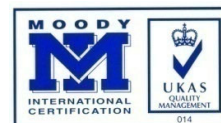
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1.0 INTRODUCTION

GGP Consult have been instructed by Allenby Commercial to prepare a drainage impact assessment for the proposed development of Brownfield land off Twibell Street, Barnsley. It's proposed the site will house a small trade counter with associated laydown and parking areas.

2.0 DESCRIPTION OF EXISTING SITE

The proposed site is located off Twibell Street, Barnsley.

The site location plan is included in Appendix I.

The OS National Grid reference of the centre of the site is approximately SE 35221 07112.

The total area of the site is 0.7112Ha.

The site is found within flood zone 1, this can be seen within the Flood Risk Note.

2.1 DESCRIPTION OF EXISTING DRAINAGE

Currently the extents of the existing drainage are unknown, however it is shown on the topo survey that there are manholes located on site. These where not able to be lifted during the survey.

There is shown to an existing foul sewer running through the north of the site.

3.0 PROPOSED SITE

It is proposed that the existing carpark is to be removed and replaced with a commercial unit, accompanied with parking and storage areas.

The proposed building foot print will be approximately 1,457m² in area.

See Appendix I for the proposed site layout plan.

For details of the proposed drainage see section 5.0.

The purpose of the Drainage Impact Assessment (DIA) is to demonstrate that: -

- a) The site can be adequately developed.
- b) Any land-take required for proposed drainage infrastructure has been allowed for; and,
- c) Due consideration has been given to the impact of the proposed development on the drainage catchment area.

The DIA will included the following information

4.0 – Design Philosophy

5.0 – Proposed Site Drainage

6.0 – Point of Discharge

6.1 – Interception Storage

6.2 – Water Quality

6.3 – Peak Flow Rates & Volume Control

6.4 – Construction Design Elements

6.5 – Water Quality Treatment

6.6 – Functionality of the Design

this report has been structured to follow the same heads as noted above.

4.0 DESIGN PHILOSOPHY

Part H of the Building Regulations recommends a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Local borehole maps indicate a high content of rock in the sub grade. Resulting in a more than likely low permeability.

Discharging into the nearest watercourse is deemed appropriate as the proposed site boundary is against the edge of the River Dearne.

Therefore, discharge to the watercourse is deemed most suitable.

5.0 PROPOSED SITE DRAINAGE

As the site is Brownfield, it is required that the permissible discharge rates are a 30% reduction of the 1 in 1 storm event. The rates of which can be found under, 'Brownfield Calculations', these can be found in **Appendix XII**.

It is proposed that the surface water is to be collected by a number of gullies, rain water pipes and aco channels. Surface water from the hardstanding will be put through a petrol interceptor to remove any sediments prior to entering the watercourse.

The collected surface water is to flow into the hydrobreak located at the north of the site and discharge into the existing watercourse at a rate 9 l/s, which is stipulated by the existing greenfield run off rates.

Attenuation is to be provided in the form of an SDS Attenuation Tank. This will be sited to cater for the 1 in 100Yr +30% CC

The foul water generated from the site is to be discharged into the public sewer which is located running through the northern area of the site.

6.0 POINT OF DISCHARGE

- a) The connections will discharge via gravity to the respective existing chamber at rate of no greater than 9l/s.
- b) MicroDrainage “Source Control” has been used to model the drainage system for the proposed development.

Refer to Appendix II for Model Details

- c) As noted in section 4.0, local boreholes indicate a high clay content. Suggesting infiltration would not be achievable.

6.1 INTERCEPTION STORAGE

- a) Preliminary calculations have been undertaken in accordance with “SuDS Manual 2015, Chapter 24.3, simple approaches to interception delivery and compliance assessment”.

6.2 WATER QUALITY

Step 1

Define pollution hazard indices – see below tables

Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries ²	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach ³ Note: extra measures may be required for discharges to protected resources ¹	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach ³ Note: extra measures may be required for discharges to protected resources ¹	Simple index approach ³ Note: extra measures may be required for discharges to protected resources ¹ In England and Wales, Risk Screening ⁴ must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit ⁵ . Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required ⁵ .	

Pollution Hazard Level is Medium.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Pollution Hazard Level is Medium.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

A petrol interceptor is to be used therefore the above is met by default.

6.3 PEAK FLOW RATE & VOLUME CONTROL

6.3.1 BROWNFIELD SITE

- a) As existing the site is entirely Brownfield.

Catchment areas can be defined as follows,

Catchment areas

Existing

Total existing impermeable area	= 743m ²
Total existing permeable area	= 6,369m ²
Total Site Area	= <u>7,112m²</u>

Proposed

Building Impermeable area	= 1,457m ³
Access Road & Parking Impermeable area	= 4,273m ²
Total impermeable area	= 5,730m²
Total permeable area	= 1,382m²

Surface water will be discharged from the site at a rate of no greater than 9l/s.

- b) The site has been initially analysed as a brownfield site with an existing outfall of a 150mm pipe discharging at an unrestricted rate into the existing sewer, these rates are as follows.

Total Existing Peak Flow Rates

Q for 1 in 1 yr. RP Storm	= 13.80 l/s
Q for 1 in 30 yr. RP Storm	= 30.30 l/s
Q100 for 1 in 100 yr. RP Storm	= 39.30 l/s

Yorkshire policy dictates that a minimum reduction of 30% of total discharge is applied giving the following permissible flow rates.

Q for 1 in 1 yr RP Storm	= 9.66 l/s
Q for 1 in 30 yr RP Storm	= 21.21 l/s
Q100 for 1 in 100 yr RP Storm	= 27.51 l/s

On the basis that it is not possible to optimise a flow control device for all 3 storm periods, the following flow rates are proposed.

Q for 1 in 1 yr RP Storm +30 %	= 9.00 l/s	(34% Reduction)
Q for 1 in 30 yr RP Storm +30 %	= 9.00 l/s	(70% Reduction)
Q100 for 1 in 100 yr RP Storm +30 %	= 9.00 l/s	(77% Reduction)

- c) The below table identifies each storage structure along with drain down time for the 1:100 yr. 6hr event + 30% CC.

Structure Name	Node	Cover Level	Max Water Level	Drain Down Time (Mins)
SW.TANK	SW.TANK	46.850m AOD	45.802m AOD (360 Winter)	546 Mins

- d) The below table identifies the maximum water level in the storage structure for the 1:100 yr. 6hr event + 30% CC.

All flows for the 1 in 100 + 30% CC year event are contained and stored within the proposed structure. Above ground flood will not occur in other areas across the proposed site.

Structure Name	Node	Cover Level	Max Water Level
SW.TANK	SW.TANK	46.850m AOD	45.802m AOD (360 Winter)

See Appendix III for full MicroDrainage calculations for the above event.

- e) All flows for the 1:75 yr. event + 30% CC are contained and stored within the proposed structure. Above ground flood will not occur in other areas across the proposed site.

The below results are a summary of max water levels for the critical duration for each structure taken from the MicroDrainage Model

Structure Name	Node	Cover Level	Max Water Level
SW.TANK	SW.TANK	46.850m AOD	45.723m AOD (240 Winter)

See Appendix IV for full MicroDrainage calculations for the above event.

- f) All flows for the 1:100 yr. event + 30% CC are contained and stored within the proposed structure. Above ground flood will not occur in other areas across the proposed site.

The below results are a summary of max water levels for the critical duration for each structure taken from the MicroDrainage Model.

Structure Name	Node	Cover Level	Max Water Level
SW.TANK	SW.TANK	46.850m AOD	45.802m AOD (240 Winter)

See Appendix V for full MicroDrainage calculations for the above event.

- g) It is demonstrated that both in the 1:150 + 30% CC and 1:200 + 30% CC yr. events that flooding occurs. However, as shown in the below tables, the maximum flooding depth is to be 21mm, this will be contained on the site.

The below table shows max water levels for the structures during a 1 in 150 year and 1 in 200 year events.

1:150 Yr. Storm + 30% CC

Structure Name	Node	Cover Level	Max Water Level	Flooding Volume	Flood Depth
SW.TANK	SW.TANK	46.850m AOD	46.858m AOD (240 Winter)	14.4m ³	8mm

1:200 Yr. Storm + 30% CC

Structure Name	Node	Cover Level	Max Water Level	Flooding Volume	Flood Depth
SW.TANK	SW.TANK	46.850m AOD	46.871m AOD (240 Winter)	39.6m ³	21mm

As shown above, the worst-case flooding to occur on site is 39.6m³ during the 1:200 yr. event and this can be adequately contained on site. The above calculations do not consider the storage available within the pipes or chambers. Therefore, taking this into account there would be no above ground flooding during the 1:200 and 1:150 year storms.

6.4 CONSTRUCTION DESIGN ELEMENTS

- a) All rain water pipes to be roddable from ground level
- b) Road gullies to be trapped to help with the initial removal of sediment
- c) All chambers discharging directly to attenuation structures should be preceded by a catchpit manhole to help remove sediment prior to discharge.
- d) All SuDs structures to be lined with an impermeable geomembrane due to local ground conditions

6.5 WATER QUALITY TREATMENT

The site has been identified as being outside all source protection zones, as shown on the Environment Agency map below however, irrespective of this, due to the site being completely impermeable infiltration techniques are deemed unreasonable.



6.6 FUNCTIONALITY OF THE DESIGN

- The client has full ownership on the land within the redline boundary. Along with the obligation to construct a new access for site.
- Pipework is to be maintained as per manufacturer's instructions.

MAINTENANCE

Recommendations for inspection and maintenance can be seen in the table overleaf. It is worth noting that both the drainage and highway elements of the design will remain under the ownership of the land owner who will be solely responsible for the maintenance and upkeep of these elements of the proposal.

The land owner will perform a thorough site inspection biannually and as a minimum the following maintenance items should be actioned without fail.

- Lifting of manhole lids to check flows.
- Catchpits to be emptied.
- Rodding of external pipework.

Where defects exist, maintenance will be carried out in accordance with the below maintenance schedule.

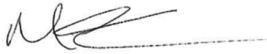
In addition to this a CCTV survey of the full drainage system will be undertaken every 5 years to check the condition of the pipework.

ITEM	DEFECT CHECK	DETAILED INSPECTION VISUAL INSPECTION	ACTION REQUIRED	REPLACEMENT	ADDITIONAL COMMENTS
FLOW CHECK	Surface water ponding	6months. Lifting of manhole lids to check flows.	Check downstream for blockages. Clean system and undertake CCTV survey if issues are identified	N/A	Under the maintenance responsibility of the landowner.
MANHOLE COVERS	Broken lids.	6 months.	Replace.	When broken.	Under the maintenance responsibility of the landowner.
MANHOLE	Blockages, surcharging.	6months. Lifting of manhole lids to check flows.	Check downstream for blockages. Clean system and undertake CCTV survey if issues are identified	N/A	Under the maintenance responsibility of the landowner.
INSPECTION CHAMBER	Blockages, surcharging.	6months. Lifting of manhole lids to check flows.	Check downstream for blockages. Clean system and undertake CCTV survey if issues are identified	N/A	Under the maintenance responsibility of the landowner.
SILT TRAPS/ CATCHPITS	Blockages, slit build up	6months. Lifting of manhole to check for silt.	Empty and clean sump	N/A	Under the maintenance responsibility of the landowner.
HYDROBRAKE CHAMBER	Blockages, condition, surcharging	6 months.	As Per Manufactures Instructions	If broken beyond repair.	Under the maintenance responsibility of the landowner.
PIPEWORK	Blockages, Cracking	6 months.	Rodding required	When damaged.	Under the maintenance responsibility of the landowner.
GUTTERING	Blockages	6 months.	Cleaning and removal of debris	N/A	Under the maintenance responsibility of the landowner.
ACCESS ROAD	Surface damage	6 months.	Pressure washing of surface Surface Patching when required	When damaged. (Surfacing to be patched to original specification.)	Under the maintenance responsibility of the landowner.

From GGP CONSULT

Report Written by:-

M. Nicholson
Civil Engineer



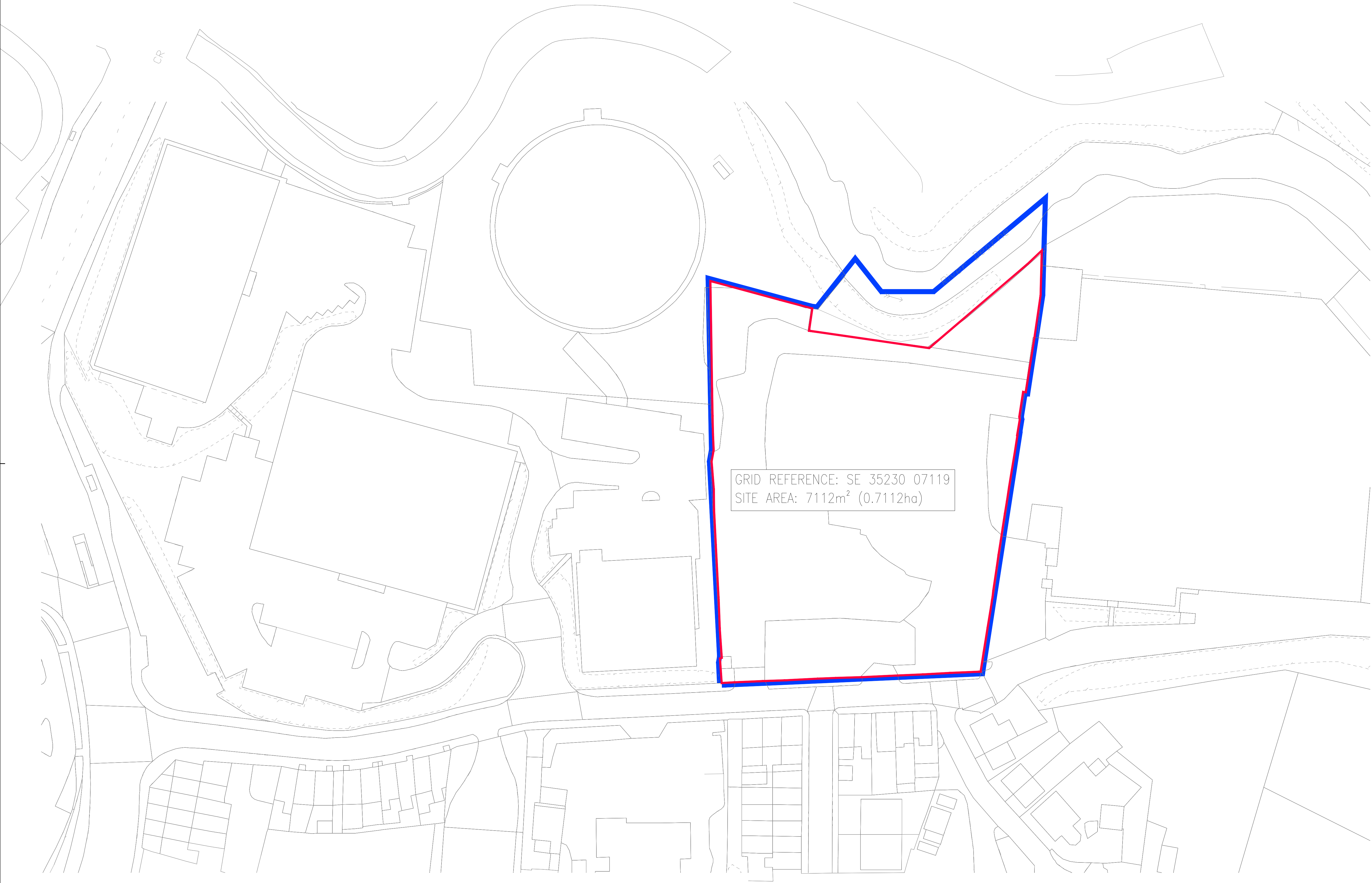
Report Checked by:-



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Senior Civil Engineer
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APPENDIX I

Site Location Plan



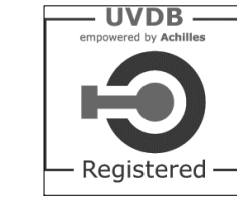
GRID REFERENCE: SE 35230 07119
SITE AREA: 7112m² (0.7112ha)

- NOTES:
1. All dimensions must be checked on site and not scaled from this drawing.
 2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
 3. All levels shown on this drawing are relative to Agreed Datum.
 4. This drawing is to be read in conjunction with 28343/100 Series Drawings.
 5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.
- DENOTES OWNERSHIP BOUNDARY
— DENOTES SITE BOUNDARY

B	16/07/19	ISSUED FOR APPROVAL	DJC	JHC
A	11/07/19	ISSUED FOR APPROVAL	DJC	JHC

Rev	Date	Description	DR	CH
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Client
ALLENBY COMMERCIAL

Job Title
PROPOSED BUILDERS
MERCHANT, TWIBELL STREET,
BARNSELY

Drawing Title
SITE LOCATION PLAN

Status
APPROVAL

Scale
1:500 @ A1

Date
11/07/2019

Drawn By
Daniel Cook

Checked
JHC

Approved
JHC

Drg. No.
28343/100

Rev
B

NOT FOR CONSTRUCTION

APPENDIX II

MicroDrainage "Source Control" Model Information

GGP Consult

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Unit 6 Priory TEC Park
Saxon Way Hessle
East Riding of Yorkshire HU...

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Micro Drainage

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Checked by

Source Control 2017.1

Micro Drainage

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 286 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15 min Summer	45.264	0.414	0.0	8.4	8.4	126.0	O K
30 min Summer	45.397	0.547	0.0	8.5	8.5	166.2	O K
60 min Summer	45.524	0.674	0.0	8.5	8.5	205.0	O K
120 min Summer	45.627	0.777	0.0	8.5	8.5	236.2	O K
180 min Summer	45.659	0.809	0.0	8.5	8.5	245.9	O K
240 min Summer	45.660	0.810	0.0	8.5	8.5	246.1	O K
360 min Summer	45.641	0.791	0.0	8.5	8.5	240.5	O K
480 min Summer	45.618	0.768	0.0	8.5	8.5	233.5	O K
600 min Summer	45.593	0.743	0.0	8.5	8.5	225.7	O K
720 min Summer	45.566	0.716	0.0	8.5	8.5	217.6	O K
960 min Summer	45.512	0.662	0.0	8.5	8.5	201.1	O K
1440 min Summer	45.408	0.558	0.0	8.5	8.5	169.8	O K
2160 min Summer	45.276	0.426	0.0	8.4	8.4	129.4	O K
2880 min Summer	45.173	0.323	0.0	8.3	8.3	98.3	O K
4320 min Summer	45.042	0.192	0.0	7.6	7.6	58.4	O K
5760 min Summer	44.972	0.122	0.0	7.0	7.0	37.0	O K
7200 min Summer	44.938	0.088	0.0	6.3	6.3	26.7	O K
8640 min Summer	44.921	0.071	0.0	5.6	5.6	21.5	O K
10080 min Summer	44.909	0.059	0.0	5.0	5.0	17.8	O K
15 min Winter	45.317	0.467	0.0	8.5	8.5	141.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.758	0.0	133.9	22
30 min Summer	83.832	0.0	180.0	36
60 min Summer	53.779	0.0	231.0	64
120 min Summer	33.321	0.0	286.3	124
180 min Summer	24.814	0.0	319.6	182
240 min Summer	19.989	0.0	343.4	236
360 min Summer	14.690	0.0	378.7	290
480 min Summer	11.803	0.0	405.6	352
600 min Summer	9.952	0.0	427.5	420
720 min Summer	8.652	0.0	446.1	488
960 min Summer	6.932	0.0	476.4	622
1440 min Summer	5.062	0.0	522.0	884
2160 min Summer	3.688	0.0	570.5	1260
2880 min Summer	2.943	0.0	606.9	1620
4320 min Summer	2.137	0.0	660.9	2332
5760 min Summer	1.700	0.0	701.3	3000
7200 min Summer	1.423	0.0	733.8	3680
8640 min Summer	1.232	0.0	762.0	4408
10080 min Summer	1.090	0.0	787.0	5136
15 min Winter	124.758	0.0	150.0	22

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Saxon Way Hessle
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Micro Drainage

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Source Control 2017.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	45.468	0.618	0.0	8.5	8.5	187.7	O K
60 min Winter	45.616	0.766	0.0	8.5	8.5	232.9	O K
120 min Winter	45.743	0.893	0.0	8.5	8.5	271.4	O K
180 min Winter	45.790	0.940	0.0	8.5	8.5	285.8	O K
240 min Winter	45.802	0.952	0.0	8.5	8.5	289.4	O K
360 min Winter	45.783	0.933	0.0	8.5	8.5	283.7	O K
480 min Winter	45.747	0.897	0.0	8.5	8.5	272.5	O K
600 min Winter	45.710	0.860	0.0	8.5	8.5	261.5	O K
720 min Winter	45.670	0.820	0.0	8.5	8.5	249.2	O K
960 min Winter	45.586	0.736	0.0	8.5	8.5	223.6	O K
1440 min Winter	45.424	0.574	0.0	8.5	8.5	174.6	O K
2160 min Winter	45.229	0.379	0.0	8.4	8.4	115.2	O K
2880 min Winter	45.097	0.247	0.0	8.0	8.0	75.0	O K
4320 min Winter	44.961	0.111	0.0	6.8	6.8	33.7	O K
5760 min Winter	44.922	0.072	0.0	5.7	5.7	21.9	O K
7200 min Winter	44.904	0.054	0.0	4.8	4.8	16.4	O K
8640 min Winter	44.893	0.043	0.0	4.1	4.1	13.0	O K
10080 min Winter	44.885	0.035	0.0	3.7	3.7	10.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	83.832	0.0	201.6	36
60 min Winter	53.779	0.0	258.7	64
120 min Winter	33.321	0.0	320.6	122
180 min Winter	24.814	0.0	358.2	178
240 min Winter	19.989	0.0	384.7	234
360 min Winter	14.690	0.0	424.1	342
480 min Winter	11.803	0.0	454.3	386
600 min Winter	9.952	0.0	478.9	460
720 min Winter	8.652	0.0	499.6	534
960 min Winter	6.932	0.0	533.6	680
1440 min Winter	5.062	0.0	584.5	954
2160 min Winter	3.688	0.0	639.1	1324
2880 min Winter	2.943	0.0	679.7	1672
4320 min Winter	2.137	0.0	740.3	2332
5760 min Winter	1.700	0.0	785.5	2992
7200 min Winter	1.423	0.0	821.8	3680
8640 min Winter	1.232	0.0	853.5	4408
10080 min Winter	1.090	0.0	881.4	5144

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Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Total Area (ha) 0.573

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.286	4 8	0.287

GGP Consult		Page 4
Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
Date 16/07/2019 16:28 File Proposed Calculations.SRCX	Designed by MitchellNicholson Checked by	
Micro Drainage Source Control 2017.1		

Model Details

Storage is Online Cover Level (m) 46.850

Cellular Storage Structure

Invert Level (m) 44.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	1.999	1.1	0.0
1.000	320.0	0.0	2.000	2000.0	0.0
1.001	1.1	0.0	2.125	2000.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0123-9000-2050-9000
Design Head (m) 2.050
Design Flow (l/s) 9.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 123
Invert Level (m) 44.797
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.050	9.0
Flush-Flo™	0.539	8.5
Kick-Flo®	1.100	6.7
Mean Flow over Head Range	-	7.6

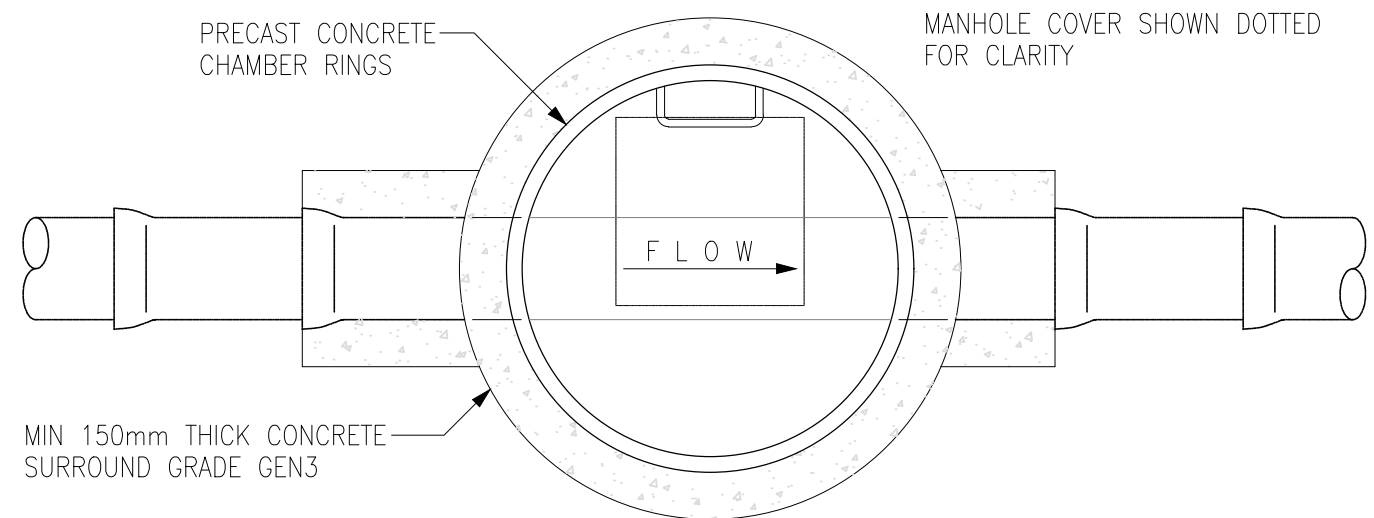
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.4	1.200	7.0	3.000	10.8	7.000	16.1
0.200	7.2	1.400	7.5	3.500	11.6	7.500	16.6
0.300	8.0	1.600	8.0	4.000	12.3	8.000	17.2
0.400	8.3	1.800	8.5	4.500	13.0	8.500	17.7
0.500	8.5	2.000	8.9	5.000	13.7	9.000	18.2
0.600	8.4	2.200	9.3	5.500	14.4	9.500	18.6
0.800	8.2	2.400	9.7	6.000	15.0		
1.000	7.4	2.600	10.1	6.500	15.5		

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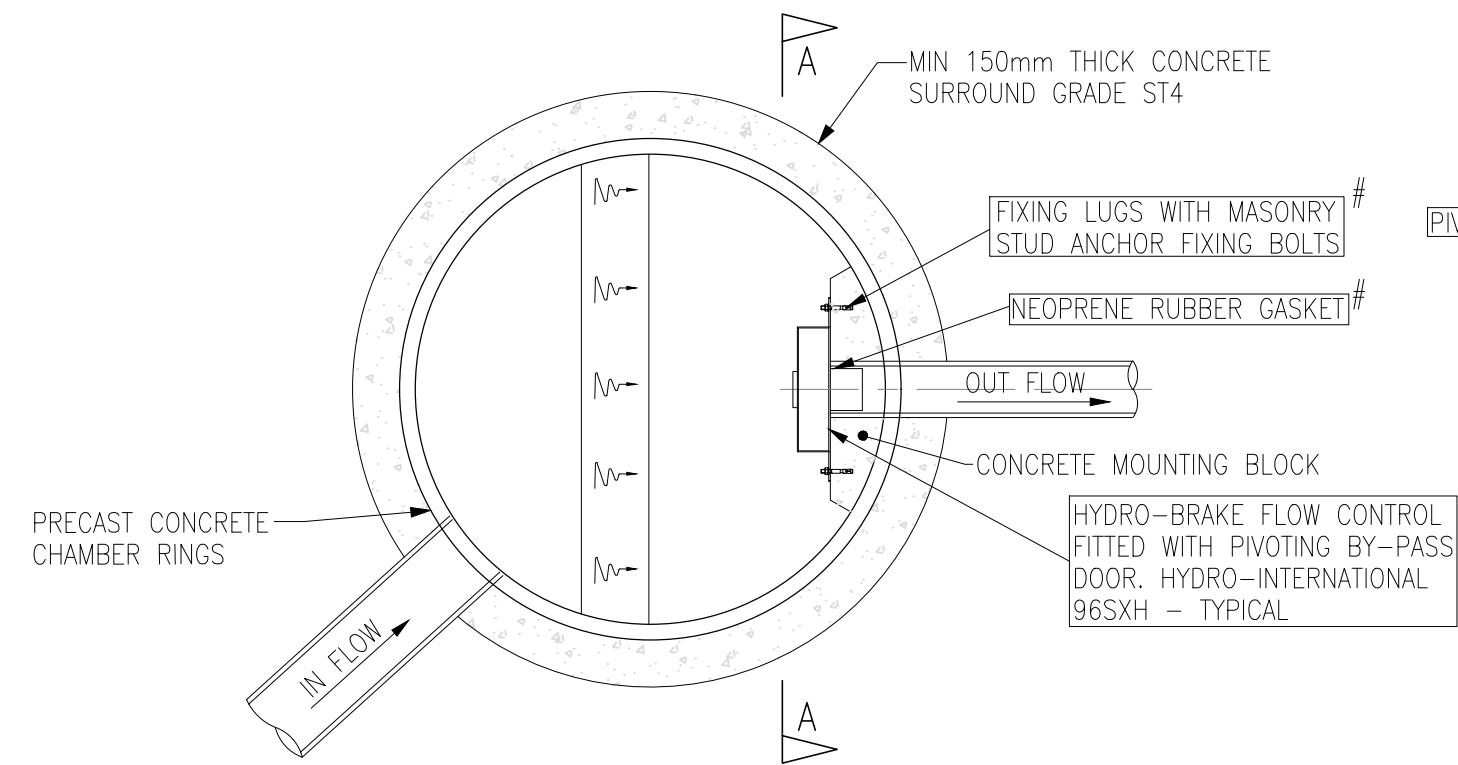
APPENDIX III

Standard Drainage Details

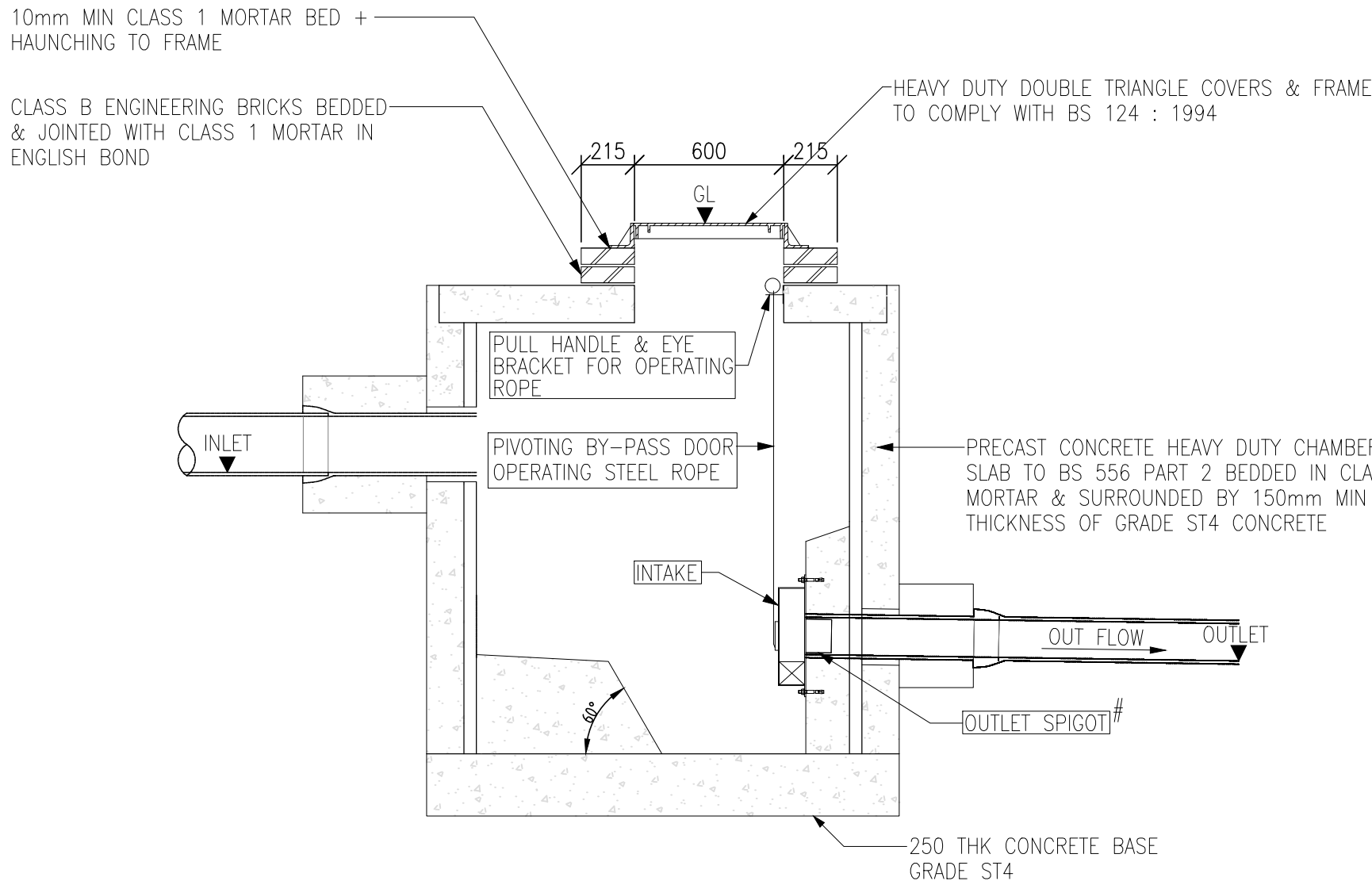


PLAN OF MANHOLE CHAMBER
SCALE: 1:25

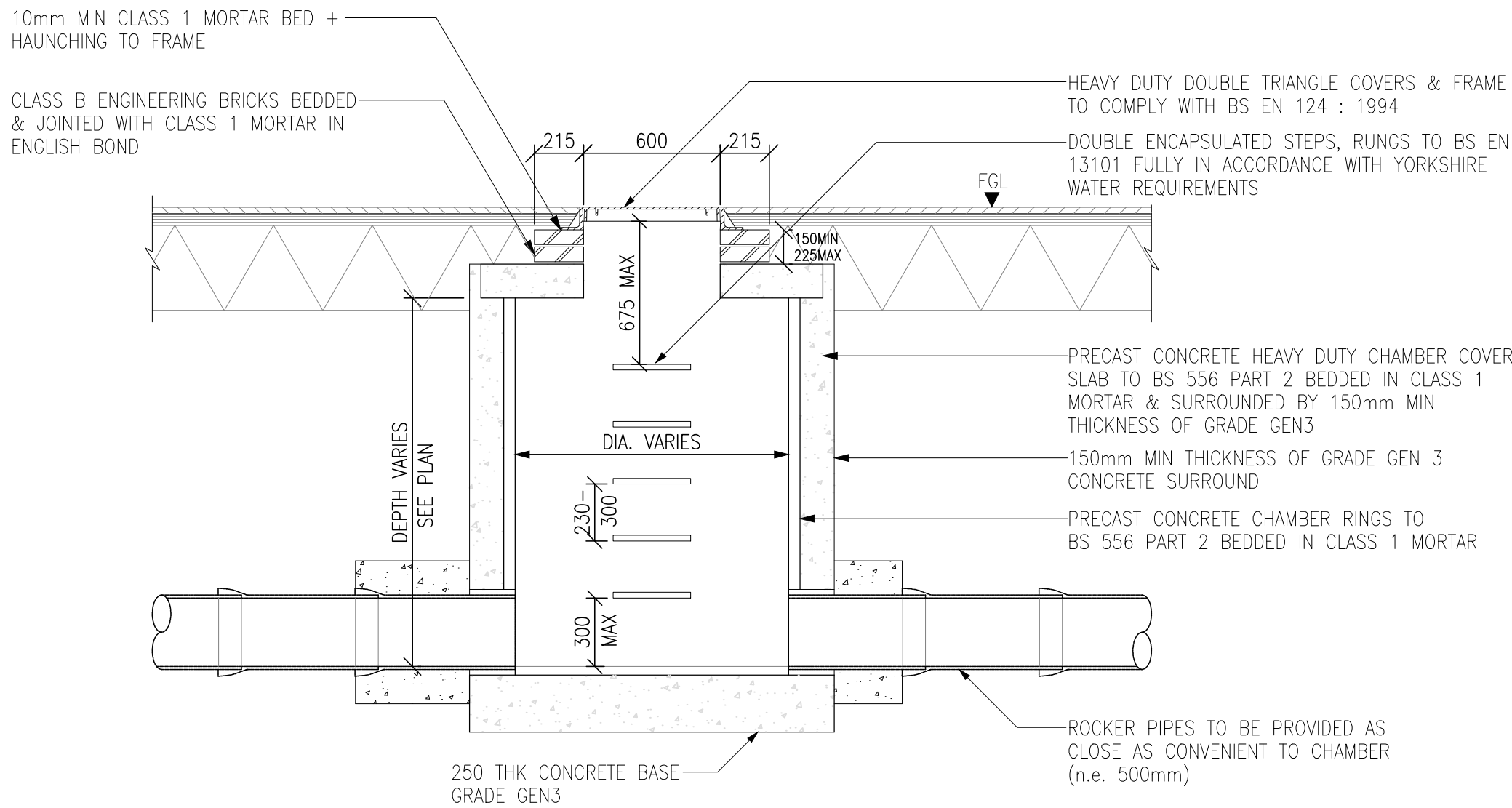
ALL CONCRETE TO BE
SULPHATE RESISTANT



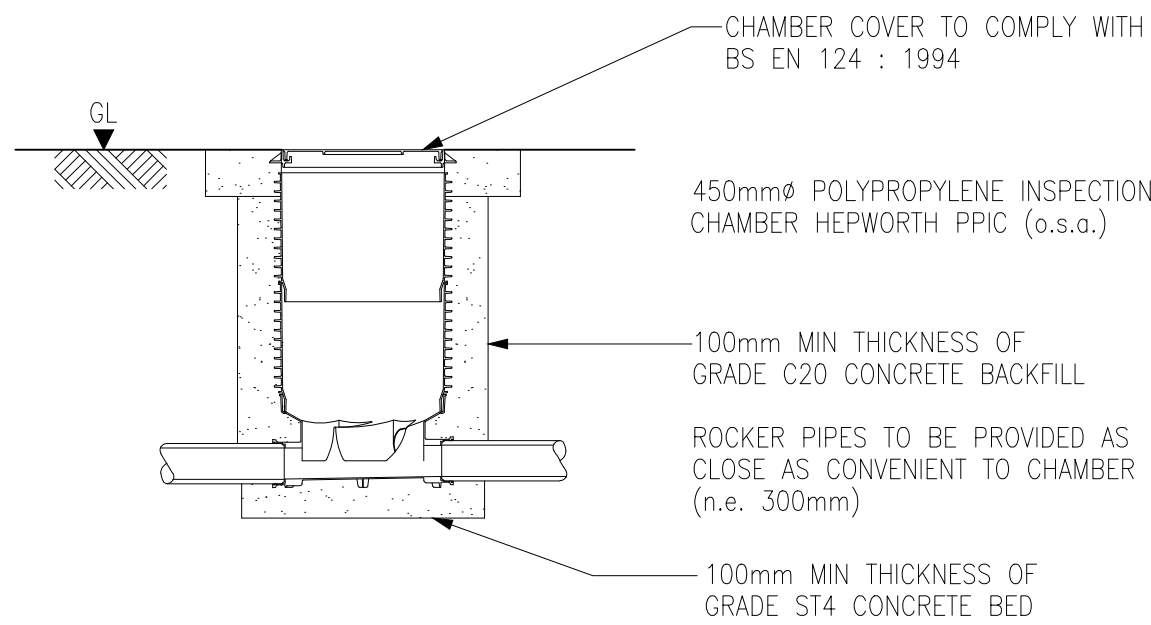
PLAN HYDRO-BRAKE CHAMBER
1:25



TYPICAL SECTION THRU' HYDRO-BRAKE CHAMBER
1:25

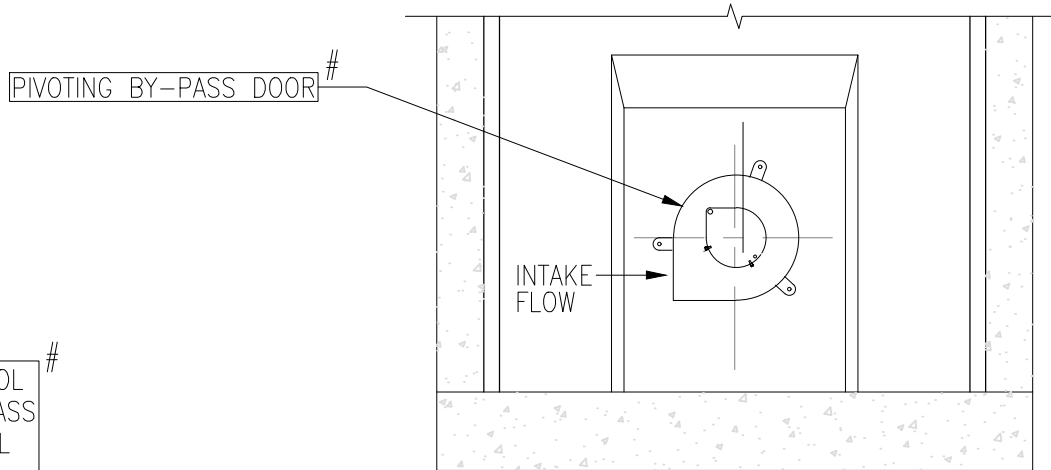


TYPICAL SECTION THRU' EXTERNAL PCC MANHOLE CHAMBER
SCALE: 1:25



TYPICAL SECTION THROUGH "PPIC" INSPECTION CHAMBER 450Ø

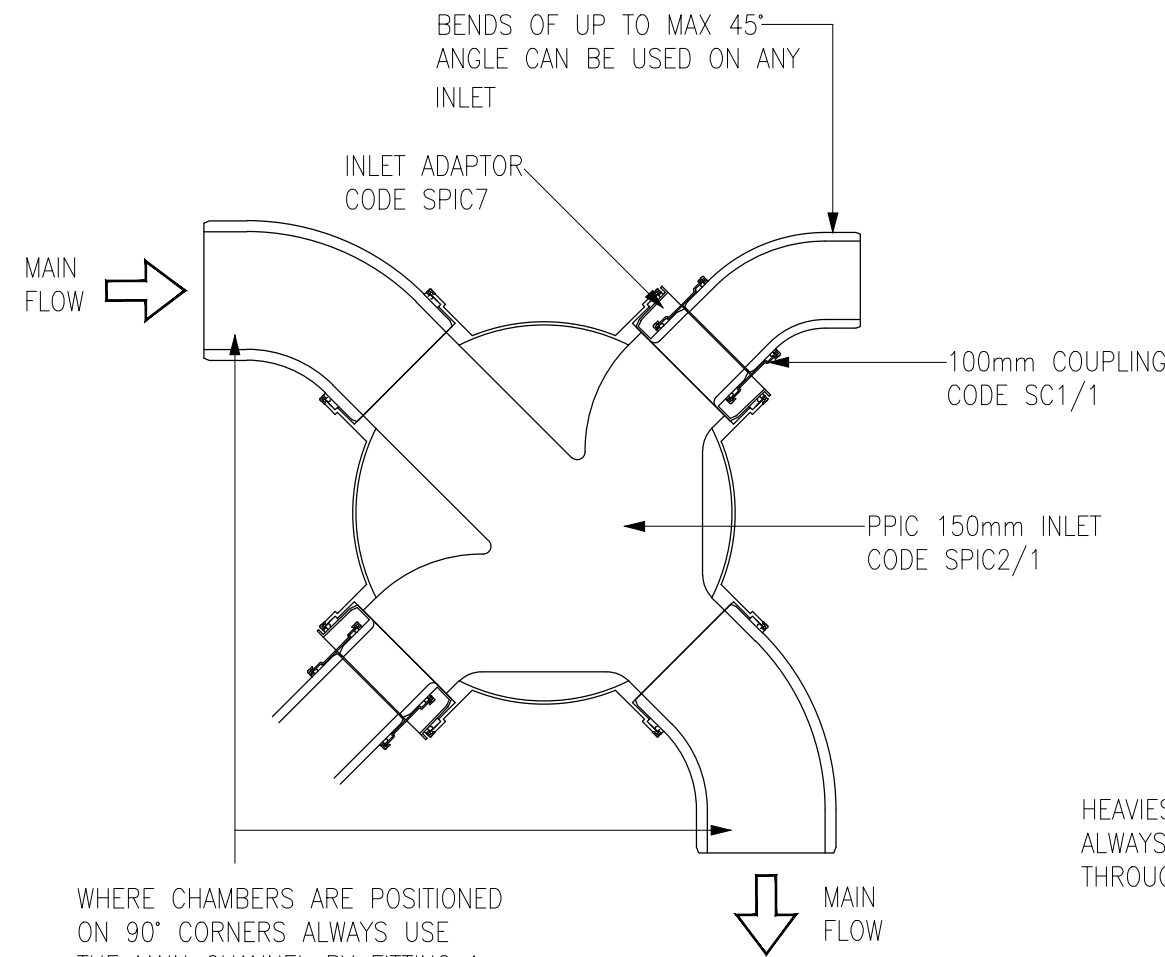
SCALE: 1:25 @ A1



SECTION A - A
1:25

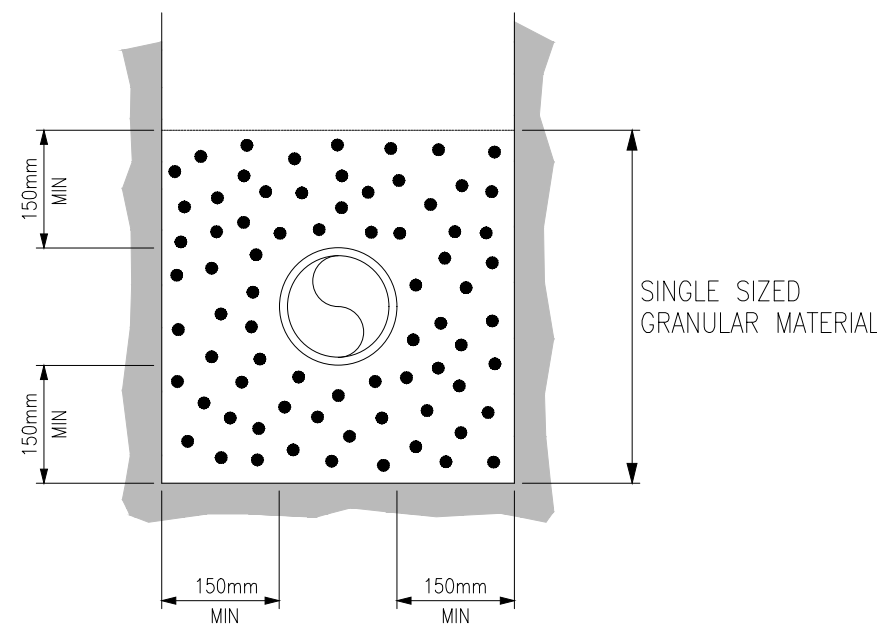
HYDRO-BRAKE CHAMBER DETAILS TO BE
READ IN CONJUNCTION WITH HYDRO
INTERNATIONAL DETAILS

SUPPLIED BY HYDRO-INTERNATIONAL



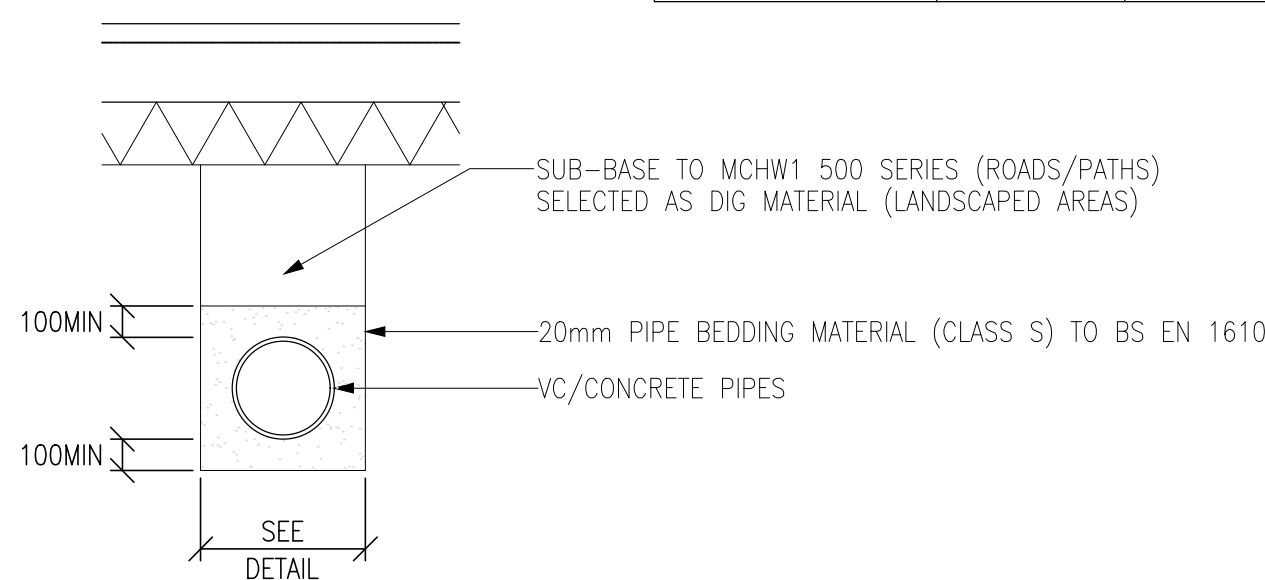
WHERE CHAMBERS ARE POSITIONED
ON 90° CORNERS ALWAYS USE
THE MAIN CHANNEL BY FITTING A
45° BEND CODE SB2/2 ON
INLET AND OUTLET

AS BUILT FLOW PLANS FOR 'PPIC' INSPECTION CHAMBER
SCALE: 1:10 @ A1



CLASS 'S' BEDDING DETAIL
(SINGLE SIZED GRANULAR SURROUND)

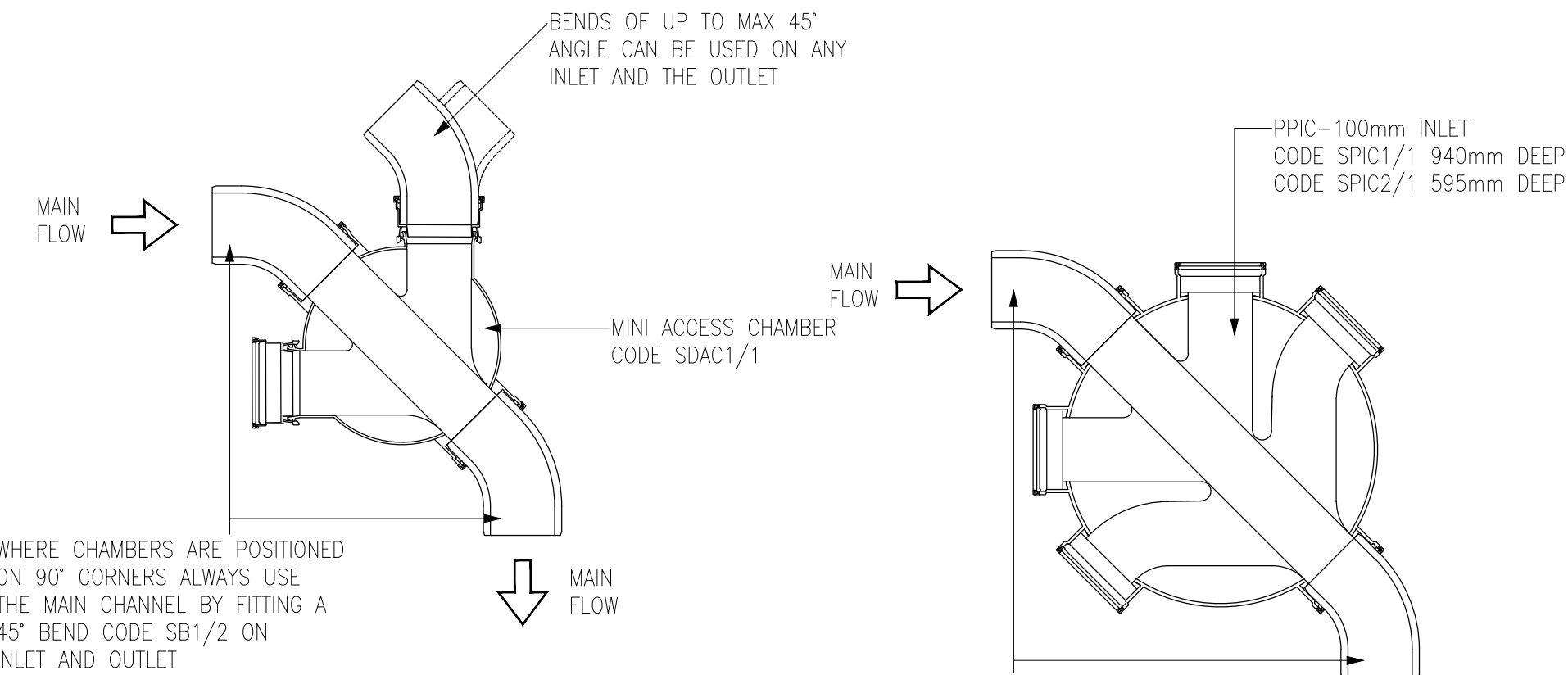
PIPE MATERIAL	PIPE SIZE	TRENCH WIDTH
VC	100Ø	550
VC	150Ø	650
VC	225Ø	750
CONCRETE	300Ø	850



PIPE COVER TO CROWN TO BE
GREATER THAN 600mm

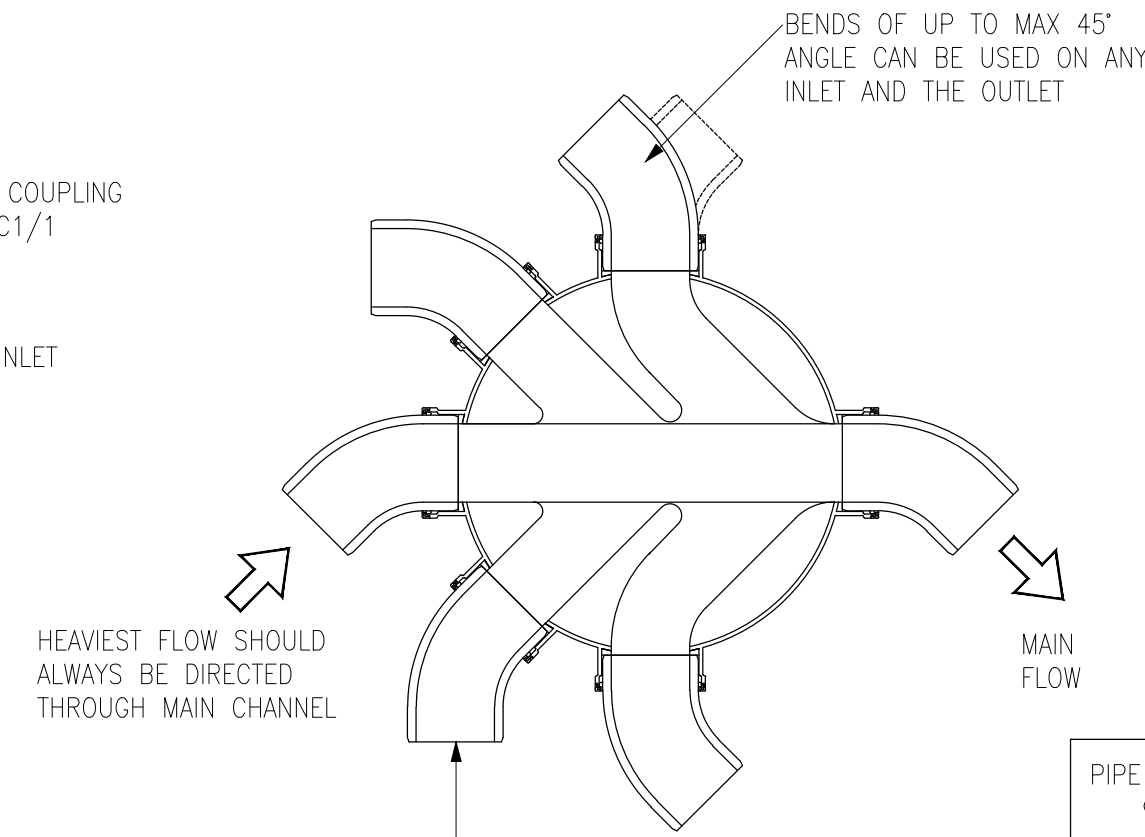
TYPICAL SEWER TRENCH DETAIL

SCALE: 1:25



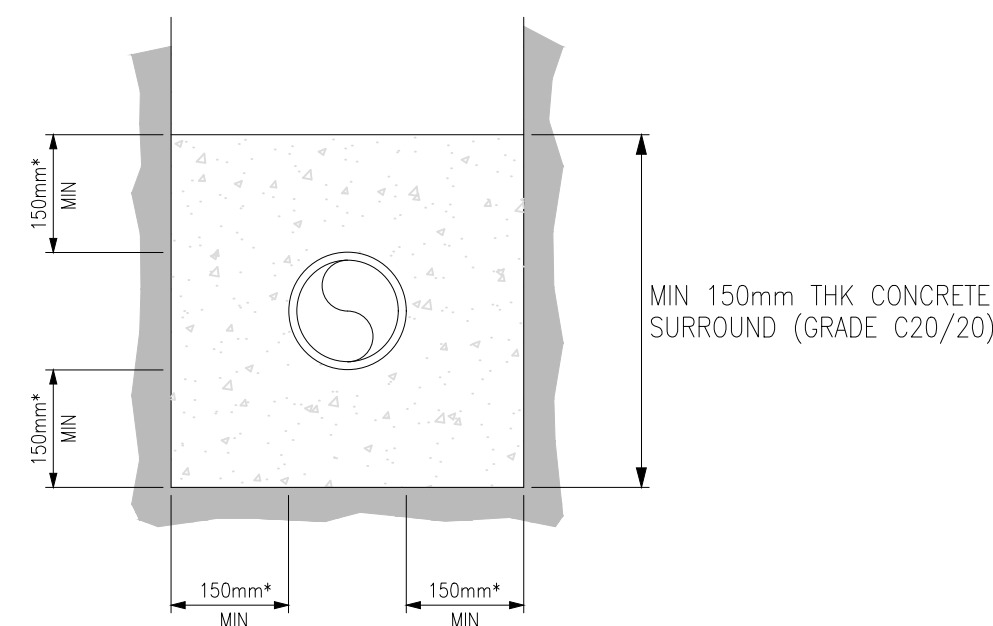
WHERE CHAMBERS ARE POSITIONED
ON 90° CORNERS ALWAYS USE
THE MAIN CHANNEL BY FITTING A
45° BEND CODE SB1/2 ON
INLET AND OUTLET

WHERE CHAMBERS ARE POSITIONED
ON 90° CORNERS ALWAYS USE
THE MAIN CHANNEL BY FITTING A
45° BEND CODE SB1/2 ON
INLET AND OUTLET



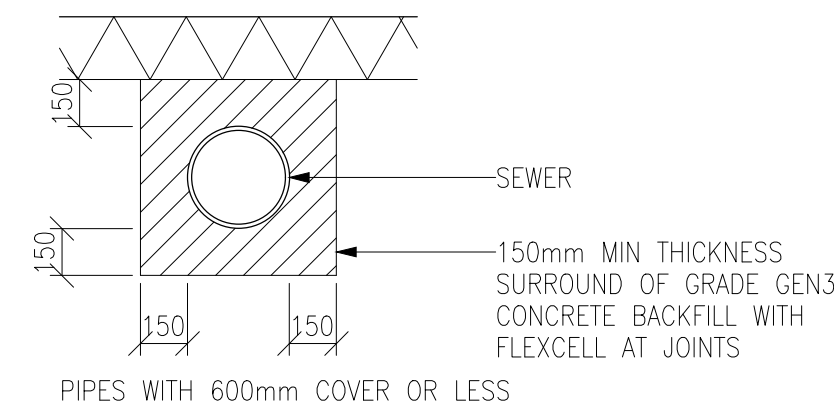
SHORTEST STEEP BRANCH CONNECTIONS
SHOULD PREFERABLY BE CONNECTED
VIA A 45° INLET USING A BEND
WHERE NECESSARY.

PIPE SIZE Ø	SINGLE SIZED	GRADED
100-125	10	-
150-200	10 or 14	14 to 5
225-300	10, 14 or 20	14 to 5 or 20 to 5
375-500	14 or 20	14 to 5 or 20 to 5



CONCRETE SURROUND (GRADE C20/20)
* 100mmTHK FOR RIGID PIPES 150mmØ OR LESS

PIPE MATERIAL	PIPE SIZE	TRENCH WIDTH
PVC-U	100Ø	550
PVC-U	150Ø	650
PVC-U	225Ø	750
VC	150Ø	650



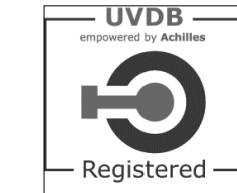
TYPICAL SEWER TRENCH DETAIL
SCALE: 1:25 @ A1

- NOTES:
- All dimensions must be checked on site and not scaled from this drawing.
 - The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
 - All levels shown on this drawing are relative to Agreed Datum
 - This drawing is to be read in conjunction with 28343/100 Series Drawings.
 - All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

B	16/07/19	ISSUED FOR APPROVAL	DJC	JHC
A	11/07/19	ISSUED FOR APPROVAL	DJC	JHC

Rev	Date	Description	DR	CH
-----	------	-------------	----	----

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Telephone (+44) 01482 627963
Fax (+44) 01482 641736
Email info@ggpconsult.co.uk

Client
ALLENBY COMMERCIAL

Job Title
PROPOSED BUILDERS
MERCHANT, TWIBELL STREET,
BARNSELY

Drawing Title
TYPICAL DETAILS
1 OF 2

Status
APPROVAL

Scale
AS NOTED @ A1

Date
11/07/2019

Drawn By
Daniel Cook

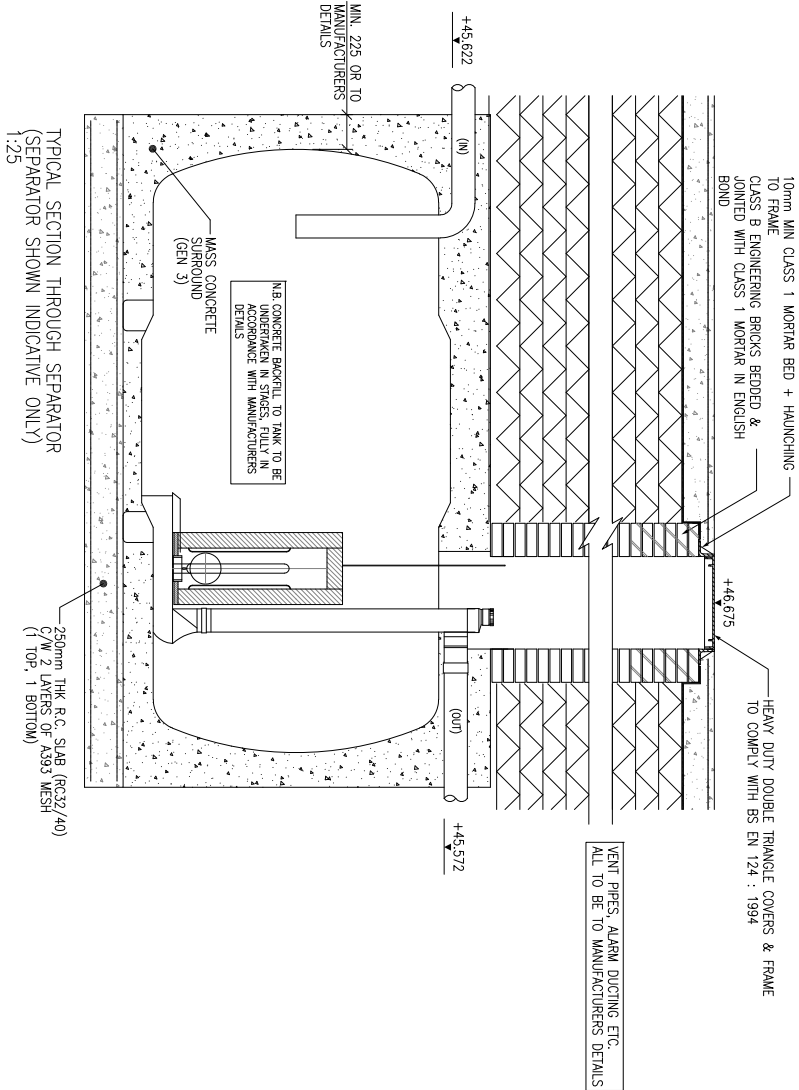
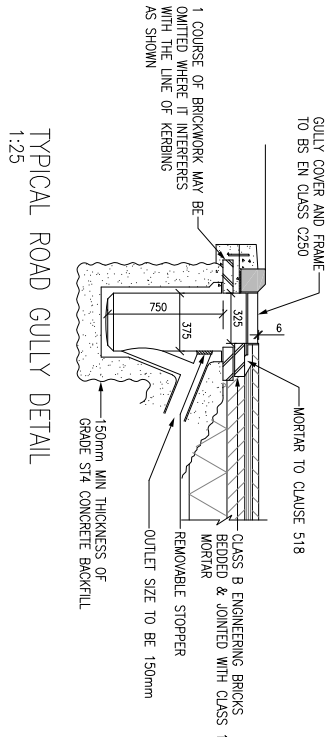
Checked
JHC

Approved
JHC

Drg. No.
28343/108

Rev
B

NOT FOR CONSTRUCTION



- NOTES:-
1. All dimensions must be checked on site and not scaled from this drawing.
 2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
 3. All levels shown on this drawing are relative to Agreed Datum.
 4. This drawing is to be read in conjunction with 28343/100 Series Drawings.
 5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

C	26/07/19	ISSUED FOR APPROVAL	TM	JHC
B	16/07/19	ISSUED FOR APPROVAL	D.C.	JHC
A	11/07/19	ISSUED FOR APPROVAL	D.C.	JHC
Rev	Date	Description	DR	CH

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Fax 1447 01482 641736
Email info@gcpconsult.co.uk

Client
ALENBY COMMERCIAL

Proposed Builders
MERCHANT, TWIBELL STREET,
BARNSELEY

Drawing Title
TYPICAL DETAILS
2 OF 2

Status
APPROVAL

Scale	AS NOTED @ A1	Date	11/07/2019
-------	---------------	------	------------

Drawn By	Checked	Approved
Donald Goble	JHC	JHC

Dwg No.	Rev
28343/109	C

NOT FOR CONSTRUCTION

APPENDIX IV

MicroDrainage "Network" Calculations
1:100 Yr – 6hr Storm + 30% CC

GGP Consult

Unit 6 Priory TEC Park
Saxon Way Hessle
East Riding of Yorkshire HU...

Date 16/07/2019 16:28
File Proposed Calculations.SRCX

Micro Drainage

Page 1



Designed by MitchellNicholson
Checked by

Source Control 2017.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 286 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15 min Summer	45.264	0.414	0.0	8.4	8.4	126.0	O K
30 min Summer	45.397	0.547	0.0	8.5	8.5	166.2	O K
60 min Summer	45.524	0.674	0.0	8.5	8.5	205.0	O K
120 min Summer	45.627	0.777	0.0	8.5	8.5	236.2	O K
180 min Summer	45.659	0.809	0.0	8.5	8.5	245.9	O K
240 min Summer	45.660	0.810	0.0	8.5	8.5	246.1	O K
360 min Summer	45.641	0.791	0.0	8.5	8.5	240.5	O K
480 min Summer	45.618	0.768	0.0	8.5	8.5	233.5	O K
600 min Summer	45.593	0.743	0.0	8.5	8.5	225.7	O K
720 min Summer	45.566	0.716	0.0	8.5	8.5	217.6	O K
960 min Summer	45.512	0.662	0.0	8.5	8.5	201.1	O K
1440 min Summer	45.408	0.558	0.0	8.5	8.5	169.8	O K
2160 min Summer	45.276	0.426	0.0	8.4	8.4	129.4	O K
2880 min Summer	45.173	0.323	0.0	8.3	8.3	98.3	O K
4320 min Summer	45.042	0.192	0.0	7.6	7.6	58.4	O K
5760 min Summer	44.972	0.122	0.0	7.0	7.0	37.0	O K
7200 min Summer	44.938	0.088	0.0	6.3	6.3	26.7	O K
8640 min Summer	44.921	0.071	0.0	5.6	5.6	21.5	O K
10080 min Summer	44.909	0.059	0.0	5.0	5.0	17.8	O K
15 min Winter	45.317	0.467	0.0	8.5	8.5	141.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.758	0.0	133.9	22
30 min Summer	83.832	0.0	180.0	36
60 min Summer	53.779	0.0	231.0	64
120 min Summer	33.321	0.0	286.3	124
180 min Summer	24.814	0.0	319.6	182
240 min Summer	19.989	0.0	343.4	236
360 min Summer	14.690	0.0	378.7	290
480 min Summer	11.803	0.0	405.6	352
600 min Summer	9.952	0.0	427.5	420
720 min Summer	8.652	0.0	446.1	488
960 min Summer	6.932	0.0	476.4	622
1440 min Summer	5.062	0.0	522.0	884
2160 min Summer	3.688	0.0	570.5	1260
2880 min Summer	2.943	0.0	606.9	1620
4320 min Summer	2.137	0.0	660.9	2332
5760 min Summer	1.700	0.0	701.3	3000
7200 min Summer	1.423	0.0	733.8	3680
8640 min Summer	1.232	0.0	762.0	4408
10080 min Summer	1.090	0.0	787.0	5136
15 min Winter	124.758	0.0	150.0	22

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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...							
Date 16/07/2019 16:28 File Proposed Calculations.SRCX							
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Micro Drainage		Source Control 2017.1					
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	45.468	0.618	0.0	8.5	8.5	187.7	O K
60 min Winter	45.616	0.766	0.0	8.5	8.5	232.9	O K
120 min Winter	45.743	0.893	0.0	8.5	8.5	271.4	O K
180 min Winter	45.790	0.940	0.0	8.5	8.5	285.8	O K
240 min Winter	45.802	0.952	0.0	8.5	8.5	289.4	O K
360 min Winter	45.783	0.933	0.0	8.5	8.5	283.7	O K
480 min Winter	45.747	0.897	0.0	8.5	8.5	272.5	O K
600 min Winter	45.710	0.860	0.0	8.5	8.5	261.5	O K
720 min Winter	45.670	0.820	0.0	8.5	8.5	249.2	O K
960 min Winter	45.586	0.736	0.0	8.5	8.5	223.6	O K
1440 min Winter	45.424	0.574	0.0	8.5	8.5	174.6	O K
2160 min Winter	45.229	0.379	0.0	8.4	8.4	115.2	O K
2880 min Winter	45.097	0.247	0.0	8.0	8.0	75.0	O K
4320 min Winter	44.961	0.111	0.0	6.8	6.8	33.7	O K
5760 min Winter	44.922	0.072	0.0	5.7	5.7	21.9	O K
7200 min Winter	44.904	0.054	0.0	4.8	4.8	16.4	O K
8640 min Winter	44.893	0.043	0.0	4.1	4.1	13.0	O K
10080 min Winter	44.885	0.035	0.0	3.7	3.7	10.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	83.832	0.0	201.6	36			
60 min Winter	53.779	0.0	258.7	64			
120 min Winter	33.321	0.0	320.6	122			
180 min Winter	24.814	0.0	358.2	178			
240 min Winter	19.989	0.0	384.7	234			
360 min Winter	14.690	0.0	424.1	342			
480 min Winter	11.803	0.0	454.3	386			
600 min Winter	9.952	0.0	478.9	460			
720 min Winter	8.652	0.0	499.6	534			
960 min Winter	6.932	0.0	533.6	680			
1440 min Winter	5.062	0.0	584.5	954			
2160 min Winter	3.688	0.0	639.1	1324			
2880 min Winter	2.943	0.0	679.7	1672			
4320 min Winter	2.137	0.0	740.3	2332			
5760 min Winter	1.700	0.0	785.5	2992			
7200 min Winter	1.423	0.0	821.8	3680			
8640 min Winter	1.232	0.0	853.5	4408			
10080 min Winter	1.090	0.0	881.4	5144			
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Checked by



Source Control 2017.1

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Total Area (ha) 0.573

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.286	4 8	0.287

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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
Date 16/07/2019 16:28 File Proposed Calculations.SRCX	Designed by MitchellNicholson Checked by	
Micro Drainage Source Control 2017.1		

Model Details

Storage is Online Cover Level (m) 46.850

Cellular Storage Structure

Invert Level (m) 44.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	1.999	1.1	0.0
1.000	320.0	0.0	2.000	2000.0	0.0
1.001	1.1	0.0	2.125	2000.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0123-9000-2050-9000
Design Head (m) 2.050
Design Flow (l/s) 9.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 123
Invert Level (m) 44.797
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.050	9.0
Flush-Flo™	0.539	8.5
Kick-Flo®	1.100	6.7
Mean Flow over Head Range	-	7.6

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	4.4	1.200	7.0	3.000	10.8	7.000	16.1
0.200	7.2	1.400	7.5	3.500	11.6	7.500	16.6
0.300	8.0	1.600	8.0	4.000	12.3	8.000	17.2
0.400	8.3	1.800	8.5	4.500	13.0	8.500	17.7
0.500	8.5	2.000	8.9	5.000	13.7	9.000	18.2
0.600	8.4	2.200	9.3	5.500	14.4	9.500	18.6
0.800	8.2	2.400	9.7	6.000	15.0		
1.000	7.4	2.600	10.1	6.500	15.5		

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APPENDIX V

MicroDrainage "Network" Calculations
1:75 Yr – Storm + 30% CC

GGP Consult

Unit 6 Priory TEC Park
Saxon Way Hessle
East Riding of Yorkshire HU...

Date 16/07/2019 16:28
File Proposed Calculations.SRCX

Micro Drainage

Page 1



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Checked by

Source Control 2017.1

Summary of Results for 75 year Return Period (+40%)

Half Drain Time : 272 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15 min Summer	45.238	0.388	0.0	8.4	8.4	118.1	O K
30 min Summer	45.360	0.510	0.0	8.5	8.5	155.2	O K
60 min Summer	45.477	0.627	0.0	8.5	8.5	190.7	O K
120 min Summer	45.568	0.718	0.0	8.5	8.5	218.3	O K
180 min Summer	45.594	0.744	0.0	8.5	8.5	226.2	O K
240 min Summer	45.592	0.742	0.0	8.5	8.5	225.7	O K
360 min Summer	45.576	0.726	0.0	8.5	8.5	220.7	O K
480 min Summer	45.554	0.704	0.0	8.5	8.5	214.1	O K
600 min Summer	45.530	0.680	0.0	8.5	8.5	206.7	O K
720 min Summer	45.504	0.654	0.0	8.5	8.5	198.9	O K
960 min Summer	45.453	0.603	0.0	8.5	8.5	183.2	O K
1440 min Summer	45.355	0.505	0.0	8.5	8.5	153.5	O K
2160 min Summer	45.231	0.381	0.0	8.4	8.4	115.9	O K
2880 min Summer	45.138	0.288	0.0	8.2	8.2	87.5	O K
4320 min Summer	45.020	0.170	0.0	7.5	7.5	51.8	O K
5760 min Summer	44.958	0.108	0.0	6.8	6.8	33.0	O K
7200 min Summer	44.931	0.081	0.0	6.1	6.1	24.7	O K
8640 min Summer	44.916	0.066	0.0	5.4	5.4	20.0	O K
10080 min Summer	44.904	0.054	0.0	4.8	4.8	16.5	O K
15 min Winter	45.288	0.438	0.0	8.4	8.4	133.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	117.321	0.0	125.9	22
30 min Summer	78.652	0.0	168.9	36
60 min Summer	50.383	0.0	216.3	64
120 min Summer	31.212	0.0	268.1	122
180 min Summer	23.261	0.0	299.7	180
240 min Summer	18.758	0.0	322.3	222
360 min Summer	13.807	0.0	355.8	282
480 min Summer	11.106	0.0	381.6	346
600 min Summer	9.372	0.0	402.7	414
720 min Summer	8.155	0.0	420.3	482
960 min Summer	6.542	0.0	449.6	616
1440 min Summer	4.786	0.0	493.6	880
2160 min Summer	3.495	0.0	540.6	1256
2880 min Summer	2.793	0.0	576.0	1616
4320 min Summer	2.033	0.0	628.8	2296
5760 min Summer	1.620	0.0	668.4	2992
7200 min Summer	1.358	0.0	700.4	3680
8640 min Summer	1.177	0.0	728.1	4408
10080 min Summer	1.043	0.0	752.6	5136
15 min Winter	117.321	0.0	141.0	22

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Micro Drainage

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Summary of Results for 75 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	45.427	0.577	0.0	8.5	8.5	175.4	O K
60 min Winter	45.563	0.713	0.0	8.5	8.5	216.7	O K
120 min Winter	45.676	0.826	0.0	8.5	8.5	251.0	O K
180 min Winter	45.716	0.866	0.0	8.5	8.5	263.1	O K
240 min Winter	45.723	0.873	0.0	8.5	8.5	265.3	O K
360 min Winter	45.699	0.849	0.0	8.5	8.5	258.0	O K
480 min Winter	45.668	0.818	0.0	8.5	8.5	248.6	O K
600 min Winter	45.632	0.782	0.0	8.5	8.5	237.8	O K
720 min Winter	45.593	0.743	0.0	8.5	8.5	225.9	O K
960 min Winter	45.512	0.662	0.0	8.5	8.5	201.3	O K
1440 min Winter	45.360	0.510	0.0	8.5	8.5	155.0	O K
2160 min Winter	45.181	0.331	0.0	8.3	8.3	100.5	O K
2880 min Winter	45.063	0.213	0.0	7.8	7.8	64.8	O K
4320 min Winter	44.947	0.097	0.0	6.6	6.6	29.4	O K
5760 min Winter	44.916	0.066	0.0	5.4	5.4	20.2	O K
7200 min Winter	44.900	0.050	0.0	4.6	4.6	15.2	O K
8640 min Winter	44.890	0.040	0.0	4.0	4.0	12.1	O K
10080 min Winter	44.883	0.033	0.0	3.5	3.5	9.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	78.652	0.0	189.1	36
60 min Winter	50.383	0.0	242.3	64
120 min Winter	31.212	0.0	300.3	122
180 min Winter	23.261	0.0	335.7	178
240 min Winter	18.758	0.0	360.9	234
360 min Winter	13.807	0.0	398.5	334
480 min Winter	11.106	0.0	427.5	376
600 min Winter	9.372	0.0	451.0	452
720 min Winter	8.155	0.0	470.8	526
960 min Winter	6.542	0.0	503.7	672
1440 min Winter	4.786	0.0	552.7	942
2160 min Winter	3.495	0.0	605.7	1316
2880 min Winter	2.793	0.0	645.1	1648
4320 min Winter	2.033	0.0	704.2	2292
5760 min Winter	1.620	0.0	748.6	2992
7200 min Winter	1.358	0.0	784.4	3680
8640 min Winter	1.177	0.0	815.6	4408
10080 min Winter	1.043	0.0	843.0	5136

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Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	75	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Total Area (ha) 0.573

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.286	4 8	0.287

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Model Details

Storage is Online Cover Level (m) 46.850

Cellular Storage Structure

Invert Level (m) 44.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	1.999	1.1	0.0
1.000	320.0	0.0	2.000	2000.0	0.0
1.001	1.1	0.0	2.125	2000.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0123-9000-2050-9000
Design Head (m) 2.050
Design Flow (l/s) 9.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 123
Invert Level (m) 44.797
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.050	9.0
Flush-Flo™	0.539	8.5
Kick-Flo®	1.100	6.7
Mean Flow over Head Range	-	7.6

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	4.4	1.200	7.0	3.000	10.8	7.000	16.1
0.200	7.2	1.400	7.5	3.500	11.6	7.500	16.6
0.300	8.0	1.600	8.0	4.000	12.3	8.000	17.2
0.400	8.3	1.800	8.5	4.500	13.0	8.500	17.7
0.500	8.5	2.000	8.9	5.000	13.7	9.000	18.2
0.600	8.4	2.200	9.3	5.500	14.4	9.500	18.6
0.800	8.2	2.400	9.7	6.000	15.0		
1.000	7.4	2.600	10.1	6.500	15.5		

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APPENDIX VI

MicroDrainage "Network" Calculations
1:100 Yr – Storm + 30% CC

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Micro Drainage

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 286 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15 min Summer	45.264	0.414	0.0	8.4	8.4	126.0	O K
30 min Summer	45.397	0.547	0.0	8.5	8.5	166.2	O K
60 min Summer	45.524	0.674	0.0	8.5	8.5	205.0	O K
120 min Summer	45.627	0.777	0.0	8.5	8.5	236.2	O K
180 min Summer	45.659	0.809	0.0	8.5	8.5	245.9	O K
240 min Summer	45.660	0.810	0.0	8.5	8.5	246.1	O K
360 min Summer	45.641	0.791	0.0	8.5	8.5	240.5	O K
480 min Summer	45.618	0.768	0.0	8.5	8.5	233.5	O K
600 min Summer	45.593	0.743	0.0	8.5	8.5	225.7	O K
720 min Summer	45.566	0.716	0.0	8.5	8.5	217.6	O K
960 min Summer	45.512	0.662	0.0	8.5	8.5	201.1	O K
1440 min Summer	45.408	0.558	0.0	8.5	8.5	169.8	O K
2160 min Summer	45.276	0.426	0.0	8.4	8.4	129.4	O K
2880 min Summer	45.173	0.323	0.0	8.3	8.3	98.3	O K
4320 min Summer	45.042	0.192	0.0	7.6	7.6	58.4	O K
5760 min Summer	44.972	0.122	0.0	7.0	7.0	37.0	O K
7200 min Summer	44.938	0.088	0.0	6.3	6.3	26.7	O K
8640 min Summer	44.921	0.071	0.0	5.6	5.6	21.5	O K
10080 min Summer	44.909	0.059	0.0	5.0	5.0	17.8	O K
15 min Winter	45.317	0.467	0.0	8.5	8.5	141.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.758	0.0	133.9	22
30 min Summer	83.832	0.0	180.0	36
60 min Summer	53.779	0.0	231.0	64
120 min Summer	33.321	0.0	286.3	124
180 min Summer	24.814	0.0	319.6	182
240 min Summer	19.989	0.0	343.4	236
360 min Summer	14.690	0.0	378.7	290
480 min Summer	11.803	0.0	405.6	352
600 min Summer	9.952	0.0	427.5	420
720 min Summer	8.652	0.0	446.1	488
960 min Summer	6.932	0.0	476.4	622
1440 min Summer	5.062	0.0	522.0	884
2160 min Summer	3.688	0.0	570.5	1260
2880 min Summer	2.943	0.0	606.9	1620
4320 min Summer	2.137	0.0	660.9	2332
5760 min Summer	1.700	0.0	701.3	3000
7200 min Summer	1.423	0.0	733.8	3680
8640 min Summer	1.232	0.0	762.0	4408
10080 min Summer	1.090	0.0	787.0	5136
15 min Winter	124.758	0.0	150.0	22

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Micro Drainage

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	45.468	0.618	0.0	8.5	8.5	187.7	O K
60 min Winter	45.616	0.766	0.0	8.5	8.5	232.9	O K
120 min Winter	45.743	0.893	0.0	8.5	8.5	271.4	O K
180 min Winter	45.790	0.940	0.0	8.5	8.5	285.8	O K
240 min Winter	45.802	0.952	0.0	8.5	8.5	289.4	O K
360 min Winter	45.783	0.933	0.0	8.5	8.5	283.7	O K
480 min Winter	45.747	0.897	0.0	8.5	8.5	272.5	O K
600 min Winter	45.710	0.860	0.0	8.5	8.5	261.5	O K
720 min Winter	45.670	0.820	0.0	8.5	8.5	249.2	O K
960 min Winter	45.586	0.736	0.0	8.5	8.5	223.6	O K
1440 min Winter	45.424	0.574	0.0	8.5	8.5	174.6	O K
2160 min Winter	45.229	0.379	0.0	8.4	8.4	115.2	O K
2880 min Winter	45.097	0.247	0.0	8.0	8.0	75.0	O K
4320 min Winter	44.961	0.111	0.0	6.8	6.8	33.7	O K
5760 min Winter	44.922	0.072	0.0	5.7	5.7	21.9	O K
7200 min Winter	44.904	0.054	0.0	4.8	4.8	16.4	O K
8640 min Winter	44.893	0.043	0.0	4.1	4.1	13.0	O K
10080 min Winter	44.885	0.035	0.0	3.7	3.7	10.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	83.832	0.0	201.6	36
60 min Winter	53.779	0.0	258.7	64
120 min Winter	33.321	0.0	320.6	122
180 min Winter	24.814	0.0	358.2	178
240 min Winter	19.989	0.0	384.7	234
360 min Winter	14.690	0.0	424.1	342
480 min Winter	11.803	0.0	454.3	386
600 min Winter	9.952	0.0	478.9	460
720 min Winter	8.652	0.0	499.6	534
960 min Winter	6.932	0.0	533.6	680
1440 min Winter	5.062	0.0	584.5	954
2160 min Winter	3.688	0.0	639.1	1324
2880 min Winter	2.943	0.0	679.7	1672
4320 min Winter	2.137	0.0	740.3	2332
5760 min Winter	1.700	0.0	785.5	2992
7200 min Winter	1.423	0.0	821.8	3680
8640 min Winter	1.232	0.0	853.5	4408
10080 min Winter	1.090	0.0	881.4	5144

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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
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Model Details

Storage is Online Cover Level (m) 46.850

Cellular Storage Structure

Invert Level (m) 44.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	1.999	1.1	0.0
1.000	320.0	0.0	2.000	2000.0	0.0
1.001	1.1	0.0	2.125	2000.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0123-9000-2050-9000
Design Head (m) 2.050
Design Flow (l/s) 9.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 123
Invert Level (m) 44.797
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.050	9.0
Flush-Flo™	0.539	8.5
Kick-Flo®	1.100	6.7
Mean Flow over Head Range	-	7.6

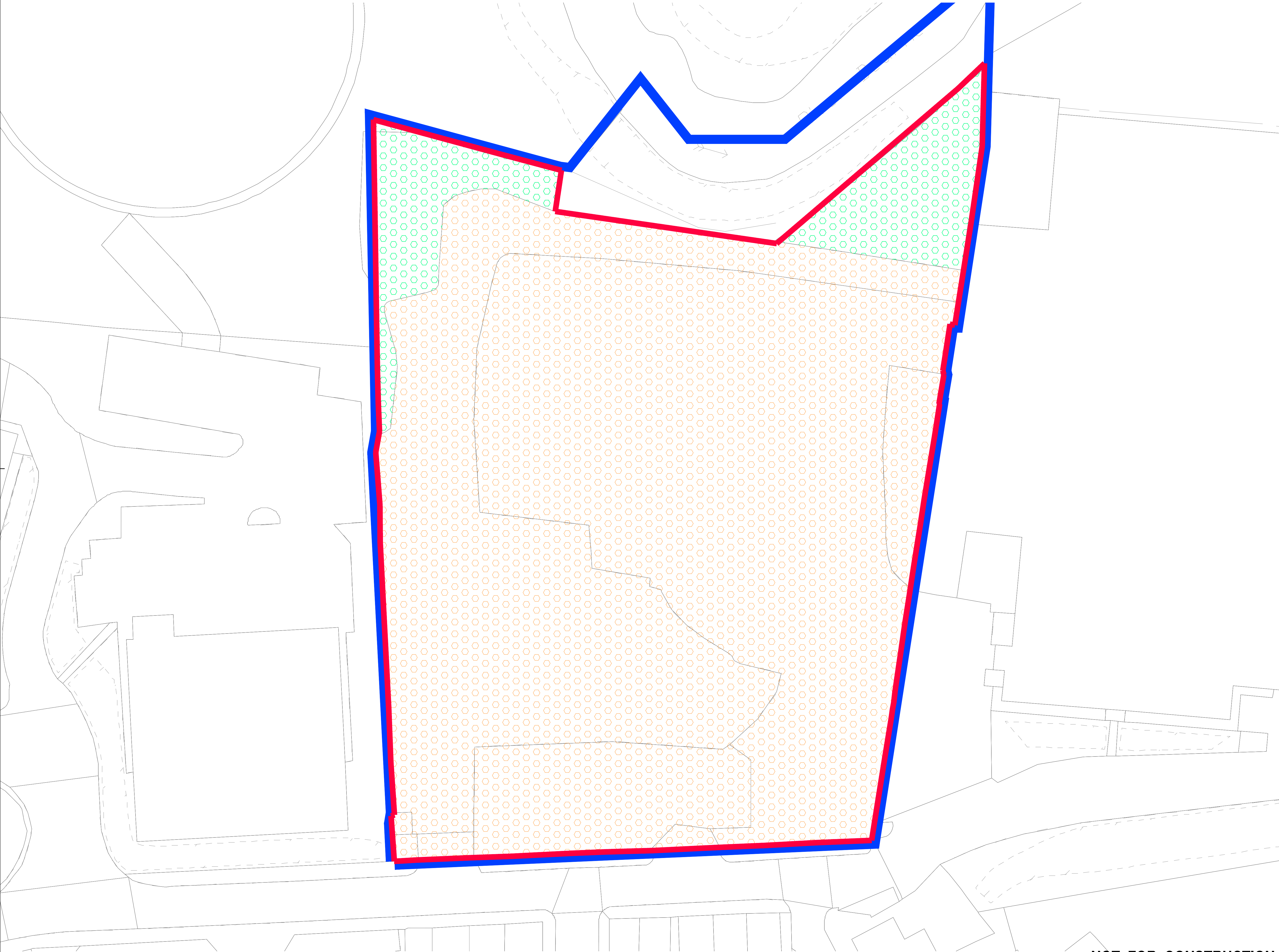
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.4	1.200	7.0	3.000	10.8	7.000	16.1
0.200	7.2	1.400	7.5	3.500	11.6	7.500	16.6
0.300	8.0	1.600	8.0	4.000	12.3	8.000	17.2
0.400	8.3	1.800	8.5	4.500	13.0	8.500	17.7
0.500	8.5	2.000	8.9	5.000	13.7	9.000	18.2
0.600	8.4	2.200	9.3	5.500	14.4	9.500	18.6
0.800	8.2	2.400	9.7	6.000	15.0		
1.000	7.4	2.600	10.1	6.500	15.5		

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APPENDIX VII

Proposed Impermeable Area Drawing



NOTES:

1. All dimensions must be checked on site and not scaled from this drawing.
2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
3. All levels shown on this drawing are relative to Agreed Datum.
4. This drawing is to be read in conjunction with 28343/100 Series Drawings.
5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

— DENOTES OWNERSHIP BOUNDARY
— DENOTES SITE BOUNDARY – 7112m²
 DENOTES EXISTING IMPERMEABLE GROUND AREA – 6,369m²
 DENOTES EXISTING PERMEABLE GROUND AREA – 743m²

B	16/07/19	ISSUED FOR APPROVAL	DJC	JHC
A	11/07/19	ISSUED FOR APPROVAL	DJC	JHC

Rev	Date	Description	DR	CH

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Client
ALLENBY COMMERCIAL

Job Title
PROPOSED BUILDERS
MERCHANT, TWIBELL STREET,
BARNSELY

Drawing Title
**EXISTING IMPERMEABLE
AREA**

Status	APPROVAL		
Scale	1:250 @ A1	Date	11/07/2019
Drawn By	Daniel Cook	Checked	JHC
		Approved	JHC

Dwg. No.	28343/101	Rev	B
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NOT FOR CONSTRUCTION

NOTES:- 1. All dimensions must be checked on site and not scaled from this drawing. 2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated. 3. All levels shown on this drawing are relative to Agreed Datum. 4. This drawing is to be read in conjunction with 28343/100 Series Drawings. 5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.				
	DENOTES OWNERSHIP BOUNDARY			
	DENOTES SITE BOUNDARY – 7112m ²			
	DENOTES PROPOSED IMPERMEABLE GROUND AREA – 4,273m ²			
	DENOTES PROPOSED IMPERMEABLE ROOF AREA – 1,457m ²			
	DENOTES PROPOSED PERMEABLE GROUND AREA – 1,382m ²			
B	16/07/19	ISSUED FOR APPROVAL	D.J.C.	J.H.C.
A	11/07/19	ISSUED FOR APPROVAL	D.J.C.	J.H.C.
Rev	Date	Description	DR	CH
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		Email	info@ggpcconsult.co.uk	
Client <div style="font-size: 24px; font-weight: bold; text-align: center;">ALLENBY COMMERCIAL</div>				
Job Title <div style="font-size: 24px; font-weight: bold; text-align: center;">PROPOSED BUILDERS MERCHANT, TWIBELL STREET, BARNSELY</div>				
<div style="border: 2px solid black; padding: 10px; min-height: 150px;"> <div style="border-bottom: 1px solid black; padding-bottom: 5px;"> Drawing Title </div> <div style="font-size: 24px; font-weight: bold; text-align: center; padding-top: 10px;"> PROPOSED IMPERMEABLE AREA </div> </div>				
Status <div style="font-size: 24px; font-weight: bold; text-align: center;">APPROVAL</div>				
Scale <div style="font-size: 24px; font-weight: bold; text-align: center;">1:250 @ A1</div>		Date <div style="font-size: 24px; font-weight: bold; text-align: center;">11/07/2019</div>		
Drawn By <div style="font-size: 24px; font-weight: bold; text-align: center;">Daniel Cook</div>		Checked <div style="font-size: 24px; font-weight: bold; text-align: center;">JHC</div>		Approved <div style="font-size: 24px; font-weight: bold; text-align: center;">JHC</div>
Drg. No. <div style="font-size: 24px; font-weight: bold; text-align: center;">28343/102</div>			Rev <div style="font-size: 24px; font-weight: bold; text-align: center;">B</div>	

APPENDIX VIII

MicroDrainage "Network" Calculations

1:150 & 1:200 Yr Storm – All Event + 30% CC

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Micro Drainage

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Summary of Results for 150 year Return Period (+40%)

Half Drain Time : 320 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	45.304	0.454	0.0	8.5	8.5	138.0	O K
30 min Summer	45.452	0.602	0.0	8.5	8.5	182.9	O K
60 min Summer	45.597	0.747	0.0	8.5	8.5	227.1	O K
120 min Summer	45.718	0.868	0.0	8.5	8.5	263.8	O K
180 min Summer	45.760	0.910	0.0	8.5	8.5	276.5	O K
240 min Summer	45.766	0.916	0.0	8.5	8.5	278.6	O K
360 min Summer	45.745	0.895	0.0	8.5	8.5	272.2	O K
480 min Summer	45.719	0.869	0.0	8.5	8.5	264.3	O K
600 min Summer	45.691	0.841	0.0	8.5	8.5	255.7	O K
720 min Summer	45.662	0.812	0.0	8.5	8.5	246.9	O K
960 min Summer	45.604	0.754	0.0	8.5	8.5	229.2	O K
1440 min Summer	45.493	0.643	0.0	8.5	8.5	195.5	O K
2160 min Summer	45.347	0.497	0.0	8.5	8.5	151.2	O K
2880 min Summer	45.231	0.381	0.0	8.4	8.4	115.9	O K
4320 min Summer	45.079	0.229	0.0	7.9	7.9	69.6	O K
5760 min Summer	44.994	0.144	0.0	7.2	7.2	43.8	O K
7200 min Summer	44.948	0.098	0.0	6.6	6.6	29.9	O K
8640 min Summer	44.929	0.079	0.0	6.0	6.0	23.9	O K
10080 min Summer	44.915	0.065	0.0	5.3	5.3	19.7	O K
15 min Winter	45.361	0.511	0.0	8.5	8.5	155.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.046	0.0	146.0	22
30 min Summer	91.718	0.0	196.9	36
60 min Summer	58.956	0.0	253.2	66
120 min Summer	36.537	0.0	313.9	124
180 min Summer	27.181	0.0	350.2	182
240 min Summer	21.863	0.0	375.6	240
360 min Summer	16.031	0.0	413.2	310
480 min Summer	12.860	0.0	441.9	370
600 min Summer	10.829	0.0	465.2	432
720 min Summer	9.405	0.0	484.8	498
960 min Summer	7.521	0.0	516.9	632
1440 min Summer	5.477	0.0	564.8	898
2160 min Summer	3.980	0.0	615.6	1280
2880 min Summer	3.168	0.0	653.3	1644
4320 min Summer	2.292	0.0	709.1	2336
5760 min Summer	1.819	0.0	750.5	3008
7200 min Summer	1.520	0.0	783.6	3680
8640 min Summer	1.313	0.0	812.4	4408
10080 min Summer	1.161	0.0	837.9	5144
15 min Winter	136.046	0.0	163.5	22

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GGP Consult		Page 3
Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
Date 16/07/2019 16:27	Designed by MitchellNicholson	
File Proposed Calculations.SRCX	Checked by	
Micro Drainage		Source Control 2017.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	150	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.573

Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)	
0 4	0.286	4 8	0.287

GGP Consult		Page 4
Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
Date 16/07/2019 16:27 File Proposed Calculations.SRCX	Designed by MitchellNicholson Checked by	
Micro Drainage Source Control 2017.1		

Model Details

Storage is Online Cover Level (m) 46.850

Cellular Storage Structure

Invert Level (m) 44.850 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	1.999	1.1	0.0
1.000	320.0	0.0	2.000	2000.0	0.0
1.001	1.1	0.0	2.125	2000.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0123-9000-2050-9000
 Design Head (m) 2.050
 Design Flow (l/s) 9.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 123
 Invert Level (m) 44.797
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.050	9.0
Flush-Flo™	0.539	8.5
Kick-Flo®	1.100	6.7
Mean Flow over Head Range	-	7.6

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	4.4	1.200	7.0	3.000	10.8	7.000	16.1
0.200	7.2	1.400	7.5	3.500	11.6	7.500	16.6
0.300	8.0	1.600	8.0	4.000	12.3	8.000	17.2
0.400	8.3	1.800	8.5	4.500	13.0	8.500	17.7
0.500	8.5	2.000	8.9	5.000	13.7	9.000	18.2
0.600	8.4	2.200	9.3	5.500	14.4	9.500	18.6
0.800	8.2	2.400	9.7	6.000	15.0		
1.000	7.4	2.600	10.1	6.500	15.5		

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GGP Consult

Unit 6 Priory TEC Park
Saxon Way Hessle
East Riding of Yorkshire HU...

Date 16/07/2019 16:27
File Proposed Calculations.SRCX

Micro Drainage

Page 1



Designed by MitchellNicholson
Checked by

Source Control 2017.1

Summary of Results for 200 year Return Period (+40%)

Half Drain Time : 345 minutes.

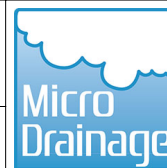
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	45.334	0.484	0.0	8.5	8.5	147.1	O K
30 min Summer	45.494	0.644	0.0	8.5	8.5	195.8	O K
60 min Summer	45.653	0.803	0.0	8.5	8.5	244.0	O K
120 min Summer	45.788	0.938	0.0	8.5	8.5	285.2	O K
180 min Summer	45.839	0.989	0.0	8.5	8.5	300.6	O K
240 min Summer	46.201	1.351	0.0	8.5	8.5	304.5	O K
360 min Summer	45.832	0.982	0.0	8.5	8.5	298.5	O K
480 min Summer	45.802	0.952	0.0	8.5	8.5	289.5	O K
600 min Summer	45.771	0.921	0.0	8.5	8.5	280.0	O K
720 min Summer	45.740	0.890	0.0	8.5	8.5	270.5	O K
960 min Summer	45.678	0.828	0.0	8.5	8.5	251.6	O K
1440 min Summer	45.560	0.710	0.0	8.5	8.5	215.9	O K
2160 min Summer	45.405	0.555	0.0	8.5	8.5	168.7	O K
2880 min Summer	45.279	0.429	0.0	8.4	8.4	130.3	O K
4320 min Summer	45.109	0.259	0.0	8.0	8.0	78.7	O K
5760 min Summer	45.013	0.163	0.0	7.4	7.4	49.6	O K
7200 min Summer	44.959	0.109	0.0	6.8	6.8	33.2	O K
8640 min Summer	44.935	0.085	0.0	6.2	6.2	25.8	O K
10080 min Summer	44.920	0.070	0.0	5.6	5.6	21.2	O K
15 min Winter	45.395	0.545	0.0	8.5	8.5	165.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	144.669	0.0	155.3	22
30 min Summer	97.759	0.0	209.9	36
60 min Summer	62.930	0.0	270.4	66
120 min Summer	39.006	0.0	335.1	124
180 min Summer	28.995	0.0	373.5	182
240 min Summer	23.299	0.0	400.4	242
360 min Summer	17.055	0.0	439.7	338
480 min Summer	13.667	0.0	469.6	388
600 min Summer	11.499	0.0	494.0	446
720 min Summer	9.979	0.0	514.4	510
960 min Summer	7.970	0.0	547.8	642
1440 min Summer	5.793	0.0	597.2	910
2160 min Summer	4.200	0.0	649.4	1296
2880 min Summer	3.338	0.0	688.4	1648
4320 min Summer	2.409	0.0	745.4	2340
5760 min Summer	1.909	0.0	787.5	3048
7200 min Summer	1.592	0.0	820.9	3744
8640 min Summer	1.374	0.0	850.2	4408
10080 min Summer	1.214	0.0	876.0	5144
15 min Winter	144.669	0.0	174.0	22

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GGP Consult		Page 2					
Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...							
Date 16/07/2019 16:27 File Proposed Calculations.SRCX							
Designed by MitchellNicholson Checked by							
Micro Drainage		Source Control 2017.1					
<u>Summary of Results for 200 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	45.577	0.727	0.0	8.5	8.5	221.0	O K
60 min Winter	45.761	0.911	0.0	8.5	8.5	276.8	O K
120 min Winter	46.860	2.010	0.0	9.0	9.0	324.0	FLOOD
180 min Winter	46.868	2.018	0.0	9.0	9.0	340.9	FLOOD
240 min Winter	46.871	2.021	0.0	9.0	9.0	345.4	FLOOD
360 min Winter	46.868	2.018	0.0	9.0	9.0	340.3	FLOOD
480 min Winter	46.863	2.013	0.0	9.0	9.0	330.6	FLOOD
600 min Winter	46.858	2.008	0.0	9.0	9.0	321.0	FLOOD
720 min Winter	46.853	2.003	0.0	9.0	9.0	310.9	FLOOD
960 min Winter	45.799	0.949	0.0	8.5	8.5	288.4	O K
1440 min Winter	45.611	0.761	0.0	8.5	8.5	231.4	O K
2160 min Winter	45.374	0.524	0.0	8.5	8.5	159.4	O K
2880 min Winter	45.200	0.350	0.0	8.3	8.3	106.5	O K
4320 min Winter	45.010	0.160	0.0	7.4	7.4	48.6	O K
5760 min Winter	44.938	0.088	0.0	6.3	6.3	26.7	O K
7200 min Winter	44.915	0.065	0.0	5.3	5.3	19.7	O K
8640 min Winter	44.901	0.051	0.0	4.6	4.6	15.5	O K
10080 min Winter	44.892	0.042	0.0	4.1	4.1	12.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	97.759	0.0	235.1	36			
60 min Winter	62.930	0.0	302.7	64			
120 min Winter	39.006	18.2	375.3	122			
180 min Winter	28.995	35.1	418.5	178			
240 min Winter	23.299	39.6	448.4	234			
360 min Winter	17.055	34.5	492.5	340			
480 min Winter	13.667	24.8	526.1	384			
600 min Winter	11.499	15.2	553.2	460			
720 min Winter	9.979	5.1	576.1	536			
960 min Winter	7.970	0.0	613.5	710			
1440 min Winter	5.793	0.0	669.0	986			
2160 min Winter	4.200	0.0	727.6	1368			
2880 min Winter	3.338	0.0	771.2	1728			
4320 min Winter	2.409	0.0	834.8	2380			
5760 min Winter	1.909	0.0	882.0	2992			
7200 min Winter	1.592	0.0	919.5	3680			
8640 min Winter	1.374	0.0	952.3	4408			
10080 min Winter	1.214	0.0	981.3	5120			
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Checked by



Source Control 2017.1

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	200	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Total Area (ha) 0.573

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.286	4 8	0.287

GGP Consult		Page 4
Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
Date 16/07/2019 16:27 File Proposed Calculations.SRCX	Designed by MitchellNicholson Checked by	
Micro Drainage Source Control 2017.1		

Model Details

Storage is Online Cover Level (m) 46.850

Cellular Storage Structure

Invert Level (m) 44.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	320.0	0.0	1.999	1.1	0.0
1.000	320.0	0.0	2.000	2000.0	0.0
1.001	1.1	0.0	2.125	2000.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0123-9000-2050-9000
Design Head (m) 2.050
Design Flow (l/s) 9.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 123
Invert Level (m) 44.797
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.050	9.0
Flush-Flo™	0.539	8.5
Kick-Flo®	1.100	6.7
Mean Flow over Head Range	-	7.6

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	4.4	1.200	7.0	3.000	10.8	7.000	16.1
0.200	7.2	1.400	7.5	3.500	11.6	7.500	16.6
0.300	8.0	1.600	8.0	4.000	12.3	8.000	17.2
0.400	8.3	1.800	8.5	4.500	13.0	8.500	17.7
0.500	8.5	2.000	8.9	5.000	13.7	9.000	18.2
0.600	8.4	2.200	9.3	5.500	14.4	9.500	18.6
0.800	8.2	2.400	9.7	6.000	15.0		
1.000	7.4	2.600	10.1	6.500	15.5		

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APPENDIX IX

Detailed Surface Water Drawing



- | | |
|---|---|
|  | DEMOTES OWNERSHIP BOUNDARY |
|  | DEMOTES SITE BOUNDARY |
|  | DEMOTES PROPOSED SURFACE WATER SEWER |
|  | DEMOTES PROPOSED SURFACE WATER PIPIC |
|  | DEMOTES PROPOSED RAIN WATER PIPE |
|  | DEMOTES PROPOSED SURFACE WATER CHAMBER |
|  | DEMOTES PROPOSED HYDROPAQUE CHAMBER |
|  | DEMOTES PROPOSED ATTENUATION TANK |
|  | DEMOTES PROPOSED ATTENUATION TANK |
|  | DEMOTES PROPOSED GULLY |
|  | DEMOTES EXISTING COMBINED WATER SEWER |
|  | DEMOTES EXISTING COMBINED WATER CHAMBER |
|  | DEMOTES EXISTING SURFACE WATER SEWER |
|  | DEMOTES EXISTING SURFACE WATER CHAMBER |

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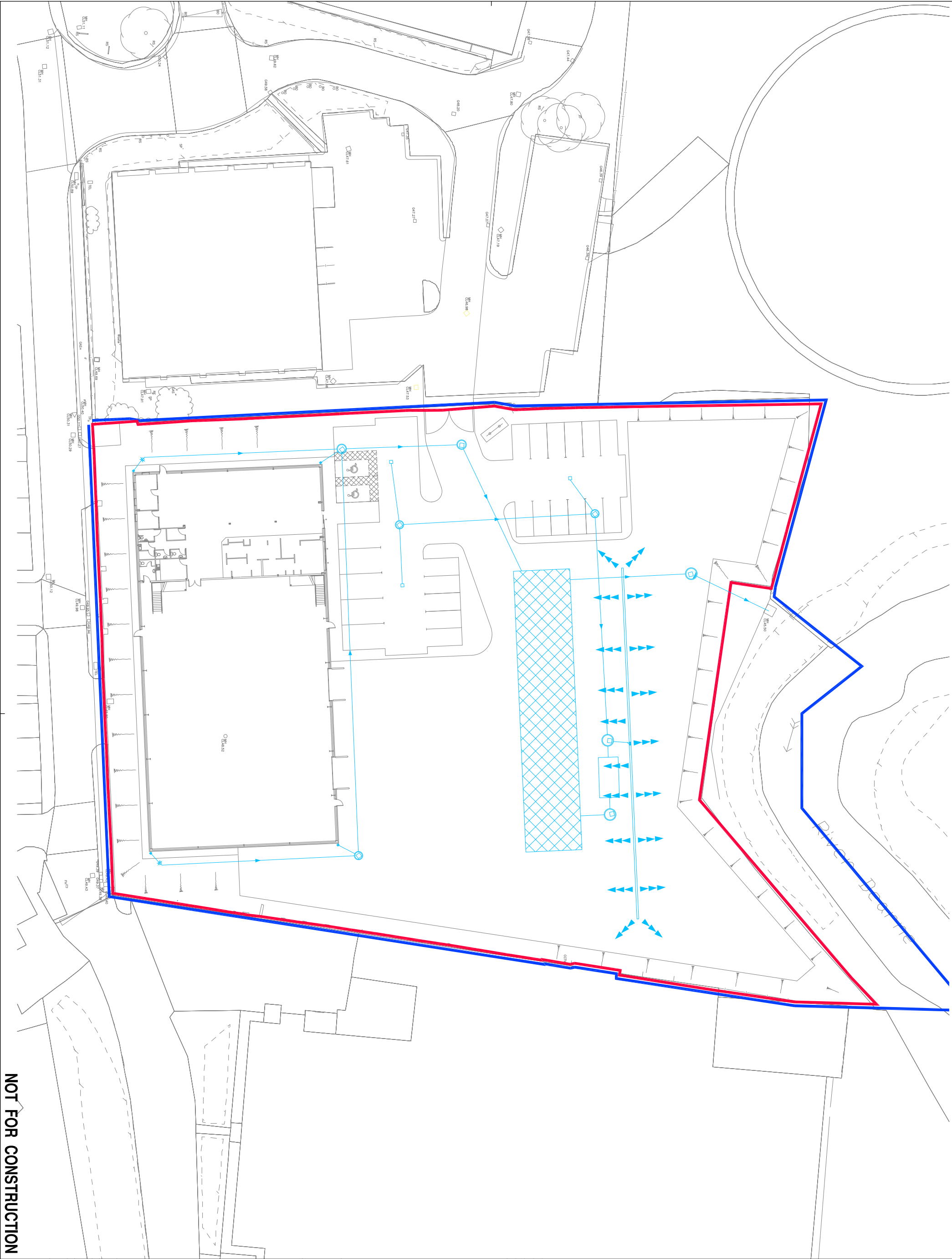
PROPOSED BUILDERS
MERCHANT, TWIBELL STREET,
BARNSELEY

Call#	Date
1:250 @ A1	11/07/2019

Drawn By	Checked	Approved
Daniel Cook	JHC	JHC

28343/103

18A
7



- NOTES:-
1. All dimensions must be checked on site and not scaled from this drawing.
 2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
 3. All levels shown on this drawing are relative to Agreed Datum.
 4. This drawing is to be read in conjunction with 28343/100 Series Drawings.
 5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

- DENOTES OWNERSHIP BOUNDARY
- DENOTES SITE BOUNDARY
- DENOTES PROPOSED SURFACE WATER SEWER
- DENOTES PROPOSED SURFACE WATER PIP
- DENOTES PROPOSED RAIN WATER PIPE
- DENOTES PROPOSED SURFACE WATER CHAMBER
- DENOTES PROPOSED HYDROBRAKE CHAMBER
- DENOTES PROPOSED ATTENUATION TANK
- DENOTES PROPOSED ATTENUATION TANK
- DENOTES FLOOD ROUTING
- DENOTES PROPOSED COMBINED SEWER CHAMBER
- DENOTES PROPOSED COMBINED WATER CHAMBER
- CONNECTIONS PENDING EXISTING DRAINAGE SURVEY

C	26/07/19	ISSUED FOR APPROVAL	REV	DATE
B	16/07/19	ISSUED FOR APPROVAL	REV	DATE
A	11/07/19	ISSUED FOR APPROVAL	REV	DATE



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Client
ALLENBY COMMERCIAL

Proposed Builders
**MERCHANT, TWIBELL STREET,
BARNESLEY**

Drawing Title
**PROPOSED SURFACE WATER
FLOOD ROUTING**

Status
APPROVAL

Scale
1:250 @ A1

Date
11/07/2019

Drawn By
Donald Goble

Checked
JHC

Approved
JHC

Dwg No.
28343/105

Rev
C

NOT FOR CONSTRUCTION

-  DENOTES OWNERSHIP BOUNDARY
 DENOTES SITE BOUNDARY
 0.000 DENOTES PROPOSED LEVEL
 0.000 DENOTES EXISTING LEVEL
 DENOTES DIRECTION OF GRADIENT

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Job Title
PROPOSED BUILDERS
MERCHANT, TWIBELL STREET,
BARNSELEY

Drawing Title

PROPOSED LEVELS

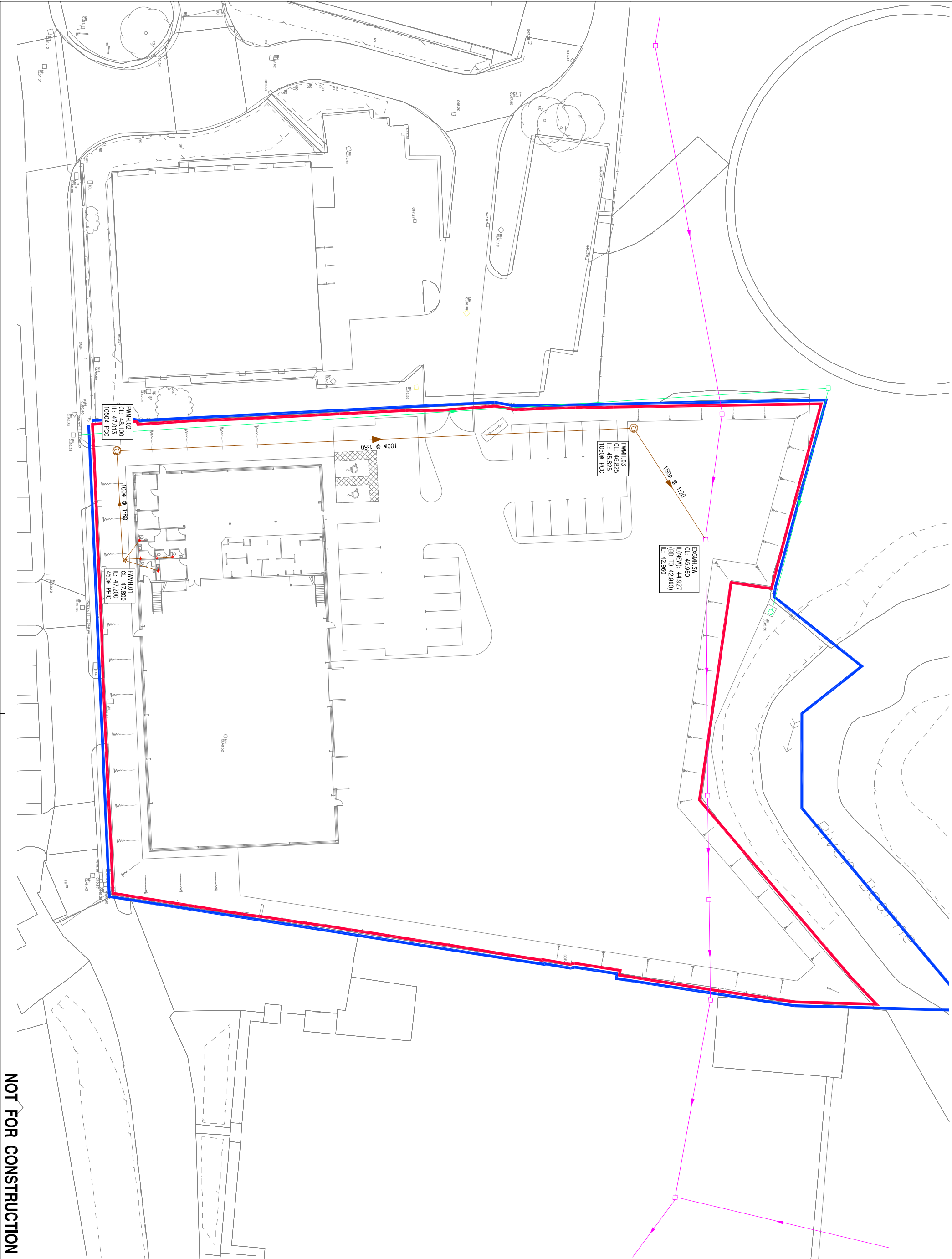
Scale	1:250 @ A1	Date	11/07/2019
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Drg. No.	Rev
28343/106	B

NOT FOR CONSTRUCTION

APPENDIX X

Detailed Foul Water Drawing



- NOTES:-
1. All dimensions must be checked on site and not scaled from this drawing.
 2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
 3. All levels shown on this drawing are relative to Agreed Datum.
 4. This drawing is to be read in conjunction with 28343/100 Series Drawings.
 5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

- DENOTES OWNERSHIP BOUNDARY
- DENOTES SITE BOUNDARY
- DENOTES PROPOSED FOUL WATER SEWER
- DENOTES PROPOSED FOUL WATER PPIC
- DENOTES PROPOSED STACK
- DENOTES PROPOSED FOUL WATER CHAMBER
- DENOTES EXISTING COMBINED WATER SEWER
- DENOTES EXISTING COMBINED WATER CHAMBER
- DENOTES EXISTING SURFACE WATER SEWER
- DENOTES EXISTING SURFACE WATER CHAMBER

Rev	Date	Description	DR	CH
E	25/07/19	ISSUED FOR APPROVAL	JVC	JVC
D	19/07/19	ISSUED FOR APPROVAL	D.G.C	JVC
C	18/07/19	ISSUED FOR APPROVAL	D.G.C	JVC
B	16/07/19	ISSUED FOR APPROVAL	D.G.C	JVC
A	11/07/19	ISSUED FOR APPROVAL	D.G.C	JVC

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Client ALLENBY COMMERCIAL

Proposed BUILDERS
MERCHANT, TWIBELL STREET,
BARNSELEY

Drawing Title
PROPOSED FOUL WATER
LAYOUT

Status APPROVAL

Scale 1:250 @ A1 Date 11/07/2019

Drawn By Donald Goble Checked JHC Approved JHC

Dwg No. 28343/104 Rev E

NOT FOR CONSTRUCTION

APPENDIX XI

Brownfield Calculations

GGP Consult					Page 1	
Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...						
Date 26/07/2019 16:46						
File Existing Calculations.SRCX						
Micro Drainage			Designed by MitchellNicholson Checked by			
			Source Control 2017.1			
<u>Summary of Results for 1 year Return Period</u>						
	Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
	15 min Summer	46.353	1.853	56.4	2.0	O K
	30 min Summer	46.400	1.900	57.1	2.1	O K
	60 min Summer	45.883	1.383	48.3	1.6	O K
	120 min Summer	45.297	0.797	35.8	1.0	O K
	180 min Summer	45.045	0.545	28.7	0.7	O K
	240 min Summer	44.913	0.413	24.3	0.6	O K
	360 min Summer	44.783	0.283	18.9	0.5	O K
	480 min Summer	44.721	0.221	15.6	0.4	O K
	600 min Summer	44.686	0.186	13.5	0.4	O K
	720 min Summer	44.664	0.164	11.9	0.3	O K
	960 min Summer	44.645	0.145	9.7	0.3	O K
	1440 min Summer	44.623	0.123	7.4	0.2	O K
	2160 min Summer	44.601	0.101	5.6	0.2	O K
	2880 min Summer	44.589	0.089	4.6	0.2	O K
	4320 min Summer	44.578	0.078	3.5	0.1	O K
	5760 min Summer	44.572	0.072	2.9	0.1	O K
	7200 min Summer	44.566	0.066	2.4	0.1	O K
	8640 min Summer	44.562	0.062	2.2	0.1	O K
	10080 min Summer	44.558	0.058	1.9	0.1	O K
	15 min Winter	46.737	2.237	62.2	2.4	O K
	30 min Winter	46.402	1.902	57.2	2.1	O K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
	15 min Summer	28.137	0.0	33.6	13	
	30 min Summer	18.655	0.0	44.5	20	
	60 min Summer	12.084	0.0	57.6	34	
	120 min Summer	7.686	0.0	73.3	64	
	180 min Summer	5.875	0.0	84.1	94	
	240 min Summer	4.852	0.0	92.6	124	
	360 min Summer	3.680	0.0	105.3	184	
	480 min Summer	3.015	0.0	115.1	244	
	600 min Summer	2.584	0.0	123.3	304	
	720 min Summer	2.278	0.0	130.4	364	
	960 min Summer	1.867	0.0	142.5	488	
	1440 min Summer	1.412	0.0	161.7	722	
	2160 min Summer	1.067	0.0	183.3	1084	
	2880 min Summer	0.875	0.0	200.3	1448	
	4320 min Summer	0.661	0.0	227.2	2132	
	5760 min Summer	0.543	0.0	248.6	2928	
	7200 min Summer	0.466	0.0	266.8	3576	
	8640 min Summer	0.410	0.0	281.9	4264	
	10080 min Summer	0.368	0.0	295.1	5088	
	15 min Winter	28.137	0.0	37.6	13	
	30 min Winter	18.655	0.0	49.8	20	
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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...					
Date 26/07/2019 16:46 File Existing Calculations.SRCX		Designed by MitchellNicholson Checked by			
Micro Drainage		Source Control 2017.1			
<p style="text-align: center;"><u>Summary of Results for 1 year Return Period</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	45.579	1.079	42.3	1.3	O K
120 min Winter	45.029	0.529	28.2	0.7	O K
180 min Winter	44.850	0.350	21.8	0.5	O K
240 min Winter	44.768	0.268	18.1	0.4	O K
360 min Winter	44.691	0.191	13.8	0.4	O K
480 min Winter	44.659	0.159	11.4	0.3	O K
600 min Winter	44.644	0.144	9.7	0.3	O K
720 min Winter	44.634	0.134	8.6	0.3	O K
960 min Winter	44.619	0.119	7.0	0.2	O K
1440 min Winter	44.598	0.098	5.3	0.2	O K
2160 min Winter	44.583	0.083	4.1	0.1	O K
2880 min Winter	44.576	0.076	3.3	0.1	O K
4320 min Winter	44.568	0.068	2.5	0.1	O K
5760 min Winter	44.560	0.060	2.1	0.1	O K
7200 min Winter	44.555	0.055	1.8	0.1	O K
8640 min Winter	44.552	0.052	1.6	0.1	O K
10080 min Winter	44.550	0.050	1.4	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	12.084	0.0	64.6	34	
120 min Winter	7.686	0.0	82.1	64	
180 min Winter	5.875	0.0	94.2	94	
240 min Winter	4.852	0.0	103.7	124	
360 min Winter	3.680	0.0	117.9	184	
480 min Winter	3.015	0.0	128.9	244	
600 min Winter	2.584	0.0	138.0	306	
720 min Winter	2.278	0.0	146.0	372	
960 min Winter	1.867	0.0	159.6	492	
1440 min Winter	1.412	0.0	181.1	716	
2160 min Winter	1.067	0.0	205.3	1092	
2880 min Winter	0.875	0.0	224.3	1460	
4320 min Winter	0.661	0.0	254.4	2192	
5760 min Winter	0.543	0.0	278.4	2800	
7200 min Winter	0.466	0.0	298.8	3744	
8640 min Winter	0.410	0.0	315.7	4320	
10080 min Winter	0.368	0.0	330.5	4944	
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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
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Micro Drainage		Source Control 2017.1
<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 47.125</p> <p style="text-align: center;"><u>Pipe Structure</u></p> <p style="text-align: center;">Diameter (m) 0.150 Length (m) 10.000 Slope (1:X) 150.000 Invert Level (m) 44.500</p> <p style="text-align: center;"><u>Pipe Outflow Control</u></p> <p style="text-align: center;">Diameter (m) 0.150 Entry Loss Coefficient 0.500 Slope (1:X) 150.0 Coefficient of Contraction 0.600 Length (m) 10.000 Upstream Invert Level (m) 44.500 Roughness k (mm) 0.600</p>		
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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...					
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Micro Drainage			Source Control 2017.1		
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	47.153	2.653	68.0	30.7	FLOOD
30 min Summer	47.154	2.654	68.0	32.2	FLOOD
60 min Summer	47.147	2.647	67.9	25.2	FLOOD
120 min Summer	47.131	2.631	67.7	9.3	FLOOD
180 min Summer	46.977	2.477	65.6	2.7	Flood Risk
240 min Summer	46.232	1.732	54.4	1.9	O K
360 min Summer	45.540	1.040	41.4	1.2	O K
480 min Summer	45.222	0.722	33.8	0.9	O K
600 min Summer	45.046	0.546	28.8	0.7	O K
720 min Summer	44.935	0.435	25.1	0.6	O K
960 min Summer	44.812	0.312	20.2	0.5	O K
1440 min Summer	44.709	0.209	14.9	0.4	O K
2160 min Summer	44.656	0.156	11.0	0.3	O K
2880 min Summer	44.636	0.136	8.8	0.3	O K
4320 min Summer	44.612	0.112	6.5	0.2	O K
5760 min Summer	44.596	0.096	5.2	0.2	O K
7200 min Summer	44.587	0.087	4.4	0.1	O K
8640 min Summer	44.581	0.081	3.9	0.1	O K
10080 min Summer	44.577	0.077	3.4	0.1	O K
15 min Winter	47.159	2.659	68.1	37.0	FLOOD
30 min Winter	47.159	2.659	68.1	36.6	FLOOD
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	68.903	27.9	82.2	16	
30 min Summer	45.851	29.3	109.4	24	
60 min Summer	29.238	22.3	139.5	40	
120 min Summer	18.103	6.5	172.7	70	
180 min Summer	13.524	0.0	193.5	96	
240 min Summer	10.942	0.0	208.8	124	
360 min Summer	8.096	0.0	231.7	184	
480 min Summer	6.535	0.0	249.4	244	
600 min Summer	5.531	0.0	263.8	304	
720 min Summer	4.824	0.0	276.1	364	
960 min Summer	3.885	0.0	296.5	484	
1440 min Summer	2.860	0.0	327.5	716	
2160 min Summer	2.103	0.0	361.1	1092	
2880 min Summer	1.689	0.0	386.7	1460	
4320 min Summer	1.239	0.0	425.4	2192	
5760 min Summer	0.993	0.0	454.8	2920	
7200 min Summer	0.836	0.0	478.8	3672	
8640 min Summer	0.727	0.0	499.6	4288	
10080 min Summer	0.646	0.0	517.9	5048	
15 min Winter	68.903	34.1	92.1	16	
30 min Winter	45.851	33.8	122.6	25	
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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...					
Date 26/07/2019 16:47 File Existing Calculations.SRCX			Designed by MitchellNicholson Checked by		
Micro Drainage			Source Control 2017.1		
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	47.145	2.645	67.9	22.8	FLOOD
120 min Winter	47.027	2.527	66.3	2.7	Flood Risk
180 min Winter	45.985	1.485	50.2	1.7	O K
240 min Winter	45.512	1.012	40.8	1.2	O K
360 min Winter	45.097	0.597	30.3	0.8	O K
480 min Winter	44.920	0.420	24.5	0.6	O K
600 min Winter	44.825	0.325	20.8	0.5	O K
720 min Winter	44.768	0.268	18.1	0.4	O K
960 min Winter	44.704	0.204	14.6	0.4	O K
1440 min Winter	44.654	0.154	10.8	0.3	O K
2160 min Winter	44.628	0.128	8.0	0.2	O K
2880 min Winter	44.611	0.111	6.4	0.2	O K
4320 min Winter	44.590	0.090	4.7	0.2	O K
5760 min Winter	44.580	0.080	3.8	0.1	O K
7200 min Winter	44.575	0.075	3.2	0.1	O K
8640 min Winter	44.572	0.072	2.9	0.1	O K
10080 min Winter	44.567	0.067	2.5	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	29.238	20.0	156.2	42	
120 min Winter	18.103	0.0	193.4	66	
180 min Winter	13.524	0.0	216.8	94	
240 min Winter	10.942	0.0	233.8	124	
360 min Winter	8.096	0.0	259.5	184	
480 min Winter	6.535	0.0	279.3	244	
600 min Winter	5.531	0.0	295.5	306	
720 min Winter	4.824	0.0	309.3	362	
960 min Winter	3.885	0.0	332.1	488	
1440 min Winter	2.860	0.0	366.7	726	
2160 min Winter	2.103	0.0	404.4	1088	
2880 min Winter	1.689	0.0	433.1	1448	
4320 min Winter	1.239	0.0	476.4	2180	
5760 min Winter	0.993	0.0	509.4	2928	
7200 min Winter	0.836	0.0	536.3	3592	
8640 min Winter	0.727	0.0	559.5	4280	
10080 min Winter	0.646	0.0	580.1	5080	
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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
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Micro Drainage Source Control 2017.1		
<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 47.125</p> <p style="text-align: center;"><u>Pipe Structure</u></p> <p style="text-align: center;">Diameter (m) 0.150 Length (m) 10.000 Slope (1:X) 150.000 Invert Level (m) 44.500</p> <p style="text-align: center;"><u>Pipe Outflow Control</u></p> <p style="text-align: center;">Diameter (m) 0.150 Entry Loss Coefficient 0.500 Slope (1:X) 150.0 Coefficient of Contraction 0.600 Length (m) 10.000 Upstream Invert Level (m) 44.500 Roughness k (mm) 0.600</p>		
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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...					
Date 26/07/2019 16:47 File Existing Calculations.SRCX		Designed by MitchellNicholson Checked by			
Micro Drainage		Source Control 2017.1			
Summary of Results for 100 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	47.172	2.672	68.2	50.1	FLOOD
30 min Summer	47.177	2.677	68.3	55.2	FLOOD
60 min Summer	47.171	2.671	68.2	49.1	FLOOD
120 min Summer	47.151	2.651	68.0	29.0	FLOOD
180 min Summer	47.135	2.635	67.7	12.7	FLOOD
240 min Summer	47.126	2.626	67.6	3.8	FLOOD
360 min Summer	46.181	1.681	53.6	1.9	O K
480 min Summer	45.642	1.142	43.6	1.3	O K
600 min Summer	45.346	0.846	37.0	1.0	O K
720 min Summer	45.159	0.659	32.1	0.8	O K
960 min Summer	44.954	0.454	25.7	0.6	O K
1440 min Summer	44.782	0.282	18.8	0.5	O K
2160 min Summer	44.690	0.190	13.7	0.4	O K
2880 min Summer	44.656	0.156	11.0	0.3	O K
4320 min Summer	44.628	0.128	8.0	0.2	O K
5760 min Summer	44.611	0.111	6.3	0.2	O K
7200 min Summer	44.598	0.098	5.3	0.2	O K
8640 min Summer	44.589	0.089	4.6	0.2	O K
10080 min Summer	44.584	0.084	4.1	0.1	O K
15 min Winter	47.182	2.682	68.4	59.7	FLOOD
30 min Winter	47.186	2.686	68.4	64.2	FLOOD
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	89.113	47.2	106.4	16	
30 min Summer	59.880	52.3	142.8	25	
60 min Summer	38.413	46.3	183.8	42	
120 min Summer	23.801	26.2	227.1	72	
180 min Summer	17.725	9.9	253.6	102	
240 min Summer	14.278	1.0	272.4	128	
360 min Summer	10.493	0.0	300.3	184	
480 min Summer	8.431	0.0	321.7	244	
600 min Summer	7.108	0.0	339.1	304	
720 min Summer	6.180	0.0	353.8	364	
960 min Summer	4.951	0.0	377.9	484	
1440 min Summer	3.616	0.0	413.9	716	
2160 min Summer	2.635	0.0	452.4	1088	
2880 min Summer	2.102	0.0	481.3	1436	
4320 min Summer	1.526	0.0	524.1	2200	
5760 min Summer	1.214	0.0	556.1	2936	
7200 min Summer	1.017	0.0	581.9	3560	
8640 min Summer	0.880	0.0	604.3	4408	
10080 min Summer	0.779	0.0	624.0	4968	
15 min Winter	89.113	56.8	119.1	17	
30 min Winter	59.880	61.3	160.1	27	
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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...					
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Micro Drainage		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	47.174	2.674	68.2	51.7	FLOOD
120 min Winter	47.141	2.641	67.8	18.8	FLOOD
180 min Winter	46.985	2.485	65.7	2.7	Flood Risk
240 min Winter	46.160	1.660	53.2	1.8	O K
360 min Winter	45.445	0.945	39.3	1.1	O K
480 min Winter	45.142	0.642	31.6	0.8	O K
600 min Winter	44.982	0.482	26.7	0.7	O K
720 min Winter	44.885	0.385	23.2	0.6	O K
960 min Winter	44.777	0.277	18.6	0.5	O K
1440 min Winter	44.688	0.188	13.6	0.4	O K
2160 min Winter	44.647	0.147	10.0	0.3	O K
2880 min Winter	44.628	0.128	7.9	0.2	O K
4320 min Winter	44.603	0.103	5.8	0.2	O K
5760 min Winter	44.589	0.089	4.6	0.2	O K
7200 min Winter	44.582	0.082	3.9	0.1	O K
8640 min Winter	44.577	0.077	3.4	0.1	O K
10080 min Winter	44.573	0.073	3.0	0.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	38.413	48.8	206.3	44	
120 min Winter	23.801	15.9	254.3	74	
180 min Winter	17.725	0.0	284.1	96	
240 min Winter	14.278	0.0	305.1	124	
360 min Winter	10.493	0.0	336.3	184	
480 min Winter	8.431	0.0	360.3	244	
600 min Winter	7.108	0.0	379.8	304	
720 min Winter	6.180	0.0	396.2	362	
960 min Winter	4.951	0.0	423.2	488	
1440 min Winter	3.616	0.0	463.6	726	
2160 min Winter	2.635	0.0	506.7	1084	
2880 min Winter	2.102	0.0	539.0	1420	
4320 min Winter	1.526	0.0	587.0	2148	
5760 min Winter	1.214	0.0	622.9	2896	
7200 min Winter	1.017	0.0	651.7	3656	
8640 min Winter	0.880	0.0	676.8	4352	
10080 min Winter	0.779	0.0	698.9	4856	
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Source Control 2017.1

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.351	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Total Area (ha) 0.636

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.318	4 8	0.318

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Unit 6 Priory TEC Park Saxon Way Hessle East Riding of Yorkshire HU...		
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