Drainage Strategy Report

Wedding Marquee – Stanley House

Preston New Road, Mellor, BB2 7NP

for

Monte Blackburn Ltd.

Revision	Date of issue	Comments	Prepared By	Checked By
01	21.01.2025	First Issue	RCTS	KTY

iSTRUCT consultants ltd
AA Business Centre Suite 5 326-340 Dunstable Road,
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Contents

Appendices

1.0 Project Information Brief

Project	**Wedding Marquee – Stanley House**
Project Location	Preston New Road, Mellor, BB2 7NP
Client	Monte Blackburn Ltd
Project Status	Planning
Construction Value	TBC
Our Reference	24053060

2.0 Introduction

2.1 Background and Scope

The purpose of this report is to provide details on the design of both the surface water and foul drainage to support the planning application for retaining the wedding marquee building and decking to the main building form of Stanley House, Mellor, Blackburn BB2 7NP.

The marquee is proposed to be in use until 31 December 2027 for the hosting of weddings and other public events.

2.2 Site Description and Location

The overall site is an existing Hotel and Spa situated in the open greenfield areas, accessed off the A677 New Preston Road via Further Lane. It is located adjacent to Rose Cottage and Woodfold Park Stud, to the west, with the Arley Brook running approx. 400m to the south boundary of the site. Beardwood Hospital is approx. 2 kilometres, and Blackburn City Centre a further 2 kilometres to southeast of the site.

The marquee and decking sits in the west quadrant to the main hotel building at the approx. size of 0.26ha, of which the total impermeable area is approx. 0.16ha (60%). The post code for the site is BB2 7NP, with OS Grid reference of E364987, N429767. A location plan of the site is shown below in Figure 1.

A copy of the site's topographical survey can be found in Appendix A.

Figure 1: Site Location Plan *(©Google Maps)*

3.0 Existing Site Drainage and Ground Conditions

Surface Water

The existing private foul and surface water drainage infrastructure of the site was obtained together with the site's topographical survey.

The private surface water sewer network picks up the existing roof s, car parks and hardstanding areas and discharges into an existing attenuation pond located to the east of the hotel and spa building. There is an existing headwall outfall from the pond to a ditch course that runs along the east boundary of the site.

It is intended to discharge the surface water drainage from the marquee to the pond in the east of the site, positively via gravity at a restricted discharge rate as specified in chapter 4 of this report.

The EA flood map identifies the site falls within Flood Zone 1, as shown in Figure 2 below, with a low probability of flooding from rivers and/or the sea.

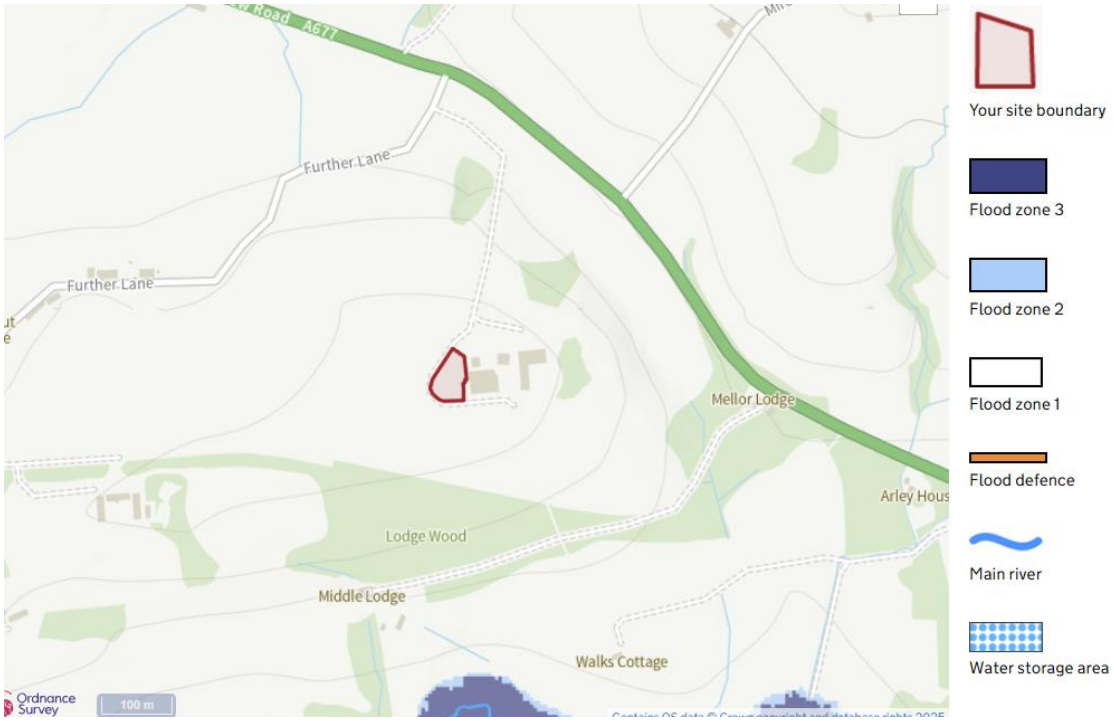


Figure 2: Site in Flood Zone 1 *(©EA Flood Map)*

Foul Water

The private foul water network runs to the north of the hotel and spa site, where it connects into an assumed public foul sewer which ultimately connects into the public sewer network in the A677 Preston New Road.

It is intended to incorporate the foul water drainage from the marquee building into the existing foul network via a diversion of the foul run around the marquee building.

Existing Ground Conditions

Geological records from British Geological Survey (BGS) open-source data (©BGS Geology Viewer) shows the superficial geology of the site is Devensian Till - Diamicton.

The BGS maps indicate the bedrock geology of the site is Warley Wise Grit - Sandstone. Figures 3 and 4 below show extracts of the BGS map data for the site.

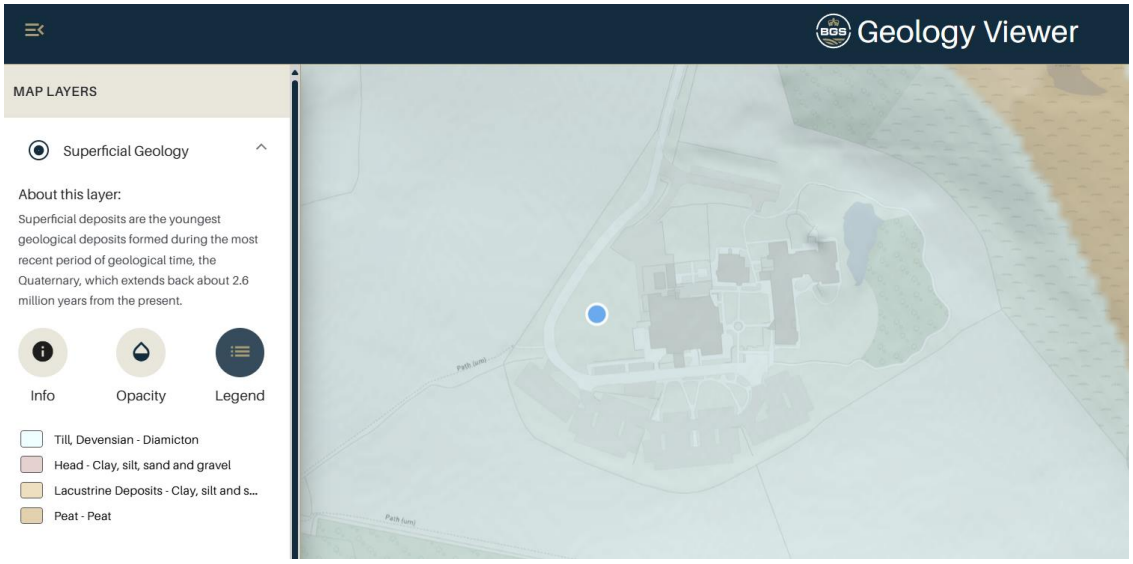


Figure 3: Site Geology – Superficial *(©BGS Geology Viewer)*

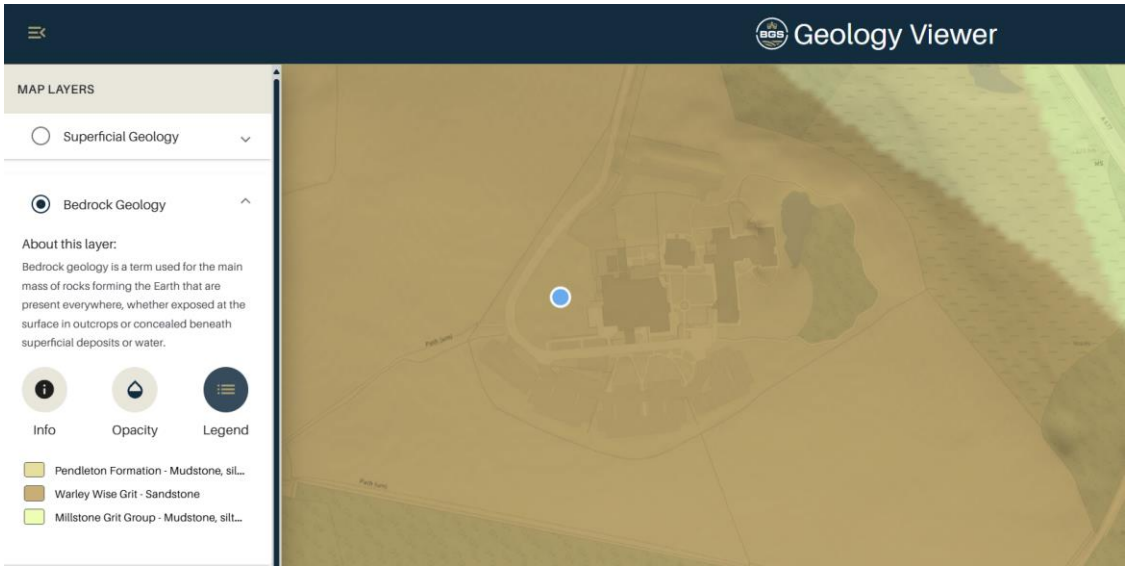


Figure 4: Site Geology – Bedrock *(©BGS Geology Viewer)*

4.0 Proposed Site Drainage

4.1 Surface Water Drainage

The surface runoff of the existing hotel and spa site is known to be sustainably managed via the existing attenuation pond on site which ultimately discharges to an existing ditch course along the east boundary of the site.

A sustainable surface water drainage scheme has been proposed and approved at planning for proposed expansion development for the wider site, which incorporates onsite flow control and attenuation tanks to restrict outfall discharge to the pond.

Ahead of the wider development proposals for site, surface water drainage for the marquee area has been designed to discharge into the pond via a Hydro-Brake flow control and underground geo-cellular attenuation tank within the redline of the marquee site. The drainage solution was designed in accordance with the principles of SuDS and was arrived at following the management train of the CIRIA SuDS Manual (C753) as follows:

1. Soakaway Discharge – this option was explored follow soakaway test results provided by the client (ref. Solmek Permeability Test report, S240634 - Stanley House, Blackburn). However, the infiltration results were found to be inaccurate as they had been inferred due to the water not soaking away. Therefore, this option of surface water drainage discharge is now deemed not feasible.

2. Watercourse / Above ground Water bodies – the existing pond to the east of the site is an above ground water body which currently collects site drainage and ultimately discharges into a ditch course along the east boundary of the wider site. It is proposed to utilise the existing pond as the discharge point for surface water from the marquee via a flow control and onsite attenuation system to **restrict outfall discharge to 2.0l/s**.

In accordance with the principles of sustainable drainage and the requirements of the LLFA, it is proposed to discharge the surface water network of the proposed development to the existing pond at a restricted discharge rate of **2l/s** via a Hydrobrake® flow control device.

The benefits of incorporating SuDS into a drainage solution include:

i. Reducing runoff volumes, peak flows and discharge rates to watercourses or sewers subsequently reducing the risk of flooding downstream (Water quantity)

ii. Improving the water quality into receiving bodies by removing or reducing the pollutants in runoff water (Water quality)

iii. Creating and sustaining better places for nature (Biodiversity)

iv. Creating and sustaining better places for people (Amenity)

v. Allowing development to adapt to the effects of climate change.

4.2 Hydraulic Design

A hydraulic design of the proposed surface water drainage network has been undertaken

using Causeway Flow modelling package for all storm events up to and including the 100yr plus 40% climate change event.

The total impermeable area for the marquee development is approx. 0.16ha, being 60% of the total redline area of 0.26ha.

From the hydraulic simulation design, **a total storage of 90m³ is required**, to be provided by a geo-cellular attenuation tank. The design ensures no flooding occurs in the drainage network proposed for this development.

Detailed calculations of the hydraulic modelling and simulation results (ref. Stanley House Marquee-Hydraulic Calcs_r.01) and the drainage strategy plan (ref. STM-LMN-XX-DR-C-0500_P2_Marquee Drainage Strategy Plan) are appended to this report.

4.3 Operation and Maintenance Plan

The proposed surface water network for the drive-thru shall be maintained by the owner's management company in accordance with the maintenance regime recommended in Table 1 below.

Table 1 SW System Operation and Maintenance

SuDS Feature	Operation and Maintenance
Attenuation Pond	Maintain and trim vegetation in and around pond banks twice a year, preferably in April and October to a height of approx. 100mm. Regularly inspect and monitor the general operation, structural condition of the inlet/outlet headwalls and any erosion of banks or scour control features should be identified and rehabilitated as required. Desilting of the pond will usually be on a 10-15 years cycle depending on the ongoing silt level checks.
Cellular Attenuation Tank	Inspect twice in the first year and after major storm events, desilt as required. Tank to be 'accessible' type with inspection chambers for maintenance.
Hydrobrake	The Hydro-brake has no moving parts and no power requirements and provides reliable, low-maintenance, engineered flood management. Periodic desilting of the Hydrobrake sump as well as checking the emergency drain down mechanism is in good working order. The sump should be emptied/checked at least as follows (but with an annual inspection and additional cleansing if required): On completion of drainage works, Year 1, Year 3, then every 5 years.

Channel drains (Aco or similar)	- Regularly inspect and take off grating to remove debris and clogged up deposits to allow free flow of water through channel drains.
Inspection chambers, Manholes, Silt Trap	Inspect six-monthly, empty every 12 months and after every major storm or local flood event

4.4 Foul Drainage

It is intended to incorporate the foul water drainage from the marquee building into the existing foul network via a diversion of the foul run around the marquee building.

5.0 Drawings and Calculations

STM-LMN-XX-DR-C-0500_P2_Marquee Drainage Strategy Plan

STM-LMN-XX--DR-C-0550_Marquee Catchment Areas Plan

SD-302 Standard Details – Drainage

SD-303 Standard Details – Manholes

SD-304 Standard Details – Attenuation Tanks

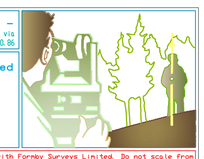
Hydraulic Model Calculation (FLOW)

Appendix A

Topographical Survey

→ BENCH MARK INFORMATION ←
Attached to clients existing survey via interpolation of cover level - Value 120.86

Formby Surveys Limited
6 Edinburgh Road
Formby
Merseyside
L37 6EP
T 01704-831482
F 01704-831485
E fsl@fsl.info



Surveyed for: REDISHER LIMITED

Land Survey
Stanley House Mellor Blackburn

Surveyed:	AA	Processed:	JD	Cad: JD	Scale: 1:500
FS Drg.No.:	6592A:500:1:1			Date:	AUGUST 2007

Amendments:

Rev-A
Building line corrections made due to station co-ordinate error.

CONTROL:

FS01	1400.270	5524.176	120.94
FS02	1363.177	5543.477	120.35
FS03	1237.348	5394.786	132.18
FS04	1233.178	5315.681	139.51
FS05	1241.972	5394.192	132.11
FS06	1237.890	5406.305	130.86
FS07	1217.036	5270.041	143.21
FS08	1196.268	5226.692	143.73
FS09	1319.909	5211.425	142.46
FS10	1311.320	5175.825	142.56
FS11	1322.636	5158.673	141.88
FS12	1286.077	5271.709	142.75

NOTATION:

BO	Bollard
BST	Bus Stop
CCTV	Closed Circuit TV (IC)
DK	Drop Kerb
DR	Drain
ER	Earth Rod
FIR	Fence Iron Rail
FPP	Fence Post Panel
FPR	Fence Post Rail
FPW	Fence Post Wire
FS	Survey Station (FS**)
FWM	Fence Wire Mesh
GAS	Gas
GU	Gulley (IC)
H	Height
IC	Inspection Cover (IC)
IL	Invert Level
LP	Lamp Post
PP	Power Point

Appendix B

Drawings

KEY

- PROPOSED SURFACE WATER DRAINAGE
- GULLY
- GEO-CELLULAR ATTENUATION TANK
- EXISTING FOUL DRAINAGE
- EXISTING FOUL DRAINAGE (DIVERTED AROUND MARQUEE FOOTPRINT)
- PROPOSED FOUL DRAINAGE
- FINISHED FLOOR LEVEL (FFL 122.50)
- PROPOSED EXTERNAL LEVEL (122.50)
- SITE BOUNDARY

S6 - Hydro-Brake
Flow Control Chamber-Ø1200
CL- 117.30
IL- 141.55
DESIGN HEAD - 1.2m
DESIGN FLOW- 2.0 l/s
CTL-SHE-0064-2000-1200-2000

FFL 143.55

SEE INSERT 1

MH	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Link	IL (m)	Dia (mm)
S1	1243.349	5206.728	143.400	1.350	1200			
						1.00	142.050	150
S2	1246.625	5195.417	143.200	1.353	1200	1.00	141.847	150
						1.001	141.847	150
S3	1212.758	5185.299	143.400	2.217	1200	1.001	141.258	150
						1.002	141.183	225
S4	1203.254	5217.628	143.400	2.554	1200	1.002	140.846	225
						1.003	140.846	225
S5	1206.631	5232.516	143.200	2.515	1200	1.003	140.685	225
						1.004	140.685	225
S6	1224.977	5246.658	143.250	2.862	1200	1.004	140.388	225
						1.005	140.388	225
S7	1303.890	5273.831	142.600	3.612	1350	1.005	139.213	225
						1.006	138.988	450
S8	1339.627	5298.354	140.000	1.679	1200	1.006	138.321	450
						1.007	138.321	450
HW1	1348.604	5299.136	139.500	1.367	1200	1.007	138.133	450

INSERT 1 - new planting etc.

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2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH STANDARDS, CODES OF PRACTICE, BUILDING REGULATIONS AND WITH SEWERS FOR ADOPTION 6TH EDITION GUIDANCE.
3. THE EXACT POSITION, LEVEL, SIZE AND USE OF EXISTING SEWERS TO BE CONFIRMED ON SITE. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO COMMENCEMENT OF WORKS.
4. ALL UNCOVERED AND SHALLOW PIPEWORK TO BE PROTECTED AGAINST CONSTRUCTION TRAFFIC AS PART OF THE CONTRACTORS TEMPORARY WORKS REQUIREMENTS.
5. COVER LEVELS SHOWN ARE APPROXIMATE ONLY, SUBJECT TO THE ARCHITECT'S EXTERNAL WORKS AND LANDSCAPING SCHEME.
6. ALL CONNECTIONS TO ROAD GULLIES AND CHANNELS SHALL BE 150MM NOMINAL BORE PIPEWORK. CONNECTIONS TO RWPS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF RWP SIZES AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW.
7. CONNECTIONS TO FOUL TERMINAL FITTINGS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF ABOVE GROUND PIPE DIAMETERS AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWNSIZED IN THE DIRECTION OF FLOW.
8. ALL PIPEWORK TO BE VITRIFIED CLAY UNLESS OTHERWISE NOTED.
9. ALL PIPES CONNECTING TO ADOPTED MANHOLES UP TO AND INCLUDING 300MM DIA. TO BE VITRIFIED CLAY.
10. ALL PIPES CONNECTING TO ADOPTED MANHOLES GREATER THAN 300MM DIA. TO BE CONCRETE.
11. ALL PIPEWORK ENTERING AND EXITING MANHOLES TO BE CONNECTED WITH PIPE SOFFITS LEVEL.
12. PRE-FORMED CHANNELS TO BE USED AT ALL MANHOLES.
13. HIGH STRENGTH CONCRETE BENCHING TO BE STEEL TROWELLED TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS AND LAID IN ACCORDANCE WITH THE SPECIFICATION.
14. PIPE BENDS TO BE PROVIDED TO SUIT DIRECTION OF FLOW.
15. ALL MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON HEAVY DUTY GRADE D400 DOUBLE TRIANGULAR TO BS EN 124 UNLESS OTHERWISE NOTED. COVERS TO BE LABELLED 'FW' AND 'SW' AS APPROPRIATE.
16. GULLY TOPS AND MANHOLE COVERS TO BE PROVIDED IN ACCORDANCE WITH BS EN 124.
17. ALL MANHOLE COVERS LOCATED INTERNALLY, TO BE RECESSED, DOUBLE SEAL, AIRTIGHT TYPE, ALUMINIUM OR STEEL. RECESS DEPTH TO ARCHITECTS REQUIREMENTS TO SUIT FINISHES ETC.
18. ALL NEW DRAINAGE TO BE CONSTRUCTED ADJACENT NEW AND PROPOSED TREE PLANTING TO BE PROTECTED AGAINST ROOT ACTIVITY USING 'ROOTCONTROL' ROOT BARRIER MATERIAL BY GREEN-TECH. ALL IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
19. FIRST FLEXIBLE JOINT IN PIPES ADJACENT TO A MANHOLE SHALL BE 600MM MAX. FROM INSIDE FACE OF MANHOLE, CONNECTING TO ROCKER PIPE. FOR PIPE DIAMETERS 150MM - 450MM THE ROCKER PIPE LENGTH SHALL BE 500MM - 750MM AND FOR PIPE DIAMETERS 451MM - 675MM THE ROCKER PIPE LENGTH SHALL BE 750MM - 1000MM.
20. MANHOLES WITH OUTGOING PIPES GREATER THAN 600MM DIA. SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER APPROVED SAFETY DEVICES.
21. WHERE THE FORMATION OF A PIPE TRENCH IS ABOVE ORIGINAL GROUND LEVEL, LEVELS ARE TO BE MADE UP WITH COMPACTED DTP TYPE 2 MATERIAL OR BETTER.
22. ALL PRIVATE DRIVES WHICH FALL TOWARDS A PUBLIC HIGHWAY AND EXCEED TWO PARKING BAYS IN AREA ARE TO BE PROVIDED WITH A SUITABLE GULLY OR DRAINAGE CHANNEL TO PREVENT WATER DISCHARGING ONTO THE HIGHWAY.
23. ALL BURIED CONCRETE MUST CATER FOR CLASS 2 SULPHATES CONDITIONS IN ACCORDANCE WITH TABLE 1 OF BRE DIGEST 363.
24. CONCRETE PROTECTION SHALL BE PROVIDED TO ALL PIPES WITH LESS THAN 300MM COVER IN PEDESTRIAN AREAS, TO ALL PIPES WITH LESS THAN 600MM COVER IN PRIVATE DRIVEWAYS NOT USED BY COMMERCIAL VEHICLES, AND TO ALL PIPES WITH LESS THAN 1200MM COVER IN ROADS OR PRIVATE DRIVEWAYS USED BY COMMERCIAL VEHICLES. WHERE CONCRETE SURROUND IS SPECIFIED FLEXIBILITY OF JOINTS IS TO BE MAINTAINED BY USING COMPRESSIBLE BITUMEN IMPREGNATED FIBREBOARD AT EACH POINT.

Rev.	Amendments	Date	By
P02	REVISED DESIGN - PLAN B AS REQUESTED BY LLFA	20.01.25	RDL
P01	INITIAL ISSUE.	29.07.24	RDL

Revisions

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Client: Monte Blackburn Ltd
Insert text here

Project: STANLEY HOUSE, PRESTON
MARQUEE HALL

Title: SOAKAWAY DRAINAGE STRATEGY PLAN

At original size A1

Status:	Drawn By:	Date:	Scale:
PRELIMINARY	RDL	29.07.2024	1:200

Drawing No.: STM-LMN-XX-DR-C-0500 Rev: P02

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Rev.	Amendments	Date	By
P01	INITIAL ISSUE.	20.01.25	RDL

Revisions

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Client:
Monte Blackburn Ltd

Project:
STANLEY HOUSE, PRESTON
MARQUEE HALL

Title:
CATCHMENT AREAS PLAN

At original size A1

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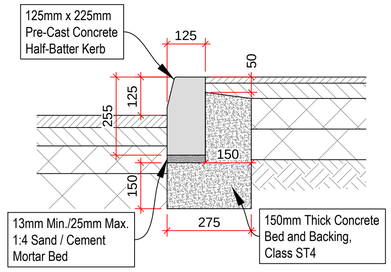
Drawing No.: STM-LMN-XX-DR-C-0550
Rev.: P01



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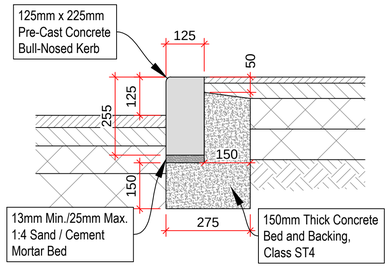
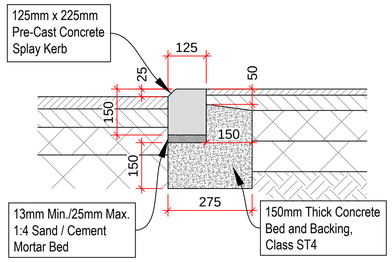


BULL-NOSE KERB - TYPICAL DETAIL



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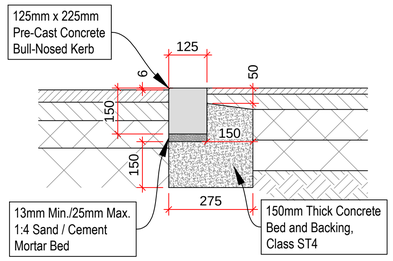

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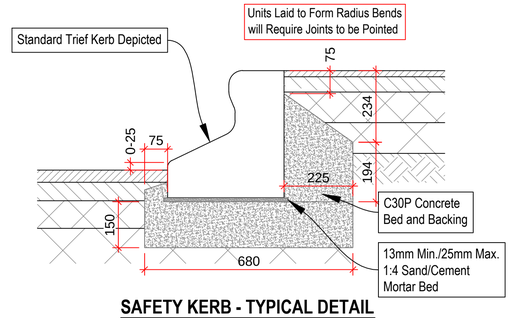
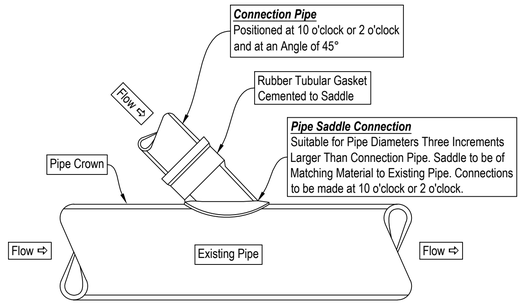


SAFETY KERB - TYPICAL DETAIL



SADDLE CONNECTION - TYPICAL DETAIL

PROPOSED CONNECTION Ø	EXISTING CONNECTION DIAMETER									
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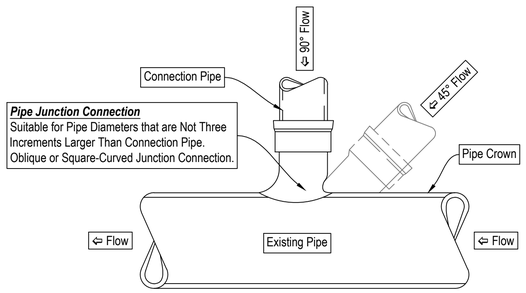
150		Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
225			Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.
300				Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.
375					Jun.	Jun.	Jun.	Sad.	Sad.	Sad.
450						Jun.	Jun.	Jun.	Sad.	Sad.



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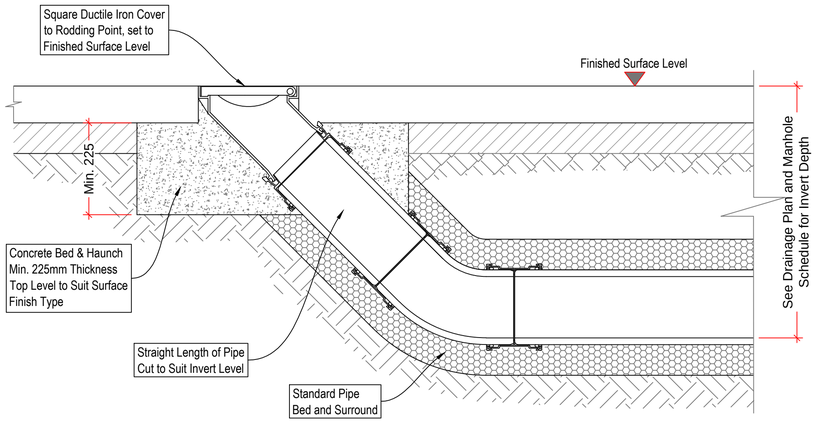
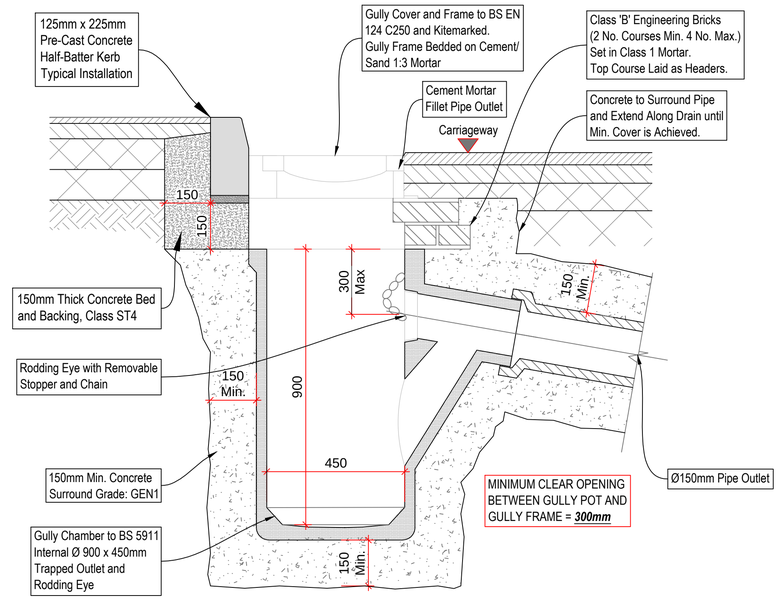
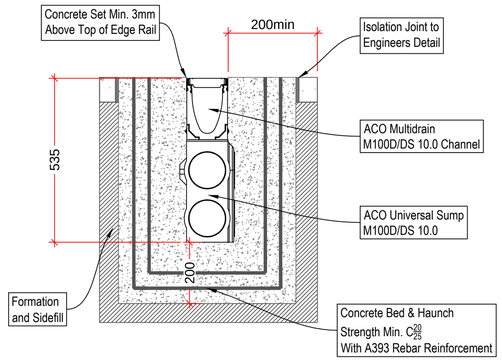


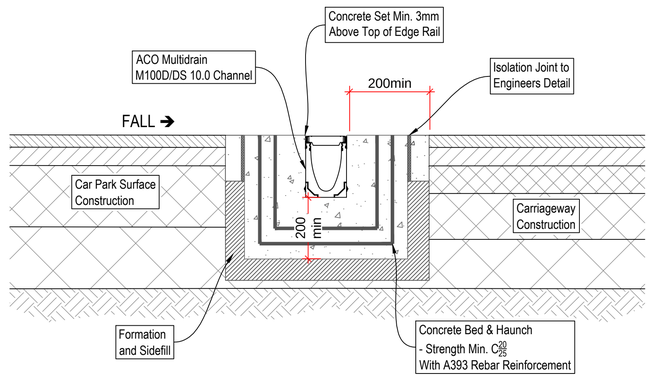
RODDING EYE - TYPICAL DETAIL



DRAINAGE GULLY - TYPICAL DETAIL



CHANNEL DRAIN SUMP - TYPICAL DETAIL



CHANNEL DRAIN - TYPICAL DETAIL

REV:	DESCRIPTION:	BY:	DATE:
P1	Standard Issue	YA	04/23

STATUS: PLANNING

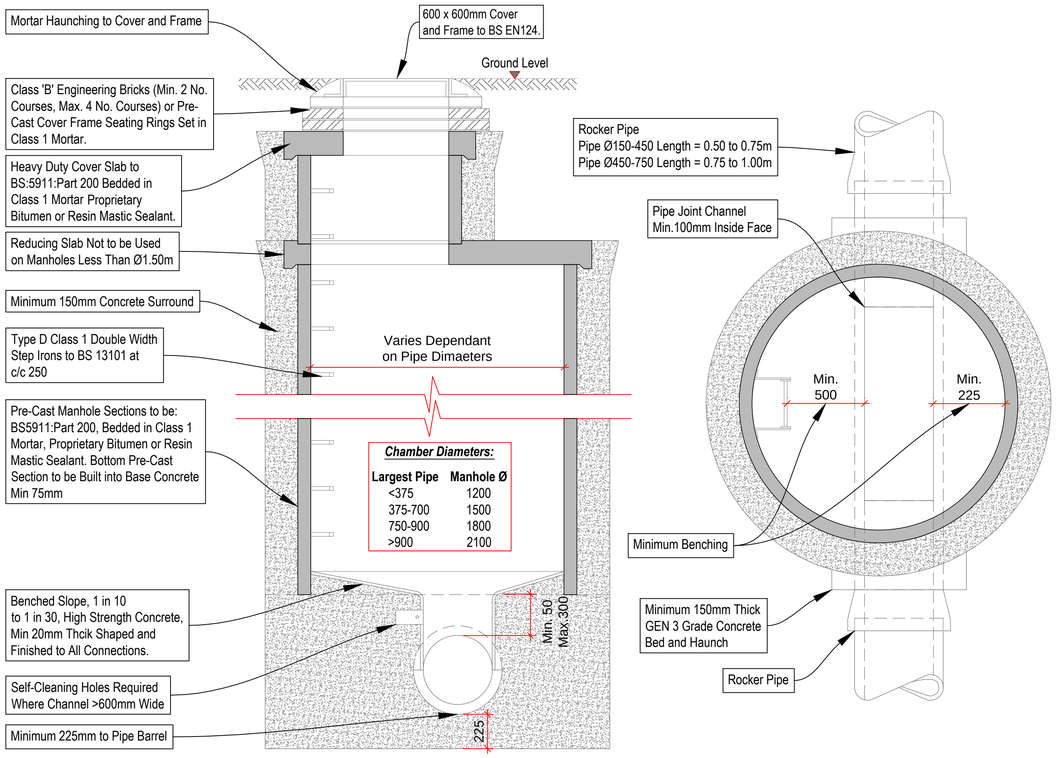
iSTRUCT consultants ltd
Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

CLIENT: Monte Blackburn Ltd

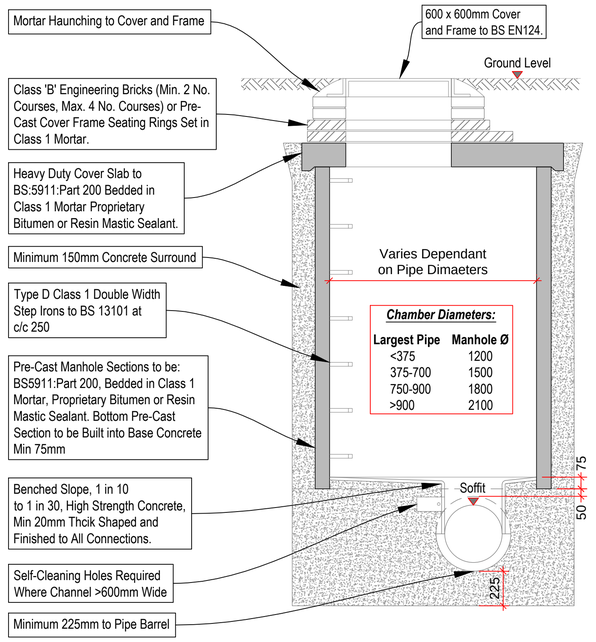
PROJECT: Proposed Development

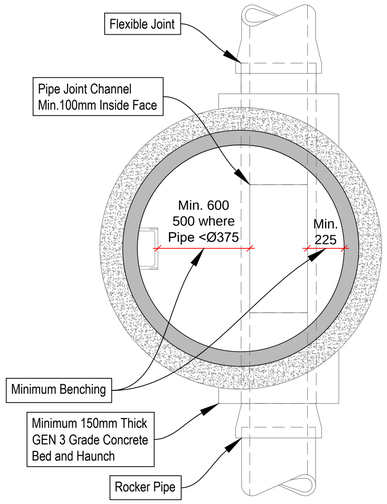
TITLE: Standard Details
Drainage & External Details

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
As Shown	APR_2023	YA	MM
PROJECT NO:	DRAWING NO:		REVISION:
-	SD-302		P1

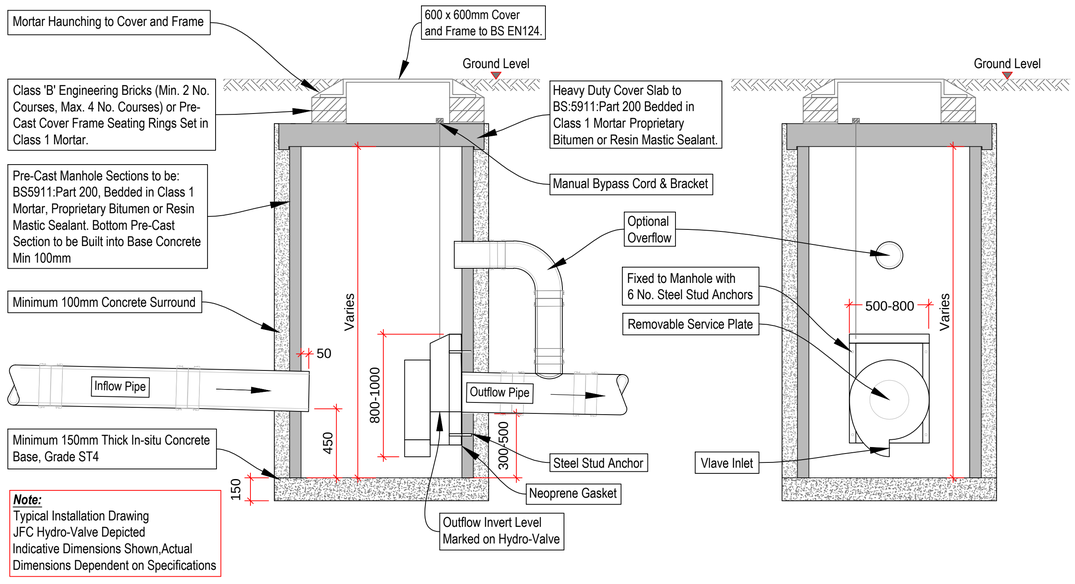


MANHOLE TYPE B - TYPICAL DETAILS



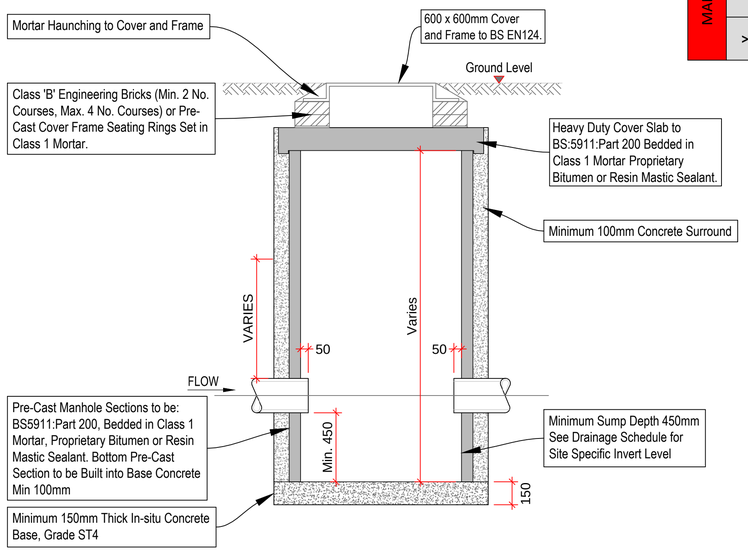


MANHOLE TYPE A - TYPICAL DETAILS



FLOW RESTRICTOR - TYPICAL SECTION DETAIL

FLOW RESTRICTOR - TYPICAL PROFILE DETAIL



CATCHPIT SECTION - TYPICAL DETAIL

MANHOLE DEPTH TO SOFFIT		DIAMETERS AND OPENINGS: LARGEST PIPE Ø	MANHOLE INTERNAL Ø	MIN. CLEAR OPENING SIZE
<1500		150	1050	750 X 750
		300	1200	675 X 675 ECCENTRIC
		450	1350	675 X 675 ECCENTRIC
		700	1500	675 X 675
		900	1800	675 X 675
		1000	2100	675 X 675
		>1000	SEE SCHEDULE	750 X 675
>1500		100 - 450	1200	600 X 600
		>450	1800+	600 X 600
		>1000	SEE SCHEDULE	600 X 600
>3000		STEPS	1050	600 X 600
		LADDERS	1200	600 X 600

REV:	DESCRIPTION:	BY:	DATE:
P1	Standard Issue	YA	04/23

STATUS: PLANNING

iSTRUCT consultants ltd
Suite E - AA Business Centre, 336-340 Dunstable Road, Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

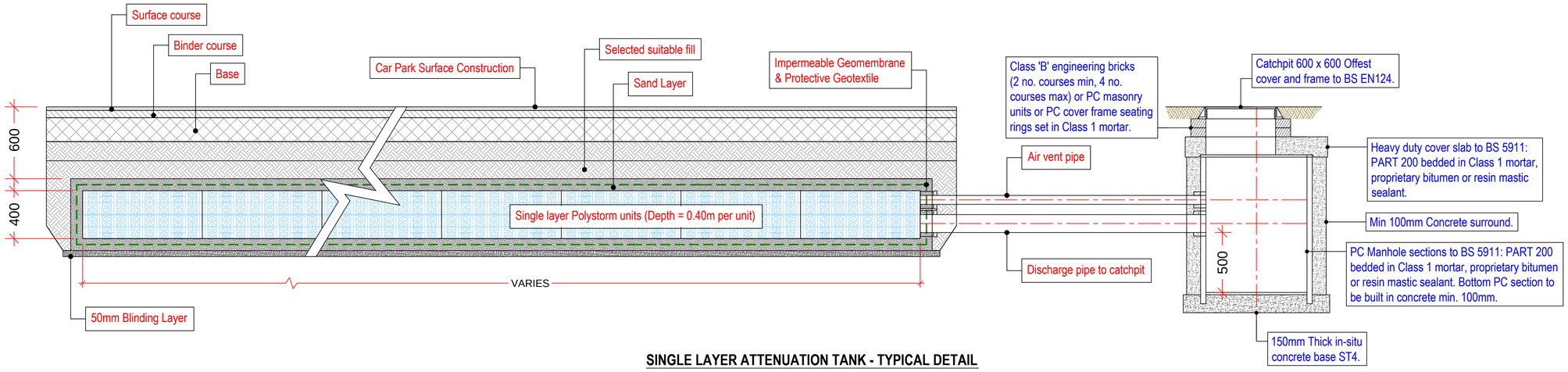
CLIENT: Monte Blackburn Ltd

PROJECT: Proposed Development

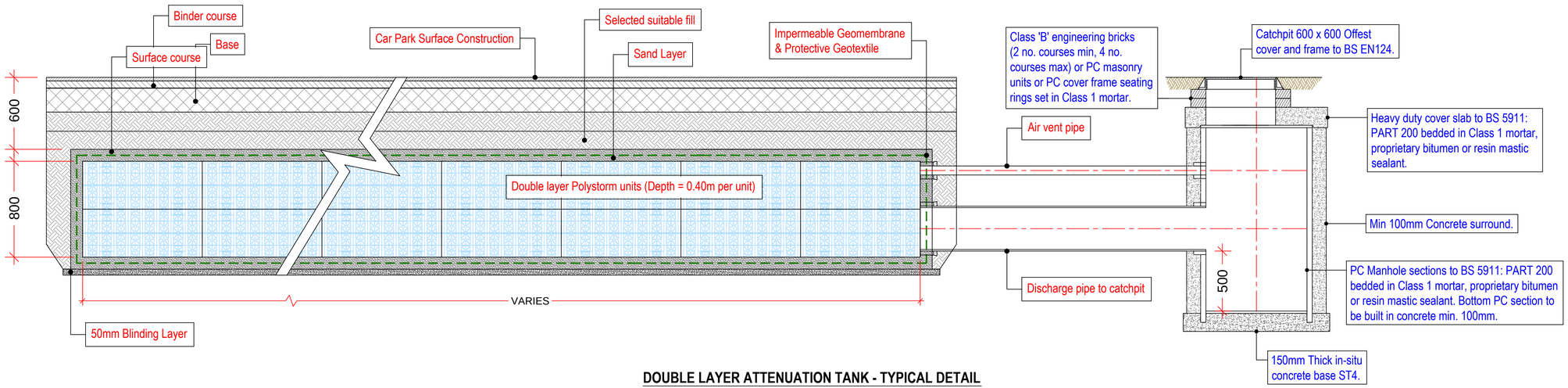
TITLE: Standard Details Manhole Construction

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
As Shown	APR_2023	YA	MM

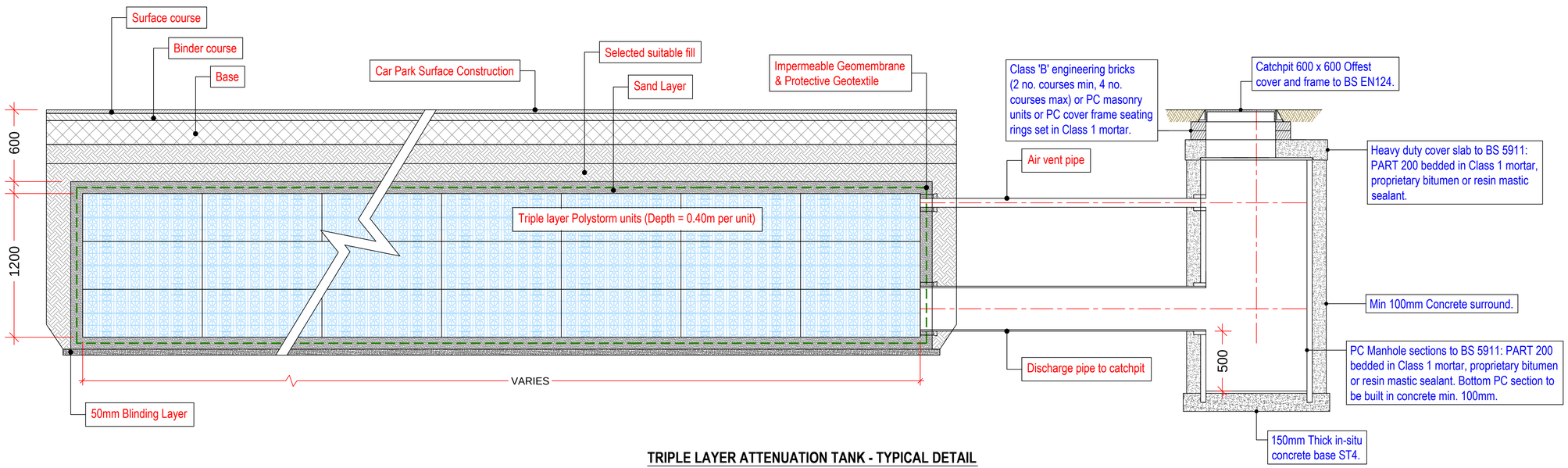
PROJECT NO:	DRAWING NO:	REVISION:
-	SD-303	P1



SINGLE LAYER ATTENUATION TANK - TYPICAL DETAIL



DOUBLE LAYER ATTENUATION TANK - TYPICAL DETAIL



TRIPLE LAYER ATTENUATION TANK - TYPICAL DETAIL

REV:	DESCRIPTION:	BY:	DATE:
P1	Standard Issue	YA	04/23

STATUS: PLANNING

iSTRUCT consultants ltd
Suite E - AA Business Centre, 336-340 Dunstable Road, Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

CLIENT: Monte Blackburn Ltd

PROJECT: Proposed Development

TITLE: Standard Details Attenuation Storage

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
As Shown	APR_2023	YA	MM
PROJECT NO:	DRAWING NO:		REVISION:
-	SD-304		P1

Appendix C

Hydraulic Modelling Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	x
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.020	5.00	143.400	1200	1243.349	5206.728	1.350
S2	0.014	5.00	143.200	1200	1246.625	5195.417	1.353
S3	0.047	5.00	143.400	1200	1212.758	5185.299	2.217
S4	0.015	5.00	143.400	1200	1203.254	5217.628	2.554
S5	0.017	5.00	143.200	1200	1206.631	5232.516	2.515
S6	0.045	5.00	143.250	1200	1224.977	5246.658	2.862
S7			142.600	1350	1303.890	5273.831	3.612
S8			140.000	1200	1339.627	5298.354	1.679
HW1			139.500	1200	1348.604	5299.136	1.367

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.00	S1	S2	11.776	0.600	142.050	141.847	0.203	58.0	150	5.15	46.8
1.001	S2	S3	35.346	0.600	141.847	141.258	0.589	60.0	150	5.60	45.2
1.002	S3	S4	33.697	0.600	141.183	140.846	0.337	100.0	225	6.03	43.8
1.003	S4	S5	15.266	0.600	140.846	140.685	0.161	95.0	225	6.22	43.3
1.004	S5	S6	23.164	0.600	140.685	140.388	0.297	78.0	225	6.48	42.5
1.005	S6	S7	83.460	0.600	140.388	139.213	1.175	71.0	225	7.38	40.1
1.006	S7	S8	43.342	0.600	138.988	138.321	0.667	65.0	450	7.66	39.4
1.007	S8	HW1	9.011	0.600	138.321	138.133	0.188	48.0	450	7.71	39.3

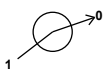
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.00	1.323	23.4	2.5	1.200	1.203	0.020	0.0	33	0.865
1.001	1.301	23.0	4.2	1.203	1.992	0.034	0.0	43	0.989
1.002	1.307	52.0	9.6	1.992	2.329	0.081	0.0	65	1.005
1.003	1.341	53.3	11.3	2.329	2.290	0.096	0.0	70	1.068
1.004	1.482	58.9	13.0	2.290	2.637	0.113	0.0	72	1.195
1.005	1.554	61.8	17.2	2.637	3.162	0.158	0.0	81	1.338
1.006	2.524	401.5	16.9	3.162	1.229	0.158	0.0	62	1.273
1.007	2.940	467.5	16.8	1.229	0.917	0.158	0.0	58	1.419

Pipeline Schedule

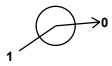
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.00	11.776	58.0	150	Circular	143.400	142.050	1.200	143.200	141.847	1.203
1.001	35.346	60.0	150	Circular	143.200	141.847	1.203	143.400	141.258	1.992
1.002	33.697	100.0	225	Circular	143.400	141.183	1.992	143.400	140.846	2.329
1.003	15.266	95.0	225	Circular	143.400	140.846	2.329	143.200	140.685	2.290
1.004	23.164	78.0	225	Circular	143.200	140.685	2.290	143.250	140.388	2.637
1.005	83.460	71.0	225	Circular	143.250	140.388	2.637	142.600	139.213	3.162
1.006	43.342	65.0	450	Circular	142.600	138.988	3.162	140.000	138.321	1.229
1.007	9.011	48.0	450	Circular	140.000	138.321	1.229	139.500	138.133	0.917

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.00	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	S3	1200	Manhole	Adoptable
1.002	S3	1200	Manhole	Adoptable	S4	1200	Manhole	Adoptable
1.003	S4	1200	Manhole	Adoptable	S5	1200	Manhole	Adoptable
1.004	S5	1200	Manhole	Adoptable	S6	1200	Manhole	Adoptable
1.005	S6	1200	Manhole	Adoptable	S7	1350	Manhole	Adoptable
1.006	S7	1350	Manhole	Adoptable	S8	1200	Manhole	Adoptable
1.007	S8	1200	Manhole	Adoptable	HW1	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1	1243.349	5206.728	143.400	1.350	1200		0	1.00	142.050	150
S2	1246.625	5195.417	143.200	1.353	1200		1	1.00	141.847	150
							0	1.001	141.847	150
S3	1212.758	5185.299	143.400	2.217	1200		1	1.001	141.258	150
							0	1.002	141.183	225
S4	1203.254	5217.628	143.400	2.554	1200		1	1.002	140.846	225
							0	1.003	140.846	225
S5	1206.631	5232.516	143.200	2.515	1200		1	1.003	140.685	225
							0	1.004	140.685	225
S6	1224.977	5246.658	143.250	2.862	1200		1	1.004	140.388	225
							0	1.005	140.388	225
S7	1303.890	5273.831	142.600	3.612	1350		1	1.005	139.213	225
							0	1.006	138.988	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S8	1339.627	5298.354	140.000	1.679	1200	1	1.006	138.321	450
									
						0	1.007	138.321	450
HW1	1348.604	5299.136	139.500	1.367	1200	1	1.007	138.133	450
									

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	1 year (l/s)	1.9
Summer CV	0.750	30 year (l/s)	3.7
Winter CV	0.840	100 year (l/s)	4.5
Analysis Speed	Normal	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.264	Betterment (%)	0
SAAR (mm)	1109	QBar	2.2
Soil Index	4	Q 1 year (l/s)	
SPR	0.47	Q 30 year (l/s)	
Region	10	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node S6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	141.550	Product Number	CTL-SHE-0064-2000-1200-2000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node S6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	141.550
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	75.0	0.0	1.200	75.0	0.0	1.201	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	99.562	28.172	30 year 360 minute summer	35.178	9.053
1 year 15 minute winter	69.868	28.172	30 year 360 minute winter	22.867	9.053
1 year 30 minute summer	67.776	19.178	30 year 480 minute summer	27.920	7.379
1 year 30 minute winter	47.562	19.178	30 year 480 minute winter	18.550	7.379
1 year 60 minute summer	48.435	12.800	30 year 600 minute summer	23.001	6.291
1 year 60 minute winter	32.179	12.800	30 year 600 minute winter	15.716	6.291
1 year 120 minute summer	31.831	8.412	30 year 720 minute summer	20.598	5.520
1 year 120 minute winter	21.148	8.412	30 year 720 minute winter	13.843	5.520
1 year 180 minute summer	25.499	6.562	30 year 960 minute summer	17.043	4.488
1 year 180 minute winter	16.575	6.562	30 year 960 minute winter	11.289	4.488
1 year 240 minute summer	20.693	5.468	30 year 1440 minute summer	12.485	3.346
1 year 240 minute winter	13.748	5.468	30 year 1440 minute winter	8.390	3.346
1 year 360 minute summer	16.369	4.212	100 year +40% CC 15 minute summer	441.486	124.925
1 year 360 minute winter	10.640	4.212	100 year +40% CC 15 minute winter	309.815	124.925
1 year 480 minute summer	13.246	3.501	100 year +40% CC 30 minute summer	304.460	86.152
1 year 480 minute winter	8.801	3.501	100 year +40% CC 30 minute winter	213.656	86.152
1 year 600 minute summer	11.089	3.033	100 year +40% CC 60 minute summer	214.603	56.713
1 year 600 minute winter	7.577	3.033	100 year +40% CC 60 minute winter	142.577	56.713
1 year 720 minute summer	10.069	2.699	100 year +40% CC 120 minute summer	135.791	35.885
1 year 720 minute winter	6.767	2.699	100 year +40% CC 120 minute winter	90.216	35.885
1 year 960 minute summer	8.526	2.245	100 year +40% CC 180 minute summer	104.615	26.921
1 year 960 minute winter	5.648	2.245	100 year +40% CC 180 minute winter	68.003	26.921
1 year 1440 minute summer	6.448	1.728	100 year +40% CC 240 minute summer	82.776	21.875
1 year 1440 minute winter	4.334	1.728	100 year +40% CC 240 minute winter	54.994	21.875
30 year 15 minute summer	243.818	68.992	100 year +40% CC 360 minute summer	63.377	16.309
30 year 15 minute winter	171.101	68.992	100 year +40% CC 360 minute winter	41.197	16.309
30 year 30 minute summer	166.387	47.082	100 year +40% CC 480 minute summer	50.006	13.215
30 year 30 minute winter	116.763	47.082	100 year +40% CC 480 minute winter	33.223	13.215
30 year 60 minute summer	116.589	30.811	100 year +40% CC 600 minute summer	40.997	11.214
30 year 60 minute winter	77.459	30.811	100 year +40% CC 600 minute winter	28.011	11.214
30 year 120 minute summer	73.902	19.530	100 year +40% CC 720 minute summer	36.560	9.799
30 year 120 minute winter	49.099	19.530	100 year +40% CC 720 minute winter	24.571	9.799
30 year 180 minute summer	57.313	14.749	100 year +40% CC 960 minute summer	30.041	7.911
30 year 180 minute winter	37.255	14.749	100 year +40% CC 960 minute winter	19.900	7.911
30 year 240 minute summer	45.598	12.050	100 year +40% CC 1440 minute summer	21.775	5.836
30 year 240 minute winter	30.295	12.050	100 year +40% CC 1440 minute winter	14.634	5.836

Results for 1 year Critical Storm Duration. Lowest mass balance: 89.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	142.084	0.034	2.6	0.0478	0.0000	OK
15 minute winter	S2	11	141.891	0.044	4.4	0.0590	0.0000	OK
360 minute winter	S3	248	141.707	0.524	2.0	0.8154	0.0000	SURCHARGED
360 minute winter	S4	248	141.707	0.861	2.3	1.0749	0.0000	SURCHARGED
360 minute winter	S5	248	141.707	1.022	2.7	1.2941	0.0000	SURCHARGED
360 minute winter	S6	248	141.707	1.319	3.7	13.1303	0.0000	SURCHARGED
360 minute winter	S7	248	139.009	0.021	1.7	0.0307	0.0000	OK
360 minute winter	S8	248	138.341	0.020	1.7	0.0227	0.0000	OK
360 minute winter	HW1	248	138.153	0.020	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.00	S2	2.6	0.715	0.109	0.0422	
15 minute winter	S2	1.001	S3	4.2	0.989	0.184	0.3695	
360 minute winter	S3	1.002	S4	1.9	0.365	0.037	1.3402	
360 minute winter	S4	1.003	S5	2.3	0.412	0.043	0.6071	
360 minute winter	S5	1.004	S6	2.6	0.105	0.045	0.9213	
360 minute winter	S6	Hydro-Brake®	S7	1.7				
360 minute winter	S7	1.006	S8	1.7	0.653	0.004	0.1111	
360 minute winter	S8	1.007	HW1	1.7	0.699	0.004	0.0216	25.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 89.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	142.103	0.053	6.3	0.0761	0.0000	OK
480 minute winter	S2	368	142.075	0.228	1.5	0.3053	0.0000	SURCHARGED
480 minute winter	S3	368	142.075	0.892	3.5	1.3872	0.0000	SURCHARGED
480 minute winter	S4	368	142.075	1.229	3.9	1.5338	0.0000	SURCHARGED
480 minute winter	S5	368	142.075	1.390	4.5	1.7597	0.0000	SURCHARGED
480 minute winter	S6	368	142.075	1.687	6.4	39.8660	0.0000	SURCHARGED
120 minute summer	S7	72	139.010	0.022	1.8	0.0314	0.0000	OK
60 minute summer	S8	48	138.342	0.021	1.8	0.0233	0.0000	OK
60 minute summer	HW1	48	138.153	0.020	1.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.00	S2	6.3	0.891	0.268	0.0966	
480 minute winter	S2	1.001	S3	1.5	0.453	0.065	0.6223	
480 minute winter	S3	1.002	S4	3.3	0.439	0.064	1.3402	
480 minute winter	S4	1.003	S5	3.8	0.435	0.072	0.6071	
480 minute winter	S5	1.004	S6	4.5	0.116	0.076	0.9213	
480 minute winter	S6	Hydro-Brake®	S7	1.8				
120 minute summer	S7	1.006	S8	1.8	0.663	0.004	0.1158	
60 minute summer	S8	1.007	HW1	1.8	0.710	0.004	0.0225	24.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 89.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S1	448	142.729	0.679	1.6	0.9689	0.0000	SURCHARGED
480 minute winter	S2	448	142.729	0.882	2.5	1.1800	0.0000	SURCHARGED
480 minute winter	S3	448	142.729	1.546	5.9	2.4034	0.0000	SURCHARGED
480 minute winter	S4	448	142.728	1.882	6.9	2.3493	0.0000	SURCHARGED
480 minute winter	S5	448	142.728	2.043	8.0	2.5868	0.0000	SURCHARGED
480 minute winter	S6	448	142.728	2.340	11.4	87.3535	0.0000	SURCHARGED
480 minute winter	S7	448	139.011	0.023	2.0	0.0331	0.0000	OK
480 minute winter	S8	448	138.343	0.022	2.0	0.0246	0.0000	OK
480 minute winter	HW1	456	138.154	0.021	2.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	S1	1.00	S2	1.4	0.573	0.060	0.2073	
480 minute winter	S2	1.001	S3	2.3	0.529	0.101	0.6223	
480 minute winter	S3	1.002	S4	5.7	0.501	0.110	1.3402	
480 minute winter	S4	1.003	S5	6.7	0.459	0.126	0.6071	
480 minute winter	S5	1.004	S6	7.9	0.198	0.134	0.9213	
480 minute winter	S6	Hydro-Brake®	S7	2.0				
480 minute winter	S7	1.006	S8	2.0	0.685	0.005	0.1258	
480 minute winter	S8	1.007	HW1	2.0	0.732	0.004	0.0245	65.6