SURFACE WATER SUSTAINABLE DRAINAGE AS-BUILT, CONSTRUCTION VERIFICATION REPORT & DRAINAGE MANAGEMENT PLAN DEVELOPMENT OF 71 NEW AFFORDABLE HOMES AT LAND OFF LOUISA STREET, OPENSHAW (PLANNING APPLICATION REF: 134775/FO/2022)

1. Background

This document has been produced pursuant to condition 15 of planning reference 134775/FO/2022, the re-development of the brownfield, former Iron Foundry (and other industrial uses) in the Manchester City Council local authority catchment. The condition reads;

"No development hereby permitted shall be occupied until details of the implementation, maintenance and management of the sustainable drainage scheme and the culverted ordinary watercourses have been submitted to and approved by the local planning authority. The scheme shall be implemented and thereafter managed and maintained in accordance with the approved details. Those details shall include:

- *Verification report providing photographic evidence of construction as per design drawings.*
- *As built construction drawings if different from design construction drawings;*
- *Management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.*

Reason- To manage flooding and pollution and to ensure that a managing body is in place for the sustainable drainage system and a maintenance mechanism for the lifetime of the development, pursuant to policies EN8, EN14, EN17 and DM1 of the Manchester Core Strategy (2012).

This document and associated appendices seeks to provide a verification of the installed drainage network, provide the as-built drawings and associated information and detail the management and maintenance arrangements for the lifetime of the development to allow the discharge of planning condition 15.

2. Competence

This report has been written by Paul Sinclair BEng (Hons), Technical director of Westchurch Homes. The author has been in the housebuilding industry since 1998 in various technical roles at Redrow Homes until May 2021, the final 10 of those years as Technical Director. In 2012, the author acted as expert witness for drainage on behalf of Redrow at successful appeal hearing for the refusal of 45 No. dwellings at Overlea Drive, Hawarden in Flintshire Council area. For the past 4 years, fulfilling the role of Technical Director at Westchurch Homes Ltd developing predominantly brownfield, affordable housing sites across Northwest England.

3. Design

Banners Gate Ltd were responsible for the detailed road and sewer design for the scheme and secured Section 104 approval from United Utilities in October 2023 for the main sewer infrastructure. The technical approval as well as the approved Section 104 drawing is included within appendix 1 (See extract in fig 1 below) and indicates the extent of those pipes and manholes that will be adopted and maintained by UU in the future in accordance with their own maintenance schedules.



Fig 1 – Extent of S104 adoption (coloured pipes and manholes)

The proposed SUDS features are as follows;

- Cellular Storage located beneath areas of shared parking & POS areas of the site and associated chambers
- Hydrobrake Manhole as approved by United Utilities and to be adopted by UU restricting surface water outflow from the development to 6.3 l/s
- Associated oversize tanks/pipes to store restricted flows to be adopted by UU.

The proposed cellular storage scheme is a Polystorm system and associated geotextile membrane. The product details for the system are included within Appendix 5 including the membrane specification, installation guide and BBA Agrement certification.

3.1 Culverted Ordinary Watercourse

Through the preparation of & during the planning application process, feedback from LLFA raised the concern about an ordinary watercourse that was deemed to be directly beneath the site. A review of the LLFA map showed that the indicative position of the culverted watercourse is noted to the south of the development site, assumed to be located within the public park.

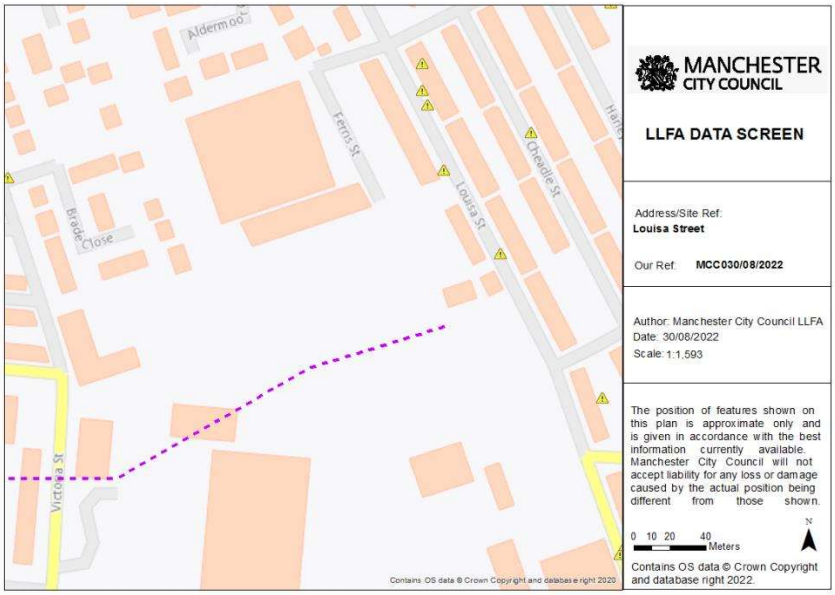


Fig 2 – Indicative location of culverted watercourse

A full and detailed drainage investigation was undertaken by Invek Surveys which concluded that the culverted watercourse could not be found and was likely to have been abandoned. The document, which was provided as part of the planning documentation is included in Appendix 2.

As a consequence of this work, it is clear that there is no management or maintenance liability towards the feature associated with the development of the site, and therefore this element of the condition should be satisfied by the results of appendix 2.

4. Construction, Installation & As-Built Info.

RJP Surveys have completed a full as-built of the site showing new manhole locations, new properties, fencelines etc. This drawing is included within Appendix 4.

The installation of the hydrobrake manhole will be inspected and signed off by United Utilities to facilitate adoption in the future.



Fig 3 Design and construction underway of Manhole CC01, hydrobrake control chamber.

The cellular storage was designed in principal by Banners Gate. Hydro Water Management Solutions Ltd are specialists in the design & installation of cellular storage units and systems. They produced a “unit diagram” drawing to deliver the necessary storage volumes.

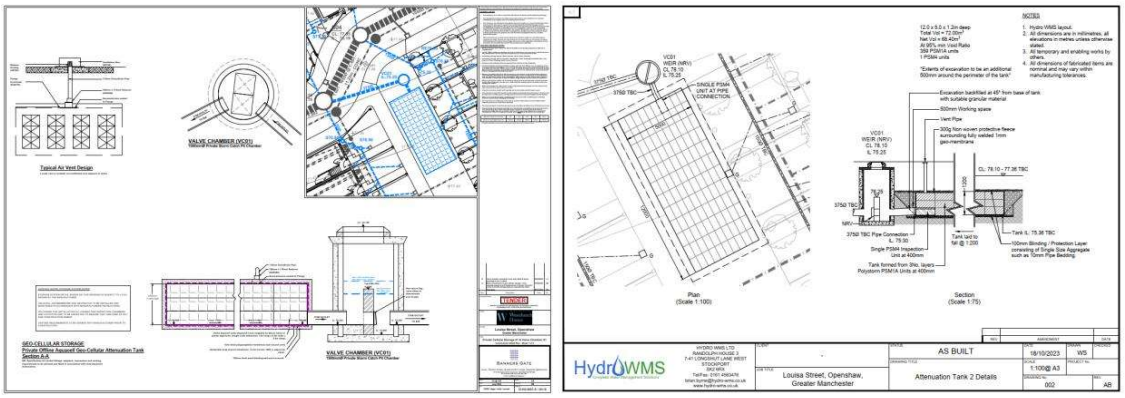


Fig 4 Banners Gate and Hydro WMS design for cellular storage tank 2 (To the rear of plots 1-8)

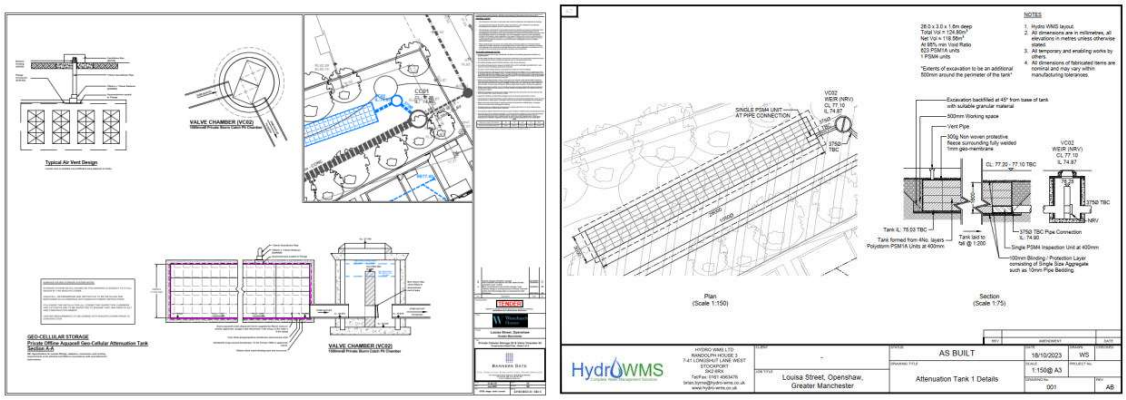


Fig 4 Banners Gate and Hydro WMS design for cellular storage tank 1 (within POS)

Hydro WMS were subsequently awarded the contract to undertake a full installation of the units including the waterproof membranes, jointing, vents etc. The product information, component parts, certification and insurance certification can be seen in Appendix 5.

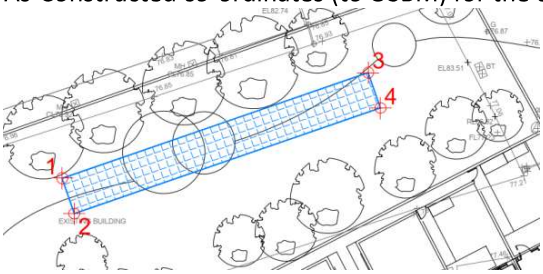
Hydro WMS have installed the units and have provided O&M manuals as well as CQA as-built information on the installation. These documents can be viewed in Appendix 6 and demonstrate that the surface water drainage SUDS system has been constructed as per the agreed scheme.

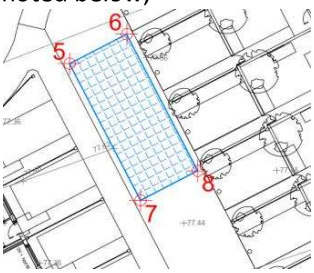




Fig 5 - Cell construction underway – Tanks 1&2

As-Constructed co-ordinates (to OSBM) for the cells are noted below;





1	E 388557.283	N 397649.170	5	E 388621.197	N 397628.182
2	E 388558.260	N 397646.333	6	E 388625.638	N 397630.479
3	E 388581.868	N 397657.632	7	E 388626.710	N 397617.523
4	E 388582.844	N 397654.795	8	E 388631.151	N 397619.820

5. Future Maintenance Responsibilities

The site has been transferred to a registered social provider, Jigsaw Homes Group who are the landowner of the site. All drainage on the site that is not to be adopted by United Utilities will be the responsibility of Jigsaw Homes Group. Jigsaw Homes are an enduring body who also own all of the newly constructed properties on the development.

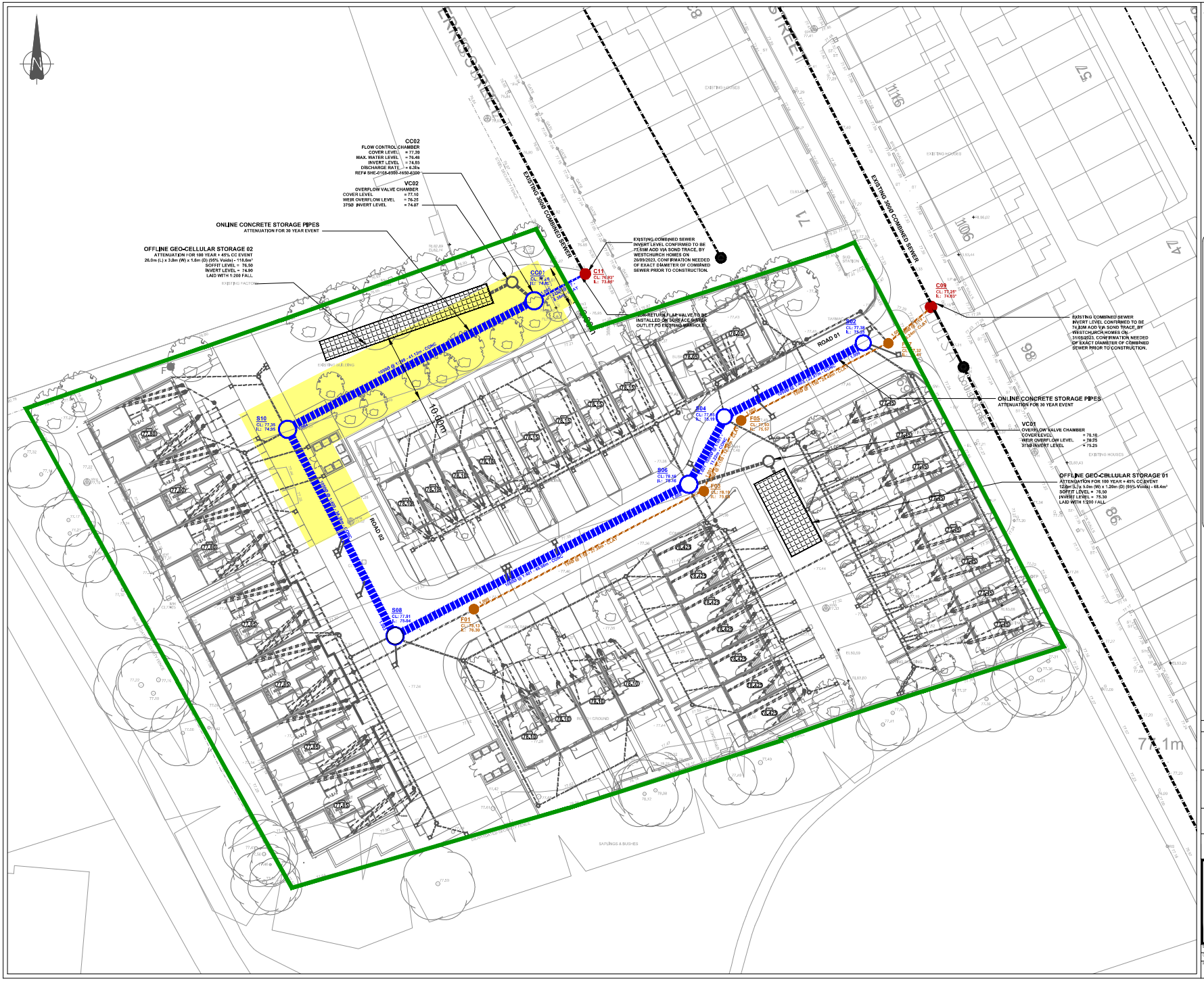
The O+M manuals for the surface water system provides the information necessary for the RP to adequately manage all of the surface water features. Appendix 5 provides a summary of the maintenance requirements for the cellular storage SuDs elements.

6. Summary

This document provides all necessary verification, as-built information and management & maintenance requirements of the SuDs elements on the Louisa Street development and provides the background on the offsite culvert investigation. The report and associated information should allow the discharge of planning condition 15 in full.

APPENDIX 1

SECTION 104 APPOVAL
&
APPROVED S104 PLAN



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GENERAL NOTES

- This drawing is to be read in conjunction with relevant architectural and engineering drawings.
- Any discrepancies between the details shown and actual on site conditions to be reported immediately to the engineer prior to commencement of works.
- This drawing is not intended to show details of ground conditions or ground contaminents. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminents on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.
- Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

ADOPTABLE ROADS AND SEWERS

- Roads, footways and parking bays which form part of the highway to be adopted under Section 38 of the Highways Act 1980 shall comply with the requirements of the Adopting Authority.
- Sewers to be adopted under Section 104 of the Water Industries Act 1991 shall comply with the Sewerage Sector Guidance (SSG) "Design & Construction Guidance" with any amendments specified by the Adopting Water Authority.
- All pipes to be used in adoptable sewerage shall be either clayware to BS EN 295 or concrete to BS EN 1916 and BS 5911: Part 1 with Class S bedding unless otherwise stated. With approval of the Adopting Authority uPVC wall corrugated external rib reinforced uPVC pipes complying with the relevant provisions of BS EN 13476 may be used.
- Where cover to a pipe is more than 1200mm under adoptable carriageway the trench shall be filled to formation of the carriageway with well compacted DTp Type 1 material.
- Where cover to a pipe is less than 1200mm under adoptable carriageway it shall be provided with concrete protection in accordance with the specification of the adopting authority and back filled to formation of the carriageway with well compacted DTp Type 1 material. Where concrete bed and surround is specified flexibility of joints is to be maintained by using compressible bitumen impregnated fibreboard at each pipe joint.
- All existing drainage invert levels, diameters and locations are to be checked by the Contractor prior to the commencement of any proposed drainage work. Any difference between actual and drawn details is to be reported to the Engineer immediately.
- Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed sewers is to be checked by the Contractor prior to starting work.

Rev.	Description	Date	By
G	Site boundary added.	23/10/2023	LJ
F	MH S2, S8 & S10 amended to UU S104 comments.	18/10/2023	LJ
E	Minor amendments to suit UU S104 comments.	16/10/2023	LJ
D	Minor amendments to suit UU S104 comments.	03/10/2023	LJ
C	Drawing updated to suit IL given for C11 & to suit amendments to 1:20's.	28/09/2023	LJ
B	Drawing updated to suit re-design of drainage to one outfall point & to I/ft outfall into combined sewer on Louisa Street following confirmation of IL.	22/09/2023	LJ
A	Drawing updated to suit replacement of Cardow Tank with online Concrete storage pipes as requested by client.	18/08/2023	LB
-	First Issue	03/07/2023	OB

Drawing Status: **TENDER**

SUBJECT TO UNITED UTILITIES SECTION 104 TECHNICAL APPROVAL. AMENDMENTS MAY THEREFORE BE REQUESTED.

Client: Westchurch Homes

Project: **Louisa Street, Openshaw**
Greater Manchester

Title: **Section 104 Agreement Plan**

BANNERS GATE
CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES
16-11 Birmingham Street, Halesowen, West Midlands B63 3HN
Tel: 0121 667 1666 Fax: 0121 667 1501
E-mail: mail@bannersgate.com

Scale: A1 @ 1:250	Drawn: CS
Date: June 2023	Checked: OB
File: 23102 / dwgs / civils / current	Drawing: 23102-BGC-D / 100S104 G

From: seweradoptions@uuplc.co.uk
Sent: Friday, October 20, 2023 12:22
To: liamjones@bannersgate.com
Cc: davidallbright@bannersgate.com; Paul Sinclair; anthony.laithwaite@uuplc.co.uk; seweradoptions@uuplc.co.uk
Subject: RE: UU REF 04354124 - Section 104 - Louisa Street, Manchester

Good afternoon,
HOUSING DEVELOPMENT, Louisa Street, Openshaw, Manchester – UU Ref 04354124

I refer to your correspondence dated **17/10/2023** and to the plans enclosed therewith, and would inform you that your submission is now satisfactory for incorporating into a Water Industry Act 1991, Section 104 Agreement, providing that the works can be constructed in full accordance with the acceptable drawings numbered as follows;

S104 Agreement Plan – 23102-BGC-D-100S104 F - Section 104 Agreement Plan
A3 Land Registry Compliant Plan – Land Registry Plan- UU Rev A
Long Sections – 23102-BGC-D-201 F - Adoptable Highways & Drainage Longitudinal Sec & MH Schedule Plan
Manhole Schedules and/or 1:20 Manholes Details – 23102-BGC-D-371 B - Foul 1-20 Manholes - General Arrangement Plan / 23102-BGC-D-372 C - Storm 1-20 Manholes - General Arrangement Plan

Please be advised we require amendments to the Land Registry Plan as outlined by Anthony Laithwaite with assets & grid references to be added.

United Utilities Standard Construction Details are available for download via the following link. **Please note: This will only be applicable to submissions working to Sewers for Adoption 6th Edition or for components included within the submission that are not covered by the Design & Construction guidance (i.e. flow control manholes or similar)**.

To enable the Section 104 Agreement to be completed and inspections to start on site, I would be grateful if you could now provide me with the following:

- **Cheque/payment** for the remainder of the S104 fees **£4,384.55**
- Sign and return the enclosed "Request for approval to commence construction of sewers before signing of agreement form".

The Developer or his contractor is responsible for verifying all existing service positions and levels on site, including those of the existing public sewerage system, before work commences.

Any costs associated with service diversions required to enable the scheme to be carried in accordance with the acceptable drawings must be borne by the developer.

Where connections are to be made to existing public sewer manholes, the costs for rebuilding the manhole to United Utilities requirements, if deemed necessary by United Utilities, must be borne by the developer. If the works cannot be constructed in accordance with the acceptable plans, the developer must submit revised proposals for appraisal before continuing with the works.

The developer must also obtain specific permission to construct any new manhole or make any connections to the public sewerage system. Please visit our website by clicking here where you will find the S106 Sewer Connection Application form. The form is in two parts but only the second part is required for this scheme which is called **'Request for permission to work on a public sewer'** application form, which the appointed contractor must complete and return to the address on the form.

I look forward to receiving the drawings and information requested above at your earliest convenience, but should you require any further information in the meantime, please do not hesitate to contact me.

United Utilities
Water for the North West

Lewis Barr
Assistant Developer Engineer
Developer Services & Metering
Customer Services
07827286541
unitedutilities.com

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APPENDIX 2

CULVERT INVESTIGATION REPORT

Title:

Search for "unnamed" Culverted Watercourse off Louisa Street, Openshaw, Manchester

Background:

Invek Surveys Ltd were asked by our client, Westchurch Homes, to investigate the existence of an "unnamed" Culverted Watercourse (and survey if found) located off Louisa Street, Openshaw.

Experience:

Invek Surveys were established in May 1993 and have been involved in the field of drainage investigations and surveys for the past 30 years.

Methodology:

We attended site on Wednesday 8th February 2023 and initially undertook a site walkover where we utilised various plans issued by our client.

1. Manchester City Council LLFA screen capture showing a purple dotted line crossing the park off Louisa Street but only showing the start of the culvert within the park itself. This line showed NO access chambers, inlets or outlets from which access may have been sought.

2. United Utilities sewer plan that showed NO indication of this culverted watercourse.

Our team of four operatives split up, and with the aid of metal detectors, thoroughly searched the open grassed areas of the park – no covers were found. Please note that there were covers on the public combined sewer system there but none on any culverted watercourse etc.

There were areas of overgrown bushes and trees to the Northern boundary of the site that we were not able to access – photos of these areas were in the final report to our client.

With absolutely NO covers or other indicators that a culverted watercourse existed, there was no more that could be done in that park area.

As a side note, it was proved that the highway gullies in Louisa Street discharged direct to the main combined sewer; this was perhaps not unusual in an area of this age, but it may be concluded that if a culverted watercourse was located here, then it may have expected to receive the rainwater runoff from the highway etc…

Once we felt the park area had been exhausted in terms of searching for any clues to the existence of the watercourse, we then relocated to the area West of the park (the suspected downstream) and started to look in the area of Victoria Street.

Here we lifted many of the covers in an attempt to find evidence of this culverted watercourse but found only Combined Water sewers.

To help show the total search area covered, we showed it as a hatched Cyan layer to the final CAD and PDF report.

With the total lack of any covers on this watercourse it proved impossible to confirm if it even existed!

Back at the office we looked at historic plans of the area hoping that there may be clues give before a lot of the newer development here but again nothing was found!

Conclusion:

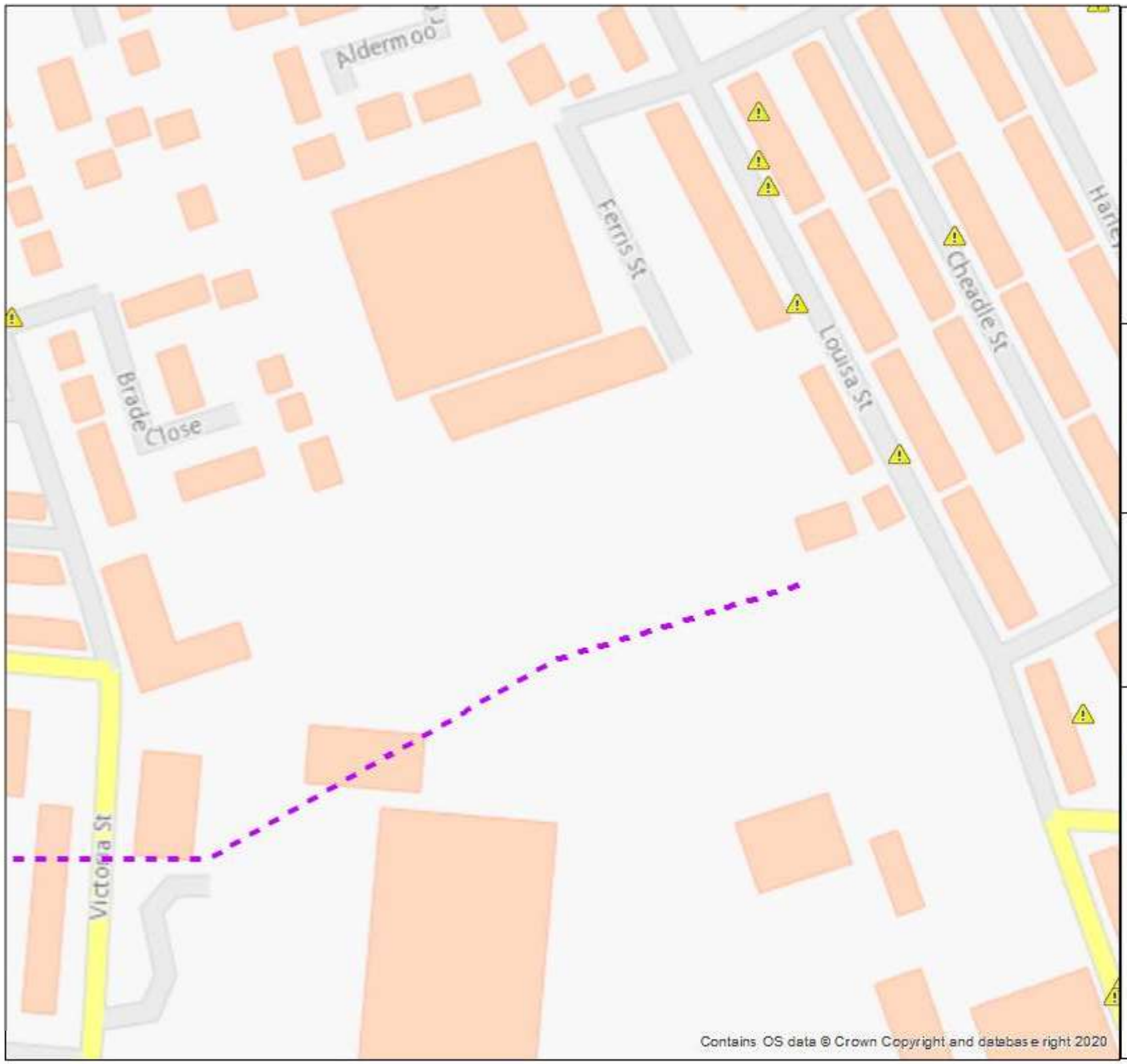
In conclusion it is our opinion that without extensive trial holes and invasive excavations, it would not be possible to locate this culverted watercourse, if indeed it still even exists today.

Attachments:

- Existing LLFA Off-Site Culvert
- Existing UU Records markup
- Louisa Street Openshaw Drainage Layout







MANCHESTER CITY COUNCIL

LLFA DATA SCREEN

Address/Site Ref:
Louisa Street

Our Ref: **MCC030/08/2022**

Author: Manchester City Council LLFA
Date: 30/08/2022
Scale: 1:1,593

The position of features shown on this plan is approximate only and is given in accordance with the best information currently available. Manchester City Council will not accept liability for any loss or damage caused by the actual position being different from those shown.

N

0 10 20 40
Meters

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The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
5709	74.6	FO	71.92	150			VC	13.51704	1 in 150
6819		CO		150			VC	4.77231	
3810	71.55	SW	69.96	300			VC	2.473863	1 in 2
4705	74.29	SW	72.71	225			VC	33.66479	1 in 153
6807		CO		225			VC	5.917015	
3542		CO		100			VC	1.448867	
4702	72.19	SW	70.64	300			VC	63.54072	1 in 205
4614	70.53	FO	68.51	150			VC	18.03077	1 in 38
4905	74.33	FO	72.08	150			VC	29.59862	1 in 148
5811		FO		100			VC	5.573564	
3812	72.55	FO	69.79	150			CO	33.94537	1 in 33
4612	71.38	FO	0	150			VC	51.92917	
3713	72.25	FO	70.43	150			VC	16.6235	1 in 119
4904	74.49	FO	71.88	150			VC	22.94392	1 in 153
5711	74.47	SW	72.49	225			VC	43.45528	1 in 167
4613	69.99	FO	68.04	150			VC	10.31255	
5307		CO		150			VC	16.51	
4807	74.66	SW	72.01	300			VC	59.02091	1 in 227
4605	71.93	SW	70.36	150			VC	9.524107	1 in 53
5812		FO		100			VC	6.079007	
5506		CO	0	300			VC	55.47234	
5901	74.48	FO	70.63	150			VC	16.05241	1 in 146
4607	69.51	SW	67.28	300			VC	6.843536	
5805	74.56	FO	72.6	150			VC	44.63219	1 in 66
5502		CO	0	300			VC	12.75014	
8305		CO		225			VC	5.247283	
5807	74.42	SW	72.19	300			VC	25.48202	1 in 319
4803	74.76	FO	71.08	150			VC	9.345306	1 in 134
4805	74.76	SW	71.59	375			BR	17.584	1 in 440
8814		CO		150			VC	7.170671	
4609	70.2	SW	69.22	150			VC	15.13448	1 in 22
8415		CO		150			VC	30.04509	
4611	72.16	FO	70.34	150			VC	27.44131	
3813	71.55	CO	68.77	300			CO	6.858271	1 in 34
4910	74.55	SW	71.55	375			BR	14.05842	1 in 351
5505		CO	0	300			VC	71.10891	
6815		CO		150			VC	11.48368	
3811	72.88	FO	69.89	150			VC	14.0735	1 in 141
6805		CO		225				11.2715	1 in
3807	72.9	SW	70.33	300			VC	14.90687	1 in 186
3809	72.2	SW	70.17	300			VC	20.97321	1 in 100
6829		CO		150			VC	14.23408	
6816		CO		150			VC	6.715095	
8807		CO		150			VC	8.878524	
5300	74.51	CO	70.92	600			CO	58.87275	1 in 40
4911	74.6	SW	72.9	225			VC	43.61435	1 in 150
4606	71.83	SW	70.18	150			VC	3.505277	
5818		CO		150			VC	3.950123	
6713		CO		150			VC	12.78175	
3712	72.23	SW	70.78	225			VC	21.56456	1 in 154
4908	74.31	SW	72.37	150			BR	18.16551	1 in 151
3714		SW	71	150			VC	13.20131	1 in 16
4909	74.4	SW		950			BR	32.38168	
4806	74.78	SW	71.75	300			BR	13.69852	1 in 86
4617		FO		150			VC	8.55903	
5308		CO		150			VC	8.480969	
6817		CO		150			VC	19.58383	
4801	74.59	FO	71.66	150			VC	24.53071	1 in 144
5717		FO		150			VC	19.98179	
3808	72.55	SW	70.25	300			VC	11.8761	1 in 148
5808	74.58	SW	72.9	225			VC	41.91187	1 in 63
4608	69.9	SW	68.54	300			VC	47.18612	1 in 37
4704	74.26	FO	72.43	150			VC	34.5785	1 in 150
4903	74.4	SW		950			BR	31.62278	
4616		FO		150			VC	7.405441	
6804		CO		225				18.75428	1 in
4604	72.66	SW	70.9	150			VC	20.28807	1 in 38
5715		CO		100			PVC	14.6303	
6711		CO		150			VC	6.447042	
5707	73.49	FO	72.2	150			VC	41.11518	1 in 147
4610	72.1	SW	70.68	150			VC	31.40906	1 in 15
6818		CO		150			VC	12.55935	
4619		FO		100			VC	9.318147	
5806	74.44	FO	71.83	150			VC	26.35326	1 in 155
4804	74.74	FO	71.01	150			VC	55.92413	1 in 147
5710	74.59	SW	72.23	300			VC	14.44217	1 in 361
4802	74.63	FO	71.49	150			VC	62.88441	1 in 153
5714		FO		150			VC	6.424744	
3510		FO		150			VC	12.14108	
4808	74.57	SW	72.11	300			VC	23.50743	1 in 235
8408		CO		150			VC	31.44667	
3515		CO		100			VC	10.15714	
7601	79.31	CO	76.31	300			VC	45.65085	1 in 123
6703	79.84	CO	78.56	225			VC	44.28318	1 in 18
6607		CO		100			VC	2.20495	
8501	79.21	CO	0	300			VC	29.96665	
3610	69.59	CO	68.5	230			VC	12	1 in 46
3604	71.31	CO	67.65	750			CO	58.1964	1 in 135
6901	80.46	CO	77.08	230			VC	91.67879	1 in 110
3611	69.34	CO	68.24	230			VC	18.43909	1 in 10
3509	68.85	SW	66.9	225			VC	45.17743	1 in 78
4703	72.19	FO	70.29	150			VC	60.0123	1 in 150
7702	80.15	CO	77.33	230			VC	45.17743	1 in 70
3801	71.7	SW	66.72	1150			CO	42.95346	1 in 100
7513	77.65	CO	74.53	450			VC	36.05551	1 in 134
3517		CO		100			VC	12.17035	
6827		CO		150			VC	5.31039	
3710	71.38	CO	68.13	300			VC	58.21512	1 in 42
7512	77.15	CO	74.25	450			VC	4.24264	1 in 71
7402	77.64	CO	74.62	225			VC	14	
6707	79.82	CO	0	300			VC	30.88689	
7700	82.12	CO	79.76	300			VC	27.29469	1 in 105
3407	69.6	CO	64.81	610			BR	4	
3504	69.12	CO	65.07	300			VC	45.18677	1 in 59
5801	77.27	CO	71.13	150			VC	9.848858	1 in 49
4501	70.64	CO	67.07	300			VC	32.24903	1 in 77
7802	81.28	CO	75.46	380			VC	90.35186	1 in 192
3622		CO		100			VC	2.836339	
7418		CO		150			VC	12.55152	
3409	68.95	CO	65.74	525			CO	13	1 in 46
3302	67.81	CO	64.59	300			VC	12.04159	
3704	71.68	CO	68.2	525			CO	43.01163	1 in 269
3600	70.33	CO	68.95	230			VC	17	
3501	68.83	CO	67.64	230			VC	19.10497	
3401	68.28	SW	65.7	300			VC	19	1 in 211
7603	78.71	CO	75.38	380			VC	25.05993	1 in 114
8800	83.93	CO	80.43	300			VC	59.94164	1 in 100
3508	67.84	SW	66.26	300			CO	21.58703	
3709	70.55	CO	69.33	230			VC	13.0384	1 in 34
8404	84.22	CO	81.92	300			CO	42.10701	1 in 13
5902	77.14	CO	0	300			VC	40.96033	
4400	69.6	CO	66.29	525			BR	11.40175	1 in 127
7704	79.61	CO	76.66	300			VC	43.82921	1 in 129
8506	78.6	CO	75.3	450			VC	57.14018	1 in 75
3814	71.61	CO	68.57	450			CO	24.9487	1 in 100
8401	80.9	CO		225			VC	56.02406	
7419		CO		150			VC	20.45925	
7602	79.03	CO	75.93	300			VC	54.12024	1 in 132
8421		CO		150			VC	16.24599	
8601	79.34	CO	75.75	380			VC	30.88689	1 in 86
7506	77.33	CO	75.73	230			VC	32.57299	1 in 71
7510	76.98	CO	74.27	450			CO	12.08305	1 in 134
7503	77.94	CO	75.54	300			VC	37.12142	1 in 91
6701	77.42	CO	70.33	380			VC	43.96946	1 in 56
4615		CO	0	375			VC	33.54081	
3402	70.16	SW	65.52	300			CO	3.605551	1 in 36
3529		CO		150			VC	2.369257	
4405		CO	0	450			CO	34.04025	
7511	77.16	CO	74.07	610			BR	24.35159	1 in 152
5905		CO		100			PVC	13.39317	
8507	79.88	CO	78.13	230			VC	39.01282	1 in 18
7800	81.44	CO	76.23	230			VC	63.82006	1 in 116
4502	70.75	CO	67.2	750			CO	6	1 in 600
6803	78.75	CO	75.83	230			VC	44.29447	1 in 221
8508	79.06	CO	76.21	300			VC	77.41447	1 in 125
3506	67.81	FO	65.78	225			VC	56.6198	
7406	77.95	CO	73.65	600			BR	46.23851	1 in 38
8824		CO		150			VC	18.78431	
3703	71.55	CO	68.65	300			VC	61.29437	1 in 37
5903		CO		100			PVC	3.015304	
7608	78.19	CO	76	230			VC	8.944272	1 in 11
5701	77.35	CO	70.51	675			CO	16.12452	1 in 179
7803	81.41	CO	79.86	230			VC	45.17743	1 in 103
7505	77.32	CO	0	230			VC	7.211102	
6601	77.67	CO	76.14	230			VC	46.95743	1 in 85
8818		CO		150			VC	10.60917	
7301	78.19	CO	0	1900			BR	230.2173	
7605	79.75	CO	78.06	230			VC	46.52956	1 in 78
4500	70.72	CO	69.7	225			VC	86.20905	1 in 42
8602	79.35	CO	76.87	230			VC	25.94224	
5702	77	CO	0	300			VC	9.848858	
6301	76.1	SW	74.27	600			CO	23.47991	1 in 391
3705	70.68	CO	69.24	230			VC	34.05877	1 in 43
7606	80.36	CO	76.55	300			VC	67.08204	1 in 120
7408		CO		100			VC	7.980164	
3608	69.25	CO	66.3	300			VC	37.21559	1 in 98
6503	77.01	CO	74.46	300			VC	48.10405	1 in 45
5835		CO		150			VC	5.203716	
6702	77.94	CO	0	225			VC	45.27692	
6503	77.01	CO	74.43	450			VC	17.46425	1 in 249
7705	80.67	CO	76.76	300			VC	34	1 in 179
3803	71.6	CO	68.6	450			CO	7.624291	1 in 254
3505	69.95	CO	66.65	300			VC	36.12478	1 in 23
6501	76.27	CO	73.37	300			VC	47.12749	1 in 46
7507	78.04	CO	0	230			VC	43	
4707		FO		100			VC	5.870307	
3708	70.14	CO	67.04	300			VC	29.06888	1 in 91
7502	77.75	CO	74.95	380			VC	10.81665	1 in 120
3700	71.54	CO	68.02	300			VC	48.25971	1 in 35
4601	71.02	CO	67.22	750			CO	5.049873	
7600	78.65	CO	76.5	230			VC	23.70654	1 in 0.31927998
7417		CO		150			VC	16.70231	
4602	74.55	CO	68.83	375			VC	46.15862	
5302		CO	0	1875			VC	305.9744	
7300	78.07	CO	0	600			BR	22.36068	
5703	76.78	CO	69.53	375			VC	40.44502	1 in 94
6502	76.27	CO	73.87	300			VC	19.69772	1 in 43
6900	79.81	CO	77.89	230			VC	53.41348	1 in 137
3609	71	CO	67.75	300			VC	81.32305	1 in 56
6500	75.21	CO	72.32	300			VC	30.67572	1 in 55
3607	71.16	CO	70.24	230			VC	53.15073	1 in 33
7642		CO		150			VC	5.74639	
7405	77.55	CO	73.75	600			BR	32.31099	1 in 359
3408	69.31	CO	65.3	525			CO	7.28011	1 in 30
6602	77.57	CO	75.58	230			VC	53.7122	1 in 73
5803	77.38	CO	70.73	300			VC	45.21818	1 in 4522
6800	80.38	CO	77.48	230			VC	55.60585	1 in 105
8500	79.56	CO	78.08	230			VC	42.48529	1 in 20
7607	78.39	CO	76.59	230			VC	45.61798	1 in 79
8600	79.8	CO	75.99	380			VC	24.59675	1 in 102
7401	77.59	CO	76.02	225			VC	12.44031	1 in 83

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
7703	79.85	CO	78.6	230			VC	27.73085	1 in 12
4706		FO		100			VC	7.706321	
3507	68.87	FO	66.3	225			VC	47.09565	1 in 96
6700	78.63	CO	74.97	375			VC	45.65085	1 in 10
5712		FO		100			VC	8.928234	
5501	75	CO	0	300			VC	17.46425	
3516		CO		100			VC	15.17295	
5704	76.67	CO	69.1	375			VC	37.74723	1 in 270
3603	71.11	CO	68.08	300			VC	65.3183	1 in 48
3530		CO		150			VC	22.79252	
3802	71.52	CO	69.2	375			VC	22.13594	1 in 101
3303	67.86	SW	64.61	450			BR	75.10659	1 in 70
3606	69.84	CO	68.64	230			VC	18.02776	1 in 10
3613	68.7	CO	65.92	300			VC	40.11234	1 in 25
5301	72.79	CO	69.08	300			VC	50.92151	1 in 268
3602	69.73	CO	66.72	300			VC	38.0526	1 in 91
7604	79.29	CO	77.45	230			VC	7.792161	
7412		CO		150			VC	5.569896	
7500	78.34	CO	76.34	230			VC	51	1 in 255
3702	71.5	CO	68.37	300			VC	50.15974	1 in 52
7501	78.19	CO	76.53	230			VC	10.63015	1 in 8
8302	80.62	CO	77.63	450			BR	58.13777	1 in 51
7504	77.29	CO	74.71	375			VC	25.63201	1 in 99
3706	71.46	CO	70.24	230			VC	31.14482	1 in 31
3612	70.89	CO	69.84	230			VC	61.75963	
3605	70.03	CO	69.03	230			VC	12	1 in 31
8502	79.68	CO	77.22	300			VC	74.68943	1 in 100
5834		CO		150			VC	13.01674	
3601	71.25	CO	69.85	230			VC	38.11824	1 in 42
7801	82	CO	75.65	380			VC	34.48188	1 in 203
3500	68.96	CO	66.91	230			VC	12.04159	1 in 16
3404	69.05	FO	66.72	150			VC	9.055386	1 in 82
7302	78.28	CO	0	600			BR	3.162278	
3701	71.62	CO	68.32	450			CO	27.51363	1 in 275
8817		CO		150			VC	10.95667	
6801	80.93	CO	76.93	230			VC	71.79691	1 in 47
4505	70.8	CO	67.92	300			VC	96.34667	1 in 48
6704	78.36	CO	75.51	300			VC	56.79789	1 in 123
7609	77.94	CO	75.84	300			VC	53.66563	1 in 65
8505	78.77	CO	75.5	450			VC	12.16553	1 in 61
6909		CO		100			PVC	3.641551	
3400	68.24	CO	64.41	600			BR	107.6569	
7400	77.53	CO	76.12	225			VC	8.944272	1 in 128
8300	79.3	CO	0	300			VC	69.46222	
6600	78.13	CO	75.87	300			VC	45.17743	1 in 129
8301	79.13	CO	75.53	300			VC	97.98979	1 in 100
6705	79.17	CO	77.68	230			VC	45.65085	1 in 76
3301	64.91	CO	61.6	300			VC	68.18358	
8414		CO		150			VC	8.769808	
5700	77.38	CO	70.7	300			VC	64.25729	1 in 68
3403	69.98	CO	65.15	300			VC	5.09902	1 in 102
6706	78.92	CO	77.07	230			VC	45.17743	1 in 0.60292844
6828		CO		150			VC	3.340506	
3707	70.05	CO	66.76	300			VC	59.21149	1 in 26
5800	77.39	CO	71.34	300			VC	36.35932	1 in 173
3627		CO		230			VC	5.508491	
3411	69.33	CO	66.09	525			CO	25.17936	1 in 93
4701	76.67	CO	68.96	375			VC	25.63201	1 in 233
5907		CO		100			PVC	13.97262	
7403	78.1	CO	75.05	300			VC	49.01723	1 in 44
7521		CO		100			VC	6.414452	
4300	70.06	SW	66.61	375			VC	81.3941	1 in 41

LEGEND

Abandoned	Foul	Surface Water	Combined	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main
				Sludge Main
				Overflow
				Water Course
				Highway Drain

All point assets follow the standard colour convention:
red - combined blue - surface water
brown - foul purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO Foul
SW Surface Water
CO Combined
OV Overflow

SEWER SHAPE

CI Circular TR Trapezoidal
EG Egg AR Arch
OV Oval BA Barrel
FT Flat Top HO HorseShoe
RE Rectangular UN Unspecified
SQ Square

SEWER MATERIAL

AC Asbestos Cement
BR Brick
PE Polyethylene
RP Reinforced Plastic Matrix
CO Concrete
CSB Concrete Segment Bolted
CSU Concrete Segment Unbolted
CC Concrete Box Culverted
PSC Plastic / Steel Composite
GRC Glass Reinforced Plastic
DI Ductile Iron
PVC Polyvinyl Chloride
CI Cast Iron
SI Spun Iron
ST Steel
VC Vitrified Clay
PP Polypropylene
PF Pitch Fibre
MAC Masonry, Coursed
MAR Masonry, Random
U Unspecified

Address or Site Reference:

Louisa Street Works Openshaw,

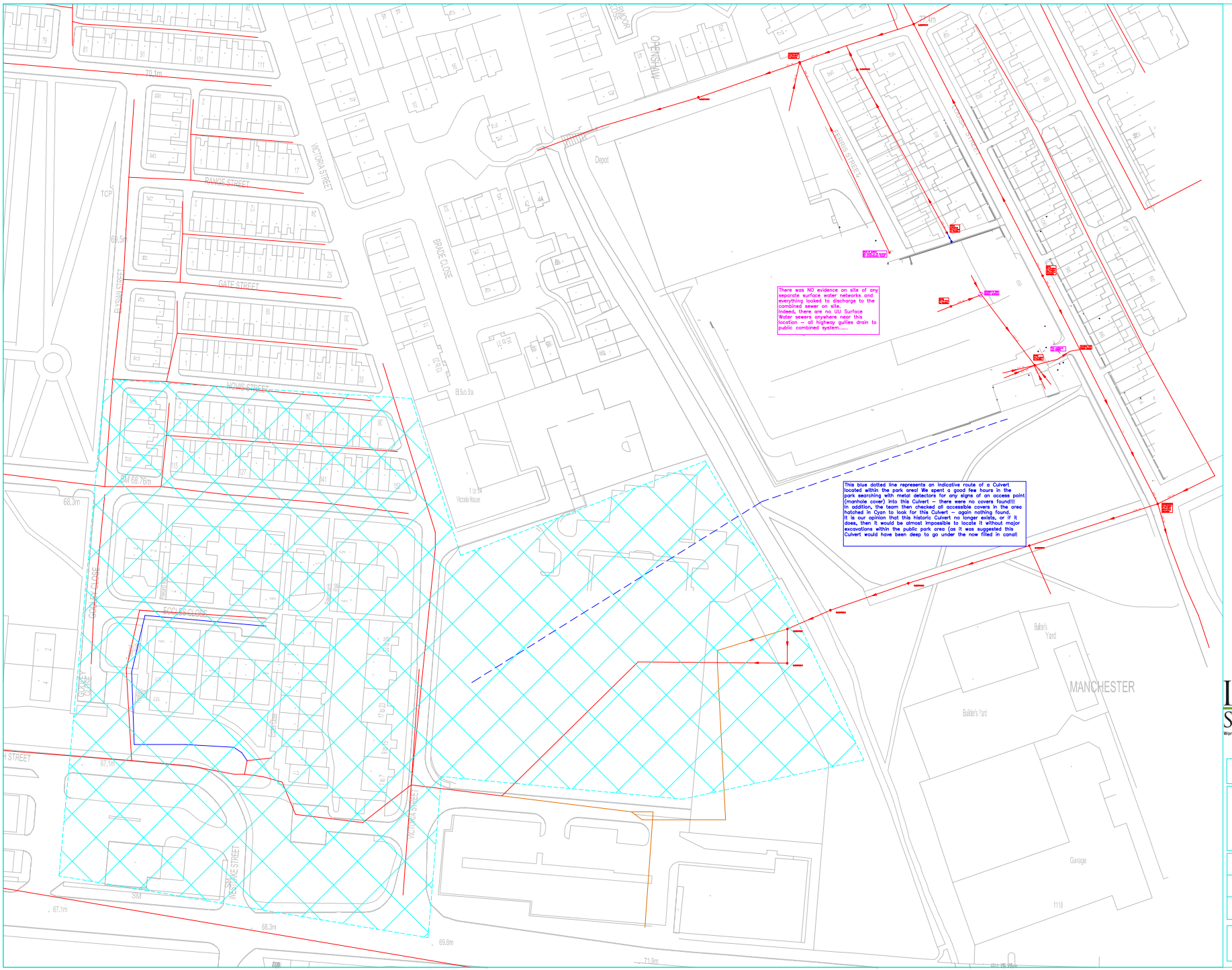
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Sheet: 1 of 1

Printed by: Property Searches

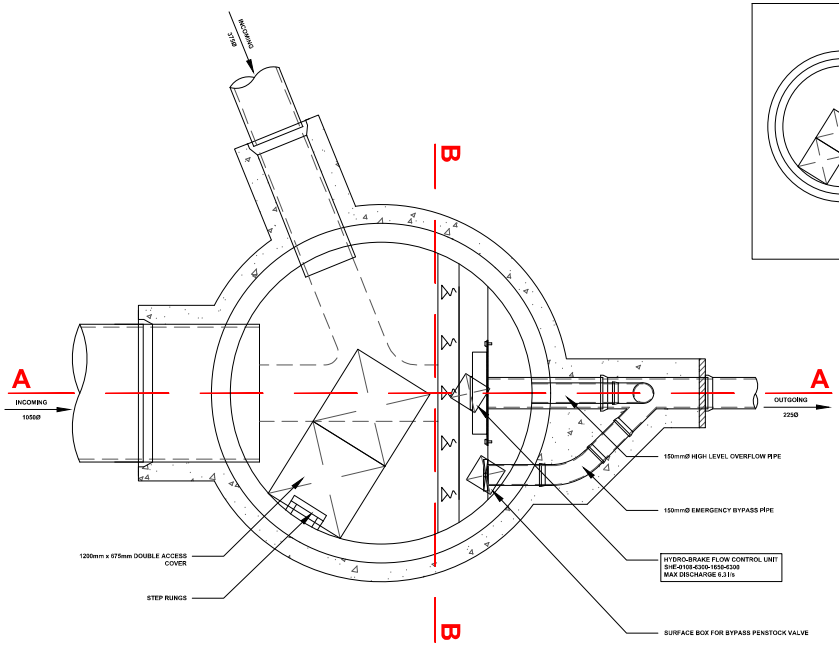
SEWER RECORDS

United Utilities
Water for the North West

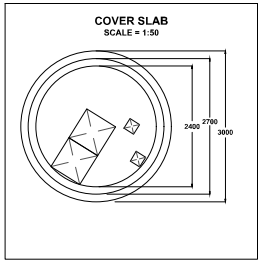

There was NO evidence on site of any separate surface water networks and everything looked to discharge to the combined sewer on site.
Indeed, there are no UU Surface Water sewers anywhere near this location – all highway gullies drain to public combined system.....
This blue dotted line represents an indicative route of a Culvert located within the park area! We spent a good few hours in the park searching with metal detectors for any signs of an access point (manhole cover) into this Culvert – there were no covers found!!! In addition, the team then checked all accessible covers in the area hatched in Cyan to look for this Culvert – again nothing found. It is our opinion that this historic Culvert no longer exists, or if it does, then it would be almost impossible to locate it without major excavations within the public park area (as it was suggested this Culvert would have been deep to go under the now filled in canal)
Legend/Notes:
Combined Sewer
Foul Sewer
SW Sewer
Assumed Sewer (Not Proven)
Rising Main
Highway Drainage
Culvert Sewer
Open Water Course
Overflow Line
Treated Line
Rain Water Down Pipe
Foul Down Pipe
Combined Down Pipe
Grey Water Down Pipe
Highway Gully
Septic Tanks
Direction of overland flows
Spot levels
RWD
FDP
CDP
GDP
VICTORIA STREET
RANGE STREET
GATE STREET
HOUS STREET
ELSHAM STREET
BRADE CLOSE
OAKENSHAW
FERRIS STREET
Depot
Victoria House
Builder's Yard
MANCHESTER
Garage
INVEK SURVEYS LTD.
Warrington Business Park, Long Lane, Warrington, Cheshire, WA2 8TX
Tel: 01925 244376 Fax: 01925 241517
Email: kevin@invek.com – www.invek.com
Client
Westchurch Homes
Drawing Title
Louisa Street
Drainage Layout
Scale(s) N.T.S
Drawn PW
Date 09.02.23
Checked RD
Job Number 2061
Approved KN
Sheet Size, Drawing Number & Revision
A1_2061/01_Rev_00

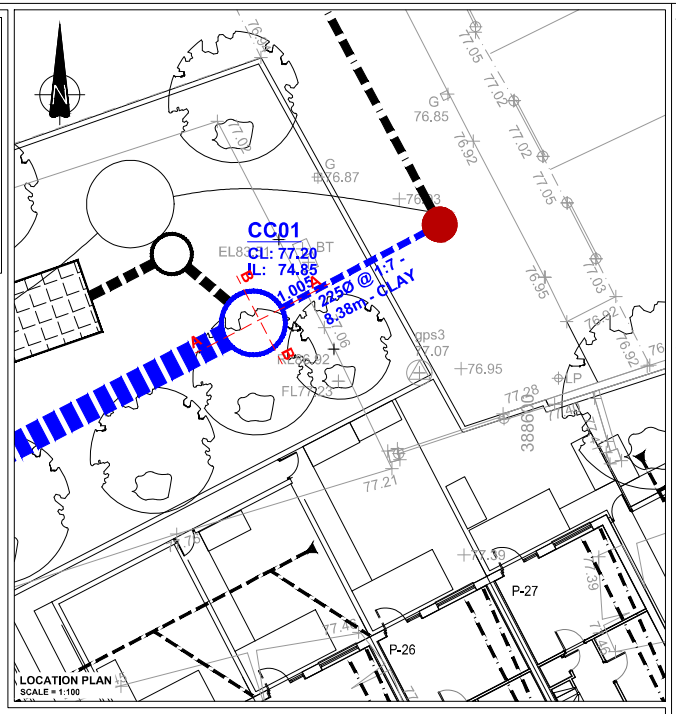
APPENDIX 3

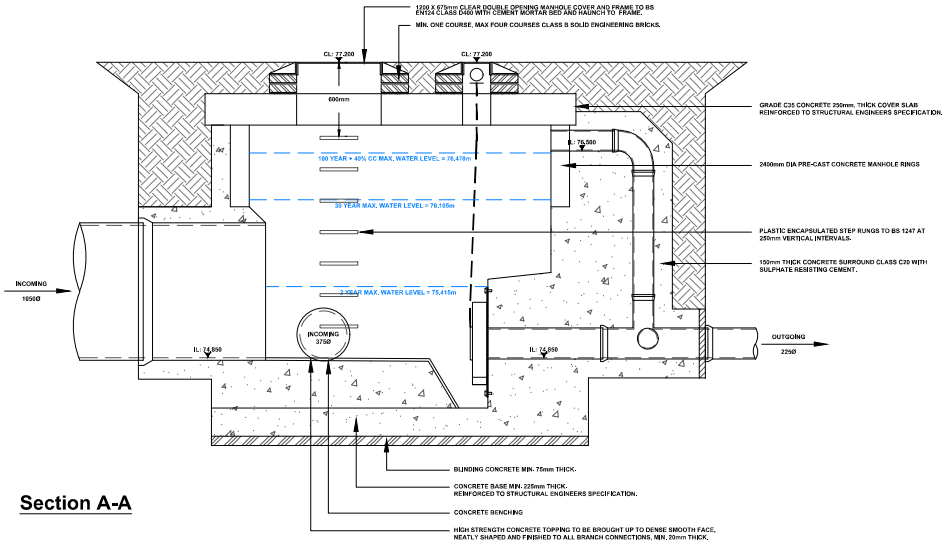
SUDS ELEMENTS
DESIGN DRAWINGS



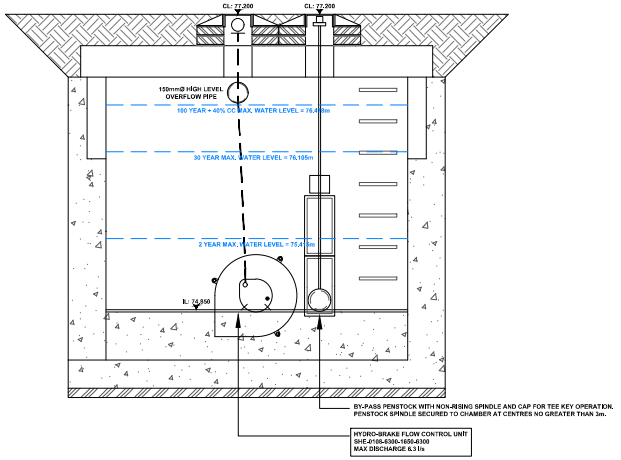
Plan







Section A-A



Section B-B

Flow Control Chamber CC01

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GENERAL NOTES

- This drawing is to be read in conjunction with relevant architectural and engineering drawings.
- Any discrepancies between the details shown and actual on site conditions to be reported immediately to the engineer prior to commencement of works.
- This drawing is not intended to show details of ground conditions or ground contaminents. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structure which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminents on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical shapes for guidance only and should be investigated further by a suitable geotechnical expert.
- Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 3 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

ADOPTABLE ROADS AND SEWERS

- Roads, footways and parking bays which form part of the highway to be adopted under Section 38 of the Highways Act 1980 shall comply with the requirements of the Adopting Authority.
- Sewers to be adopted under Section 104 of the Water Industries Act 1991 shall comply with the Sewerage Sector Guidance (SSG) "Design & Construction Guidance" with any amendments specified by the Adopting Water Authority.
- All pipes to be used in adoptable sewerage shall be either clayware to BS EN 295 or concrete to BS EN 1916 and BS 5911, Part 1 with Class S bedding unless otherwise stated. With approval of the Adopting Authority solid wall concentric external rib reinforced uPVC pipes complying with the relevant provisions of BS EN 13476 may be used.
- Where cover to a pipe is more than 1200mm under adoptable carriageway the trench shall be filled to formation of the carriageway with well compacted DTp Type 1 material.
- Where cover to a pipe is less than 1200mm under adoptable carriageway it shall be provided with concrete protection in accordance with the specification of the adopting authority and back filled to formation of the carriageway with well compacted DTp Type 1 material. Where concrete bed and surround is specified flexibility of joints is to be maintained by using compressible bitumen impregnated fibreboard at each pipe joint.
- All existing drainage invert levels, diameters and locations are to be checked by the Contractor prior to the commencement of any proposed drainage work. Any difference between actual and drawn details is to be reported to the Engineer immediately.
- Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed sewers is to be checked by the Contractor prior to starting work.

HYDROBRAKE SPECIFIC NOTES

- Alternative types of hydrobrakes have different sump configuration & size, always consult the manufacturer.
- Warning signs are to be 40mm high red lettering on a white plastic base. The plastic base dimensions are to be approx 300mm x 4mm.
- The warning sign is to be mounted on a removeable safety grid available from cover manufacturer.
- The sign in these manholes are to read "Caution - Hydrobrake located here".
- A sign must be fitted in the upstream MH to read "Caution - Hydrobrake downstream".
- A sign must be fitted in the downstream MH which reads "Caution - Hydrobrake upstream".
- Any difference between actual and drawn details is to be reported immediately.
- The base is to be resistant to attack by sewage.

Rev.	Description	Date	By
C	Minor amendments to suit UU S104 comments.	02/10/2023	LJ
B	Flow control chamber amended to suit one surface water outfall.	22/09/2023	LJ
A	Minor amendments to flow control chamber design to suit replacement of Carlow Tank with online Concrete storage pipes as requested by client.	18/08/2023	OB
-	First Issue	03/07/2023	OB

Drawing Status: **TENDER**

SUBJECT TO UNITED UTILITIES SECTION 104 TECHNICAL APPROVAL. AMENDMENTS MAY THEREFORE BE REQUESTED.

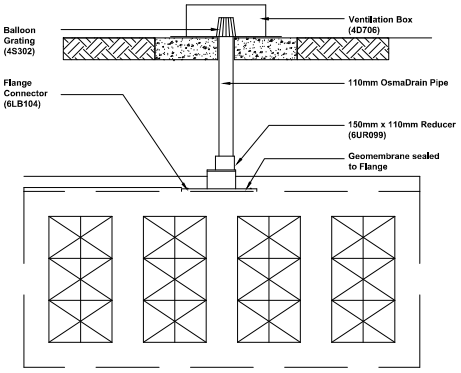
Client: Westchurch Homes

Project: **Louisa Street, Openshaw**
Greater Manchester

Title: **Flow Control Chamber Construction Details Plan**
Sheet 1 of 2

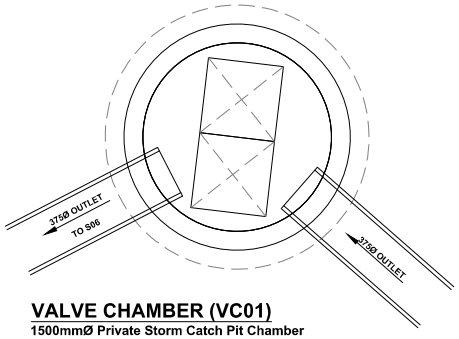
BANNERS GATE
CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES
16-11 Birmingham Street, Halesowen, West Midlands B63 3HN
Tel: 0121 667 1666 Fax: 0121 667 1661
E-mail: mail@bannersgate.com

Scale	A1 @ 1:20	Drawn	OB
Date	June 2023	Checked	DA
File	23102 / dwgs / civils / current	Drawing	23102-BGC-D / 321 C



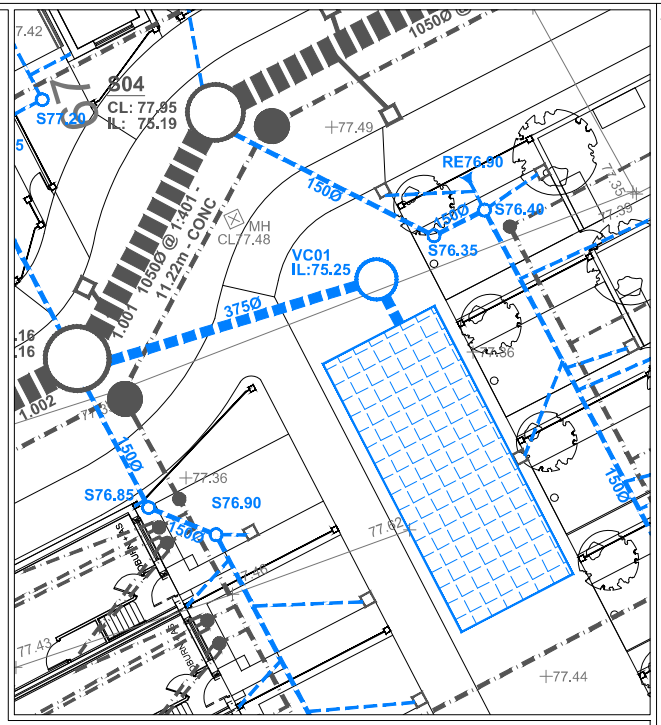
Typical Air Vent Design

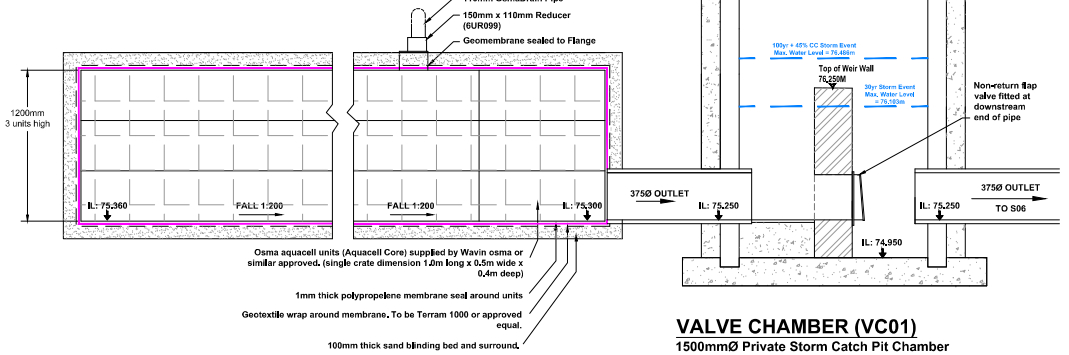
Locate vent in suitable non-trafficked area adjacent to tanks.



VALVE CHAMBER (VC01)

1500mmØ Private Storm Catch Pit Chamber





VALVE CHAMBER (VC01)

1500mmØ Private Storm Catch Pit Chamber

SURFACE WATER STORAGE SYSTEM NOTES

STORAGE SYSTEM DETAIL SHOWN ON THIS DRAWING IS SUBJECT TO A FULL DESIGN BY THE MANUFACTURER.

AQUACELL, GEOMEMBRANE AND GEOTEXTILE TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS

FOLLOWING THE INSTALLATION ALL CONNECTING INSPECTION CHAMBERS AND CATCHPITS ARE TO BE INSPECTED TO ENSURE THEY ARE FREE OF SILT AND CONSTRUCTION DEBRIS

VENTING REQUIREMENTS TO BE AGREED WITH MANUFACTURER PRIOR TO CONSTRUCTION

GEO-CELLULAR STORAGE

Private Offline Aquacell Geo-Cellular Attenuation Tank Section A-A

NB: Specification for socket fittings, adaptors, connectors and venting requirements to be advised and fitted in accordance with manufacturers instructions.

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- This drawing is not intended to show details of ground conditions or ground contaminents. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminents on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.
- Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

BUILDING DRAINAGE NOTES

- Building drainage shall comply with BS EN 752 2008 and the Building Regulations 2002 part H (updated 2015).
- All SVP, RWP and IBG are indicative and must be confirmed on site using latest architectural plans. Any discrepancies must be reported to Engineer prior to commencement on site.
- All building drainage shall be 100mm diameter unless shown otherwise.
- All building drainage shall be Aquvere to BS EN 295 or uPVC to BS 4660 and BS EN 1401-1 with Class S or Class D bedding unless shown otherwise.
- All pipes under buildings without suspended floors shall have Class S bedding.
- 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 900mm cover in roads and driveways used by commercial vehicles, and under kerbs. Where concrete surround is specified flexibility of joints is to be maintained by using compressible bitumen impregnated fibreboard at each joint.
- Where a pipe passes through a wall an opening is to be formed to give at least 50mm clearance around the pipe. Brickwork over shall be supported by a lintel. The opening is to be rendered each side with rigid sheet material. Pipes embedded in walls shall have a joint formed within 150mm of each wall face. A rocker pipe of maximum 600mm length shall be used to continue the pipework.
- Where a pipe trench is within 1m of a building, the pipe is to be provided with concrete protection and the trench filled with concrete up to a level below the building equal to the distance from the building less 150mm.
- Where the formation of a pipe trench is above original ground level levels are to be made up with well compacted Sf3 Type 2 material or better.
- Inspection chambers located within garages are to have double seal bolt down covers.
- 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.
- Where a driveway falls towards a dwelling it shall be provide with a suitable gully or drainage channel to prevent water damaging the building.
- The invert level of a middling eye at the head of a surface water drain is to be set 450mm below finished ground level unless shown otherwise.
- The maximum depth of both foul and storm access chambers is 600mm below finished ground level.
- The invert level of an inspection chamber on a foul drain from a building is to be set in accordance with Table H1 of Part H of the Building Regulations 2002 (updated 2015) to allow for future connections longer than 12m as stated in Part H. This is assuming a 450mm floor construction thickness and 1:80 fall to inspection chamber which must be confirmed prior to construction.

Maximum Length of Connection	6m	15m	14m*	17m*	20m*
Minimum Invert Depth below FFL	750mm	825mm	900mm	975mm	1050mm

*Inspection Chamber to be used for connections longer than 12m as stated in Part H.

Rev.	Description	Date	By
B	Valve chamber amended to weir wall, detail & levels amended to suit 1 outfall.	22/09/2023	LJ
A	Minor amendments to geo-cellular storage / valve chamber design to suit replacement of Carlow Tank with online Concrete storage pipes as requested by client.	18/08/2023	OB
-	First Issue	03/07/2023	OB

Drawing Status: **TENDER**

SUBJECT TO UNITED UTILITIES SECTION 104 TECHNICAL APPROVAL. AMENDMENTS MAY THEREFORE BE REQUESTED.

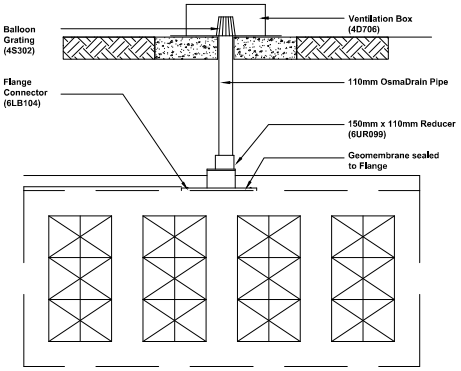
Client: Westchurch Homes

Project: **Louisa Street, Openshaw**
Greater Manchester

Title: **Private Cellular Storage 01 & Valve Chamber 01**
Construction Detail Plan - Sheet 1 of 2

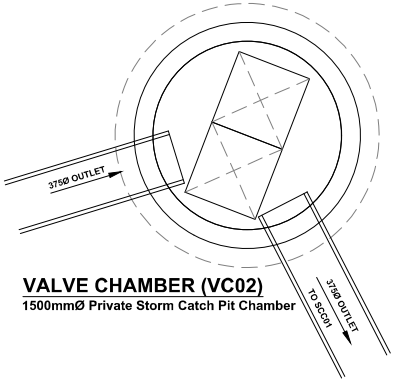
BANNERS GATE
CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES
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E-mail: mail@bannersgate.com

Scale	A1 @ 1:20	Drawn	CS
Date	June 2023	Checked	OB
File	23102 / dwgs / civils / current	Drawing	23102-BGC-D / 361 B



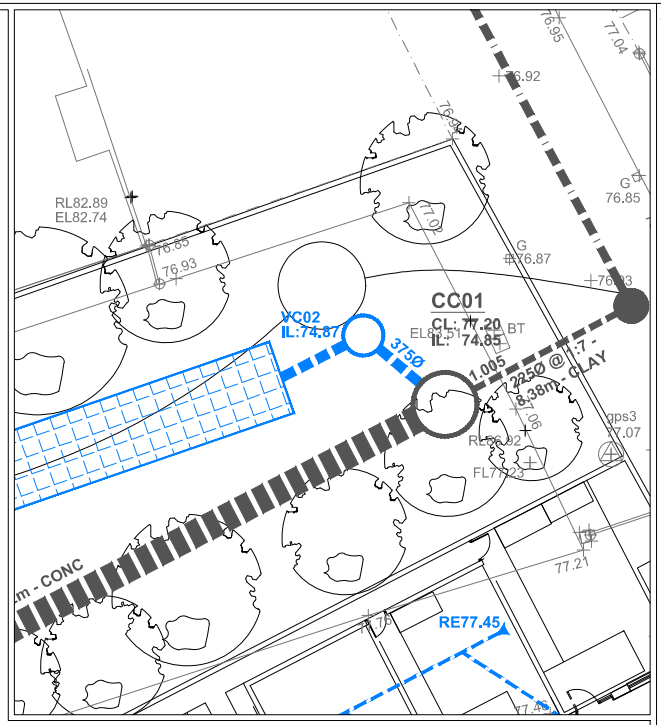
Typical Air Vent Design

Locate vent in suitable non-trafficked area adjacent to tanks.



VALVE CHAMBER (VC02)

1500mmØ Private Storm Catch Pit Chamber



SURFACE WATER STORAGE SYSTEM NOTES

STORAGE SYSTEM DETAIL SHOWN ON THIS DRAWING IS SUBJECT TO A FULL DESIGN BY THE MANUFACTURER.

AQUACELL, GEOMEMBRANE AND GEOTEXTILE TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS

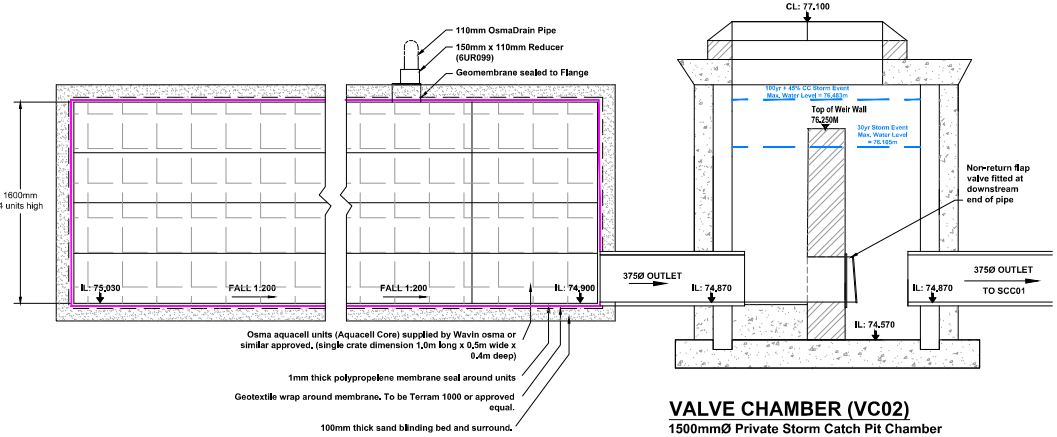
FOLLOWING THE INSTALLATION ALL CONNECTING INSPECTION CHAMBERS AND CATCHPITS ARE TO BE INSPECTED TO ENSURE THEY ARE FREE OF SILT AND CONSTRUCTION DEBRIS

VENTING REQUIREMENTS TO BE AGREED WITH MANUFACTURER PRIOR TO CONSTRUCTION

GEO-CELLULAR STORAGE

Private Offline Aquacell Geo-Cellular Attenuation Tank Section A-A

NB: Specification for socket fittings, adaptors, connectors and venting requirements to be advised and fitted in accordance with manufacturers instructions.



VALVE CHAMBER (VC02)

1500mmØ Private Storm Catch Pit Chamber

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GENERAL NOTES

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BUILDING DRAINAGE NOTES

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- Where a pipe passes through a wall an opening is to be formed, to give at least 50mm clearance around the pipe. Brickwork over shall be supported by a lintel. The opening is to be rendered each side with rigid sheet material. Pipes embedded in walls shall have a joint formed within 150mm of each wall face. A rocker pipe of maximum 600mm length shall be used to continue the pipework.
- Where a pipe trench is within 1m of a building, the pipe is to be provided with concrete protection and the trench filled with concrete up to a level below the building equal to the distance from the building less 150mm.
- Where the formation of a pipe trench is above original ground level levels are to be made up with well compacted Type 2 material or better.
- Inspection chambers located within garages are to have double seal bolt down covers.
- 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.
- Where a driveway falls towards a dwelling it shall be provide with a suitable gully or drainage channel to prevent water damaging the building.
- The invert level of a misiding eye at the head of a surface water drain is to be set 450mm below finished ground level unless shown otherwise.
- The maximum depth of both foul and storm access chambers is 600mm below finished ground level.
- The invert level of an inspection chamber on a foul drain from a building is to be set in accordance with Table H1 of Part H of the Building Regulations 2010 (maximum depth of 2.5m for drainage connections longer than 12m as stated in Part H). This is assuming a 450mm floor construction thickness and 1:40 fall to inspection chamber which must be confirmed prior to construction.

Maximum Length of Connection	6m	15m	14m*	17m*	20m*
Minimum Invert Depth below FFL	750mm	825mm	900mm	975mm	1050mm

*Inspection Chamber to be used for connections longer than 12m as stated in Part H.

Rev.	Description	Date	By
C	Cellular storage orientation changed.	02/10/2023	LJ
B	Valve chamber amended to weir wall, detail & levels amended to suit 1 outfall.	23/09/2023	LJ
A	Minor amendments to geo-cellular storage / valve chamber design to suit replacement of Carlow Tank with online Concrete storage pipes as requested by client.	16/08/2023	OB
-	First Issue	03/07/2023	OB

Drawing Status: **TENDER**

SUBJECT TO UNITED UTILITIES SECTION 104 TECHNICAL APPROVAL. AMENDMENTS MAY THEREFORE BE REQUESTED.

Client: Westchurch Homes

Project: **Louisa Street, Openshaw**
Greater Manchester

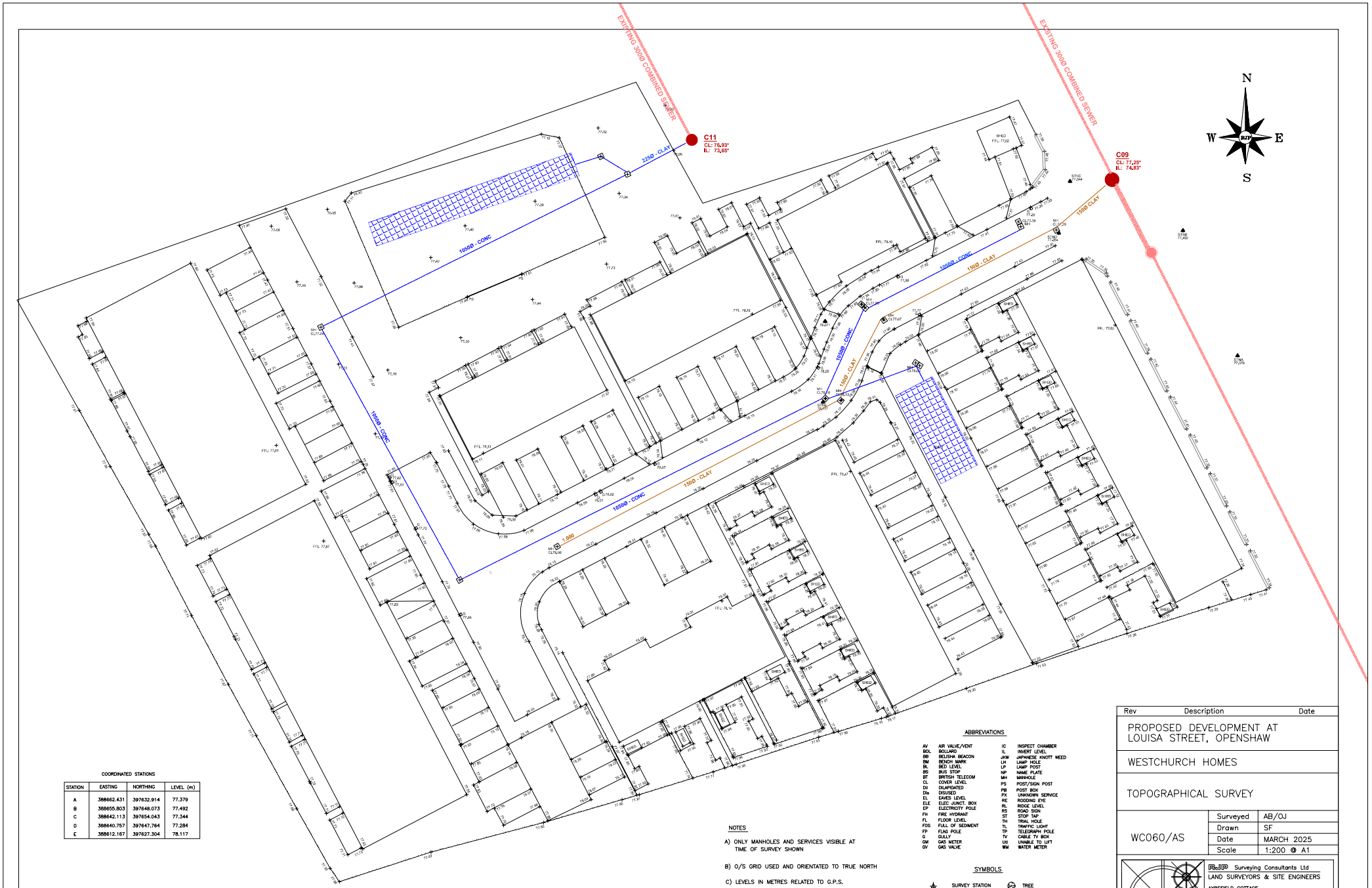
Title: **Private Cellular Storage 02 & Valve Chamber 02**
Construction Detail Plan - Sheet 2 of 2

BANNERS GATE
CIVIL, STRUCTURAL & ARCHITECTURAL DESIGN SERVICES
16-11 Birmingham Street, Halesowen, West Midlands B63 3HN
Tel: 0121 667 1666 Fax: 0121 667 1501
E-mail: mail@bannersgate.com

Scale	A1 @ 1:20	Drawn	CS
Date	June 2023	Checked	OB
File	23102 / dwgs / civils / current	Drawing	23102-BGC-D / 362 C

APPENDIX 4

DEVELOPMENT
AS BUILT
DRAWING



COORDINATED STATIONS

STATION	EASTING	NORTHING	LEVEL (m)
A	388662.431	397632.914	77.379
B	388655.803	397648.073	77.492
C	388642.113	397654.043	77.344
D	388640.757	397647.764	77.284
E	388612.167	397627.304	78.117

ABBREVIATIONS

AV	AIR VALVE/VENT	IC	INSPECT CHAMBER
BOL	BOLLARD	IL	INVERT LEVEL
BB	BELISHA BEACON	JKW	JAPANESE KNOTT WEED
BM	BENCH MARK	LH	LAMP HOLE
BL	BED LEVEL	LP	LAMP POST
BS	BUS STOP	NP	NAME PLATE
BT	BRITISH TELECOM	MH	MANHOLE
CL	COVER LEVEL	PS	POST/SIGN POST
DI	DILAPIDATED	PB	POST BOX
Dis	DISUSED	PX	UNKNOWN SERVICE
EL	EAVES LEVEL	RE	RODDING EYE
ELE	ELEC JUNCT. BOX	RL	RIDGE LEVEL
EP	ELECTRICITY POLE	RS	ROAD SIGN
FH	FIRE HYDRANT	ST	STOP TAP
FL	FLOOR LEVEL	TH	TRIAL HOLE
FOS	FULL OF SEDIMENT	TL	TRAFFIC LIGHT
FP	FLAG POLE	TP	TELEGRAPH POLE
G	GULLY	TV	CABLE TV BOX
GM	GAS METER	UN	UNABLE TO LIFT
GV	GAS VALVE	WM	WATER METER

NOTES

A) ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN

B) O/S GRID USED AND ORIENTATED TO TRUE NORTH

C) LEVELS IN METRES RELATED TO G.P.S.

D) DRAINAGE INFORMATION MUST BE CHECKED PRIOR TO WORK COMMENCING

SYMBOLS

SURVEY STATION
E — O\H ELEC CABLE
T — O\H PHONE LINE
CANOPY\HEDGE
TREE
BENCH MARK
TRIAL PIT
BOREHOLE

Rev	Description	Date

PROPOSED DEVELOPMENT AT LOUISA STREET, OPENSHAW

WESTCHURCH HOMES

TOPOGRAPHICAL SURVEY

WC060/AS

Surveyed	AB/OJ
Drawn	SF
Date	MARCH 2025
Scale	1:200 @ A1

RJP Surveying Consultants Ltd
LAND SURVEYORS & SITE ENGINEERS
AYREFIELD COTTAGE
AYREFIELD ROAD
ROBY MILL
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WEBSITE : www.rjpsurveyors.co.uk
E-MAIL: mail@rjpsurveyors.co.uk

APPENDIX 5

PRODUCT DATA,
BBA CERTIFICATION
& CQA INSTALLATION INFORMATION

Polypipe Civils
Charnwood Business Park
North Road
Loughborough
Leicestershire LE11 1LE
Tel: 01509 615100 Fax: 01509 610215
e-mail: civilssales@polypipe.com
website: www.polypipe.com

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
06/4297
Product Sheet 3

POLYSTORM STORMWATER MANAGEMENT SYSTEMS

POLYSTORM-R STORMWATER MANAGEMENT SYSTEM

This Agrément Certificate Product Sheet(1) relates to the Polystorm-R Stormwater Management System, an attenuation and infiltration system comprising recycled polypropylene modular units for use in storm water management systems as below-ground water storage or as a soakaway to manage run-off from impermeable surfaces.

(1) Hereinafter referred to as 'Certificate'.



CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Hydraulic design — data is provided in this Certificate to assist in the design of a below-ground stormwater management system (see section 6).

Structural performance — the system has adequate strength and stiffness to resist long- and short-term loading when used in accordance with this Certificate (see section 7).

Maintenance — data is provided to assist in planning the maintenance of a completed system installation (see section 11).

Durability — the system will have a service life in excess of 60 years when installed in accordance with this Certificate (see section 12).

The BBA has awarded this Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 16 April 2014

Brian Chamberlain
Head of Approvals — Engineering

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

British Board of Agrément
Bucknalls Lane
Watford
Herts WD25 9BA
©2014
tel: 01923 665300
fax: 01923 665301
e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk

Regulations

In the opinion of the BBA, the Polystorm-R Stormwater Management System, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	H3(3)	Rainwater drainage
Comment:		The system can be used in a construction to meet this Requirement. See sections 6.1 to 6.9 of this Certificate.
Regulation	7	Materials and workmanship
Comment:		The units are acceptable. See section 12 and the *Installation* part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The units can contribute to satisfying this Regulation. See sections 11.1 to 11.6, 12 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	3.6	Surface water drainage
Comment:		The system can contribute to a construction satisfying this Standard, with reference to clauses 3.6.1[1][2] to 3.6.5[1][2]. See sections 6.1 to 6.9 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The units can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012

Regulation:	23(a)(i)(iii)(b)	Fitness of materials and workmanship
Comment:		The units are acceptable. See section 12 and the *Installation* part of this Certificate.
Regulation:	82	Rainwater drainage
Comment:		The system can be used in a construction to satisfy this Regulation. See sections 6.1 to 6.9 of this Certificate.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 3 *Delivery and site handling* (3.3, 3.5 and 3.6) and 15 *Procedure* (15.1 and 15.10) of this Certificate.

Additional Information

NHBC Standards 2014

In the opinion of the BBA, the use of the Polystorm-R Stormwater Management System, in relation to this Certificate, is not subject to the requirements of these Standards.

Technical Specification

1 Description

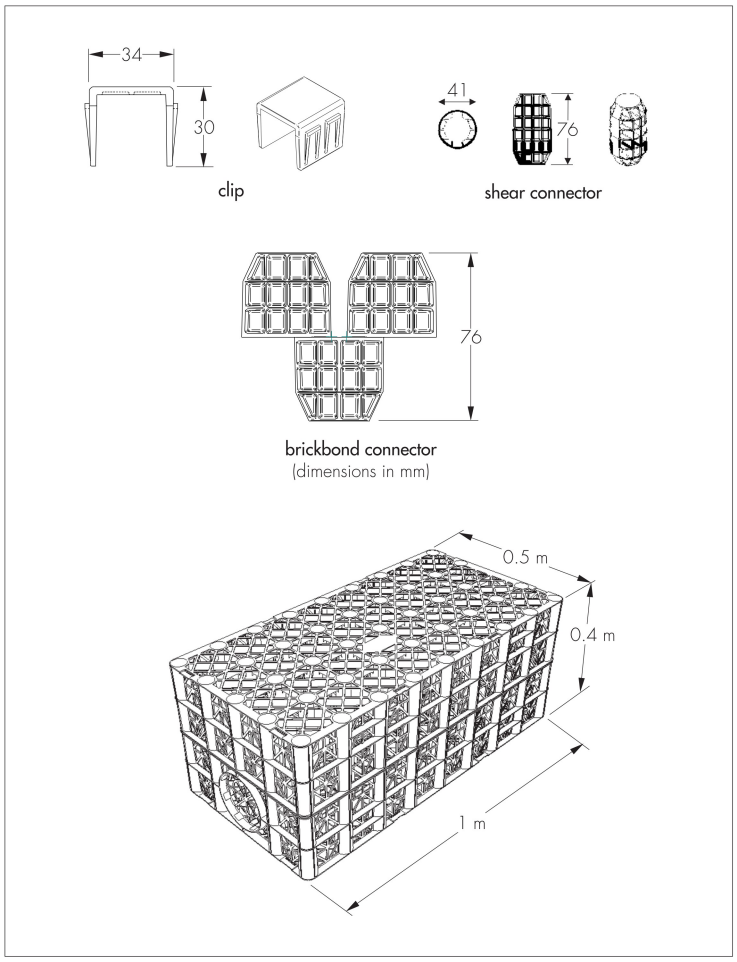
1.1 The Polystorm-R Stormwater Management System comprises modular units manufactured from recycled polypropylene (see Table 1 and Figure 1). The units have pre-formed sockets to enable connection with 160 mm diameter pipework (to BS EN 1401-1 : 1998). Alternatively, connection to 150 mm Ridgidrain, 110 mm or 100 mm pipework is possible using suitable adaptors.

Table 1 Characteristics of modular unit

Characteristic (unit)	Value
Dimensions (nominal) (l x w x h) (mm)	1000 x 500 x 400
Volume (nominal) (m^3)	0.20
Storage volume (nominal) (m^3)	0.19
Porosity (void ratio) (%)	95

1.2 Clips, shear and brick bond connectors are manufactured from black polypropylene and used to secure the units together.

Figure 1 Modular unit and components



1.3 Items used with the units to form a stormwater management system but outside the scope of this Certificate include:

- Adaptors and connecting pipework
- permeable geotextile —wrapped around each assembly when used for infiltration.
- geomembrane — wrapped around each assembly when used for storage (attenuation).
- air vents/connections/pipework
- silt traps
- flow control/chamber devices
- granular material/coarse sand.

2 Manufacture

2.1 The units are manufactured by injection moulding the recycled polypropylene material to one specification.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested, calibrated and operated by trained personnel
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Polypipe Civils has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2000 by BSI (Certificate Q06225).

3 Delivery and site handling

3.1 The units are supplied to site in packs of 12 or 15 units secured to a wooden pallet. Each pack carries a label bearing the product name, quantity, operator initials and pallet number.

3.2 Clips, shear connectors and brick bond connectors are packed in sealed polythene bags of 60, 30 and 30 respectively.

3.3 The unit packs should be carefully placed on level ground and should not be stacked on site. Loose individual units should not be stored more than two units high.

3.4 The units contain an inhibitor to resist the effects of ultraviolet light for up to six months. However, prolonged storage in direct sunlight and high temperatures should be avoided.

3.5 The units should not be stored near fuel bowsers, fuel tanks or other solvents to avoid potential chemical spillages.

3.6 The units are resistant to damage likely to be caused during normal handling. However, they should be stored in locations where impacts from vehicles and other construction plant will be avoided.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Polystorm-R Stormwater Management System.

Design Considerations

4 General

4.1 The design of the Polystorm-R Stormwater Management System must be in accordance with the Certificate holder's design guidelines. Guidance on the application of sustainable drainage systems (SUDS) for new developments can also be found in the Communities and Local Government Planning Policy Statement PPS25 and the Construction Industry Research and Information Association (CIRIA) Report C697.

4.2 The system is suitable for the surface water management system of stormwater run-off from impermeable surfaces and can be utilised in two main ways (see Figure 2):

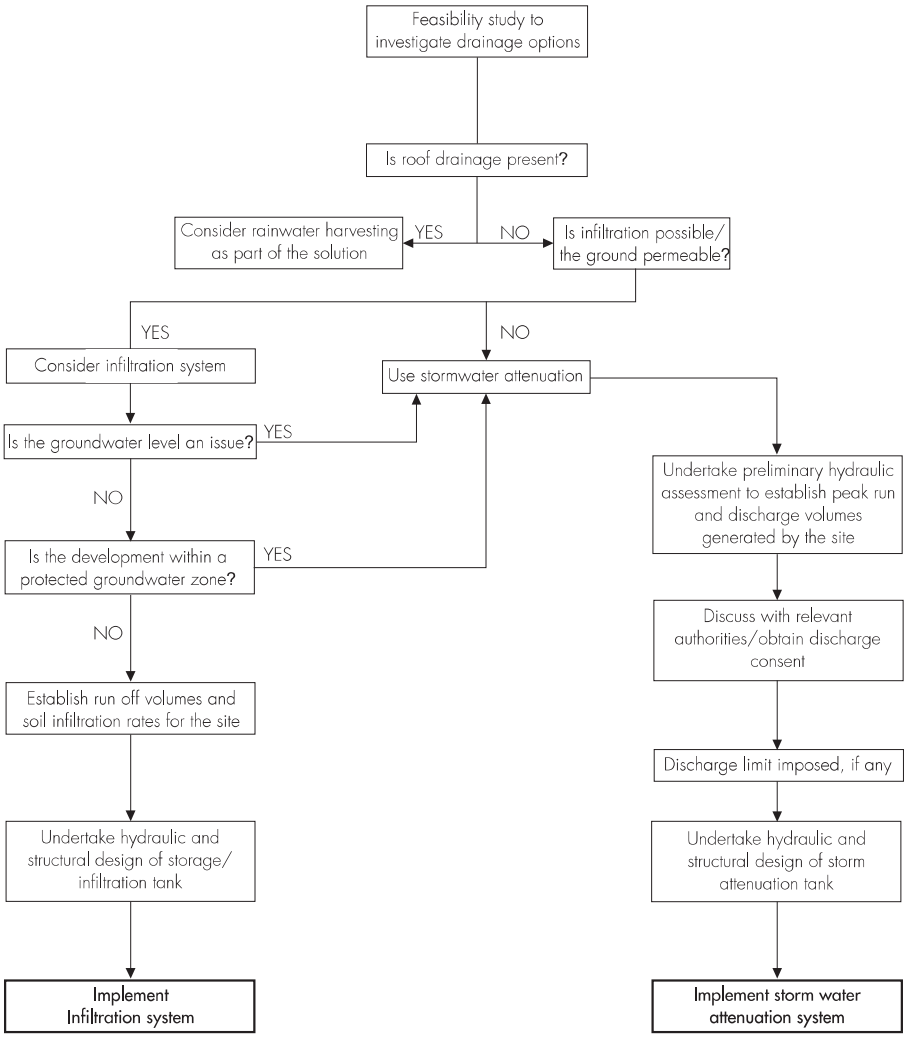
- infiltration — stormwater is collected in the units during rainfall and allowed to drain away by soaking into the surrounding ground over a substantial period of time after rainfall
- attenuation — stormwater is collected in the units during rainfall and released at a reduced flow rate through a flow control device into an appropriate outfall. This reduces peak flows in the watercourse and thereby, minimising the risk of flooding
- a combination of infiltration and attenuation.

4.3 Design of the appropriate system for a specific project must always be preceded by a detailed audit of the proposed site to establish:

- existing factors and considerations applicable to the site
- predicted factors relating to the site's use following the planned development, and the parameters within which the installation is required to function
- the type of function of application suggested by this audit.

4.4 Once the project criteria have been established from the site audit, there are two main parts to the design procedure of individual installations; hydraulic design and structural design.

Figure 2 Sustainable drainage system selection and design



5 Practicability of installation

The system is designed to be installed by a competent general builder, or a contractor, experienced with this type of system.

6 Hydraulic design

Infiltration

Calculation principles



6.1 There are two approaches, either of which may be adopted: the Construction Industry Research and Information Association (CIRIA) Report 156 or BRE Digest 365. Further information on the design of SUDS may be obtained from CIRIA Report C697.

6.2 A simplified approximate approach can be used on a small site (ie a single-house development), where detailed site infiltration rate information may not be required nor available (see Table 2). From Approved Document H of the England and Wales Building Regulations, a storage volume equal to the area to be drained multiplied by 10 mm, for areas up to 25 m^2 is allowed. Beyond this size, design should be carried out in accordance with BS EN 752 : 2008 or BRE Digest 365. It is suggested in BS EN 752 : 2008 that a storage volume equal to 20 mm multiplied by the area to be drained may be used. In Scotland, guidance for the design of single-house soakaways is given in Mandatory Standard 3.6, clause 3.6.5[1]

(1) Technical Handbook (Domestic).

Table 2 Simplified soakaway design for single-house development[1]

Number of units	Storage volume (m^3)	Maximum area to be drained (m^2)
1	0.19	19.0[2]
2	0.38	25.0[2]
3	0.57	28.5[3]
4	0.76	38.0[3]
5	0.95	47.5[3]
6	1.14	57.0[3]

(1) When doubt exists over suitability of ground for infiltration permeability, figures should be derived by test (see BRE Digest 365).
(2) In accordance with Approved Document H.
(3) In accordance with BS EN 752 : 2008, clause NA 4.4.8.

6.3 When the BRE or CIRIA approach is used, the design volumes and areas for trench or cuboid type installations can be found from Tables 3 and 4.

Table 3 Data for use in hydraulic design — one unit wide trench configurations

Number of units high	System volume (m^3)	Vertical surface area around sides and ends of tank (m^2)	Surface area beneath base of tank (m^2)
1	0.19	1.2	0.5
2	0.38	2.4	0.5

Table 4 Data for use in hydraulic design — three-dimensional system, two units high

System length (units long) (1 m side)	2 wide (0.5 m side)			4 wide (0.5 m side)			8 wide (0.5 m side)		
	volume (m^3)	side (m^2)	base (m^2)	volume (m^3)	side (m^2)	base (m^2)	volume (m^3)	side (m^2)	base (m^2)
1	0.76	3.2	1.0	1.52	4.8	2.0	3.04	8.0	4.0
2	1.52	4.8	2.0	3.04	6.4	4.0	6.08	9.6	8.0
4	3.04	8.0	4.0	6.08	9.6	8.0	12.16	12.8	16.0
8	6.08	14.4	8.0	12.16	16.0	16.0	24.32	19.2	32.0
10	7.60	17.6	10.0	15.20	19.2	20.0	30.40	22.4	40.0
100	76.00	161.6	100.0	152.00	163.2	200.0	304.00	166.4	400.0

6.4 For calculations, the size and volume of the units are given in Table 1. The total areas of the base and sides are required as water is absorbed through the geotextile soil interface. Storage volume is 95% of the total volume. As an example, using Table 4, for a typical system 1 metre wide (two units) linear trench 40 m long and two units high, the volume is 0.76 x 40 = 30.4 m^3 and the side area 3.2 x 40 = 128 m^2.

Attenuation

Calculation principles

6.5 The anticipated total run-off volume from the site is estimated. The most commonly-used method for evaluating storm rainfall events in the UK is the Wallingford Procedure by which the total rainfall level of storms over defined time periods ranging from five minutes up to 48 hours is assessed. The allowable discharge rate from the site to an appropriate outfall is established, which will normally be set by the Environment Agency, Scottish Environmental Protection Agency or Planning Authorities. The volume to be stored underground in the system is then determined and the number of units needed to contain this volume is calculated on the basis that the storage volume is equal to 95% of the total volume of the system.

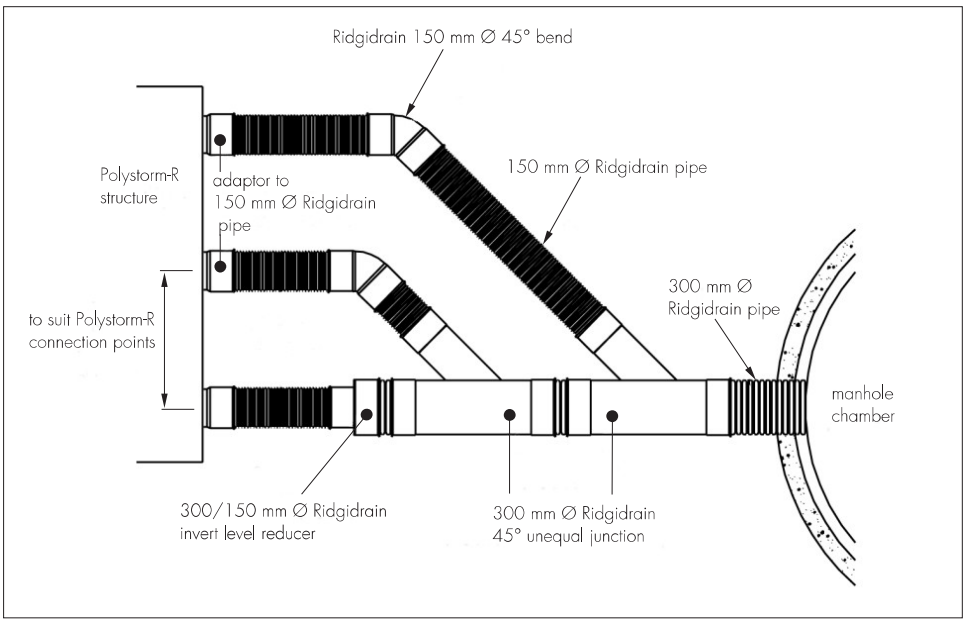
Connections

6.6 Connection is made to the system using a preformed socket and adaptor.

Manifold design

6.7 The units are manufactured to allow a connection to be formed by insertion of 160 mm diameter BS EN 1401-1 : 2009 pipes into the convenient knock-out incorporated in each cell. The capacity of a 160 mm pipe is limited and may be insufficient for the anticipated design flow. The flow may be split amongst a number of 160 mm pipes connected to a manifold to provide increased hydraulic capacity (see Figure 3). The system designer should ensure the pipework connecting the Polystorm-R units to the drainage system has sufficient capacity to cope with the design flow.

Figure 3 Typical manifold design



Flow control

6.8 The outflow from the system must be controlled to comply with the discharge rate consent of the site. The main methods to achieve outflow control are: orifice plate, vortex control or small pipe. Comparative features and benefits of these various control flow devices should be considered prior to selection.

Outflow positioning and head calculations

6.9 The invert level of the outflow pipe should be flush with the bottom of the lowest unit to allow the system to drain. As the system fills, a depth of water develops on the upstream side of the outflow control. For a system with two layers of units, this depth is 0.8 m when the units are full, creating a driving head to push the flow through the control device. For design purposes, the head used in calculations is taken as that at the invert line of the outflow device.

7 Structural performance

General

7.1 The structural design of each installation incorporating the system should be verified by a suitably qualified and experienced engineer.

7.2 Guidance on the design and installation of systems incorporating the units can be found in CIRIA Report C680. Consideration should be given to the effects of cumulative deflection in systems comprising several layers of units.

7.3 The system can be placed under landscaped or car park areas. For areas where greater loads are anticipated, these applications are outside the scope of this Certificate. Advice should be sought from the Certificate holder.

7.4 Care should be taken when the system is used for infiltration below trafficked areas and close to structures. It is important to ensure that the infiltrating water will not soften the soils or cause loss of fines and settlement.

7.5 The engineer responsible for the design of the installation must confirm that the ground-bearing capacity at the formation level is sufficient for the proposed operational loads. In areas of weak or compressible soils, advice should be sought from a geotechnical engineer.

7.6 When the system is wrapped in an impermeable geomembrane and placed below the groundwater table, flotation may occur. To prevent this, the weight of the soil over the top of the system must be greater than the uplift force caused by the system's buoyancy in the water. This can be achieved with most types of fill if the depth of cover fill is equal to, or greater than, the depth of penetration of the system below groundwater level.

Unit performance characteristics

7.7 Characteristic compressive strength at the yield point and elastic deflection values for the system have been determined from independent, short-term tests (see Table 5).

Table 5 Short-term performance values

Element (unit)	Value
Characteristic compressive strength at yield ($kN \cdot m^{-2}$)	
vertical loading on top face	610
lateral loading on side face	63
Short-term deflection (mm per $kN \cdot m^{-2}$) (applied load)	
vertical loading on top side face	1 per 60
lateral loading on side face	1 per 4.4

7.8 The following equations have been established from creep tests, on a single unit, exceeding 9,000 hours and can be used to estimate the long-term vertical and lateral deflection for periods up to 60 years at 20°C (see Table 6).

Table 6 Equations for estimating long-term creep deflection

For loads up to ($kN \cdot m^{-2}$)	Equation for estimation of long-term deflection
162 (vertical)	Deflection = 0.2798 Ln [time (hours)] + 0.4855
31 (lateral)	Deflection = 1.0192 Ln [time (hours)] – 3.8674

7.9 The following partial load and material factors, as defined in CIRIA Report C680, should be used for design (Table 7).

Table 7 Partial factors for loads and materials

Description	Ultimate limit state	Serviceability limit state
Partial factors for loads		
Vertical dead-load (F_{dl})	1.40	1.00
Earth pressure (horizontal) + hydrostatic (horizontal) load (F_{ep})	1.35	1.00
Imposed live-load (F_{ll})	1.60	1.00
Partial safety factors for materials (F_m)	2.75	1.50

7.10 Example maximum installation depths and minimum depths of cover calculated as described in this section and in accordance with CIRIA Report C680 are shown in Tables 8, 9 and 10:

For small-scale applications such as soakaways for individual house roof drainage — the system is located below a garden a minimum of 5 m from the building, inaccessible to motor vehicles. Table 8 indicates the maximum depth and minimum cover.

Table 8 Design criteria for use of Polystorm-R as soakaway for an individual house(1)

Criterion	Value
Maximum depth to base of system (m)	2.74
Minimum depth of cover required over system to prevent accidental damage (m)	0.50

(1) The following assumptions apply:
- soakaway constructed in sandy gravels with a soil weight not exceeding 20 $kg.m^{-3}$ and angle of shearing resistance for surrounding soil not less than 30°
- groundwater at least one metre below the base of the units
- soakaway located beneath small gardens or landscaped areas, no vehicles in accordance with CIRIA C680, Table 4.2.

For installation below landscaped and lightly-trafficked areas — the information given in Tables 9 and 10 are only applicable in temperate climate conditions such as those in the UK. Site specific calculations should be carried out for configurations and prevailing ground conditions other than those shown.

Table 9 Maximum installation depths (to base of system)

Typical soil type	Soil weight ($kN \cdot m^{-3}$)	Angle of friction (φ)	Maximum installation depth (from invert of structure) (m)			
			No groundwater present		Groundwater level 1.0 m below ground level (attenuation structure	
			Trafficked (cars only)[1]	Non-trafficked[2]	Trafficked (cars only)[1]	Non-trafficked[2]
Over consolidated stiff clay	20	24°	1.96	2.21	1.65	1.79
Silty sandy clay	19	26°	2.22	2.48	1.76	1.90
Loose sand and gravel	18	30°	2.74	3.02	1.93	2.06
Medium-dense sand and gravel	19	34°	3.09	3.35	1.98	2.09
Dense sand and gravel	20	38°	3.51	3.76	2.08	2.18

(1) Trafficked areas taken as driveways to individual houses and car parks with height barrier to limit vehicle size with vehicles up to 3,000 kg gross vehicle weight (GVW), defined in CIRIA C680, Table 4.2.

(2) Non-trafficked areas taken as small gardens or landscaped areas where no vehicles are used, defined in CIRIA C680, Table 4.2.

Notes:

- Calculations are based on tanks comprising two layers of units.
- The load spread through asphaltic surfaces (for trafficked areas) is assumed to be 27°. The load spread through landscaped areas is taken as ϕ.
- Ground surface is horizontal.
- Shear planes or other weaknesses are not present within the structure of the soil.
- Weight of ground water taken as 10 $kN \cdot m^{-3}$.
- Accidental loading is not considered.
- Partial load and material factors shall be as defined in Table 7.

Table 10 Minimum cover depths over Polystorm-R

Live load conditions	Landscaped area[1]	Trafficked	
		Car park with vehicle mass <3000 kg[2]	Car park with occasional vehicle mass <9000 kg[3]
Minimum cover depth required (m)	0.50	0.50	0.85

(1) Landscaped areas taken as small gardens or landscaped areas where no vehicles are used, defined in CIRIA C680, Table 4.2.

(2) Trafficked areas taken as driveways to individual houses and car parks with height barrier to limit vehicle size with vehicles up to 3,000 kg gross vehicle weight (GVW), defined in CIRIA C680, Table 4.2.

(3) Trafficked areas taken as car parks with vehicles up to 9,000 kg gross vehicle weight (GVW), defined in CIRIA C680, Table 4.2.

Notes:

- Calculations are based on tanks comprising one layer of units.
- Assumes angle of friction of the surrounding soil of 38° and a soil weight of 20 $kN \cdot m^{-3}$. Groundwater must be at least one metre below base of units.
- The load spread through asphaltic surfaces (for trafficked areas) is assumed to be 27°. The load spread through landscaped areas is taken as ϕ.
- Ground surface is horizontal.
- Shear planes or other weaknesses are not present within the structure of the soil.
- Calculations based on there being no groundwater present.
- Accidental loading is not considered.
- Partial load and material factors shall be as defined in Table 7.

8 Geotextiles and geomembranes

Infiltration

8.1 The system requires a geotextile wrapping when used as an infiltration device to prevent:

- silt that may be contained in the surface water run-off from contaminating the surrounding soil, in addition to reducing its permeability
- surrounding soil from entering the units.

8.2 Selection of an appropriate geotextile requires careful consideration (see section 8.6).

Attenuation

8.3 The system requires a sealed geomembrane wrapping to create an attenuation storage tank and prevent:

- the release of surface water into the surrounding ground
- inflow of groundwater that may overload downstream systems and contain pollutants on contaminated sites.

8.4 Site conditions may require the use of a thick, protective geotextile to prevent puncture or excessive strain in the geomembrane, on which further advice should be sought from the geomembrane manufacturer.

8.5 Selection of an appropriate geomembrane requires careful consideration (see section 8.6).

8.6 A recognised design methodology is to follow these steps:

- define the application filter requirements — retention (attenuation storage) or permeability (soakaway)
- define boundary conditions — site investigation to establish in-situ soil parameters, enabling lateral earth pressures and water flow conditions to be calculated

- determine soil retention requirements — using the in-situ soil parameters, determine if additional bed and surround measures should be specified
- determine geosynthetic permeability requirements — the breakthrough head should be considered in addition to water flow rates
- determine anti-clogging requirements (infiltration only) — ensure that the porosity of the geotextile in conjunction with the specified bed and surround is sufficient to prevent the geotextile from prematurely clogging
- determine resistance to mechanical damage requirements — the geosynthetic should be sufficiently robust to survive installation activities
- determine durability requirements — consideration should be given as to whether the geosynthetic will be subjected to a significant chemical exposure, either present in the ground or rainwater run off
- miscellaneous design considerations:
  - intrusion of geosynthetic into drainage layer
  - biological and bio-chemical clogging factors
  - safety factors.

8.7 All joints should be sealed, using proprietary techniques recommended by the manufacturer. Advice on seam testing procedures is given in CIRIA Report SP124.

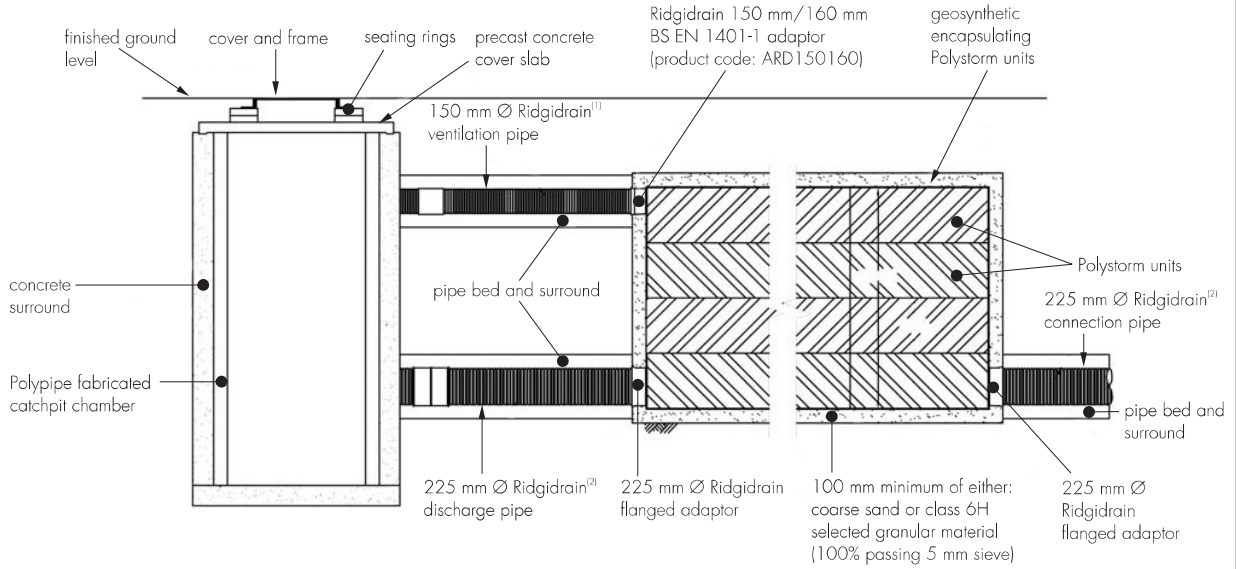
8.8 The designer/installer should confirm with the geosynthetic manufacturer that the specification of the proposed material is suitable for the application and site conditions by following the design methodology (see section 8.6).

9 Venting

9.1 Adequate venting must be provided to the system. As a minimum, one 110 mm diameter air vent is required per 7500 m^2 of impermeable catchment area to be drained (see Figure 4). Air vent connections and pipework for use with this system are outside the scope of this Certificate.

9.2 Typical air vent connectors and pipework can be seen in the Certificate holder's *Design Manual*. It is recommended that all air vent installations in storage applications (using a geomembrane) are made using a flange adaptor. Thermal welding, adhesive or double-sided tape should be used between the geomembrane and flange adaptor to ensure a watertight seal.

Figure 4 Typical Polystorm-R arrangement including ventilation pipe



(1) Alternative ventilation pipes are 160 mm pipes to BS EN 1401-1 : 2009 or 150 mm Polysewer.
(2) Alternative discharge and connection pipes are pipes to BS EN 1401-1 : 2009 or 225 mm Polysewer.

10 Resistance to chemicals

10.1 An assessment by the BBA indicates that the components of the system are suitable for use in contact with the chemicals likely to be found in rainwater.

10.2 An assessment of the suitability for use of the system on brownfield sites should be made only after a suitable site (outside the scope of this Certificate) investigation to determine the possibility for chemical attack. Particular care must be taken where acids and organic solvents are present at high concentrations. Further information can be obtained from the Certificate holder.

11 Maintenance

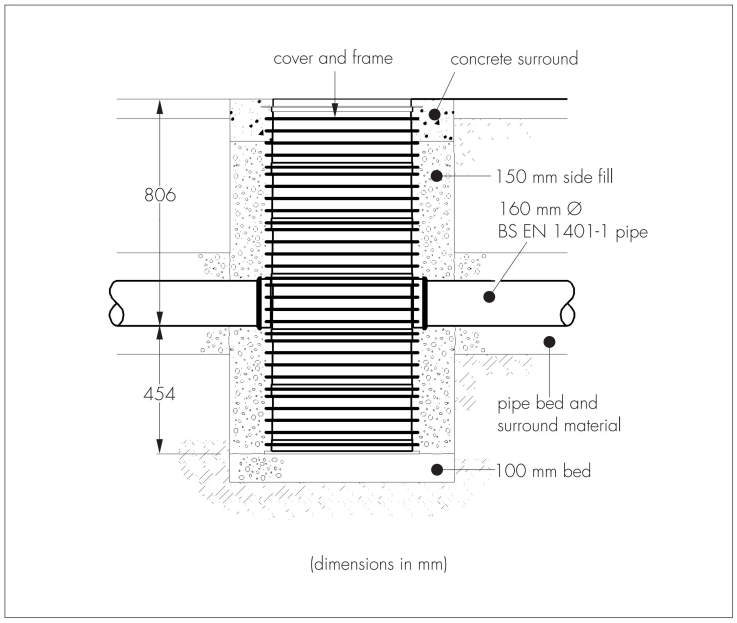
11.1 The owner of the structure is responsible for maintenance.

11.2 For soakaways to individual houses, the only necessary maintenance of the system is to keep all gullies clear of debris such as leaves.

11.3 For large installations or where the receiving waters are environmentally sensitive, a system of regular inspections should be established to prevent siltation of the system which, if allowed to develop, would reduce effectiveness. They should also be inspected after every major storm event.

11.4 It is recommended that a silt trap is incorporated into the pipework at the inlet to the tank (see Figure 5). There must be a maintenance plan that ensures regular cleaning of the trap to ensure correct performance.

Figure 5 Typical silt trap



11.5 For all flow control devices it is sensible to incorporate access (via a manhole or similar) to the location of the pipe entry, orifice or vortex control. This will enable easy removal of any blockage. The orifice itself may be protected by a debris screen.

11.6 Paved surface areas above an installation should be inspected at the same time to ensure the system continues to provide the required structural support.

12 Durability

The structural properties of the recycled polypropylene used in the components of the system will deteriorate with time and should be taken into account at the design stage by the application of suitable safety factors. In the opinion of the BBA, the system, when used in accordance with this Certificate, will have a life in excess of 60 years.

13 Reuse and recyclability

The units consist of polypropylene material which is readily recyclable.

14 General

The Polystorm-R Stromwater Management System should be installed in accordance with the Certificate holder's installation instructions and relevant legislation. Special attention should be paid to temporary work requirements in excavations.

15 Procedure

15.1 The hole or trench is excavated to the required plan, dimensions and level ensuring that the excavation will allow installation of connecting pipework. It must be ensured that sufficient construction plant access is maintained for reinstating around the installed system. The base must be smooth and level without sharp drops or humps. Slopes must be cut to a safe angle or adequately supported and safe access must be provided to allow personnel to enter the excavation. Excavation should be carried out in accordance with BS 6031 : 2009, with particular attention paid to safety procedures.

15.2 It must be ensured that the ground-bearing capacity at formation level is adequate for the design loads.

15.3 The base must be inspected for soft spots in the formation — any present must be excavated and replaced with compacted granular fill material.

15.4 For an attenuation application, a 100 mm thick bedding layer of coarse sand is laid on the base of the excavation. The geotextile protection fleece is laid on base and sides, if required. The geomembrane is laid over the sand bedding/fleece and up the sides of the excavation. Joints should be made in accordance with the manufacturer's recommendations with allowance made for connecting pipework or adaptors. The geomembrane and joints are inspected for damage.

15.5 For an infiltration application, a 100 mm thick bedding of either coarse sand or Class 6H selected granular material [with 100% passing the 5 mm sieve, in accordance with the Manual of Contract Documents for Highway Works (MCHW), Volumes 1 and 2] is laid on the base of the excavation. The geotextile is laid over the bedding and up the sides of the excavation and joints formed in accordance with the manufacturer's recommendations, and allowance made for connecting pipework or adaptors.

15.6 The system is installed in accordance with the installation schedule for correct orientation. Wherever possible, continuous vertical joints should be avoided. The units are arranged within the system so that preformed sockets are in the correct alignment for inlet and outlet pipes. For single-layer applications, Polystorm clips (four per unit) are used only and for multi-layers Polystorm clips, in conjunction with shear connectors and brick-bond connectors (when using brick-bond arrangement) are used.

15.7 The geotextile or geomembrane encapsulation to base, sides and top of installation, including protective geotextile (where required) is completed. Geomembranes must be welded in accordance with the manufacturer's recommendations. The geomembrane and/or geotextile are inspected for damage and all welds are tested as required.

15.8 Drainage connections are made to the installation using proprietary adaptors. Preformed socket positions for pipe connections must be located at the correct position for receiving pipework. In attenuation applications, all pipe connections penetrating the geomembrane must be adequately sealed.

15.9 The installation is backfilled around the side of the encapsulated system to form a 100 mm layer of coarse sand or Class 6H selected granular material immediately adjacent to the system. Any remaining excavated areas around the system are backfilled with Class 6N or 6P selected granular material in accordance with the MCHW, Volumes 1 and 2. The backfill is compacted in 150 mm layers.

15.10 A coarse sand protection layer 100 mm thick should be placed over the top of the system that are wrapped in either a geotextile (infiltration system) or a geomembrane with protective geotextile (attenuation system). Backfilling is continued with:

- trafficked areas (eg restricted access car parks) — Type 1 or 2 sub-base material compacted in 150 mm layers in accordance with the MCHW, Volumes 1 and 2. Compaction plant over the top of the system must not exceed 2300 kg per metre width. Where the system is to be installed beneath a paved area the pavement sub-base may form part of the backfill material provided minimum cover depths are maintained
- landscaped and non-trafficked areas — selected as-dug material with size of particles less than 40 mm within 300 mm of top of system. Above this level selected as-dug material may be used. Backfill is placed and compacted in layers no greater than 300 mm thick. Compaction plant over top of system must not exceed 2300 kg per metre width.

15.11 The pavement construction or landscaping is completed over the system.

Technical Investigations

16 Tests

Tests were carried out on the system to determine:

- short-term resistance to vertical and horizontal loading
- long-term resistance to vertical and horizontal loading
- volumetric capacity.

17 Investigations

17.1 The manufacturing process was examined including the method adopted for quality control, and details obtained on the quality and composition of the material used.

17.2 An assessment of the system was made in relation to:

- material properties
- design procedures.

17.3 A site visit was made to assess the practicability and ease of installation and connection.

Bibliography

BRE Digest 365 *Soakaway Design.*

BS 6031 : 2009 *Code of practice for earthworks*

BS EN 752 : 2008 *Drain and sewer systems outside buildings*

BS EN 1401-1 : 2009 *Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinylchloride) (PVC-U) — Specifications for pipes, fittings and the system*

BS EN ISO 9001 : 2000 *Quality management systems — Requirements*

CIRIA Report 156 *Infiltration drainage — Manual of good practice*

CIRIA Report C680 *Structural design of modular geocellular drainage tanks*

CIRIA Report C697 *The SUDS manual*

CIRIA Report SP124 : 1996 *Barriers, liners and cover systems for containment and control of land contamination*

Manual of Contract Documents for Highway Works, Volume 1 *Specification for Highway Works*

Manual of Contract Documents for Highway Works, Volume 2 *Notes for Guidance on the Specification for Highway Works*

PPS25, *Development and Flood Risk.*

18 Conditions

18.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

18.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

18.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

18.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

18.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

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Polystorm-R Modular Cell

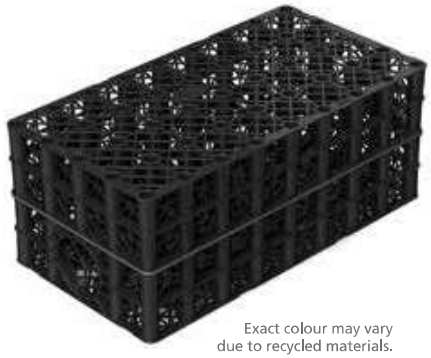
Data Sheet

PRODUCT INFORMATION P1 ISSUE 4 - SEPT 2017

Product code: PSM1A

The Polystorm-R modular cell is ideally suited for loaded applications at greater depths, such as housing, commercial and infrastructure projects and has a compressive strength of up to 61 tonnes/m². It offers all the proven performance of the Polystorm cell, with the added benefits of being manufactured from over 90% recycled material content.

Wherever performance criteria and standards allow, we will always maximise the sustainability of our products by using post consumer plastics in their manufacture. By sourcing and carefully controlling the quality of the recycled material we use our precision injection moulding. Therefore we are able to guarantee consistent quality in our recycled plastic, giving you the confidence and the performance levels you expect from the market leader.



Exact colour may vary due to recycled materials.

Key Benefits

- Made from specially selected and controlled recycled materials
- Environmentally friendly, sustainable solution
- Has undergone stringent testing to ensure product performance
- Compressive strength of 61 tonnes/m²
- Ideal for retention, attenuation and infiltration applications with a suitable geomembrane or geotextile
- BBA approved
- Allow flexibility of shape - ideal for shallow excavation systems, narrow strips or use in restricted areas
- Can be used as part of a value engineered hybrid system with Polystorm, Polystorm Lite and Polystorm Xtra
- Integrated inlet and outlet
- 3D flow throughout the structure
- 95% void ratio
- Light weight yet robust - excellent Health and Safety and installation benefits
- 60 years creep limited life expectancy

Technical Support

Detailed guidance and assistance is available.
For further information, please contact our Technical Team on **+44 (0) 1509 615100** or email **civils@polypipe.com**

BBA BRITISH BOARD OF AGRÉMENT
CERTIFICATE No. 06/4297

ELEMENT	VALUE
PHYSICAL PROPERTIES	
Length	1m
Width	0.5m
Depth	0.4m
Total volume	0.2m³
Unit weight	9kg (approx)
Unit storage volume	0.19m³ (190 litres)
Void ratio	95%
SHORT TERM COMPRESSIVE STRENGTH	
Vertical	610 kN/m² **
Lateral	63 kN/m² **
SHORT TERM DEFLECTION	
Short-term vertical deflection	60 kN/m² per mm
LONG TERM DEFLECTION	
Estimated long term vertical deflection (creep)	0.2798 Ln (design life in hrs) +0.485 [Based on an applied test load = 162 kN/m²] Creep data limit 60 years
Estimated long term lateral deflection (creep)	1.0192 Ln (design life in hrs) -3.864 [Based on an applied test load = 30.8 kN/m²] Creep data limit 60 years

Note: Polystorm-R is ideal for use in trafficked and pedestrian applications subject to a structural design check and suitable installation conditions

* Each unit includes 4 Clips and 2 Shear Connectors.

** Compressive strength at yield, maximum recommended value for design purposes.

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Polypipe

Polystorm-R Modular Cell

Data Sheet

RECOMMENDED MAXIMUM DEPTH OF INSTALLATION (to cell invert) [m]

TYPICAL SOIL TYPE	TYPICAL ANGLE OF SHEAR RESISTANCE	SOIL WEIGHT kN/m³	WITHOUT GROUNDWATER (below base of cells) NORMAL CASE		WITH GROUNDWATER AT 1M BELOW GROUND LEVEL AND UNITS WRAPPED IN GEOMEMBRANE	
			Pedestrian	Trafficked (cars) <3000kg GVW	Pedestrian	Trafficked (cars) <3000kg GVW
Stiff over consolidated clay e.g. London clay	24	20.0	2.2	1.9	1.8	1.6
Normally consolidated silty sandy clay e.g. alluvium, made ground	26	19.0	2.4	2.2	1.9	1.7
Loose sand and gravel	30	18.0	3.0	2.7	2.0	1.9
Medium dense sand and gravel	33	19.0	3.2	2.9	2.0	1.9
Dense sand and gravel	38	20.0	3.7	3.5	2.1	2.0

Note:
1) Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)
2) Assuming water density = 10.0kN/m³
3) Assumed ultimate limit state (ULS) partial factor of safety applied to: Material = 2.75 Lateral pressure = 1.35

Durability

The polymer material used in the manufacture of the Polystorm-R unit has an adequate resistance to attack from the type and quantities of chemicals that may be expected to naturally occur in uncontaminated soils and rainwater runoff. When installed in accordance with our recommendations, it is expected that the Polystorm-R unit will have a design life in excess of 60 years*. The installer of a proposed geocellular structure should ensure that an appropriate design check has been undertaken, in accordance with the recommended methodology and factors of safety given in CIRIA C680 (2008), Structural Design of Modular Geocellular Drainage Tanks, prior to the commencement of construction activities.

* Derived from long term extrapolated creep testing

Notes

1. Unless stated, all values are nominal and may vary within normal production tolerances.
2. The characteristic unit parameters stated have been based on Polypipe BBA certificate N° 06/4297, sheet 3.
3. Polypipe reserve the right to change product specifications without prior notice.
4. This document is uncontrolled and updates will not be issued automatically.

RECOMMENDED MINIMUM COVER LEVELS [m]

LIVE LOAD CONDITIONS	PEDESTRIAN	LIGHT TRAFFICKED	
		Car park with vehicle mass <GVW	
Minimum cover depth required (m)	0.50	<3000kg 0.50	<9000kg 0.65

Note
1) Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)
2) Assumed serviceability limit state (SLS) partial factor of safety applied to: Material = 1.5 Live load = 1.0 Dead load = 1.0
3) Shallower minimum burial depths may be applicable subject to an assessment of the specific site conditions. For further details please consult our Technical Team on 01509 615100.

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CQA Record

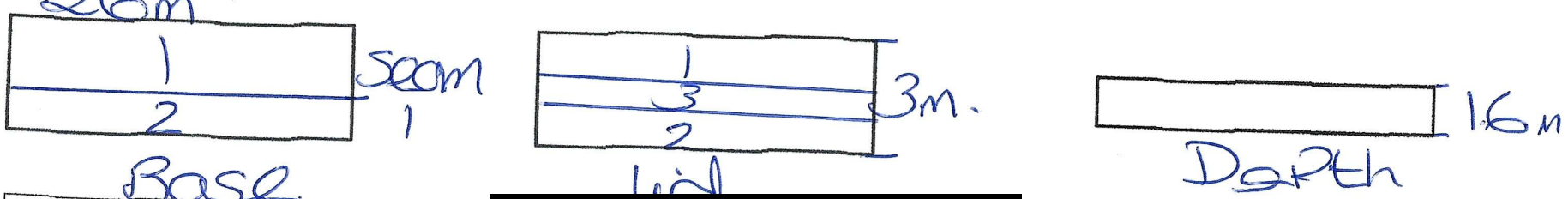
(TANK 1) P.O. 303128.

HydroWMS
Complete Water Management Solutions

Site	Louisa St Marshall Manchester	Contractor	Westchurch Homes	Date	21/02/23
Supervisor	George	Technicians	Dean.		

Roll No	Operator	Machine No	Panel No	Seam No	Date	Time	Length	A/T Start Time	A/T Start Bar	A/T End Time	A/T End Bar
CU1 23 08/0271	George	RL2	1.2	1	1123	1220	30200	1238	1	1232	1

Start Up Type	Wedge	Operator	George	Time	1220	Date	1123	Machine	RL2	Temp	400	Speed	750
Start Up Type		Operator		Time		Date		Machine		Temp		Speed	
Start Up Type		Operator		Time		Date		Machine		Temp		Speed	



Measure Agreed	26 × 3 × 1.6	Signed	[redacted]	On Behalf Of	Hydro WMS
		Signed		On Behalf Of	Westchurch Homes

CQA Record

(TANK 2) P.O. 303128.

HydroWMS
Complete Water Management Solutions

Site	Louisa St Openshaw manchester	Contractor	Westchurch Homes	Date	1 11 23
Supervisor	George	Technicians	Dean		

Roll No	Operator	Machine No	Panel No	Seam No	Date	Time	Length	A/T Start Time	A/T Start Bar	A/T End Time	A/T End Bar
041/23 08/0271	George	RRL2	1-2	1	31023	1150	15,400	1156	1	1152	1

Start Up Type	Wedge	Operator	George	Time	1150	Date	31023	Machine	RRL2	Temp	400	Speed	750
Start Up Type		Operator		Time		Date		Machine		Temp		Speed	
Start Up Type		Operator		Time		Date		Machine		Temp		Speed	

12m

Panel 1 / 2 — Seam 1

1 / 3 / 2 — 5m

Lid

1.2m

Depth.

Base.

Measure Agreed	12m x 5m x 12m	Signed	[redacted]	On Behalf Of	Hydro wms
		Signed		On Behalf Of	Westchurch Homes

APPENDIX 6

SUDS MAINTENANCE REQUIREMENTS

HydroWMS
Complete Water Management Solutions

Hydro Water Management Solutions Maintenance Requirements

Regular inspection and maintenance is required to ensure the effective long term operation of below ground modular storage systems. The following table details the recommended maintenance requirements for modular systems.

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required take remedial action.	Monthly for 3 months then annually
	Debris removal from catchment surface (where may cause risk to performance)	Monthly or as required
	Remove sediment from pre-treatment structures and/or manifold connections	Monthly or as required
Remedial actions	Repair/rehabilitation of inlets/outlets, overflows and vents	Annual inspection or as required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build up and remove if necessary	Annually and after large storms

The maintenance plan and schedule should be developed during the design phase. Specific maintenance requirements should be identified based on upstream drainage sedimentation controls and the schedule developed to suit these needs.

Maintenance details should be detailed in the project Health & safety file and a risk assessment should be undertaken and recorded.

Note,
It is generally recommended that the cells be flushed through with large volumes of water under low pressure.

Certain modular units will allow higher pressure jetting to remove larger objects or heavier deposits of sediment. These modules can be accessed via integral access chambers (where applicable) and surveyed/flushed in a linear fashion or alternately water can be flushed/jetted through via the inlet/outlet pipe connections.

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