

Job No: 2474E

14th January 2025

Pennywood, Hollybush Ride, Finchampstead

Existing Surface Water Assessment and Improved Drainage Strategy

Surface Water Drainage

It is our understanding that planning enforcement action has been taken against the developer, due to the hard-paving of the driveway and parking areas, which is contrary to the planning approval.

It has been requested that the drainage system be assessed and improved to accommodate a 1 in 100 year + 40% climate change event.

Having received surveyed information in respect of the already installed surface water drainage system, we can confirm that the current drainage will not accommodate a 1 in 100 year +40% storm event, however to remedy this, we recommend that the channel drain at the rear of the patio be removed, and allow run-off from the patio to drain directly on to the soft landscaping which falls away from the house to the woodland, this would usually be the preferred method of draining a patio. Removing this run-off from approximately 400m² of hard standing significantly improves the performance of the surface water network.

In addition to this, after carrying out hydraulic-modelling, it has been established that storage attenuation should be provided in the volume of approximately 34 cubic metres, this can be provided in the form of geocellular storage units with overall dimensions of 4.5m wide, 10m long and 0.8m deep, the surface water will drain through these units, discharging to a flow control manhole with a flow restriction of 4 l/s, which is the lowest practical rate in this instance. The surface water ultimately discharges at a maximum rate of 4 l/s for all storms up to and including the 1 in 100 year +40% event, to a watercourse within woodland inside the site curtilage.

Hydraulic Modelling has been carried out to support this, and is attached at the end of this report, along with a Drainage Layout outlining the measures to be taken to improve the surface water drainage system on-site.

Maintenance Management Plan

The maintenance requirements for each proposed SuDS component is given below, based on the CIRIA report C753 "The SuDS Manual".

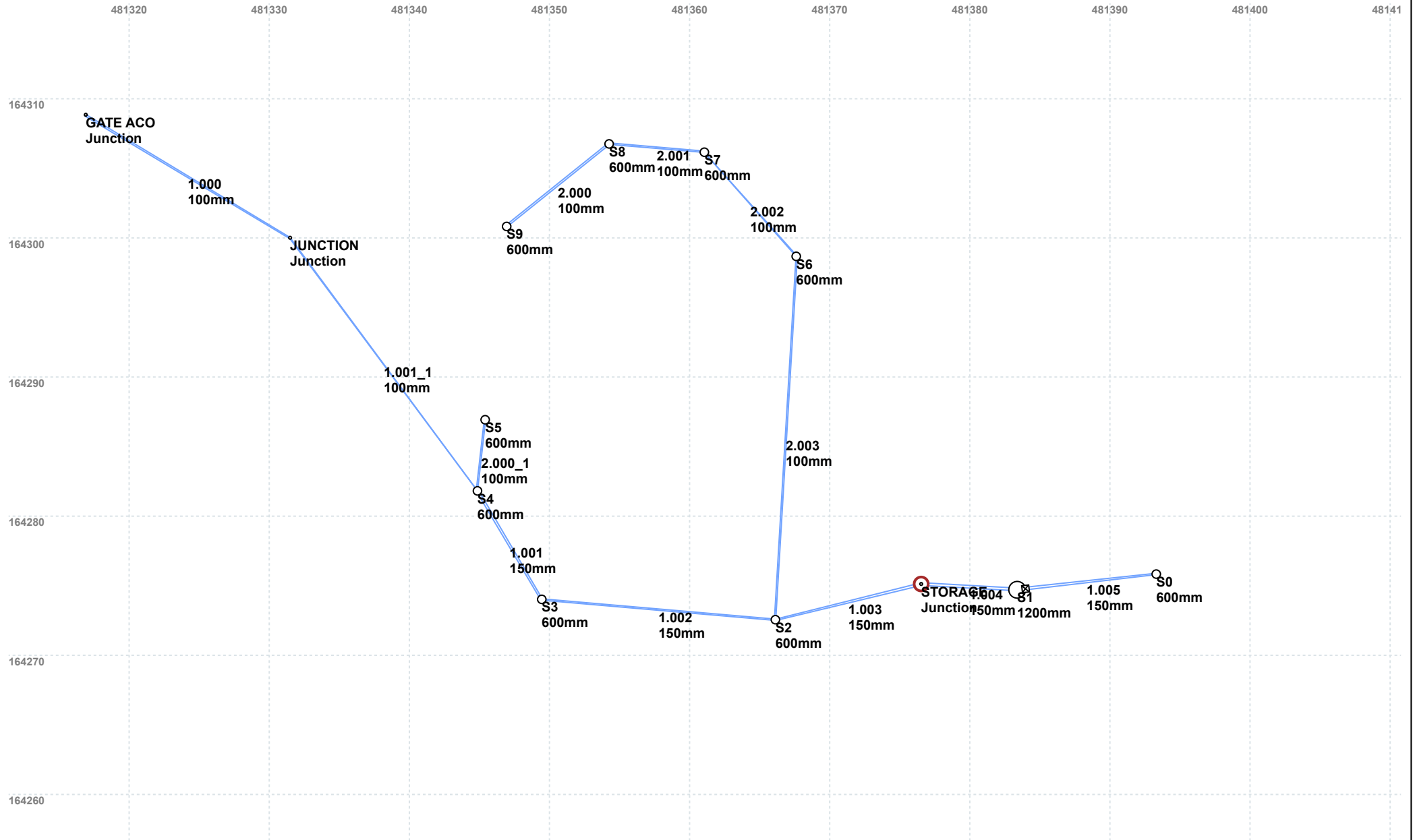
The maintenance of the private drainage system will be the responsibility of the property owner or their appointed maintenance company.

Drainage Pipes and Inspection Chambers/Manholes and Flow Control

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove sediment and debris from inspection chambers, gullies, channel drains and flow control manhole.	Annually
	Cleaning of gutters and any filters on downpipes.	Annually
	Remove any root ingress	As required
Occasional Maintenance	CCTV Survey of drains to check for cracking, misalignment, blockage.	10 year interval

Attenuation Tank

Maintenance Schedule	Required Action	Typical Frequency
Occasional Maintenance	CCTV Survey to check condition, to include jetting through and removal of any silt build-up.	10 year interval



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
STORAGE			74.740		2.222
S0			73.340	600	0.925
S1			74.100	1200	1.602
S2	0.021	4.00	74.970	600	1.300
S3	0.005	4.00	75.030	600	0.993
S4	0.006	4.00	75.080	600	0.946
S5	0.006	4.00	75.080	600	0.852
S6	0.009	4.00	75.030	600	1.098
S7	0.005	4.00	75.040	600	0.985
S8	0.005	4.00	75.030	600	0.855
S9	0.013	4.00	75.080	600	0.800
JUNCTION	0.023	4.00	74.850		0.540
GATE ACO	0.007	4.00	74.740		0.340

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	GATE ACO	JUNCTION	17.000	0.600	74.400	74.310	0.090	188.9	100	4.65	50.0
1.001_1	JUNCTION	S4	22.000	0.600	74.310	74.134	0.176	125.0	100	5.18	50.0
1.001	S4	S3	9.000	0.600	74.134	74.037	0.097	92.8	150	4.80	50.0
1.002	S3	S2	16.750	0.600	74.037	73.670	0.367	45.6	150	5.08	50.0
1.003	S2	STORAGE	6.000	0.600	73.670	73.183	0.487	12.3	150	5.16	50.0
1.004	STORAGE	S1	2.000	0.600	72.518	72.498	0.020	100.0	150	5.18	50.0
1.005	S1	S0	10.000	0.600	72.498	72.415	0.083	120.5	150	5.42	50.0
2.000	S9	S8	9.500	0.600	74.280	74.175	0.105	90.5	100	4.16	50.0
2.001	S8	S7	6.800	0.600	74.175	74.055	0.120	56.7	100	4.27	50.0
2.002	S7	S6	10.000	0.600	74.055	73.932	0.123	81.3	100	4.44	50.0
2.003	S6	S2	26.000	0.600	73.932	73.670	0.262	99.2	100	4.87	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	0.556	4.4	0.9	0.240	0.440	0.007	0.0
1.001_1	0.686	5.4	4.1	0.440	0.846	0.030	0.0
1.001	1.043	18.4	5.7	0.796	0.843	0.042	0.0
1.002	1.493	26.4	6.4	0.843	1.150	0.047	0.0
1.003	2.886	51.0	13.6	1.150	1.407	0.100	0.0
1.004	1.005	17.8	13.6	2.072	1.452	0.100	0.0
1.005	0.914	16.2	13.6	1.452	0.775	0.100	0.0
2.000	0.809	6.4	1.8	0.700	0.755	0.013	0.0
2.001	1.025	8.1	2.4	0.755	0.885	0.018	0.0
2.002	0.854	6.7	3.1	0.885	0.998	0.023	0.0
2.003	0.772	6.1	4.3	0.998	1.200	0.032	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 360 minute summer	31.221	8.034	100 year 720 minute summer	22.452	6.017
30 year 360 minute winter	20.295	8.034	100 year 720 minute winter	15.089	6.017
30 year 480 minute summer	24.324	6.428	100 year 960 minute summer	18.166	4.784
30 year 480 minute winter	16.160	6.428	100 year 960 minute winter	12.033	4.784
30 year 600 minute summer	19.756	5.404	100 year 1440 minute summer	12.896	3.456
30 year 600 minute winter	13.498	5.404	100 year 1440 minute winter	8.667	3.456
30 year 720 minute summer	17.490	4.687	100 year +40% CC 15 minute summer	488.233	138.153
30 year 720 minute winter	11.754	4.687	100 year +40% CC 15 minute winter	342.620	138.153
30 year 960 minute summer	14.215	3.743	100 year +40% CC 30 minute summer	320.551	90.705
30 year 960 minute winter	9.416	3.743	100 year +40% CC 30 minute winter	224.948	90.705
30 year 1440 minute summer	10.161	2.723	100 year +40% CC 60 minute summer	214.603	56.713
30 year 1440 minute winter	6.829	2.723	100 year +40% CC 60 minute winter	142.577	56.713
100 year 15 minute summer	348.738	98.681	100 year +40% CC 120 minute summer	129.587	34.246
100 year 15 minute winter	244.728	98.681	100 year +40% CC 120 minute winter	86.094	34.246
100 year 30 minute summer	228.965	64.789	100 year +40% CC 180 minute summer	97.729	25.149
100 year 30 minute winter	160.677	64.789	100 year +40% CC 180 minute winter	63.526	25.149
100 year 60 minute summer	153.288	40.510	100 year +40% CC 240 minute summer	75.977	20.078
100 year 60 minute winter	101.841	40.510	100 year +40% CC 240 minute winter	50.477	20.078
100 year 120 minute summer	92.562	24.461	100 year +40% CC 360 minute summer	56.677	14.585
100 year 120 minute winter	61.496	24.461	100 year +40% CC 360 minute winter	36.841	14.585
100 year 180 minute summer	69.806	17.964	100 year +40% CC 480 minute summer	43.979	11.622
100 year 180 minute winter	45.376	17.964	100 year +40% CC 480 minute winter	29.219	11.622
100 year 240 minute summer	54.269	14.342	100 year +40% CC 600 minute summer	35.604	9.738
100 year 240 minute winter	36.055	14.342	100 year +40% CC 600 minute winter	24.327	9.738
100 year 360 minute summer	40.484	10.418	100 year +40% CC 720 minute summer	31.433	8.424
100 year 360 minute winter	26.315	10.418	100 year +40% CC 720 minute winter	21.125	8.424
100 year 480 minute summer	31.414	8.302	100 year +40% CC 960 minute summer	25.432	6.697
100 year 480 minute winter	20.871	8.302	100 year +40% CC 960 minute winter	16.847	6.697
100 year 600 minute summer	25.431	6.956	100 year +40% CC 1440 minute summer	18.055	4.839
100 year 600 minute winter	17.376	6.956	100 year +40% CC 1440 minute winter	12.134	4.839

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	STORAGE	27	72.695	0.177	14.1	6.5091	0.0000	SURCHARGED
15 minute summer	S0	1	72.415	0.000	3.1	0.0000	0.0000	OK
30 minute winter	S1	27	72.694	0.196	3.5	0.2216	0.0000	SURCHARGED
15 minute winter	S2	10	73.736	0.066	18.7	0.0402	0.0000	OK
15 minute winter	S3	10	74.098	0.061	8.8	0.0233	0.0000	OK
15 minute winter	S4	10	74.207	0.073	7.9	0.0300	0.0000	OK
15 minute summer	S5	10	74.254	0.026	1.2	0.0109	0.0000	OK
15 minute winter	S6	11	74.018	0.086	6.2	0.0384	0.0000	OK
15 minute summer	S7	10	74.117	0.062	4.5	0.0236	0.0000	OK
15 minute winter	S8	10	74.223	0.048	3.5	0.0193	0.0000	OK
15 minute summer	S9	10	74.325	0.045	2.5	0.0274	0.0000	OK
15 minute winter	JUNCTION	10	74.398	0.088	5.7	0.0751	0.0000	OK
15 minute winter	GATE ACO	10	74.437	0.037	1.3	0.0153	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	STORAGE	1.004	S1	4.9	0.740	0.275	0.0311	
30 minute winter	S1	ACO Q-Brake	S0	3.4				10.9
15 minute winter	S2	1.003	STORAGE	18.5	2.562	0.363	0.0434	
15 minute winter	S3	1.002	S2	8.8	1.234	0.333	0.1191	
15 minute winter	S4	1.001	S3	7.8	1.029	0.425	0.0686	
15 minute summer	S5	2.000_1	S4	1.2	0.321	0.144	0.0193	
15 minute winter	S6	2.003	S2	6.0	0.939	0.985	0.1644	
15 minute summer	S7	2.002	S6	4.5	0.733	0.673	0.0608	
15 minute winter	S8	2.001	S7	3.5	0.796	0.434	0.0298	
15 minute summer	S9	2.000	S8	2.5	0.699	0.394	0.0340	
15 minute winter	JUNCTION	1.001_1	S4	5.5	0.823	1.022	0.1479	
15 minute winter	GATE ACO	1.000	JUNCTION	1.3	0.260	0.296	0.0845	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	STORAGE	50	72.902	0.384	17.8	15.3629	0.0000	SURCHARGED
15 minute summer	S0	1	72.415	0.000	4.0	0.0000	0.0000	OK
60 minute winter	S1	50	72.901	0.403	4.5	0.4554	0.0000	SURCHARGED
15 minute winter	S2	10	73.758	0.088	29.3	0.0533	0.0000	OK
15 minute winter	S3	11	74.118	0.081	14.0	0.0309	0.0000	OK
15 minute winter	S4	11	74.231	0.097	12.3	0.0400	0.0000	OK
15 minute summer	S5	10	74.263	0.035	2.2	0.0149	0.0000	OK
15 minute winter	S6	12	74.227	0.295	8.8	0.1317	0.0000	SURCHARGED
15 minute winter	S7	12	74.341	0.286	6.6	0.1100	0.0000	SURCHARGED
15 minute winter	S8	12	74.393	0.218	6.5	0.0870	0.0000	SURCHARGED
15 minute winter	S9	12	74.427	0.147	4.8	0.0896	0.0000	SURCHARGED
15 minute winter	JUNCTION	11	74.694	0.384	9.5	0.3271	0.0000	FLOOD RISK
15 minute winter	GATE ACO	11	74.710	0.310	2.6	0.1279	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	STORAGE	1.004	S1	5.0	0.733	0.279	0.0340	
60 minute summer	S1	ACO Q-Brake	S0	4.0				23.0
15 minute winter	S2	1.003	STORAGE	29.1	2.845	0.571	0.0614	
15 minute winter	S3	1.002	S2	14.0	1.386	0.532	0.1698	
15 minute winter	S4	1.001	S3	12.4	1.137	0.672	0.0979	
15 minute summer	S5	2.000_1	S4	2.2	0.416	0.265	0.0254	
15 minute winter	S6	2.003	S2	8.0	1.041	1.327	0.1965	
15 minute winter	S7	2.002	S6	5.8	0.745	0.869	0.0782	
15 minute summer	S8	2.001	S7	5.3	0.837	0.662	0.0532	
15 minute winter	S9	2.000	S8	4.7	0.764	0.743	0.0743	
15 minute winter	JUNCTION	1.001_1	S4	8.5	1.084	1.573	0.1716	
15 minute winter	GATE ACO	1.000	JUNCTION	2.7	0.344	0.616	0.1330	

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.93%

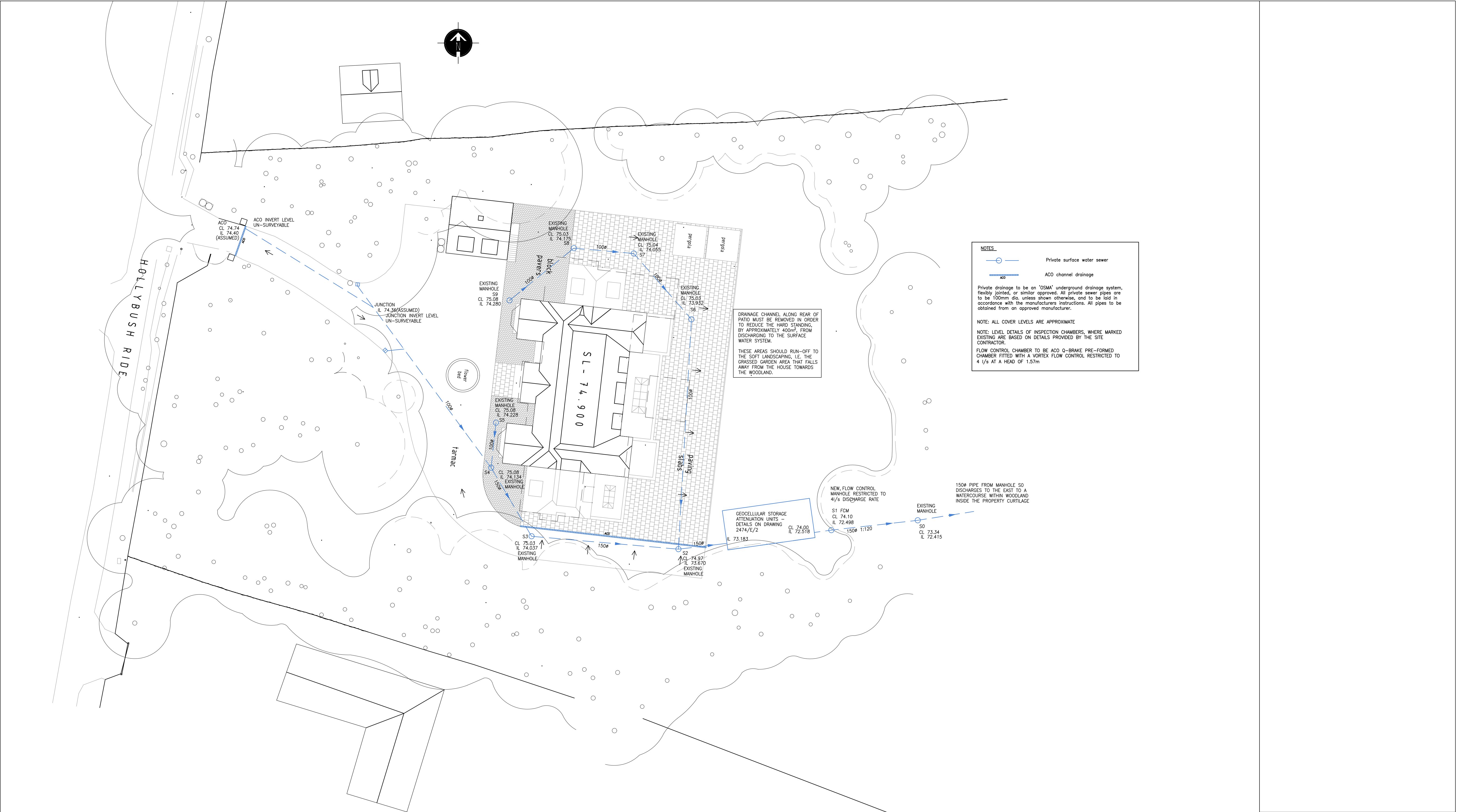
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	STORAGE	61	73.089	0.571	22.1	23.3530	0.0000	SURCHARGED
15 minute summer	S0	1	72.415	0.000	4.0	0.0000	0.0000	OK
60 minute winter	S1	61	73.088	0.590	4.5	0.6678	0.0000	SURCHARGED
15 minute winter	S2	10	73.771	0.101	35.4	0.0609	0.0000	OK
15 minute winter	S3	11	74.129	0.092	17.3	0.0354	0.0000	OK
15 minute winter	S4	11	74.247	0.113	15.1	0.0462	0.0000	OK
15 minute winter	S5	10	74.268	0.040	2.8	0.0170	0.0000	OK
15 minute winter	S6	12	74.403	0.471	9.8	0.2107	0.0000	SURCHARGED
15 minute winter	S7	12	74.544	0.489	7.2	0.1877	0.0000	SURCHARGED
15 minute winter	S8	12	74.608	0.433	6.9	0.1732	0.0000	SURCHARGED
15 minute winter	S9	12	74.654	0.374	6.2	0.2275	0.0000	SURCHARGED
15 minute summer	JUNCTION	11	74.850	0.540	12.0	0.5079	0.0000	FLOOD RISK
15 minute summer	GATE ACO	10	74.740	0.340	3.3	0.2162	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	STORAGE	1.004	S1	5.0	0.739	0.282	0.0247	
15 minute summer	S1	ACO Q-Brake	S0	4.0				18.6
15 minute winter	S2	1.003	STORAGE	35.2	2.955	0.690	0.0715	
15 minute winter	S3	1.002	S2	17.2	1.450	0.652	0.2000	
15 minute winter	S4	1.001	S3	15.1	1.178	0.819	0.1151	
15 minute winter	S5	2.000_1	S4	2.8	0.453	0.337	0.0269	
15 minute winter	S6	2.003	S2	9.2	1.181	1.515	0.2034	
15 minute winter	S7	2.002	S6	6.7	0.854	0.996	0.0782	
15 minute summer	S8	2.001	S7	6.0	0.842	0.740	0.0532	
30 minute summer	S9	2.000	S8	5.0	0.762	0.794	0.0743	
15 minute winter	JUNCTION	1.001_1	S4	10.3	1.314	1.907	0.1721	
15 minute winter	GATE ACO	1.000	JUNCTION	3.4	0.432	0.774	0.1330	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	STORAGE	60	74.056	1.538	29.3	33.1551	0.0000	SURCHARGED
15 minute summer	S0	1	72.415	0.000	4.0	0.0000	0.0000	OK
60 minute winter	S1	60	74.055	1.557	7.7	1.7606	0.0000	FLOOD RISK
60 minute winter	S2	60	74.060	0.390	29.3	0.2365	0.0000	SURCHARGED
15 minute winter	S3	11	74.150	0.113	22.3	0.0433	0.0000	OK
15 minute winter	S4	11	74.304	0.170	19.6	0.0697	0.0000	SURCHARGED
15 minute winter	S5	11	74.323	0.095	4.0	0.0404	0.0000	OK
15 minute winter	S6	12	74.719	0.787	12.0	0.3520	0.0000	SURCHARGED
15 minute winter	S7	13	74.921	0.866	8.9	0.3325	0.0000	FLOOD RISK
15 minute winter	S8	13	75.010	0.835	8.7	0.3341	0.0000	FLOOD RISK
15 minute winter	S9	12	75.073	0.793	8.6	0.4823	0.0000	FLOOD RISK
15 minute summer	JUNCTION	9	74.850	0.540	15.7	0.8917	0.0000	FLOOD RISK
15 minute summer	GATE ACO	9	74.740	0.340	5.2	0.4162	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	STORAGE	1.004	S1	7.7	0.774	0.434	0.0352	
600 minute winter	S1	ACO Q-Brake	S0	4.0				81.9
15 minute winter	S2	1.003	STORAGE	45.4	3.056	0.891	0.0890	
15 minute winter	S3	1.002	S2	22.3	1.544	0.844	0.2498	
15 minute winter	S4	1.001	S3	19.5	1.222	1.058	0.1433	
15 minute summer	S5	2.000_1	S4	3.7	0.554	0.446	0.0363	
15 minute winter	S6	2.003	S2	10.9	1.389	1.793	0.2034	
15 minute winter	S7	2.002	S6	8.0	1.022	1.192	0.0782	
15 minute winter	S8	2.001	S7	6.1	0.832	0.762	0.0532	
15 minute winter	S9	2.000	S8	5.4	0.784	0.846	0.0743	
15 minute winter	JUNCTION	1.001_1	S4	13.2	1.689	2.452	0.1721	
15 minute winter	GATE ACO	1.000	JUNCTION	4.4	0.567	1.017	0.1330	



NOTES

Private surface water sewer

ACO channel drainage

Private drainage to be on 'OSMA' underground drainage system, flexibly jointed, or similar approved. All private sewer pipes are to be 100mm dia. unless shown otherwise, and to be laid in accordance with the manufacturers instructions. All pipes to be obtained from an approved manufacturer.

NOTE: ALL COVER LEVELS ARE APPROXIMATE

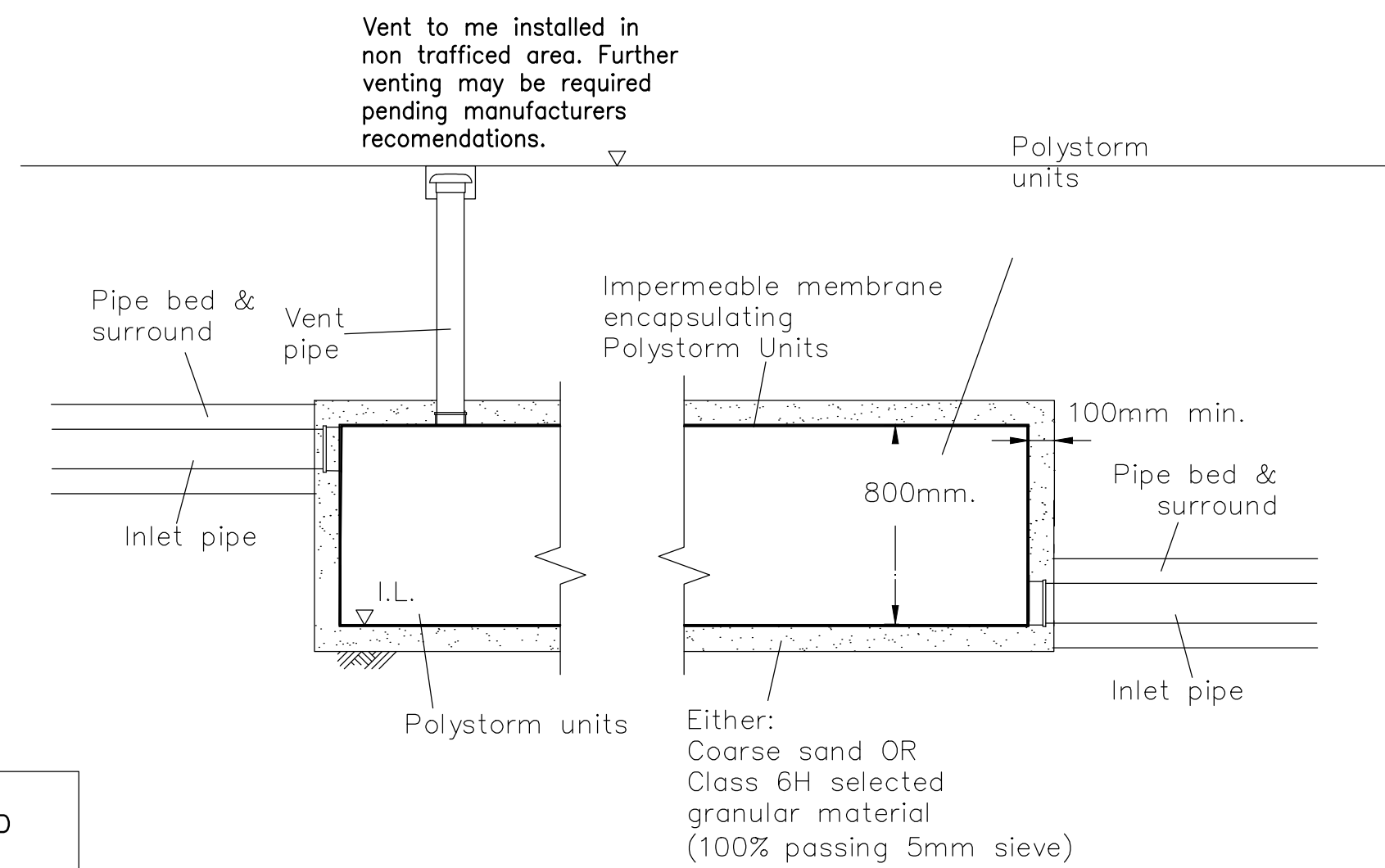
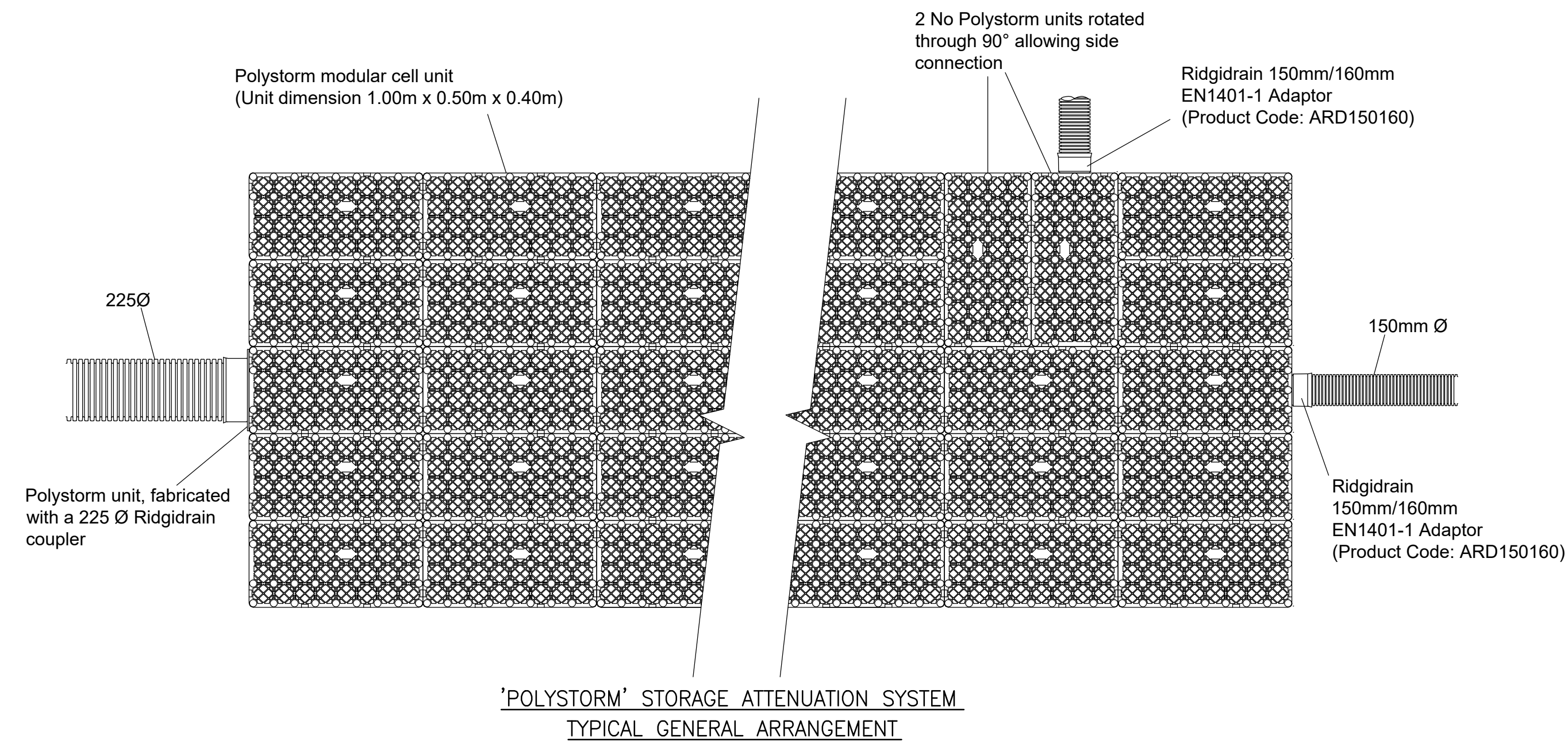
NOTE: LEVEL DETAILS OF INSPECTION CHAMBERS, WHERE MARKED EXISTING ARE BASED ON DETAILS PROVIDED BY THE SITE CONTRACTOR.

FLOW CONTROL CHAMBER TO BE ACO Q-BRAKE PRE-FORMED CHAMBER FITTED WITH A VORTEX FLOW CONTROL RESTRICTED TO 4 l/s AT A HEAD OF 1.57m

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ARCHITECTS LAYOUT. ANY DISCREPANCIES ARE TO BE REPORTED IMMEDIATELY

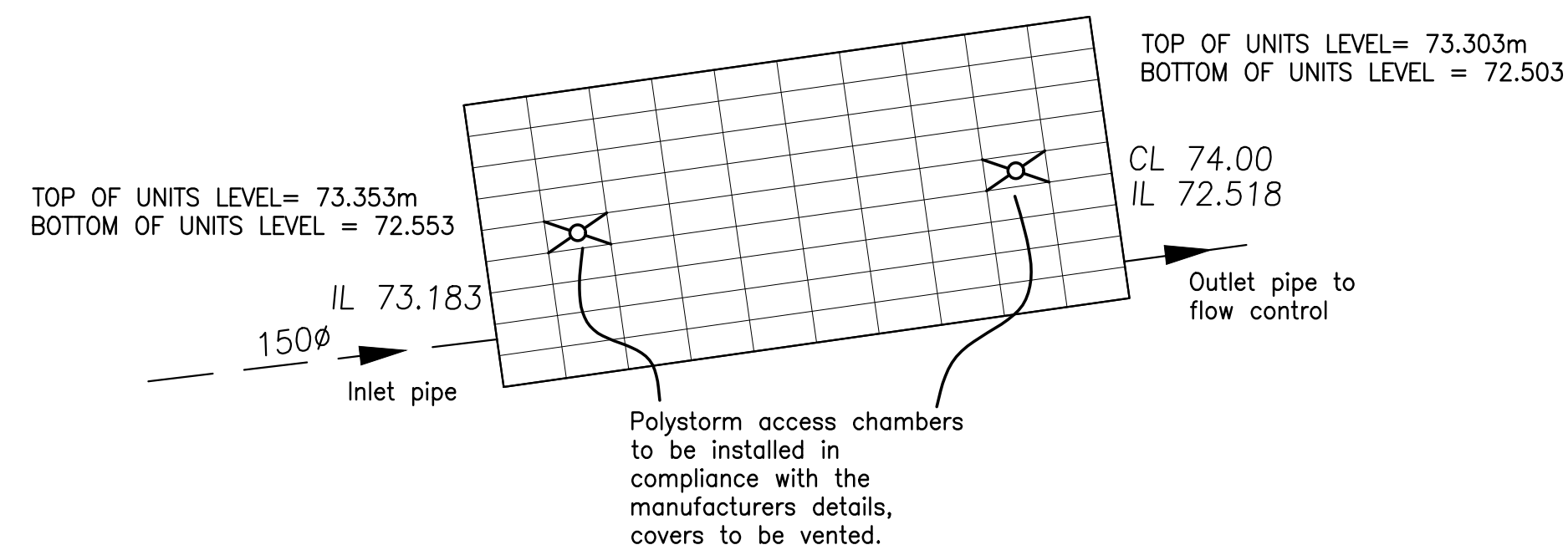
THIS DRAWING IS NOT TO BE USED FOR SETTING OUT OF BUILDINGS

D.J.Barton Associates CIVIL & STRUCTURAL ENGINEERING CONSULTANTS Tel: Kelvedon (01376) 573247 Email: djbarton@btinternet.com		
Client	MRS LI	
Job	PENNYWOOD, HOLLYBUSH RIDE FINCHAMPSTEAD	
Title	SURFACE WATER DRAINAGE STRATEGY	
Scale	1 IN 200	Drg. No.
Date	JANUARY 2025	2474/E/1
		Rev.



NOTE: STORAGE TO BE CONSTRUCTED USING A 'POLYSTORM' STORAGE SYSTEM MANUFACTURED BY POLYPIPE (TEL. NO: 01509 615100)

TO BE CONSTRUCTED IN FULL COMPLIANCE WITH THE MANUFACTURERS RECOMMENDATIONS.



D.J.Barton Associates CIVIL & STRUCTURAL ENGINEERING CONSULTANTS Tel: (01376) 573247 E-mail: djbarton@btinternet.com		
Client	MRS LI	
Job	PENNYWOOD, HOLLYBUSH RIDE FINCHAMPSTEAD	
Title	STORAGE ATTENUATION TANK DETAILS	
Scale	NTS	Dr. No.
Date	JANUARY 2025	2474/E/2
		Rev.