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CIVIL AND STRUCTURAL ENGINEERING CONSULTANTS

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Job No: 2379E

16th May 2022

19, Linksway, Northwood, Middlesex, HA6 2XA
Proposed Re-Development of the above site with 1 replacement residential house

Surface Water Drainage

Impermeable Areas
Existing

The existing house and its garage and driveway, all drain to the public surface water sewer in Nicholas Way.

A*p* = 0.054 hectares (existing site)

Therefore existing 1 in 1 year site discharge approximates to:

Q = 2.78 x 55 x 0.054 = 8.26 litres per second (based on Tc = 5 mins, R = 55mm/hr)

Proposed (1 house development)

Ap_1 house (roofs) = 0.075 ha
Ap_2 driveway = 0.032 ha

Total A*p* = 0.107ha (post development)

It has been established that there are no ditches, or watercourses in the vicinity of the site and that the sub-soil is predominantly clay and not suitable for a soakaway system of drainage.

It is therefore proposed to discharge surface water run-off from the developed site to the public surface water sewer in Linksway. The surface water sewer in Linksway is quite shallow and therefore the surface water run-off from the site cannot drain by gravity to this sewer. It is therefore proposed to utilise a surface water pumping station within the site.

The minimum practical pump rate for the pumping station is 3.8 litres/second, this is a better than 50% reduction in the flow rate for the 1 in 1 year storm, and all storms up to and including the 1 in 100 + climate change storm event will be attenuated in an underground geocellular storage tank.

From the attached hydraulic modelling it can be seen that a storage attenuation tank of 4m wide x 9.6m long x 1.32m depth provides sufficient storage to accommodate a 1 in 100 year storm event + 40% allowance for climate change and an allowance of an additional 10% impermeable area for urban creep, with a flow restriction of 3.8 litres per second.

Rainwater Harvesting

A rainwater harvesting tank has been proposed at the rear of the property under the patio, providing 1500 litres of water for irrigation. This tank will be filled during rainfall by runoff from the roof of the house.

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 drainage system will be the responsibility of the property owner.

Drainage Pipes and Inspection Chambers

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove sediment and debris from inspection chambers, gullies and catchpit 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

Stormbloc 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

Surface Water Pumping Station

Maintenance Schedule	Required Action	Typical Frequency
Occasional Maintenance	Maintenance in accordance with the manufacturers recommendations. It is recommended that a service agreement is arranged with the manufacturer.	As recommended by the manufacturer

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)	Easting (m)	Northing (m)	Depth (m)
PUMP	0.000		66.600	1500	508464.525	190920.513	2.519
S1	0.107	4.00	66.650	1050	508471.742	190923.758	2.907
STORAGE		4.00	66.650	0	508472.000	190922.000	2.415

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	STORAGE	S1	4.200	0.600	64.235	64.193	0.042	100.0	150	4.07	50.0
1.001	S1	PUMP	6.700	0.600	64.193	64.081	0.112	60.0	150	4.16	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	1.005	17.8	0.0	2.265	2.307	0.000	0.0
1.001	1.301	23.0	14.5	2.307	2.369	0.107	0.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0	100	40	10	0
30	0	0	0				

Node PUMP Online Pump Control

Flap Valve	x	Design Depth (m)	4.000	Switch off depth (m)	0.250
Replaces Downstream Link	✓	Design Flow (l/s)	3.8		
Invert Level (m)	64.081	Switch on depth (m)	0.750		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.240	0.000	0.250	3.800	4.000	3.800

Node STORAGE Geocellular Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	64.235	Slope (1:X)	120.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	156	Depth (m)	1.320
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.96	Length (m)	9.600		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 15 minute summer	211.819	59.937
10 year 15 minute winter	148.645	59.937
10 year 30 minute summer	136.831	38.718
10 year 30 minute winter	96.022	38.718
10 year 60 minute summer	90.826	24.003
10 year 60 minute winter	60.342	24.003
10 year 120 minute summer	54.899	14.508
10 year 120 minute winter	36.474	14.508
10 year 180 minute summer	41.666	10.722
10 year 180 minute winter	27.084	10.722
10 year 240 minute summer	32.645	8.627
10 year 240 minute winter	21.689	8.627
10 year 360 minute summer	24.632	6.339
10 year 360 minute winter	16.012	6.339
10 year 480 minute summer	19.260	5.090
10 year 480 minute winter	12.796	5.090
10 year 600 minute summer	15.690	4.291
10 year 600 minute winter	10.720	4.291
10 year 720 minute summer	13.925	3.732
10 year 720 minute winter	9.358	3.732
10 year 960 minute summer	11.365	2.993
10 year 960 minute winter	7.528	2.993
10 year 1440 minute summer	8.174	2.191
10 year 1440 minute winter	5.493	2.191
30 year 15 minute summer	268.706	76.035
30 year 15 minute winter	188.566	76.035
30 year 30 minute summer	174.929	49.499
30 year 30 minute winter	122.757	49.499
30 year 60 minute summer	116.589	30.811
30 year 60 minute winter	77.459	30.811
30 year 120 minute summer	70.438	18.615
30 year 120 minute winter	46.797	18.615
30 year 180 minute summer	53.298	13.715
30 year 180 minute winter	34.645	13.715
30 year 240 minute summer	41.604	10.995
30 year 240 minute winter	27.641	10.995
30 year 360 minute summer	31.221	8.034
30 year 360 minute winter	20.295	8.034
30 year 480 minute summer	24.324	6.428
30 year 480 minute winter	16.160	6.428
30 year 600 minute summer	19.756	5.404
30 year 600 minute winter	13.498	5.404
30 year 720 minute summer	17.490	4.687
30 year 720 minute winter	11.754	4.687
30 year 960 minute summer	14.215	3.743
30 year 960 minute winter	9.416	3.743
30 year 1440 minute summer	10.161	2.723
30 year 1440 minute winter	6.829	2.723
100 year +40% CC +10% A 15 minute summer	488.233	138.153
100 year +40% CC +10% A 15 minute winter	342.620	138.153
100 year +40% CC +10% A 30 minute summer	320.551	90.705
100 year +40% CC +10% A 30 minute winter	224.948	90.705

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC +10% A 60 minute summer	214.603	56.713
100 year +40% CC +10% A 60 minute winter	142.577	56.713
100 year +40% CC +10% A 120 minute summer	129.587	34.246
100 year +40% CC +10% A 120 minute winter	86.094	34.246
100 year +40% CC +10% A 180 minute summer	97.729	25.149
100 year +40% CC +10% A 180 minute winter	63.526	25.149
100 year +40% CC +10% A 240 minute summer	75.977	20.078
100 year +40% CC +10% A 240 minute winter	50.477	20.078
100 year +40% CC +10% A 360 minute summer	56.677	14.585
100 year +40% CC +10% A 360 minute winter	36.841	14.585
100 year +40% CC +10% A 480 minute summer	43.979	11.622
100 year +40% CC +10% A 480 minute winter	29.219	11.622
100 year +40% CC +10% A 600 minute summer	35.604	9.738
100 year +40% CC +10% A 600 minute winter	24.327	9.738
100 year +40% CC +10% A 720 minute summer	31.433	8.424
100 year +40% CC +10% A 720 minute winter	21.125	8.424
100 year +40% CC +10% A 960 minute summer	25.432	6.697
100 year +40% CC +10% A 960 minute winter	16.847	6.697
100 year +40% CC +10% A 1440 minute summer	18.055	4.839
100 year +40% CC +10% A 1440 minute winter	12.134	4.839

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PUMP	120	64.831	0.750	3.9	1.3249	0.0000	OK
120 minute summer	S1	120	64.831	0.638	12.2	1.1078	0.0000	SURCHARGED
240 minute summer	STORAGE	160	64.831	0.596	6.7	20.5018	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PUMP	Pump		3.8				20.1
120 minute summer	S1	1.001	PUMP	3.9	0.597	0.169	0.1180	
240 minute summer	STORAGE	1.000	S1	-6.7	-0.379	-0.375	0.0739	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.81%

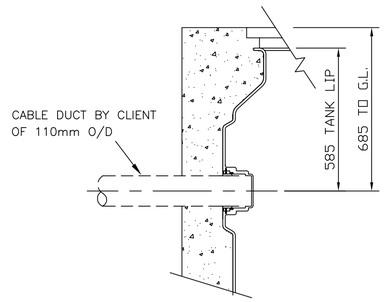
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	PUMP	124	64.886	0.805	4.0	1.4228	0.0000	OK
180 minute winter	S1	124	64.891	0.698	8.6	1.2119	0.0000	SURCHARGED
180 minute winter	STORAGE	124	64.891	0.656	7.8	22.7027	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	PUMP	Pump		3.8				33.7
180 minute winter	S1	1.001	PUMP	4.0	0.274	0.172	0.1180	
180 minute winter	STORAGE	1.000	S1	-7.8	-0.446	-0.442	0.0739	

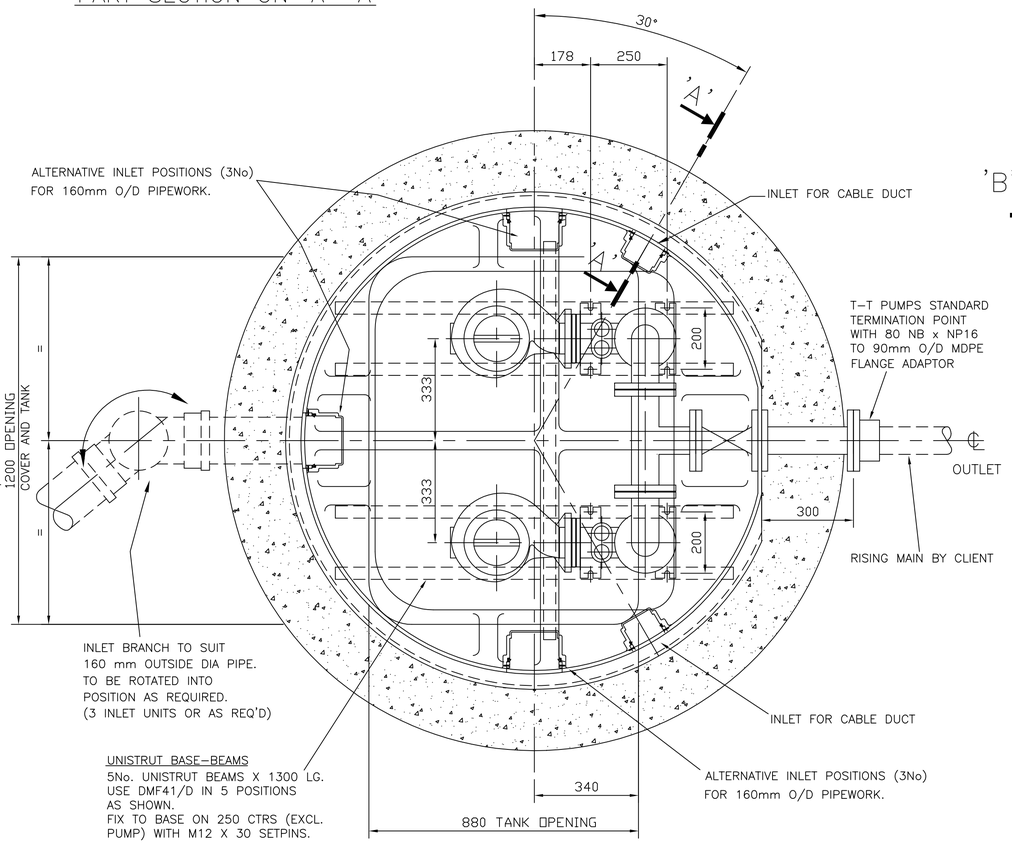
Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	PUMP	140	65.670	1.589	4.4	2.8072	0.0000	OK
180 minute winter	S1	140	65.674	1.481	17.4	2.7017	0.0000	SURCHARGED
180 minute winter	STORAGE	140	65.674	1.439	12.4	47.2084	0.0000	SURCHARGED

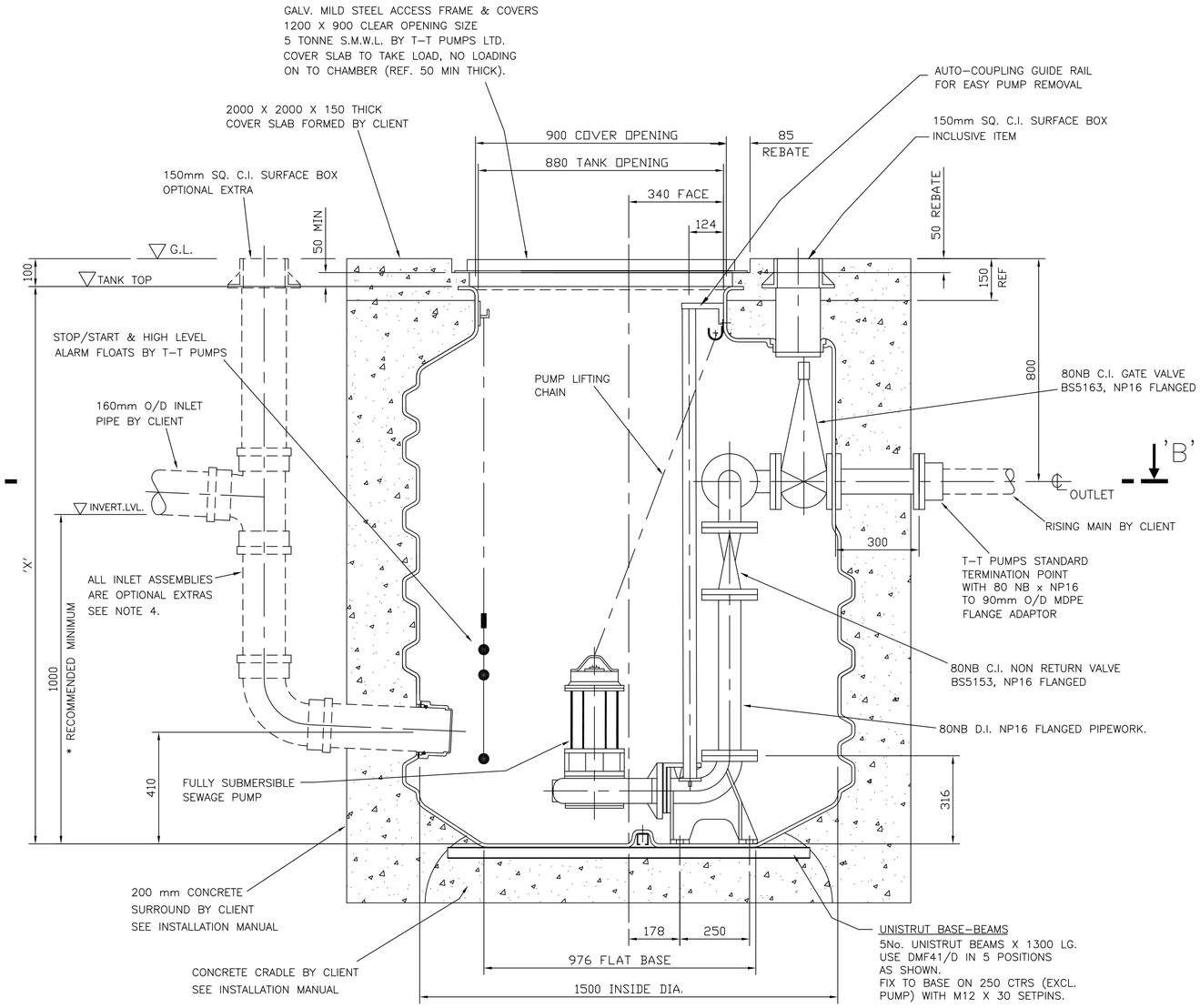
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	PUMP	Pump		3.8				71.1
180 minute winter	S1	1.001	PUMP	4.4	0.250	0.192	0.1180	
180 minute winter	STORAGE	1.000	S1	-12.4	-0.703	-0.697	0.0739	



PART SECTION ON 'A'–'A'



SECTIONAL PLAN VIEW 'B'–'B'



SECTIONAL ELEVATION ON OUTLET CENTRE LINE

TANK DEPTHS	
TANK REF.	DIMN 'X'
✳ A	2000 ✳
B	3000
C	4000
D	4500

✳ STANDARD TANK

NOTES

1. POLYETHYLENE TANK SUPPLIED C/W PIPEW'K & VALVES TO TERMINATION POINT, FOR CLIENT TO INSTALL INTO GROUND – SEE SEPARATE INSTALLATION DATA SHEET.
2. ALL CIVILS WORK TO BE BY CLIENT.
3. PUMP STARTER OR CONTROL PANEL MUST BE FIXED INDOORS OR IN A WEATHERPROOF ENCLOSURE.
4. A MINIMUM OF 1000mm IS REQUIRED BETWEEN INLET INVERT AND SUMP BASE. IF IN DOUBT CONSULT T–T PUMPS LTD. (SEE DIM * ABOVE)

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G	BS REFERENCE REMOVED FROM PIPE & DUCT NOTES	DCC	CBB	02.03.18
F	BASE RIBS ADDED & UNISTRUT BEAMS REPOSITIONED	D.C.	T.R.P.	08.06.06
E	INLET SOCKET & CABLE DUCT SOCKET RE-DESIGNED	D.C.	D.J.P.	05.04.04
--	CABLE DUCT SOCKET RE-POSITIONED IN PLAN VIEW	--	--	--
--	UNISTRUT BASE BEAMS RE-POSITIONED.	--	--	--
D	AUTOCOUPLING TYPE CHANGED, PUMP LISTING DELETED	D.C.	T.R.P.	23.10.02
C	300MM LONG D.FL. PIPE ADDED TO TERMINATION POINT	D.C.	T.R.P.	21.01.02
B	PUMP DESIGNATIONS UPDATED	D.C.	T.R.P.	06.06.01
A	SIZE OF CABLE DUCT ENTRY AMENDED	D.C.	T.R.P.	1.12.00

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CLIENT APPROVAL

TITLE: GENERAL ARRANGEMENT FOR SATURN DUAL (80 NB D.IRON P'WK) PACKAGE PUMPING STATION

CLIENT

SCHEME

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APPROVED BY	R.D.
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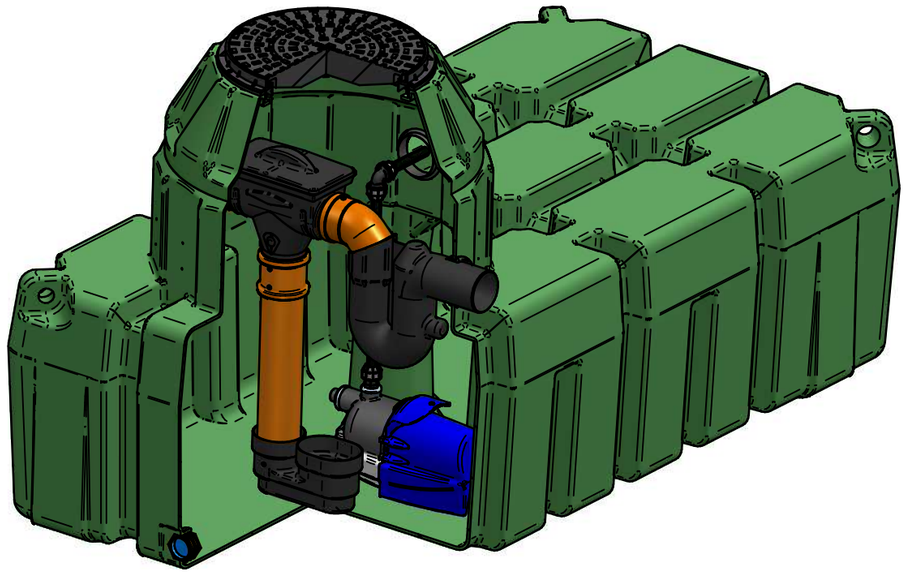

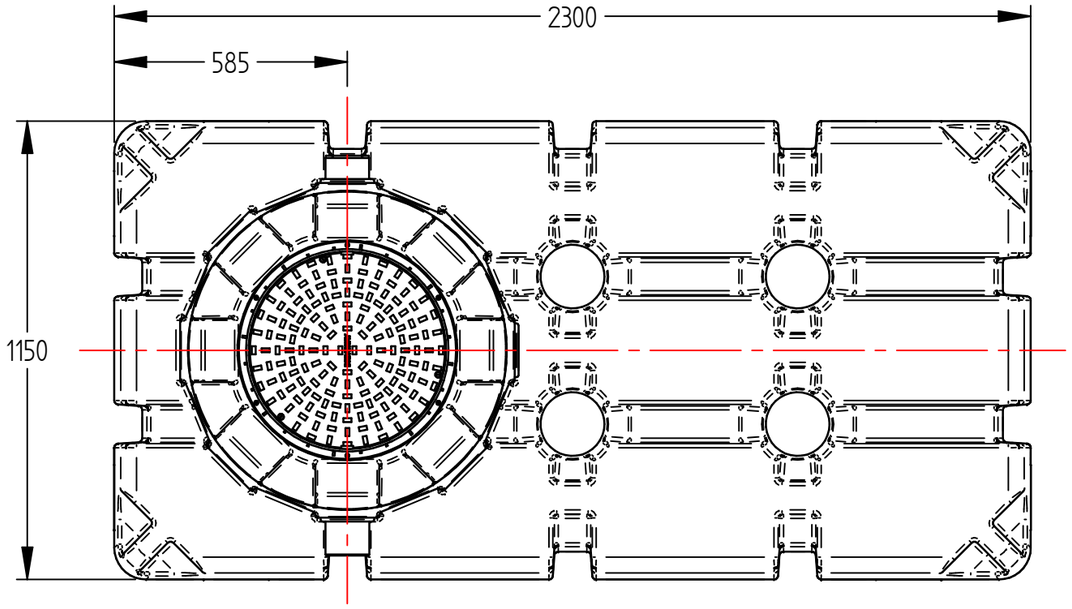

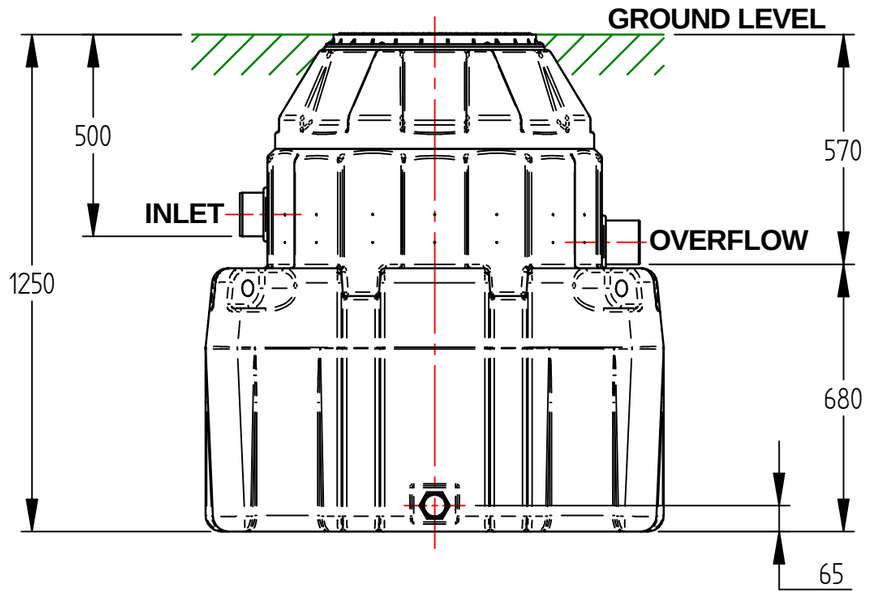

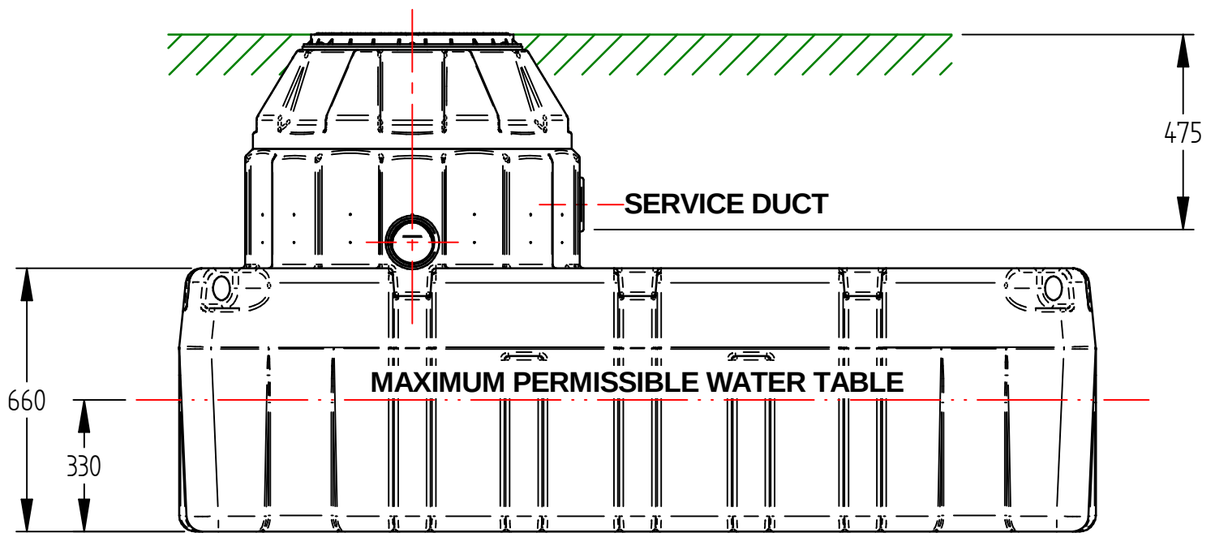

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