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Design Ltd
Consulting Structural & Civil Engineers

Proposed Residential Development

Broad Lane

Moulton

PE12 6PN

Drainage Strategy Report

Project No. 9892

July 2025

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Steve Gilman
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Drainage Strategy Report

Proposed Residential Development – Broad Lane, Moulton

Introduction

This drainage strategy has been developed to show the site is being developed in a sustainable manner.

This report is to accompany drawings 9892/10 and 11, and its purpose is to support and explain the methodology behind the drainage strategy for the site.

Site Description

The development site consists of an existing single dwelling located off Broad Lane, Moulton approximately 6km east of Spalding Town Centre. The site can be accessed from Broad Lane. A proposed site plan is included below.



Figure 1 Proposed Site Plan, c/o cdm design

Development Proposals

The development comprises of two proposed dwellings with sufficient access and parking spaces.

Surface Water Drainage

For new developments there is a requirement to apply sustainable drainage principles (SuDS) to the disposal of surface water from the site. Generally, the aim should be to discharge surface water as high up the following hierarchy of drainage options as reasonably practicable:

1. Into the ground (infiltration);
2. To a surface water body;
3. To a surface water sewer or highway drain;
4. To a combined sewer.

A site investigation was undertaken by Evolve Geo-Environmental which included percolation testing, however the percolation tests failed. Infiltration is therefore considered to not be a viable method for disposing of surface water.

The existing dwelling is served by an existing combined drain, however Anglian Water sewer maps indicate the local sewer is foul water only. A proposed discharge to the combined site drain is proposed, subject to agreement with Anglian Water. The Proposed Drainage Layout drawing is included as Appendix A.

Drainage Strategy Overview

The overall SuDS strategy for the development site comprises of a box culvert to provide surface water attenuation. The proposed impermeable surfaces will be drained as follows;

Surface Water – Roofs

Surface water runoff will be collected via traditional gutters from the roofs, flows will then be directed towards the existing combined drain, restricted to 1 l/s, with attenuation in the form of a box culvert.

The proposed driveways will consist of unbound granular construction, e.g. gravel.

Water Quantity

Comprehensive surface water modelling has been undertaken for the proposed drainage system using the industry standard Causeway Flow software. This modelling is included as Appendix B and illustrates how the proposed drainage system provides adequate water quantity control in all storms up to and including the 1 in 100 year storm including 40% allowance for climate change, with no flooding present.

Maintenance

It is crucial that the elements mentioned in the drainage elements and water quality are maintained to a sufficient standard to ensure that the devices can still function. Generally, the maintenance requirements are either from CIRIA 753, or manufacturer guidance.

<u>Drainage Component</u>	<u>Required Action</u>	<u>Typical Frequency</u>
Pipework, flow control device and chambers	Stabilise adjacent areas	As required
	Remove weeds	As required
	Clear any poor performing structures	As required
	Inspect all structures for poor operation	Three monthly, 48 hours after large storms
	Monitor inspection chambers. Inspect silt accumulation rates and determine silt clearance frequencies.	Annually

Foul Proposal

A below ground gravity drainage system will be implemented to serve the proposed units. The below ground gravity drainage system has been designed to ensure self-cleansing velocities are achieved. Foul drainage will be designed in accordance with Building Regulations and discharge units contained within BS EN 12056-2:2000.

It is proposed that foul flows are discharged to the public sewer via the existing combined site drainage, subject to agreement with Anglian Water.

Due to the topography of the site and depth of the existing drainage, a pump will be required to discharge foul water to the public sewer. The minimum specification for the pump has been included in the proposed drainage layout.

The proposed foul water drainage network described above is included as Appendix A.

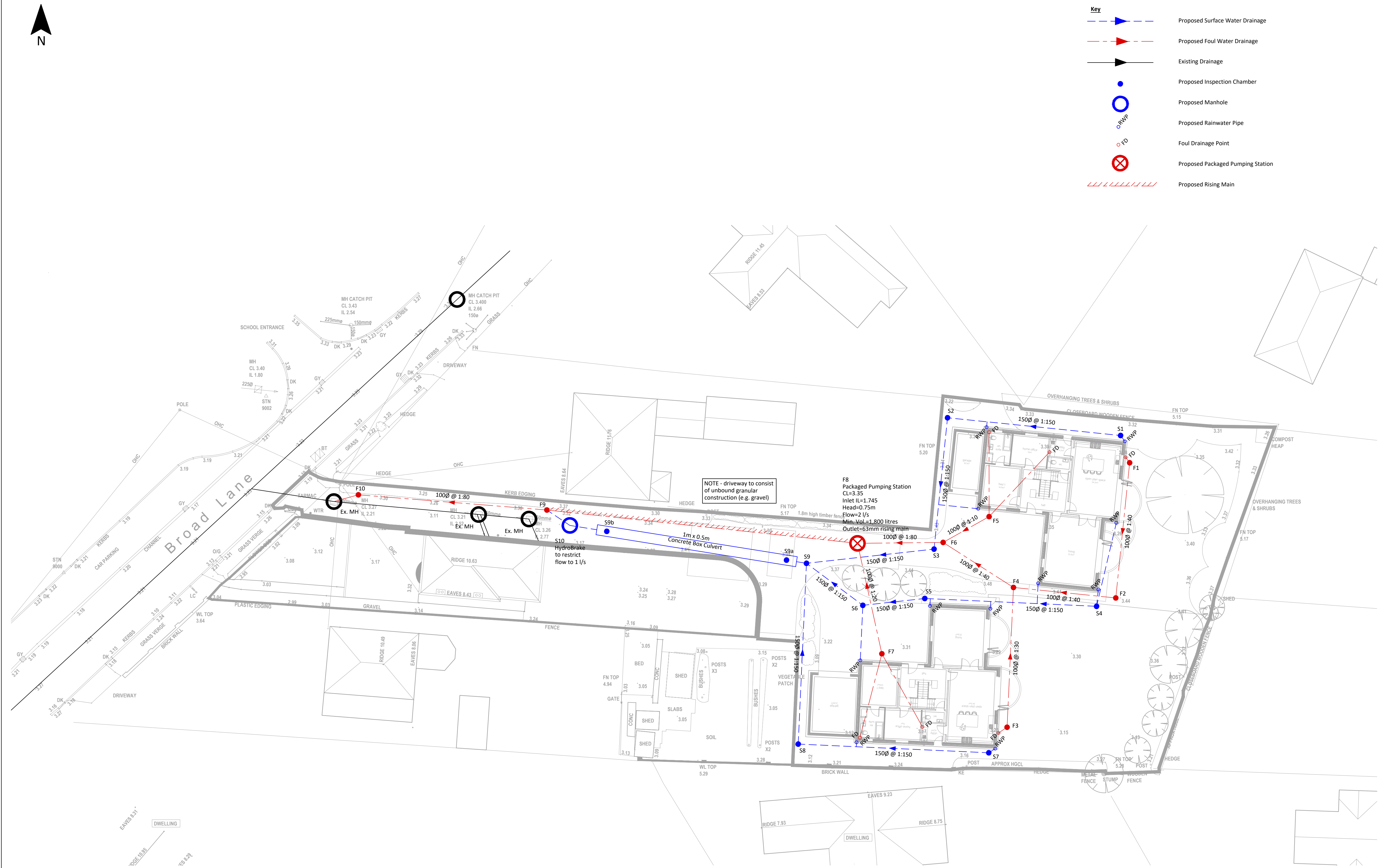


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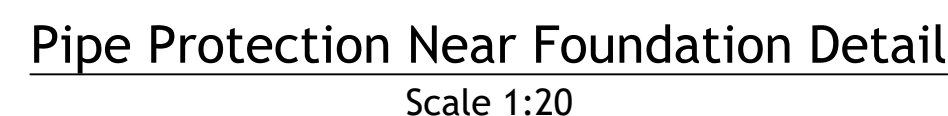
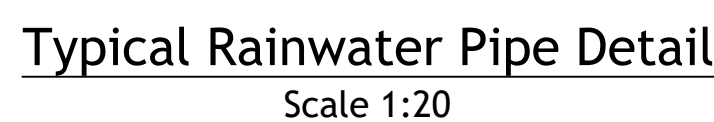
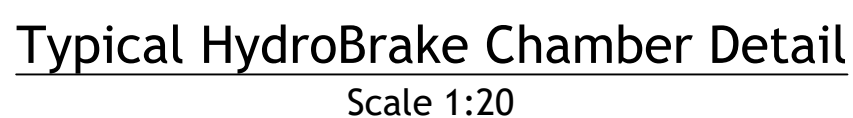
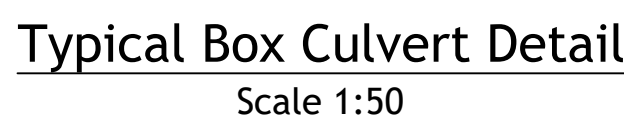
Appendices

Appendix A

Proposed Drainage Drawings



-	-	-
Revision	Details	Date
Steve Gilman Design Ltd. Lych Gate Barn, Church Lane Carlton Le Moorland, Lincoln, LN5 9HS Tel : 01522 788000 Email : mail@stevegilmansdesign.co.uk		
Project	Proposed Residential Development Broad Lane, Moulton	
Client	Woodola Group Ltd	
Title	Proposed Drainage Layout	
Drawn	CC	Checked AF
Date	July 2025	Scale 1:200
Number	9892/10	Status Preliminary



-	-	-
Revision	Details	Date
 Steve Gilman Design Ltd. Lyth Gate Barn, Church Lane Carlton Le Moorland, Lincoln, LN5 9HS Tel : 01522 788000 Email : mail@stevegilmandesign.co.uk		
Project	Proposed Residential Development Broad Lane, Moulton	
Client	Woodola Group Ltd	
Title	Proposed Drainage Details	
Drawn	CC	Checked AF
Date	July 2025	Scale As Shown
Number	9892/11	Status Preliminary

Appendix B

Modelled Outputs

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)	2.000
Ratio-R	0.400	Preferred Cover Depth (m)	0.200
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)
S1	0.009	4.00	3.350	450	530578.829	323893.481	0.350
S2			3.350	450	530561.714	323895.235	0.465
S3			3.350	450	530560.382	323882.240	0.552
S4	0.009	4.00	3.350	450	530576.453	323876.581	0.450
S5	0.009	4.00	3.300	450	530559.465	323877.357	0.513
S6			3.300	450	530553.339	323876.679	0.554
S7	0.009	4.00	3.300	450	530565.793	323862.091	0.350
S8			3.300	450	530546.949	323862.952	0.476
S9			3.350	450	530547.765	323880.837	0.650
S10			3.300	1200	530524.368	323884.584	0.758
F9			3.300	450	530522.093	323886.109	0.792

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	S1	S2	17.205	0.600	3.000	2.885	0.115	150.0	150	4.35	50.0
1.001	S2	S3	13.063	0.600	2.885	2.798	0.087	150.0	150	4.62	50.0
1.002	S3	S9	12.695	0.600	2.798	2.700	0.098	129.5	150	4.86	50.0
3.000	S4	S5	17.006	0.600	2.900	2.787	0.113	150.0	150	4.35	50.0
3.001	S5	S6	6.163	0.600	2.787	2.746	0.041	150.0	150	4.47	50.0
3.002	S6	S9	6.954	0.600	2.746	2.700	0.046	150.0	150	4.61	50.0
2.000	S7	S8	18.864	0.600	2.950	2.824	0.126	150.0	150	4.38	50.0
2.001	S8	S9	17.904	0.600	2.824	2.700	0.124	144.4	150	4.74	50.0
1.003	S9	S10	23.695	0.600	2.700	2.542	0.158	150.0	150	5.34	50.0
1.004	S10	F9	2.739	0.600	2.542	2.508	0.034	80.0	150	5.38	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)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.818	14.5	1.2	0.200	0.315	0.009	0.0	30	0.499
1.001	0.818	14.5	1.2	0.315	0.402	0.009	0.0	30	0.499
1.002	0.881	15.6	1.2	0.402	0.500	0.009	0.0	28	0.524
3.000	0.818	14.5	1.2	0.300	0.363	0.009	0.0	30	0.499
3.001	0.818	14.5	2.4	0.363	0.404	0.018	0.0	42	0.611
3.002	0.818	14.5	2.4	0.404	0.500	0.018	0.0	42	0.611
2.000	0.818	14.5	1.2	0.200	0.326	0.009	0.0	30	0.499
2.001	0.834	14.7	1.2	0.326	0.500	0.009	0.0	29	0.502
1.003	0.818	14.5	4.9	0.500	0.608	0.036	0.0	60	0.739
1.004	1.125	19.9	4.9	0.608	0.642	0.036	0.0	51	0.933

Pipeline Schedule

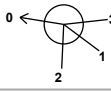
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	17.205	150.0	150	Circular	3.350	3.000	0.200	3.350	2.885	0.315
1.001	13.063	150.0	150	Circular	3.350	2.885	0.315	3.350	2.798	0.402
1.002	12.695	129.5	150	Circular	3.350	2.798	0.402	3.350	2.700	0.500
3.000	17.006	150.0	150	Circular	3.350	2.900	0.300	3.300	2.787	0.363
3.001	6.163	150.0	150	Circular	3.300	2.787	0.363	3.300	2.746	0.404
3.002	6.954	150.0	150	Circular	3.300	2.746	0.404	3.350	2.700	0.500
2.000	18.864	150.0	150	Circular	3.300	2.950	0.200	3.300	2.824	0.326
2.001	17.904	144.4	150	Circular	3.300	2.824	0.326	3.350	2.700	0.500
1.003	23.695	150.0	150	Circular	3.350	2.700	0.500	3.300	2.542	0.608
1.004	2.739	80.0	150	Circular	3.300	2.542	0.608	3.300	2.508	0.642

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	450	Manhole	PPIC	S2	450	Manhole	PPIC
1.001	S2	450	Manhole	PPIC	S3	450	Manhole	PPIC
1.002	S3	450	Manhole	PPIC	S9	450	Manhole	PPIC
3.000	S4	450	Manhole	PPIC	S5	450	Manhole	PPIC
3.001	S5	450	Manhole	PPIC	S6	450	Manhole	PPIC
3.002	S6	450	Manhole	PPIC	S9	450	Manhole	PPIC
2.000	S7	450	Manhole	PPIC	S8	450	Manhole	PPIC
2.001	S8	450	Manhole	PPIC	S9	450	Manhole	PPIC
1.003	S9	450	Manhole	PPIC	S10	1200	Manhole	PPIC
1.004	S10	1200	Manhole	PPIC	F9	450	Manhole	PPIC

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S1	530578.829	323893.481	3.350	0.350	450		0	1.000	3.000	150
S2	530561.714	323895.235	3.350	0.465	450		1	1.000	2.885	150
							0	1.001	2.885	150
S3	530560.382	323882.240	3.350	0.552	450		1	1.001	2.798	150
							0	1.002	2.798	150
S4	530576.453	323876.581	3.350	0.450	450		0	3.000	2.900	150
S5	530559.465	323877.357	3.300	0.513	450		1	3.000	2.787	150
							0	3.001	2.787	150
S6	530553.339	323876.679	3.300	0.554	450		1	3.001	2.746	150
							0	3.002	2.746	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S7	530565.793	323862.091	3.300	0.350	450		0	2.000	2.950	150
S8	530546.949	323862.952	3.300	0.476	450		1	2.000	2.824	150
S9	530547.765	323880.837	3.350	0.650	450		0	2.001	2.824	150
							1	3.002	2.700	150
							2	2.001	2.700	150
							3	1.002	2.700	150
							0	1.003	2.700	150
S10	530524.368	323884.584	3.300	0.758	1200		1	1.003	2.542	150
							0	1.004	2.542	150
F9	530522.093	323886.109	3.300	0.792	450		1	1.004	2.508	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Starting Level (m)	
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 %)
2	0	0	0
30	0	0	0
100	40	0	0

Node S10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	2.542	Product Number	CTL-SHE-0050-1000-0750-1000
Design Depth (m)	0.750	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node S10 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.542	Depth (m)	0.500
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	156	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	1.000	Number Required	1
Porosity	1.00	Pit Length (m)	20.000		

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	3.035	0.035	1.7	0.0237	0.0000	OK
15 minute winter	S2	10	2.921	0.036	1.7	0.0057	0.0000	OK
15 minute winter	S3	11	2.831	0.033	1.7	0.0053	0.0000	OK
15 minute winter	S4	10	2.935	0.035	1.7	0.0194	0.0000	OK
15 minute winter	S5	10	2.840	0.053	3.4	0.0268	0.0000	OK
15 minute winter	S6	10	2.797	0.051	3.4	0.0080	0.0000	OK
15 minute summer	S7	10	2.985	0.035	1.7	0.0238	0.0000	OK
15 minute winter	S8	10	2.858	0.034	1.7	0.0054	0.0000	OK
15 minute summer	S9	10	2.777	0.077	6.7	0.0123	0.0000	OK
60 minute winter	S10	48	2.683	0.141	3.2	2.9828	0.0000	OK
60 minute winter	F9	49	2.530	0.022	0.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	1.7	0.538	0.118	0.0545	
15 minute winter	S2	1.001	S3	1.7	0.559	0.117	0.0396	
15 minute winter	S3	1.002	S9	1.7	0.290	0.107	0.0760	
15 minute winter	S4	3.000	S5	1.7	0.400	0.118	0.0729	
15 minute winter	S5	3.001	S6	3.4	0.633	0.235	0.0330	
15 minute winter	S6	3.002	S9	3.4	0.474	0.234	0.0498	
15 minute summer	S7	2.000	S8	1.7	0.554	0.118	0.0580	
15 minute winter	S8	2.001	S9	1.7	0.283	0.114	0.1084	
15 minute summer	S9	1.003	S10	6.8	1.089	0.474	0.1819	
60 minute winter	S10	1.004	F9	0.9	0.550	0.046	0.0045	4.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	3.050	0.050	3.3	0.0335	0.0000	OK
15 minute summer	S2	10	2.935	0.050	3.3	0.0080	0.0000	OK
15 minute winter	S3	10	2.845	0.047	3.3	0.0074	0.0000	OK
15 minute winter	S4	10	2.949	0.049	3.3	0.0272	0.0000	OK
15 minute winter	S5	10	2.866	0.079	6.6	0.0405	0.0000	OK
60 minute winter	S6	57	2.832	0.086	3.2	0.0136	0.0000	OK
15 minute summer	S7	10	3.000	0.050	3.3	0.0336	0.0000	OK
15 minute winter	S8	10	2.872	0.048	3.3	0.0076	0.0000	OK
60 minute winter	S9	58	2.832	0.132	6.4	0.0209	0.0000	OK
60 minute winter	S10	59	2.831	0.289	6.4	6.1111	0.0000	SURCHARGED
60 minute summer	F9	67	2.531	0.023	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.000	S2	3.3	0.642	0.229	0.0885	
15 minute summer	S2	1.001	S3	3.3	0.672	0.228	0.0642	
15 minute winter	S3	1.002	S9	3.3	0.341	0.210	0.1210	
15 minute winter	S4	3.000	S5	3.3	0.463	0.228	0.1224	
15 minute winter	S5	3.001	S6	6.6	0.686	0.454	0.0599	
60 minute winter	S6	3.002	S9	3.2	0.495	0.221	0.0931	
15 minute summer	S7	2.000	S8	3.3	0.664	0.229	0.0939	
15 minute winter	S8	2.001	S9	3.3	0.339	0.223	0.1718	
60 minute winter	S9	1.003	S10	6.4	0.802	0.441	0.4027	
60 minute winter	S10	1.004	F9	1.0	0.559	0.049	0.0047	9.1

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	S1	116	3.218	0.218	1.8	0.1466	0.0000	FLOOD RISK
120 minute winter	S2	116	3.218	0.333	1.8	0.0529	0.0000	FLOOD RISK
120 minute winter	S3	116	3.218	0.420	1.8	0.0667	0.0000	FLOOD RISK
120 minute winter	S4	116	3.218	0.318	1.8	0.1776	0.0000	FLOOD RISK
120 minute winter	S5	116	3.218	0.431	3.6	0.2197	0.0000	FLOOD RISK
120 minute winter	S6	116	3.218	0.472	3.3	0.0750	0.0000	FLOOD RISK
120 minute winter	S7	116	3.218	0.268	1.8	0.1802	0.0000	FLOOD RISK
120 minute winter	S8	116	3.218	0.394	1.8	0.0626	0.0000	FLOOD RISK
120 minute winter	S9	116	3.218	0.518	6.2	0.0823	0.0000	FLOOD RISK
120 minute winter	S10	116	3.217	0.675	5.4	10.7735	0.0000	FLOOD RISK
480 minute summer	F9	480	2.531	0.023	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	S1	1.000	S2	1.8	0.555	0.125	0.3029	
120 minute winter	S2	1.001	S3	1.8	0.553	0.125	0.2300	
120 minute winter	S3	1.002	S9	1.6	0.292	0.101	0.2235	
120 minute winter	S4	3.000	S5	1.8	0.402	0.125	0.2994	
120 minute winter	S5	3.001	S6	3.3	0.622	0.226	0.1085	
120 minute winter	S6	3.002	S9	3.0	0.479	0.206	0.1224	
120 minute winter	S7	2.000	S8	1.8	0.558	0.125	0.3321	
120 minute winter	S8	2.001	S9	1.7	0.290	0.113	0.3152	
120 minute winter	S9	1.003	S10	5.4	0.757	0.375	0.4171	
120 minute winter	S10	1.004	F9	1.0	0.559	0.049	0.0047	18.0

Appendix C

Anglian Water Sewer Maps



(c) Crown copyright and database rights 2024 Ordnance Survey 100022432 Date: 17/07/24 Scale: 1:1250 Map Centre: 530530,323900 Data updated: 30/06/24 Our Ref: 1522350 - 1 Wastewater Plan A3
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Foul Sewer		Outfall*		Sewage Treatment Works	
Surface Sewer		Inlet*		Public Pumping Station	
Combined Sewer		Manhole*		Decommissioned Pumping Station	
Final Effluent					
Rising Main*					
Private Sewer*					
Decommissioned Sewer*					

*(Colour denotes effluent type)

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