Steve Gilman Design Ltd

Consulting Structural & Civil Engineers

Torgate Lane,

Bassingham

Drainage Strategy Report

Project No. 7597 (Revision B – 26/01/2022)

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Registered Office: Lych Gate Barn, Church Lane, Carlton Le Moorland, Lincoln, LN5 9HS
Tel: 01522 788000 - **Email:** mail@stevegilmandesign.co.uk - **Web:** www.stevegilmandesign.co.uk
Directors: S.Gilman B.Eng, C.Eng, M.I.Struct.E. **A.M.Foottit** I.Eng, A.M.I.Struct.E.
Company Secretary: H.L.Gilman B.A.(Hons).
Registered in England. Registration Number: 5337463 V.A.T. Registration Number: 852 7676 88

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Drainage Strategy Report

Torgate Lane, Bassingham

Introduction

This drainage strategy has been developed as part of the planning permission to compliment the Flood Risk Assessment, and show the site is being developed in a sustainable manner.

This report is to accompany drawing 7597/11, and its purpose is to support and explain the methodology behind the drainage strategy for the site.

Site Description

The residential development site is located in the village of Bassingham, approximately 12km south west of Lincoln City Centre. The site can be accessed from Torgate Lane and through Vasey Close which is a previous phase of the same development. The site is bound by Vasey Close to the north and agricultural land to the east, south and west. The centre of the site is located at approximately 491389 (easting) and 359659 (northing), see figure 1 below.

Figure 1 Site location plan c/o Delta-Simons ref. 12-0310.03

Development Proposals

The prospective 0.7ha Lindum Homes development comprises of 23 no. residential plots, an access road and open space including sustainable drainage features. The plots are predominantly semi-detached with ample plot sizes and each dwelling has substantial garden space.

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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 Delta-Simons Environmental Consultants Limited October 2021, ref. 12-0310.03. Infiltration testing was undertaken in accordance with BRE365 Methodology. All three tests undertaken failed suggesting infiltration is not an appropriate means of surface water disposal for this site.

There are no watercourses or other surface water bodies located within the immediate vicinity of the site.

Surface water will therefore discharge into the adopted surface water sewer within Vasey Close via a stub which has been left during phase 1 of the development. The proposed Proposed Surface & Foul Water Drainage Layout drawing is included as Appendix A.

Drainage Strategy Overview

The overall SuDS strategy for the development site comprises of a series of roadside swales and a detention pond for additional surface water attenuation. The proposed impermeable surfaces will be drained as follows;

Surface Water - Adoptable Access Road

The Adoptable Access Road will predominantly drain into the roadside swale via “over-edge” drainage. There are isolated areas where this arrangement will not be possible. In these instances, traditional gullies will be implemented.

Surface Water – Private driveway and roofs

Private & roof water will be discharged directly the roadside swales where possible. Where no road side swales are present, a gravity piped system will be used to direct flows beneath the road and into the nearest swale. Site levels have been engineered to facilitate this connection into the swales although additional pipe protection may be required for shallow pipes.

Surface water runoff will be restricted into the existing stub pipe via a HydroBrake flow control device to 2.5l/s which is recognised as the lowest achievable rate.

It is proposed that the swales, detention basin and associated piped network including inspection chambers will be presented for adoption by Anglian Water through a Section 104 agreement. The proposed highway including gullies and associated laterals pipes will form part of a separate Section 38 adoption agreement with the Lincolnshire County Council as the Local Highways Authority.

Water Quantity

Appropriate water quantity management must be implemented as part of the site SuDS strategy to achieve the 2.5l/s restricted discharge rate. Some attenuation is provided by the roadside conveyance swales however a majority of this is provided by the onsite detention basin. The cover level of the detention basin is set at 14.260mAOD and the base at 13.700mAOD to form a total depth of 0.56m. After incorporating 1:3 safe side slopes for access and egress, a total storage volume of approximately 215m³ is provided by the pond.

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 to the site.

Water Quality

The methods of surface water disposal mentioned above have included provisions for water quality. In accordance with CIRIA C753, the pollution hazard features for the drainage areas are;

- Residential roofs - Very low
- Individual property driveways - Low
- Adoptable access road - Low

To remove the pollution risks, CIRA have developed 'Pollution hazard indices' and the 'mitigation indices' that the SuDS components provide, further details of these are found in the figures below.

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 2 - Pollution Hazard Indices for Different Land use Classifications

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 3 - Indicative SuDS Mitigation Indices for Discharging to Surface waters

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each containment type) that equals or exceeds the pollution hazard index (for each contaminant type):

Total SuDS mitigation index ≥ pollution hazard index

For the calculations below the hazards are represented by;
Total suspended solids = Red
Metals = Blue
Hydrocarbons = Green

The figures are presented to show the actual achieved in the right-hand side column. The right-hand side's total must be higher than the left-hand side. Given that the detention basin does not provide water quality benefits for all areas of the site, it has conservatively been excluded from this analysis

Roofs
0.2 0.2 0.05 = Swales 0.5 0.6 0.6
The mitigation provided by the soakaway exceeds all the pollution indices, therefore sufficient treatment has been provided.

Driveways
0.5 0.4 0.4 = Swales 0.5 0.6 0.6
The mitigation provided by the permeable paving satisfies the mitigation index, therefore sufficient treatment has been provided.

Adoptable Access Road
0.5 0.4 0.4 = Swales 0.5 0.6 0.6
The mitigation provided by the permeable paving alone satisfies the mitigation index, therefore sufficient treatment has been provided.

All the methods above provide enough water quality in accordance with CIRIA's C753 document.

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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.

Swale Maintenance

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Figure 4 – Swale Maintenance Requirements

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Detention Basin Maintenance

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Figure 5 – Soakaway Maintenance Requirements.

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Foul Proposal

A below ground gravity drainage system will be implemented to serve the proposed dwellings. 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 existing public foul sewer within Vasey Close through appropriate agreement with Anglian Water.

The proposed foul water drainage network described above is displayed in the Proposed Surface & Foul Water Drainage Layout drawing included as Appendix A.

In accordance with 'Design and Construction Guidance' the proposed peak foul flows have been calculated as follows:

4000 litres per dwelling per day or 0.05 litres per second

23 dwellings x 0.05 litres per second = 1.15 litres per second

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Appendices

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Appendix A

Proposed Surface & Foul Water Drainage Layout Drawing

N

VASEY CLOSE

AW FW MH
CL=14.316
IL=12.582

AW SW MH
CL=14.300
IL=13.581

SW MH
HydroBrake to restrict flows to 2.5l/s

Attenuation Basin
560mm deep

225Ø @ 1:160
Type Z Bed/Surround

100Ø @ 1:40
Type Z Bed/Surround

Swale 6

Plot 01 | Plot 02 | Plot 03 | Plot 04 | Plot 05 | Plot 06 | Plot 07 | Plot 08 | Plot 09

Bung Type B 2b3p | Type B 3b5p | Type C 2b4p | Type B 3b5p | Type A 2b4p

225Ø @ 1:100
Type Z Bed/Surround

Swale 3 | Swale 2 | Swale 1

150Ø @ 1:150
Type Z Bed/Surround

SIC1 | SIC2 | FIC1

100Ø @ 1:80
Type Z Bed/Surround

FMH1 | FMH2 | FMH3 | FMH4 | FMH5

100Ø @ 1:65
Type Z Bed/Surround

100Ø @ 1:30
Type Z Bed/Surround

FIC2 | FIC3 | FIC4 | FIC5 | FIC6 | FIC7 | FIC8 | FIC9 | FIC10

SIC3 | SIC4 | SIC5 | SIC6 | SIC7

150Ø @ 1:100
Type Z Bed/Surround

150Ø @ 1:130
Type Z Bed/Surround

100Ø @ 1:80
Type Z Bed/Surround

100Ø @ 1:35
Type Z Bed/Surround

225Ø @ 1:250
Type Z Bed/Surround

150Ø @ 1:150
Type Z Bed/Surround

Swale 5 | Swale 4

Plot 23 | Plot 22 | Plot 21 | Plot 20

Bung Type A 1b2p | Type A 2b4p

Plot 19 | Plot 18 | Plot 17 | Plot 16 | Plot 15 | Plot 14 | Plot 13 | Plot 12 | Plot 11 | Plot 10

Notes
1. Do note scale this drawing.
2. This drawing is to be read in conjunction with all other project drawings and specifications.
3. All dimensions are in millimetres unless stated otherwise.
4. Should there be any conflict between the details indicated on this drawing and those indicated on other drawings the Project Engineer shall be informed prior to construction.
5. Until technical approval has been obtained from the relevant authority, it should be understood that all drawings issued are preliminary and not for construction. Should the contractor commence site work prior to such approval being given, it is entirely at their own risk.
6. All 100Ø proposed foul drainage pipes shown are to be laid at a gradient of 1:80.
7. All 150Ø proposed foul drainage pipes shown are to be laid at a gradient of 1:150.
8. All existing land drains encountered on site during construction are to be re-connected.
9. Temporary protection to be provided to drainage work during construction as necessary.
10. Topographical survey and architectural layout based on third party information.
11. Anticipated foul flow rates calculated using discharge unit method to BS EN 12056-2.
12. Drawing to be read in conjunction with Causeway Flow design pack.
13. Pipes to be structured walled to BS EN 13476, Polypropylene to BE EN 1852 or PVC-U to BS EN 1401.
14. Both clay and concrete pipes shall be strength class 120 (100/150mm min crushing strength 28kN/m). Thermoplastic pipes shall have a minimum ring stiffness of SN4
15. Pipes which run adjacent to buildings shall be installed in strict accordance with Building Regulations Part H, clauses 2.23 to 2.25
16. Class Z concrete bed and surround to all foul and surface water pipes with less than 900mm cover depth. Type S granular bed and surround to all foul and surface water pipes with greater than 900mm cover depth.
17. All manholes and inspection chambers to have D400 load-rated covers and frames to BS EN 124.
18. Concrete to be GEN1 unless specified otherwise.
19. The first flexible joint in pipes adjoining a manhole shall be a maximum length of 600mm from the inside face of the manhole, connecting to a rocker pipe. The length of the rocker pipe shall be 600mm.
20. All foul and surface water pipes to be constructed to Building Regulations Part H.
21. Manufacturer to provide structural calculations to relevant industry guidance which confirm the product is suitable for use at the proposed depth and expected loading conditions.
22. If soft spots are encountered the whole area is to be excavated until firm ground is encountered and all excavated material disposed. Material excavated from soft spots should not be used for fill on site. The excavation should be reinstated with MOT Type 1 compacted in 100mm-150mm layers.

CDM Requirements
Risk - Deep excavation
Control method - Contractor to design trench support to depths shown on drawings and in the manhole schedule, appropriate to the ground conditions.
Risk - Water ingress into excavations, including ground water
Control method - Contractor to specify method of dealing with ingress of water into excavations, in particular if ground water is experienced. Contractor to undertake trench inspections prior to entry into any excavation, and again if left overnight or if conditions change.

Key
- Proposed Surface Water Drainage
- Existing Drainage
- Proposed Foul Drainage
- Proposed Inspection Chamber
- Proposed Manhole
- Proposed Road Gully
- Proposed Swale or Attenuation Basin

Revision	Details	Date
B	Site layout amended	26/01/2022
A	Pipe annotation added	23/01/2022

Steve Gilman Design Ltd.
Lych Gate Barn, Church Lane
Carlton Le Moorland, Lincoln, LN5 9HS
Tel : 01522 788000
Email : mail@stevegilmandesign.co.uk

Project	Proposed Residential Development Torgate Lane, Bassingham		
Client	Lindum Homes		
Title	Proposed Drainage Layout		
Drawn	CC	Checked	AF
Date	December 2021	Scale	1:200
Number	7597/11 B	Status	Preliminary

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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 Inverts
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
IC3	0.035	4.00	15.250	450	491429.134	359637.056	1.050
IC4	0.017	4.00	15.000	450	491410.092	359640.243	0.929
IC1	0.013	4.00	15.105	450	491420.046	359662.321	0.960
IC2	0.028	4.00	14.985	450	491419.684	359651.811	0.910
Swale1.1	0.029	4.00	14.585		491406.357	359651.841	0.600
Swale1.2			14.570		491399.763	359651.841	0.600
IC5	0.016	4.00	14.750	450	491393.165	359641.393	0.805
Swale2.1	0.035	4.00	14.465		491388.220	359651.841	0.600
Swale2.2			14.455		491383.545	359651.839	0.610
IC6	0.017	4.00	14.650	450	491375.798	359641.293	0.835
Swale3.1	0.060	4.00	14.325		491371.771	359651.540	0.600
Swale3.2			14.305		491359.112	359651.742	0.605
IC7	0.020	4.00	14.500	450	491355.472	359641.460	0.700
Swale6.1	0.020	4.00	14.260		491355.046	359652.190	0.600
Swale4.1	0.032	4.00	14.405		491341.537	359622.472	0.600
Swale4.2			14.395		491341.537	359626.725	0.594
Swale5.1	0.037	4.00	14.325		491340.699	359638.977	0.600
Swale5.2			14.320		491340.699	359647.157	0.600
Pond	0.050	4.00	14.260		491341.524	359668.982	0.560
Swale6.2			14.260		491353.603	359670.182	0.636
SW MH			14.300	1200	491353.602	359675.010	0.696

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	IC3	IC4	19.307	0.600	14.200	14.071	0.129	150.0	150	4.39	50.0
1.001	IC4	Swale1.1	12.185	0.600	14.071	13.985	0.086	141.7	150	4.63	50.0
2.000	IC1	IC2	10.516	0.600	14.145	14.075	0.070	150.0	150	4.21	50.0
2.001	IC2	Swale1.1	13.327	0.600	14.075	13.985	0.090	148.1	150	4.48	50.0
1.002	Swale1.1	Swale1.2	6.594	0.600	13.985	13.970	0.015	439.6	400	4.69	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	4.7	0.900	0.779	0.035	0.0	59	0.732
1.001	0.842	14.9	7.0	0.779	0.450	0.052	0.0	72	0.829
2.000	0.818	14.5	1.8	0.810	0.760	0.013	0.0	35	0.555
2.001	0.823	14.6	5.6	0.760	0.450	0.041	0.0	64	0.768
1.002	1.831	2416.4	16.5	0.000	0.000	0.122	0.0	57	0.514

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)
1.003	Swale1.2	Swale2.1	11.543	0.600	13.970	13.865	0.105	109.9	225	4.85	50.0
3.000	IC5	Swale2.1	11.559	0.600	13.945	13.865	0.080	144.5	150	4.23	50.0
1.004	Swale2.1	Swale2.2	4.675	0.600	13.865	13.845	0.020	233.8	400	4.88	50.0
1.005	Swale2.2	Swale3.1	11.778	0.600	13.845	13.725	0.120	98.1	225	5.03	50.0
4.000	IC6	Swale3.1	11.010	0.600	13.815	13.725	0.090	122.3	100	4.26	50.0
1.006	Swale3.1	Swale3.2	12.661	0.600	13.725	13.700	0.025	506.4	400	5.15	50.0
1.007	Swale3.2	Swale6.1	4.091	0.600	13.700	13.660	0.040	102.3	225	5.21	50.0
5.000	IC7	Swale6.1	10.738	0.600	13.800	13.700	0.100	107.4	150	4.18	50.0
1.008	Swale6.1	Swale6.2	18.050	0.600	13.660	13.624	0.036	500.0	400	5.38	50.0
6.000	Swale4.1	Swale4.2	4.253	0.600	13.805	13.801	0.004	1063.2	400	4.06	50.0
6.001	Swale4.2	Swale5.1	12.281	0.600	13.801	13.725	0.076	161.6	150	4.32	50.0
6.002	Swale5.1	Swale5.2	8.180	0.600	13.725	13.720	0.005	1636.0	400	4.46	50.0
6.003	Swale5.2	Pond	9.000	0.600	13.720	13.700	0.020	450.0	225	4.71	50.0
6.004	Pond	Swale6.2	12.138	0.600	13.700	13.624	0.076	159.7	225	4.91	50.0
1.009	Swale6.2	SW MH	4.828	0.600	13.624	13.604	0.020	241.4	300	5.46	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)
1.003	1.246	49.5	16.5	0.375	0.375	0.122	0.0	89	1.123
3.000	0.834	14.7	2.2	0.655	0.450	0.016	0.0	39	0.598
1.004	2.515	3320.1	23.4	0.000	0.010	0.173	0.0	57	0.713
1.005	1.320	52.5	23.4	0.385	0.375	0.173	0.0	105	1.282
4.000	0.694	5.4	2.3	0.735	0.500	0.017	0.0	46	0.667
1.006	1.705	2250.2	33.9	0.000	0.005	0.250	0.0	86	0.598
1.007	1.292	51.4	33.9	0.380	0.375	0.250	0.0	133	1.376
5.000	0.969	17.1	2.7	0.550	0.410	0.020	0.0	40	0.707
1.008	1.716	2264.7	39.3	0.000	0.036	0.290	0.0	93	0.627
6.000	1.173	1547.9	4.3	0.000	-0.006	0.032	0.0	35	0.249
6.001	0.788	13.9	4.3	0.444	0.450	0.032	0.0	58	0.698
6.002	0.943	1244.8	9.4	0.000	0.000	0.069	0.0	60	0.270
6.003	0.610	24.2	9.4	0.375	0.335	0.069	0.0	97	0.572
6.004	1.032	41.0	16.1	0.335	0.411	0.119	0.0	98	0.972
1.009	1.007	71.2	55.4	0.336	0.396	0.409	0.0	200	1.110

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	19.307	150.0	150	Circular	15.250	14.200	0.900	15.000	14.071	0.779
1.001	12.185	141.7	150	Circular	15.000	14.071	0.779	14.585	13.985	0.450
2.000	10.516	150.0	150	Circular	15.105	14.145	0.810	14.985	14.075	0.760
2.001	13.327	148.1	150	Circular	14.985	14.075	0.760	14.585	13.985	0.450
1.002	6.594	439.6	400	Swale	14.585	13.985	0.000	14.570	13.970	0.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	IC3	450	Manhole	Adoptable	IC4	450	Manhole	Adoptable
1.001	IC4	450	Manhole	Adoptable	Swale1.1		Junction	
2.000	IC1	450	Manhole	Adoptable	IC2	450	Manhole	Adoptable
2.001	IC2	450	Manhole	Adoptable	Swale1.1		Junction	
1.002	Swale1.1		Junction		Swale1.2		Junction	

Pipeline Schedule

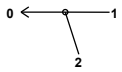
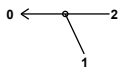
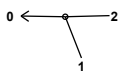
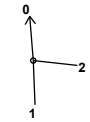
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	11.543	109.9	225	Circular	14.570	13.970	0.375	14.465	13.865	0.375
3.000	11.559	144.5	150	Circular	14.750	13.945	0.655	14.465	13.865	0.450
1.004	4.675	233.8	400	Swale	14.465	13.865	0.000	14.455	13.845	0.010
1.005	11.778	98.1	225	Circular	14.455	13.845	0.385	14.325	13.725	0.375
4.000	11.010	122.3	100	Circular	14.650	13.815	0.735	14.325	13.725	0.500
1.006	12.661	506.4	400	Swale	14.325	13.725	0.000	14.305	13.700	0.005
1.007	4.091	102.3	225	Circular	14.305	13.700	0.380	14.260	13.660	0.375
5.000	10.738	107.4	150	Circular	14.500	13.800	0.550	14.260	13.700	0.410
1.008	18.050	500.0	400	Swale	14.260	13.660	0.000	14.260	13.624	0.036
6.000	4.253	1063.2	400	Swale	14.405	13.805	0.000	14.395	13.801	-0.006
6.001	12.281	161.6	150	Circular	14.395	13.801	0.444	14.325	13.725	0.450
6.002	8.180	1636.0	400	Swale	14.325	13.725	0.000	14.320	13.720	0.000
6.003	9.000	450.0	225	Circular	14.320	13.720	0.375	14.260	13.700	0.335
6.004	12.138	159.7	225	Circular	14.260	13.700	0.335	14.260	13.624	0.411
1.009	4.828	241.4	300	Circular	14.260	13.624	0.336	14.300	13.604	0.396

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	Swale1.2		Junction		Swale2.1		Junction	
3.000	IC5	450	Manhole	Adoptable	Swale2.1		Junction	
1.004	Swale2.1		Junction		Swale2.2		Junction	
1.005	Swale2.2		Junction		Swale3.1		Junction	
4.000	IC6	450	Manhole	Adoptable	Swale3.1		Junction	
1.006	Swale3.1		Junction		Swale3.2		Junction	
1.007	Swale3.2		Junction		Swale6.1		Junction	
5.000	IC7	450	Manhole	Adoptable	Swale6.1		Junction	
1.008	Swale6.1		Junction		Swale6.2		Junction	
6.000	Swale4.1		Junction		Swale4.2		Junction	
6.001	Swale4.2		Junction		Swale5.1		Junction	
6.002	Swale5.1		Junction		Swale5.2		Junction	
6.003	Swale5.2		Junction		Pond		Junction	
6.004	Pond		Junction		Swale6.2		Junction	
1.009	Swale6.2		Junction		SW MH	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
IC3	491429.134	359637.056	15.250	1.050	450				
						0	1.000	14.200	150
IC4	491410.092	359640.243	15.000	0.929	450		1.000	14.071	150
						0	1.001	14.071	150
IC1	491420.046	359662.321	15.105	0.960	450				
						0	2.000	14.145	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
IC2	491419.684	359651.811	14.985	0.910	450	 1	2.000	14.075	150
						0	2.001	14.075	150
Swale1.1	491406.357	359651.841	14.585	0.600		1	2.001	13.985	150
						 2	1.001	13.985	150
						0	1.002	13.985	400
Swale1.2	491399.763	359651.841	14.570	0.600		1	1.002	13.970	400
						0	1.003	13.970	225
IC5	491393.165	359641.393	14.750	0.805	450				
						0	3.000	13.945	150
Swale2.1	491388.220	359651.841	14.465	0.600		1	3.000	13.865	150
						 2	1.003	13.865	225
						0	1.004	13.865	400
Swale2.2	491383.545	359651.839	14.455	0.610		1	1.004	13.845	400
						0	1.005	13.845	225
IC6	491375.798	359641.293	14.650	0.835	450				
						0	4.000	13.815	100
Swale3.1	491371.771	359651.540	14.325	0.600		1	4.000	13.725	100
						 2	1.005	13.725	225
						0	1.006	13.725	400
Swale3.2	491359.112	359651.742	14.305	0.605		1	1.006	13.700	400
						0	1.007	13.700	225
IC7	491355.472	359641.460	14.500	0.700	450				
						0	5.000	13.800	150
Swale6.1	491355.046	359652.190	14.260	0.600		 1	5.000	13.700	150
						2	1.007	13.660	225
						0	1.008	13.660	400
Swale4.1	491341.537	359622.472	14.405	0.600					
						0	6.000	13.805	400
Swale4.2	491341.537	359626.725	14.395	0.594		 1	6.000	13.801	400
						0	6.001	13.801	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Swale5.1	491340.699	359638.977	14.325	0.600		1	6.001	13.725	150
						0	6.002	13.725	400
Swale5.2	491340.699	359647.157	14.320	0.600		1	6.002	13.720	400
						0	6.003	13.720	225
Pond	491341.524	359668.982	14.260	0.560		1	6.003	13.700	225
						0	6.004	13.700	225
Swale6.2	491353.603	359670.182	14.260	0.636		1	6.004	13.624	225
						2	1.008	13.624	400
						0	1.009	13.624	300
SW MH	491353.602	359675.010	14.300	0.696	1200	1	1.009	13.604	300

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 %)
2	0	0	0
30	0	0	0
100	40	0	0

Node SW MH Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	13.604	Product Number	CTL-SHE-0079-2500-0719-2500
Design Depth (m)	0.719	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node Pond Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	13.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	293.0	0.0	0.560	421.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.12%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	IC3	10	14.271	0.071	6.7	0.0590	0.0000	OK
15 minute winter	IC4	10	14.164	0.093	10.0	0.0488	0.0000	OK
15 minute winter	IC1	10	14.187	0.042	2.5	0.0181	0.0000	OK
15 minute summer	IC2	10	14.156	0.081	7.9	0.0627	0.0000	OK
15 minute winter	Swale1.1	10	14.078	0.093	23.5	0.0898	0.0000	OK
15 minute winter	Swale1.2	10	14.077	0.107	23.2	0.0000	0.0000	OK
15 minute winter	IC5	10	13.992	0.047	3.1	0.0259	0.0000	OK
15 minute winter	Swale2.1	11	13.973	0.108	32.7	0.1264	0.0000	OK
15 minute winter	Swale2.2	11	13.975	0.130	32.1	0.0000	0.0000	OK
15 minute winter	IC6	11	13.902	0.087	3.3	0.0491	0.0000	OK
15 minute winter	Swale3.1	12	13.883	0.158	45.7	0.3161	0.0000	OK
15 minute winter	Swale3.2	12	13.884	0.184	42.8	0.0000	0.0000	OK
15 minute winter	IC7	12	13.873	0.073	3.9	0.0530	0.0000	OK
15 minute winter	Swale6.1	12	13.872	0.212	47.8	0.1417	0.0000	OK
15 minute winter	Swale4.1	10	13.870	0.065	6.2	0.0696	0.0000	OK
15 minute winter	Swale4.2	10	13.870	0.069	6.1	0.0000	0.0000	OK
180 minute winter	Swale5.1	172	13.841	0.116	3.0	0.1435	0.0000	OK
180 minute winter	Swale5.2	172	13.841	0.121	2.9	0.0000	0.0000	OK
180 minute winter	Pond	172	13.841	0.141	13.8	43.9769	0.0000	OK
15 minute winter	Swale6.2	12	13.872	0.248	46.1	0.0000	0.0000	OK
15 minute winter	SW MH	13	13.875	0.271	8.1	0.3060	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	IC3	1.000	IC4	6.7	0.681	0.464	0.1904	
15 minute winter	IC4	1.001	Swale1.1	10.0	0.871	0.670	0.1396	
15 minute winter	IC1	2.000	IC2	2.5	0.368	0.173	0.0722	
15 minute summer	IC2	2.001	Swale1.1	7.9	0.756	0.543	0.1406	
15 minute winter	Swale1.1	1.002	Swale1.2	23.2	0.335	0.010	0.4620	
15 minute winter	Swale1.2	1.003	Swale2.1	22.9	1.238	0.463	0.2139	
15 minute winter	IC5	3.000	Swale2.1	3.1	0.390	0.210	0.1041	
15 minute winter	Swale2.1	1.004	Swale2.2	32.1	0.376	0.010	0.4223	
15 minute winter	Swale2.2	1.005	Swale3.1	31.6	1.260	0.602	0.3137	
15 minute winter	IC6	4.000	Swale3.1	3.1	0.452	0.572	0.0828	
15 minute winter	Swale3.1	1.006	Swale3.2	42.8	0.386	0.019	1.9797	
15 minute winter	Swale3.2	1.007	Swale6.1	41.4	1.293	0.806	0.1505	
15 minute winter	IC7	5.000	Swale6.1	3.9	0.579	0.228	0.1399	
15 minute winter	Swale6.1	1.008	Swale6.2	43.9	0.356	0.019	4.5545	
15 minute winter	Swale4.1	6.000	Swale4.2	6.1	0.158	0.004	0.1712	
15 minute winter	Swale4.2	6.001	Swale5.1	6.0	0.630	0.434	0.1188	
180 minute winter	Swale5.1	6.002	Swale5.2	2.9	0.105	0.002	0.7361	
180 minute winter	Swale5.2	6.003	Pond	2.9	0.572	0.118	0.2165	
180 minute winter	Pond	6.004	Swale6.2	-8.9	-0.412	-0.218	0.3980	
15 minute winter	Swale6.2	1.009	SW MH	8.1	0.491	0.114	0.3094	
15 minute winter	SW MH	Hydro-Brake®		2.5				29.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.12%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	IC3	10	14.369	0.169	12.8	0.1393	0.0000	SURCHARGED
15 minute winter	IC4	11	14.269	0.198	18.3	0.1038	0.0000	SURCHARGED
15 minute winter	IC1	10	14.217	0.072	4.8	0.0310	0.0000	OK
15 minute winter	IC2	10	14.213	0.138	14.7	0.1069	0.0000	OK
15 minute winter	Swale1.1	12	14.145	0.160	42.2	0.1543	0.0000	OK
15 minute winter	Swale1.2	12	14.145	0.175	41.5	0.0000	0.0000	OK
15 minute winter	IC5	12	14.121	0.176	5.9	0.0983	0.0000	SURCHARGED
15 minute winter	Swale2.1	12	14.117	0.252	57.9	0.2942	0.0000	OK
15 minute winter	Swale2.2	12	14.117	0.272	52.4	0.0000	0.0000	SURCHARGED
15 minute winter	IC6	11	14.096	0.281	6.2	0.1593	0.0000	SURCHARGED
15 minute winter	Swale3.1	13	14.023	0.298	75.6	0.5958	0.0000	OK
15 minute winter	Swale3.2	13	14.023	0.323	66.1	0.0000	0.0000	FLOOD RISK
240 minute winter	IC7	236	13.990	0.190	1.3	0.1386	0.0000	SURCHARGED
240 minute winter	Swale6.1	236	13.990	0.330	22.2	0.2200	0.0000	OK
240 minute winter	Swale4.1	236	13.990	0.185	2.1	0.1974	0.0000	OK
240 minute winter	Swale4.2	236	13.990	0.189	2.0	0.0000	0.0000	SURCHARGED
240 minute winter	Swale5.1	236	13.990	0.265	4.3	0.3267	0.0000	OK
240 minute winter	Swale5.2	236	13.990	0.270	3.9	0.0000	0.0000	SURCHARGED
240 minute winter	Pond	236	13.990	0.290	20.5	95.0936	0.0000	FLOOD RISK
240 minute winter	Swale6.2	236	13.990	0.366	18.7	0.0000	0.0000	FLOOD RISK
240 minute winter	SW MH	236	13.990	0.386	3.0	0.4364	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	IC3	1.000	IC4	12.1	0.747	0.834	0.3399	
15 minute winter	IC4	1.001	Swale1.1	17.2	0.979	1.158	0.2145	
15 minute winter	IC1	2.000	IC2	4.5	0.405	0.313	0.1332	
15 minute winter	IC2	2.001	Swale1.1	14.3	0.856	0.986	0.2299	
15 minute winter	Swale1.1	1.002	Swale1.2	41.5	0.353	0.017	0.9950	
15 minute winter	Swale1.2	1.003	Swale2.1	40.4	1.282	0.816	0.4205	
15 minute winter	IC5	3.000	Swale2.1	4.7	0.452	0.320	0.2035	
15 minute winter	Swale2.1	1.004	Swale2.2	52.4	0.386	0.016	1.4561	
15 minute winter	Swale2.2	1.005	Swale3.1	48.6	1.361	0.927	0.4684	
15 minute winter	IC6	4.000	Swale3.1	5.3	0.680	0.977	0.0861	
15 minute winter	Swale3.1	1.006	Swale3.2	66.1	0.405	0.029	5.2395	
15 minute winter	Swale3.2	1.007	Swale6.1	59.8	1.504	1.164	0.1627	
240 minute winter	IC7	5.000	Swale6.1	1.2	0.326	0.072	0.1890	
240 minute winter	Swale6.1	1.008	Swale6.2	18.7	0.181	0.008	9.0842	
240 minute winter	Swale4.1	6.000	Swale4.2	2.0	0.108	0.001	0.7645	
240 minute winter	Swale4.2	6.001	Swale5.1	2.0	0.356	0.142	0.2162	
240 minute winter	Swale5.1	6.002	Swale5.2	3.9	0.102	0.003	2.6312	
240 minute winter	Swale5.2	6.003	Pond	3.6	0.644	0.147	0.3579	
240 minute winter	Pond	6.004	Swale6.2	-14.0	-0.394	-0.342	0.4827	
240 minute winter	Swale6.2	1.009	SW MH	3.0	0.348	0.042	0.3400	
240 minute winter	SW MH	Hydro-Brake®		2.5				66.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.12%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	IC3	11	15.115	0.915	23.3	0.7555	0.0000	FLOOD RISK
15 minute winter	IC4	11	14.813	0.742	31.7	0.3898	0.0000	FLOOD RISK
15 minute winter	IC1	11	14.694	0.549	8.6	0.2360	0.0000	SURCHARGED
15 minute winter	IC2	11	14.671	0.596	25.2	0.4615	0.0000	SURCHARGED
15 minute winter	Swale1.1	13	14.464	0.479	72.0	0.4631	0.0000	OK
15 minute winter	Swale1.2	13	14.464	0.494	58.8	0.0000	0.0000	FLOOD RISK
15 minute winter	IC5	13	14.371	0.426	10.6	0.2372	0.0000	SURCHARGED
15 minute winter	Swale2.1	13	14.364	0.498	76.9	0.5817	0.0000	OK
15 minute winter	Swale2.2	13	14.364	0.519	68.5	0.0000	0.0000	FLOOD RISK
15 minute winter	IC6	11	14.466	0.651	11.3	0.3683	0.0000	FLOOD RISK
600 minute winter	Swale3.1	585	14.241	0.516	15.4	1.0325	0.0000	OK
600 minute winter	Swale3.2	585	14.241	0.541	12.9	0.0000	0.0000	FLOOD RISK
600 minute winter	IC7	585	14.241	0.441	1.1	0.3217	0.0000	FLOOD RISK
600 minute winter	Swale6.1	585	14.241	0.581	22.0	0.3874	0.0000	OK
600 minute winter	Swale4.1	585	14.240	0.435	13.9	0.4637	0.0000	OK
600 minute winter	Swale4.2	585	14.244	0.443	24.7	0.0000	0.0000	FLOOD RISK
600 minute winter	Swale5.1	585	14.241	0.516	3.5	0.6368	0.0000	OK
600 minute winter	Swale5.2	585	14.241	0.521	3.1	0.0000	0.0000	FLOOD RISK
600 minute winter	Pond	585	14.241	0.541	15.5	192.8342	0.0000	FLOOD RISK
600 minute winter	Swale6.2	585	14.241	0.617	13.4	0.0000	0.0000	FLOOD RISK
600 minute winter	SW MH	585	14.241	0.637	3.3	0.7201	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	IC3	1.000	IC4	20.4	1.159	1.412	0.3399	
15 minute winter	IC4	1.001	Swale1.1	29.6	1.679	1.986	0.2145	
15 minute winter	IC1	2.000	IC2	7.2	0.407	0.496	0.1851	
15 minute winter	IC2	2.001	Swale1.1	23.3	1.325	1.603	0.2346	
15 minute winter	Swale1.1	1.002	Swale1.2	58.8	0.354	0.024	5.9651	
15 minute winter	Swale1.2	1.003	Swale2.1	48.6	1.286	0.981	0.4591	
15 minute winter	IC5	3.000	Swale2.1	9.3	0.530	0.634	0.2035	
15 minute winter	Swale2.1	1.004	Swale2.2	68.5	0.388	0.021	4.5797	
15 minute winter	Swale2.2	1.005	Swale3.1	62.6	1.574	1.193	0.4684	
15 minute winter	IC6	4.000	Swale3.1	9.7	1.242	1.782	0.0861	
600 minute winter	Swale3.1	1.006	Swale3.2	12.9	0.254	0.006	13.2949	
600 minute winter	Swale3.2	1.007	Swale6.1	19.6	0.772	0.382	0.1627	
600 minute winter	IC7	5.000	Swale6.1	1.5	0.326	0.088	0.1890	
600 minute winter	Swale6.1	1.008	Swale6.2	13.4	0.135	0.006	23.7565	
600 minute winter	Swale4.1	6.000	Swale4.2	24.7	0.086	0.016	3.2005	
600 minute winter	Swale4.2	6.001	Swale5.1	1.4	0.278	0.103	0.2162	
600 minute winter	Swale5.1	6.002	Swale5.2	3.1	0.069	0.003	8.3070	
600 minute winter	Swale5.2	6.003	Pond	2.7	0.564	0.113	0.3579	
600 minute winter	Pond	6.004	Swale6.2	-10.0	-0.251	-0.243	0.4827	
600 minute winter	Swale6.2	1.009	SW MH	3.3	0.191	0.046	0.3400	
600 minute winter	SW MH	Hydro-Brake®		2.5				113.4

Steve Gilman Design Ltd
Consulting Structural & Civil Engineers

Appendix C

Anglian Water Pre-Planning Assessment Report

Pre-Planning Assessment Report

Torgate Lane, Bassingham

InFlow Reference: PPE-0131677

Assessment Type: Water & Used Water

Report published: 08/10/2021

Thank you for submitting a pre-planning enquiry.

This has been produced for LINDUM GROUP LTD DART.

Your reference number is **PPE-0131677**.

This report can be submitted as a drainage strategy for the development should it seek planning permission.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

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Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	**No. Of units**
Dwellings	20

The anticipated residential build rate is:

Year	Y1
Build rate	20

Development type: Greenfield

Planning application status: Unknown

Site grid reference number: SK9138459648

The comments contained within this report relate to the public water mains and sewers indicated on our records.

Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that there are no public water mains/public sewers or other assets owned by Anglian Water within the boundary of your development site. However, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water supply

In examining the available capacity for your development site we assess the capacity and costs for two categories of water main. These are:

Strategic

These are the offsite potable water mains which deliver water within an area to a large number of development sites often across a number of towns. The strategic provision of these water mains enables us to provide of the cheapest solution across a large geographical area.

Local reinforcement

These are localised reinforcement mains to enable us to provide water to your development site. On most sites we also have two categories of water mains the Spine Mains and Housing Estate Mains (HEMs). To support your budgeting arrangements we have also examined the estimated cost for delivering the onsite water mains needed for a site of your size.

Water supply network

The water supply to the proposed development site can be provided from the existing mains. Anglian Water cannot reserve capacity and therefore you are recommended to formally apply for a connection at your earliest convenience. Please note that available capacity in our network can be reduced at any time due to increased requirements from existing businesses and houses as well as from new housing and new commercial developments.

Connection point(s)

Connection Point	Address	National Grid Reference (NGR)
CP-4860	Vasey Close	SK9135059674

Water infrastructure and costs

Your development site will be required to pay an **infrastructure charge** for each new property connecting to the public sewer that benefits from Full planning permission.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

Payment of the infrastructure charge must be made before premises are connected to the public sewer.

Infrastructure charge for water	
Anglian Water supply	£ 342.00

The **infrastructure discount** is a new element, introduced to reflect the changes in Ofwat's charging rules from April 2020.

The discount is £402.00 for each connection to the water supply network in the Anglian Water area.

Due to the changes in the charging rules, any discount must now be applied to the infrastructure charge rather than the requisition charge. This has provided us the opportunity to offer the discount (via the infrastructure charge) not just to water main requisitioners, but to those seeking water connections too.

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non-household premises, the Infrastructure charges is calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge.

Details of the relevant multiplier for each fitting can be found at our website.

The Water Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 342.00	20	£ 6840.00

The Infrastructure discount for your dwellings is:

Infrastructure discount	Number of units	Total
-£ 402.00	20	-£ 8040.00

The estimated cost for the onsite water main for your development is:

Onsite water main	£
Estimated cost of delivery	£ 12,000.00

Please note, a detailed cost breakdown will be provided on receipt of a formal application for a new water main.

Alternatively, you may wish to have the onsite main delivered by a Self-lay Provider under terms set out in a self-lay agreement.

For more information on water mains and self-lay of water mains, please visit our website

Section 4 - Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and effluent quality arising from your development.

Water recycling centre

The foul drainage from this development is in the catchment of Bassingham Water Recycling Centre, which currently does not have capacity to treat the flows from your development site. Anglian Water are obligated to accept the foul flows from your development with the benefit of planning consent and would therefore take the necessary steps to ensure that there is sufficient treatment capacity should the planning authority grant planning permission.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 150mm diameter sewer at manhole 3600 in Vasey Close at National Grid Reference NGR SK9134559677. Anglian Water has assessed the impact of a pumped conveyance from the planned development to the public foul sewerage network and we can confirm that this connection is acceptable as the foul sewerage system, at present, has available capacity for your site. In line with Sewers for Adoption, the pumped discharge will need to connect via an intermediate manhole and at least 5 metres of an appropriately sized gravity sewer. The pump rate and configuration of the connection will be determined with your detailed design. You should submit this detail with your Section 106 new connection application. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

In principle, your proposed method of surface water disposal is acceptable to Anglian Water. It is our understanding that the evidence to confirm compliance with the surface water hierarchy is not available. Once the evidence has been confirmed, then a connection point may be made to manhole 3650 in Vasey Close at NGR SK9135359675 at a maximum rate of 2.42l/s this is the 1 in 1 year rate for the development site. Our assessment has been based on development flows connecting to the nearest surface water sewer of the same size or greater pipe diameter. It is your responsibility to provide the evidence to confirm that all alternative methods of surface water disposal have been explored and these will be required before your connection can be agreed. This is subject to satisfactory evidence which shows the surface water management hierarchy as outlined in Building Regulations Part H has been explored. This would encompass the results from the site specific infiltration testing and/or confirmation that the flows cannot be discharged to a watercourse. Anglian Water's surface water policy follows the Surface Water hierarchy, outlined in Part H of the Building Regulations. Should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required. You are therefore advised to update Anglian Water with the key supporting evidence at your earliest convenience.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an infrastructure charge for each new property connecting to the public sewer that benefits from Full planning permission.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

Payment of the infrastructure charge must be made before premises are connected to the public sewer.

Infrastructure charge for water recycling:	**£ 573.00**

The Water Recyling Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 573.00	20	£ 11460

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non- household premises, the fixed element is calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge.

Details of the relevant multiplier for each fitting can be found at our website.

It has been assumed that the onsite used water network will be provided under Section 104 of the Water Industry Act

It is recommended that you also budget for connection costs.

Please note that we offer alternative types of connections depending on your needs and these costs are available at our website.

Section 5 - Map of Proposed Connection Points

Figure 1:Showing your water point of connection

Figure 2:Showing your used water point of connection

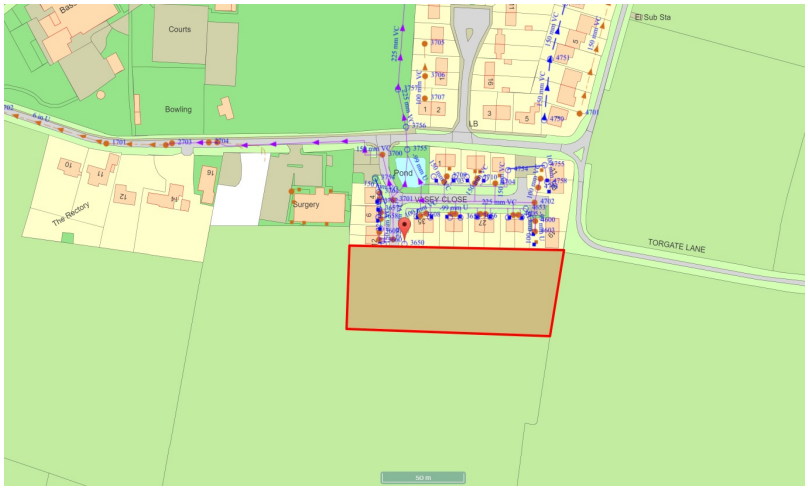

Figure 3:Showing your surface water point of connection

Section 6 - Useful information

Water Industry Act – Key water sections

Section 41:

This provides you with the right to requisition a new water main for domestic purposes to connect your site to the public water network.

Section 45:

This provides you with the right to have a connection for domestic purposes from a building or part of a building to the public water main.

Section 51A - E:

This provides you with the right to provide the water main or service connection yourself and for us to vest them into our company.

Section 55:

This applies where you request a supply of water for non-domestic purposes.

Section 185:

This provides you with the right to make a reasonable request to have a public water main, sewer or public lateral drain removed or altered, at your expense.

Details on how you can make a formal application for a new water main, new connection or diversion are available on from our Development Services team on **0345 60 66 087** or via our website

If you have any other queries on the rights to requisition or connect your housing to the public water and sewerage infrastructure then please contact our Development Services team at:

Anglian Water
PO Box 495
Huntingdon
PE29 6YY

Telephone: 0345 60 66 087
Email: developmentservices@anglianwater.co.uk

Water pressure and flow rate

The water pressure and consistency that we must meet for your site is laid out in the Water Industry Act (1991). This states that we must supply a flow rate of 9 litres per minute at a pressure of 10 metres of head to the external stop tap. If your water pressure requirements exceed this then you will need to provide and maintain any booster requirements to the development site.

Self-lay of water mains

A list of accredited self-lay provider organisations can be found on the Lloyds Registrar website

Water Industry Act – Key used water sections

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website or via our Development Services team on **0345 60 66 087**.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. .

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfers

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from digdat

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our website

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our website

Section 7 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content. Furthermore, in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).