

**Residential Development
Phase 2
Applefields
Wrawby
Lincolnshire**

Flood Risk Assessment

Rev	Date	Purpose/Status	Document Ref.	QA
A	08.08.2025	For approval	First issue	RAC/STC
B				
C				
D				
E				

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This report is for the use of the Client only and is not for the use of any other parties without the express permission of the Client. All calculations and related quantified assumptions are indicative for planning purposes only and are based solely on the available design proposals and must be reassessed during detailed design with the appropriate compliance methodology.

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EXECUTIVE SUMMARY

RCD Consultants Ltd has been appointed to complete a Flood Risk Assessment for the proposed development at Phase 2, Applefields, Wrawby, North Lincolnshire.

The site is Greenfield with an area of approximately 1.4Ha. It lies to the west of Phase 1 Applefields and is surrounded to the north, west and south by green fields. The topography falls in a south-westerly direction with levels ranging from 25.0m to 17.30m AOD. There is a ditch that runs along the southern boundary of the site that is already consented to take surface water flows from the Phase 1 development.

The report outlines the strategy for the surface water drainage for the proposed development with reference to Ciria 753, the SUDS manual, the National Planning Policy Framework (NPPF) and the joint Lincolnshire Flood Risk and Drainage Management Strategy 2012-2025.

The proposed development consists of the construction of twenty-three houses and twelve garages with a total roof area of 0.27Ha, 0.2Ha of impermeable access road and 0.13Ha of porous paved drives.

The Flood Warning Information Services website confirms that the site is in Flood Zone 1 and that there is no risk of surface water flooding other than that within close proximity to the ditch.

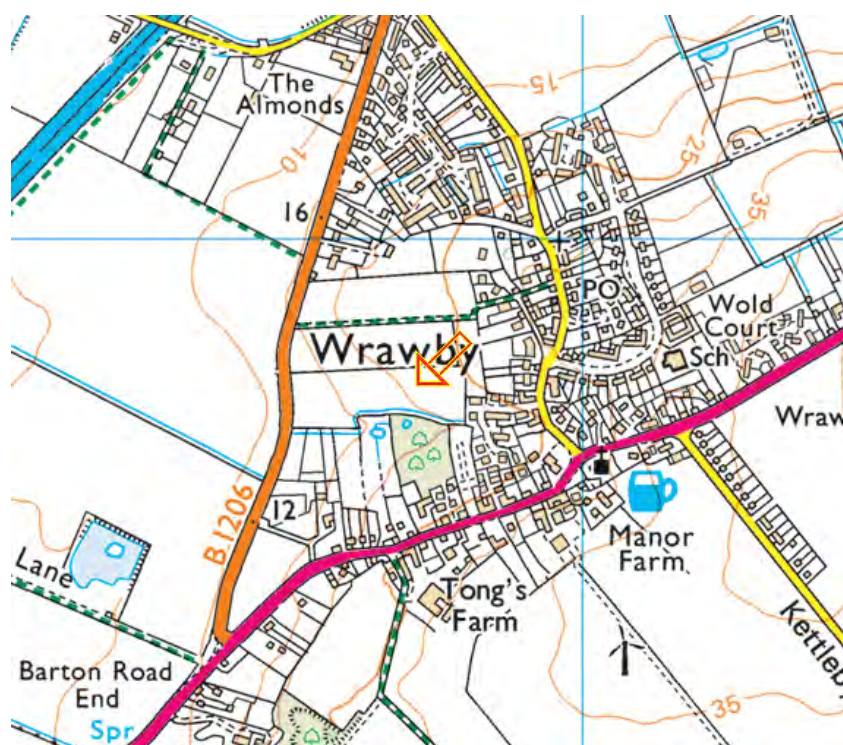
The British Geological Society website confirms that the site is underlain by Glaciolacustrine superficial deposits (Sand and gravel) over bedrock of the Ampthill Clay Formation. Soakage testing results for phase 1 are shown in Appendix A and these confirm that no superficial deposits were identified during investigation works.

The owners will be responsible for SUDs components within their own curtilage and the remainder will be either adopted by Anglina Water or maintained by a management company.

1.0 DEVELOPMENT DESCRIPTION AND LOCATION

1.1 What type of development is proposed and where will it be located.

The site is Greenfield with an area of approximately 1.4Ha. It lies to the west of Phase 1 Applefields and is surrounded to the north, west and south by green fields. The topography falls in a south-westerly direction with levels ranging from 25.0m to 17.30m AOD.



Extract from the Streetmap website showing the site location.

The proposed development consists of the construction of twenty-three houses and twelve garages with a total roof area of 0.27Ha, 0.2Ha of impermeable access road and 0.13Ha of porous paved drives.

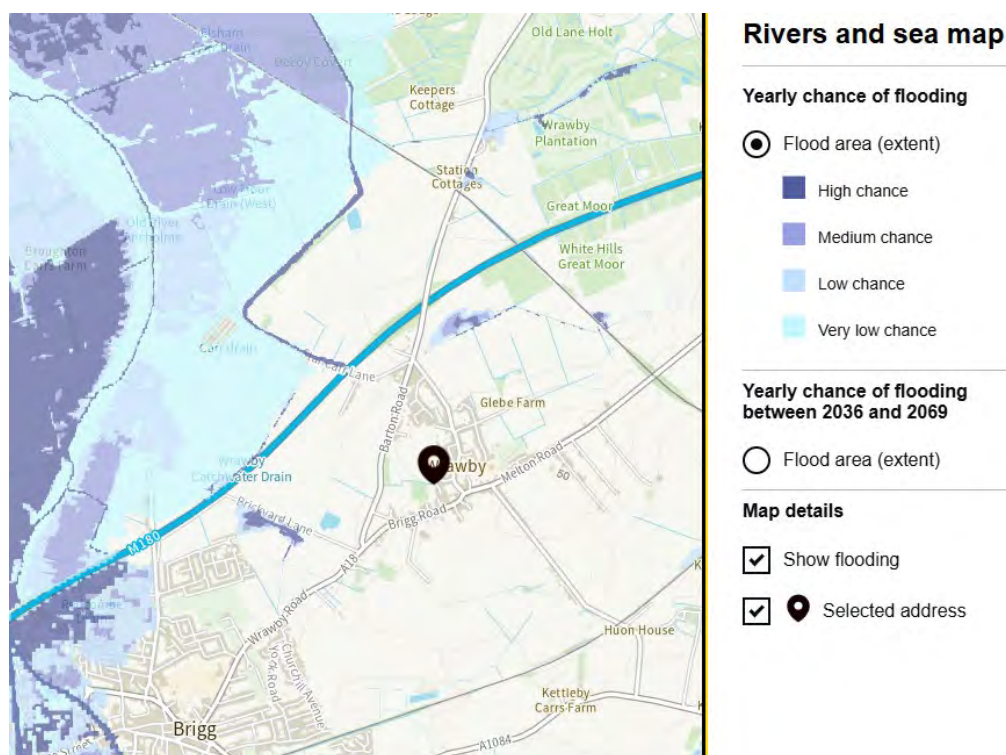
A copy of the topographical survey is shown in Appendix A.

1.2. What is the vulnerability classification?

In accordance with Table 2 of the NPPF, the proposed buildings are classified as “more vulnerable” being of residential use.

1.3. Is the proposed development consistent with the Local Development Documents

The Flood Warning Information Services website extract below confirms that the development is in flood zone 1 and that there is no risk of fluvial flooding.



The development is therefore consistent with local development documents.

1.4. Please provide evidence that the Sequential Test or Exception Test has been applied in the selection of this site for this development type?

Table 3 of the NPPF below shows that residential use is classed as “more vulnerable” and that an exception test is not required, however the following sections will discuss all sources of flood risk.

Table 3: Flood risk vulnerability and flood zone ‘compatibility’

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
 × Development should not be permitted.

2.0 DEFINITION OF FLOOD HAZARD

2.1. What sources of flooding could affect the site?

Risk factor	Low	Medium	High	After mitigation
Source				
Sea	No	No	No	No
Rivers	No	No	No	No
Surface Water	No	Yes	No	No
Groundwater	No	No	No	No
Sewers	No	No	No	No
Artificial sources	No	No	No	No

2.2. For each identified source, describe how flooding would occur, with reference to any historic records wherever these are available?

FLOODING FROM RIVERS

The nearest watercourse is The Little Carr Drain approximately 0.6Km due north from the site.

There is a ditch that runs along the southern boundary of the development site.

Section 1.3 of this report confirmed that the site is in flood zone 1 and not at risk of fluvial flooding.

Phase 2, Applefields, Wrawby

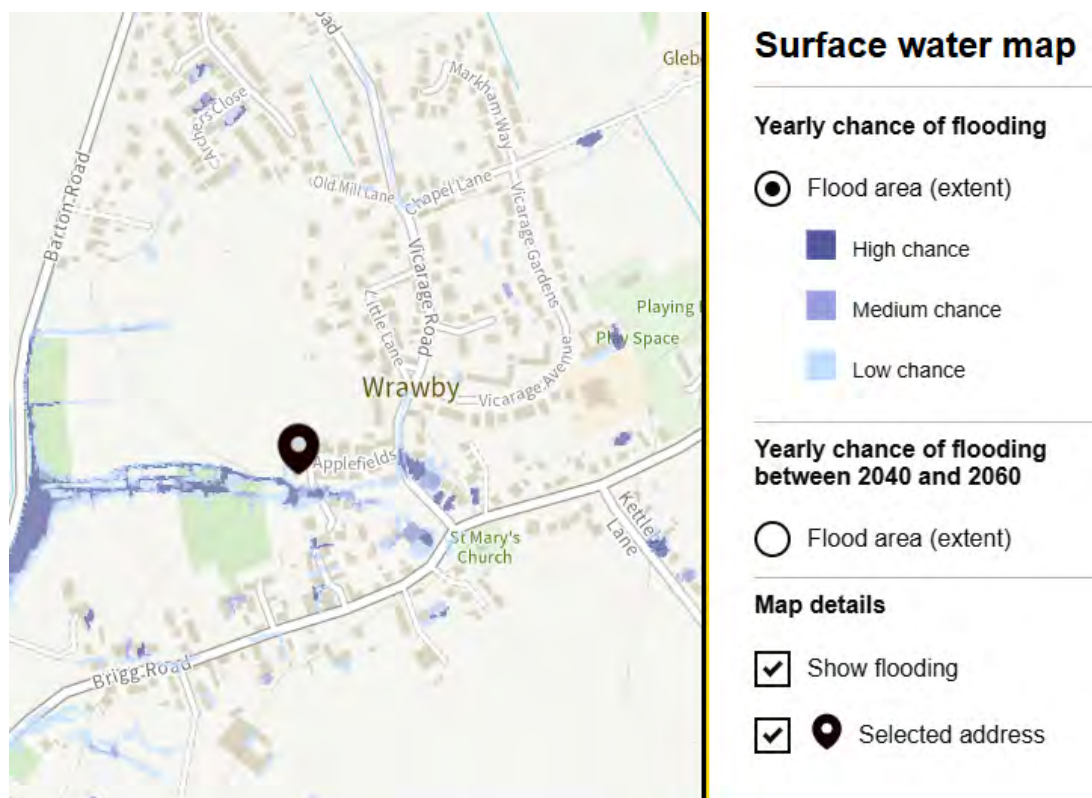
FLOODING FROM THE SEA

The River Humber estuary is affected by tidal influences and is approximately 13Km due north from the development site.

The risk of flooding is low.

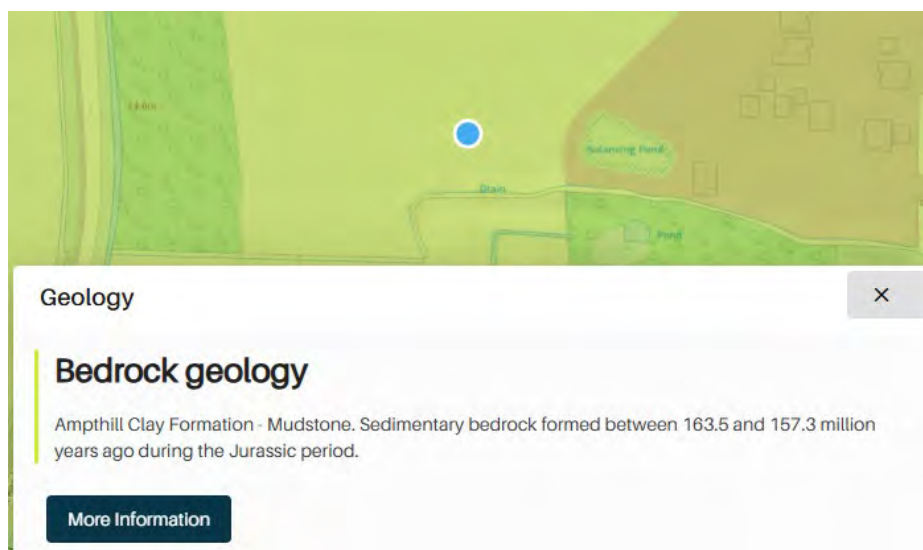
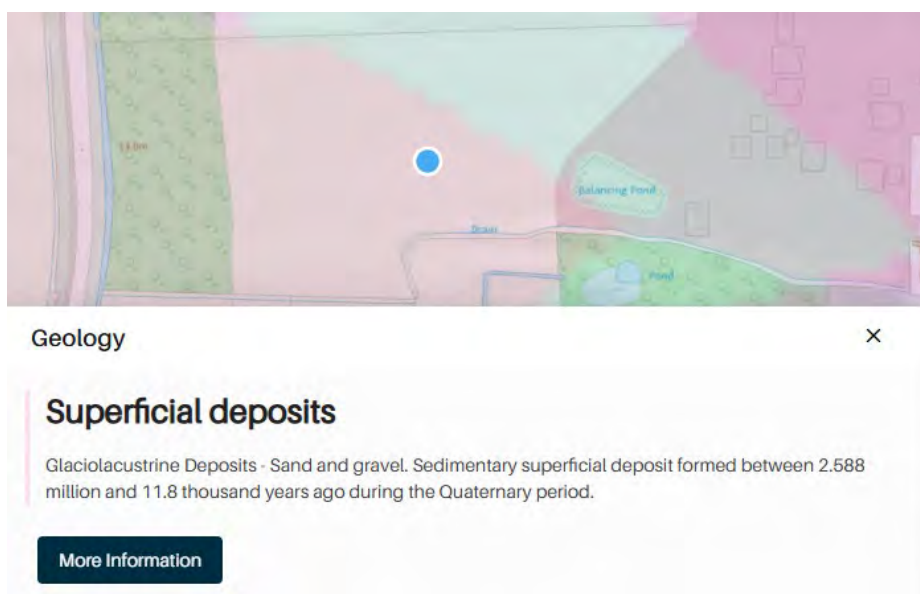
FLOODING FROM SURFACE WATER

The Flood Information Services website confirms that there is a medium risk of surface water flooding along the line of the existing ditch and that the remainder of the site is risk free. All house FFLs will be at least 1.0m higher than the banks of the ditch, therefore the risk is low.



FLOODING FROM GROUNDWATER

The British Geological Society website confirms that the site is underlain by Glaciolacustrine superficial deposits (Sand and gravel) over bedrock of the Amphill Clay Formation.



Soakage testing results for phase 1 are shown in Appendix A and these confirm that no superficial deposits were identified during investigation works.

The soils are predominantly of clay content with very poor leaching potential, therefore the risk of flooding is therefore low.

FLOODING FROM SEWERS

There are foul sewers associated with phase 1 of this development that will be offered for adoption under a S104 Agreement with Anglian Water.

There are no recorded incidents in the SFRA.

There are foul sewers in Applefields. A copy of the sewer records is shown in Appendix A.

The sewers are maintained by Anglian Water, therefore the risk is low.

FLOODING FROM RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

The Flood Warning information services website confirms that the site is not at risk.

3.0 PROBABILITY

3.1. Which flood zone is the site within?

The relevant flood map shown in section 1.3 represents current best estimates of zone 2 and zone 3 flooding as in the NPPF.

Zone 1	Low Probability of river or sea flooding
Zone 2	Medium Probability of river or sea flooding
Zone 3a	High Probability of river or sea flooding
Zone 3b	Functional Floodplain

The Flood Warning information services website shows that the site is in flood zone 1.

3.2. If there is a Strategic Flood Risk Assessment covering this site, what does it show?

The North and North East Lincolnshire SFRA dated November 2021 confirms that the site is in flood zone 1, there is a risk of surface water flooding adjacent to the existing ditch, there is no risk of groundwater flooding, no risk of flooding from sewer and no risk of flooding from artificial sources.

3.3. What is the probability of the site flooding taking account of the contents of the SFRA and of any further site-specific assessments?

There is no risk of fluvial. There is a risk of surface water close to the ditch running along the southern boundary but FFLs will be set at least 1.0m higher than the banks of the ditch therefore the risk of flooding is low. There are no other risks of flooding.

3.4. What are the existing rates and volumes of run-off generated by this site?

The Greenfield storm flow rates are summarised in Table A on the drainage layout.

The phase 1 drainage calculations are shown in Appendix B and confirm the flows and volumes generated for the 2, 30 and 100 year storm events with current climate change allowances. The flow rates are summarised in Table A on the drainage layout.

The phase 1 drainage calculations are shown in Appendix B and confirm the flows and volumes generated for the 2, 30 and 100 year storm events with current climate change allowances. The flow rates are summarised in Table A on the drainage layout.

The approved discharge rate of 5l/s for Phase 1 will remain for phase 2 by increasing the size of the attenuation basin.

4.0 CLIMATE CHANGE

4.1. How is flood risk at the site likely to be affected by climate change?

The phase 1 surface water calculations shown in Appendix B confirm that no flooding occurs during the 1 in 100 year storm event with a 40% climate change allowance and confirm that no flooding occurs.

The phase 2 surface water calculations shown in Appendix D include the phase 1 network because they share the attenuation basin and flow control and show that a small volume of flooding occurs, 2.1116m³, during the 1 in 100 year storm event with a 40% climate change allowance. Downstream from this flooding there is spare capacity to accommodate this flooding as it flows down the access road.

The calculations show that there is a 600mm freeboard in the attenuation basin during the worst-case 1 in 100 year storm event with a 40% climate change allowance.

The Environment Agency flood mapping includes climate change modelling and shows that the site will not be affected by flooding.

The site will therefore not be affected by climate change.

5.0 DETAILED DEVELOPMENT PROPOSALS

5.1. Please provide details of the development layout, referring to the relevant drawings.

The drainage strategy layout is shown in Appendix C.

Post-development surface water calculations are shown in Appendix D.

Surface water from the roofs and impermeable access road will discharge to the ditch running along the southern boundary. The agreed Phase 1 discharge rate of 5l/s will remain as part of the phase 2 development. The phase 1 attenuation basin has been extended to contain excess water discharged from the phase 2 development so that no flooding occurs during the worst-case 1 in 100 year storm event, other than the small volume mentioned in section 4.1.

With regard to the proposed drainage strategy there is a preference to dispose of surface water runoff by infiltration methods. If infiltration is not possible then discharging to a watercourse should be considered before discharge to a sewer. The following table considers each of the options:

Method	Yes/No	Reason
Infiltration	No	The soils are of clay content.
Watercourse	Yes	There is a watercourse.
Sewers	No	There are no public surface water sewers.

6.0 FLOOD RISK MANAGEMENT MEASURES

6.1. How will the site be protected from flooding, including the potential impacts of climate change, over the development's lifetime?

There is no risk of fluvial flooding. There is a risk of surface water flooding adjacent to the ditch running along the southern boundary. To mitigate this all FFLs will be at least 1.0m above the ditch. There are no other risks of flooding.

The surface water calculations shown in Appendix D include current climate change allowances and confirm that no flooding will occur during the lifetime of the development.

7.0 OFF SITE IMPACTS

7.1. How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?

The surface water calculations shown in Appendix D include current climate change allowance and confirm that no flooding will occur during the lifetime of the development.

The combined discharge rate of 5l/s is less than the corresponding greenfield flow rates therefore the proposed development has provided a betterment and the risk of flooding has reduced.

8.0 RESIDUAL RISKS

8.1. What flood-related risks will remain after you have implemented the measures to protect the site from flooding?

The risk of surface water flooding adjacent to the ditch will remain but will not affect the new houses in phase 1 or phase 2.

The surface water flow path will be maintained as existing and will not increase the risk of flooding.

8.2. How and by whom will these risks be managed over the lifetime of the development?

The owners will be responsible for the maintenance of the porous paved drives.

The porous paving shall be swept and weeded on a monthly basis.

Every twenty-five years or at a period specified by the manufacturer the permeable paving shall be lifted, and the laying course cleaned or replaced.

The adoptable sewers and SUDs components not in private ownership will be maintained by Anglian Water and adopted under a S104 Agreement.

9.0 CONTAMINATION MITIGATION

The British Geological Society website confirms that the site is underlain by Glaciolacustrine superficial deposits (Sand and gravel) over bedrock of the Amphill Clay Formation.

The site lies above an unproductive bedrock aquifer, a secondary superficial deposit aquifer and the Groundwater vulnerability is low.

Ciria 753 Chapter 26 Mitigation indices:

Pre-development pollution indices:

Chapter 26 identifies the pre-development use as greenfield and is assumed to be classed as a very low pollution hazard level;

Roofs: Total Solids = 0.2, Metals = 0.2 and Hydrocarbons = 0.05

The mitigation index is therefore $MI = 0.2 + 0.5 \times 0.2 + 0.5 \times 0.05 = 0.325$

These could be higher depending upon the agricultural use.

Post-development

residential use is identified in Table 26.2 as a very low pollution hazard level;

Roofs: Total Solids = 0.2, Metals = 0.2 and Hydrocarbons = 0.05

The mitigation index is therefore $MI = 0.2 + 0.5 \times 0.2 + 0.5 \times 0.05 = 0.325$

The pre-development mitigation indices are the same as the post-development indices.

Most waterborne contaminants will be removed as a result of flows through the grass lined attenuation basin, therefore the risk of contamination to the watercourse will be very low.

Table 26.5 Risk matrix

Element Number	Description	Risk Score	Weighting Factor	Score
1	Pollution Hazard Traffic Density	1	15	15
2	Average annual rainfall	1	15	15
3	Type of SUDS	2	15	30
4	Unsaturated zone depth	1	20	20
5	Flow through sub-soils	1	20	20
6	Unsaturated zone material	1	10	10
7	Soil organic matter	1	5	5
8	Unsaturated zone ph	1	5	5
Total				120

Based upon the above table the risk to groundwater is low as the total value is less than 180.

Appendix A

Topographical Survey

Phase 1 Drainage Layout

Soakage testing results



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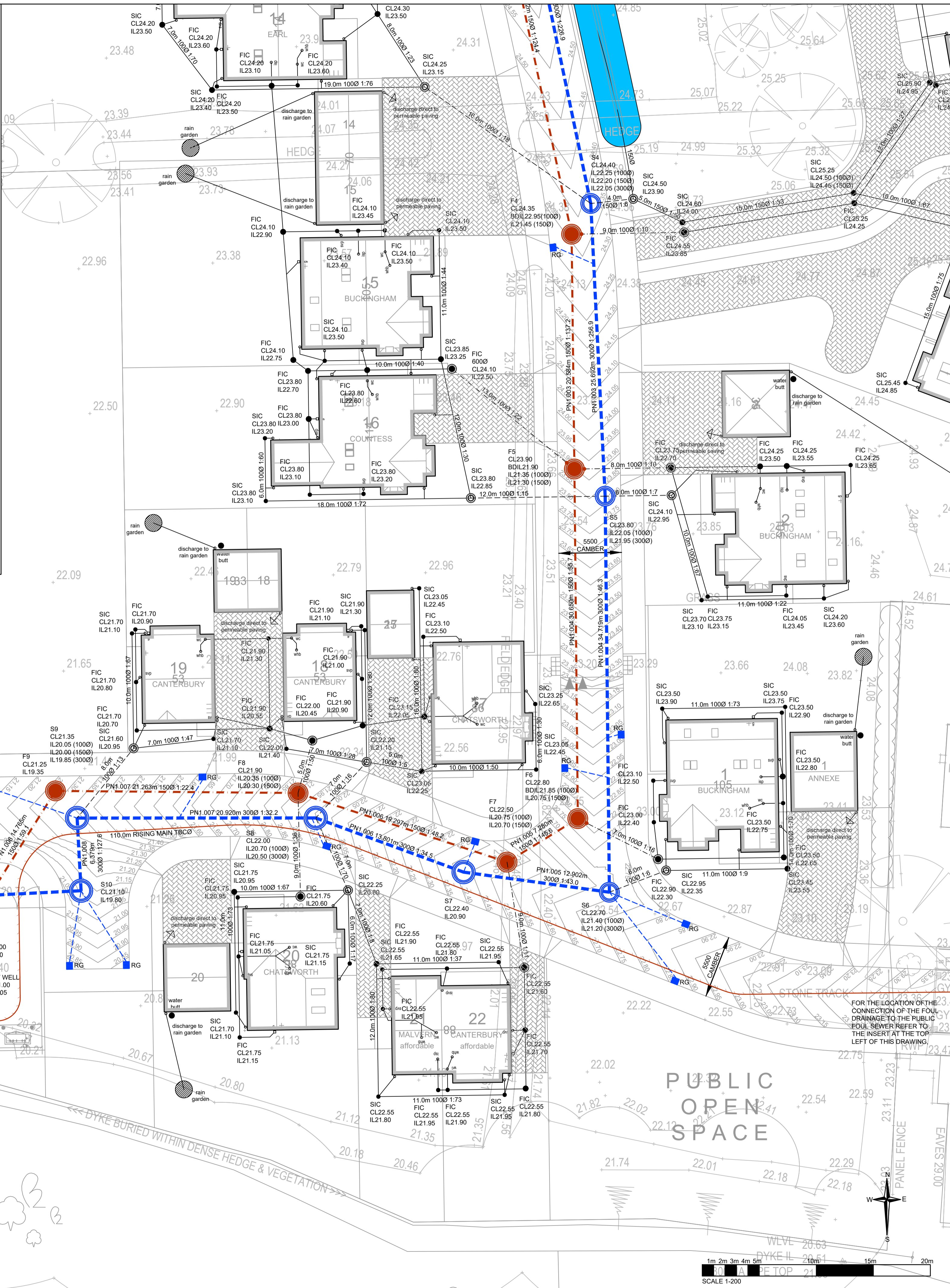
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Foul Sewer		Outfall (Colour denotes effluent type)	
Surface Sewer		Inlet (Colour denotes effluent type)	
Combined Sewer		Manhole (Colour denotes effluent type)	
Final Effluent		Sewage Treatment Works	
Rising Main (Colour denotes effluent type)		Pumping Station	
Private Sewer (Colour denotes effluent type)			
Decommissioned Sewer (Colour denotes effluent type)			

roy.lobley@outlook.com
Applefield



DRAWING LEGEND	
SURFACE WATER DRAINAGE	
S1	ADOPTABLE PCC MANHOLE
---	ADOPTABLE SURFACE WATER SEWER
SIC	4500 INSPECTION CHAMBER
RE	RODDING EYE
---	SURFACE WATER SEWER
RG	ROAD GULLY
-R	RAINWATER PIPE
□	HEADWALL
▨	450mm DEEP POROUS PAVED SINGLE DRIVE
FOUL WATER DRAINAGE	
◆	EXISTING PUBLIC FOUL MANHOLE
---	EXISTING PUBLIC FOUL SEWER
F1	ADOPTABLE PCC MANHOLE
---	ADOPTABLE FOUL SEWER
FIC	4500 INSPECTION CHAMBER
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DP	DRAINAGE POINT
BIG	BACK INLET GULLY



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 6. SMALL LIGHTWEIGHT ACCESS COVERS SHOULD BE SECURED (FOR EXAMPLE WITH SCREWS) TO DETER UNAUTHORISED ACCESS.
 7. ALL ABOVE GROUND DRAINAGE TO INCORPORATE RODDING ACCESS FACILITIES.
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 10. THE CONTRACTOR IS RESPONSIBLE FOR MAKING THE S106 SEWER CONNECTION APPLICATION TO ANGLIAN WATER SERVICES LTD.
 11. ALL WORK WITHIN THE HIGHWAY IS TO BE COMPLETED TO THE FULL SATISFACTION AND APPROVAL OF THE NORTH LINCOLNSHIRE COUNTY COUNCIL HIGHWAYS DEPARTMENT.
 12. THE CONTRACTOR IS RESPONSIBLE FOR MAKING ALL NECESSARY LICENCE APPLICATIONS FOR WORKS WITHIN THE EXISTING HIGHWAY.

STORM EVENT (1 IN)	GREENFIELD FLOW RATE l/s	POST-DEVELOPMENT FLOW RATE l/s
QBAR	2.84	-
1	2.44	4.9
30	4.98	5.0
100	5.90	5.0
100 + 40%CC	-	5.0

REV	AMENDMENT	DATE	CHKD
P4	PLOT SURFACE WATER PIPES AND POND ANNOTATED	17.10.2022	RAC
P3	INSERT OF FOUL DRAINAGE ADDED	11.10.2022	RAC
P2	AMENDED TO SUIT REVISED LAYOUT	04.08.2022	RAC
P1	PRELIMINARY ISSUE	31.05.2022	RAC

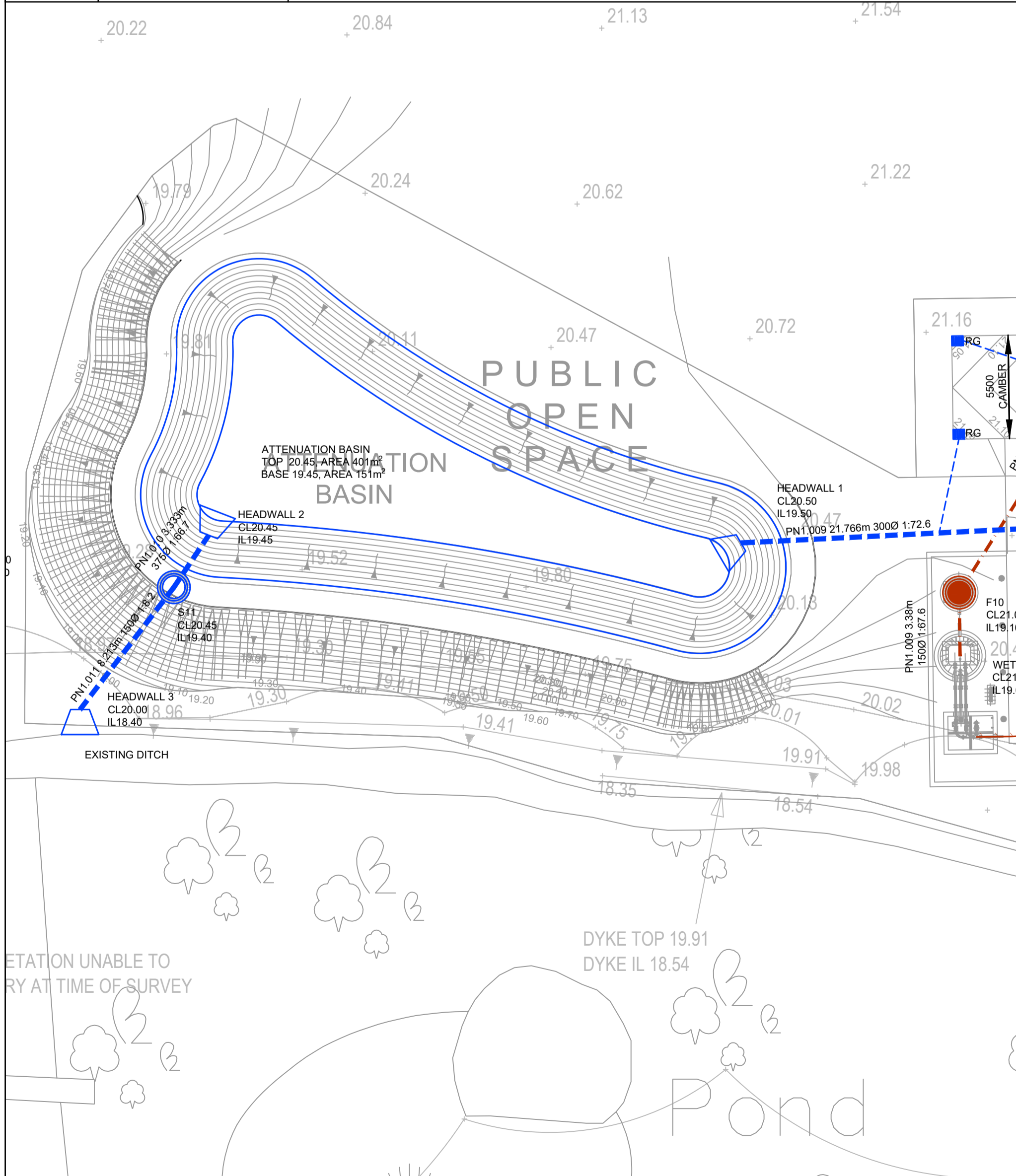
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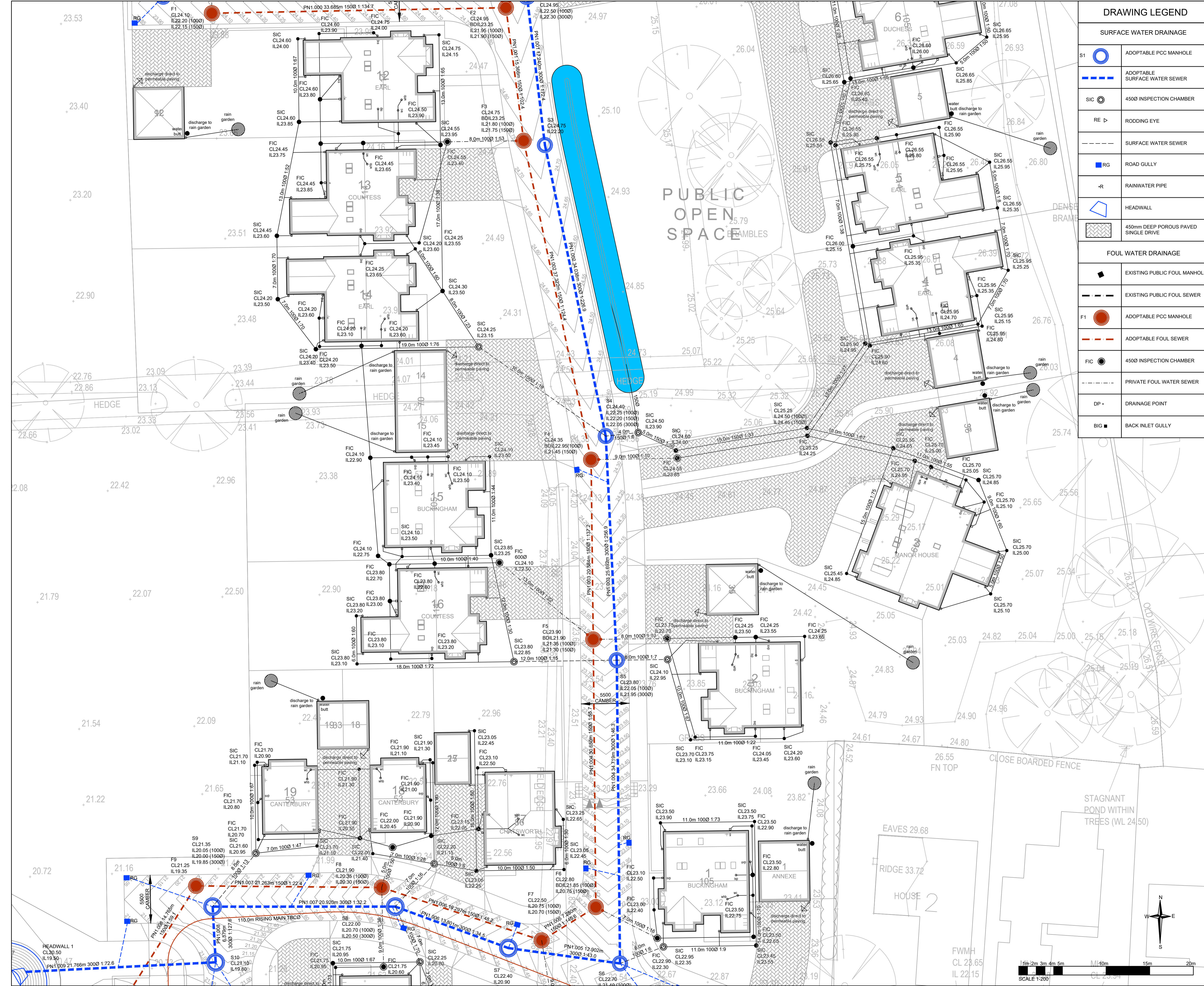
PRELIMINARY

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CLIENT	KIEGAR HOMES
PROJECT	PROPOSED RESIDENTIAL DEVELOPMENT APPLEFIELDS WRAWBY
DRAWING TITLE	DRAINAGE LAYOUT SHEET 1 OF 3
CIVILS	
SCALE	1:200 @ A1 1:400 @ A3
DRAWN BY	LD
CHECKED	RAC
DATE	MAY 2022
DRAWING NUMBER	1111-2211-CIV-10
REVISION	P4





DRAWING LEGEND

SURFACE WATER DRAINAGE	
S1	ADOPTABLE PCC MANHOLE
---	ADOPTABLE SURFACE WATER SEWER
SIC	4500 INSPECTION CHAMBER
RE	RODDING EYE
---	SURFACE WATER SEWER
RG	ROAD GULLY
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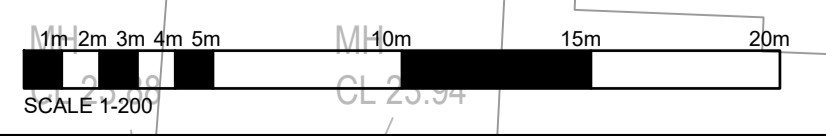
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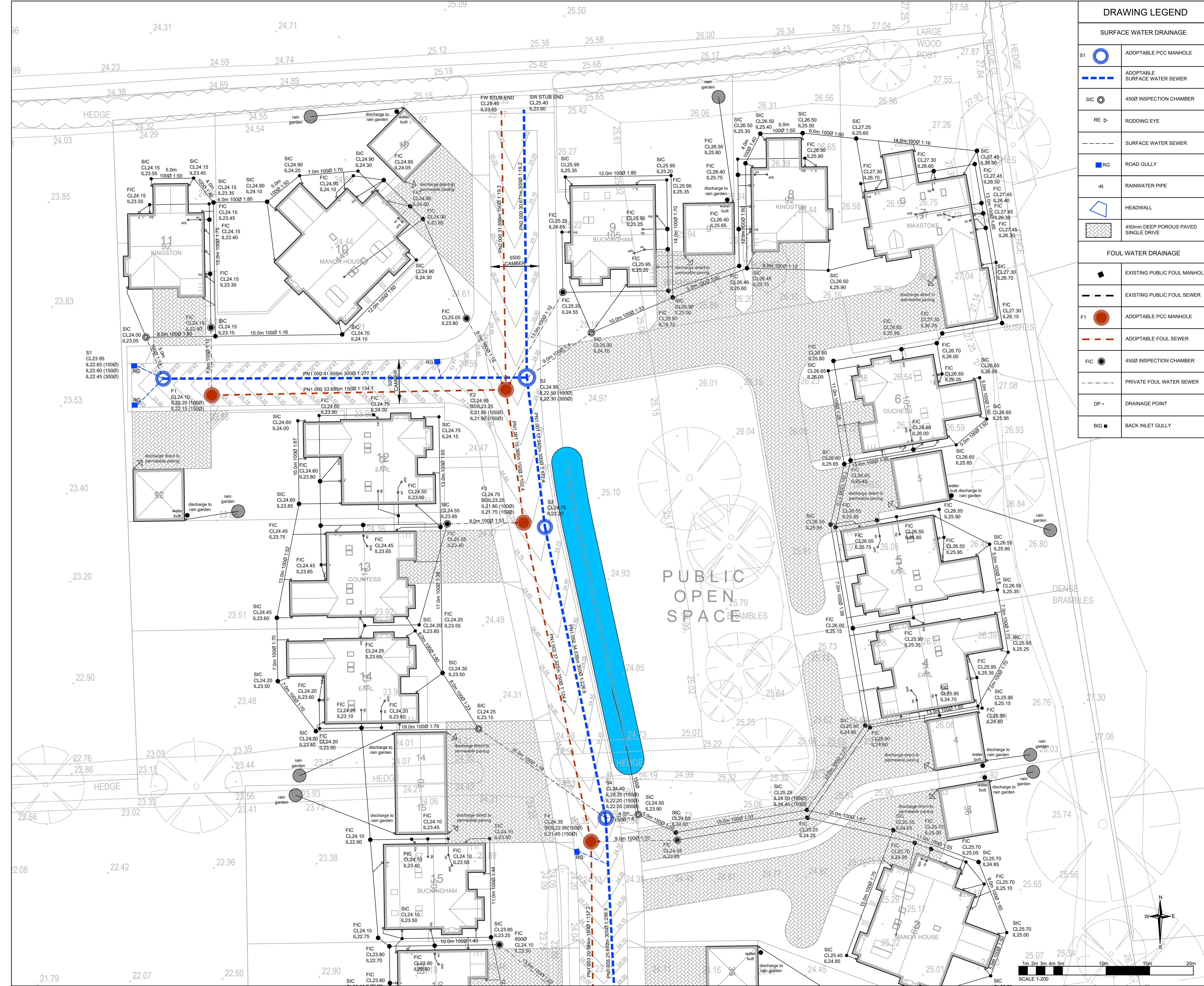
PROJECT
**PROPOSED RESIDENTIAL DEVELOPMENT
 APPLEFIELDS
 WRABBY**

DRAWING TITLE
**DRAINAGE LAYOUT
 SHEET 2 OF 3**

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:200 @ A1 1:400 @ A3	LD	RAC	MAY 2022
DRAWING NUMBER	REVISION		
1111-2211-CIV-11	P3		





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- ALL BUILDING DRAINAGE TO BE INSTALLED AND TESTED IN COMPLIANCE WITH THE BUILDING REGULATIONS 2000 DRAINAGE AND WASTE DISPOSAL APPROVED DOCUMENT H 2002 EDITION.
- SMALL LIGHTWEIGHT ACCESS COVERS SHOULD BE SECURED (FOR EXAMPLE WITH SCREWS) TO DETER UNAUTHORISED ACCESS.
- ALL ABOVE GROUND DRAINAGE TO INCORPORATE RODDING ACCESS FACILITIES.
- ALL PIPES TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE.
- PRIOR TO STARTING ANY CONSTRUCTION WORK ON SITE THE CONTRACTOR IS TO CONFIRM TO THE RCD ENGINEER THE INVERT LEVEL OF THE EXISTING FOUL AND SURFACE WATER SEWERS AT CONNECTION POINTS.
- THE CONTRACTOR IS RESPONSIBLE FOR MAKING THE S106 SEWER CONNECTION APPLICATION TO ANGLIAN WATER SERVICES LTD.
- ALL WORK WITHIN THE HIGHWAY IS TO BE COMPLETED TO THE FULL SATISFACTION AND APPROVAL OF THE NORTH LINCOLNSHIRE COUNTY COUNCIL HIGHWAYS DEPARTMENT.
- THE CONTRACTOR IS RESPONSIBLE FOR MAKING ALL NECESSARY LICENCE APPLICATIONS FOR WORKS WITHIN THE EXISTING HIGHWAY.

STORM EVENT (1 IN)	GREENFIELD FLOW RATE l/s	POST-DEVELOPMENT FLOW RATE l/s
QBAR	2.84	-
1	2.44	4.9
30	4.98	5.0
100	5.90	5.0
100 + 40%CC	-	5.0

REV	AMENDMENT	DATE	CHKD
P3	PLOT SURFACE WATER PIPES ANNOTATED	17.10.2022	RAC
P2	AMENDED TO SUIT REVISED LAYOUT.	04.08.2022	RAC
P1	PRELIMINARY ISSUE.	31.05.2022	RAC

DRAWING STATUS: **PRELIMINARY**

RCD

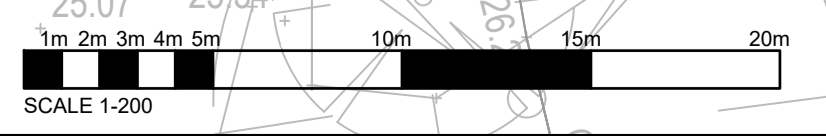
RCD CONSULTANTS LTD
9 BIRCH TREE WAY, MAIDSTONE, KENT, ME15 7RP
MOBILE: 07702 052 137
EMAIL: ray@rcd-consultants.com

CLIENT: **KIEGAR HOMES**

PROJECT: **PROPOSED RESIDENTIAL DEVELOPMENT APPLEFIELDS WRAWBY**

DRAWING TITLE: **DRAINAGE LAYOUT SHEET 3 OF 3**

CIVILS			
SCALE: 1:200 @ A1 1:400 @ A3	DRAWN BY: LD	CHECKED: RAC	DATE: MAY 2022
DRAWING NUMBER: 1111-2211-CIV-12	REVISION: P3		



**SOAKAWAY INFILTRATION REPORT
LAND OFF BARTON ROAD, WRABBY
DELTA-SIMONS PROJECT NUMBER: 16-1070.01
DATED: 8TH DECEMBER 2016**

1.0 Authorisation, Context and Purpose

Delta-Simons Environmental Consultants Limited (Delta-Simons) has been requested by Globe Consultants Limited on behalf of Roger Herring (the 'Client') to undertake three soakage tests (SA101 to SA103) to provide information for the suitability and design for soakaways as a drainage solution for the proposed development on land off Barton Road, Wrawby (hereafter referred to as the "Site"). A Site Layout Plan is included as Figure 1, and an Intrusive Location Plan is included as Figure 2.

2.0 Desktop Information

The Site is currently undeveloped land and indicated to be underlain by superficial Glaciofluvial Deposits (Sand and Gravel), underlain in turn by bedrock of the Ampthill Clay Formation (Mudstone). An agricultural land drain is located along the southern boundary of the Site. The Site slopes to the south between approximately 25.5 meters above ordnance datum (mAOD) and 22.3 mAOD.

3.0 Fieldworks

Soakage testing was undertaken in general accordance with BRE Digest 365: Soakaway Design ^[Ref. 1] on the 28th November 2016.

The soakage testing comprised excavating three trial pits (SA101 to SA103) to depths of between 1.40 and 1.60 m bgl. The geology at each trial pit location was logged by the Delta-Simons engineer. Approximately one tonne of gravel and monitoring pipes were then installed in the trial pit and the remaining void was backfilled with arisings. The remaining spoil was graded back to original ground level.

The gravel pack in each test location was then filled with water from a water container and the depth to water from ground level recorded at intervals over a period up to 24 hours.

The soakage test data was recorded and used to calculate the soil infiltration rate for each location.

3.1 Identified Ground and Groundwater Conditions

Topsoil was identified in all test locations to a depth of 0.30 m bgl. Beneath the topsoil, firm sandy clay with rare chalk and flint gravel was encountered to the maximum advanced depth in SA101 and SA103. Light grey wet gravelly sand was identified in SA102 between 1.40 and 1.60 m bgl. It is considered the geology is consistent with the upper Ampthill Clay Formation (bedrock), which may indicate the superficial deposits are absent in the areas investigated.

3.2 Limitations

Before testing was undertaken, SA102 was found to have filled with groundwater to a depth of 0.89 m bgl. As such, testing was not able to be undertaken at this location.

In addition, given the slow soakage rate only one fill was able to be undertaken from SA101 and SA103, which did not reach the required 75% of infiltration over 24 hours. However it should be noted that a 50% effective depth was reached after the 24 hour monitoring point.

4.0 Soakage Tests

Test results are provided in Appendix I and summarised in Table 1 below. The approximate locations of the Soakage Tests are shown in Figure 2.



Table 1: Summary of Testing in General Accordance with BRE 365

Soakaway Test Reference Number	Test Depth Range (m bgl)	Soil Infiltration Rate (ms ⁻¹)	Geology
SA101	0.70 – 1.50	2.56 x 10 ⁻⁶	Ampthill Clay Formation
SA102	Not monitored due to high groundwater table.		
SA103	0.50 – 1.40	2.97 x 10 ⁻⁶	

5.0 References

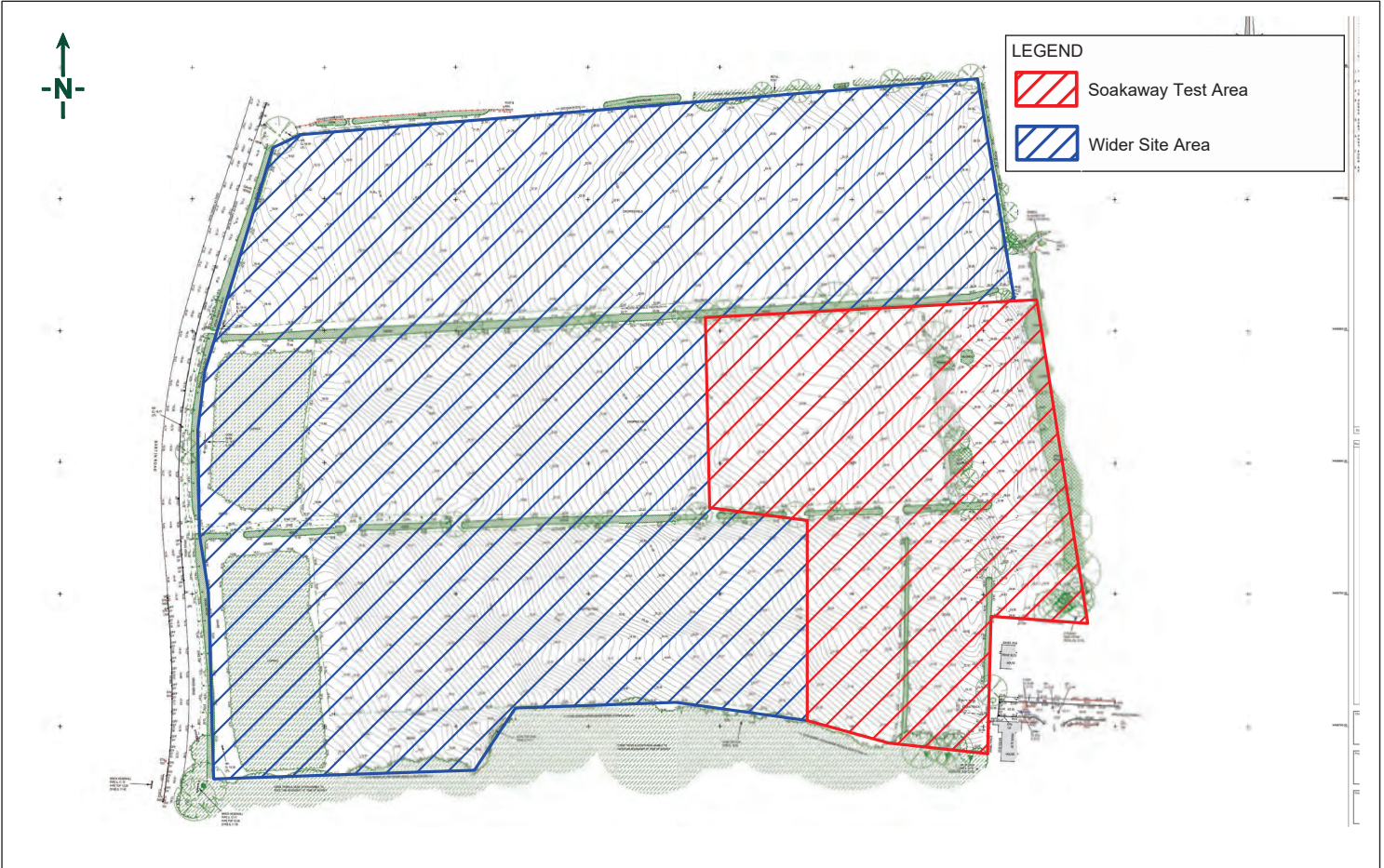
Ref 1: BRE Digest 365: Soakaway Design, BRE 2015



6.0 Project Contacts

Name	Signature	Position	Mobile	Email
Andrew Howells		Geo-Environmental Consultant	07786 962892	andrew.howells@deltasimons.com
Paul Huteson		Principal – Regions	07770 748792	paul.huteson@deltasimons.com

Encl.

- Figure 1 Site Layout Plan
- Figure 2 Approximate Intrusive Location Plan
- Appendix I Soakaway Test Results



LEGEND	
	Soakaway Test Area
	Wider Site Area




TITLE:
 Site Layout Plan
 Land Off Burton Road
 Wrawby

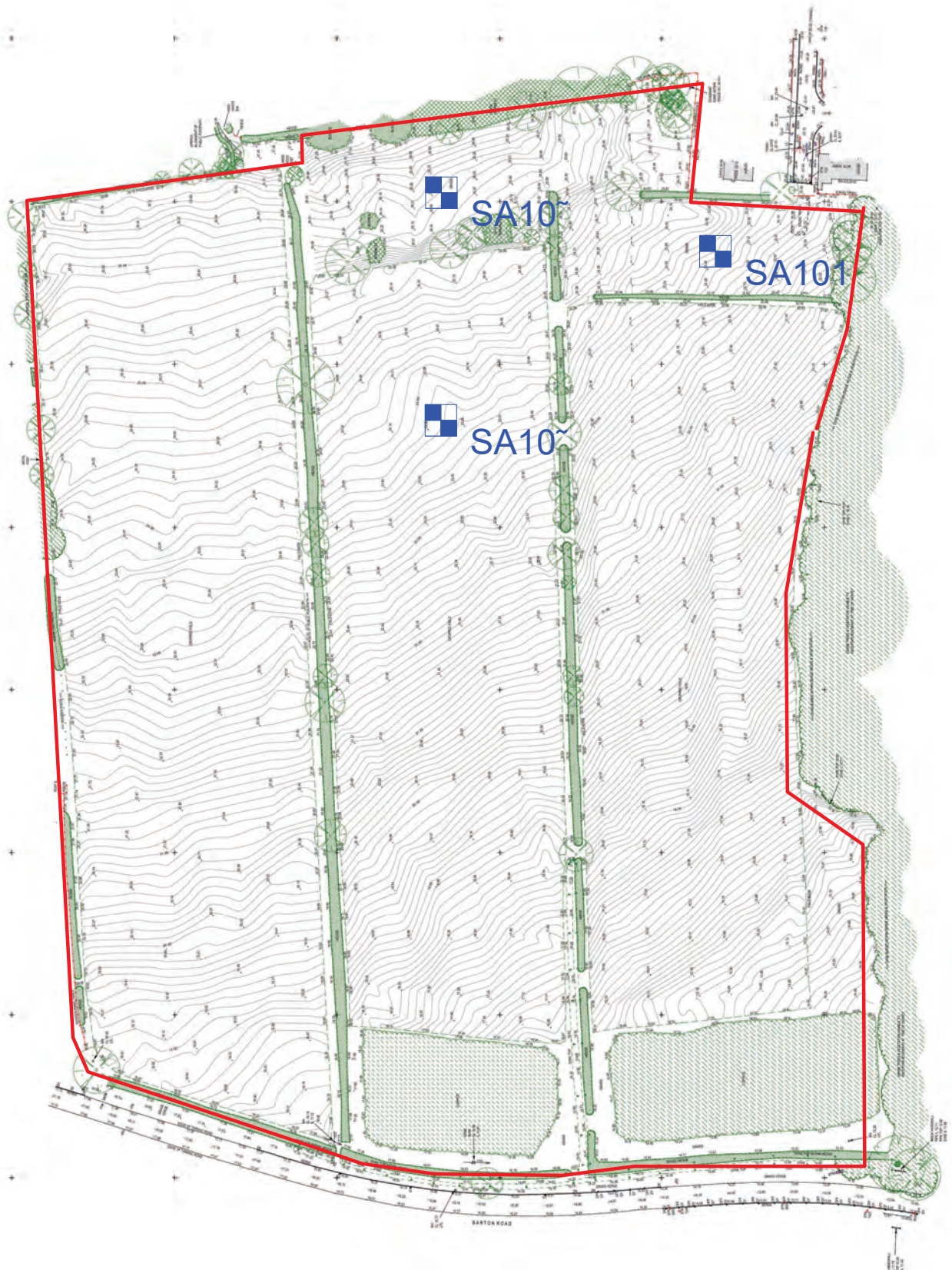
DRAWN BY: PH	SCALE: Not to Scale	PROJECT NO: 16-1070.01
CHECKED BY: AH	REVISION: 1	FIGURE NO: 1
DATE: 30 November 2016		



LEGEND

 Site Boundary

 SA Soakaway Location



Appendix B

Phase 1 Drainage Calculations

RCD		Page 1
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	10.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.305	4-8	0.143

Total Area Contributing (ha) = 0.448

Total Pipe Volume (m³) = 16.418

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	41.656	0.150	277.7	0.061	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	17.240	0.100	172.4	0.036	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	33.800	0.150	225.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	25.692	0.100	256.9	0.124	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	34.719	0.750	46.3	0.069	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	6.300	0.300	21.0	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	5.74	22.450	0.061	0.0	0.0	0.0	0.94	66.3	0.0
1.001	0.00	5.98	22.300	0.097	0.0	0.0	0.0	1.19	84.4	0.0
1.002	0.00	6.52	22.200	0.097	0.0	0.0	0.0	1.04	73.7	0.0
1.003	0.00	6.96	22.050	0.221	0.0	0.0	0.0	0.98	69.0	0.0
1.004	0.00	7.21	21.950	0.290	0.0	0.0	0.0	2.32	163.8	0.0
1.005	0.00	7.24	21.200	0.322	0.0	0.0	0.0	3.45	243.6	0.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.006	20.555	0.400	51.4	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	20.920	0.650	32.2	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	6.400	0.050	128.0	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.009	20.580	0.200	102.9	0.024	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.010	2.500	0.050	50.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.011	7.648	1.150	6.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	0.00	7.39	20.900	0.342	0.0	0.0	0.0	2.20	155.4	0.0
1.007	0.00	7.52	20.500	0.403	0.0	0.0	0.0	2.78	196.6	0.0
1.008	0.00	7.60	19.850	0.424	0.0	0.0	0.0	1.39	98.1	0.0
1.009	0.00	7.82	19.800	0.448	0.0	0.0	0.0	1.55	109.5	0.0
1.010	0.00	7.84	19.600	0.448	0.0	0.0	0.0	2.23	157.5	0.0
1.011	0.00	7.87	19.550	0.448	0.0	0.0	0.0	3.93	69.5	0.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	23.950	1.500	Open Manhole	1500	1.000	22.450	300				
S2	24.950	2.650	Open Manhole	1500	1.001	22.300	300	1.000	22.300	300	
S3	24.750	2.550	Open Manhole	1500	1.002	22.200	300	1.001	22.200	300	
S4	24.400	2.350	Open Manhole	1500	1.003	22.050	300	1.002	22.050	300	
S5	23.800	1.850	Open Manhole	1500	1.004	21.950	300	1.003	21.950	300	
S6	22.700	1.500	Open Manhole	1500	1.005	21.200	300	1.004	21.200	300	
S7	22.400	1.500	Open Manhole	1500	1.006	20.900	300	1.005	20.900	300	
S8	22.000	1.500	Open Manhole	1500	1.007	20.500	300	1.006	20.500	300	
S9	21.350	1.500	Open Manhole	1500	1.008	19.850	300	1.007	19.850	300	
S10	21.100	1.300	Open Manhole	1500	1.009	19.800	300	1.008	19.800	300	
POND	20.700	1.100	Open Manhole	300	1.010	19.600	300	1.009	19.600	300	
S11	20.700	1.150	Open Manhole	1500	1.011	19.550	150	1.010	19.550	300	
DITCH	20.000	1.600	Open Manhole	300		OUTFALL		1.011	18.400	150	

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

Upstream Manhole


PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S1	23.950	22.450	1.200	Open Manhole	1500
1.001	o	300	S2	24.950	22.300	2.350	Open Manhole	1500
1.002	o	300	S3	24.750	22.200	2.250	Open Manhole	1500
1.003	o	300	S4	24.400	22.050	2.050	Open Manhole	1500
1.004	o	300	S5	23.800	21.950	1.550	Open Manhole	1500
1.005	o	300	S6	22.700	21.200	1.200	Open Manhole	1500
1.006	o	300	S7	22.400	20.900	1.200	Open Manhole	1500
1.007	o	300	S8	22.000	20.500	1.200	Open Manhole	1500
1.008	o	300	S9	21.350	19.850	1.200	Open Manhole	1500
1.009	o	300	S10	21.100	19.800	1.000	Open Manhole	1500
1.010	o	300	POND	20.700	19.600	0.800	Open Manhole	300
1.011	o	150	S11	20.700	19.550	1.000	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	41.656	277.7	S2	24.950	22.300	2.350	Open Manhole	1500
1.001	17.240	172.4	S3	24.750	22.200	2.250	Open Manhole	1500
1.002	33.800	225.3	S4	24.400	22.050	2.050	Open Manhole	1500
1.003	25.692	256.9	S5	23.800	21.950	1.550	Open Manhole	1500
1.004	34.719	46.3	S6	22.700	21.200	1.200	Open Manhole	1500
1.005	6.300	21.0	S7	22.400	20.900	1.200	Open Manhole	1500
1.006	20.555	51.4	S8	22.000	20.500	1.200	Open Manhole	1500
1.007	20.920	32.2	S9	21.350	19.850	1.200	Open Manhole	1500
1.008	6.400	128.0	S10	21.100	19.800	1.000	Open Manhole	1500
1.009	20.580	102.9	POND	20.700	19.600	0.800	Open Manhole	300
1.010	2.500	50.0	S11	20.700	19.550	0.850	Open Manhole	1500
1.011	7.648	6.7	DITCH	20.000	18.400	1.450	Open Manhole	300

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.011	DITCH	20.000	18.400	18.400	300	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs		0 Number of Storage Structures	
Number of Online Controls		1 Number of Time/Area Diagrams	
Number of Offline Controls		0 Number of Real Time Controls	

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm


Hydro-Brake® Optimum Manhole: S11, DS/PN: 1.011, Volume (m³): 2.1

Unit Reference MD-SHE-0105-5000-1050-5000
 Design Head (m) 1.050
 Design Flow (l/s) 5.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 105
 Invert Level (m) 19.550
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.050	5.0	Kick-Flo®	0.667	4.1
Flush-Flo™	0.313	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	5.3	3.000	8.2	7.000	12.2
0.200	4.8	1.400	5.7	3.500	8.8	7.500	12.6
0.300	5.0	1.600	6.1	4.000	9.4	8.000	13.0
0.400	4.9	1.800	6.4	4.500	9.9	8.500	13.4
0.500	4.8	2.000	6.7	5.000	10.4	9.000	13.8
0.600	4.5	2.200	7.1	5.500	10.9	9.500	14.1
0.800	4.4	2.400	7.3	6.000	11.3		
1.000	4.9	2.600	7.6	6.500	11.8		

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Storage Structures for Storm

Tank or Pond Manhole: POND, DS/PN: 1.010

Invert Level (m) 19.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	310.0	1.000	575.0	1.100	700.0

Volume Summary (Static)


Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
1.000	S1	2.651	2.944	0.000	5.595
1.001	S2	4.683	1.219	0.000	5.902
1.002	S3	4.506	2.389	0.000	6.895
1.003	S4	4.153	1.816	0.000	5.969
1.004	S5	3.269	2.454	0.000	5.723
1.005	S6	2.651	0.445	0.000	3.096
1.006	S7	2.651	1.453	0.000	4.104
1.007	S8	2.651	1.479	0.000	4.129
1.008	S9	2.651	0.452	0.000	3.103
1.009	S10	2.297	1.455	0.000	3.752
1.010	POND	0.078	0.177	499.380	499.634
1.011	S11	2.032	0.135	0.000	2.167
Total		34.272	16.418	499.380	550.070

Volume Summary (Static)

Length Calculations based on True Length


Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
1.000	S1	2.651	2.838	0.000	5.489
1.001	S2	4.683	1.113	0.000	5.796
1.002	S3	4.506	2.283	0.000	6.789
1.003	S4	4.153	1.710	0.000	5.863
1.004	S5	3.269	2.348	0.000	5.617
1.005	S6	2.651	0.339	0.000	2.990
1.006	S7	2.651	1.347	0.000	3.998
1.007	S8	2.651	1.373	0.000	4.023
1.008	S9	2.651	0.346	0.000	2.997
1.009	S10	2.297	1.391	0.000	3.688
1.010	POND	0.078	0.113	499.380	499.571
1.011	S11	2.032	0.119	0.000	2.151

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Volume Summary (Static)

Pipe	USMH	Manhole	Pipe	Storage	Total
Number	Name	Volume (m ³)	Volume (m ³)	Volume (m ³)	Volume (m ³)
Total		34.272	15.321	499.380	548.973

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
8640, 10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 0


PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	1	+0%					22.522
1.001	S2	15 Winter	1	+0%					22.381
1.002	S3	15 Winter	1	+0%					22.284
1.003	S4	15 Winter	1	+0%	100/15 Summer				22.181
1.004	S5	15 Winter	1	+0%					22.042
1.005	S6	15 Winter	1	+0%	100/15 Winter				21.302
1.006	S7	15 Winter	1	+0%	100/15 Summer				21.005
1.007	S8	15 Winter	1	+0%	100/15 Summer				20.601
1.008	S9	15 Winter	1	+0%	30/15 Summer				20.039
1.009	S10	15 Winter	1	+0%	30/15 Summer				19.948
1.010	POND	120 Winter	1	+0%	30/120 Winter				19.714
1.011	S11	240 Winter	1	+0%	1/60 Winter				19.726

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (1/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)						
1.000	S1	-0.228	0.000	0.13			7.8	OK	
1.001	S2	-0.219	0.000	0.16			11.7	OK	
1.002	S3	-0.216	0.000	0.17			11.5	OK	
1.003	S4	-0.169	0.000	0.39			24.0	OK	
1.004	S5	-0.208	0.000	0.21			30.9	OK	
1.005	S6	-0.198	0.000	0.25			34.1	OK	
1.006	S7	-0.195	0.000	0.27			36.1	OK	
1.007	S8	-0.199	0.000	0.25			42.2	OK	
1.008	S9	-0.111	0.000	0.72			44.2	OK	
1.009	S10	-0.152	0.000	0.48			46.3	OK	
1.010	POND	-0.186	0.000	0.09			5.3	OK	
1.011	S11	0.026	0.000	0.08			4.7	SURCHARGED	

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
8640, 10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 0


PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	2	+0%					22.533
1.001	S2	15 Winter	2	+0%					22.393
1.002	S3	15 Winter	2	+0%					22.296
1.003	S4	15 Winter	2	+0%	100/15 Summer				22.202
1.004	S5	15 Winter	2	+0%					22.055
1.005	S6	15 Winter	2	+0%	100/15 Winter				21.317
1.006	S7	15 Winter	2	+0%	100/15 Summer				21.021
1.007	S8	15 Winter	2	+0%	100/15 Summer				20.616
1.008	S9	15 Winter	2	+0%	30/15 Summer				20.078
1.009	S10	15 Winter	2	+0%	30/15 Summer				19.973
1.010	POND	120 Winter	2	+0%	30/120 Winter				19.747
1.011	S11	240 Winter	2	+0%	1/60 Winter				19.754

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (1/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow	Overflow						
1.000	S1	-0.217	0.000	0.16					10.1	OK	
1.001	S2	-0.207	0.000	0.21					15.1	OK	
1.002	S3	-0.204	0.000	0.22					15.0	OK	
1.003	S4	-0.148	0.000	0.50					31.2	OK	
1.004	S5	-0.195	0.000	0.27					40.1	OK	
1.005	S6	-0.183	0.000	0.32					44.3	OK	
1.006	S7	-0.179	0.000	0.34					46.8	OK	
1.007	S8	-0.184	0.000	0.32					54.6	OK	
1.008	S9	-0.072	0.000	0.93					57.0	OK	
1.009	S10	-0.127	0.000	0.62					59.8	OK	
1.010	POND	-0.153	0.000	0.09					5.7	OK	
1.011	S11	0.054	0.000	0.08					4.8	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
8640, 10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	30	+0%					22.567
1.001	S2	15 Winter	30	+0%					22.436
1.002	S3	15 Winter	30	+0%					22.364
1.003	S4	15 Winter	30	+0%	100/15 Summer				22.327
1.004	S5	15 Winter	30	+0%					22.112
1.005	S6	15 Winter	30	+0%	100/15 Winter				21.385
1.006	S7	15 Winter	30	+0%	100/15 Summer				21.094
1.007	S8	15 Winter	30	+0%	100/15 Summer				20.749
1.008	S9	15 Winter	30	+0%	30/15 Summer				20.461
1.009	S10	15 Winter	30	+0%	30/15 Summer				20.232
1.010	POND	180 Winter	30	+0%	30/120 Winter				19.907
1.011	S11	180 Winter	30	+0%	1/60 Winter				19.937

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow (l/s)	Overflow (l/s)					
1.000	S1	-0.183	0.000	0.31				19.2	OK	
1.001	S2	-0.164	0.000	0.42				30.3	OK	
1.002	S3	-0.136	0.000	0.44				29.7	OK	
1.003	S4	-0.023	0.000	1.00				61.8	OK	
1.004	S5	-0.138	0.000	0.55				82.9	OK	
1.005	S6	-0.115	0.000	0.68				93.2	OK	
1.006	S7	-0.106	0.000	0.73				99.8	OK	
1.007	S8	-0.051	0.000	0.66				114.0	OK	
1.008	S9	0.311	0.000	1.95				119.4	SURCHARGED	
1.009	S10	0.132	0.000	1.31				125.2	SURCHARGED	
1.010	POND	0.007	0.000	0.11				6.6	SURCHARGED	
1.011	S11	0.237	0.000	0.08				5.0	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
8640, 10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	100	+0%					22.585
1.001	S2	15 Winter	100	+0%					22.498
1.002	S3	15 Winter	100	+0%					22.459
1.003	S4	15 Winter	100	+0%	100/15 Summer				22.404
1.004	S5	15 Winter	100	+0%					22.137
1.005	S6	15 Winter	100	+0%	100/15 Winter				21.503
1.006	S7	15 Winter	100	+0%	100/15 Summer				21.310
1.007	S8	15 Winter	100	+0%	100/15 Summer				21.029
1.008	S9	15 Winter	100	+0%	30/15 Summer				20.645
1.009	S10	15 Winter	100	+0%	30/15 Summer				20.341
1.010	POND	180 Winter	100	+0%	30/120 Winter				20.014
1.011	S11	180 Winter	100	+0%	1/60 Winter				20.027

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow Cap.	Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)					
1.000	S1	-0.165	0.000	0.40		24.8	OK	
1.001	S2	-0.102	0.000	0.52		37.5	OK	
1.002	S3	-0.041	0.000	0.59		40.0	OK	
1.003	S4	0.054	0.000	1.26		78.0	SURCHARGED	
1.004	S5	-0.113	0.000	0.70		104.9	OK	
1.005	S6	0.003	0.000	0.81		110.6	SURCHARGED	
1.006	S7	0.110	0.000	0.85		115.2	SURCHARGED	
1.007	S8	0.229	0.000	0.77		132.1	SURCHARGED	
1.008	S9	0.495	0.000	2.24		137.5	SURCHARGED	
1.009	S10	0.241	0.000	1.50		144.1	SURCHARGED	
1.010	POND	0.114	0.000	0.10		6.4	SURCHARGED	
1.011	S11	0.327	0.000	0.08		5.0	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	10.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.305	4-8	0.143

Total Area Contributing (ha) = 0.448

Total Pipe Volume (m³) = 16.418

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	41.656	0.150	277.7	0.061	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	17.240	0.100	172.4	0.036	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	33.800	0.150	225.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	25.692	0.100	256.9	0.124	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	34.719	0.750	46.3	0.069	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	6.300	0.300	21.0	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	5.74	22.450	0.061	0.0	0.0	0.0	0.94	66.3	0.0
1.001	0.00	5.98	22.300	0.097	0.0	0.0	0.0	1.19	84.4	0.0
1.002	0.00	6.52	22.200	0.097	0.0	0.0	0.0	1.04	73.7	0.0
1.003	0.00	6.96	22.050	0.221	0.0	0.0	0.0	0.98	69.0	0.0
1.004	0.00	7.21	21.950	0.290	0.0	0.0	0.0	2.32	163.8	0.0
1.005	0.00	7.24	21.200	0.322	0.0	0.0	0.0	3.45	243.6	0.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.006	20.555	0.400	51.4	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	20.920	0.650	32.2	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	6.400	0.050	128.0	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.009	20.580	0.200	102.9	0.024	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.010	2.500	0.050	50.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.011	7.648	1.150	6.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	0.00	7.39	20.900	0.342	0.0	0.0	0.0	2.20	155.4	0.0
1.007	0.00	7.52	20.500	0.403	0.0	0.0	0.0	2.78	196.6	0.0
1.008	0.00	7.60	19.850	0.424	0.0	0.0	0.0	1.39	98.1	0.0
1.009	0.00	7.82	19.800	0.448	0.0	0.0	0.0	1.55	109.5	0.0
1.010	0.00	7.84	19.600	0.448	0.0	0.0	0.0	2.23	157.5	0.0
1.011	0.00	7.87	19.550	0.448	0.0	0.0	0.0	3.93	69.5	0.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	23.950	1.500	Open Manhole	1500	1.000	22.450	300				
S2	24.950	2.650	Open Manhole	1500	1.001	22.300	300	1.000	22.300	300	
S3	24.750	2.550	Open Manhole	1500	1.002	22.200	300	1.001	22.200	300	
S4	24.400	2.350	Open Manhole	1500	1.003	22.050	300	1.002	22.050	300	
S5	23.800	1.850	Open Manhole	1500	1.004	21.950	300	1.003	21.950	300	
S6	22.700	1.500	Open Manhole	1500	1.005	21.200	300	1.004	21.200	300	
S7	22.400	1.500	Open Manhole	1500	1.006	20.900	300	1.005	20.900	300	
S8	22.000	1.500	Open Manhole	1500	1.007	20.500	300	1.006	20.500	300	
S9	21.350	1.500	Open Manhole	1500	1.008	19.850	300	1.007	19.850	300	
S10	21.100	1.300	Open Manhole	1500	1.009	19.800	300	1.008	19.800	300	
POND	20.700	1.100	Open Manhole	300	1.010	19.600	300	1.009	19.600	300	
S11	20.700	1.150	Open Manhole	1500	1.011	19.550	150	1.010	19.550	300	
DITCH	20.000	1.600	Open Manhole	300		OUTFALL		1.011	18.400	150	

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

Upstream Manhole


PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S1	23.950	22.450	1.200	Open Manhole	1500
1.001	o	300	S2	24.950	22.300	2.350	Open Manhole	1500
1.002	o	300	S3	24.750	22.200	2.250	Open Manhole	1500
1.003	o	300	S4	24.400	22.050	2.050	Open Manhole	1500
1.004	o	300	S5	23.800	21.950	1.550	Open Manhole	1500
1.005	o	300	S6	22.700	21.200	1.200	Open Manhole	1500
1.006	o	300	S7	22.400	20.900	1.200	Open Manhole	1500
1.007	o	300	S8	22.000	20.500	1.200	Open Manhole	1500
1.008	o	300	S9	21.350	19.850	1.200	Open Manhole	1500
1.009	o	300	S10	21.100	19.800	1.000	Open Manhole	1500
1.010	o	300	POND	20.700	19.600	0.800	Open Manhole	300
1.011	o	150	S11	20.700	19.550	1.000	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	41.656	277.7	S2	24.950	22.300	2.350	Open Manhole	1500
1.001	17.240	172.4	S3	24.750	22.200	2.250	Open Manhole	1500
1.002	33.800	225.3	S4	24.400	22.050	2.050	Open Manhole	1500
1.003	25.692	256.9	S5	23.800	21.950	1.550	Open Manhole	1500
1.004	34.719	46.3	S6	22.700	21.200	1.200	Open Manhole	1500
1.005	6.300	21.0	S7	22.400	20.900	1.200	Open Manhole	1500
1.006	20.555	51.4	S8	22.000	20.500	1.200	Open Manhole	1500
1.007	20.920	32.2	S9	21.350	19.850	1.200	Open Manhole	1500
1.008	6.400	128.0	S10	21.100	19.800	1.000	Open Manhole	1500
1.009	20.580	102.9	POND	20.700	19.600	0.800	Open Manhole	300
1.010	2.500	50.0	S11	20.700	19.550	0.850	Open Manhole	1500
1.011	7.648	6.7	DITCH	20.000	18.400	1.450	Open Manhole	300

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.011	DITCH	20.000	18.400	18.400	300	0

9 Birchtree Way Maidstone Kent ME15 7RP	APPLEFIELDS WRAWBY	
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs		0 Number of Storage Structures	
Number of Online Controls		1 Number of Time/Area Diagrams	
Number of Offline Controls		0 Number of Real Time Controls	

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

RCD		Page 6
9 Birchtree Way Maidstone Kent ME15 7RP	APPLEFIELDS WRAWBY	
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Online Controls for Storm


Hydro-Brake® Optimum Manhole: S11, DS/PN: 1.011, Volume (m³): 2.1

Unit Reference MD-SHE-0105-5000-1050-5000
 Design Head (m) 1.050
 Design Flow (l/s) 5.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 105
 Invert Level (m) 19.550
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.050	5.0	Kick-Flo®	0.667	4.1
Flush-Flo™	0.313	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	5.3	3.000	8.2	7.000	12.2
0.200	4.8	1.400	5.7	3.500	8.8	7.500	12.6
0.300	5.0	1.600	6.1	4.000	9.4	8.000	13.0
0.400	4.9	1.800	6.4	4.500	9.9	8.500	13.4
0.500	4.8	2.000	6.7	5.000	10.4	9.000	13.8
0.600	4.5	2.200	7.1	5.500	10.9	9.500	14.1
0.800	4.4	2.400	7.3	6.000	11.3		
1.000	4.9	2.600	7.6	6.500	11.8		

RCD		Page 7
9 Birchtree Way Maidstone Kent ME15 7RP	APPLEFIELDS WRAWBY	
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Storage Structures for Storm

Tank or Pond Manhole: POND, DS/PN: 1.010

Invert Level (m) 19.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	310.0	1.000	575.0	1.100	700.0

Volume Summary (Static)


Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
1.000	S1	2.651	2.944	0.000	5.595
1.001	S2	4.683	1.219	0.000	5.902
1.002	S3	4.506	2.389	0.000	6.895
1.003	S4	4.153	1.816	0.000	5.969
1.004	S5	3.269	2.454	0.000	5.723
1.005	S6	2.651	0.445	0.000	3.096
1.006	S7	2.651	1.453	0.000	4.104
1.007	S8	2.651	1.479	0.000	4.129
1.008	S9	2.651	0.452	0.000	3.103
1.009	S10	2.297	1.455	0.000	3.752
1.010	POND	0.078	0.177	499.380	499.634
1.011	S11	2.032	0.135	0.000	2.167
Total		34.272	16.418	499.380	550.070

Volume Summary (Static)

Length Calculations based on True Length


Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
1.000	S1	2.651	2.838	0.000	5.489
1.001	S2	4.683	1.113	0.000	5.796
1.002	S3	4.506	2.283	0.000	6.789
1.003	S4	4.153	1.710	0.000	5.863
1.004	S5	3.269	2.348	0.000	5.617
1.005	S6	2.651	0.339	0.000	2.990
1.006	S7	2.651	1.347	0.000	3.998
1.007	S8	2.651	1.373	0.000	4.023
1.008	S9	2.651	0.346	0.000	2.997
1.009	S10	2.297	1.391	0.000	3.688
1.010	POND	0.078	0.113	499.380	499.571
1.011	S11	2.032	0.119	0.000	2.151

9 Birchtree Way Maidstone Kent ME15 7RP	APPLEFIELDS WRABBY	
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Volume Summary (Static)

Pipe	USMH	Manhole	Pipe	Storage	Total
Number	Name	Volume (m³)	Volume (m³)	Volume (m³)	Volume (m³)
Total		34.272	15.321	499.380	548.973

RCD		Page 9
9 Birchtree Way Maidstone Kent ME15 7RP	APPLEFIELDS WRAWBY	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840
Margin for Flood Risk Warning (mm) 450.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
8640, 10080
Return Period(s) (years) 100
Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	100	+40%	100/15 Summer				23.013
1.001	S2	15 Winter	100	+40%	100/15 Summer				22.928
1.002	S3	15 Winter	100	+40%	100/15 Summer				22.837
1.003	S4	15 Winter	100	+40%	100/15 Summer				22.760
1.004	S5	15 Winter	100	+40%	100/15 Summer				22.549
1.005	S6	15 Winter	100	+40%	100/15 Summer				22.123
1.006	S7	15 Winter	100	+40%	100/15 Summer				21.874
1.007	S8	15 Winter	100	+40%	100/15 Summer				21.490
1.008	S9	15 Winter	100	+40%	100/15 Summer				20.955
1.009	S10	15 Winter	100	+40%	100/15 Summer				20.536
1.010	POND	240 Winter	100	+40%	100/15 Winter				20.198
1.011	S11	360 Winter	100	+40%	100/15 Summer				20.209

9 Birchtree Way
 Maidstone
 Kent ME15 7RP

APPLEFIELDS
 WRAWBY



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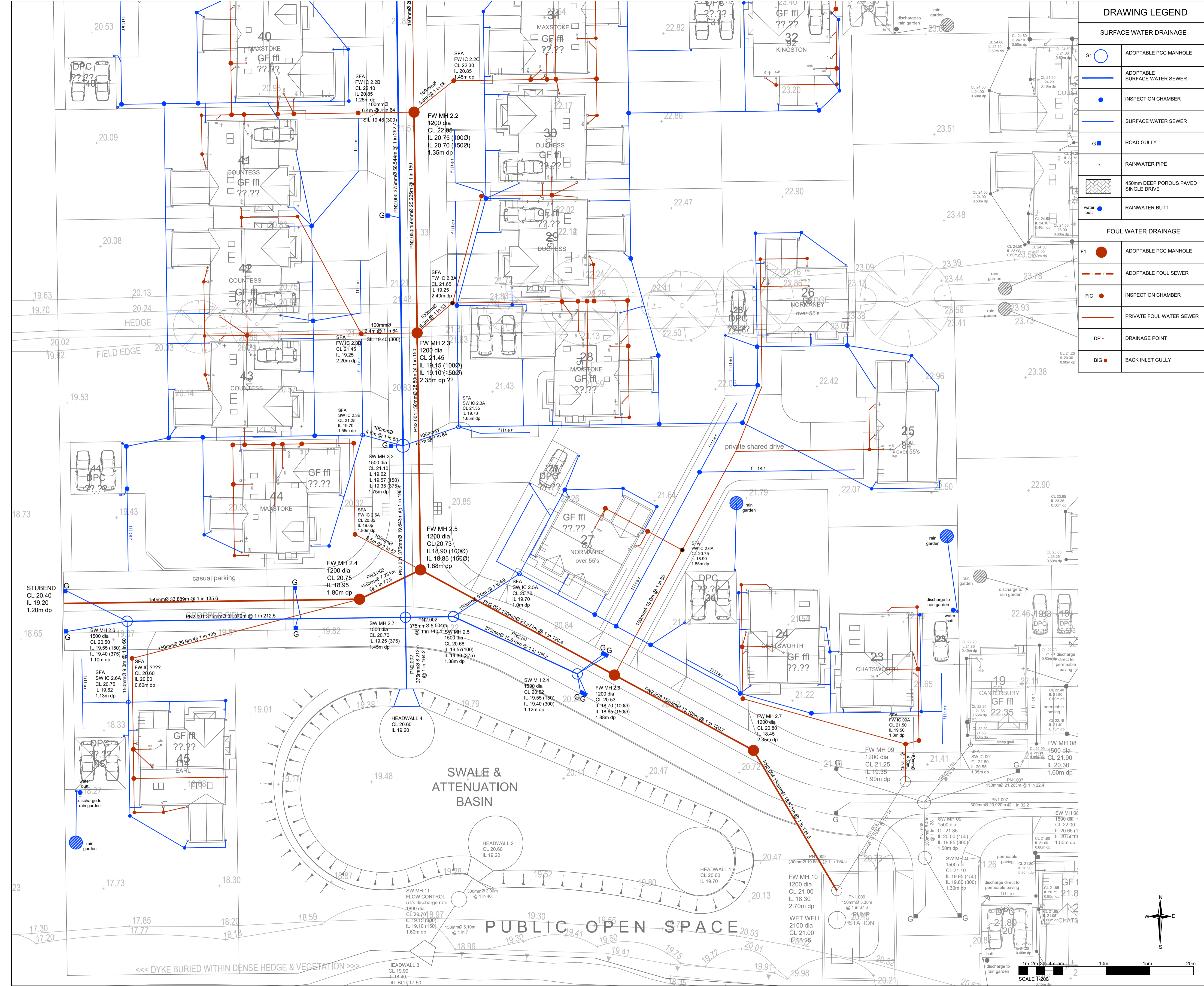
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow (l/s)	Overflow (l/s)					
1.000	S1	0.263	0.000	0.49				30.3	SURCHARGED	
1.001	S2	0.328	0.000	0.55				39.4	SURCHARGED	
1.002	S3	0.337	0.000	0.65				44.2	SURCHARGED	
1.003	S4	0.410	0.000	1.54				95.1	SURCHARGED	
1.004	S5	0.299	0.000	0.80				120.1	SURCHARGED	
1.005	S6	0.623	0.000	0.91				125.4	SURCHARGED	
1.006	S7	0.674	0.000	0.98				133.7	SURCHARGED	
1.007	S8	0.690	0.000	0.90				154.3	SURCHARGED	
1.008	S9	0.805	0.000	2.64				162.2	FLOOD RISK	
1.009	S10	0.436	0.000	1.79				171.8	SURCHARGED	
1.010	POND	0.298	0.000	0.10				6.1	SURCHARGED	
1.011	S11	0.509	0.000	0.08				5.0	SURCHARGED	

Appendix C

Phase 2 Drainage Layout

Phase 2 impermeable area plan



DRAWING LEGEND	
SURFACE WATER DRAINAGE	
S1	ADOPTABLE PCC MANHOLE
(Blue line)	ADOPTABLE SURFACE WATER SEWER
(Blue dot)	INSPECTION CHAMBER
(Blue line)	SURFACE WATER SEWER
G	ROAD GULLY
(Blue line)	RAINWATER PIPE
(Blue dot)	RAINWATER BUTT
FOUL WATER DRAINAGE	
F1	ADOPTABLE PCC MANHOLE
(Red line)	ADOPTABLE FOUL SEWER
(Red dot)	INSPECTION CHAMBER
(Red line)	PRIVATE FOUL WATER SEWER
DP	DRAINAGE POINT
BIG	BACK INLET GULLY

- NOTES**
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 - ALL BUILDING DRAINAGE TO BE INSTALLED AND TESTED IN COMPLIANCE WITH THE BUILDING REGULATIONS 2000 DRAINAGE AND WASTE DISPOSAL APPROVED DOCUMENT H 2002 EDITION.
 - SMALL LIGHTWEIGHT ACCESS COVERS SHOULD BE SECURED (FOR EXAMPLE WITH SCREWS) TO DETER UNAUTHORISED ACCESS.
 - ALL ABOVE GROUND DRAINAGE TO INCORPORATE RODDING ACCESS FACILITIES.
 - ALL PIPES TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE.
 - PRIOR TO STARTING ANY CONSTRUCTION WORK ON SITE THE CONTRACTOR IS TO CONFIRM TO THE RCD ENGINEER THE INVERT LEVEL OF THE EXISTING FOUL AND SURFACE WATER SEWERS AT CONNECTION POINTS.
 - THE CONTRACTOR IS RESPONSIBLE FOR MAKING THE S106 SEWER CONNECTION APPLICATION TO ANGLIAN WATER SERVICES LTD.
 - ALL WORK WITHIN THE HIGHWAY IS TO BE COMPLETED TO THE FULL SATISFACTION AND APPROVAL OF THE NORTH LINCOLNSHIRE COUNTY COUNCIL HIGHWAYS DEPARTMENT.
 - THE CONTRACTOR IS RESPONSIBLE FOR MAKING ALL NECESSARY LICENCE APPLICATIONS FOR WORKS WITHIN THE EXISTING HIGHWAY.

STORM EVENT (1 IN)	PHASE 1 FLOW RATE l/s	PHASE 1 AND 2 FLOW RATE l/s
1 (2)	4.7	(4.8)
30 (+35%CC)	5.0	(5.0)
100 + 40%CC	5.0	5.0

P1	PRELIMINARY ISSUE	09.08.2025	RAC
REV	AMENDMENT	DATE	CHKD
DRAWING STATUS			

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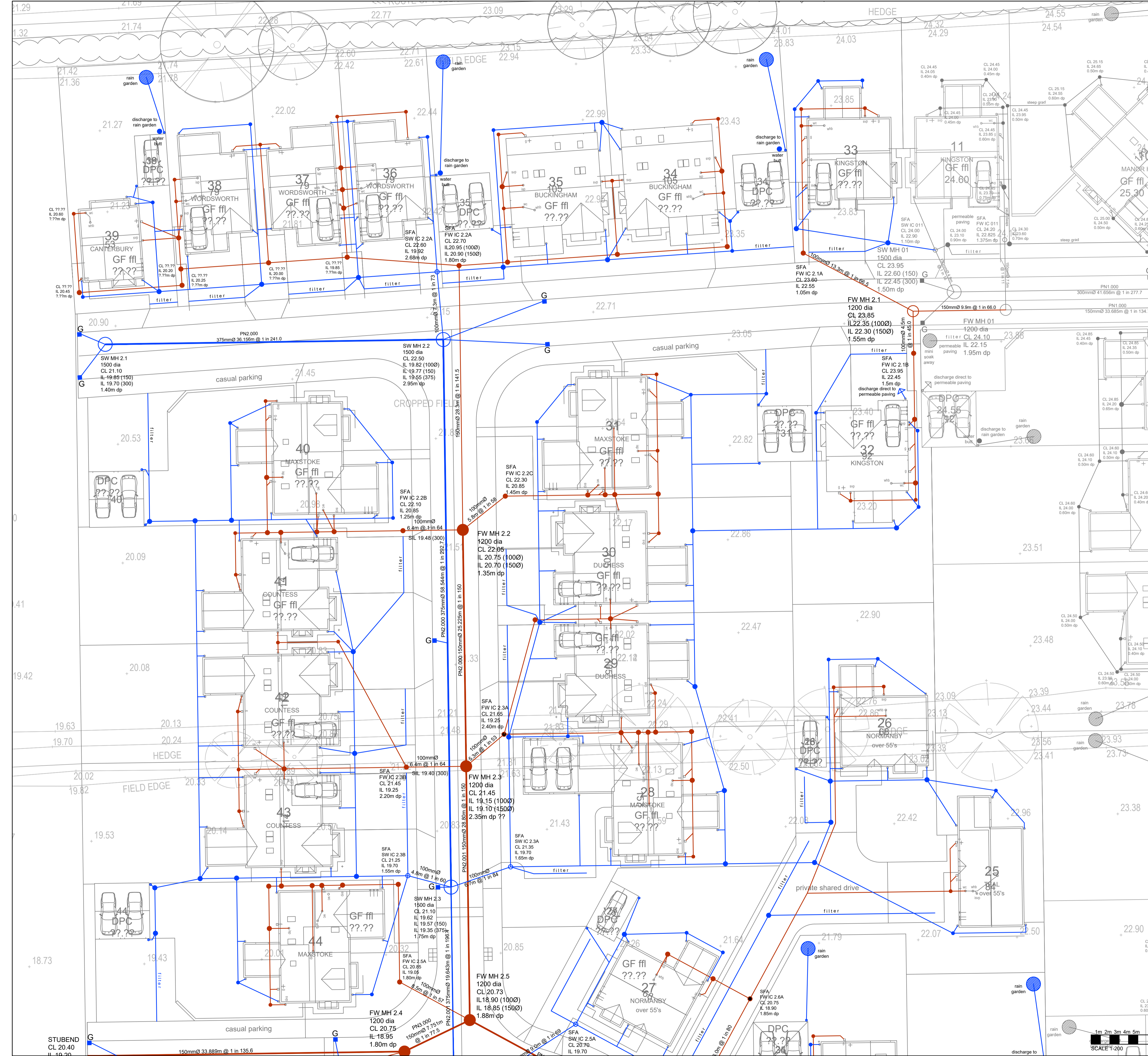
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EMAIL: ray@rcd-consultants.com

CLIENT
KIEGAR HOMES

PROJECT
**PROPOSED RESIDENTIAL DEVELOPMENT
PHASE 2, APPLEFIELDS
WRAWBY**

DRAWING TITLE
**DRAINAGE LAYOUT
SHEET 1 OF 2**

CIVILS			
SCALE	DRAWN BY	CHECKED	DATE
1:200 @ A1 1:400 @ A3	STC	RAC	AUG 2025
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1111-2211-CIV-10	P1		



DRAWING LEGEND	
SURFACE WATER DRAINAGE	
S1	ADOPTABLE PCC MANHOLE
(Blue line)	ADOPTABLE SURFACE WATER SEWER
(Blue dot)	INSPECTION CHAMBER
(Blue line)	SURFACE WATER SEWER
G	ROAD GULLY
(Blue line)	RAINWATER PIPE
(Blue hatched area)	450mm DEEP POROUS PAVED SINGLE DRIVE
(Blue dot)	RAINWATER BUTT
FOUL WATER DRAINAGE	
F1	ADOPTABLE PCC MANHOLE
(Red dashed line)	ADOPTABLE FOUL SEWER
FC	INSPECTION CHAMBER
(Red solid line)	PRIVATE FOUL WATER SEWER
DP	DRAINAGE POINT
BIG	BACK INLET GULLY

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 - ALL PIPES TO BE 100mm DIAMETER UNLESS NOTED OTHERWISE.
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STORM EVENT (1 IN)	PHASE 1 FLOW RATE l/s	PHASE 1 AND 2 FLOW RATE l/s
1 (2)	4.7	(4.8)
30 (+35%CC)	5.0	(5.0)
100 + 40%CC	5.0	5.0

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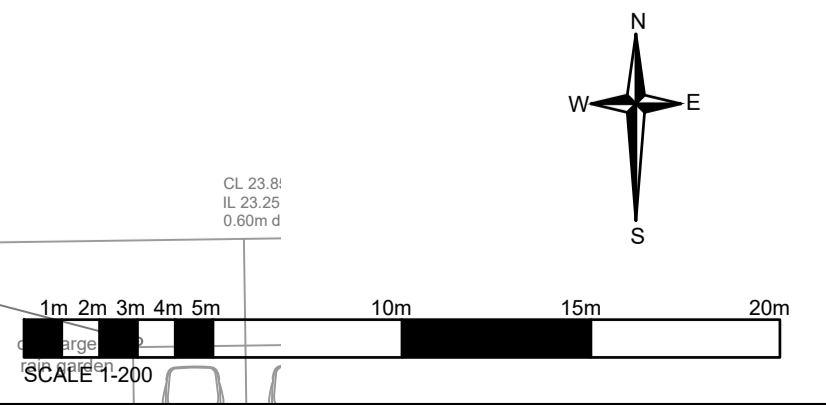
CLIENT
KIEGAR HOMES

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
PHASE 2, APPLEFIELDS
WRAWBY

DRAWING TITLE
DRAINAGE LAYOUT
SHEET 2 OF 2

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
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DRAWING LEGEND	
	2,710m ² ROOF AREA
	1,974m ² ROAD AREA
	1,314m ² POROUS PAVING

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DRAWING STATUS			
PRELIMINARY			

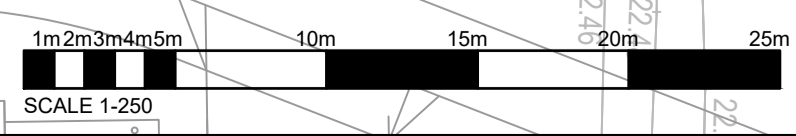
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CLIENT	KIEGAR HOMES
PROJECT	PROPOSED RESIDENTIAL DEVELOPMENT PHASE 2, APPLEFIELDS WRABBY
DRAWING TITLE	IMPERMEABLE AREA PLAN

CIVILS

SCALE	DRAWN BY	CHECKED	DATE
1:250 @ A1 1:500 @ A3	STC	RAC	AUG 2025
DRAWING NUMBER	REVISION		
1111-2211-CIV-12	P1		



Appendix D

Phase 2 Drainage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
S1	0.070	5.00	23.950	1500	1.500
S2	0.037	5.00	24.950	1500	2.650
S3	0.000		24.750	1500	2.550
S4	0.124	5.00	24.400	1500	2.350
S5	0.069	5.00	23.800	1500	1.850
S6	0.032	5.00	22.700	1500	1.500
S7	0.020	5.00	22.400	1500	1.500
S8	0.061	5.00	22.000	1500	1.500
S9	0.021	5.00	21.350	1500	1.500
S10	0.024	5.00	21.100	1500	1.300
S2.1	0.036	5.00	21.100	1500	1.400
S2.2	0.106	5.00	22.500	1500	2.950
S2.3	0.150	5.00	21.100	1500	1.750
S2.4	0.055	5.00	20.520	1500	1.120
S2.5	0.050	5.00	20.680	1500	1.380
S2.6	0.052	5.00	20.500	1500	1.100
S2.7	0.000		20.700	1500	1.450
BASIN	0.000		20.600	300	1.400
S11	0.000		20.600	1500	1.450
S12	0.000		20.450	1200	1.350
DITCH	0.000		20.000	150	2.000

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	41.656	0.600	22.450	22.300	0.150	277.7	300	5.74	0.0
1.001	S2	S3	17.240	0.600	22.300	22.200	0.100	172.4	300	5.98	0.0
1.002	S3	S4	34.038	0.600	22.200	22.050	0.150	226.9	300	6.53	0.0
1.003	S4	S5	25.692	0.600	22.050	21.950	0.100	256.9	300	6.97	0.0
1.004	S5	S6	34.719	0.600	21.950	21.200	0.750	46.3	300	7.21	0.0
1.005	S6	S7	6.300	0.600	21.200	20.900	0.300	21.0	300	7.25	0.0

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	0.938	66.3	0.0	1.200	2.350	0.070	0.0	0	0.000
1.001	1.194	84.4	0.0	2.350	2.250	0.107	0.0	0	0.000
1.002	1.039	73.5	0.0	2.250	2.050	0.107	0.0	0	0.000
1.003	0.976	69.0	0.0	2.050	1.550	0.231	0.0	0	0.000
1.004	2.316	163.7	0.0	1.550	1.200	0.300	0.0	0	0.000
1.005	3.446	243.5	0.0	1.200	1.200	0.332	0.0	0	0.000

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)
1.006	S7	S8	20.555	0.600	20.900	20.500	0.400	51.4	300	7.40	0.0
1.007	S8	S9	20.920	0.600	20.500	19.850	0.650	32.2	300	7.53	0.0
1.008	S9	S10	6.400	0.600	19.850	19.800	0.050	128.0	300	7.60	0.0
1.009	S10	BASIN	20.576	0.600	19.800	19.600	0.200	102.9	300	7.82	0.0
2.000	S2.1	S2.2	36.156	0.600	19.700	19.550	0.150	241.0	375	5.52	0.0
2.001	S2.2	S2.3	58.544	0.600	19.550	19.350	0.200	292.7	375	6.44	0.0
2.002	S2.3	S2.7	19.643	0.600	19.350	19.250	0.100	196.4	375	6.70	0.0
4.000	S2.4	S2.5	15.616	0.600	19.400	19.300	0.100	156.2	375	5.18	0.0
4.001	S2.5	S2.7	5.504	0.600	19.300	19.250	0.050	110.1	375	5.23	0.0
3.000	S2.6	S2.7	31.879	0.600	19.400	19.250	0.150	212.5	375	5.43	0.0
2.003	S2.7	BASIN	8.212	0.600	19.250	19.200	0.050	164.2	375	6.80	0.0
1.010	BASIN	S11	2.500	0.600	19.200	19.150	0.050	50.0	300	7.84	0.0
1.011	S11	S12	4.682	0.600	19.150	19.100	0.050	93.6	300	7.89	0.0
1.012	S12	DITCH	3.000	0.600	19.100	18.000	1.100	2.7	300	7.90	0.0

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)
1.006	2.198	155.4	0.0	1.200	1.200	0.352	0.0	0	0.000
1.007	2.781	196.6	0.0	1.200	1.200	0.413	0.0	0	0.000
1.008	1.388	98.1	0.0	1.200	1.000	0.434	0.0	0	0.000
1.009	1.550	109.5	0.0	1.000	0.700	0.458	0.0	0	0.000
2.000	1.162	128.4	0.0	1.025	2.575	0.036	0.0	0	0.000
2.001	1.054	116.4	0.0	2.575	1.375	0.142	0.0	0	0.000
2.002	1.289	142.4	0.0	1.375	1.075	0.292	0.0	0	0.000
4.000	1.447	159.8	0.0	0.745	1.005	0.055	0.0	0	0.000
4.001	1.726	190.6	0.0	1.005	1.075	0.105	0.0	0	0.000
3.000	1.239	136.8	0.0	0.725	1.075	0.052	0.0	0	0.000
2.003	1.411	155.8	0.0	1.075	1.025	0.449	0.0	0	0.000
1.010	2.228	157.5	0.0	1.100	1.150	0.907	0.0	0	0.000
1.011	1.625	114.9	0.0	1.150	1.050	0.907	0.0	0	0.000
1.012	9.584	677.5	0.0	1.050	1.700	0.907	0.0	0	0.000

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	41.656	277.7	300	Circular	23.950	22.450	1.200	24.950	22.300	2.350
1.001	17.240	172.4	300	Circular	24.950	22.300	2.350	24.750	22.200	2.250
1.002	34.038	226.9	300	Circular	24.750	22.200	2.250	24.400	22.050	2.050
1.003	25.692	256.9	300	Circular	24.400	22.050	2.050	23.800	21.950	1.550
1.004	34.719	46.3	300	Circular	23.800	21.950	1.550	22.700	21.200	1.200
1.005	6.300	21.0	300	Circular	22.700	21.200	1.200	22.400	20.900	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1500	Manhole	Adoptable	S2	1500	Manhole	Adoptable
1.001	S2	1500	Manhole	Adoptable	S3	1500	Manhole	Adoptable
1.002	S3	1500	Manhole	Adoptable	S4	1500	Manhole	Adoptable
1.003	S4	1500	Manhole	Adoptable	S5	1500	Manhole	Adoptable
1.004	S5	1500	Manhole	Adoptable	S6	1500	Manhole	Adoptable
1.005	S6	1500	Manhole	Adoptable	S7	1500	Manhole	Adoptable

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)
1.006	20.555	51.4	300	Circular	22.400	20.900	1.200	22.000	20.500	1.200
1.007	20.920	32.2	300	Circular	22.000	20.500	1.200	21.350	19.850	1.200
1.008	6.400	128.0	300	Circular	21.350	19.850	1.200	21.100	19.800	1.000
1.009	20.576	102.9	300	Circular	21.100	19.800	1.000	20.600	19.600	0.700
2.000	36.156	241.0	375	Circular	21.100	19.700	1.025	22.500	19.550	2.575
2.001	58.544	292.7	375	Circular	22.500	19.550	2.575	21.100	19.350	1.375
2.002	19.643	196.4	375	Circular	21.100	19.350	1.375	20.700	19.250	1.075
4.000	15.616	156.2	375	Circular	20.520	19.400	0.745	20.680	19.300	1.005
4.001	5.504	110.1	375	Circular	20.680	19.300	1.005	20.700	19.250	1.075
3.000	31.879	212.5	375	Circular	20.500	19.400	0.725	20.700	19.250	1.075
2.003	8.212	164.2	375	Circular	20.700	19.250	1.075	20.600	19.200	1.025
1.010	2.500	50.0	300	Circular	20.600	19.200	1.100	20.600	19.150	1.150
1.011	4.682	93.6	300	Circular	20.600	19.150	1.150	20.450	19.100	1.050
1.012	3.000	2.7	300	Circular	20.450	19.100	1.050	20.000	18.000	1.700

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	S7	1500	Manhole	Adoptable	S8	1500	Manhole	Adoptable
1.007	S8	1500	Manhole	Adoptable	S9	1500	Manhole	Adoptable
1.008	S9	1500	Manhole	Adoptable	S10	1500	Manhole	Adoptable
1.009	S10	1500	Manhole	Adoptable	BASIN	300	Manhole	Adoptable
2.000	S2.1	1500	Manhole	Adoptable	S2.2	1500	Manhole	Adoptable
2.001	S2.2	1500	Manhole	Adoptable	S2.3	1500	Manhole	Adoptable
2.002	S2.3	1500	Manhole	Adoptable	S2.7	1500	Manhole	Adoptable
4.000	S2.4	1500	Manhole	Adoptable	S2.5	1500	Manhole	Adoptable
4.001	S2.5	1500	Manhole	Adoptable	S2.7	1500	Manhole	Adoptable
3.000	S2.6	1500	Manhole	Adoptable	S2.7	1500	Manhole	Adoptable
2.003	S2.7	1500	Manhole	Adoptable	BASIN	300	Manhole	Adoptable
1.010	BASIN	300	Manhole	Adoptable	S11	1500	Manhole	Adoptable
1.011	S11	1500	Manhole	Adoptable	S12	1200	Manhole	Adoptable
1.012	S12	1200	Manhole	Adoptable	DITCH	150	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	23.950	1.500	1500				
				0	1.000	22.450	300
S2	24.950	2.650	1500				
				0	1.001	22.300	300
S3	24.750	2.550	1500				
				0	1.002	22.200	300
S4	24.400	2.350	1500				
				0	1.003	22.050	300

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S5	23.800	1.850	1500		1	1.003	21.950	300
					0	1.004	21.950	300
S6	22.700	1.500	1500		1	1.004	21.200	300
					0	1.005	21.200	300
S7	22.400	1.500	1500		1	1.005	20.900	300
					0	1.006	20.900	300
S8	22.000	1.500	1500		1	1.006	20.500	300
					0	1.007	20.500	300
S9	21.350	1.500	1500		1	1.007	19.850	300
					0	1.008	19.850	300
S10	21.100	1.300	1500		1	1.008	19.800	300
					0	1.009	19.800	300
S2.1	21.100	1.400	1500		0	2.000	19.700	375
					1	2.000	19.550	375
S2.2	22.500	2.950	1500		0	2.001	19.550	375
					1	2.001	19.350	375
S2.3	21.100	1.750	1500		0	2.002	19.350	375
					1	4.000	19.400	375
S2.4	20.520	1.120	1500		0	4.000	19.300	375
					1	4.001	19.300	375
S2.5	20.680	1.380	1500		0	3.000	19.400	375
					1	4.001	19.250	375
S2.6	20.500	1.100	1500		1	4.001	19.250	375
					2	3.000	19.250	375
					3	2.002	19.250	375
					0	2.003	19.250	375
S2.7	20.700	1.450	1500		1	4.001	19.250	375
					2	3.000	19.250	375
					3	2.002	19.250	375
					0	2.003	19.250	375

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
BASIN	20.600	1.400	300	○	1	2.003	19.200	375
					2	1.009	19.600	300
					0	1.010	19.200	300
S11	20.600	1.450	1500	○	1	1.010	19.150	300
					0	1.011	19.150	300
S12	20.450	1.350	1200	○	1	1.011	19.100	300
					0	1.012	19.100	300
DITCH	20.000	2.000	150	○	1	1.012	18.000	300

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m ³ /ha)	0.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	10080	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	35	0	0
100	40	0	0

Node S11 Online Hydro-Brake® Control

Flap Valve	x	Objective (HE)	Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	19.150	Product Number	CTL-SHE-0101-5000-1300-5000
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node BASIN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	705

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	645.0	0.0	1.400	896.0	0.0

Other (defaults)

Entry Loss (manhole) 0.250	Entry Loss (junction) 0.000	Apply Recommended Losses	x
Exit Loss (manhole) 0.250	Exit Loss (junction) 0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m ³)	
Full Bore Velocity	✓		

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	22.522	0.072	8.9	0.1278	0.0000	OK
15 minute winter	S2	11	22.383	0.083	13.3	0.1469	0.0000	OK
15 minute winter	S3	11	22.284	0.084	13.2	0.1489	0.0000	OK
15 minute winter	S4	11	22.185	0.135	27.8	0.2378	0.0000	OK
15 minute winter	S5	11	22.049	0.099	36.1	0.1752	0.0000	OK
15 minute winter	S6	11	21.290	0.090	39.8	0.1598	0.0000	OK
15 minute winter	S7	11	21.013	0.113	42.1	0.2004	0.0000	OK
15 minute winter	S8	11	20.601	0.101	49.2	0.1791	0.0000	OK
15 minute winter	S9	11	20.029	0.179	51.5	0.3157	0.0000	OK
15 minute winter	S10	11	19.959	0.159	54.0	0.2812	0.0000	OK
15 minute winter	S2.1	11	19.747	0.047	4.6	0.0831	0.0000	OK
15 minute winter	S2.2	11	19.646	0.096	17.9	0.1691	0.0000	OK
15 minute winter	S2.3	10	19.514	0.164	35.3	0.2892	0.0000	OK
15 minute winter	S2.4	10	19.512	0.112	7.0	0.1986	0.0000	OK
15 minute winter	S2.5	10	19.512	0.212	17.4	0.3739	0.0000	OK
15 minute summer	S2.6	10	19.510	0.110	6.8	0.1951	0.0000	OK
15 minute winter	S2.7	10	19.508	0.258	63.8	0.4554	0.0000	OK
360 minute winter	BASIN	288	19.375	0.175	24.2	115.7387	0.0000	OK
360 minute winter	S11	288	19.375	0.225	13.0	0.3978	0.0000	OK
360 minute winter	S12	288	19.119	0.019	4.8	0.0216	0.0000	OK
360 minute winter	DITCH	288	18.018	0.018	4.8	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 winter	S1	1.000	S2	8.6	0.603	0.130	0.6014	
15 minute winter	S2	1.001	S3	13.2	0.827	0.156	0.2765	
15 minute winter	S3	1.002	S4	12.9	0.567	0.176	0.7963	
15 minute winter	S4	1.003	S5	27.8	1.094	0.402	0.6538	
15 minute winter	S5	1.004	S6	36.0	1.886	0.220	0.6626	
15 minute winter	S6	1.005	S7	39.7	1.881	0.163	0.1331	
15 minute winter	S7	1.006	S8	41.9	1.852	0.270	0.4655	
15 minute winter	S8	1.007	S9	49.0	1.522	0.250	0.6763	
15 minute winter	S9	1.008	S10	51.1	1.251	0.521	0.2614	
15 minute winter	S10	1.009	BASIN	53.6	1.491	0.490	0.7399	
15 minute winter	S2.1	2.000	S2.2	4.4	0.309	0.034	0.5436	
15 minute winter	S2.2	2.001	S2.3	17.1	0.558	0.147	1.9905	
15 minute winter	S2.3	2.002	S2.7	40.0	0.751	0.281	1.2466	
15 minute winter	S2.4	4.000	S2.5	11.0	0.403	0.069	0.7168	
15 minute winter	S2.5	4.001	S2.7	18.1	0.472	0.095	0.3986	
15 minute summer	S2.6	3.000	S2.7	9.8	0.261	0.072	1.6867	
15 minute winter	S2.7	2.003	BASIN	70.2	2.152	0.451	0.3388	
360 minute winter	BASIN	1.010	S11	13.0	0.523	0.082	0.1243	
360 minute winter	S11	Hydro-Brake®	S12	4.8				
360 minute winter	S12	1.012	DITCH	4.8	2.703	0.007	0.0053	183.8

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	12	22.726	0.276	35.9	0.4869	0.0000	OK
15 minute winter	S2	12	22.675	0.375	54.9	0.6632	0.0000	SURCHARGED
15 minute winter	S3	12	22.643	0.443	53.2	0.7834	0.0000	SURCHARGED
15 minute winter	S4	12	22.602	0.552	102.0	0.9758	0.0000	SURCHARGED
15 minute winter	S5	12	22.426	0.476	133.8	0.8417	0.0000	SURCHARGED
15 minute winter	S6	12	22.003	0.803	139.1	1.4194	0.0000	SURCHARGED
15 minute winter	S7	12	21.840	0.940	134.7	1.6612	0.0000	SURCHARGED
15 minute winter	S8	12	21.438	0.938	159.4	1.6576	0.0000	SURCHARGED
15 minute winter	S9	12	20.866	1.016	166.8	1.7945	0.0000	SURCHARGED
15 minute winter	S10	12	20.571	0.771	176.7	1.3622	0.0000	SURCHARGED
15 minute winter	S2.1	11	19.898	0.198	18.5	0.3493	0.0000	OK
15 minute winter	S2.2	11	19.920	0.370	70.6	0.6530	0.0000	OK
15 minute winter	S2.3	11	19.831	0.481	140.7	0.8500	0.0000	SURCHARGED
480 minute winter	S2.4	472	19.809	0.409	3.0	0.7226	0.0000	SURCHARGED
480 minute winter	S2.5	472	19.809	0.509	5.5	0.8998	0.0000	SURCHARGED
480 minute winter	S2.6	464	19.809	0.409	2.8	0.7232	0.0000	SURCHARGED
480 minute winter	S2.7	472	19.809	0.559	23.6	0.9872	0.0000	SURCHARGED
480 minute winter	BASIN	472	19.809	0.608	46.4	425.7173	0.0000	SURCHARGED
480 minute winter	S11	472	19.808	0.658	11.5	1.1633	0.0000	SURCHARGED
30 minute summer	S12	31	19.120	0.020	5.0	0.0222	0.0000	OK
30 minute summer	DITCH	31	18.018	0.018	5.0	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 winter	S1	1.000	S2	35.9	0.820	0.541	2.8774	
15 minute winter	S2	1.001	S3	53.2	1.081	0.631	1.2140	
15 minute winter	S3	1.002	S4	57.0	0.861	0.775	2.3969	
15 minute winter	S4	1.003	S5	98.4	1.532	1.426	1.8092	
15 minute winter	S5	1.004	S6	122.8	2.279	0.750	2.4449	
15 minute winter	S6	1.005	S7	126.8	2.181	0.521	0.4436	
15 minute winter	S7	1.006	S8	133.8	2.075	0.861	1.4475	
15 minute winter	S8	1.007	S9	158.4	2.250	0.806	1.4732	
15 minute winter	S9	1.008	S10	167.1	2.374	1.704	0.4507	
15 minute winter	S10	1.009	BASIN	177.0	2.514	1.616	1.4343	
15 minute winter	S2.1	2.000	S2.2	28.3	0.413	0.220	3.0517	
15 minute winter	S2.2	2.001	S2.3	76.3	0.797	0.656	6.4463	
15 minute winter	S2.3	2.002	S2.7	140.9	1.277	0.990	2.1666	
480 minute winter	S2.4	4.000	S2.5	2.8	0.407	0.017	1.7224	
480 minute winter	S2.5	4.001	S2.7	9.5	0.346	0.050	0.6071	
480 minute winter	S2.6	3.000	S2.7	2.4	0.155	0.017	3.5162	
480 minute winter	S2.7	2.003	BASIN	21.7	0.983	0.139	0.9058	
480 minute winter	BASIN	1.010	S11	11.5	0.503	0.073	0.1760	
480 minute winter	S11	Hydro-Brake®	S12	5.0				
30 minute summer	S12	1.012	DITCH	5.0	2.742	0.007	0.0055	249.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	12	23.879	1.429	47.8	2.5250	0.0000	FLOOD RISK
15 minute winter	S2	12	23.832	1.532	67.9	2.7074	0.0000	SURCHARGED
15 minute winter	S3	12	23.783	1.583	51.5	2.7963	0.0000	SURCHARGED
15 minute winter	S4	12	23.701	1.651	111.8	2.9181	0.0000	SURCHARGED
15 minute winter	S5	12	23.381	1.431	151.4	2.5292	0.0000	SURCHARGED
15 minute winter	S6	12	22.669	1.469	160.3	2.5949	0.0000	FLOOD RISK
15 minute winter	S7	12	22.400	1.500	170.7	2.6505	2.1116	FLOOD
15 minute winter	S8	12	21.922	1.422	185.8	2.5122	0.0000	FLOOD RISK
15 minute winter	S9	12	21.190	1.340	192.5	2.3684	0.0000	FLOOD RISK
15 minute winter	S10	12	20.804	1.004	204.1	1.7749	0.0000	FLOOD RISK
15 minute winter	S2.1	11	20.368	0.668	29.2	1.1807	0.0000	SURCHARGED
15 minute winter	S2.2	11	20.359	0.809	93.8	1.4288	0.0000	SURCHARGED
15 minute winter	S2.3	10	20.212	0.862	193.0	1.5238	0.0000	SURCHARGED
480 minute winter	S2.4	480	20.010	0.610	3.8	1.0778	0.0000	SURCHARGED
480 minute winter	S2.5	488	20.014	0.714	7.0	1.2624	0.0000	SURCHARGED
480 minute winter	S2.6	480	20.011	0.611	3.6	1.0788	0.0000	SURCHARGED
600 minute winter	S2.7	585	20.008	0.758	23.8	1.3388	0.0000	SURCHARGED
600 minute winter	BASIN	600	20.008	0.808	49.4	579.4861	0.0000	SURCHARGED
600 minute winter	S11	600	20.008	0.858	12.5	1.5153	0.0000	SURCHARGED
15 minute summer	S12	18	19.120	0.020	5.0	0.0222	0.0000	OK
15 minute summer	DITCH	18	18.018	0.018	5.0	0.0000	0.0000	OK

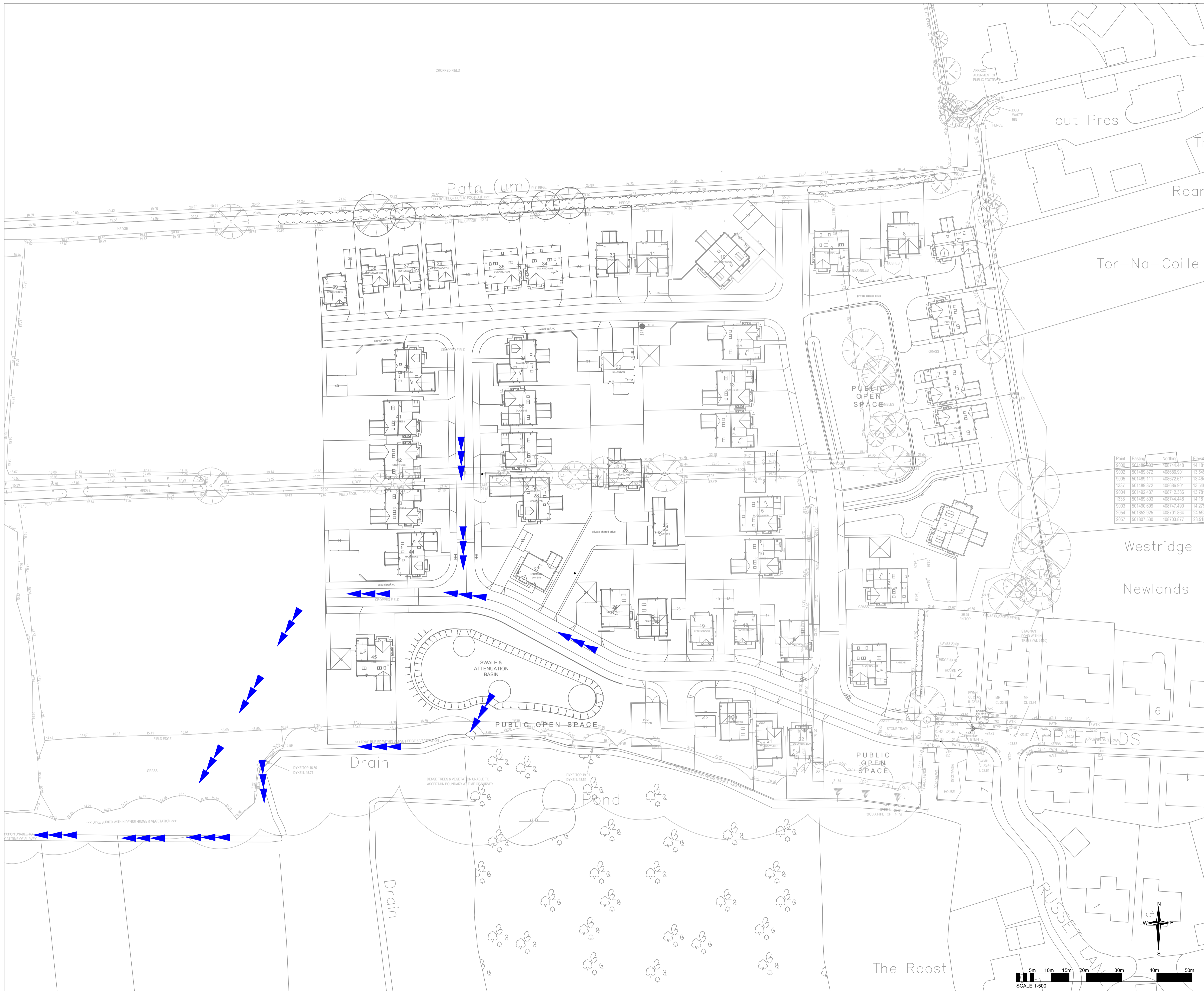
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	44.1	0.832	0.664	2.9334	
15 minute winter	S2	1.001	S3	51.5	1.073	0.610	1.2140	
15 minute winter	S3	1.002	S4	62.8	0.967	0.855	2.3969	
15 minute winter	S4	1.003	S5	109.9	1.562	1.594	1.8092	
15 minute winter	S5	1.004	S6	143.2	2.282	0.875	2.4449	
15 minute winter	S6	1.005	S7	160.0	2.273	0.657	0.4436	
15 minute winter	S7	1.006	S8	156.0	2.216	1.004	1.4475	
15 minute winter	S8	1.007	S9	179.0	2.543	0.911	1.4732	
15 minute winter	S9	1.008	S10	191.3	2.717	1.950	0.4507	
15 minute winter	S10	1.009	BASIN	205.0	2.912	1.872	1.4343	
15 minute winter	S2.1	2.000	S2.2	30.4	0.417	0.237	3.9879	
15 minute winter	S2.2	2.001	S2.3	96.6	0.876	0.830	6.4572	
15 minute winter	S2.3	2.002	S2.7	195.2	1.770	1.371	2.1666	
480 minute winter	S2.4	4.000	S2.5	3.5	0.389	0.022	1.7224	
480 minute winter	S2.5	4.001	S2.7	6.7	0.400	0.035	0.6071	
480 minute winter	S2.6	3.000	S2.7	3.1	0.151	0.023	3.5162	
600 minute winter	S2.7	2.003	BASIN	23.2	0.988	0.149	0.9058	
600 minute winter	BASIN	1.010	S11	12.5	0.486	0.080	0.1760	
600 minute winter	S11	Hydro-Brake®	S12	5.0				
15 minute summer	S12	1.012	DITCH	5.0	2.742	0.007	0.0055	253.7

Appendix E

Flood Exceedance Plan

NOTES
 CONTRACTORS MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK ON SHOP DRAWINGS
 DO NOT SCALE FROM THIS DRAWING
 RCD CONSULTANTS LTD COPYRIGHT


 FLOOD EXCEEDANCE ROUTE



Point	Easting	Northing	Height
9000	501488.805	408744.448	14.181
9002	501489.872	408696.901	13.549
9005	501488.111	408672.611	13.464
1337	501489.872	408686.901	13.549
9004	501489.437	408712.386	13.781
1338	501488.803	408744.448	14.181
9003	501489.299	408747.909	14.279
2054	501852.925	408701.864	24.588
2057	501807.530	408703.877	23.518

P1	PRELIMINARY ISSUE	09.08.2025	RAC
REV	AMENDMENT	DATE	CHKD

DRAWING STATUS: **PRELIMINARY**

RCD

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CLIENT
KIEGAR HOMES

PROJECT
**PROPOSED RESIDENTIAL DEVELOPMENT
 PHASE 2, APPLEFIELDS
 WRABBY**

DRAWING TITLE
FLOOD EXCEEDANCE PLAN

CIVILS

SCALE: 1:500 @ A1, 1:1000 @ A3
 DRAWN BY: STC
 CHECKED: RAC
 DATE: AUG 2025

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