DRAINAGE STRATEGY

INCORPORATING AN ASSESSMENT OF FLOOD RISK

for

Mr BEN LEE

PROPOSED RESIDENTIAL DEVELOPMENT

on

LAND TO THE REAR OF THE DOG INN

MARKET PLACE, LONGRIDGE, PR3 3RR

APRIL 2024 – Revision C

REFORD

Consulting Engineers Limited

Hindley Fallows, Midgery Lane, Fulwood, Preston, PR2 9QD

Mobile: 07970 265334 Email: refordcel@hotmail.com

Company number: 09620365 VAT Reg. 215 5638 12

CONTENTS

1. INTRODUCTION

1.1 This surface water and foul water drainage strategy, incorporating an assessment of flood risk, has been produced on behalf of Mr Ben Lee in support of a planning application for a proposed development comprising eight residential dwellings on land to the rear of the Dog Inn, Market Place, Longridge, PR3 3RR. A location plan is included within Appendix A.

1.2 This report describes the existing site conditions and proposed development. It assesses the potential impact of proposals on existing sewers and includes a proposed strategy for the provision of new drainage to serve the proposed development.

2. BASE INFORMATION

Existing site

2.1 The site is located in the centre of the town of Longridge off Market Place. The site lies to the rear of The Dog Inn public house and is accessed via a lane to the north east side of the pub which also serves the customer carpark.

2.2 The site size has been measured as 0.37ha.

2.3 The site is currently vacant, being made up of an area of shrub and brownfield land.

2.4 The site falls in a south easterly direction, with the access point off Market Place being at a higher level than the south eastern elements of the site, and the area of the site where the proposed dwellings are to be located is a level area approx. 8m below the level of Market Street.

Proposed development

2.5 The proposed development will comprise eight residential dwellings. The masterplan is shown on the drawing accompanying the planning application.

Site geology

2.6 The online Soilscapes Viewer has identified the site lying in a region characterised by the following two types of soils:

- Freely draining slightly acid loamy soils
- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage.

2.7 Initial infiltration testing has been carried out at two locations within the area of the site where the development is proposed. One test was carried out in each of the locations and permeability rates of 2.438×10^{-5} m/s and 3.881×10^{-5} m/s have been calculated.

Understanding of existing drainage within and local to the site

2.8 United Utilities sewer records identify a 225mm diameter public sewer crossing the site in a northeast to southwest direction before turning southeast along the public footpath to the west of the site. The line of the public sewer where it crosses the site is clearly identified as existing manholes lie within the development site boundary. The public sewer is unaffected by the development proposals. The sewer records are included within Appendix B.

2.9 The sewer records also identify a possible watercourse in culvert that lies approx. 70m to the northwest of the development site and flows in a south westerly direction along the rear of the properties that lie along King Street, the southern end of Dixon Road to cross Berry Lane and along Brewery Street.

2.10 The existing Dog Inn public house has an existing private drainage system which connects to the public sewer network.

Flood risk

2.11 The flood map for planning identifies the site within Flood Zone 1, the lowest risk.

2.12 The Long Term Flood Risk map on the GOV.uk website shows the site is at a very low risk of surface water flooding. A very low risk means that each year, this area has a chance of flooding of less than 1 in 1000 (0.1%).

2.13 There are no canals or other artificial sources local to the development site.

2.14 A 225mm diameter public foul sewer crosses the site in a northeast to southwest direction before turning southeast along the public footpath to the west of the site.

2.15 The Environment Agency risk of flooding from reservoirs map identifies the site is not at risk.

2.16 The Environment Agency does not consider groundwater flooding to be a significant flood risk factor in the Ribble Valley area.

2.17 Surface water runoff from the development will be controlled and as such, there will be no change to the flood risk upstream or downstream of this location.

3. PROPOSED DRAINAGE STRATEGY

3.1 The proposed drainage layout is included within Appendix C.

Surface Water Drainage

3.2 In accordance with the National Standards for Sustainable Drainage, the drainage strategy should incorporate the use of Sustainable Drainage (SUDS) where possible. The approach promotes the use infiltration features in the first instance. If drainage cannot be achieved solely through infiltration due to site conditions or contamination risks, the preferred options are (in order of preference):

(i) a controlled discharge to a local waterbody or watercourse, or
(ii) a controlled discharge into the public sewer network (depending on availability and capacity).

3.3 The rate and volume of discharge should be restricted to the pre-development values as far as practicable.

Surface water drainage discharges from the developed site

3.4 The online Soilscapes Viewer has identified the site lying in a region characterised by the following two types of soils:

- Freely draining slightly acid loamy soils
- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage.

3.5 Initial infiltration testing has been carried out at two locations within the area of the site where a soakaway is proposed. One test was carried out in each of the locations and permeability rates of 2.438×10^{-5} m/s and 3.881×10^{-5} m/s have been calculated.

3.6 It is therefore intended that surface water runoff from the proposed residential roofs and accessway will discharge to a soakaway located within the site. As three tests were not carried out, based upon previous experience the infiltration rate to be used within the design of the soakaway should be halved. Using the most conservative rate of

2.438 x 10^{-5} m/s, a permeability rate of 1.219 x 10^{-5} m/s (0.0439 m/hr) has been used within the calculation.

3.7 Surface water will be managed within the non-drained areas of the site, i.e. the gardens, footpaths, etc. by allowing water to infiltrate into the upper strata and be stored where it will be either taken up by plants or evaporated. There may, potentially, be periods where the upper strata may become saturated and surface ponding may occur but this will be shallow in depth and will disappear over a short period of time.

3.8 The soakaway has been designed to take surface water runoff generated by all rainfall events up to the 100 year critical rain storm plus 50%. The additional 50% is to allow for climate change.

3.9 A surface water drainage design has been carried out for the proposed development using a total area of roofs and hardstandings of 1,850m^2.

3.10 The design demonstrates that a soakaway of size 6m x 24m x 1.2m deep will be adequate to drain the surface water runoff from the building roof for storm events up to a 1 in 100 year return period with an additional 50% added to rainfall intensities to allow for climate change. The surface water drainage design is included within Appendix D.

3.11 A catchpit is to be placed on each pipe discharging into the soakaway to allow silt and other debris to settle out.

3.12 The soakaway is to comprise storage crates and is to be located a distance of at least 5m from the building and 2.5m from boundaries. Crates are to be installed in accordance with manufacturer's instructions.

3.13 Further infiltration testing is to be carried out prior to the detailed design of the surface water drainage to confirm that a soakaway solution is viable. If infiltration rates are proved not to be suitable then alternative methods of discharge of surface water from the developed site are to be investigated.

3.14 The sewer records identify a possible watercourse in culvert that lies approx. 70m to the northwest of the development site and flows in a south westerly direction along the rear of the properties that lie along King Street, the southern end of Dixon Road to cross Berry Lane and along Brewery Street. The development site lies approx. 8m below Berry Lane where the culverted watercourse crosses and therefore it is not possible for a connection to be made.

3.15 The existing Dog Inn public house has an existing drainage system which connects to the public sewer network. As such it would be intended that an attenuated surface water discharge would be made into the public sewer crossing the site if a soakaway is not possible.

Foul Water Drainage

3.16 United Utilities sewer records identify a 225mm diameter public sewer crossing the site in a northeast to southwest direction before turning southeast along the public footpath to the west of the site. The line of the sewer where it crosses the site is clearly identified as existing manholes lie within the development site boundary.

3.17 The public sewer crossing the site is unaffected by the development proposals.

3.18 It is intended that foul water from the proposed development will be collected by a piped system and be discharged into the public sewer where it lies along the public footpath at the south western corner of the site. Because the connections to the public foul sewer will be downstream of the development site there will not be any risk to the residential properties should the sewer surcharge.

4. SUMMARY AND CONCLUSIONS

4.1 This surface water and foul water drainage strategy, incorporating an assessment of flood risk, has been produced on behalf of Mr Ben Lee in support of a planning application for a proposed development comprising eight residential dwellings on land to the rear of the Dog Inn, Market Place, Longridge, PR3 3RR.

4.2 The nature of the local geology means that infiltration of surface water runoff back into the ground is likely to be feasible on this site.

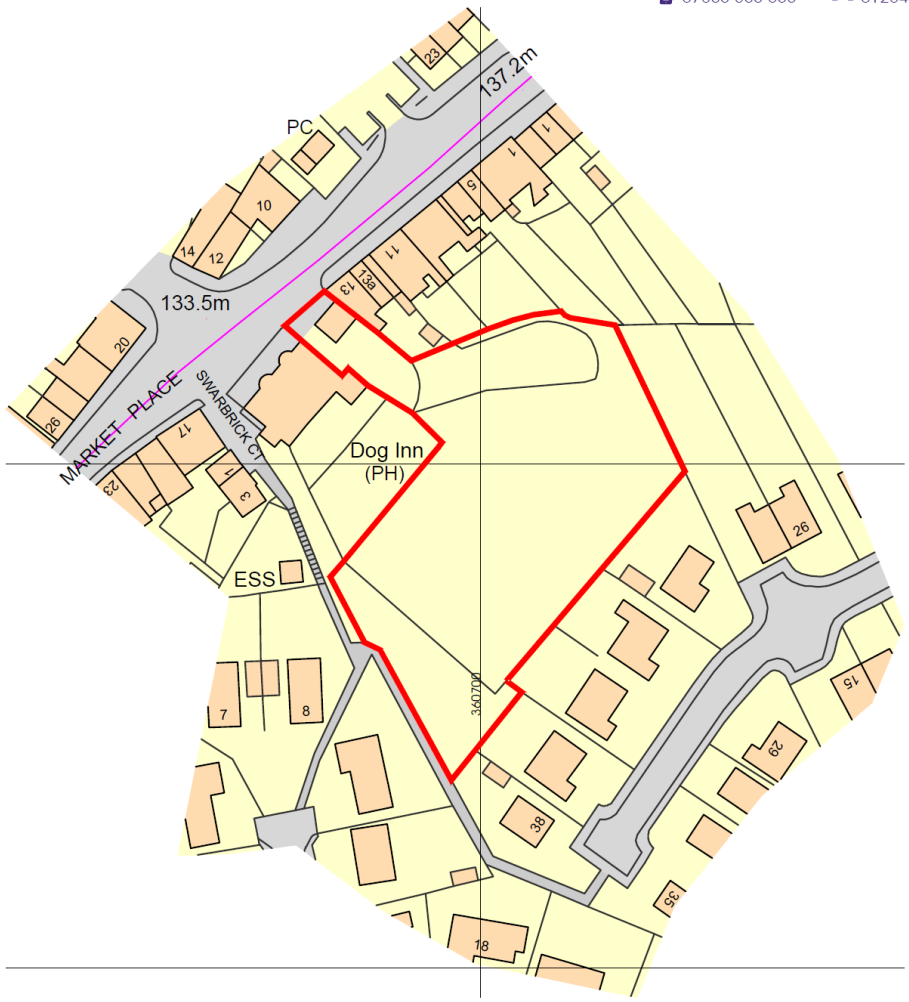
4.3 United Utilities sewer records identify a 225mm diameter public sewer crossing the site in a northeast to southwest direction before turning southeast along the public footpath to the west of the site. The public sewer crossing the site is unaffected by the development proposals.

4.4 It is intended that surface water runoff from the developed site will be discharged back into the ground via a soakaway.

4.5 Foul water from the proposed development will be collected by a piped system and be discharged into the public sewer where it lies along the public footpath at the south western corner of the site.

APPENDIX A

PGB Architectural Services LTD Lily Cottage, 12 Glen Avenue, Knowle Green, Preston PR3 2ZQ
07866 366 565 01254 820092 info@pgb-arch.com pgb-arch.com



Land to the Rear of
The Dog Inn Market Place Longridge
NGJ Holdings Ltd

Location Plan

DATE 06.04.2020

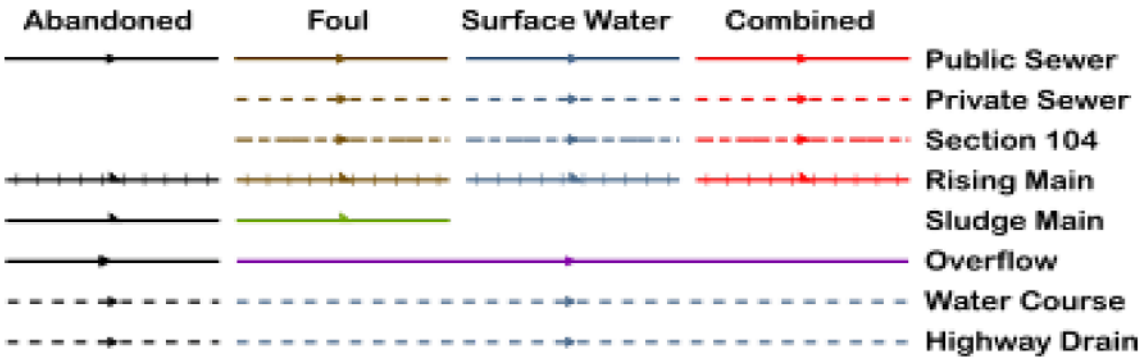
JOB NO. 3156
DRAWING NO. 001
REVISION
SCALE 1:1250 @ A4

PGB ARCHITECTURAL SERVICES LTD

APPENDIX B

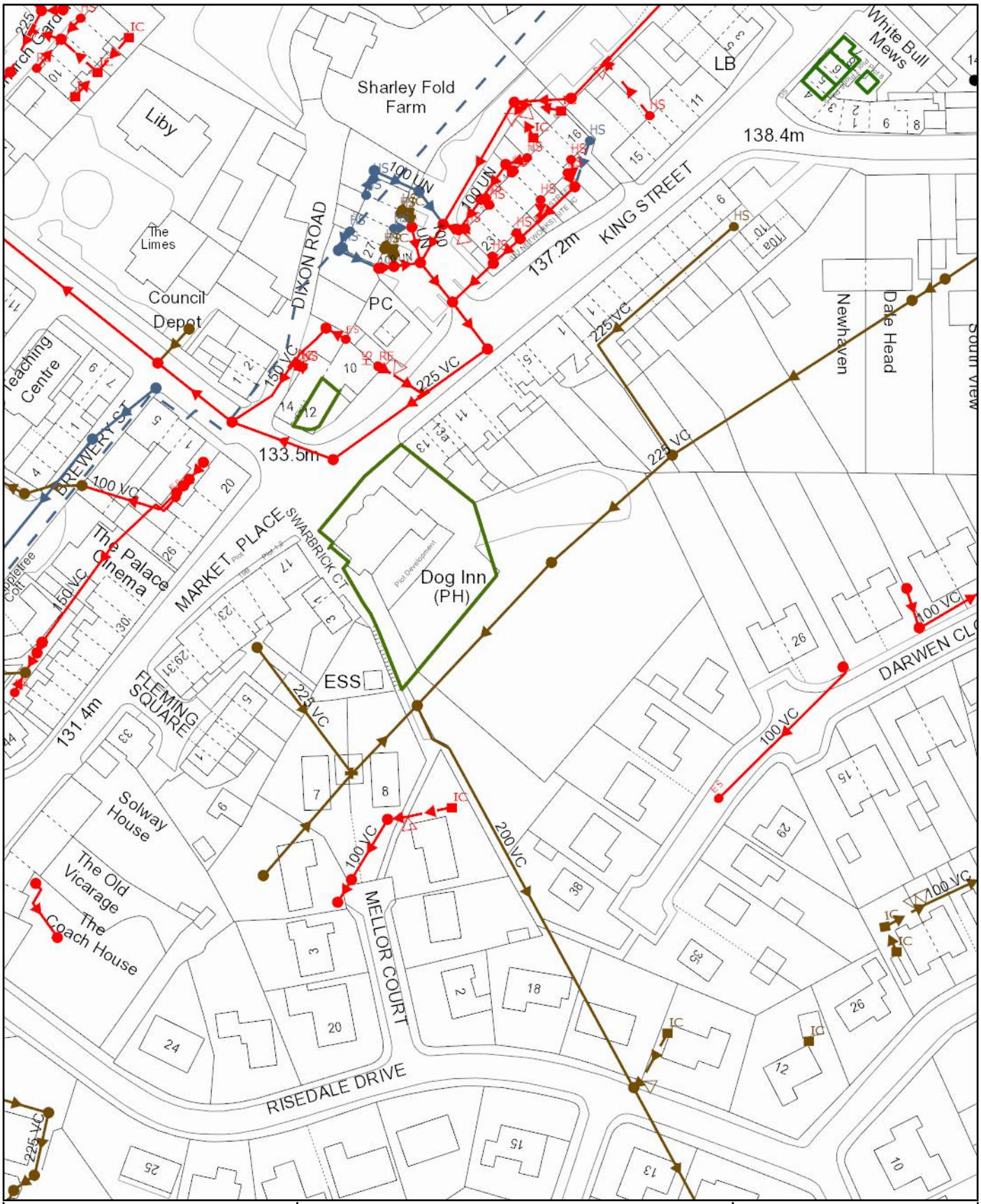
United Utilities
Water for the North West

Wastewater Symbology



All point assets follow the standard colour convention: red – combined, brown - foul, blue – surface water, purple - overflow

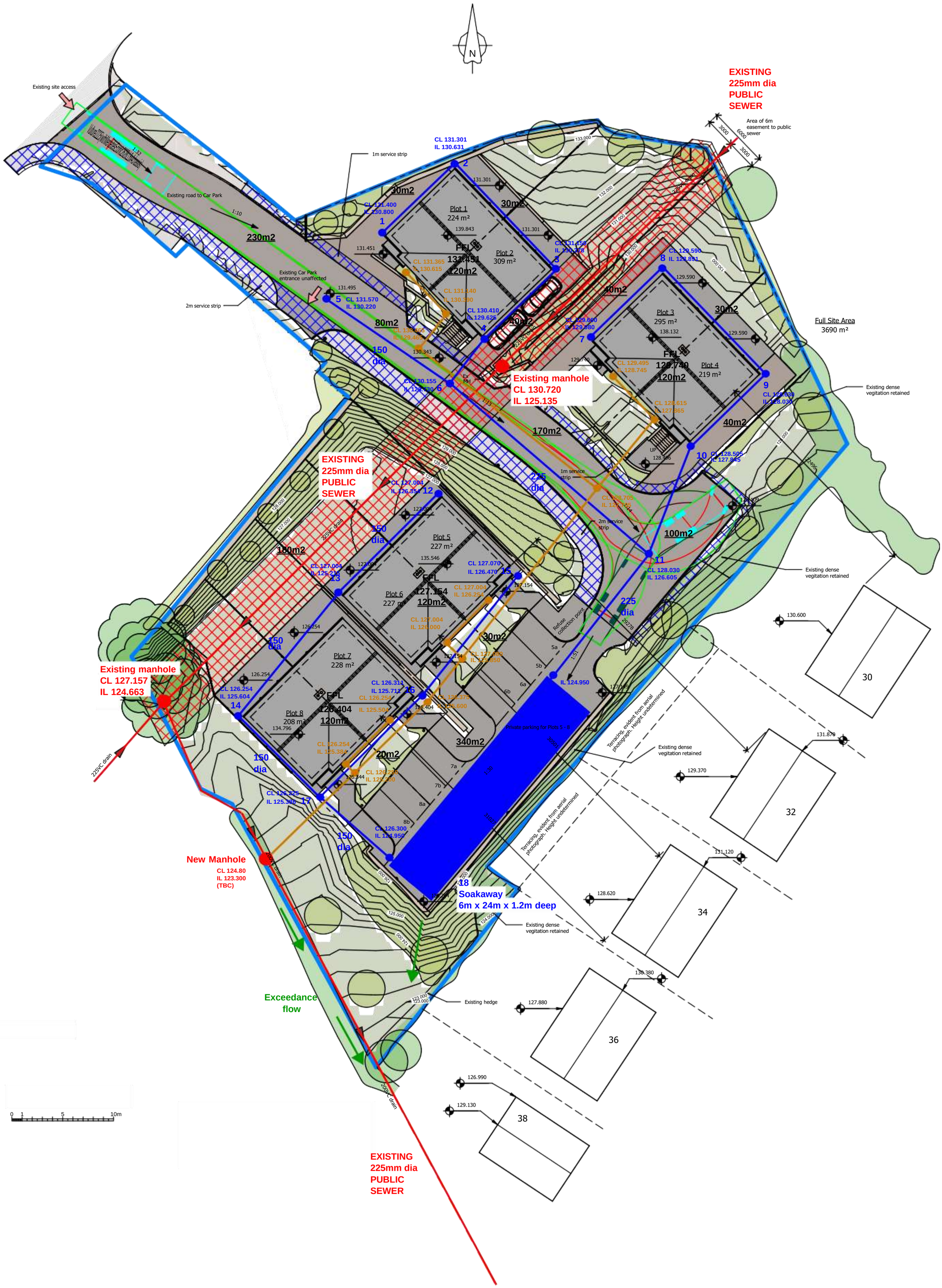
- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- CA Catchpit
- VC Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- ST Septic Tank
- CK Control Kiosk
- Change of Characteristic



Scale:	1:1250	**SEWER RECORDS**	United Utilities Water for the North West
Date:	11/12/2020		
Address or Site Reference:	dog inn		
Printed by:	Property Searches		

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

APPENDIX C



PROPOSED DRAINAGE LAYOUT

APPENDIX D

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	75.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.800	Minimum Backdrop Height (m)	2.000
Ratio-R	0.290	Preferred Cover Depth (m)	0.500
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.006	5.00	131.400	1200	0.600
2	0.004	5.00	131.301	1200	0.670
3	0.004	5.00	131.150	1200	0.772
4	0.006	5.00	130.410	1200	0.785
5	0.031	5.00	131.570	1200	1.350
6	0.017	5.00	130.155	1200	1.425
7	0.006	5.00	129.660	1200	0.600
8	0.005	5.00	129.590	1200	0.699
9	0.005	5.00	128.630	1200	0.600
10	0.007	5.00	128.505	1200	0.660
11	0.044	5.00	128.030	1200	1.425
12	0.010	5.00	127.004	1200	0.650
13	0.018	5.00	127.004	1200	0.789
14	0.010	5.00	126.254	1200	0.650
15	0.003	5.00	127.070	1200	0.600
16	0.006	5.00	126.311	1200	0.600
17	0.003	5.00	126.225	1200	0.839
18			126.300	1200	1.350
19			126.300	1200	1.400

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	1	2	10.000	0.600	130.800	130.631	0.169	59.2	100	5.17	55.3
1.001	2	3	15.000	0.600	130.631	130.378	0.253	59.3	100	5.42	54.3
1.002	3	4	11.000	0.600	130.378	129.625	0.753	14.6	100	5.51	53.9
1.003	4	6	4.000	0.600	129.625	128.780	0.845	4.7	100	5.52	53.9
2.000	5	6	16.000	0.600	130.220	128.805	1.415	11.3	150	5.09	55.6
1.004	6	11	26.000	0.600	128.730	126.605	2.125	12.2	225	5.64	53.4
3.000	7	8	10.000	0.600	129.060	128.891	0.169	59.2	100	5.17	55.3
3.001	8	9	15.000	0.600	128.891	128.030	0.861	17.4	100	5.30	54.7
3.002	9	10	11.000	0.600	128.030	127.845	0.185	59.5	100	5.48	54.0
3.003	10	11	11.000	0.600	127.845	126.730	1.115	9.9	100	5.56	53.7
1.005	11	18	40.000	0.600	126.605	124.950	1.655	24.2	225	5.89	52.5
4.000	12	13	14.000	0.600	126.354	126.215	0.139	100.7	150	5.23	55.0
4.001	13	14	15.000	0.600	126.215	125.604	0.611	24.5	150	5.36	54.5
4.002	14	17	12.000	0.600	125.604	125.386	0.218	55.0	150	5.50	53.9

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	1.003	7.9	0.9	0.500	0.570	0.006	0.0	23	0.668
1.001	1.002	7.9	1.5	0.570	0.672	0.010	0.0	29	0.767
1.002	2.031	16.0	2.0	0.672	0.685	0.014	0.0	24	1.383
1.003	3.578	28.1	2.9	0.685	1.275	0.020	0.0	21	2.295
2.000	3.013	53.2	4.7	1.200	1.200	0.031	0.0	30	1.871
1.004	3.761	149.5	9.8	1.200	1.200	0.068	0.0	39	2.157
3.000	1.003	7.9	0.9	0.500	0.599	0.006	0.0	23	0.668
3.001	1.859	14.6	1.6	0.599	0.500	0.011	0.0	22	1.216
3.002	1.001	7.9	2.3	0.500	0.560	0.016	0.0	37	0.869
3.003	2.475	19.4	3.3	0.560	1.200	0.023	0.0	28	1.840
1.005	2.672	106.2	19.2	1.200	1.125	0.135	0.0	65	2.042
4.000	1.001	17.7	1.5	0.500	0.639	0.010	0.0	30	0.611
4.001	2.040	36.1	4.1	0.639	0.500	0.028	0.0	34	1.364
4.002	1.358	24.0	5.6	0.500	0.689	0.038	0.0	49	1.107

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)
5.000	15	16	15.000	0.600	126.470	125.711	0.759	19.8	100	5.14	55.4
5.001	16	17	14.000	0.600	125.711	125.436	0.275	50.9	100	5.36	54.5
4.003	17	18	9.000	0.600	125.386	125.025	0.361	24.9	150	5.58	53.7
1.006	18	19	2.000	0.600	124.950	124.900	0.050	40.0	150	5.91	52.4

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)
5.000	1.745	13.7	0.5	0.500	0.500	0.003	0.0	13	0.810
5.001	1.082	8.5	1.3	0.500	0.689	0.009	0.0	27	0.790
4.003	2.025	35.8	7.3	0.689	1.125	0.050	0.0	46	1.597
1.006	1.596	28.2	26.3	1.200	1.250	0.185	0.0	115	1.808

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m³/ha)	20.0
M5-60 (mm)	18.800	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.290	Skip Steady State	x	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	100	0	0	0
30	0	0	0	100	50	0	0

Node 18 Online Orifice Control

Flap Valve	x	Invert Level (m)	124.950	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.001		

Node 18 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.04388	Porosity	0.95	Pit Width (m)	6.000	Inf Depth (m)	
Side Inf Coefficient (m/hr)	0.04388	Invert Level (m)	123.750	Pit Length (m)	24.000	Number Required	1
Safety Factor	2.0	Time to half empty (mins)		Depth (m)	1.200		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	130.820	0.020	0.7	0.0269	0.0000	OK
15 minute winter	2	10	130.658	0.027	1.2	0.0336	0.0000	OK
15 minute winter	3	10	130.400	0.022	1.6	0.0271	0.0000	OK
15 minute winter	4	11	129.645	0.020	2.3	0.0260	0.0000	OK
15 minute winter	5	10	130.247	0.027	3.7	0.0432	0.0000	OK
15 minute winter	6	10	128.765	0.035	7.9	0.0478	0.0000	OK
15 minute winter	7	11	129.081	0.021	0.7	0.0273	0.0000	OK
15 minute winter	8	11	128.911	0.020	1.3	0.0258	0.0000	OK
15 minute winter	9	11	128.066	0.036	1.9	0.0465	0.0000	OK
15 minute winter	10	11	127.871	0.026	2.7	0.0346	0.0000	OK
15 minute winter	11	11	126.664	0.059	15.6	0.1030	0.0000	OK
15 minute winter	12	10	126.380	0.026	1.2	0.0374	0.0000	OK
15 minute winter	13	10	126.245	0.030	3.3	0.0480	0.0000	OK
15 minute winter	14	11	125.649	0.045	4.4	0.0644	0.0000	OK
15 minute winter	15	10	126.481	0.011	0.4	0.0139	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	1	1.000	2	0.7	0.505	0.089	0.0141	
15 minute winter	2	1.001	3	1.1	0.772	0.144	0.0222	
15 minute winter	3	1.002	4	1.6	1.316	0.099	0.0132	
15 minute winter	4	1.003	6	2.3	2.095	0.082	0.0044	
15 minute winter	5	2.000	6	3.7	1.708	0.069	0.0343	
15 minute winter	6	1.004	11	7.8	1.320	0.052	0.1578	
15 minute winter	7	3.000	8	0.7	0.613	0.089	0.0114	
15 minute winter	8	3.001	9	1.3	0.728	0.089	0.0273	
15 minute winter	9	3.002	10	1.9	0.927	0.241	0.0226	
15 minute winter	10	3.003	11	2.7	1.711	0.138	0.0173	
15 minute winter	11	1.005	18	15.5	1.902	0.146	0.3263	
15 minute winter	12	4.000	13	1.2	0.507	0.065	0.0319	
15 minute winter	13	4.001	14	3.2	0.930	0.089	0.0520	
15 minute winter	14	4.002	17	4.3	1.020	0.181	0.0510	
15 minute winter	15	5.000	16	0.4	0.395	0.026	0.0143	

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	16	11	125.735	0.024	1.1	0.0321	0.0000	OK
15 minute winter	17	11	125.429	0.043	5.7	0.0511	0.0000	OK
480 minute winter	18	344	123.920	-1.030	3.7	23.2640	0.0000	OK
15 minute summer	19	1	124.900	0.000	0.0	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	16	5.001	17	1.0	0.730	0.123	0.0201	
15 minute winter	17	4.003	18	5.7	1.442	0.160	0.0358	
480 minute winter	18	Orifice	19	0.0				0.0
480 minute winter	18	Infiltration		0.9				

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	130.831	0.031	1.7	0.0417	0.0000	OK
15 minute winter	2	10	130.674	0.043	2.9	0.0543	0.0000	OK
15 minute winter	3	10	130.413	0.035	4.0	0.0435	0.0000	OK
15 minute winter	4	10	129.658	0.033	5.6	0.0419	0.0000	OK
15 minute winter	5	10	130.263	0.043	9.0	0.0681	0.0000	OK
15 minute winter	6	10	128.784	0.054	19.4	0.0745	0.0000	OK
15 minute summer	7	10	129.092	0.032	1.7	0.0430	0.0000	OK
15 minute winter	8	10	128.923	0.032	3.2	0.0402	0.0000	OK
15 minute winter	9	11	128.089	0.059	4.6	0.0769	0.0000	OK
15 minute winter	10	11	127.887	0.041	6.5	0.0557	0.0000	OK
15 minute winter	11	11	126.700	0.095	38.5	0.1665	0.0000	OK
15 minute winter	12	10	126.395	0.041	2.9	0.0590	0.0000	OK
15 minute winter	13	10	126.263	0.048	8.0	0.0760	0.0000	OK
15 minute winter	14	10	125.679	0.075	10.8	0.1074	0.0000	OK
15 minute winter	15	10	126.487	0.017	0.9	0.0211	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	1	1.000	2	1.7	0.626	0.212	0.0268	
15 minute winter	2	1.001	3	2.8	0.979	0.354	0.0429	
15 minute winter	3	1.002	4	3.9	1.682	0.246	0.0257	
15 minute winter	4	1.003	6	5.6	2.651	0.198	0.0084	
15 minute winter	5	2.000	6	8.9	2.198	0.168	0.0649	
15 minute winter	6	1.004	11	19.3	1.676	0.129	0.3029	
15 minute summer	7	3.000	8	1.7	0.786	0.212	0.0212	
15 minute winter	8	3.001	9	3.1	0.907	0.214	0.0519	
15 minute winter	9	3.002	10	4.5	1.151	0.579	0.0434	
15 minute winter	10	3.003	11	6.5	2.170	0.334	0.0329	
15 minute winter	11	1.005	18	37.9	2.423	0.357	0.6262	
15 minute winter	12	4.000	13	2.8	0.650	0.160	0.0612	
15 minute winter	13	4.001	14	7.9	1.175	0.220	0.1019	
15 minute winter	14	4.002	17	10.7	1.267	0.444	0.1010	
15 minute winter	15	5.000	16	0.9	0.496	0.063	0.0271	

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	16	11	125.749	0.038	2.6	0.0506	0.0000	OK
15 minute winter	17	11	125.457	0.071	14.0	0.0848	0.0000	OK
720 minute winter	18	555	124.215	-0.735	5.9	63.5858	0.0000	OK
15 minute summer	19	1	124.900	0.000	0.0	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	16	5.001	17	2.5	0.927	0.293	0.0376	
15 minute winter	17	4.003	18	14.0	1.811	0.392	0.0697	
720 minute winter	18	Orifice	19	0.0				0.0
720 minute winter	18	Infiltration		1.0				

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	130.836	0.036	2.2	0.0478	0.0000	OK
15 minute winter	2	10	130.681	0.050	3.7	0.0629	0.0000	OK
15 minute winter	3	10	130.418	0.040	5.1	0.0498	0.0000	OK
15 minute winter	4	10	129.663	0.038	7.2	0.0484	0.0000	OK
15 minute winter	5	10	130.269	0.049	11.6	0.0780	0.0000	OK
15 minute winter	6	10	128.792	0.062	25.1	0.0848	0.0000	OK
15 minute winter	7	10	129.097	0.037	2.2	0.0495	0.0000	OK
15 minute winter	8	10	128.927	0.036	4.1	0.0459	0.0000	OK
15 minute winter	9	11	128.100	0.070	5.9	0.0914	0.0000	OK
15 minute winter	10	11	127.893	0.048	8.4	0.0647	0.0000	OK
15 minute winter	11	10	126.716	0.111	49.7	0.1933	0.0000	OK
15 minute winter	12	10	126.401	0.047	3.7	0.0675	0.0000	OK
15 minute winter	13	10	126.270	0.055	10.3	0.0869	0.0000	OK
15 minute winter	14	10	125.692	0.088	14.0	0.1262	0.0000	OK
15 minute winter	15	11	126.489	0.019	1.1	0.0237	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	1	1.000	2	2.2	0.673	0.276	0.0324	
15 minute winter	2	1.001	3	3.6	1.044	0.457	0.0518	
15 minute winter	3	1.002	4	5.0	1.783	0.315	0.0311	
15 minute winter	4	1.003	6	7.2	2.824	0.255	0.0102	
15 minute winter	5	2.000	6	11.5	2.353	0.216	0.0782	
15 minute winter	6	1.004	11	24.9	1.783	0.167	0.3673	
15 minute winter	7	3.000	8	2.2	0.838	0.276	0.0259	
15 minute winter	8	3.001	9	4.0	0.955	0.276	0.0630	
15 minute winter	9	3.002	10	5.8	1.210	0.744	0.0529	
15 minute winter	10	3.003	11	8.4	2.313	0.431	0.0399	
15 minute winter	11	1.005	18	48.9	2.582	0.460	0.7570	
15 minute winter	12	4.000	13	3.6	0.693	0.206	0.0736	
15 minute winter	13	4.001	14	10.3	1.244	0.284	0.1238	
15 minute winter	14	4.002	17	13.8	1.335	0.574	0.1238	
15 minute winter	15	5.000	16	1.1	0.525	0.080	0.0328	

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	16	10	125.755	0.044	3.3	0.0587	0.0000	OK
15 minute winter	17	11	125.469	0.083	18.1	0.0999	0.0000	OK
600 minute winter	18	525	124.395	-0.555	8.5	88.2033	0.0000	OK
15 minute summer	19	1	124.900	0.000	0.0	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	16	5.001	17	3.2	0.992	0.381	0.0457	
15 minute winter	17	4.003	18	18.1	1.919	0.507	0.0851	
600 minute winter	18	Orifice	19	0.0				0.0
600 minute winter	18	Infiltration		1.1				

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	130.846	0.046	3.4	0.0610	0.0000	OK
15 minute winter	2	10	130.697	0.066	5.5	0.0820	0.0000	OK
15 minute winter	3	11	130.429	0.051	7.6	0.0632	0.0000	OK
15 minute winter	4	10	129.673	0.048	10.9	0.0622	0.0000	OK
15 minute winter	5	10	130.282	0.061	17.4	0.0977	0.0000	OK
15 minute winter	6	10	128.807	0.077	37.7	0.1049	0.0000	OK
15 minute winter	7	10	129.108	0.048	3.4	0.0635	0.0000	OK
15 minute winter	8	10	128.936	0.045	6.1	0.0575	0.0000	OK
15 minute winter	9	11	128.175	0.145	8.9	0.1879	0.0000	SURCHARGED
15 minute winter	10	11	127.905	0.060	11.8	0.0802	0.0000	OK
15 minute winter	11	10	126.748	0.143	73.7	0.2497	0.0000	OK
15 minute winter	12	10	126.413	0.059	5.6	0.0853	0.0000	OK
15 minute winter	13	10	126.284	0.069	15.6	0.1090	0.0000	OK
15 minute winter	14	10	125.724	0.120	21.1	0.1727	0.0000	OK
15 minute winter	15	10	126.494	0.024	1.7	0.0292	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	1	1.000	2	3.3	0.747	0.425	0.0447	
15 minute winter	2	1.001	3	5.4	1.150	0.691	0.0709	
15 minute winter	3	1.002	4	7.6	1.954	0.476	0.0427	
15 minute winter	4	1.003	6	10.9	3.113	0.387	0.0140	
15 minute winter	5	2.000	6	17.3	2.619	0.324	0.1055	
15 minute winter	6	1.004	11	37.6	1.956	0.251	0.5000	
15 minute winter	7	3.000	8	3.3	0.942	0.425	0.0356	
15 minute winter	8	3.001	9	6.1	1.014	0.416	0.0844	
15 minute winter	9	3.002	10	8.1	1.224	1.026	0.0698	
15 minute winter	10	3.003	11	11.7	2.497	0.604	0.0518	
15 minute winter	11	1.005	18	72.4	2.820	0.682	1.0300	
15 minute winter	12	4.000	13	5.5	0.771	0.312	0.1003	
15 minute winter	13	4.001	14	15.5	1.328	0.429	0.1723	
15 minute winter	14	4.002	17	20.7	1.420	0.863	0.1748	
15 minute winter	15	5.000	16	1.7	0.570	0.122	0.0450	

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	16	10	125.768	0.057	5.1	0.0755	0.0000	OK
15 minute winter	17	11	125.498	0.112	27.4	0.1351	0.0000	OK
960 minute winter	18	885	124.837	-0.113	8.8	148.6538	0.0000	OK
15 minute summer	19	1	124.900	0.000	0.0	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	16	5.001	17	5.0	1.057	0.588	0.0674	
15 minute winter	17	4.003	18	27.4	2.073	0.766	0.1188	
960 minute winter	18	Orifice	19	0.0				0.0
960 minute winter	18	Infiltration		1.3				