Report Title	# Drainage Report
Property Address	The Flax Mill Cleator Mills Mill Street Cleator Cumbria CA23 3FA
Client	Cleator Mills Business Park Ltd
Our Reference	24-275r001B
Date	August 2024
Prepared by	Josh Gemmell BEng Hons Graduate Engineer
Checked by	Colin Aimers BEng Hons CEng MICE CEnv Director

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CONTENTS

INTRODUCTION

The purpose of this report is to present the detailed drainage design for a planning application associated with the redevelopment of a mill and associated infrastructure on land at Cleator Mills, Mill Street, Cleator, Cumbria, CA23 3FA.

The site lies within the administrative boundary of Cumberland Council (CC) and this report is supporting a planning application.

Research has been undertaken on the site and observations made regarding the existing site and its former history. The report should be read in conjunction with the documents referenced to it, generally appended to this report, and all works have been designed in accordance with the following standards :

- CIRIA Publication C753 The SuDS Manual
- CIRIA Publication C768 Guidance on the Construction of SuDS

Calculations associated with the drainage have been performed using analysis packages and where appropriate copies of calculations are provided in this report.

EXISTING SITE AND DRAINAGE

Historic Usage

The area of the proposed development has historically been developed and has been the site of the former Mill. The main mill building remains including drainage and Infrastructure with limited maintenance being undertaken on the site in recent years.

Some elements of the mill have been demolished and investigations have taken place as to the remaining below ground services and drainage.

Existing Site Drainage

The site has an existing surface water system which flows to the southern boundary of the site into the River Ehen. The system is to be cleaned and inspected to ensure it is suitable for reuse.

A private foul sewer system is located on the site servicing the properties which discharges to the United Utilities foul drainage system located on the site boundary to the south of the development.

A preliminary drainage strategy has been used as part of the planning application process and this detailed design follows the agreed strategy.

Flood Risk Assessment

A detailed flood risk assessment has been conducted on the overall site and presented as part of planning application reference 4/22/2364/0F1.. The report produced by UNDA indicates that the existing property is in a Flood Zone 2 location.

The zoning associated with the initial flood appraisal considered earlier in this report is based on a generalised flood model and the EA states the following :

The Flood Zones for this requested location are based upon the original 2004 Jflow Data (national generalised modelling). This is available through Data.gov.uk as "Modelled fluvial flood depth data

created 2004". This data is not suitable for identifying whether an individual property will flood, for detailed decision making or for use in site specific Flood Risk or Strategic Flood Risk Assessments. Where this data is used for anything other than broad catchment or Shoreline Management Plan scale further evidence, verification and studies should be undertaken.

The Flood Zone classifications are as follows :

- Flood Zone 1 - land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

- Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.

- Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

In respect to the proposed development, this is classified as Less Vulnerable and as such the flood risk assessment is required to address :

- Surface water management
- Access and evacuation

DETAILED DESIGN

Surface Water Drainage

Principally the surface water drainage has been calculated on the impermeable areas of the existing structure and hardstandings. .

Modelling has been conducted on the following rainfall events:

- 1 in 10 years
- 1 in 30 years
- 1 in 100 years plus 50 % increase due to climate change over a 6 hour period

An assessment of the proposed network has been undertaken to identify the requirements of the property and arrangements for the drainage of surface water. The existing outfall into the River Ehen will be utilised to ensure that runoff from the site does not flood.

The following parameters were adopted in the analysis. These were obtained from UK SUDS based on the site location and data held by HR Wallingford.

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)	0.0
M5-60 (mm)	20.000	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.400	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 %)
10	0	0	0	100	50	0	0
30	0	0	0				

Pre Development Discharges

The following rates and volumes have been calculated associated with the predevelopment discharge.

Pre-development Discharge Rate

Site Makeup	Brownfield	SAAR (mm)	1335	Growth Factor 10 year	1.38	QBar	1.5
Brownfield Method	Greenfield	Soil Index	4	Growth Factor 30 year	1.70	Q 10 year (l/s)	2.1
Greenfield Method	IH124	SPR	0.47	Growth Factor 100 year	2.08	Q 30 year (l/s)	2.6
Positively Drained Area (ha)	0.150	Region	10	Betterment (%)	0	Q 100 year (l/s)	3.2

Pre-development Discharge Volume

Site Makeup	Brownfield	Soil Index	4	Climate Change (%)	0	Runoff Volume (m³)	48
Brownfield Method	Greenfield	SPR	0.47	Storm Duration (mins)	360		
Greenfield Method	FSR/FEH	CWI	125.838	Betterment (%)	0		
Positively Drained Area (ha)	0.150	Return Period (years)	100	PR	0.512		

Results

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	59.350	0.000	0.0	0.0000	0.0000	OK
15 minute winter	2	10	59.107	0.055	5.5	0.0156	0.0000	OK
15 minute winter	3	10	58.845	0.080	11.2	0.0228	0.0000	OK
15 minute summer	4	1	58.875	0.000	0.0	0.0000	0.0000	OK
15 minute winter	5	11	58.736	0.182	17.0	0.0515	0.0000	SURCHARGED
15 minute winter	6	11	58.671	0.184	21.4	0.1591	0.0000	SURCHARGED
15 minute winter	7	11	58.243	0.132	20.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.0700	
15 minute winter	2	1.001	3	5.5	0.947	0.275	0.1137	
15 minute winter	3	1.002	5	11.2	0.828	0.565	0.2297	
15 minute summer	4	2.000	3	0.0	0.000	0.000	0.0421	
15 minute winter	5	1.003	6	15.7	0.951	0.791	0.0950	
15 minute winter	6	1.004	7	20.9	1.215	1.054	0.5110	10.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	59.350	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	10	59.114	0.062	7.0	0.0175	0.0000	OK
15 minute winter	3	11	58.954	0.189	14.4	0.0535	0.0000	SURCHARGED
15 minute winter	4	11	58.951	0.076	1.9	0.0216	0.0000	OK
15 minute winter	5	11	58.871	0.317	19.7	0.0897	0.0000	SURCHARGED
15 minute winter	6	11	58.793	0.306	24.0	0.2650	0.0000	SURCHARGED
15 minute winter	7	11	58.247	0.136	23.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.0819	
15 minute summer	2	1.001	3	7.2	0.978	0.360	0.2240	
15 minute winter	3	1.002	5	13.2	0.836	0.666	0.2971	
15 minute winter	4	2.000	3	-1.9	-0.195	-0.094	0.1164	
15 minute winter	5	1.003	6	17.5	0.992	0.879	0.0950	
15 minute winter	6	1.004	7	23.2	1.317	1.166	0.5168	12.6

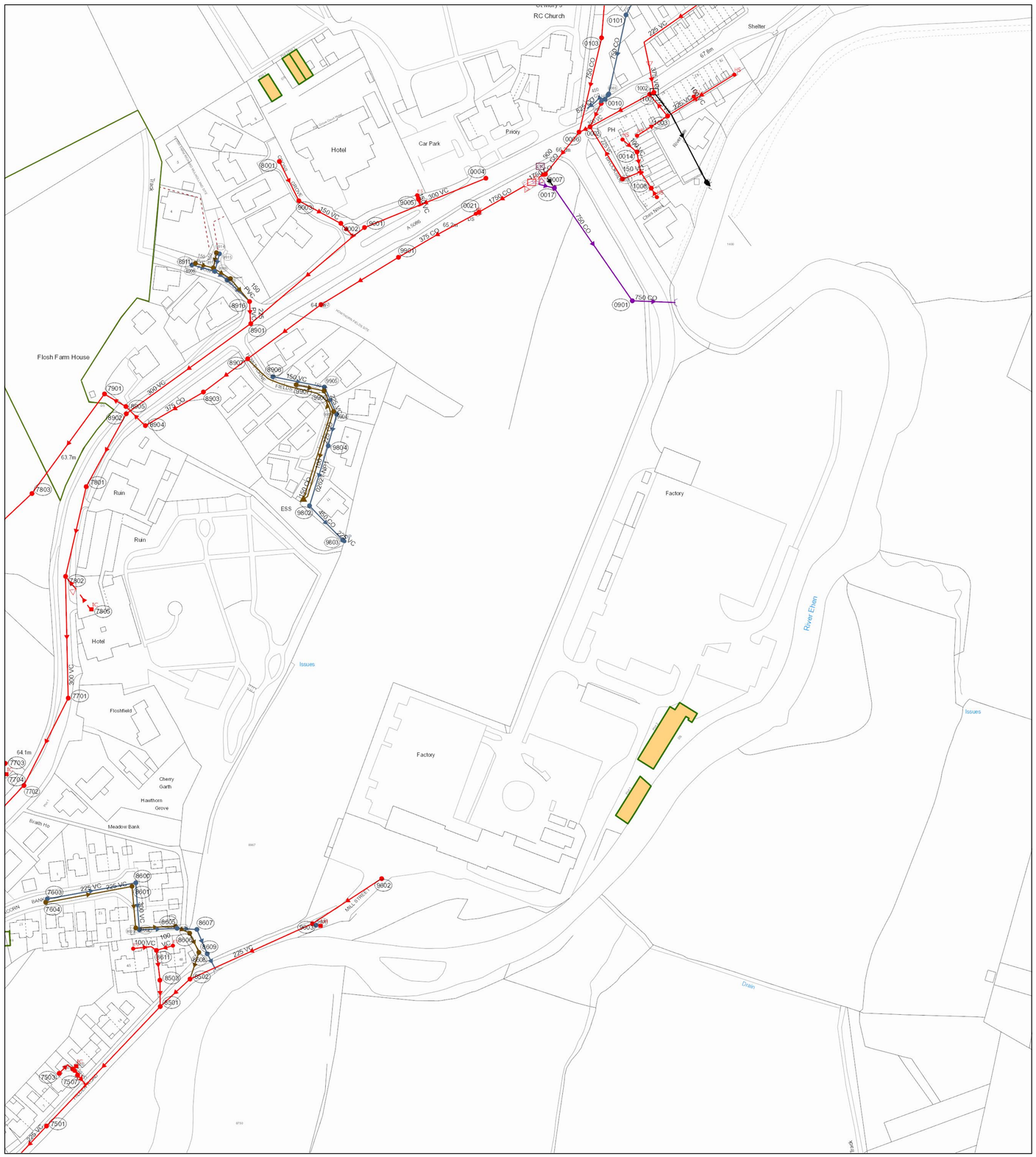
Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	59.842	0.492	8.3	0.1391	0.0000	SURCHARGED
15 minute winter	2	12	59.837	0.785	13.5	0.2220	0.0000	FLOOD RISK
15 minute winter	3	12	59.795	1.030	23.0	0.2914	0.0000	SURCHARGED
15 minute winter	4	12	59.795	0.920	8.9	0.2605	0.0000	FLOOD RISK
15 minute winter	5	12	59.637	1.083	24.5	0.3064	0.0000	SURCHARGED
15 minute winter	6	12	59.475	0.988	35.3	0.8556	0.0000	SURCHARGED
15 minute summer	7	10	58.253	0.142	32.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	-8.3	-0.547	-0.417	0.4197	
15 minute winter	2	1.001	3	10.8	0.978	0.542	0.3474	
15 minute winter	3	1.002	5	17.9	1.019	0.903	0.2971	
15 minute winter	4	2.000	3	-8.9	-0.505	-0.447	0.1543	
15 minute winter	5	1.003	6	25.1	1.428	1.265	0.0950	
15 minute winter	6	1.004	7	34.1	1.937	1.716	0.5240	24.4

APPENDICES

Appendix A - United Utility Records



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.

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
9906		FO	0	150			VC	12.49358	
8602	58.45	FO	57.81	225			VC	22.02382	1 in 200
9002		CO	0	150			VC	9.915614	
8908		SW	0	150			PVC	13.26928	
9804		SW	0	450			CO	34.91094	
9003		CO	0	150			VC	26.35387	
7901	63.51	CO	60.65	375			CO	68.28825	1 in 341
8914		FO	0	150			PVC	8.711358	
9907		FO	0	150			VC	15.79905	
1008		CO	0	150			VC	21.58698	
9602	59.29	CO	58.32	225			VC	45.7736	1 in 269
8912		FO	0	150			PVC	11.2507	
7604	59.37	FO	58.23	225			VC	48.7333	1 in 180
8606	58.27	FO	57.51	225			VC	11.74072	
8609	58.56	FO	57.6	225			VC	15.71337	1 in 786
8903	62.7	CO	60.98	375			CO	37.29629	1 in 414
1003	66.89	CO	64.58	225			VC	15.58465	1 in 92
0003	67.25	SW	66.3	400			CO	3.650055	1 in 30
7506		CO	0	150			VC	4.597703	
8501	58.63	CO	57.42	225			VC	91.54932	1 in 109
1002	66.69	CO	64.39	300			VC	37.57233	1 in 111
7501	57.68	CO	56.56	225			VC	27.54096	1 in 250
0002	66.09	CO	63.31	300			VC	6.726165	1 in 96
0001	66.76	CO	64.78	300			VC	14.42889	1 in 16
7802	63.63	CO	61.4	300			VC	67.49644	1 in 281
7507		CO	0	150			VC	7.075876	
8502	58.57	CO	57.56	225			VC	22.48161	1 in 187
9903		SW	0	225			CO	18.06061	
1001	66.64	CO	64.37	300			VC	2.720386	1 in 68
7702	64.43	CO	60.96	300			VC	69.90163	1 in 280
8605	58.54	SW	57.01	300			VC	10.90289	
7801	63.19	CO	61.54	300			VC	51.24173	1 in 427
7803	63.26	CO	60.43	375			CO	65.81774	1 in 299
8909		SW	0	150			PVC	8.404471	
9905		SW	0	225			VC	16.55733	
8911		FO	0	150			PVC	10.34075	
7703		CO	0	150			VC	53.21195	
0006	66.12	CO	63	900			CO	29.8326	1 in 88
8001		CO	0	150			VC	24.41345	
9005		CO		150			VC	3.747339	
8906		SW	0	150			VC	29.16249	
0103	67.1	CO	64.54	750			CO	53.849	1 in 37
8503		CO		100			VC	14.56423	
9601	59.1	CO	58.13	225			VC	74.59718	1 in 141
8905	63.45	CO	60.71	375			CO	13.91837	1 in 348
8907		CO		375			CO	30.63209	
0021	65.67	CO	61.76	375			CO	49.28566	1 in 205
8600	58.7	SW	57.32	300			VC	26.12666	1 in 114
8608	58.38	SW	56.85	300			VC	9.980045	
0014	65.95	CO	65.28	100			VC	11.18034	
7603	59.36	SW	57.58	225			VC	49.71674	1 in 199
0021	65.67	CO	61.76	375			CO	1.841113	1 in 213
8915		SW	0	150			PVC	9.923841	
8902	63.45	CO	61.77	300			VC	46.00353	1 in 219
9904		FO	0	150			CO	51.93475	
7503		CO		150			VC	10.45405	
8607	58.47	SW	57.12	300			VC	14.68401	1 in 54
0018	65.52	CO	63.92	225			VC	34.08552	1 in 58
7701	64.05	CO	61.14	300			VC	54.19455	1 in 339
0010	67.23	SW	66.06	450			CO	7.467225	
0017	65.6	OV	62.72	750			CO	75.95836	1 in 47
9001	64.73	CO	62.82	300			VC	82.72395	1 in 103
8603	58.44	SW	57.09	300			VC	21.05266	1 in 351
9803		SW		225			VC	1.12388	
0101	67.46	SW	65.91	750			CO	44.8147	1 in 83
0007	66.04	CO	62.09	1750			CO	4.192268	1 in 84
9902	62.92	CO	61.3	375			CO	50.56905	
8910		SW	0	150			PVC	17.16067	
9901	63.64	CO	61.5	375			CO	50.41189	1 in 280
9802		SW	0	450			CO	26.56332	
8913		FO	0	150			PVC	16.42226	
8604	58.55	FO	57.69	225			VC	8.792554	1 in 49
8904	62.91	CO	60.87	375			CO	14.97653	1 in 115
8611		CO		100			VC	16.7821	
8901	64	CO	62	300			VC	85.15518	1 in 406
0004	65.69	CO	62.99	300			VC	72.6037	1 in 484
8916		CO	0	225			PVC	12.34147	
8601	58.75	FO	57.96	225			VC	23.08766	1 in 178
0901	63.81	OV	61.1	750			CO	23.97238	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

LEGEND

Abandoned · Foul · Surface Water · Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

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

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement
BR	Brick
PE	Polyethylene
RP	Reinforced Plastic Matrix
CO	Concrete
CSB	Concrete Segment Bolted
CSU	Concrete Segment Unbolted
CC	Concrete Box Culverted
PSC	Plastic / Steel Composite
GRC	Glass Reinforecd Plastic
DI	Ductile Iron
PVC	Polyvinyl Chloride
CI	Cast Iron
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

CHEZ NOUS BROOKSIDE,
CLEATOR,
CA23 3DU

Scale: 1:1250 **Date:** 24/01/2024

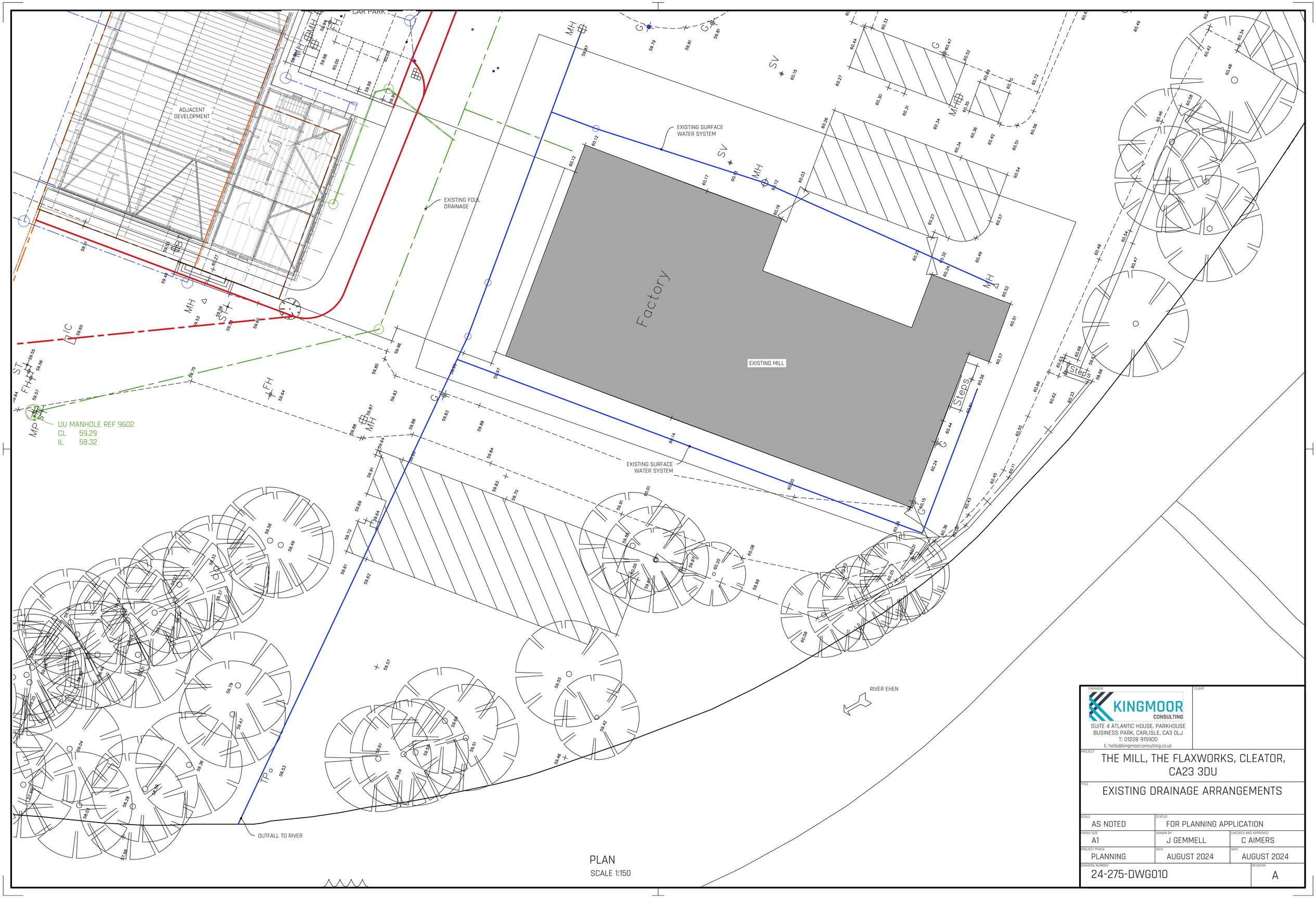
Sheet: 1 of 1

Printed by: Property Searches

SEWER RECORDS

United Utilities
Water for the North West

Appendix B - Drawings



PLAN

SCALE 1:150

ENGINEER

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CLIENT

PROJECT

THE MILL, THE FLAXWORKS, CLEATOR, CA23 3DU

TITLE

EXISTING DRAINAGE ARRANGEMENTS

SCALE	STATUS	
AS NOTED	FOR PLANNING APPLICATION	
PAPER SIZE	DRAWN BY	CHECKED AND APPROVED
A1	J GEMMELL	C AIMERS
PROJECT PHASE	DATE	DATE
PLANNING	AUGUST 2024	AUGUST 2024

DRAWING NUMBER

24-275-DWG010

REVISION

A

Appendix C - Calculations

- Hydraulic Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1		4.00	60.400	600	302057.438	513665.068	1.050
2	0.019	4.00	60.120	600	302035.649	513674.740	1.068
3	0.020	4.00	60.120	600	302016.808	513680.613	1.355
4		4.00	59.925	600	302018.470	513689.216	1.050
5	0.020	4.00	60.070	600	302009.600	513665.355	1.516
6	0.020	4.00	60.000	1050	302007.718	513660.300	1.513
7			59.290	600	302010.568	513630.366	1.179

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	23.839	0.600	59.350	59.052	0.298	80.0	150	4.35	50.0
1.001	2	3	19.735	0.600	59.052	58.805	0.247	80.0	150	4.65	50.0
2.000	4	3	8.762	0.600	58.875	58.765	0.110	80.0	150	4.13	50.0
1.002	3	5	16.875	0.600	58.765	58.554	0.211	80.0	150	4.90	50.0
1.003	5	6	5.394	0.600	58.554	58.487	0.067	80.0	150	4.98	50.0
1.004	6	7	30.069	0.600	58.487	58.111	0.376	80.0	150	5.42	50.0

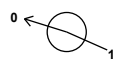
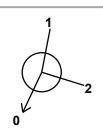
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.125	19.9	0.0	0.900	0.918	0.000	0.0	0	0.000
1.001	1.125	19.9	3.6	0.918	1.165	0.019	0.0	43	0.855
2.000	1.125	19.9	0.0	0.900	1.205	0.000	0.0	0	0.000
1.002	1.125	19.9	7.4	1.205	1.366	0.039	0.0	64	1.045
1.003	1.125	19.9	11.2	1.366	1.363	0.059	0.0	81	1.157
1.004	1.125	19.9	15.0	1.363	1.029	0.079	0.0	98	1.234

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	23.839	80.0	150	Circular	60.400	59.350	0.900	60.120	59.052	0.918
1.001	19.735	80.0	150	Circular	60.120	59.052	0.918	60.120	58.805	1.165
2.000	8.762	80.0	150	Circular	59.925	58.875	0.900	60.120	58.765	1.205
1.002	16.875	80.0	150	Circular	60.120	58.765	1.205	60.070	58.554	1.366
1.003	5.394	80.0	150	Circular	60.070	58.554	1.366	60.000	58.487	1.363
1.004	30.069	80.0	150	Circular	60.000	58.487	1.363	59.290	58.111	1.029

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	600	Manhole	Adoptable
2.000	4	600	Manhole	Adoptable	3	600	Manhole	Adoptable
1.002	3	600	Manhole	Adoptable	5	600	Manhole	Adoptable
1.003	5	600	Manhole	Adoptable	6	1050	Manhole	Adoptable
1.004	6	1050	Manhole	Adoptable	7	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	302057.438	513665.068	60.400	1.050	600				
						0	1.000	59.350	150
2	302035.649	513674.740	60.120	1.068	600	1	1.000	59.052	150
									
						0	1.001	59.052	150
3	302016.808	513680.613	60.120	1.355	600	1	2.000	58.765	150
						2	1.001	58.805	150
									
						0	1.002	58.765	150
4	302018.470	513689.216	59.925	1.050	600				
						0	2.000	58.875	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
5	302009.600	513665.355	60.070	1.516	600		1	1.002	58.554	150
							0	1.003	58.554	150
6	302007.718	513660.300	60.000	1.513	1050		1	1.003	58.487	150
							0	1.004	58.487	150
7	302010.568	513630.366	59.290	1.179	600		1	1.004	58.111	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal	30 year (l/s)	2.6
FSR Region	England and Wales	Skip Steady State	x	100 year (l/s)	3.2
M5-60 (mm)	20.000	Drain Down Time (mins)	240	Check Discharge Volume	✓
Ratio-R	0.400	Additional Storage (m³/ha)	0.0	100 year 360 minute (m³)	48
Summer CV	0.750	Check Discharge Rate(s)	✓		
Winter CV	0.840	10 year (l/s)	2.1		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0	100	50	0	0
30	0	0	0				

Pre-development Discharge Rate

Site Makeup	Brownfield	SAAR (mm)	1335	Growth Factor 10 year	1.38	QBar	1.5
Brownfield Method	Greenfield	Soil Index	4	Growth Factor 30 year	1.70	Q 10 year (l/s)	2.1
Greenfield Method	IH124	SPR	0.47	Growth Factor 100 year	2.08	Q 30 year (l/s)	2.6
Positively Drained Area (ha)	0.150	Region	10	Betterment (%)	0	Q 100 year (l/s)	3.2

Pre-development Discharge Volume

Site Makeup	Brownfield	Soil Index	4	Climate Change (%)	0	Runoff Volume (m³)	48
Brownfield Method	Greenfield	SPR	0.47	Storm Duration (mins)	360		
Greenfield Method	FSR/FEH	CWI	125.838	Betterment (%)	0		
Positively Drained Area (ha)	0.150	Return Period (years)	100	PR	0.512		

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

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year 15 minute summer	211.819	59.937	30 year 60 minute summer	116.589	30.811
10 year 15 minute winter	148.645	59.937	30 year 60 minute winter	77.459	30.811
10 year 30 minute summer	136.831	38.718	30 year 120 minute summer	70.438	18.615
10 year 30 minute winter	96.022	38.718	30 year 120 minute winter	46.797	18.615
10 year 60 minute summer	90.826	24.003	30 year 180 minute summer	53.298	13.715
10 year 60 minute winter	60.342	24.003	30 year 180 minute winter	34.645	13.715
10 year 120 minute summer	54.899	14.508	30 year 240 minute summer	41.604	10.995
10 year 120 minute winter	36.474	14.508	30 year 240 minute winter	27.641	10.995
10 year 180 minute summer	41.666	10.722	30 year 360 minute summer	31.221	8.034
10 year 180 minute winter	27.084	10.722	30 year 360 minute winter	20.295	8.034
10 year 240 minute summer	32.645	8.627	30 year 480 minute summer	24.324	6.428
10 year 240 minute winter	21.689	8.627	30 year 480 minute winter	16.160	6.428
10 year 360 minute summer	24.632	6.339	30 year 600 minute summer	19.756	5.404
10 year 360 minute winter	16.012	6.339	30 year 600 minute winter	13.498	5.404
10 year 480 minute summer	19.260	5.090	30 year 720 minute summer	17.490	4.687
10 year 480 minute winter	12.796	5.090	30 year 720 minute winter	11.754	4.687
10 year 600 minute summer	15.690	4.291	30 year 960 minute summer	14.215	3.743
10 year 600 minute winter	10.720	4.291	30 year 960 minute winter	9.416	3.743
10 year 720 minute summer	13.925	3.732	30 year 1440 minute summer	10.161	2.723
10 year 720 minute winter	9.358	3.732	30 year 1440 minute winter	6.829	2.723
10 year 960 minute summer	11.365	2.993	100 year +50% CC 15 minute summer	523.107	148.021
10 year 960 minute winter	7.528	2.993	100 year +50% CC 15 minute winter	367.093	148.021
10 year 1440 minute summer	8.174	2.191	100 year +50% CC 30 minute summer	343.448	97.184
10 year 1440 minute winter	5.493	2.191	100 year +50% CC 30 minute winter	241.016	97.184
30 year 15 minute summer	268.706	76.035	100 year +50% CC 60 minute summer	229.932	60.764
30 year 15 minute winter	188.566	76.035	100 year +50% CC 60 minute winter	152.761	60.764
30 year 30 minute summer	174.929	49.499	100 year +50% CC 120 minute summer	138.843	36.692
30 year 30 minute winter	122.757	49.499	100 year +50% CC 120 minute winter	92.244	36.692

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +50% CC 180 minute summer	104.709	26.945	100 year +50% CC 600 minute summer	38.147	10.434
100 year +50% CC 180 minute winter	68.064	26.945	100 year +50% CC 600 minute winter	26.064	10.434
100 year +50% CC 240 minute summer	81.404	21.513	100 year +50% CC 720 minute summer	33.678	9.026
100 year +50% CC 240 minute winter	54.083	21.513	100 year +50% CC 720 minute winter	22.634	9.026
100 year +50% CC 360 minute summer	60.725	15.627	100 year +50% CC 960 minute summer	27.249	7.175
100 year +50% CC 360 minute winter	39.473	15.627	100 year +50% CC 960 minute winter	18.050	7.175
100 year +50% CC 480 minute summer	47.121	12.453	100 year +50% CC 1440 minute summer	19.345	5.185
100 year +50% CC 480 minute winter	31.306	12.453	100 year +50% CC 1440 minute winter	13.001	5.185

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	59.350	0.000	0.0	0.0000	0.0000	OK
15 minute winter	2	10	59.107	0.055	5.5	0.0156	0.0000	OK
15 minute winter	3	10	58.845	0.080	11.2	0.0228	0.0000	OK
15 minute summer	4	1	58.875	0.000	0.0	0.0000	0.0000	OK
15 minute winter	5	11	58.736	0.182	17.0	0.0515	0.0000	SURCHARGED
15 minute winter	6	11	58.671	0.184	21.4	0.1591	0.0000	SURCHARGED
15 minute winter	7	11	58.243	0.132	20.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.0700	
15 minute winter	2	1.001	3	5.5	0.947	0.275	0.1137	
15 minute winter	3	1.002	5	11.2	0.828	0.565	0.2297	
15 minute summer	4	2.000	3	0.0	0.000	0.000	0.0421	
15 minute winter	5	1.003	6	15.7	0.951	0.791	0.0950	
15 minute winter	6	1.004	7	20.9	1.215	1.054	0.5110	10.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.36%

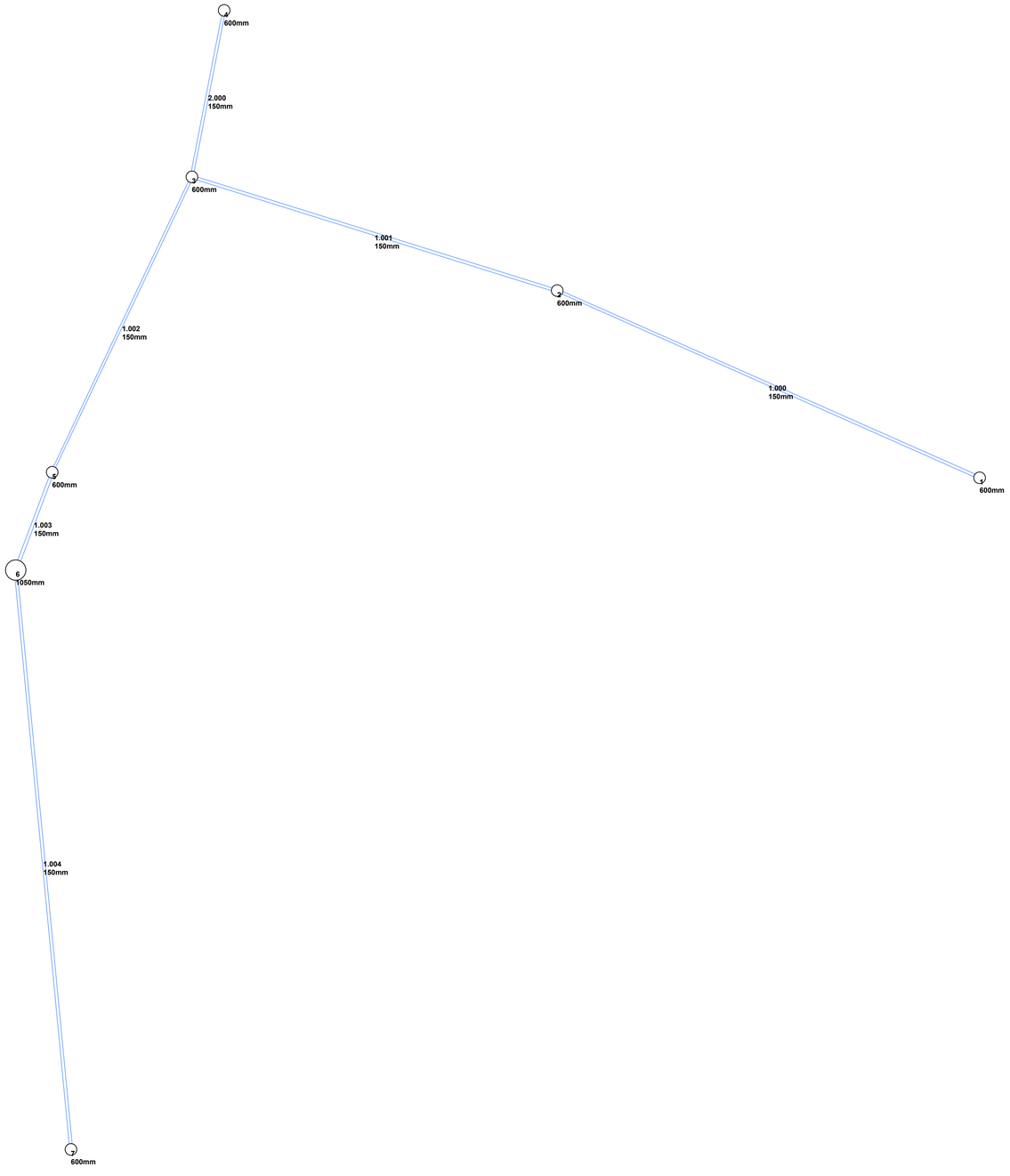
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	59.350	0.000	0.0	0.0000	0.0000	OK
15 minute summer	2	10	59.114	0.062	7.0	0.0175	0.0000	OK
15 minute winter	3	11	58.954	0.189	14.4	0.0535	0.0000	SURCHARGED
15 minute winter	4	11	58.951	0.076	1.9	0.0216	0.0000	OK
15 minute winter	5	11	58.871	0.317	19.7	0.0897	0.0000	SURCHARGED
15 minute winter	6	11	58.793	0.306	24.0	0.2650	0.0000	SURCHARGED
15 minute winter	7	11	58.247	0.136	23.2	0.0000	0.0000	OK

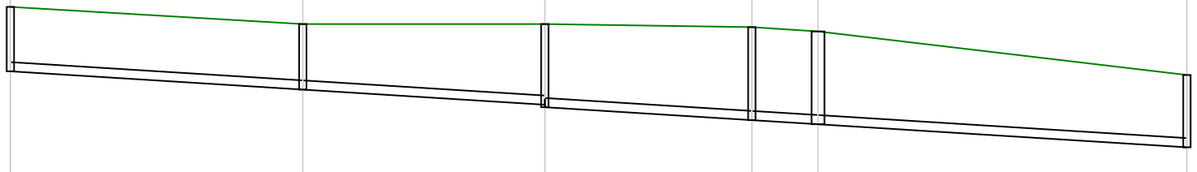
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.0819	
15 minute summer	2	1.001	3	7.2	0.978	0.360	0.2240	
15 minute winter	3	1.002	5	13.2	0.836	0.666	0.2971	
15 minute winter	4	2.000	3	-1.9	-0.195	-0.094	0.1164	
15 minute winter	5	1.003	6	17.5	0.992	0.879	0.0950	
15 minute winter	6	1.004	7	23.2	1.317	1.166	0.5168	12.6

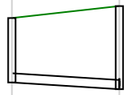
Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	59.842	0.492	8.3	0.1391	0.0000	SURCHARGED
15 minute winter	2	12	59.837	0.785	13.5	0.2220	0.0000	FLOOD RISK
15 minute winter	3	12	59.795	1.030	23.0	0.2914	0.0000	SURCHARGED
15 minute winter	4	12	59.795	0.920	8.9	0.2605	0.0000	FLOOD RISK
15 minute winter	5	12	59.637	1.083	24.5	0.3064	0.0000	SURCHARGED
15 minute winter	6	12	59.475	0.988	35.3	0.8556	0.0000	SURCHARGED
15 minute summer	7	10	58.253	0.142	32.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	-8.3	-0.547	-0.417	0.4197	
15 minute winter	2	1.001	3	10.8	0.978	0.542	0.3474	
15 minute winter	3	1.002	5	17.9	1.019	0.903	0.2971	
15 minute winter	4	2.000	3	-8.9	-0.505	-0.447	0.1543	
15 minute winter	5	1.003	6	25.1	1.428	1.265	0.0950	
15 minute winter	6	1.004	7	34.1	1.937	1.716	0.5240	24.4



Node Name		1		2		3		5		6		7	
A3 drawing Hor Scale 500 Ver Scale 100 Datum (m) 49.000													
Link Name			1.000		1.001		1.002		1.003		1.004		
Section Type			150mm		150mm		150mm		150mm		150mm		
Slope (1:X)			80.0		80.0		80.0		80.0		80.0		
Cover Level (m)		60.400		60.120		60.120		60.070		60.000		59.290	
Invert Level (m)		59.350	59.052	59.052	58.805	58.765	58.554	58.554	58.487	58.487	58.111		
Length (m)			23.839		19.735		16.875		5.394		30.069		

Node Name		4	3
A3 drawing Hor Scale 500 Ver Scale 100 Datum (m) 49.000			
Link Name		2.000	
Section Type		150mm	
Slope (1:X)		80.0	
Cover Level (m)		59.925	60.120
Invert Level (m)		58.875	58.765
Length (m)		8.762	

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