

SDP

**Consulting
Engineers**

21a Bargates
Christchurch
Dorset
BH23 1QD

Job Ref: Ford Road
Arundel

Title: Surface Water Drainage Calculations Report

Job No: E19-003

By: Nigel Jones

Date: April 2020 (Second Issue)

Structural Design Consulting Engineers Ltd Registered No. 2601187 England
Head Office: Suite 3, Salar House, Campfield Road, St Albans, Herts AL1 5HT

Contents Page:

Surface Water Network MicroDrainage Calculations -

Outfall 1 Network –

Scenario 1 - Existing Drainage Ditch full to top of Bank Level
Scenario 2 – Fluvial Flood Conditions i.e. 4.12m AOD

Outfall 2 Network –

Scenario 1 - Existing Drainage Ditch full to top of Bank Level
Scenario 2 – Fluvial Flood Conditions i.e. 4.12m AOD

Outfall 3 Network –

Scenario 1 - Existing Drainage Ditch full to top of Bank Level

Site Drainage Plan

Surface Water Network MicroDrainage Calculations -

Outfall 1 Network

Scenario 1

Existing Drainage Ditch full to top of Bank Level

SDP Consulting Engineers		Page 1
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:12 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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	0.053	4-8	0.019

Total Area Contributing (ha) = 0.072

Total Pipe Volume (m³) = 53.564

SDP Consulting Engineers		Page 2
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:12 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	5.225	2.975	Open Manhole	600	1.000	2.250	300				
2	5.225	2.985	Open Manhole	600	1.001	2.240	300	1.000	2.240	300	
3	3.990	1.940	Open Manhole	600	1.002	1.960	300	1.001	1.960		
4	3.990	1.950	Open Manhole	600	1.003	1.950	300	1.002	1.950	300	
5	3.750	1.850	Open Manhole	600	1.004	1.900	300	1.003	1.900	300	
6	3.700	1.820	Open Manhole	600	1.005	1.880	300	1.004	1.880	300	
7	3.500	1.680	Sealed Manhole	1200	1.006	1.820	150	1.005	1.820	300	
	3.120	1.375	Open Manhole	0		OUTFALL		1.006	1.745	150	

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

SDP Consulting Engineers		Page 3
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:12 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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		1	3.225	2.250	2.675	Open Manhole	600
1.001	→[↓]		2	3.225	2.240	1.734	Open Manhole	500
1.002	o	300	3	3.900	1.960	1.640	Open Manhole	500
1.003	o	300	4	3.900	1.950	1.650	Open Manhole	600
1.004	o	300	5	3.750	1.900	1.550	Open Manhole	600
1.005	o	300	6	3.700	1.880	1.520	Open Manhole	600
1.006	o	150	7	3.500	1.820	1.530	Sealed Manhole	1200

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	1.400	140.0	2	3.225	2.240	2.685	Open Manhole	500
1.001	44.000	157.1	3	3.900	1.960	1.689	Open Manhole	500
1.002	1.000	100.0	4	3.900	1.950	1.650	Open Manhole	600
1.003	1.780	35.6	5	3.750	1.900	1.550	Open Manhole	600
1.004	1.900	95.0	6	3.700	1.880	1.520	Open Manhole	600
1.005	9.500	158.3	7	3.500	1.820	1.380	Sealed Manhole	1200
1.006	10.860	144.8		3.120	1.745	1.225	Open Manhole	0

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.006 3.120 1.745 0.000 0 0

Datum (m) 1.745 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
15	1.255	195	1.255	375	1.255	555	1.255	735	1.255	915	1.255	1095	1.255	1275	1.255
30	1.255	210	1.255	390	1.255	570	1.255	750	1.255	930	1.255	1110	1.255	1290	1.255
45	1.255	225	1.255	405	1.255	585	1.255	765	1.255	945	1.255	1125	1.255	1305	1.255
60	1.255	240	1.255	420	1.255	600	1.255	780	1.255	960	1.255	1140	1.255	1320	1.255
75	1.255	255	1.255	435	1.255	615	1.255	795	1.255	975	1.255	1155	1.255	1335	1.255
90	1.255	270	1.255	450	1.255	630	1.255	810	1.255	990	1.255	1170	1.255	1350	1.255
105	1.255	285	1.255	465	1.255	645	1.255	825	1.255	1005	1.255	1185	1.255	1365	1.255
120	1.255	300	1.255	480	1.255	660	1.255	840	1.255	1020	1.255	1200	1.255	1380	1.255
135	1.255	315	1.255	495	1.255	675	1.255	855	1.255	1035	1.255	1215	1.255	1395	1.255
150	1.255	330	1.255	510	1.255	690	1.255	870	1.255	1050	1.255	1230	1.255	1410	1.255
165	1.255	345	1.255	525	1.255	705	1.255	885	1.255	1065	1.255	1245	1.255	1425	1.255
180	1.255	360	1.255	540	1.255	720	1.255	900	1.255	1080	1.255	1260	1.255	1440	1.255

SDP Consulting Engineers		Page 4
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:12 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 7, DS/PN: 1.006, Volume (m³): 2.5

Unit Reference MD-SHE-0042-1000-1500-1000
Design Head (m) 1.500
Design Flow (l/s) 1.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 42
Invert Level (m) 1.820
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.0	Kick-Flo®	0.378	0.5
Flush-Flo™	0.186	0.7	Mean Flow over Head Range	-	0.7

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)	Depth (m)	Flow (l/s)
0.100	0.6	0.800	0.8	2.000	1.1	4.000	1.6	7.000	2.0
0.200	0.7	1.000	0.8	2.200	1.2	4.500	1.6	7.500	2.1
0.300	0.6	1.200	0.9	2.400	1.2	5.000	1.7	8.000	2.1
0.400	0.6	1.400	1.0	2.600	1.3	5.500	1.8	8.500	2.2
0.500	0.6	1.600	1.0	3.000	1.4	6.000	1.9	9.000	2.3
0.600	0.7	1.800	1.1	3.500	1.5	6.500	1.9	9.500	2.3

SDP Consulting Engineers		Page 5
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:12 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Storage Structures for Storm

Cellular Storage Pipe: 1.001

Manning's N 0.030 Infiltration Coefficient Side (m/hr) 0.00000
 Invert Level (m) 2.240 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	44.0	44.0	1.250	44.0	44.0	1.251	0.0	44.0

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	1	0.841	0.060	0.000	0.901
1.001	2	0.586	51.677	0.000	52.263
1.002	3	0.381	0.032	0.000	0.413
1.003	4	0.551	0.083	0.000	0.635
1.004	5	0.523	0.092	0.000	0.615
1.005	6	0.515	0.608	0.000	1.122
1.006	7	1.900	0.181	0.000	2.081
Total		5.297	52.733	0.000	58.031

SDP Consulting Engineers		Page 6
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:12 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

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

US/MH		Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	1 1440 Winter		100	+40%	100/120 Winter				2.934	0.384
1.001	2 1440 Winter		100	+40%					2.933	-0.558
1.002	3 1440 Winter		100	+40%	100/15 Summer				2.933	0.673
1.003	4 1440 Winter		100	+40%	100/15 Summer				3.159	0.909
1.004	5 1440 Winter		100	+40%	100/15 Summer				3.339	1.139
1.005	6 1440 Winter		100	+40%	100/15 Summer				3.433	1.253
1.006	7 1440 Winter		100	+40%	100/15 Summer				3.500	1.530

Flooded		US/MH	Volume	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level
PN	Name							Exceeded
1.000	1		0.000	0.00		0.2	SURCHARGED	
1.001	2		0.000	0.02		25.1	OK	
1.002	3		0.000	0.77		44.6	SURCHARGED	
1.003	4		0.000	0.67		41.2	SURCHARGED	
1.004	5		0.000	0.66		35.9	SURCHARGED	
1.005	6		0.000	0.46		28.5	SURCHARGED	
1.006	7		0.000	0.07		0.9	FLOOD RISK*	1

Scenario 2

Fluvial Flood Conditions i.e. 4.12m AOD

SDP Consulting Engineers		Page 1
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 11:33 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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	0.053	4-8	0.019

Total Area Contributing (ha) = 0.072

Total Pipe Volume (m³) = 53.564

SDP Consulting Engineers		Page 2
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 11:33 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	5.225	2.975	Open Manhole	600	1.000	2.250	300				
2	5.225	2.985	Open Manhole	600	1.001	2.240	300	1.000	2.240	300	
3	3.990	1.940	Open Manhole	600	1.002	1.960	300	1.001	1.960		
4	3.990	1.950	Open Manhole	600	1.003	1.950	300	1.002	1.950	300	
5	3.750	1.850	Open Manhole	600	1.004	1.900	300	1.003	1.900	300	
6	3.700	1.820	Open Manhole	600	1.005	1.880	300	1.004	1.880	300	
7	3.500	1.680	Sealed Manhole	1200	1.006	1.820	150	1.005	1.820	300	
	3.120	1.375	Open Manhole	0		OUTFALL		1.006	1.745	150	

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

SDP Consulting Engineers		Page 3
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 11:33 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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		1	3.225	2.250	2.675	Open Manhole	600
1.001	→[↓]		2	3.225	2.240	1.734	Open Manhole	500
1.002	o	300	3	3.900	1.960	1.640	Open Manhole	500
1.003	o	300	4	3.900	1.950	1.650	Open Manhole	600
1.004	o	300	5	3.750	1.900	1.550	Open Manhole	600
1.005	o	300	6	3.700	1.880	1.520	Open Manhole	600
1.006	o	150	7	3.500	1.820	1.530	Sealed Manhole	1200

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	1.400	140.0	2	3.225	2.240	2.685	Open Manhole	500
1.001	44.000	157.1	3	3.900	1.960	3.689	Open Manhole	500
1.002	1.000	100.0	4	3.900	1.950	1.650	Open Manhole	600
1.003	1.780	35.6	5	3.750	1.900	1.550	Open Manhole	600
1.004	1.900	95.0	6	3.700	1.880	1.520	Open Manhole	600
1.005	9.500	158.3	7	3.500	1.820	1.380	Sealed Manhole	1200
1.006	10.860	144.8		3.120	1.745	1.225	Open Manhole	0

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

1.006 3.120 1.745 0.000 0 0

Datum (m) 1.745 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
15	2.375	195	2.375	375	2.375	555	2.375	735	2.375	915	2.375	1095	2.375	1275	2.375
30	2.375	210	2.375	390	2.375	570	2.375	750	2.375	930	2.375	1110	2.375	1290	2.375
45	2.375	225	2.375	405	2.375	585	2.375	765	2.375	945	2.375	1125	2.375	1305	2.375
60	2.375	240	2.375	420	2.375	600	2.375	780	2.375	960	2.375	1140	2.375	1320	2.375
75	2.375	255	2.375	435	2.375	615	2.375	795	2.375	975	2.375	1155	2.375	1335	2.375
90	2.375	270	2.375	450	2.375	630	2.375	810	2.375	990	2.375	1170	2.375	1350	2.375
105	2.375	285	2.375	465	2.375	645	2.375	825	2.375	1005	2.375	1185	2.375	1365	2.375
120	2.375	300	2.375	480	2.375	660	2.375	840	2.375	1020	2.375	1200	2.375	1380	2.375
135	2.375	315	2.375	495	2.375	675	2.375	855	2.375	1035	2.375	1215	2.375	1395	2.375
150	2.375	330	2.375	510	2.375	690	2.375	870	2.375	1050	2.375	1230	2.375	1410	2.375
165	2.375	345	2.375	525	2.375	705	2.375	885	2.375	1065	2.375	1245	2.375	1425	2.375
180	2.375	360	2.375	540	2.375	720	2.375	900	2.375	1080	2.375	1260	2.375	1440	2.375

SDP Consulting Engineers		Page 4
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 11:33 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 7, DS/PN: 1.006, Volume (m³): 2.5

Unit Reference MD-SHE-0042-1000-1500-1000
Design Head (m) 1.500
Design Flow (l/s) 1.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 42
Invert Level (m) 1.820
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.0	Kick-Flo®	0.378	0.5
Flush-Flo™	0.186	0.7	Mean Flow over Head Range	-	0.7

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)	Depth (m)	Flow (l/s)
0.100	0.6	0.800	0.8	2.000	1.1	4.000	1.6	7.000	2.0
0.200	0.7	1.000	0.8	2.200	1.2	4.500	1.6	7.500	2.1
0.300	0.6	1.200	0.9	2.400	1.2	5.000	1.7	8.000	2.1
0.400	0.6	1.400	1.0	2.600	1.3	5.500	1.8	8.500	2.2
0.500	0.6	1.600	1.0	3.000	1.4	6.000	1.9	9.000	2.3
0.600	0.7	1.800	1.1	3.500	1.5	6.500	1.9	9.500	2.3

SDP Consulting Engineers		Page 5
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 11:33 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Storage Structures for Storm

Cellular Storage Pipe: 1.001

Manning's N 0.030 Infiltration Coefficient Side (m/hr) 0.00000
 Invert Level (m) 2.240 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	44.0	44.0	1.250	44.0	44.0	1.251	0.0	44.0

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	1	0.841	0.060	0.000	0.901
1.001	2	0.586	51.677	0.000	52.263
1.002	3	0.381	0.032	0.000	0.413
1.003	4	0.551	0.083	0.000	0.635
1.004	5	0.523	0.092	0.000	0.615
1.005	6	0.515	0.608	0.000	1.122
1.006	7	1.900	0.181	0.000	2.081
Total		5.297	52.733	0.000	58.031

SDP Consulting Engineers		Page 6
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 1 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 11:33 File OUTFALL 1 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

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

US/MH		Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	1 1440 Winter		100	+40%	100/120 Winter				3.020	0.470
1.001	2 1440 Winter		100	+40%					3.020	-0.471
1.002	3 1440 Winter		100	+40%	100/15 Summer				3.018	0.758
1.003	4 1440 Winter		100	+40%	100/15 Summer				3.251	1.001
1.004	5 1440 Winter		100	+40%	100/15 Summer				3.439	1.239
1.005	6 1440 Winter		100	+40%	100/15 Summer				3.541	1.361
1.006	7 1440 Winter		100	+40%	100/15 Summer				3.500	1.530

Flooded		US/MH	Volume	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level
PN	Name							Exceeded
1.000	1		0.000	0.00		0.2	SURCHARGED	
1.001	2		0.000	0.02		26.1	OK	
1.002	3		0.000	0.80		46.4	SURCHARGED	
1.003	4		0.000	0.70		42.8	SURCHARGED	
1.004	5		0.000	0.68		36.8	SURCHARGED	
1.005	6		0.000	0.48		29.4	SURCHARGED	
1.006	7		0.000	0.07		1.0	FLOOD RISK*	3

Outfall 2 Network

Scenario 1

Existing Drainage Ditch full to top of Bank Level

SDP Consulting Engineers		Page 1
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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	0.054	4-8	0.012

Total Area Contributing (ha) = 0.066

Total Pipe Volume (m³) = 39.044

SDP Consulting Engineers		Page 2
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	5.375	1.055	Open Manhole	500	1.000	4.320	100				
2	5.375	1.071	Open Manhole	500	1.001	4.304		1.000	4.304	100	
3	5.375	1.081	Open Manhole	500	1.002	4.294	300	1.001	4.294		
4	5.375	1.091	Open Manhole	500	1.003	4.284		1.002	4.284	300	
5	5.375	1.103	Open Manhole	500	1.004	4.272	300	1.003	4.272		
6	5.375	1.118	Open Manhole	500	1.005	4.257		1.004	4.257	300	
7	5.375	1.134	Open Manhole	500	1.006	4.241	150	1.005	4.241		
8	2.650	1.000	Sealed Manhole	500	1.007	1.650	150	1.006	1.650	150	
9	2.500	1.200	Sealed Manhole	1200	1.008	1.300	150	1.007	1.300	150	
	2.000	0.850	Open Manhole	0		OUTFALL		1.008	1.150	150	

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

SDP Consulting Engineers		Page 3
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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		1	5.375	4.320	0.955	Open Manhole	500
1.001	- \ /		2	5.375	4.304	0.570	Open Manhole	500
1.002	o	300	3	5.375	4.294	0.791	Open Manhole	500
1.003	- \ /		4	5.375	4.284	0.590	Open Manhole	500
1.004	o	300	5	5.375	4.272	0.803	Open Manhole	500
1.005	- \ /		6	5.375	4.257	0.617	Open Manhole	500
1.006	o	150	7	5.375	4.241	0.984	Open Manhole	500
1.007	o	150	8	2.650	1.650	0.850	Sealed Manhole	500
1.008	o	150	9	2.500	1.300	1.050	Sealed Manhole	1200

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	1.600	100.0	2	5.375	4.304	0.971	Open Manhole	500
1.001	5.000	500.0	3	5.375	4.294	0.580	Open Manhole	500
1.002	3.200	320.0	4	5.375	4.284	0.791	Open Manhole	500
1.003	6.000	500.0	5	5.375	4.272	0.602	Open Manhole	500
1.004	4.450	296.7	6	5.375	4.257	0.818	Open Manhole	500
1.005	8.000	500.0	7	5.375	4.241	0.693	Open Manhole	500
1.006	6.000	2.3	8	2.650	1.650	0.850	Sealed Manhole	500
1.007	6.800	19.4	9	2.500	1.300	1.050	Sealed Manhole	1200
1.008	12.800	85.3		2.000	1.150	0.700	Open Manhole	0

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
------------------------	-----------------	-----------------	-----------------	------------------------	-------------	-----------

1.008 2.000 1.150 0.000 0 0

Datum (m) 1.150 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
5	1.350	45	1.350	85	1.350	125	1.350	165	1.350	205	1.350	245	1.350
10	1.350	50	1.350	90	1.350	130	1.350	170	1.350	210	1.350	250	1.350
15	1.350	55	1.350	95	1.350	135	1.350	175	1.350	215	1.350	255	1.350
20	1.350	60	1.350	100	1.350	140	1.350	180	1.350	220	1.350	260	1.350
25	1.350	65	1.350	105	1.350	145	1.350	185	1.350	225	1.350	265	1.350
30	1.350	70	1.350	110	1.350	150	1.350	190	1.350	230	1.350	270	1.350
35	1.350	75	1.350	115	1.350	155	1.350	195	1.350	235	1.350	275	1.350
40	1.350	80	1.350	120	1.350	160	1.350	200	1.350	240	1.350	280	1.350

SDP Consulting Engineers										Page 4			
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT					OUTFALL 2 NETWORK FORD ROAD ARUNDEL								
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX					Designed by NJ Checked by								
Innovyze					Network 2019.1								
<u>Surcharged Outfall Details for Storm</u>													
Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
325	1.350	465	1.350	605	1.350	745	1.350	885	1.350	1025	1.350	1165	1.350
330	1.350	470	1.350	610	1.350	750	1.350	890	1.350	1030	1.350	1170	1.350
335	1.350	475	1.350	615	1.350	755	1.350	895	1.350	1035	1.350	1175	1.350
340	1.350	480	1.350	620	1.350	760	1.350	900	1.350	1040	1.350	1180	1.350
345	1.350	485	1.350	625	1.350	765	1.350	905	1.350	1045	1.350	1185	1.350
350	1.350	490	1.350	630	1.350	770	1.350	910	1.350	1050	1.350	1190	1.350
355	1.350	495	1.350	635	1.350	775	1.350	915	1.350	1055	1.350	1195	1.350
360	1.350	500	1.350	640	1.350	780	1.350	920	1.350	1060	1.350	1200	1.350
365	1.350	505	1.350	645	1.350	785	1.350	925	1.350	1065	1.350	1205	1.350
370	1.350	510	1.350	650	1.350	790	1.350	930	1.350	1070	1.350	1210	1.350
375	1.350	515	1.350	655	1.350	795	1.350	935	1.350	1075	1.350	1215	1.350
380	1.350	520	1.350	660	1.350	800	1.350	940	1.350	1080	1.350	1220	1.350
385	1.350	525	1.350	665	1.350	805	1.350	945	1.350	1085	1.350	1225	1.350
390	1.350	530	1.350	670	1.350	810	1.350	950	1.350	1090	1.350	1230	1.350
395	1.350	535	1.350	675	1.350	815	1.350	955	1.350	1095	1.350	1235	1.350
400	1.350	540	1.350	680	1.350	820	1.350	960	1.350	1100	1.350	1240	1.350
405	1.350	545	1.350	685	1.350	825	1.350	965	1.350	1105	1.350	1245	1.350
410	1.350	550	1.350	690	1.350	830	1.350	970	1.350	1110	1.350	1250	1.350
415	1.350	555	1.350	695	1.350	835	1.350	975	1.350	1115	1.350	1255	1.350
420	1.350	560	1.350	700	1.350	840	1.350	980	1.350	1120	1.350	1260	1.350
425	1.350	565	1.350	705	1.350	845	1.350	985	1.350	1125	1.350	1265	1.350
430	1.350	570	1.350	710	1.350	850	1.350	990	1.350	1130	1.350	1270	1.350
435	1.350	575	1.350	715	1.350	855	1.350	995	1.350	1135	1.350	1275	1.350
440	1.350	580	1.350	720	1.350	860	1.350	1000	1.350	1140	1.350	1280	1.350
445	1.350	585	1.350	725	1.350	865	1.350	1005	1.350	1145	1.350	1285	1.350
450	1.350	590	1.350	730	1.350	870	1.350	1010	1.350	1150	1.350	1290	1.350
455	1.350	595	1.350	735	1.350	875	1.350	1015	1.350	1155	1.350	1295	1.350
460	1.350	600	1.350	740	1.350	880	1.350	1020	1.350	1160	1.350	1300	1.350
©1982-2019 Innovyze													

SDP Consulting Engineers		Page 5
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 9, DS/PN: 1.008, Volume (m³): 1.5

Unit Reference MD-SHE-0042-1000-1500-1000
Design Head (m) 1.500
Design Flow (l/s) 1.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 42
Invert Level (m) 1.300
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	1.0	Kick-Flo®	0.378	0.5
Flush-Flo™	0.186	0.7	Mean Flow over Head Range	-	0.7

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)	Depth (m)	Flow (l/s)
0.100	0.6	0.800	0.8	2.000	1.1	4.000	1.6	7.000	2.0
0.200	0.7	1.000	0.8	2.200	1.2	4.500	1.6	7.500	2.1
0.300	0.6	1.200	0.9	2.400	1.2	5.000	1.7	8.000	2.1
0.400	0.6	1.400	1.0	2.600	1.3	5.500	1.8	8.500	2.2
0.500	0.6	1.600	1.0	3.000	1.4	6.000	1.9	9.000	2.3
0.600	0.7	1.800	1.1	3.500	1.5	6.500	1.9	9.500	2.3

SDP Consulting Engineers		Page 6
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Storage Structures for Storm

Tank or Pond Pipe: 1.001

Manning's N 0.030 Invert Level (m) 4.304

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	20.0	0.500	20.0	0.501	0.0

Tank or Pond Pipe: 1.003

Manning's N 0.030 Invert Level (m) 4.284

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	24.0	0.500	24.0	0.501	0.0

Tank or Pond Pipe: 1.005

Manning's N 0.030 Invert Level (m) 4.257

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	32.0	0.500	32.0	0.501	0.0

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	1	0.207	0.009	0.000	0.216
1.001	2	0.210	9.009	0.000	9.219
1.002	3	0.212	0.191	0.000	0.403
1.003	4	0.214	11.011	0.000	11.225
1.004	5	0.217	0.279	0.000	0.496
1.005	6	0.220	15.015	0.000	15.235
1.006	7	0.223	0.097	0.000	0.320
1.007	8	0.196	0.105	0.000	0.301
1.008	9	1.357	0.216	0.000	1.573
Total		3.056	35.932	0.000	38.988

SDP Consulting Engineers		Page 7
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

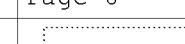
Rainfall Model FSR M5-60 (mm) 19.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
1.000	1	180 Winter	100	+40%	100/15 Summer				4.659	0.239
1.001	2	180 Winter	100	+40%					4.659	-0.146
1.002	3	180 Winter	100	+40%	100/120 Winter				4.659	0.065
1.003	4	180 Winter	100	+40%					4.658	-0.127
1.004	5	180 Winter	100	+40%	100/60 Winter				4.659	0.087
1.005	6	180 Winter	100	+40%					4.658	-0.100
1.006	7	180 Winter	100	+40%	100/15 Summer				4.658	0.267
1.007	8	120 Winter	100	+40%	100/15 Summer				2.650	0.850
1.008	9	120 Winter	100	+40%	100/15 Summer				2.500	1.050

PN	US/MH Name	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level
						Exceeded
1.000	1	0.000	0.00	0.0	SURCHARGED	
1.001	2	0.000	0.00	3.2	OK	
1.002	3	0.000	0.03	1.7	SURCHARGED	
1.003	4	0.000	0.00	4.2	OK	
1.004	5	0.000	0.07	3.1	SURCHARGED	
1.005	6	0.000	0.01	4.9	OK	

SDP Consulting Engineers		Page 8
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:24 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
1.006	7	0.000	0.03	3.4	SURCHARGED		
1.007	8	0.000	0.11	3.9	FLOOD RISK*		24
1.008	9	0.000	0.07	1.2	FLOOD RISK*		24

Scenario 2

Fluvial Flood Conditions i.e. 4.12m AOD

SDP Consulting Engineers		Page 1
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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	0.054	4-8	0.012

Total Area Contributing (ha) = 0.066

Total Pipe Volume (m³) = 39.044

SDP Consulting Engineers		Page 2
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	5.375	1.055	Open Manhole	500	1.000	4.320	100				
2	5.375	1.071	Open Manhole	500	1.001	4.304		1.000	4.304	100	
3	5.375	1.081	Open Manhole	500	1.002	4.294	300	1.001	4.294		
4	5.375	1.091	Open Manhole	500	1.003	4.284		1.002	4.284	300	
5	5.375	1.103	Open Manhole	500	1.004	4.272	300	1.003	4.272		
6	5.375	1.118	Open Manhole	500	1.005	4.257		1.004	4.257	300	
7	5.375	1.134	Open Manhole	500	1.006	4.241	150	1.005	4.241		
8	2.650	1.000	Sealed Manhole	500	1.007	1.650	150	1.006	1.650	150	
9	2.500	1.200	Sealed Manhole	1200	1.008	1.300	150	1.007	1.300	150	
	2.000	0.850	Open Manhole	0		OUTFALL		1.008	1.150	150	

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

SDP Consulting Engineers		Page 3
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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		1	5.375	4.320	0.955	Open Manhole	500
1.001	- \ /		2	5.375	4.304	0.570	Open Manhole	500
1.002	o	300	3	5.375	4.294	0.791	Open Manhole	500
1.003	- \ /		4	5.375	4.284	0.590	Open Manhole	500
1.004	o	300	5	5.375	4.272	0.602	Open Manhole	500
1.005	- \ /		6	5.375	4.257	0.617	Open Manhole	500
1.006	o	150	7	5.375	4.241	0.984	Open Manhole	500
1.007	o	150	8	2.650	1.650	0.850	Sealed Manhole	500
1.008	o	150	9	2.500	1.300	1.050	Sealed Manhole	1200

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	1.600	100.0	2	5.375	4.304	0.971	Open Manhole	500
1.001	5.000	500.0	3	5.375	4.294	0.580	Open Manhole	500
1.002	3.200	320.0	4	5.375	4.284	0.791	Open Manhole	500
1.003	6.000	500.0	5	5.375	4.272	0.602	Open Manhole	500
1.004	4.450	296.7	6	5.375	4.257	0.818	Open Manhole	500
1.005	8.000	500.0	7	5.375	4.241	0.693	Open Manhole	500
1.006	6.000	2.3	8	2.650	1.650	0.850	Sealed Manhole	500
1.007	6.800	19.4	9	2.500	1.300	1.050	Sealed Manhole	1200
1.008	12.800	85.3		2.000	1.150	0.700	Open Manhole	0

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.008 2.000 1.150 0.000 0 0

Datum (m) 1.150 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
5	2.970	45	2.970	85	2.970	125	2.970	165	2.970	205	2.970	245	2.970
10	2.970	50	2.970	90	2.970	130	2.970	170	2.970	210	2.970	250	2.970
15	2.970	55	2.970	95	2.970	135	2.970	175	2.970	215	2.970	255	2.970
20	2.970	60	2.970	100	2.970	140	2.970	180	2.970	220	2.970	260	2.970
25	2.970	65	2.970	105	2.970	145	2.970	185	2.970	225	2.970	265	2.970
30	2.970	70	2.970	110	2.970	150	2.970	190	2.970	230	2.970	270	2.970
35	2.970	75	2.970	115	2.970	155	2.970	195	2.970	235	2.970	275	2.970
40	2.970	80	2.970	120	2.970	160	2.970	200	2.970	240	2.970	280	2.970

SDP Consulting Engineers		Page 4
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
325	2.970	465	2.970	605	2.970	745	2.970	885	2.970	1025	2.970	1165	2.970	1305	2.970
330	2.970	470	2.970	610	2.970	750	2.970	890	2.970	1030	2.970	1170	2.970	1310	2.970
335	2.970	475	2.970	615	2.970	755	2.970	895	2.970	1035	2.970	1175	2.970	1315	2.970
340	2.970	480	2.970	620	2.970	760	2.970	900	2.970	1040	2.970	1180	2.970	1320	2.970
345	2.970	485	2.970	625	2.970	765	2.970	905	2.970	1045	2.970	1185	2.970	1325	2.970
350	2.970	490	2.970	630	2.970	770	2.970	910	2.970	1050	2.970	1190	2.970	1330	2.970
355	2.970	495	2.970	635	2.970	775	2.970	915	2.970	1055	2.970	1195	2.970	1335	2.970
360	2.970	500	2.970	640	2.970	780	2.970	920	2.970	1060	2.970	1200	2.970	1340	2.970
365	2.970	505	2.970	645	2.970	785	2.970	925	2.970	1065	2.970	1205	2.970	1345	2.970
370	2.970	510	2.970	650	2.970	790	2.970	930	2.970	1070	2.970	1210	2.970	1350	2.970
375	2.970	515	2.970	655	2.970	795	2.970	935	2.970	1075	2.970	1215	2.970	1355	2.970
380	2.970	520	2.970	660	2.970	800	2.970	940	2.970	1080	2.970	1220	2.970	1360	2.970
385	2.970	525	2.970	665	2.970	805	2.970	945	2.970	1085	2.970	1225	2.970	1365	2.970
390	2.970	530	2.970	670	2.970	810	2.970	950	2.970	1090	2.970	1230	2.970	1370	2.970
395	2.970	535	2.970	675	2.970	815	2.970	955	2.970	1095	2.970	1235	2.970	1375	2.970
400	2.970	540	2.970	680	2.970	820	2.970	960	2.970	1100	2.970	1240	2.970	1380	2.970
405	2.970	545	2.970	685	2.970	825	2.970	965	2.970	1105	2.970	1245	2.970	1385	2.970
410	2.970	550	2.970	690	2.970	830	2.970	970	2.970	1110	2.970	1250	2.970	1390	2.970
415	2.970	555	2.970	695	2.970	835	2.970	975	2.970	1115	2.970	1255	2.970	1395	2.970
420	2.970	560	2.970	700	2.970	840	2.970	980	2.970	1120	2.970	1260	2.970	1400	2.970
425	2.970	565	2.970	705	2.970	845	2.970	985	2.970	1125	2.970	1265	2.970	1405	2.970
430	2.970	570	2.970	710	2.970	850	2.970	990	2.970	1130	2.970	1270	2.970	1410	2.970
435	2.970	575	2.970	715	2.970	855	2.970	995	2.970	1135	2.970	1275	2.970	1415	2.970
440	2.970	580	2.970	720	2.970	860	2.970	1000	2.970	1140	2.970	1280	2.970	1420	2.970
445	2.970	585	2.970	725	2.970	865	2.970	1005	2.970	1145	2.970	1285	2.970	1425	2.970
450	2.970	590	2.970	730	2.970	870	2.970	1010	2.970	1150	2.970	1290	2.970	1430	2.970
455	2.970	595	2.970	735	2.970	875	2.970	1015	2.970	1155	2.970	1295	2.970	1435	2.970
460	2.970	600	2.970	740	2.970	880	2.970	1020	2.970	1160	2.970	1300	2.970	1440	2.970

SDP Consulting Engineers		Page 5
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 9, DS/PN: 1.008, Volume (m³): 1.5

Unit Reference MD-SHE-0047-1000-1000-1000
Design Head (m) 1.000
Design Flow (l/s) 1.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 47
Invert Level (m) 1.300
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

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)	Depth (m)	Flow (l/s)
0.100	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

SDP Consulting Engineers		Page 6
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Storage Structures for Storm

Tank or Pond Pipe: 1.001

Manning's N 0.030 Invert Level (m) 4.304

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	20.0	0.500	20.0	0.501	0.0

Tank or Pond Pipe: 1.003

Manning's N 0.030 Invert Level (m) 4.284

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	24.0	0.500	24.0	0.501	0.0

Tank or Pond Pipe: 1.005

Manning's N 0.030 Invert Level (m) 4.257

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	32.0	0.500	32.0	0.501	0.0

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	1	0.207	0.009	0.000	0.216
1.001	2	0.210	9.009	0.000	9.219
1.002	3	0.212	0.191	0.000	0.403
1.003	4	0.214	11.011	0.000	11.225
1.004	5	0.217	0.279	0.000	0.496
1.005	6	0.220	15.015	0.000	15.235
1.006	7	0.223	0.097	0.000	0.320
1.007	8	0.196	0.105	0.000	0.301
1.008	9	1.357	0.216	0.000	1.573
Total		3.056	35.932	0.000	38.988

SDP Consulting Engineers		Page 7
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

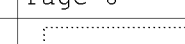
Rainfall Model FSR M5-60 (mm) 19.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

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

US/MH		Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	1 360 Winter		100	+40%	100/15 Summer				4.718	0.298
1.001	2 360 Winter		100	+40%					4.718	-0.087
1.002	3 360 Winter		100	+40%	100/60 Winter				4.718	0.124
1.003	4 360 Winter		100	+40%					4.718	-0.067
1.004	5 360 Winter		100	+40%	100/60 Winter				4.718	0.146
1.005	6 360 Winter		100	+40%					4.718	-0.040
1.006	7 360 Winter		100	+40%	100/15 Summer				4.718	0.327
1.007	8 120 Winter		100	+40%	100/15 Summer				2.650	0.850
1.008	9 120 Winter		100	+40%	100/15 Summer				2.500	1.050

Flooded		Pipe		Level Exceeded
US/MH PN	Name	Volume (m³)	Flow / Overflow Cap. (l/s)	
1.000	1	0.000	0.00	SURCHARGED
1.001	2	0.000	0.00	OK
1.002	3	0.000	0.02	SURCHARGED
1.003	4	0.000	0.00	OK
1.004	5	0.000	0.03	SURCHARGED
1.005	6	0.000	0.00	OK

SDP Consulting Engineers		Page 8
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 2 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 14:15 File OUTFALL 2 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
1.006	7	0.000	0.01	1.2	SURCHARGED		
1.007	8	0.000	0.10	3.3	FLOOD RISK*		24
1.008	9	0.000	0.05	0.8	FLOOD RISK*		24

Outfall 3 Network

Scenario 1

Existing Drainage Ditch full to top of Bank Level

SDP Consulting Engineers		Page 1
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 3 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 12:19 File OUTFALL 3 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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	0.098	4-8	0.036

Total Area Contributing (ha) = 0.134

Total Pipe Volume (m³) = 75.190

SDP Consulting Engineers		Page 2
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 3 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 12:19 File OUTFALL 3 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	2.800	0.900	Open Manhole	500	1.000	1.800	225				
2	2.800	0.915	Open Manhole	500	1.001	1.885	225	1.000	1.885	225	
3	2.800	0.960	Open Manhole	500	1.002	1.840	225	1.001	1.840	225	
4	2.800	1.000	Open Manhole	500	1.003	1.800	225	1.002	1.800	225	
5	2.700	1.100	Open Manhole	500	1.004	1.600	225	1.003	1.600	225	
6	2.500	1.200	Open Manhole	1200	1.005	1.300	225	1.004	1.300	225	
	2.020	0.870	Open Manhole	0		OUTFALL		1.005	1.150	225	

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

SDP Consulting Engineers		Page 3
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 3 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 12:19 File OUTFALL 3 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	o		1	2.800	1.800	0.675	Open Manhole	500
1.001	→[↓]		2	2.800	1.885	0.464	Open Manhole	500
1.002	o	225	3	2.800	1.840	0.735	Open Manhole	500
1.003	o	225	4	2.800	1.800	0.775	Open Manhole	500
1.004	o	225	5	2.700	1.600	0.875	Open Manhole	500
1.005	o	225	6	2.500	1.300	0.975	Open Manhole	1200

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	1.200	80.0	2	2.800	1.885	0.690	Open Manhole	500
1.001	22.000	488.9	3	2.800	1.840	0.509	Open Manhole	500
1.002	1.000	25.0	4	2.800	1.800	0.775	Open Manhole	500
1.003	9.600	48.0	5	2.700	1.600	0.875	Open Manhole	500
1.004	15.000	50.0	6	2.500	1.300	0.975	Open Manhole	1200
1.005	12.900	86.0		2.020	1.150	0.645	Open Manhole	0

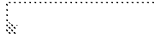
Surcharged Outfall Details for Storm

Outfall	Outfall	C. Level	I. Level	Min	D,L	W
Pipe Number	Name	(m)	(m)	I. Level	(mm)	(mm)
				(m)		

1.005 2.020 1.150 0.000 0 0

Datum (m) 1.150 Offset (mins) 0

Time	Depth	Time	Depth	Time	Depth	Time	Depth	Time	Depth	Time	Depth	Time	Depth
(mins)	(m)	(mins)	(m)	(mins)	(m)	(mins)	(m)	(mins)	(m)	(mins)	(m)	(mins)	(m)
5	0.850	75	0.850	145	0.850	215	0.850	285	0.850	355	0.850	425	0.850
10	0.850	80	0.850	150	0.850	220	0.850	290	0.850	360	0.850	430	0.850
15	0.850	85	0.850	155	0.850	225	0.850	295	0.850	365	0.850	435	0.850
20	0.850	90	0.850	160	0.850	230	0.850	300	0.850	370	0.850	440	0.850
25	0.850	95	0.850	165	0.850	235	0.850	305	0.850	375	0.850	445	0.850
30	0.850	100	0.850	170	0.850	240	0.850	310	0.850	380	0.850	450	0.850
35	0.850	105	0.850	175	0.850	245	0.850	315	0.850	385	0.850	455	0.850
40	0.850	110	0.850	180	0.850	250	0.850	320	0.850	390	0.850	460	0.850
45	0.850	115	0.850	185	0.850	255	0.850	325	0.850	395	0.850	465	0.850
50	0.850	120	0.850	190	0.850	260	0.850	330	0.850	400	0.850	470	0.850
55	0.850	125	0.850	195	0.850	265	0.850	335	0.850	405	0.850	475	0.850
60	0.850	130	0.850	200	0.850	270	0.850	340	0.850	410	0.850	480	0.850
65	0.850	135	0.850	205	0.850	275	0.850	345	0.850	415	0.850	485	0.850
70	0.850	140	0.850	210	0.850	280	0.850	350	0.850	420	0.850	490	0.850

SDP Consulting Engineers		Page 4
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 3 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 12:19 File OUTFALL 3 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Surcharged Outfall Details for Storm

SDP Consulting Engineers		Page 5
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 3 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 12:19 File OUTFALL 3 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 6, DS/PN: 1.005, Volume (m³): 1.9

Unit Reference MD-SHE-0067-2000-1000-2000
Design Head (m) 1.000
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 67
Invert Level (m) 1.300
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	Mean Flow over Head Range	-	1.7

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)	Depth (m)	Flow (l/s)
0.100	1.6	0.800	1.8	2.000	2.7	4.000	3.8	7.000	4.9
0.200	1.9	1.000	2.0	2.200	2.9	4.500	4.0	7.500	5.1
0.300	1.9	1.200	2.2	2.400	3.0	5.000	4.2	8.000	5.2
0.400	1.9	1.400	2.3	2.600	3.1	5.500	4.4	8.500	5.4
0.500	1.8	1.600	2.5	3.000	3.3	6.000	4.6	9.000	5.5
0.600	1.6	1.800	2.6	3.500	3.5	6.500	4.7	9.500	5.7

SDP Consulting Engineers		Page 6
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 3 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 12:19 File OUTFALL 3 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

Storage Structures for Storm

Cellular Storage Pipe: 1.001

Manning's N 0.030 Infiltration Coefficient Side (m/hr) 0.00000
 Invert Level (m) 1.885 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	172.0	172.0	0.450	172.0	172.0	0.451	0.0	172.0

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	1	0.177	0.028	0.000	0.205
1.001	2	0.180	71.939	0.000	72.118
1.002	3	0.188	0.020	0.000	0.208
1.003	4	0.196	0.362	0.000	0.558
1.004	5	0.216	0.563	0.000	0.779
1.005	6	1.357	0.489	0.000	1.846
Total		2.314	73.400	0.000	75.714

SDP Consulting Engineers		Page 7
Suite 3, Salar House 61 Campfield Road St Albans AL1 5HT	OUTFALL 3 NETWORK FORD ROAD ARUNDEL	
Date 24/04/2020 12:19 File OUTFALL 3 NETWORK.MDX	Designed by NJ Checked by	
Innovyze	Network 2019.1	

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

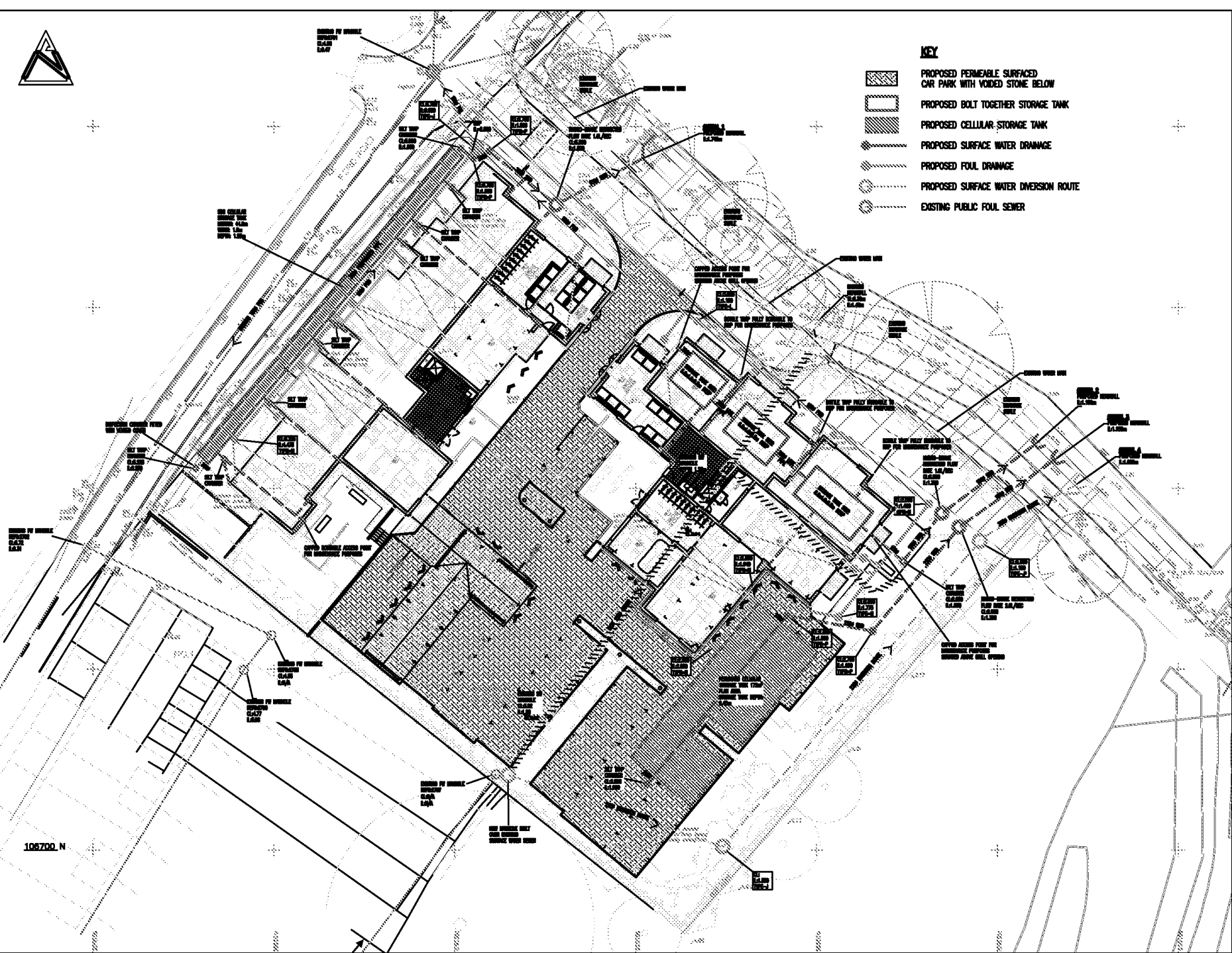
Margin for Flood Risk Warning (mm) 150.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
									(m)	(m)
1.000	1	720 Winter	100	+40%	100/360 Winter				2.147	0.022
1.001	2	720 Winter	100	+40%					2.147	-0.189
1.002	3	720 Winter	100	+40%	100/120 Summer				2.147	0.082
1.003	4	720 Winter	100	+40%	100/60 Summer				2.160	0.135
1.004	5	720 Winter	100	+40%	100/15 Summer				2.176	0.351
1.005	6	720 Winter	100	+40%	100/15 Summer				2.182	0.657

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m ³)	Flow / Cap. (l/s)	Flow (l/s)	Overflow (l/s)		
1.000	1	0.000	0.00	0.0		SURCHARGED	
1.001	2	0.000	0.00	6.4		OK	
1.002	3	0.000	0.10	3.1		SURCHARGED	
1.003	4	0.000	0.05	2.9		SURCHARGED	
1.004	5	0.000	0.04	2.7		SURCHARGED	
1.005	6	0.000	0.03	1.7		SURCHARGED	

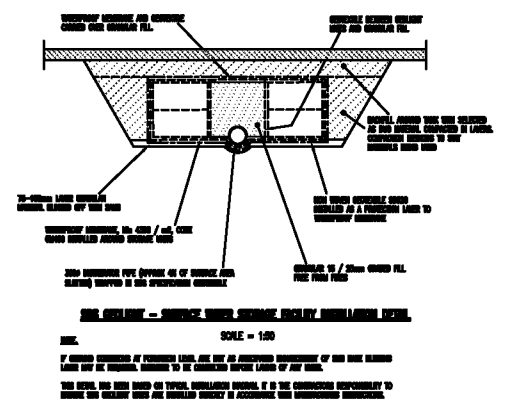
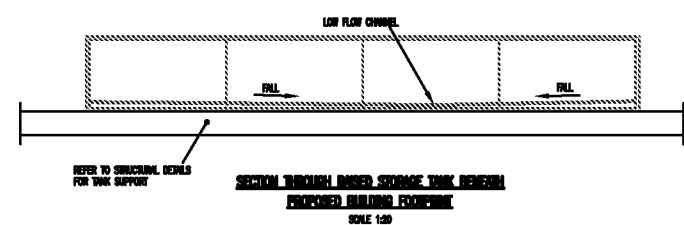
Site Drainage Plan



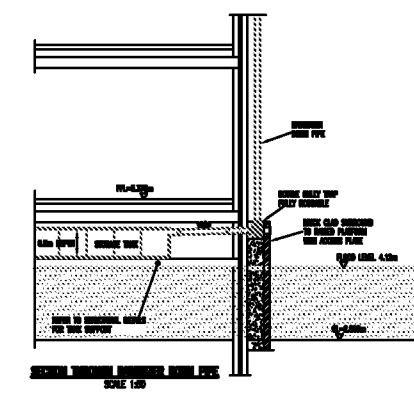
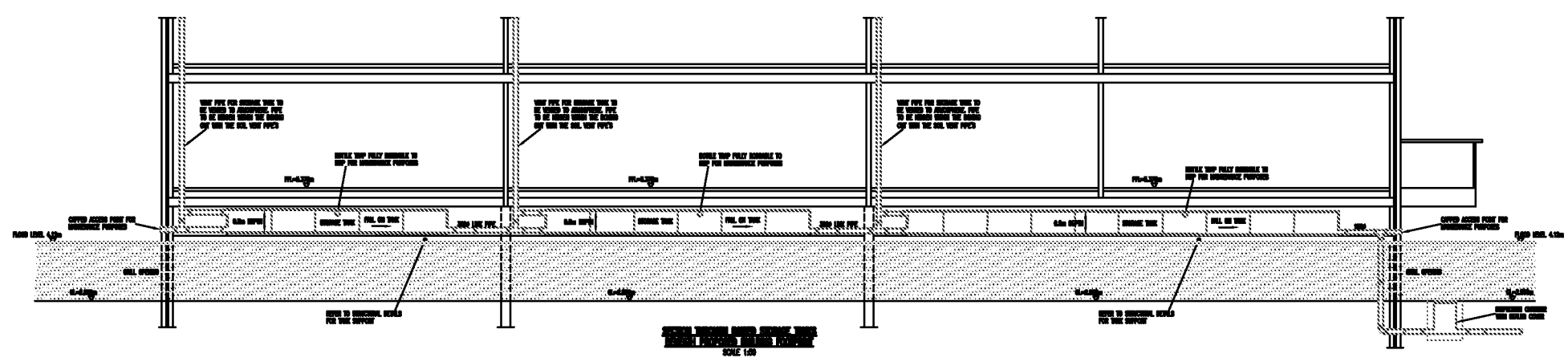
- KEY**
- PROPOSED PERMEABLE SURFACED CAR PARK WITH VOIDED STONE BELOW
 - PROPOSED BOLT TOGETHER STORAGE TANK
 - PROPOSED CELLULAR STORAGE TANK
 - PROPOSED SURFACE WATER DRAINAGE
 - PROPOSED FOUL DRAINAGE
 - PROPOSED SURFACE WATER DIVERSION ROUTE
 - EXISTING PUBLIC FOUL SEWER

ALL PROPOSED INSPECTION CHAMBERS & MANHOLES THAT HAVE A COVER LEVEL LOWER THAN THAT OF THE FLOOD LEVEL OF 4.12m TO BE FITTED WITH A SEALED COVER.

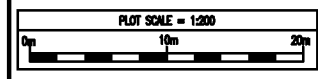
AN ADDITIONAL STORAGE VOLUME OF 184m³ IS PROVIDED WITHIN THE PERMEABLE PAVING SUB-BASE STORAGE STONE (30% VOID RATIO) BASED ON A DEPTH OF 400mm. THIS WILL HELP COMPENSATE FOR THE FLUMM FLOOD WATER



SITE DRAINAGE PLAN
SCALE 1:200



1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT DOCUMENTS. ANY DISCREPANCIES FOUND BETWEEN INFORMATION SHOWN ON THIS OR ANY OTHER DRAWING SHALL BE REFERRED TO THE DESIGNER IMMEDIATELY AND PRIOR TO ANY WORK COMMENCING ON SITE.



B	APR 20	DRAINAGE PROPOSAL, REVISION 2 TO SUB COMMENTS RECEIVED BY CIVIL, DATED 22/04/20	NU
A	APR 20	DRAINAGE PROPOSAL, REVISION 1 TO SUB COMMENTS RECEIVED BY CIVIL, DATED 22/04/20	NU

PLANNING

OAKFORD HOMES

FORD ROAD, ARUNDEL

Strategy Site Drainage Plan & Drainage Construction Details

SDP
CONSULTING
ENGINEERS

1000	NU	Feb 20
1000	100	
1000	E10-005-1000	B