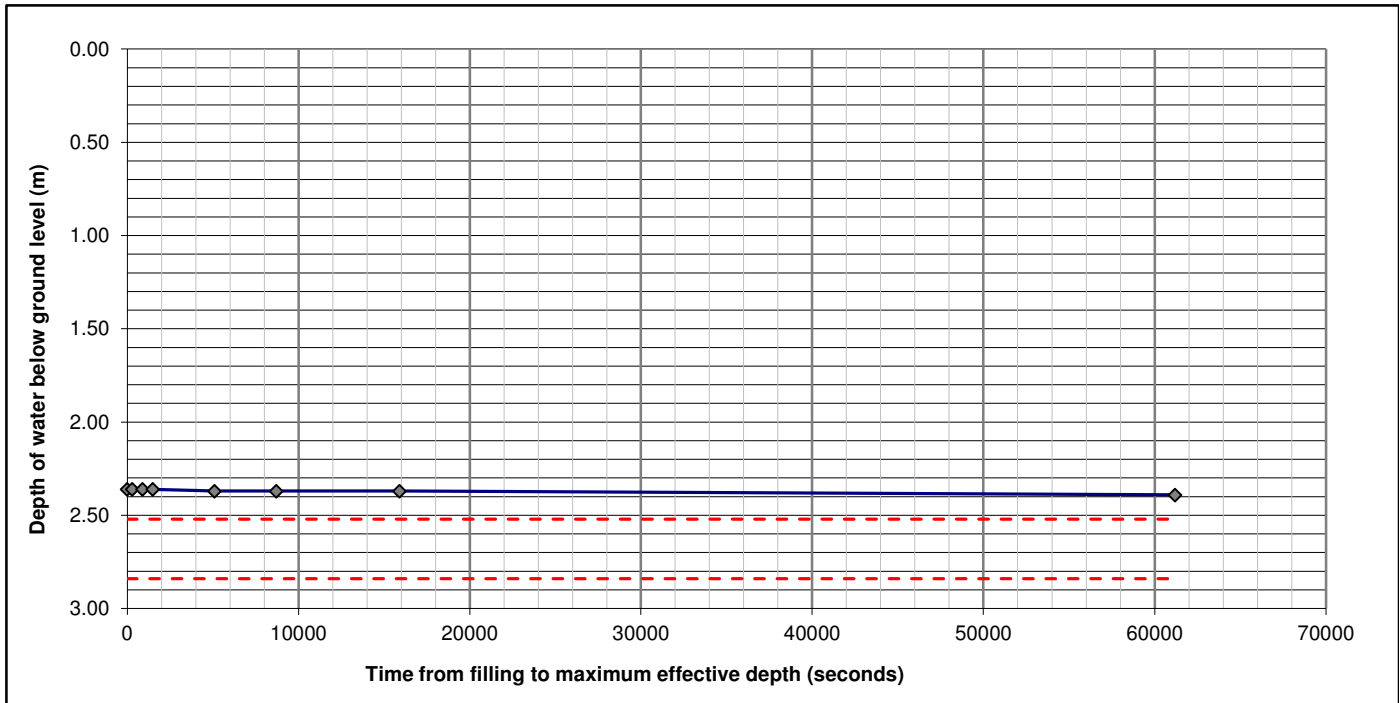


Appendix B Infiltration Testing Results



DATE:	12/07/2022
PROJECT No:	B040401
PROJECT NAME:	Church Stoke
CLIENT:	Severn Trent
TRIAL PIT ID:	TP02
TEST NUMBER:	1

SOAKAWAY TEST - SOIL INFILTRATION RATE/PERMEABILITY CALCULATION




Time Elapsed (s)	Time Elapsed (mins)	Distance to water surface from ground level (m)
	0.00	2.360
300	5.00	2.360
900	15.00	2.360
1500	25.00	2.360
5100	85.00	2.370
8700	145.00	2.370
15900	265.00	2.370
61200	1020.00	2.390

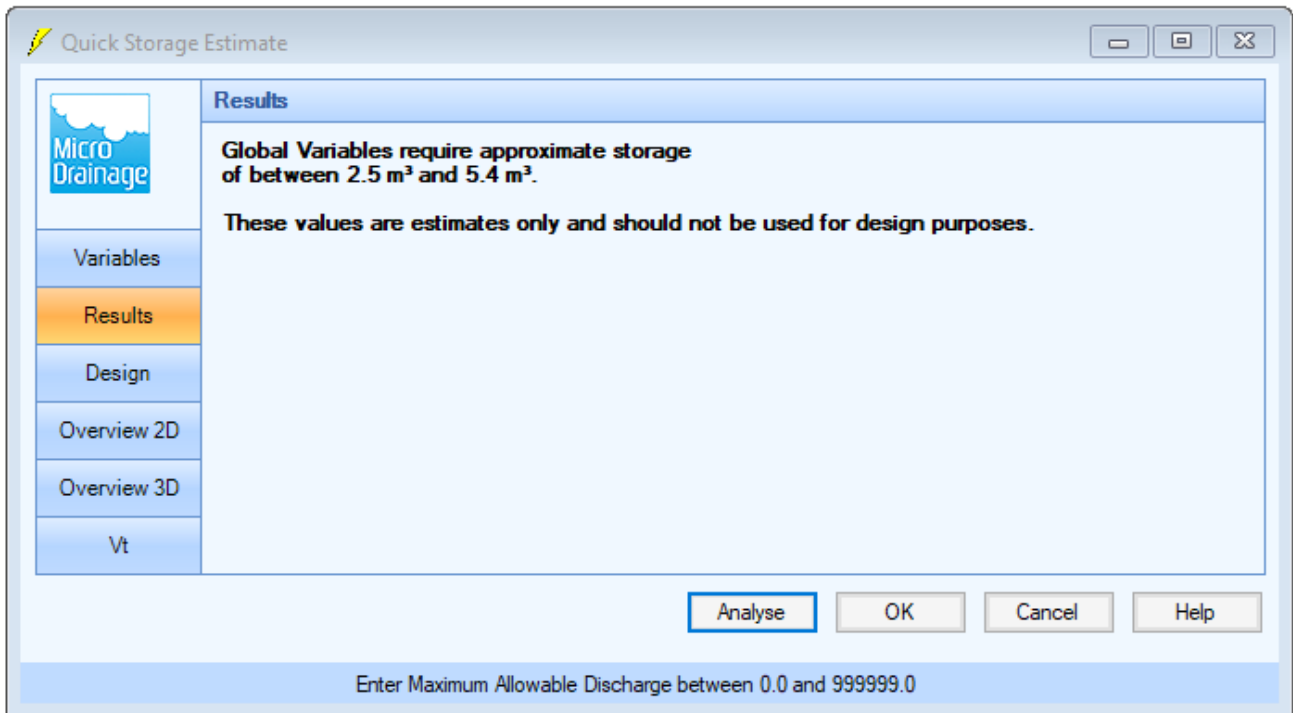
PIT LENGTH (m):	3.60	Pit construction	
PIT WIDTH (m):	0.60	Open - no gravel backfill. Water level monitored by manual dips. Excavator.	
PIT DEPTH (m):	3.00		
INPUT PARAMETERS:			
Total volume of pit	(m ³)	1.38	
Pit volume between 75% and 25% depths = L x W x 1/2D	(m ³)	0.69	
Effective depth of Pit	(m)	0.64	
Proportion of pit volume occupied by gravel solids	(0-1)	0.00	
Maximum potential volume of Water	(m ³)	1.38	
Level of water in pit at 75% effective depth (p ₇₅)	(m)	0.16	
Level of water in pit at 25% effective depth (p ₂₅)	(m)	0.48	
Effective volume between 75% & 25% depth V _{p75-25} = V x P _g	(m ³)	0.69	
Surface area of pit up to 50% effective depth (A _{p50})	(m ²)	4.85	
Time at 75% effective depth (p ₇₅)	(s)	#N/A	
Time at 25% effective depth (p ₂₅)	(s)	#N/A	
Time for outflow for 75% and 25% effective depth (T _{p75-25})	(s)	#N/A	
OUTPUT:			
SOIL INFILTRATION RATE (f)	V _{p75-25}	(m/s)	#N/A
	A _{p50} x T _{p75-25}		
WATER INPUT:	300 L	2 mins	
GEOLOGY OF TEST SECTION:			
Dark brown sandy clayey GRAVEL with patches of grey sandy gravelly clay. Sand is fine to medium, gravel is fine to medium, angular to subrounded sandstone and mudstone. Becomes more clayey with			
Compiled by:		JM	
Checked by:		NEB	

Appendix C MicroDrainage Calculations

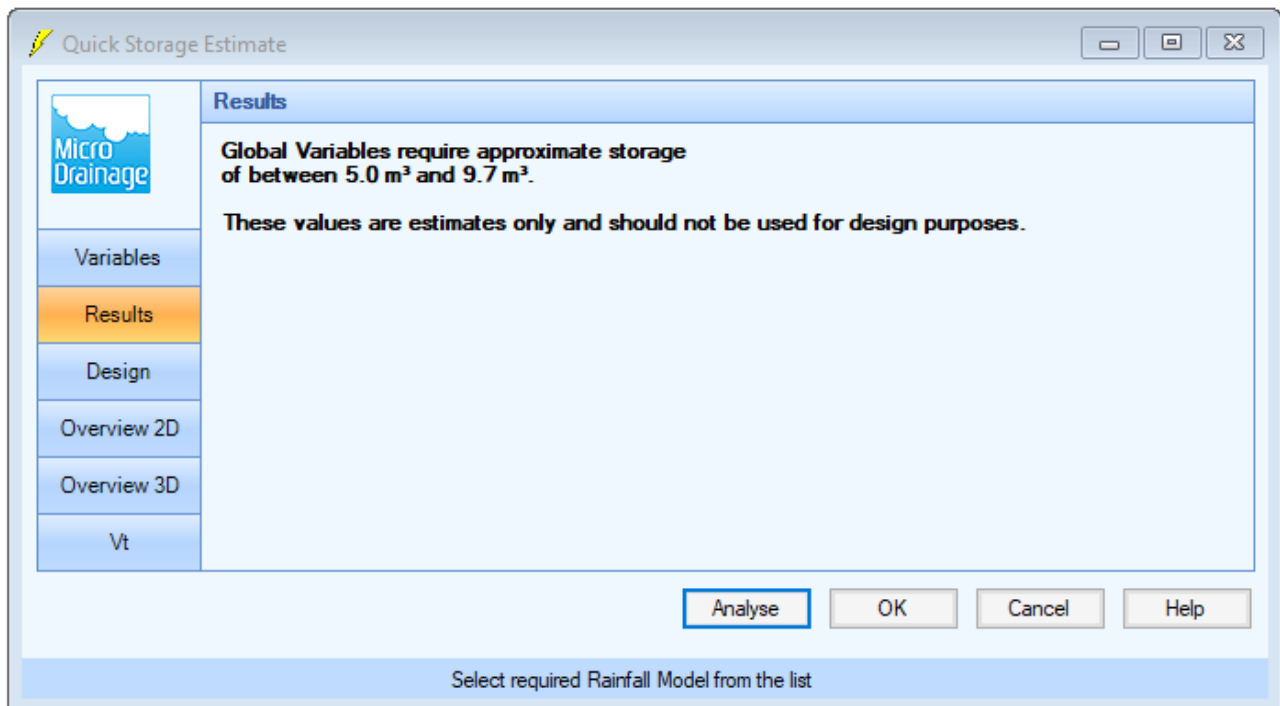
Greenfield Runoff Calculation

Pell Frischmann		Page 1
5 Manchester Square London W1U 3PD		
Date 03/10/2022 14:38 File	Designed by NStarkey Checked by	
Innovyze	Source Control 2020.1	
<p><u>ICP SUDS Mean Annual Flood</u></p> <p>Input</p> <p>Return Period (years) 100 Soil 0.450 Area (ha) 1.000 Urban 0.000 SAAR (mm) 919 Region Number Region 9</p> <p>Results l/s</p> <p>QBAR Rural 6.0 QBAR Urban 6.0</p> <p>Q100 years 13.2</p> <p>Q1 year 5.3 Q30 years 10.7 Q100 years 13.2</p>		
©1982-2020 Innovyze		

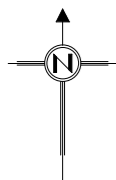
Dosing Plant Access Road Attenuation



Main Site Access Road Attenuation



Appendix D Drainage Design



DO NOT SCALE
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HEALTH & SAFETY

SITE HAZARDS

NOTES:
1. DRAWING FOR PLANNING, NOT FOR CONSTRUCTION AT THIS STAGE.

- LEGEND
- EXISTING
 - EXISTING SURFACE WATER
 - PROPOSED UNDERGROUND PIPEWORK
 - PROPOSED SURFACE WATER
 - PROPOSED LAND DRAINAGE
 - PROPOSED PUMPED MAIN
 - EXISTING GULLY
 - PROPOSED GULLY



Pell Frischmann

PENINSULA PARK RYDON LANE EXETER EX2 7NT

Tel: +44(0) 1392 444345 Fax: +44(0) 1392 444880

Email: pfexeter@pellfrischmann.com

www.pellfrischmann.com



PROJECT TITLE
**CHURCH STOKE STW
AMP 7 Q WFD - DETAIL DESIGN**

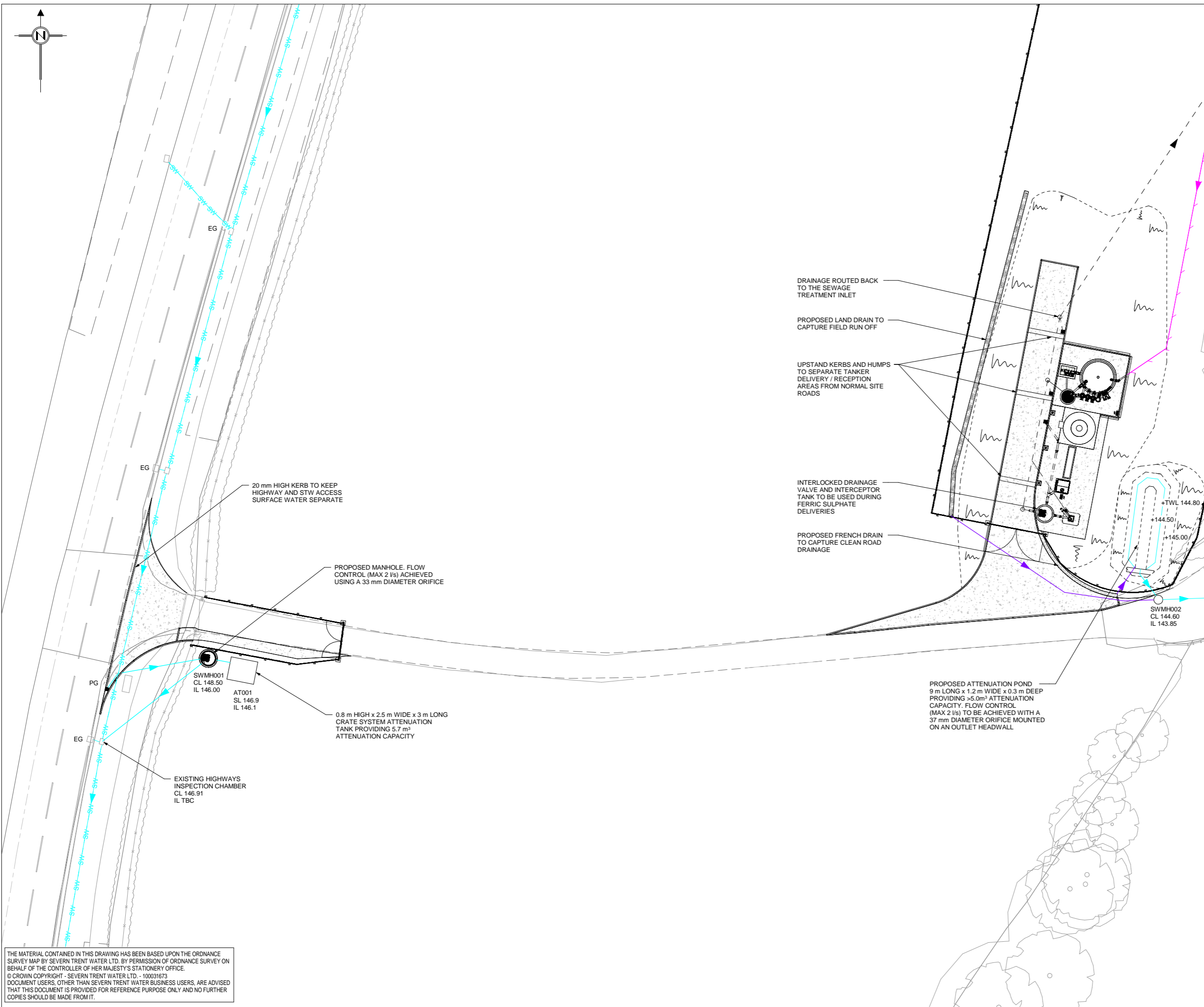
DRAWING TITLE
**PROPOSED DRAINAGE PLAN
SHEET 1**

DRAWING NO:
H7S00101-PFC-XX-ZZ-DR-T-0009

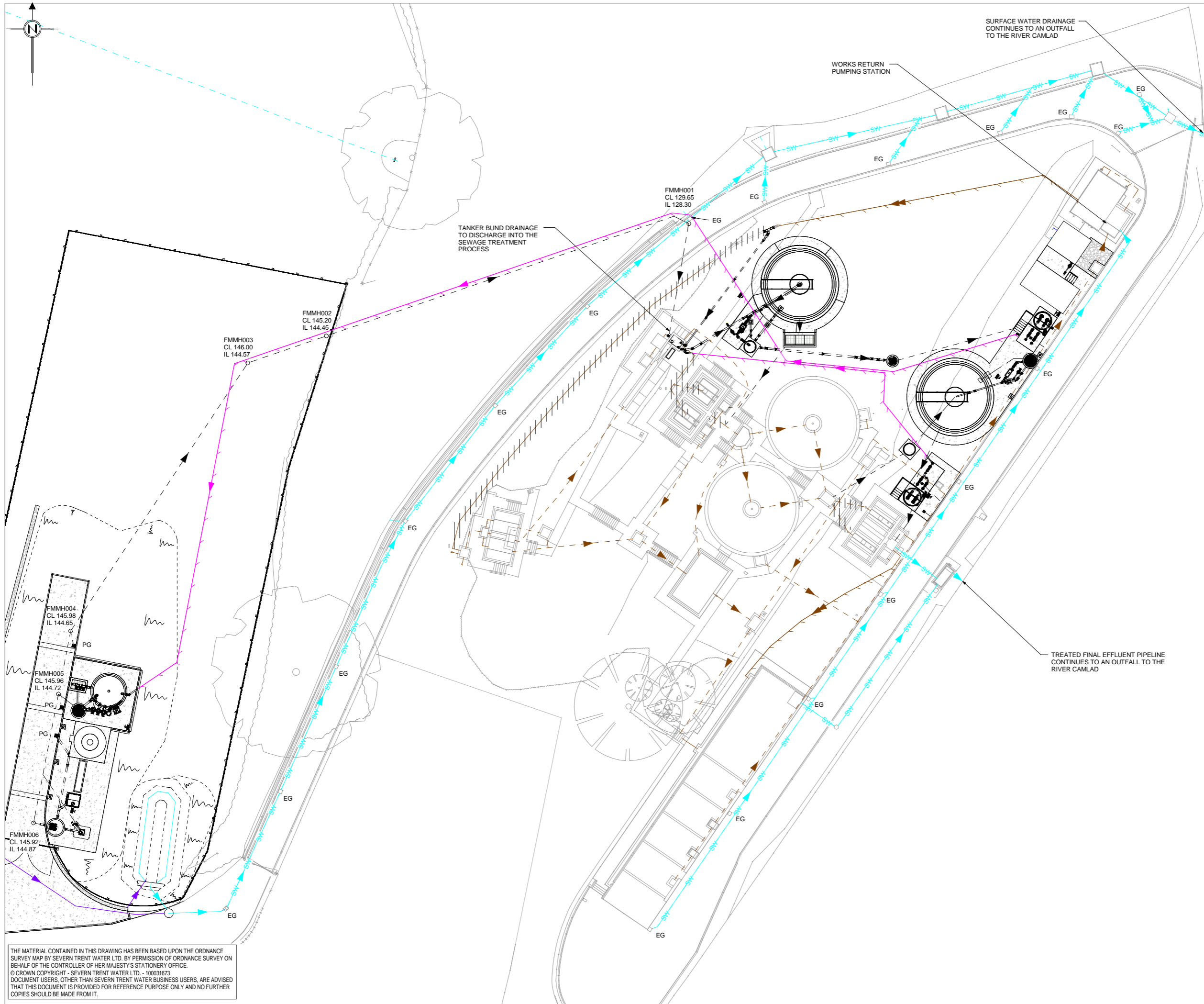
SCALE: **1:200** SHEET SIZE: **A1**

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HEALTH & SAFETY
SITE HAZARDS

NOTES:
1. DRAWING FOR PLANNING, NOT FOR CONSTRUCTION AT THIS STAGE.

LEGEND

- EXISTING
- SW—SW— EXISTING SURFACE WATER
- EXISTING FOUL WATER
- EXISTING PUMPED MAIN
- PROPOSED
- - - PROPOSED UNDERGROUND PIPEWORK
- PROPOSED SURFACE WATER
- PROPOSED LAND DRAINAGE
- PROPOSED PUMPED MAIN
- /// ABANDONED PIPE
- EG EXISTING GULLY
- PG PROPOSED GULLY

0 4 8
Metres
Scale 1:200

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PENINSULA PARK RYDON LANE EXETER EX2 7NT
Tel: +44(0) 1392 444345 Fax: +44(0) 1392 444880
Email: pfxeter@pellfrischmann.com
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HAFREN
DYFRDWY
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PROJECT TITLE
CHURCH STOKE STW
AMP 7 Q WFD - DETAIL DESIGN

DRAWING TITLE
PROPOSED DRAINAGE PLAN
SHEET 2


DRAWING NO:
H7S00101-PFC-XX-ZZ-DR-T-0010

SCALE: 1:200 SHEET SIZE: A1

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Innovyze		Network 2020.1

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	11.430	0.100	114.3	0.023	5.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	4.344	0.000	0.0	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	16.907	0.100	169.1	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.000	2.242	0.000	0.0	0.015	5.00	0.0	0.600	o	100	Pipe/Conduit	
3.001	8.805	1.500	5.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.27	146.420	0.023	0.0	0.0	0.0	0.72	5.6	3.1
2.000	50.00	6.04	146.100	0.000	0.0	0.0	0.0	0.07	0.5	0.0
1.001	50.00	6.52	146.100	0.023	0.0	0.0	0.0	0.59	4.6	3.1
3.000	50.00	5.54	144.300	0.015	0.0	0.0	0.0	0.07	0.5«	2.0
3.001	50.00	5.58	144.300	0.015	0.0	0.0	0.0	3.21	25.2	2.0

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	147.170	0.750	Open Manhole	1200	1.000	146.420	100				
2	148.500	2.400	Open Manhole	1200	2.000	146.100	100				
2	148.500	2.400	Open Manhole	1200	1.001	146.100	100	1.000	146.320	100	220
	146.900	0.900	Open Manhole	0		OUTFALL		2.000	146.100	100	
4	144.600	0.300	Open Manhole	1200	3.000	144.300	100	1.001	146.000	100	
5	145.000	0.700	Open Manhole	1200	3.001	144.300	100	3.000	144.300	100	
	143.512	0.712	Open Manhole	0		OUTFALL		3.001	142.800	100	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	327070.070	294654.884	327070.070	294654.884	Required	
2	327085.696	294652.729	327085.696	294652.729	Required	
2	327081.385	294653.268	327081.385	294653.268	Required	
	327067.106	294644.216			No Entry	
4	327181.085	294663.987	327181.085	294663.987	Required	
5	327183.325	294664.096	327183.325	294664.096	Required	
	327191.901	294666.091			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	100	1	147.170	146.420	0.650	Open Manhole	1200
2.000	o	100	2	148.500	146.100	2.300	Open Manhole	1200
1.001	o	100	2	148.500	146.100	2.300	Open Manhole	1200
3.000	o	100	4	144.600	144.300	0.200	Open Manhole	1200
3.001	o	100	5	145.000	144.300	0.600	Open 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	11.430	114.3	2	148.500	146.320	2.080	Open Manhole	1200
2.000	4.344	0.0	2	148.500	146.100	2.300	Open Manhole	1200
1.001	16.907	169.1		146.900	146.000	0.800	Open Manhole	0
3.000	2.242	0.0	5	145.000	144.300	0.600	Open Manhole	1200
3.001	8.805	5.9		143.512	142.800	0.612	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		146.900	146.000	146.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
3.001		143.512	142.800	143.000	0	0

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Online Controls for Storm

Orifice Manhole: 2, DS/PN: 1.001, Volume (m³): 2.8

Diameter (m) 0.032 Discharge Coefficient 0.600 Invert Level (m) 146.100

Orifice Manhole: 5, DS/PN: 3.001, Volume (m³): 0.8

Diameter (m) 0.037 Discharge Coefficient 0.600 Invert Level (m) 144.300

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Storage Structures for Storm

Tank or Pond Manhole: 2, DS/PN: 2.000

Invert Level (m) 146.100

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	12.0	0.800	12.0	0.801	0.0

Tank or Pond Manhole: 4, DS/PN: 3.000

Invert Level (m) 144.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	15.0	0.300	15.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.316
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+40%	30/15 Summer				146.483
2.000	2	120 Winter	1	+40%	1/30 Winter				146.217
1.001	2	15 Summer	1	+40%	1/15 Summer				146.240
3.000	4	60 Winter	1	+40%	30/15 Summer				144.365
3.001	5	60 Winter	1	+40%	30/15 Summer				144.363

PN	US/MH Name	Surcharged Flooded			Half Drain Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)		
1.000	1	-0.037	0.000	0.71		3.7	OK	
2.000	2	0.017	0.000	0.11		0.4	SURCHARGED	
1.001	2	0.040	0.000	0.17		0.7	SURCHARGED	
3.000	4	-0.035	0.000	0.16		0.6	FLOOD RISK	
3.001	5	-0.037	0.000	0.03		0.6	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
 Number of Online Controls 2 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.316
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+40%	30/15 Summer				146.678
2.000	2	120 Winter	30	+40%	1/30 Winter				146.440
1.001	2	120 Winter	30	+40%	1/15 Summer				146.444
3.000	4	60 Winter	30	+40%	30/15 Summer				144.466
3.001	5	60 Winter	30	+40%	30/15 Summer				144.463

PN	US/MH Name	Surcharged Flooded			Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)			
1.000	1	0.158	0.000	1.59		8.4	SURCHARGED		
2.000	2	0.240	0.000	0.26		0.9	SURCHARGED		
1.001	2	0.244	0.000	0.28		1.2	SURCHARGED		
3.000	4	0.066	0.000	0.28		1.1	FLOOD RISK		
3.001	5	0.063	0.000	0.05		1.1	SURCHARGED		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
 Number of Online Controls 2 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.316
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s)

Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%	30/15 Summer				146.826
2.000	2	120 Winter	100	+40%	1/30 Winter				146.563
1.001	2	120 Winter	100	+40%	1/15 Summer				146.566
3.000	4	60 Winter	100	+40%	30/15 Summer				144.525
3.001	5	60 Winter	100	+40%	30/15 Summer				144.521

PN	US/MH Name	Surcharged Flooded			Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)			
1.000	1	0.306	0.000	1.99		10.6	SURCHARGED		
2.000	2	0.363	0.000	0.29		1.0	SURCHARGED		
1.001	2	0.366	0.000	0.32		1.4	SURCHARGED		
3.000	4	0.125	0.000	0.34		1.3	FLOOD RISK		
3.001	5	0.121	0.000	0.06		1.3	SURCHARGED		