

Rogers Cory Partnership		Page 0
The Old School Old School Road Hook Hampshire RG27 9NJ		
Date 01/09/2021 16:55 File SW3-FEH REVIEW.MDX		
Designed by Tim K Checked by Terry S		
Innovyze		Network 2017.1.2

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Net 3

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 489800 99500 SZ 89800 99500
Data Type	Catchment
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	10
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm - Net 3

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
S1.000	14.282	0.024	585.0	0.036	5.00	0.0	0.600	o	500	Pipe/Conduit	
S1.001	23.685	0.040	585.0	0.089	0.00	0.0	0.600	o	500	Pipe/Conduit	
S1.002	63.535	0.109	585.0	0.111	0.00	0.0	0.600	o	500	Pipe/Conduit	
S1.003	20.138	0.034	585.0	0.047	0.00	0.0	0.600	o	500	Pipe/Conduit	
S1.004	26.439	0.045	585.0	0.053	0.00	0.0	0.600	o	500	Pipe/Conduit	
S1.005	9.354	0.016	584.6	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
S1.006	4.409	0.008	585.0	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL E (m)	I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	-11.45	5.24	4.288	0.036	0.0	0.0	0.0	1.00	282.6	0.0
S1.001	-10.65	5.63	4.283	0.125	0.0	0.0	0.0	1.00	282.6	0.0
S1.002	-8.97	6.69	4.223	0.236	0.0	0.0	0.0	1.00	282.6	0.0
S1.003	-8.54	7.03	4.114	0.283	0.0	0.0	0.0	1.00	282.6	0.0
S1.004	-8.03	7.47	4.080	0.336	0.0	0.0	0.0	1.00	282.6	0.0
S1.005	-7.87	7.62	4.035	0.336	0.0	0.0	0.0	1.00	282.7	0.0
S1.006	-7.79	7.70	4.013	0.336	0.0	0.0	0.0	1.00	282.6	0.0

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<u>Manhole Schedules for Storm - Net 3</u>											
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)
S58	6.320	2.032	Open Manhole	1500	S1.000	4.288	600				
S59	6.360	2.097	Open Manhole	1500	S1.001	4.263	600	S1.000	4.264	600	1
S60	6.130	1.907	Open Manhole	1500	S1.002	4.223	600	S1.001	4.223	600	
S61	6.910	1.796	Open Manhole	1500	S1.003	4.114	600	S1.002	4.114	600	
S62	6.970	1.890	Open Manhole	1500	S1.004	4.080	600	S1.003	4.080	600	
S63	6.620	1.585	Open Manhole	1500	S1.005	4.035	600	S1.004	4.035	600	
S64	6.500	1.481	Open Manhole	2100	S1.006	4.019	600	S1.005	4.019	600	
S65	6.500	1.489	Open Manhole	0		OUTFALL		S1.006	4.011	600	
<u>Free Flowing Outfall Details for Storm - Net 3</u>											
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)					
S1.006	S65	5.500	4.011	0.000	0	0					
<u>Simulation Criteria for Storm - Net 3</u>											
Volumetric Runoff Coeff		0.840	Additional Flow - % of Total Flow		10.000						
Areal Reduction Factor		1.000	MADD Factor * 10m³/ha Storage		2.000						
Hot Start (mins)		0	Inlet Coefficient		0.800						
Hot Start Level (mm)		0	Flow per Person per Day (l/per/day)		0.000						
Manhole Headloss Coeff (Global)		0.500	Run Time (mins)		480						
Foul Sewage per hectare (l/s)		0.000	Output Interval (mins)		4						
Number of Input Hydrographs		0	Number of Storage Structures		1						
Number of Online Controls		1	Number of Time/Area Diagrams		0						
Number of Offline Controls		0	Number of Real Time Controls		0						
<u>Synthetic Rainfall Details</u>											
Rainfall Model		FEH									
Return Period (years)		100									
FEH Rainfall Version		2013									
Site Location		GB 489800 99500 SZ 89800 99500									
Data Type		Catchment									
Summer Storms		No									
Winter Storms		Yes									
Cv (Summer)		0.750									
Cv (Winter)		0.840									
Storm Duration (mins)		240									
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Online Controls for Storm - Net 3

Hydro-Brake® Optimum Manhole: S64, DS/PN: S1.006, Volume (m³): 7.3

Unit Reference MD-SHE-0082-3000-1000-3000	
Design Head (m)	1.000
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82
Invert Level (m)	4.019
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	3.0	Kick-Flo®	0.623	2.4
Flush-Flo™	0.297	3.0	Mean Flow over Head Range	-	2.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		

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<u>Storage Structures for Storm - Net 3</u> <u>Tank or Pond Manhole: S63, DS/PN: S1.005</u> Invert Level (m) 4.035 <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>184.1</td> <td>1.000</td> <td>378.0</td> <td>1.300</td> <td>450.0</td> </tr> </tbody> </table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	184.1	1.000	378.0	1.300	450.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)									
0.000	184.1	1.000	378.0	1.300	450.0									
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 3

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S58	30 Summer	30	+0%					4.497
S1.001	S59	30 Summer	30	+0%					4.494
S1.002	S60	480 Winter	30	+0%					4.481
S1.003	S61	480 Winter	30	+0%	100/240 Winter				4.481
S1.004	S62	480 Winter	30	+0%	100/180 Winter				4.481
S1.005	S63	480 Winter	30	+0%	100/120 Winter				4.481
S1.006	S64	2160 Winter	30	+0%	30/2160 Winter				4.632

PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S58	-0.391	0.000	0.07		10.5	OK	
S1.001	S59	-0.369	0.000	0.18		36.5	OK	
S1.002	S60	-0.342	0.000	0.04		9.7	OK	
S1.003	S61	-0.233	0.000	0.06		10.6	OK	
S1.004	S62	-0.199	0.000	0.06		12.3	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 3

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
S1.005	S63	-0.154	0.000	0.02		3.5	OK	
S1.006	S64	0.013	0.000	0.01		2.6	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm - Net 3

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	10.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

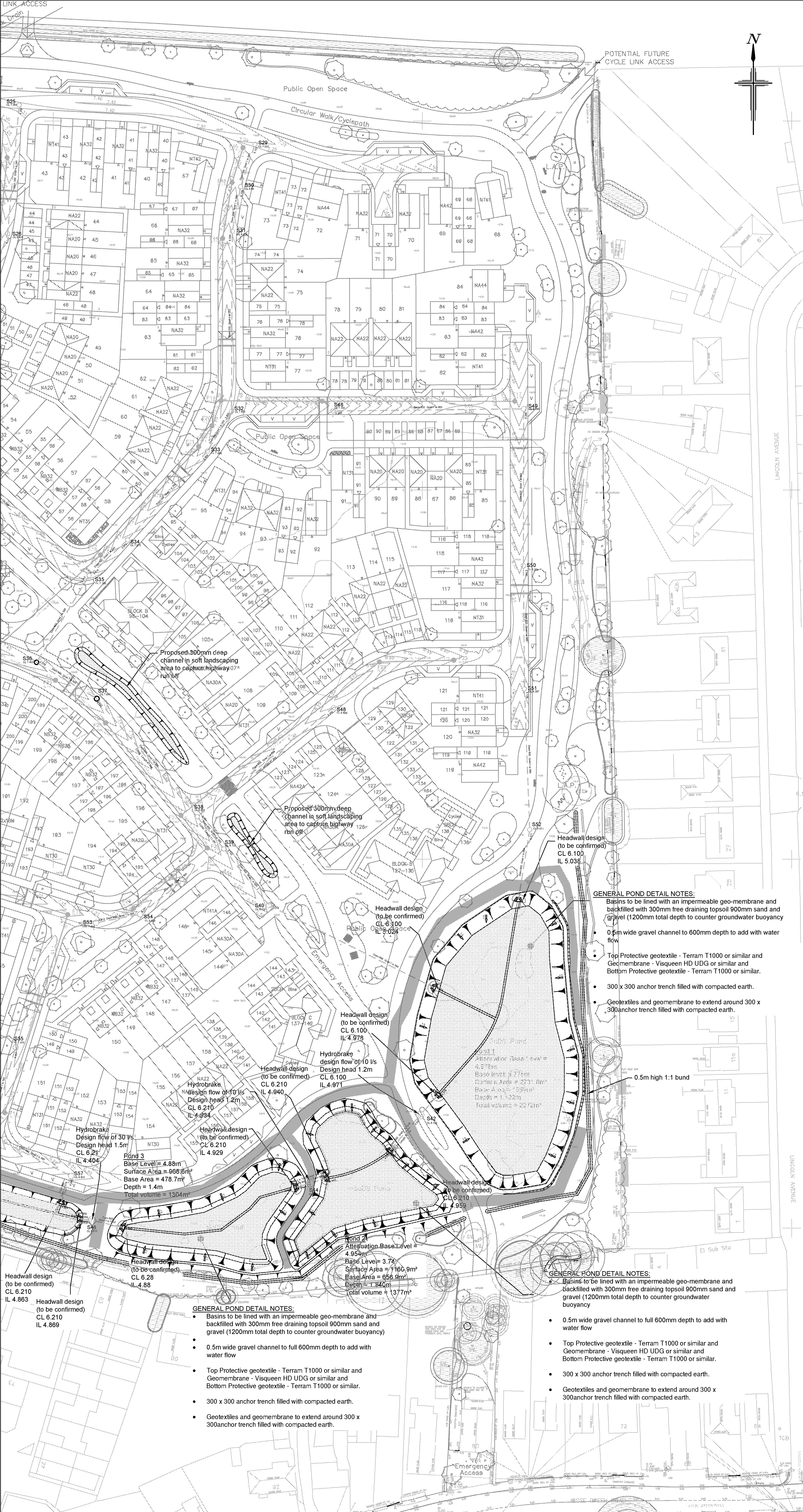
Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30, 100
Climate Change (%)	0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S58	600 Winter	100	+40%					4.783
S1.001	S59	600 Winter	100	+40%					4.783
S1.002	S60	720 Winter	100	+40%					4.782
S1.003	S61	720 Winter	100	+40%	100/240 Winter				4.781
S1.004	S62	720 Winter	100	+40%	100/180 Winter				4.780
S1.005	S63	720 Winter	100	+40%	100/120 Winter				4.780
S1.006	S64	960 Winter	100	+40%	30/2160 Winter				4.924

PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S58	-0.105	0.000	0.02		2.2	OK	
S1.001	S59	-0.080	0.000	0.04		7.3	OK	
S1.002	S60	-0.041	0.000	0.05		11.8	OK	
S1.003	S61	0.067	0.000	0.07		12.6	SURCHARGED	
S1.004	S62	0.100	0.000	0.07		15.0	SURCHARGED	

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NOTES

- All dimensions are in metres unless stated otherwise.
- Do not scale from this drawing. Only written dimensions are to be used.
- Site layout based on Cooper Baillie Planning Layout, drawing number CB_84-139_001 Rev F dated 21st July 2021.
- Topographical survey based on MK Surveys layout, drawing number 22496-2 dated January 2021.
- Level strategy is subject to further design development. Cover Levels are indicative only and subject to further detailed review
- The proposed surface and foul water drainage show is indicative only and subject to further design development. Detailed proposals for the surface and foul water drainage strategy will be provided as part of the Discharge of Conditions applications associated with the current Outline Planning Consent P.134.16.OUT
- ANY VARIANCE OR DISCREPANCY MUST BE REPORTED BACK TO RCP ENGINEERING BEFORE WORK BEGINS.**

KEY

- Site Boundary
- Potential School, care home or residential site under separate planning application
- Proposed Surface Water Sewer
- Proposed Foul Water Sewer
- Basin and swale base to consist of 300mm free draining topsoil and clean coarse granular material nominal size 40/60mm with full depth 0.5m channel to allow for water flow
- Proposed Headwall
- Existing Trees And Hedgerows root protection areas. Any works to be carried out to be undertaken in accordance with arboriculturist's method statement and approval
- Proposed indicative permeable paving (Subject to further soakage and infiltration testing to inform permeability rates and depths within parking areas and driveway)
- Indicative location of 0.5m high bund to prevent over ground water flow entering existing residents plots from SuDs features.
- Indicative location of 140m² attenuation tank
- Indicative gradient for SuDs basins and swale
- Route for future maintenance access to SuDs basins, swales and diverted watercourse

CDM NOTES

- EXISTING SERVICES:** Depth of existing services must be determined prior to works commencing. The contractor is responsible for establishing underground services in accordance with HSE Guidance note HS (G) 47. Any services which would be within the proposed construction layers must be lowered to below the sub-base.



G	01.09.21	Maintenance access route added	TRs	LD	TRs
F	26.07.21	Basin backfill updated	TRs	LD	TRs
E	22.07.21	Site layout updated.	TRs	LD	TRs
D	19.03.21	Site layout updated.	TK	LD	TRs
C	04.02.21	Site layout updated.	TK	LD	TRs
B	22.01.21	0.5m high bund added to south eastern SuDs features, topographical survey and site layout updated.	TK	LD	TRs
A	11.01.21	Surface water and foul water networks updated to suit latest site layout	TK	LD	TRs
Rev.	Date	Details	By	Chkd	Appd

Client:-

Taylor Wimpey

Site:-

Sefter Road, Bognor

Drawing Title:-

Surface Water Drainage Strategy Layout

Sheet 3 of 3

Date: January 2020

Drawn: TK

Drawing No.

Scales: 1:500 at A1

Checked: TK

Approved: TRS

WSC/E4775/010 G

FOR INFORMATION ONLY

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