

NOLA DESIGN - TECHNICAL RESPONSE TO THE COMMENTS RAISED BY HAMPSHIRE COUNTY COUNCIL – Prepared by Rob Colins on 16/03/2023.

Lead Local Flood Authority response for F/22/93970 THORNEYDOWN FARM, MOORHILL ROAD, WEST END, SOUTHAMPTON, SO30 3AY

Change of use of land for the siting of touring caravans, motorhomes and tents including a small amenity block and the terracing of the site to accommodate roads, parking and pitches (where appropriate)

The following comments are made in response to the letter from Hampshire County Council in their capacity of Lead Local Planning Authority, to Eastleigh Borough Council, Reference SWM/2022/0579/; dated 11 November 2022.

1. Existing Flow Paths

1.1 *Evidence that existing surface water flow paths will not be obstructed by the proposed development*

Response – Along the northern site boundary, an ecological buffer strip has been introduced and the site plan adjusted to suit.

- With reference to the topo survey, the existing flow path along the southern site boundary is the start of a small local depression which overflows in an easterly direction along the toe of the embankment to Main Road A334. As this is the head of a natural flow path, it has little flow.
- The new access road to the west of the communal amenity building will be slightly elevated and is set back from the existing flow path so will not obstruct any natural flow.
- The new amenity building will have an apron level similar to ground level and it is only the access covers of the new pumping station which will be slightly elevated and also set back from the existing flow path and will not obstruct natural flow paths.
- The new refuse bin storage area has been rotated and moved away from the flow path to prevent any obstruction.

2. Micro Drainage Hydraulic Modelling

Response – We have been assisted by our colleagues Ardent Consulting Engineers who have a more up to date version of this software, this now includes the following:

- Greenfield Runoff
- Critical Storm Events for the 1;30 and 100yr events
- Climate Change Allowance
- Network Modelling
- Complex Flow Control

3. Greenfield Runoff Rates

Response – Greenfield Runoff Calculations have been calculated for QBAR; 1;30;100yr events – (Refer to enclosed).

4. Peak Rainfall Allowances (Critical Storm Events)

Response – Critical Storm Events for the 1;30 and 100yr events – (Refer to enclosed).

5. Climate Change Allowance

Response – The Planning Practice Guidance states that an allowance should be made for the predicted impacts of climate change on surface water runoff. Within the East Hampshire Management Catchment, the following increases to rainfall intensities should be considered (Refer to Table 1). For development with a lifetime between 2061 and 2100, the Central allowance for the 2070s epoch (25%) should be used. However, following a conservative approach, the Upper end allowance of 45% has been used in the drainage calculations which can be adjusted during detailed design (Refer to enclosed).

Table 1 East Hampshire Management Catchment Peak Rainfall Allowances

1% annual exceedance rainfall event		
	Central allowance	Upper end allowance
2050s	20%	40%
2070s	25%	45%

6. Network Modelling

Response – Network modelling has been provided for the surface water drainage system (Refer to Attached). Included are critical storm events, attenuation, and a restricted flow off site in line with greenfield rates of runoff.

7. Complex Flow Control Criteria

Response – This has been designed to accord with the greenfield runoff rates for the 1yr and 100yr events (Refer to enclosed).

8. SuDS Maintenance Information

Response – The following Drainage Maintenance measures and schedule are proposed for each of the drainage components:

Drainage Maintenance

- 8.1 The proposed filter drains, attenuation crates, and flow control device would be the responsibility of, and maintained by the site owner to ensure their effectiveness over the lifetime of the development.
- 8.2 The private drainage systems on site will be managed by the site owner or appointed management company to ensure the capacity and functionality of all the drainage components is maintained during the lifetime of its use.
- 8.3 Access for inspection and maintenance of the SuDS features should be made available at all times, this would include adequate access for appropriate equipment and vehicles.

- 8.4 The following Table 32.1 from the Ciria SuDS Manual provides the recommended regular, occasional, and remedial operation and maintenance activities for each of the SuDS elements.

TABLE 32.1 Typical key SuDS components operation and maintenance activities (for full specifications, see Chapters 11–23)

Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management ¹	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

■ will be required

□ may be required

Notes

¹ Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

9. Water Quality Information

Response – The following Simple Index Approach has been used to assess water quality.

The Simple Index Approach is used to assess water quality of the site below, in accordance with the guidance in CIRIA SuDS Manual. Tables 26.2 and 26.3 of the SuDS Manual indicate that the site, which will be used for the siting of touring caravans, motorhomes and tents including a small amenity block and the terracing of the site to accommodate roads, parking and pitches is considered to be within the second category of land use as defined in Table 26.2 below.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Therefore, the pollution hazard indices for the site are as follows:

Total suspended solids (TSS) = 0.5
 Metals = 0.4
 Hydrocarbons = 0.4

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

The proposed use of both filter drains and porous pavements are selected as SuDS components for the site. Based on Table 26.3, the total SuDS mitigation index for each component is calculated using the following formula:

Total SuDS mitigation index = mitigation index₁ + 0.5 (mitigation index₂)
 Where: mitigation index_n = mitigation index for component n

Therefore, the total SuDS mitigation index for each component are:

Total suspended solid (TSS) = (Filter Drain + Porous Pavements) = $0.4 + (0.5) 0.7 = 0.75$

Metals = (Filter Drain + Porous Pavements) = $0.4 + (0.5) 0.6 = 0.70$

Hydrocarbons = (Filter Drain + Porous Pavements) = $0.4 + (0.5) 0.7 = 0.75$

There is no infiltration from the SuDS to groundwater, therefore, the groundwater indices are not considered.

The comparison of the Total SuDS mitigation indices and the pollution hazard indices are shown in the following Table 2:

Component	Total SuDS Mitigation index	Pollution Hazard index	Does the total SuDS mitigation index equal or exceed the pollution hazard index?
Total suspended solid (TSS)	0.75	0.5	Yes
Metals	0.70	0.4	Yes
Hydrocarbons	0.75	0.4	Yes

Table 2: Comparison of the Total SuDS mitigation indices and the pollution hazard indices.

For each contaminant type, the total SuDS mitigation index exceeds the pollution hazard of the same contaminant type. Therefore, the proposed SuDS components will deliver adequate treatment of surface water prior to discharging to the ordinary watercourse. However, in addition and if deemed necessary, following consultation on the discharge of conditions, a final “Downstream Defender” can be installed as a further measure of protection at the outfall.

10.. Exceedance Flow Rates

Response – Please refer to a new drawing enclosed which details this information.

11. Connection to Existing Watercourse

Response - It is our Client’s intention to discharge flows from this development site into the existing watercourse which follows the northern site boundary.

Any Consent to Discharge into this watercourse will be obtained from the LLFA if permission is granted and this can be a condition.

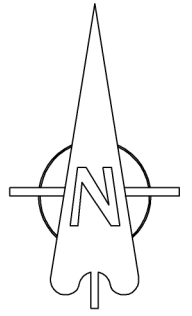
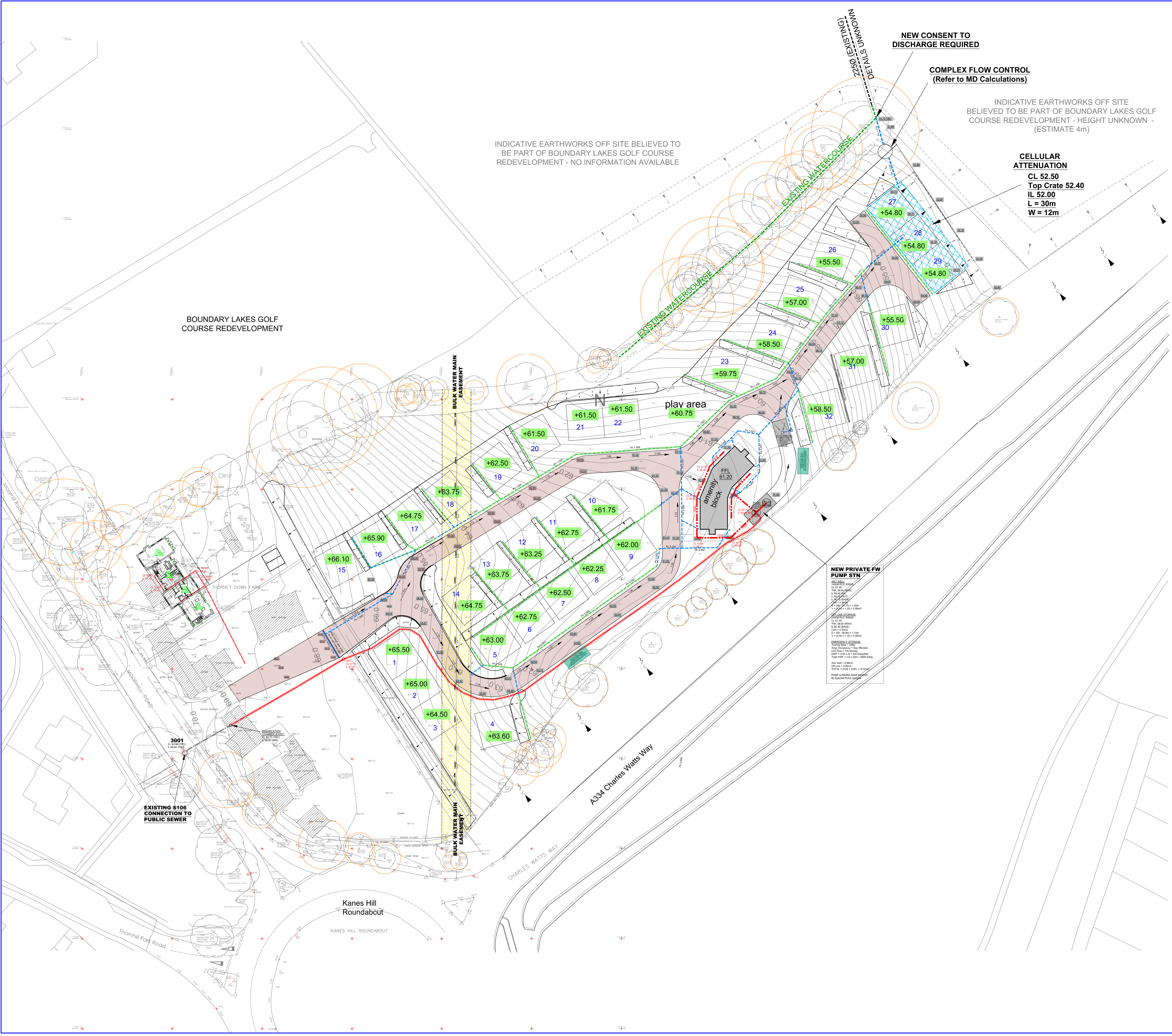
12. Diversion and Culverting of Off Site Watercourse

Response – The existing water course has been partly culverted off site outside the application site boundary by the adjoining landowner. We do not have details of the off-site downstream drainage arrangements, and these are not the responsibility of the applicant.

13.. Enclosures

The following supporting documents are enclosed:

- Dwg2000.0016_103_P3 – Proposed Touring Park Combined Drainage Layout.
- Dwg2000.0016_110_P1 – Exceedance Flow Routes.
- Greenfield Runoff Calculations.
- Network Calculations for all storms.



Legend:

- LATERAL DRAIN TO PUBLIC FW SEWER
- PRIVATE FW GRAVITY SEWER
- PRIVATE FW RISING MAIN
- PRIVATE FW PUMPING STATION
- PRIVATE SW GRAVITY SEWER
- PRIVATE SW FILTER DRAIN
- PRIVATE SW CELLULAR ATTENUATION
- PITCH SUITABLE FOR DISABLED USE AND ACCESS ROUTE TO AMENITY FACILITIES
- MOTORHOME SERVICE POINT
- REFUSE BIN STORAGE AREA
- EARTHWORKS PITCH LEVEL
- BONDED GRAVEL ACCESS ROAD

PLANNING

Rev.	Description	Date	Chkd
P3	Minor Relocation of Refuse Bin Store.	05/04/23	RC
P3	SW Pipe Numbers and Annotation Added.	05/04/23	RC
P2	Layout & Drainage Updated to Suit Ecology	28/03/23	RC
P1	Issued for Discussion.	09/09	RC

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Client:

MR JOHN MOBEY.

Project:

THORNEYDOWN FARM,
MOORHILL ROAD, WEST END,
SOUTHAMPTON, SO30 3AY.

Title:

PROPOSED TOURING PARK
COMBINED DRAINAGE LAYOUT

Scale:

1:500 @ A1

Drawn:

RC

Checked:

RC

Date:

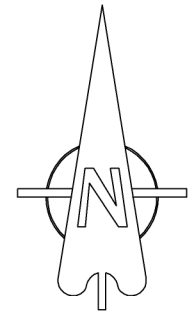
09/09/2022

Drawing No:

2000.0016

103

P3



PLANNING

P1	Issued for Planning.	05/04/23	RC
Rev.	Description	Date	Chkd

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Client:

MR JOHN MOBEY.

Project:

THORNEYDOWN FARM,
MOORHILL ROAD, WEST END,
SOUTHAMPTON, SO30 3AY.

Title:

EXCEEDANCE FLOOD FLOW
ROUTES

Scale: 1:500 @ A1	Drawn: RC	
Checked: RC	Date: 05/04/2023	
Drawing No: 2000.0016	110	P1

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52-56 LeadenHall Street	Touring Park	
London, EC3M 5JE	Hampshire	
Date 30/03/2023 12:12	Designed by TA	
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Innovyze	Source Control 2020.1	
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.300 Area (ha) 1.500 Urban 0.000 SAAR (mm) 800 Region Number Region 7 Results 1/s QBAR Rural 3.2 QBAR Urban 3.2 Q100 years 10.2 Q1 year 2.7 Q30 years 7.2 Q100 years 10.2		
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Innovyze				Network 2020.1							
<u>Manhole Schedules for Storm</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)
1	67.650	1.000	Open Manhole	1050	1.000	66.650	150				
2	66.000	1.183	Open Manhole	1050	1.001	64.817	150	1.000	64.817	150	
3	65.500	1.150	Open Manhole	1050	1.002	64.350	150	1.001	64.350	150	
4	64.500	1.192	Open Manhole	1050	1.003	63.308	150	1.002	63.308	150	
5	63.500	1.192	Open Manhole	1050	1.004	62.308	150	1.003	62.308	150	
6	62.500	1.157	Open Manhole	1050	1.005	61.343	150	1.004	61.343	150	
7	61.500	1.232	Open Manhole	1050	1.006	60.268	225	1.005	60.343	150	
8	63.000	1.000	Open Manhole	1050	2.000	62.000	150				
9	63.250	1.330	Open Manhole	1050	2.001	61.920	150	2.000	61.920	150	
10	63.000	1.210	Open Manhole	1050	2.002	61.790	150	2.001	61.790	150	
11	62.250	1.260	Open Manhole	1050	2.003	60.990	150	2.002	60.990	150	
12	61.650	1.193	Open Manhole	1050	2.004	60.457	150	2.003	60.457	150	
13	61.550	1.260	Open Manhole	1050	2.005	60.290	150	2.004	60.290	150	
14	61.300	1.285	Open Manhole	1050	2.006	60.015	225	2.005	60.090	150	
15	61.100	1.250	Open Manhole	1050	2.007	59.850	225	2.006	59.850	225	
16	61.150	1.420	Open Manhole	1050	1.007	59.730	225	1.006	59.768	225	38
								2.007	59.730	225	
17	60.350	1.237	Open Manhole	1050	1.008	59.113	225	1.007	59.113	225	
18	61.000	1.000	Open Manhole	1050	3.000	60.000	150				
19	59.150	1.213	Open Manhole	1050	3.001	57.938	150	3.000	57.938	150	
20	59.000	1.453	Open Manhole	1050	1.009	57.547	225	1.008	57.547	225	
								3.001	57.622	150	
21	57.500	1.509	Open Manhole	1050	1.010	55.991	225	1.009	55.991	225	
22	56.000	1.564	Open Manhole	1050	1.011	54.436	225	1.010	54.436	225	
23	55.000	1.422	Open Manhole	1050	1.012	53.578	225	1.011	53.578	225	
24	54.900	1.422	Open Manhole	1050	1.013	53.478	225	1.012	53.478	225	
25	54.800	2.800	Open Manhole	1200	1.014	52.000	225	1.013	52.228	225	228
26	52.500	0.522	Open Manhole	1050	1.015	51.978	225	1.014	51.978	225	
	52.000	0.300	Open Manhole	0		OUTFALL		1.015	51.700	225	
No coordinates have been specified, layout information cannot be produced.											
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Online Controls for Storm

Complex Manhole: 26, DS/PN: 1.015, Volume (m³): 1.3

Orifice

Diameter (m) 0.090 Discharge Coefficient 0.600 Invert Level (m) 51.978

Hydro-Brake® Optimum

Unit Reference MD-SHE-0147-1020-1000-1020
Design Head (m) 1.000
Design Flow (l/s) 10.2
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 147
Invert Level (m) 52.278
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	10.2	Kick-Flo®	0.676	8.5
Flush-Flo™	0.306	10.2	Mean Flow over Head Range	-	8.7

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)
0.100	5.3	1.200	11.1	3.000	17.2	7.000	25.8
0.200	9.9	1.400	11.9	3.500	18.5	7.500	26.6
0.300	10.2	1.600	12.7	4.000	19.7	8.000	27.5
0.400	10.1	1.800	13.5	4.500	20.8	8.500	28.3
0.500	9.8	2.000	14.1	5.000	21.9	9.000	29.1
0.600	9.3	2.200	14.8	5.500	22.9	9.500	29.9
0.800	9.2	2.400	15.4	6.000	23.9		
1.000	10.2	2.600	16.0	6.500	24.9		

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Storage Structures for Storm

Cellular Storage Manhole: 25, DS/PN: 1.014

Invert Level (m) 52.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	360.0	0.0	1.300	0.0	0.0
0.100	360.0	0.0	1.400	0.0	0.0
0.200	360.0	0.0	1.500	0.0	0.0
0.300	360.0	0.0	1.600	0.0	0.0
0.400	360.0	0.0	1.700	0.0	0.0
0.401	0.0	0.0	1.800	0.0	0.0
0.600	0.0	0.0	1.900	0.0	0.0
0.700	0.0	0.0	2.000	0.0	0.0
0.800	0.0	0.0	2.100	0.0	0.0
0.900	0.0	0.0	2.200	0.0	0.0
1.000	0.0	0.0	2.300	0.0	0.0
1.100	0.0	0.0	2.400	0.0	0.0
1.200	0.0	0.0	2.401	0.0	0.0

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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 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	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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 (%)	0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+0%					66.674
1.001	2	15 Winter	1	+0%					64.856
1.002	3	15 Winter	1	+0%					64.385
1.003	4	15 Winter	1	+0%					63.347
1.004	5	15 Winter	1	+0%					62.349
1.005	6	15 Winter	1	+0%					61.384
1.006	7	15 Winter	1	+0%					60.328
2.000	8	15 Summer	1	+0%					62.038
2.001	9	15 Winter	1	+0%					61.964
2.002	10	15 Winter	1	+0%					61.824
2.003	11	15 Winter	1	+0%					61.031
2.004	12	15 Winter	1	+0%	100/15 Summer				60.507
2.005	13	15 Winter	1	+0%	100/15 Summer				60.339
2.006	14	15 Winter	1	+0%					60.074
2.007	15	15 Winter	1	+0%	100/15 Summer				59.915
1.007	16	15 Winter	1	+0%	100/15 Summer				59.801
1.008	17	15 Winter	1	+0%					59.170

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Date 30/03/2023 15:24 File SW Network_100yr_ 310320...	Designed by RC Checked by	
Innovyze	Network 2020.1	

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

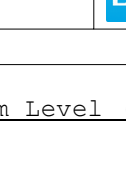
PN	US/MH Name	Surcharged Flooded		Flow / Overflow Cap. (l/s)	Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
1.000	1	-0.126	0.000	0.06		3.0	OK	
1.001	2	-0.111	0.000	0.15		4.6	OK	
1.002	3	-0.115	0.000	0.12		5.7	OK	
1.003	4	-0.111	0.000	0.15		6.3	OK	
1.004	5	-0.110	0.000	0.16		7.3	OK	
1.005	6	-0.108	0.000	0.17		8.0	OK	
1.006	7	-0.165	0.000	0.16		10.0	OK	
2.000	8	-0.112	0.000	0.15		2.3	OK	
2.001	9	-0.106	0.000	0.19		3.1	OK	
2.002	10	-0.116	0.000	0.11		3.8	OK	
2.003	11	-0.109	0.000	0.16		5.0	OK	
2.004	12	-0.100	0.000	0.24		6.2	OK	
2.005	13	-0.101	0.000	0.23		6.2	OK	
2.006	14	-0.166	0.000	0.16		7.2	OK	
2.007	15	-0.160	0.000	0.18		8.0	OK	
1.007	16	-0.154	0.000	0.22		18.6	OK	
1.008	17	-0.169	0.000	0.14		19.9	OK	

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

US/MH		Return Climate		First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act. Level (m)
3.000	18	15 Summer	1	+0%				60.014
3.001	19	15 Summer	1	+0%				57.956
1.009	20	15 Winter	1	+0%				57.604
1.010	21	15 Winter	1	+0%				56.050
1.011	22	15 Winter	1	+0%	100/15 Summer			54.500
1.012	23	15 Winter	1	+0%	30/15 Summer			53.699
1.013	24	15 Winter	1	+0%				53.539
1.014	25	360 Winter	1	+0%	100/30 Winter			52.082
1.015	26	360 Winter	1	+0%	100/30 Winter			52.054

US/MH		Surcharged	Flooded	Half Drain		Pipe	Level	
PN	Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status Exceeded
3.000	18	-0.136	0.000	0.02			1.1	OK
3.001	19	-0.131	0.000	0.04			1.1	OK
1.009	20	-0.167	0.000	0.15			22.4	OK
1.010	21	-0.166	0.000	0.15			23.3	OK
1.011	22	-0.161	0.000	0.18			23.4	OK
1.012	23	-0.105	0.000	0.56			24.2	OK
1.013	24	-0.164	0.000	0.17			26.1	OK
1.014	25	-0.143	0.000	0.22		276	2.2	OK
1.015	26	-0.149	0.000	0.03			2.2	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 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	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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)

Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440	Summer and Winter
Return Period(s) (years)	1, 30, 100	
Climate Change (%)	0, 0, 45	

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%					66.689
1.001	2	15 Winter	30	+0%					64.883
1.002	3	15 Summer	30	+0%					64.410
1.003	4	15 Summer	30	+0%					63.376
1.004	5	15 Winter	30	+0%					62.379
1.005	6	15 Winter	30	+0%					61.417
1.006	7	15 Summer	30	+0%					60.375
2.000	8	15 Summer	30	+0%					62.062
2.001	9	15 Summer	30	+0%					61.995
2.002	10	15 Summer	30	+0%					61.848
2.003	11	15 Winter	30	+0%					61.062
2.004	12	15 Summer	30	+0%	100/15 Summer				60.549
2.005	13	15 Summer	30	+0%	100/15 Summer				60.379
2.006	14	15 Summer	30	+0%					60.122
2.007	15	15 Winter	30	+0%	100/15 Summer				59.967
1.007	16	15 Winter	30	+0%	100/15 Summer				59.861
1.008	17	15 Winter	30	+0%					59.214

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow Cap. (l/s)	Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
1.000	1	-0.111	0.000	0.15		7.3	OK	
1.001	2	-0.083	0.000	0.41		12.2	OK	
1.002	3	-0.090	0.000	0.34		15.8	OK	
1.003	4	-0.082	0.000	0.42		17.9	OK	
1.004	5	-0.079	0.000	0.46		20.6	OK	
1.005	6	-0.076	0.000	0.48		22.5	OK	
1.006	7	-0.118	0.000	0.45		28.0	OK	
2.000	8	-0.088	0.000	0.36		5.6	OK	
2.001	9	-0.075	0.000	0.50		8.1	OK	
2.002	10	-0.092	0.000	0.31		10.5	OK	
2.003	11	-0.078	0.000	0.46		13.9	OK	
2.004	12	-0.057	0.000	0.69		17.6	OK	
2.005	13	-0.061	0.000	0.64		17.4	OK	
2.006	14	-0.118	0.000	0.44		20.2	OK	
2.007	15	-0.108	0.000	0.52		23.2	OK	
1.007	16	-0.094	0.000	0.63		54.0	OK	
1.008	17	-0.124	0.000	0.41		57.8	OK	

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

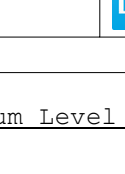
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PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
3.000	18	15 Winter	30	+0%					60.021
3.001	19	15 Summer	30	+0%					57.968
1.009	20	15 Winter	30	+0%					57.650
1.010	21	15 Winter	30	+0%					56.096
1.011	22	15 Winter	30	+0%	100/15 Summer				54.550
1.012	23	15 Winter	30	+0%	30/15 Summer				53.955
1.013	24	15 Winter	30	+0%					53.589
1.014	25	240 Winter	30	+0%	100/30 Winter				52.157
1.015	26	240 Winter	30	+0%	100/30 Winter				52.135

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	18	-0.129	0.000	0.05			2.8	OK	
3.001	19	-0.120	0.000	0.09			2.8	OK	
1.009	20	-0.122	0.000	0.43			64.9	OK	
1.010	21	-0.120	0.000	0.44			67.3	OK	
1.011	22	-0.110	0.000	0.51			67.2	OK	
1.012	23	0.151	0.000	1.60			69.2	SURCHARGED	
1.013	24	-0.115	0.000	0.47			74.2	OK	
1.014	25	-0.068	0.000	0.56		172	5.7	OK	
1.015	26	-0.068	0.000	0.08			5.7	OK	

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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 Coeffiecient	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	Ratio R	0.350
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	20.000	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 (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+45%					66.704
1.001	2	15 Winter	100	+45%					64.916
1.002	3	15 Summer	100	+45%					64.437
1.003	4	15 Summer	100	+45%					63.410
1.004	5	15 Summer	100	+45%					62.416
1.005	6	15 Winter	100	+45%					61.455
1.006	7	15 Winter	100	+45%					60.430
2.000	8	15 Winter	100	+45%					62.091
2.001	9	15 Summer	100	+45%					62.035
2.002	10	15 Summer	100	+45%					61.873
2.003	11	15 Winter	100	+45%					61.130
2.004	12	15 Winter	100	+45%	100/15 Summer				60.756
2.005	13	15 Winter	100	+45%	100/15 Summer				60.503
2.006	14	15 Winter	100	+45%					60.237
2.007	15	15 Winter	100	+45%	100/15 Summer				60.137
1.007	16	15 Winter	100	+45%	100/15 Summer				60.044
1.008	17	15 Winter	100	+45%					59.252

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
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PN	US/MH Name	Surcharged Flooded		Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)					
1.000	1	-0.096	0.000	0.28		13.8	OK	
1.001	2	-0.051	0.000	0.77		23.0	OK	
1.002	3	-0.063	0.000	0.63		29.6	OK	
1.003	4	-0.048	0.000	0.79		33.5	OK	
1.004	5	-0.042	0.000	0.86		38.7	OK	
1.005	6	-0.038	0.000	0.90		42.3	OK	
1.006	7	-0.063	0.000	0.84		53.0	OK	
2.000	8	-0.059	0.000	0.68		10.5	OK	
2.001	9	-0.035	0.000	0.94		15.2	OK	
2.002	10	-0.067	0.000	0.59		19.7	OK	
2.003	11	-0.010	0.000	0.85		25.5	OK	
2.004	12	0.150	0.000	1.23		31.5	SURCHARGED	
2.005	13	0.063	0.000	1.16		31.4	SURCHARGED	
2.006	14	-0.003	0.000	0.77		35.5	OK	
2.007	15	0.062	0.000	0.93		41.3	SURCHARGED	
1.007	16	0.089	0.000	1.07		91.6	SURCHARGED	
1.008	17	-0.086	0.000	0.69		97.3	OK	

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

for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
3.000	18	15 Winter	100	+45%					60.030
3.001	19	15 Winter	100	+45%					57.979
1.009	20	15 Winter	100	+45%					57.690
1.010	21	15 Winter	100	+45%					56.138
1.011	22	15 Winter	100	+45%	100/15 Summer				55.097
1.012	23	15 Winter	100	+45%	30/15 Summer				54.442
1.013	24	15 Winter	100	+45%					53.634
1.014	25	120 Winter	100	+45%	100/30 Winter				52.296
1.015	26	120 Winter	100	+45%	100/30 Winter				52.384

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	18	-0.120	0.000	0.09			5.3	OK	
3.001	19	-0.109	0.000	0.17			5.3	OK	
1.009	20	-0.082	0.000	0.72			109.9	OK	
1.010	21	-0.078	0.000	0.75			114.4	OK	
1.011	22	0.436	0.000	0.87			113.5	SURCHARGED	
1.012	23	0.639	0.000	2.72			118.0	SURCHARGED	
1.013	24	-0.070	0.000	0.80			126.4	OK	
1.014	25	0.071	0.000	0.98		144	9.8	SURCHARGED	
1.015	26	0.182	0.000	0.13			9.9	FLOOD RISK	

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