



14-006-03A

Part 7

Appendix H, I, J, K & L

APPENDIX H

Brownfield Runoff Calculations and Storage Estimate

Odyssey Markides LLP		Page 1
Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT EXISTING SURFACE SEWER 1YR BROWNFIELD RUNOFF	
Date 26/06/2015	Designed by SHO	
File BROWNFIELD RUNOFF RATE.MDX	Checked by SJO	
Micro Drainage		Network 2015.1

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)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	19.300	Minimum Backdrop Height (m)	0.200
Ratio R	0.350	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	20.610	0.123	168.2	0.210	4.00	0.0	0.600	o	225	
1.001	18.370	0.109	168.2	0.000	0.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (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)
1.000	50.00	4.34	8.032	0.210	0.0	0.0	0.0	1.01	40.0	28.4
1.001	50.00	4.65	7.909	0.210	0.0	0.0	0.0	1.01	40.0	28.4

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		9.080	7.800	7.800	0	0

Odyssey Markides LLP		Page 2
Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT EXISTING SURFACE SEWER 1YR BROWNFIELD RUNOFF	
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Micro Drainage		Network 2015.1

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	0
Number of Online Controls	0	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)	19.300	Cv (Winter)	0.840

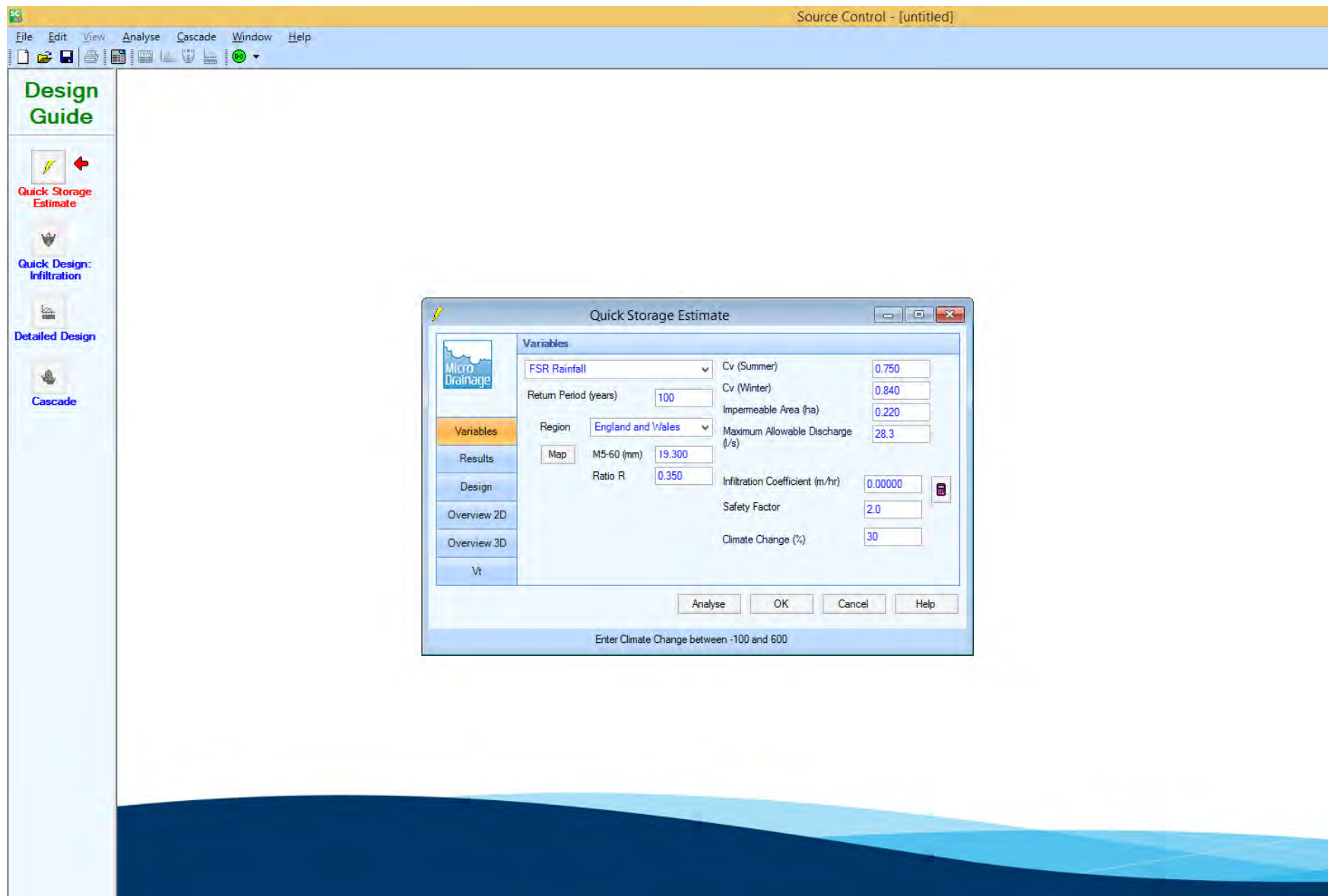
Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

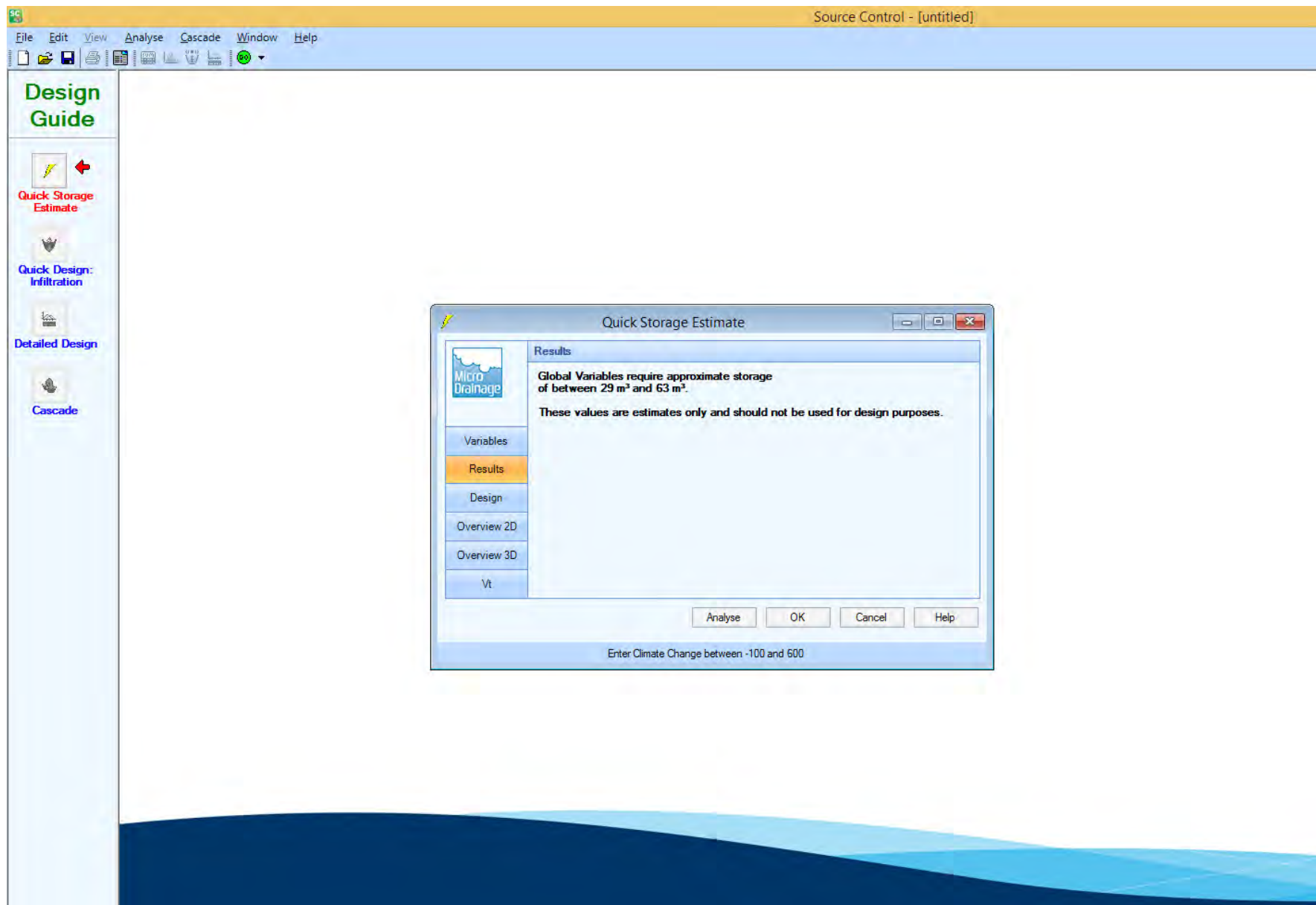
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1
Climate Change (%)	0

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%					8.184
1.001	2	15 Winter	1	+0%					8.061

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.073	0.000	0.78		28.5	OK	
1.001	2	-0.073	0.000	0.79		28.3	OK	

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APPENDIX I

Downstream Defender Design Data Sheet

Downstream Defender® Advanced Hydrodynamic Vortex Separator

The Downstream Defender® is an advanced hydrodynamic vortex separator for the effective and reliable removal of fine particles, oils and other floatable debris from surface water runoff.

Its innovative design delivers high efficiency across a wide range of flows in a much smaller footprint than conventional or other swirl-type devices and it is the perfect choice for any catchment likely to convey high quantities of contamination.

1. Access for removal of floatables and sediments.
2. Inlet pipe.
3. Inlet chute.
4. Centre shaft.
5. Dip plate.
6. Centre cone.
7. Benching skirt.
8. Floatables and oil storage.
9. Isolated sediment storage zone.
10. Outlet pipe.

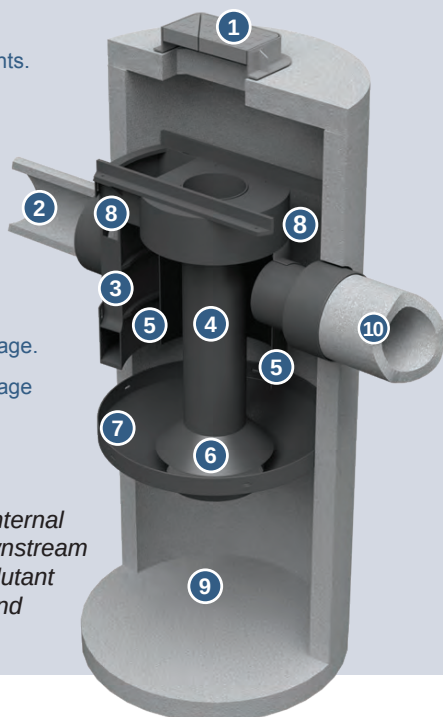


Figure 1 - The unique internal components of the Downstream Defender® enhance pollutant removal performance and prevent wash out.

Unique Flow Modifying Components

The Downstream Defender® consists of a structural concrete chamber with unique flow modifying internal components. It is these internal components that differentiate the Downstream Defender® from catchpits, sedimentation basins or sedimentation sumps. They facilitate advanced hydrodynamic vortex separation by reducing turbulence, lengthening the flow path to increase chamber residence time and introducing shear planes.

The internal components also ensure that the pollutant storage zones are isolated and protected from high flows that could cause pollutant re-entrainment or wash out.

Compared to devices that have poorly designed internal components, the Downstream Defender® captures and retains more of the annual pollutant load.

Watch a short video showing the Downstream Defender® components and operation at:

<http://www.hydro-int.com/uk/products/downstream-defender>



Repeatable, Reliable Performance

The Downstream Defender® delivers high removal of pollutants through advanced, hydrodynamic separation across a wide range of flows. The device has a proven track record of tackling an assortment of pollutants including:

Fine particles



Greater than 80% removal of fine sand particles.

See Technical Abstract: Performance Verification of Fine Sediment Removal with US Silica OK-110.

Gross Pollutants



100% of floatable debris, such as food wrappers, Styrofoam cups and drinks cartons removed in independent site trials.

Liquid and Sediment Bound Hydrocarbons



Greater than 50% removal of various forms of hydrocarbons, including free floating oils and polycyclic aromatic hydrocarbons (PAHs).

See Technical Abstract: Removal of Hydrocarbons.

Sediment Bound Heavy Metals and Nutrients

Heavy Metals

As an efficient device for removal of fine sediment, the Downstream Defender® is also effective for removal of sediment bound pollutants.

Nutrients

See Technical Abstract: Pollutant Removal Through Association with Sediments.

Design Data

Downstream Defender®

Advanced Hydrodynamic Vortex Separator

No Risk of Pollutant Wash Out

The Downstream Defender® has been specially designed to isolate the pollutant storage zones and is proven to prevent pollutant wash out. See Technical Abstract: The Importance of Pollutant Wash Out Protection.

Sizing

The Downstream Defender® can be sized for different treatment goals and objectives.

For design purposes, the selected model's Treatment Flow Rate should be greater than or equal to the site's Water Quality Flow Rate.

The hydraulic capacity of the selected model should be considered with respect to the peak discharge flow rate from the site.

Model Diameter (m)	Treatment Flow Rate (l/s) ^{a)}	Hydraulic Capacity (l/s) ^{b)}	Oil Storage Capacity (l)	Sediment Storage Capacity (m³)
1.2	42	120	270	0.7
1.8	119	300	1350	1.7
2.55	150	600	2500	3.8
3.0	250	750	4650	4.4

Notes:

- a) Treatment flow rates based on >80% removal of US Silica Sand OK110 with no flow bypass. Sizing based on removal of finer or coarser sediment ranges or for free oil removal can be provided if required.
- b) Maximum flow rate that can pass through the chamber without surcharge to the upstream network.

Head loss at the treatment flow rate is typically less than 150 mm.

Table 1 - Downstream Defender® design information.

Expert Design Service

Hydro's professional engineers are on hand to provide free support with the correct sizing and selection of the Downstream Defender® within each drainage design.

We can also provide estimated maintenance intervals, whole life cost estimates and predicted pollutant removal performance.

Call the StormTrain® Hotline on: 01275 337955 or email stormtrain@hydro-int.com

Setting Out

The Downstream Defender® can accommodate a change in pipe direction to suit site specific requirements. Combined with the high rate internal bypass, this helps to avoid the need for additional manholes on site. Head loss across the chamber is kept to a minimum (see Table 1).

The inlet and outlet pipes should be sized in accordance with Table 2 (opposite), and a minimum of 90 degrees between inlet and outlet is required.

Inlet and outlet pipe connections are at the same invert level.

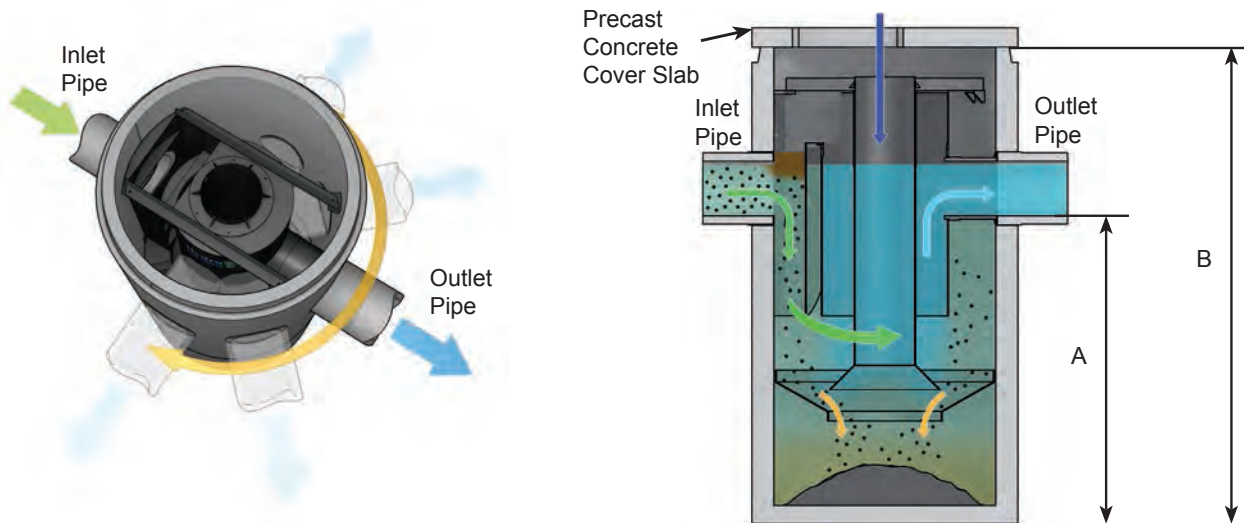
Additional manhole sections can be provided to extend the chamber to meet site cover and invert levels or provide additional pollutant storage where required.



Design Data

Downstream Defender®

Advanced Hydrodynamic Vortex Separator



Dimensions and Weights

General arrangement drawings of all units are available for download from:

<http://www.hydro-int.com/uk/products/downstream-defender>

Unit	External Diameter of Unit (mm)	Inlet & Outlet Pipe Diameter (mm)	Depth (m)			Lift Weight (t)
			A	B	Component Depth ^{a)}	
1.2 m Sealed Manhole System with HD Cover Slab	1460	300	1.910	2.600	2.830	
HD Cover Slab ^{b)}					0.230	0.6
Base Section					0.825	1.5
Top Section					1.765	2.5
1.8 m Sealed Manhole System with HD Cover Slab	2160	450	2.510	3.800	4.050	
HD Cover Slab ^{b)}					0.290	1.4
Base Section					1.235	5.0
Top Section					2.485	8.0
2.55 m System with HD Cover Slab	2850	600	2.950	4.750	4.950	
HD Cover Slab ^{b)}					0.200	2.8
Base Section					1.750	8.0
Top Section					3.000	10.0
3.0 m System with HD Cover Slab	3350	750	3.125	5.000	5.200	
HD Cover Slab ^{b)}					0.200	4.6
Base Section					2.000	12.5
Top Section					3.000	14.0
Notes:						
a) Base and Top Section component depths are shown as the total height during transportation / before assembly on site. The total depth is the depth of the assembled unit.						
b) Cover slabs are heavy duty, suited for highways loading and are supplied with one or two access openings for maintenance.						
c) Inlets and outlets are supplied with cast-in holes only. No stub pipes are provided.						
Dimensional Tolerances: Height ± 25 mm; Diameter ± 12 mm; Wall Thickness ± 10 mm						

Table 2 - Downstream Defender® dimensions and weights.

Design Data

Downstream Defender®

Advanced Hydrodynamic Vortex Separator

Easy to Install

The Downstream Defender® is typically delivered to site as a precast concrete manhole with internal components already installed. Installation is therefore similar to any other manhole installation on site. Full installation guidelines are available.

Lightweight High Density Polyethylene (HDPE) chambers can be provided where installation of a concrete manhole is not practical.

Easy to Maintain

Maintenance of the Downstream Defender® is simple, safe and cost-effective. Maintenance is carried out from the surface, using a standard vacuum tanker and personnel are not required to enter the device.

With a large capacity to store sediments and oils (see Table 1), and with a proven ability to prevent wash out, maintenance intervals can be years rather than months - depending on site conditions.

Additional pollutant storage can be built into the chamber to extend maintenance intervals if required.

Watch a short video showing the Downstream Defender® maintenance at:

<http://www.hydro-int.com/uk/products/downstream-defender>



Downstream Defender® Technical Guidance



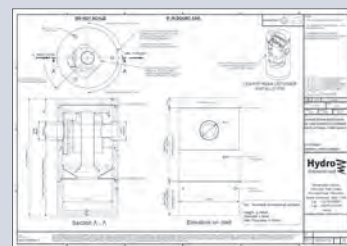
Technical Abstracts



Case Studies



Installation and Maintenance Guidelines



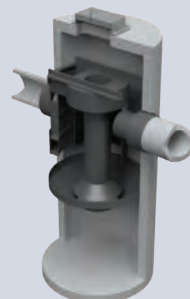
General Arrangement Drawings

The Hydro StormTrain® Series of Surface Water Treatment Devices

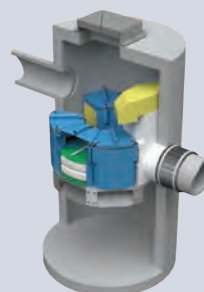
The Downstream Defender® is one of the Hydro StormTrain® Series of surface water treatment devices. Each device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific needs of a site or combined to form a management train. They can be used alongside natural SuDS features to protect, enable or enhance them.



First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodynamic
Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow
Filtration System



Hydro BioCell™
Bioretention System

APPENDIX J

Surface Water Drainage Strategy and Drainage Network Calculations

DRAINAGE STRATEGY NOTES:

1. ALL BELOW GROUND DRAINAGE TO COMPLY WITH PART H OF THE BUILDING REGULATIONS.
2. PROPOSED CONNECTION TO THE EXISTING SURFACE WATER NETWORK SUBJECT TO A SECTION 106 AGREEMENT WITH SOUTHERN WATER.
3. EXISTING DRAINAGE REGIME AND CONNECTIONS TO BE REVIEWED AT DETAILED DESIGN STAGE AND UTILIZED WHERE POSSIBLE.
4. SURFACE WATER RUN OFF FROM ROOF AND SURROUNDING HARDSTANDING AREAS TO DISCHARGE TO CELLULAR ATTENUATION UNITS FITTED WITH ORIFICE FLOW CONTROL UNIT LOCATED AT BASEMENT CARPARK, SUBJECT TO DETAILED DESIGN DEVELOPMENT. STORMCELL OR SIMILAR APPROVED.
5. A PUMP UNIT IS REQUIRED TO CONVEY SURFACE WATER FROM BASEMENT AND ROOFTOP AREAS TO THE PROPOSED SURFACE WATER SEWER AT GROUND LEVEL..
6. A DOWNSTREAM DEFENDER UNIT IS REQUIRED AT MANHOLE UPSTREAM OF THE PUMP UNIT TO HELP REDUCE POLLUTANTS. REFER TO HYDRO INTERNATIONAL FOR PRODUCT SPECIFICATION.

Havant Station

Havant Railway Station

TCBs

NORTH STREET

Station House

BASEMENT CARPARK
Ba... 58 SPACES

PROPOSED FLOW CONTROL UNIT

PROPOSED SURFACE WATER DRAINAGE
TO BE CONNECTED TO EXISTING
MANHOLE REF. 8551 SUBJECT TO EXISTING
CONNECTION REVIEW.

PROPOSED PUMP UNIT FOR CONVEYING SURFACE
WATER RUNOFF FROM BASEMENT CAR PARK AND
ROOFTOP. WITH DESIGN FLOW RATE EQUIVALENT
TO THE EXISTING 1 YEAR BROWNFIELD RATE.

PROPOSED DOWNSTREAM DEFENDER UNIT TO HELP
REDUCE POLLUTANTS

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE ODYSSEY MARKIDES NPPF FLOOD RISK ASSESSMENT REPORT FOR PROJECT 14-006-03.
3. SURROUNDING TOPOGRAPHICAL DATA AND SERVICES SURVEY HAS BEEN PROVIDED BY SOLENT SURVEYS IN DRAWING 13355/S1. ODYSSEY MARKIDES CONSULTING ENGINEERS DOES NOT TAKE RESPONSIBILITY FOR THE ACCURACY OF THE SURVEY INFORMATION.
4. SITE LAYOUT HAS BEEN PROVIDED BY HGP ARCHITECTS, DRAWING 13/077/001.
5. PROPOSED RUN-OFF FROM SITE TO BE CONVEYED TO THE EXISTING SURFACE WATER NETWORK AND TO MATCH PRE DEVELOPMENT 1 YEAR BROWNFIELD RUN-OFF RATES.
6. PROPOSALS ARE INDICATIVE ONLY TO DEMONSTRATE THE SURFACE WATER DRAINAGE STRATEGY AND ARE SUBJECT TO EVOLVE IN LINE WITH DETAILED DESIGN REQUIREMENTS FOLLOWING OUTLINE PLANNING PERMISSION.
7. THE AVOIDANCE AND PROTECTION OF SERVICES DURING THE WORKS IS THE RESPONSIBILITY OF THE CONTRACTOR.
8. THE CONTRACTOR IS REMINDED OF HIS OBLIGATION TO VERIFY THE ROUTE OF ALL SERVICES ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
9. THE CONTRACTOR SHOULD ALLOW FOR ANY NECESSARY LIAISON WITH THE STATUTORY UTILITIES DURING THE COURSE OF THE WORKS TO AVOID ANY DISRUPTION TO EXISTING CUSTOMER SUPPLIES.
10. THE CONTRACTOR SHOULD NOTE THAT THE SERVICES SHOWN ARE NOT TO BE CONSIDERED EXHAUSTIVE. PRIVATE SERVICES MAY BE PRESENT WITHIN THE LIMIT OF WORKS AND CARE SHOULD BE TAKEN TO LOCATE AND AVOID THESE DURING CONSTRUCTION.

KEY

— SITE BOUNDARY

— PROPOSED SURFACE WATER
SEWER AND MANHOLE

— PROPOSED CELLULAR STORAGE

— EXISTING SURFACE WATER SEWER
WITH MANHOLE

— CULVERTED LAVANT STREAM

FOR PLANNING
PURPOSES ONLY

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W: www.odysseymarkides.com

Job Title
**MARKET PARADE, HAVANT
HAMPSHIRE**

Drawing Title
**SURFACE WATER
DRAINAGE STRATEGY**

Client
**HAMPSHIRE & REGIONAL
PROPERTY GROUP**

Scale 1:200@A1	Date JUN 15	Designed SH
Drawn SH	Checked SJO	Approved LH
Job No 14-006	Drawing No 14-006/002	Rev A

PROPOSED CATCHMENTS AREAS:

ROOF AREA:	2017.18m ²
FOOTWAY AREA:	220.35m ²
TOTAL:	2237.53m ²
SAY	≈ 2200m ²

CELLULAR STORAGE

PLAN AREA = 129.6m²
CELLULAR STORAGE (95% VOID) DEPTH = 0.5mm
PROVIDED STORAGE VOLUME = 61.56cu. m

	AREA (m ²)	DISCHARGE (l/s)
1 IN 1 YEAR BROWNFIELD	2100	Q1 years = 28.3
PROPOSED DEVELOPMENT	2200	Q100 years = 28.3 + 30%

Odyssey Markides LLP		Page 1
Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE NETOWRK CALCULATION	
Date 07/08/2015	Designed by SHO	
File STORM NETWORK SIMULATIO...	Checked by SJO/LH	
Micro Drainage		Network 2015.1

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	2.400	0.015	160.0	0.220	4.00	0.0	0.600	o	225
1.001	3.230	0.015	215.3	0.000	0.00	0.0	0.600	o	300
1.002	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	300
1.003	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	300
1.004	14.040	-2.965	-4.7	0.000	0.00	0.0	0.600	o	225
1.005	4.600	0.032	143.8	0.000	0.00	0.0	0.600	o	225
1.006	10.520	0.020	526.0	0.000	0.00	0.0	0.600	o	600

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	5.587	0.220	0.0	1.03	41.0
1.001	5.297	0.220	0.0	1.07	75.5
1.002	5.282	0.220	0.0	1.11	78.3
1.003	5.272	0.220	0.0	1.11	78.3
1.004	5.262	0.220	0.0	0.00	0.0
1.005	8.227	0.220	0.0	1.09	43.3
1.006	7.820	0.220	0.0	1.05	298.2

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Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE NETOWRK CALCULATION	
Date 07/08/2015 File STORM NETWORK SIMULATIO...	Designed by SHO Checked by SJO/LH	
Micro Drainage	Network 2015.1	

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	225	1	6.712	5.587	0.900	Open Manhole	1200
1.001	o	300	Cellular Storage	6.712	5.297	1.115	Open Manhole	1200
1.002	o	300	Flow Control	6.712	5.282	1.130	Open Manhole	1200
1.003	o	300	DD	6.712	5.272	1.140	Open Manhole	1200
1.004	o	225	Pump	6.712	5.262	1.225	Open Manhole	1200
1.005	o	225	2	8.952	8.227	0.500	Open Manhole	1200
1.006	o	600	3	8.920	7.820	0.500	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	2.400	160.0	Cellular Storage	6.712	5.572	0.915	Open Manhole	1200
1.001	3.230	215.3	Flow Control	6.712	5.282	1.130	Open Manhole	1200
1.002	2.000	200.0	DD	6.712	5.272	1.140	Open Manhole	1200
1.003	2.000	200.0	Pump	6.712	5.262	1.150	Open Manhole	1200
1.004	14.040	-4.7	2	8.952	8.227	0.500	Open Manhole	1200
1.005	4.600	143.8	3	8.920	8.195	0.500	Open Manhole	1200
1.006	10.520	526.0	Ex MH 8551	9.080	7.800	0.680	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)
1.006	Ex MH 8551	9.080	7.800	0.000	0	0

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Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE NETOWRK CALCULATION	
Date 07/08/2015	Designed by SHO	
File STORM NETWORK SIMULATIO...	Checked by SJO/LH	
Micro Drainage	Network 2015.1	

Online Controls for Storm

Orifice Manhole: Flow Control, DS/PN: 1.002, Volume (m³): 1.8

Diameter (m) 0.168 Discharge Coefficient 0.600 Invert Level (m) 5.282

Pump Manhole: Pump, DS/PN: 1.004, Volume (m³): 1.7

Invert Level (m) 5.262

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	28.3000	1.200	28.3000	3.000	28.3000	7.000	28.3000
0.200	28.3000	1.400	28.3000	3.500	28.3000	7.500	28.3000
0.300	28.3000	1.600	28.3000	4.000	28.3000	8.000	28.3000
0.400	28.3000	1.800	28.3000	4.500	28.3000	8.500	28.3000
0.500	28.3000	2.000	28.3000	5.000	28.3000	9.000	28.3000
0.600	28.3000	2.200	28.3000	5.500	28.3000	9.500	28.3000
0.800	28.3000	2.400	28.3000	6.000	28.3000		
1.000	28.3000	2.600	28.3000	6.500	28.3000		

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Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE NETOWRK CALCULATION	
Date 07/08/2015	Designed by SHO	
File STORM NETWORK SIMULATIO...	Checked by SJO/LH	
Micro Drainage		Network 2015.1

Storage Structures for Storm

Cellular Storage Manhole: Cellular Storage, DS/PN: 1.001

Invert Level (m) 5.297 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	129.6	0.0	0.600	0.0	0.0
0.500	129.6	0.0			

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Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE 1YR, 30YR & 100YR	
Date 07/08/2015	Designed by SHO	
File STORM NETWORK SIMULATIO...	Checked by SJO/LH	
Micro Drainage		Network 2015.1

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 1
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 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.300 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440, 2160, 2880, 4320, 5760,
7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
1.000		1 15 Winter	1	+0%	30/15 Summer		
1.001	Cellular Storage	180 Winter	1	+0%	30/60 Winter		
1.002	Flow Control	180 Winter	1	+0%	30/30 Winter		
1.003	DD	180 Winter	1	+0%			
1.004	Pump	180 Winter	1	+0%			
1.005		2 120 Winter	1	+0%			
1.006		3 120 Winter	1	+0%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000		1	5.804	-0.008	0.000	1.00		28.1	OK
1.001	Cellular Storage		5.462	-0.135	0.000	0.08		3.8	OK
1.002	Flow Control		5.476	-0.106	0.000	0.06		3.0	OK
1.003	DD		5.319	-0.253	0.000	0.06		3.1	OK

Odyssey Markides LLP		Page 2
Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE 1YR, 30YR & 100YR	
Date 07/08/2015	Designed by SHO	
File STORM NETWORK SIMULATIO...	Checked by SJO/LH	
Micro Drainage		Network 2015.1

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

PN	US/MH Name	Overflow Act.	Water Surcharged Flooded			Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
			Level (m)	Depth (m)	Volume (m ³)				
1.004	Pump		5.273	-0.214	0.000	0.27		3.0	OK
1.005	2		8.276	-0.176	0.000	0.10		3.0	OK
1.006	3		7.884	-0.536	0.000	0.02		3.1	OK

PN	US/MH Name	Level Exceeded
1.000		1
1.001	Cellular Storage	
1.002	Flow Control	
1.003	DD	
1.004	Pump	
1.005	2	
1.006	3	

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Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE 1YR, 30YR & 100YR	
Date 07/08/2015 File STORM NETWORK SIMULATIO...	Designed by SHO Checked by SJO/LH	
Micro Drainage	Network 2015.1	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.004	Pump		5.308	-0.179	0.000	1.16		12.9
1.005	2		8.330	-0.122	0.000	0.43		12.9
1.006	3		7.941	-0.479	0.000	0.09		12.9

PN	US/MH Name	Status	Level Exceeded
1.000		1	SURCHARGED
1.001	Cellular Storage		SURCHARGED
1.002	Flow Control		SURCHARGED
1.003	DD		OK
1.004	Pump		OK
1.005	2		OK
1.006	3		OK

Odyssey Markides LLP		Page 5
Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE 1YR, 30YR & 100YR	
Date 07/08/2015 File STORM NETWORK SIMULATIO...	Designed by SHO Checked by SJO/LH	
Micro Drainage	Network 2015.1	

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 1
 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 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.300 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760,
 7200, 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000		1 15 Winter	100	+0%	30/15 Summer			
1.001	Cellular Storage	60 Winter	100	+0%	30/60 Winter			
1.002	Flow Control	60 Winter	100	+0%	30/30 Winter			
1.003	DD	60 Winter	100	+0%				
1.004	Pump	60 Winter	100	+0%				
1.005		2 60 Winter	100	+0%				
1.006		3 60 Winter	100	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Pipe Flow / Cap. (l/s)	Overflow (l/s)	Status
1.000		1 6.235	0.423	0.000	3.27	91.9	SURCHARGED
1.001	Cellular Storage	5.673	0.076	0.000	0.40	20.3	SURCHARGED
1.002	Flow Control	5.667	0.085	0.000	0.37	20.2	SURCHARGED
1.003	DD	5.399	-0.173	0.000	0.37	20.2	OK

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Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE 1YR, 30YR & 100YR	
Date 07/08/2015 File STORM NETWORK SIMULATIO...	Designed by SHO Checked by SJO/LH	
Micro Drainage	Network 2015.1	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.004	Pump	5.333	-0.154	0.000	1.81		20.2	OK
1.005	2	8.363	-0.089	0.000	0.68		20.2	OK
1.006	3	7.969	-0.451	0.000	0.14		20.2	OK

PN	US/MH Name	Level Exceeded
1.000		1
1.001	Cellular Storage	
1.002	Flow Control	
1.003	DD	
1.004	Pump	
1.005	2	
1.006	3	

Odyssey Markides LLP		Page 2
Tuscany House White Hart Lane Basingstoke RG21 4AF	MARKET PARADE, HAVANT SURFACE WATER DRAINAGE 100 YEAR + 30% CC	
Date 07/08/2015 File STORM NETWORK SIMULATIO...	Designed by SHO Checked by SJO/LH	
Micro Drainage	Network 2015.1	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.004	Pump		5.355	-0.132	0.000	2.37		26.4
1.005	2		8.393	-0.059	0.000	0.88		26.3
1.006	3		7.994	-0.426	0.000	0.18		26.4

PN	US/MH Name	Status	Level Exceeded
1.000		1 FLOOD RISK	
1.001	Cellular Storage	SURCHARGED	
1.002	Flow Control	SURCHARGED	
1.003	DD	OK	
1.004	Pump	OK	
1.005	2	OK	
1.006	3	OK	

APPENDIX K

Foul Water Drainage Strategy

DRAINAGE STRATEGY NOTES:

1. ALL BELOW GROUND DRAINAGE TO COMPLY WITH PART H OF THE BUILDING REGULATIONS.
2. PROPOSED CONNECTION TO THE EXISTING FOUL WATER NETWORK SUBJECT TO A SECTION 106 AGREEMENT WITH SOUTHERN WATER.
3. EXISTING DRAINAGE REGIME AND CONNECTIONS TO BE REVIEWED AT DETAILED DESIGN STAGE AND UTILIZED WHERE POSSIBLE.

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE ODYSSEY MARKIDES NPPF FLOOD RISK ASSESSMENT REPORT FOR PROJECT 14-006-03.
3. SURROUNDING TOPOGRAPHICAL DATA AND SERVICES SURVEY HAS BEEN PROVIDED BY SOLENT SURVEYS IN DRAWING 13355/S/1. ODYSSEY MARKIDES CONSULTING ENGINEERS DOES NOT TAKE RESPONSIBILITY FOR THE ACCURACY OF THE SURVEY INFORMATION.
4. SITE LAYOUT HAS BEEN PROVIDED BY HGP ARCHITECTS, DRAWING 13/077/001.
6. PROPOSALS ARE INDICATIVE ONLY TO DEMONSTRATE THE FOUL WATER DRAINAGE STRATEGY AND ARE SUBJECT TO EVOLVE IN LINE WITH DETAILED DESIGN REQUIREMENTS FOLLOWING OUTLINE PLANNING PERMISSION.
7. THE AVOIDANCE AND PROTECTION OF SERVICES DURING THE WORKS IS THE RESPONSIBILITY OF THE CONTRACTOR.
8. THE CONTRACTOR IS REMINDED OF HIS OBLIGATION TO VERIFY THE ROUTE OF ALL SERVICES ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS.
9. THE CONTRACTOR SHOULD ALLOW FOR ANY NECESSARY LIAISON WITH THE STATUTORY UTILITIES DURING THE COURSE OF THE WORKS TO AVOID ANY DISRUPTION TO EXISTING CUSTOMER SUPPLIES.
10. THE CONTRACTOR SHOULD NOTE THAT THE SERVICES SHOWN ARE NOT TO BE CONSIDERED EXHAUSTIVE. PRIVATE SERVICES MAY BE PRESENT WITHIN THE LIMIT OF WORKS AND CARE SHOULD BE TAKEN TO LOCATE AND AVOID THESE DURING CONSTRUCTION.

KEY

- SITE BOUNDARY
- PROPOSED FOUL SEWER AND MANHOLE
- EXISTING FOUL SEWER WITH MANHOLE

FOR PLANNING PURPOSES ONLY

A	UPDATED TO CLIENTS COMMENTS	SH	SJO/LH	09/09/15
Rev	Amendments	Drm	Chk	App

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Job Title MARKET PARADE, HAVANT HAMPSHIRE		
Drawing Title FOUL WATER DRAINAGE STRATEGY		
Client HAMPSHIRE & REGIONAL PROPERTY GROUP		
Scale 1:200@A1	Date JUN 15	Designed SH
Drawn SH	Checked SJO	Approved LH
Job No 14-006	Drawing No 14-006/003	Rev A

APPENDIX L
Existing and Proposed Foul Water Discharge Calculations

Project			Reference		Sheet No	
Market Parade, Havant, Hampshire			14-006		1	
Purpose			Calcs By	Date	Checked	Date
Existing and Proposed Peak Foul Discharging Rate			SHO	11/06/15	LH	28/07/15
Ref	Calculation					Output
	<u>Introduction</u> The former three storey terraced building site has been proposed for re-development of circa 130 apartments with 1,166m sq of ground floor commercial space and associated infrastructure and 58 basement parking spaces. The following calculations have been undertaken to provide evidence that the existing foul sewer networks can accommodate the change of existing premise to 130 apartments with 6 commercial (A1-A5 and B1a uses) units on the ground floor as a result of the re-development of the site. ----- <u>Existing Foul Drain</u> The former development was a three storey terraced building comprising 14 x 2-bed flat over the first and second floors with 516m sq of commercial/retail floor area on the ground floor. The peak foul water discharging rate from the existing site have been calculated based on the total no. of pupils and Thames Water’s daily peak discharging rate. <u>Sewers for Adoption</u> Sewers for Adoption advises hydraulic design for peak foul discharge is based on design flow rates for dwellings at 4000 litres per dwelling per day. Therefore in accordance with Sewers for Adoption the peak discharge rate from the 14 dwellings within this existing development equates to: 14 x (4000 ÷ 24 ÷ 3600) = 14 x 0.0463 = 0.648 l/s. <u>Thames Water’s Daily Peak Discharging Rate</u> Thames Water has produced a schedule of Daily Peak Discharge flow rates for various types of building usage, and advises that the hydraulic design for peak foul discharge for commercial premises is 1980 litres per 100m sq per day (Assumed 10 hours a day for commercial). Therefore in accordance with Thames Water the peak discharge rate from the total commercial floor space of 516m sq within this existing development equates to: 516 x (1980 ÷ 10 ÷ 3600) ÷ 100 = 516 x 0.00055 = 0.284 l/s.					

Total Peak Discharging Rate from the Existing Development

Therefore based on the calculation, the total peak foul discharging rate from the existing development equates to:

$$0.648 + 0.284 = 0.932 \text{ l/s}$$

Peak Foul Discharge from the Proposed Re-Development

The method of calculating foul flows used in determining the peak discharge rate from the development is in accordance with Sewers for Adoption 7th Edition and Thames Water's daily peak discharging rate.

Sewers for Adoption

Sewers for Adoption advises hydraulic design for peak foul discharge is based on design flow rates for dwellings at 4000 litres per dwelling per day.

Therefore in accordance with Sewers for Adoption the peak discharge rate from the 130 dwellings within this development equates to:

$$130 \times (4000 \div 24 \div 3600) = 130 \times 0.0463 = 6.019 \text{ l/s.}$$

Thames Water's Daily Peak Discharging Rate

Thames Water has produced a schedule of Daily Peak Discharge flow rates for various types of building usage, and advises that the hydraulic design for peak foul discharge for commercial premises is 1980 litres per 100m sq per day (Assumed 10 hours a day for commercial).

Therefore in accordance with Thames Water the peak discharge rate from the total commercial floor space of 1,166m sq within this development equates to:

$$1166 \times (1980 \div 10 \div 3600) \div 100 = 1166 \times 0.00055 = 0.641 \text{ l/s.}$$

Total Peak Discharging Rate from the Proposed Re-Development

Therefore based on the calculation, the total peak foul discharging rate from the proposed re-development equates to:

$$6.019 + 0.641 = 6.66 \text{ l/s}$$

Conclusion

The above calculations show the peak foul discharge rate from the existing development site to be 0.932 l/s. The peak foul discharge rate from the proposed development of 6.66 l/s generates an increase flow to the existing Southern Water sewers in the order of 5.728 l/s.