Detailed Design Drainage Statement

Sadlers Hall Farm, Basildon

Project Reference: EX2208509

SuDS DESIGNS

Contents

Figures

Revisions and Additional Material

Document History and Status

Revision	Date	Purpose/Status
-	November 2022	First Issue
A	August 2023	Revision to accord with LLFA comments (Dec 2022)
B	September	Revision to accord with LLFA comments (Sept 2023)

Document Details

Project Number	EX2208509
Project Director	David Brunning

Preamble

This report has been prepared by SuDS Designs, a trading name of JMS Engineers (Chelmsford) Ltd. on the instructions of the Client and for the sole use and benefit of the Client.

JMS Engineers shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared and provided. If the Client wishes to pass copies of the report to other parties for information, the whole of the report should be copied. No professional liability or warranty is extended to other parties by JMS Engineers. because of permitting the report to be copied or by any other cause without the express written agreement of JMS Engineers

The conclusions and recommendations made in this report are limited to those that can be made based on the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside of the stated scope of the research. Any comments made based on information obtained from third parties are given in good faith on the assumption that the information is accurate. No independent validation of third-party information has been made by JMS Engineers

1 Introduction

1.0.1 SuDS Designs have been appointed to prepare a drainage strategy to accompany a planning application. As part of the proposals, this report will assess the potential impact from alterations to the site drainage, and the surface water characteristics are considered within the scope of the parameters set out in the National Planning Policy Framework (NPPF) and Technical Guidance to the NPPF

1.0.2 This report will also review the requirements set out by Essex County Council as the Lead Local Flood Authority (LLFA)

1.1 Site Proposals

1.1.1 The proposals are construction of an industrial estate for employment use and associated infrastructure works, to include a large attenuation system with outfall into existing drainage system

2 SuDS Considerations

2.0.1 Consideration of SuDS are a planning requirement for new developments. SuDS are designed to replicate the natural course of drainage as closely as possible with a view to reducing the impact of flooding, removing pollutants at source, and combining water management with green space.

Developments should utilise SuDS where possible and ensure that surface water run-off is managed as close to its source as possible in line with the following hierarchy:

1. Into ground (infiltration).
2. To a surface water body.
3. To a surface water sewer.
4. To a combined sewer.

2.0.2 Sustainable Drainage Systems should be included in the design to manage surface water flood risk. SuDS should be inspired by natural drainage processes and manage water as close to its source as possible whilst offering pollution control and landscape benefits.

2.1 SuDS Incorporation

Component Type	Description	Design Criteria							
		Collection Mechanism	Water Quantity (Chapter 3)			Water Quality (Chapter 4)	Amenity (Chapter 5)	Biodiversity (Chapter 6)	Further Information (Chapter Ref)
			Peak Runoff Rate	Runoff Volumes					
				Events (Interceptions)	Large Events				
Rainwater Harvesting Systems	Systems that collect runoff from the roof of a building or other paved surface for use	P		●	●		●		11
Green roofs	Planted soil layers on the roof of buildings that slow and store runoff	S	○	●		●	●	●	12
Infiltration systems	Systems that collect and store runoff, allowing it to infiltrate into the ground	P	●	●	●	●	●	●	13
Proprietary treatment systems	Subsurface structures design to provide treatment to runoff	P				●			14
Filter strips	Grass strips hat promote sedimentation and filtration as runoff is conveyed over the surface	L		●		●	○	○	15

Filter drains	Shallow stone-filled trenches that provide attenuation, conveyance and treatment of runoff	L	●	○		●	○	○	16
Swales	Shallow landscaped depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils	L	●	●	●	●	●	●	17
Bioretention systems	Trees with soil-filled tree pits, tree planters or structural soils used to collect, store and treat runoff	P	●	●	●	●	●	●	18
Trees	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	P	●	●		●	●	●	19
Pervious pavements	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	S	●	●	●	●	○	○	20
Attenuation storage tanks	Large, below-ground voided spaces used to temporarily store runoff before infiltration-controlled release or use	P	●						21
Detention basins	Vegetated depressions that store and treat runoff	P	●	●		●	●	●	22
Ponds and wetlands	Permanent pools of water used to facilitate treatment of runoff – runoff can also be stored in an attenuation zone above the pool	P	●			●	●	●	23
P-Point L-Lateral S-Surface ● – likely valuable contribution to delivery of design criterion ○ - some potential contribution to delivery of design criterion, if specifically included in the design									

Figure 1 CIRIA Table 7.1 SuDS Components

2.1.1 The above table gives examples of various SuDS components, which may offer source control in accordance with the requirements.

2.1.2 In accordance with Table 26.2 of CIRIA Report C753, the pollution hazard level can be classified as 'high', as below.

Land Use	Pollution Hazard Level	Total suspended Solids (TSS)	Metals	Hydro-carbons
Residential Roofs	Very Low	0.2	0.2	0.05
Other Roofs (typically commercial / industrial roofs	Low	0.3	0.2 (up to 0.2 where there is potential for metals to leach from the roof)	0.05

Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change i.e < 300 traffic movements / day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads / motorways	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) are to be delivered, handled, stored, used or manufactured; industrial sties, trunk roads and motorways.	High	0.8	0.8	0.9

Figure 2 Table 26.2 of CIRIA Report C753 - Pollution hazard indices for different land use classifications

2.1.3 Pollution indices from different land types can be found per as per table 26.15 CIRIA SuDS Manual 2015, below, and it is confirmed that the mitigation indices values exceed the hazards.

SuDS Type	Total suspended solids pollution index (PI_{TSS})	Hydrocarbon pollution index (PI_{PAD})	Organic pollution index (PI_{Orgi})	Metals Pollution index (PI)
Filter Drains	0.6	0.8	0.7	0.7
Porous Asphalt	0.7	0.9	0.9	0.9
Porous Paving	0.2	0.3	0.2	0.3
Sedimentation tank	0.95	0.95	0.95	0.95
Green Roof	0.8-0.9	0.9	0.5	0.7-0.9
Filter Strip	0.9	0.8	0.8	0.7
Swales	0.7	0.6	0.4	0.4
Soakaways	0.3	0.6	0.5	0.5
Infiltration Trench	0.3	0.6	0.5	0.5
Infiltration Basin	0.05	0.05	0.01	0.05
Retention pond	0.6	0.5	0.6	0.5
Detention Basin	0.7	0.7	0.8	0.6
Lagoons	0.9	0.9	0.9	0.8
Constructed Wetlands				

• **Subsurface flow** • **Surface flow**	0.2 0.4	0.1 0.2	0.1 0.2	0.1 0.2
Conventional gully and pipe drainage	1.0	1.0	1.0	1.0

Figure 3 Pollution mitigation indices for different SuDS components and conventional pipe drainage

2.1.4 In addition to the above, the SPEL Stormceptor has been proposed which also offers TSS – 0.8, Metals – 0.6, and Hydrocarbons -0.9. Additional protection is given by the D-Rainclean retrofit for the channel existing channel drains, as per the appended specification

2.2 Climate Change

2.2.1 The appended drainage calculation allows for a 1:100-year storm plus 45% climate change, this has been sourced from the [DEFRA Hydrology Data Explorer for Climate Change Allowances](), as below.

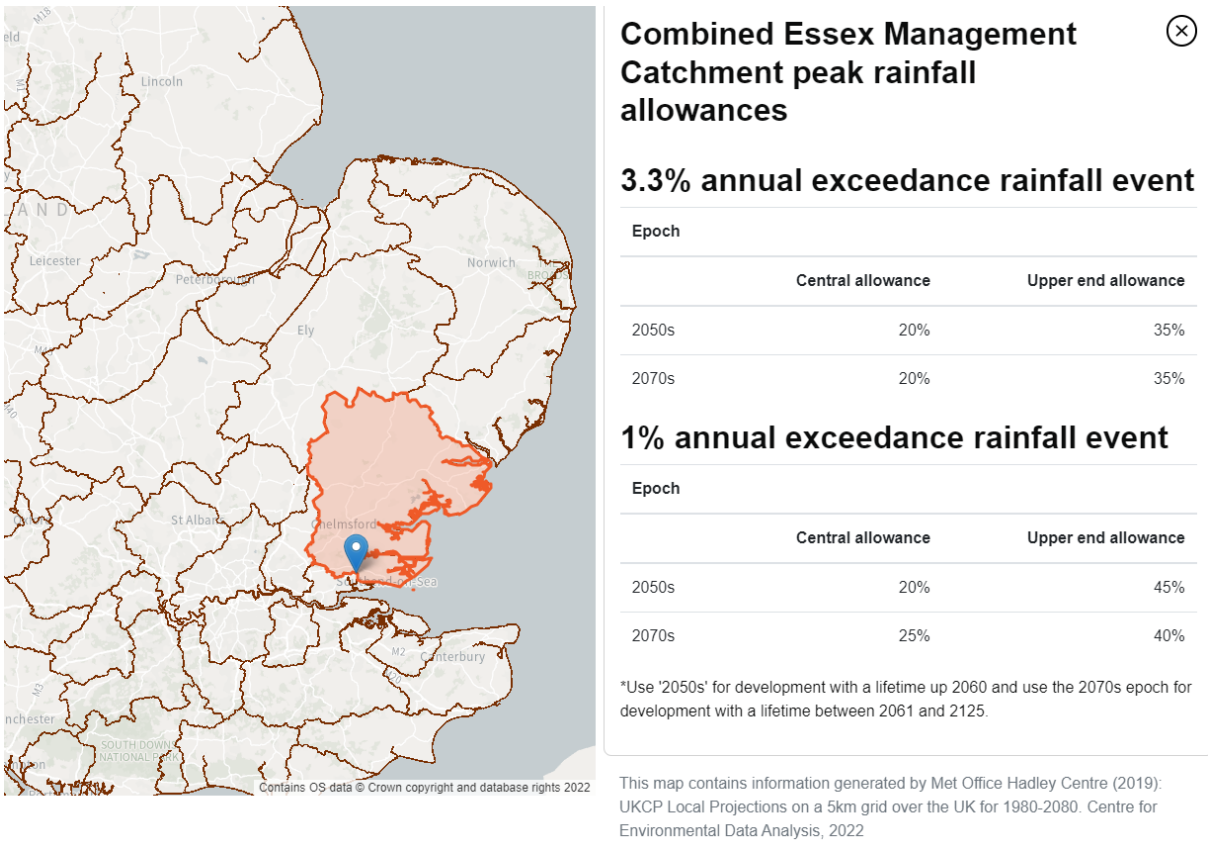


Figure 4 climate change allowances for peak rainfall in England by catchment area

2.2.2 Safety factors have been cautiously applied to demonstrate the effectiveness of this development in reducing flood risk. The safety factors that have been applied are referenced from Table 25.2 of CIRIA SuDS Manual 2015.

3 Surface Water Strategy

3.0.1 The proposals are to mitigate the existing as-built drainage system; the drainage network has therefore been designed to capture surface runoff, while providing water quality enhancements and reducing the potential for surface water flooding.

3.0.2 In accordance with local and national SuDS policies, the hierarchy has been followed and when infiltration is unavailable, then outfall into positive drainage system is plausible

3.0.3 The design storm event is 1 in 100yr + 45% climate uplift, with flow control to 4.2 l/s as per the greenfield runoff calculations.

3.0.4 A by-pass separator is proposed upstream of the outfall, as appended

3.1 Management and Maintenance Regime

To be handled by the site owner – Peter Colby Commercial

Table 1– Rainwater Pipes, and Chambers: System storage operation and maintenance requirements

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspection of silt trap chamber and removal of debris when necessary	Quarterly or as required following monitoring
Remedial Actions	Check for blockages in manholes and pipes. Rodding and jetting of pipes to be carried out. CCTV survey can be carried out to inspect condition of pipework	Quarterly or as required following monitoring
Monitoring	Inspect collection apparatus for debris and litter. Remove where necessary to prevent blockages in the system.	Monthly or after periods of heavy rainfall

Flow Control

Table 2 - System storage operation and maintenance requirements (flow control)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter and debris and grass cuttings from upstream to prevent being washed into the flow control. Inspection of the flow control	Quarterly or as required following monitoring

	chamber and the removal of any sediment/debris when required.	
Remedial Actions	Check flow control is functional	Quarterly or as required following monitoring
Monitoring	Inspect flow control and check flows are not impeded	Monthly or after periods of heavy rainfall

Table 3 System operation and maintenance requirements (Attenuatiom)

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter, debris and grass cuttings from upstream chamber to prevent being washed into the tank. Inspection of the chamber and the removal of any sediment/debris when required.	Quarterly or as required following monitoring
Monitoring	Inspect for evidence of deposits affecting run off.	Monthly for 3 no. months after installation, then during regular maintenance visits

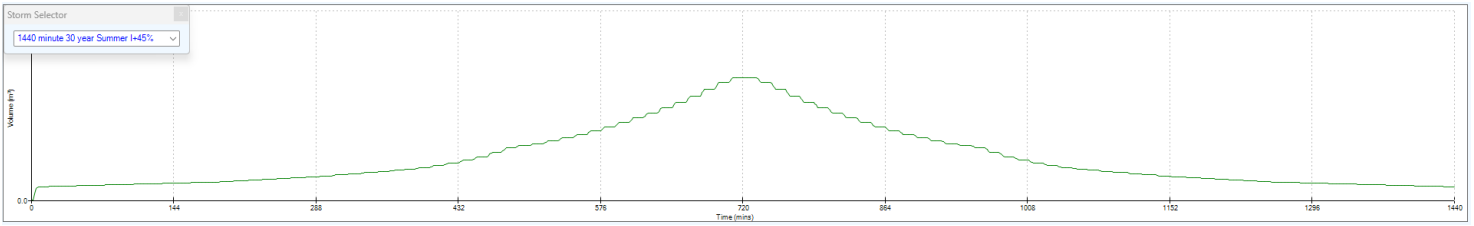
4 LLFA Position

4.1 LLFA Letter dates 7th December 2022

Lead Local Flood Authority Position, and responses in red:

Having reviewed the Flood Risk Assessment and the associated documents which accompanied the planning application, we wish to issue a ***holding objection*** *to the granting of planning permission based on the following:*

- *The updated surface water calculations in section 4.2 only seem to model a 1 year storm event. Please provide calculations for the 1 in 30 and 1 in 100 storm event.*
  Simulation criteria states a return period of 100 years, the previous criteria are superseded in using Micro-drainage this way.
  However, to aid ***your*** *understanding I have separated each storm duration out, but please note that no changes have been made to the calculations.*
- *Demonstrate that all storage features can half empty within 24 hours for the 1 in 30 plug climate change critical storm event. The half drain time has not been included as part of the surface water calculations.*
  As per the below graph for the 1440-minute duration 1 in 30yr + 45% event that shows how the volume discharges.



- *Urban Creep Should be considered.*
  Urban Creep is not considered appropriate as the catchment area is the site area.
- *The SuDS incorporation information provided in section 2.1 conflicts with the treatment information provided in 2.1.3. For example, a swale was outlined in section 2.1 but is not included as part of the pollution hazard indices. Please update this information accordingly and ensure it corresponds to the drainage plan also.*
  The swale upstream of pipe 1.000 has been added to the pollution mitigation indices table.
- *The drainage plan provided on page 10 does not have a key and does not coincide with the SuDS features highlighted in section 2.1. Please provide a drainage plan which details exceedance and conveyance routes, FFL and ground levels and location and sizing of any drainage features.*
  No changes in levels are proposed, please see appended site plan.
  Exceedance routing is notated on the drawing with large blue arrows.
- *The SPEL stormceptor should have a flow control device however this is hard to determine on the current drainage plan. Please label the features.*

The flow control device has been set ahead of the separator to prevent it becoming overwhelmed and to maximise pollution removal efficiency.

- *Please provide a maintenance plan detailing the maintenance arrangements including who is responsible for different elements of the surface water drainage system and the maintenance activities/frequencies.*
  Now included in section 3.1
- *There we require an updated drainage strategy which incorporates all of the above bullet points.*
  As appended

4.2 LLFA Letter dated 6th September 2023

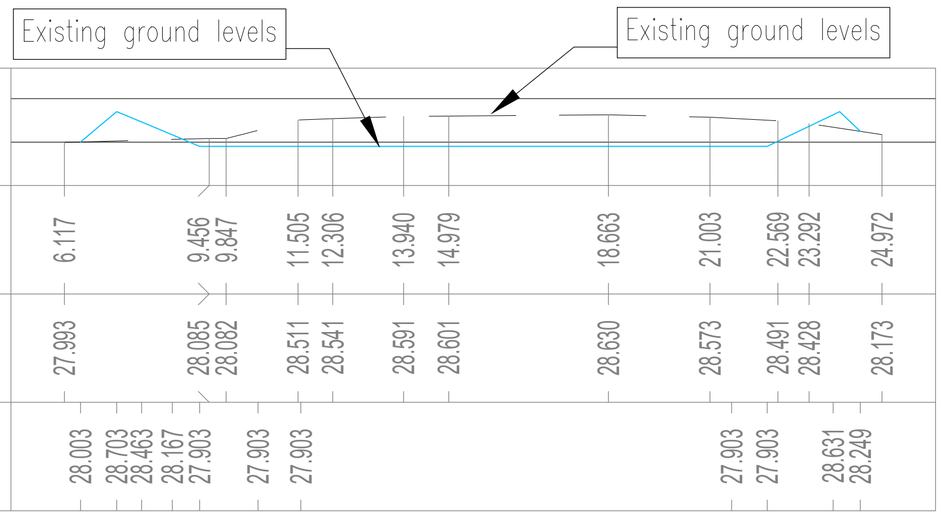
- *Please provide a detailed drainage plan. After the SPEL Stormceptor the drainage plan fails to indicate where the surface water will be directed to. The discharge location should be clarified and shown on the drainage plan. Additional please add CL's and IL's of the attenuation tanks.*
  Outfall indicated on plan, including cover and invert levels of the attenuation tanks
- *MADD factor must be set to 0. Please revision the hydraulic modelling calculations.*
  Noted, calculations re-printed with adjusted factor
- *Please provide the source of the pollution mitigation indices figures.*
  Pollution mitigation figures have come from C753, I have also highlighted the mitigation indices included in the Stormceptor, and the D-Rainclean gullies retrofit which also contributes.

5 Appendices

5.1 Drainage Drawings

A-A

Datum: 27.000M AOD



Drainage Strategy Key

Surface Water	
Surface Water Manhole Text	SMH CL.00.000 IL.00.000 BD.00.000
Surface Water Pipe Run Diameter / Gradient	PN 1.001 150/150
Surface Water Manhole	
Exceedance Routing	
Swale	
Cellular attenuation	
Restrictive kerbline	HB HB HB HB HB HB

swale providing capture of runoff and temporary storage during more severe rainfall events, section A–A adjacent

Designed with 1:3 side slopes

Existing channel drainage to be retrofitted as d–rainclean – bio–remediation channel system for pollution control

Flow control chamber throttled to 4.2 l/s

SPEL STORMCEPTOR OR SIMILAR APPROVED TO PROVIDE POLLUTION MITIGATION INDICES: TSS –0.8 METALS –0.6 HYDROCARBONS –0.9

Existing outfall into adjacent drainage ditch via concrete headwall

SPEL Stormceptor to replace existing chamber

Existing channel drainage to be retrofitted as d–rainclean – bio–remediation channel system for pollution control

Existing channel drainage to be retrofitted as d–rainclean – bio–remediation channel system for pollution control

Kerbline to prevent HGV runover of attenuation area

Cellular attenuation tank to cater for a total volume of 615.6m³ when a 95% void ratio is considered
Minimum Cover Level 29.467

Invert Level 27.907

Existing drainage regime kept, and modeled to prove resilience

SMH1 CL.30.850 IL28.670
SMH2 CL.30.400 IL.28.215
SMH3 CL.29.696 IL.28.008
SMH4 CL.29.467 IL.27.904
SMH5 CL.29.509 IL.27.890
SMH6 CL.29.830 IL.28.065
SMH7 CL.30.341 IL.28.129
SMH8 CL.29.340 IL.27.967

Existing Tarmac
Existing Buildings
Existing Concrete
Parapet Wall
Parapet Concrete Slab
Court Yard
Loose Stone
Flower Beds
Shrubs and Bushes
Patio
Steps
Gate
Tree
Cesspit or Septic tank Inlet pipe IL 29.712
FWMH1 IL 30.767
FWMH2 IL 30.416
EXFWMH IL 30.639

Boundary

Scale 1:500 (10m 0m 10m 20m 30m)

Existing Concrete Yard

Tank reinforcement/foundation/specification to be designed by others

Impermeable membrane encapsulating polystream units

Course sand bed

Cross Section Through Attenuation

Scale 1:20

Issue	Notes	Drawn	Approved	Date
P3	Outfall confirmed	DB	DB	07.09.2023
P2	Notes added	DB	DB	30.08.2023
P1	Preliminary Issue	DB	DB	01.12.2022

jms Group — Engineering That Brings Design To Life.

Issuing Office:
JMS East Anglia (Cambridge): Vision Park Chivers Way,
Histon, Cambridge, United Kingdom, CB24 9AD, Tel: 01223 967924

Project
Sadlers Hall Farm
Basildon

Drawing Title
Drainage Layout
Sheet 1 of 1

Project No. EX2208509
Drawing No. 200
Revision P3

STRATEGY

Original Sheet Size: A1

5.2 Surface Water Calculations

1 in 100yr + 45%

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	21.000	Add Flow / Climate Change (%)	0
Ratio R	0.434	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.929	4-8	0.275

Total Area Contributing (ha) = 1.204

Total Pipe Volume (m³) = 36.359

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)	Section Type	Auto Design
1.000	46.495	0.155	300.0	0.183	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	62.110	0.207	300.0	0.164	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	16.154	0.057	283.4	0.155	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	31.087	0.104	298.9	0.020	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	67.567	0.225	300.3	0.238	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	4.227	0.014	301.9	0.286	0.00	0.0	0.600	o	450	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	4.86	28.670	0.183	0.0	0.0	0.0	0.90	63.8	24.8
1.001	50.00	5.74	28.215	0.347	0.0	0.0	0.0	1.17	185.8	47.0
2.000	50.00	4.22	28.065	0.155	0.0	0.0	0.0	1.20	191.3	21.0
1.002	50.00	6.19	28.008	0.522	0.0	0.0	0.0	1.17	186.2	70.7
3.000	50.00	4.96	28.129	0.238	0.0	0.0	0.0	1.17	185.8	32.2
1.003	50.00	6.25	27.904	1.046	0.0	0.0	0.0	1.16	185.2	141.6

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)	Section Type	Auto Design
4.000	22.891	0.076	301.2	0.046	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	3.912	0.015	260.8	0.112	0.00	0.0	0.600	o	450	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)
4.000	50.00	4.33	27.967	0.046	0.0	0.0	0.0	1.17	185.5	6.2
1.004	50.00	6.30	27.890	1.204	0.0	0.0	0.0	1.25	199.5	163.0

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)
1.004		29.509	27.875	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	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)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Storm Duration (mins)	30
Ratio R	0.434		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 5, DS/PN: 1.004, Volume (m³): 6.2

Unit Reference	MD-SHE-0092-4200-1367-4200
Design Head (m)	1.367
Design Flow (l/s)	4.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	92
Invert Level (m)	27.890
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.367	4.2	Kick-Flo®	0.818	3.3
Flush-Flo™	0.400	4.1	Mean Flow over Head Range	-	3.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	0.800	3.4	2.000	5.0	4.000	6.9	7.000	9.0
0.200	3.8	1.000	3.6	2.200	5.2	4.500	7.3	7.500	9.3
0.300	4.1	1.200	3.9	2.400	5.4	5.000	7.7	8.000	9.6
0.400	4.1	1.400	4.2	2.600	5.7	5.500	8.1	8.500	9.9
0.500	4.1	1.600	4.5	3.000	6.0	6.000	8.4	9.000	10.2
0.600	4.0	1.800	4.8	3.500	6.5	6.500	8.7	9.500	10.4

Storage Structures for Storm

Complex Manhole: 4, DS/PN: 1.003

Tank or Pond

Invert Level (m) 27.904

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	540.0	1.200	540.0	1.201	0.0

Complex Manhole: 8, DS/PN: 4.000

Pipe

Diameter (m) 0.450 Slope (1:X) 300.000 Length (m) 17.848 Invert Level (m) 27.967

Tank or Pond

Invert Level (m) 27.967

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	214.0	1.366	334.0	1.367	0.0

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	0.000
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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 20.300 Cv (Summer)	0.750
Region England and Wales		Ratio R 0.416 Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1	15 Winter	100	+45%	100/15 Summer				29.835	0.865
1.001	2	15 Winter	100	+45%	100/15 Summer				29.146	0.481
2.000	6	1440 Winter	100	+45%	100/15 Summer				29.044	0.529
1.002	3	1440 Winter	100	+45%	100/15 Summer				29.044	0.586
3.000	7	1440 Winter	100	+45%	100/30 Winter				29.043	0.464
1.003	4	1440 Winter	100	+45%	100/15 Summer				29.044	0.690
4.000	8	1440 Winter	100	+45%	100/30 Winter				29.013	0.596
1.004	5	60 Winter	100	+45%	100/15 Summer	100/120 Winter			29.146	0.806

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	2.01		120.3	SURCHARGED	
1.001	2	0.000	1.25		214.4	SURCHARGED	
2.000	6	0.000	0.03		4.5	SURCHARGED	
1.002	3	0.000	0.09		14.8	SURCHARGED	
3.000	7	0.000	0.04		6.9	SURCHARGED	
1.003	4	0.000	0.14		16.0	FLOOD RISK	
4.000	8	0.000	0.03		5.0	FLOOD RISK	
1.004	5	0.000	0.03		4.1	FLOOD RISK	

1 in 30yr

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)	30	PIMP (%)	100
M5-60 (mm)	21.000	Add Flow / Climate Change (%)	0
Ratio R	0.434	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.929	4-8	0.275

Total Area Contributing (ha) = 1.204

Total Pipe Volume (m³) = 36.359

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)	Section Type	Auto Design
1.000	46.495	0.155	300.0	0.183	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	62.110	0.207	300.0	0.164	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	16.154	0.057	283.4	0.155	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	31.087	0.104	298.9	0.020	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	67.567	0.225	300.3	0.238	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	4.227	0.014	301.9	0.286	0.00	0.0	0.600	o	450	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	4.86	28.670	0.183	0.0	0.0	0.0	0.90	63.8	24.8
1.001	50.00	5.74	28.215	0.347	0.0	0.0	0.0	1.17	185.8	47.0
2.000	50.00	4.22	28.065	0.155	0.0	0.0	0.0	1.20	191.3	21.0
1.002	50.00	6.19	28.008	0.522	0.0	0.0	0.0	1.17	186.2	70.7
3.000	50.00	4.96	28.129	0.238	0.0	0.0	0.0	1.17	185.8	32.2
1.003	50.00	6.25	27.904	1.046	0.0	0.0	0.0	1.16	185.2	141.6

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)	Section Type	Auto Design
4.000	22.891	0.076	301.2	0.046	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	3.912	0.015	260.8	0.112	0.00	0.0	0.600	o	450	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)
4.000	50.00	4.33	27.967	0.046	0.0	0.0	0.0	1.17	185.5	6.2
1.004	50.00	6.30	27.890	1.204	0.0	0.0	0.0	1.25	199.5	163.0

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)
1.004		29.509	27.875	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	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)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Storm Duration (mins)	30
Ratio R	0.434		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 5, DS/PN: 1.004, Volume (m³): 6.2

Unit Reference	MD-SHE-0092-4200-1367-4200
Design Head (m)	1.367
Design Flow (l/s)	4.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	92
Invert Level (m)	27.890
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.367	4.2	Kick-Flo®	0.818	3.3
Flush-Flo™	0.400	4.1	Mean Flow over Head Range	-	3.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	0.800	3.4	2.000	5.0	4.000	6.9	7.000	9.0
0.200	3.8	1.000	3.6	2.200	5.2	4.500	7.3	7.500	9.3
0.300	4.1	1.200	3.9	2.400	5.4	5.000	7.7	8.000	9.6
0.400	4.1	1.400	4.2	2.600	5.7	5.500	8.1	8.500	9.9
0.500	4.1	1.600	4.5	3.000	6.0	6.000	8.4	9.000	10.2
0.600	4.0	1.800	4.8	3.500	6.5	6.500	8.7	9.500	10.4

Storage Structures for Storm

Complex Manhole: 4, DS/PN: 1.003

Tank or Pond

Invert Level (m) 27.904

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	540.0	1.200	540.0	1.201	0.0

Complex Manhole: 8, DS/PN: 4.000

Pipe

Diameter (m) 0.450 Slope (1:X) 300.000 Length (m) 17.848 Invert Level (m) 27.967

Tank or Pond

Invert Level (m) 27.967

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	214.0	1.366	334.0	1.367	0.0

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	0.000
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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 20.300 Cv (Summer)	0.750
Region England and Wales		Ratio R 0.416 Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	30
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1	15 Winter	30	+0%	30/15 Summer				29.006	0.036
1.001	2	15 Winter	30	+0%					28.515	-0.150
2.000	6	15 Winter	30	+0%					28.463	-0.052
1.002	3	480 Winter	30	+0%					28.453	-0.005
3.000	7	960 Winter	30	+0%					28.448	-0.131
1.003	4	960 Winter	30	+0%	30/120 Winter				28.448	0.094
4.000	8	960 Winter	30	+0%	30/360 Winter				28.420	0.003
1.004	5	960 Winter	30	+0%	30/120 Winter				28.498	0.158

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	1.15		68.7	SURCHARGED	
1.001	2	0.000	0.71		122.2	OK	
2.000	6	0.000	0.38		56.7	OK	
1.002	3	0.000	0.11		18.2	OK	
3.000	7	0.000	0.03		5.2	OK	
1.003	4	0.000	0.08		9.8	SURCHARGED	
4.000	8	0.000	0.07		10.5	SURCHARGED	
1.004	5	0.000	0.03		4.1	SURCHARGED	

1 in 1yr

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	PIMP (%)	100
M5-60 (mm)	21.000	Add Flow / Climate Change (%)	0
Ratio R	0.434	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.929	4-8	0.275

Total Area Contributing (ha) = 1.204

Total Pipe Volume (m³) = 36.359

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)	Section Type	Auto Design
1.000	46.495	0.155	300.0	0.183	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	62.110	0.207	300.0	0.164	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	16.154	0.057	283.4	0.155	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	31.087	0.104	298.9	0.020	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	67.567	0.225	300.3	0.238	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	4.227	0.014	301.9	0.286	0.00	0.0	0.600	o	450	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	4.86	28.670	0.183	0.0	0.0	0.0	0.90	63.8	24.8
1.001	50.00	5.74	28.215	0.347	0.0	0.0	0.0	1.17	185.8	47.0
2.000	50.00	4.22	28.065	0.155	0.0	0.0	0.0	1.20	191.3	21.0
1.002	50.00	6.19	28.008	0.522	0.0	0.0	0.0	1.17	186.2	70.7
3.000	50.00	4.96	28.129	0.238	0.0	0.0	0.0	1.17	185.8	32.2
1.003	50.00	6.25	27.904	1.046	0.0	0.0	0.0	1.16	185.2	141.6

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)	Section Type	Auto Design
4.000	22.891	0.076	301.2	0.046	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	3.912	0.015	260.8	0.112	0.00	0.0	0.600	o	450	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)
4.000	50.00	4.33	27.967	0.046	0.0	0.0	0.0	1.17	185.5	6.2
1.004	50.00	6.30	27.890	1.204	0.0	0.0	0.0	1.25	199.5	163.0

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)
1.004		29.509	27.875	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	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)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Storm Duration (mins)	30
Ratio R	0.434		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 5, DS/PN: 1.004, Volume (m³): 6.2

Unit Reference	MD-SHE-0092-4200-1367-4200
Design Head (m)	1.367
Design Flow (l/s)	4.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	92
Invert Level (m)	27.890
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.367	4.2	Kick-Flo®	0.818	3.3
Flush-Flo™	0.400	4.1	Mean Flow over Head Range	-	3.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	0.800	3.4	2.000	5.0	4.000	6.9	7.000	9.0
0.200	3.8	1.000	3.6	2.200	5.2	4.500	7.3	7.500	9.3
0.300	4.1	1.200	3.9	2.400	5.4	5.000	7.7	8.000	9.6
0.400	4.1	1.400	4.2	2.600	5.7	5.500	8.1	8.500	9.9
0.500	4.1	1.600	4.5	3.000	6.0	6.000	8.4	9.000	10.2
0.600	4.0	1.800	4.8	3.500	6.5	6.500	8.7	9.500	10.4

Storage Structures for Storm

Complex Manhole: 4, DS/PN: 1.003

Tank or Pond

Invert Level (m) 27.904

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	540.0	1.200	540.0	1.201	0.0

Complex Manhole: 8, DS/PN: 4.000

Pipe

Diameter (m) 0.450 Slope (1:X) 300.000 Length (m) 17.848 Invert Level (m) 27.967

Tank or Pond

Invert Level (m) 27.967

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	214.0	1.366	334.0	1.367	0.0

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	0.000
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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.300
Region	England and Wales	Ratio R	0.416
Cv (Summer)	0.750		
Cv (Winter)	0.840		

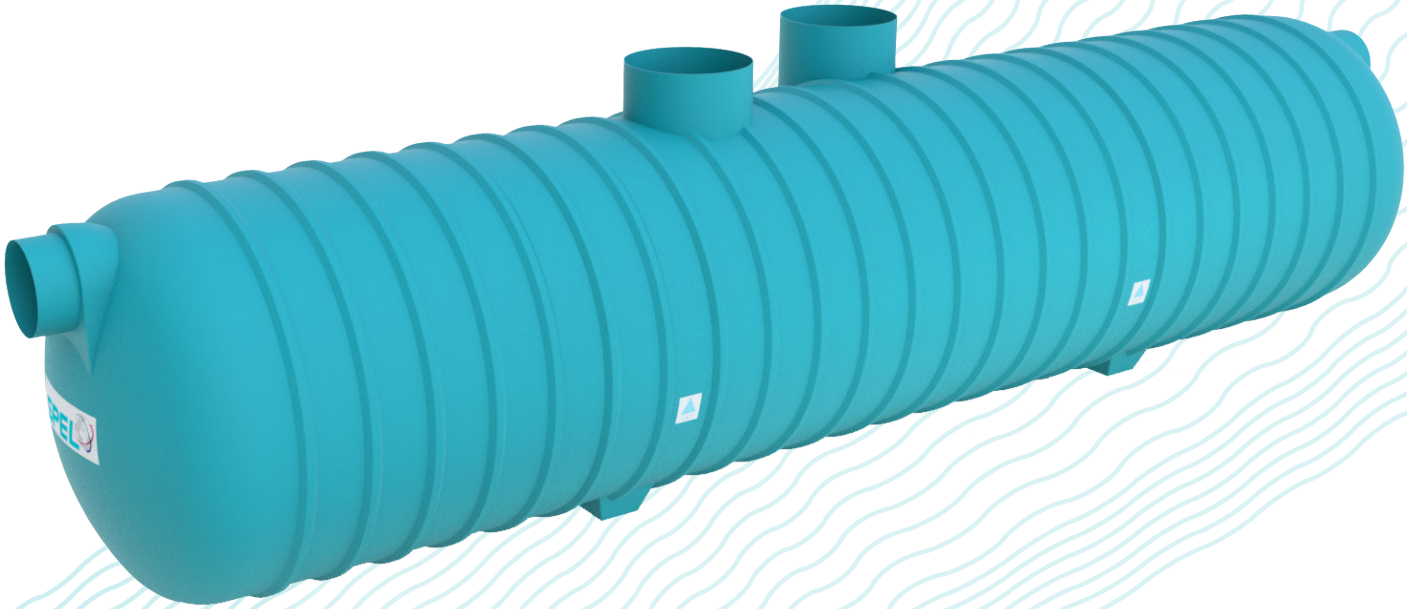
Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	OFF

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	1	15 Winter	1	+0%					28.814	-0.156	0.000
1.001	2	15 Winter	1	+0%					28.377	-0.288	0.000
2.000	6	15 Winter	1	+0%					28.226	-0.289	0.000
1.002	3	15 Winter	1	+0%					28.212	-0.246	0.000
3.000	7	15 Winter	1	+0%					28.269	-0.310	0.000
1.003	4	480 Winter	1	+0%					28.139	-0.215	0.000
4.000	8	960 Winter	1	+0%					28.139	-0.278	0.000
1.004	5	480 Winter	1	+0%					28.156	-0.184	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.47		28.0	OK	
1.001	2	0.27		45.9	OK	
2.000	6	0.16		23.4	OK	
1.002	3	0.42		67.6	OK	
3.000	7	0.21		36.0	OK	
1.003	4	0.08		8.9	OK	
4.000	8	0.01		1.5	OK	
1.004	5	0.03		3.9	OK	

5.3 Separator Information



SPEL Stormceptor

ESR (Enhanced Silt Retention)

SuDS Compliant ESR Range

spelproducts.co.uk

SPEL Stormceptor ESR Range
By-Pass System

The **total** treatment solution for SuDS

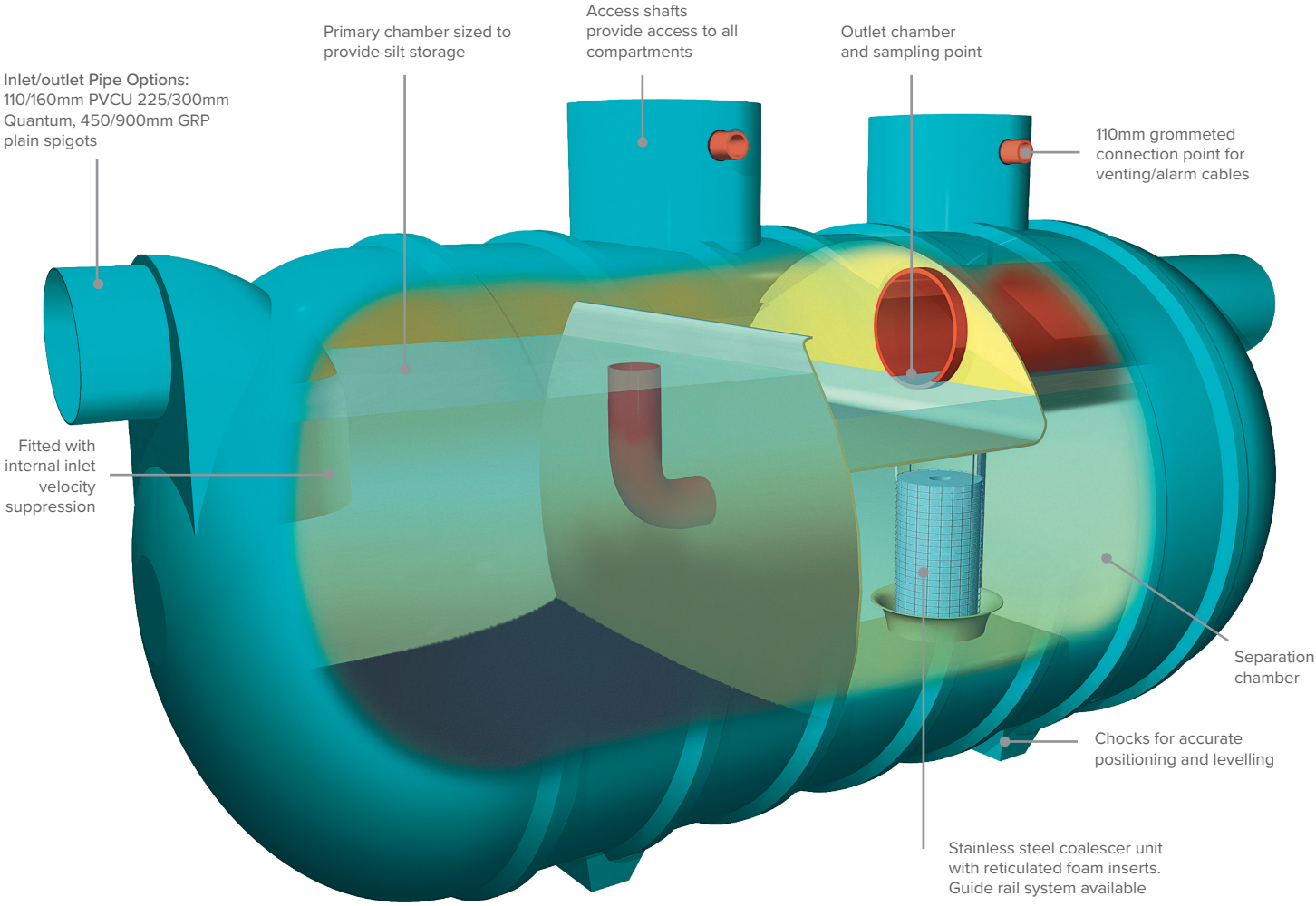
The new SPEL ESR System is fully certified to meet the CIRIA SuDS Mitigation Index. It has been tested by WRc (for TSS and Metals) to the British Water Code of Practice for Manufactured Treatment Devices. This unit is also compliant to the British and European Standard BS EN 858.

SPEL's ESR range is a total treatment system removing Hydrocarbons, Total Suspended Solids (TSS) and Metals (particulate). It's a highly efficient, single unit, water quality SuDS component.

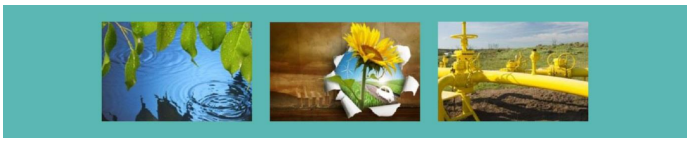
SPEL ESR Stormceptor Certified Mitigation Index

TSS	0.8
Metals	0.6
Hydrocarbons	0.9*

**H R Wallingford test results to BS EN 858*



SPEL Stormceptor ESR Range
By-Pass System



Surface Water Treatment Device Performance Declaration

Testing carried out according to British Water Code of Practice

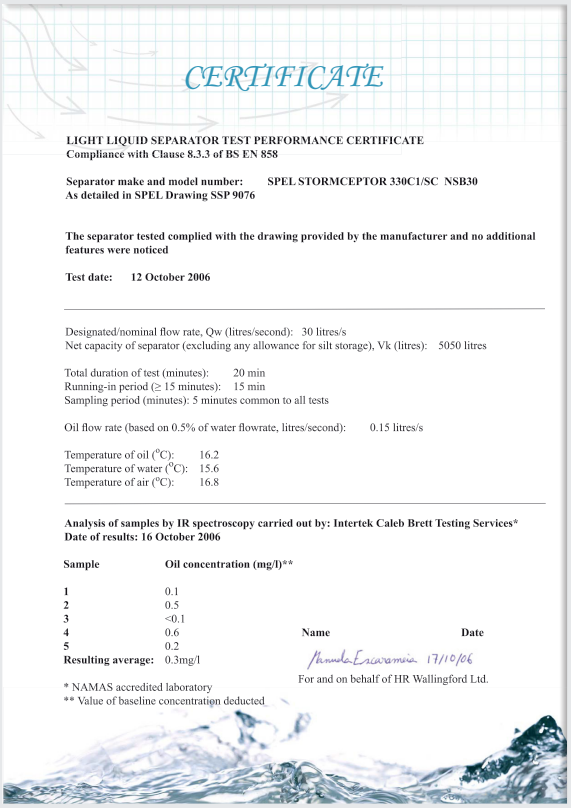
Product Details	Description
Manufacturer	SPEL Products
Treatment Device Name/Model	Stormceptor Type 210 C1/SC
General description	Class 1 By-pass Separator with Silt Capacity
Envisaged application	Treatment of Surface Water Run-off
Pollutant(s) captured	Suspended Solids

Test	Value	Unit
Treatment device capacity	3200	litres
Sediment Storage capacity	1000	litres
Treatment Flow rate	10	l/s
Connected Area	1,333	m²
Pollution retention flow rate	10	l/s

Parameter	Value	Unit
Maximum capacity flow rate	100	l/s
Device head loss (at treatment flowrate)	0.15	m
Device head loss (at maximum capacity treatment flowrate)	-	m
TSS capture and retention efficiency (Milisil W4 test sediment)	**82**	**%**
Zinc capture efficiency (if tested)	Not tested for dissolved metals	%
Zinc retention efficiency (if tested)	Not tested for dissolved metals	%
Copper capture efficiency (if tested)	Not tested for dissolved metals	%
Copper retention efficiency (if tested)	Not tested for dissolved metals	%
Dissolved Metals reduction	0.0	%
Particulate metals reduction*	61.5*	%
Total Metals reduction*	61.5*	%
Total Metals Mitigation Index	0.615*	-

* Extrapolated value in accordance with British Water How to Guide: Applying the CIRIA The SuDS Manual (C753) Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices. Version 7, Section 4.3, (2021- under pre-publication review).

Certificates of compliance from WRc and HR Wallingford for the SPEL Stormceptor ESR Range



CERTIFICATE

LIGHT LIQUID SEPARATOR TEST PERFORMANCE CERTIFICATE
Compliance with Clause 8.3.3 of BS EN 858

Separator make and model number: SPEL STORMCEPTOR 330C1/SC NSB30
As detailed in SPEL Drawing SSP 9076

The separator tested complied with the drawing provided by the manufacturer and no additional features were noticed

Test date: 12 October 2006

Designated/nominal flow rate, Qw (litres/second): 30 litres/s
Net capacity of separator (excluding any allowance for silt storage), Vk (litres): 5050 litres

Total duration of test (minutes): 20 min
Running-in period (≥ 15 minutes): 15 min
Sampling period (minutes): 5 minutes common to all tests

Oil flow rate (based on 0.5% of water flowrate, litres/second): 0.15 litres/s

Temperature of oil (°C): 16.2
Temperature of water (°C): 15.6
Temperature of air (°C): 16.8

Analysis of samples by IR spectroscopy carried out by: Intertek Caleb Brett Testing Services*
Date of results: 16 October 2006

Sample	Oil concentration (mg/l)**
1	0.1
2	0.5
3	<0.1
4	0.6
5	0.2
Resulting average:	0.3mg/l

Name Date
17/10/06
For and on behalf of HR Wallingford Ltd.

* NAMAS accredited laboratory
** Value of baseline concentration deducted

SPEL's Head of Technical Development alongside the WRc testing officer.

Research and Development

Research and development is at the heart of what we do at SPEL, our passion as Zero Pollution Ambassadors is to be at the cutting edge of clean surface water technology.

Months of rigorous testing has resulted in the new SPEL Stormceptor ESR Range.


Quality Assured Company
BS EN ISO 9001
Design & Manufacture

Protecting our environment for over 45 years

The SuDS Manual is leading good practise in drainage design, SPEL are endorsing this with the release of the new SPEL Stormceptor ESR range.

Total Suspended Solids (TSS)	Metals	Hydrocarbons
0.8	0.6	0.9*

**H R Wallingford test results to BS EN 858*

Added to these class-leading Mitigation Indices, the ESR range benefits from:

- British/European Standard BS EN 858-1 2002 certification.
- The SPEL 25 year shell Warranty.
- 50 year+ life expectancy.
- ISO9001 quality assurance.
- ISO14001 committed to environmental improvement

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 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]

26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation Indices		
Type of SuDS component	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.		

Tables from The SuDS Manual (C753), p568-569
For reference notes, please see the full manual: https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

SPEL Stormceptor ESR Range By-Pass System

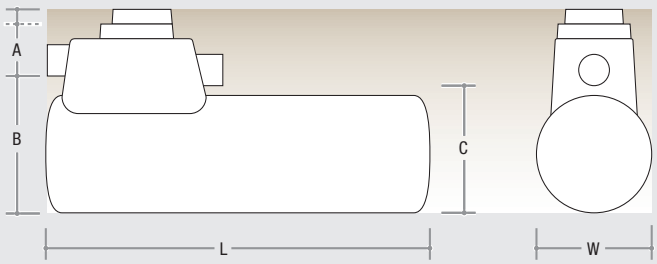
ESR Specification Chart

Model	Series	Treated Flow Rate - l/s	Maximum Flow	Catchment area (m^2)*	Oil storage (litres)	Silt capacity (litres)	Overall length* (mm) L	Overall diameter (mm)	Inlet Invert (mm) A	Base to Inlet (mm) B	Base to outlet (mm) C	Max in/ out pipe diameter** (mm)	Number of access shafts (dia. mm)			
													600	750	900	1200
210C1/ESR	200	10	100	1,333	150	1,000	2,920	1,225	560	1,350	1,300	300	-	1	-	-
215C1/ESR	200	15	150	2,000	225	1,500	4,237	1,225	560	1,350	1,300	300	-	1	-	-
320C1/ESR	300	20	200	2,665	300	2,000	3,200	1,875	700	1,450	1,350	450	2	-	-	-
325C1/ESR	300	25	250	3,333	375	2,500	3,540	1,875	700	1,450	1,350	450	2	-	-	-
330C1/ESR	300	30	300	4,000	450	3,000	4,420	1,875	700	1,450	1,350	450	-	1	1	-
340C1/ESR	300	40	400	5,333	600	4,000	5,760	1,875	740	1,410	1,310	450	1	1	-	-
345C1/ESR	300	45	450	6,000	675	4,500	6,570	1,875	740	1,410	1,310	450	1	1	-	-
350/C1/ESR	300	50	500	6,665	750	5,000	7,060	1,875	740	1,410	1,310	450	1	1	-	-
460C1/ESR	400	60	600	8,000	900	6,000	4,400	2,700	950	2,100	2,000	600	1	-	1	-
470C1/ESR	400	70	700	9,333	1,050	7,000	5,250	2,700	950	2,100	2,000	600	1	-	1	-
480C1/ESR	400	80	800	10,665	1,200	8,000	6,170	2,700	950	2,100	2,000	600	1	-	1	-
4100C1/ESR	400	100	1000	13,333	1,500	10,000	7,400	2,700	1,100	1,950	1,850	750	1	-	1	-
4125C1/ESR	400	125	1250	16,665	1,875	12,500	9,050	2,700	1,100	1,950	1,850	750	1	-	1	-
4150C1/ESR	400	150	1500	20,000	2,250	15,000	9,950	2,700	1,100	1,950	1,850	750	-	-	2	-
4160C1/ESR	400	160	1600	21,333	2,400	16,000	11,830	2,700	1,250	1,800	1,700	750	1	1	1	-
5180C1/ESR	500	180	1800	24,000	2,700	18,000	7,470	3,650	1,185	2,690	2,550	900	-	-	-	-
5200C1/ESR	500	200	2000	26,665	3,000	20,000	8,530	3,650	1,185	2,690	2,355	1,200	-	-	-	-
5250C1/ESR	500	250	2500	33,333	3,750	25,000	10,040	3,650	1,185	2,690	2,355	1,200	-	-	-	-
6300C1/ESR	600	300	3000	40,000	4,500	30,000	10,310	4,150	1,325	2,850	2,675	1,200	-	-	-	-
6350C1/ESR	600	350	3500	46,665	5,250	35,000	11,470	4,150	1,325	2,850	2,675	1,200	-	-	-	-
6400C1/ESR	600	400	4000	53,333	6,000	40,000	12,690	4,150	1,325	2,850	2,675	1,200	-	-	-	-
6500C1/ESR	600	500	5000	66,665	7,500	50,000	15,870	4,150	1,325	2,850	2,675	1,200	-	-	-	-
6600C1/ESR	600	600	6000	80,000	9,000	60,000	18,260	4,150	1,325	2,850	2,675	1,200	-	-	-	-
6700C1/ESR	600	700	7000	93,333	10,500	70,000	22,250	4,150	2,850	2,850	2,675	1,200	-	-	-	-

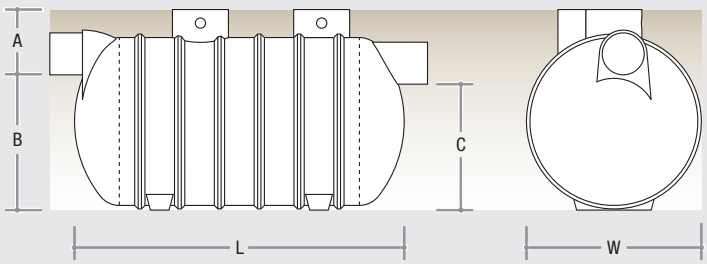
**These catchment areas are based on the SuDS Manual requirement for By-Pass devices to treat the 1 in 1 year storm event (27mm).*
***This dimension is for A-C inlet/outlet options, larger pipe sizes are available for D-I inlet/outlet options.*

200 Series ESR – Inside diameter 1200mm, outside diameter 1225mm.
300 series ESR – Inside diameter 1800mm, outside diameter 1875mm.
400 series ESR – Inside diameter 2600mm, outside diameter 2700mm.
500 series ESR – Inside diameter 3500mm, outside diameter 3650mm.
600 series ESR – Inside diameter 4000mm, outside diameter 4150mm.

200 series



300/400/500 & 600 series



Optional extras

SPEL coalescer unit guide rail systems

To facilitate easy insertion of coalescer units, the SPEL guide rail system manufactured in stainless steel can be incorporated into SPEL Puraceptors and class 1 Stormceptors.

Brackets fixed to the top and bottom of the coalescer unit simply engage the stainless steel guide rail fixed to the top of the stub access shaft. The coalescer unit is then lowered in the normal way, being guided at the correct angle into the conical base.

Lifting chains are available for the larger coalescer units and where extension shafts are fitted.

Extension guide rails can be incorporated into SPEL extension shafts to suit.

SPEL coalescer unit lifting, locating and locking system

The SPEL lifting, locating and locking system is manufactured in stainless steel and replaces the standard coalescer unit handle.

The locating/locking handle ensures the coalescer unit is seated and locked in its correct position after maintenance.

Above left:
Lifting, locating and locking system with guide rail system.

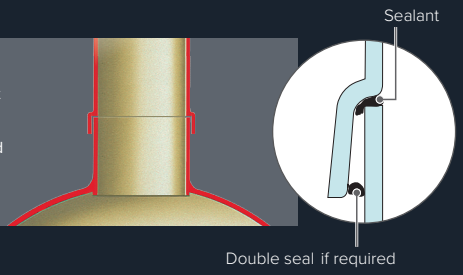
Above right:
The SPEL coalescer unit with lifting chain.

SPEL extension access shafts

Extension access shafts are available for deep invert applications.

Socket joint stub access shaft with extension shaft.

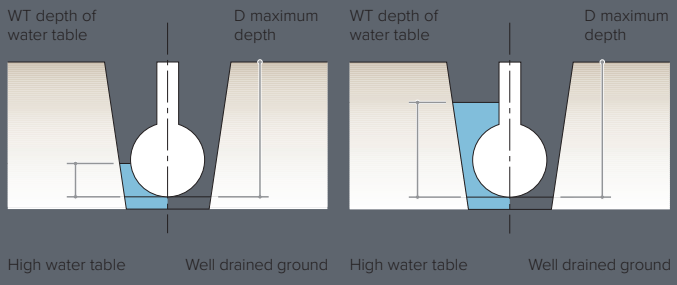
600mm, 750mm, 900mm and 1200mm diameter.



Tank shell specifications

The 'standard' specification is normally adequate for most installations but heavier specifications are available depending upon the burial depth and water table level, in winter. The concern is when the system is emptied completely and remains empty for a period of time.

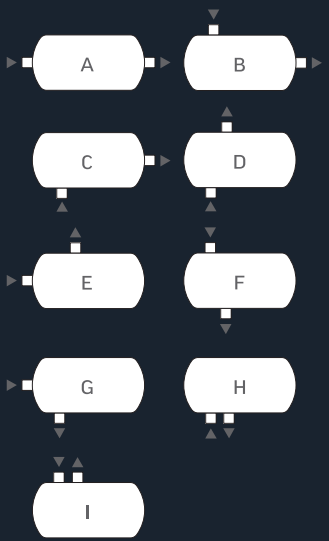
Standard tanks			Heavy tanks		
Series	WT (m)	D (m)	Series	WT (m)	D (m)
100/200	1.0	4.0	100/200	2.0	6.0
300	0.9	4.0	300	2.8	5.6
400	1.3	5.0	400	3.5	6.0
500	1.9	5.7	500	4.5	7.25
600	2.4	6.2	600	4.7	7.3



Based on installation in concrete with concrete surround
For pea gravel surround, see SPEL Data Manual p13.5

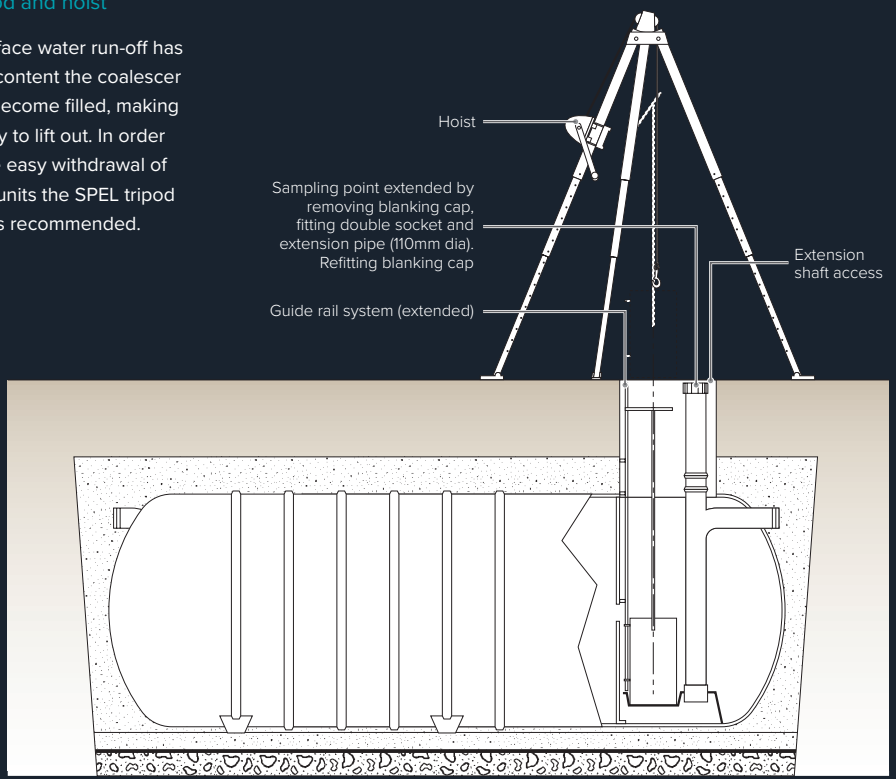
SPEL ESR Range – Inlet/outlet orientation

Dependent upon model and diameter of connections, these nine different orientations are available. However on the larger models it is important to check with our technical department.



SPEL tripod and hoist

Where surface water run-off has a high silt content the coalescer units can become filled, making them heavy to lift out. In order to facilitate easy withdrawal of coalescer units the SPEL tripod and hoist is recommended.



SPEL

Quality that protects the environment the **safest way**

The SPEL underground tanks have been designed with reference to BS EN 13121

SPEL Tank shells carry a 25 year Warranty and have a life expectancy of over 50 years

Rigorous quality control procedures at all stages of manufacture for each serial numbered tank, ISO 9001.

SPEL is an environmentally accredited company to ISO 14001.

Certificate No: FM 35174 UVDB/Achilles accredited – Supplier No. 88611.

Scan code with a QR reader to launch our website: spelproducts.co.uk

#ZeroPollutionAmbassadors

SPEL 11/21

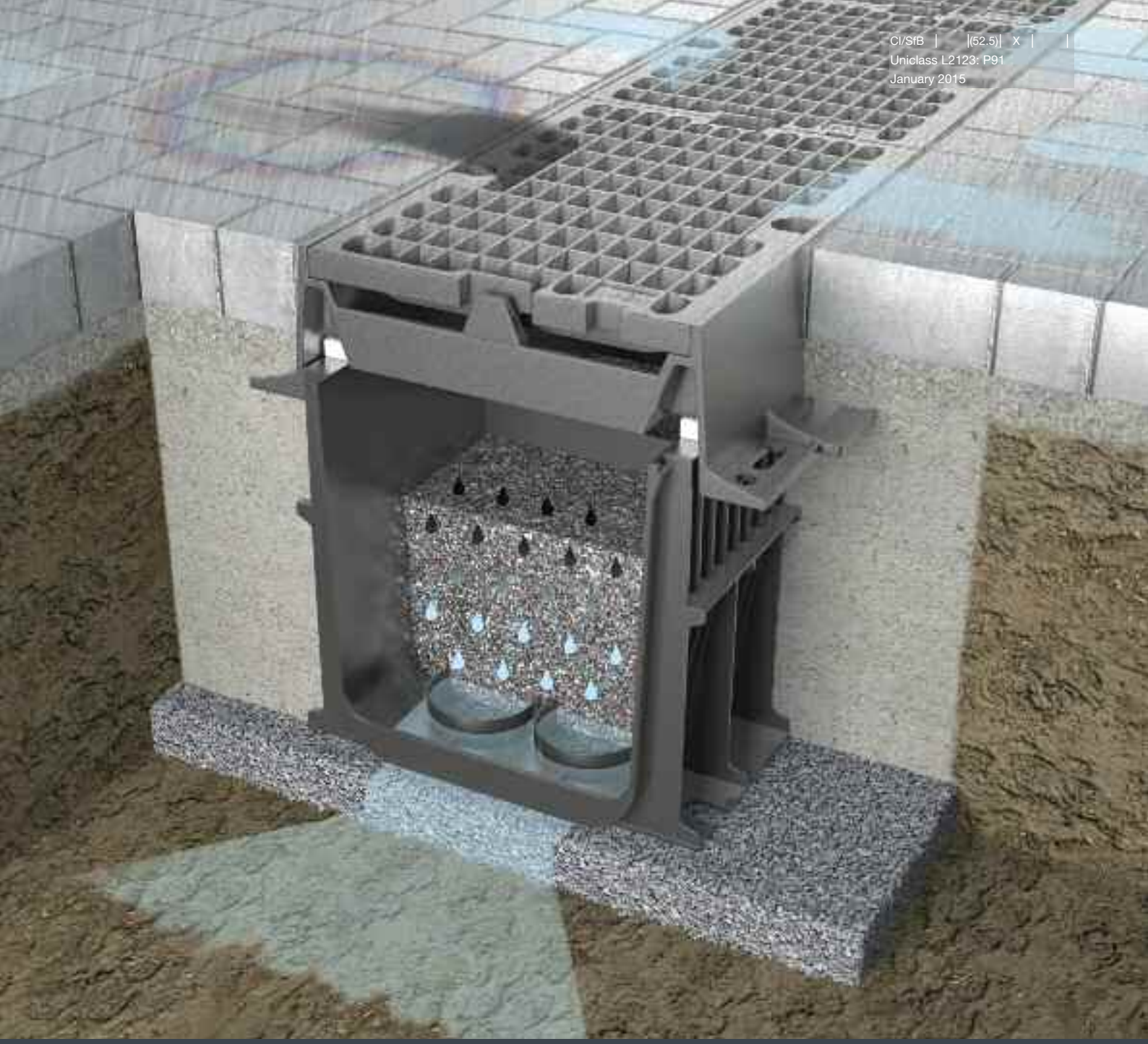
SPEL spelproducts.co.uk
+44 (0)1743 445 200

SPEL Products
Lancaster Road
Shrewsbury, Shropshire
SY1 3NQ, England.

T. +44 (0)1743 445200
E. info@spelproducts.co.uk
E. sales@spelproducts.co.uk

5.4 D-Rainclean Details

CI/SfB | |(52.5)| X | |
Uniclass L2123: P91
January 2015



D-Rainclean

Bio-remediation channel systems for surface water pollution control

stormwater MANAGEMENT

D-Rainclean

Bio-remediation channel systems for surface water pollution control

With increasingly intense, frequent, and extreme weather events, there is a need to mitigate the flooding and pollution risks caused by uncontrolled surface water run-off. D-Rainclean is a robust, 300mm polypropylene channel drainage system with a unique bio-remediation medium.

The system deals with surface water run-off and treats the flow at source, making it an ideal treatment component in a Sustainable Drainage (SuDs) solution.

- Forms part of a SuDs solution
- Excellent hydraulic capacity
- Long service life 10-20 years – years before media replacement
- Excellent solids retention and prevents soil migration when laid to a fall
- Unique filter media – optimised grain size lowers clogging risk
- Adsorber agents provide a high retention of dissolved pollutants
- Active soil microbiology, gives a vitalised soil
- Helps decomposition of organic pollutants
- Resistant to de-icing salt
- Simple replacement of filter-media in the event of accidental spillage (e.g. oil spillage)
- Internal baffle walls allows the system to be laid level or to a fall
- Simple and easy to lay
- Suitable for use in a range of trafficked areas with B and D class gratings
- Non trafficked areas require no concrete reinforcement, reducing installation cost and time
- Filter media can be used for other applications (e.g. ponds, swales)
- Eight 100mm holes in the channel base allow infiltration at source
- Calculable hydraulic capacity over its service life
- Cast iron grates are fixed via a tamper proof tensioned spring or can be bolted for extra security
- Emergency overflow allows exceedence events to be accommodated
- D-Rainclean can be installed in soils with very low permeability when used in combination with geocellular units

Flooding and pollution

The problem

Flooding is an issue that needs no introduction in the UK.

Pluvial flooding has become a regular occurrence as our drainage networks become incapable of coping with increased urbanisation combined with climate change.

Since the turn of the millennium, the construction industry has sought to tackle the problems associated with more intensive rainfall, and in particular the volumes of water generated.

This culminated in the Flood and Water Management Act 2010, which sets out the responsibilities for the design, construction, and maintenance of sustainable drainage systems.

What is perhaps less well known is that, enshrined in this legislation, is the requirement to address surface water quality leaving development sites in order to comply with the Water Framework Directive.

Much of the onus to comply with the FWM Act falls on Local Authorities whose role it is to mitigate and minimise both flood and pollution risk by ensuring that hard-landscaping design and installation 'design-out' and build-out' both flood risk and pollution risk, usually by employing SuDs techniques.

The solution

Stormwater Management Limited offer the highly innovative and proven D-Rainclean porous channel and bio-remediation filter media system that treats the priority pollutants identified by the regulatory authorities (Environment Agency and Highways Authority), principally total suspended solids (TSS) and dissolved heavy metals such as copper and zinc – meeting both these key requirements within a single solution.

The Water Framework Directive 2015

The Water Framework Directive 2015 has identified 44 chemicals, 16 of which are deemed as hazardous and 8 that are bio accumulative. On heavily trafficked roads and parking areas, heavy metal waste water reaches critical concentrations and regularly exceeds the threshold values for pollution run off. Heavy metal pollution increases the toxicity of river water that can be damaging to aquatic life, reduces the quality of crops and plant life and ultimately this can be damaging to human life.

D-Rainclean
The solution

D-Rainclean comprises a 300mm polypropylene channel system filled with a unique engineered bio-remediation filter media that treats run-off from any impermeable surface.

Using the processes of separation, adsorbtion, absorption, and bioremediation D-Rainclean allows contaminated run-off to be treated to a sufficient quality to allow infiltration back into the ground at the closest point to its generation, meeting one of the key requirements in drainage hierarchy – 'source control'.

D-Rainclean uses a unique engineered bio-remediation filter media containing selected natural minerals with a high cation exchange and filtration capacity. These media clean surface water as it passes through the filter layers, degrading and diffusing hydrocarbons, and dissolved heavy metal like copper and zinc.

A properly installed D-Rainclean system can drain areas of up to one hectare and the system has been proven to meet the stringent requirements set down by the DIBt.

Cover options A
D-Rainclean can be covered by either flush or raised cast iron grill sections, suitable for heavily trafficked areas. The D400 cast iron cover can support HGV traffic. D-Rainclean can also be left open to allow for vegetation growth at car park borders and similar areas.

Bulkheads B
Built in to the channels section at 500mm intervals, these ensure dimensional stability and more importantly, limit pollution spillages to a confined section of the system.

Channel units C
Robust and durable 500mm length polypropylene sections have an integrated bulkhead at mid point (250mm from either end). Each mid-section has 8 apertures in its base to allow the controlled infiltration of filtered water into the sub-base.

Filter media D
This unique engineered bio-remediation mixture lies at the heart of the D-Rainclean system.

Surface water flowing from impermeable areas contaminated with pollutants passes through the D-Rainclean filter media layer where it is treated before being discharged through the base holes.

The remarkable levels of performance are due to selected natural minerals with a high exchange capacity and filtration efficiencies. Diffuse hydrocarbons (oil drops) emitted in trafficked areas are virtually degraded. An accidental oil spill of up to 10 litres can be retained within 1 linear metre of channel for up to 24 hours.

Full details of the filter-media are shown on pages 6-7.

Controlled, pollution-free water E

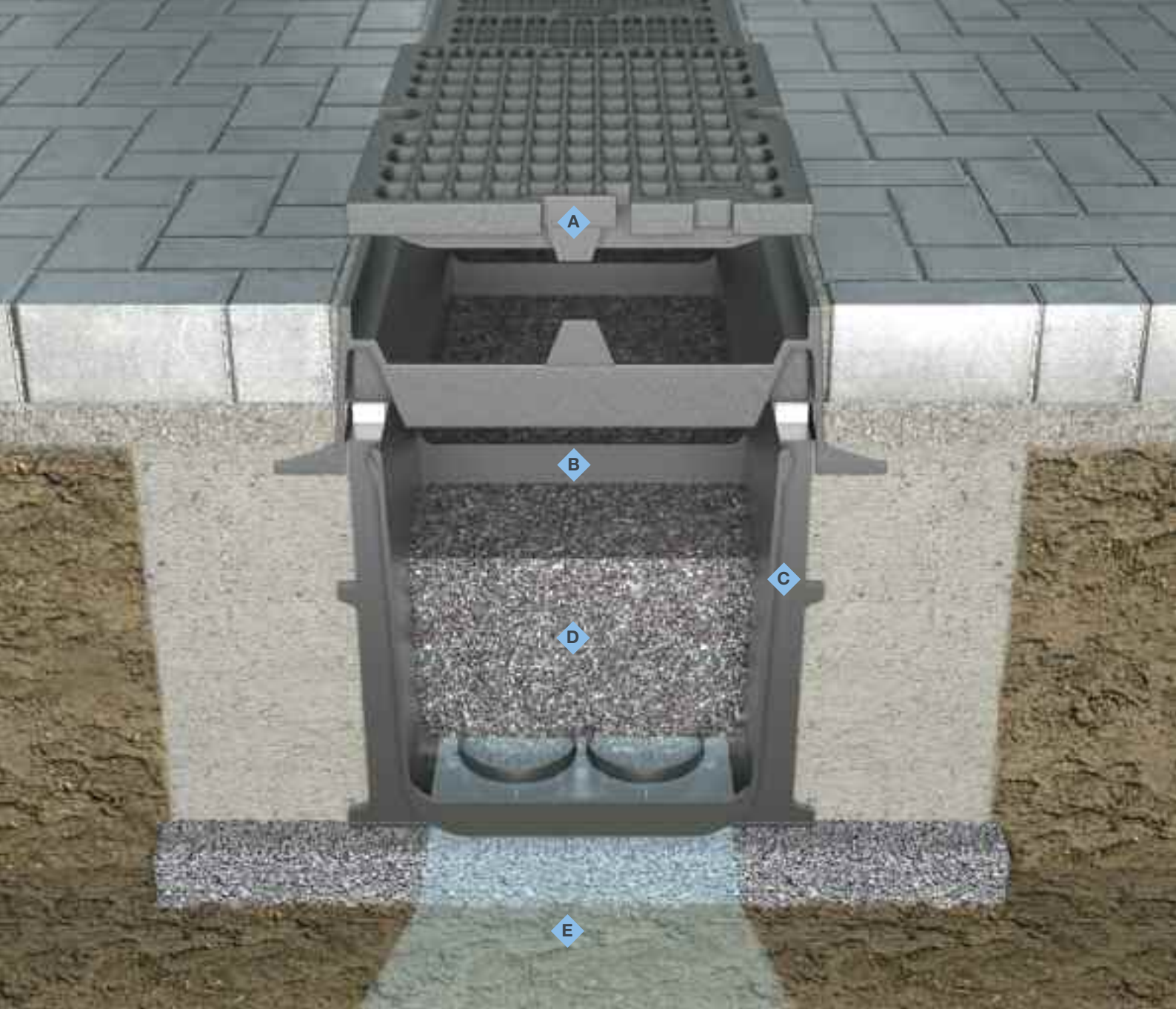
Components & accessories

The D-Rainclean system contains an extensive range of components and accessories allowing designers to achieve a broad spectrum of project criteria.

Filter-media
- 14 litre sack
- Code: DRFC005

Filter-media
- 1.5m³ bulk bags
- Code: DRFC006

Channel
- Colour: Black
- Dimensions: 500 x 400 x 366mm with integrated middle bulkhead
- Material: PP
- 8 infiltration apertures
- Code: DRFC001



End piece

- Can be used for left or right hand ends
- Dimensions: 250 x 400 x 366mm
- Code: RH: DRFC002
  LH: DRFC003

Emergency overflow unit

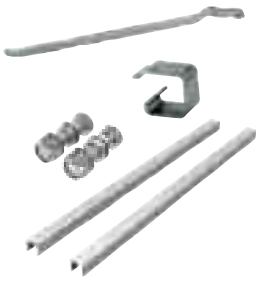
- With 110mm socket connections for left or right hand
- Dimensions: 500 x 400 x 366mm
- Code: DRFC004

Cast-iron cover

- Class B125
- Includes cast iron frame. Connection clamps need to be ordered separately
- Includes child safeguard
- Code: DRFC007

Cast-iron cover

- Class D400
- Includes cast-iron frame and child safeguard
- Code: DRFC009



Tools and clips

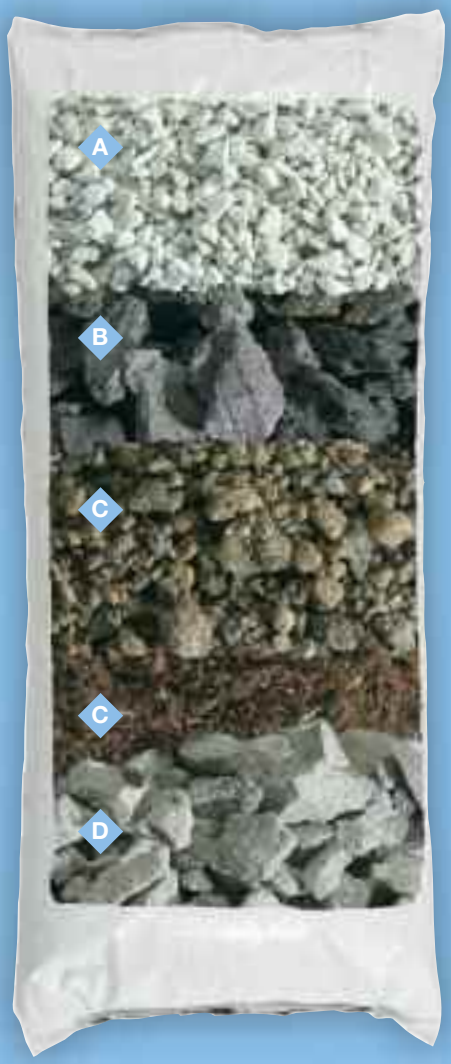
- Wrench
  Code: DRFC011
- Security bolts:
  Code DRFC010
- Joint Clamps
  Code: DRFC008
- Aluminium rails
  Code: DRFC012

Filter media

D-Rainclean Filter Media is a unique series of media that perform different functions in order to clean surface water runoff using the processes of filtration, adsorption, ion exchange, phosphate and retention.

The unique D-Rainclean filter media can be used in other SuDs applications including:

- **Swales**
- **Infiltration basins**
- **Rain gardens**
- **Special Filter Media is available for Innolet gully (see back cover)**



Absorption area/exchanger A
Water storage/filter B
Organic matrix/settlement area C
pH-buffer area/acid limiter D

Components pictured schematically – grain size not to scale.

Filtration

Many contaminants attach themselves to sediment particles. The smaller the particle, the higher its concentration. The filter-media in D-Rainclean retains these sediments by depth filtration, ensuring they are retained in the upper 5-10cm of the filter media. This significantly reduces the risk of surface clogging (colmatage) and ponding, particularly in extreme events, something which some surface filtration systems, such as permeable paving are prone to.

Heavy metal absorption/ desorption and precipitation

D-Rainclean uses a number of processes to remove dissolved heavy metals:

- Nickel – sorption
- Lead, cadmium, copper and zinc – sorption, precipitation and PH balancing
- Chromium – ion exchange

Water retention

Soil microbiology performs a valuable degradation role, particularly during periods of warmer weather. As such the D-Rainclean filter media retains moisture to allow this degradation process to occur. Large pore spaces within strata of the media combined with organic substances and the design of the D-Rainclean channel allow 3.0 litres per linear metre to be stored to ensure that this optimised process can occur.

Soil Testing Values*

Arsenic (As)	10 µg/l
Lead (Pb)	25 µg/l
Cadmium (Cd)	5 µg/l
Chromium (Cr)	50 µg/l
Copper (Cu)	50 µg/l
Nickel (Ni)	50 µg/l
Mercury (Hg)	1 µg/l
Zinc (Zn)	500 µg/l

* Ground Water according to German Federal Soil Conservation Law (Bundesbodenschutzgesetz)

Laboratory testing

Tested independently and compared with natural ‘good soil’, Filter media has considerably better adsorption properties. On average: 99% adsorption of zinc and 99% of copper based on a 10 years total load input (source: DIBt test report).

Hydraulic capacity

The D-Rainclean filter media has a water permeability coefficient of 9 x 10-4 m/s, the secret to this high permeability rate is due to the graduated grain sizing within the media that produces a widely spaced distribution curve. The coefficient has been derived by testing which allows sufficient detention time for adsorption to occur.

The water reservoir built into the channel design also ensures that soil microbiology continues to occur and does not dry out during extreme dry spells.

Harmful organic materials

D-Rainclean uses an organic matrix and a specific activated carbon that supports bonding and degradation of organic pollutants, as such D-Rainclean degrades mineral oils from impermeable trafficked areas such as car parks.

De-icing salts

The use of de-icing salts can block adsorption and reverse the adsorption of already captured hazardous material.

The performance of the filter-media is not adversely affected by sodium chloride even in shock loads. However frequency and concentration of de-icing will have an effect on overall service life – see Design life on page 7.

Oil bonding and degradation

The large void space within the media allows oil to lose its fluidity and cover the pore space where micro organisms can degrade it. In the event of accidental spillage the internal baffles within the D-Rainclean channel design ensure that 10 litres of oil per linear metre can be retained for up to 24 hours so that it can be removed, professionally disposed, and the media replaced.

Phosphate bonding

The enhanced adsorption capacity within the filter media is crucial to maintaining clean water courses.

pH Value

The carbonate buffer range of the media is above pH 7.2

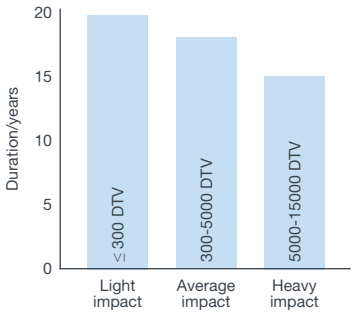
Cation exchange capacity

D-Rainclean filter media acts as an ion exchanger using zeolites and adsorptive elements that ensure bonding with heavy metal ions.

Design life

The design life of the D-Rainclean filter media is a function of its daily use. The Filter media has been tested to DIBt standard approval and based on applications since 2002.

Design life of D-Rainclean filter media**



** DTV = average daily traffic volume

Disposal

The filter media should be removed and disposed in line with local authority and regulatory guidelines.

Planting

The filter media contains sufficient nutrients for selected plants e.g. pachysandra, mahonia, vinca minor or cotoneaster. For further information please contact the Stormwater Management technical department.

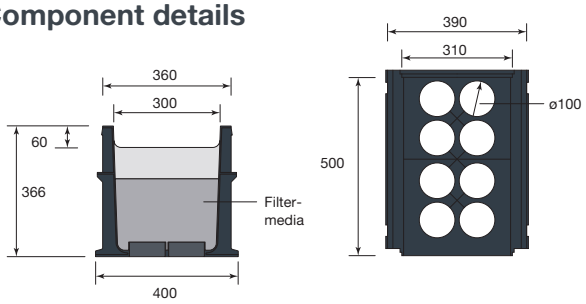
Component and installation details

Stormwater Management provide technical support from concept design right through to the construction phase. We are able to offer site specific design solutions to provide our clients with the most cost effective and environmentally sympathetic solutions. Our engineering department can provide preliminary calculations and CAD details.

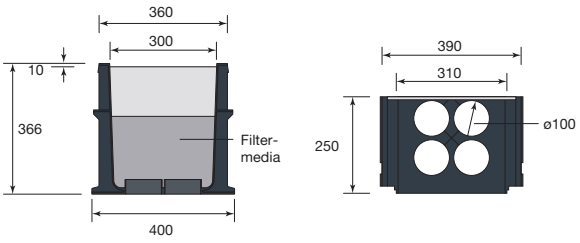
The B125 Cast-iron grate is ideal for occasionally or constantly light trafficked areas.

The D400 cast-iron grate and frame is suitable for heavier trafficked areas and heavy goods vehicles.

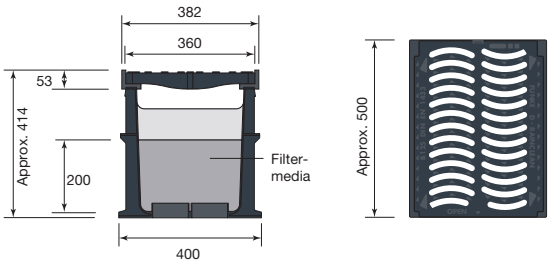
Component details



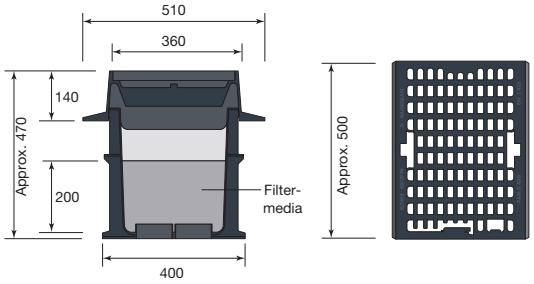
D-Rainclean open



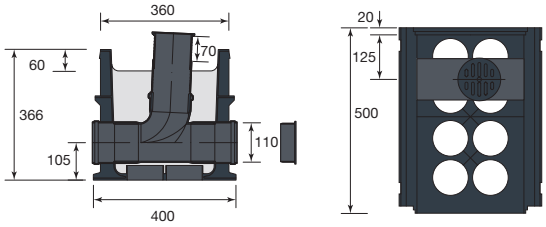
D-Rainclean end unit



D-Rainclean cast-iron – class B125

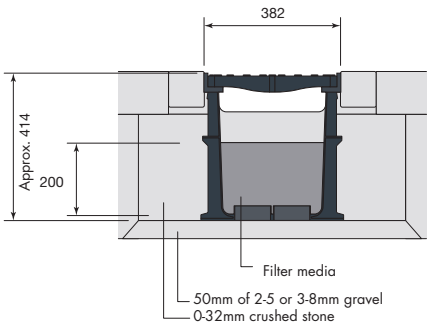


D-Rainclean cast-iron – class D400



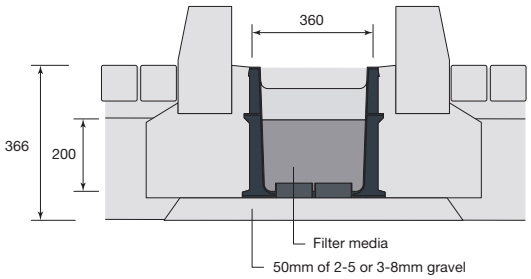
D-Rainclean overflow unit

Installation details

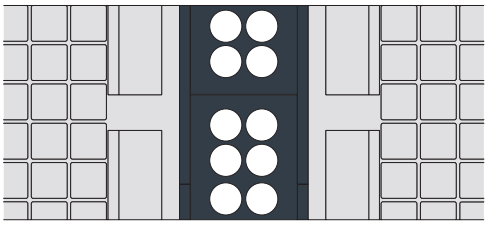


D-Rainclean cast-iron - class B125

No supporting concrete haunching is needed, only compactible materials (e.g. gravel 0-32mm) installed and compacted in layers along both sides of the channel.

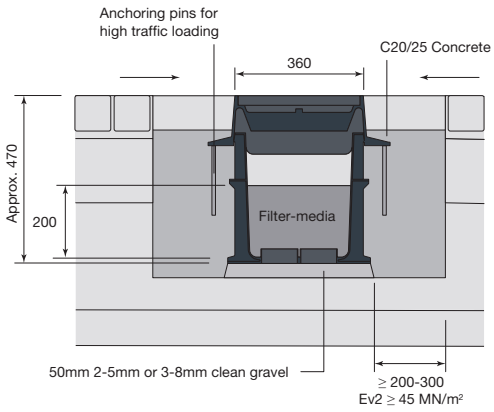


Top view



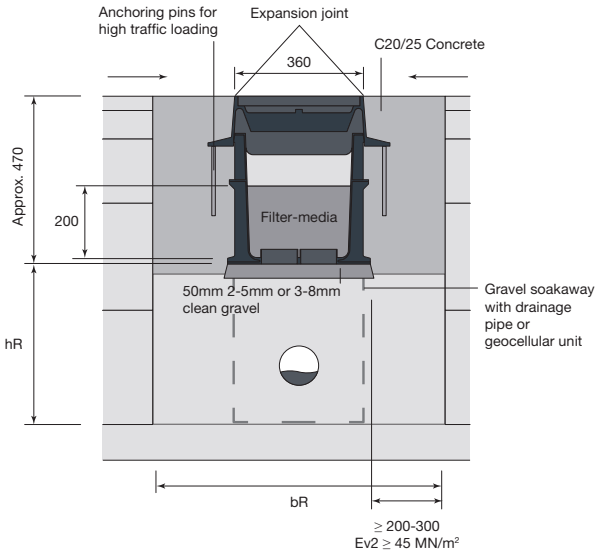
D-Rainclean open with elevated kerbs

The use of D-Rainclean with raised open kerbs is an option between rows of car parks.



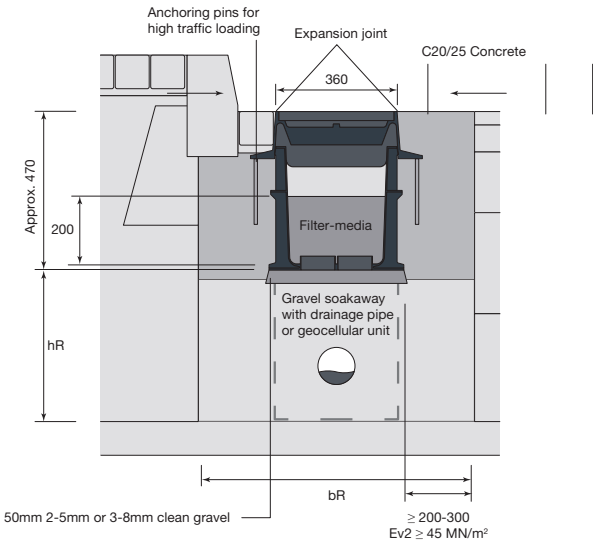
D-Rainclean cast-iron – class D400

The D-Rainclean filter channel has a D400 cast iron cover and frame (500mm × 360mm) is particularly suitable for use in trafficked areas.



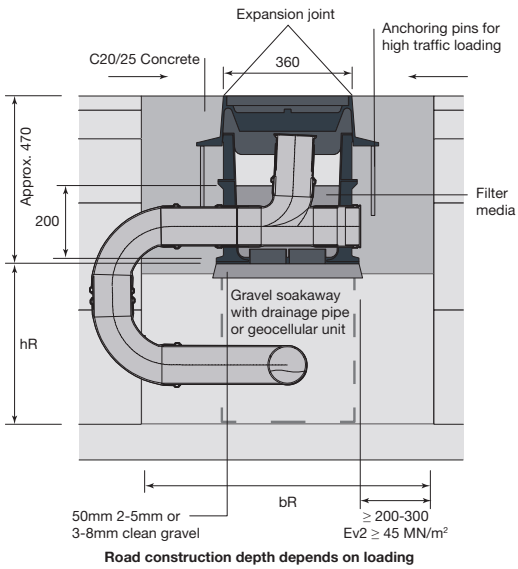
D-Rainclean Class D with perforated drain pipe

Combination with a perforated, high strength carrier pipe allows the D-Rainclean System to be installed in soils with low water permeability.



D-Rainclean Class D abutting kerb with perforated drain pipe

Combination with a perforated, high strength carrier pipe allows the D-Rainclean System to be installed in soils with low water permeability.



Road construction depth depends on loading

Overflow detail for exceedence events

The 110mm overflow pipe connects to a perforated high strength carrier pipe in a trench drain.

Sizing the system

The D-Rainclean system can be sized by our engineering team if the following information is provided:

- **Location of project**
- **Design rainfall event**
- **Soil infiltration coefficient at the required location**
- **Drainage catchment area**
- **Surface material type**
- **Allowable discharge rate**
- **Groundwater level**
- **Available area for channel system**
- **Receiving water body e.g. ground, watercourse, etc.**

From this data our engineers will be able to calculate the quantity of channel required and where necessary, design in exceedence measures to meet the rainfall design criteria.

Worked example for a car park in Witley, Surrey.

The above car park has an impermeable area of 900m^2 with 38 car spaces. With a run off coefficient of 0.66 this equates to an effective drainage area of 590m^2. Using the rainfall data for Witley, Surrey:

N= 0.2 a^{-1} = 5 year storm event

The D-Rainclean filter media has an infiltration coefficient of 9 x 10^{-4}, and it is assumed that the natural soil has the same coefficient.

Using DWA138 method of sizing, this equates to 55m of D-Rainclean channel being needed, in the above example, 27.5m has been designed using a trafficable B125 cast-iron grating, and 27.5m in an open channel design adjacent to a landscaped area.

Not only will the D-Rainclean channel hydraulically control and treat the runoff it also negates the need for positive drainage, silt traps, oil separator and flow control.

Case study: B&Q, South Gloucester

D-Rainclean offered an economical and high-performance alternative to the originally proposed porous paving design concept. The use of conventional tarmac combined with the D-Rainclean system offered time and cost savings without compromising the car park area's ability to control run-off and deal with contaminants. The efficiency of D-Rainclean filter media means that contaminated run-off is effectively treated at source before being returned to the water course – in this case, the river Trym. This removed the need for an expensive Petrol Interceptor and the associated electrical hook up and maintenance ramifications. Independent performance testing of the installation has indicated that the media will perform for 18 years before replacement of the media becomes necessary.

For further information and a copy of the test report, please contact Stormwater Management Ltd directly on sales@storm-water.co.uk

D-Rainclean Specification Clause

The stormwater bio-remediation channel system shall be D-Rainclean by Stormwater Management Ltd. The system shall comply with EN1433 and have been tested and approved for Stormwater treatment in accordance with DIBt requirements. The system shall be designed to remove TSS to sub 63µg and nominated dissolved heavy metals (Zinc and Copper).

NBS Specification

The D-Rainclean bio-remediation channel should be specified in NBS section R17:315. Assistance in completing this clause can be found in the Stormwater Management entry in NBS Plus or a model specification can be downloaded from www.storm-water.co.uk. For further assistance, please contact the Stormwater Engineering Team.

Stormwater Management Ltd

Stormwater Management Ltd are specialists in the design, supply and install of surface water and sustainable drainage systems, whether the requirement is for landscaped, hybrid or more engineered drainage systems Stormwater Management Ltd are able to offer a solution.

Based in Hinckley, Leicestershire with a team of design and site engineers, Stormwater Management Ltd provide a wide range of drainage solutions for volume control and surface water treatment.

Maintenance

Replacing the filter-media

Where required use the installation wrench open the cast iron cover of the D-Rainclean® filtration channel.

Remove the filter media using a standard suction and rinsing vehicle.

Carefully remove filter media using suction hose. A weak water jet can be used in order to accelerate the process if desired.

Continue removing the media until the openings on the lower edge of the filtration channel are visible.

This will ensure that the substructure gravel remains in situ.

Pour the new filter media into the channel. This requires four standard bags per metre of channel.
A 1.5m^3 bag is sufficient for approx. 27 linear metres of channel.

When laying the media, ensure that it is evenly spread along the channel to a depth of 200mm.

Once completed, replace the cast iron gratings in their frames and lock in place.

Other products and applications

The D-Rainclean filter-media

This unique and versatile filter media can be used for other sustainable drainage treatment train components, such as:

- Infiltration basins (shown above)
- Swales
- Rain gardens

Innolet

Innolet is a range of point drain cartridges that treat Stormwater run-off from roads and comprise aerobic and anaerobic filter to remove priority pollutants such as

- Heavy metals – zinc, copper, cadmium and lead
- Hydrocarbons
- PAH
- Phosphates

Technical Support

Stormwater Management design service

Stormwater Management provide full technical support from design right through to installation and commissioning – from product and system selection, design calculations and CAD drawings, we aim to provide clients with all the relevant technical information.

Whether your scheme uses soft, engineered or hybrid drainage systems Stormwater Management have a range of product and system solutions to allow you to meet your objectives.

On site support

Stormwater Management Ltd. now boasts the largest product range of its kind in the UK. Fully conversant in all D-Rainclean solutions as well as other associated products, our well- trained staff are always available to discuss the technical merits of D-Rainclean and to advise which solution would be most suited to a particular application.

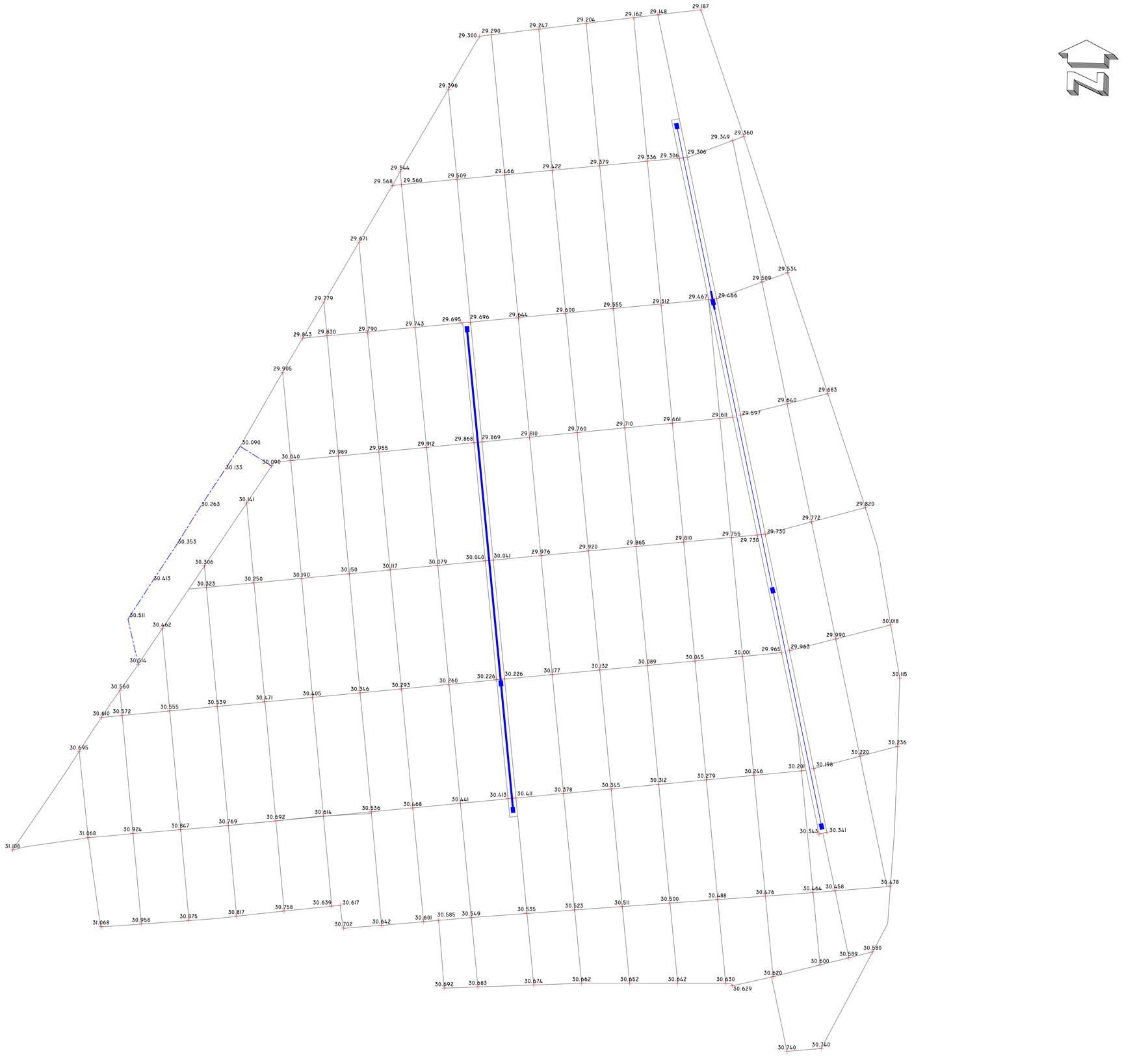
Tel 01455 502222
Email sales@storm-water.co.uk

Stormwater Management Limited
Fleming Road, Harrowbrook Industrial Estate, Hinckley, Leicestershire LE10 3DU

Tel 01455 502222 **Fax** 01455 502223 **Email** sales@storm-water.co.uk **www.storm-water.co.uk**

stormwater MANAGEMENT

5.5 As-built levels drawing (by others)



13-05-21

Drawing Number:

BJP-COS-SF-06

Notes:

Levels relate to OS Datum

New Concrete Yard Area
8912m2

Legend:

BJP Site Engineering Services Ltd
Iffin Lane, Canterbury, Kent
E:barry@bjpuk.com
T:07766 162699

Project:

Rotamead Yard
Sadlers Farm
Essex

Title:

Proposed levels of
concrete yard slabs

Scale:	Drawn:	Checked:	Date:
1:250@A1	BJP	BJP	13-05-21

Drawing Number:

BJP-COS-SF-06

Questions?
Contact us.

www.sudsdesigns.co.uk
info@sudsdesigns.co.uk