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Conceptual Sustainable Drainage Strategy

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REPORT

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J. Morley 13 February 2025

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Contents

1 INTRODUCTION AND POLICY 1
1.1 Project Brief 1
1.2 Planning Policy Context 1
Local Development Plan 1
Climate Change 2

2 SITE LOCATION AND PROPOSED DEVELOPMENT 3
2.1 Site Location 3
2.2 Proposed Development 3

3 CONCEPTUAL DRAINAGE STRATEGY 4
3.1 Introduction 4
3.2 Greenfield Runoff Rates 4
3.3 Proposed Surface Water Drainage 4
Drainage Hierarchy 4
3.4 Drainage Strategy 5
3.5 Benefits of SuDS Measures 6
Bio-remediation Channels 6
Geocellular Storage Systems 6
3.6 Pollution Mitigation 6
3.7 Event Exceedance 7
3.8 Maintenance and Adoption 7

4 SUMMARY AND CONCLUSIONS 10

Tables

Table 1 - Change to extreme rainfall intensity compared to a 1961-90 baseline 2
Table 2 – Greenfield Runoff Rates (Based on a 1ha area) 4
Table 3 – Pollution Hazard and Mitigation Indices 7
Table 4 - Proprietary Treatment Systems (Bio-remediation channels) Suggested Maintenance Requirements 8
Table 5 - Attenuation Tanks Suggested Maintenance Requirements 8
Table 6 – Flow Control Manhole Suggested Maintenance Schedule 9
Table 7 - Oil and Sediment Filters Suggested Maintenance Schedule 9

Figures

Figure 1 – Site Location Plan 3

Appendices

Appendix A – Site Layout 11
Appendix B – Greenfield Runoff Rates 12
Appendix C – Conceptual Surface Water Drainage Strategy 13
Appendix D – Surface Water Storage Calculations 14
Appendix E – Pollution Mitigation Product Sheets 15

1 INTRODUCTION AND POLICY

1.1 Project Brief

1.1.1 RPS Consulting Services Ltd. ("RPS") has been commissioned to prepare a Conceptual Sustainable Drainage Strategy on behalf of Marubeni Europower Ltd. to support a planning application for a proposed Hydrogen Refuelling station located at land off *Amazon Way, Skewen, Swansea, SA1 8QL.*

1.1.2 The purpose of this report is to provide details regarding the management of surface water runoff from the proposed development. This report is not intended to provide formal details of the final drainage design for the development. However, it provides information regarding the capabilities of the conceptual surface water drainage strategy to meet the requirements of national and local policy referenced below.

1.2 Planning Policy Context

1.2.1 Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of greenfield surface water drainage by allowing water to flow along natural flow routes and also aims to reduce the runoff rates and volumes during storm events, whilst providing water treatment benefits.

1.2.2 Schedule 3 of the Flood and Water Management Act 2010 was enacted in Wales in January 2019, leading to the requirement for all new developments to incorporate SuDS.

1.2.3 The following national guidance documents and design standards have been considered in the development of this Conceptual SuDS strategy:

- C753 The SuDS Manual (CIRIA, 2015);
- Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (Welsh Government, 2018)[1];
- Planning Policy Wales – Edition 12, February 2024[2];
- Technical Advice Note 15: Development and Flood Risk (TAN15);
- The Building Regulations 2010 Part H: Drainage and Waste Disposal;
- County/City wide guidance from the local SuDS Approval Body (SAB), if available.

Local Development Plan

1.2.4 The Neath Port Talbot Local Development Plan 2011-2026[3] was published January 2016, contains the following Policies relating to drainage:

"***Policy BE 1 - Design***

All development proposals will be expected to demonstrate high quality design which fully takes into account the natural, historic and built environmental context and contributes to the creation of attractive, sustainable places.

Proposals will only be permitted where all of the following criteria, where relevant, are satisfied:

[1] Welsh Governments Statutory Standards for SuDS- https://www.gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf

[2] Planning Policy Wales Edition 12 - https://www.gov.wales/sites/default/files/publications/2024-07/planning-policy-wales-edition-12.pdf

[3] Neath Port Talbot Local Development Plan - https://media.npt.gov.uk/media/ca2fbumd/ldp_written_statement_jan16.pdf?v=20240823155047

[…] 9. Its drainage systems are designed to limit surface water run-off and flood risk and prevent pollution."

Climate Change

1.2.5 The TAN15 states that when considering new development proposals, it is necessary to take account of the potential impact of climate change over the lifetime of development. In line with TAN15, the climate change allowances have been informed by latest available information on climate change projections and different scenarios of carbon dioxide (CO2) emissions to the atmosphere.

1.2.6 Supplementary guidance published by the Welsh Government provides climate change allowances[4] for different epochs (periods) of time over the next century. This guidance will be reviewed when more up-to-date climate change research is available. It is recommended that the 2080s changes are used when considering any time beyond 2115.

1.2.7 Table 1 presents both the central and upper end estimates for climate change associated with rainfall intensity.

Table 1 - Change to extreme rainfall intensity compared to a 1961-90 baseline

Applies across all of Wales	Total potential change anticipated for '2020s' 2015- 39)	Total potential change anticipated for '2050s' (2040- 2069)	Total potential change anticipated for the '2080s' (2070-2115)
Upper Estimate	10%	20%	40%
Central Estimate	5%	10%	20%

[4] Welsh Government Climate Change Allowances - www.gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf

2 SITE LOCATION AND PROPOSED DEVELOPMENT

2.1 Site Location

2.1.1 The site is located approximately 5.5 km east of Swansea and approximately 4.2 km north west of Neath Port Talbot and comprises an area of approximately 0.951 hectares (ha). A site location plan is provided as Figure 1 below.

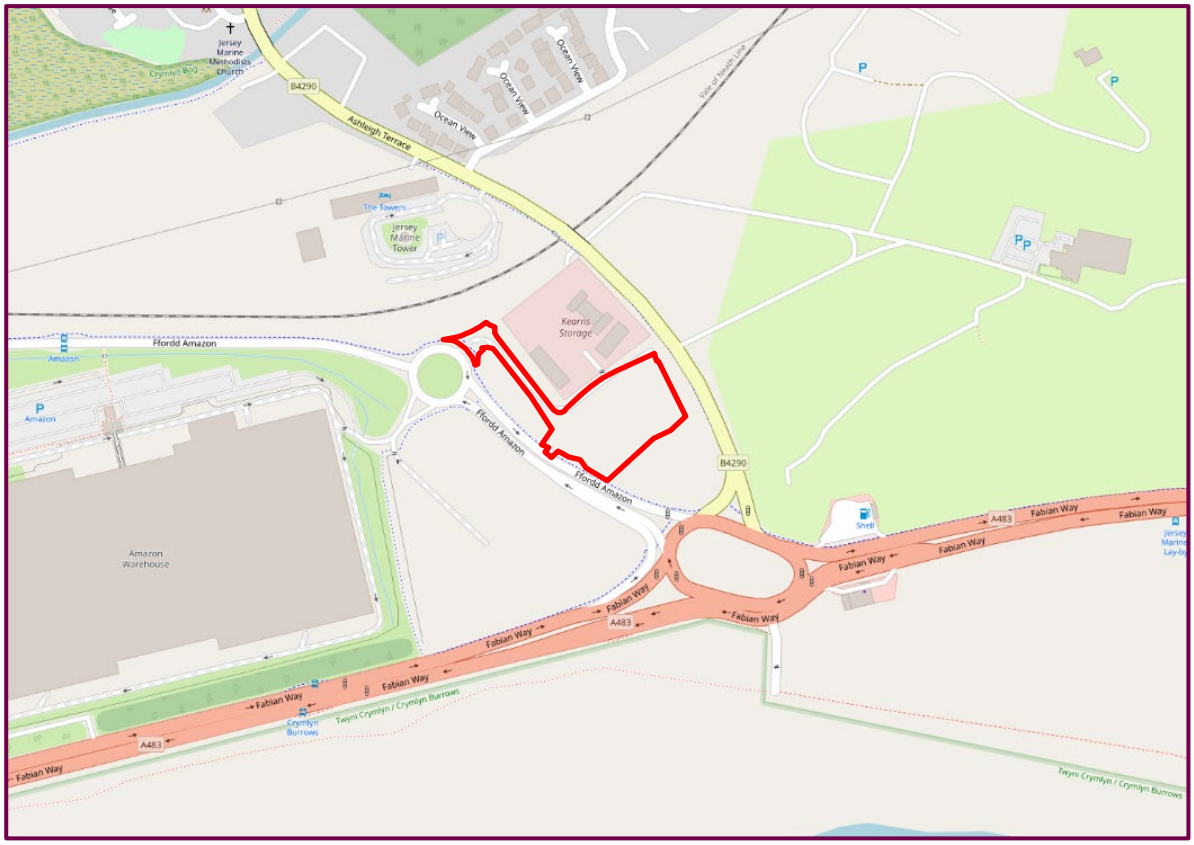

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Figure 1 – Site Location Plan

2.1.2 The site is currently greenfield land. The site is bordered by roads. The B4290 / Ashleigh Terrace is immediately present to the east and a roundabout associated with the A483 / Fabian Way is present to the south. Fford Amazon is to the west of the southern boundary and an access road to the north.

2.1.3 Beyond this, land use is primarily commercial and industrial. The access road to the north currently serves a self-storage development and beyond this, there is a hotel and spa approximately 230 m to the north. Low-rise residential properties associated with the outskirts of Jersey Marine begin approximately 280 m north of the site. Land further to the east is largely associated with two golf clubs. Approximately 180 m to the west there is a warehouse development.

2.1.4 Just south of Fabian Way, approximately 130 m to the south of the site, land is associated with the Crymlyn Burrows Sites of Special Scientific Interest (SSSI). Other designated areas include Cors Crymlyn / Crymlyn Bog SSSI and Special Areas of Conservation (SAC) approximately 475 m north of the site.

2.2 Proposed Development

2.2.1 Development proposals comprise installation and operation of a hydrogen refuelling station. Access is proposed to be from the north, via the existing access road off Fford Amazon. The site layout is provided in Appendix A for reference.

3 CONCEPTUAL DRAINAGE STRATEGY

3.1 Introduction

3.1.1 This report provides conceptual details of the proposed surface water drainage strategy for the site. The aim of the strategy is to ensure that the Proposed Development will not adversely affect the surface water regime in the area, and to demonstrate that overall the current situation will be improved.

3.1.2 For the purposes of this assessment, taking into account the Welsh Government's climate change allowances (published in September 2021)[4], a 40% increase in peak rainfall intensity has been included as climate change allowance, which caters up to the year 2115. No climate change guidance is available beyond 2115.

3.2 Greenfield Runoff Rates

3.2.1 The greenfield nature of the site means that surface water will slowly soak into the ground (infiltrate), be intercepted by vegetation or run off by way of overland flow, according to the soil characteristics and following the topography of the site.

3.2.2 Greenfield runoff rates for the site have been calculated using the (Flood Estimation Handbook) FEH Statistical Method, based on a hypothetical 1ha area. The greenfield runoff calculations have been included for reference within Appendix B and the outputs are summarised within Table 2.

Return Period	Greenfield Runoff Rate (l/s/ha)
Q1	3.35
QBAR	3.94
Q30	7.68
Q100	9.77

Table 2 – Greenfield Runoff Rates (Based on a 1ha area)

3.3 Proposed Surface Water Drainage

Drainage Hierarchy

3.3.1 The Welsh Government advises of the following hierarchy for the disposal of surface water:

1. Collected for reuse;
2. Infiltration to ground;
3. Discharge to surface water body;
4. Discharge to a surface water sewer, highway drain or another drainage system;
5. Discharge to a combined sewer.

3.3.2 The drainage hierarchy[1] has been considered as follows:

Collected for Reuse

3.3.3 Given the nature of the proposed development and operational requirements, there is considered limited demand for potable water at the site. Therefore, rainwater reuse has not been considered further at this stage.

Infiltration

3.3.4 The entirety of the site is underlain by superficial deposits of Blown Sand comprising sand. It is recommended that infiltration testing is undertaken to inform detailed drainage design and confirm the final drainage strategy.

To a Surface Water Body

3.3.5 There is a drainage ditch within the boundary surrounding the site which will be utilised as the surface water outfall for the proposed development.

To a Surface Water Sewer, Highway Drain or Another Drainage System

3.3.6 As it is proposed to discharge to a surface water body, discharging to a surface water sewer has not been considered.

To a Combined Sewer

3.3.7 As it is proposed to discharge to a surface water body, discharging to a combined sewer has not been considered.

3.4 Drainage Strategy

3.4.1 The Conceptual Drainage Strategy illustrating drainage proposals based upon a discharge to a nearby drainage ditch is provided within Appendix C. The strategy has been designed based upon the following parameters:

- Proposed Impermeable Area = 0.529 ha
- QBAR Greenfield runoff rate = 3.94 l/s/ha
- Restriction Rate = 2.1 l/s
- Attenuation Requirement for 1:100+40%CC design storm event = 527m³

3.4.2 Following the Drainage Hierarchy, the potential for storage and infiltration of runoff has been considered. Storage within open features is not feasible given the limited size of the site and infiltration methods are not appropriate given the underlying geology and potential for contamination. However, storage will be provided within the geocellular attenuation crates for gradual release. This will ensure that runoff is managed as closely to the source as possible. Runoff will be treated via bio-remediation channels and a petrol / silt interceptor prior to discharging into the drainage ditch adjacent to the site, further details on the water quality benefits of these SuDS features is provided in Section 2.5.

3.4.3 Two geocellular attenuation crates are proposed at the site with a combined surface area of 1387.5 m^2, each to a depth of 0.4 m and 95% porosity, providing a total of 527.25 m^3 of attenuation on site. Flows will then be directed east, with an outfall to the drainage ditch adjacent to the site at a restricted runoff rate of 2.1 l/s. Surface water calculations are provided in Appendix D, demonstrating that sufficient surface water storage has been provided up to the 1:100+40% climate change storm event.

3.4.4 A surface water outfall is proposed to the drainage ditch located to the northeast of the site. This drainage ditch connects to a 300mm diameter surface water sewer approximately 90m to the southeast. It is proposed to regrade the drainage ditch to have a 1:500 slope to improve the drainage of the site.

3.4.5 It should be noted that both the Conceptual Drainage Strategy indicated within Appendix C, and supporting calculations within Appendix D, are preliminary, and as such, subject to further detailed design and approval by the relevant authorities. However, the designs illustrate that surface water arising from the development may be sustainably managed such that it does not pose a flood risk, either to proposed or existing development, to the 1:100+40% climate change storm event.

3.5 Benefits of SuDS Measures

3.5.1 Sustainable drainage is a departure from the traditional approach to draining sites. There are some key principles that influence the planning and design process enabling SuDS to mimic natural drainage by:

- storing run-off and releasing it slowly (attenuation);
- allowing water to soak into the ground (infiltration);
- slowly transporting (conveying) water on the surface;
- filtering out pollutants;
- allowing sediments to settle out by controlling the flow of water.

3.5.2 CIRIA has produced several guidance documents covering a range of water management scenarios. A summary of the publications used as reference when the site drainage strategy was produced are listed below.

- Planning for SUDS – making it happen (C687)
- Site handbook for the construction of SUDS (C698)
- The SUDS Manual 2015 (C753)
- Sustainable Drainage Systems – Hydraulic, structural and water quality advice.

Bio-remediation Channels

3.5.3 Bio-remediation channel systems use the processes of separation, adsorption, and bioremediation to treat contaminated run-off prior to discharge. They act to degrade and diffuse hydrocarbons and dissolved heavy metals as well as retaining sediments. Bio-remediation channels are proposed throughout the site to intercept surface water runoff and convey flows to the geocellular crates.

Geocellular Storage Systems

3.5.4 Geocellular storage systems are modular plastic units with a high porosity (generally around 95%) that can be used to efficiently create a below-ground structure for the temporary storage of surface water before controlled release or use. The storage structure (tank) is formed by assembling the required number of individual units (sometimes in several layers), and wrapping them in either a geotextile or a geomembrane.

3.6 Pollution Mitigation

3.6.1 Surface water run-off should be managed by SuDS that are designed to attenuate flows and to avoid water quality impacts downstream. To demonstrate that surface water arising from the development will be appropriately treated prior to discharge, the Simple Index Approach, as outlined within the SuDS Manual (CIRIA C753) has been followed.

3.6.2 As stated in the SuDS Manual 2015 (C753), the risk posed by surface water runoff to the receiving environment is a function of:

- the pollution hazard at a particular site (i.e. the *pollutant source*)
- the effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, groundwater (i.e. the *pollutant pathway*)
- the sensitivity of the receiving environment (i.e. the *environmental receptor*).

3.6.3 The site consists of a hydrogen refuelling station, therefore the pollution hazard level is 'high'. The pollutant hazard indices for this type of development are outlined in The SuDS Manual (CIRIA C753) Table 26.2 and Table 3 below.

Table 3 – Pollution Hazard and Mitigation Indices

Land Use / SuDS Feature	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Proposed Land Use			
'High' pollution hazard	0.8	0.8	0.9
Mitigation			
Bioretention Channel	0.98	0.99	0.98
Interceptor	0.8	0.6	0.9
Total Mitigation Accounting for 50% Efficiency of Secondary Stage			
Bio-retention channels, Interceptor (Latter at 50% Efficiency)	1.38	1.29	1.43

3.6.4 Values for the Bio-remediation channels and Petrol/silt interceptor have been obtained from specific products for the purpose of demonstrating that sufficient treatment can be provided. Details of these typical products are provided in Appendix E. Note, that these products have been used as examples to demonstrate that these indices can be achieved.

3.6.5 This confirms that surface water arising from the development will receive an appropriate level of treatment in advance of discharge from site. The maintenance and adoption of the SuDS features are described below.

3.7 Event Exceedance

3.7.1 The proposed indicative surface water drainage concept provides underground storage up to the 1 in 100 year plus climate change event. In an event exceeding this magnitude, detailed drainage design will identify mitigation measures to ensure that the resulting above-ground flooding will be confined to temporary shallow flooding of the on-site road network and will not affect the buildings on site or significantly increase flood risk to off-site locations.

3.7.2 Event exceedance planning will be undertaken as part of the final design process. Suitable mitigation measures will be incorporated into the development to ensure water is retained on-site should surcharging of on-site drains occur during extreme rainfall events.

3.8 Maintenance and Adoption

3.8.1 A specialist management company will be identified at the detailed design stage and appointed to maintain the SuDS features for the lifetime of the development.

3.8.2 Tables 4 to 7, below, indicate the envisaged maintenance activities associated with the proposed geocellular crates, bio-remediation channels, petrol/silt interceptor and flow control manhole, along with the approximate frequency within which they should be completed.

Table 4 - Proprietary Treatment Systems (Bio-remediation channels) Suggested Maintenance Requirements

Maintenance schedule	Require Action	Typical Frequency
Routine Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial Actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

Table 5 - Attenuation Tanks Suggested Maintenance Requirements

Maintenance schedule	Require Action	Typical Frequency
Routine Maintenance	Inspect and identify any areas that are not operating correctly, if required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually.
	Remove sediment from pre-treatment structures and/or internal forebays.	Annually, or as required.
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.

	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.

Table 6 – Flow Control Manhole Suggested Maintenance Schedule

Maintenance schedule	Require Action	Typical Frequency
Routine Maintenance	Inspect vegetation above and around flow control chamber and remove nuisance plants (for first 3 years).	Monthly (at start, then as required)
	Remove sediment from flow control chambers	Annually
	Flow control devices: Check for and clear obstructions	Quarterly
Remedial Actions	Repair of Penstock and flow control device	As required
Monitoring	Inspect structures for evidence of poor operation	Monthly/after large storm
	Inspect structures, flow control and pipework etc. for evidence of physical damage	Monthly/after large storm
	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Table 7 - Oil and Sediment Filters Suggested Maintenance Schedule

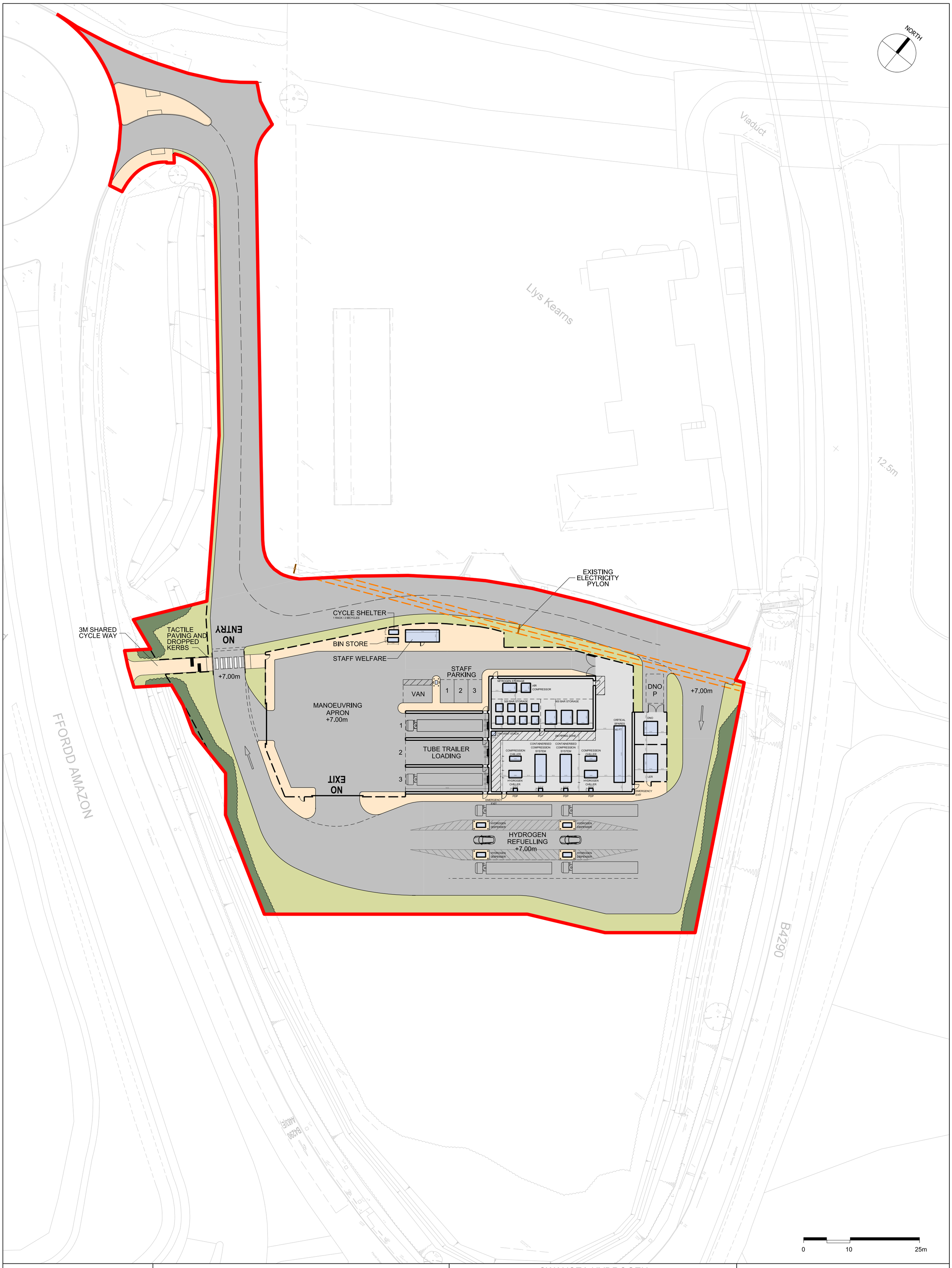
Maintenance schedule	Require Action	Typical Frequency
Routine Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation.	Six monthly.
	Change the filter media.	As recommended by manufacturer.
	Remove sediment, oil, grease and floatables.	As necessary – indicated by system inspections or immediately following significant spill.
Remedial Actions	Replace malfunctioning parts or structures.	As required.
Monitoring	Inspect for evidence of poor operation.	Six monthly.
	Inspect filter media and establish appropriate replacement frequencies.	Six monthly.
	Inspect sediment accumulation rates and establish appropriate removal frequencies.	Monthly during first half year of operation, then every six months.

4 SUMMARY AND CONCLUSIONS

4.1.1 The management of surface water runoff for the proposed hydrogen refuelling station located at land off *Amazon Way, Skewen, Swansea, SA1 8QL* is summarised below.

- On site surface water attenuation will be provided within two geocellular attenuation crates. Surface water runoff will be restricted to the greenfield runoff rate of 2.1l/s and an outfall is proposed to the drainage ditch located adjacent to the site;
- Prior to discharge, surface water will be treated via bio-remediation channels and a petrol/silt interceptor;
- All proposed surface water drainage will be suitable to attenuate flows up to and including the 1 in 100 year + 40% climate change rainfall event;
- A specialist management company will be identified at the detailed design stage and appointed to maintain the SuDS features for the lifetime of the development.

Appendix A – Site Layout



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4. WHERE DISCREPANCIES EXIST BETWEEN REFERENCE OR ASSEMBLY DRAWINGS & DETAIL DRAWINGS, THE LATTER TAKE PREFERENCE.

LEGEND

- RED LINE APPLICATION BOUNDARY
- GRASSLAND
- FOLIAGE AND TREES
- PEDESTRIAN WALKWAY
- ROADS
- HARDSTANDING
- OVERHEAD ELECTRICITY CABLES

PROJECT	SWANSEA HYDROGEN					
DRAWING	Proposed Site Plan					
FOR PLANNING		-	25/01/30	Issued for Planning		
SCALE 1:250@A0 1:500@A2	25/01/30 DATE					
1463 PL011 DWG. NO.	- REVISION					

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Appendix B – Greenfield Runoff Rates

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Josh Hughes
Site name:	Swansea Hydrogen
Site location:	Swansea

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	
Longitude:	
Reference:	3389332294
Date:	Oct 25 2024 13:45

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 1

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.746
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.11

Hydrological characteristics

	Default	Edited
SAAR (mm):	0	1214
Hydrological region:	1	1
Growth curve factor 1 year:	-	0.85
Growth curve factor 30 years:	-	1.95
Growth curve factor 100 years:	-	2.48
Growth curve factor 200 years:	-	2.84

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):		3.94
1 in 1 year (l/s):		3.35
1 in 30 years (l/s):		7.68
1 in 100 year (l/s):		9.77
1 in 200 years (l/s):		11.19

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix C – Conceptual Surface Water Drainage Strategy

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Notes

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2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

PRELIMINARY
SUBJECT TO DETAILED DESIGN

This drawing illustrates a sketch proposal only and as such is subject to detailed site investigation including ground conditions/contaminants, drainage, design and planning/density negotiations. The layout maybe based upon an enlargement of an OS sheet or other small scale plans and its accuracy will need to be verified by Survey. Full risk analysis under the CDM Regulations has not been undertaken.

Total Site Area = 0.9511ha
Impermeable Area = 0.522ha
QBAR Greenfield Runoff Rate = 3.94l/s/ha
Restriction Rate = 2.1l/s
Storage Volume for a 1 in 100 year plus 40% Climate Change storm event = 527m³

KEY

- Surface Water Manhole
- Surface Water Pipe Line
- Surface Water Headwall
- Geocellular Crates
- Bio-Remediation Channel

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Appendix D – Surface Water Storage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.000
CV	1.000	Preferred Cover Depth (m)	1.000
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

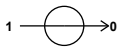
Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1-STORAGE	0.529	5.00	100.000	1200	1010.000	1000.000	0.400
2-FC			100.000	1200	1020.000	1000.000	0.500
3-OF			100.000	1200	1030.000	1000.000	0.600

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	1-STORAGE	2-FC	10.000	0.600	99.600	99.500	0.100	100.0	300	5.11	50.0
1.002	2-FC	3-OF	10.000	0.600	99.500	99.400	0.100	100.0	300	5.21	50.0

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
1-STORAGE	1010.000	1000.000	100.000	0.400	1200		0	1.001	99.600	300
2-FC	1020.000	1000.000	100.000	0.500	1200		1 0	1.001 1.002	99.500 99.500	300 300
3-OF	1030.000	1000.000	100.000	0.600	1200		1	1.002	99.400	300

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	2880	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Flow+ v10.8 Copyright © 1988-2025 Causeway Technologies Ltd

Node 2-FC Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	99.500	Product Number	CTL-SHE-0078-2100-0400-2100
Design Depth (m)	0.400	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.1	Min Node Diameter (mm)	1200

Node 1-STORAGE Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	99.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1500.0	0.0	0.400	1500.0	0.0

Flow+ v10.8 Copyright © 1988-2025 Causeway Technologies Ltd

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	1-STORAGE	2040	99.969	0.369	14.6	526.0747	0.0000	FLOOD RISK
2160 minute winter	2-FC	2040	99.969	0.469	8.7	0.5302	0.0000	FLOOD RISK
15 minute summer	3-OF	1	99.400	0.000	2.1	0.0000	0.0000	OK

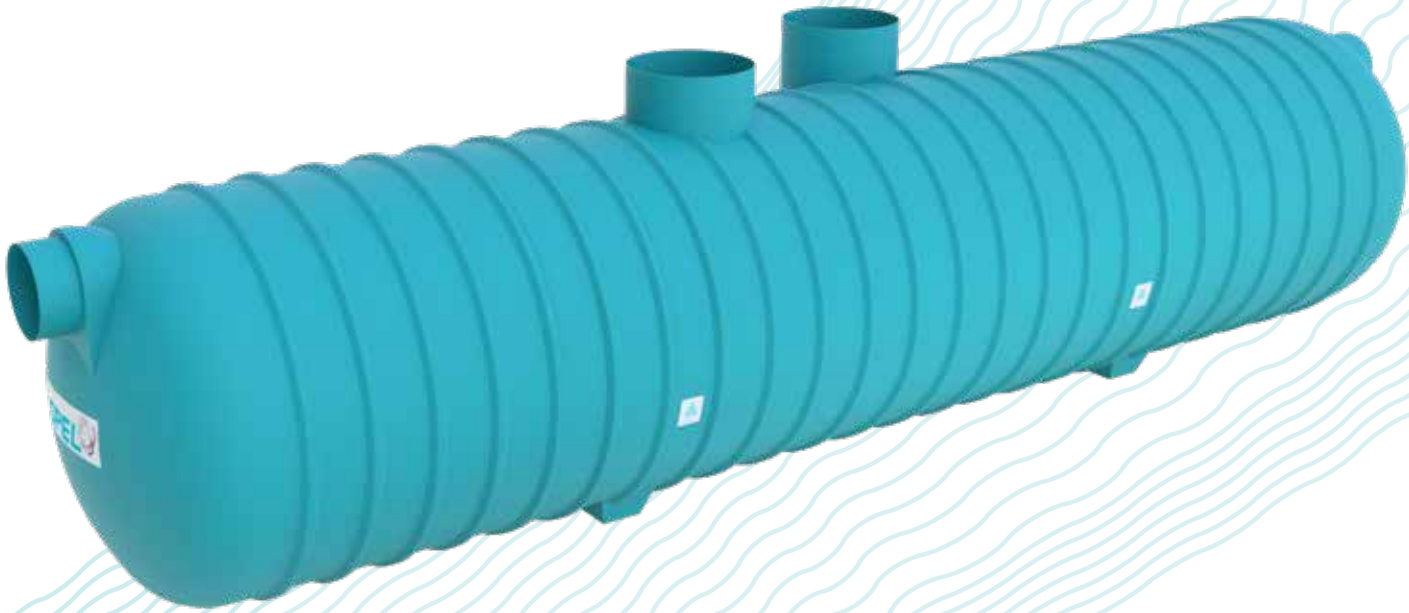
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	1-STORAGE	1.001	2-FC	8.7	0.302	0.078	0.7042	
2160 minute winter	2-FC	Hydro-Brake®	3-OF	2.3				580.5

Flow+ v10.8 Copyright © 1988-2025 Causeway Technologies Ltd

Appendix E – Pollution Mitigation Product Sheets

Quality solutions protecting our global environment

*The **safest answer** for **pollution control** and our **environment***



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

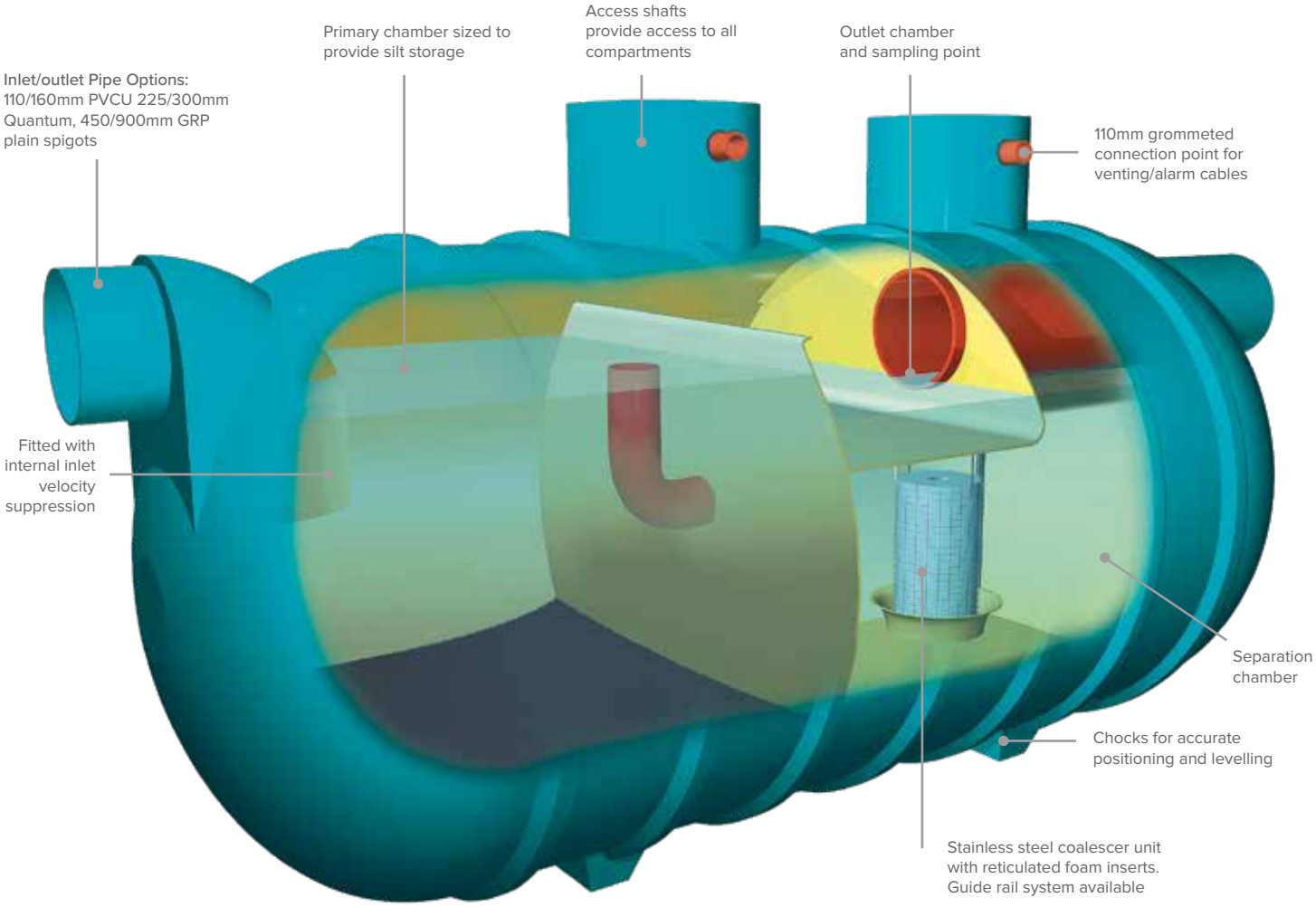
The new SPEL ESR System is fully certified to meet the CIRIA SuDS Mitigation Index. It has been tested by WRc (for TSS and Metals) to the British Water Code of Practice for Manufactured Treatment Devices. This unit is also compliant to the British and European Standard BS EN 858.

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

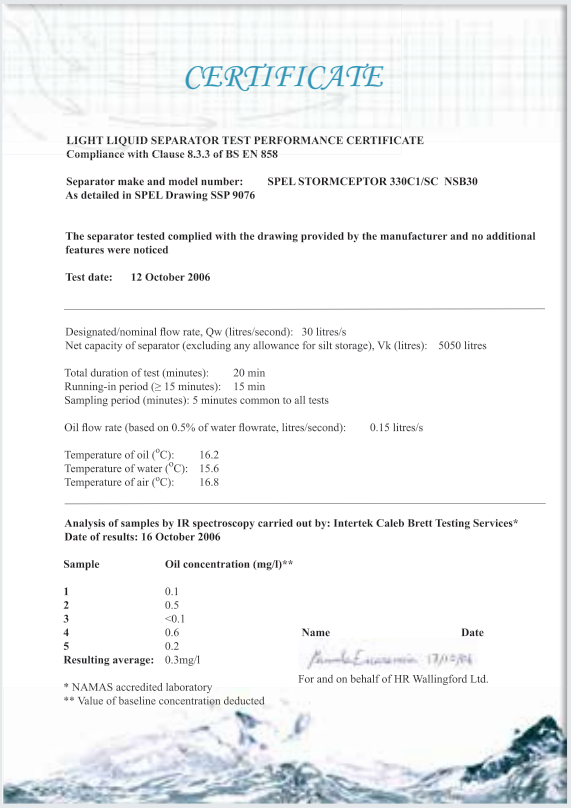
Product Details	Description
Manufacturer	SPEL Products
Treatment Device Name/Model	Stormceptor Type 210 C1/SC
General description	Class 1 By-pass Separator with Silt Capacity
Envisaged application	Treatment of Surface Water Run-off
Pollutant(s) captured	Suspended Solids

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**

For and on behalf of HR Wallingford Ltd.

* NAMAS accredited laboratory
** Value of baseline concentration deducted

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.

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

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	-	-
212C1/ESR	200	12	120	1,600	180	1200	3,570	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				

Access shafts dependent on orientation of pipework (see page 7 for orientation options).

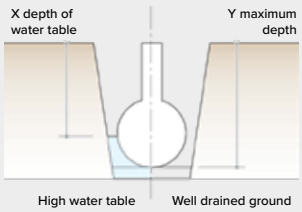
**These catchment areas are based on the SuDS Manual requirement for By-Pass devices to treat the 1 in 1 year storm event (27mm).*
***This dimension is for A-C inlet/outlet options, larger pipe sizes are available for D-I inlet/outlet options.*

Tank Shell Specifications

The 'standard' specification is normally adequate for most installations but Heavy, Extra Heavy and Special 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.

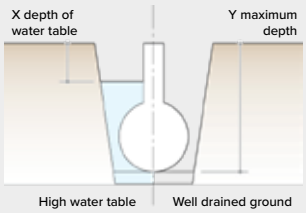
Standard tanks

Series	WT (m)	D (m)
200	1.0	4.0
300	0.9	4.0
400	1.3	5.0
500	1.9	5.7
600	2.4	6.2



Heavy tanks

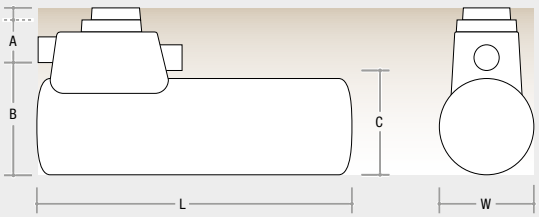
Series	WT (m)	D (m)
200	2.0	6.0
300	2.8	5.6
400	3.5	6.0
500	4.5	7.25
600	4.7	7.3



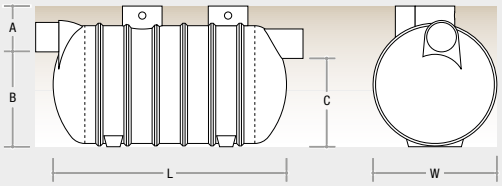
Based on installation in concrete with concrete surround.
For pea gravel surround, see SPEL Data Manual p13.5

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



Commissioning, Installation & Maintenance

Installation

SPEL Separators can be installed with a concrete or pea gravel surround, dependent upon ground conditions and water table level. Detailed installation instructions are provided with each unit, see Installation TSII or SPEL Data Manual Section 13.

Site access and conditions

It is the responsibility of the contractor to ensure suitable access to good hard ground that is safe and suitable for off-loading.

Off-loading/handling

The contractor is responsible for off-loading. The tank must be handled with care to prevent accidental damage from impact or contact with sharp objects.

Tanks should be lifted using slings, not chains or wire ropes. Do not drag tanks along the ground for any distance and avoid jarring or bumps. Do not lift with water in the tank.

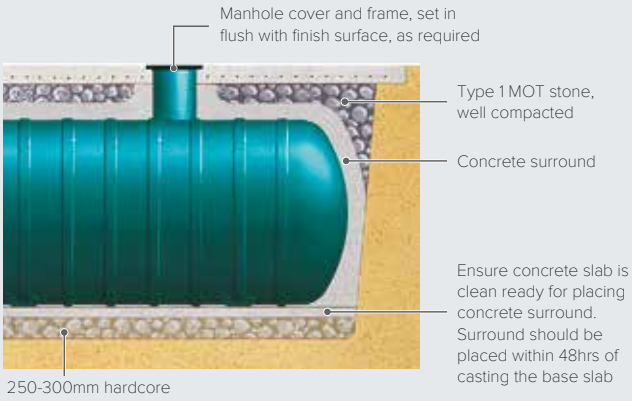
Health and safety

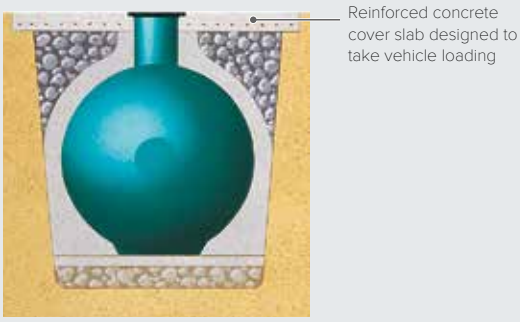
Installation should be carried out by a competent contractor in accordance with Health & Safety at Work legislation and good building practice.

A warning notice should be visible at the top of each access shaft – 'danger, harmful fumes' and 'respirators must be worn in this tank'. Before entering persons must be qualified in accordance with 'confined space' requirements.

Installation – Concrete

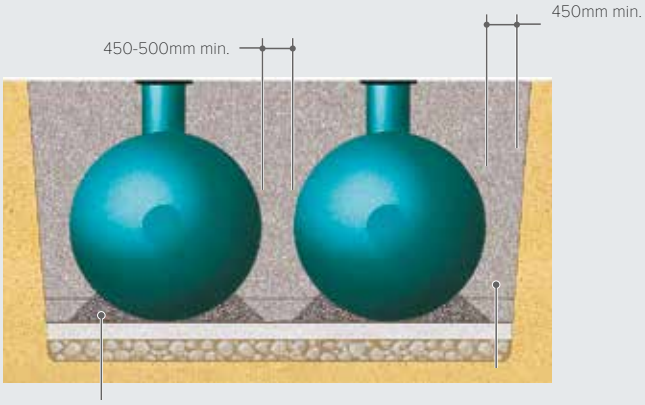
Installation of SPEL Separator tank with chocks and a load bearing cover slab.





Installation – Pea gravel

Installation of SPEL Separator tank where ground over installation is not required to be vehicle load bearing.



Tanks surrounded with pea gravel or similar

Where it is economical to do so, SPEL Separator tanks can be surrounded in pea gravel or with similar free flowing clean rounded aggregate. Details of the installation procedure, approved backfill materials and the need for mechanical anchoring in specific circumstances are contained in the SPEL Data Manual and SPEL Separator Installation Instructions.

Maintenance Requirements

We recommend the SPEL Separator is checked at 3, 6 or 12 monthly intervals to determine the depth of silt in the primary chamber.

The SPEL automatic alarm/monitoring system will automatically warn you when the SPEL Separator requires emptying of light liquids. See ref. 3.10 – 3.19. However, silt will accumulate and require removing at intervals depending on the site conditions.

SPELGuard contracts available.
For more information contact us:
info@spelproducts.co.uk | 01743 445 200

SPELGuard Commissioning & Maintenace

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.

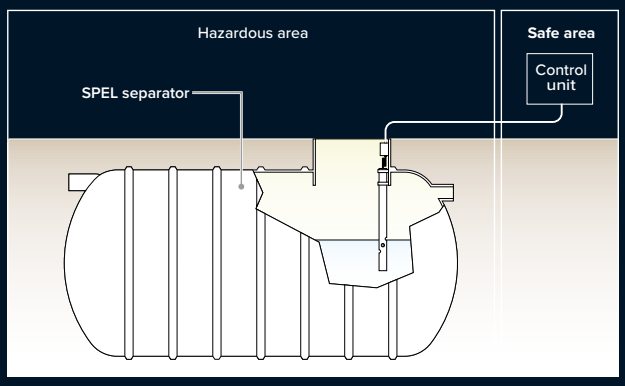
SPEL coalescer unit lifting, locating and locking system

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 offer a range of alarms, *for full details refer to the SPEL Data Manual Section 3.* Kiosks with beacons and provision for BMS and remote information via browser user interface.

SPEL Model Alarm-DY14400
Oil alarm only – not BMS compatible

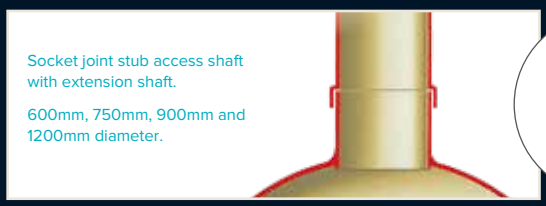
SPEL Model IdOil-20
Oil, silt and/or high level alarm with volt free terminal for beacon and BMS capability

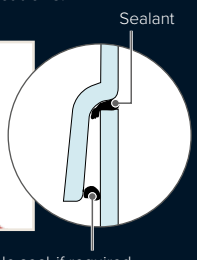
SPEL Model IdOil-30
For oil, silt and/or high level as required. This alarm provides a range of options for BMS and remote information to on or off-site monitoring facilities.

SPEL Model IdOil Solar Oil Separator Alarm
for remote off-grid areas.

SPEL extension access shafts

Extension access shafts are available for deep invert applications.

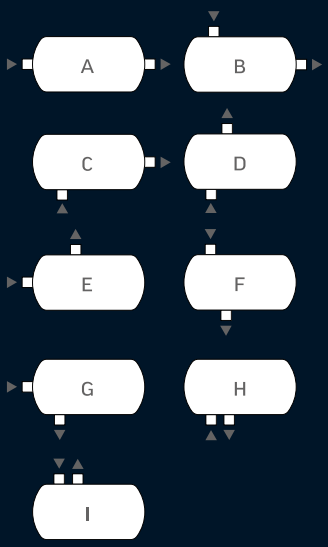




See tripod drawing below for other extension adjustments

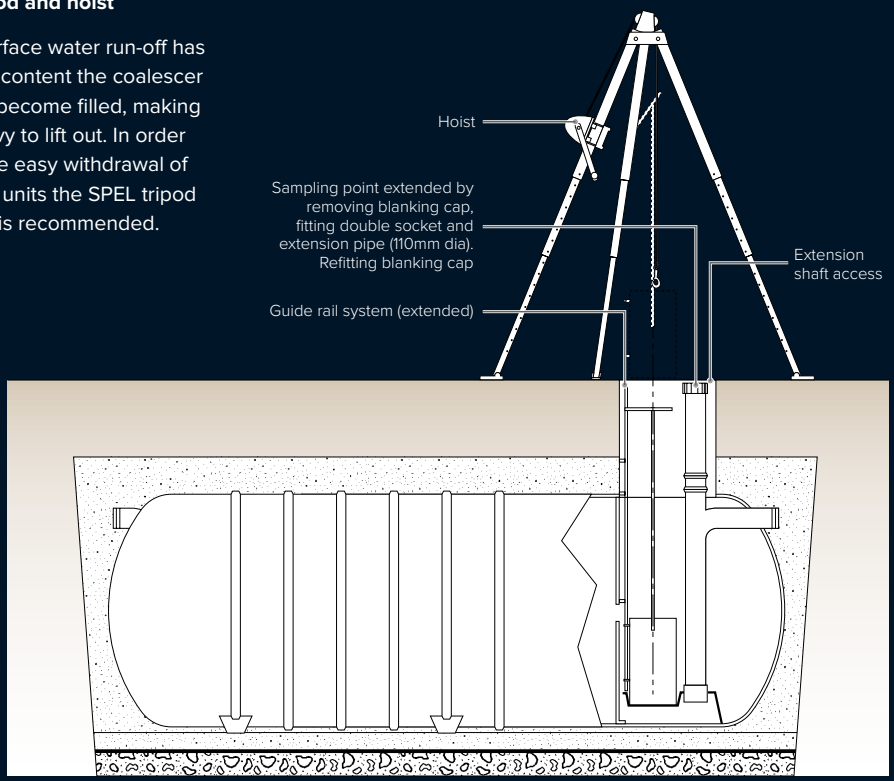
SPEL ESR Range – Inlet/outlet orientation

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.



Stormceptor ESR

Enhanced Silt Retention

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.

Lancaster Road, Shrewsbury, Shropshire SY1 3NQ

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08/22

stormwater MANAGEMENT

D-Rainclean® Bioretention System

Product Data Sheet

The D-Rainclean® Bioretention System provides treatment for surface water run-off and exceeds the required SuDS Mitigation Indices as outlined in C753, The SuDS Manual

Typical Application

- Driveways
- Car Parks
- HGV service yards

Features and Benefits

- Excellent SuDS Mitigation Indices calculated in accordance with the British Water 'How to Guide':
  - TSS – 0.98
  - Hydrocarbon – 0.99
  - Heavy Metals – 0.98
- Independently accredited and monitored by DiBt, supported with field test data
- Excellent hydraulic capacity
- Long media service life of up to 40 years
- Excellent silt retention
- Unique filter media – optimised grain size lowers clogging risk
- Adsorption agents ensure high retention of dissolved pollutants
- Active soil microbiology, gives a vitalised soil, assisting with decomposition of organic pollutants
- Retains adsorption in the presence of de-icing salt
- Simple replacement of filter media in the event of accidental spillage (e.g., oil spillages)
- Internal baffle walls allow the system to be laid level or to a fall
- Suitable for use in a range of trafficked areas, with grating options for loadings B125, D400 & E600
- Non-trafficked areas require no concrete reinforcement, reducing installation cost and time
- Emergency overflow allows exceedance events to be accommodated
- Aluminium edge rails allow installation without gratings where applicable, leading to cost savings

Maintenance

The D-Rainclean® Bioretention System requires very little maintenance, with only periodic inspection required. The filter media generally needs replacement at the end of its expected life, which can be accurately determined at the design stage, although DIBt recommends taking samples to measure pollutant loadings at 10-yearly intervals. If replacement is required, carefully remove the filter media using a standard suction and rinsing vehicle. 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 bioretention section's are visible. This will ensure that the substructure gravel remains in situ. Pour the new filter media into the bioretention section's. A 1.5m^3 bag is sufficient for approx. 27 linear metres of bioretention section's. When laying the media, ensure that it is evenly spread along the bioretention section's to a depth of 200mm. Once completed, replace the cast iron gratings in their frames and lock in place. Regardless of pollutant loadings, the current DIBt certificate requires the media to be fully replaced after 40 years. A copy of the DIBt certificate is available on request.

D-Rainclean® Components & accessories

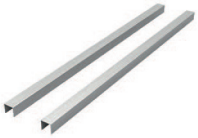
Bioretention Section 500mm

End Piece 250mm LH or RH

Overflow Section 500mm

Filter Media 14 Litre Bag

Filter Media 1.5 m^3 Sack



Aluminium Rails 3000mm

Cast Iron Grating 500mm B125

Connecting Clamp for B125 Grating

Cast Iron Grating 500mm D400

Cast Iron Grating 500mm E600

Special Screw Fixing for D400/E600 Grating

Installation Wrench

Specification clause:

The bioretention system shall be D-Rainclean®, manufactured by Funke Kuntstoffe and distributed in the UK by Stormwater Management Ltd. The system shall be loading Class B/D/E (delete as appropriate) to comply with EN1433 and have been tested and approved for Stormwater treatment in accordance with DIBt requirements, verified by field testing data. The system shall be designed to DWA138 to remove TSS to sub 63µg, hydrocarbons and nominated dissolved heavy metals (Zinc and Copper). Mitigation Indices, as defined by C753 The SuDS Manual, to be as per the manufacturer's published figures, calculated in accordance with the British Water 'How to Guide'.

- TSS – 0.98
- Hydrocarbon – 0.99
- Heavy Metals – 0.98 average (Zinc 0.97, Copper 0.99)