CAPITA

Campws Glynllifon – Welsh Sheep Centre

Proposed Drainage Strategy

July 2022

CAPITA

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Campws Glynllifon – Welsh Sheep Centre
Proposed Drainage Strategy

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1. Introduction

1.1 Document purpose

This Proposed Drainage Strategy is to support the planning application(s) and pre-application to the Gwynedd SAB (SuDS Approval Board), with respect to the Campws Glynllifon – Welsh Sheep Centre on behalf of the client, Grwp Llandrillo-Menai

1.2 Client and project overview

Capita Real Estate and Infrastructure have been commissioned by Grwp Llandrillo-Menai to undertake the design of a new sheep centre and lamb rearing shed comprising of a large shed with facilities for milking sheep, storage units, and welfare as well as a smaller shed adjacent for the purpose of lambing. The current site is occupied by a shed facility and associate buildings which will be demolished.

The proposed site is located on current farmland located at Coleg Meirion-Dwyfor, Ffrod Clynnog, Llandwrog, LL54 5DU, with grid reference 246021, 355001. The design life of the drainage development is taken to be 25 years. The redline development area is approximately1.4 Ha. See Drawing WSC-CAP-00-ZZ-DR-A-050002 – Site Location Plan provided in **Appendix A1**.

2. Existing site

2.1 Existing flood risk

A desk top study has been conducted for the proposal and the flood risk map can be found in **Appendix A2**. Data from Natural Resources Wales (NRW) shows the site is in an area with no associated flood risk.

2.2 Existing drainage regime

2.2.1 Foul Flows

There is no foul network onsite or opportunity to connect.

2.2.2 Surface Water

There are no formal existing drainage arrangements currently on the site. The current land is served by a natural fall in gradient, which allows for runoff to flow into the surrounding land. Figure 2.1 shows part of the current land use of the proposed site with rainwater gutters and downpipes on the existing building flowing into the surrounding fields. Figure 2.2 shows the pond area where surface water runoff naturally collects.

Figure 2.1 - Current site of proposed sheep shed

Figure 2.2 - Pond area shown behind trees and fencing

2.2.3 Hydrogeology and groundwater

A ground Investigation (GI) is planned for the area that will include boreholes and/or window samples, and trial pits to determine the current ground conditions.

2.2.3.1 Infiltration rates

Awaiting ground investigation reports for infiltration.

2.2.3.2 Groundwater levels

Awaiting ground investigation reports

2.2.3.3 Groundwater vulnerability

Awaiting ground investigation reports

3. Proposed foul water management

3.1 Introduction

The greenfield site has no viable connection to the existing network or treatment works. Consequently, as the site does not communicate to the public foul sewerage system, it is proposed to locally treat the 'domestic' foul flows via a small package treatment works and discharge to the watercourse or via infiltration.

Foul will be split into two categories with lightly fouled discharge and domestic foul. A small below ground hold tank for chemically contaminated fouled will be provided as well as a septic tank for domestic foul. Both will be discharged to the surrounding environment as described below.

3.2 Foul flows

3.2.1 Domestic Foul

All domestic foul from the office areas including toilets, showers, handwashing facilities will be collected in a domestic septic tank as a form of primary treatment. This will then be discharged to a series of vertical reed beds filtering out sewage and hydrocarbons where effluent is periodically distributed across the surface of the bed uniformly and percolates down. This will then be discharged via infiltration.

3.2.2 Chemical & Light Foul

Chemical foul will be collected from the Process Area, Bulking Room, Plant room and from washdown in the milking parlour through the use of an ACO Channel and a floor gully within the milking pit. These will be held in a small holding tank and distributed across the fields. Light foul will include the discharge from the washing down areas in the sheep pens through French drains, the external yard and foot wash bay. Discharge will be held in the same holding tank before being pumped and discharged across fields.

4. Proposed surface water management

4.1 Design standards and methods

All SuDS assets are designed to meet guidelines set out under The SuDS Manual (CIRIA C753, 2015). Information, typical descriptions, and figures of the proposed SuDS assets are given in **Appendix B**.

All surface water proposals will be modelled using Causeway Flow software. The surface water drainage system will be simulated using critical storm events up to the design storm event, the 1 in 100 year return period plus future allowances of 30% on rainfall flow rates for climate change.

This drainage strategy has been designed to establish a SuDS management train to satisfy the statutory SuDS Standards S1 to S6 as set out under the SuDS Standard document (Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems, Welsh Government, 2018). The SuDS Standards are the minimum criteria a SAB require for approvals.

The design elements have been detailed based on standard design detail proven for cost effectiveness, reliability and ease of construction and operation. The proposed methodology and maintenance routines are standard practice taken from accepted guidance. The green SuDS infrastructure proposed has inherent environmental benefits.

4.2 Surface water drainage and SuDS catchments

4.2.1 General description

All surface water runoff managed by the proposed positive drainage system is designed to mimic existing flow paths as much as possible. Flow rates and volumes are to be controlled using rainwater harvesting, inception and attenuation. The proposal has adequate SuDS space provision, is feasible and compliant to, and can be maintained in accordance with appropriate best practice and regulatory requirements. The SuDS asset devices used for both water quality and quantity treatment include:

- Potential for active rainwater harvesting system to store and provide water for all vehicle, yard, and food waste basin washdown and toilet flushing needs
- Holding tanks to hold lightly fouled and chemical discharge.
- Domestical septic tank as a form of primary treatment
- Attenuation storage tanks to provide storage for excess runoff
- Vertical reed bed to naturally treat any wastewater
- Existing swale within the downstream area to provide final treatment, amenity and improve biodiversity.

The drainage system utilises existing swales and ponds to discharge into. The below ground attenuation storage excavation will be carried out within the external works footprint, minimising additional cost of construction. Below ground attenuation will be formed of large gravel and potential recycled construction material with porosity of 30%. The system is self-cleansing using gravity. Additional environmental benefit includes sustaining the marshland habitat.

4.2.2 Discharge strategy, draining areas and runoff

4.2.2.1 Discharge strategy

The primary discharge is infiltration to ground via natural means once sufficient water quality treatment has been undertaken by upstream devices such as a septic tank or reed bed. Excess runoff that has not already infiltrated to ground or flows in times of exceedance above the system's storage capacity, will be discharged as per the existing site, to the surrounding fields and to the existing pond area.

4.2.2.2 Draining areas

Development areas not drained by the proposed positively drained network are to be retained as is and are therefore not considered as part of this drainage strategy. These include:

- The existing northern and western site access roads, yard, and permeable areas draining to the north and west with no positive drainage system

Existing and proposed non-permeable and permeable areas, and the extent of the proposed development's positive drainage system, are provided in the Drainage Layout drawing in Error! Reference source not found..

4.3 Allowance for interception storage of runoff

Interception, the capture and retention of the first 5mm for most rainfall events, has been considered in design for the site to meet the SuDS Standards criterion: compliance of zero runoff for the first 5mm of rainfall for most rainfall events (80% of events during the summer and 50% in winter). A drainage model is available however a continuous time series rainfall data analysis is not, and therefore a simple approach is used to demonstrate compliance, based on assumed compliance of various drainage components, as per Table 24.6 of The SuDS Manual, and Table G2.1 of the SuDS Standards document. A drainage layout drawing showing the existing and proposed impermeable and permeable areas is provided in **Appendix C**.

Table 4-1 below lists the devices, criteria, and their contributing surfaces to interception:

Table 4-1 Interception mechanisms with assumed compliance

System	Compliance criteria for devices and contributing catchments	System provision onsite	Compliant (Yes / No)	Inception provided (Ha)
Rainwater harvesting systems	Designed to BS EN 16941-1:2018, for surface water management and water supply, based on regular daily demand for non-potable water	Yes, 0.185 ha of effective roofing area serving an active rainwater harvesting system designed to BS EN 16941-1:2018, for surface water management and water supply, based on regular daily demand for non-potable water. See **Section 5.1.1** for more information.	Yes	0.185
Soakaway / infiltration systems	if the device is designed to The SuDS Manual Chapter 14 and 25.	Yes, 0.244 ha of area served by filter drains. See **Section 5.1.4** for more information.	Yes	0.244
TOTAL				**0.429**

4.4 Infiltration considerations

4.4.1 Ground stability

A site investigation is in the process of taking place, after which the suitability of the ground conditions will be reviewed in terms of stability of soil characteristics from chemical or structural changes due to infiltration, and on the stability of surrounding slopes and any underlying contaminated land.

4.4.2 Infiltration rates

To be confirmed upon acquisition of the GI survey and results.

4.4.3 Groundwater levels

To be confirmed upon acquisition of the GI survey and results.

5. Proposed surface water devices

5.1 SuDS asset technical detail

Each form of the SuDS assets may serve more than one catchment or type of impermeable surface so to reduce repetition for the reader, any exceptions, and particulars the SuDS assets employed within the drainage strategy design are discussed in this section and grouped and named as per The SuDS Manual.

5.1.1 Rainwater harvesting (RWH)

An active system with a pumped distribution network has been designed with the objective for water conservation (supply) and surface water management, and therefore can be considered to deliver interception for the contributing impermeable area and to reduce the runoff volumes through storage. The 'simple approach' method has been used for tank storage volume calculations requirements with estimated supply and demand flows, as per BS EN 16941-1:2018 On-site non-potable water systems, with a 21 day dry period allowance.

It is proposed rainwater is collected from the roof in an underground tank, and to be pumped via a distribution network to all Phases for vehicle, yard, basin washdowns, and toilet flushing. Tank overflows in times of exceedance will be directed via the surface water network to the downstream bioretention system.

5.1.2 Proprietary Treatment Systems

5.1.2.1 Foul Water (FW) treatment

A suitably sized below ground cesspit/domestic septic tank is proposed to be installed to treat the foul flows. Treated flows will discharge downstream to the vertical reed bed which will provide further water treatment.

5.1.2.2 Vertical Reed Bed

A suitably sized vertical reed bed is proposed to be installed to the southwest of the site. This will provide further water treatment to all foul wastewater. Discharge will be directed on to the existing swale further south. **Figure 5.1** shows a typical section through a reed bed.

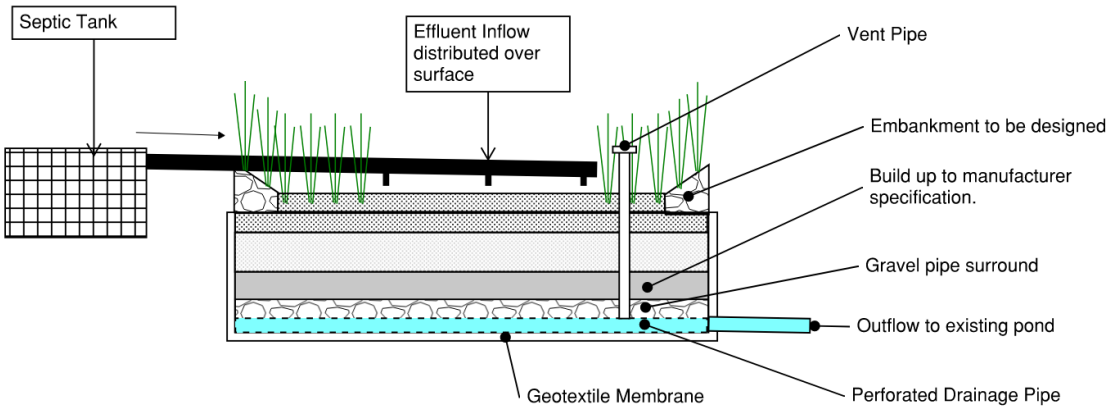

Figure 5.1 - Typical section through a vertical reed bed

5.1.3 Swales

It is proposed to use the existing unlined infiltrating swales at the south of the site. An onsite inspection showed no signs of erosion, and vegetation was found with a well maintained healthy sward of grass. The swale infiltrates to the existing marshland directly below. It is proposed the swales be unaltered, apart from connections made to the proposed drainage network.

Figure 5.2 Existing swale and marshland area (Source: site walkover 20/05/2022)

5.1.4 Attenuation storage tanks

A geocellular storage system is to be used to produce an underground attenuation storage tank with an expected void ratio of 0.95. A system is proposed with a suitable upstream pre-treatment device to protect the storage tanks from sedimentation with access for maintenance. Sufficient ventilation is to be provided to dissipate air as the tank fills. The tank is proposed with maximum storage depths at least 0.5m below surrounding buildings floor levels. Storage capacity has been oversized by 10% to allow for sediment losses and have suitable access for inspection and cleansing. An offline system should be considered to reduce sedimentation. Any downstream flow restriction devices to throttle the tanks outlet and so increase its storage capability should be housed in their own downstream control chamber to facilitate maintenance.

5.1.5 Ponds and Wetlands

A pond currently exists on the site, of approximately 0.19ha with a natural ditch between the access road and the pond. South of the pond lies 0.26ha of marshland as identified by ecologists. The proposed drainage strategy will discharge at a controlled rate into the ditch/swale which will feed the marshland.

Source for the pond is yet to be determined, however if existing run-off is feeding the pond levels, then this should be designed into the drainage layout. If not, then to prevent current levels being flooded, surface water will be directed to sustain the marshland habitat. Ecologists have recommended the existing pond to be left to its own condition.

Appendix A Location Plan and Flood Risk Map

A1 Site Location Plan

A2 Flood Risk Map NRW

1 **Site Location Plan**
1 : 2500

0m 50m 100m 150m 200m

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Refer to the relevant Construction (Design and Management) documentation where applicable.

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N

Key

- Ownership Boundary
- Application Boundary
- Special Area of Conservation & SSSI

Rev	Description	(Chk'd / App'd)	Date
P01	Draft issue for pre planning consultation		27.05.22

Status
D5 - Planning Approval

Classification
Confidential

Client
Grwp Llandrillo-Menai

Project
Welsh Sheep Centre - Campws Glynllifon

Drawing
Site Location Plan

Scale @ A0	Drawn	Checked	Approved
As indicated	EC	MB	EC

Project No.	Date
CS/098555-39	23.03.2022

Drawing Identifier

project	origin	zone	level	file type	role	number	revision
WSC-	CAP -	00 -	ZZ -	DR -	A -	050002 _rev	P01

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Natural Resources Wales

Glynllifon Flood Risk Map -

Allwedd / Map Key

Risk Level Under Review

Flood Risk from Rivers - Extent
- High
- Medium
- Low

Flood Risk from the Sea
- High
- Medium
- Low

Flood Risk from Surface Water & Small Watercourses - Extent
- High
- Medium
- Low

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
11/05/2022

0.3 0 0.13 0.3
British_National_Grid Kilometers

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Appendix B Suds Assets Typical Details

B1 Rainwater Harvesting

This is the collection of rainwater runoff, normally from roofs, for non-potable use, such as toilet flushing, cleaning (vehicle washdown) or irrigation. Runoff from commercial roofs require treatment before infiltrating to ground, however domestic roofs can be infiltrating to ground with no treatment necessary. RWH can be counted toward interception if the level of design is appropriately considered, reducing the contributing impermeable area, and therefore reduce runoff volumes required to store.

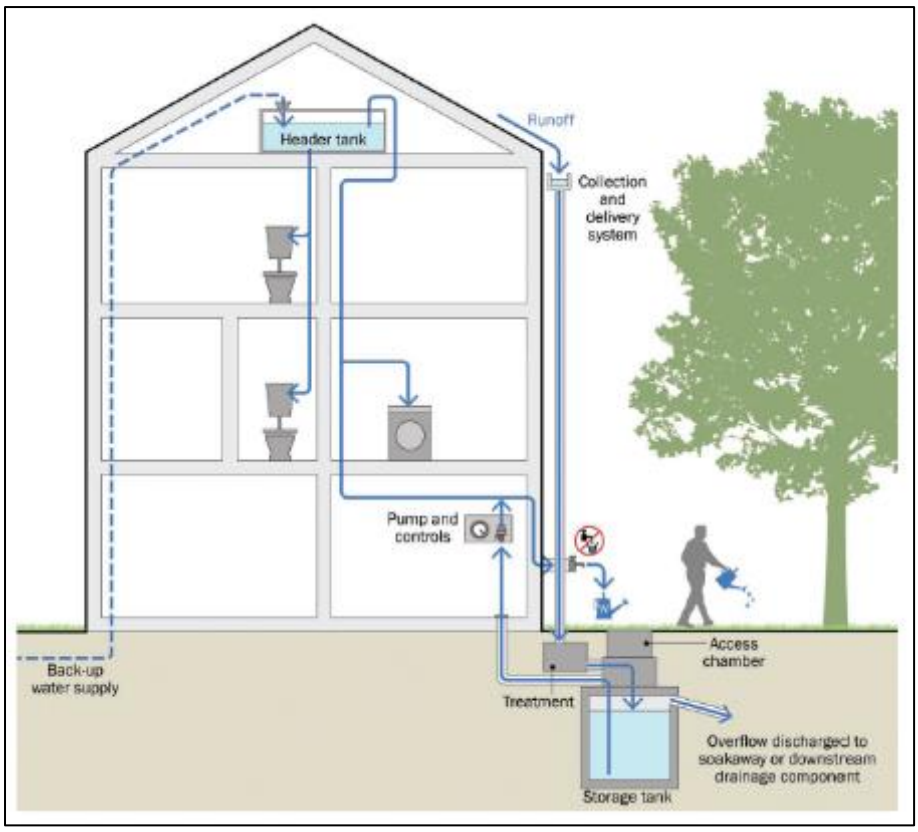


Figure B-1 Pumped rainwater harvesting system with underground storage

B2 Proprietary treatment systems

Proprietary treatment systems are manufactured systems that remove specified pollutants from surface runoff systems. Generally used to support natural processes where they are unavailable or unable to cope with imposed demands on their own.

Oil water separators

Separators are designed to treat a specific incoming flow rate by providing settlement and separation of light liquids and silt from water.

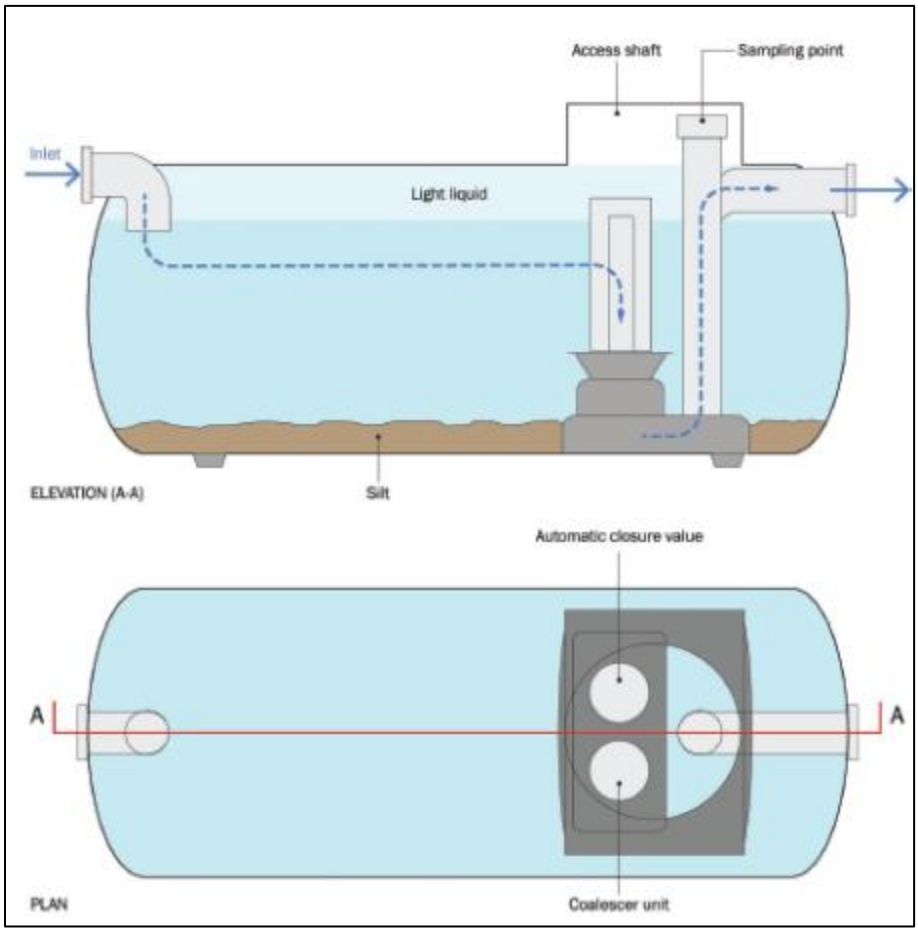


Figure B-2 Prefabricated single chamber oil water separator

B3 Rain Gardens

Rain gardens are small bio-retention systems that serve roofs or driveways, they are more natural structures with a 200-500mm layer of compost/sand-amended native soils or specified soil mixes (engineered soils). Rain gardens have a simple inflow with 150mm standing water, and an outflow connected to a chamber with flow control.

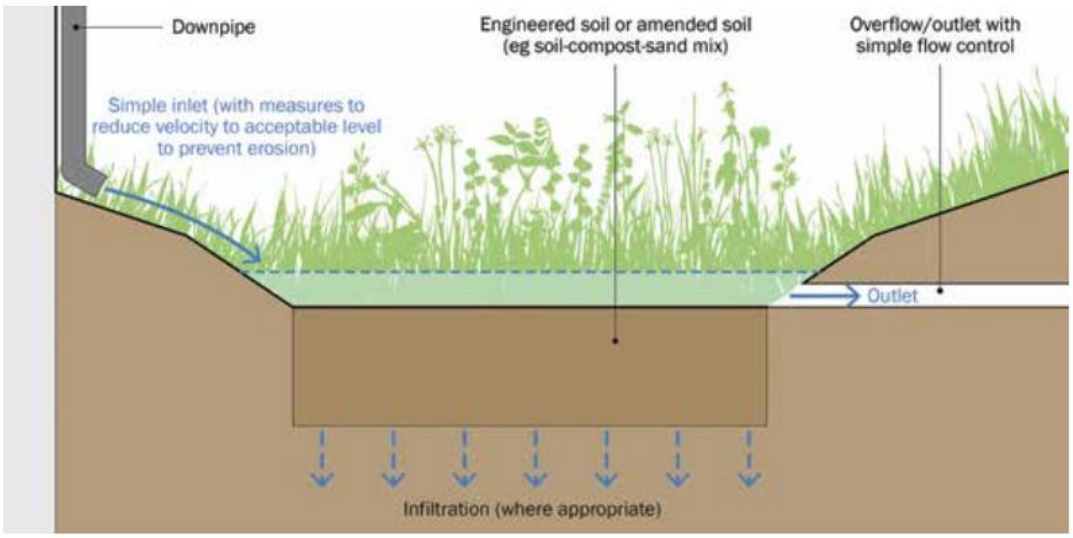


Figure B-3 Rain Garden typical detail

B4 Pervious pavements

For modular surface type permeable paving, the wearing surface is made up of permeable block paving laid on a fine aggregate bedding layer, where the surface water flows drain through the joints of the block paving and filtrate through the bedding layer. Below the bedding layer a filter geotextile is to be laid to provide additional treatment and prevent fines from the bedding layer from migrating into the porous sub-base. Pervious pavements provide surfacing suitable for expected traffic. Wearing surface types include:

- modular permeable paving – impermeable block paving material with widened joints filled with grit to provide voids for permeability.
- porous asphalt.
- grass reinforcement – plastic or concrete grids infilled with grass or gravel.
- resin bound gravel.
- porous concrete.
- macro pervious – an impermeable surface with separate collecting devices conveying runoff to the underlying sub-base.
- sports surfaces – grassed pitches with topsoil designed to be permeable.
- block porous paving - permeable block paving material.

The pavement has underlying sub-base layers to store and treat runoff with three different systems types.

Type A – total infiltration: The sub-base is wrapped in a geofabric to separate the underlying ground allowing direct infiltration to ground.

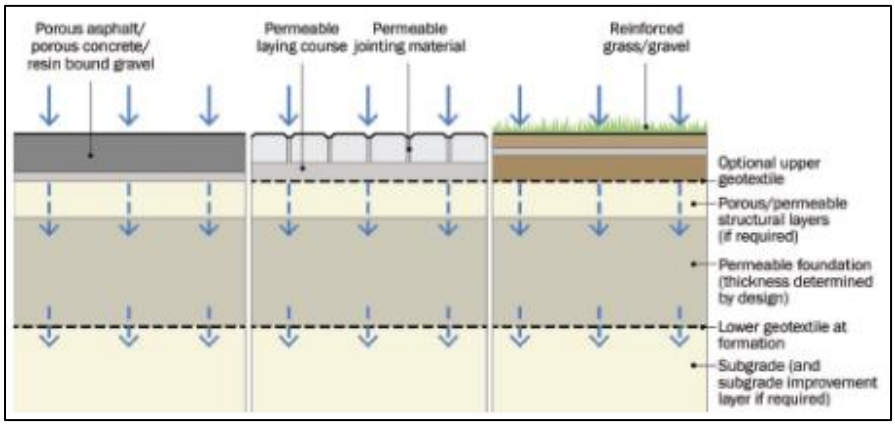


Figure B-4a Pervious pavement water management system Type A – total infiltration

Type B – partial infiltration: The sub-base is wrapped in a geofabric to separate the underlying ground allowing direct infiltration to ground and underlain with drainage layers for conveyance downstream.

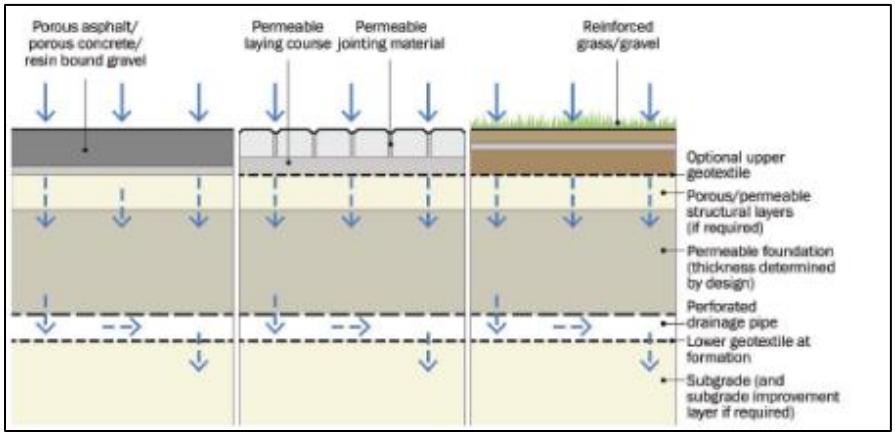


Figure B-4b Pervious pavement water management system Type B – partial infiltration

Type C – no infiltration. The sub-base is wrapped in an impermeable membrane to prevent infiltration and underlain with drainage layers for conveyance downstream.

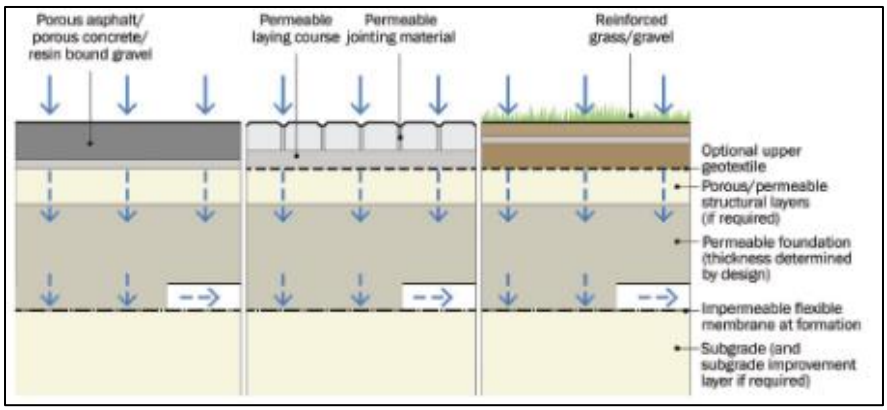
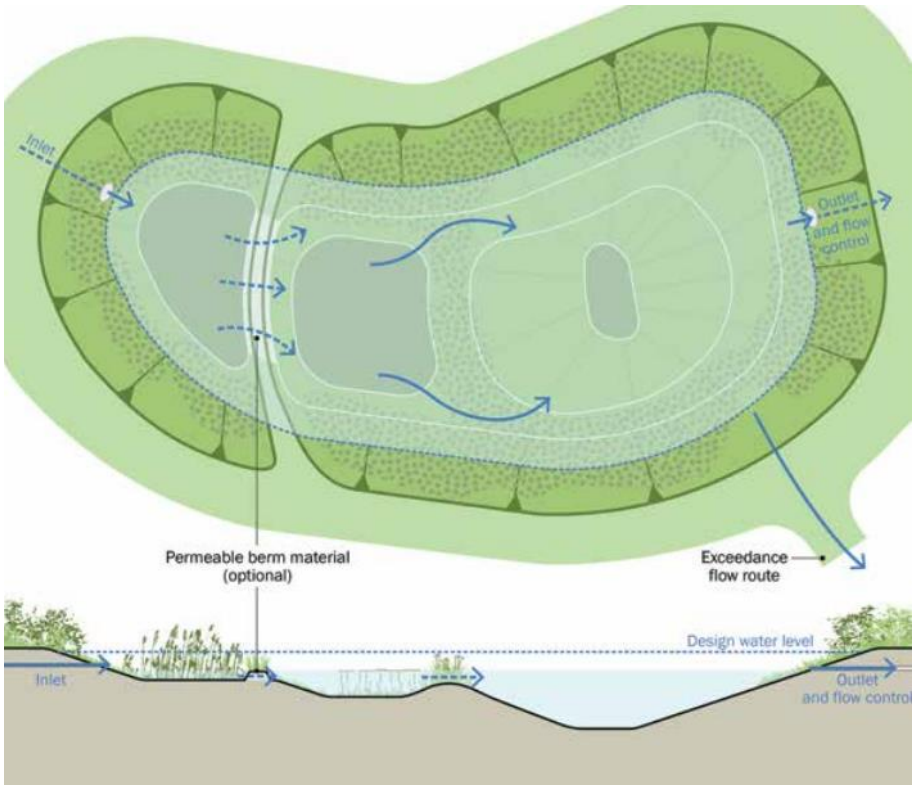


Figure B-4c Pervious pavement water management system Type C – no infiltration

Typical construction materials vary according to design needs. The wearing surface depends on desired appearance and maintenance requirements; traffic types, loads and shearing (turning forces), silt and pollution loads. A bedding layer generally 500mm thick of 2/6.3 aggregate underlies the wearing surface with a filter geotextile, such as Terram T100 or similar, to separate the underlying sub-base. The sub-base material should be a clean single sized Type B filter material, pea gravel or 4/40 aggregate in accordance with BS 7553-12:2009, giving 30% porosity for storage and surface area for treatment. The sub-base may be under drained if required. The system is lined, either in a permeable geotextile or an impermeable geomembrane, such as Visqueen UDG or similar. If additional groundwater body protection is required, a 300mm minimum thick surround of good contaminant potential soil can be specified.

B5 Ponds and wetlands

These are permanent water features providing attenuation above the permanent water level only, but give treatment through settlement, and aerobic decomposition. They support high levels of amenity and biodiversity with appropriate aquatic vegetation. Appropriate shoreline depths and width detail provide aquatic benching, bettering safety, maintenance access and increased emergent and submerged vegetation diversity.



Appendix C Proposed Drainage Layout

C1 Proposed Drainage Layout

	Existing Foul Water Manhole Drainage
	Existing Surface Water Manhole Drainage
	Proposed Foul Water Manhole/Catchpit Drainage
	Proposed Surface Water Manhole Drainage
	Proposed Surface Water Inspection Chamber
	Flow Control Chamber
	Foul ACO Channel Drain
	Surface ACO Channel Drain
	Open Channel Drain
162.095	Proposed Levels
fg	Foul Floor Gully
sp	Foul Silt Pit
sp	Surface Silt Pit
svp	Soil Vent Pipe
rwp	Rainwater Downpipe
	Foul Water Flow Direction
	Surface Water Flow Direction
	Below Ground Attenuation Tank
	Vertical Reed Bed
	Lightly Fouled Holding Tank
	Domestic Septic Tank/ Interceptor

CL	Cover Level
IL	Invert level
SL	Sump level
S/A	Soakaway
RAI	Reverse Action Interceptor
bd	backdrop
re	rodding eye
svp	soil & vent pipe (rodable)
wvp	waste and vent pipe (rodable)
wp	waste pipe (rodable)
ss	stub stack (rodable)
sg	shower gully (rodable)
sp	silt pit (rodable)
ra	rodding access
rg	450Ø x 900 deep precast concrete trapped, rodable, road gully with grating area greater than 900cm^2
fg	floor gully (rodable)
rwp	rainwater downpipe (rodable)
psdp	primary siphonic downpipe
ssdp	secondary siphonic downpipe
vp	vent pipe (oil separator)
aav	air admittance valve
TOB	Top of base level
CI	Cast Iron
VC	Vitrified Clay
R	Flexible `Rocker' joint
S/FIC	Surface/ Foul inspection chamber

Note: Final setting out of all drainage points at ground level to the Architect's and M and E Engineer's details.

Rev	Drwn	Chk'd	App'd	Description	Date
P04	SK	AGB	AGB	Updated to latest Architect Layout.	15.07.2022
P03	SK	SD	SD	Updated to latest Architect Layout. Updated to latest DTM Comments	08.06.2022
P02	SK	SD	SD	Updated to suit comments on foul discharge	19.05.2022
P01	SK	SD	SD	Draft	11.05.2022

Purpose of Issue: Preliminary
Status: S1

Classification: Confidential

Client: Grwp Llandrillo-Menai

Project: Rural Economy Food Hub - Campws Glynllifon

Drawing: Welsh Sheep Centre Drainage Layout

Scale @ A1	Drawn	Checked	Approved
1:500	SK	SD	SD

Project No.: ED/098555
Date: 11.05.2022

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Project - Originator - Zone - Level - File Type - Role - Number
WSC-CAP-Z1-00-DR-C-520001
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