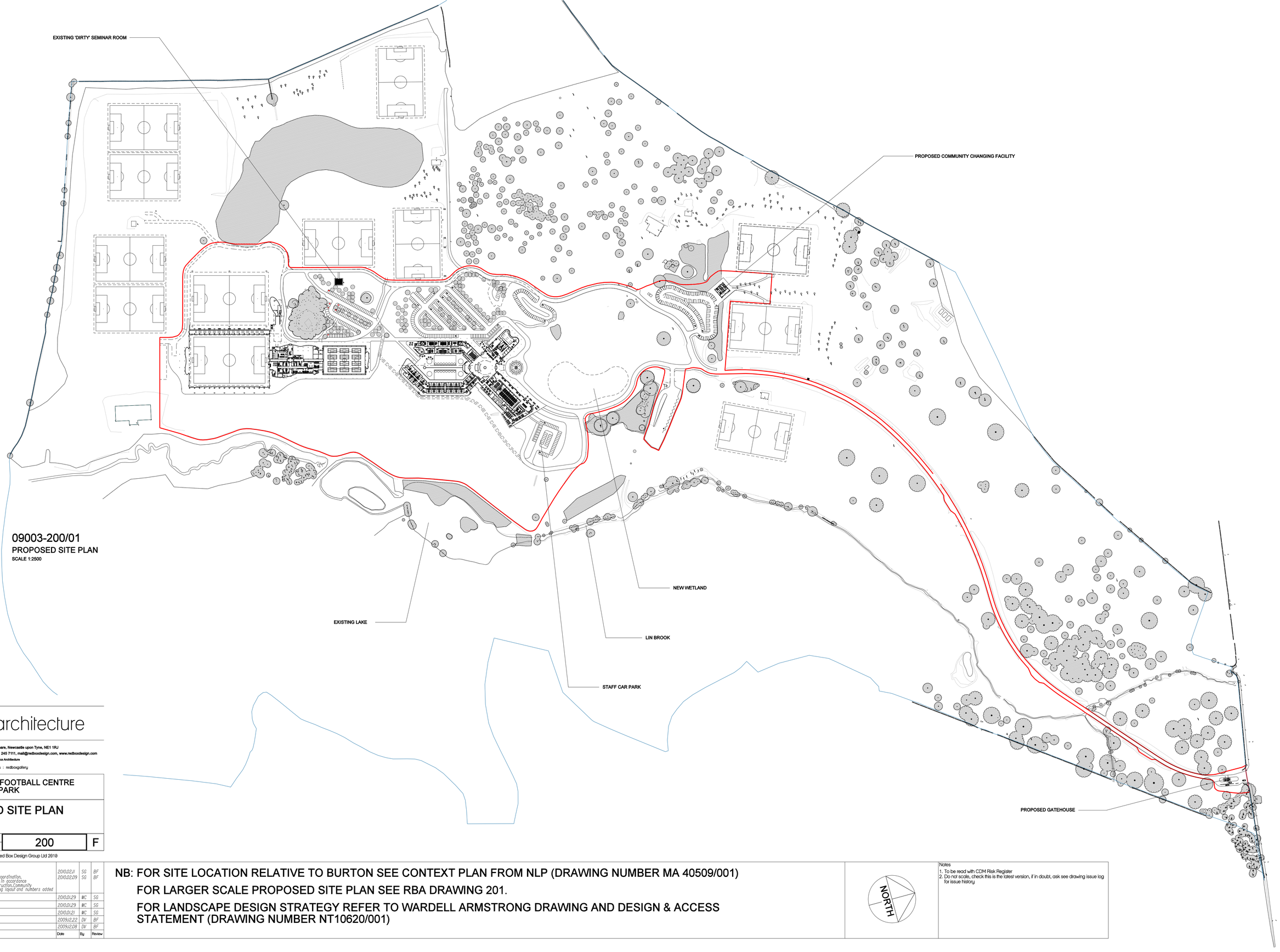

09003-200/01

PROPOSED SITE PLAN

SCALE 1:2500

redboxarchitecture

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Red Box Design Group Ltd trading as Red Box Architecture
redboxdesigngroup : redboxinteriors : redboxgallery

THE NATIONAL FOOTBALL CENTRE
ST. GEORGE'S PARK

PROPOSED SITE PLAN

1:2500	09 003	200	F
A1	PLANNING		

Rev	Notes	Date	By	Review
F	ISSUED FOR PLANNING	2010.02.11	SG	BF
E	Draft Issue for design team coordination. Hotel car park layout modified in accordance with Drivers Jonas verbal instruction.Community changing car and coach parking layout and numbers added	2010.02.09	SG	BF
D	Draft Issue For Comments	2010.01.29	MC	SG
C	Draft Issue For Comments	2010.01.29	MC	SG
B	General Update	2010.01.21	MC	SG
A	General Update	2009.12.22	DV	BF
-	First Issue	2009.12.08	DV	BF

NB: FOR SITE LOCATION RELATIVE TO BURTON SEE CONTEXT PLAN FROM NLP (DRAWING NUMBER MA 40509/001)

FOR LARGER SCALE PROPOSED SITE PLAN SEE RBA DRAWING 201.

FOR LANDSCAPE DESIGN STRATEGY REFER TO WARDELL ARMSTRONG DRAWING AND DESIGN & ACCESS STATEMENT (DRAWING NUMBER NT10620/001)

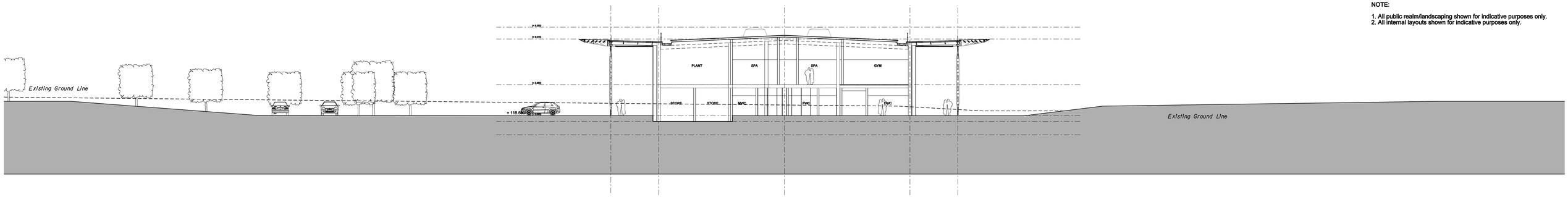
NORTH

Notes
1. To be read with CDM Risk Register
2. Do not scale, check this is the latest version, if in doubt, ask see drawing issue log for issue history

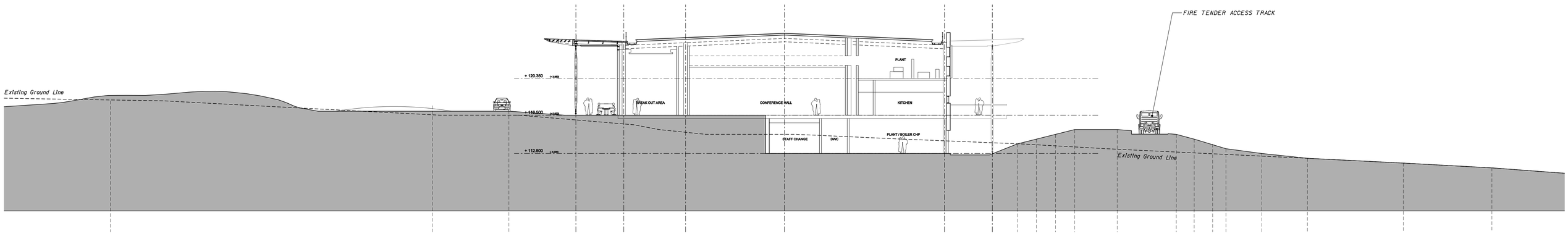
Notes
1. To be read with CDM Risk Register
2. Do not scale, check this is the latest version, if in doubt, ask see drawing issue log for issue history

NOTE:

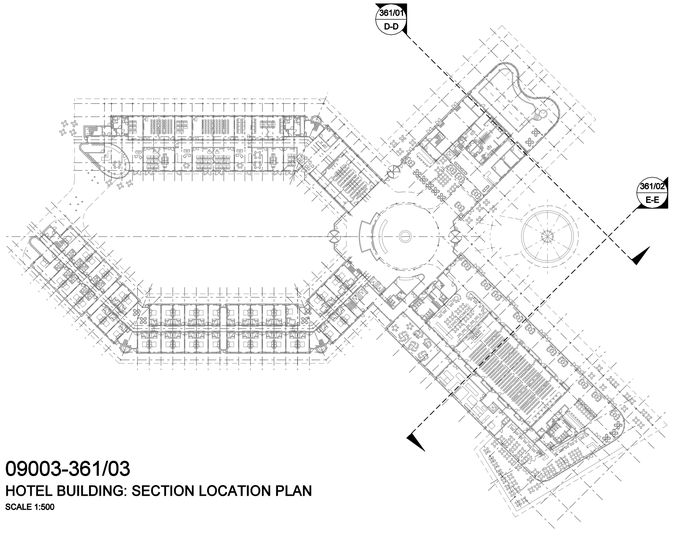
1. All public realm/landscaping shown for indicative purposes only.
2. All internal layouts shown for indicative purposes only.



09003-361/01
HOTEL BUILDING: SECTION D-D
SCALE 1:200



09003-361/02
HOTEL BUILDING: SECTION E-E
SCALE 1:200



09003-361/03
HOTEL BUILDING: SECTION LOCATION PLAN
SCALE 1:500

Rev	Notes	Date	By	Review
B	ISSUED FOR PLANNING	2010.02.12	MC	SG
A	Draft Issue For Comments	2009.01.29	MC	SG
-	First Issue	2009.12.22	DV	BF

redboxarchitecture

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Red Box Design Group Ltd trading as Red Box Architecture
redboxdesigngroup : redboxinteriors : redboxgallery

DRAFT ISSUE

THE NATIONAL FOOTBALL CENTRE
ST GEORGE'S PARK

HOTEL BUILDING
Section D-D & E-E

AS SHOWN	09 003	361	B
A1	Preliminary		

Capabilities on project:
Water

Appendix C: Environment Agency Flooding Information

creating a better place

Environment Agency

Mr Edward Jones
Faber Maunsell Ltd
160 Croydon Road
Beckenham
Kent
BR3 4DE

Our Ref: MC 15707/DT

Your Ref: N/A

Date: 05 December 2008

Dear Mr Jones

Re: national Football Centre, Burton upon Trent

Thank you for your e-mail dated 18 November 2008 requesting information relating to the above site.

According to our published Flood Map, which provides a general estimate of the **likelihood** of flooding across England & Wales, the majority of the property/site is shown to be outside of the Extreme Flood Outline (the area which may have an annual chance of flooding of 1 in 1000 (0.1%) from rivers ignoring the presence and effect of flood defences).

However, a small percentage is in floodplain (1in100yr)

Our published flood map which provides a general estimate of the likelihood of flooding across England & Wales, the site is shown to be within an area which may have an annual chance of flooding of 1% (1 in 100) or greater from rivers, ignoring the presence and effect of flood defences. Please see the supporting map to identify the Flood Zone.

Historic Flooding

Following examination of our records of Historic Flooding (see explanation below) we have no record of flooding in the area. This does

not mean that the area of the property / site has never flooded, only that we do not currently have records of flooding in this area.

You may also wish to contact your local authority or internal drainage board, to see if they have other relevant local flood information.

What are our records of Historic Flooding?

Our records of Historic Flooding show the extents of known flooding from rivers, the sea, and groundwater. It cannot show all the flooding that may ever have occurred – we can only show flooding where we have adequate records. So, just because an area of land is shown outside the extents of our recorded flooding does not mean it has never flooded. As more data on historic flooding comes to light, and as flood incidents occur, then we will record this where we have adequate information to do so.

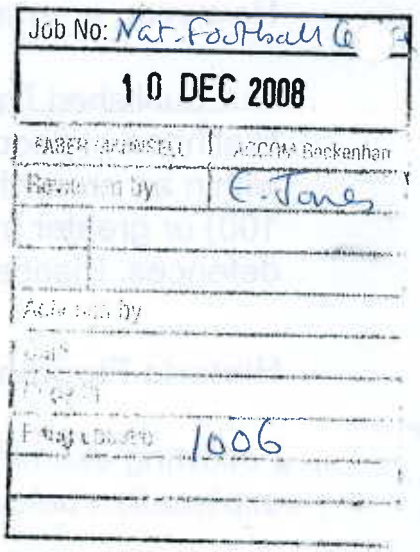
Flood Zones

The flood zones in this area where produced using our generalised flood mapping, we are unable to provide level data for this location.

Our Flood Map shows the extent of the natural floodplain area, assuming there are no flood defences present. **This is a precautionary approach** in case flood defences are overtopped or breached.

Yours sincerely

Dawn JW Taylor
External Relations Assistant
Direct Dial: 01543 405004
Direct e-mail: midscentral@environment-agency.gov.uk



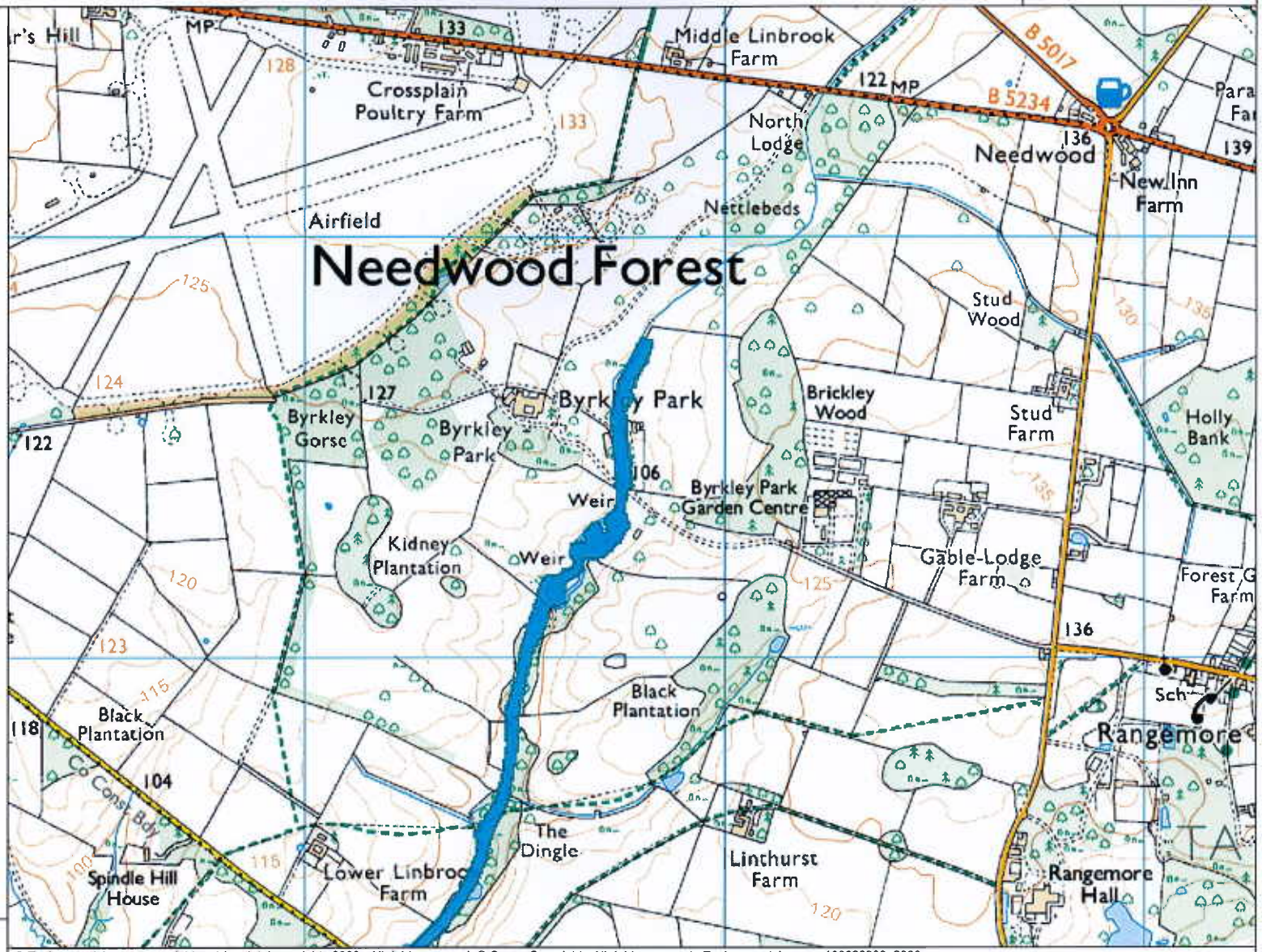
Environment Agency
Sentinel House, 9 Wellington Crescent, Fradley Park, Lichfield, Staffordshire, WS13 8RR
Customer Service Line: 08708 506 506
Email: enquires@environment-agency.gov.uk
www.environment-agency.gov.uk

National Football centre

Environment Agency

Legend

- Flood Map - Defences
- Areas Benefiting from Flood Defences
- Flood Map - Flood Storage Areas
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2



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(Standard Notice – Commercial)

1. Nothing in this notice will in any way restrict your statutory or any other rights of access to the Information. If you wish to do anything in excess of those rights you may do so in accordance with the following paragraphs only if you agree to all the terms.
2. All intellectual property rights in the documents, data or information supplied to you (referred to as "the Information") whether owned by the Environment Agency (referred to as "Agency information") or third parties (referred to as "Third Party information") will continue to be owned by them.
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5. The Environment Agency will take reasonable precautions to ensure that we provide you with an accurate copy of the Information from our records.
6. If we have specified that you must pay us for supply of the Information you must pay us before we respond to your request. You will only be able to cancel and request your fee back up to the point when we start work on providing the requested information.
7. If you have asked for the Information to be supplied in an electronic format we cannot guarantee that either the disk or the data file is free of any defects and you should check it for viruses and other items that may affect your computer.
8. Use of Third Party information, including copying, must be limited to statutory rights. This generally means that you will need to seek permission to copy. Third Party information may include information from our public registers, which has been supplied to us by a third party, for example the Information provided in an application form.

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   c) you do not supply the Information (or any information derived from, or based on the use of it) to others.
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Customer Service Line: 08708 506 506
Email: enquires@environment-agency.gov.uk
www.environment-agency.gov.uk

Capabilities on project:
Water

Appendix D: Preliminary Foul and Surface Water Drainage Strategy

The Football Association

The National Football Centre, St. George's Park

Preliminary Foul and Surface Water Drainage Strategy

The Football Association

The National Football Centre, St. George's Park

Preliminary Foul and Surface Water Drainage Strategy

February 2010

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Job number 209289

ARUP

Document Verification

Job title	The National Football Centre, St. George's Park		Job number 209289
Document title	Preliminary Foul and Surface Water Drainage Strategy		File reference 27
Document ref	209289/CIV/01		

Revision	Date				
Draft 1	22/12/09	Filename	RP-CDH-Drainage Strategy-221209.doc		
		Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Chris Heath	Daren Carr	Daren Carr
		Signature			
Issue	21/01/10	Filename	RP-CDH-Drainage Strategy-ISSUE-210110.doc		
		Description	Amended to incorporate EA consultation response		
			Prepared by	Checked by	Approved by
		Name	Chris Heath	Andy Johnson	Andy Johnson
		Signature			
Issue 2	11/02/10	Filename	RP-CDH-Drainage Strategy-ISSUE-210110.doc		
		Description	Amended to incorporate NLP comments		
			Prepared by	Checked by	Approved by
		Name	Chris Heath	Daren Carr	Andy Johnson
		Signature			
Issue 3	12/02/10	Filename	RP-CDH-Drainage Strategy-ISSUE 3-120210.doc		
		Description	Formatting error corrected.		
			Prepared by	Checked by	Approved by
		Name	Chris Heath	Daren Carr	Andy Johnson
		Signature			

Issue Document Verification with Document ✓

Contents

Drawings

Appendices

1 Introduction

This report summarises the foul and surface water drainage strategy for the proposed sports and leisure development at St George's Park, formerly named Byrkley Park, Burton upon Trent.

The development was subject to a previous planning application (PA/16573/010) in Jun 2001, which received consent in September 2001. Correspondence from ESBC dated May 2002 advised that conditions relating to the disposal of foul and surface water attached to the original application had been discharged. Acceptable proposals were:

- Foul to drain to a wastewater treatment facility, with treated effluent discharging to the Lin Brook;
- A surface water system incorporating recycling to use as irrigation water.

The present proposals include the provision of a two storey prestige hotel, indoor sports facilities, an indoor synthetic pitch, associated car parking and hard and soft landscaping.

2 Environment Agency Consultation

The Environment Agency were consulted with Draft 1 of this report. The Agency confirmed that they have no objection to the development in principle, subject to:

- The provision of an adequate flood risk assessment;
- Consideration of green roofs to be provided within the development proposals, or justification as to why green roofs have been discounted;
- A drainage system to deal with surface water up to the critical 1 in 100 year event with an allowance of 30% increase in peak rainfall intensity to account for potential climate change;
- Two chains of treatment to be incorporated into the surface water drainage system receiving flows from car parks and hardstandings;
- A consent being required for the discharge of treated foul effluent; and
- A sampling point provided downstream of the wastewater treatment facility.

The Agency's consultation response is included in Appendix D.

3 Foul drainage proposals

Public sewer records indicate that there are no public sewers local to the development site.

As such, and as with the previously submitted scheme, it is proposed that foul flows are conveyed to a wastewater treatment facility provided as part of the development. Treated effluent will be discharged to the Lin Brook, subject to the consent of the Environment Agency, either directly or via additional treatment as necessary.

Preliminary foul drainage proposals are indicated on drawing C.960.SK.002.

Initial treatment proposals from Conder products are included in Appendix A.

The proposed community changing facilities will connect to the main development drainage.

Sanitary appliances at the proposed gatehouse will connect to a septic tank or package treatment plant, discharging treated effluent to the Lin Brook with any additional treatment necessary, and subject to Environment Agency consent.

4 Surface water drainage proposals

Introduction

The development site forms part of a larger overall development, comprising a number of grass and synthetic pitches, and small training facilities. The existing pitches drain to a storage facility. Stored water is used for pitch irrigation, and the facility has an overflow to the Lin Brook.

The development site comprises undeveloped grassed/vegetated land, areas that have been partially prepared for the previously proposed development, and a full size synthetic football pitch that will be covered as part of the proposals.

The proposals include approximately 6.1 ha of building roofs, car parks, roads and other hard surfaces.

The overall development setting, development layout, and site topography lead the design of surface water drainage features towards sustainable techniques, with runoff being controlled at source where possible and the incorporation of soft engineered solutions.

4.1 Existing pitches and storage facility

It is proposed that the existing pitch drainage and irrigation system will remain unchanged by the proposed development, and that the proposed development will drain to a separate outfall.

Should there be insufficient runoff from the pitches to meet the irrigation demand, then it may be possible to divert some of the runoff from the proposed development to the storage facility to supplement the runoff from the pitches, and to reduce potable water demand. This should be considered during detailed design and discussed with the Environment Agency and facility managers as necessary.

4.2 Potential for infiltration

Ground investigations and geotechnical studies undertaken suggest that the proposed site will not be suitable for infiltration drainage, due to underlying impermeable ground conditions. A positive outfall for surface water is therefore required.

4.3 Surface water management proposals

Preliminary surface water drainage proposals are indicated on drawing C.960.SK.001.

Proposals are subject to budgetary and site constraints, and will be development further during detailed design, but are expected to include:

4.3.1 Road

Shallow roadside swales are provided to the existing site access road. It is proposed that a similar approach is adopted for new roads provided as part of the development.

Where the longitudinal fall on a new road is 1 in 40 or flatter, a shallow roadside swale will be provided to accept runoff from the road surface. Check dams will be provided at intervals in accordance with the guidance in CIRIA report C697. Flow control will be provided to swales along flat stretches of road in order to further attenuate runoff.

Swales will be a maximum of 600mm in depth, with side slopes of 1 in 4 and a minimum base width of 0.5m.

Where the longitudinal fall in steeper than 1 in 40, filter drains will be provided as an alternative in order to reduce the risk of erosion.

4.3.2 Car parks

Permeable surfaces will be incorporated where appropriate within the three car parking areas.

Topography and the resultant car park gradients will limit the volume within the car park construction available for storage, although some attenuation and storage should still be possible. Permeable surfacing will also provide the first level of treatment of surface water runoff.

4.3.3 Other hardstandings

Other hardstandings will be drained to adjacent swales, filter trenches or, where development proposals do not allow this, via a gullied system.

4.3.4 Building roofs

Rainwater harvesting will be considered to reduce surface water volumes, and to reduce potable water demand. Only water from roofs would be harvested, due to the additional treatment that may be required and potential for contamination resulting from using water from other areas of hardstanding.

The provisions of rainwater harvesting will be subject to budgetary and operational constraints (it may not be acceptable to hotel operators to use recycled water due to discolouration).

The opportunity for implementing green roofs has been explored in great detail for the development.

However there are significant areas of roof that require other architectural treatments and material specifications to facilitate the functions within the building, and the 'green' credentials of these spaces. For example; the unheated Indoor Training Hall requires a Teflon fabric roof to allow natural light into the building, minimising the need for artificial lighting; and the multi-purpose hall has north lights, solar thermal collectors and windcatchers, all designed to minimise energy usage.

Open plant areas are provided to the central section of the sport building and to the hotel roof, avoiding the need for energy buildings that would otherwise be located within the landscape, and roof lights are provided throughout to minimise the requirement for artificial lighting. The only available and viable roof spaces available for green roofs are therefore limited.

Although green roofs can offer advantages over traditional roofs in the interception and retention of rainfall from the early part of storms or from light rainfall, for single severe storms, the benefit in providing a green roof to the limited areas available, simply to reduce storage volume elsewhere in the drainage system will be marginal.

It is therefore considered more practical and environmentally beneficial to further invest in the SUDs scheme, swales etc, the landscaping (ecology) strategies including the creation of the large new wetland area noted elsewhere within this document, and to couple this with improvements to the thermal performance of the buildings, each of which will provide the benefits generally offered by green roofs.

4.3.5 Below ground storage

The significant increase in impermeable area results in the requirement for significant storage volumes. Because of topography, it may not be possible to achieve the required storage volumes in above ground open water features. As a result, some underground storage, such as geocellular storage, may be required to supplement other surface water management features. Any underground storage should be lined in order to prevent the ingress of groundwater.

4.3.6 Wetland

A wetland feature is proposed to the north of the development. Some roads and landscape areas will drain to the Lin Brook via the wetland. Due to site levels, it will not possible to drain much of the main development to the wetland.

4.3.7 Storage swales

A number of deeper (800mm) swales are proposed to the vegetated slope between the development and the Lin Brook.

Flow control would be provided at each swale, with low flow passed forward towards the outfall to Lin Brook.

4.4 Preliminary Design

4.4.1 Climate Change

In accordance with Environment Agency requirements, an allowance of 30% increased peak rainfall intensity has been included within the design to account for potential climate change.

4.4.2 Design Proposals

It is proposed that surface water flows are restricted to the equivalent, undeveloped, greenfield runoff rates.

The Interim Code of Practice for Sustainable Drainage Systems (2004) recommends the use of the method set out in the Institute of Hydrology Report 124 *Flood estimation for small catchments* (1994) to calculate greenfield runoff rates. However, the previously designed scheme used the method set out in ADAS report 345, as this method takes into account the steeply sloping catchment at the development site.

The use of the ADAS method was discussed with the EA on 11th January 2010 (refer to Appendix D), who confirmed that this would be an acceptable method to calculate greenfield runoff rates.

Greenfield runoff calculations are included in Appendix B.

The preliminary design for the surface water drainage system is indicated on drawing C.960.SK.001. Contributing impermeable areas and significant surface water storage features are indicated on drawing C.960.SK.003.

The drainage system has been modelled simplistically using the Source Control module within MicroDrainage WinDes. Design storms have been routed through storage features using the Cascading Ponds function.

The design has been checked to ensure that the equivalent greenfield runoff rate has not been exceeded for both the 1 in 1 year and the 1 in 100 year critical storms.

Because the surface water system has been modelled simplistically, further improvements in performance are expected in practice, due to the additional attenuating effects of filter drains, swales and permeable surfaces.

Preliminary design flows into the Lin Brook are as follows:

Return Period	Pre-development Greenfield Runoff (l/s)	Post-development runoff (l/s)
1 in 1 year	30.3	21.6
1 in 100 year	93.9	93.3

Simulation printouts from Source Control for the preliminary design are included in Appendix C.

The current proposals include approximately 5070m³ of surface water storage for the critical 1 in 100 year storm, including an allowance of 30% increased peak rainfall intensity has been included within the design to account for potential climate change, split down as follows:

Swales:	4015m³
Underground Storage:	590m³
Storage beneath permeable surfaces:	464m³
Total:	**5070m³**

The above volumes are subject to change during detailed design.

DRAWINGS

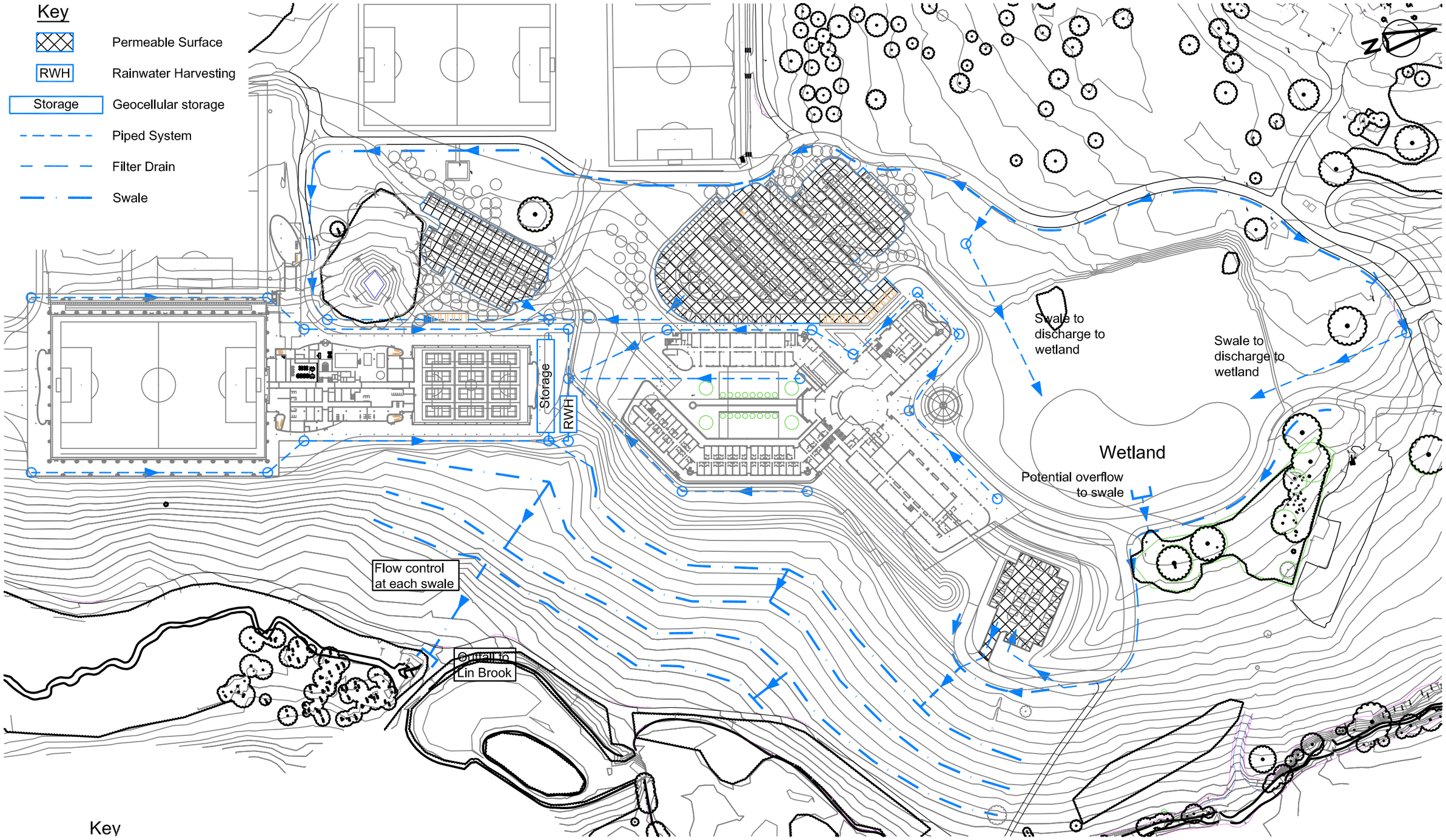
A3

A B C D E F G H

1 1 1 1

Key

- Permeable Surface
- RWH — Rainwater Harvesting
- Storage — Geocellular storage
- Piped System
- Filter Drain
- Swale



Notes

Outfall to Lin Brook and discharge rate are subject to EA approval.

Issue	Date	By	Chkd	Appd
P4	11/02/10	CDH	DC	ARJ
Client and job title updated				

Client
The Football Association

Job Title
The National Football Centre
St. George's Park

Scale at A3 1:2000

Discipline Civils

ARUP
Central Square, Forth Street
Newcastle upon Tyne NE1 3PL
Tel +44 (0)191 261 6080 Fax +44 (0)191 261 7879
www.arup.com

Drawing Title
Surface Water Drainage Strategy

Drawing Status
Preliminary

Job No	Drawing No	Issue
209289	C.960.SK.001	P4

Do not scale

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A3

Key

WWTF — Wastewater Treatment Facility

Foul Drainage

WWTF

Outfall to SW system or direct to Lin Brook as per EA requirements. Sampling point to be provided in manhole downstream of WWTF.

Drainage from community training facilities.

Septic tank/package treatment plant for gatehouse. Discharge to watercourse subject to EA consent. Additional treatment provided as necessary.

Notes

1. Turning for 35,000 litre tanker required at WWTF.
2. WWTF subject to confirmation of development occupancy.
3. Outfall of treated effluent subject to EA consent,

Issue	Date	By	Chkd	Appd
P4	12/02/10	CDH	DC	ARJ
Client and job title updated				

Client
The Football Association

Job Title
The National Football Centre
St. George's Park

Scale at A3 1:2000

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www.arup.com

Drawing Title
Foul Water Drainage Strategy

Drawing Status
Preliminary

Job No	Drawing No	Issue
209289	**C.960.SK.002**	**P4**

Do not scale

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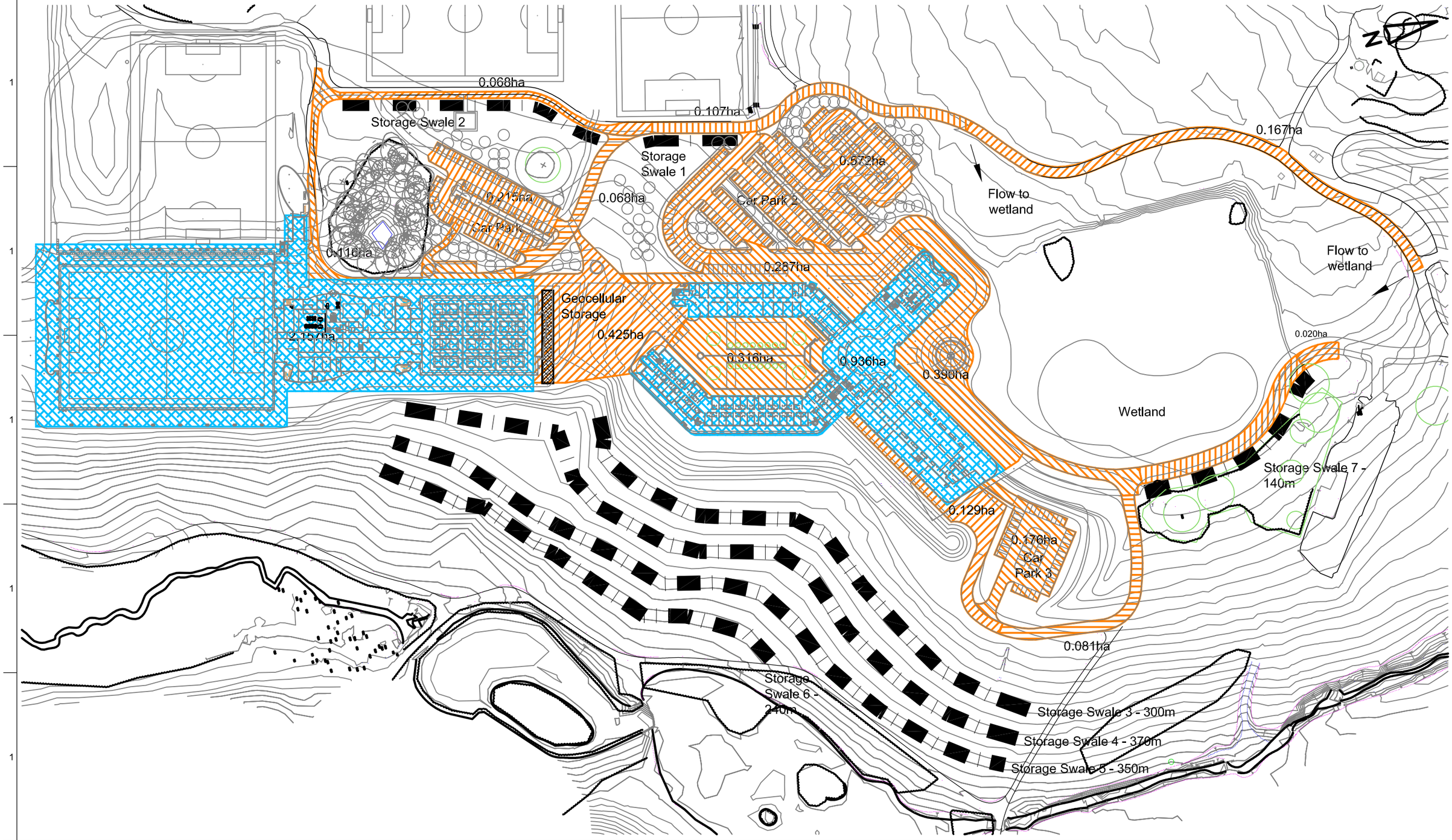

Issue	Date	By	Chkd	Appd
P3	11/02/10	CDH	DC	ARJ
Client and job title updated				
P2	19/01/10	CDH	DC	DC
Site plan updated				
P1	22/12/09	CDH	DC	DC
Preliminary Issue				

Client
The Football Association

Job Title
The National Football Centre
St. George's Park

Scale at A3 1:2000

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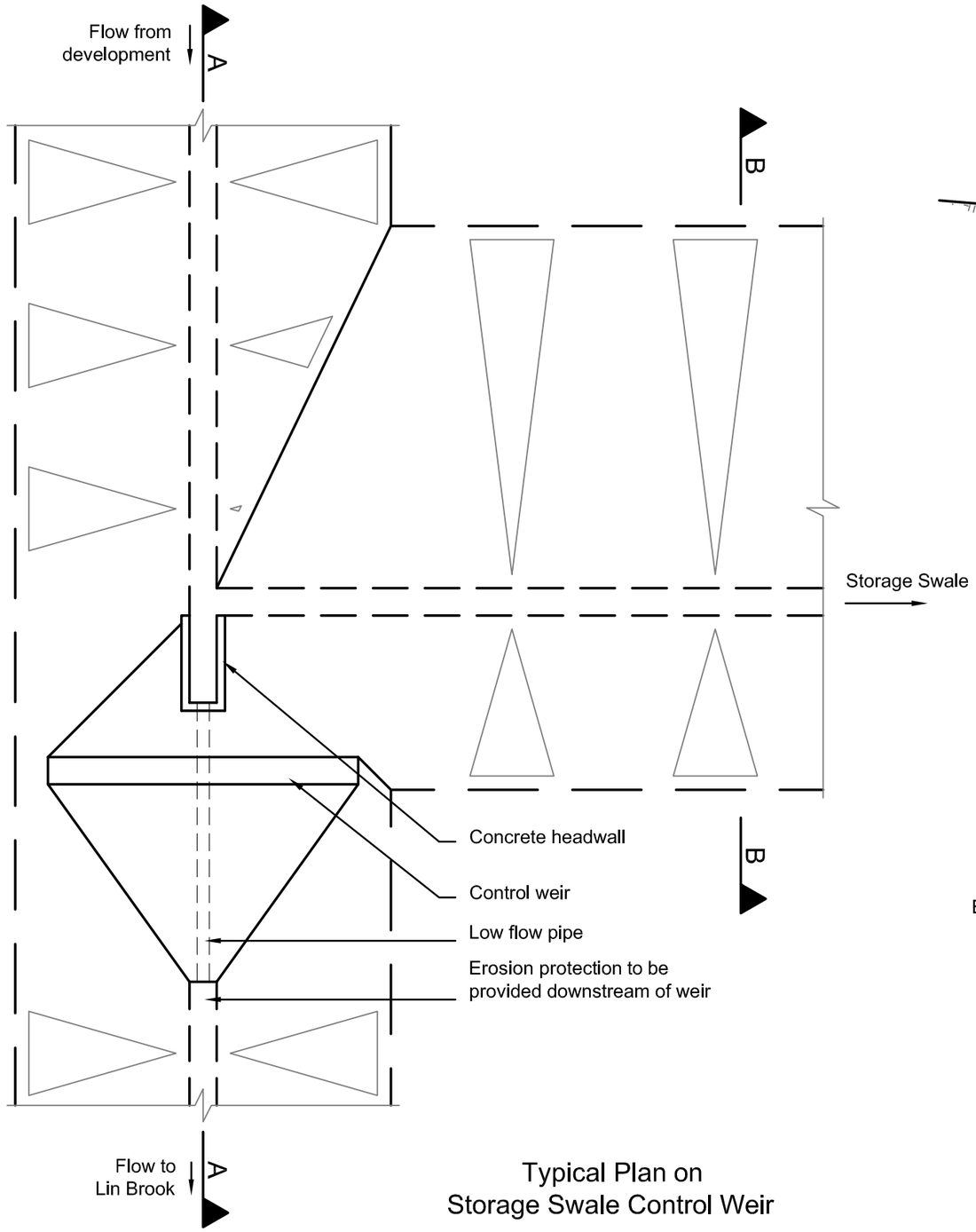
Drawing Title
Impermeable areas and surface water storage features

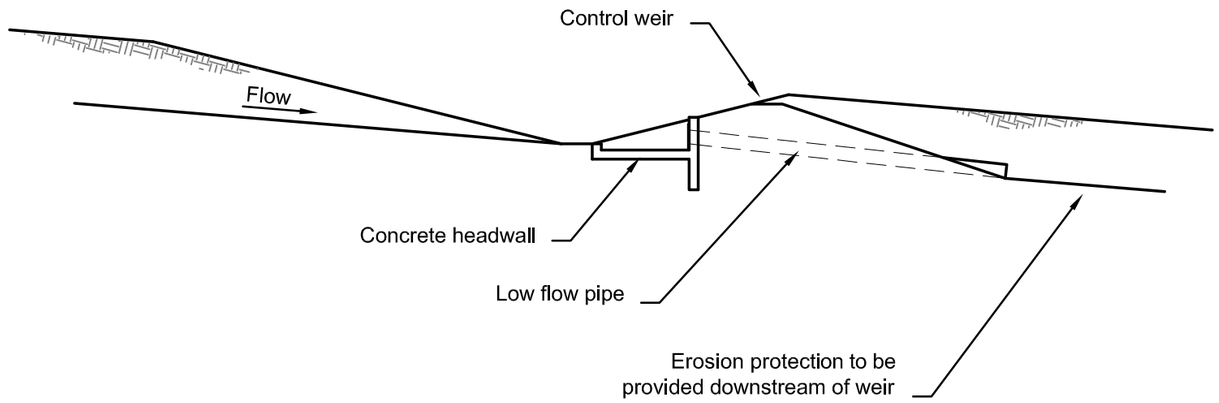
Drawing Status
Preliminary

Job No	Drawing No	Issue
209289	**C.960.SK.003**	**P3**

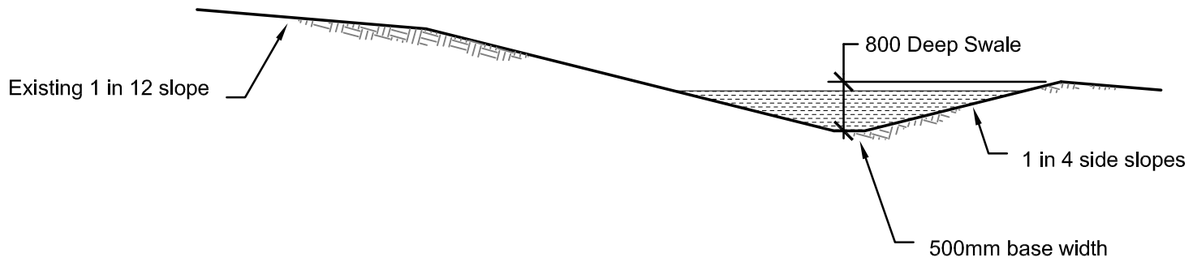
Do not scale



Typical Plan on Storage Swale Control Weir



Typical Section A-A Through Storage Swale Control Weir



Typical Section B-B Through Storage Swale

Issue	Date	By	Chkd	Appd
P2	11/02/10	CDH	DC	ARJ
Client and job title updated				
P1	22/12/09	CDH	DC	DC
Preliminary Issue				

Client
The Football Association

Job Title
The National Football Centre
St. George's Park

Scale at A3 1:100

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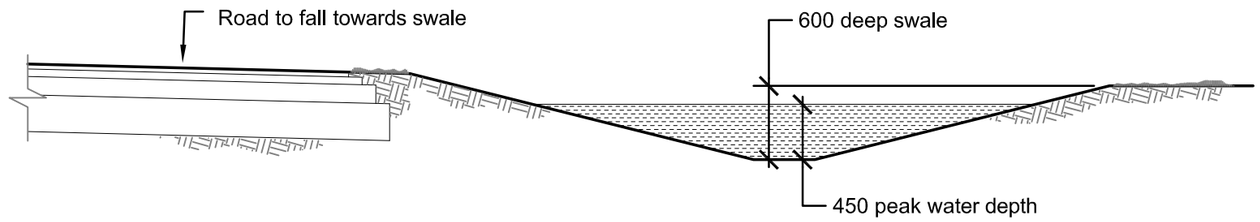
www.arup.com

Drawing Title
Storage Swales
Typical Details

Drawing Status
Preliminary

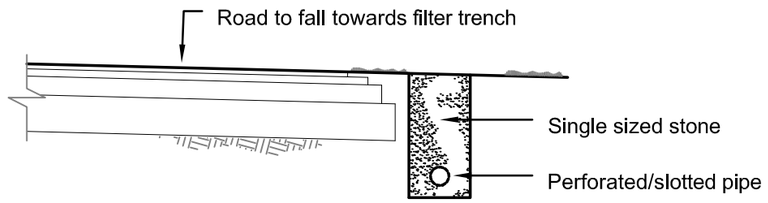
Job No	Drawing No	Issue
209289	**C.960.SK.004**	**P2**

Do not scale



Typical Section Through Roadside Swales

(1 in 40 maximum longitudinal fall)
Scale 1:50



Typical Section Through Roadside Filter Trench

(Where longitudinal fall exceeds 1 in 40)
Scale 1:50

Issue	Date	By	Chkd	Appd
P2	11/02/10	CDH	DC	ARJ
	Client and job title updated			
P1	22/12/09	CDH	DC	DC
	Preliminary Issue			

Client
The Football Association

Job Title
The National Football Centre
St. George's Park

Scale at A3 1:50

Discipline Civils

ARUP
Central Square, Forth Street
Newcastle upon Tyne NE1 3PL
Tel +44 (0)191 261 6080 Fax +44 (0)191 261 7879
www.arup.com

Drawing Title
Roadside Swales and Filter Trenches
Typical Details

Drawing Status
Preliminary

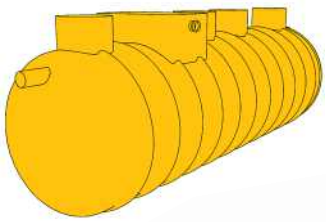
Job No	Drawing No	Issue
209289	**C.960.SK.005**	**P2**

Do not scale

Appendix A

Wastewater Treatment Facility Preliminary Information

conder
ENVIRONMENTAL SOLUTIONS



the conder **SAF range** of package sewage treatment plants

techflo™ SAF 60-600 - single stream

techflo™ SAF 700-1800 - multi stream

above or below ground installation
granular or concrete backfill

demand special treatment

Conder Environmental Solutions (Conder) has further developed its range of package sewage treatment plants utilising proven Submerged Aerated Filter (SAF) technology for optimum performance and dependability. Using reliable, cost effective and energy efficient blowers for aeration with an integral flow management system, the range is packaged for installation completely below ground. The range can be adapted to provide an above ground treatment solution.

In standard configuration the plants offer treatment to a 20mg/l BOD: 30mg/l SS effluent quality standard with options for 20, 10 or 5mg/l NH_3 effluent quality.

Designed in accordance with the British Water Code of Practice for Flows and Loads, the Conder range will serve a population range from 60-600PE as a single stream unit. Larger populations can be accommodated with multiple stream plants. The SAF technology utilised in the Conder Techflo range has been type tested in accordance with BSEN 12566-3.

PRODUCT RANGE

The Techflo 60-600 range is suitable for larger-scale commercial applications including leisure facilities, hotels, schools, offices and industrial situations.

For larger applications, Conder's Technical Solutions division offers a range of modular sewage treatment systems up to 1800PE, utilising SAF technology. This modular system includes flow balancing, primary settlement/sludge storage, SAF Biozone (BOD removal and nitrification) and humus settlement as discrete stages. This design flexibility means that we can offer a bespoke solution within a package format. Please call our sales office for more information: 08702 640004.

Clereflo SAF 25-50 is the solution for housing developments and other smaller scale projects where access to mains drainage is not available. Typical applications include small communities or developments in rural areas.

The combination of features, benefits, high performance, reliability and quality assurance makes the Conder SAF range the product choice for 'off mains' drainage solutions.

FEATURES AND BENEFITS

- Type tested in accordance with BSEN 12566-3
- Proven SAF technology with reliable performance
- Completely below-ground installation
- Low running cost air-blower
- Easy to install – reduced costs
- Quiet, odourless operation
- Compact unitank design with no below ground moving parts
- Deeper inverts available
- Option for pumped influent or effluent
- Effluent Standard: 20mg/l BOD; 30mg/l SS; 20-5mg/l NH_3
- High Rate nitrification options available
- Plants suitable for installation with either granular or concrete backfill

PRODUCT SELECTOR

All applications should be specified to comply with the British Water Code of Practice for Flows and Loads. Further advice and assistance is available from our experienced internal and external sales teams. Site visits and assessments are recommended to ensure the correct equipment is proposed for each application.

The correct plant should be selected to meet the requirements of the applicable discharge consent granted by the Environment Agency, SEPA or EHS (NI).

PLANT	DRY WEATHER FLOW (DWF) m^3/d	MAX LOAD PER DAY		MINIMUM DESLUDGE PERIOD
		BOD kg	NH_3 kg	
Techflo SAF 60	12	3.6	0.48	90
Techflo SAF 75	15	4.5	0.6	90
Techflo SAF 100	20	6	0.8	90
Techflo SAF 125	25	7.5	1.0	90
Techflo SAF 150	30	9	1.2	90
Techflo SAF 200	40	12	1.6	60
Techflo SAF 250	50	15	2.0	60
Techflo SAF 300	60	18	2.4	60
Techflo SAF 350	70	21	2.8	60
Techflo SAF 400	80	24	3.2	60
Techflo SAF 500	100	30	4.0	60
Techflo SAF 600	120	36	4.8	60

* Desludge period is at maximum loading, plants not loaded to maximum will have longer desludge periods
**Different desludge periods can be accommodated, please contact us for further information

process and plant description

The Conder SAF 60-600 treatment plant comprises a single tank (unitank) or two tanks (semi-modular), or three tanks (modular). The tank(s) form three treatment stages: primary settlement, biological treatment (biozone) and humus settlement. Flow through all of the treatment stages from inlet to outlet is by gravity.

The incoming wastewater is received in the primary settlement zone. The purpose of the zone being twofold; to remove the majority of the incoming settleable material reducing the biological load passing forward to the biozone; and to store this material (primary sludge) along with humus sludge (returned from the humus zone) until it is periodically removed by desludging. The primary zone has two compartments to ensure efficient operation. The primary zone also incorporates a flow balancing facility where, periodically, the liquid level is lowered by an airlift transferring some of the contents forward into the biozone. This creates a storage volume which is filled before gravity flow into the biozone continues.
Flow from the primary zone passes forward into the biozone.
The biozone contains a number of sections (depending on the plant size and required discharge consent), which contain structured plastic media. The high surface area of the media encourages growth of the bacteria and other organisms (biomass) which treat the wastewater. Air, by means of above ground blower(s), is introduced below the media. The air fulfils two functions: supplying the oxygen required by the biomass; scouring the media, removing excess biomass.

The combination of treated wastewater and excess humus solids is transferred forward into the humus settlement zone. In this zone the humus solids settle to the bottom of the tank with the treated water (final effluent) being discharged at the top. The humus solids (humus sludge) which settle to the bottom of the tank are transferred to the primary zone by means of an airlift pump, where they are ultimately removed by the desludging operation.

PLANT KIOSK

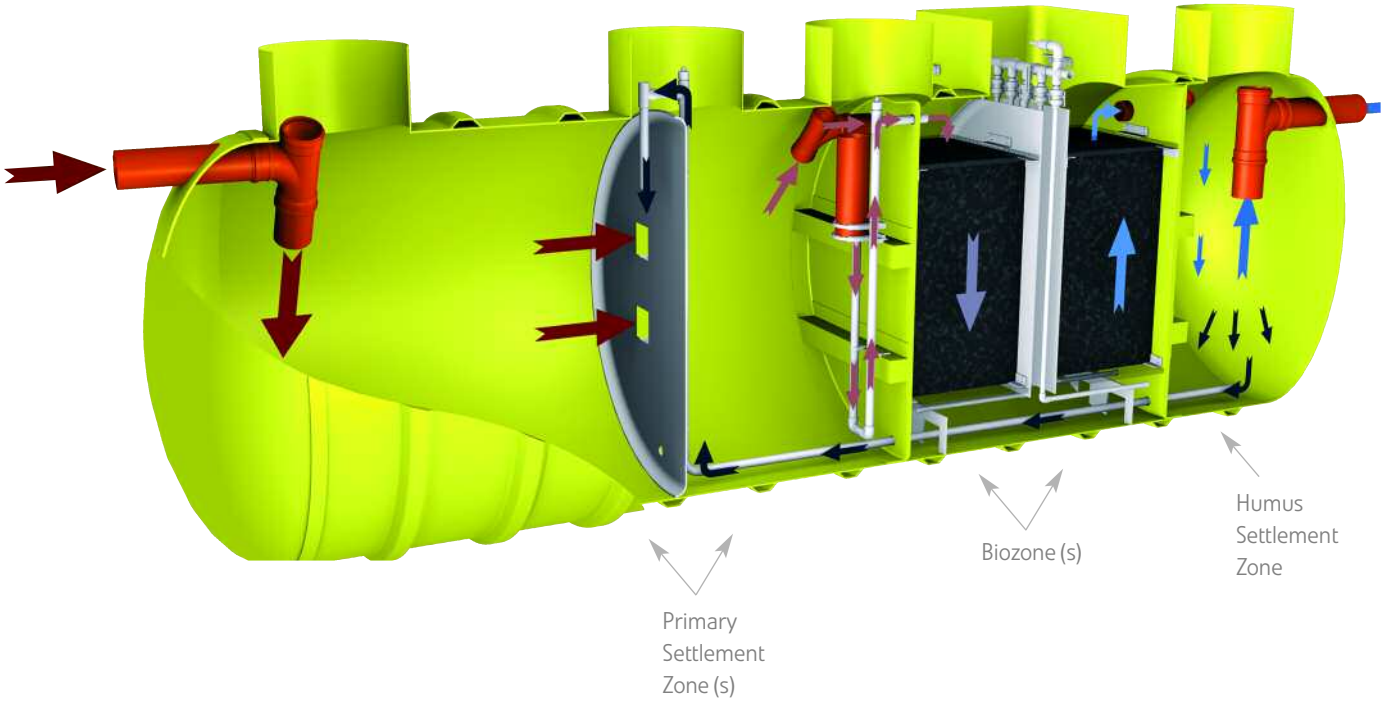
All Conder Techflo SAF plants are provided with a painted mild steel plant kiosk. This kiosk houses the aeration blowers, timer valve(s) and the electrical control panel.

The side channel blower(s) fitted within the kiosk vary in capacity and utilise either single of three phase electrical supply. Please contact us for further information.

The electrical control panel provides all of the required electrical equipment for the starting, running and monitoring of the plant. The control panel can be adapted to accommodate other mechanical / electrical devices associated with the plant, for example a final effluent pump station.

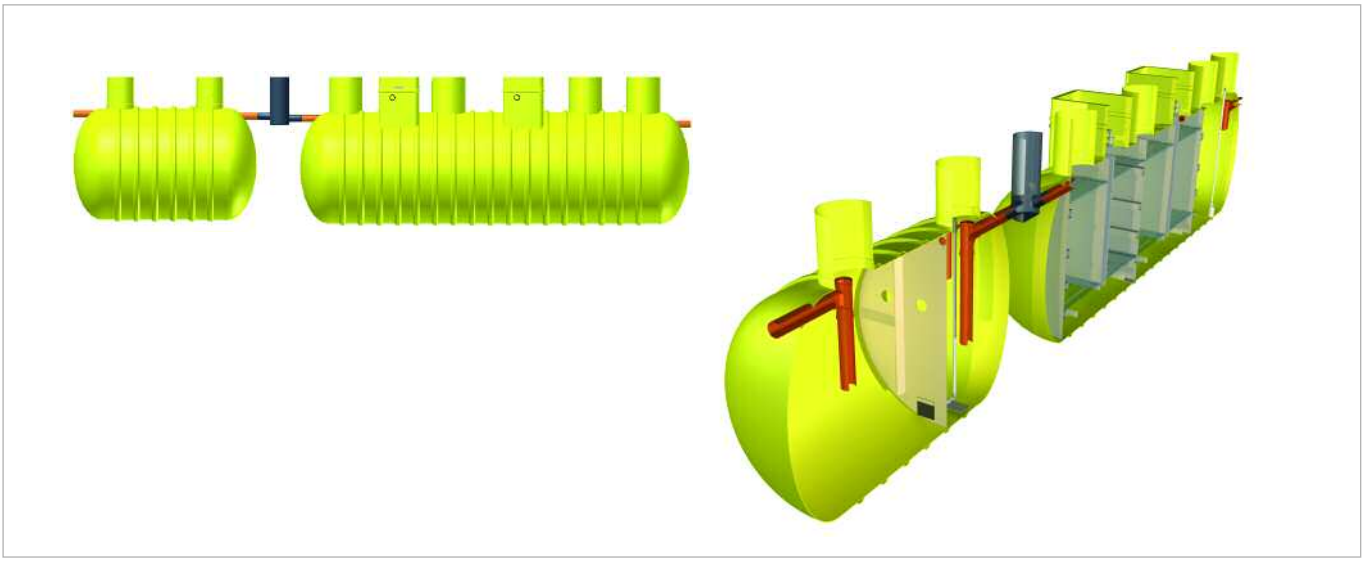
The kiosk is fitted with an alarm beacon as standard and can be provided with telemetry for remote plant monitoring.

CONDER TECHFLO SAF UNITANK TREATMENT PLANT

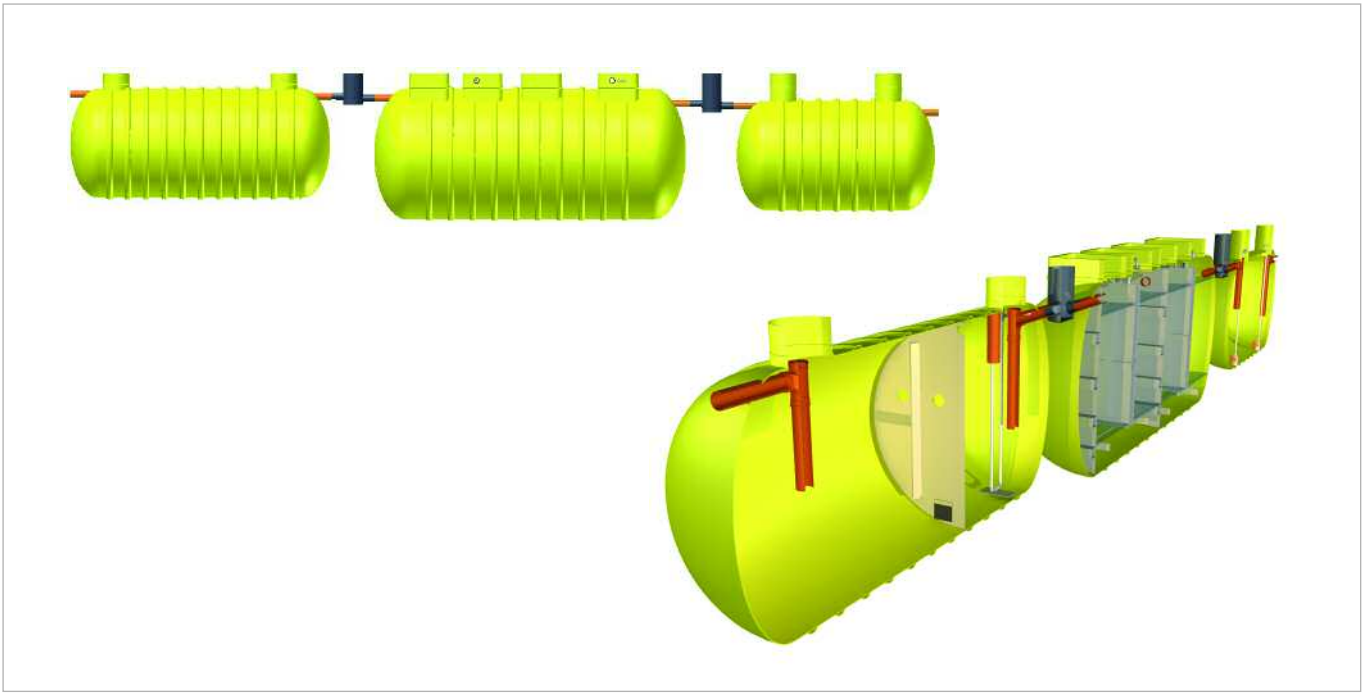


semi modular & modular

PRIMARY SETTLEMENT TANK AND COMBINED BIOZONE AND HUMUS SETTLEMENT TANK



PRIMARY SETTLEMENT TANK, BIOZONE TANK AND HUMUS SETTLEMENT TANK



* The system layout for semi-modular and modular plants is flexible, i.e. tanks can be installed in series or in parallel.
** Above ground options also available.

specification and installation

INSTALLATION

Conder advises the use of a suitably experienced and qualified installation company to install any of its products. For suggested installers in your area, please contact our sales team on: 08702 640004. Care should be taken to fully assess the site ground conditions prior to commencement of installation. Detailed installation guidelines are provided for each product. All electrical work should be carried out in accordance with current regulations (for example NIC EIC / building regulations). All Conder SAF plants are manufactured to allow installation with either granular or concrete backfill, client's choice. Granular backfill will provide significant reductions in installation costs.

TECHFLO SAF PLANT SELECTION TABLE

PLANT	DISCHARGE AMMONIA LEVEL (mg/l)		
	20	10	5
Techflo SAF 60	Unitank	Unitank	Unitank
Techflo SAF 75	Unitank	Unitank	Unitank
Techflo SAF 100	Unitank	Unitank	Unitank
Techflo SAF 125	Unitank	Unitank	Semi Modular
Techflo SAF150	Unitank	Unitank	Semi Modular
Techflo SAF 200	Unitank	Semi Modular	Semi Modular
Techflo SAF 250	Semi Modular	Modular	Modular
Techflo SAF 300	Semi Modular	Modular	Modular
Techflo SAF 350	Semi Modular	Modular	Modular
Techflo SAF 400	Modular	Modular	Modular
Techflo SAF 500	Modular	Modular	on request
Techflo SAF 600	Modular	on request	on request

* Larger applications, or those which are outside the scope of the above table are available, please contact us for details.

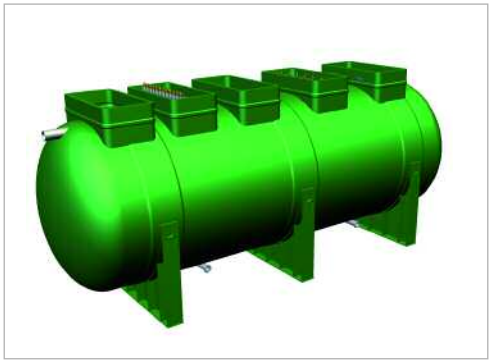
SERVICE

Conder recommends that a maintenance agreement is taken out to service the plant as indicated in the Environment Agency Guideline PPG4. Desludging of the Primary Tank should take place between 60-365 days depending on the size of the plant and the plant loading. Through a nationwide network of British Water accredited engineers, Conder's service partner Pims Service, offers a comprehensive range of services including commissioning and ongoing service contracts.

Hire/lease and buy back options available.

OPTIONAL EXTRAS

- Client specified Control Panel e.g. Form 4
- Standby Blower
- Client specified Control Kiosk
- Access Shafts (for deeper pipework inverts)
- Sample Chamber
- Phosphate Reduction
- UV Disinfection
- Scada/Telenetry
- GMS Dial Out
- Tertiary Treatment
- Heavy-duty Covers
- Acoustically lagged controlled Kiosk



overground option

Techflo SAF Standard Plant Sizing Table

UNITANK SYSTEMS

UNITANK

PLANT	PRIMARY SETTLEMENT ZONE / BIOZONE / HUMUS ZONE TANK	
	TANK DIAMETER (m)	OVERALL LENGTH (m)
Techflo SAF 60N20	2.5	5.220
Techflo SAF 60N10	2.5	6.030
Techflo SAF 60N05	2.5	6.808
Techflo SAF 75N20	2.5	5.920
Techflo SAF 75N10	2.5	7.108
Techflo SAF 75N05	2.5	7.678
Techflo SAF 100N20	2.5	7.830
Techflo SAF 100N10	2.5	8.880
Techflo SAF 100N05	2.5	9.918
Techflo SAF 125N20	2.5	9.550
Techflo SAF 125N10	2.5	11.175
Techflo SAF150N20	2.5	11.215
Techflo SAF150N10	2.5	12.880
Techflo SAF 200N20	2.5	13.365

SEMI-MODULAR-TWO TANK SYSTEMS

SEMI-MODULAR

	PRIMARY SETTLEMENT TANK		BIOZONE / HUMUS ZONE TANK	
	TANK & DIAMETER (m)	OVERALL LENGTH (m)	TANK DIAMETER (m)	OVERALL LENGTH (m)
Techflo SAF 125N05	PT18-2.5	4.118	2.5	8.780
Techflo SAF 150N05	PT22-2.5	4.921	2.5	10.208
Techflo SAF 200N10	PT22-2.5	4.921	2.5	11.108
Techflo SAF 200N05	PT22-2.5	4.921	3.0	10.450
Techflo SAF 250N20	PT27-2.5	5.950	2.5	10.800
Techflo SAF 300N20	PT32-2.5	6.970	2.5	12.684
Techflo SAF 350N20	PT40-2.5	8.598	2.5	14.384

MODULAR-THREE TANK SYSTEMS

MODULAR

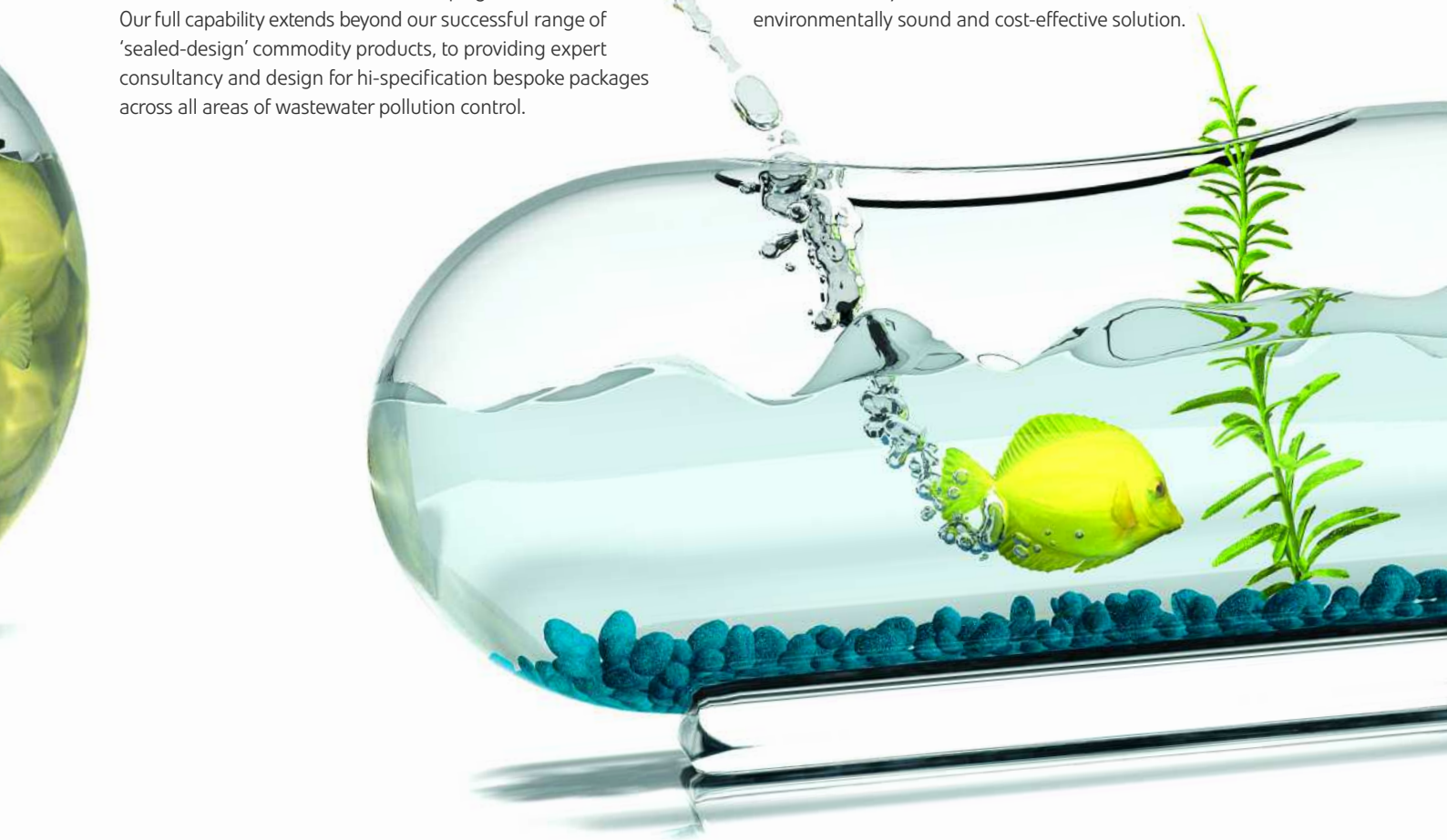
	PRIMARY SETTLEMENT TANK		BIOZONE TANK		HUMUS SETTLEMENT TANK	
	TANK & DIAMETER (m)	OVERALL LENGTH (m)	TANK DIAMETER (m)	OVERALL LENGTH (m)	TANK & DIAMETER (m)	OVERALL LENGTH (m)
Techflo SAF 250N10	PT27-2.5	5.950	3.0	7.135	HM20-2.5	4.524
Techflo SAF 250N05	PT27-2.5	5.950	3.0	8.850	HM20-2.5	4.524
Techflo SAF 300N10	PT32-2.5	6.970	3.0	8.250	HM24-2.5	5.430
Techflo SAF 300N05	PT32-2.5	6.970	3.0	10.210	HM24-2.5	5.430
Techflo SAF 350N10	PT40-2.5	8.598	3.0	9.150	HM27-2.5	5.950
Techflo SAF 350N05	PT40-2.5	8.598	3.0	12.340	HM27-2.5	5.950
Techflo SAF 400N20	PT45-2.5	9.616	3.0	7.135	HM32-2.5	6.970
Techflo SAF 400N10	PT45-2.5	9.616	3.0	10.210	HM32-2.5	6.970
Techflo SAF 400N05	PT45-2.5	9.616	3.0	13.328	HM32-2.5	6.970
Techflo SAF 500N20	PT54-2.5	11.450	3.0	8.850	HM45-2.5	9.616
Techflo SAF 500N10	PT54-2.5	11.450	3.0	12.340	HM45-2.5	9.616
Techflo SAF 600N20	PT65-2.5	13.690	3.0	10.210	HM45-2.5	11.450

* Standard plant inlet invert depth is 1m. Deeper inlet options are available.
The tank sizes detailed in the above table refer to our standard plant configurations. We can offer bespoke solutions to suit different plant configurations and footprint requirements, for both below ground and above ground plants. If you have particular plant requirements please contact us for further details.

about conder environmental solutions

Protecting the water environment has been the mission of Conder Environmental Solutions, since it was established in the early 1970s. The business is organised into specialist divisions: Conder Products, Conder Technical Solutions, Conder Pumping Solutions.
Our full capability extends beyond our successful range of 'sealed-design' commodity products, to providing expert consultancy and design for hi-specification bespoke packages across all areas of wastewater pollution control.

Conder works closely with engineers, architects, specifiers, developers and self-builders. Providing support from detailed site surveys, plant selection, full technical proposals and liaison with regulatory bodies where necessary, we will ensure that our client achieves the most environmentally sound and cost-effective solution.



CONDER PRODUCTS

Our specialist commodity division offers a portfolio of products ranging from oil/water separators and small sewage treatment plant, to pumping stations and attenuation or storm water balancing tanks. Our Clereflo range of small-scale domestic sewage treatment plants serve 6-50 population equivalents, utilising either Activated Sludge Plant (ASP) or Submerged Aerated Filter (SAF) technology. Highly price-competitive, with minimal running costs, the Clereflo range is the low energy solution for applications where access to mains drainage is not available.

CONDER TECHNICAL SOLUTIONS

The capability of Conder's Technical Solutions division illustrates the breadth of the company's expertise and has established Conder as the authority in hi-specification projects. As a solutions provider our expertise extends across a product range that includes SAF technology unitank and modular sewage treatment systems up to 1800pe, Membrane BioReactor package sewage treatment up to 5000pe, attenuation, engineered vessels and other specialist tanks.

CONDER PUMPING SOLUTIONS

We offer a range of water and wastewater pumping solutions for domestic, commercial and industrial applications from off the shelf packages, through to custom-built pumping solutions.

SERVICE

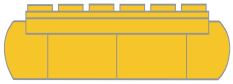
Products installed to protect the environment must be maintained and serviced regularly to ensure that they continue to operate efficiently and effectively. Failure to do this will undoubtedly lead to pollution of the water environment, which is an offence and may result in prosecution. Through a nationwide network of British Water accredited engineers, Pims Service, Conder's service partner, offers a full service and technical package which can include product support, commissioning, waste management and ongoing service and maintenance programmes.

let us make your environment
a better place to be...
demand special treatment

ASP 6-20pe Package Sewage Treatment Plant

NSAF 25-50pe

Techflo SAF 60-600pe single-stream and multi-stream up to 1800pe



MBR Membrane Technology Package Sewage Treatment Systems (up to 5000pe)

General Underground Storage Tanks

For product enquiries, specification advice, project assessments or further information, please contact the Conder team on:

conder
ENVIRONMENTAL SOLUTIONS

t: 08702 640004 **f:** 08702 640005 **e:** sales@conderproducts.com
www.conderproducts.com
Conder Solutions Ltd, 2 Whitehouse Way,
South West Industrial Estate, Peterlee, Co Durham SR8 2RA

For nationwide service enquiries please contact:

PIMS GROUP

Pims (Services) Ltd
t: 0870 405 0902 **f:** 01252 516404 **e:** sales@pimsgroup.co.uk
www.pimsgroup.co.uk

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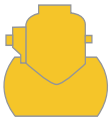
BRITISH WATER · UVDB UTILITIES PREQUALIFICATION SCHEME · CPD MEMBER Construction CPD Certification Service · FM 81587 BS EN ISO 9001:2000 · eps Pumping & Treatment Systems

Attenuation & Storm Water Balancing



Class 1&2 Bypass & Full Retention oil/water separators

Package Pump Stations

Plus:

Double Wall Tanks
Fuel Tanks
Cesspools & Septics
Rainwater Harvesting Systems
Grease/Oil Separators
Bucket Lift Elevators
Screenpack CSOs
ConderCell Modular Storage
Above Ground Engineered Vessels
Sprinkler Tanks

Appendix B

Greenfield Runoff Calculations

ADAS 345

Input

Area (Ha)	6.144	Soil Type Factor (St)	0.800
Length (m)	500.000	Paved Area (%)	0.000
Average Slope (1:x)	22.0	Dominant Crop Type	Grass
AAR (mm)	700	Region Number	4

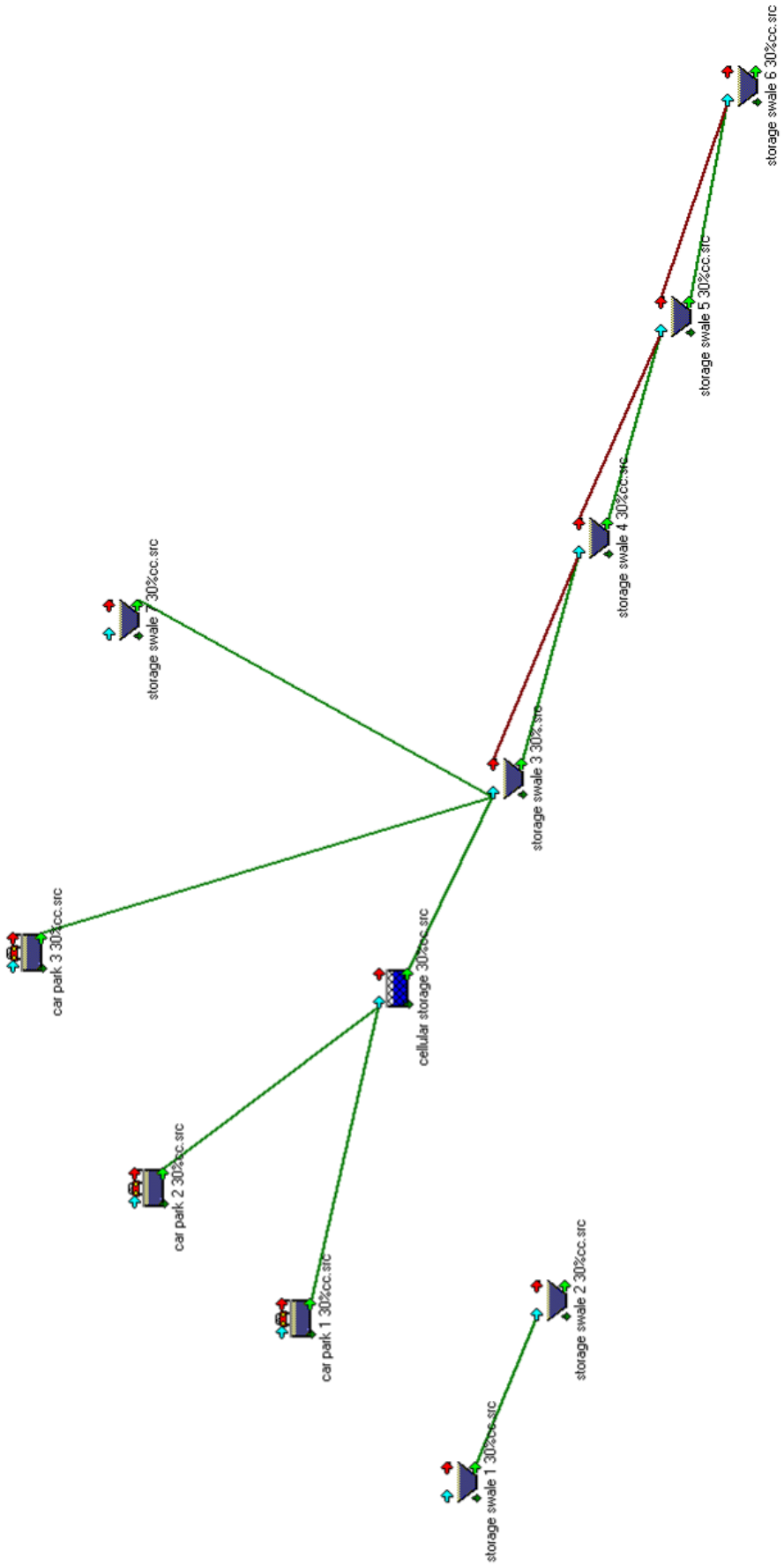
Results l/s

Q0 - Peak Flood Flow	30.3
Total Q0	30.3
QBAR	36.5
Q 1 year	30.3

Q 1 year	30.3
Q 2 years	32.8
Q 5 years	44.9
Q 10 years	54.5
Q 20 years	65.0
Q 25 years	68.6
Q 30 years	71.6
Q 50 years	80.5
Q 100 years	93.9
Q 200 years	110.4
Q 250 years	115.8
Q 1000 years	152.0

Appendix C

Surface Water Drainage - Preliminary Design Calculations


storage swale 6 30%cc.src
storage swale 5 30%cc.src
storage swale 4 30%cc.src
storage swale 7 30%cc.src
storage swale 3 30%cc.src
car park 3 30%cc.src
cellular storage 30%cc.src
car park 2 30%cc.src
car park 1 30%cc.src
storage swale 2 30%cc.src
storage swale 1 30%cc.src

1 in 1 year Simulations

Cascade Summary of Results for storage swale 1 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	storage swale 2 30%cc.src	(None)

Half Drain Time : 7 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	6.3	0.0	6.3	116.7497	0.2497	4.2	O K
30 Summer	6.3	0.0	6.3	116.7503	0.2502	4.2	O K
60 Summer	6.1	0.0	6.1	116.7318	0.2317	3.5	O K
120 Summer	5.6	0.0	5.6	116.6882	0.1882	2.2	O K
180 Summer	5.2	0.0	5.2	116.6507	0.1507	1.4	O K
240 Summer	4.8	0.0	4.8	116.6237	0.1238	0.9	O K
360 Summer	3.9	0.0	3.9	116.6028	0.1028	0.6	O K
480 Summer	3.2	0.0	3.2	116.5908	0.0908	0.5	O K
600 Summer	2.7	0.0	2.7	116.5827	0.0828	0.4	O K
720 Summer	2.4	0.0	2.4	116.5762	0.0763	0.3	O K
960 Summer	2.0	0.0	2.0	116.5658	0.0657	0.2	O K
1440 Summer	1.5	0.0	1.5	116.5553	0.0552	0.2	O K
2160 Summer	1.1	0.0	1.1	116.5488	0.0487	0.1	O K
2880 Summer	0.9	0.0	0.9	116.5443	0.0442	0.1	O K
4320 Summer	0.7	0.0	0.7	116.5372	0.0372	0.1	O K
5760 Summer	0.5	0.0	0.5	116.5338	0.0337	0.1	O K
7200 Summer	0.5	0.0	0.5	116.5313	0.0312	0.1	O K
8640 Summer	0.4	0.0	0.4	116.5293	0.0292	0.0	O K
10080 Summer	0.4	0.0	0.4	116.5273	0.0273	0.0	O K
15 Winter	6.4	0.0	6.4	116.7653	0.2652	4.8	O K
30 Winter	6.4	0.0	6.4	116.7612	0.2612	4.6	O K
60 Winter	6.1	0.0	6.1	116.7298	0.2297	3.4	O K
120 Winter	5.3	0.0	5.3	116.6608	0.1607	1.6	O K
180 Winter	4.6	0.0	4.6	116.6148	0.1148	0.8	O K
240 Winter	3.8	0.0	3.8	116.6012	0.1013	0.6	O K
360 Winter	2.9	0.0	2.9	116.5853	0.0853	0.4	O K
480 Winter	2.3	0.0	2.3	116.5748	0.0748	0.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	13
30 Summer	25.41	21
60 Summer	16.08	38
120 Summer	9.97	68
180 Summer	7.50	98
240 Summer	6.13	126
360 Summer	4.58	184
480 Summer	3.72	246
600 Summer	3.16	306
720 Summer	2.76	366
960 Summer	2.24	482
1440 Summer	1.67	722
2160 Summer	1.24	1084
2880 Summer	1.01	1424
4320 Summer	0.75	2196
5760 Summer	0.61	2920
7200 Summer	0.52	3544
8640 Summer	0.45	4344
10080 Summer	0.40	5064
15 Winter	39.03	14
30 Winter	25.41	23
60 Winter	16.08	40
120 Winter	9.97	70
180 Winter	7.50	96
240 Winter	6.13	126
360 Winter	4.58	186
480 Winter	3.72	246

Cascade Summary of Results for storage swale 1 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600 Winter	2.0	0.0	2.0	116.5667	0.0668	0.2	O K
720 Winter	1.7	0.0	1.7	116.5608	0.0607	0.2	O K
960 Winter	1.4	0.0	1.4	116.5547	0.0547	0.2	O K
1440 Winter	1.1	0.0	1.1	116.5482	0.0482	0.1	O K
2160 Winter	0.8	0.0	0.8	116.5413	0.0412	0.1	O K
2880 Winter	0.6	0.0	0.6	116.5368	0.0367	0.1	O K
4320 Winter	0.5	0.0	0.5	116.5318	0.0317	0.1	O K
5760 Winter	0.4	0.0	0.4	116.5287	0.0287	0.0	O K
7200 Winter	0.3	0.0	0.3	116.5263	0.0262	0.0	O K
8640 Winter	0.3	0.0	0.3	116.5247	0.0247	0.0	O K
10080 Winter	0.3	0.0	0.3	116.5232	0.0232	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	3.16	306
720 Winter	2.76	366
960 Winter	2.24	476
1440 Winter	1.67	740
2160 Winter	1.24	1084
2880 Winter	1.01	1456
4320 Winter	0.75	2136
5760 Winter	0.61	2976
7200 Winter	0.52	3720
8640 Winter	0.45	4328
10080 Winter	0.40	5032

Cascade Rainfall Details for storage swale 1 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.107

Time (mins) from:	to:	Area (ha)
0	4	0.107

Cascade Storage Controls for storage swale 1 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	60.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	116.500
Porosity	1.00	Cover Level (m)	117.100
Base Width (m)	2.0	Slope (1:x)	50.0

Pipe Outflow Control

Pipe Diameter (m)	0.100	Roughness (mm)	0.600	Invert Level (m)	116.500
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	25.000	Coef of Contraction	0.600		

Cascade Summary of Results for storage swale 2 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 1 30%cc.src	(None)	(None)

Half Drain Time : 31 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	4.4	0.0	4.4	116.6103	0.2102	8.5	O K
30 Summer	4.9	0.0	4.9	116.6298	0.2297	10.4	O K
60 Summer	5.1	0.0	5.1	116.6452	0.2452	12.0	O K
120 Summer	5.2	0.0	5.2	116.6497	0.2497	12.5	O K
180 Summer	5.1	0.0	5.1	116.6448	0.2447	11.9	O K
240 Summer	5.0	0.0	5.0	116.6357	0.2357	10.9	O K
360 Summer	4.8	0.0	4.8	116.6188	0.2187	9.3	O K
480 Summer	4.3	0.0	4.3	116.6087	0.2087	8.3	O K
600 Summer	3.8	0.0	3.8	116.6008	0.2007	7.7	O K
720 Summer	3.4	0.0	3.4	116.5947	0.1947	7.2	O K
960 Summer	2.9	0.0	2.9	116.5858	0.1857	6.4	O K
1440 Summer	2.2	0.0	2.2	116.5723	0.1723	5.5	O K
2160 Summer	1.7	0.0	1.7	116.5608	0.1608	4.7	O K
2880 Summer	1.4	0.0	1.4	116.5548	0.1548	4.3	O K
4320 Summer	1.1	0.0	1.1	116.5483	0.1483	3.9	O K
5760 Summer	0.9	0.0	0.9	116.5438	0.1438	3.7	O K
7200 Summer	0.7	0.0	0.7	116.5398	0.1398	3.5	O K
8640 Summer	0.7	0.0	0.7	116.5373	0.1373	3.3	O K
10080 Summer	0.6	0.0	0.6	116.5353	0.1353	3.2	O K
15 Winter	4.7	0.0	4.7	116.6168	0.2167	9.1	O K
30 Winter	5.0	0.0	5.0	116.6397	0.2397	11.4	O K
60 Winter	5.2	0.0	5.2	116.6572	0.2572	13.3	O K
120 Winter	5.2	0.0	5.2	116.6563	0.2562	13.2	O K
180 Winter	5.1	0.0	5.1	116.6417	0.2417	11.6	O K
240 Winter	4.9	0.0	4.9	116.6267	0.2267	10.1	O K
360 Winter	4.2	0.0	4.2	116.6083	0.2082	8.3	O K
480 Winter	3.6	0.0	3.6	116.5973	0.1972	7.4	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	26
30 Summer	25.41	36
60 Summer	16.08	54
120 Summer	9.97	82
180 Summer	7.50	112
240 Summer	6.13	140
360 Summer	4.58	198
480 Summer	3.72	258
600 Summer	3.16	318
720 Summer	2.76	378
960 Summer	2.24	500
1440 Summer	1.67	738
2160 Summer	1.24	1100
2880 Summer	1.01	1468
4320 Summer	0.75	2188
5760 Summer	0.61	2928
7200 Summer	0.52	3616
8640 Summer	0.45	4384
10080 Summer	0.40	5136
15 Winter	39.03	27
30 Winter	25.41	37
60 Winter	16.08	56
120 Winter	9.97	86
180 Winter	7.50	116
240 Winter	6.13	144
360 Winter	4.58	202
480 Winter	3.72	262

Cascade Summary of Results for storage swale 2 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600 Winter	3.1	0.0	3.1	116.5892	0.1892	6.7	O K
720 Winter	2.7	0.0	2.7	116.5827	0.1827	6.2	O K
960 Winter	2.3	0.0	2.3	116.5728	0.1728	5.5	O K
1440 Winter	1.7	0.0	1.7	116.5598	0.1598	4.6	O K
2160 Winter	1.3	0.0	1.3	116.5523	0.1523	4.2	O K
2880 Winter	1.0	0.0	1.0	116.5478	0.1478	3.9	O K
4320 Winter	0.8	0.0	0.8	116.5408	0.1408	3.5	O K
5760 Winter	0.6	0.0	0.6	116.5368	0.1368	3.3	O K
7200 Winter	0.5	0.0	0.5	116.5338	0.1338	3.2	O K
8640 Winter	0.5	0.0	0.5	116.5318	0.1318	3.1	O K
10080 Winter	0.4	0.0	0.4	116.5298	0.1298	3.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	3.16	322
720 Winter	2.76	384
960 Winter	2.24	502
1440 Winter	1.67	736
2160 Winter	1.24	1108
2880 Winter	1.01	1468
4320 Winter	0.75	2208
5760 Winter	0.61	2928
7200 Winter	0.52	3656
8640 Winter	0.45	4312
10080 Winter	0.40	5144

Cascade Rainfall Details for storage swale 2 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.068

Time (mins) from:	to:	Area (ha)
0	4	0.068

Cascade Storage Controls for storage swale 2 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	140.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	116.400
Porosity	1.00	Cover Level (m)	117.000
Base Width (m)	2.0	Slope (1:x)	150.0

Pipe Outflow Control

Pipe Diameter (m)	0.100	Roughness (mm)	0.600	Invert Level (m)	116.500
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	25.000	Coef of Contraction	0.600		

Cascade Summary of Results for car park 1 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	cellular storage 30%cc.src	(None)

Half Drain Time : 24 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	3.3	0.0	3.3	114.3682	0.1183	3.6	O K
30 Summer	4.0	0.0	4.0	114.4063	0.1562	6.3	O K
60 Summer	4.5	0.0	4.5	114.4317	0.1817	8.5	O K
120 Summer	4.7	0.0	4.7	114.4477	0.1977	10.0	O K
180 Summer	4.7	0.0	4.7	114.4492	0.1992	10.2	O K
240 Summer	4.7	0.0	4.7	114.4457	0.1957	9.9	O K
360 Summer	4.5	0.0	4.5	114.4333	0.1832	8.6	O K
480 Summer	4.2	0.0	4.2	114.4177	0.1677	7.2	O K
600 Summer	4.0	0.0	4.0	114.4033	0.1532	6.0	O K
720 Summer	3.8	0.0	3.8	114.3907	0.1408	5.1	O K
960 Summer	3.4	0.0	3.4	114.3702	0.1203	3.7	O K
1440 Summer	2.7	0.0	2.7	114.3483	0.0983	2.5	O K
2160 Summer	2.1	0.0	2.1	114.3313	0.0813	1.7	O K
2880 Summer	1.7	0.0	1.7	114.3213	0.0713	1.3	O K
4320 Summer	1.2	0.0	1.2	114.3098	0.0598	0.9	O K
5760 Summer	1.0	0.0	1.0	114.3008	0.0508	0.7	O K
7200 Summer	0.8	0.0	0.8	114.2952	0.0452	0.5	O K
8640 Summer	0.7	0.0	0.7	114.2917	0.0417	0.4	O K
10080 Summer	0.7	0.0	0.7	114.2897	0.0397	0.4	O K
15 Winter	3.8	0.0	3.8	114.3932	0.1432	5.3	O K
30 Winter	4.5	0.0	4.5	114.4317	0.1817	8.5	O K
60 Winter	4.8	0.0	4.8	114.4542	0.2042	10.7	O K
120 Winter	4.9	0.0	4.9	114.4622	0.2122	11.5	O K
180 Winter	4.8	0.0	4.8	114.4562	0.2062	10.9	O K
240 Winter	4.7	0.0	4.7	114.4463	0.1962	9.9	O K
360 Winter	4.3	0.0	4.3	114.4222	0.1722	7.6	O K
480 Winter	3.9	0.0	3.9	114.3988	0.1488	5.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	17
30 Summer	25.41	30
60 Summer	16.08	44
120 Summer	9.97	78
180 Summer	7.50	112
240 Summer	6.13	144
360 Summer	4.58	206
480 Summer	3.72	266
600 Summer	3.16	326
720 Summer	2.76	384
960 Summer	2.24	502
1440 Summer	1.67	736
2160 Summer	1.24	1100
2880 Summer	1.01	1468
4320 Summer	0.75	2188
5760 Summer	0.61	2896
7200 Summer	0.52	3656
8640 Summer	0.45	4288
10080 Summer	0.40	5088
15 Winter	39.03	17
30 Winter	25.41	30
60 Winter	16.08	48
120 Winter	9.97	84
180 Winter	7.50	120
240 Winter	6.13	152
360 Winter	4.58	216
480 Winter	3.72	274

Cascade Summary of Results for car park 1 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600 Winter	3.6	0.0	3.6	114.3792	0.1293	4.3	O K
720 Winter	3.3	0.0	3.3	114.3643	0.1143	3.3	O K
960 Winter	2.7	0.0	2.7	114.3477	0.0978	2.4	O K
1440 Winter	2.0	0.0	2.0	114.3303	0.0803	1.6	O K
2160 Winter	1.5	0.0	1.5	114.3167	0.0668	1.1	O K
2880 Winter	1.2	0.0	1.2	114.3083	0.0583	0.9	O K
4320 Winter	0.9	0.0	0.9	114.2968	0.0467	0.6	O K
5760 Winter	0.7	0.0	0.7	114.2913	0.0412	0.4	O K
7200 Winter	0.6	0.0	0.6	114.2882	0.0382	0.4	O K
8640 Winter	0.5	0.0	0.5	114.2858	0.0357	0.3	O K
10080 Winter	0.4	0.0	0.4	114.2838	0.0337	0.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	3.16	332
720 Winter	2.76	386
960 Winter	2.24	500
1440 Winter	1.67	736
2160 Winter	1.24	1100
2880 Winter	1.01	1436
4320 Winter	0.75	2196
5760 Winter	0.61	2864
7200 Winter	0.52	3608
8640 Winter	0.45	4384
10080 Winter	0.40	5072

Cascade Rainfall Details for car park 1 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.215

Time (mins) from:	to:	Area (ha)
0	4	0.215

Cascade Storage Controls for car park 1 30%cc.src

Porous Car Park Details

Infil Coef - Base (m/hr)	0.000000	Invert Level (m)	114.250
Membrane Percolation (mm/hr)	1000	Cover Level (m)	115.000
Safety Factor	2.0	Slope (1:x)	30.0
Porosity	0.30	Max Percolation (l/s)	601.7
Length (m)	38.0	Depression Storage (mm)	5
Width (m)	57.0	Evaporation (mm/day)	3

Orifice Outflow Control

Diameter (m)	0.075	Discharge Coefficient	0.600	Invert Level (m)	114.250

Cascade Summary of Results for car park 2 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	cellular storage 30%cc.src	(None)

Half Drain Time : 18 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	10.5	0.0	10.5	115.9013	0.1512	9.4	O K
30 Summer	14.9	0.0	14.9	115.9412	0.1912	15.1	O K
60 Summer	17.8	0.0	17.8	115.9688	0.2187	19.7	O K
120 Summer	18.5	0.0	18.5	115.9802	0.2302	21.8	O K
180 Summer	18.2	0.0	18.2	115.9757	0.2257	21.0	O K
240 Summer	17.7	0.0	17.7	115.9672	0.2172	19.5	O K
360 Summer	15.9	0.0	15.9	115.9498	0.1997	16.5	O K
480 Summer	14.1	0.0	14.1	115.9337	0.1837	13.9	O K
600 Summer	12.6	0.0	12.6	115.9208	0.1707	12.0	O K
720 Summer	11.4	0.0	11.4	115.9098	0.1597	10.5	O K
960 Summer	9.6	0.0	9.6	115.8932	0.1433	8.5	O K
1440 Summer	7.3	0.0	7.3	115.8723	0.1223	6.2	O K
2160 Summer	5.5	0.0	5.5	115.8503	0.1003	4.2	O K
2880 Summer	4.5	0.0	4.5	115.8372	0.0873	3.2	O K
4320 Summer	3.3	0.0	3.3	115.8258	0.0758	2.4	O K
5760 Summer	2.7	0.0	2.7	115.8197	0.0698	2.0	O K
7200 Summer	2.2	0.0	2.2	115.8128	0.0628	1.6	O K
8640 Summer	1.9	0.0	1.9	115.8077	0.0578	1.4	O K
10080 Summer	1.7	0.0	1.7	115.8043	0.0543	1.2	O K
15 Winter	13.7	0.0	13.7	115.9303	0.1802	13.4	O K
30 Winter	17.8	0.0	17.8	115.9688	0.2187	19.8	O K
60 Winter	19.1	0.0	19.1	115.9912	0.2412	24.0	O K
120 Winter	18.9	0.0	18.9	115.9877	0.2377	23.4	O K
180 Winter	18.0	0.0	18.0	115.9723	0.2222	20.4	O K
240 Winter	16.7	0.0	16.7	115.9567	0.2067	17.6	O K
360 Winter	13.9	0.0	13.9	115.9317	0.1817	13.6	O K
480 Winter	11.7	0.0	11.7	115.9122	0.1622	10.8	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	17
30 Summer	25.41	25
60 Summer	16.08	42
120 Summer	9.97	74
180 Summer	7.50	106
240 Summer	6.13	136
360 Summer	4.58	196
480 Summer	3.72	254
600 Summer	3.16	314
720 Summer	2.76	374
960 Summer	2.24	492
1440 Summer	1.67	736
2160 Summer	1.24	1100
2880 Summer	1.01	1468
4320 Summer	0.75	2200
5760 Summer	0.61	2936
7200 Summer	0.52	3640
8640 Summer	0.45	4392
10080 Summer	0.40	5120
15 Winter	39.03	16
30 Winter	25.41	26
60 Winter	16.08	44
120 Winter	9.97	78
180 Winter	7.50	110
240 Winter	6.13	140
360 Winter	4.58	200
480 Winter	3.72	258

Cascade Summary of Results for car park 2 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
600 Winter	10.1	0.0	10.1	115.8982	0.1483	9.0	O K
720 Winter	8.9	0.0	8.9	115.8873	0.1373	7.7	O K
960 Winter	7.3	0.0	7.3	115.8717	0.1218	6.1	O K
1440 Winter	5.4	0.0	5.4	115.8487	0.0988	4.0	O K
2160 Winter	4.0	0.0	4.0	115.8327	0.0828	2.8	O K
2880 Winter	3.2	0.0	3.2	115.8252	0.0753	2.3	O K
4320 Winter	2.3	0.0	2.3	115.8148	0.0648	1.7	O K
5760 Winter	1.9	0.0	1.9	115.8067	0.0568	1.3	O K
7200 Winter	1.6	0.0	1.6	115.8018	0.0518	1.1	O K
8640 Winter	1.3	0.0	1.3	115.7982	0.0483	1.0	O K
10080 Winter	1.2	0.0	1.2	115.7952	0.0453	0.8	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	3.16	318
720 Winter	2.76	376
960 Winter	2.24	498
1440 Winter	1.67	736
2160 Winter	1.24	1088
2880 Winter	1.01	1452
4320 Winter	0.75	2172
5760 Winter	0.61	2928
7200 Winter	0.52	3624
8640 Winter	0.45	4376
10080 Winter	0.40	5120

Cascade Rainfall Details for car park 2 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.572

Time (mins) from:	to:	Area (ha)
0	4	0.572

Cascade Storage Controls for car park 2 30%cc.src

Porous Car Park Details

Infil Coef - Base (m/hr)	0.000000	Invert Level (m)	115.750
Membrane Percolation (mm/hr)	1000	Cover Level (m)	116.500
Safety Factor	2.0	Slope (1:x)	50.0
Porosity	0.30	Max Percolation (l/s)	1588.9
Length (m)	104.0	Depression Storage (mm)	5
Width (m)	55.0	Evaporation (mm/day)	3

Orifice Outflow Control

Diameter (m)	0.150	Discharge Coefficient	0.600	Invert Level (m)	115.750

Cascade Summary of Results for cellular storage 30%cc.src

Upstream Structures	Outflow To	Overflow To
car park 1 30%cc.src car park 2 30%cc.src	storage swale 3 30%.src	(None)

Half Drain Time : 18 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	119.2	0.0	119.2	110.3493	0.3492	165.9	O K
30 Summer	149.6	0.0	149.6	110.4087	0.4087	194.1	O K
60 Summer	162.6	0.0	162.6	110.4287	0.4287	203.6	O K
120 Summer	155.8	0.0	155.8	110.4182	0.4182	198.6	O K
180 Summer	140.7	0.0	140.7	110.3942	0.3942	187.3	O K
240 Summer	129.4	0.0	129.4	110.3708	0.3707	176.2	O K
360 Summer	111.3	0.0	111.3	110.3327	0.3327	158.1	O K
480 Summer	98.0	0.0	98.0	110.3047	0.3047	144.7	O K
600 Summer	87.7	0.0	87.7	110.2858	0.2857	135.6	O K
720 Summer	78.5	0.0	78.5	110.2712	0.2712	128.9	O K
960 Summer	65.6	0.0	65.6	110.2507	0.2507	119.2	O K
1440 Summer	49.3	0.0	49.3	110.2207	0.2207	104.9	O K
2160 Summer	37.9	0.0	37.9	110.1898	0.1897	90.0	O K
2880 Summer	31.1	0.0	31.1	110.1712	0.1713	81.3	O K
4320 Summer	23.2	0.0	23.2	110.1488	0.1488	70.6	O K
5760 Summer	18.8	0.0	18.8	110.1322	0.1323	62.7	O K
7200 Summer	15.9	0.0	15.9	110.1213	0.1213	57.7	O K
8640 Summer	14.0	0.0	14.0	110.1138	0.1138	54.0	O K
10080 Summer	12.5	0.0	12.5	110.1083	0.1083	51.3	O K
15 Winter	136.1	0.0	136.1	110.3848	0.3847	182.7	O K
30 Winter	171.7	0.0	171.7	110.4427	0.4427	210.4	O K
60 Winter	177.3	0.0	177.3	110.4512	0.4512	214.3	O K
120 Winter	154.4	0.0	154.4	110.4162	0.4162	197.8	O K
180 Winter	133.0	0.0	133.0	110.3783	0.3782	179.5	O K
240 Winter	117.5	0.0	117.5	110.3457	0.3457	164.3	O K
360 Winter	95.8	0.0	95.8	110.3002	0.3002	142.5	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	28
30 Summer	25.41	36
60 Summer	16.08	50
120 Summer	9.97	82
180 Summer	7.50	112
240 Summer	6.13	144
360 Summer	4.58	204
480 Summer	3.72	264
600 Summer	3.16	322
720 Summer	2.76	382
960 Summer	2.24	504
1440 Summer	1.67	748
2160 Summer	1.24	1108
2880 Summer	1.01	1476
4320 Summer	0.75	2208
5760 Summer	0.61	2936
7200 Summer	0.52	3672
8640 Summer	0.45	4400
10080 Summer	0.40	5096
15 Winter	39.03	28
30 Winter	25.41	36
60 Winter	16.08	52
120 Winter	9.97	84
180 Winter	7.50	116
240 Winter	6.13	146
360 Winter	4.58	206

Cascade Summary of Results for cellular storage 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
480 Winter	80.4	0.0	80.4	110.2742	0.2742	130.3	O K
600 Winter	69.4	0.0	69.4	110.2568	0.2567	122.0	O K
720 Winter	61.2	0.0	61.2	110.2438	0.2437	115.9	O K
960 Winter	49.5	0.0	49.5	110.2213	0.2212	105.2	O K
1440 Winter	37.4	0.0	37.4	110.1882	0.1883	89.3	O K
2160 Winter	27.9	0.0	27.9	110.1628	0.1628	77.2	O K
2880 Winter	22.5	0.0	22.5	110.1462	0.1463	69.6	O K
4320 Winter	16.7	0.0	16.7	110.1243	0.1243	59.1	O K
5760 Winter	13.6	0.0	13.6	110.1123	0.1123	53.2	O K
7200 Winter	11.5	0.0	11.5	110.1038	0.1038	49.2	O K
8640 Winter	10.1	0.0	10.1	110.0963	0.0963	45.6	O K
10080 Winter	9.0	0.0	9.0	110.0902	0.0903	42.8	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
480 Winter	3.72	264
600 Winter	3.16	326
720 Winter	2.76	386
960 Winter	2.24	514
1440 Winter	1.67	750
2160 Winter	1.24	1108
2880 Winter	1.01	1480
4320 Winter	0.75	2212
5760 Winter	0.61	2888
7200 Winter	0.52	3664
8640 Winter	0.45	4392
10080 Winter	0.40	5032

Cascade Rainfall Details for cellular storage 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 3.082

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.000	8	12	0.771	16	20	0.770
4	8	0.771	12	16	0.770			

Cascade Storage Controls for cellular storage 30%cc.src

Cellular Storage Details

Infil Coef - Base (m/hr)	0.000000	Porosity	0.95
Infil Coef - Sides (m/hr)	0.000000	Invert Level (m)	110.000
Safety Factor	2.0	Ground Level (m)	112.000

Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)
0.00	500.0	500.0	1.40	0.0	616.3	2.80	0.0	616.3	4.20	0.0	616.3
0.20	500.0	517.9	1.60	0.0	616.3	3.00	0.0	616.3	4.40	0.0	616.3
0.40	500.0	535.8	1.80	0.0	616.3	3.20	0.0	616.3	4.60	0.0	616.3
0.60	500.0	553.7	2.00	0.0	616.3	3.40	0.0	616.3	4.80	0.0	616.3
0.80	500.0	571.6	2.20	0.0	616.3	3.60	0.0	616.3	5.00	0.0	616.3
1.00	500.0	589.4	2.40	0.0	616.3	3.80	0.0	616.3			
1.20	500.0	607.3	2.60	0.0	616.3	4.00	0.0	616.3			

Orifice Outflow Control

Diameter (m) 0.500 Discharge Coefficient 0.600 Invert Level (m) 110.000

Cascade Summary of Results for car park 3 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	storage swale 3 30%.src	(None)

Half Drain Time : 155 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	0.9	0.0	0.9	113.4402	0.1902	38.2	O K
30 Summer	2.6	0.0	2.6	113.4692	0.2192	50.8	O K
60 Summer	4.3	0.0	4.3	113.4932	0.2432	62.6	O K
120 Summer	5.4	0.0	5.4	113.5092	0.2592	71.0	O K
180 Summer	6.1	0.0	6.1	113.5173	0.2672	75.1	O K
240 Summer	6.5	0.0	6.5	113.5222	0.2722	77.7	O K
360 Summer	7.0	0.0	7.0	113.5272	0.2772	80.3	O K
480 Summer	7.1	0.0	7.1	113.5282	0.2782	80.8	O K
600 Summer	7.0	0.0	7.0	113.5277	0.2777	80.5	O K
720 Summer	6.9	0.0	6.9	113.5262	0.2762	79.7	O K
960 Summer	6.5	0.0	6.5	113.5222	0.2722	77.8	O K
1440 Summer	5.8	0.0	5.8	113.5143	0.2642	73.5	O K
2160 Summer	4.9	0.0	4.9	113.5033	0.2532	67.9	O K
2880 Summer	4.3	0.0	4.3	113.4942	0.2442	63.0	O K
4320 Summer	3.5	0.0	3.5	113.4812	0.2312	56.5	O K
5760 Summer	3.0	0.0	3.0	113.4737	0.2237	52.9	O K
7200 Summer	2.6	0.0	2.6	113.4688	0.2187	50.7	O K
8640 Summer	2.3	0.0	2.3	113.4652	0.2152	49.0	O K
10080 Summer	2.0	0.0	2.0	113.4622	0.2123	47.7	O K
15 Winter	1.5	0.0	1.5	113.4532	0.2032	43.6	O K
30 Winter	3.6	0.0	3.6	113.4832	0.2332	57.4	O K
60 Winter	5.4	0.0	5.4	113.5088	0.2587	70.6	O K
120 Winter	6.8	0.0	6.8	113.5257	0.2757	79.5	O K
180 Winter	7.5	0.0	7.5	113.5332	0.2832	83.4	O K
240 Winter	7.8	0.0	7.8	113.5368	0.2867	85.3	O K
360 Winter	7.9	0.0	7.9	113.5378	0.2877	85.8	O K
480 Winter	7.7	0.0	7.7	113.5352	0.2852	84.4	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	26
30 Summer	25.41	40
60 Summer	16.08	66
120 Summer	9.97	108
180 Summer	7.50	136
240 Summer	6.13	168
360 Summer	4.58	234
480 Summer	3.72	300
600 Summer	3.16	364
720 Summer	2.76	428
960 Summer	2.24	554
1440 Summer	1.67	798
2160 Summer	1.24	1168
2880 Summer	1.01	1528
4320 Summer	0.75	2248
5760 Summer	0.61	2944
7200 Summer	0.52	3680
8640 Summer	0.45	4408
10080 Summer	0.40	5144
15 Winter	39.03	26
30 Winter	25.41	39
60 Winter	16.08	64
120 Winter	9.97	106
180 Winter	7.50	140
240 Winter	6.13	176
360 Winter	4.58	248
480 Winter	3.72	316

Cascade Summary of Results for car park 3 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600 Winter	7.3	0.0	7.3	113.5313	0.2812	82.5	O K
720 Winter	7.0	0.0	7.0	113.5277	0.2777	80.5	O K
960 Winter	6.4	0.0	6.4	113.5202	0.2702	76.6	O K
1440 Winter	5.3	0.0	5.3	113.5078	0.2577	70.1	O K
2160 Winter	4.2	0.0	4.2	113.4928	0.2427	62.4	O K
2880 Winter	3.6	0.0	3.6	113.4822	0.2322	57.1	O K
4320 Winter	2.7	0.0	2.7	113.4707	0.2207	51.6	O K
5760 Winter	2.2	0.0	2.2	113.4648	0.2147	48.8	O K
7200 Winter	1.9	0.0	1.9	113.4607	0.2107	46.9	O K
8640 Winter	1.6	0.0	1.6	113.4563	0.2062	44.9	O K
10080 Winter	1.5	0.0	1.5	113.4528	0.2028	43.4	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	3.16	384
720 Winter	2.76	448
960 Winter	2.24	576
1440 Winter	1.67	826
2160 Winter	1.24	1192
2880 Winter	1.01	1540
4320 Winter	0.75	2252
5760 Winter	0.61	2952
7200 Winter	0.52	3680
8640 Winter	0.45	4416
10080 Winter	0.40	5144

Cascade Rainfall Details for car park 3 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.647

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.176	4	8	0.235	8	12	0.236

Cascade Storage Controls for car park 3 30%cc.src

Porous Car Park Details

Infil Coef - Base (m/hr)	0.000000	Invert Level (m)	113.250
Membrane Percolation (mm/hr)	1000	Cover Level (m)	114.000
Safety Factor	2.0	Slope (1:x)	150.0
Porosity	0.30	Max Percolation (l/s)	483.1
Length (m)	37.0	Depression Storage (mm)	5
Width (m)	47.0	Evaporation (mm/day)	3

Orifice Outflow Control

Diameter (m)	0.130	Discharge Coefficient	0.600	Invert Level (m)	113.400

Cascade Summary of Results for storage swale 7 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	storage swale 3 30%.src	(None)

Half Drain Time : 1 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	11.6	0.0	11.6	117.5168	0.1168	1.3	O K
30 Summer	11.5	0.0	11.5	117.4967	0.0968	0.9	O K
60 Summer	11.1	0.0	11.1	117.4263	0.0262	0.1	O K
120 Summer	7.9	0.0	7.9	117.4000	0.0000	0.0	O K
180 Summer	6.1	0.0	6.1	117.4000	0.0000	0.0	O K
240 Summer	5.1	0.0	5.1	117.4000	0.0000	0.0	O K
360 Summer	3.8	0.0	3.8	117.4000	0.0000	0.0	O K
480 Summer	3.1	0.0	3.1	117.4000	0.0000	0.0	O K
600 Summer	2.6	0.0	2.6	117.4000	0.0000	0.0	O K
720 Summer	2.3	0.0	2.3	117.4000	0.0000	0.0	O K
960 Summer	1.8	0.0	1.8	117.4000	0.0000	0.0	O K
1440 Summer	1.4	0.0	1.4	117.4000	0.0000	0.0	O K
2160 Summer	1.0	0.0	1.0	117.4000	0.0000	0.0	O K
2880 Summer	0.8	0.0	0.8	117.4000	0.0000	0.0	O K
4320 Summer	0.6	0.0	0.6	117.4000	0.0000	0.0	O K
5760 Summer	0.5	0.0	0.5	117.4000	0.0000	0.0	O K
7200 Summer	0.4	0.0	0.4	117.4000	0.0000	0.0	O K
8640 Summer	0.4	0.0	0.4	117.4000	0.0000	0.0	O K
10080 Summer	0.3	0.0	0.3	117.4000	0.0000	0.0	O K
15 Winter	11.7	0.0	11.7	117.5228	0.1228	1.5	O K
30 Winter	11.5	0.0	11.5	117.4818	0.0818	0.6	O K
60 Winter	9.4	0.0	9.4	117.4000	0.0000	0.0	O K
120 Winter	5.9	0.0	5.9	117.4000	0.0000	0.0	O K
180 Winter	4.5	0.0	4.5	117.4000	0.0000	0.0	O K
240 Winter	3.7	0.0	3.7	117.4000	0.0000	0.0	O K
360 Winter	2.7	0.0	2.7	117.4000	0.0000	0.0	O K
480 Winter	2.2	0.0	2.2	117.4000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	12
30 Summer	25.41	19
60 Summer	16.08	34
120 Summer	9.97	0
180 Summer	7.50	0
240 Summer	6.13	0
360 Summer	4.58	0
480 Summer	3.72	0
600 Summer	3.16	0
720 Summer	2.76	0
960 Summer	2.24	0
1440 Summer	1.67	0
2160 Summer	1.24	0
2880 Summer	1.01	0
4320 Summer	0.75	0
5760 Summer	0.61	0
7200 Summer	0.52	0
8640 Summer	0.45	0
10080 Summer	0.40	0
15 Winter	39.03	12
30 Winter	25.41	20
60 Winter	16.08	0
120 Winter	9.97	0
180 Winter	7.50	0
240 Winter	6.13	0
360 Winter	4.58	0
480 Winter	3.72	0

Cascade Summary of Results for storage swale 7 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600 Winter	1.9	0.0	1.9	117.4000	0.0000	0.0	O K
720 Winter	1.6	0.0	1.6	117.4000	0.0000	0.0	O K
960 Winter	1.3	0.0	1.3	117.4000	0.0000	0.0	O K
1440 Winter	1.0	0.0	1.0	117.4000	0.0000	0.0	O K
2160 Winter	0.7	0.0	0.7	117.4000	0.0000	0.0	O K
2880 Winter	0.6	0.0	0.6	117.4000	0.0000	0.0	O K
4320 Winter	0.4	0.0	0.4	117.4000	0.0000	0.0	O K
5760 Winter	0.4	0.0	0.4	117.4000	0.0000	0.0	O K
7200 Winter	0.3	0.0	0.3	117.4000	0.0000	0.0	O K
8640 Winter	0.3	0.0	0.3	117.4000	0.0000	0.0	O K
10080 Winter	0.2	0.0	0.2	117.4000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	3.16	0
720 Winter	2.76	0
960 Winter	2.24	0
1440 Winter	1.67	0
2160 Winter	1.24	0
2880 Winter	1.01	0
4320 Winter	0.75	0
5760 Winter	0.61	0
7200 Winter	0.52	0
8640 Winter	0.45	0
10080 Winter	0.40	0

Cascade Rainfall Details for storage swale 7 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.101

Time (mins) from:	to:	Area (ha)
0	4	0.101

Cascade Storage Controls for storage swale 7 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	140.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	117.400
Porosity	1.00	Cover Level (m)	118.000
Base Width (m)	1.0	Slope (1:x)	150.0

Pipe Outflow Control

Pipe Diameter (m)	0.100	Roughness (mm)	0.600	Invert Level (m)	116.500
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	25.000	Coef of Contraction	0.600		

Cascade Summary of Results for storage swale 3 30%.src

Upstream Structures	Outflow To	Overflow To
car park 3 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 7 30%cc.src	storage swale 4 30%cc.src	storage swale 4 30%cc.src

Half Drain Time : 89 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	40.7	0.0	0.0	40.7	110.8372	0.3372	0.0	185.7	O K
30 Summer	47.1	0.0	0.0	47.1	110.9187	0.4187	0.0	271.5	O K
60 Summer	52.5	0.0	0.0	52.5	110.9947	0.4947	0.0	365.9	O K
120 Summer	56.1	0.0	0.0	56.1	111.0508	0.5507	0.0	444.2	O K
180 Summer	57.0	0.0	0.0	57.0	111.0662	0.5662	0.0	467.5	O K
240 Summer	57.4	0.0	0.0	57.4	111.0727	0.5727	0.0	477.4	O K
360 Summer	57.4	0.0	0.0	57.4	111.0727	0.5727	0.0	477.1	O K
480 Summer	56.8	0.0	0.0	56.8	111.0628	0.5627	0.0	462.3	O K
600 Summer	56.0	0.0	0.0	56.0	111.0502	0.5502	0.0	443.3	O K
720 Summer	55.1	0.0	0.0	55.1	111.0358	0.5357	0.0	422.9	O K
960 Summer	53.2	0.0	0.0	53.2	111.0067	0.5067	0.0	382.0	O K
1440 Summer	49.4	0.0	0.0	49.4	110.9507	0.4507	0.0	309.8	O K
2160 Summer	44.4	0.0	0.0	44.4	110.8822	0.3822	0.0	230.8	O K
2880 Summer	40.1	0.0	0.0	40.1	110.8302	0.3302	0.0	179.1	O K
4320 Summer	33.3	0.0	0.0	33.3	110.7702	0.2702	0.0	126.9	O K
5760 Summer	27.8	0.0	0.0	27.8	110.7387	0.2387	0.0	103.1	O K
7200 Summer	24.1	0.0	0.0	24.1	110.7168	0.2168	0.0	88.0	O K
8640 Summer	21.3	0.0	0.0	21.3	110.7008	0.2008	0.0	77.4	O K
10080 Summer	19.1	0.0	0.0	19.1	110.6872	0.1873	0.0	69.4	O K
15 Winter	43.6	0.0	0.0	43.6	110.8722	0.3722	0.0	220.3	O K
30 Winter	50.0	0.0	0.0	50.0	110.9592	0.4592	0.0	319.8	O K
60 Winter	55.3	0.0	0.0	55.3	111.0387	0.5387	0.0	426.8	O K
120 Winter	59.0	0.0	0.0	59.0	111.0998	0.5998	0.0	519.3	O K
180 Winter	60.0	0.0	0.0	60.0	111.1162	0.6163	0.0	545.5	FLOOD RISK
240 Winter	60.1	0.0	0.0	60.1	111.1188	0.6188	0.0	550.1	FLOOD RISK

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	48
30 Summer	25.41	60
60 Summer	16.08	82
120 Summer	9.97	128
180 Summer	7.50	166
240 Summer	6.13	198
360 Summer	4.58	264
480 Summer	3.72	330
600 Summer	3.16	396
720 Summer	2.76	460
960 Summer	2.24	588
1440 Summer	1.67	834
2160 Summer	1.24	1192
2880 Summer	1.01	1544
4320 Summer	0.75	2252
5760 Summer	0.61	2960
7200 Summer	0.52	3688
8640 Summer	0.45	4416
10080 Summer	0.40	5144
15 Winter	39.03	50
30 Winter	25.41	62
60 Winter	16.08	84
120 Winter	9.97	128
180 Winter	7.50	176
240 Winter	6.13	208

Cascade Summary of Results for storage swale 3 30%.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
360 Winter	59.7	0.0	0.0	59.7	111.1107	0.6108	0.0	536.5	FLOOD RISK
480 Winter	58.5	0.0	0.0	58.5	111.0908	0.5908	0.0	505.0	O K
600 Winter	57.1	0.0	0.0	57.1	111.0677	0.5677	0.0	469.5	O K
720 Winter	55.6	0.0	0.0	55.6	111.0437	0.5437	0.0	433.9	O K
960 Winter	52.6	0.0	0.0	52.6	110.9962	0.4962	0.0	367.7	O K
1440 Winter	46.7	0.0	0.0	46.7	110.9127	0.4127	0.0	264.5	O K
2160 Winter	39.4	0.0	0.0	39.4	110.8227	0.3227	0.0	171.9	O K
2880 Winter	33.7	0.0	0.0	33.7	110.7728	0.2727	0.0	129.2	O K
4320 Winter	25.6	0.0	0.0	25.6	110.7258	0.2258	0.0	93.8	O K
5760 Winter	20.8	0.0	0.0	20.8	110.6978	0.1978	0.0	75.7	O K
7200 Winter	17.7	0.0	0.0	17.7	110.6793	0.1793	0.0	64.5	O K
8640 Winter	15.5	0.0	0.0	15.5	110.6657	0.1658	0.0	56.9	O K
10080 Winter	13.8	0.0	0.0	13.8	110.6543	0.1543	0.0	51.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	4.58	280
480 Winter	3.72	352
600 Winter	3.16	420
720 Winter	2.76	488
960 Winter	2.24	618
1440 Winter	1.67	860
2160 Winter	1.24	1208
2880 Winter	1.01	1544
4320 Winter	0.75	2252
5760 Winter	0.61	2952
7200 Winter	0.52	3680
8640 Winter	0.45	4408
10080 Winter	0.40	5144

Cascade Rainfall Details for storage swale 3 30%.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 1.352

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.000	4	8	0.676	8	12	0.676

Cascade Storage Controls for storage swale 3 30%.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	300.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	110.500
Porosity	1.00	Cover Level (m)	111.300
Base Width (m)	0.5	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m)	0.200	Discharge Coefficient	0.600	Invert Level (m)	110.500

Weir / Flume Overflow Control

Discharge Coef	0.544	Width (m)	6.000	Crest Level (m)	111.150

Cascade Summary of Results for storage swale 4 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 3 30%.src car park 3 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 7 30%cc.src	storage swale 5 30%cc.src	storage swale 5 30%cc.src

Half Drain Time : 175 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
15 Summer	19.7	0.0	0.0	19.7	109.2513	0.2512	0.0	149.3	O K
30 Summer	22.8	0.0	0.0	22.8	109.3107	0.3107	0.0	214.4	O K
60 Summer	25.5	0.0	0.0	25.5	109.3692	0.3692	0.0	289.2	O K
120 Summer	27.8	0.0	0.0	27.8	109.4252	0.4252	0.0	371.2	O K
180 Summer	29.0	0.0	0.0	29.0	109.4567	0.4567	0.0	422.1	O K
240 Summer	29.8	0.0	0.0	29.8	109.4782	0.4782	0.0	458.1	O K
360 Summer	30.8	0.0	0.0	30.8	109.5042	0.5042	0.0	503.9	O K
480 Summer	31.2	0.0	0.0	31.2	109.5167	0.5167	0.0	526.5	O K
600 Summer	31.4	0.0	0.0	31.4	109.5212	0.5212	0.0	535.5	O K
720 Summer	31.4	0.0	0.0	31.4	109.5212	0.5212	0.0	535.0	O K
960 Summer	31.2	0.0	0.0	31.2	109.5172	0.5172	0.0	528.0	O K
1440 Summer	30.8	0.0	0.0	30.8	109.5037	0.5037	0.0	503.3	O K
2160 Summer	29.7	0.0	0.0	29.7	109.4752	0.4752	0.0	452.6	O K
2880 Summer	28.4	0.0	0.0	28.4	109.4407	0.4407	0.0	395.5	O K
4320 Summer	25.6	0.0	0.0	25.6	109.3732	0.3732	0.0	294.5	O K
5760 Summer	23.2	0.0	0.0	23.2	109.3192	0.3192	0.0	224.7	O K
7200 Summer	21.2	0.0	0.0	21.2	109.2783	0.2782	0.0	177.2	O K
8640 Summer	19.4	0.0	0.0	19.4	109.2462	0.2462	0.0	144.3	O K
10080 Summer	18.0	0.0	0.0	18.0	109.2223	0.2223	0.0	121.8	O K
15 Winter	21.1	0.0	0.0	21.1	109.2762	0.2762	0.0	175.3	O K
30 Winter	24.1	0.0	0.0	24.1	109.3387	0.3387	0.0	249.0	O K
60 Winter	26.8	0.0	0.0	26.8	109.3997	0.3997	0.0	332.4	O K
120 Winter	29.1	0.0	0.0	29.1	109.4582	0.4582	0.0	424.5	O K
180 Winter	30.3	0.0	0.0	30.3	109.4917	0.4917	0.0	481.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	143
30 Summer	25.41	181
60 Summer	16.08	230
120 Summer	9.97	296
180 Summer	7.50	348
240 Summer	6.13	394
360 Summer	4.58	478
480 Summer	3.72	554
600 Summer	3.16	628
720 Summer	2.76	690
960 Summer	2.24	806
1440 Summer	1.67	1044
2160 Summer	1.24	1400
2880 Summer	1.01	1748
4320 Summer	0.75	2452
5760 Summer	0.61	3160
7200 Summer	0.52	3856
8640 Summer	0.45	4560
10080 Summer	0.40	5264
15 Winter	39.03	155
30 Winter	25.41	197
60 Winter	16.08	250
120 Winter	9.97	318
180 Winter	7.50	372

Cascade Summary of Results for storage swale 4 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
240 Winter	31.1	0.0	0.0	31.1	109.5142	0.5142	0.0	522.6	O K
360 Winter	32.1	0.0	0.0	32.1	109.5423	0.5422	0.0	574.8	O K
480 Winter	32.6	0.0	0.0	32.6	109.5557	0.5557	0.0	601.7	O K
600 Winter	32.8	0.0	0.0	32.8	109.5618	0.5617	0.0	613.7	O K
720 Winter	32.8	0.0	0.0	32.8	109.5622	0.5623	0.0	614.1	O K
960 Winter	32.5	0.0	0.0	32.5	109.5532	0.5532	0.0	596.3	O K
1440 Winter	31.5	0.0	0.0	31.5	109.5257	0.5257	0.0	543.6	O K
2160 Winter	29.5	0.0	0.0	29.5	109.4692	0.4692	0.0	442.6	O K
2880 Winter	27.2	0.0	0.0	27.2	109.4102	0.4102	0.0	348.6	O K
4320 Winter	23.1	0.0	0.0	23.1	109.3167	0.3167	0.0	221.4	O K
5760 Winter	19.8	0.0	0.0	19.8	109.2533	0.2532	0.0	151.3	O K
7200 Winter	17.5	0.0	0.0	17.5	109.2138	0.2138	0.0	113.9	O K
8640 Winter	15.3	0.0	0.0	15.3	109.1947	0.1948	0.0	98.0	O K
10080 Winter	13.8	0.0	0.0	13.8	109.1807	0.1808	0.0	86.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
240 Winter	6.13	418
360 Winter	4.58	502
480 Winter	3.72	580
600 Winter	3.16	654
720 Winter	2.76	726
960 Winter	2.24	844
1440 Winter	1.67	1086
2160 Winter	1.24	1436
2880 Winter	1.01	1792
4320 Winter	0.75	2488
5760 Winter	0.61	3176
7200 Winter	0.52	3816
8640 Winter	0.45	4544
10080 Winter	0.40	5272

Cascade Rainfall Details for storage swale 4 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.000

Time (mins) from:	to:	Area (ha)
0	4	0.000

Cascade Storage Controls for storage swale 4 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	400.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	109.000
Porosity	1.00	Cover Level (m)	109.800
Base Width (m)	0.5	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m)	0.150	Discharge Coefficient	0.600	Invert Level (m)	109.000

Weir / Flume Overflow Control

Discharge Coef	0.544	Width (m)	3.500	Crest Level (m)	109.650

Cascade Summary of Results for storage swale 5 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 4 30%cc.src storage swale 3 30%.src car park 3 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 7 30%cc.src	storage swale 6 30%cc.src	storage swale 6 30%cc.src

Half Drain Time : 449 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
15 Summer	9.7	0.0	0.0	9.7	107.7642	0.2642	0.0	155.0	O K
30 Summer	11.0	0.0	0.0	11.0	107.8292	0.3292	0.0	226.3	O K
60 Summer	12.2	0.0	0.0	12.2	107.8922	0.3922	0.0	307.6	O K
120 Summer	13.3	0.0	0.0	13.3	107.9542	0.4542	0.0	398.9	O K
180 Summer	13.9	0.0	0.0	13.9	107.9907	0.4907	0.0	458.3	O K
240 Summer	14.3	0.0	0.0	14.3	108.0167	0.5167	0.0	503.2	O K
360 Summer	14.8	0.0	0.0	14.8	108.0522	0.5522	0.0	568.0	O K
480 Summer	15.1	0.0	0.0	15.1	108.0752	0.5753	0.0	612.2	O K
600 Summer	15.4	0.0	0.0	15.4	108.0928	0.5928	0.0	645.8	O K
720 Summer	15.6	0.0	0.0	15.6	108.1053	0.6053	0.0	671.8	FLOOD RISK
960 Summer	15.8	0.0	0.0	15.8	108.1228	0.6228	0.0	707.6	FLOOD RISK
1440 Summer	16.0	0.0	0.0	16.0	108.1363	0.6363	0.0	735.5	FLOOD RISK
2160 Summer	15.9	0.0	0.0	15.9	108.1308	0.6308	0.0	724.7	FLOOD RISK
2880 Summer	15.8	0.0	0.0	15.8	108.1213	0.6213	0.0	704.2	FLOOD RISK
4320 Summer	15.4	0.0	0.0	15.4	108.0928	0.5928	0.0	645.9	O K
5760 Summer	14.9	0.0	0.0	14.9	108.0567	0.5567	0.0	576.7	O K
7200 Summer	14.3	0.0	0.0	14.3	108.0187	0.5187	0.0	507.2	O K
8640 Summer	13.7	0.0	0.0	13.7	107.9817	0.4817	0.0	443.4	O K
10080 Summer	13.2	0.0	0.0	13.2	107.9472	0.4472	0.0	388.4	O K
15 Winter	10.3	0.0	0.0	10.3	107.7917	0.2917	0.0	183.5	O K
30 Winter	11.6	0.0	0.0	11.6	107.8592	0.3592	0.0	263.5	O K
60 Winter	12.8	0.0	0.0	12.8	107.9247	0.4247	0.0	354.2	O K
120 Winter	13.8	0.0	0.0	13.8	107.9892	0.4892	0.0	456.3	O K
180 Winter	14.4	0.0	0.0	14.4	108.0277	0.5277	0.0	522.8	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	317
30 Summer	25.41	391
60 Summer	16.08	482
120 Summer	9.97	590
180 Summer	7.50	668
240 Summer	6.13	732
360 Summer	4.58	838
480 Summer	3.72	928
600 Summer	3.16	1010
720 Summer	2.76	1090
960 Summer	2.24	1242
1440 Summer	1.67	1530
2160 Summer	1.24	1880
2880 Summer	1.01	2228
4320 Summer	0.75	2940
5760 Summer	0.61	3648
7200 Summer	0.52	4344
8640 Summer	0.45	5048
10080 Summer	0.40	5760
15 Winter	39.03	343
30 Winter	25.41	426
60 Winter	16.08	522
120 Winter	9.97	638
180 Winter	7.50	718

Cascade Summary of Results for storage swale 5 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
240 Winter	14.8	0.0	0.0	14.8	108.0553	0.5552	0.0	573.2	O K
360 Winter	15.4	0.0	0.0	15.4	108.0928	0.5928	0.0	646.3	O K
480 Winter	15.7	0.0	0.0	15.7	108.1173	0.6173	0.0	696.5	FLOOD RISK
600 Winter	16.0	0.0	0.0	16.0	108.1358	0.6358	0.0	735.2	FLOOD RISK
720 Winter	16.2	0.0	0.0	16.2	108.1503	0.6503	0.0	765.8	FLOOD RISK
960 Winter	16.3	0.0	3.8	20.1	108.1608	0.6608	29.9	789.5	FLOOD RISK
1440 Winter	16.4	0.0	6.4	22.8	108.1653	0.6653	68.8	798.5	FLOOD RISK
2160 Winter	16.3	0.0	4.6	21.0	108.1623	0.6623	51.0	792.5	FLOOD RISK
2880 Winter	16.2	0.0	1.5	17.7	108.1558	0.6558	9.6	777.9	FLOOD RISK
4320 Winter	15.5	0.0	0.0	15.5	108.1023	0.6023	0.0	665.6	FLOOD RISK
5760 Winter	14.6	0.0	0.0	14.6	108.0387	0.5387	0.0	543.0	O K
7200 Winter	13.7	0.0	0.0	13.7	107.9782	0.4782	0.0	437.9	O K
8640 Winter	12.8	0.0	0.0	12.8	107.9262	0.4262	0.0	356.3	O K
10080 Winter	12.0	0.0	0.0	12.0	107.8807	0.3807	0.0	292.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
240 Winter	6.13	784
360 Winter	4.58	894
480 Winter	3.72	986
600 Winter	3.16	1068
720 Winter	2.76	1148
960 Winter	2.24	1250
1440 Winter	1.67	1484
2160 Winter	1.24	1864
2880 Winter	1.01	2296
4320 Winter	0.75	3040
5760 Winter	0.61	3744
7200 Winter	0.52	4464
8640 Winter	0.45	5176
10080 Winter	0.40	5872

Cascade Rainfall Details for storage swale 5 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.000

Time from:	(mins) to:	Area (ha)
0	4	0.000

Cascade Storage Controls for storage swale 5 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	382.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	107.500
Porosity	1.00	Cover Level (m)	108.300
Base Width (m)	0.5	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m)	0.100	Discharge Coefficient	0.600	Invert Level (m)	107.500

Weir / Flume Overflow Control

Discharge Coef	0.544	Width (m)	2.000	Crest Level (m)	108.150

Cascade Summary of Results for storage swale 6 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 5 30%cc.src storage swale 4 30%cc.src storage swale 3 30%.src car park 3 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 7 30%cc.src	(None)	(None)

Half Drain Time : 43 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	9.5	0.0	9.5	106.1158	0.1158	40.2	O K
30 Summer	11.0	0.0	11.0	106.1233	0.1233	43.5	O K
60 Summer	12.1	0.0	12.1	106.1288	0.1288	46.3	O K
120 Summer	13.2	0.0	13.2	106.1343	0.1343	48.9	O K
180 Summer	13.8	0.0	13.8	106.1373	0.1373	50.4	O K
240 Summer	14.2	0.0	14.2	106.1397	0.1398	51.7	O K
360 Summer	14.7	0.0	14.7	106.1432	0.1433	53.5	O K
480 Summer	15.1	0.0	15.1	106.1458	0.1458	54.6	O K
600 Summer	15.3	0.0	15.3	106.1472	0.1473	55.5	O K
720 Summer	15.5	0.0	15.5	106.1488	0.1488	56.2	O K
960 Summer	15.8	0.0	15.8	106.1503	0.1503	57.0	O K
1440 Summer	15.9	0.0	15.9	106.1513	0.1513	57.6	O K
2160 Summer	15.8	0.0	15.8	106.1507	0.1508	57.5	O K
2880 Summer	15.8	0.0	15.8	106.1503	0.1503	57.0	O K
4320 Summer	15.3	0.0	15.3	106.1473	0.1473	55.6	O K
5760 Summer	14.9	0.0	14.9	106.1442	0.1443	53.9	O K
7200 Summer	14.3	0.0	14.3	106.1403	0.1403	52.0	O K
8640 Summer	13.7	0.0	13.7	106.1367	0.1368	50.1	O K
10080 Summer	13.2	0.0	13.2	106.1343	0.1343	48.8	O K
15 Winter	10.2	0.0	10.2	106.1193	0.1193	41.6	O K
30 Winter	11.5	0.0	11.5	106.1258	0.1258	44.9	O K
60 Winter	12.7	0.0	12.7	106.1318	0.1318	47.7	O K
120 Winter	13.8	0.0	13.8	106.1373	0.1373	50.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	39.03	374
30 Summer	25.41	444
60 Summer	16.08	534
120 Summer	9.97	630
180 Summer	7.50	710
240 Summer	6.13	786
360 Summer	4.58	894
480 Summer	3.72	968
600 Summer	3.16	1060
720 Summer	2.76	1146
960 Summer	2.24	1276
1440 Summer	1.67	1584
2160 Summer	1.24	1952
2880 Summer	1.01	2268
4320 Summer	0.75	3008
5760 Summer	0.61	3672
7200 Summer	0.52	4432
8640 Summer	0.45	5048
10080 Summer	0.40	5816
15 Winter	39.03	384
30 Winter	25.41	477
60 Winter	16.08	566
120 Winter	9.97	672

Cascade Summary of Results for storage swale 6 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
180 Winter	14.3	0.0	14.3	106.1407	0.1408	52.3	O K
240 Winter	14.8	0.0	14.8	106.1438	0.1438	53.6	O K
360 Winter	15.3	0.0	15.3	106.1472	0.1473	55.5	O K
480 Winter	15.7	0.0	15.7	106.1497	0.1498	56.7	O K
600 Winter	15.9	0.0	15.9	106.1513	0.1513	57.6	O K
720 Winter	16.2	0.0	16.2	106.1527	0.1528	58.3	O K
960 Winter	19.3	0.0	19.3	106.1732	0.1733	69.6	O K
1440 Winter	21.6	0.0	21.6	106.1878	0.1878	78.2	O K
2160 Winter	20.2	0.0	20.2	106.1793	0.1793	73.1	O K
2880 Winter	17.3	0.0	17.3	106.1602	0.1603	62.4	O K
4320 Winter	15.5	0.0	15.5	106.1483	0.1483	56.2	O K
5760 Winter	14.6	0.0	14.6	106.1428	0.1428	53.1	O K
7200 Winter	13.7	0.0	13.7	106.1367	0.1368	50.1	O K
8640 Winter	12.8	0.0	12.8	106.1323	0.1323	47.8	O K
10080 Winter	12.0	0.0	12.0	106.1283	0.1283	45.9	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
180 Winter	7.50	778
240 Winter	6.13	828
360 Winter	4.58	944
480 Winter	3.72	1020
600 Winter	3.16	1116
720 Winter	2.76	1190
960 Winter	2.24	1298
1440 Winter	1.67	1544
2160 Winter	1.24	1924
2880 Winter	1.01	2336
4320 Winter	0.75	3120
5760 Winter	0.61	3824
7200 Winter	0.52	4584
8640 Winter	0.45	5192
10080 Winter	0.40	5920

Cascade Rainfall Details for storage swale 6 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.000

Time from:	(mins) to:	Area (ha)
0	4	0.000

Cascade Storage Controls for storage swale 6 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	240.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	106.000
Porosity	1.00	Cover Level (m)	106.800
Base Width (m)	1.0	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m)	0.233	Discharge Coefficient	0.600	Invert Level (m)	106.000

1 in 100 Year Simulations

Cascade Summary of Results for storage swale 1 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	storage swale 3 30%.src	(None)

Half Drain Time : 28 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	8.2	0.0	8.2	116.9777	0.4777	18.7	FLOOD RISK
30 Summer	8.4	0.0	8.4	117.0032	0.5032	21.1	FLOOD RISK
60 Summer	8.4	0.0	8.4	117.0032	0.5032	21.2	FLOOD RISK
120 Summer	8.2	0.0	8.2	116.9772	0.4772	18.7	FLOOD RISK
180 Summer	8.0	0.0	8.0	116.9452	0.4452	15.8	FLOOD RISK
240 Summer	7.7	0.0	7.7	116.9112	0.4112	13.1	FLOOD RISK
360 Summer	7.2	0.0	7.2	116.8477	0.3477	8.8	O K
480 Summer	6.7	0.0	6.7	116.7923	0.2922	5.9	O K
600 Summer	6.2	0.0	6.2	116.7448	0.2447	4.0	O K
720 Summer	5.8	0.0	5.8	116.7042	0.2042	2.6	O K
960 Summer	5.1	0.0	5.1	116.6417	0.1418	1.2	O K
1440 Summer	3.9	0.0	3.9	116.6018	0.1018	0.6	O K
2160 Summer	2.8	0.0	2.8	116.5833	0.0833	0.4	O K
2880 Summer	2.2	0.0	2.2	116.5713	0.0713	0.3	O K
4320 Summer	1.6	0.0	1.6	116.5577	0.0578	0.2	O K
5760 Summer	1.3	0.0	1.3	116.5518	0.0517	0.1	O K
7200 Summer	1.1	0.0	1.1	116.5482	0.0482	0.1	O K
8640 Summer	0.9	0.0	0.9	116.5447	0.0447	0.1	O K
10080 Summer	0.8	0.0	0.8	116.5417	0.0418	0.1	O K
15 Winter	8.4	0.0	8.4	117.0067	0.5067	21.5	FLOOD RISK
30 Winter	8.7	0.0	8.7	117.0357	0.5357	24.6	FLOOD RISK
60 Winter	8.6	0.0	8.6	117.0342	0.5342	24.4	FLOOD RISK
120 Winter	8.4	0.0	8.4	116.9942	0.4942	20.3	FLOOD RISK
180 Winter	8.0	0.0	8.0	116.9462	0.4462	15.9	FLOOD RISK
240 Winter	7.6	0.0	7.6	116.8962	0.3962	12.0	O K
360 Winter	6.8	0.0	6.8	116.8037	0.3037	6.5	O K
480 Winter	6.0	0.0	6.0	116.7267	0.2267	3.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	16
30 Summer	81.51	26
60 Summer	51.03	44
120 Summer	30.89	78
180 Summer	22.72	110
240 Summer	18.17	142
360 Summer	13.19	202
480 Summer	10.52	262
600 Summer	8.81	320
720 Summer	7.63	376
960 Summer	6.06	492
1440 Summer	4.38	732
2160 Summer	3.16	1100
2880 Summer	2.51	1460
4320 Summer	1.80	2140
5760 Summer	1.43	2920
7200 Summer	1.19	3656
8640 Summer	1.02	4320
10080 Summer	0.90	4984
15 Winter	124.07	16
30 Winter	81.51	29
60 Winter	51.03	46
120 Winter	30.89	84
180 Winter	22.72	118
240 Winter	18.17	150
360 Winter	13.19	210
480 Winter	10.52	266

Cascade Summary of Results for storage swale 1 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
600 Winter	5.3	0.0	5.3	116.6647	0.1648	1.7	O K
720 Winter	4.8	0.0	4.8	116.6192	0.1193	0.8	O K
960 Winter	3.9	0.0	3.9	116.6018	0.1018	0.6	O K
1440 Winter	2.8	0.0	2.8	116.5837	0.0838	0.4	O K
2160 Winter	2.0	0.0	2.0	116.5667	0.0668	0.2	O K
2880 Winter	1.6	0.0	1.6	116.5577	0.0577	0.2	O K
4320 Winter	1.2	0.0	1.2	116.5498	0.0497	0.1	O K
5760 Winter	0.9	0.0	0.9	116.5452	0.0452	0.1	O K
7200 Winter	0.8	0.0	0.8	116.5403	0.0402	0.1	O K
8640 Winter	0.7	0.0	0.7	116.5372	0.0373	0.1	O K
10080 Winter	0.6	0.0	0.6	116.5352	0.0352	0.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	8.81	320
720 Winter	7.63	370
960 Winter	6.06	488
1440 Winter	4.38	724
2160 Winter	3.16	1068
2880 Winter	2.51	1440
4320 Winter	1.80	2168
5760 Winter	1.43	2936
7200 Winter	1.19	3568
8640 Winter	1.02	4160
10080 Winter	0.90	5064

Cascade Rainfall Details for storage swale 1 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.107

Time from:	(mins) to:	Area (ha)
0	4	0.107

Cascade Storage Controls for storage swale 1 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	60.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	116.500
Porosity	1.00	Cover Level (m)	117.100
Base Width (m)	2.0	Slope (1:x)	50.0

Pipe Outflow Control

Pipe Diameter (m)	0.100	Roughness (mm)	0.600	Invert Level (m)	116.500
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	25.000	Coef of Contraction	0.600		

Cascade Summary of Results for storage swale 2 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 7 30%cc.src	cellular storage 30%cc.src	(None)

Half Drain Time : 67 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	6.4	0.0	6.4	116.7622	0.3622	29.2	O K
30 Summer	6.8	0.0	6.8	116.8037	0.4037	37.6	FLOOD RISK
60 Summer	7.1	0.0	7.1	116.8377	0.4377	45.5	FLOOD RISK
120 Summer	7.2	0.0	7.2	116.8482	0.4482	48.1	FLOOD RISK
180 Summer	7.1	0.0	7.1	116.8392	0.4392	45.9	FLOOD RISK
240 Summer	7.0	0.0	7.0	116.8277	0.4277	43.1	FLOOD RISK
360 Summer	6.8	0.0	6.8	116.8022	0.4022	37.3	FLOOD RISK
480 Summer	6.5	0.0	6.5	116.7787	0.3787	32.4	O K
600 Summer	6.3	0.0	6.3	116.7562	0.3562	28.1	O K
720 Summer	6.1	0.0	6.1	116.7357	0.3357	24.4	O K
960 Summer	5.7	0.0	5.7	116.6992	0.2992	18.8	O K
1440 Summer	5.1	0.0	5.1	116.6438	0.2437	11.8	O K
2160 Summer	4.2	0.0	4.2	116.6083	0.2082	8.3	O K
2880 Summer	3.4	0.0	3.4	116.5947	0.1947	7.2	O K
4320 Summer	2.5	0.0	2.5	116.5778	0.1778	5.9	O K
5760 Summer	2.0	0.0	2.0	116.5663	0.1663	5.0	O K
7200 Summer	1.7	0.0	1.7	116.5588	0.1588	4.6	O K
8640 Summer	1.4	0.0	1.4	116.5548	0.1548	4.3	O K
10080 Summer	1.3	0.0	1.3	116.5518	0.1518	4.1	O K
15 Winter	6.5	0.0	6.5	116.7787	0.3787	32.4	O K
30 Winter	6.9	0.0	6.9	116.8217	0.4217	41.7	FLOOD RISK
60 Winter	7.3	0.0	7.3	116.8587	0.4587	50.8	FLOOD RISK
120 Winter	7.4	0.0	7.4	116.8712	0.4712	54.3	FLOOD RISK
180 Winter	7.3	0.0	7.3	116.8607	0.4607	51.4	FLOOD RISK
240 Winter	7.1	0.0	7.1	116.8427	0.4427	46.8	FLOOD RISK
360 Winter	6.8	0.0	6.8	116.8067	0.4067	38.3	FLOOD RISK
480 Winter	6.5	0.0	6.5	116.7728	0.3727	31.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	34
30 Summer	81.51	47
60 Summer	51.03	66
120 Summer	30.89	96
180 Summer	22.72	120
240 Summer	18.17	154
360 Summer	13.19	222
480 Summer	10.52	286
600 Summer	8.81	348
720 Summer	7.63	410
960 Summer	6.06	528
1440 Summer	4.38	754
2160 Summer	3.16	1104
2880 Summer	2.51	1468
4320 Summer	1.80	2200
5760 Summer	1.43	2936
7200 Summer	1.19	3616
8640 Summer	1.02	4336
10080 Summer	0.90	5136
15 Winter	124.07	38
30 Winter	81.51	51
60 Winter	51.03	70
120 Winter	30.89	98
180 Winter	22.72	130
240 Winter	18.17	168
360 Winter	13.19	238
480 Winter	10.52	302

Cascade Summary of Results for storage swale 2 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
600 Winter	6.2	0.0	6.2	116.7407	0.3407	25.3	O K
720 Winter	5.9	0.0	5.9	116.7107	0.3107	20.5	O K
960 Winter	5.3	0.0	5.3	116.6602	0.2602	13.7	O K
1440 Winter	4.3	0.0	4.3	116.6093	0.2092	8.4	O K
2160 Winter	3.1	0.0	3.1	116.5898	0.1897	6.8	O K
2880 Winter	2.5	0.0	2.5	116.5783	0.1782	5.9	O K
4320 Winter	1.8	0.0	1.8	116.5622	0.1623	4.8	O K
5760 Winter	1.4	0.0	1.4	116.5547	0.1548	4.3	O K
7200 Winter	1.2	0.0	1.2	116.5508	0.1508	4.1	O K
8640 Winter	1.0	0.0	1.0	116.5478	0.1478	3.9	O K
10080 Winter	0.9	0.0	0.9	116.5448	0.1448	3.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	8.81	366
720 Winter	7.63	426
960 Winter	6.06	540
1440 Winter	4.38	748
2160 Winter	3.16	1100
2880 Winter	2.51	1468
4320 Winter	1.80	2180
5760 Winter	1.43	2872
7200 Winter	1.19	3640
8640 Winter	1.02	4312
10080 Winter	0.90	5008

Cascade Rainfall Details for storage swale 2 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.068

Time (mins) from:	to:	Area (ha)
0	4	0.068

Cascade Storage Controls for storage swale 2 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	140.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	116.400
Porosity	1.00	Cover Level (m)	117.000
Base Width (m)	2.0	Slope (1:x)	150.0

Pipe Outflow Control

Pipe Diameter (m)	0.100	Roughness (mm)	0.600	Invert Level (m)	116.500
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	25.000	Coef of Contraction	0.600		

Cascade Summary of Results for car park 1 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	cellular storage 30%cc.src	cellular storage 30%cc.src

Half Drain Time : 78 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	6.8	0.0	6.8	114.6202	0.3702	35.2	O K
30 Summer	7.3	0.0	7.3	114.6777	0.4277	46.9	O K
60 Summer	7.7	0.0	7.7	114.7127	0.4627	54.9	O K
120 Summer	7.8	0.0	7.8	114.7257	0.4757	58.1	O K
180 Summer	7.8	0.0	7.8	114.7232	0.4732	57.4	O K
240 Summer	7.7	0.0	7.7	114.7137	0.4637	55.2	O K
360 Summer	7.4	0.0	7.4	114.6892	0.4392	49.5	O K
480 Summer	7.2	0.0	7.2	114.6647	0.4147	44.1	O K
600 Summer	7.0	0.0	7.0	114.6407	0.3907	39.2	O K
720 Summer	6.8	0.0	6.8	114.6182	0.3682	34.8	O K
960 Summer	6.3	0.0	6.3	114.5782	0.3282	27.6	O K
1440 Summer	5.6	0.0	5.6	114.5143	0.2642	17.9	O K
2160 Summer	4.7	0.0	4.7	114.4473	0.1972	10.0	O K
2880 Summer	4.0	0.0	4.0	114.4043	0.1543	6.1	O K
4320 Summer	3.1	0.0	3.1	114.3568	0.1068	2.9	O K
5760 Summer	2.4	0.0	2.4	114.3402	0.0903	2.1	O K
7200 Summer	2.0	0.0	2.0	114.3298	0.0798	1.6	O K
8640 Summer	1.7	0.0	1.7	114.3228	0.0728	1.3	O K
10080 Summer	1.5	0.0	1.5	114.3167	0.0668	1.1	O K
15 Winter	7.1	0.0	7.1	114.6492	0.3992	40.9	O K
30 Winter	7.6	0.0	7.6	114.7102	0.4602	54.3	O K
60 Winter	8.0	0.0	8.0	114.7492	0.4992	63.9	O K
120 Winter	8.1	0.0	8.1	114.7602	0.5102	66.7	O K
180 Winter	8.0	0.0	8.0	114.7537	0.5037	65.0	O K
240 Winter	7.9	0.0	7.9	114.7397	0.4897	61.5	O K
360 Winter	7.6	0.0	7.6	114.7042	0.4542	52.9	O K
480 Winter	7.2	0.0	7.2	114.6687	0.4187	45.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	18
30 Summer	81.51	32
60 Summer	51.03	60
120 Summer	30.89	90
180 Summer	22.72	124
240 Summer	18.17	158
360 Summer	13.19	226
480 Summer	10.52	292
600 Summer	8.81	356
720 Summer	7.63	420
960 Summer	6.06	540
1440 Summer	4.38	780
2160 Summer	3.16	1128
2880 Summer	2.51	1472
4320 Summer	1.80	2200
5760 Summer	1.43	2936
7200 Summer	1.19	3672
8640 Summer	1.02	4360
10080 Summer	0.90	5136
15 Winter	124.07	17
30 Winter	81.51	31
60 Winter	51.03	58
120 Winter	30.89	96
180 Winter	22.72	134
240 Winter	18.17	172
360 Winter	13.19	244
480 Winter	10.52	312

Cascade Summary of Results for car park 1 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600 Winter	6.9	0.0	6.9	114.6347	0.3847	38.0	O K
720 Winter	6.6	0.0	6.6	114.6032	0.3532	32.0	O K
960 Winter	6.0	0.0	6.0	114.5482	0.2982	22.8	O K
1440 Winter	5.0	0.0	5.0	114.4662	0.2162	12.0	O K
2160 Winter	3.8	0.0	3.8	114.3938	0.1438	5.3	O K
2880 Winter	3.1	0.0	3.1	114.3573	0.1073	2.9	O K
4320 Winter	2.2	0.0	2.2	114.3347	0.0848	1.9	O K
5760 Winter	1.7	0.0	1.7	114.3228	0.0728	1.4	O K
7200 Winter	1.4	0.0	1.4	114.3148	0.0648	1.1	O K
8640 Winter	1.2	0.0	1.2	114.3092	0.0592	0.9	O K
10080 Winter	1.1	0.0	1.1	114.3037	0.0537	0.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	8.81	376
720 Winter	7.63	440
960 Winter	6.06	560
1440 Winter	4.38	794
2160 Winter	3.16	1128
2880 Winter	2.51	1468
4320 Winter	1.80	2204
5760 Winter	1.43	2896
7200 Winter	1.19	3672
8640 Winter	1.02	4376
10080 Winter	0.90	5048

Cascade Rainfall Details for car park 1 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.215

Time (mins) from:	to:	Area (ha)
0	4	0.215

Cascade Storage Controls for car park 1 30%cc.src

Porous Car Park Details

Infil Coef - Base (m/hr)	0.000000	Invert Level (m)	114.250
Membrane Percolation (mm/hr)	1000	Cover Level (m)	115.000
Safety Factor	2.0	Slope (1:x)	30.0
Porosity	0.30	Max Percolation (l/s)	601.7
Length (m)	38.0	Depression Storage (mm)	5
Width (m)	57.0	Evaporation (mm/day)	3

Orifice Outflow Control

Diameter (m)	0.075	Discharge Coefficient	0.600	Invert Level (m)	114.250

Cascade Summary of Results for car park 2 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	cellular storage 30%cc.src	cellular storage 30%cc.src

Half Drain Time : 47 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	29.3	0.0	29.3	116.2132	0.4632	88.5	O K
30 Summer	31.5	0.0	31.5	116.2752	0.5252	113.7	O K
60 Summer	32.6	0.0	32.6	116.3073	0.5572	128.1	FLOOD RISK
120 Summer	32.8	0.0	32.8	116.3117	0.5617	130.2	FLOOD RISK
180 Summer	32.2	0.0	32.2	116.2943	0.5442	122.2	O K
240 Summer	31.4	0.0	31.4	116.2707	0.5207	111.8	O K
360 Summer	29.5	0.0	29.5	116.2207	0.4707	91.5	O K
480 Summer	27.9	0.0	27.9	116.1772	0.4272	75.3	O K
600 Summer	26.3	0.0	26.3	116.1387	0.3887	62.4	O K
720 Summer	24.9	0.0	24.9	116.1057	0.3557	52.2	O K
960 Summer	22.4	0.0	22.4	116.0518	0.3017	37.6	O K
1440 Summer	18.5	0.0	18.5	115.9808	0.2307	21.9	O K
2160 Summer	14.3	0.0	14.3	115.9352	0.1852	14.2	O K
2880 Summer	11.5	0.0	11.5	115.9102	0.1603	10.6	O K
4320 Summer	8.2	0.0	8.2	115.8808	0.1308	7.0	O K
5760 Summer	6.5	0.0	6.5	115.8623	0.1123	5.2	O K
7200 Summer	5.4	0.0	5.4	115.8483	0.0983	4.0	O K
8640 Summer	4.6	0.0	4.6	115.8388	0.0888	3.2	O K
10080 Summer	4.1	0.0	4.1	115.8333	0.0833	2.8	O K
15 Winter	30.6	0.0	30.6	116.2502	0.5002	103.3	O K
30 Winter	32.9	0.0	32.9	116.3167	0.5667	132.6	FLOOD RISK
60 Winter	34.0	0.0	34.0	116.3477	0.5978	147.4	FLOOD RISK
120 Winter	33.8	0.0	33.8	116.3438	0.5938	145.4	FLOOD RISK
180 Winter	32.9	0.0	32.9	116.3148	0.5647	131.6	FLOOD RISK
240 Winter	31.7	0.0	31.7	116.2792	0.5292	115.6	O K
360 Winter	29.1	0.0	29.1	116.2087	0.4587	86.9	O K
480 Winter	26.7	0.0	26.7	116.1482	0.3982	65.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	17
30 Summer	81.51	30
60 Summer	51.03	46
120 Summer	30.89	80
180 Summer	22.72	114
240 Summer	18.17	148
360 Summer	13.19	212
480 Summer	10.52	274
600 Summer	8.81	334
720 Summer	7.63	394
960 Summer	6.06	512
1440 Summer	4.38	740
2160 Summer	3.16	1100
2880 Summer	2.51	1468
4320 Summer	1.80	2188
5760 Summer	1.43	2936
7200 Summer	1.19	3664
8640 Summer	1.02	4368
10080 Summer	0.90	5120
15 Winter	124.07	17
30 Winter	81.51	30
60 Winter	51.03	50
120 Winter	30.89	88
180 Winter	22.72	124
240 Winter	18.17	158
360 Winter	13.19	224
480 Winter	10.52	286

Cascade Summary of Results for car park 2 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
600 Winter	24.5	0.0	24.5	116.0967	0.3467	49.6	O K
720 Winter	22.5	0.0	22.5	116.0542	0.3042	38.2	O K
960 Winter	19.2	0.0	19.2	115.9918	0.2417	24.1	O K
1440 Winter	14.4	0.0	14.4	115.9368	0.1868	14.4	O K
2160 Winter	10.5	0.0	10.5	115.9013	0.1513	9.4	O K
2880 Winter	8.2	0.0	8.2	115.8808	0.1308	7.1	O K
4320 Winter	5.9	0.0	5.9	115.8553	0.1053	4.5	O K
5760 Winter	4.6	0.0	4.6	115.8388	0.0888	3.2	O K
7200 Winter	3.9	0.0	3.9	115.8313	0.0813	2.7	O K
8640 Winter	3.3	0.0	3.3	115.8258	0.0758	2.4	O K
10080 Winter	2.9	0.0	2.9	115.8217	0.0718	2.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	8.81	344
720 Winter	7.63	404
960 Winter	6.06	512
1440 Winter	4.38	738
2160 Winter	3.16	1100
2880 Winter	2.51	1468
4320 Winter	1.80	2196
5760 Winter	1.43	2848
7200 Winter	1.19	3664
8640 Winter	1.02	4392
10080 Winter	0.90	5136

Cascade Rainfall Details for car park 2 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.572

Time (mins) from:	to:	Area (ha)
0	4	0.572

Cascade Storage Controls for car park 2 30%cc.src

Porous Car Park Details

Infil Coef - Base (m/hr)	0.000000	Invert Level (m)	115.750
Membrane Percolation (mm/hr)	1000	Cover Level (m)	116.500
Safety Factor	2.0	Slope (1:x)	50.0
Porosity	0.30	Max Percolation (l/s)	1588.9
Length (m)	104.0	Depression Storage (mm)	5
Width (m)	55.0	Evaporation (mm/day)	3

Orifice Outflow Control

Diameter (m)	0.150	Discharge Coefficient	0.600	Invert Level (m)	115.750

Cascade Summary of Results for cellular storage 30%cc.src

Upstream Structures	Outflow To	Overflow To
car park 1 30%cc.src car park 2 30%cc.src storage swale 2 30%cc.src storage swale 7 30%cc.src	storage swale 3 30%.src	(None)

Half Drain Time : 13 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	437.3	0.0	437.3	110.9523	0.9523	452.4	O K
30 Summer	488.9	0.0	488.9	111.1278	1.1278	535.7	O K
60 Summer	494.7	0.0	494.7	111.1488	1.1488	545.7	O K
120 Summer	460.4	0.0	460.4	111.0283	1.0283	488.5	O K
180 Summer	419.2	0.0	419.2	110.8953	0.8953	425.1	O K
240 Summer	383.2	0.0	383.2	110.7893	0.7893	375.0	O K
360 Summer	322.4	0.0	322.4	110.6658	0.6658	316.3	O K
480 Summer	274.4	0.0	274.4	110.5957	0.5957	282.9	O K
600 Summer	240.4	0.0	240.4	110.5457	0.5457	259.1	O K
720 Summer	214.6	0.0	214.6	110.5077	0.5077	241.1	O K
960 Summer	178.3	0.0	178.3	110.4527	0.4527	215.1	O K
1440 Summer	134.7	0.0	134.7	110.3817	0.3817	181.4	O K
2160 Summer	101.3	0.0	101.3	110.3117	0.3117	148.0	O K
2880 Summer	81.7	0.0	81.7	110.2763	0.2762	131.2	O K
4320 Summer	59.3	0.0	59.3	110.2408	0.2408	114.3	O K
5760 Summer	46.8	0.0	46.8	110.2138	0.2138	101.4	O K
7200 Summer	39.0	0.0	39.0	110.1927	0.1928	91.5	O K
8640 Summer	33.5	0.0	33.5	110.1777	0.1778	84.4	O K
10080 Summer	29.6	0.0	29.6	110.1673	0.1673	79.3	O K
15 Winter	469.4	0.0	469.4	111.0593	1.0593	503.3	O K
30 Winter	523.2	0.0	523.2	111.2552	1.2553	592.7	O K
60 Winter	515.9	0.0	515.9	111.2272	1.2273	582.0	O K
120 Winter	452.5	0.0	452.5	111.0018	1.0018	475.9	O K
180 Winter	393.0	0.0	393.0	110.8173	0.8173	388.3	O K
240 Winter	347.5	0.0	347.5	110.7023	0.7023	333.6	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	27
30 Summer	81.51	35
60 Summer	51.03	50
120 Summer	30.89	82
180 Summer	22.72	112
240 Summer	18.17	142
360 Summer	13.19	202
480 Summer	10.52	262
600 Summer	8.81	322
720 Summer	7.63	382
960 Summer	6.06	504
1440 Summer	4.38	746
2160 Summer	3.16	1108
2880 Summer	2.51	1472
4320 Summer	1.80	2204
5760 Summer	1.43	2936
7200 Summer	1.19	3664
8640 Summer	1.02	4400
10080 Summer	0.90	5128
15 Winter	124.07	27
30 Winter	81.51	36
60 Winter	51.03	52
120 Winter	30.89	84
180 Winter	22.72	114
240 Winter	18.17	142

Cascade Summary of Results for cellular storage 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
360 Winter	269.9	0.0	269.9	110.5892	0.5892	279.9	O K
480 Winter	223.8	0.0	223.8	110.5212	0.5212	247.6	O K
600 Winter	192.6	0.0	192.6	110.4747	0.4747	225.5	O K
720 Winter	170.1	0.0	170.1	110.4402	0.4402	209.1	O K
960 Winter	138.3	0.0	138.3	110.3892	0.3892	184.9	O K
1440 Winter	102.5	0.0	102.5	110.3142	0.3142	149.4	O K
2160 Winter	74.8	0.0	74.8	110.2653	0.2652	126.1	O K
2880 Winter	59.6	0.0	59.6	110.2412	0.2412	114.5	O K
4320 Winter	42.7	0.0	42.7	110.2028	0.2028	96.2	O K
5760 Winter	33.8	0.0	33.8	110.1787	0.1788	84.8	O K
7200 Winter	28.1	0.0	28.1	110.1633	0.1633	77.5	O K
8640 Winter	24.1	0.0	24.1	110.1523	0.1523	72.4	O K
10080 Winter	21.2	0.0	21.2	110.1413	0.1413	67.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	13.19	204
480 Winter	10.52	264
600 Winter	8.81	324
720 Winter	7.63	386
960 Winter	6.06	510
1440 Winter	4.38	750
2160 Winter	3.16	1108
2880 Winter	2.51	1468
4320 Winter	1.80	2204
5760 Winter	1.43	2920
7200 Winter	1.19	3600
8640 Winter	1.02	4408
10080 Winter	0.90	5144

Cascade Rainfall Details for cellular storage 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 3.082

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.000	8	12	0.771	16	20	0.770
4	8	0.771	12	16	0.770			

Cascade Storage Controls for cellular storage 30%cc.src

Cellular Storage Details

Infil Coef - Base (m/hr)	0.000000	Porosity	0.95
Infil Coef - Sides (m/hr)	0.000000	Invert Level (m)	110.000
Safety Factor	2.0	Ground Level (m)	112.000

Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)
0.00	500.0	500.0	1.40	0.0	616.3	2.80	0.0	616.3	4.20	0.0	616.3
0.20	500.0	517.9	1.60	0.0	616.3	3.00	0.0	616.3	4.40	0.0	616.3
0.40	500.0	535.8	1.80	0.0	616.3	3.20	0.0	616.3	4.60	0.0	616.3
0.60	500.0	553.7	2.00	0.0	616.3	3.40	0.0	616.3	4.80	0.0	616.3
0.80	500.0	571.6	2.20	0.0	616.3	3.60	0.0	616.3	5.00	0.0	616.3
1.00	500.0	589.4	2.40	0.0	616.3	3.80	0.0	616.3			
1.20	500.0	607.3	2.60	0.0	616.3	4.00	0.0	616.3			

Orifice Outflow Control

Diameter (m) 0.500 Discharge Coefficient 0.600 Invert Level (m) 110.000

Cascade Summary of Results for car park 3 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	storage swale 3 30%.src	(None)

Half Drain Time : 119 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	14.2	0.0	14.2	113.6277	0.3777	132.8	O K
30 Summer	17.1	0.0	17.1	113.7007	0.4507	170.8	O K
60 Summer	19.2	0.0	19.2	113.7607	0.5107	202.0	O K
120 Summer	20.2	0.0	20.2	113.7937	0.5437	219.3	O K
180 Summer	20.5	0.0	20.5	113.8032	0.5532	224.2	FLOOD RISK
240 Summer	20.5	0.0	20.5	113.8032	0.5532	224.2	FLOOD RISK
360 Summer	20.1	0.0	20.1	113.7912	0.5412	218.0	O K
480 Summer	19.6	0.0	19.6	113.7747	0.5247	209.5	O K
600 Summer	19.1	0.0	19.1	113.7567	0.5067	200.1	O K
720 Summer	18.5	0.0	18.5	113.7387	0.4887	190.7	O K
960 Summer	17.3	0.0	17.3	113.7057	0.4557	173.4	O K
1440 Summer	15.3	0.0	15.3	113.6537	0.4037	146.3	O K
2160 Summer	13.1	0.0	13.1	113.6037	0.3537	120.2	O K
2880 Summer	11.4	0.0	11.4	113.5762	0.3262	105.9	O K
4320 Summer	8.6	0.0	8.6	113.5457	0.2957	90.0	O K
5760 Summer	7.0	0.0	7.0	113.5277	0.2777	80.6	O K
7200 Summer	5.9	0.0	5.9	113.5153	0.2652	74.1	O K
8640 Summer	5.2	0.0	5.2	113.5062	0.2562	69.2	O K
10080 Summer	4.5	0.0	4.5	113.4977	0.2477	64.9	O K
15 Winter	15.6	0.0	15.6	113.6602	0.4102	149.8	O K
30 Winter	18.6	0.0	18.6	113.7432	0.4932	192.9	O K
60 Winter	20.8	0.0	20.8	113.8118	0.5617	228.7	FLOOD RISK
120 Winter	21.8	0.0	21.8	113.8463	0.5963	246.7	FLOOD RISK
180 Winter	21.9	0.0	21.9	113.8518	0.6018	249.5	FLOOD RISK
240 Winter	21.7	0.0	21.7	113.8447	0.5948	246.1	FLOOD RISK
360 Winter	21.0	0.0	21.0	113.8193	0.5692	232.6	FLOOD RISK
480 Winter	20.1	0.0	20.1	113.7902	0.5402	217.6	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	24
30 Summer	81.51	37
60 Summer	51.03	64
120 Summer	30.89	100
180 Summer	22.72	132
240 Summer	18.17	166
360 Summer	13.19	234
480 Summer	10.52	300
600 Summer	8.81	366
720 Summer	7.63	430
960 Summer	6.06	556
1440 Summer	4.38	800
2160 Summer	3.16	1152
2880 Summer	2.51	1504
4320 Summer	1.80	2244
5760 Summer	1.43	2944
7200 Summer	1.19	3680
8640 Summer	1.02	4416
10080 Summer	0.90	5144
15 Winter	124.07	24
30 Winter	81.51	37
60 Winter	51.03	64
120 Winter	30.89	104
180 Winter	22.72	142
240 Winter	18.17	178
360 Winter	13.19	252
480 Winter	10.52	322

Cascade Summary of Results for car park 3 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
600 Winter	19.2	0.0	19.2	113.7622	0.5122	202.8	O K
720 Winter	18.4	0.0	18.4	113.7357	0.4857	189.0	O K
960 Winter	16.7	0.0	16.7	113.6897	0.4397	165.1	O K
1440 Winter	14.1	0.0	14.1	113.6247	0.3747	131.1	O K
2160 Winter	11.3	0.0	11.3	113.5747	0.3247	105.2	O K
2880 Winter	9.1	0.0	9.1	113.5512	0.3012	92.8	O K
4320 Winter	6.7	0.0	6.7	113.5237	0.2737	78.5	O K
5760 Winter	5.3	0.0	5.3	113.5082	0.2582	70.3	O K
7200 Winter	4.4	0.0	4.4	113.4958	0.2457	63.7	O K
8640 Winter	3.8	0.0	3.8	113.4863	0.2362	58.9	O K
10080 Winter	3.4	0.0	3.4	113.4792	0.2292	55.5	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	8.81	390
720 Winter	7.63	456
960 Winter	6.06	582
1440 Winter	4.38	824
2160 Winter	3.16	1168
2880 Winter	2.51	1532
4320 Winter	1.80	2252
5760 Winter	1.43	2992
7200 Winter	1.19	3688
8640 Winter	1.02	4416
10080 Winter	0.90	5144

Cascade Rainfall Details for car park 3 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.647

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.176	4	8	0.235	8	12	0.236

Cascade Storage Controls for car park 3 30%cc.src

Porous Car Park Details

Infil Coef - Base (m/hr)	0.000000	Invert Level (m)	113.250
Membrane Percolation (mm/hr)	1000	Cover Level (m)	114.000
Safety Factor	2.0	Slope (1:x)	150.0
Porosity	0.30	Max Percolation (l/s)	483.1
Length (m)	37.0	Depression Storage (mm)	5
Width (m)	47.0	Evaporation (mm/day)	3

Orifice Outflow Control

Diameter (m)	0.130	Discharge Coefficient	0.600	Invert Level (m)	113.400

Cascade Summary of Results for storage swale 7 30%cc.src

Upstream Structures	Outflow To	Overflow To
(None)	storage swale 2 30%cc.src	(None)

Half Drain Time : 13 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	12.6	0.0	12.6	117.7107	0.3107	13.3	O K
30 Summer	12.7	0.0	12.7	117.7178	0.3177	14.0	O K
60 Summer	12.6	0.0	12.6	117.7032	0.3032	12.5	O K
120 Summer	12.4	0.0	12.4	117.6537	0.2537	8.1	O K
180 Summer	12.1	0.0	12.1	117.5963	0.1962	4.4	O K
240 Summer	11.7	0.0	11.7	117.5363	0.1363	1.9	O K
360 Summer	10.9	0.0	10.9	117.4000	0.0000	0.0	O K
480 Summer	8.7	0.0	8.7	117.4000	0.0000	0.0	O K
600 Summer	7.3	0.0	7.3	117.4000	0.0000	0.0	O K
720 Summer	6.3	0.0	6.3	117.4000	0.0000	0.0	O K
960 Summer	5.0	0.0	5.0	117.4000	0.0000	0.0	O K
1440 Summer	3.6	0.0	3.6	117.4000	0.0000	0.0	O K
2160 Summer	2.6	0.0	2.6	117.4000	0.0000	0.0	O K
2880 Summer	2.1	0.0	2.1	117.4000	0.0000	0.0	O K
4320 Summer	1.5	0.0	1.5	117.4000	0.0000	0.0	O K
5760 Summer	1.2	0.0	1.2	117.4000	0.0000	0.0	O K
7200 Summer	1.0	0.0	1.0	117.4000	0.0000	0.0	O K
8640 Summer	0.8	0.0	0.8	117.4000	0.0000	0.0	O K
10080 Summer	0.7	0.0	0.7	117.4000	0.0000	0.0	O K
15 Winter	12.8	0.0	12.8	117.7332	0.3332	15.7	O K
30 Winter	12.8	0.0	12.8	117.7383	0.3382	16.3	O K
60 Winter	12.7	0.0	12.7	117.7132	0.3132	13.5	O K
120 Winter	12.3	0.0	12.3	117.6338	0.2337	6.6	O K
180 Winter	11.7	0.0	11.7	117.5318	0.1318	1.8	O K
240 Winter	10.8	0.0	10.8	117.4000	0.0000	0.0	O K
360 Winter	7.9	0.0	7.9	117.4000	0.0000	0.0	O K
480 Winter	6.3	0.0	6.3	117.4000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	14
30 Summer	81.51	23
60 Summer	51.03	40
120 Summer	30.89	72
180 Summer	22.72	102
240 Summer	18.17	130
360 Summer	13.19	0
480 Summer	10.52	0
600 Summer	8.81	0
720 Summer	7.63	0
960 Summer	6.06	0
1440 Summer	4.38	0
2160 Summer	3.16	0
2880 Summer	2.51	0
4320 Summer	1.80	0
5760 Summer	1.43	0
7200 Summer	1.19	0
8640 Summer	1.02	0
10080 Summer	0.90	0
15 Winter	124.07	15
30 Winter	81.51	25
60 Winter	51.03	44
120 Winter	30.89	76
180 Winter	22.72	104
240 Winter	18.17	0
360 Winter	13.19	0
480 Winter	10.52	0

Cascade Summary of Results for storage swale 7 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600 Winter	5.3	0.0	5.3	117.4000	0.0000	0.0	O K
720 Winter	4.5	0.0	4.5	117.4000	0.0000	0.0	O K
960 Winter	3.6	0.0	3.6	117.4000	0.0000	0.0	O K
1440 Winter	2.6	0.0	2.6	117.4000	0.0000	0.0	O K
2160 Winter	1.9	0.0	1.9	117.4000	0.0000	0.0	O K
2880 Winter	1.5	0.0	1.5	117.4000	0.0000	0.0	O K
4320 Winter	1.1	0.0	1.1	117.4000	0.0000	0.0	O K
5760 Winter	0.9	0.0	0.9	117.4000	0.0000	0.0	O K
7200 Winter	0.7	0.0	0.7	117.4000	0.0000	0.0	O K
8640 Winter	0.6	0.0	0.6	117.4000	0.0000	0.0	O K
10080 Winter	0.5	0.0	0.5	117.4000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	8.81	0
720 Winter	7.63	0
960 Winter	6.06	0
1440 Winter	4.38	0
2160 Winter	3.16	0
2880 Winter	2.51	0
4320 Winter	1.80	0
5760 Winter	1.43	0
7200 Winter	1.19	0
8640 Winter	1.02	0
10080 Winter	0.90	0

Cascade Rainfall Details for storage swale 7 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.101

Time (mins) from:	to:	Area (ha)
0	4	0.101

Cascade Storage Controls for storage swale 7 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	140.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	117.400
Porosity	1.00	Cover Level (m)	118.000
Base Width (m)	1.0	Slope (1:x)	150.0

Pipe Outflow Control

Pipe Diameter (m)	0.100	Roughness (mm)	0.600	Invert Level (m)	116.500
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	25.000	Coef of Contraction	0.600		

Cascade Summary of Results for storage swale 3 30%.src

Upstream Structures	Outflow To	Overflow To
car park 3 30%cc.src storage swale 1 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 2 30%cc.src storage swale 7 30%cc.src	storage swale 4 30%cc.src	storage swale 4 30%cc.src

Half Drain Time : 122 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
15 Summer	65.6	0.0	180.3	245.9	111.2178	0.7178	290.5	723.5	FLOOD RISK
30 Summer	67.6	0.0	349.1	416.7	111.2553	0.7553	637.5	794.4	FLOOD RISK
60 Summer	68.7	0.0	458.6	527.3	111.2763	0.7763	996.3	836.1	FLOOD RISK
120 Summer	68.9	0.0	488.9	557.9	111.2818	0.7818	1344.0	848.2	FLOOD RISK
180 Summer	68.9	0.0	480.6	549.5	111.2803	0.7803	1520.6	844.0	FLOOD RISK
240 Summer	68.6	0.0	447.8	516.3	111.2743	0.7743	1615.8	832.9	FLOOD RISK
360 Summer	67.9	0.0	376.8	444.7	111.2608	0.7608	1671.5	806.1	FLOOD RISK
480 Summer	67.3	0.0	319.7	387.0	111.2493	0.7493	1645.0	782.7	FLOOD RISK
600 Summer	66.8	0.0	274.9	341.7	111.2398	0.7398	1590.4	764.8	FLOOD RISK
720 Summer	66.4	0.0	241.2	307.6	111.2323	0.7323	1533.5	750.3	FLOOD RISK
960 Summer	65.8	0.0	192.4	258.2	111.2208	0.7208	1417.0	728.6	FLOOD RISK
1440 Summer	65.0	0.0	132.8	197.7	111.2053	0.7053	1179.8	699.5	FLOOD RISK
2160 Summer	64.2	0.0	85.7	149.9	111.1913	0.6913	839.2	674.1	FLOOD RISK
2880 Summer	63.7	0.0	56.5	120.1	111.1813	0.6813	539.3	657.0	FLOOD RISK
4320 Summer	62.7	0.0	15.6	78.3	111.1633	0.6633	100.4	624.5	FLOOD RISK
5760 Summer	57.6	0.0	0.0	57.6	111.0758	0.5757	0.0	482.0	O K
7200 Summer	51.6	0.0	0.0	51.6	110.9817	0.4817	0.0	348.5	O K
8640 Summer	46.5	0.0	0.0	46.5	110.9102	0.4102	0.0	261.9	O K
10080 Summer	42.3	0.0	0.0	42.3	110.8568	0.3567	0.0	205.0	O K
15 Winter	66.6	0.0	256.7	323.3	111.2358	0.7358	424.7	757.3	FLOOD RISK
30 Winter	68.2	0.0	413.1	481.3	111.2678	0.7678	815.1	819.7	FLOOD RISK
60 Winter	69.3	0.0	528.4	597.7	111.2888	0.7888	1220.4	861.7	FLOOD RISK
120 Winter	69.4	0.0	539.9	609.3	111.2908	0.7908	1618.1	865.9	FLOOD RISK
180 Winter	68.9	0.0	483.4	552.3	111.2808	0.7808	1825.9	845.6	FLOOD RISK

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	41
30 Summer	81.51	46
60 Summer	51.03	60
120 Summer	30.89	86
180 Summer	22.72	116
240 Summer	18.17	146
360 Summer	13.19	204
480 Summer	10.52	264
600 Summer	8.81	326
720 Summer	7.63	386
960 Summer	6.06	506
1440 Summer	4.38	750
2160 Summer	3.16	1108
2880 Summer	2.51	1480
4320 Summer	1.80	2276
5760 Summer	1.43	3080
7200 Summer	1.19	3776
8640 Summer	1.02	4496
10080 Summer	0.90	5176
15 Winter	124.07	39
30 Winter	81.51	44
60 Winter	51.03	58
120 Winter	30.89	86
180 Winter	22.72	116

Cascade Summary of Results for storage swale 3 30%.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
240 Winter	68.3	0.0	423.7	492.0	111.2698	0.7698	1945.3	823.3	FLOOD RISK
360 Winter	67.3	0.0	322.1	389.4	111.2498	0.7498	2039.5	784.4	FLOOD RISK
480 Winter	66.6	0.0	259.0	325.6	111.2363	0.7363	2033.1	758.2	FLOOD RISK
600 Winter	66.1	0.0	215.3	281.4	111.2263	0.7263	1970.1	739.4	FLOOD RISK
720 Winter	65.7	0.0	184.3	250.0	111.2188	0.7188	1885.7	724.5	FLOOD RISK
960 Winter	65.1	0.0	140.1	205.1	111.2073	0.7073	1719.3	703.2	FLOOD RISK
1440 Winter	64.3	0.0	88.8	153.1	111.1923	0.6923	1354.6	676.0	FLOOD RISK
2160 Winter	63.5	0.0	49.8	113.4	111.1788	0.6788	822.8	651.6	FLOOD RISK
2880 Winter	63.0	0.0	26.3	89.2	111.1688	0.6688	380.9	634.7	FLOOD RISK
4320 Winter	58.1	0.0	0.0	58.1	111.0837	0.5838	0.0	494.3	O K
5760 Winter	48.8	0.0	0.0	48.8	110.9412	0.4412	0.0	297.9	O K
7200 Winter	41.7	0.0	0.0	41.7	110.8497	0.3497	0.0	197.5	O K
8640 Winter	36.5	0.0	0.0	36.5	110.7907	0.2907	0.0	143.6	O K
10080 Winter	32.3	0.0	0.0	32.3	110.7643	0.2642	0.0	122.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
240 Winter	18.17	146
360 Winter	13.19	206
480 Winter	10.52	268
600 Winter	8.81	330
720 Winter	7.63	394
960 Winter	6.06	510
1440 Winter	4.38	756
2160 Winter	3.16	1120
2880 Winter	2.51	1500
4320 Winter	1.80	2424
5760 Winter	1.43	3112
7200 Winter	1.19	3768
8640 Winter	1.02	4456
10080 Winter	0.90	5152

Cascade Rainfall Details for storage swale 3 30%.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 1.352

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.000	4	8	0.676	8	12	0.676

Cascade Storage Controls for storage swale 3 30%.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	300.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	110.500
Porosity	1.00	Cover Level (m)	111.300
Base Width (m)	0.5	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m)	0.200	Discharge Coefficient	0.600	Invert Level (m)	110.500

Weir / Flume Overflow Control

Discharge Coef	0.544	Width (m)	6.000	Crest Level (m)	111.150

Cascade Summary of Results for storage swale 4 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 3 30%.src car park 3 30%cc.src storage swale 1 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 2 30%cc.src storage swale 7 30%cc.src	storage swale 5 30%cc.src	storage swale 5 30%cc.src

Half Drain Time : 279 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	34.2	0.0	0.0	34.2	109.6053	0.6053	0.0	702.9	FLOOD RISK
30 Summer	36.3	0.0	21.8	58.2	109.6738	0.6738	216.7	856.1	FLOOD RISK
60 Summer	37.8	0.0	118.2	156.1	109.7233	0.7233	614.9	977.0	FLOOD RISK
120 Summer	38.9	0.0	219.8	258.7	109.7608	0.7608	1030.6	1072.2	FLOOD RISK
180 Summer	39.1	0.0	241.0	280.1	109.7678	0.7678	1265.2	1090.8	FLOOD RISK
240 Summer	39.2	0.0	248.7	287.9	109.7703	0.7703	1415.6	1098.4	FLOOD RISK
360 Summer	39.1	0.0	247.1	286.3	109.7698	0.7698	1584.7	1097.2	FLOOD RISK
480 Summer	39.0	0.0	236.4	275.4	109.7663	0.7663	1669.8	1086.7	FLOOD RISK
600 Summer	38.9	0.0	219.8	258.7	109.7608	0.7608	1711.4	1072.9	FLOOD RISK
720 Summer	38.7	0.0	203.6	242.4	109.7553	0.7553	1730.6	1058.1	FLOOD RISK
960 Summer	38.4	0.0	175.3	213.8	109.7453	0.7453	1723.2	1032.2	FLOOD RISK
1440 Summer	38.0	0.0	134.3	172.3	109.7298	0.7298	1594.7	993.1	FLOOD RISK
2160 Summer	37.5	0.0	93.7	131.3	109.7128	0.7128	1361.0	950.0	FLOOD RISK
2880 Summer	37.1	0.0	66.2	103.3	109.6998	0.6998	1142.4	919.0	FLOOD RISK
4320 Summer	36.6	0.0	33.7	70.3	109.6818	0.6818	759.2	875.4	FLOOD RISK
5760 Summer	36.3	0.0	20.5	56.8	109.6728	0.6728	456.9	853.4	FLOOD RISK
7200 Summer	36.1	0.0	12.4	48.5	109.6663	0.6663	206.8	839.0	FLOOD RISK
8640 Summer	35.8	0.0	2.0	37.7	109.6548	0.6548	13.6	812.6	FLOOD RISK
10080 Summer	33.9	0.0	0.0	33.9	109.5963	0.5963	0.0	684.3	O K
15 Winter	35.8	0.0	3.0	38.8	109.6563	0.6563	9.7	816.1	FLOOD RISK
30 Winter	37.0	0.0	58.4	95.4	109.6958	0.6958	404.9	908.8	FLOOD RISK
60 Winter	38.7	0.0	195.0	233.7	109.7523	0.7523	858.5	1051.1	FLOOD RISK
120 Winter	39.7	0.0	304.9	344.6	109.7878	0.7878	1329.6	1144.3	FLOOD RISK

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	289
30 Summer	81.51	170
60 Summer	51.03	98
120 Summer	30.89	122
180 Summer	22.72	150
240 Summer	18.17	178
360 Summer	13.19	240
480 Summer	10.52	302
600 Summer	8.81	362
720 Summer	7.63	424
960 Summer	6.06	546
1440 Summer	4.38	794
2160 Summer	3.16	1168
2880 Summer	2.51	1552
4320 Summer	1.80	2356
5760 Summer	1.43	3176
7200 Summer	1.19	3976
8640 Summer	1.02	4864
10080 Summer	0.90	5576
15 Winter	124.07	281
30 Winter	81.51	94
60 Winter	51.03	90
120 Winter	30.89	118

Cascade Summary of Results for storage swale 4 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
180 Winter	39.8	0.0	320.0	359.8	109.7923	0.7923	1598.6	1156.9	FLOOD RISK
240 Winter	39.7	0.0	313.3	353.0	109.7903	0.7903	1774.2	1151.4	FLOOD RISK
360 Winter	39.4	0.0	280.4	319.8	109.7803	0.7803	1982.9	1125.5	FLOOD RISK
480 Winter	39.2	0.0	248.7	287.9	109.7703	0.7703	2095.4	1097.5	FLOOD RISK
600 Winter	38.9	0.0	219.8	258.7	109.7608	0.7608	2148.5	1072.8	FLOOD RISK
720 Winter	38.7	0.0	196.4	235.1	109.7528	0.7528	2168.4	1051.4	FLOOD RISK
960 Winter	38.3	0.0	159.0	197.3	109.7393	0.7393	2162.5	1017.0	FLOOD RISK
1440 Winter	37.7	0.0	112.2	150.0	109.7208	0.7208	2017.3	969.9	FLOOD RISK
2160 Winter	37.2	0.0	73.3	110.5	109.7033	0.7033	1679.4	926.8	FLOOD RISK
2880 Winter	36.9	0.0	50.0	86.8	109.6913	0.6913	1357.0	898.3	FLOOD RISK
4320 Winter	36.3	0.0	21.8	58.2	109.6738	0.6738	788.0	855.9	FLOOD RISK
5760 Winter	36.1	0.0	12.4	48.5	109.6663	0.6663	321.0	838.3	FLOOD RISK
7200 Winter	35.5	0.0	0.0	35.5	109.6473	0.6473	0.0	795.7	FLOOD RISK
8640 Winter	32.4	0.0	0.0	32.4	109.5522	0.5522	0.0	594.7	O K
10080 Winter	29.7	0.0	0.0	29.7	109.4757	0.4757	0.0	453.9	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
180 Winter	22.72	146
240 Winter	18.17	178
360 Winter	13.19	240
480 Winter	10.52	302
600 Winter	8.81	362
720 Winter	7.63	422
960 Winter	6.06	546
1440 Winter	4.38	786
2160 Winter	3.16	1164
2880 Winter	2.51	1560
4320 Winter	1.80	2428
5760 Winter	1.43	3208
7200 Winter	1.19	4288
8640 Winter	1.02	4920
10080 Winter	0.90	5592

Cascade Rainfall Details for storage swale 4 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.000

Time (mins) from:	to:	Area (ha)
0	4	0.000

Cascade Storage Controls for storage swale 4 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	400.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	109.000
Porosity	1.00	Cover Level (m)	109.800
Base Width (m)	0.5	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m)	0.150	Discharge Coefficient	0.600	Invert Level (m)	109.000

Weir / Flume Overflow Control

Discharge Coef	0.544	Width (m)	3.500	Crest Level (m)	109.650

Cascade Summary of Results for storage swale 5 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 4 30%cc.src storage swale 3 30%.src car park 3 30%cc.src storage swale 1 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 2 30%cc.src storage swale 7 30%cc.src	storage swale 6 30%cc.src	storage swale 6 30%cc.src

Half Drain Time : 579 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	15.7	0.0	0.0	15.7	108.1178	0.6178	0.0	697.6	FLOOD RISK
30 Summer	16.5	0.0	13.3	29.8	108.1748	0.6748	225.1	820.3	FLOOD RISK
60 Summer	16.7	0.0	30.1	46.9	108.1928	0.6928	618.7	860.9	FLOOD RISK
120 Summer	17.0	0.0	52.3	69.3	108.2118	0.7118	1063.0	905.9	FLOOD RISK
180 Summer	17.3	0.0	93.2	110.5	108.2408	0.7408	1329.3	974.6	FLOOD RISK
240 Summer	17.5	0.0	113.1	130.6	108.2533	0.7533	1512.0	1005.9	FLOOD RISK
360 Summer	17.6	0.0	122.2	139.8	108.2588	0.7588	1752.9	1019.9	FLOOD RISK
480 Summer	17.6	0.0	129.9	147.5	108.2633	0.7633	1917.1	1031.3	FLOOD RISK
600 Summer	17.7	0.0	134.2	151.9	108.2658	0.7658	2035.6	1037.6	FLOOD RISK
720 Summer	17.7	0.0	136.0	153.6	108.2668	0.7668	2126.5	1039.6	FLOOD RISK
960 Summer	17.6	0.0	131.6	149.2	108.2643	0.7643	2251.9	1033.9	FLOOD RISK
1440 Summer	17.5	0.0	113.9	131.4	108.2538	0.7538	2362.2	1007.7	FLOOD RISK
2160 Summer	17.3	0.0	89.3	106.7	108.2383	0.7383	2377.2	969.4	FLOOD RISK
2880 Summer	17.2	0.0	71.8	88.9	108.2263	0.7263	2300.7	939.6	FLOOD RISK
4320 Summer	16.9	0.0	48.5	65.5	108.2088	0.7088	2041.4	898.3	FLOOD RISK
5760 Summer	16.8	0.0	39.0	55.8	108.2008	0.7008	1808.3	879.7	FLOOD RISK
7200 Summer	16.7	0.0	31.2	47.9	108.1938	0.6938	1596.0	863.1	FLOOD RISK
8640 Summer	16.6	0.0	20.7	37.3	108.1833	0.6833	1399.2	839.7	FLOOD RISK
10080 Summer	16.6	0.0	17.5	34.1	108.1798	0.6798	1231.9	831.0	FLOOD RISK
15 Winter	16.3	0.0	2.8	19.1	108.1588	0.6588	17.7	784.5	FLOOD RISK
30 Winter	16.6	0.0	17.9	34.5	108.1803	0.6803	407.3	832.2	FLOOD RISK
60 Winter	16.9	0.0	40.1	57.0	108.2018	0.7018	870.2	882.0	FLOOD RISK
120 Winter	17.4	0.0	97.8	115.2	108.2438	0.7438	1379.3	982.9	FLOOD RISK

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	743
30 Summer	81.51	571
60 Summer	51.03	326
120 Summer	30.89	218
180 Summer	22.72	222
240 Summer	18.17	256
360 Summer	13.19	310
480 Summer	10.52	368
600 Summer	8.81	428
720 Summer	7.63	490
960 Summer	6.06	614
1440 Summer	4.38	864
2160 Summer	3.16	1244
2880 Summer	2.51	1628
4320 Summer	1.80	2416
5760 Summer	1.43	3240
7200 Summer	1.19	4016
8640 Summer	1.02	4904
10080 Summer	0.90	5680
15 Winter	124.07	765
30 Winter	81.51	429
60 Winter	51.03	256
120 Winter	30.89	178

Cascade Summary of Results for storage swale 5 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m^3)	Maximum Volume (m^3)	Status
180 Winter	17.8	0.0	149.3	167.0	108.2743	0.7743	1682.9	1058.6	FLOOD RISK
240 Winter	17.9	0.0	164.8	182.7	108.2828	0.7828	1891.9	1080.8	FLOOD RISK
360 Winter	18.0	0.0	178.0	196.0	108.2898	0.7898	2172.4	1099.3	FLOOD RISK
480 Winter	18.0	0.0	180.9	198.9	108.2913	0.7913	2365.7	1103.0	FLOOD RISK
600 Winter	17.9	0.0	176.1	194.1	108.2888	0.7888	2503.3	1096.7	FLOOD RISK
720 Winter	17.9	0.0	168.6	186.5	108.2848	0.7848	2606.5	1086.1	FLOOD RISK
960 Winter	17.8	0.0	150.2	167.9	108.2748	0.7748	2753.1	1060.7	FLOOD RISK
1440 Winter	17.5	0.0	118.0	135.6	108.2563	0.7563	2891.4	1014.1	FLOOD RISK
2160 Winter	17.3	0.0	86.3	103.6	108.2363	0.7363	2909.8	964.8	FLOOD RISK
2880 Winter	17.1	0.0	66.9	84.0	108.2228	0.7228	2835.0	931.1	FLOOD RISK
4320 Winter	16.9	0.0	41.3	58.2	108.2028	0.7028	2520.1	883.9	FLOOD RISK
5760 Winter	16.7	0.0	31.2	47.9	108.1938	0.6938	2185.4	863.1	FLOOD RISK
7200 Winter	16.6	0.0	18.8	35.4	108.1813	0.6813	1875.5	835.4	FLOOD RISK
8640 Winter	16.5	0.0	16.2	32.7	108.1783	0.6783	1595.1	827.6	FLOOD RISK
10080 Winter	16.5	0.0	13.3	29.8	108.1748	0.6748	1313.0	819.8	FLOOD RISK

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
180 Winter	22.72	204
240 Winter	18.17	238
360 Winter	13.19	296
480 Winter	10.52	360
600 Winter	8.81	424
720 Winter	7.63	488
960 Winter	6.06	612
1440 Winter	4.38	862
2160 Winter	3.16	1240
2880 Winter	2.51	1620
4320 Winter	1.80	2460
5760 Winter	1.43	3248
7200 Winter	1.19	4384
8640 Winter	1.02	5040
10080 Winter	0.90	5624

Cascade Rainfall Details for storage swale 5 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.000

Time from:	(mins) to:	Area (ha)
0	4	0.000

Cascade Storage Controls for storage swale 5 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	382.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	107.500
Porosity	1.00	Cover Level (m)	108.300
Base Width (m)	0.5	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 107.500

Weir / Flume Overflow Control

Discharge Coef 0.544 Width (m) 2.000 Crest Level (m) 108.150

Cascade Summary of Results for storage swale 6 30%cc.src

Upstream Structures	Outflow To	Overflow To
storage swale 5 30%cc.src storage swale 4 30%cc.src storage swale 3 30%.src car park 3 30%cc.src storage swale 1 30%cc.src cellular storage 30%cc.src car park 1 30%cc.src car park 2 30%cc.src storage swale 2 30%cc.src storage swale 7 30%cc.src	(None)	(None)

Half Drain Time : 80 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
15 Summer	15.7	0.0	15.7	106.1497	0.1498	56.7	O K
30 Summer	28.6	0.0	28.6	106.2213	0.2212	99.3	O K
60 Summer	41.5	0.0	41.5	106.2813	0.2812	142.3	O K
120 Summer	56.3	0.0	56.3	106.3632	0.3632	212.6	O K
180 Summer	66.0	0.0	66.0	106.4552	0.4552	307.0	O K
240 Summer	72.8	0.0	72.8	106.5287	0.5287	393.9	O K
360 Summer	78.4	0.0	78.4	106.5957	0.5958	481.8	O K
480 Summer	80.1	0.0	80.1	106.6163	0.6163	511.0	FLOOD RISK
600 Summer	81.1	0.0	81.1	106.6283	0.6283	528.0	FLOOD RISK
720 Summer	81.7	0.0	81.7	106.6358	0.6358	538.5	FLOOD RISK
960 Summer	81.9	0.0	81.9	106.6388	0.6388	543.2	FLOOD RISK
1440 Summer	79.8	0.0	79.8	106.6128	0.6128	505.8	FLOOD RISK
2160 Summer	74.2	0.0	74.2	106.5457	0.5457	415.4	O K
2880 Summer	68.1	0.0	68.1	106.4777	0.4777	332.2	O K
4320 Summer	59.2	0.0	59.2	106.3892	0.3892	237.7	O K
5760 Summer	53.6	0.0	53.6	106.3402	0.3402	192.0	O K
7200 Summer	46.4	0.0	46.4	106.3037	0.3037	160.6	O K
8640 Summer	36.9	0.0	36.9	106.2603	0.2603	126.7	O K
10080 Summer	33.8	0.0	33.8	106.2458	0.2458	116.2	O K
15 Winter	18.2	0.0	18.2	106.1663	0.1663	65.9	O K
30 Winter	33.1	0.0	33.1	106.2428	0.2427	113.8	O K
60 Winter	51.1	0.0	51.1	106.3252	0.3252	178.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	124.07	781
30 Summer	81.51	644
60 Summer	51.03	386
120 Summer	30.89	336
180 Summer	22.72	320
240 Summer	18.17	346
360 Summer	13.19	420
480 Summer	10.52	484
600 Summer	8.81	540
720 Summer	7.63	600
960 Summer	6.06	726
1440 Summer	4.38	986
2160 Summer	3.16	1372
2880 Summer	2.51	1764
4320 Summer	1.80	2616
5760 Summer	1.43	3352
7200 Summer	1.19	4104
8640 Summer	1.02	4944
10080 Summer	0.90	5664
15 Winter	124.07	808
30 Winter	81.51	522
60 Winter	51.03	338

Cascade Summary of Results for storage swale 6 30%cc.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
120 Winter	66.8	0.0	66.8	106.4637	0.4637	316.1	O K
180 Winter	78.2	0.0	78.2	106.5933	0.5933	478.5	O K
240 Winter	84.8	0.0	84.8	106.6763	0.6763	599.1	FLOOD RISK
360 Winter	90.7	0.0	90.7	106.7568	0.7568	729.2	FLOOD RISK
480 Winter	92.5	0.0	92.5	106.7823	0.7823	773.3	FLOOD RISK
600 Winter	93.1	0.0	93.1	106.7918	0.7918	789.8	FLOOD RISK
720 Winter	93.3	0.0	93.3	106.7948	0.7948	795.4	FLOOD RISK
960 Winter	92.4	0.0	92.4	106.7808	0.7808	770.6	FLOOD RISK
1440 Winter	87.7	0.0	87.7	106.7153	0.7153	660.8	FLOOD RISK
2160 Winter	78.8	0.0	78.8	106.5998	0.5998	487.6	O K
2880 Winter	70.3	0.0	70.3	106.5012	0.5012	359.8	O K
4320 Winter	56.5	0.0	56.5	106.3652	0.3652	214.8	O K
5760 Winter	47.1	0.0	47.1	106.3073	0.3072	163.6	O K
7200 Winter	35.4	0.0	35.4	106.2533	0.2532	121.4	O K
8640 Winter	32.4	0.0	32.4	106.2393	0.2393	111.5	O K
10080 Winter	29.7	0.0	29.7	106.2268	0.2268	103.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
120 Winter	30.89	276
180 Winter	22.72	292
240 Winter	18.17	328
360 Winter	13.19	412
480 Winter	10.52	488
600 Winter	8.81	548
720 Winter	7.63	614
960 Winter	6.06	752
1440 Winter	4.38	1022
2160 Winter	3.16	1412
2880 Winter	2.51	1792
4320 Winter	1.80	2640
5760 Winter	1.43	3376
7200 Winter	1.19	4488
8640 Winter	1.02	5008
10080 Winter	0.90	5664

Cascade Rainfall Details for storage swale 6 30%cc.src

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	19.400	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.000

Time from:	(mins) to:	Area (ha)
0	4	0.000

Cascade Storage Controls for storage swale 6 30%cc.src

Swale Details

Infil Coef - Base (m/hr)	0.000000	Length (m)	240.0
Infil Coef - Sides (m/hr)	0.000000	Side Slope (1:x)	4.0
Safety Factor	2.0	Invert Level (m)	106.000
Porosity	1.00	Cover Level (m)	106.800
Base Width (m)	1.0	Slope (1:x)	100000.0

Orifice Outflow Control

Diameter (m)	0.233	Discharge Coefficient	0.600	Invert Level (m)	106.000

Appendix D

Environment Agency Consultation

ARUP

Record of Verbal Communication

Project title	Project F	Job number	209289
Communication from	Chris Heath	File reference	
Organisation	Arup		40
Telephone no			
Communication to	Karen Yates	Date of communication	
Organisation	Environment Agency		11 January 2010
Telephone no	01543 404989		
Copy to			

Record of communication	Action
CDH spoke to Karen Yates at the EA regarding our proposals and to get further clarification regarding their consultation response. Karen confirmed that there are a couple of issues that we need to address in our drainage strategy and the FRA: • 30% increase in rainfall intensity to allow for climate change (we would normally allow 20% in accordance with Table B.2 of PPS25, but in the Midlands the EA are requesting 30% for any residential - this includes hotels and schools - development, regardless of design life); • Justification as to why we're not incorporating green roofs; • Flood routing of overland flows to ensure that the buildings are not at risk of flooding during intense rainfall; and • Confirmation that the buildings are with Flood Zone 1. Other than that, she confirmed that she is happy with our proposals. CDH discussed the method for calculating greenfield runoff of KY. KY agreed that the most appropriate method should be used, and that if it was more appropriate to use ADAS as this allows for a sloping catchment then this would be acceptable.	

Mr Chris Heath
ARUP
Central Square Forth Street
Newcastle upon Tyne
Tyne and Wear
NE1 3PL

Our ref: UT/2009/107326/02-L01
Your ref: F. A. Project

Date: 11 January 2010

FAO Mr Heath

Dear Sir,

PRE-DEVELOPMENT ENQUIRY CONCERNING FORTHCOMING PLANNING APPLICATION CURRENTLY BEING PREPARED BY AEECOM

BYRKLEY PARK, BURTON-UPON-TRENT

Thank you for the Preliminary Foul and Surface Water Strategy emailed to us on 22 December 2009. We have the following comments to make:

Flood Risk
We acknowledge that a Flood Risk Assessment is currently being prepared by Aecom.

Our records show that the majority of the site lies within Flood Zone 1, which is defined by Planning Policy Statement 25: Development and Flood Risk (PPS25), as having a low probability of flooding. However, the Lin Brook runs along the boundary of the site therefore part of the site lies within Flood Zone 3. Flood Zone 3 is defined by PPS25 as having a high probability of flooding.

Under the terms of PPS25, this Flood Risk Assessment should addresses flood risk to the site which would include flood risk from the Lin Brook and how surface water run-off from this development will be managed.

We would comment that we would have no objections in principle to the development, however, this is subject to a satisfactory Flood Risk Assessment being produced.

PPS25 advocates that “In areas at risk of river flooding, preference should be given to locating new development in Flood Zone 1”. The Flood Risk Assessment will need to demonstrate that the development, particularly the buildings, will be safe from flooding from the Lin Brook, therefore, the exact flood plain extent of this watercourse would need to be determined.

As a minimum the Environment Agency requires that any surface water scheme

meets the following criteria:-

1. Any outflow from the site must be limited to the maximum allowable rate, i.e. greenfield equivalent (5 l/s/ha average).

2. Sustainable Drainage Systems (SuDS) should be considered as the first method of surface water disposal for the site, provided that ground conditions are appropriate. Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management. This approach involves using a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water run-off from a site. This approach can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements. Approved Document Part H of the Building Regulations 2000 sets out a hierarchy for surface water disposal which encourages a SUDS approach.

Whilst we have no objection to a connection being made to the Lin Brook, C697 (Table 5.6 page 5-8) specifies how many treatment train elements should be included in a development. We would therefore require at least two treatment train elements are incorporated into the development before the surface water discharges to this watercourse. Surface water design should follow the latest industry guidance CIRIA C697 SUDS Manual.

We have reviewed the proposed surface water drainage strategy with regard to the SuDS on the site and we consider this approach to still be relevant. We welcome the creation of a wetland area, use of rainwater harvesting, swales and permeable paving being proposed within this strategy. However, we are extremely disappointed that Green Roofs have not been considered as part of this development as green roofs may offer some additional attenuation and benefits, listed below.

The Environment Agency and LPA's in the area are actively encouraging development techniques that will improve various aspects of the local environment. The Environment Agency is therefore asking for Green Roofs as a first choice for larger developments in this area. An independent study, (carried out by the Livingroofs Organisation and Ecology Consultancy Ltd.), states that the use of green roofs can give significant improvements to:

1) Energy conservation, by providing improved heat insulation and thereby reducing overall production of Carbon Dioxide,
2) Air quality, by removing airborne particles and compounds,
3) Ozone level, by reducing the "Heat Island" effect,
4) Noise pollution, by offering improved sound insulation to buildings,
5) Natural habitat creation, to offset the loss of natural habitats for Black Redstarts, bats and other species,
6) Water quality, greenery and plant-life provides natural biological water treatment for rainwater and helps improve oxygen levels in surface water (poor Oxygen levels are a particular problem in urban areas),
7) Future flooding pressures, green roofs attenuate the rainfall that falls upon them by storing the water and releasing it a controlled rate. Normal roofs shed water almost immediately into local systems, which increases the pressure on the capacity of public sewers and the river systems that they discharge to. In the future, it is predicted that rainfall will become more intense at times and so there is a need to relieve the pressures on existing surface water systems. The Agency would take

green roofs into account, when considering the amount of attenuation storage that must be provided for a site. Overall, the provision of green roof area is likely to be significantly cheaper than providing below ground attenuation storage on a site.
8) Provision of green space amenity, (if accessible), which is shown to have beneficial effects on people's health.
9) Recycling, careful planning of the roof construction will allow the re-use of demolition waste as growing media for a green roof.

Bearing in mind the significant and varied benefits listed above, we would ask developer to use green roofs as part of this scheme. If you do not intend to use green roofs, you must demonstrate how you will achieve the same or better benefits for the development, through an alternative proposal. Details of green roofing techniques, consultants and suppliers are available through the Livingroofs website, www.livingroofs.org

3. We acknowledge that some MicroDrainage Calculations have been submitted, however, the system must deal with the surface water run-off from the site up to the critical 1 in a 100-year return period storm event, plus an additional 30% to account for climate change. Drainage calculations must be included to demonstrate this (e.g. MicroDrainage or similar package calculations which include the necessary attenuation volume).

An assessment of the proposed drainage system should show that no above ground flooding occurs in a 30 year event, and that if flooding occurs in the 100 year event (plus climate change) that it remains on site and safe. If above ground flooding does occur in the 100 year event (plus climate change) it should be demonstrated that it remains on site & safe via plans, calculations (e.g. Microdrainage), manhole schedules and text. This information should show flow routes, locations of ponding, depths of ponding and durations of ponding. Evidence should also be submitted to show the determination of the critical storm duration.

Should you wish to discuss these comments concerning flood risk further, please contact the Drainage Engineer, Karen Yates, Tel. 01543 404989.

Foul Drainage
The effluent from the waste water treatment plant will require a consent to discharge whether it is mixed with surface water or discharged direct to the water course. An inspection/sampling chamber should be provided before the effluent is allowed to mix with any other discharge.

We look forward to receiving further information in due course

Yours sincerely

Mr Richard Austen
Planning Liaison Team Leader

If you have any questions regarding the above information please contact Sarah Victor Tel. 01543 404880.

End