

**Below Ground Drainage,
Statement, Description and Calculation
In
Support of Planning Application
For
New B8 Warehouse
On
Plot 2
At
Dunsbury Hill Farm
Havant.
Hampshire.**

September 2015.

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BAM Design Technical Report.

SUBJECT

Below Ground Drainage Design.

CLIENT: BAM Construction South East.

PROJECT: B8 Warehouse, Plot 2, Dunsbury Hill Farm.

Contract no:
Prepared by: S Bliss.

Job no: 4487.
Checked by: SGB.

Date: September 2015

Status of drawings / specifications: For Approval

AMENDMENTS				
ref.	date	amendment	amended by	checked by
AP0	Sept. 2015	First Issue for planning approval.	SGB	SGB
AP1	Sept 2015	Appendix 7 added.	SGB	SGB
AP2	Jan 2016	Amendments as PBA Comments Drained Hardstanding Area increased.	SGB	SGB

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Below ground drainage statement in support of planning application.**1.0 Introduction.**

Dunsbury Hill Farm is a parcel of land located between The A3(M) and Leigh Park Housing Estate. The site is currently comprised of extensive open fields with established hedgerows and is owned by Portsmouth City Council. The total site has an area of 33 hectares, 20.2 hectares of which is proposed for development. Planning permission ref APP/12/00338 has been granted.

The application was described as : **Hybrid planning application comprising a part outline application relating to development for employment uses with a hotel and conference facilities and a part detailed application for a new access link road with bus gate to Woolston Road; together with landscaping, Infrastructure and associated works.**

The planning permission has been granted in two batches.

Detailed permission has been granted for: **New access road and bus gate to Woolston Road; together with landscaping, infrastructure and associated works.**

Outline planning permission has been granted for: **Development for employment uses and a hotel with conference facilities; together with landscaping, infrastructure and associated works.**

This new planning application is to gain detailed permission for the construction of a 80,000ft² type B8 warehouse unit located on plot 2 of the Dunsbury Hill Farm development.

Appendix 1 indicates the Dunsbury Hill Farm site boundary.

Appendix 2 indicates the link road for which detailed planning permission has previously been granted.

Appendix 3 indicates the original whole site drainage strategy, the proposed plots with the detailed application plot 2, highlighted.

A Flood Risk Assessment has been produced by Atkins Ltd for the complete Dunsbury Hill Farm development. This document was submitted and accepted as part of this original planning application. The document advises that the site is not at risk of flooding from outside sources and will not subject other properties to flooding providing green field run-off discharge rates are adhered to.

It is considered that the original Flood Risk Assessment covers the requirements of plot 2 and a new plot specific Flood Risk Assessment will not be required.

2.0 Plot 2 Description.

The plot 2 site is approximately 2.1 hectares in area. The site is currently used for grazing and can be considered to be 100% green field. There are numerous hedges and trees around the perimeter which have various protection orders. Portsmouth City Council Arboriculturalist department have been involved with all aspects of design on this plot and will continue to offer advice for the duration of the project.

The proposed hardstanding development consists Building Roof, Car Parking, Access Roads and Goods Yard. These areas total 1.76 Hectares.

A site wide surface water drainage strategy was produced by Peter Brett Associates to address Condition A2 of the site planning permission application. This required all plots on the Dunsbury Hill Farm site to provide an element of storm water attenuation both locally on each plot and via a centralised storm water attenuation pond. This drainage strategy is detailed within appendix 3.

The area of land proposed for a storm water attenuation pond is currently undergoing various ecology surveys to confirm that the location is suitable for the construction of a balancing pond. These surveys are expected to extend for approximately 9 months. This timescale will result in the pond not being available to accept storm water run-off on completion of the Plot 2, B8 warehouse development. It is therefore proposed to provide full on site storm water attenuation for the Plot 2 site.

The proposed site layout provides very little opportunity to offer SuDS drainage techniques as these were intended to be the aforementioned balancing pond. The car parking area will be provided with porous surfaces over a granular sub base. This will act as a storm water attenuation reservoir whilst also providing an improvement in the quality of the water discharged.

The remainder of the Plot 2 development will discharge to on-site below ground storm water attenuation tanks. The outfall from these tanks will be restricted to green field run-off rates and a temporary outfall routed to the Hermitage Stream.

Once the storm water attenuation pond has been constructed, this restricted temporary outfall will be re-routed to discharge into the pond. This pond will in turn help to further improve water quality prior to discharge into the Hermitage Stream.

Whilst it is understood that the proposed underground attenuation tanks provide little SuDS benefits, it is considered that this is only a temporary measure that will improve once the ecology surveys approve the construction of a balancing pond.

The fallow area for the phase 2 building, to the western boundary of Plot 2 has not been included within any drainage design or calculations and will be subject to a separate conditions submission when phase 2 comes online.

The table below has been extracted from the FRA and provides green field run off rates for differing storm events.

For the purposes of establishing storm water attenuation volumes, the QBAR rate has been used.

Return Period	1	Q BAR*	30	100
Greenfield Runoff Rate l/s/ha	2.9	3.4	7.7	10.9

*QBAR relates to the mean annual Greenfield runoff rate.

Greenfield Runoff Rates for Different Return Periods

The permitted run off rate from Plot 2 will be 3.4 L/sec x 1.76 ha = 6 L/sec.

3.0 Drainage General.

The below ground drainage for Dunsbury Hill Farm, plot 2 will comprise separate foul and storm water systems. The systems will be designed in accordance with BS EN 752, The Building Regulations section H and Environment agency Planning Policy Statement PPS25. Foul water flows will be calculated in accordance with BS EN 12056 part 3.

The Requirement H3 of the Building Regulations 2000 has been considered for this project. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to a soakaway infiltration system, secondly to a watercourse and finally to a sewer in that priority order.

We do not currently have access to the site in order to perform soil percolation tests. On the basis of geological information, it is assumed that the permeability of the soil and bedrock is low. Information from the PUSH SFRA suggests that ground underlain by clay is unlikely to be at significant risk of groundwater flooding. The development is also not within a Source Protection Zone and groundwater quality is considered to be of low importance.

Once access to the plot is available, soil infiltration tests will be performed in accordance with BRE Digest 365.

Assuming the above indications are correct and the infiltration tests fail, storm water discharge will need to be routed to the Hermitage Stream. This discharge will be restricted to the previously discussed green field run off rate of 5.27 Litres per second.

When detailed design commences, the entire drainage network will be sized and levelled using the industry accepted Micro Drainage software suite.

4.0 Storm Water Drainage.

In accordance with current practice the storm water drainage system will be designed to prevent flooding from a 1 in 30 year storm event. The design will then be further interrogated against a 1 in 100 year storm event + 30% for future climate change. This will be performed to ensure that any flood water from this storm event will be contained within the boundaries of the development. Ground levels will be set to ensure that a safe passage of exit exists from the building during this 100 year event.

In order to achieve the above requirements whilst restricting the off-site discharge to 5.27 Litres per second, storm water attenuation has been provided in three areas.

- | | |
|---------------------------------|---|
| • Car parking and access roads. | Porous surfaces over granular reservoir sub base. |
| • Building Roof. | Below Ground Storm Water attenuation tanks. |
| • Goods Yard & HGV parking. | Below Ground Storm Water attenuation tanks. |

Car Parking & Access Roads.

The parking bays will have porous surfaces over a layer of approximately 400mm deep granular fill. This fill will contain a minimum of 30% voids ratio. These voids provide a volume within which, storm water can be stored for the duration of rainfall. Water will freely flow through the attenuation layer and will discharge to a manhole containing a vortex flow control device. This flow control will limit the discharge to 5 L/sec maximum. The remainder of the water that cannot pass through the flow control will back up and be stored within the granular reservoir.

Appendix 5, provides the design calculations for this porous car park.

The complete granular fill and all perforated inlet / outlet pipes will be wrapped with Inbitex Geotextile fabric. This is a polypropylene and polyethylene non-woven fabric. During the manufacturing process, small dishes are created on the surface of the hairs from which the geotextile is manufactured. This allows an early establishment of a microbial biomass which is responsible for eating and degrading oils in the water. It is also important during dry periods, that the microbial population can retreat into the dishes where moisture is to be found. Thus when it rains again the microbial biomass is quickly re-established. This therefore negates the need for traditional petrol interceptors.

Porous drainage techniques help to intercept and prevent silt from entering the drainage system which further helps to improve the quality of the water discharged off site.

Building Roof.

The Storm Water Drainage concept for the Dunsbury Hill Farm development is to provide a proportion of storm water attenuation on site with the remainder being stored in a centralised balancing pond. The car park and access roads design for Plot 2 have achieved the first requirement of on-site storage and treatment.

Ongoing ecology surveys being performed by Portsmouth City Council have delayed the construction of the centralised balancing pond. It has therefore become necessary to provide on-site storm water storage within below ground attenuation tanks and discharge the restricted 5.27 litres per second flow direct to the Hermitage Stream. Whilst this is not considered to be the most friendly SuDS drainage technique, the discharge pipe will be diverted into the centralised balancing pond once it has been constructed. This pond will assist suspended matter settlement and further improve the water quality being discharged into the Hermitage Stream.

The detailed design of the attenuation tanks and pipe network will be produced using the industry accepted Micro Drainage Software package.

We believe all of the above is in accordance current SuDS legislation and the requirements of the "Technical Guidance to the National Planning Policy Framework".

Our Storm Water Drainage strategy drawing is attached under Appendix 4 of this report.

Goods Yard and HGV Parking.

The Goods Yard drainage will follow exactly the design philosophy as the building roof drainage. This area will discharge to below ground attenuation tanks with a restricted temporary discharge to the Hermitage Stream. Once the centralised storm water balancing pond has been constructed, the discharge pipe will be diverted to the pond. The vortex flow control on the outlets of the attenuation structures will remain in place.

In accordance with Environment Agency Planning Policy Guidance 3, all storm water run-off from the Plot 2 Goods Yard, will be routed through a Bye Pass type oil separator. This oil separator will be class 1 specification with automatic shut off and alarm.

5.0 Foul Water Drainage.

Southern Water Asset records indicate that there is a 1025 diameter public foul water sewer within the boundary of the Dunsbury Hill Farm site.

We have made contact with Southern Water who have advised that two separate foul connections to this sewer will be permitted subject to a section 106 application. The Southern Water Asset record indicating this sewer is attached as appendix 6 to this report.

A system of foul water drainage will be provided for the site wide Dunsbury Hill Farm development. This system will include a 150mm foul drainage connection for each plot. Subject to discussions with Southern Water, it is intended to offer the completed site wide drainage network for adoption by the Water Authority.

Plot 2 will be provided with a gravity foul water drainage system. This system will discharge to a 150mm foul water connection installed specifically for this plot.

Access Chambers and rodding points will be provided to allow future maintenance of the system. Adequate ventilation pipes and trapped gullies will be provided to prevent the build-up of foul smells in or around the building.

In an effort to reduce water usage, wash hand basin taps and showers will be provided with flow limiters whilst WC's will have 6 – 3 litre dual flush mechanisms.

6.0 Summary.

The site specific Flood Risk Assessment and the Site Wide Drainage Report, both require storm water run-off to be restricted to green field run off rates. The remainder of the water generated by rainfall onto hard standing areas is to be attenuated on site until the storm has receded. The attenuation volumes are to be calculated for a 100 year return period storm + 30% for future climate change. Safe egress from all buildings needs to be maintained for this storm event.

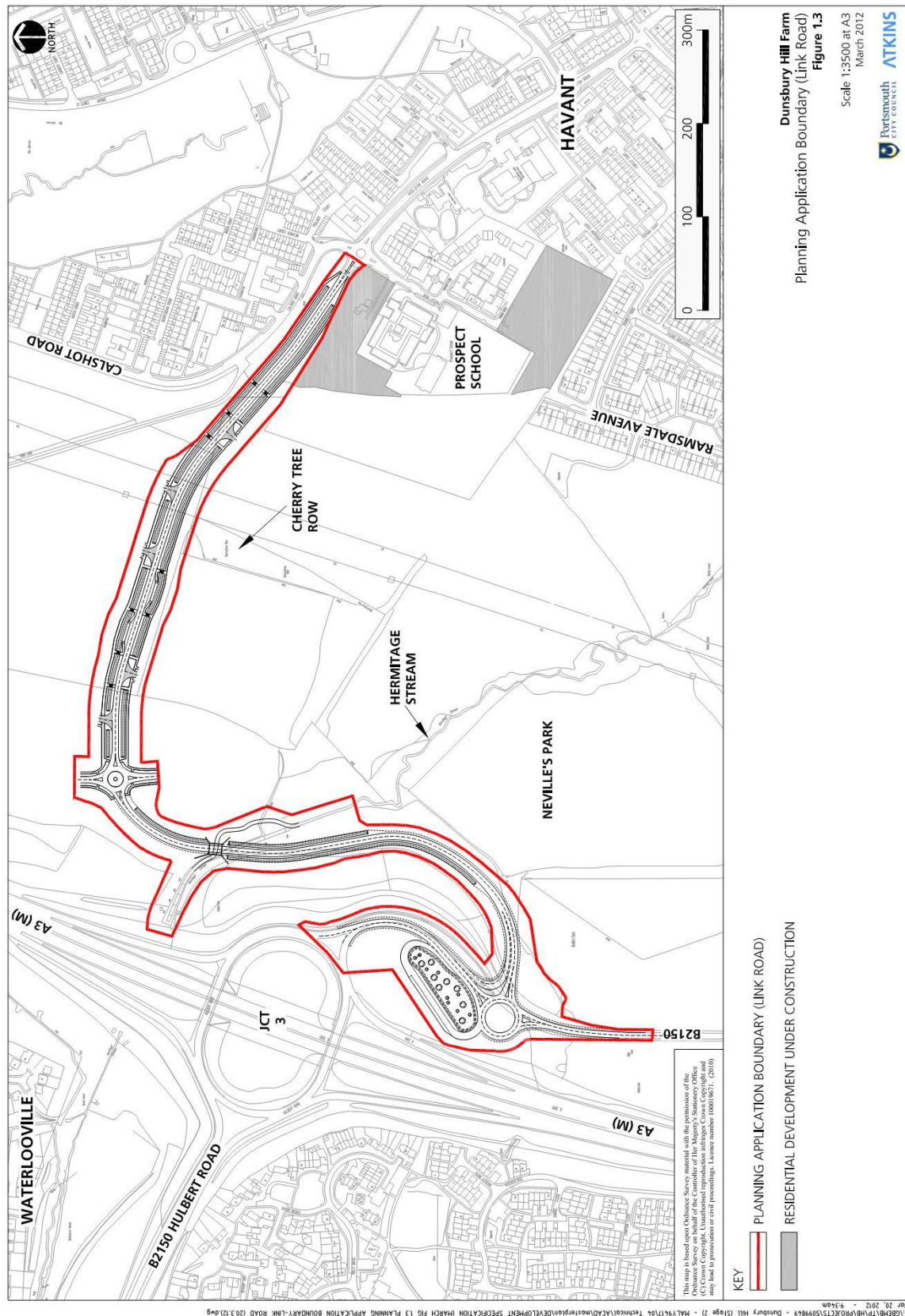
The attenuation is to be achieved via a proportion of “on plot” attenuation and a centralised balancing pond. This effectively provides two forms of treatment to the storm water prior to discharge to the Hermitage Stream.

The Plot 2 drainage proposal offers a porous car park SuDS drainage technique which will improve water quality prior to discharge off site.

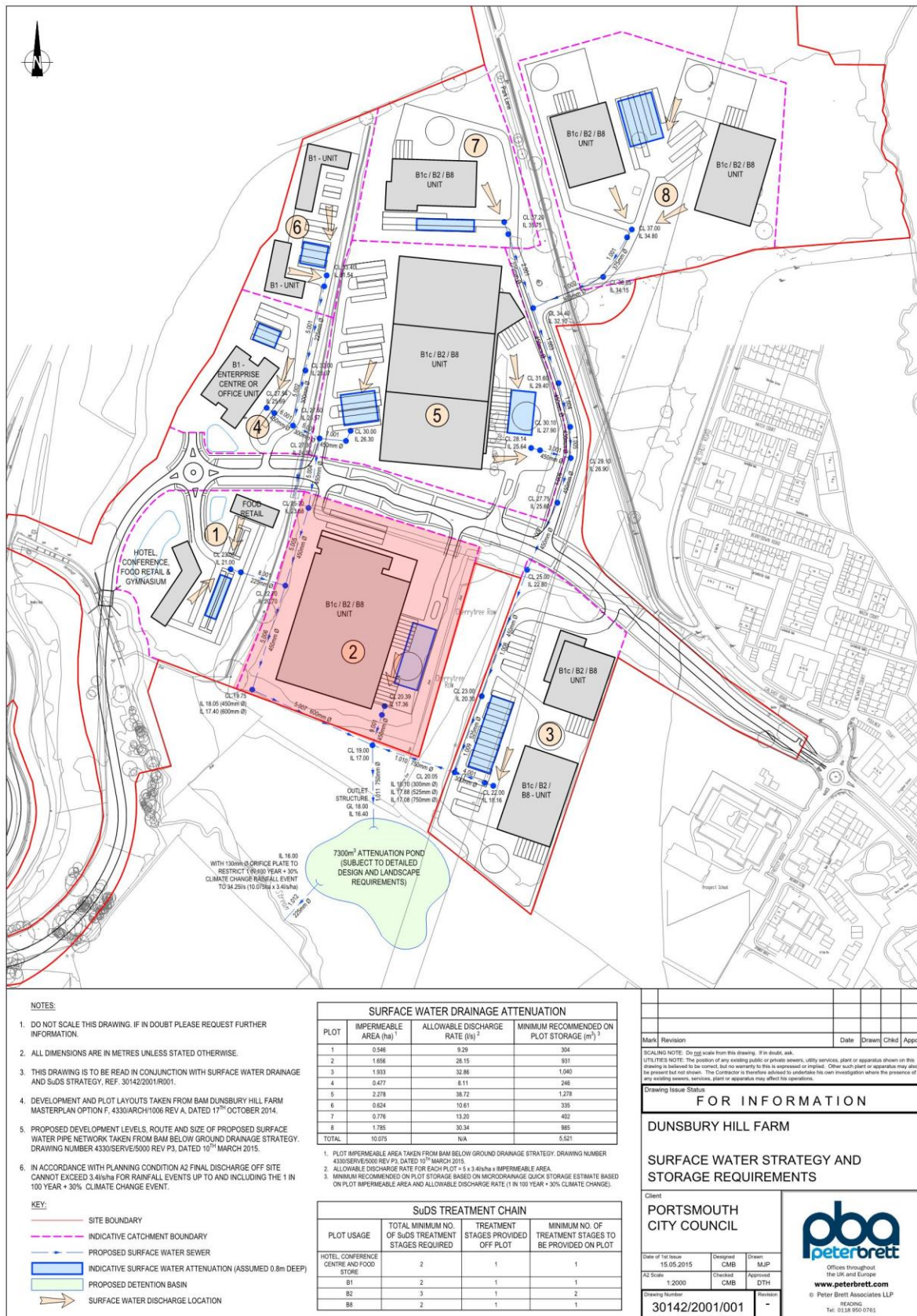
The remainder of the plot storm drainage, discharges to below ground attenuation tanks which have a restricted outfall to the Hermitage stream. This is a temporary measure until the centralised balancing pond is constructed following ecology surveys. Once the pond is completed, the plot 2 outfall will be diverted into this pond.

The Plot 2 storm water drainage design therefore meets with the requirements of the Flood Risk Assessment and the Atkins Drainage Strategy.

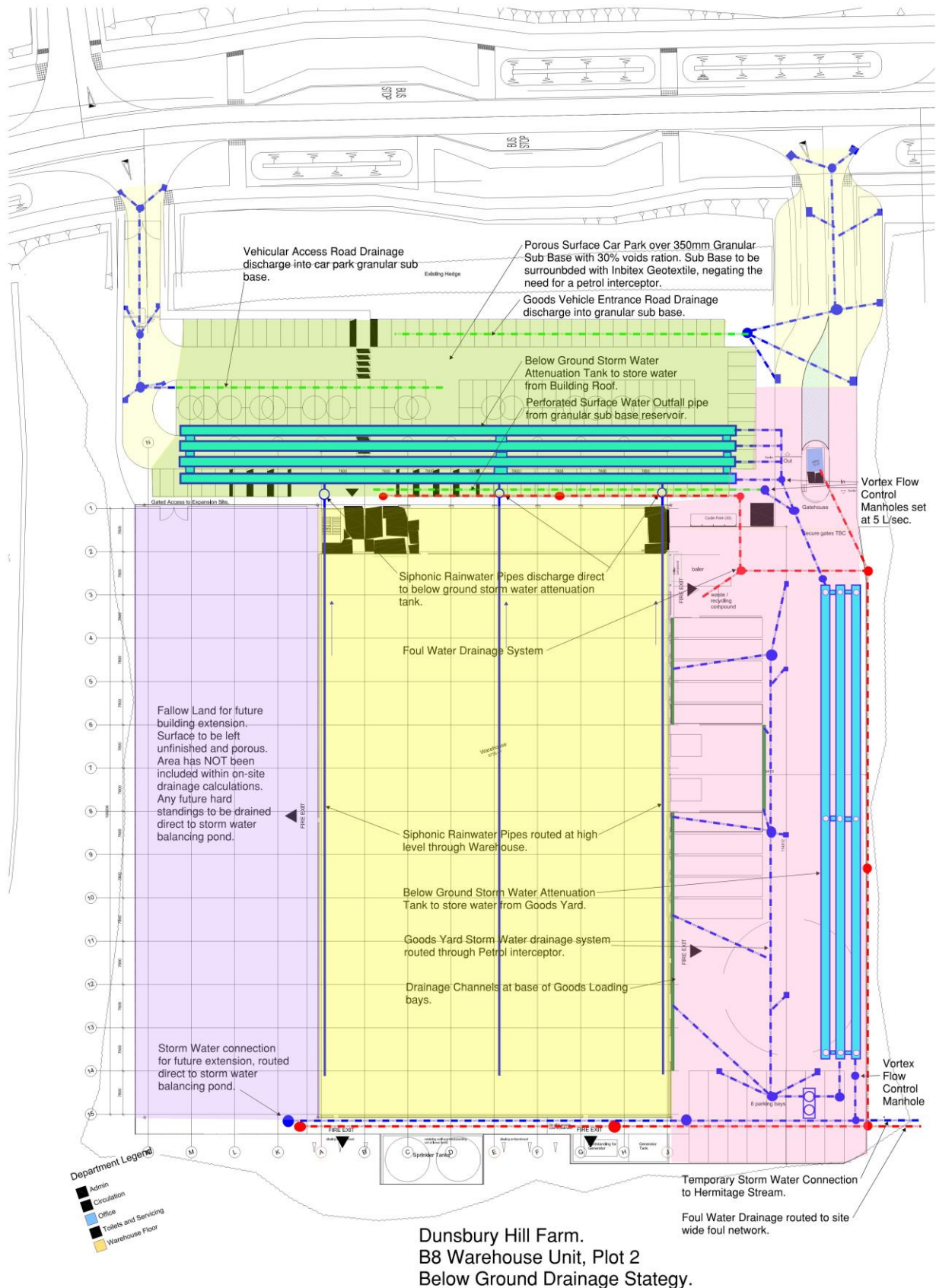
Low flow water fittings will be specified to reduce water consumption and foul water discharge volumes.



Appendix 3. New B8 Warehouse, Plot 2, Boundary & Site Wide Drainage concept strategy.



Appendix 4. B8 Warehouse Unit, Plot 2. Drainage Strategy.



Appendix 5. Porous Car Park Design Calculations. Page 1.

BAM Design Ltd						Page 1	
Centrium, Griffiths Way St Albans Herts AL1 2RD			Dunsbury Hill Farm B8 Warehouse, Plot 2 Porous Car Park Design				
Date August 2015			Designed by S Bliss				
File 4487 DHF B8 Warehouse P...			Checked by SGB				
Micro Drainage			Source Control 2015.1				
Summary of Results for 100 year Return Period (+30%)							
Half Drain Time : 333 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	23.377	0.077	0.0	4.5	4.5	77.7	O K
30 min Summer	23.401	0.101	0.0	4.5	4.5	102.1	O K
60 min Summer	23.423	0.123	0.0	4.5	4.5	123.8	O K
120 min Summer	23.438	0.138	0.0	4.5	4.5	139.4	O K
180 min Summer	23.441	0.141	0.0	4.5	4.5	142.4	O K
240 min Summer	23.439	0.139	0.0	4.5	4.5	140.0	O K
360 min Summer	23.430	0.130	0.0	4.5	4.5	131.0	O K
480 min Summer	23.420	0.120	0.0	4.5	4.5	120.5	O K
600 min Summer	23.415	0.115	0.0	4.5	4.5	116.3	O K
720 min Summer	23.411	0.111	0.0	4.5	4.5	112.1	O K
960 min Summer	23.403	0.103	0.0	4.5	4.5	103.5	O K
1440 min Summer	23.385	0.085	0.0	4.5	4.5	86.2	O K
2160 min Summer	23.361	0.061	0.0	4.5	4.5	61.3	O K
2880 min Summer	23.339	0.039	0.0	4.5	4.5	38.9	O K
4320 min Summer	23.317	0.017	0.0	4.5	4.5	17.2	O K
5760 min Summer	23.314	0.014	0.0	4.5	4.5	14.2	O K
7200 min Summer	23.314	0.014	0.0	4.5	4.5	14.2	O K
8640 min Summer	23.314	0.014	0.0	4.5	4.5	14.2	O K
10080 min Summer	23.314	0.014	0.0	4.5	4.5	14.2	O K
15 min Winter	23.386	0.086	0.0	4.5	4.5	86.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	115.731	0.0	85.0	31			
30 min Summer	77.804	0.0	111.1	36			
60 min Summer	49.937	0.0	140.2	64			
120 min Summer	30.956	0.0	171.4	122			
180 min Summer	23.058	0.0	189.8	182			
240 min Summer	18.577	0.0	202.9	236			
360 min Summer	13.656	0.0	222.1	292			
480 min Summer	10.974	0.0	236.8	356			
600 min Summer	9.254	0.0	248.6	424			
720 min Summer	8.046	0.0	258.2	492			
960 min Summer	6.447	0.0	273.5	630			
1440 min Summer	4.709	0.0	296.5	900			
2160 min Summer	3.432	0.0	317.0	1296			
2880 min Summer	2.739	0.0	332.8	1644			
4320 min Summer	1.989	0.0	353.8	32			
5760 min Summer	1.583	0.0	363.1	32			
7200 min Summer	1.325	0.0	371.5	32			
8640 min Summer	1.147	0.0	377.5	32			
10080 min Summer	1.015	0.0	381.7	32			
15 min Winter	115.731	0.0	94.0	31			
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Appendix 5. Porous Car Park Design Calculations. Page 2.

BAM Design Ltd						Page 2	
Centrium, Griffiths Way St Albans Herts AL1 2RD			Dunsbury Hill Farm B8 Warehouse, Plot 2 Porous Car Park Design				
Date August 2015			Designed by S Bliss				
File 4487 DHF B8 Warehouse P...			Checked by SGB				
Micro Drainage			Source Control 2015.1				
Summary of Results for 100 year Return Period (+30%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	23.414	0.114	0.0	4.5	4.5	114.4	O K
60 min Winter	23.439	0.139	0.0	4.5	4.5	139.7	O K
120 min Winter	23.458	0.158	0.0	4.6	4.6	159.2	O K
180 min Winter	23.463	0.163	0.0	4.6	4.6	164.8	O K
240 min Winter	23.463	0.163	0.0	4.6	4.6	164.1	O K
360 min Winter	23.454	0.154	0.0	4.5	4.5	155.7	O K
480 min Winter	23.444	0.144	0.0	4.5	4.5	144.9	O K
600 min Winter	23.435	0.135	0.0	4.5	4.5	136.5	O K
720 min Winter	23.429	0.129	0.0	4.5	4.5	130.2	O K
960 min Winter	23.416	0.116	0.0	4.5	4.5	116.9	O K
1440 min Winter	23.389	0.089	0.0	4.5	4.5	90.0	O K
2160 min Winter	23.350	0.050	0.0	4.5	4.5	50.9	O K
2880 min Winter	23.319	0.019	0.0	4.5	4.5	18.7	O K
4320 min Winter	23.317	0.017	0.0	4.5	4.5	17.2	O K
5760 min Winter	23.314	0.014	0.0	4.5	4.5	14.2	O K
7200 min Winter	23.314	0.014	0.0	4.5	4.5	14.2	O K
8640 min Winter	23.314	0.014	0.0	4.5	4.5	14.2	O K
10080 min Winter	23.314	0.014	0.0	4.5	4.5	14.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	77.804	0.0	123.3	36			
60 min Winter	49.937	0.0	156.2	64			
120 min Winter	30.956	0.0	191.0	120			
180 min Winter	23.058	0.0	211.9	178			
240 min Winter	18.577	0.0	226.7	234			
360 min Winter	13.656	0.0	247.9	336			
480 min Winter	10.974	0.0	264.3	380			
600 min Winter	9.254	0.0	277.5	458			
720 min Winter	8.046	0.0	288.8	534			
960 min Winter	6.447	0.0	306.3	686			
1440 min Winter	4.709	0.0	332.0	972			
2160 min Winter	3.432	0.0	356.7	1364			
2880 min Winter	2.739	0.0	374.5	1676			
4320 min Winter	1.989	0.0	399.7	32			
5760 min Winter	1.583	0.0	411.4	32			
7200 min Winter	1.325	0.0	422.3	32			
8640 min Winter	1.147	0.0	430.4	32			
10080 min Winter	1.015	0.0	436.6	32			
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Appendix 5. Porous Car Park Design Calculations. Page 3.

BAM Design Ltd		Page 3
Centrium, Griffiths Way	Dunsbury Hill Farm	
St Albans	B8 Warehouse, Plot 2	
Herts AL1 2RD	Porous Car Park Design	
Date August 2015	Designed by S Bliss	
File 4487 DHF B8 Warehouse P...	Checked by SGB	
Micro Drainage		Source Control 2015.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.350

Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:
0	4 0.200	4	8 0.150

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Appendix 5. Porous Car Park Design Calculations. Page 4.

BAM Design Ltd		Page 4
Centrium, Griffiths Way St Albans Herts AL1 2RD	Dunsbury Hill Farm B8 Warehouse, Plot 2 Porous Car Park Design	
Date August 2015 File 4487 DHF B8 Warehouse P...	Designed by S Bliss Checked by SGB	
Micro Drainage	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 23.800

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	32.0
Membrane Percolation (mm/hr)	1000	Length (m)	105.0
Max Percolation (l/s)	933.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	23.300	Cap Volume Depth (m)	0.350

ACO Q-Brake Outflow Control

Design Head (m)	0.550	Diameter (mm)	99
Design Flow (l/s)	5.0	Invert Level (m)	23.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.5	1.200	7.4	3.000	11.7	7.000	17.8
0.200	4.9	1.400	8.0	3.500	12.6	7.500	18.4
0.300	4.5	1.600	8.5	4.000	13.5	8.000	19.0
0.400	4.3	1.800	9.0	4.500	14.3	8.500	19.6
0.500	4.8	2.000	9.5	5.000	15.0	9.000	20.2
0.600	5.2	2.200	10.0	5.500	15.8	9.500	20.7
0.800	6.0	2.400	10.4	6.000	16.5		
1.000	6.7	2.600	10.8	6.500	17.1		

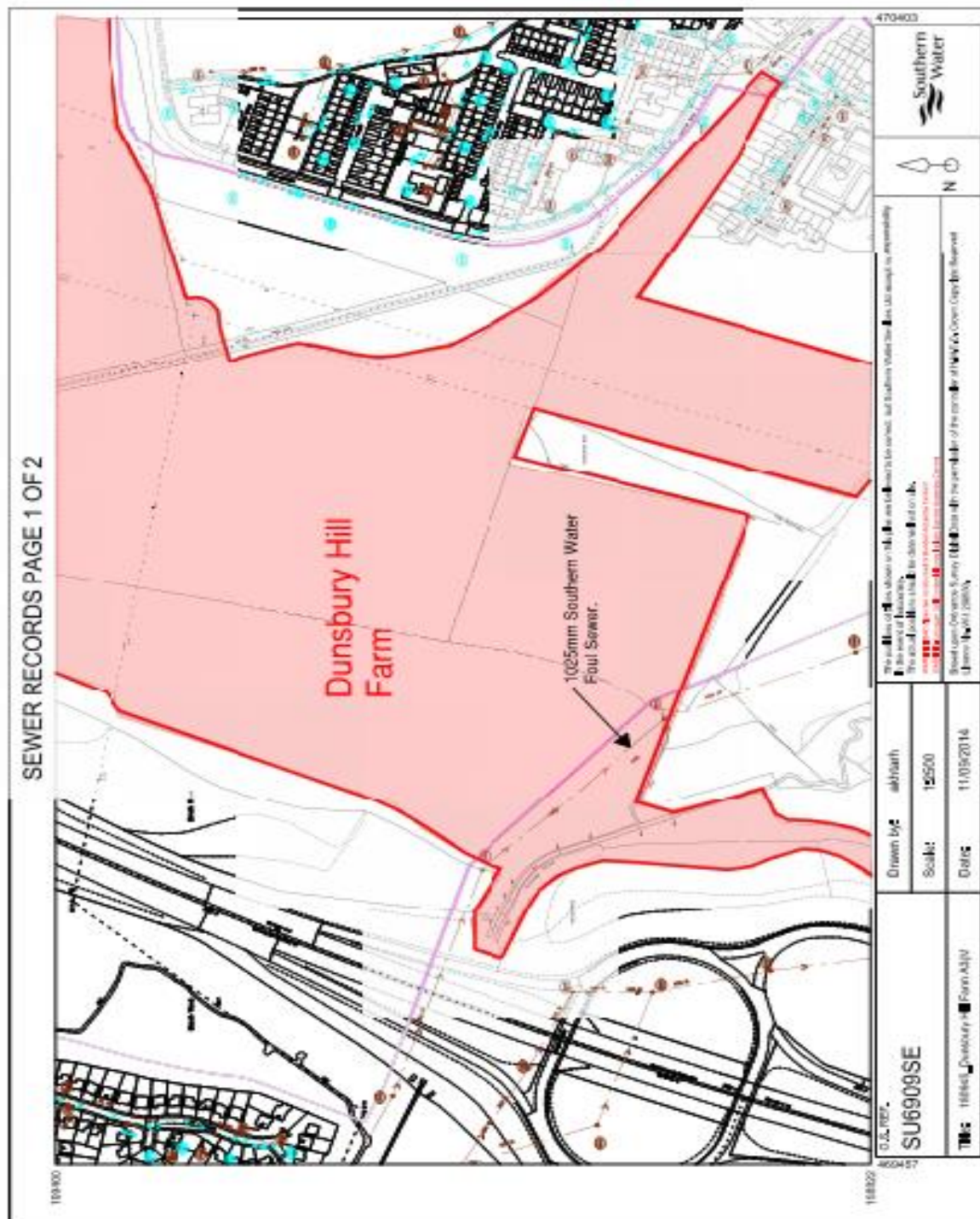
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Appendix 5. Porous Car Park Design Calculations. Page 5.

BAM Design Ltd		Page 5	
Centrium, Griffiths Way		Dunsbury Hill Farm	
St Albans		B8 Warehouse, Plot 2	
Herts AL1 2RD		Porous Car Park Design	
Date August 2015		Designed by S Bliss	
File 4487 DHF B8 Warehouse P...		Checked by SGB	
Micro Drainage		Source Control 2015.1	

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Appendix 6. Southern Water Foul Sewer Record.



Appendix 7. BAM Design, Site Wide Drainage Strategy.

