

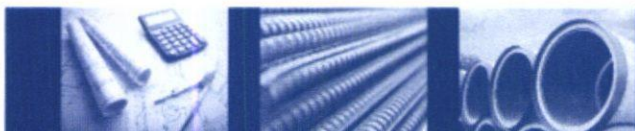


**PROPOSED RESIDENTIAL DEVELOPMENT – CLASS C3A
MANOR FARM & COPSEYS NURSERIES
DENVILLES
HAVANT
HAMPSHIRE**

SURFACE WATER DRAINAGE STRATEGY & EXCEEDANCE FLOWS

BDW SOUTHAMPTON

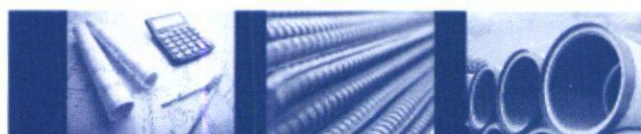
Date: 12th Sept 2014
Ref: 14/0576/4527
Rev: -



DOCUMENT CONTROL RECORD

Document Issue:

Rev	Date	Issue Status	Prepared by	Checked by
-	12.09.14	First Issue for comment	C.Pendle	A.McShane



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Appendix C

- 4527:71 – Cross Section through Overflow System

Appendix D

- Soakaway Calculations (Micro Drainage)

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- Hampshire County Council – Works Effecting an Ordinary Watercourse Consent

1 Scope

- 1.1 This report is to be read in conjunction with the site specific Flood Risk Assessment – Revision I (MJA 13/0105/4527).
- 1.2 The scope of this report is to outline the proposed surface water drainage strategy for the development and summarise the MJA responses to the key flood risk issues identified by the Environment Agency.

2 Surface Water Drainage Strategy

- 2.1 The surface water drainage strategy proposed for this development is a sustainable and robust system which will afford complete protection to new residents within the proposed scheme, and provide a positive and significant improvement in flood protection to both upstream properties to the west and properties downstream of the site.
This will be achieved by controlling and reducing the peak rate of surface water runoff discharged from the developed site, mitigating any increase in flood risk to the catchment downstream of the Nore Farm Stream watercourse.
- 2.2 The National Planning Policy Framework requires that new developments do not exacerbate flood risks elsewhere, which means there is a need to control drainage and runoff to ensure there are no increases in overland flow as a result of the development.
Environment Agency guidance and government legislation such as the Flood and Water Management Act (Defra 2010) requires surface water drainage strategies for new developments to be in accordance with the ideals of 'sustainable development' via the provision of Sustainable Urban Drainage Systems (SuDS).
- 2.3 The Building Regulations Document H (2002) details a hierarchy of potential methods of disposing of surface water from a site:
- An adequate soakaway or some other adequate infiltration system, or where that is not practicable,
 - A watercourse, or where that is not practicable,
 - A sewer
- 2.4 Following a review of the site geology, potential groundwater levels and soil permeability, infiltration as a method of surface was considered suitable.
Results from soil permeability testing in accordance with BRE Digest 365 methodology range from $1.2 \times 10^{-5} \text{m/s}$ – $1.8 \times 10^{-6} \text{m/s}$.
This indicates that the use of infiltration would be a feasible method of managing the surface water runoff generated by the proposed development.
- 2.5 The principle surface water drainage strategy for the proposed development is to utilise SuDS via infiltration to ground.
SuDS features such as permeable block paving will drain runoff from the road network and driveways, whilst cellular crate soakaway cells will dispose of runoff from roofs.
The philosophy of the SuDS is to replicate as closely as possible the natural drainage regime of the site before development and to improve the quality of the runoff, reducing and improving the impact on receiving watercourses.



- 2.6 In the rare occurrence of an exceedance event or during periods of exceptionally high groundwater, a 'back-up' overflow system will be incorporated into the drainage system to safely direct excess runoff into a series of lined attenuation basins situated at the eastern boundary of the site, prior to discharging into the existing Nore Farm Stream watercourse at a controlled rate equivalent to the Greenfield runoff rate.
The existing site produced a combined Qbar (Mean annual Greenfield peak flow) of **28 l/s** leaving the site into the Nore Farm Stream Watercourse.
The northern portion of the site, formerly Copseys Nursery produced a Qbar of **16l/s**.
The southern portion of the site, formerly Manor Farm produced a Qbar of **12l/s**.
- 2.7 Therefore, the post development flows into the Nore Farm stream will be limited to a maximum of **28 l/s** up to the 1 in 100 year +30% storm event.
The control structures will be a brick built or precast concrete manhole ring control chamber containing a hydraulic vortex flow control device, i.e Hydrobrake or similar.
- 2.8 The attenuation ponds are to be lined with an impermeable membrane to prevent the interaction of the groundwater table with the function of the SuDS structure.
- 2.9 The complete surface water drainage system has been designed with a significant factor of safety, with all SuDS features including the Permeable Block Paving, Cellular Soakaways and Attenuation Ponds capable of containing runoff from the exceptionally rare 1 in 100 storm event (1% chance of occurrence each year) plus an allowance of 30% for predicted future climate change effects.
The design of the attenuation ponds accounts for the 'worst case scenario' of the total failure of all infiltration systems including a significant area of offsite runoff (0.4ha) which could potentially be picked up by the proposed land drainage network.
In addition, whilst the system is robustly designed to protect against high groundwater inundation, the overall storage capacity of the ponds has been increased by a further 25% to provide an additional safety buffer providing significant improvement and safety to properties along the Nore Farm Stream.
- 2.10 Although the site has no official recorded history of flooding, anecdotal evidence from local residents has indicated an historic flood event caused by rapid melting of snow from the site onto Fifth Avenue as well as flooding to rear gardens from rainfall runoff, possibly due to a combination of blocked road gullies and lack of maintenance of the existing drainage systems.
Therefore the effects of developing this site upon the existing properties to the west and properties downstream of the Nore Farm stream has taken a significant importance in the design of the surface water drainage strategy for the site and the improvement it can provide.
- 2.11 Although the construction of the proposed development will not impact on flood risk to the existing adjoining properties, a new positive land drainage system will be installed at the western boundary of the site to intercept and safely dispose of any overland flood flows encountered by existing home owners, improving the flooding risk situation currently experienced by the properties off Fifth Avenue.



- 2.12 A ground water monitoring programme has indicated that the water table is highly seasonable with rapid fluctuations, found generally between 0.31m and 1.97m bgl. It is proposed that only shallow soakaway structures are used and that the site is raised in the region of 450mm to increase the dissolution layer (the distance between the underside of any permeable structure and the groundwater table) to a minimum of 1m.
- 2.13 The material used to raise the site is a free-draining open graded aggregate, i.e. Type 3 granular sub-base or similar. Any residual overland runoff caused by the raising of site levels will be intercepted by a proposed network of land drains and ditches around the western boundary of the site and conveyed into the proposed development drainage system.

3 Designing for Exceedance

- 3.1 In the rare occurrence of an exceedance rainfall event (>1:100+30%) or during periods of exceptionally high groundwater, there are two flood flow routes for safely managing excess runoff from both soakaways and the permeable block paving.
A 'back-up' overflow system (below ground within the permeable paving stone sub-base) and an overland (above ground) flood route will be incorporated into the drainage system to ultimately direct excess runoff into a series of attenuation ponds situated at the eastern boundary of the site.
A series of cellular Permaflow cells connected to DN150 overflow pipes located within the stone sub-base at the eastern extent of the permeable block paved highway will collect and discharge flows into the balancing ponds.
- 3.2 If groundwater should rise into the road stone sub-base / soakaways, or the capacity of the permeable paving / soakaways to infiltrate is exceeded, runoff will already be transferring horizontally through the stone sub-base of the road across the site, via the hydraulic gradient to the low point (eastern boundary) and discharging through the overflows into the balancing ponds, providing a continual capacity with the sub-base system to receive further groundwater and overflows from soakaways.
During the majority of exceedance events flood water will be contained below the surface of the road.
- 3.3 The vast majority of house soakaways incorporate a high level overflow connected to the stone sub-base of the permeable blocked paved highways.
Out of the proposed 191 units for the whole Manor Farm and Copsey's Nurseries development, only 19 soakaways are not provided with an overflow.
All soakaways along the critical western boundary have an overflow into the land drain, providing flood protection to the existing properties that border the site.
- 3.4 During an exceedance event (>1:100+30%) the soakaways for these 19 properties will surcharge from the upstream catchpit manhole from the soakaway unit, where runoff will be primarily contained within the limits of the rear garden by fencing / brick walls.
This flood water will temporarily pond on the surface of the rear garden until capacity returns within the soakaway and surrounding soils.
If residual flood water should flow beyond the boundary of the property, the design level of rear gardens and finished floor levels of houses (min 150mm above ground level) will prevent property flooding and route runoff through gardens and between properties to the downstream permeable drives / highway and into the main overflow system.
- 3.5 Across the site the overflow conveyance system will be the main carriageways.
The whole site incorporates block paved carriageway with raised pavement edged with kerbs and drop kerbs to contain all runoff within the carriageway at all locations.
The level of this road will provide the conduit to route runoff to the eastern low point of the site (adjacent to balancing ponds).
The raised kerb / back of footpath (where there are dropped kerbs) provides a minimum depth of 150mm the length of the carriageway, ensuring runoff is contained within the limits of the road.
The resulting flood flow will tip into the balancing ponds as described above along routes where the risk of property flooding and the risk to health and safety is minimal.
This is in line with CIRIA document C635 - Designing for exceedance in urban drainage.

- 3.6 Refer to the site Flood Risk Assessment (Ref: MJA CP/13/0105/4527) for detailed calculations of the estimated peak runoff rates and volumes of surface water leaving the site, for the pre and post development conditions.
- 3.7 Note that although the 'proposed' peak runoff rate within the FRA is stated for a range of return periods, (1046 l/s for the 1:100+30% event) this in reality is only an approximate figure derived from the 'Rational Method' and is only used in pre-detailed design to give an approximate figure of pre & post development runoff and volumes generated, regardless of proposed drainage strategy.
This assumes complete failure of all the primary infiltration systems for the whole site and assumes 100% runoff from all impermeable areas on the development discharging to the downstream end of the system.
- 3.8 Current limitations of modelling software mean it is not possible to accurately demonstrate the laminar horizontal flow rate of runoff over a specified gradient through a granular media.
However, our investigations have concluded that the approximate K(i) value (hydraulic conductivity at a specific gradient and head) of 10-63mm coarse aggregate laid at a gradient of 1:250 is approximately 5m/minute (0.08m/sec).
This demonstrates that any groundwater entering the system at the furthest point of the site would reach the balancing ponds within approximately 20-30 minutes, ensuring continual capacity is provided within the system to adequately receive and discharge flows in the event of high groundwater.
- 3.9 The 30 minute 'time of concentration' is a reasonably conservative estimate for preliminary purposes, but can by no means be quantified as there are too many variables within the system and this does not represent the integrated effects of infiltration, evaporation, retention, flow routing, and interception, all of which affect the time distribution and peak rate of runoff.
- 3.10 Notwithstanding, if 100% of the infiltration system should completely fail and groundwater should rise into the permeable road sub-base, runoff will already be overflowing into the ponds at the downstream end of the system through the permavoids at a combined rate of 88 l/s providing continually capacity within the whole paving system to receive further runoff.
If the peak rate of runoff at the downstream end of the system should exceed the capacity of the piped overflow system (88 l/s), then flood waters will temporarily rise to the surface of the permeable paving at this downstream point of the site.
Raised kerb edging, drives and slab levels (main 150mm above ground level) will prevent flooding to properties.
A 50mm kerb face on the eastern side of the downstream road will temporary retain a maximum of 50mm depth of water before tipping overland away from properties and following the topography of the site where all runoff will discharge safely into the balancing ponds.
These balancing pond are designed to attenuate 100% of the runoff protecting the Nore Farm Stream.



- 3.11 The highest groundwater levels recorded during the two year monitoring program are below the base of the proposed permeable road construction in all nine test locations, owing to the proposed raising of ground levels across the site.
The level of the permeable block paving roads and stone sub-base across the site has been designed to create an overall fall towards the eastern low point of the site.
In the event that groundwater rises above the underside of the permeable paving sub-base, exceedance flows (groundwater and rainfall runoff) will be safely conveyed within the stone sub-base across the site towards the eastern low point due to hydraulic gravity.
The approximate gradient of the paving sub-base is 1:250.
Refer to Appendix C for a typical section through the permeable block paving and balancing pond, demonstrating the link through the SuDS components in the system.
- 3.12 A series of cellular Permavoid cells connected to DN150 overflow pipes located within the stone sub-base at the eastern extent of the permeable block paving will collect and discharge flows into the balancing ponds (Manor Farm) and both the watercourse and balancing pond (Copseys Nursery).
A single permavoid cell with a DN150 overflow pipe has a flow capacity of 8 l/s.
There are 11no. overflows into the 4no. balancing ponds equating to a potential total discharge capability of 88 l/s (317m³/hr) from the sub-base system and into the ponds.

4 Managing Flood Risk Safely

- 4.1 NPPF states that for developments at high flood risk of flooding from any source, it is necessary to assess the danger of that source to properties and prove safe access and egress routes in the event of an extreme flood, in accordance with DEFRA report 'Flood Risk Assessment Guidance for New Developments R&D Technical Report FD2320' and CIRIA document C635 - Designing for exceedance in urban drainage.
- 4.2 Across the site the primary overland exceedance conveyance system will be the roads. The whole site incorporates block paved carriageway with raised pavement edged with kerbs and drop kerbs to contain all runoff within the carriageway. The levels of this road will provide the conduit to route runoff to the eastern low point of the site (adjacent to balancing ponds). This provides a minimum depth of 150mm to back of footpath / drop kerb at any given point along the carriageway / drives, ensuring runoff is contained within the limits of the road. A 50mm kerb face on the eastern side of the downstream road will temporarily retain a maximum of 50mm depth of water before the resulting flood flows spill into the balancing ponds as described above along routes where the risk of property flooding and the risk to health and safety is minimal.
- 4.3 Refer to Appendix A for Flood Flow Route plans incorporating the potential flood flow routes and identifying areas of potential ponding with associated maximum depth of water. Referencing the table below (Fig 8 from FD2320), it can be demonstrated that all areas of potential ponding are below the threshold considered a danger for safe access and egress.
- 4.4 Locations of potential ponding have been identified with the maximum depth ranging from 0.05-0.2m. Due to the flat nature of the site the velocity of this flow is likely to be $<0.5\text{m/s}$. Therefore referencing the table below from FD2320, it can be demonstrated that all areas of potential ponding are below the threshold considered a danger for safe access and egress.
- 4.5 In a small number of locations it has been determined that the potential secondary overland flood route could occur through residential parking areas and private rear gardens, with the depth of these waters considered to be low risk ($<0.05\text{m}$). The design level of rear gardens and finished floor levels of properties (min 150mm above surrounding ground level) will prevent property flooding and safely route runoff to downstream permeable drives / highway and into the main overflow system.



Figure 8: Table 13.1 FD2320/TR2

Velocity (m/s)	Depth of flooding (m)											
	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.00												
0.10												
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- Key:
- Danger for some
 - Danger for most
 - Danger for all

5 Detailed Design

5.1 Pond Lining Calculations

The highest groundwater level was 0.31mBGL at borehole 5(GL 13.60mAOD) making the water level 13.29mAOD.

The base of all ponds are set at 12.80mAOD, therefore the potential groundwater level is 490mm above the base of the ponds.

Uplift force of groundwater = $10\text{ kN/m}^3 \times \text{potential water depth above base of liner } 0.990\text{m}$
 $(0.49 + 0.20\text{m topsoil} + 0.30\text{m of stone}) = \mathbf{9.9\text{ kN/m}^2 \text{ UPLIFT}}$

Mass of topsoil = $19.5\text{ kN/m}^3 \times 0.200\text{m} = 3.9\text{ kN/m}^2$

Mass of stone = $20\text{ kN/m}^3 \times 0.300\text{m} = 6.6\text{ kN/m}^2$

Bentonite Liner = 0.05 kN/m^2

Total mass = **$10.55\text{ kN/m}^2 \text{ DOWNFORCE}$**

Therefore the total force acting on the liner is sufficient to prevent uplift if groundwater should rise above the base of the pond.

5.2 Soakaway Design / Maintenance

Results from the 5No. soakaway tests carried out during the site investigation:

Test 1 – $5.8 \times 10^{-6}\text{ m/s}$

Test 2 – 1.2×10^{-5}

Test 3 – 1.9×10^{-6}

Test 4 – 3.1×10^{-6}

Test 5 – 1.8×10^{-6}

Average – 4.9×10^{-6}

The calculations have been run using the 5 test average infiltration rate of $4.9 \times 10^{-6}\text{ m/s}$ and demonstrates the specified soakaways can adequately manage the 1:100+30% event.

The majority of properties discharge into the road sub-base or to an individual soakaway within its rear garden, so is not reliant upon others for their regular drainage.

Where linked soakaways have been proposed, a management company will share maintenance responsibility with all effected homeowners by writing to residents annually to offer inspection of the soakaway and associated pipework/chambers and to carry out maintenance where necessary.

Refer to Appendix D for soakaway calculations.

5.3 Diversion of existing ditch

Consent from Hampshire County Council for the proposed ditch diversion works between Manor Farm and Copseys Nurseries has been given.

Refer to Appendix E for Decision Notice OWC-2014-0262

5.4 Copsey's Nurseries Re-plan

An area of the Copsey's Nurseries development has been re-planned increasing the number of plot by 9 units bringing the total site wide number to 200 units.

Although the number of units has changed, the surrounding highways, finished slab levels, ground, road levels and flood routes have not been effected by the re-plan.



APPENDIX A



FOR INFORMATION

REV. No.	DATE	DESCRIPTION	INITIALS
Client			
Project			
Site			
Scale			
Checked			
Date			
Drawn			
Drawing No.			
Rev			

BARRATT
BARRATT SOUTHAMPTON

MJA CONSULTING
CIVIL AND STRUCTURAL ENGINEERS

Manor Farm
Denville

Scale: 1:2500A1
Checked: CP

Date: Sept 14
Drawn: CP

Drawing No: 4527:75

Rev: -



FOR INFORMATION

REV. No.	DATE	DESCRIPTION	INITIALS
Client			
BARRATT			
BARRATT SOUTHAMPTON			
Project Manor Farm			
Dennville			
Title Exceedance Flow			
Routes			
Sheet 2 of 3			
Scale 2500A1	Date Sept 14	Drawing No 4527:76	Rev -
Checked	Drawn CP		

MJA CONSULTING
CIVIL AND STRUCTURAL ENGINEERS
10-12 Oak Street, Brighton
Phone: 01323 555111
Fax: 01323 555112
Email: info@mjaconsulting.co.uk







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Client	Barrett	Barrett Southamptons	Project	Copsey Nursery Derrivilles	Scale	1:250@A1	Date	Sept 14	Drawing No.	4884:76
Exceedance Flow Routes	Sheet 2 of 3	Checked	Drawn	CP						

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REV. No.	DATE	DESCRIPTION	INITIALS
Client	 		
Project	Copsey Nursery Demolition		
Title	Exceedance Flow Routes Sheet 2 of 3		
Scale	1:250@A1	Date	Sept 14
Checked		Drawn	CP
		Drawing No.	4884:76



APPENDIX B

KEY:

Proposed Adoptable Sewers:

- Foul sewer
- Storm sewer
- Highway Gully

Proposed Private Drainage:

- Foul drain
- Storm drain
- Rodding eye
- Yard gully
- Aco drain

Permeable distribution tank by Charcon 708 x 354 x 150mm

All private inspection chambers shall be polypropylene non-access chambers in accordance with The Building Regulations, Part H

Chamber sizes:
Depth to invert < 0.6m DN300
Depth to invert > 0.6m DN475

Invert levels shown thus: F10.00 F10.00
Finished floor levels shown thus: FFL 10.00
Fall Arrows:
Proposed Levels:
Primary Access:
Secondary Access:

CELLULAR SOAKAWAY SIZES

- A = 2.0 x 2.0 x 0.8m
- B = 3.0 x 2.5 x 0.8m
- C = 3.0 x 4.0 x 0.8m
- D = 4.0 x 4.0 x 0.8m

ALL SOAKAWAYS DESIGNED TO RECEIVE THE 1:100 YEAR + 30% CC STORM FOS x2

SOAKAWAYS CAN BE RE-SHAPED TO SUIT LOCATION PROVIDED STORAGE VOLUME IS MAINTAINED

FOR CONSTRUCTION

REV	NO	DATE	DESCRIPTION	INITIALS
1	20.02.14		Boundary to the rear of plots 74-78 amended	KTG
2	15.01.15		Southern Water comments re storm drains all added to layout	KTG
3	09.01.14		Revised to construction	KTG
4	14.10.12		Pumping station added & utility chamber all rising main	KTG
5	18.09.13		Lotential adoptable memoranda numbered	KTG
6	14.08.13		VWS propose invert levels revised	KTG
7	29.07.12		Disconnection unit added to rising main following comment from SW	KTG

Client		MJA CONSULTING	
BARRATT SOUTHAMPTON		CIVIL AND STRUCTURAL ENGINEERS	
Project		Manor Farm Denvilles	
Title		Engineering and drainage layout	
Scale		1:250 @ A1	
Date		Feb 13	
Drawn by		KTG	
Drawing No		4527:01	

For Notes see drawing 4527:03

CELLULAR SOAKAWAY SIZES:

- A = 2.0 x 2.0 x 0.8m
- B = 3.0 x 2.5 x 0.8m
- C = 3.0 x 4.0 x 0.8m
- D = 4.0 x 4.0 x 0.8m

ALL SOAKAWAYS DESIGNED TO RECEIVE THE 1:100 YEAR + 30% CC

SOAKAWAYS CAN BE RE-SHAPED TO SUIT LOCATION PROVIDED STORAGE VOLUME IS MAINTAINED

PERMAVOID DISTRIBUTION CELL BY CHARCON 708 x 154 x 150mm

PERMEABLE BLOCK PAVING

PERMEABLE MACADAM

VERGE

KEY:

Proposed Adoptable Sewers:



All private inspection chambers shall be polypropylene non-access chambers in accordance with The Building Regulations, Part H

Chamber sizes:
Depth to invert <0.6m DN300
Depth to invert >0.6m DN475

Invert levels shown thus: F10.00 S10.00

Finished floor levels shown thus: FFL 10.00

Fall Arrows

Proposed Levels

Primary Access

Secondary Access

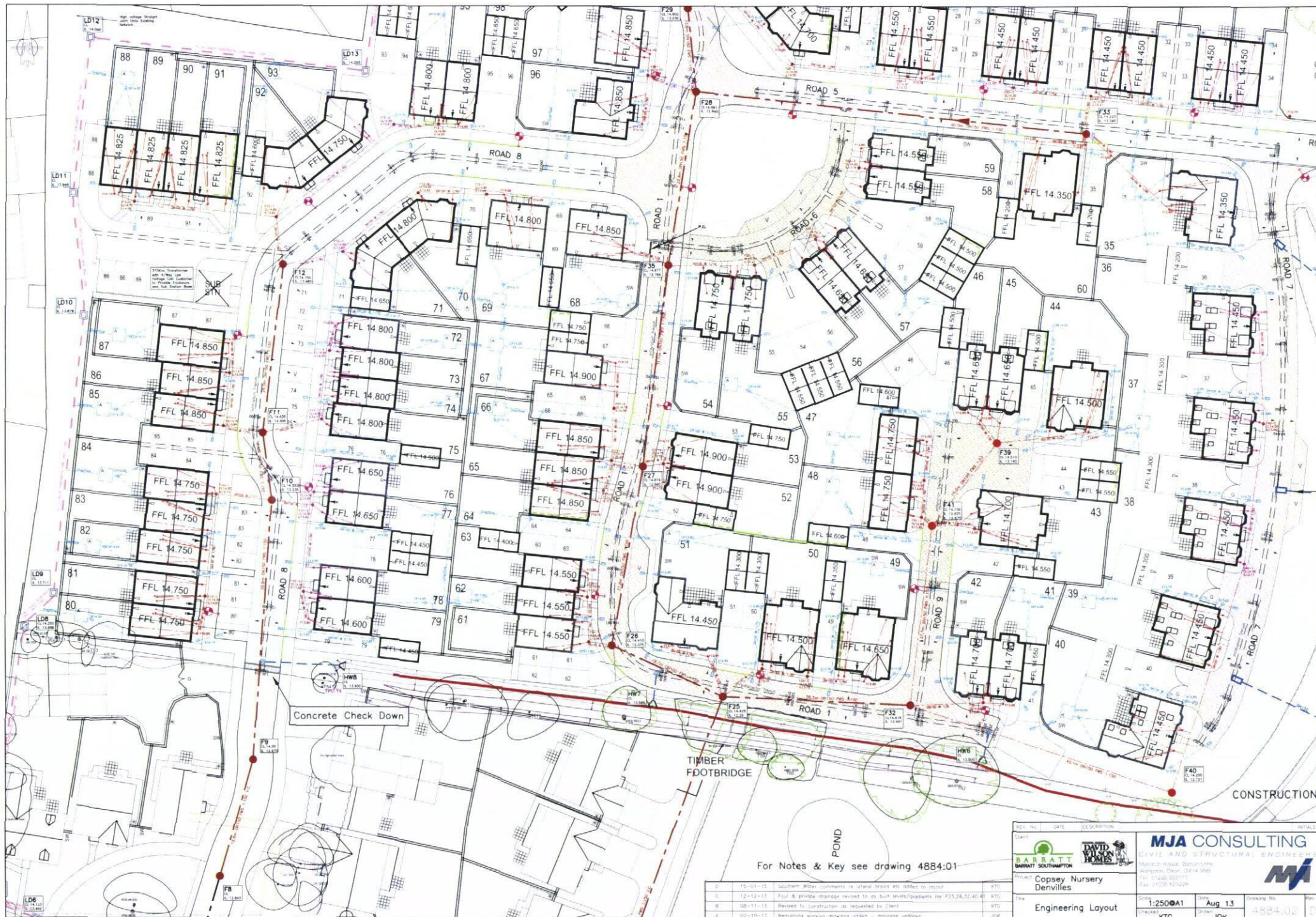
3m - 10m LANDSCAPE BUFFER

Construction Notes:

- Do not scale from this drawing.
- All dimensions in metres
- All levels relate to Ordnance Datum
- This drawing is based on the latest Architectural planning layout and shall be read in conjunction with all other relevant longitudinal sections and construction drawings
- Any discrepancies with any of the drawings shall be reported to MJA Consulting Engineer
- The level and location of all existing services shall be verified on site by the Contractor before commencing any construction work.
- Contractor must comply with all current legislation relating to CDM, Health and Safety and COSHH
- All material in excess of 20kg (i.e. kerbs, manhole units, cover etc.) shall be mechanically lifted and laid where possible at all times.
- Manholes, sewers, headwalls and other structures intended to convey surface water or sewerage are to be constructed in accordance with the Water Authorities Association specification "Sewers for Adoption" 6th edition and the Interim Technical Addendum No 1 (ITA1) published May 2011, and to Southern Water specification and addendum.
- Gullies, gully connections, drains, manholes, catchpits, soakaways, headwalls and other drainage structures intended to convey highway water are to be constructed in accordance with the specification issued by Hampshire County Council.
- All foul and storm water drains which are not to be adopted as public sewers under a section 104 agreement shall be constructed using uPVC pipes or similar approved, bedded and backfilled in accordance with the manufacturers instructions and to the Building Regulations Part H, BS EN 752 & BREE SD1
- All building drainage to be 100mm dia laid at a minimum gradient of 1 in 40 where serving less than 1 WC, 1 in 80 otherwise (RW) and 1 in 80 (SW) unless otherwise shown
- Sewers and drains of different diameters should be laid soffit to soffit
- Inspection chambers on private drains shall be non-access preformed polypropylene:
Depth to invert Minimum size:
< 0.6m DN300
> 0.6m DN475
in accordance with the Building Regulations Part H & BS EN 752
- Position of soil pipes, stubstacks, WC outlets rainwater downpipes etc positions shall be checked against architects house type drawings to ensure compatibility
- Where back inlet gullies are used they should be roddable
- All stub stacks to be fitted with air admittance valve where branch drain exceeds 12m except at head of run
- Rainwater downpipes to be connected directly to drains via removable adapter to permit access for rodding
- Positions of yard and house gullies are nominal and may be adjusted on site, aco drains to be installed at the end of all drives falling towards the public highway. All gully gratings in drives and parking areas should be of sufficient strength to withstand vehicular loading
- Lintels or sleeves are to be provided for drains passing through foundation brickwork
- All gully connections to be 150 dia uPVC ultrabond or similar
- All gully connections other than at manholes to be "Y" junctions
- All drain runs are to be flushed through and building materials removed where necessary at the time of final test by Building Inspector and prior to occupation
- All soakaways to be positioned a minimum of 50m from buildings (where utilised)
- All finished floor levels are shown on the drawing for guidance only and may need to be adjusted on site. However there is to be no deviation without prior approval
- All drives are to have a crossfall or gradient of 1:40 minimum. Maximum drive gradient on down slopes to be 1 in 10 and 1 in 8 on up slopes
- Continuous edging to be laid at rear of service margin



MJA CONSULTING CIVIL AND STRUCTURAL ENGINEERS Manly House, Barton Lane Wokingham, Dorset, BA14 4BB Tel: 01248 553171 Fax: 01248 553229		Engineering Layout Scale: 1:2500 A1 Date: Aug 13 Drawn: JOK Checked: JOK
--	--	---



For Notes & Key see drawing 4884:01

D	15-01-15	Southern Water comments re lateral drains etc added to layout	KTG
C	12-12-13	Final & probe drainage revised to its final levels/spotfalls for F25,26,32,42 etc	KTG
B	08-11-13	Revised to construction as requested by Client	KTG
A	02-10-13	Revising working drawings, added drainage updates	JOK

Client: Barratt Southamption	Date: 13 Aug 2015	Description: Copsey Nursery Denville	Scale: 1:250	Date: Aug 13	Drawing No: 4884:02
Project: Copsey Nursery Denville			Scale: 1:250	Date: Aug 13	Drawing No: 4884:02
Engineering Layout			Scale: 1:250	Date: Aug 13	Drawing No: 4884:02

MJA CONSULTING
 CIVIL AND STRUCTURAL ENGINEERS
 Manton House, Barton Arms
 Ainslie, Dorset, DT11 4 3BH
 Tel: 01426 503171
 Fax: 01426 503229



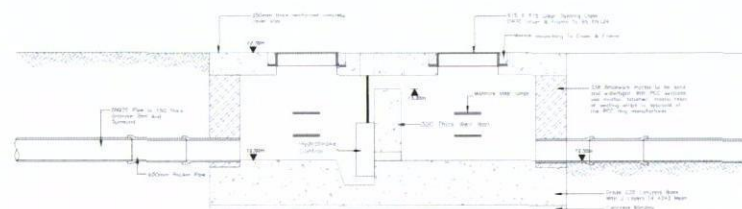
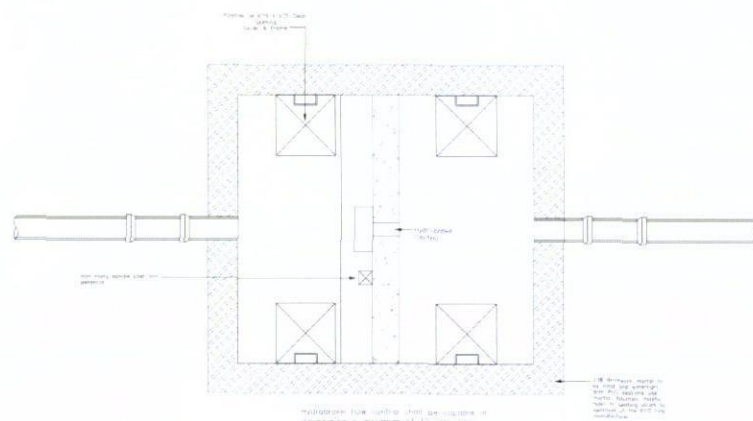
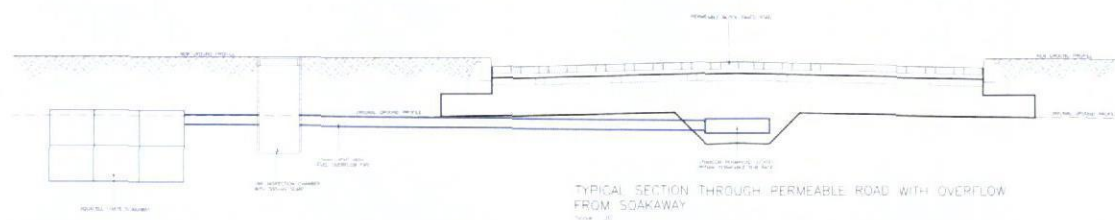
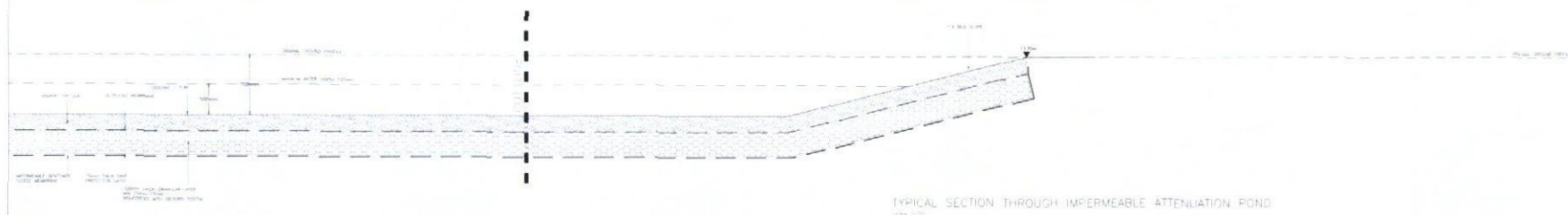
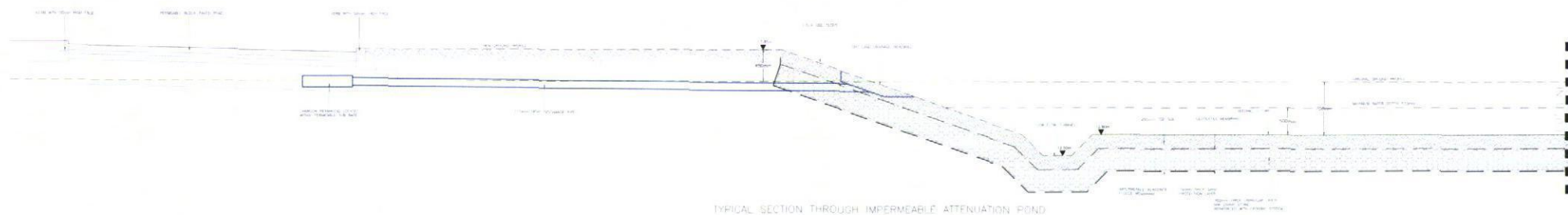
ALLOTMENTS - 24 PLOTS @ 75 sq m



				CONSTRUCTION	
Q	15-07-15	Southern Water comments re lateral drain etc. added to drawing			KTG
Q	12-12-13	Foul & waste drainage revised to suit built works/probables for 12.15.13 32.40.41			KTG
R	08-11-13	Revised to construction as requested by Client			KTG
A	22-11-13	Remaining working drawings issued - drainage updated			JOK
REV. No.	Date	By/Comments			NATROL
Client			  		
Project Cospsey Nursery Devniles					
Title	Drawn 1:250/0A1 Checked KTG	Date Aug 13 Drawn JOK	Working No.	4884.03	
Engineering Layout					



APPENDIX C

[illegible]



APPENDIX D

Michael A Jennings Associates			Page 1		
58-62 Ock Street		Copseys Nursey, Denvi...			
Abingdon		Soakaway Type A			
Oxon OX14 5BZ		2.0 x 2.0 x 0.8m deep			
Date 24.10.13		Designed by C.Pendle			
File SOAKAWAY TYPE A....		Checked by			
Micro Drainage		Source Control 2013.1.1			
Summary of Results for 100 year Return Period (+30%)					
Half Drain Time : 569 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.286	0.286	0.0	1.1	O K
30 min Summer	99.380	0.380	0.0	1.4	O K
60 min Summer	99.477	0.477	0.0	1.8	O K
120 min Summer	99.568	0.568	0.0	2.2	O K
180 min Summer	99.610	0.610	0.0	2.3	O K
240 min Summer	99.630	0.630	0.0	2.4	O K
360 min Summer	99.645	0.645	0.0	2.5	O K
480 min Summer	99.647	0.647	0.0	2.5	O K
600 min Summer	99.646	0.646	0.0	2.5	O K
720 min Summer	99.642	0.642	0.0	2.4	O K
960 min Summer	99.630	0.630	0.0	2.4	O K
1440 min Summer	99.599	0.599	0.0	2.3	O K
2160 min Summer	99.550	0.550	0.0	2.1	O K
2880 min Summer	99.504	0.504	0.0	1.9	O K
4320 min Summer	99.425	0.425	0.0	1.6	O K
5760 min Summer	99.359	0.359	0.0	1.4	O K
7200 min Summer	99.303	0.303	0.0	1.2	O K
8640 min Summer	99.257	0.257	0.0	1.0	O K
10080 min Summer	99.218	0.218	0.0	0.8	O K
15 min Winter	99.321	0.321	0.0	1.2	O K
30 min Winter	99.427	0.427	0.0	1.6	O K
60 min Winter	99.537	0.537	0.0	2.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	118.408	0.0	19		
30 min Summer	79.579	0.0	33		
60 min Summer	51.031	0.0	64		
120 min Summer	31.581	0.0	122		
180 min Summer	23.488	0.0	182		
240 min Summer	18.897	0.0	242		
360 min Summer	13.902	0.0	360		
480 min Summer	11.169	0.0	418		
600 min Summer	9.417	0.0	480		
720 min Summer	8.187	0.0	542		
960 min Summer	6.558	0.0	674		
1440 min Summer	4.789	0.0	952		
2160 min Summer	3.489	0.0	1364		
2880 min Summer	2.783	0.0	1764		
4320 min Summer	2.020	0.0	2552		
5760 min Summer	1.607	0.0	3344		
7200 min Summer	1.346	0.0	4104		
8640 min Summer	1.165	0.0	4840		
10080 min Summer	1.032	0.0	5544		
15 min Winter	118.408	0.0	19		
30 min Winter	79.579	0.0	33		
60 min Winter	51.031	0.0	62		
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Michael A Jennings Associates		Page 2
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type A	
Oxon OX14 5BZ	2.0 x 2.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File SOAKAWAY TYPE A....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	99.641	0.641	0.0	2.4	O K
180 min Winter	99.690	0.690	0.0	2.6	O K
240 min Winter	99.715	0.715	0.0	2.7	O K
360 min Winter	99.739	0.739	0.0	2.8	O K
480 min Winter	99.743	0.743	0.0	2.8	O K
600 min Winter	99.738	0.738	0.0	2.8	O K
720 min Winter	99.733	0.733	0.0	2.8	O K
960 min Winter	99.718	0.718	0.0	2.7	O K
1440 min Winter	99.674	0.674	0.0	2.6	O K
2160 min Winter	99.601	0.601	0.0	2.3	O K
2880 min Winter	99.535	0.535	0.0	2.0	O K
4320 min Winter	99.422	0.422	0.0	1.6	O K
5760 min Winter	99.333	0.333	0.0	1.3	O K
7200 min Winter	99.260	0.260	0.0	1.0	O K
8640 min Winter	99.202	0.202	0.0	0.8	O K
10080 min Winter	99.154	0.154	0.0	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
120 min Winter	31.581	0.0	120
180 min Winter	23.488	0.0	178
240 min Winter	18.897	0.0	236
360 min Winter	13.902	0.0	348
480 min Winter	11.169	0.0	454
600 min Winter	9.417	0.0	540
720 min Winter	8.187	0.0	568
960 min Winter	6.558	0.0	722
1440 min Winter	4.789	0.0	1026
2160 min Winter	3.489	0.0	1472
2880 min Winter	2.783	0.0	1904
4320 min Winter	2.020	0.0	2724
5760 min Winter	1.607	0.0	3512
7200 min Winter	1.346	0.0	4256
8640 min Winter	1.165	0.0	5016
10080 min Winter	1.032	0.0	5744

Michael A Jennings Associates		Page 3
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type A	
Oxon OX14 5BZ	2.0 x 2.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File SOAKAWAY TYPE A....	Checked by	
Micro Drainage	Source Control 2013.1.1	

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.005

Time (mins)	Area
From:	To: (ha)

0	4	0.005
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Michael A Jennings Associates		Page 4
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type A	
Oxon OX14 5BZ	2.0 x 2.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File SOAKAWAY TYPE A....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.01771 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.01771

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	4.0	4.0	0.900	0.0	10.4
0.800	4.0	10.4			

Michael A Jennings Associates			Page 1		
58-62 Ock Street		Copseys Nursey, Denvi...			
Abingdon		Soakaway Type B			
Oxon OX14 5BZ		2.5 x 3.0 x 0.8m deep			
Date 24.10.13		Designed by C.Pendle			
File Soakaway Type B....		Checked by			
Micro Drainage		Source Control 2013.1.1			
Summary of Results for 100 year Return Period (+30%)					
Half Drain Time : 696 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.306	0.306	0.1	2.2	O K
30 min Summer	99.407	0.407	0.1	2.9	O K
60 min Summer	99.513	0.513	0.1	3.7	O K
120 min Summer	99.614	0.614	0.1	4.4	O K
180 min Summer	99.663	0.663	0.1	4.7	O K
240 min Summer	99.689	0.689	0.1	4.9	O K
360 min Summer	99.715	0.715	0.1	5.1	O K
480 min Summer	99.721	0.721	0.1	5.1	O K
600 min Summer	99.720	0.720	0.1	5.1	O K
720 min Summer	99.717	0.717	0.1	5.1	O K
960 min Summer	99.707	0.707	0.1	5.0	O K
1440 min Summer	99.679	0.679	0.1	4.8	O K
2160 min Summer	99.631	0.631	0.1	4.5	O K
2880 min Summer	99.586	0.586	0.1	4.2	O K
4320 min Summer	99.505	0.505	0.1	3.6	O K
5760 min Summer	99.435	0.435	0.1	3.1	O K
7200 min Summer	99.374	0.374	0.1	2.7	O K
8640 min Summer	99.322	0.322	0.1	2.3	O K
10080 min Summer	99.278	0.278	0.1	2.0	O K
15 min Winter	99.335	0.335	0.1	2.4	O K
30 min Winter	99.446	0.446	0.1	3.2	O K
60 min Winter	99.563	0.563	0.1	4.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	118.408	0.0	19		
30 min Summer	79.579	0.0	34		
60 min Summer	51.031	0.0	64		
120 min Summer	31.581	0.0	122		
180 min Summer	23.488	0.0	182		
240 min Summer	18.897	0.0	242		
360 min Summer	13.902	0.0	360		
480 min Summer	11.169	0.0	476		
600 min Summer	9.417	0.0	524		
720 min Summer	8.187	0.0	586		
960 min Summer	6.558	0.0	712		
1440 min Summer	4.789	0.0	982		
2160 min Summer	3.489	0.0	1404		
2880 min Summer	2.783	0.0	1816		
4320 min Summer	2.020	0.0	2596		
5760 min Summer	1.607	0.0	3400		
7200 min Summer	1.346	0.0	4176		
8640 min Summer	1.165	0.0	4928		
10080 min Summer	1.032	0.0	5648		
15 min Winter	118.408	0.0	19		
30 min Winter	79.579	0.0	33		
60 min Winter	51.031	0.0	62		
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Michael A Jennings Associates		Page 2
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type B	
Oxon OX14 5BZ	2.5 x 3.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type B....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	99.675	0.675	0.1	4.8	O K
180 min Winter	99.731	0.731	0.1	5.2	O K
240 min Winter	99.761	0.761	0.1	5.4	O K
360 min Winter	99.794	0.794	0.1	5.7	O K
480 min Winter	99.807	0.807	0.1	5.7	O K
600 min Winter	99.807	0.807	0.1	5.7	O K
720 min Winter	99.801	0.801	0.1	5.7	O K
960 min Winter	99.788	0.788	0.1	5.6	O K
1440 min Winter	99.750	0.750	0.1	5.3	O K
2160 min Winter	99.682	0.682	0.1	4.9	O K
2880 min Winter	99.616	0.616	0.1	4.4	O K
4320 min Winter	99.500	0.500	0.1	3.6	O K
5760 min Winter	99.403	0.403	0.1	2.9	O K
7200 min Winter	99.322	0.322	0.1	2.3	O K
8640 min Winter	99.255	0.255	0.1	1.8	O K
10080 min Winter	99.199	0.199	0.0	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
120 min Winter	31.581	0.0	120
180 min Winter	23.488	0.0	178
240 min Winter	18.897	0.0	236
360 min Winter	13.902	0.0	350
480 min Winter	11.169	0.0	460
600 min Winter	9.417	0.0	566
720 min Winter	8.187	0.0	660
960 min Winter	6.558	0.0	748
1440 min Winter	4.789	0.0	1054
2160 min Winter	3.489	0.0	1512
2880 min Winter	2.783	0.0	1956
4320 min Winter	2.020	0.0	2772
5760 min Winter	1.607	0.0	3576
7200 min Winter	1.346	0.0	4392
8640 min Winter	1.165	0.0	5104
10080 min Winter	1.032	0.0	5848

Michael A Jennings Associates		Page 3
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type B	
Oxon OX14 5BZ	2.5 x 3.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type B....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.820
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.010

Time (mins) Area
From: To: (ha)

0 4 0.010

Michael A Jennings Associates		Page 4
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type B	
Oxon OX14 5BZ	2.5 x 3.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type B....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.01771 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.01771

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	7.5	7.5	0.900	0.0	16.3
0.800	7.5	16.3			

Michael A Jennings Associates			Page 1		
58-62 Ock Street		Copseys Nursey, Denvi...			
Abingdon		Soakaway Type C			
Oxon OX14 5BZ		3.0 x 4.0 x 0.8m deep			
Date 24.10.13		Designed by C.Pendle			
File Soakaway Type C....		Checked by			
Micro Drainage		Source Control 2013.1.1			
Summary of Results for 100 year Return Period (+30%)					
Half Drain Time : 755 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.287	0.287	0.1	3.3	O K
30 min Summer	99.382	0.382	0.1	4.4	O K
60 min Summer	99.481	0.481	0.1	5.5	O K
120 min Summer	99.577	0.577	0.1	6.6	O K
180 min Summer	99.624	0.624	0.1	7.1	O K
240 min Summer	99.650	0.650	0.1	7.4	O K
360 min Summer	99.676	0.676	0.1	7.7	O K
480 min Summer	99.684	0.684	0.1	7.8	O K
600 min Summer	99.683	0.683	0.1	7.8	O K
720 min Summer	99.680	0.680	0.1	7.8	O K
960 min Summer	99.670	0.670	0.1	7.6	O K
1440 min Summer	99.644	0.644	0.1	7.3	O K
2160 min Summer	99.599	0.599	0.1	6.8	O K
2880 min Summer	99.557	0.557	0.1	6.3	O K
4320 min Summer	99.480	0.480	0.1	5.5	O K
5760 min Summer	99.411	0.411	0.1	4.7	O K
7200 min Summer	99.352	0.352	0.1	4.0	O K
8640 min Summer	99.301	0.301	0.1	3.4	O K
10080 min Summer	99.257	0.257	0.1	2.9	O K
15 min Winter	99.322	0.322	0.1	3.7	O K
30 min Winter	99.429	0.429	0.1	4.9	O K
60 min Winter	99.541	0.541	0.1	6.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	118.408	0.0	19		
30 min Summer	79.579	0.0	34		
60 min Summer	51.031	0.0	64		
120 min Summer	31.581	0.0	122		
180 min Summer	23.488	0.0	182		
240 min Summer	18.897	0.0	242		
360 min Summer	13.902	0.0	360		
480 min Summer	11.169	0.0	480		
600 min Summer	9.417	0.0	550		
720 min Summer	8.187	0.0	608		
960 min Summer	6.558	0.0	732		
1440 min Summer	4.789	0.0	996		
2160 min Summer	3.489	0.0	1408		
2880 min Summer	2.783	0.0	1820		
4320 min Summer	2.020	0.0	2636		
5760 min Summer	1.607	0.0	3408		
7200 min Summer	1.346	0.0	4176		
8640 min Summer	1.165	0.0	4928		
10080 min Summer	1.032	0.0	5648		
15 min Winter	118.408	0.0	19		
30 min Winter	79.579	0.0	33		
60 min Winter	51.031	0.0	62		
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Michael A Jennings Associates			Page 2		
58-62 Ock Street		Copseys Nursey, Denvi...			
Abingdon		Soakaway Type C			
Oxon OX14 5BZ		3.0 x 4.0 x 0.8m deep			
Date 24.10.13		Designed by C.Pendle			
File Soakaway Type C....		Checked by			
Micro Drainage		Source Control 2013.1.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	99.651	0.651	0.1	7.4	O K
180 min Winter	99.706	0.706	0.1	8.0	O K
240 min Winter	99.737	0.737	0.1	8.4	O K
360 min Winter	99.772	0.772	0.1	8.8	O K
480 min Winter	99.786	0.786	0.1	9.0	O K
600 min Winter	99.789	0.789	0.1	9.0	O K
720 min Winter	99.785	0.785	0.1	9.0	O K
960 min Winter	99.771	0.771	0.1	8.8	O K
1440 min Winter	99.737	0.737	0.1	8.4	O K
2160 min Winter	99.674	0.674	0.1	7.7	O K
2880 min Winter	99.611	0.611	0.1	7.0	O K
4320 min Winter	99.497	0.497	0.1	5.7	O K
5760 min Winter	99.400	0.400	0.1	4.6	O K
7200 min Winter	99.318	0.318	0.1	3.6	O K
8640 min Winter	99.250	0.250	0.1	2.8	O K
10080 min Winter	99.192	0.192	0.1	2.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
120 min Winter	31.581	0.0	120		
180 min Winter	23.488	0.0	180		
240 min Winter	18.897	0.0	238		
360 min Winter	13.902	0.0	352		
480 min Winter	11.169	0.0	464		
600 min Winter	9.417	0.0	572		
720 min Winter	8.187	0.0	674		
960 min Winter	6.558	0.0	764		
1440 min Winter	4.789	0.0	1070		
2160 min Winter	3.489	0.0	1532		
2880 min Winter	2.783	0.0	1964		
4320 min Winter	2.020	0.0	2812		
5760 min Winter	1.607	0.0	3632		
7200 min Winter	1.346	0.0	4400		
8640 min Winter	1.165	0.0	5184		
10080 min Winter	1.032	0.0	5856		
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58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type C	
Oxon OX14 5BZ	3.0 x 4.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type C....	Checked by	
Micro Drainage	Source Control 2013.1.1	

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.015

Time (mins)	Area
From: To:	(ha)

0	4	0.015
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Michael A Jennings Associates		Page 4
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type C	
Oxon OX14 5BZ	3.0 x 4.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type C....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.01771 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.01771

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	12.0	12.0	0.900	0.0	23.2
0.800	12.0	23.2			

Michael A Jennings Associates		Page 1
58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type D	
Oxon OX14 5BZ	4.0 x 4.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type D....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 818 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.287	0.287	0.1	4.4	O K
30 min Summer	99.382	0.382	0.1	5.8	O K
60 min Summer	99.482	0.482	0.1	7.3	O K
120 min Summer	99.579	0.579	0.1	8.8	O K
180 min Summer	99.627	0.627	0.1	9.5	O K
240 min Summer	99.654	0.654	0.1	9.9	O K
360 min Summer	99.682	0.682	0.1	10.4	O K
480 min Summer	99.693	0.693	0.1	10.5	O K
600 min Summer	99.692	0.692	0.1	10.5	O K
720 min Summer	99.689	0.689	0.1	10.5	O K
960 min Summer	99.680	0.680	0.1	10.3	O K
1440 min Summer	99.654	0.654	0.1	9.9	O K
2160 min Summer	99.611	0.611	0.1	9.3	O K
2880 min Summer	99.569	0.569	0.1	8.7	O K
4320 min Summer	99.492	0.492	0.1	7.5	O K
5760 min Summer	99.424	0.424	0.1	6.4	O K
7200 min Summer	99.364	0.364	0.1	5.5	O K
8640 min Summer	99.312	0.312	0.1	4.7	O K
10080 min Summer	99.266	0.266	0.1	4.0	O K
15 min Winter	99.322	0.322	0.1	4.9	O K
30 min Winter	99.429	0.429	0.1	6.5	O K
60 min Winter	99.542	0.542	0.1	8.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	19
30 min Summer	79.579	0.0	34
60 min Summer	51.031	0.0	64
120 min Summer	31.581	0.0	122
180 min Summer	23.488	0.0	182
240 min Summer	18.897	0.0	242
360 min Summer	13.902	0.0	362
480 min Summer	11.169	0.0	480
600 min Summer	9.417	0.0	582
720 min Summer	8.187	0.0	626
960 min Summer	6.558	0.0	752
1440 min Summer	4.789	0.0	1010
2160 min Summer	3.489	0.0	1428
2880 min Summer	2.783	0.0	1844
4320 min Summer	2.020	0.0	2640
5760 min Summer	1.607	0.0	3456
7200 min Summer	1.346	0.0	4184
8640 min Summer	1.165	0.0	4936
10080 min Summer	1.032	0.0	5656
15 min Winter	118.408	0.0	19
30 min Winter	79.579	0.0	33
60 min Winter	51.031	0.0	62

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58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type D	
Oxon OX14 5BZ	4.0 x 4.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type D....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	99.653	0.653	0.1	9.9	O K
180 min Winter	99.709	0.709	0.1	10.8	O K
240 min Winter	99.741	0.741	0.1	11.3	O K
360 min Winter	99.779	0.779	0.1	11.8	O K
480 min Winter	99.795	0.795	0.1	12.1	O K
600 min Winter	99.800	0.800	0.1	12.2	O K
720 min Winter	99.798	0.798	0.1	12.1	O K
960 min Winter	99.784	0.784	0.1	11.9	O K
1440 min Winter	99.752	0.752	0.1	11.4	O K
2160 min Winter	99.691	0.691	0.1	10.5	O K
2880 min Winter	99.629	0.629	0.1	9.6	O K
4320 min Winter	99.516	0.516	0.1	7.8	O K
5760 min Winter	99.417	0.417	0.1	6.3	O K
7200 min Winter	99.333	0.333	0.1	5.1	O K
8640 min Winter	99.262	0.262	0.1	4.0	O K
10080 min Winter	99.202	0.202	0.1	3.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
120 min Winter	31.581	0.0	120
180 min Winter	23.488	0.0	180
240 min Winter	18.897	0.0	238
360 min Winter	13.902	0.0	352
480 min Winter	11.169	0.0	466
600 min Winter	9.417	0.0	576
720 min Winter	8.187	0.0	680
960 min Winter	6.558	0.0	788
1440 min Winter	4.789	0.0	1082
2160 min Winter	3.489	0.0	1540
2880 min Winter	2.783	0.0	1988
4320 min Winter	2.020	0.0	2852
5760 min Winter	1.607	0.0	3640
7200 min Winter	1.346	0.0	4464
8640 min Winter	1.165	0.0	5192
10080 min Winter	1.032	0.0	5944

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58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type D	
Oxon OX14 5BZ	4.0 x 4.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type D....	Checked by	
Micro Drainage	Source Control 2013.1.1	

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)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.020

Time (mins)		Area
From:	To:	(ha)
	0	4 0.020

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58-62 Ock Street	Copseys Nursey, Denvi...	
Abingdon	Soakaway Type D	
Oxon OX14 5BZ	4.0 x 4.0 x 0.8m deep	
Date 24.10.13	Designed by C.Pendle	
File Soakaway Type D....	Checked by	
Micro Drainage	Source Control 2013.1.1	

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 99.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.01771 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.01771

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	16.0	16.0	0.900	0.0	28.8
0.800	16.0	28.8			



APPENDIX E



Hampshire
County Council

Land Drainage Act 1991

Ordinary Watercourse Land Drainage Consent

To: Chris Pendle
Monarch House
Barton Lane
Abingdon
Oxfordshire
OX14 3NB

Consent No: **OWC/2014/0262**

HCC Ref: HVOW012

For: Chris Pendle

Date of Application: 4 June 2014

Hampshire County Council, as Lead Local Flood Authority in exercise of its powers under **Section 23** of the Land Drainage Act 1991, hereby grants its consent for the following works, in accordance with the plans and documents listed and subject to the attached conditions:

Description of works: Ditch to be diverted into proposed attenuation pond, additional flows are to be discharged into this ditch, which are required to be attenuated before discharge into Nore Farm Stream

Location: Hallett Road, Kings Chase, Havant, Hampshire, PO9 2PJ

Watercourse: N/A

Map reference: 473005, 106742

Plans and documents: Location Plan (Fig 1, 2a & 2b), Site Plan, Existing Ordinary Watercourse Plan, 4884:03, Den:DS

This consent shall come into effect on: 31 July 2014

All enquiries should be referred to the Economy, Transport & Environment
Department, The Castle, Winchester, SO23 8UD
Tel: (01962) 846746 Fax: (01962) 847055

**Director of Economy, Transport
& Environment**
31 July 2014

Introduction

This Note does not form part of the Certificate of Authorisation.

Hampshire County Council Land Drainage Consents are required by virtue of the Land Drainage Act 1991. The following activities on an Ordinary (non-main) Watercourse require Local Authority Consent:

under Section 23 of the Land Drainage Act 1991

- the erection or alteration of any mill dam, weir or other like obstruction to the flow of any watercourse
- the erection or alteration of any culvert that would be likely to affect the flow of any watercourse

under Sections 17 and 20(2) of the Land Drainage Act 1991

- Any drainage works carried out by a local authority against flooding in connection with any watercourse

under Section 61F Land Drainage Act 1991 (Inserted by Schedule 22 Environment Act 1995)

- the operation of any drainage works, under the control of any Internal Drainage Board or local authority, so as to manage the level of water in a watercourse for the purposes of facilitating spray irrigation.

Note: Consent under the above legislation is required irrespective of whether the works are permanent or temporary.

Contraventions

In relation to Ordinary Watercourses, the authority can under Section 24 of the Land Drainage Act 1991 serve a legal notice requiring the person to abate the nuisance within a specified time. Failure to abide by such a notice can result in the Hampshire County Council carrying out the necessary remedial work and seeking to recover costs.



Hampshire
County Council

Land Drainage Act 1991

Ordinary Watercourse Land Drainage Consent

1. Written notification is to be provided no less than seven days before commencement of the consented works and upon completion of the works.
2. On completion of the works all debris and surplus material shall be removed from the banks of the watercourse and any bank damage resulting directly or indirectly from the works is to be repaired so as to restore it to its former conditions, all to the satisfaction of Hampshire County Council.
3. Under Regulations 12 and 38 of the Environmental Permitting (England and Wales) Regulations 2010 it is an offence if you cause or knowingly permit a discharge into a watercourse of poisonous, noxious or polluting matter, of any waste matter or of any trade or sewage effluent other than under and in accordance with an environmental permit. The requirements set out within the Environment Agency's Pollution Prevention Guideline 5 (PPG5) entitled "Works and Maintenance in or near Water" must be complied with to ensure the works are carried out in a proper manner and do not adversely affect the watercourse. A copy of this Guideline can be found on the Environment Agency's website at <http://www.environment-agency.gov.uk/ppg>
4. Works should be carried out to ensure minimum obstruction to flows in the watercourse at all times.
5. The mitigation measures detailed in the SSSI Restoration Plan 2014 and the Biodiversity Statement are followed completely through out the period of work.
6. The flow volumes in the original ditch must be maintained through the existing diverted low flow ditch and hydrobrake chamber.

Notes

Hampshire County Council does not accept any responsibility for the design and construction of the works referred hereto and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

The issue of a Land Drainage Consent by Hampshire County Council does not absolve a person proposing to execute works etc. from the need to obtain any other permits, licences, consents, approvals or permissions. This includes Byelaw Consents or permissions (including planning permission), either from Hampshire County Council or other Bodies which may be required in law, or in order to comply with any duties and responsibilities for the protection of the environment. In addition, you should ensure that you obtain the consent of any owners or occupiers of land, as appropriate. This consent does not confer any rights of entry or rights over property.

Attention should be given to safety aspects when carrying out works pursuant to this consent, as structures in watercourses can be a danger to members of the public.

All enquiries should be referred to the Economy, Transport & Environment

Department, The Castle, Winchester, SO23 8UD

Tel: (01962) 846746 Fax: (01962) 847055

**Director of Economy, Transport
& Environment**

31 July 2014

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