

Ventura Developments Ltd
PO Box 3632
Chester
CH1 9NH

16th March 2011

for the attention of Mr Andrew Kennerley

Scheme : Acrefair, Wrexham

Subject : Preliminary Drainage Assessment

Waterco was instructed to carry out Stage 1 of a Preliminary Drainage Assessment (PDA) for a proposed residential development of 5 houses at King Street, Acrefair, Wrexham, LL14 3RH. Grid Reference 327783, 343012.

The purpose of this PDA is to assess the likely surface water and foul drainage solutions, before proceeding to the detailed design stage. Each drainage solution is discussed further below.

Drainage Solutions

Surface Water

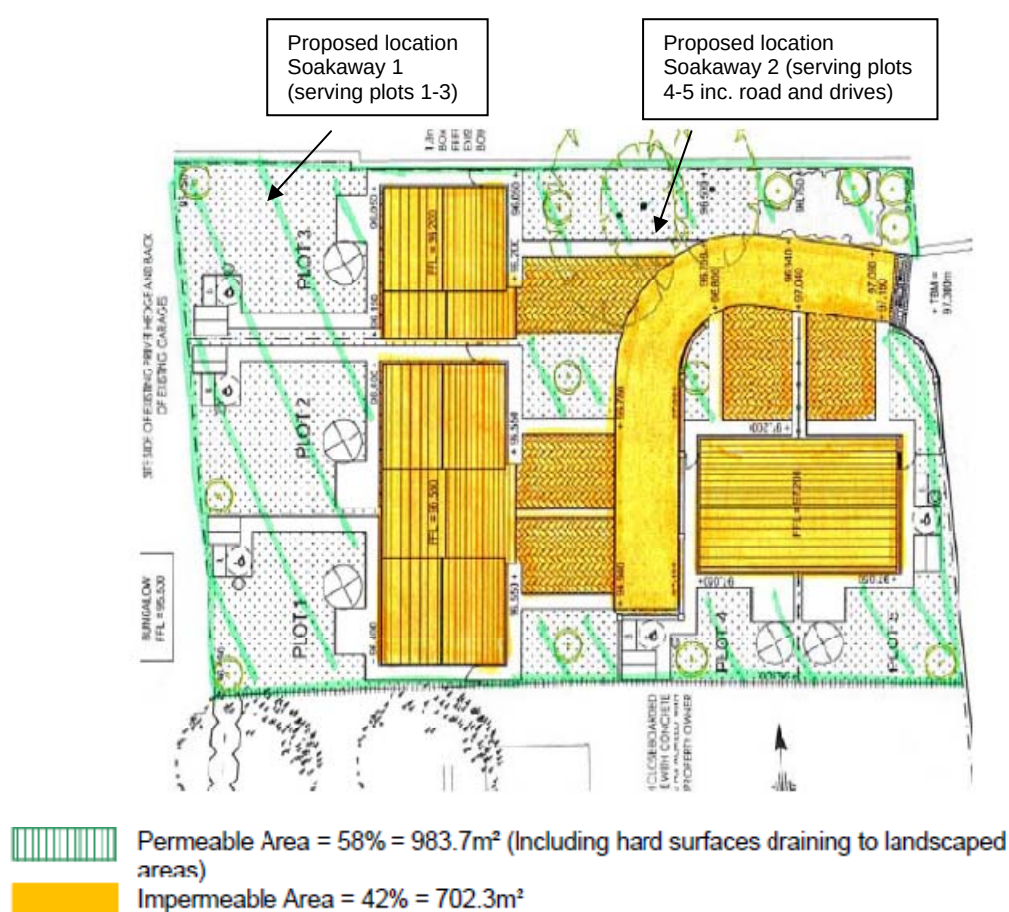
In accordance with Building Regulations Approved Document Part H surface water run-off from new development should be disposed of by one of the following methods, listed in order of priority:

1. Soakaway
2. Watercourse
3. Sewer

In order to assess the site's suitability for soakaways, 9 no. percolation tests in accordance with Building Regulations Approved Document H were carried out on site in February 2011. A plan showing the location of the trial pits is enclosed. Trial pits 1, 5, 6 and 8 drained within 1 minute, giving an *average infiltration rate (f) of $1.7 \times 10^{-3} \text{ m/s}$* . The remaining trial pits were dense clay and did not drain within a reasonable time frame.

Waterco used the percolation test results to assess whether soakaways would be suitable at this site i.e. whether soakaways to drain all of the impermeable areas would fit within the site, taking into account the 5m from distance required from buildings/adopted roads.

The figure below shows all of the impermeable areas to be served. It is unclear at this stage whether permeable paving will be used for the individual driveways. These areas have therefore been included at this stage to give a 'worst case' scenario.



It was assumed 1no. soakaway located in the garden of plot 3 would serve plots 1-3 and 1 no. soakaway located on the north-eastern boundary of the site would serve plots 4-5, the access road and individual drives (as shown above).

The two soakaway calculations are enclosed. These show that soakaways would fit within the site. These calculations should not be used for detailed design and are only presented to illustrate that soakaways will fit within the site.

Foul

A developer enquiry was submitted to Dwr Cymru Welsh Water (DCWW) on 22/02/2011. A response was received on 03/03/2011.

DCWW has confirmed that foul only flows from the development can be accommodated within the public sewerage system.

An existing 150mm combined sewer crosses the north-eastern corner of the site. This is shown on the sewer plan provided with the developer enquiry response.

Recommendations

Surface Water

In order to carry out the detailed design of the soakaways, percolation tests in accordance with BRE365 should be carried out. Waterco has provided Ventura Development Ltd with details on this test procedure.

Soakaways should not be located within 5m of buildings or adopted roads.

If soakaways are proposed within the canopy of any existing/proposed trees, an arboriculturist should be consulted to check on any root protection zones.

Details will need to be provided in the deeds for plots 1-3 regarding the maintenance of the soakaway serving them in the garden of plot 3. Details of the maintenance of the second soakaway serving plots 4-5, the road and drives should also be provided.

Foul

DCWW require a 3m easement either side of the existing 150mm combined sewer. This should be taken into account in the site layout. A Section 106 (Water Industry Act 1991) application should be submitted to DCWW to make a foul connection to the public sewer. A copy of the DCWW online system is enclosed.

Other Issues

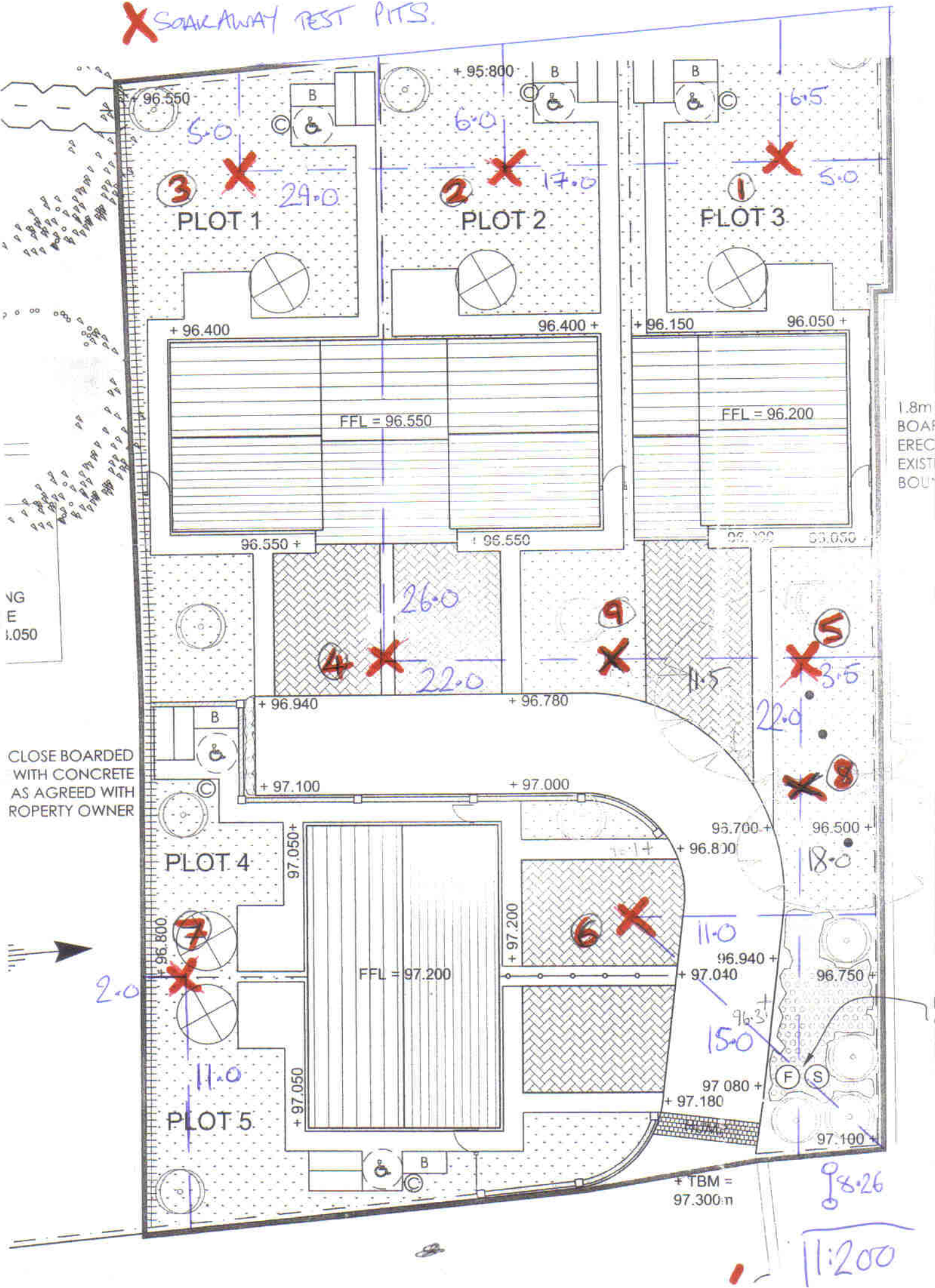
It is understood that an existing 450mm clay surface water drain briefly crosses the north eastern corner of the site. The sewer is not picked up on the DCWW online network system (including abandoned and private sewers) and is therefore unlikely to belong to DCWW.

The Local Authority should be contacted to check if it has any records of this sewer.

Enclosures

1. Building Regulations Part H test locations
2. Soakaway calculations x 2
3. DCWW developer enquiry response
4. DCWW online network plan

X SOAKAWAY TEST PITS.



	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	w984
Client :	Ventura Developments Ltd		Page 1 of 3
Scheme :	Garden Plot, King Street, Acrefair, Wrexham	Prefix	Rev.
Section :	Soakaway Design Plots 1-3 - Building Regs Part H test	SD	A
Prepared By: Gemma Roberts		Date: 23/02/11	
Checked By: Robert Evans		Date: 25/02/11	

Determination of soakaway storage requirement and proposed dimensions

Development description and estimate of Impervious areas

Proposed development of 5 dwellings on existing greenfield site. Impervious areas include dwellings, access road and individual driveways.

This calculation is for a soakaway for plots 1-3. Total impervious area 260m².

Design Procedure from BRE Digest 365

The design method for sizing a soakaway is based upon the equation of volumes:

$$S = I - O$$

Where: S = Required storage in the soakaway to balance inflow and outflow.
I = Inflow from Impermeable Areas drained to soakaway.
O = Outflow Infiltrating into the soil.

I = Total inflow Volume

I = Inflow to soakaway from on-site impervious areas
= Impervious Area, A x Total Rainfall (10yr Return Period)

O = Outflow Volume = as50 x f x D x 60

as50 = Internal Surface Area of soakaway to 50% effective depth (m²)
f = Soil Infiltration Rate (Taken from Infiltration Test Calc sheets) (m/s)
D = Storm Duration (mins)

f = Soil Infiltration Rate

Figures determined in accordance with Building Regulations Approved Document H;

Trial pit locations on site layout. 300mm square x 300mm deep trial pits, 1m below ground surface, emptied within 1 minute.

Average 1.7×10^{-3} m/s

Average infiltration rate used in design.



Eden Court, Lon Parcwr,
Ruthin, 01824 702220

Calculations

w984

Client :	Ventura Developments Ltd	Page 2 of 3	
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Section :	Soakaway Design Plots 1-3 - Building Regs Part H test	SD	A

Rainfall Parameters

Storm return frequency - 1 in (yrs)	10.00	(Required Return Period in BRE Digest 365)
M5-60 min rainfall (mm)	20.00	(BRE Digest 365: 20mm to be taken for all UK)
Ratio (M5-60 / M5-2day) - r	0.25	(From Map on Page 3)

Drainage Area

Total impervious area A (m ²)	260.00
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Soakaway Details

(Rectangular soakaway)	Length L (m) =	4.00	
	Width W (m) =	1.00	
	Effective Depth d (m) =	1.00	
	Design Area (m ²), as50 (m ²) =	5.00	Area of side to 50% depth
	Percentage Voids P (%) =	30	Typical 30% for single size stone
	Design Volume V (m ³) =	1.20	(P/100 x L x W x d)

Soil Infiltration

Infiltration Rate f (m/s) =	1.70E-03	From infiltration test results
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Calculations in table below

Total rainfall **R** = M5-60 * Z1 * Z2 (calculated page 3)

Inflow Volume, **I** = A x R (100% run-off)

Outflow Volume **O** = as50 * f * D * 60

Storage Volume **S** = I - O

Storm duration (D)		R (M10-D)	I	O	S		
(Minutes)	(Hrs)	(mm)	m³	m³	m³		
Crit D	15	0.25	13.89	3.611	7.650	0.000	Max
Crit D	30	0.50	18.68	4.857	15.300	0.000	Max
Crit D	60	1.00	24.80	6.448	30.600	0.000	Max
Crit D	120	2.00	31.91	8.296	61.200	0.000	Max
Crit D	240	4.00	40.78	10.602	122.400	0.000	Max
Crit D	360	6.00	46.74	12.153	183.600	0.000	Max
Crit D	600	10.00	55.20	14.352	306.000	0.000	Max
Crit D	1440	24.00	75.24	19.562	734.400	0.000	Max

Design Storage Requirement = Maximum Volume (m³) = 0.000

Proposed Soakaway Dimension Check = OK, but check Time of Emptying

Time of Emptying of Soakaway (Taken from BRE Digest 365)

The soakaway should discharge from full to half-volume within 24 hours in readiness for subsequent storm inflow.

ts50 = Time to empty 50% of total storage volume

$$ts50 = \frac{S \times 0.5}{as50 \times f \times 3600} = 0.02 \text{ hrs} < 24 \text{ hrs, Therefore Design Acceptable}$$

Summary of acceptable dimensions:

Length =	4.00 m
Width =	1.00 m
Effective Depth =	1.00 m



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Client :

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Scheme :

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Prefix

Rev.

Section :

Soakaway Design Plots 1-3 - Building Regs Part H test

SD

A

Values of Factor Z1 (From BRE 365 - Table 1)

Ratio	Rainfall Duration (mins)							
r	15	30	60	120	240	360	600	1440
0.12	0.450	0.670	1.000	1.480	2.170	2.750	3.700	6.000
0.15	0.480	0.690	1.000	1.420	2.020	2.460	3.230	4.900
0.18	0.510	0.710	1.000	1.360	1.860	2.250	2.860	4.300
0.20	0.530	0.723	1.000	1.340	1.800	2.163	2.700	3.833
0.21	0.540	0.730	1.000	1.330	1.770	2.120	2.620	3.600
0.24	0.560	0.750	1.000	1.300	1.710	2.000	2.400	3.350
0.25	0.567	0.753	1.000	1.290	1.687	1.960	2.347	3.267
0.27	0.580	0.760	1.000	1.270	1.640	1.880	2.240	3.100
0.30	0.590	0.770	1.000	1.250	1.570	1.780	2.120	2.840
0.33	0.610	0.780	1.000	1.230	1.530	1.730	2.040	2.600
0.35	0.617	0.787	1.000	1.223	1.497	1.690	1.947	2.480
0.36	0.620	0.790	1.000	1.220	1.480	1.670	1.900	2.420
0.39	0.630	0.800	1.000	1.210	1.460	1.620	1.820	2.280
0.40	0.633	0.823	1.000	1.207	1.447	1.603	1.793	2.240
0.42	0.640	0.810	1.000	1.200	1.420	1.570	1.740	2.160
0.45	0.650	0.820	1.000	1.190	1.380	1.510	1.680	2.030

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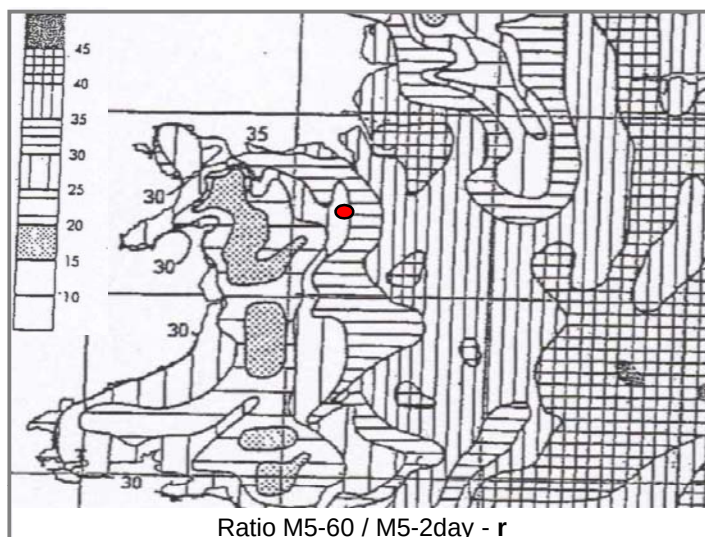
Calculating Design Rainfall, R (10yr Return Period)

Pro-rata values **

M5-60 rain (mm)		20.00	(Taken from Page 1)					
Ratio M5-60/M5-2day		0.25	(Taken from Page 1)					
Duration (mins)	Duration (hrs)	Factor Z1	R (M5-D) (mm)	Z2 Values - M10			Prorata Z2	R (M10-D) (mm)
15.0	0.25	0.567	11.333	1.22	5.00	1.24	1.225	13.887
30.0	0.50	0.753	15.067	1.24	5.00	1.24	1.240	18.683
60.0	1.00	1.000	20.000	1.24	5.00	1.24	1.240	24.800
120.0	2.00	1.290	25.800	1.24	5.00	1.22	1.237	31.909
240.0	4.00	1.687	33.733	1.22	10.00	1.19	1.209	40.777
360.0	6.00	1.960	39.200	1.22	10.00	1.19	1.192	46.742
600.0	10.00	2.347	46.933	1.19	10.00	1.17	1.176	55.200
1440.0	24.00	3.267	65.333	1.17	25.00	1.14	1.152	75.238

Z2 Factors - England & Wales (from BRE 365 Table 2)

M5 Rain (mm)	Diff (mm)	M10
0	5	1.190
5	5	1.190
10	5	1.220
15	5	1.240
20	5	1.240
25	5	1.240
30	10	1.220
40	10	1.190
50	25	1.170
75	25	1.140
100	50	1.130
150	50	1.120
200	50	1.110



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Client :	Ventura Developments Ltd		Page 1 of 3
Scheme :	Garden Plot, King Street, Acrefair, Wrexham		Prefix SD
Section :	Soakaway Design Plots 4-5, Road & Drives - Building Regs Part H test		Rev. A
Prepared By: Gemma Roberts			Date: 23/02/2011
Checked By: Robert Evans			Date: 25/02/2011

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Proposed development of 5 dwellings on existing greenfield site. Impervious areas include dwellings, access road and individual driveways.

This calculation is for a soakaway for plots 4-5, access road and individual driveways.

Total impervious area 453.8m²

Design Procedure from BRE Digest 365

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I = Inflow to soakaway from on-site impervious areas
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O = Outflow Volume = as50 x f x D x 60

as50 = Internal Surface Area of soakaway to 50% effective depth (m²)
f = Soil Infiltration Rate (Taken from Infiltration Test Calc sheets) (m/s)
D = Storm Duration (mins)

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Figures determined in accordance with Building Regulations Approved Document H;

Trial pit locations on site layout. 300mm square x 300mm deep trial pits, 1m below ground surface, emptied within 1 minute.

Average 1.7 x 10⁻³

Average infiltration rate used in design.



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Drainage Area

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(Minutes)	(Hrs)	(mm)	m ³	m ³	m ³	
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Crit D 30	0.50	18.68	8.482	15.300	0.000	Max
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Crit D 120	2.00	31.91	14.487	61.200	0.000	Max
Crit D 240	4.00	40.78	18.513	122.400	0.000	Max
Crit D 360	6.00	46.74	21.221	183.600	0.000	Max
Crit D 600	10.00	55.20	25.061	306.000	0.000	Max
Crit D 1440	24.00	75.24	34.158	734.400	0.000	Max

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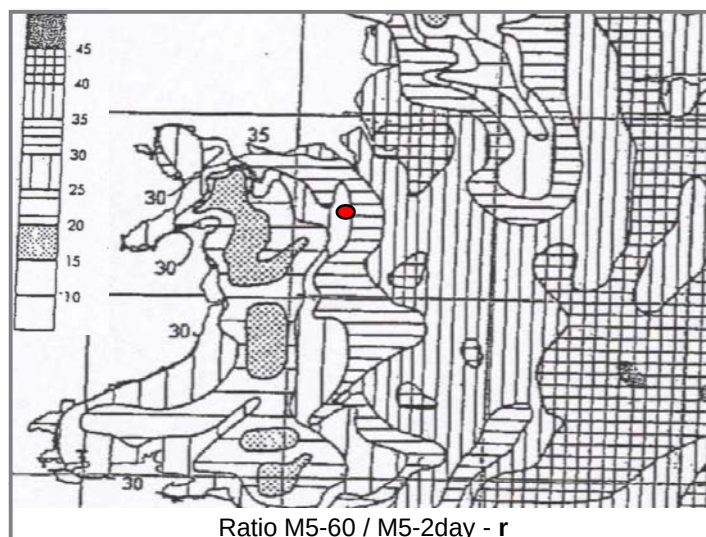
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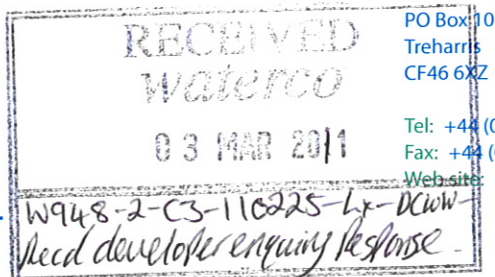
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240.0	4.00	1.687	33.733	1.22	10.00	1.19	1.209	40.777
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30	10	1.220
40	10	1.190
50	25	1.170
75	25	1.140
100	50	1.130
150	50	1.120
200	50	1.110





Waterco Ltd
Eden Court
Lon Parcwr Business Park
Ruthin
Wrexham
LL15 1NJ

Date: 25/02/2011
Enquiries Tel.: 01443331155
Our Ref.: 2011/DCWW/72433
Your Ref.: -----
Grid Ref.: SJ2778243009

Ms Gemma Roberts

Dear Madam

03 MAR 2011

Re: 5 No dwellings, King Street, Acrefair, Wrexham

Further to the above consultation we would provide the following comments:-

SEWERAGE

The public sewerage system in the vicinity of the proposed site is generally of a combined type.

The foul only flows from the proposed development can be accommodated within the public sewerage system.

In relation to surface water flows from the proposed development, these will have to be disposed of separately by other means, i.e. using soakaways or discharging directly to a watercourse in liaison with the Land Drainage and / or Environment Agency.

Please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

Please note that the site is crossed by a 150mm public combined sewer as shown on the attached sewer extract. No development (including the raising or lowering of ground levels) will be permitted within the safety zone of the public sewer, which is measured 3 metres either side of the centreline of this pipe.

If any onsite or offsite sewers are to be offered for adoption they must be constructed to conform with the publication "Sewers for Adoption"- 6th Edition.

If a connection is required to the public sewerage system, the developer is advised to contact the Dwr Cymru Welsh Water Network Development Consultants on Tel: 01443 331155.

Please note that in order to make a connection to the public sewerage system, it may be necessary to cross third party land, for which you must first gain permission from all the relevant landowners. Should you encounter difficulties in gaining the permission to do so, it may be possible to requisition a new sewer under Sections 98 to 101 of the Water Industry Act 1991 from the boundary of the proposed development to the public sewerage system. Should you require further information please write to us at the address given above.

SEWAGE TREATMENT

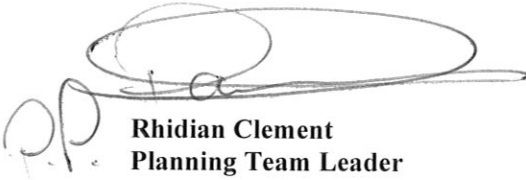
No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

WATER SUPPLY

Please note that the area in question is not administered for water supply by Dwr Cymru Welsh Water. You should contact Dee Valley Water plc on 01978 846946.

We hope the above is satisfactory. However, should you require further assistance please contact us on the above telephone number, quoting our reference.

Yours faithfully,

A handwritten signature in dark ink, appearing to be 'Rhidian Clement', written over a horizontal line.

Rhidian Clement
Planning Team Leader

Demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.

Enc

Sewer Plan
Cheque Receipt



LEGEND

- | | |
|--|--------------------------------------|
| | Feed (number) |
| | Isolates water |
| | Cathodic |
| | Anodic |
| | Electrolyte |
| | Separator |
| | Membrane |
| | Temperature |
| | Treatment waste |
| | Pumping station |
| | Area calculation indicates flow rate |
| | Water meter |
| | Water supply |
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Notes:

Over Century Cy gives this information as to the position of its underground apparatus by way of general guidance only on the first understanding that it is based on the best information available and no warranty as to correctness is relied upon in the event of excavations or other works made in the vicinity of the Company's apparatus and any risk of losing the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New York Law of 1961 and the Company's right to be compensated for any damage to its apparatus.

EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.

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