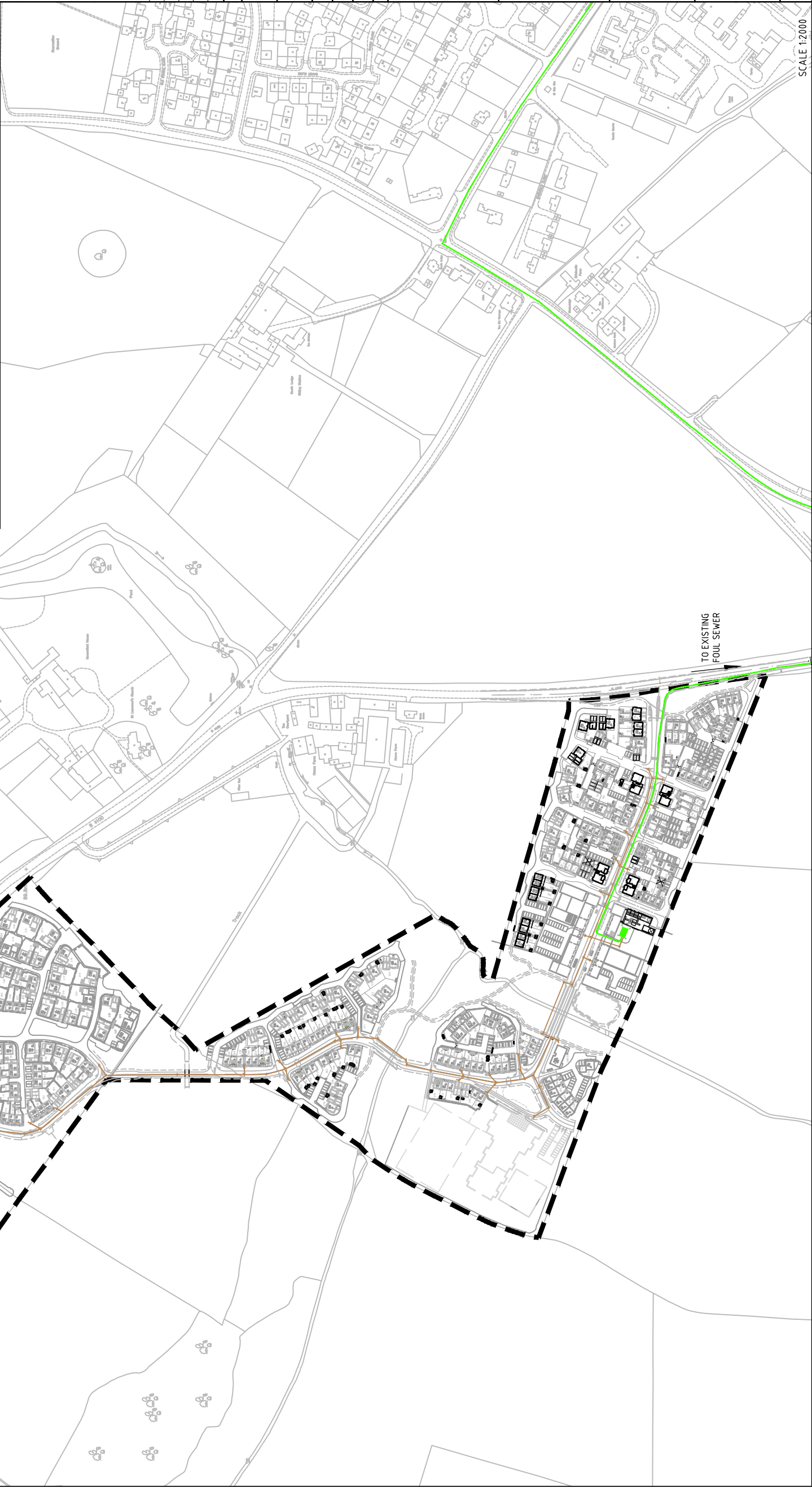


KEY

- SITE BOUNDARY
- ON-SITE FOUL WATER GRAVITY NETWORK
- INDICATIVE RISING MAIN TO CONNECT TO EXISTING FOUL SEWER NETWORK
- ON-SITE PUMPING STATION LOCATION TO BE AGREED



Issue	Description	Date
05	MASTERPLAN REVISED	05/09/12
04	LAYOUT REVISED	AUG 11
03	LAYOUT REVISED	15/03/11
02	LAYOUT REVISED	11/11/10
01	FIRST ISSUE	14/09/10

AS SHOWN	Author
Original Size	P. WILLIAMS
Height	Checker M PEARSON
Datum	Approver S.A. DAVIES
Grid	© Copyright reserved

Filename:
Client:



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SW1E 5DZ
Tel: +44 (0)870 000 3006
Fax: +44 (0)870 000 3906

Project:
**BICESTER ECO
DEVELOPMENT EXEMPLAR SITE**

Title:
**EXEMPLAR SITE
PROPOSED DEVELOPMENT
FOUL DRAINAGE STRATEGY**

Drawing No. 7041 — Project No. UA001881 — Issue 05

KEY

- SURFACE WATER PIPE RUN
- VILLAGE STREET SUDS FEATURE
- ROADSIDE SUDS FEATURE
- CATCHMENT BOUNDARIES
- APPROXIMATE EXTENT OF SPINE ROAD INFRASTRUCTURE AND PHASE 1 RESIDENTIAL AREAS
- PERMEABLE PAVING
- IMPERMEABLE PAVING
- PLOT SOAKAWAYS
- POND
- BASIN
- SWALE
- EXCEEDANCE FLOW PATHS
- MAINTENANCE ACCESS

Issue	Description	Date	Status
06	REVISED TO MATCH DESIGN REVISIONS	05/09/22	
05	AMENDED TO MATCH DETAILED DESIGN	21/10/21	
04	CHECK ISSUE	05/10/21	
03	LAYOUT REVISED	03/06/21	
02	LAYOUT REVISED	04/04/21	
01	FIRST ISSUE	24/11/20	

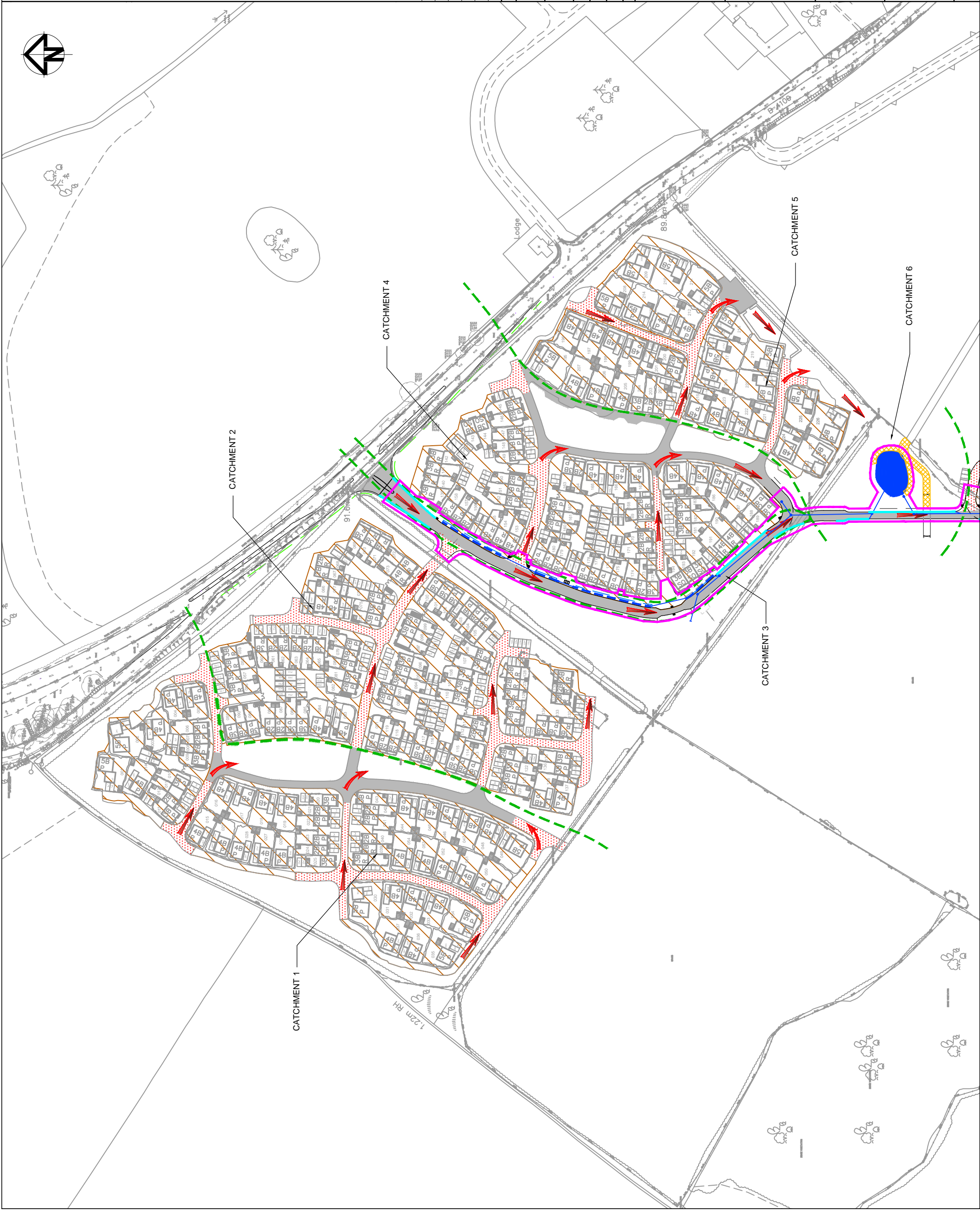
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Original Size	A1
Height	-
Datum	SA DAVIES
Grid	0.S.

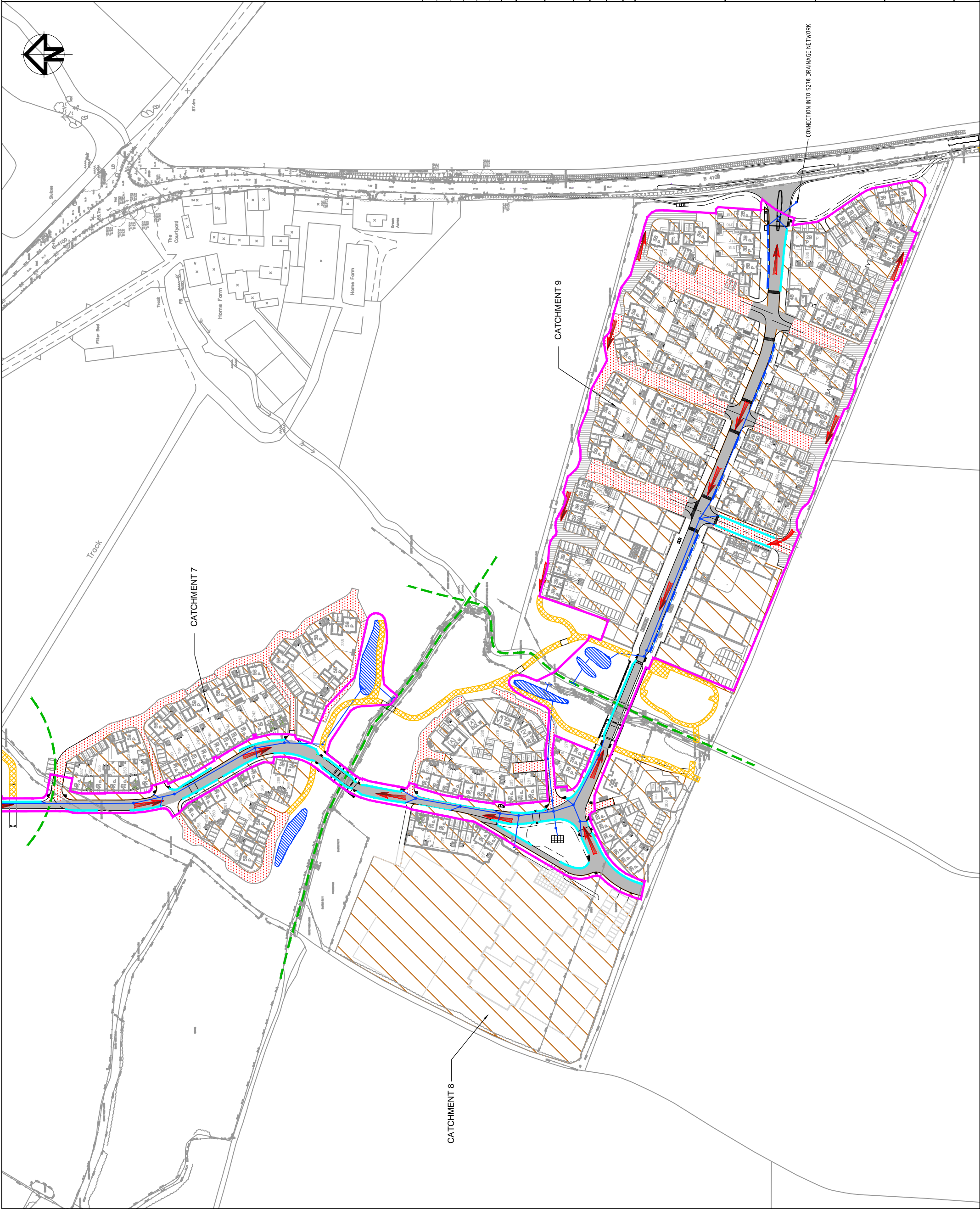
Client
 azdminion
 Hyder Consulting (UK) Limited
 29, Bressenden Place
 London
 SW1E 5DZ
 Tel: +44 (0)870 000 3006
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Project
 BICESTER ECO DEVELOPMENT EXEMPLAR SITE

Title
 EXEMPLAR SITE PROPOSED DEVELOPMENT SURFACE WATER DRAINAGE LAYOUT SHT 1 OF 2

Drawing No. 7160 — Project No. UA001881 — Issue 06





KEY

- SURFACE WATER PIPE RUN
- VILLAGE STREET SUDS FEATURE
- ROADSIDE SUDS FEATURE
- CATCHMENT BOUNDARIES
- APPROXIMATE EXTENT OF SPINE ROAD INFRASTRUCTURE AND PHASE 1 RESIDENTIAL AREAS
- FERMEABLE PAVING
- IMPERMEABLE PAVING
- SURFACED INFILTRATION BLANKET
- PLOT SOAKAWAYS
- POND
- BASIN
- SWALE
- EXCEEDANCE FLOW PATHS
- MAINTENANCE ACCESS

Issue No.	Description	Date
06	REVISED TO MATCH DESIGN REVISIONS	05/09/12
05	AMENDED TO MATCH DETAILED DESIGN	21/10/11
04	CHECK ISSUE	05/10/11
03	DETAILS ADDED, MAINTENANCE ACCESS REVISED	21/06/11
02	LAYOUT REVISED	04/04/11
01	FIRST ISSUE	24/11/10

Scales	Author	Checker	Approver
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1:2000 @ A3			
Original Size	A1		
Height			
Datum			
Grid	0.S.		

Client: azdminion

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Project: BICESTER ECO DEVELOPMENT EXEMPLAR SITE

Title: EXEMPLAR SITE PROPOSED DEVELOPMENT SURFACE WATER DRAINAGE LAYOUT SHT 2 OF 2
 Drawing No. 7161 — Project No. UA001881 — Issue 06

Appendix B

GROUND INFILTRATION RATES

2005-UA001881 – Soakaway Test Locations

Figure 2-UA004041 – Additional Soakaway Location Plan

Soil Infiltration Rate Test Data

Client



Project

Bicester –
Additional
Soakaways

Title

Exploratory Hole
Location Plan

Scale

NTS

Datum

N/A



Hyder Consulting Ltd
HCL House
Fortran Road
Cardiff CF3 0EY

Tel: 029 20925000
Fax: 029 20925222

Project Code

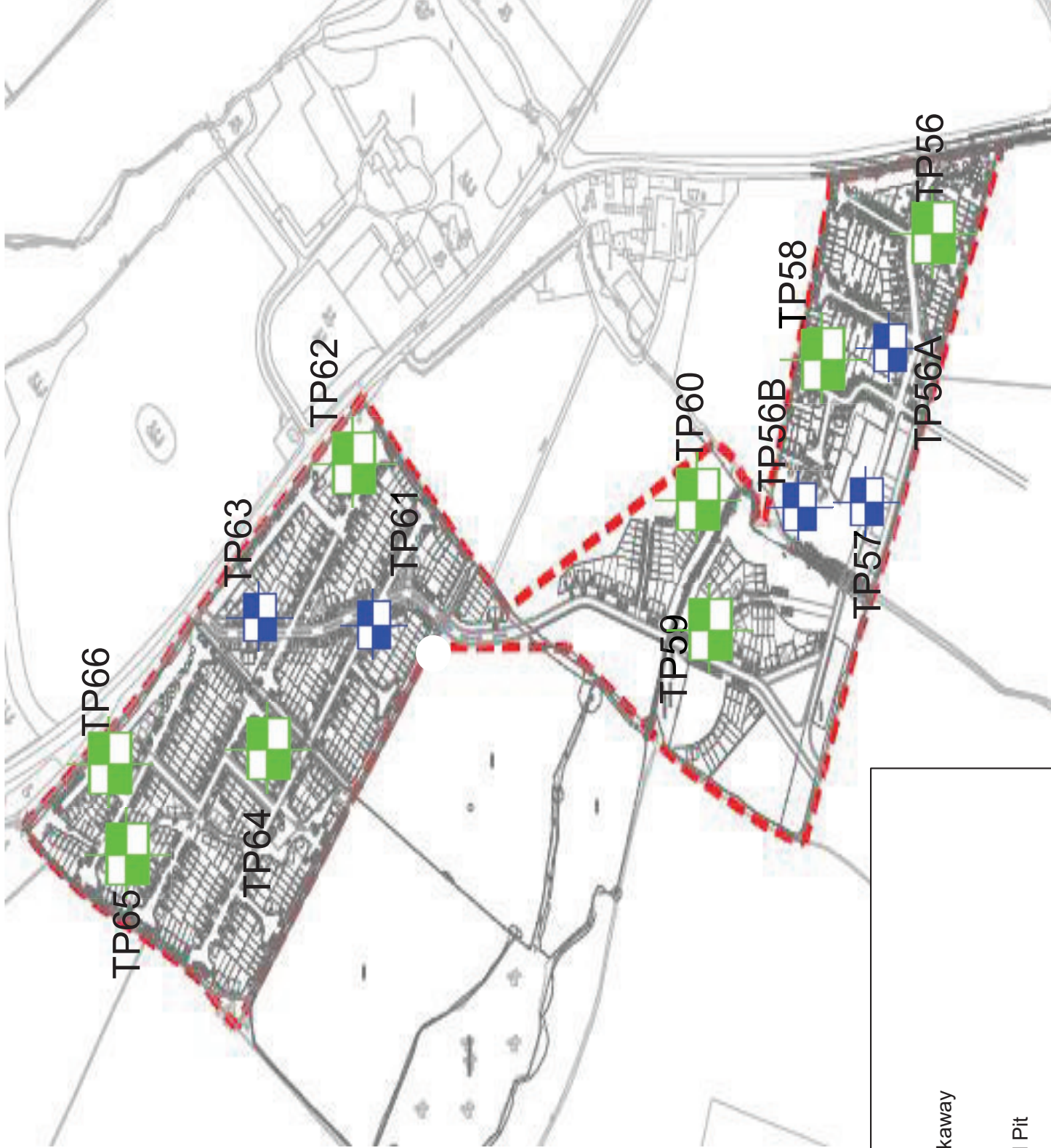
UA004014

Drawing No.

Figure 2

Issue

1

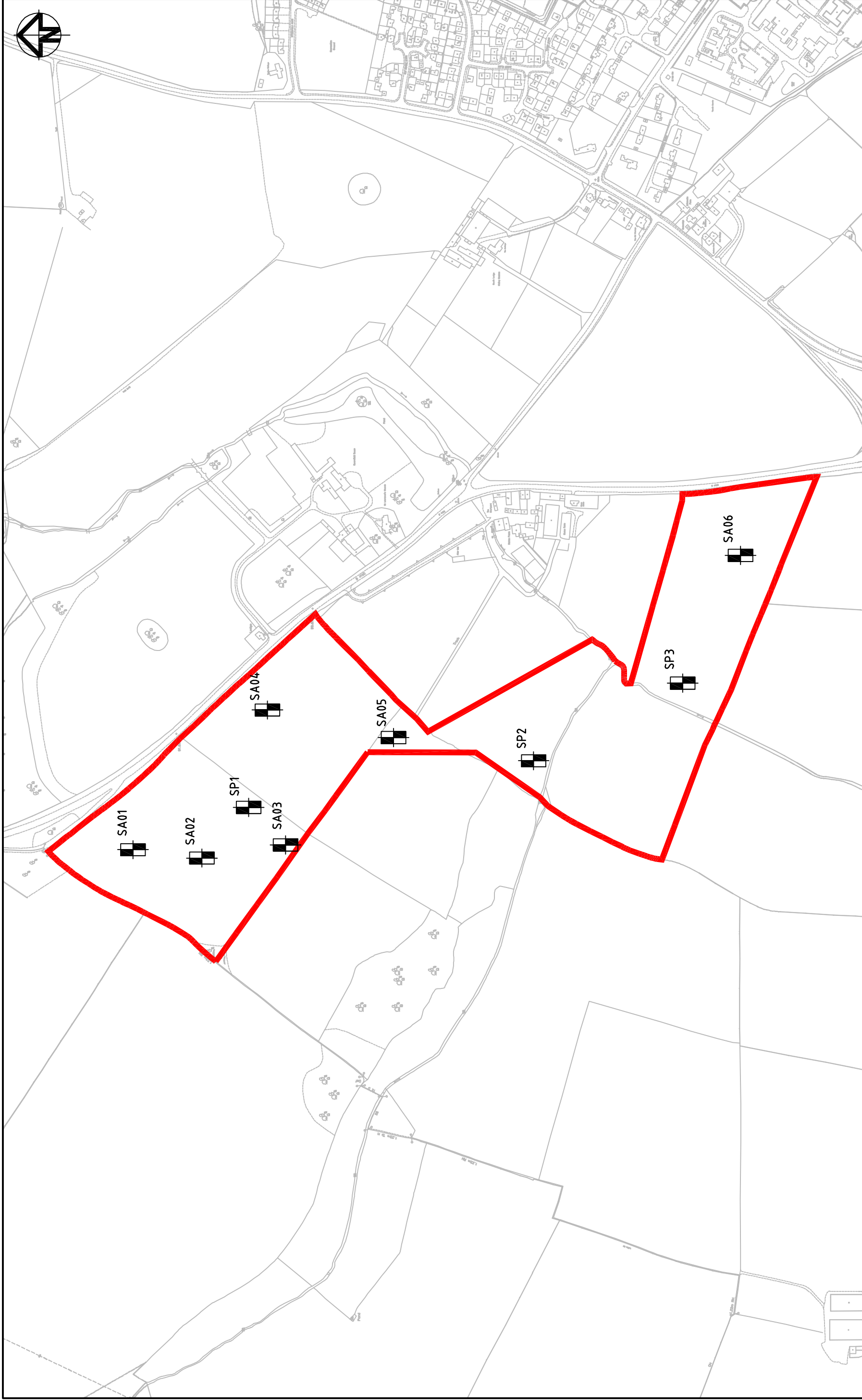


Key



Soakaway

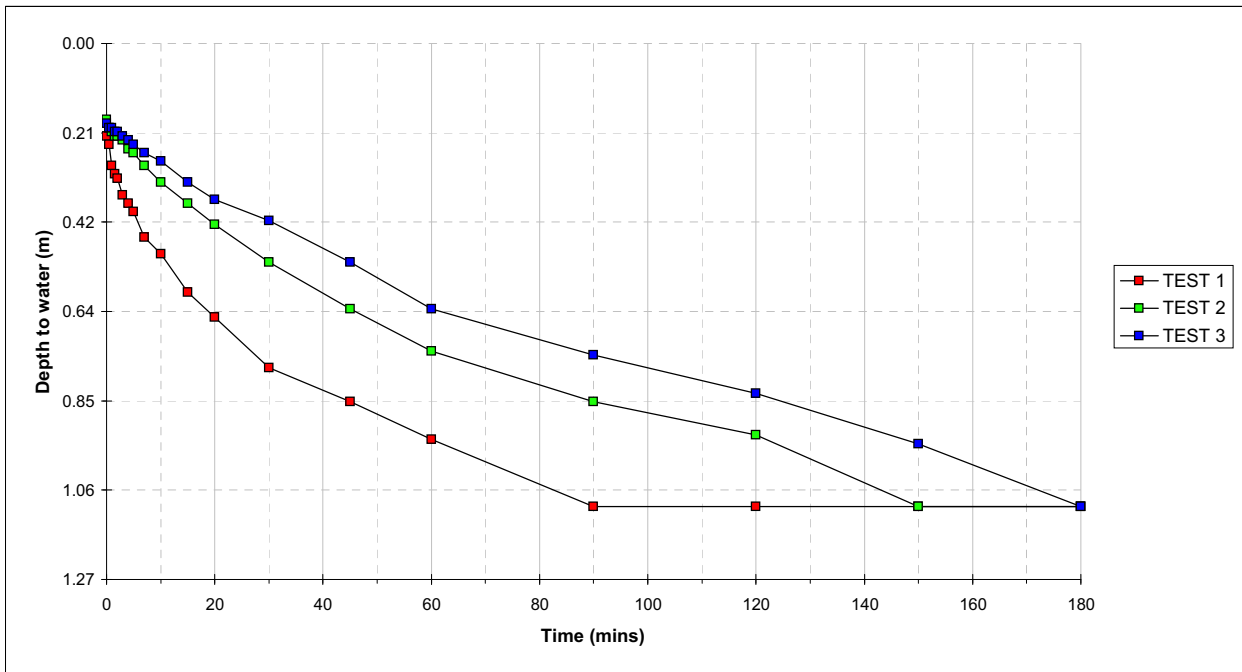
Trial Pit



<p>Hyder Consulting (UK) Limited 29, Bressenden Place London SW1E 5DZ</p> <p>Hyder Consulting</p> <p>Tel: +44 (0)870 000 3006 Fax: +44 (0)870 000 3906</p>		<p>Project BICESTER ECO DEVELOPMENT</p>																					
<p>Drawing No. 2005</p>		<p>Issue No. 01</p>																					
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Scales	1:12,500	Current Issue Signatures	Author P. WILLIAMS																				
Original Size	A3	Checker	M. PEARSON																				
Height Datum	-	Approver	S.A. DAVIES																				
Grid	OS	Copyright reserved	©																				
Filename:	2005-UA001881-UP33D-01.DWG																						
<p>Client</p> <p>azdominion</p> <p>P3Eco Ltd</p>		<p>Project</p> <p>BICESTER ECO DEVELOPMENT</p>																					
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01	FIRST ISSUE	Date	04/04/11																				
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01	FIRST ISSUE	Date	04/04/11																				

C.J. ASSOCIATES GEOTECHNICAL LTD.		Site..... Bicester		Trial Pit Number..... SP2	
SOIL INFILTRATION RATE TEST		Job Number..... Y0964		Length..... 1.50 m	
See B.R.E. Digest 365, 1991, Soakaway Design.		Date of Test..... 06.10.2010		Width..... 0.30 m	
				Depth..... 1.10 m	
				Groundwater Level..... Dry	
		TEST 1		TEST 2	
		Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0.0	0.22	0.0	0.18
		0.5	0.24	0.5	0.20
		1.0	0.29	1.0	0.21
		1.5	0.31	1.5	0.22
		2.0	0.32	2.0	0.22
		3.0	0.36	3.0	0.23
		4.0	0.38	4.0	0.25
		5.0	0.40	5.0	0.26
		7.0	0.46	7.0	0.29
		10	0.50	10	0.33
		15	0.59	15	0.38
		20	0.65	20	0.43
		30	0.77	30	0.52
		45	0.85	45	0.63
		60	0.94	58	0.73
		75	1.10	90	0.85
		120	1.10	120	0.93
		150	1.10	136	1.10
		180	1.10	180	1.10
Effective Storage Depth		m		0.88	
75% Effective Storage Depth		m		0.92	
(i.e. depth below GL)		m		0.69	
25% Effective Storage Depth		m		0.68	
(i.e. depth below GL)		m		0.41	
Effective Storage Depth 75%-25%		m		0.23	
		m		0.23	
		m		0.87	
		m		0.87	
		m		0.46	
		m		0.46	
Time to fall to 75% effective depth		mins		6.50	
Time to fall to 25% effective depth		mins		50.00	
		mins		18.00	
		mins		98.00	
		mins		30.00	
		mins		135.00	
V (75%-25%)		m3		0.20	
a (50%)		m2		2.03	
t (75%-25%)		mins		43.50	
		mins		80.00	
		mins		105.00	
SOIL INFILTRATION RATE		m/s		3.73E-05	
				2.05E-05	
				1.56E-05	

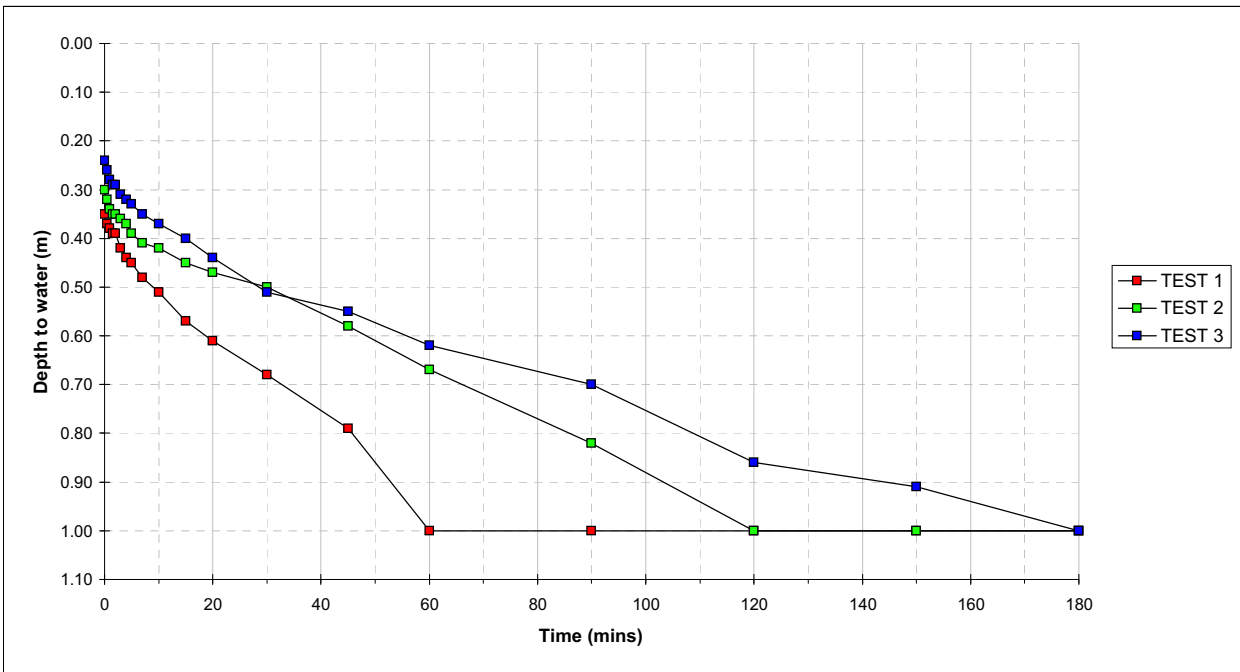
DESIGN SOIL INFILTRATION RATE, f	1.56E-05 m/s
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C.J. ASSOCIATES GEOTECHNICAL LTD. SOIL INFILTRATION RATE TEST See B.R.E. Digest 365, 1991, Soakaway Design.	Site..... Bicester Job Number..... Y0964 Date of Test..... 05.10.2010	Trial Pit Number..... SP3 Length..... 2.10 m Width..... 0.30 m Depth..... 1.00 m Groundwater Level..... Dry

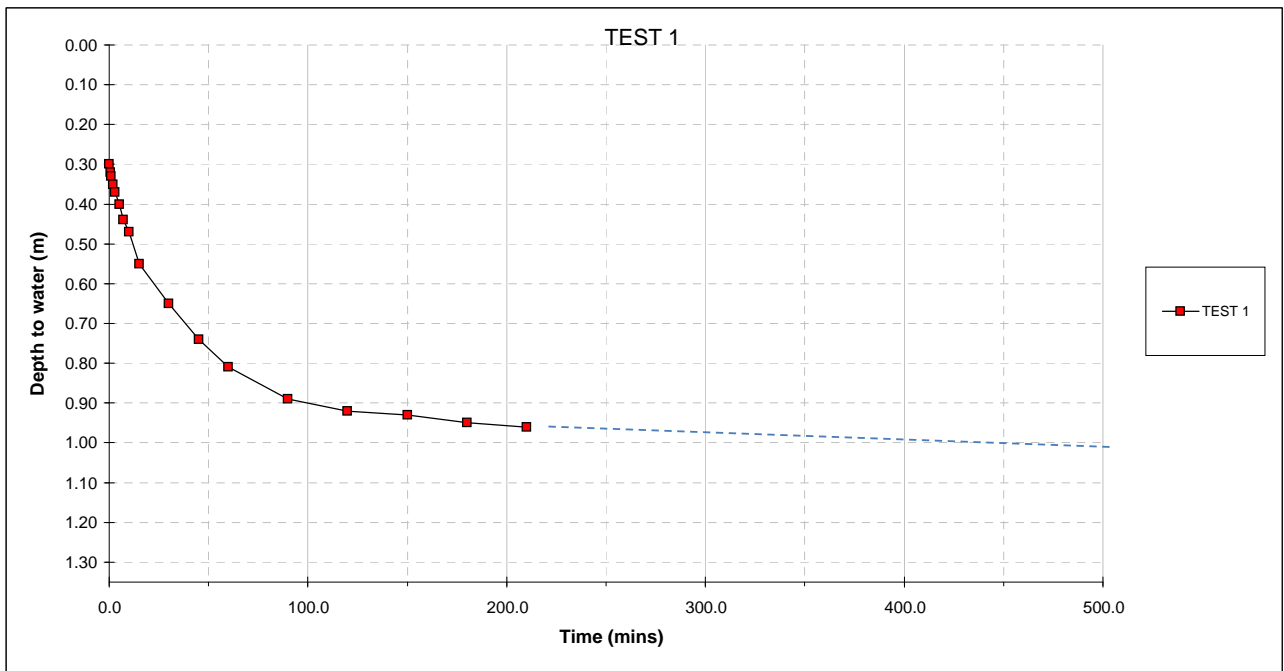
	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.0	0.35	0.0	0.30	0.0	0.24
	0.5	0.37	0.5	0.32	0.5	0.26
	1.0	0.38	1.0	0.34	1.0	0.28
	1.5	0.39	1.5	0.35	1.5	0.29
	2.0	0.39	2.0	0.35	2.0	0.29
	3.0	0.42	3.0	0.36	3.0	0.31
	4.0	0.44	4.0	0.37	4.0	0.32
	5.0	0.45	5.0	0.39	5.0	0.33
	7.0	0.48	7.0	0.41	7.0	0.35
	10	0.51	10	0.42	10	0.37
	15	0.57	15	0.45	15	0.40
	20	0.61	20	0.47	20	0.44
	30	0.68	30	0.50	30	0.51
	45	0.79	45	0.58	45	0.55
	55	1.00	60	0.67	60	0.62
	90	1.00	90	0.82	90	0.70
	120	1.00	110	1.00	120	0.86
	150	1.00	150	1.00	150	0.91
	180	1.00	180	1.00	165	1.00
Effective Storage Depth	m	0.65		0.70		0.76
75% Effective Storage Depth	m	0.49		0.53		0.57
(i.e. depth below GL)	m	0.51		0.48		0.43
25% Effective Storage Depth	m	0.16		0.18		0.19
(i.e. depth below GL)	m	0.84		0.83		0.81
Effective Storage Depth 75%-25%	m	0.33		0.35		0.38
Time to fall to 75% effective depth	mins	10.00		22.00		18.00
Time to fall to 25% effective depth	mins	50.00		92.00		110.00
V (75%-25%)	m3	0.20		0.22		0.24
a (50%)	m2	2.19		2.31		2.45
t (75%-25%)	mins	40.00		70.00		92.00
SOIL INFILTRATION RATE	m/s	3.90E-05		2.27E-05		1.77E-05

DESIGN SOIL INFILTRATION RATE, f	1.77E-05 m/s
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C.J. ASSOCIATES GEOTECHNICAL LTD.		Site..... Bicester		Trial Pit Number..... SA4		
SOIL INFILTRATION RATE TEST		Job Number..... Z0326		Length..... 1.45 m		
See B.R.E. Digest 365, 1991, Soakaway Design.		Date of Test..... 23/03/2011		Width..... 0.50 m		
				Depth..... 1.20 m		
				Groundwater Level.....		
Remarks -	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
Infiltration rates obtained through extrapolated results.	0.0	0.30				
	0.5	0.32				
	1.0	0.33				
	2.0	0.35				
	3.0	0.37				
	5.0	0.40				
	7.0	0.44				
	10.0	0.47				
	15.0	0.55				
	30	0.65				
	45	0.74				
	60	0.81				
	90	0.89				
	120	0.92				
	150	0.93				
	180	0.95				
	210	0.96				
Effective Storage Depth	m	0.90				
75% Effective Storage Depth	m	0.68				
(i.e. depth below GL)	m	0.53				
25% Effective Storage Depth	m	0.23				
(i.e. depth below GL)	m	0.98				
Effective Storage Depth 75%-25%	m	0.45				
Time to fall to 75% effective depth	mins	12.00				
Time to fall to 25% effective depth	mins	300.00				
V (75%-25%)	m3	0.33				
a (50%)	m2	2.48				
t (75%-25%)	mins	288.00				
SOIL INFILTRATION RATE	m/s	7.61E-06				

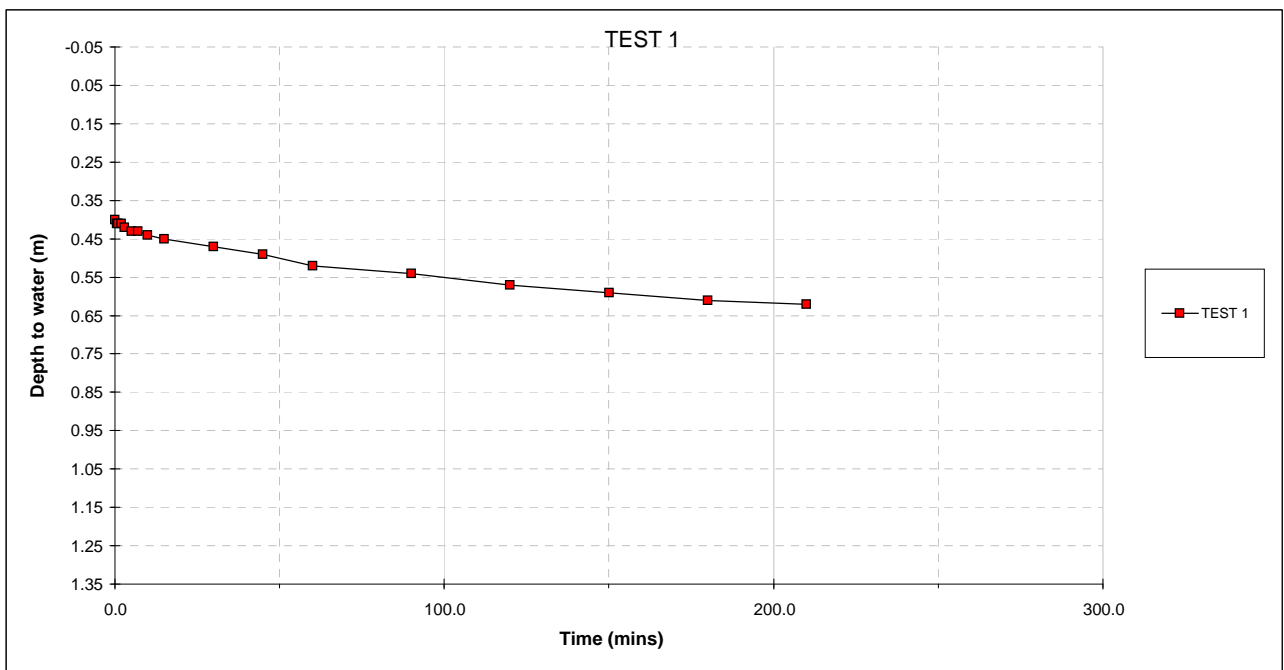
DESIGN SOIL INFILTRATION RATE, f	7.61E-06	m/s
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C.J. ASSOCIATES GEOTECHNICAL LTD. SOIL INFILTRATION RATE TEST See B.R.E. Digest 365, 1991, Soakaway Design.	Site..... Bicester Job Number..... Z0326 Date of Test..... 23/03/2011	Trial Pit Number..... SA5 Length..... 1.50 m Width..... 0.50 m Depth..... 1.35 m Groundwater Level.....

Remarks -	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.0	0.40				
	0.5	0.41				
	1.0	0.41				
	2.0	0.41				
	3.0	0.42				
	5.0	0.43				
	7.0	0.43				
	10.0	0.44				
	15.0	0.45				
	30	0.47				
	45	0.49				
	60	0.52				
	90	0.54				
	120	0.57				
	150	0.59				
	180	0.61				
	210	0.62				
Effective Storage Depth	m	0.95				
75% Effective Storage Depth (i.e. depth below GL)	m	0.71				
25% Effective Storage Depth (i.e. depth below GL)	m	0.24				
Effective Storage Depth 75%-25%	m	1.11				
Effective Storage Depth 75%-25%	m	0.48				
Time to fall to 75% effective depth	mins	N/A				
Time to fall to 25% effective depth	mins	N/A				
V (75%-25%)	m3	0.36				
a (50%)	m2	2.65				
t (75%-25%)	mins	N/A				
SOIL INFILTRATION RATE	m/s	Insufficient Uptake				

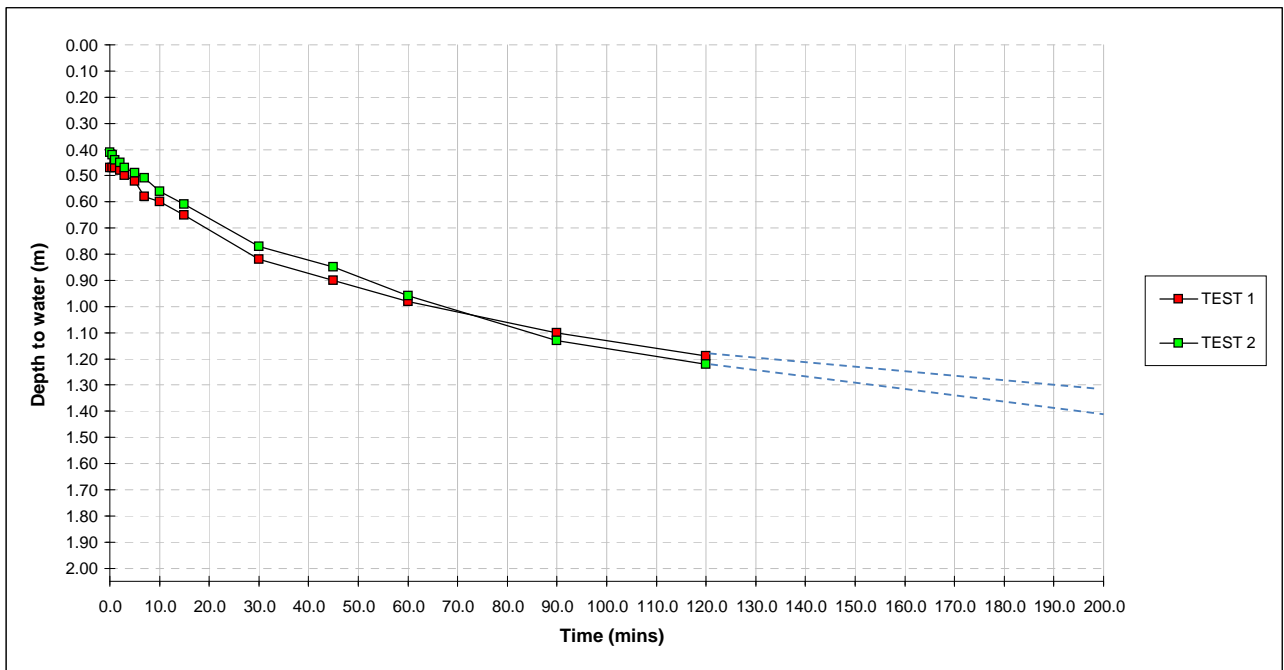
DESIGN SOIL INFILTRATION RATE, f	Insufficient Uptake
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C.J. ASSOCIATES GEOTECHNICAL LTD. SOIL INFILTRATION RATE TEST See B.R.E. Digest 365, 1991, Soakaway Design.	Site..... Bicester Job Number..... Z0326 Date of Test..... 23/03/2011	Trial Pit Number..... SA6 Length..... 1.90 m Width..... 0.50 m Depth..... 1.60 m Groundwater Level..... 1.5

Remarks -	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
Infiltration rates obtained through extrapolated results.	0.0	0.47	0.0	0.41		
	0.5	0.47	0.5	0.42		
	1.0	0.47	1.0	0.44		
	2.0	0.48	2.0	0.45		
	3.0	0.50	3.0	0.47		
	5.0	0.52	5.0	0.49		
	7.0	0.58	7.0	0.51		
	10.0	0.60	10.0	0.56		
	15.0	0.65	15.0	0.61		
	30	0.82	30	0.77		
	45	0.90	45	0.85		
	60	0.98	60	0.96		
	90	1.10	90	1.13		
120	1.19	120	1.22			
Effective Storage Depth	m	1.13	1.19			
75% Effective Storage Depth	m	0.85	0.89			
(i.e. depth below GL)	m	0.75	0.71			
25% Effective Storage Depth	m	0.28	0.30			
(i.e. depth below GL)	m	1.32	1.30			
Effective Storage Depth 75%-25%	m	0.57	0.60			
Time to fall to 75% effective depth	mins	22.00	26.00			
Time to fall to 25% effective depth	mins	185.00	152.00			
V (75%-25%)	m3	0.54	0.57			
a (50%)	m2	3.66	3.81			
t (75%-25%)	mins	163.00	126.00			
SOIL INFILTRATION RATE	m/s	1.50E-05	1.96E-05			

DESIGN SOIL INFILTRATION RATE, f **1.50E-05 m/s**



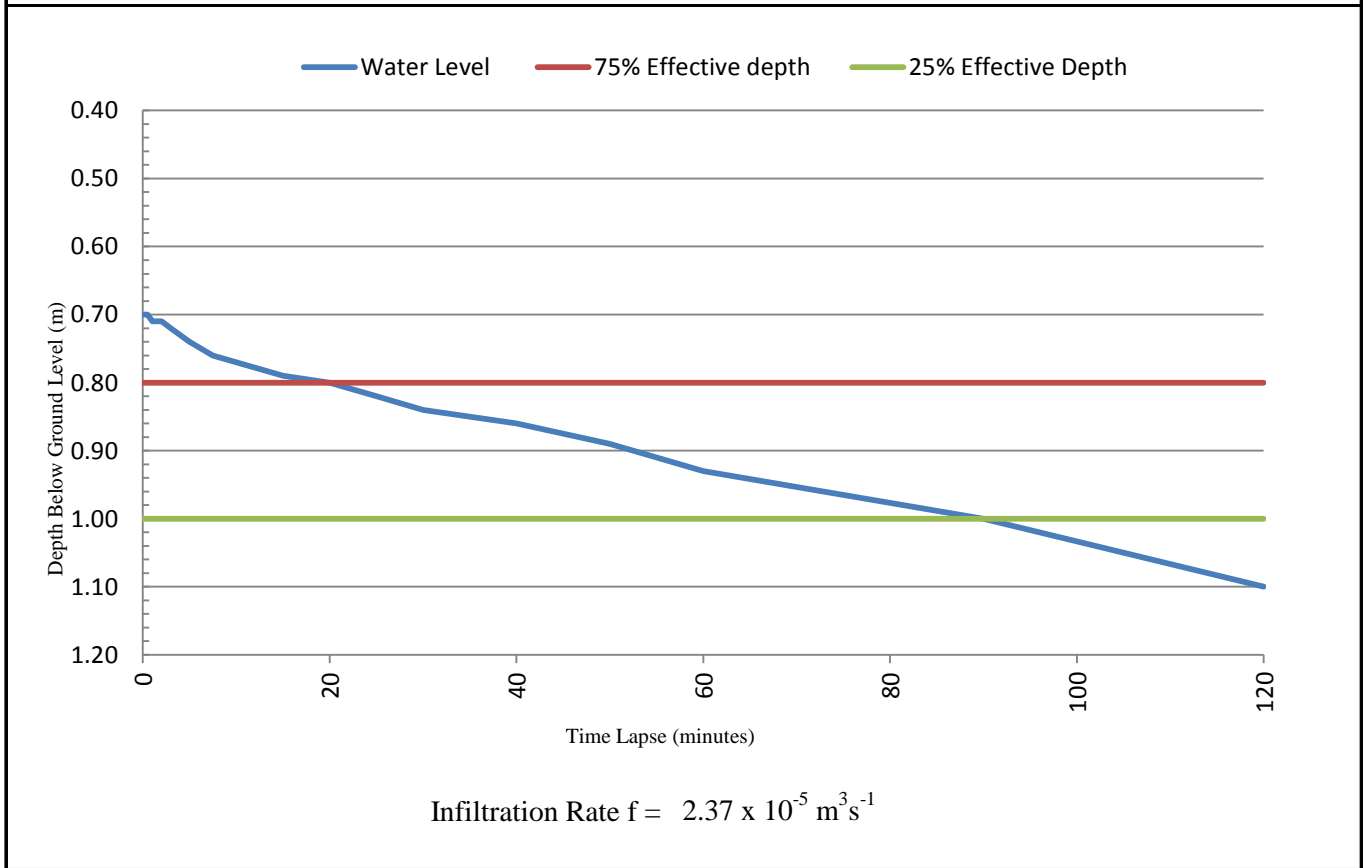


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP56 Test1
Job No. UA004014	Date 30/7/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 1 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.90	Length	1.90
Width	0.50	Width	0.50
Depth	1.10	Depth	1.10

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.70	30	0.84
0.5	0.70	40	0.86
1	0.71	50	0.89
2	0.71	60	0.93
3	0.72	90	1
4	0.73	120	Dry
5	0.74		
7.5	0.76		
10	0.77		
15	0.79		
20	0.80		
25	0.82		



All dimensions in metres	Client A2Dominion	Logged By IP
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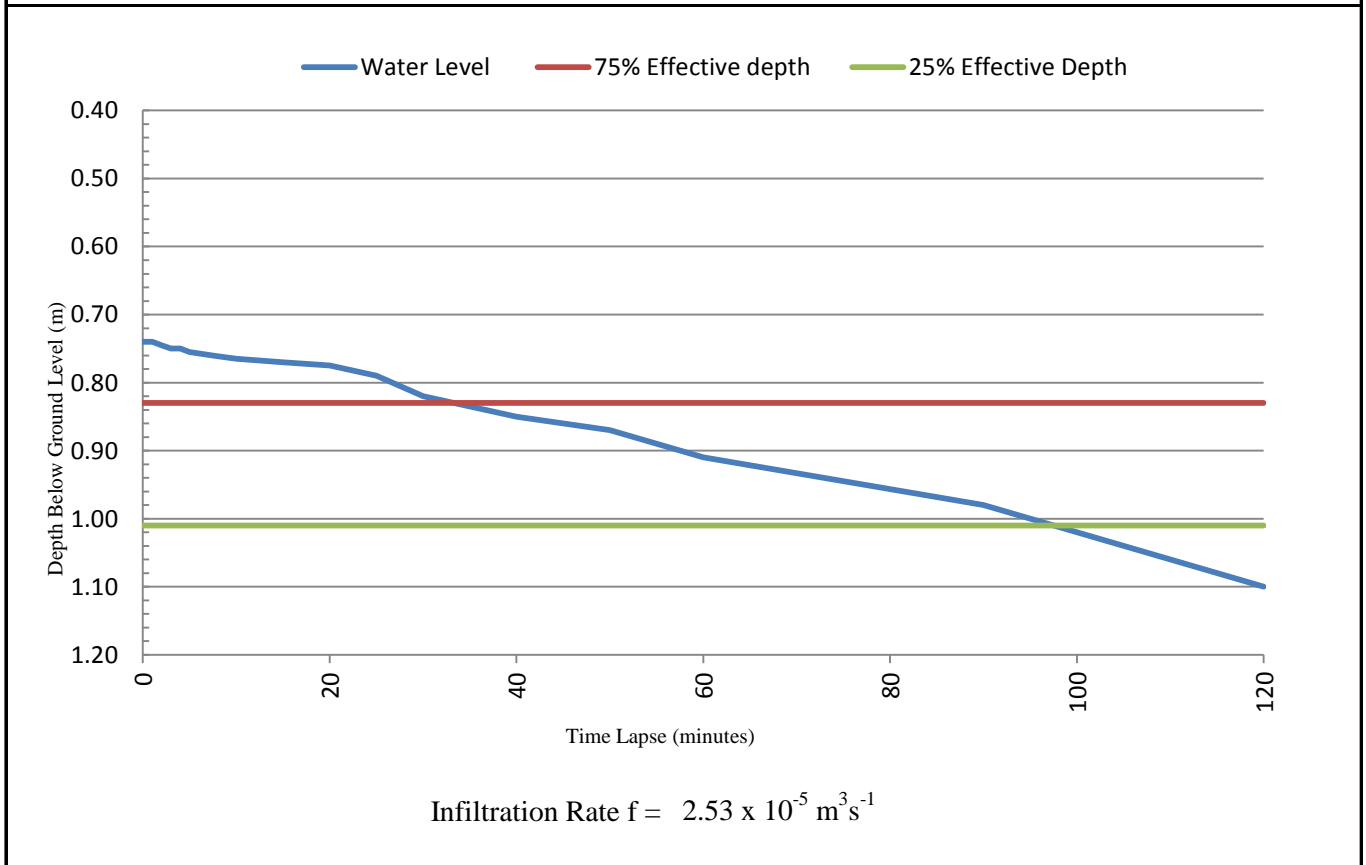


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP56 Test2
Job No. UA004014	Date 30/7/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 2 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.90	Length	1.90
Width	0.50	Width	0.50
Depth	1.10	Depth	1.10

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.74	30	0.820
0.5	0.74	40	0.850
1	0.74	50	0.870
2	0.75	60	0.910
3	0.75	90	0.980
4	0.75	120	Dry
5	0.76		
7.5	0.76		
10	0.77		
15	0.77		
20	0.78		
25	0.79		



All dimensions in metres	Client A2Dominion	Logged By IP
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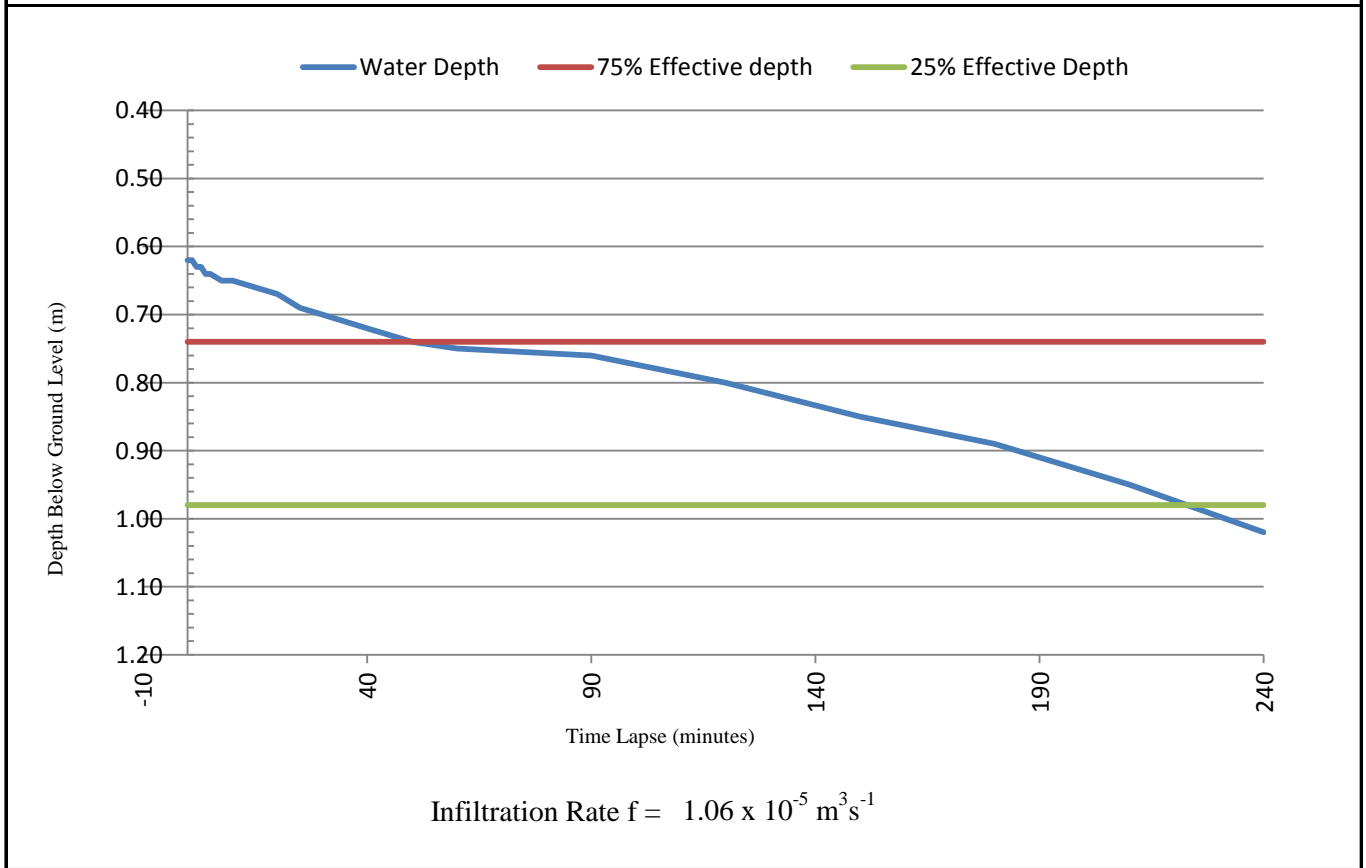


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP56 Test3
Job No. UA004014	Date 30/7/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 3 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.90	Length	1.90
Width	0.50	Width	0.50
Depth	1.10	Depth	1.10

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.62	30	0.700
0.5	0.62	40	0.720
1	0.62	50	0.740
2	0.63	60	0.750
3	0.63	90	0.760
4	0.64	120	0.800
5	0.64	150	0.850
7.5	0.65	180	0.890
10	0.65	210	0.950
15	0.66	240	1.020
20	0.67		
25	0.69		



All dimensions in metres	Client A2Dominion	Logged By IP
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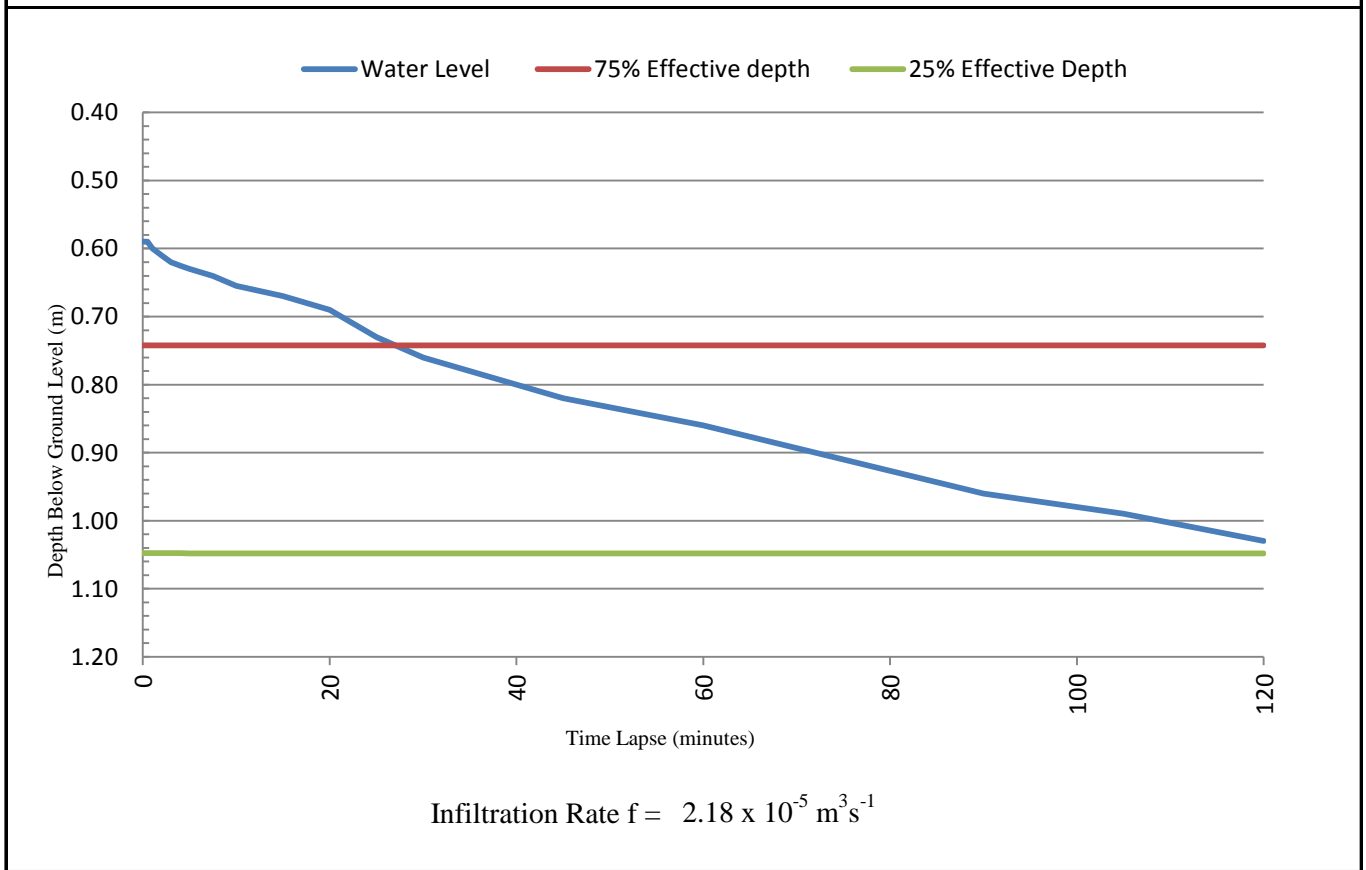


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP58 Test1
Job No. UA004014	Date 30/7/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 1 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.80	Length	1.80
Width	0.60	Width	0.60
Depth	1.20	Depth	1.20

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.59	30	0.760
0.5	0.59	45	0.820
1	0.60	60	0.860
2	0.61	90	0.960
3	0.62	105	0.990
4	0.63	120	1.030
5	0.63		
7.5	0.64		
10	0.66		
15	0.67		
20	0.69		
25	0.73		



All dimensions in metres	Client A2Dominion	Logged By IP
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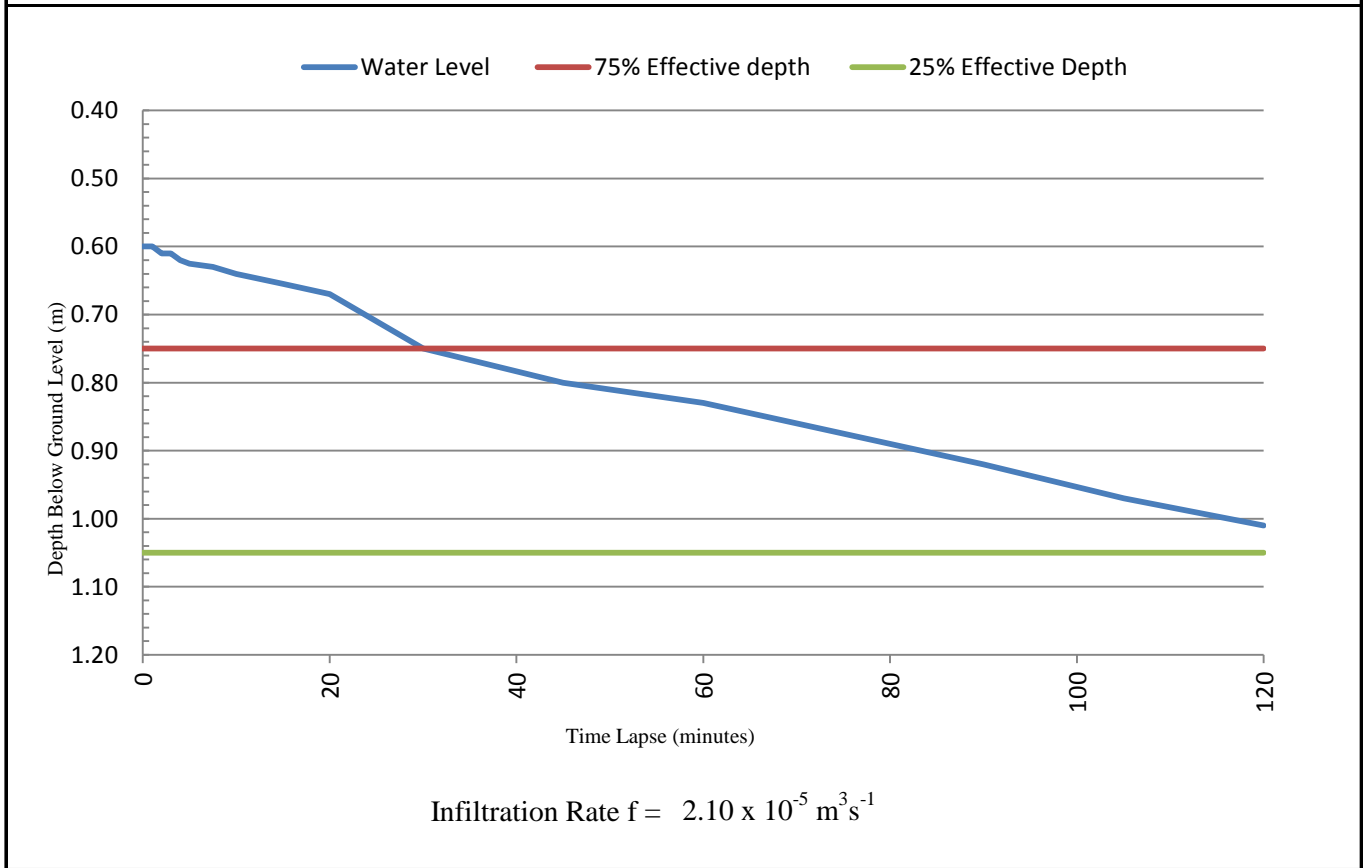


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP58 Test2
Job No. UA004014	Date 30/7/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 2 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.80	Length	1.80
Width	0.60	Width	0.60
Depth	1.20	Depth	1.20

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.60	30	0.750
0.5	0.60	45	0.800
1	0.60	60	0.830
2	0.61	90	0.920
3	0.61	105	0.970
4	0.62	120	1.010
5	0.63		
7.5	0.63		
10	0.64		
15	0.66		
20	0.67		
25	0.71		



All dimensions in metres	Client A2Dominion	Logged By IP
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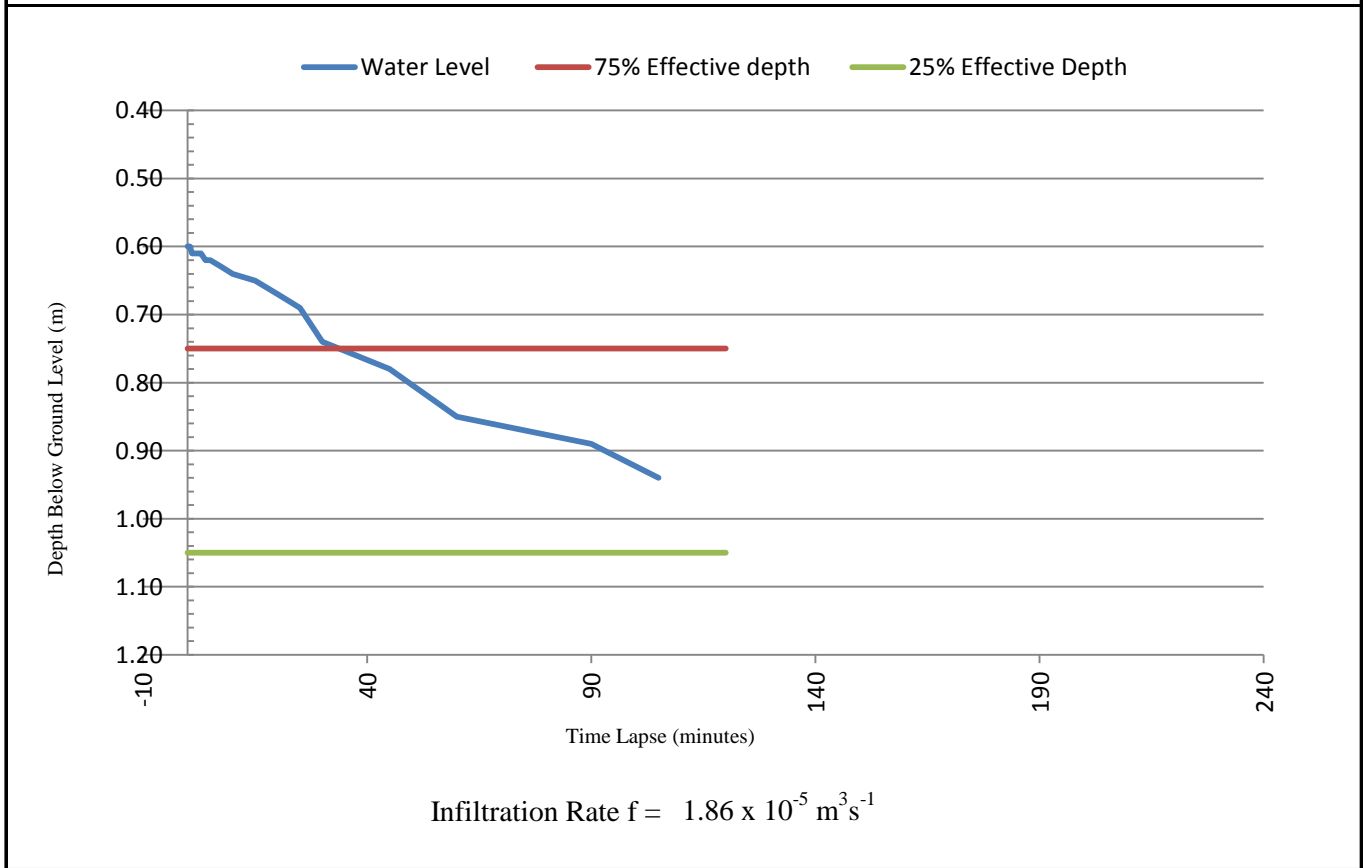


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP58 Test3
Job No. UA004014	Date 30/7/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 3 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.80	Length	1.80
Width	0.60	Width	0.60
Depth	1.20	Depth	1.20

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.60	30	0.740
0.5	0.60	45	0.780
1	0.61	60	0.850
2	0.61	90	0.890
3	0.61	105	0.940
4	0.62		
5	0.62		
7.5	0.63		
10	0.64		
15	0.65		
20	0.67		
25	0.69		



All dimensions in metres	Client A2Dominion	Logged By IP
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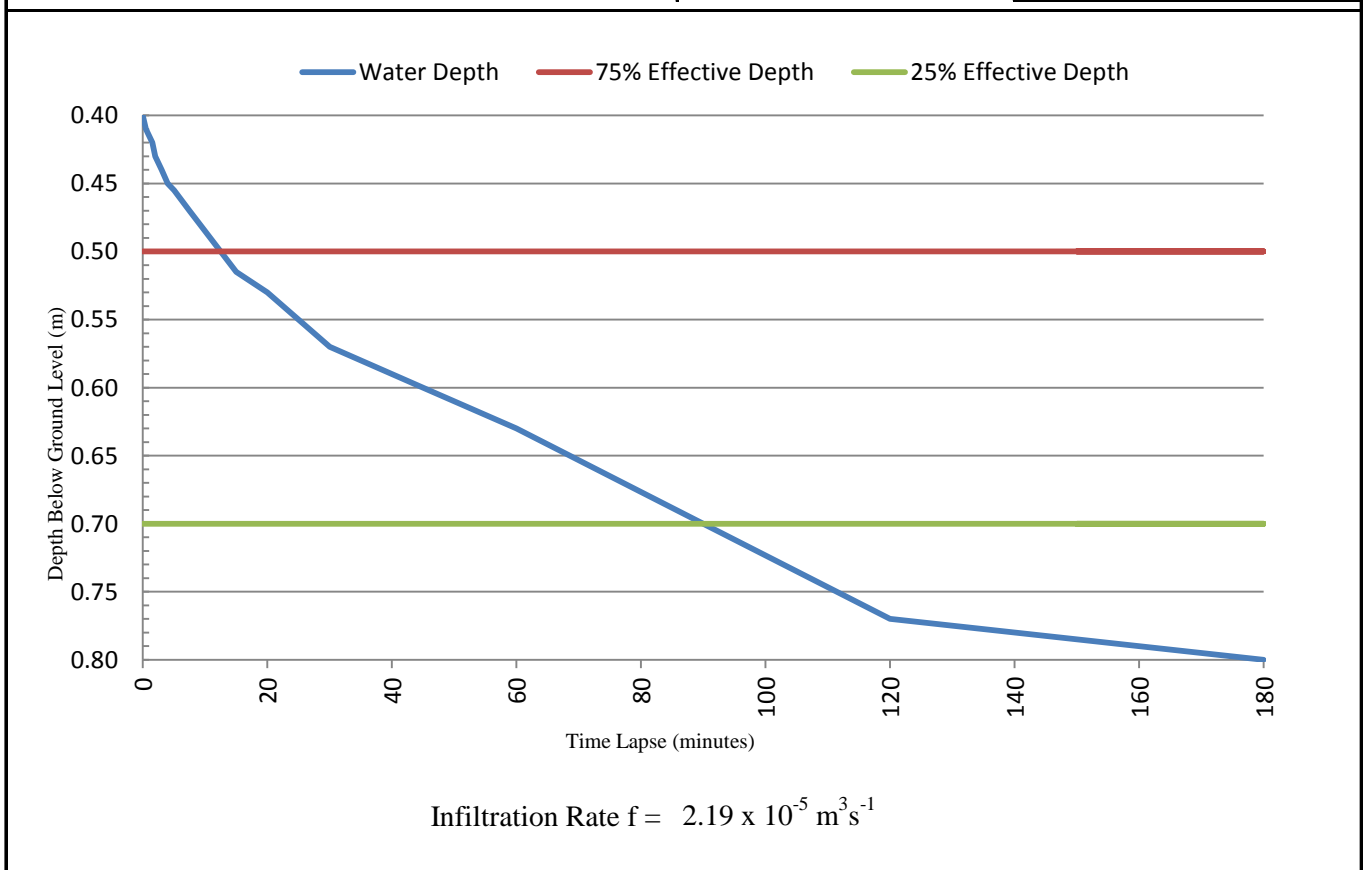


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP59 Test1
Job No. UA004014	Date 1/8/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 1 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.40	Length	1.40
Width	0.60	Width	0.60
Depth	0.80	Depth	0.80

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.41	30	0.600
0.5	0.42	45	0.630
1	0.42	60	0.700
1.5	0.43	90	0.770
2	0.44	120	0.770
3	0.45	180	Dry
4	0.46		
5	0.47		
7.5	0.49		
10	0.52		
15	0.53		
20	0.57		



All dimensions in metres. Insufficient time to allow full test	Client A2Dominion	Logged By IP
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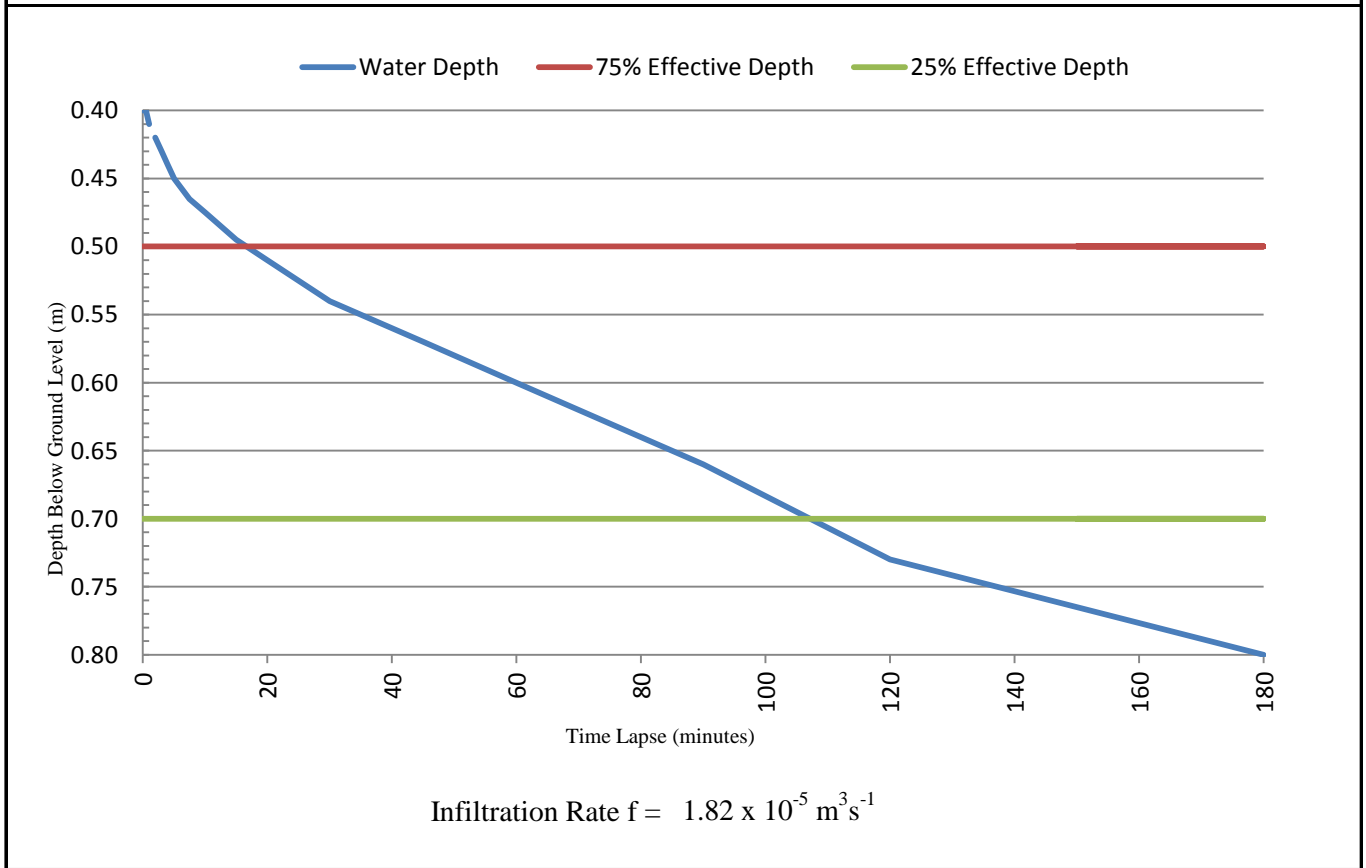


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP59 Test2
Job No. UA004014	Date 1/8/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 2 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.40	Length	1.40
Width	0.60	Width	0.60
Depth	0.80	Depth	0.80

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.40	30	0.540
0.5	0.41	45	0.570
1	0.42	60	0.600
1.5	0.43	90	0.660
2	0.44	180	Dry
3	0.45		
4	0.47		
5	0.48		
7.5	0.50		
10	0.51		
15	0.54		
20	0.57		



All dimensions in metres. Insufficient time to allow full test	Client A2Dominion	Logged By IP
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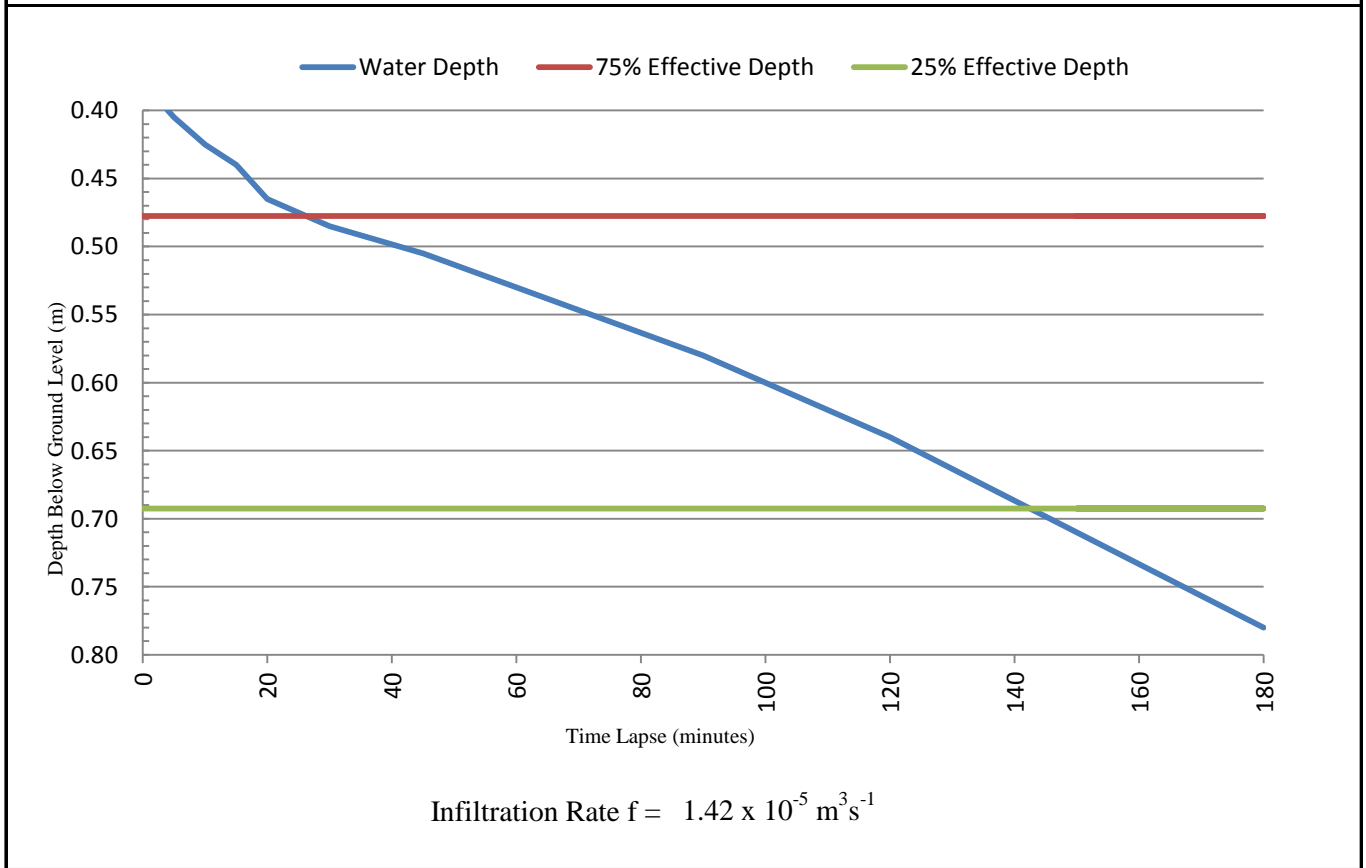


SOAKAWAY INFILTRATION TEST

Project Bicester Eco Village - Additional Soakaways				Trial Pit No TP59 Test3
Job No. UA004014	Date 1/8/12	Ground Level (m)	Co-Ordinates ()	
Contractor Hyder Consulting Limited				Sheet 3 of 3

Pit Dimension Prior To Test		Pit Dimension After Test	
Length	1.40	Length	1.40
Width	0.60	Width	0.60
Depth	0.80	Depth	0.80

Time Lapsed (minutes)	Depth to Water (m bgl)	Time Lapsed (minutes)	Depth to Water (m bgl)
0	0.370	30	0.485
0.5	0.375	45	0.505
1	0.375	60	0.530
1.5	0.000	90	0.580
2	0.380	120	0.640
3	0.390	180	0.780
4	0.400		
5	0.405		
7.5	0.415		
10	0.440		
15	0.465		
20	0.530		



All dimensions in metres. Insufficient time to allow full test	Client A2Dominion	Logged By IP
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Appendix C

TREATMENT TRAIN ASSESSMENT


Treatment Characteristics										
Water Source	Description	Train Description	SUDS Group	Technique	Total Suspended Solids	Heavy Metals	Nutrients	Bacteria	Fines and dissolved	Potential additional pretreatment
Building rooftops	Relatively clean, likely to contain some sediment, metals and organic matter	Roof to rainwater harvesting with overflow to soakaway discharging to ground	Source Control Infiltration	Rainwater harvesting	M	L	L	L	-	Leaf guards in guttering system
		Roof to soakaway discharging to ground	Infiltration	Soakaway	H	H	H	M	H	Leaf guards in guttering system
		Green roof to soakaway discharging to ground	Source Control Infiltration	Enhanced wet swale	H	H	M	H	H	
Residential Roads	Likely to contain grits, limited hydrocarbons and metals	Percolates surface of permeable paving, filters through substructure and infiltrates ground	Source Control Infiltration	Permeable Pavement	H	H	H	H	H	
		Runs over edge of shared paving into collection channel, filters through permeable filtration medium and infiltrates the ground	Source Control Infiltration	Soakaway	H	H	H	M	H	
Main Roads	Likely to contain grits, limited hydrocarbons and metals	Runs over edge of road and percolates through vegetated strip to ground below. In large rainfall events, runs through vegetation to infiltration trench beyond for storage prior to discharge to ground	Filtration Infiltration	Bioretention/filter strips Soakaway	H H	H H	H H	M M	H H	
		Conveyed by kerb drains and pipes to swale and discharging to watercourse	Retention Open Channel	Subsurface storage Enhanced wet swale	H L	H L	M L	H L	H L	

Appendix D

RUNOFF VOLUME CALCULATIONS

7016-UA001881- Greenfiled Runoff Volume

7019-UA001881- Spine Road and Phase One Residential Area Runoff

		<h1>CALCULATIONS</h1>				DOCUMENT No 7016-UA001881-UP21B-01		
OFFICE <p style="text-align: center;">Cardiff</p>				PROJECT TITLE <p style="text-align: center;">NW Bicester Eco-Town</p>				
SUBJECT <p style="text-align: center;">Greenfield Runoff - Volumetric Calculation</p>							SHEET No <p style="text-align: center;">1 OF 1</p>	
ISSUE	TOTAL SHEETS	AUTHOR	DATE	CHECKED BY	DATE	APPROVED BY	DATE	COMMENTS
1	1	DCB	25/03/11	MP	25/03/11	SAD	25/03/11	
2								
3								
4								
5								
SUPERSEDES DOC No							DATE	

DESIGN BASIS STATEMENT (Inc. sources of info/data, assumptions made, standards, etc.)

Introduction

This calculation has been prepared to assess the greenfield runoff volume in accordance with The SUDS Manual (CIRIA) - Section 4.2.2: Estimating greenfield runoff volumes.

For the purpose of this calculation we have used the FSSR 16 runoff model - fixed percentage runoff, assuming larger rainfall depths.

Assumptions

- 1) Catchment Area = 17.5 Ha
- 2) SPR = 13.1 (obtained from FEH descriptors)
- 3) CWI = 103 (obtained from The SUDS Manual - Fig 4.4 for an annual average rainfall of 647mm)
- 4) Rainfall Depth (P) = 62.5mm (obtained through Windes modelling for the 100 year 360 minute storm)

Results

The SUDS Manual - Box 4.3:

$$\text{Percentage Runoff (PR}_{\text{RURAL}}) = \text{SPR} + \text{DPR}_{\text{CWI}} + \text{DPR}_{\text{RAIN}}$$

Where:

- $\text{DPR}_{\text{CWI}} = 0.25 \times (\text{CWI} - 125) = -5.5$
- $\text{DPR}_{\text{RAIN}} = 0.45 (\text{P} - 40)^{0.7} = 4.0$

Therefore:


$$\text{PR}_{\text{RURAL}} = 13.1 + (-5.5) + 4.0 = 11.6 \%$$

The SUDS Manual - Section 4.2.2:

$$\begin{aligned} \text{Runoff Volume} &= \text{Percentage Runoff (PR)} \times \text{Catchment Area} \times \text{Rainfall Depth} \\ &= 0.116 \times 175,000 \times 0.0625 \\ &= \underline{1,270 \text{ m}^3} \end{aligned}$$

The above runoff volume represents the approximate existing greenfield runoff for the undeveloped Exemplar Site.

Assuming the proposed development is to be limited to the same runoff volume of 1,270m³, this would equate to the discharge volume from a developed area of approximately 25,400m² (2.5 Ha), assuming a PR of 80%.

		<h1>CALCULATIONS</h1>				DOCUMENT No 7019-UA001881-UP33B-01		
OFFICE <p style="text-align: center;">Cardiff</p>				PROJECT TITLE <p style="text-align: center;">NW Bicester Eco-Town</p>				
SUBJECT <p style="text-align: center;">Spine Road and Phase 1 Residential Runoff - Volumetric Calculation</p>							SHEET No <p style="text-align: center;">1 OF 1</p>	
ISSUE	TOTAL SHEETS	AUTHOR	DATE	CHECKED BY	DATE	APPROVED BY	DATE	COMMENTS
1	1	SJ	04/09/12	MP	07/09/12	SAD	07/09/12	
2								
3								
4								
5								
SUPERSEDES DOC No							DATE	

DESIGN BASIS STATEMENT (Inc. sources of info/data, assumptions made, standards, etc.)

Introduction

This calculation has been prepared to assess the Phase 1 residential runoff volume in accordance with The SUDS Manual (CIRIA) - Section 4.2.2: Estimating greenfield runoff volumes.

For the purpose of this calculation we have used the FSSR 16 runoff model - fixed percentage runoff, assuming larger rainfall depths.

Assumptions

- Catchment Area = 17.5 Ha
- Impermeable Area (Spine Road) = 1.55 Ha
- Permeable Area (Residential Area) = 3.31 Ha
- Rainfall Depth (P) = 62.5mm (obtained through Windes modelling for the 100 year 360 minute storm)
- Impermeable percentage runoff (PR) assumed to be 84%, however, to account for grassed verges, coefficient may be reduced to 75%.
- Permeable percentage runoff (PR) assumed to be 10% (less than greenfield PR due to SUDS features)

Results

Impermeable Area Runoff

Impermeable Runoff Volume = Percentage Runoff (PR) x Impermeable Area x Rainfall Depth

$$= 0.75 \times 15500 \times 0.0625$$

$$= 727 \text{ m}^3$$

Permeable Area Runoff

Permeable Runoff Volume = Percentage Runoff (PR) x Permeable Area x Rainfall Depth

$$= 0.10 \times 33100 \times 0.0625$$

$$= 207 \text{ m}^3$$

Total Runoff = Impermeable Runoff Volume + Permeable Runoff Volume

$$= 934 \text{ m}^3$$

The above runoff volume represents the approximate runoff for the spine infrastructure and phase one residential areas of the Exemplar Site.

Appendix E

FOUL WATER LOADINGS

7006-UA001881- Site Sewage Generation



CALCULATIONS

DOCUMENT No

7006-UA001881-UP21B-03

OFFICE

CARDIFF

PROJECT TITLE

NW Bicester Eco Development

SUBJECT

Exemplar Site Sewage Generation Calculation

SHEET No

1 OF 2

ISSUE	TOTAL SHEETS	AUTHOR	DATE	CHECKED BY	DATE	APPROVED BY	DATE	COMMENTS
1	2	DB	02/09/10	SD	02/09/10	SD	02/09/10	
2	2	DB	12/11/10	MP	12/11/10	SD	12/11/10	
3	2	DB	25/11/10	MP	25/11/10	SD	25/11/10	
4								
5								

SUPERSEDES DOC No

DATE

DESIGN BASIS STATEMENT (Inc. sources of info/data, assumptions made, standards, etc.)

Property information (use, size, etc.):

Plot areas and land use split in accordance with data provided within the Exemplar Site masterplan non-residential buildings brief (4/11/2010) and Accommodation Schedule (29/10/1010).

Water Demand:

Conventional Development Rates:

Thames Water Guidelines for Undertaking Sewerage Modelling (November 2005)

Sustainable Development Rates:

Code For Sustainable Homes Technical Guide (May 2009 - Version 2)

BREEAM Offices - Assessment Prediction Checklist

NW Bicester Eco Development
7006-UA001881-UP21B-03
Exemplar Site Sewage Generation Calculation

Land Use	Area (m2)	Number of Properties	Total Population	Water Consumption (l/person(m2)/day)	Rainwater Harvesting Contribution (l/person(m2)/day)	Average Discharge (l/day)	Average Discharge (l/s)	Peak Discharge (l/s)
Residential		400	1151	80	12.00	105,928.80	3.68	22.07
Social / Community	540	N/A	123	6.5	0.98	920.45	0.03	0.19
Commercial	3,610	N/A	820	6.5	0.98	6,153.41	0.21	1.28
Restaurant	300	N/A	68	162	24.30	12,702.27	0.44	2.65
Retail / Leisure	660	N/A	N/A	2.4	0.36	1,821.60	0.06	0.38
Education	1,110	N/A	139	48	7.20	7,659.00	0.27	1.60
						135,185.54	4.69	28.16

Development Total						135,186	5	28
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Assumptions:

Factors

Peaking Factor	6	[Conversion from average discharge rate to peak discharge rate]
Infiltration	0%	
Rainwater Harvesting	15%	[Additional contribution to foul discharge rates]

Residential:

Baseline for Conventional Development		150 l/person/day	[Thames Water Guidelines for Undertaking Sewerage Modelling (November 2005); General Housing = 600 l/property/day]
Sustainable Development		80 l/person/day	[Code for Sustainable Homes (Level 6)]
Residential split	Affordable	123	
	Private	270	
Residents per property	Affordable	4.40	
	Private	2.26	
Water consumption assumed to be over an		8 hour day	

Commercial (Offices / Hairdressers) and Social / Community:

Baseline for Conventional Development		33 l/person/day	[Thames Water Guidelines for Undertaking Sewerage Modelling (November 2005); Offices = 750 l/100m2/day (population density as below)]
Sustainable Development		6.5 l/person/day	[BREEAM Offices 2005 (16-24 points): 1.5m3 per person per year (assume 230 working days per year)]
Staff density		4.4 m2/person	[The Workplace (Health, Safety & Welfare) Regulations 1992: Minimum working space = 11m3 (assume 2.5m high)]
Water consumption assumed to be over an		8 hour day	

Restaurant (Take-away / Pub):

Baseline for Conventional Development		270 l/person/day	[Thames Water Guidelines for Undertaking Sewerage Modelling (November 2005); Restaurant = 270 l/seat/day (population density as below)]
Sustainable Development		162 l/person/day	[Assume 40% reduction from baseline]
Staff / customer density		4.4 m2/person	[Assumption - The Workplace (Health, Safety & Welfare) Regulations 1992: Minimum working space = 11m3 (assume 2.5m high)]
Water consumption assumed to be over an		8 hour day	

Retail / Leisure:

Baseline for Conventional Development		4 l/m2/day	[Thames Water Guidelines for Undertaking Sewerage Modelling (November 2005); Shopping Centre = 400 l/100m2/day]
Sustainable Development		2.4 l/m2/day	[Assume 40% reduction from baseline]
Water consumption assumed to be over an		8 hour day	

Education:

Baseline for Conventional Development		80 l/person/day	[Thames Water Guidelines for Undertaking Sewerage Modelling (November 2005); School]
Sustainable Development		48 l/person/day	[Assume 40% reduction from baseline]
Pupil density		8 m2/pupil	[Assumption]
Water consumption assumed to be over an		8 hour day	