

DRAINAGE STRATEGY REPORT

PROPOSED RESIDENTIAL DEVELOPMENT FORMER OAKENROD SCHOOL & MILL SITES BURY ROAD ROCHDALE OL11 5EU

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Client: Hallmark Developments Ltd
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Revision	Date	Reason
0	November 2024	Original for Planning.
1	November 2024	Updated Site Plan & levels.

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1 Introduction.

The purpose of the assessment is to inform & accompany a planning application for a residential development on the former adjacent Oakenrod School & Oakenrod Mill Sites.

A planning application has been submitted under application No. 22/01068/FUL.

The proposed Site will comprise 52No. residential dwellings fed by a new access road. Included in the development will be a wildlife area and green corridor to the south part of the Site adjacent the River Roch, which will serve as a habitat and biodiversity area.

A previous drainage plan & strategy was undertaken by Elluc. However, T J Booth Associates have now been instructed to undertake a drainage plan/strategy moving forward, and all Elluc documents are considered superseded.

1.1 Planning consultation.

Comments have been received from the LLFA Drainage Officer in "Drainage Consultation 22_01068 Oakenrod School" dated 24.07.2024 as follows:

- i. The FRA should be reviewed to incorporate all available current data. The exception and sequential test should be undertaken for the development.*
- ii. Infiltration potential should be comprehensively assessed for all areas of the site. If full infiltration does not prove viable then options for hybrid solutions should also be investigated.*
- iii. A traditional buried storage approach is not consistent with the most sustainable options and does not deliver the maximum benefit. The proposals should therefore be revisited.*
- iv. Early liaison with UU regarding s104 adoption and associated responses should be provided.*
- v. Early liaison with EA regarding revised flood modelling and works / impacts to the River Roch should be provided.*
- vi. Private / housing drainage proposals should be provided.*
- vii. An operation and maintenance plan should be provided for all drainage assets and incorporate any mitigation for the outfall location.*

Comments have been received from United Utilities who requested further information in consultation "DC-23-2", dated 12.01.2023 as follows:

- i. REQUEST FOR ADDITIONAL INFORMATION We request that the applicant submits a plan outlining the proposed levels (including finished floor levels and ground levels) shown in metres above Ordnance Datum and an indicative foul and surface water drainage strategy (including cover and invert levels). It is our recommendation this information is submitted for our review so that any risk of sewer surcharge can be further assessed. The applicant should note that it may be necessary to raise finished floor and ground levels and / or include mitigation measures to manage the risk of sewer surcharge. Also, we noted that the applicant introduced a foul pump station, please identify the foul rate of discharge.*

1.2 General regulatory requirements.

The primary purpose of the report is to assess drainage proposals in accordance with the national drainage hierarchy for surface water disposal & exceedance characteristics, also considering the proposed end adopters and their requirements.

Regarding Site assessment, this report will appraise the existing and local drainage infrastructure, assess the suitability of the proposed development, giving recommendations for drainage design & management, specifically for approval of the LLFA/EA/sewerage undertakers, as applicable.

Drainage from new developments is to be designed to follow the national drainage hierarchy for surface water discharge to the following networks in order of preference:

- infiltration.
- Watercourse.
- surface water sewer.
- combined sewer.

Flow rates (existing & proposed) are to be estimated for approval using the following methodology:

- Development should aim to deliver greenfield runoff on greenfield sites up to a 100yr rainfall event, considering climate change.
- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites on a 1yr rainfall event.
- Development should be designed so that there is no flooding to the development in a 30yr event, and so that there is no property flooding in a 100yr event considering climate change.

2 Plans.

2.1 Location plan.

Refer to Location Plan in Appendix showing the area features.

The Site is made up of Oakenrod School adjacent to Bury Road, and the former Oakenrod Mill adjacent the River Roch to the south.

Access to the Site is via Bury Road to the northeast corner.

The River Roch flows NE-SW past the Site, flowing over a weir nominally halfway along the south boundary.

2.2 Site plan.

The north part of the Site formerly comprised Oakenrod School, and the south part of the Site adjacent the River Roch was formerly Oakenrod Mill.

Oakenrod Mill was historically a cotton mill, and was situated on a weir over the River Roch which remains. The mill historically abstracted water from the upper reach of the River Roch via sluices and storage reservoirs, driving 2No. water wheels initially (later replaced with a single turbine generator), with an outlet to the lower reach of the weir central to the south boundary.

The mill proper was demolished in the late 1960s/early 1970s, with some smaller units remaining until the early 2000s. Most of the sluices and channels were infilled at the time of demolition.

The School was demolished c2013 in readiness for planning applications for development.

The Application Site now encompasses both Sites.

The proposal is for a residential housing development, accessed via a new road approximately in place of the former access through the centre of the Site. The dwellings are to be laid out around the central access and comprise a mix of detached, semi-detached, and terrace town houses. Generally, the dwellings have driveways to the front and gardens to the rear.

Existing Site areas:

Total Site Area (considered greenfield)	18000 sqm
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Proposed Site areas:

Proposed developed area (dwellings, access rd & attenuation basin)	14100 sqm
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Wildlife area (minus attenuation basin)	3900 sqm
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Refer to Proposed Plan in appendix.

3 Derivation of Data, Surveys and Models.

3.1 Topography.

Due to the presence of the weir central to the Site boundary, there are both upper and lower reaches each with associated flood levels.

A topographic survey has been undertaken and indicated levels as follows:

Bury Road to the North boundary between 124.00m aOD to c120.00m aOD at the Site entrance.

The upper reach of the Site has a bank level of around 116.00-117.00m aOD. There are some small mounds of earth in this area up to c119.00m aOD.

The weir has a sill level of 113.74m aOD.

The break between the upper and lower reaches of the Site are controlled by the old mill sluice wall which projects back into the Site from the weir at around 116.00-116.10m aOD.

The lower reach of the Site has a bank level of around 114.50m aOD around the vicinity of the weir, which drops to around 114.00m aOD around 50m downstream. There are some significant mounds of earth in this area up to 117.80m aOD.

3.2 Site Investigations.

Site investigations have been undertaken by E3P and the information compiled in a 'PHASE II GEOENVIRONMENTAL SITE ASSESSMENT'.

Summarising the ground, the report notes the following:

'Historically, the site has been subjected to a number of industrial uses including Oakenrod Woollen Mill and associated chimney, tank and reservoir. Chemical by-products of manufacturing processes and compounds within the Made Ground may have subsequently leached down into underlying ground and contaminated groundwater both within Made Ground and natural drift deposits.

The site is underlain by cohesive (soil) that is interbedded with granular drift deposits in localised areas. The granular deposits will afford less protection to the adjacent River Roch in comparison to where clay deposits have been identified in excess of 5.00 m in areas. Impacted groundwater has the potential to migrate laterally and vertically towards nearby controlled water receptors, including the river, as a result of this high permeability strata. Controlled water receptors are therefore deemed to be at a high sensitivity with respect to potential onsite contamination.

The source of the contaminants cannot be attributed to one area or point source on the site and the majority of the contamination is considered present on a site wide basis due to a legacy of historic site uses.'

3.2.1 Liaison with E3P.

In October 2024, E3P were contacted to enquire as to the viability of infiltration as means of controlling surface water runoff for the proposed development. E3P advised that infiltration testing had not been undertaken and should not be used for the following reasons (summary points below, and email correspondence in the Appendix):

- The Made Ground is entirely underlain by cohesive soils which are unlikely to offer the required permeability for soakaway drainage.
- Widespread exceedances of PAHs within the soils restrict infiltration testing as this can result in leaching of contaminants downwards into the natural soils and ultimately groundwater – which could create a more significant issue.

3.3 Drainage Surveys.

Historically undertaken but now expected to have been removed as part of the mill/school demolition.

3.4 Sewer Undertaker Records.

There is UU infrastructure across the far west corner of the Site, but it is at high level, not suitable for the proposed development.

There is a combined 450 sewer in Bury Road which will be suitable as foul drainage for part of the Site.

3.5 Landmark Records.

Not obtained.

4 Drainage Strategy.

4.1 Existing Rainfall & Drainage Systems.

Local rainfall characteristics are as follows:

SAAR (mm)	1147
M5-60 rainfall depth (mm)	20
'r' ratio M5-60 / M5-2day	0.3
FEH/FSR conversion factor	1.12
Hydrological region	10
Specify SOIL type	4
SPR	0.47

The HR Wallingford UK SUDS Website was used to estimate greenfield flow rates at the Site (excerpts below & full report in Appendix):

Site characteristics

Total site area (ha):

Notes

(1) Is $Q_{BAR} < 2.0 \text{ l/s/ha}$?

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	12.13	12.13
1 in 1 year (l/s):	10.55	10.55
1 in 30 years (l/s):	20.62	20.62
1 in 100 year (l/s):	25.23	25.23
1 in 200 years (l/s):	28.75	28.75

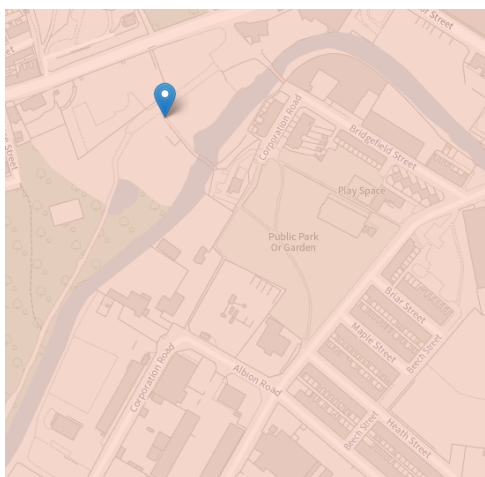
4.2 Rainfall Climate change impacts on the proposed development.

Climate change allowances to peak rainfall intensity are given nationally across the whole of England, based upon river management catchment areas. Refer to graphic inset:

Given the proposed residential end use, the 2070s epoch is considered suitable for climate change allowance estimation, which suggests the following allowances to be used:

30yr rainfalls +40% climate change allowance.

100yr rainfalls +45% climate change allowance.



3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

4.3 Proposed Rainfall & Drainage Systems.

Following the guidance of hierarchy for disposal of surface water (SUDS):

- INFILTRATION:**

Site investigations have been undertaken by a third-party environmental consultancy, who have advised that the ground beneath the Site is contaminated, and infiltration should not be used where possible as a means of surface water control from the proposed development.

This method is not considered to be a suitable means of control, and the next available method should be considered.

- **WATERCOURSE:** The River Roch forms the southeast boundary of the Site and should be used for the discharge of surface water. The developed areas of the Site are proposed to be controlled via a hydrobrake vortex flow control at QBar, and an offline storage basin will be used to control pluvial rainfall up to the 100yr+CC return period event.
- **SW SEWER:** not required.
- **COMBINED SEWER:** not required.

4.3.1 Proposed Foul Water System.

The full Site will discharge to the United Utilities combined sewer in Bury Road.

The various foul drainage runs will combine in the northeast Site corner adjacent Plot 30, discharging to a new manhole in Bury Road.

FOUL FLOWS & LOADS															
Client:				Hallmark											
Site Name & Location:				Oakenrod											
Route Description:				Foul flows											
Revision date:				06.11.2024											
PLOTS 01-30 & 44-52, FULL SITE ANALYSIS VIA GRAVITY:															
Plots Type (Ax4, Bx11, Dx2, D1x6, Fx6, F1x4)				Plots Type (Cx6, C1x1)				Plots Type (Ex6)				Plots Type (Gx6)			
BS EN 752-4				BS EN 752-4				BS EN 752-4				BS EN 752-4			
Appliance Type	No of Appliances	DU	DU Tot	Appliance Type	No of Appliances	DU	DU Tot	Appliance Type	No of Appliances	DU	DU Tot	Appliance Type	No of Appliances	DU	DU Tot
w.machine	1	0.6	0.6	w.machine	1	0.6	0.6	w.machine	1	0.6	0.6	w.machine	1	0.6	0.6
d.washer	1	0.2	0.2	d.washer	1	0.2	0.2	d.washer	1	0.2	0.2	d.washer	1	0.2	0.2
Kitchen sink	1	1.3	1.3	Kitchen sink	1	1.3	1.3	Kitchen sink	1	1.3	1.3	Kitchen sink	1	1.3	1.3
Basin	2	0.3	0.6	Basin	3	0.3	0.9	Basin	3	0.3	0.9	Basin	4	0.3	1.2
Toilet	2	1.8	3.6	Toilet	3	1.8	5.4	Toilet	3	1.8	5.4	Toilet	4	1.8	7.2
Bath	1	1.3	1.3	Bath	1	1.3	1.3	Bath	1	1.3	1.3	Bath	1	1.3	1.3
Shower	0	0.6	0	Shower	1	0.6	0.6	Shower	2	0.6	1.2	Shower	2	0.6	1.2
		Tot DU tot	7.6			Tot DU tot	10.3			Tot DU tot	10.9			Tot DU tot	13
no of props per house type			33				7				6				6
cumulative total Dus per house type			250.8				72.1				65.4				78
Total No of Dwellings			52												
Total DU's			466.3												
Freq Factor			0.5												
Peak Foul flow l/s			10.8												

4.3.2 Adoption.

The drainage systems drainage will remain private.

4.3.3 Maintenance.

Maintenance of suds will be private. A maintenance plan is included on the Drainage Plan specification.

Signed.....  .

D.S. Slattery BSc (Hons).

T J Booth Associates.

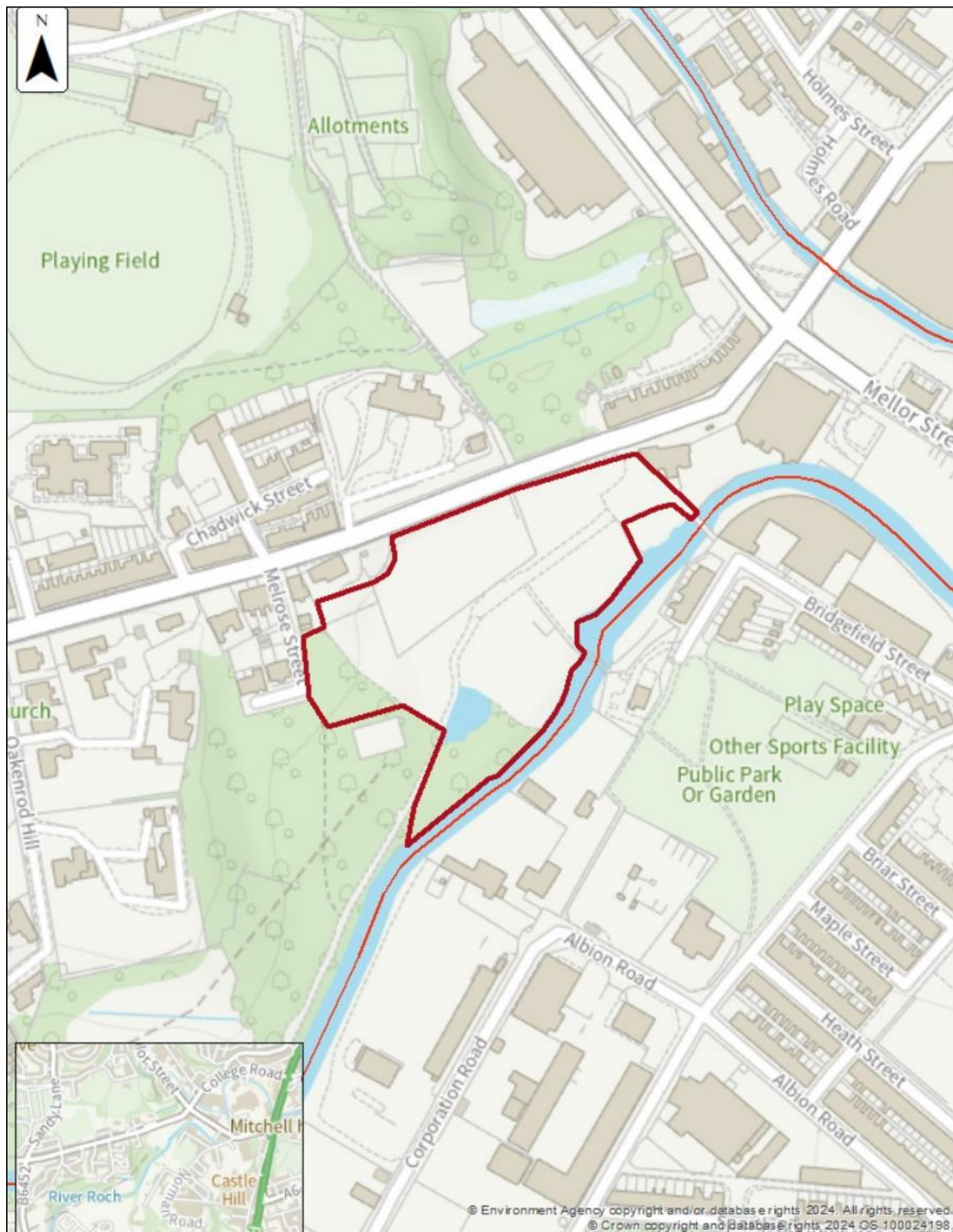
Authorised...  .

T J Booth BSc (Hons), C. Eng. C. Env. MICE.

T J Booth Associates.

5 Appendix.

5.1 Location Plan.



5.2 Proposed Plans.

5.3 HR Wallingford UK SUDS Greenfield Runoff Estimation Report.



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Dan S
Site name:	Hallmark-Oakenrod
Site location:	Oakenrod, Rochdale

Site Details

Latitude:	53.61441° N
Longitude:	2.17172° W
Reference:	3431193638
Date:	Nov 06 2024 15:05

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	1.41
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Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	1147	1147
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	12.13	12.13
1 in 1 year (l/s):	10.55	10.55
1 in 30 years (l/s):	20.62	20.62
1 in 100 year (l/s):	25.23	25.23
1 in 200 years (l/s):	28.75	28.75

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

5.4 Microdrainage Calculation Proposed Development.

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104 Yorkshire St Rochdale Lancashire OL16 1JY		attenuation pond hallmark oakenrod rochdale					
Date october 2024 File CALC-T~1.SRC		Designed By ds Checked By					
Micro Drainage		Source Control W.10.4					
Summary of Results for 1 year Return Period							
Storm Duration (mins)		Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer		11.2	11.2	112.9973	0.0973	33.8	O K
30 Summer		11.5	11.5	113.0188	0.1188	41.3	O K
60 Summer		11.6	11.6	113.0348	0.1348	47.0	O K
120 Summer		11.7	11.7	113.0417	0.1418	49.6	O K
180 Summer		11.7	11.7	113.0417	0.1418	49.5	O K
240 Summer		11.6	11.6	113.0373	0.1373	48.0	O K
360 Summer		11.6	11.6	113.0257	0.1258	43.7	O K
480 Summer		11.5	11.5	113.0133	0.1133	39.3	O K
600 Summer		11.4	11.4	113.0018	0.1018	35.3	O K
720 Summer		11.0	11.0	112.9928	0.0928	32.1	O K
960 Summer		10.1	10.1	112.9778	0.0778	26.8	O K
1440 Summer		8.8	8.8	112.9548	0.0548	18.7	O K
2160 Summer		7.4	7.4	112.9318	0.0317	10.8	O K
2880 Summer		6.5	6.5	112.9163	0.0163	5.6	O K
4320 Summer		5.6	5.6	112.9000	0.0000	0.0	O K
5760 Summer		4.6	4.6	112.9000	0.0000	0.0	O K
7200 Summer		4.0	4.0	112.9000	0.0000	0.0	O K
8640 Summer		3.5	3.5	112.9000	0.0000	0.0	O K
10080 Summer		3.2	3.2	112.9000	0.0000	0.0	O K
15 Winter		11.5	11.5	113.0113	0.1113	38.6	O K
30 Winter		11.6	11.6	113.0378	0.1378	48.2	O K
60 Winter		11.7	11.7	113.0563	0.1562	54.8	O K
120 Winter		11.8	11.8	113.0628	0.1627	57.2	O K
180 Winter		11.7	11.7	113.0573	0.1572	55.2	O K
240 Winter		11.7	11.7	113.0482	0.1483	51.9	O K
	Storm Duration (mins)		Rain (mm/hr)		Time-Peak (mins)		
	15 Summer		28.17		16		
	30 Summer		19.18		30		
	60 Summer		12.80		46		
	120 Summer		8.41		82		
	180 Summer		6.56		116		
	240 Summer		5.47		152		
	360 Summer		4.21		218		
	480 Summer		3.50		280		
	600 Summer		3.03		342		
	720 Summer		2.70		404		
	960 Summer		2.25		528		
	1440 Summer		1.73		766		
	2160 Summer		1.33		1128		
	2880 Summer		1.11		1496		
	4320 Summer		0.85		0		
	5760 Summer		0.71		0		
	7200 Summer		0.61		0		
	8640 Summer		0.54		0		
	10080 Summer		0.49		0		
	15 Winter		28.17		17		
	30 Winter		19.18		30		
	60 Winter		12.80		50		
	120 Winter		8.41		90		
	180 Winter		6.56		128		
	240 Winter		5.47		164		
(c)1982-2006 Micro Drainage							

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104 Yorkshire St Rochdale Lancashire OL16 1JY	attenuation pond hallmark oakenrod rochdale	
Date october 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Summary of Results for 1 year Return Period

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
360 Winter	11.6	11.6	113.0263	0.1263	44.0	O K
480 Winter	11.4	11.4	113.0058	0.1058	36.8	O K
600 Winter	10.9	10.9	112.9912	0.0913	31.5	O K
720 Winter	10.2	10.2	112.9792	0.0793	27.3	O K
960 Winter	9.1	9.1	112.9598	0.0598	20.5	O K
1440 Winter	7.5	7.5	112.9323	0.0322	11.0	O K
2160 Winter	6.0	6.0	112.9078	0.0078	2.7	O K
2880 Winter	5.2	5.2	112.9000	0.0000	0.0	O K
4320 Winter	4.0	4.0	112.9000	0.0000	0.0	O K
5760 Winter	3.3	3.3	112.9000	0.0000	0.0	O K
7200 Winter	2.9	2.9	112.9000	0.0000	0.0	O K
8640 Winter	2.6	2.6	112.9000	0.0000	0.0	O K
10080 Winter	2.3	2.3	112.9000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	4.21	232
480 Winter	3.50	294
600 Winter	3.03	356
720 Winter	2.70	420
960 Winter	2.25	542
1440 Winter	1.73	792
2160 Winter	1.33	1144
2880 Winter	1.11	0
4320 Winter	0.85	0
5760 Winter	0.71	0
7200 Winter	0.61	0
8640 Winter	0.54	0
10080 Winter	0.49	0

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104 Yorkshire St
Rochdale
Lancashire OL16 1JY

attenuation pond
hallmark
oakenrod rochdale

Date october 2024
File CALC-T~1.SRC

Designed By ds
Checked By



Micro Drainage

Source Control W.10.4

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	1	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.300	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+0
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 0.801

Time	(mins)	Area
from:	to:	(ha)
0	4	0.801

(c)1982-2006 Micro Drainage

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104 Yorkshire St Rochdale Lancashire OL16 1JY	attenuation pond hallmark oakenrod rochdale	
Date october 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Tank/Pond Details

Invert Level (m) 112.900 Ground Level (m) 114.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.00	339.0	0.60	438.0	1.20	528.0	1.80	528.0	2.40	528.0
0.10	354.0	0.70	455.0	1.30	528.0	1.90	528.0	2.50	528.0
0.20	370.0	0.80	473.0	1.40	528.0	2.00	528.0		
0.30	387.0	0.90	491.0	1.50	528.0	2.10	528.0		
0.40	403.0	1.00	510.0	1.60	528.0	2.20	528.0		
0.50	420.0	1.10	528.0	1.70	528.0	2.30	528.0		

Depth / Flow Outflow Control

Invert Level of Control 112.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	5.6	0.80	10.0	2.00	15.5	4.00	21.9	7.00	29.0
0.20	11.4	1.00	11.1	2.20	16.2	4.50	23.2	7.50	30.0
0.30	12.0	1.20	12.1	2.40	17.0	5.00	24.5	8.00	31.0
0.40	12.1	1.40	13.0	2.60	17.7	5.50	25.7	8.50	31.9
0.50	11.9	1.60	13.9	3.00	19.0	6.00	26.8	9.00	32.9
0.60	11.6	1.80	14.7	3.50	20.5	6.50	27.9	9.50	33.8

(c)1982-2006 Micro Drainage

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104 Yorkshire St Rochdale Lancashire OL16 1JY	attenuation pond hallmark oakenrod rochdale	
Date october 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage Source Control W.10.4		

Summary of Results for 30 year Return Period (+40%)

Storm Duration (mins)		Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15	Summer	12.1	12.1	113.2647	0.3647	134.2	O K
30	Summer	12.1	12.1	113.3727	0.4727	177.9	O K
60	Summer	12.1	12.1	113.4748	0.5747	221.3	O K
120	Summer	12.1	12.1	113.5538	0.6538	256.0	O K
180	Summer	12.1	12.1	113.5763	0.6763	266.1	O K
240	Summer	12.1	12.1	113.5783	0.6783	267.0	O K
360	Summer	12.1	12.1	113.5703	0.6703	263.4	O K
480	Summer	12.1	12.1	113.5548	0.6548	256.5	O K
600	Summer	12.1	12.1	113.5363	0.6363	248.3	O K
720	Summer	12.1	12.1	113.5163	0.6163	239.5	O K
960	Summer	12.1	12.1	113.4733	0.5733	220.6	O K
1440	Summer	12.1	12.1	113.3827	0.4827	182.1	O K
2160	Summer	12.1	12.1	113.2572	0.3572	131.1	O K
2880	Summer	12.1	12.1	113.1563	0.2562	91.9	O K
4320	Summer	11.6	11.6	113.0313	0.1313	45.8	O K
5760	Summer	10.5	10.5	112.9843	0.0843	29.1	O K
7200	Summer	9.1	9.1	112.9603	0.0603	20.7	O K
8640	Summer	8.1	8.1	112.9427	0.0427	14.6	O K
10080	Summer	7.3	7.3	112.9287	0.0287	9.8	O K
15	Winter	12.1	12.1	113.3077	0.4077	151.4	O K
30	Winter	12.1	12.1	113.4297	0.5297	201.9	O K
60	Winter	12.1	12.1	113.5468	0.6468	253.0	O K
120	Winter	12.1	12.1	113.6433	0.7433	296.8	O K
180	Winter	12.1	12.1	113.6753	0.7753	311.6	O K
240	Winter	12.1	12.1	113.6833	0.7833	315.5	O K

Storm Duration (mins)		Rain (mm/hr)	Time-Peak (mins)
15	Summer	68.99	18
30	Summer	47.08	33
60	Summer	30.81	62
120	Summer	19.53	122
180	Summer	14.75	180
240	Summer	12.05	222
360	Summer	9.05	284
480	Summer	7.38	346
600	Summer	6.29	414
720	Summer	5.52	484
960	Summer	4.49	616
1440	Summer	3.35	878
2160	Summer	2.49	1252
2880	Summer	2.02	1588
4320	Summer	1.50	2252
5760	Summer	1.21	2944
7200	Summer	1.03	3672
8640	Summer	0.90	4408
10080	Summer	0.81	5144
15	Winter	68.99	18
30	Winter	47.08	32
60	Winter	30.81	62
120	Winter	19.53	118
180	Winter	14.75	176
240	Winter	12.05	230

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Micro Drainage	Source Control W.10.4	

Summary of Results for 30 year Return Period (+40%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
360 Winter	12.1	12.1	113.6718	0.7718	309.9	O K
480 Winter	12.1	12.1	113.6528	0.7528	301.2	O K
600 Winter	12.1	12.1	113.6278	0.7278	289.6	O K
720 Winter	12.1	12.1	113.5968	0.6968	275.5	O K
960 Winter	12.1	12.1	113.5243	0.6243	242.9	O K
1440 Winter	12.1	12.1	113.3727	0.4727	178.1	O K
2160 Winter	12.1	12.1	113.1797	0.2797	101.0	O K
2880 Winter	11.7	11.7	113.0523	0.1523	53.4	O K
4320 Winter	9.7	9.7	112.9707	0.0708	24.4	O K
5760 Winter	7.9	7.9	112.9403	0.0402	13.7	O K
7200 Winter	6.8	6.8	112.9202	0.0202	6.9	O K
8640 Winter	6.0	6.0	112.9063	0.0063	2.1	O K
10080 Winter	5.3	5.3	112.9000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
360 Winter	9.05	328
480 Winter	7.38	374
600 Winter	6.29	452
720 Winter	5.52	532
960 Winter	4.49	674
1440 Winter	3.35	938
2160 Winter	2.49	1296
2880 Winter	2.02	1612
4320 Winter	1.50	2248
5760 Winter	1.21	2952
7200 Winter	1.03	3680
8640 Winter	0.90	4408
10080 Winter	0.81	0

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Micro Drainage	Source Control W.10.4	

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	30	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.300	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+40
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 0.801

Time (mins)	Area (ha)
from: to:	
0 4	0.801

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104 Yorkshire St Rochdale Lancashire OL16 1JY	attenuation pond hallmark oakenrod rochdale	
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Micro Drainage	Source Control W.10.4	

Tank/Pond Details

Invert Level (m) 112.900 Ground Level (m) 114.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.00	339.0	0.60	438.0	1.20	528.0	1.80	528.0	2.40	528.0
0.10	354.0	0.70	455.0	1.30	528.0	1.90	528.0	2.50	528.0
0.20	370.0	0.80	473.0	1.40	528.0	2.00	528.0		
0.30	387.0	0.90	491.0	1.50	528.0	2.10	528.0		
0.40	403.0	1.00	510.0	1.60	528.0	2.20	528.0		
0.50	420.0	1.10	528.0	1.70	528.0	2.30	528.0		

Depth / Flow Outflow Control

Invert Level of Control 112.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	5.6	0.80	10.0	2.00	15.5	4.00	21.9	7.00	29.0
0.20	11.4	1.00	11.1	2.20	16.2	4.50	23.2	7.50	30.0
0.30	12.0	1.20	12.1	2.40	17.0	5.00	24.5	8.00	31.0
0.40	12.1	1.40	13.0	2.60	17.7	5.50	25.7	8.50	31.9
0.50	11.9	1.60	13.9	3.00	19.0	6.00	26.8	9.00	32.9
0.60	11.6	1.80	14.7	3.50	20.5	6.50	27.9	9.50	33.8

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104 Yorkshire St Rochdale Lancashire OL16 1JY		attenuation pond hallmark oakenrod rochdale				
Date october 2024 File CALC-T~1.SRC		Designed By ds Checked By				
Micro Drainage		Source Control W.10.4				
Summary of Results for 100 year Return Period (+45%)						
Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	12.1	12.1	113.3852	0.4852	183.2	O K
30 Summer	12.1	12.1	113.5358	0.6358	248.1	O K
60 Summer	12.1	12.1	113.6828	0.7828	315.3	O K
120 Summer	12.1	12.1	113.7993	0.8993	371.2	O K
180 Summer	12.1	12.1	113.8368	0.9368	389.8	FLOOD RISK
240 Summer	12.1	12.1	113.8478	0.9478	395.2	FLOOD RISK
360 Summer	12.1	12.1	113.8428	0.9428	392.7	FLOOD RISK
480 Summer	12.1	12.1	113.8298	0.9298	386.2	FLOOD RISK
600 Summer	12.1	12.1	113.8138	0.9138	378.3	FLOOD RISK
720 Summer	12.1	12.1	113.7963	0.8963	369.7	O K
960 Summer	12.1	12.1	113.7588	0.8588	351.4	O K
1440 Summer	12.1	12.1	113.6773	0.7773	312.6	O K
2160 Summer	12.1	12.1	113.5303	0.6303	245.5	O K
2880 Summer	12.1	12.1	113.3817	0.4817	181.8	O K
4320 Summer	12.1	12.1	113.1697	0.2697	97.1	O K
5760 Summer	11.7	11.7	113.0508	0.1508	52.8	O K
7200 Summer	11.2	11.2	112.9963	0.0963	33.3	O K
8640 Summer	9.9	9.9	112.9738	0.0738	25.4	O K
10080 Summer	8.9	8.9	112.9563	0.0563	19.3	O K
15 Winter	12.1	12.1	113.4408	0.5407	206.6	O K
30 Winter	12.1	12.1	113.6083	0.7083	280.7	O K
60 Winter	12.1	12.1	113.7708	0.8708	357.3	O K
120 Winter	12.1	12.1	113.9063	1.0063	424.7	FLOOD RISK
180 Winter	12.1	12.1	113.9548	1.0548	449.6	FLOOD RISK
240 Winter	12.1	12.1	113.9738	1.0738	459.6	FLOOD RISK
Storm Duration (mins)	Rain (mm/hr)		Time-Peak (mins)			
15 Summer	89.23		18			
30 Summer	61.54		33			
60 Summer	40.51		62			
120 Summer	25.63		122			
180 Summer	19.23		182			
240 Summer	15.63		240			
360 Summer	11.65		310			
480 Summer	9.44		374			
600 Summer	8.01		438			
720 Summer	7.00		506			
960 Summer	5.65		646			
1440 Summer	4.17		924			
2160 Summer	3.07		1320			
2880 Summer	2.46		1672			
4320 Summer	1.81		2340			
5760 Summer	1.45		3008			
7200 Summer	1.23		3672			
8640 Summer	1.07		4408			
10080 Summer	0.95		5144			
15 Winter	89.23		18			
30 Winter	61.54		33			
60 Winter	40.51		62			
120 Winter	25.63		120			
180 Winter	19.23		176			
240 Winter	15.63		232			
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104 Yorkshire St Rochdale Lancashire OL16 1JY		attenuation pond hallmark oakenrod rochdale				
Date october 2024 File CALC-T~1.SRC		Designed By ds Checked By				
Micro Drainage		Source Control W.10.4				
Summary of Results for 100 year Return Period (+45%)						
Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
360 Winter	12.1	12.1	113.9753	1.0753	460.5	FLOOD RISK
480 Winter	12.1	12.1	113.9563	1.0563	450.5	FLOOD RISK
600 Winter	12.1	12.1	113.9368	1.0368	440.3	FLOOD RISK
720 Winter	12.1	12.1	113.9128	1.0128	428.0	FLOOD RISK
960 Winter	12.1	12.1	113.8573	0.9573	399.9	FLOOD RISK
1440 Winter	12.1	12.1	113.7333	0.8333	339.2	O K
2160 Winter	12.1	12.1	113.4983	0.5983	231.6	O K
2880 Winter	12.1	12.1	113.2752	0.3752	138.2	O K
4320 Winter	11.6	11.6	113.0273	0.1273	44.3	O K
5760 Winter	9.8	9.8	112.9728	0.0728	25.0	O K
7200 Winter	8.3	8.3	112.9473	0.0472	16.2	O K
8640 Winter	7.3	7.3	112.9293	0.0292	9.9	O K
10080 Winter	6.5	6.5	112.9157	0.0158	5.3	O K
Storm Duration (mins)	Rain (mm/hr)		Time-Peak (mins)			
360 Winter	11.65		340			
480 Winter	9.44		392			
600 Winter	8.01		466			
720 Winter	7.00		544			
960 Winter	5.65		702			
1440 Winter	4.17		1008			
2160 Winter	3.07		1408			
2880 Winter	2.46		1732			
4320 Winter	1.81		2332			
5760 Winter	1.45		2952			
7200 Winter	1.23		3680			
8640 Winter	1.07		4408			
10080 Winter	0.95		5136			
(c)1982-2006 Micro Drainage						

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Date october 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	100	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.300	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+45
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 0.801

Time	(mins)	Area
from:	to:	(ha)
0	4	0.801

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Date october 2024 File CALC-T~1.SRC	Designed By ds Checked By	
Micro Drainage	Source Control W.10.4	

Tank/Pond Details

Invert Level (m) 112.900 Ground Level (m) 114.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.00	339.0	0.60	438.0	1.20	528.0	1.80	528.0	2.40	528.0
0.10	354.0	0.70	455.0	1.30	528.0	1.90	528.0	2.50	528.0
0.20	370.0	0.80	473.0	1.40	528.0	2.00	528.0		
0.30	387.0	0.90	491.0	1.50	528.0	2.10	528.0		
0.40	403.0	1.00	510.0	1.60	528.0	2.20	528.0		
0.50	420.0	1.10	528.0	1.70	528.0	2.30	528.0		

Depth / Flow Outflow Control

Invert Level of Control 112.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	5.6	0.80	10.0	2.00	15.5	4.00	21.9	7.00	29.0
0.20	11.4	1.00	11.1	2.20	16.2	4.50	23.2	7.50	30.0
0.30	12.0	1.20	12.1	2.40	17.0	5.00	24.5	8.00	31.0
0.40	12.1	1.40	13.0	2.60	17.7	5.50	25.7	8.50	31.9
0.50	11.9	1.60	13.9	3.00	19.0	6.00	26.8	9.00	32.9
0.60	11.6	1.80	14.7	3.50	20.5	6.50	27.9	9.50	33.8

5.6 Correspondence.

RE: Oakenrod drainage

AS Alex Smith
To Dan Slattery

You replied to this message on 24/10/2024 09:26.

Hi Dan,

Thanks for the note, soakaway tests were not carried out for two reasons.

- The Made Ground is entirely underlain by cohesive soils which are unlikely to offer the required permeability for soakaway drainage.
- Widespread exceedances of PAHs within the soils restrict infiltration testing as this can result in leaching of contaminants downwards into the natural soils and ultimately groundwater – which could create a more significant issue.

I trust this clarifies.

Alex Smith
Associate Director



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