

FAO James Weir Planning Department Renfrewshire Council Renfrewshire House Cotton Street Paisley PA1 1AN

By email: james.weir@Renfrewshire.gov.uk

30th September 2021

Your Reference: 21/0034/PP Our Reference: 3547/SuDS

Dear Mr Weir,

Drainage Design for the construction and operation of Neilston Greener Grid Park at Land off Gleniffer Road, Renfrewshire

In accordance with Renfrewshire Council, Drainage Assessment: Notes for Guidance¹ an outline Sustainable Drainage System (SuDS) has been designed to serve the proposed Greener Grid Park on land off Gleniffer Road, Renfrewshire.

As outlined in the application the Development involves the installation of a battery storage facility which includes the impermeable elements totalling 0.95 ha and the initial design utilised attenuation structures which infiltrated to ground.

The greenfield run-off rate (Q_{BAR}) was calculated at 136.4 l/s using the Flood Estimation Handbook (FEH) rainfall data and ICP SuDS method using Micro Drainage software.

Following consultation, it has been suggested that the SuDS should discharge to the adjacent wetlands to the west of the Site rather than utilise infiltration.

The wetland to the west is a designated Site of Importance for Nature conservation (SINC) and will require a 30 m buffer from development infrastructure as advised during consultation. As such no development infrastructure, including the SuDS infrastructure, is to be located within 30 m of the SINC wetland (see Figure 1).

Disposal via Attenuated Release to Wetlands

Adequately sized structures are considered practicable within the proposed construction phase to attenuate surface water run-off for the 1:200 year event, plus a 55 % allowance for climate change.

The overall storage volume required to attenuate surface water flows for the 1:200 year (+55 %) event are shown in Plate 1, based on the areas of hardstanding outlined in Table 1 of the Outline Sustainable Drainage Strategy (Arcus 2021).



¹ Renfrewshire Council, Drainage Assessment: Notes for Guidance. [Online]. Available at:

http://www.renfrewshire.gov.uk/media/1097/Drainage-assessment-

guidance/pdf/Drainage_assessment_guidance.pdf?m=1455808042243

Plate 1: Micro Drainage Storage Calculations

💋 Quick Storage	Estimate		🖌 Quick Storage Es	timate 🖸 🖾
	Variables		F	Results
Micro	FEH Rainfall V (Summer)	0.750	Micro	Global Variables require approximate storage
Diamage	Return Period (years) 200 Cv (Winter)	0.840	trainage	These values are estimates only and should not be used for design numoses
	Site Location	0.950		
Variables	GB 245000 659100 NS 45000 5910 (/s)	harge 136.0	Variables	
Results	C (1km) -0.018 D3 (1km) 0.383		Results	
Design	D1 (1km) 0.434 E (1km) 0.246 Infiltration Coefficient (m/	hr) 0.00000	Design	
Overview 2D	D2 (1km) 0.451 F (1km) 2.455 Safety Factor	2.0	Overview 2D	
Overview 3D	Climate Change (%)	55	Overview 3D	
Vt			Vt	
	Analyse OK	Cancel Help		Analyse OK Cancel Help
				Enter Site Location

As such, a detention basin will be used to attenuate flows and discharge at greenfield rates via an orifice plate or similar flow restriction device, with a depth of 0.5 m and an area of 585 m² as shown in Plate 2. Further details are provided in the Micro Drainage outputs in Appendix 2.

Estimation Pond Area / N	/olume Calcula	tion (base	d on rectar	igular pon	d)						
Base width	12	m									
Base length	36	m									
Ratio (L to W)	3		SuDS for R	oad 1.5:1 t	o 4:1, Sew	ers for Sco	tland Min	imum 3:5			
Side slope (1 in)	3										
Increment	0.1	m									
	Denth			the second se	and shall						
	Depth	Area	volume	Length	width						
	Deptn 0	Area 432	Volume 0	Length 36	width 12	Invert Lev	el of Orifa	ice In Outl	et Cham	ber	
	0 0.1	432 461.16	0 44.658	Length 36 36.6	12 12.6	Invert Lev	el of Orifa	ice In Outl	et Cham	ber	
	0 0.1 0.2	Area 432 461.16 491.04	Volume 0 44.658 92.268	Length 36 36.6 37.2	12 12.6 13.2	Invert Lev	el of Orifa	ice In Outl	et Cham	ber	
	0 0.1 0.2 0.3	Area 432 461.16 491.04 521.64	Volume 0 44.658 92.268 142.902	Length 36 36.6 37.2 37.8	12 12.6 13.2 13.8	Invert Lev	el of Orifa	ice In Outl	et Cham	ber	
	0 0.1 0.2 0.3 0.4	Area 432 461.16 491.04 521.64 552.96	Volume 0 44.658 92.268 142.902 196.632	Length 36.6 37.2 37.8 38.4	width 12 12.6 13.2 13.8 14.4	Invert Lev	el of Orifa	ice In Outl	et Cham	ber	

Plate 2: Attenuation Basin Dimensions

The detention basin will be located in the south western section of the Site and will be served by filter drains and standard catch pits.

The Simple Index Approach (SIA) Tool

The Site will not be occupied by personnel and it is anticipated that occasional maintenance visits will be required, which will limit vehicle movements. This will involve significantly less than 300 traffic movements per day. Table 26.2 *Pollution hazard indices for different land use classifications* of the SuDS Manual identifies that the Development has a Pollution Hazard Level of Low, taken from the 'Low Traffic Roads *e.g. residential roads and general access roads, < 300 traffic movements/day*' scenario.

A SIA has been developed on behalf of Construction Indsutry Research and Information Association (CIRIA) to support the implementation of the water quality management design methods set out in the SuDS Manual, with appropriate cross referencing to the relevant 'Design Conditions' in the tool.

The SIA outputs are shown in Appendix 2 and as shown in Table 1, demonstrate that the combined Pollution Mitigation Indices for the run-off area are adequately met by the installation of permeable hardcore layer and a pond.

Table 1: SIA Outputs for Low Pollution Hazard Level Scenario

	Total Suspended Solids	Metals	Hydrocarbons
Pollution Hazard Indices	0.5	0.4	0.4

Pond / basin treatment	0.7	0.7	0.5
marces			

As such, the treatment of the surface water run-off, in the absence of significant spillages of hydrocarbons or other pollutants, will adequately meet the minimum requirements of the pollution mitigation indices outlined in the SIA Tool.

Responsibilities and Long-Term Management

It will be the responsibility of the site operator to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person will also have responsibility for reporting on the functionality of drainage measures.

Where impermeable areas remain through the lifetime of the Development, the SuDS measures serving these areas will be checked on a regular basis. Should drainage measures require dredging or unblocking, this will be undertaken as soon as practicable by a local contractor engaged by the site operator.

It is not anticipated that the Council will adopt the new drainage network. Therefore, it will be the responsibility of the site operator to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person from a management company will also have responsibility for reporting on the functionality of drainage measures. This should be secured through an appropriately worded planning condition.

An outline management / maintenance plan is provided in Table 1 and is based on the SuDS Manual.

Maintenance Schedule	Required Action	Frequency
Regular	Litter removal	A required
Maintenance	Cut grass – for spillways and access routes (within the approved Applicant ownership agreement extents)	Monthly (during growing season), or as required
	Grass cutting – meadow grass in and around basin	Half yearly (spring, before nesting season, and autumn)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc. for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional	Reseed areas of poor vegetation growth	As required

Long-term Maintenance Schedule for the Detention Basin (based on Table 22.1 -Operation and maintenance requirements for detention basins of the SuDS Manual)

Maintenance	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

An outline management / maintenance plan for the filter drains is provided in Table 2 and is based on Table 16.1 of the SuDS Manual.

 Table 2: Outline maintenance plan for filter drains

Maintenance schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly, or as required
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Sergeantlaw Moss Peatland Restoration

In September 2021, NatureScot published the Peatland Restoration Feasibility Assessment Report for the Sergeantlaw Moss, which includes an assessment of the potential impacts of the Development.

Notably within this report was a recommendation that "*a minimum 30m hydrological protection / buffer zone is established between the edge of Sergeantlaw Moss and any development*", as shown in figure 1 below.

Figure 1: Sergeantlaw Moss and Development



The Applicant has incorporated the 30m buffer prescribed in the NatureScot Report, and this is demonstrated in the revised layout within Appendix 1.

Timescales

Drainage measures outlined within this report should be implemented as soon as practical by the Developer's Contractor but in any event before the construction of any impermeable surfaces which are proposed to drain into the approved drainage system. Measures such as drainage pipes should be installed at the same time as the excavations, or as soon as practicable thereafter.

I trust that the above design provides sufficient information to condition the drainage scheme to serve the Development. Should you require any further information please contact me on the details below.

Yours sincerely,

Liam Nevins BSc (hons) MCIWEM C.WEM

Associate Director

Encs Appendix 1 - Drainage Drawing 3547-DR-HYDR-0001 Appendix 2 - Micro Drainage outputs and drainage schematic

APPENDIX 1



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		KEY:	
		SITE BOUNDARY	
	-0	2.4m HIGH PALISADE FENCE	
	-0	3.4m HIGH PALISADE FENCE	
		BATTERY (12.9m x 2.44m x 2.59m)	
		INVERTER (6.1m x 2.44m x 2.59m)	
		TRANSFORMERS WITH 7.0M HIGH CONNECTING BUS BARS	
		LV SWITCH HOUSE (7.5m x 9.1m)	
		FIRE WALL (46.7m x 0.5m x 14.0m)	
		BUILDING (20.7m x 36.7m x 10.0m TO ROOF PITCH)	
		E-HOUSE (ENCLOSED IN BUILDING 20.7m x 38.6m x 10.0m TO ROOF PITCH)	
	-	ENERGY MANAGEMENT SYSTEM (ENCLOSED IN BUILDING 20.7m x 36.7m x 10.0m TO ROOF PITCH)	
		COOLER (11.3m x 2.4m x 2.5m)	
		PROPOSED ROADS	
		SWITCHGEAR CONTAINER (12.2m x 2.44m x 3.0m)	
		EMERGENCY BACK UP DIESEL GENERATOR (6.1m x 3.6m x 2.9m)	
		COMMS HOUSE (12.19m x 2.44m x 2.59m)	
		DISCONNECTOR (2.2m x 4.5m)	
\langle	٥	6m SECURITY COLUMN	
		4m HIGH WALL	
		WW2 BUILDING 5m BUFFER	
		ATTENUATION BASIN	
		Little Contraction of the contra	

Arcus Consultancy Services 7th Floor 144 West George Street Glasgow, G2 2HG Tel: +44 (0)141 221 9997 Fax: +44 (0)141 221 5610 www.arcusconsulting.co.uk



APPENDIX 2

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3 Swinegate						4
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Data 00/00/2021 11 52				1 a.v. 37 -		Micro
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File 3547_Pond_v1.SRCX	Cł	necked	l by			Diamage
XP Solutions	Sc	ource	Contro	1 2015	.1	
Summary of Result	s for	200 .	year Re	eturn P	eriod (+55%)	
					· · ·	
Storm	Max	Max	Max	Max	Status	
Event	Level	Depth	Control	Volume		
	(m)	- (m)	(1/s)	(m³)		
15 min Summer	1.077	0.377	122.4	184.0	Flood Risk	
30 min Summer	1.118	0.418	126.9	206.4	Flood Risk	
60 min Summer	1.117	0.417	126.8	205.8	Flood Risk	
120 min Summer	1.083	0.383	123.0	187.2	Flood Risk	
180 min Summer	1.042	0.342	112 4	142 7	Flood Risk	
240 min Summer	1.002	0.302	104 0	143./	FLOOD RISK	
180 min Summer	0.933	0.233	104.6 07 1	21 QUL Q1 Q	rioua Kisk O V	
400 min Summer	0.837	0.137	90 Q	01.0 61 Q	0 K	
720 min Summer	0.806	0.106	85.9	47.3	O K	
960 min Summer	0.768	0.068	75.1	29.8	0 K	
1440 min Summer	0.720	0.020	61.1	8.6	ОК	
2160 min Summer	0.700	0.000	49.1	0.0	ОК	
2880 min Summer	0.700	0.000	40.8	0.0	O K	
4320 min Summer	0.700	0.000	30.6	0.0	O K	
5760 min Summer	0.700	0.000	24.9	0.0	O K	
7200 min Summer	0.700	0.000	21.2	0.0	ОК	
8640 min Summer	0.700	0.000	18.6	0.0	ОК	
10080 min Summer	0.700	0.000	16.7	0.0	O K	
15 min Winter	1.129	0.429	120.1	212.0	Flood Risk	
So mill wincer	1.1/5	0.175	100.1	230.9	FIOOD NISK	
Storm	Rai	n Flo	oded Di	scharge	Time-Peak	
Event	(mm/)		Joaca Di	bonarge	rine reak	
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15 min Summer 30 min Summer 60 min Summer 120 min Summer 180 min Summer 240 min Summer 360 min Summer 480 min Summer 720 min Summer 720 min Summer 1440 min Summer 2800 min Summer 2800 min Summer 5760 min Summer 7200 min Summer 5760 min Summer 10080 min Summer 15 min Winter	 166.1 105.0 66.4 41.5 20.3 16.5 12.8 10.6 8.2 6.3 5.2 3.2 3.2 2.4 2.4 16.5 	(i) 137 048 122 998 120 555 310 791 187 342 5669 216 327 257 938 208 737 403 154 137	lume m ³) 0.0	<pre>Zolume (m³) 294.6 374.6 473.9 597.2 684.6 758.1 867.6 957.8 1031.9 1097.8 1215.7 1404.8 1622.9 1797.7 2020.1 2194.4 2339.9 2465.9 2577.7 330.1</pre>	(mins) 21 30 46 80 112 144 204 264 324 382 502 740 0 0 0 0 0 0 0 0 0 0 21 31	
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3 Swinegate						L'A
York YO1 8AJ						Micco
Date 09/09/2021	11:52	Des	igned by	y Liam N	MCIWEM C.V	
File 3547 Pond	v1.SRCX	Che	cked by	-		Urainagi
 XP Solutions	-	Sou	rce Cont	trol 2015	.1	
					-	
Sum	mary of Result:	s for 2	200 year	Return B	eriod (+5	<u>5%)</u>
	Storm	Max	Max Ma	x Max	Status	
	Event	Level D	epth Cont (m) (1/	rol Volume		
		(111)	(111) (17)	s) (m)		
	60 min Winter	1.165 0	.465 13	2.0 233.3	Flood Risk	
	120 min Winter	1.100 0	.400 12	4.9 196.4	Flood Risk	
	180 min Winter	1.031 0	.331 11	6.9 158.8	Flood Risk	
	240 min Winter	0.969 0	.269 10	9.3 126.8	Flood Risk	
	Jou min Winter	0.0/4 0	.110 9	0.4 /9.4 67 /0.2	U K	
	600 min Winter	0.010 0	.110 8 074 7	0./ 49.3 70 22 0	O K	
	720 min Winter	0.748 0	.048 6	9.2 21 0	0 K 0 K	
	960 min Winter	0.711 0	.011 5	8.6 5.0	0 K	
	1440 min Winter	0.700 0	.000 4	6.1 0.0	ОК	
	2160 min Winter	0.700 0	.000 3	5.5 0.0	O K	
	2880 min Winter	0.700 0	.000 2	9.5 0.0	O K	
	4320 min Winter	0.700 0	.000 2	2.1 0.0	0 K	
	5760 min Winter	0.700 0	.000 1	8.0 0.0	ОК	
	7200 min Winter	0.700 0	.000 1	5.3 0.0	ОК	
	8640 min Winter	0.700 0	.000 1	3.5 0.0	ΟK	
	10080 min Winter	0.700 0	.000 1	2.1 0.0	ОК	
	10080 min Winter Storm	0.700 0 Rain	.000 1 Flooded	2.1 0.0 Discharge	O K Time-Peak	
	10080 min Winter Storm Event	0.700 0 Rain (mm/hr	.000 1 Flooded) Volume	2.1 0.0 Discharge Volume	OK Time-Peak (mins)	
	10080 min Winter Storm Event	0.700 0 Rain (mm/hr	.000 1 Flooded) Volume (m ³)	2.1 0.0 Discharge Volume (m ³)	OK Time-Peak (mins)	
	10080 min Winter Storm Event 60 min Winter	0.700 0 Rain (mm/hr 66.42	.000 1 Flooded) Volume (m ³) 2 0.0	<pre>2.1 0.0 Discharge Volume (m³) 526.8</pre>	OK Time-Peak (mins)	
	10080 min Winter Storm Event 60 min Winter 120 min Winter	0.700 0 Rain (mm/hr 66.42 41.99	.000 1 Flooded) Volume (m ³) 2 0.0 8 0.0	2.1 0.0 Discharge Volume (m ³) 526.8 672.6	0 K Time-Peak (mins) 50 84	
	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12	.000 1 Flooded) Volume (m ³) 2 0.0 8 0.0 0 0.0	<pre>2.1 0.0 Discharge Volume (m³) 526.8 672.6 767.2</pre>	0 K Time-Peak (mins) 50 84 118	
	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 240 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12 26.55	.000 1 Flooded) Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0	<pre>2.1 0.0 Discharge Volume (m³) 526.8 672.6 767.2 846.3</pre>	0 K Time-Peak (mins) 50 84 118 150	
	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter	0.700 0 Rain (mm/hr 66.42. 41.99 32.12 26.55 20.31	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0	<pre>2.1 0.0 Discharge Volume (m³) 526.8 672.6 767.2 846.3 971.7</pre>	0 K Time-Peak (mins) 50 84 118 150 210	
	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 360 min Winter 480 min Winter	0.700 0 Rain (mm/hr 66.42. 41.99 32.12 26.55 20.31 16.79	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 1 0.0 1 0.0 0 0.0	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4	O K Time-Peak (mins) 50 84 118 150 210 266	
	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 480 min Winter 600 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12 26.55 20.31 16.79 14.48 22.22	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 1 0.0 7 0.0 0 0.0 1 0.0 0 0.0 1 0.0 0 0.	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1220.4	O K Time-Peak (mins) 50 84 118 150 210 266 326	
	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 600 min Winter 720 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12 26.55 20.31 16.79 14.48 12.84 10.66	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 1 0.0 1 0.0 7 0.0 2 0.0 9 0.0	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1229.4 1362 2	O K Time-Peak (mins) 50 84 118 150 210 266 326 386 504	
	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 600 min Winter 960 min Winter 1440 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12 26.55 20.31 16.79 14.48 12.84 12.84 10.66 8.21	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 1 0.0 1 0.0 7 0.0 2 0.0 9 0.0 6 0 0	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1229.4 1362.2 1573 5	O K Time-Peak (mins) 50 84 118 150 210 266 326 386 504 0	
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	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 480 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12 26.55 20.31 16.79 14.48 12.84 10.66 8.21 6.32 5.25	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 1 0.0 7 0.0 2 0.0 1 0.0 7 0.0 7 0.0 7 0.0 7 0.0 7 0.0	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1229.4 1362.2 1573.5 1817.6 2013.5	O K Time-Peak (mins) 50 84 118 150 210 266 326 326 386 504 0 0 0 0	
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	Storm Event 60 min Winter 120 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 480 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 2880 min Winter 4320 min Winter 5760 min Winter 8640 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12 26.55 20.31 16.79 14.48 12.84 10.66 8.21 6.32 5.25 3.93 3.20 2.73 2.40	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 1 0.0 7 0.0 9 0.0 6 0.0 7 0.0 8 0.0 7 0.0 8 0.0 7 0.0 8 0.0 7 0.0 8 0.0 9 0.0 6 0.0 7 0.0 8 0.0 9 0.0 9 0.0 1 0.0 9 0.0 9 0.0 1 0.0 9 0.0 9 0.0 1 0.	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1229.4 1362.2 1573.5 1817.6 2013.5 2262.6 2457.8 2620.7 2761.8	O K Time-Peak (mins) 50 84 118 150 210 266 326 386 504 0 0 0 0 0 0 0 0 0 0 0 0 0	
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	Storm Event 60 min Winter 120 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 480 min Winter 720 min Winter 960 min Winter 1440 min Winter 2160 min Winter 280 min Winter 5760 min Winter 5760 min Winter 8640 min Winter	0.700 0 Rain (mm/hr 66.42 41.99 32.12 26.55 20.31 16.79 14.48 12.84 10.66 8.21 6.32 5.25 3.93 3.20 2.73 2.40 2.15	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 1 0.0 0 0.0 1 0.0 0 0.0 1 0.0 0 0.0 0 0.0 1 0.0 0 0.0 0 0.0 1 0.0 0 0.0 0 0.0 1 0.0 0 0.	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1229.4 1362.2 1573.5 1817.6 2013.5 2262.6 2457.8 2620.7 2761.8 2887.1	O K Time-Peak (mins) 50 84 118 150 210 266 326 326 326 386 504 0 0 0 0 0 0 0 0 0 0 0	
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	10080 min Winter Storm Event 60 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 480 min Winter 720 min Winter 960 min Winter 2440 min Winter 2400 min Winter 2400 min Winter 260 min Winter 360 min Winter	0.700 0 Rain (mm/hr 66.42. 41.99 32.12 26.55 20.31 16.79 14.48 12.84. 10.66 8.21 6.32 5.25 3.93 3.20 2.73 2.40 2.15	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.0 5 0.0 0 0.0 1 0.0 7 0.0 9 0.0 6 0.0 7 0.0 8 0.0 7 0.0 8 0.0 7 0.0 8 0.0 7 0.0 8 0.0 9 0.0 1 0.0 9 0.0 1 0.0 1 0.0 1 0.0 1 0.0 1 0.0 1 0.0 2 0.0 1 0.	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1229.4 1362.2 1573.5 1817.6 2013.5 2262.6 2457.8 2620.7 2761.8 2887.1	O K Time-Peak (mins) 50 84 118 150 210 266 326 386 504 0 0 0 0 0 0 0 0 0 0 0	
	Storm Event 60 min Winter 120 min Winter 120 min Winter 180 min Winter 240 min Winter 360 min Winter 480 min Winter 960 min Winter 1440 min Winter 280 min Winter 280 min Winter 5760 min Winter 8640 min Winter	0.700 0 Rain (mm/hr 66.42. 41.99 32.12 26.55 20.31 16.79 14.48 12.84 10.66 8.21 6.32 5.25 3.93 3.20 2.73 2.40 2.15	.000 1 Flooded Volume (m ³) 2 0.0 8 0.0 0 0.0 5 0.0 0 0.	2.1 0.0 Discharge Volume (m ³) 526.8 672.6 767.2 846.3 971.7 1072.4 1155.8 1229.4 1362.2 1573.5 1817.6 2013.5 2262.6 2457.8 2620.7 2761.8 2887.1	O K Time-Peak (mins) 50 84 118 150 210 266 326 386 504 0 0 0 0 0 0 0 0 0 0 0 0	

Arcus Consulting		Page 3
1C Swinegate Ct East		
3 Swinegate		<u> </u>
York YO1 8AJ		Micco
Date 09/09/2021 11:52	Designed by Liam N MCIWEM C.WEM	
File 3547_Pond_v1.SRCX	Checked by	Diamaye
XP Solutions	Source Control 2015.1	
Rai	infall Details	
Rainfall Mode	ा हम्म	
Return Period (years	200	
Site Locatio	on GB 245000 659100 NS 45000 59100	
C (1km D1 (1km	-0.018	
D1 (1Km D2 (1km	a) 0.451	
D3 (1km	n) 0.383	
E (1km	a) 0.246 a) 2.455	
Summer Storm	is Yes	
Winter Storm	ns Yes	
Cv (Summer	c) 0.750 c) 0.840	
Shortest Storm (mins	a) 15	
Longest Storm (mins	10080	
Climate Change	% +55	
Tim	e Area Diagram	
	<u></u>	
Tota	al Area (ha) 0.950	
Time (mins) Area Tiu	me (mins) Area Time (mins) Area	
From: To: (ha) Fro	om: To: (ha) From: To: (ha)	
0 4 0.317	4 8 0.317 8 12 0.317	
	I	
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Arcus Consulting		Page 4
1C Swinegate Ct East		
3 Swinegate		<u> </u>
York YO1 8AJ		Micco
Date 09/09/2021 11:52	Designed by Liam N MCIWEM C.WEM	
File 3547_Pond_v1.SRCX	Checked by	Diamarje
XP Solutions	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 1.200

Tank or Pond Structure

Invert Level (m) 0.700

Depth (m) Area (m^2) Depth (m) Area (m^2)

0.000 432.0 0.500 585.0

Orifice Outflow Control

Diameter (m) 0.283 Discharge Coefficient 0.600 Invert Level (m) 0.400

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Source Control - [3547_Pond_v1.SRCX] - [3D Animation] 🦉 <u>F</u>ile Edit View Analyse Cascade Window Help | 🗋 🖨 🖬 | 🎟 🖬 🗑 🔹 🛩 🖬 🎒 Design Guide Total Vol $(m^3) = 173.4$ 60 min Winter 1 1 Quick Storage Estimate Ŵ 1 Quick Design: Infiltration * **Detailed Design** Cascade Outflow Water Level

Source Control A.P.T. 2015.1







SIMPLE INDEX APPROACH: SUMMARY TABLE



HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tools, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type Pollution Hazard Level Pollution Hazard Indices TSS Metals Hydrocarbons	Other 0.5 0.4 0.4	Where indices are approved by the environmental regulator as part of the required risk assessment process, these should be entered in the 'User Defined Indices' row below. If indices are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment.		
SuDS components proposed					
Component 1	Pond or wetland	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulica and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Ponds/wetlands should be preceded by an upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events		
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices TSS Metals Hydrocarbons	0.7 0.7 0.5				
Groundwater protection type Groundwater protection Pollution Mitigation Indices TSS Metals	None 0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices TSS Metals Hydrocarbons Acceptability of Pollution Mitigation TSS Metals Hydrocarbons	0.7 0.7 0.5 Sufficient Sufficient	7 Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The Su02 design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSI), should be considered via consultation with relevant conservation bodies such as Natural England		