Curtins Consulting Ltd		Page 1
Curtins House Columbus Quay	SFX College	
Riverside Drive	Liverpool	<u> </u>
Liverpool L3 4DB		Micco
Date 12-11-2014	Designed by J. Poole	
File Proposed drainage systems	Checked by A. O'Neill	Diamaye
Micro Drainage	Network 2014.1.1	1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - science bk system 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and WalesReturn Period (years)2Add Flow / Climate Change (%)0M5-60 (mm)19.200Minimum Backdrop Height (m)0.200Ratio R0.400Maximum Backdrop Height (m)1.500Maximum Rainfall (mm/hr)50Min Design Depth for Optimisation (m)1.200Maximum Time of Concentration (mins)30Min Vel for Auto Design only (m/s)1.00Foul Sewage (l/s/ha)0.000Min Slope for Optimisation (1:X)500Volumetric Runoff Coeff.0.7500.7500.750

Designed with Level Inverts

Network Design Table for Storm - science bk system 1

PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)	Design
S1.000	21.204	0.150	141.4	0.014	5.00	4.1	0.060	0	150	ð
S1.001	29.830	0.200	149.2	0.031	0.00	6.3	0.060	0	150	<u>.</u>
S1.002	10.194	0.200	51.0	0.000	0.00	0.0	0.060	0	150	.

Network Results Table

PN	Rain	T.C.	US/IL	Σ I.Area	Σ Base	Foul	Add Flow	Vel	Cap	Flow
	(mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(l/s)	(1/s)	(m/s)	(l/s)	(l/s)
S1.000 S1.001	50.00 50.00		<mark>80.610</mark> 80.460	0.014 0.045		0.0			18.6 18.1	
S1.002	50.00	5.92	80.260	0.045	10.4	0.0	0.0	1.80	31.8	16.5

Free Flowing Outfall Details for Storm - science bk system 1

Outfall Outfall C. Level I. Level Min D,L W Pipe Number Name (m) (m) I. Level (mm) (mm) (m)

S1.002 SCW04 81.750 80.060 78.980 1200 0

Simulation Criteria for Storm - science bk system 1

Volumetric Runoff Coeff 0.750Additional Flow - % of Total Flow 0.000Areal Reduction Factor 1.000MADD Factor * 10m³/ha Storage 2.000Hot Start (mins)0Hot Start Level (mm)0 Flow per Person per Day (1/per/day) 0.000Manhole Headloss Coeff (Global)0.500Foul Sewage per hectare (1/s)0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall ModelFSRM5-60 (mm)19.200Return Period (years)2Ratio R0.400Region England and WalesProfile TypeSummer

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Curtins Consulting Ltd		Page 2
Curtins House Columbus Quay	SFX College	
Riverside Drive	Liverpool	<u> </u>
Liverpool L3 4DB		Micco
Date 12-11-2014	Designed by J. Poole	
File Proposed drainage systems	Checked by A. O'Neill	Drainage
Micro Drainage	Network 2014.1.1	

Synthetic Rainfall Details

Cv (Summer) 0.750 Storm Duration (mins) 30 Cv (Winter) 0.840

Curtine House Columbus Quay EFX College Riverside Drive Liverpool Liverpool L3 40B Date 12-11-2014 Designed by J. Poole File Proposed drainage systems Checked by A. 0'Neill Micro Drainage Network 2014.1.1 Summary of Critical Results by Maximum Level (Rank 1) for Storm - science bk system Similation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Bot Start India) 0 Late Coefficient 0.000 Monoble Headlows Coeff (Blobb) 0.500 Flow per Person per Bay (L/ger/day) 0.000 Foul Seage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Start Level (main 1) 2.200 Cv (Summar) 0.750 Rainfall Model FEM S-00 Um 10.200 Cv (Summar) 0.750 Region England and Ales Sammer and Minter Duration(s) (inins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 580, 140, 200, 200 Return Deriol(s) (vers) 1, 10, 100 Climate Change (8)	Curtins Consulting Ltd									Page 3
Liverpool L3 4DB Date 12-11-2014 File Proposed drainage systems Micro Drainage Network 2014.1.1 Summary of Critical Results by Maximum Level (Rank 1) for Storm - science bk syste Simulation Criteria Areal Reduction Factor 1.000 Additional Flow * of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m*/ha Storage 2.000 Hot Start tevel (mm) 0 Inlet Coefficient 0.800 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Real Time Controls 0 Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Real Time Controls 0 Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Real Time Controls 0 Nargin For Flood Risk Warning (mm) 30.0 DVD Status OFF Nalysis Timestep Fine Inertia Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880 Return Period(s) (years) Climate Change Sturched Volume Flood Overflow Act. Exc. S1.000 15 Winter 100 +20% 10/15 Summer S1.001 15 Winter 100 +20% 10/15 Summer N Neme (m) Depth (m) (m') Cap. (1/s) (1/s) Status S1.000 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S2 81.122 0.512 0.000 1.67 0.0 31.6 SURCHARGED	Curtins House Columbu	s Qua	У	SF	X Colle	ge				
Date 12-11-2014 Designed by J. Poole File Proposed drainage systems Checked by A. 0'Neill Micro Drainage Network 2014.1.1 Summary of Critical Results by Maximum Level (Rank 1) for Storm - science bk systems Simulation Criteria Areal Reduction Factor 1.000 Mot Start (wins) 0 MADD Factor * 1001 Maining (min) Manhole Headloss Coeff (dobal) 0.500 Flow per Person per Day (1/per/day) Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0 Number of Input Hydrographs 0 Number of Critical Status OFF Rainfall Model FSR M5-60 (mm) 19.200 Cv (Summer) 0.750 Region England and Wales Ratio R 0.400 Cv (Summer) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 140, 2160, 2880 Return Period(s) (years) 1, 10, 100 Climate Change (s) 0, 20, 20 Return Climate First X First Y First Z O/F Lvl FN Storm Foodd Virty Status	Riverside Drive			Li	verpool					Y a
Date 12-11-2014 File Proposed drainage systems Micro Drainage Summary of Critical Results by Maximum Level (Rank 1) for Storm - science bk system Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m ³ /ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Stewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Time/Area Diagrams 0 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status 0N Profile(s) 0, 20, 20 Return Period(s) (years) 1, 10, 100 Climate Change (%) 0, 20, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880 Return Period Change Surcharge Flood Overflow Act. Exc. S1.000 15 Winter 100 +20% 10/15 Summer S1.001 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S2 81.128 0.512 0.000 1.87 0.0 13.6 SURCHARGED	Liverpool L3 4DB									Micco
Micro Drainage Network 2014.1.1 Network 2014.1.1 Micro Drainage Network 2014.1.1 Network 2014.1.1 Network 2014.1.1 Micro Drainage Network 2014.1.1 Network 2014.1.	Date 12-11-2014			De	signed	by J. H	Poole			
Micro Drainage Network 2014.1.1 <u>Summary of Critical Results by Maximum Level (Rank 1) for Storm - science bk syste</u> <u>Simulation Criteria</u> Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mis) 0 MADD Factor * 10m ³ /ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR M5-60 (mm) 19,200 Cv (Summer) 0.750 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1400, 2160, 2880 Return Period(s) (years) 1, 10, 100 Climate Change (%) 0, 0, 20, 20 Return Climate First X First Y First Z O/F Lvl FN Storm Period Change Surcharge Flood Overflow Act. Exc. S1.000 15 Winter 100 +20% 10/15 Summer S1.001 15 Winter 100 +20% 10/15 Summer S1.002 15 Winter 100 +20% 10/15 Summer S1.003 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S1 81.186 0.426 0.000 0.64 0.0 0.10.9 SURCHARGED S1.001 S1 81.186 0.426 0.000 0.64 0.0 0.10.9 SURCHARGED	File Proposed drainage	syst	ems	Ch	ecked b	y A. O'	'Neill			Drainag
Summary of Critical Results by Maximum Level (Rank 1) for Storm - science bk syste Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m'/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficienten 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Foul Sewage per hectare (1/s) 0.000 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0 Number of Online Controls 0 Number of Storage Structures 0 Number of Ime/Area Diagrams 0 Number of Online Controls 0 Number of Storage Structures 0 Number of 0.840 Rainfall Model FSR M5-60 (mm) 19,200 Cv (Summer) 0.750 Region England and Wales Rainfall Model FSR M5-60 (mm) 19,200 Cv (Summer) 0.750 Region England and Wales Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880 Return Period(s) (years) Climate Change (%) 0, 20, 20 Return Climate First X First Y First Z O/F Lvl PN Storage Flood Moverflow Act. Exc. S1,000 15 Winter 100 +20% 10/15 Summer S1.002 15 Winter 100 +20% 10/15 Summer S1.002 15 Winter 100	Micro Drainage									
Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR M5-60 (mm) 19.200 Cv (Summer) 0.750 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status ON Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880 Return Period(s) (years) Climate Change (%) 0, 20, 20 Return Climate First X First Y First Z O/F Lvl PN Storm Period Change Surcharge Flood Overflow Act. Exc. S1.000 15 Winter 100 +20% 10/15 Summer S1.001 15 Winter 100 +20% 10/15 Summer S1.001 15 Winter 100 +20% 10/15 Summer S1.002 15 Winter 100 +20% 10/15 Summer S1.002 15 Winter 100 +20% 10/15 Summer S1.001 15 Winter 100 +20% 10/15 Summer Mater Flooded Pipe US/MH Level Surch'ed Volume Flow / O'flow Flow PN Name (m) Depth (m) (m ³) Cap. (1/s) (1/s) Status S1.000 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S2 81.122 0.512 0.000 1.87 0.0 31.6 SURCHARGED	Are H Manhole Head	al Red Hot ot Sta loss C	luction E Start (Int Level Coeff (G]	<u>Simul</u> Factor 1.0 (mins) ((mm) Lobal) 0.5	lation Cr 000 Add 0 0 500 Flow	riteria litional MADD Fa	Flow - actor * Ini	% of ' 10m³/] let Co	Total Flow 0.0 ha Storage 2.0 effiecient 0.8	00 00 00
Analysis Timestep Fine Inertia Status OFF DTS Status ON Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880 Return Period(s) (years) 1440, 2160, 2880 Climate Change (%) 0, 20, 20 Return Climate First X First Y First Z O/F Lvl PN Storm Period Change S1.000 15 Winter 100 +20% S1.001 15 Winter 100 +20% Water Flooded Pipe US/MH Level Surch'ed Volume FN Name (m) (m³) Cap. S1.000 S1 81.186 0.426 0.000 0.64 0.0 10.9 SurcHargeD S1.001 S2 81.122 0.512 0.000 1.87 0.0 31.6 SURCHARGED	Number of Input Hy Number of Online	drogra Contr	phs 0 ols 0 Nu	Number of umber of S Syntheti	E Offline Storage S <u>c Rainfa</u> FSR M5-6	Structure <u>11 Detai</u> 0 (mm) 1	es 0 Nui <u>ls</u> .9.200 C	mber o Zv (Sun	f Real Time Co mmer) 0.750	-
PN Storm Period Change Surcharge Flood Overflow Act. Exc. \$1.000 15 Winter 100 +20% 10/15 Summer \$1.001 15 Winter 100 +20% 10/15 Summer \$1.002 15 Winter 100 +20% 100/15 Summer Water Flooded Pipe Pipe Pipe Pipe Pipe \$15 Name (m) Depth (m) (m³) Cap. (1/s) Status \$1.000 \$1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED	Durat: Return Perio	Prot Lon(s)	file(s) (mins) (years)	Analysis D	Timeste TS Statu	p Fine s ON	Inertia	S1 S1 S1 S1	ummer and Wints , 600, 720, 966 1440, 2160, 288 1, 10, 10	0, 80 00
S1.001 15 Winter 100 +20% 10/15 Summer S1.002 15 Winter 100 +20% 100/15 Summer Water Flooded Pipe US/MH Level Surch'ed Volume Flow Flow FN Name (m) Depth (m) (m³) Cap. (1/s) Status S1.000 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S2 81.122 0.512 0.000 1.87 0.0 31.6 SURCHARGED	PN	Storm							- •	
US/MH Level Surch'ed Volume Flow / O'flow Flow PN Name (m) Depth (m) (m ³) Cap. (l/s) Status S1.000 S1 81.186 0.426 0.000 0.64 0.0 10.9 SURCHARGED S1.001 S2 81.122 0.512 0.000 1.87 0.0 31.6 SURCHARGED	S1.001 15	5 Winte	er 10	0 +20%	10/15	Summer				
S1.001 S2 81.122 0.512 0.000 1.87 0.0 31.6 SURCHARGED	PN		Level		Volume	Flow /		Flow	Status	
	S1.001	S2	81.122	0.512	0.000	1.87	0.0	31.6	SURCHARGED	

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Curtins House Columbus Quay	SFX College			
Riverside Drive	Liverpool	L.		
Liverpool L3 4DB		Micro		
Date 12-11-2014	Designed by J. Poole	Drainage		
File Proposed drainage systems	Checked by A. O'Neill	Diamaye		
Micro Drainage	Network 2014.1.1			

Design Audit Report for Storm - science bk system 1

Filename T:\LI1195A St Francis Xavier's College\Calculations \Microdrainage\Proposed drainage systems 03-03-2015.mdx Network Name Storm - science bk system 1 06/03/2015 15:38 Date Audited Pipes 3 Current Network Slope (1:X) 111.3 Storms Used (mins) 15min Summer, 30min Summer, 60min Summer, 120min Summer, 180min Summer, 240min Summer, 360min Summer, 480min Summer, 600min Summer, 720min Summer, 960min Summer, 1440min Summer, 2160min Summer, 2880min Summer, 15min Winter, 30min Winter, 60min Winter, 120min Winter, 180min Winter, 240min Winter, 360min Winter, 480min Winter, 600min Winter, 720min Winter, 960min Winter, 1440min Winter, 2160min Winter, 2880min Winter

Audit	Failures	Status
Manhole Sizes	2	Failed
Surcharge	2	Failed
Flood	0	Passed
Storage	0	Passed
Pipe Diameters	0	Passed
Pipe Lengths	0	Passed
Coordinate Accuracy	0	Passed
Cover Levels	0	Passed
Backdrops	0	Passed
Full Bore Velocity	0	Passed
Proportional Velocity	1	Failed
Crossings/Conflicts	0	Passed
Manhole Headloss	2	Failed
ICP Audit	0	Not Run

Manhole Size Audit

The following Manhole sizes are smaller than those specified.

US/MH	PN	US/MH	US/MH	Min	Min	
Name		Dia/Len (mm)	Width (mm)	Dia/Len (mm)	Width (mm)	
S 1	s 1.000	375	0	1050	0	
S 2	S 1.001	1000	0	1050	0	

Surcharge Audit

The following pipes exceeded the 20 mm surcharge limit for the 10 year +20% climate change storm.

PN US/MH Name Storm (mins) Sur. Depth (mm)

S1.000	S1	15min	Winter	73
S1.001	s2	15min	Winter	184

Flood Audit

No pipes flood for the 100 year +20% climate change storm.

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Curting House Columbus Our	SEV Collogo	
Curtins House Columbus Quay Riverside Drive	SFX College Liverpool	2
Liverside Drive Liverpool L3 4DB	LIVERPOOL	L'un
Date 12-11-2014	Designed by J. Poole	——— Micro
File Proposed drainage systems	Checked by A. O'Neill	Drainage
Micro Drainage	Network 2014.1.1	
	Storage Audit	
Storage V	Olume is at typical design values.	
	Pipe Diameter Audit	
All	pipe diameters are >= 150 mm.	
	Pipe Length Audit	
All j	pipe lengths are <= 100.000 m.	
Co	ordinate Accuracy Audit	
	ths are within 1.000 m of coordinates.	
	stream Cover Level Audit	
	am Cover Depths within the range 0.500-6.	.000 m.
	nstream Cover Level Audit	
All pipes have Downstre	eam Cover Depths within the range 0.500-6 Backdrop Audit	5.000 m.
All backdrou	os are within the range 0.200-1.500m.	
	all Bore Velocity Audit	
—	Bore Velocity within the range 1.00-3.00	m/s.
Pro	portional Velocity Audit	
The following pipes have Proportional Velo	ocity outside of the range 1.00-3.00 m/s change storm.	for the 1 year +0% clima
	PN Storm Velocity (mins) (m/s)	
S	1.000 15min Winter 0.88	
Cro	ssings / Conflicts Audit	
The following filter setting	s were used to determine the crossings a	nd conflicts.
Vertical Separation (m): Horizontal Separation (m): Networks included:	Storm - car park, Storm - science bk sy - sports hall, Storm - science	
Networks excluded:	Sports hair, Storm - Scrence	
	cated for the current network based on t	he settings above.
1	Manhole Headloss Audit	
The following	manholes may have insufficient headloss.	

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Curtins House Columbus Quay	SFX College	
Riverside Drive	Liverpool	L'
Liverpool L3 4DB		Micro
Date 12-11-2014	Designed by J. Poole	Drainage
File Proposed drainage systems	Checked by A. O'Neill	Diamaye
Micro Drainage	Network 2014.1.1	
Manh PN USMH	ole Headloss Audit Angle Headloss Recommended	

(degrees)				Value
S1.001	S2	89.8	0.500	0.900
S1.002	S4	89.9	0.500	0.900

Interim Code of Practice

The Interim Code of Practice Audit was not completed by user request

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