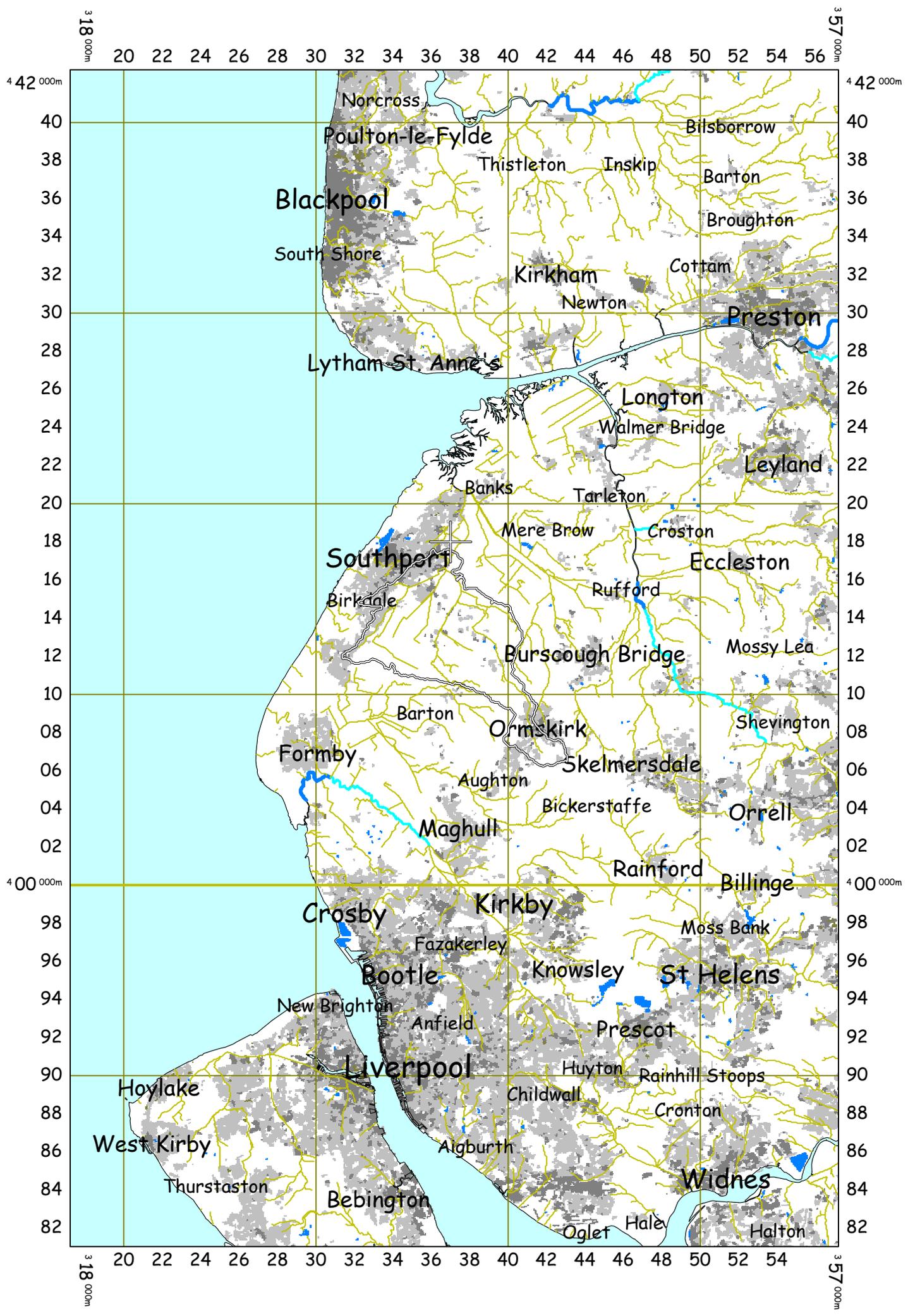


APPENDIX D: FEH CATCHMENT DATA & DESCRIPTIONS

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VERSION	FEH CD-ROM	Version	3	exported at	10:53:32 GMT Thu	03-Sep-15
CATCHMENT	GB	337150	417450	SD 37150	17450	
CENTROID	GB	337181	412649	SD 37181	12649	
AREA		49.4				
ALTBAR		16				
ASPBAR		352				
ASPVAR		0.31				
BFIHOST		0.683				
DPLBAR		7.41				
DPSBAR		8.2				
FARL		0.994				
LDP		16.8				
PROPWET		0.42				
RMED-1H		10.7				
RMED-1D		34.5				
RMED-2D		45.6				
SAAR		864				
SAAR4170		879				
SPRHOST		19.01				
URBCONC1990		0.799				
URBEXT1990		0.095				
URBLOC1990		0.93				
C		-0.02466				
D1		0.34323				
D2		0.32268				
D3		0.31278				
E		0.28816				
F		2.50753				
C(1 km)		-0.025				
D1(1 km)		0.343				
D2(1 km)		0.317				
D3(1 km)		0.341				
E(1 km)		0.288				
F(1 km)		2.478				

DESIGN RAINFALL DEPTHS

Calculate : **Design rainfall** for

- catchment 337150 417450 [SD 37150 17450]
- 1 km grid point 337000 418000 [SD 37000 18000]
- Manually entered values for a point

Area : 49.4000 km²

C : -0.02466 D3 : 0.31278

D1 : 0.34323 E : 0.28816

D2 : 0.32268 F : 2.50753

Duration : 6 Hours Fixed Sliding

Return period : 1.0004 Years AM POT

Rainfall depth 12.6886 mm

Buttons: Calculate... Export... Cancel

An areal reduction factor of 0.923 has been applied to a point rainfall of 13.7 mm to yield a catchment design rainfall of 12.7 mm.

Calculate : **Design rainfall** for

- catchment 337150 417450 [SD 37150 17450]
- 1 km grid point 337000 418000 [SD 37000 18000]
- Manually entered values for a point

Area : 49.4000 km²

C : -0.02466 D3 : 0.31278

D1 : 0.34323 E : 0.28816

D2 : 0.32268 F : 2.50753

Duration : 6 Hours Fixed Sliding

Return period : 2.0 Years AM POT

Rainfall depth 22.9208 mm

Buttons: Calculate... Export... Cancel

An areal reduction factor of 0.923 has been applied to a point rainfall of 24.8 mm to yield a catchment design rainfall of 22.9 mm.

Calculate : Design rainfall for

- catchment 337150 417450 [SD 37150 17450]
- 1 km grid point 337000 418000 [SD 37000 18000]
- Manually entered values for a point

Area : 49.4000 km²

C : -0.02466 D3 : 0.31278

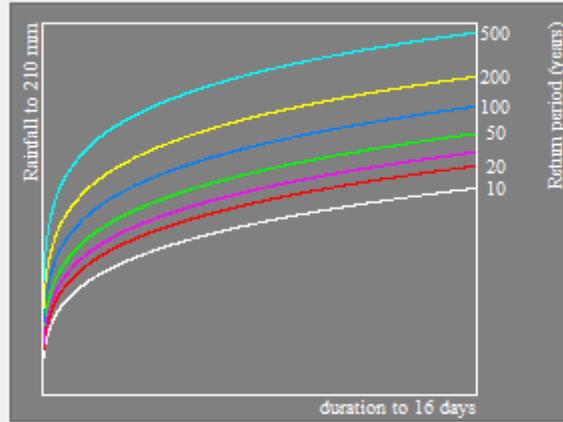
D1 : 0.34323 E : 0.28816

D2 : 0.32268 F : 2.50753

Duration : 6 Hours Fixed Sliding

Return period : 30.0 Years AM POT

Rainfall depth 47.8613 mm



Calculate...

Export...

Cancel



An areal reduction factor of 0.923 has been applied to a point rainfall of 51.8 mm to yield a catchment design rainfall of 47.9 mm.



Calculate : Design rainfall for

- catchment 337150 417450 [SD 37150 17450]
- 1 km grid point 337000 418000 [SD 37000 18000]
- Manually entered values for a point

Area : 49.4000 km²

C : -0.02466 D3 : 0.31278

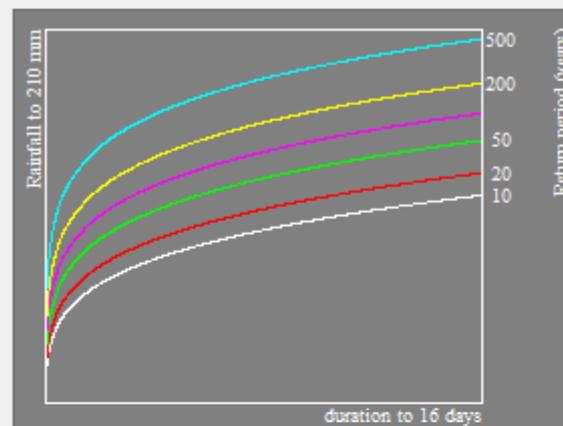
D1 : 0.34323 E : 0.28816

D2 : 0.32268 F : 2.50753

Duration : 6 Hours Fixed Sliding

Return period : 100.0 Years AM POT

Rainfall depth 64.3892 mm



Calculate...

Export...

Cancel



An areal reduction factor of 0.923 has been applied to a point rainfall of 69.7 mm to yield a catchment design rainfall of 64.4 mm.



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APPENDIX E: NPPF EXTRACTS

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Table 1: Flood zones

(Note: These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences)

<p>Zone 1 - low probability</p> <p>Definition This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).</p> <p>Appropriate uses All uses of land are appropriate in this zone.</p> <p>Flood risk assessment requirements For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems².</p>
<p>Zone 2 - medium probability</p> <p>Definition This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.</p> <p>Appropriate uses Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are <i>only</i> appropriate in this zone if the Exception Test is passed.</p> <p>Flood risk assessment requirements All development proposals in this zone should be accompanied by a flood risk assessment.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.</p>
<p>Zone 3a - high probability</p> <p>Definition This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.</p> <p>Appropriate uses The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.</p> <p>The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.</p> <p>Flood risk assessment requirements All development proposals in this zone should be accompanied by a flood risk assessment.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to:</p> <ul style="list-style-type: none">• reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;

- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b - the functional floodplain

Definition

This zone comprises land where water *has* to flow or be stored in times of flood.

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land with a lower probability of flooding.

Table 2: Flood risk vulnerability classification

<p>Essential infrastructure</p> <ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
<p>Highly vulnerable</p> <ul style="list-style-type: none"> • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use³. • Installations requiring hazardous substances consent⁴. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure")⁵.
<p>More vulnerable</p> <ul style="list-style-type: none"> • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste⁶. • Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan</i>.⁷
<p>Less vulnerable</p> <ul style="list-style-type: none"> • Police, ambulance and fire stations which are <i>not</i> required to be operational during flooding. • Buildings used for shops, financial, professional and other services,
<p>restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure.</p> <ul style="list-style-type: none"> • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do <i>not</i> need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
<p>Water-compatible development</p> <ul style="list-style-type: none"> • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, <i>subject to a specific warning and evacuation plan</i>.

APPENDIX F: UU SEWER RECORDS & CORRESPONDENCE

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Kirsty Williams

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 04 September 2015 14:43
To: Kirsty Williams
Subject: RE: MOSS LANE, SOUTHPORT

Good afternoon

I can confirm that there are no recorded historical sewer flooding issues within the vicinity of the proposed development site.

Please note that United Utilities Water plc (UUW) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the 'at risk' register.

Also, this does not include any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which UUW has no control and not a facet of sewer capacity.

Should you require any further information please do not hesitate to contact me.

Thanks

Louise Kitchingman
Building Control Analyst
Developer Services and Planning
Operational Services
United Utilities
T: 01925 679363 (internal 79363)
unitedutilities.com

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From: Kirsty Williams [mailto:kirstywilliams@betts-associates.co.uk]
Sent: 02 September 2015 15:59
To: Wastewater Developer Services
Subject: FRA: MOSS LANE, SOUTHPORT

To whom it may concern,

LAND AT MOSS LANE, SOUTHPORT, PR9 7QT

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment for the above site (location plan attached), including details of historical flooding; this would be greatly appreciated.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Kirsty Williams
Graduate Flood Risk Analyst

Betts Associates Ltd

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
T - 01244 288178

kirstywilliams@betts-associates.co.uk
www.betts-associates.co.uk

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FLOOD RISK MANAGEMENT | STRUCTURAL SURVEYS | PARTY WALL DUTIES | ECOLOGY

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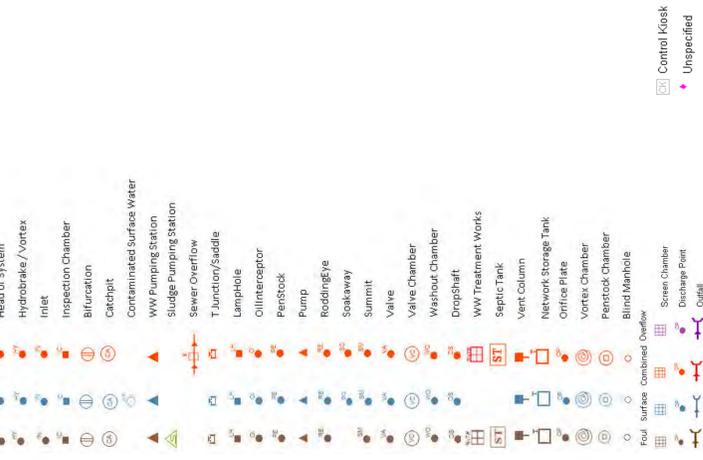
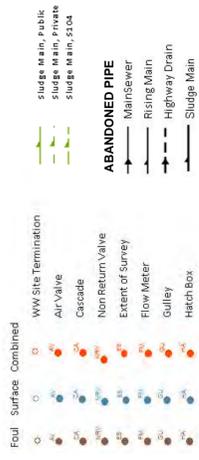
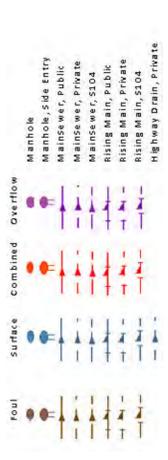
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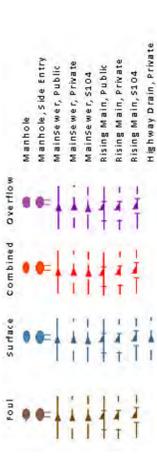
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WASTE WATER SYMBOLOGY



WASTE WATER SYMBOLOGY



Ratio	Cover Func	Invert	Size (Dia)	Shape	Material	Length	Grid
5201	CO	3.7	225	CI	VC	24.2	5201
5202	CO	3.7	225	CI	VC	24.2	5202
5203	CO	3.7	225	CI	VC	24.2	5203
5204	CO	3.7	225	CI	VC	24.2	5204
5205	CO	3.7	225	CI	VC	24.2	5205
5206	CO	3.7	225	CI	VC	24.2	5206
5207	CO	3.7	225	CI	VC	24.2	5207
5208	CO	3.7	225	CI	VC	24.2	5208
5209	CO	3.7	225	CI	VC	24.2	5209
5210	CO	3.7	225	CI	VC	24.2	5210
5211	CO	3.7	225	CI	VC	24.2	5211
5212	CO	3.7	225	CI	VC	24.2	5212
5213	CO	3.7	225	CI	VC	24.2	5213
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5299	CO	3.7	225	CI	VC	24.2	5299
5300	CO	3.7	225	CI	VC	24.2	5300



LEGEND

MANHOLE FUNCTION	SEWER SHAPE	SEWER MATERIAL
FO Foul	TR Trapezoidal	DI Ductile Iron
SW Surface Water	AR Arch	PVC Polyvinyl Chloride
CO Combined	BA Barrel	CI Cast Iron
OV Overflow	HO Horse Shoe	SI Spun Iron
EG Egg	UN Unspecified	ST Steel
OY Oval		VC Vitrifed Clay
FT Flat Top		PP Polypropylene
RE Rectangular		PF Pitch Fibre
SQ Square		MAC Masonry, Coursed
AC Asbestos Cement		MAR Masonry, Random
BR Brick		U Unspecified
PE Polyethylene		
RP Reinforced Plastic Matrix		
CO Concrete		
CSB Concrete Segment Bolted		
CSU Concrete Segment Unbolted		
CC Concrete Box Culvert		
PSC Plastic/Steel Composite		
GRC Glass Reinforced Concrete		
GRP Glass Reinforced Plastic		

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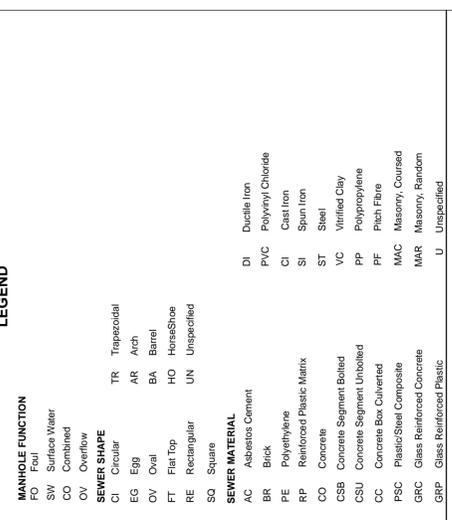
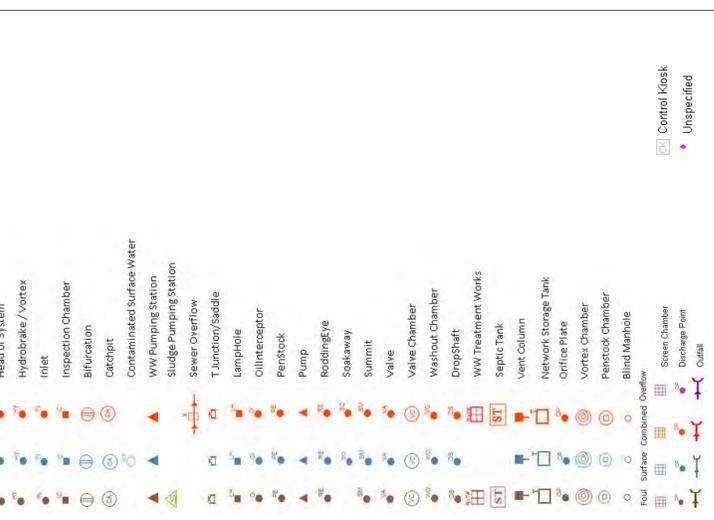
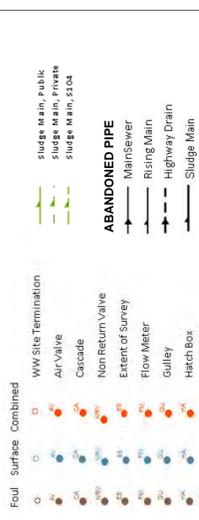
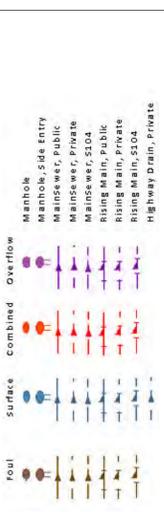
OS Sheet No: SD3617SE
 Scale: 1: 1250 Date: 08/09/2015
 32 Nodes
 Sheet 1 of 1



OS Sheet No: SD3617SE
 Scale: 1: 1250 Date: 08/09/2015

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WASTE WATER SYMBOLOGY



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OS Sheet No: SD3717NW
 Scale: 1: 1250 Date: 08/09/2015
 9 Nodes
 Sheet 1 of 1



Refno	Cover	Invert	Size	Shape	Material	Length	Gas
3702	3.54	1.89	150	CI	PVC	48.3	
3703	3.54	1.89	150	CI	PVC	48.3	
3704	3.54	1.89	150	CI	PVC	48.3	
3705	3.54	1.89	150	CI	PVC	48.3	
3706	3.54	1.89	150	CI	PVC	48.3	
3707	3.54	1.89	150	CI	PVC	48.3	
3708	3.54	1.89	150	CI	PVC	48.3	
3709	3.54	1.89	150	CI	PVC	48.3	
3710	3.54	1.89	150	CI	PVC	48.3	

OS Sheet No: SD3717NW

Scale: 1: 1250 Date: 08/09/2015

Printed By: Property Searches

WASTE WATER SYMBOLOGY

Foul	Surface	Combined	Overflow	
				Manhole
				Manhole, Side Entry
				MainSewer, Public
				MainSewer, Private
				MainSewer, S104
				Rising Main, Public
				Rising Main, Private
				Rising Main, S104
				Highway Drain, Private
				Abandoned Pipe
				MainSewer
				Rising Main
				Highway Drain
				Sludge Main

Foul	Surface	Combined	Foul	Surface	Combined

Foul	Surface	Combined	Foul	Surface	Combined	Overflow

Legend

MANHOLE FUNCTION	SEWER SHAPE	
FO Foul	CI Circular	TR Trapezoidal
SW Surface Water	EG Egg	AR Arch
CO Combined	OV Oval	BA Barrel
OV Overflow	FT Flat Top	HO HorseShoe
	RE Rectangular	UN Unspecified
	SQ Square	
SEWER MATERIAL		
AC Asbestos Cement	DI Ductile Iron	
BR Brick	VC Vitrified Clay	
CO Concrete	PP Polypropylene	
CSB Concrete Segment	PF Pitched Fibre	
CSU Concrete Segment	MA Masonry, Coursed	
CC Concrete Box Culvert	MA Masonry, Random	
PSC Plastic / Steel	RP Reinforced Plastic	
GR Glass Reinforced	CI Cast Iron	
GRP Glass Reinforced	SI Spun Iron	
PVC Polyvinyl Chloride	ST Steel	
PE Polyethylene	U Unspecified	

CLEAN WATER SYMBOLOGY

PIPE WORK	PIPE WORK	NODES/FURNITURES	NODES/FURNITURES
Live	Proposed	Live	Proposed

PROPERTY TYPES	PROPERTY TYPES
Live	Proposed

Legend	Legend
MATERIAL TYPES	LINING TYPES
AC ASBESTOS CEMENT	CL CEMENT LINING
CI CAST IRON	TB TAR OR BITUMEN
CU COPPER	ERL EPOXY RESIN
CO CONCRETE	
DI DUCTILE IRON	INSERTION TYPES
GI GALVANISED IRON	DD DIE DRAWN
GR GREY IRON	DR DIRECTIONAL DRILLING
OT OTHERS	MO MOLING
PB LEAD	PI PIPELINE
PV UPVC	SL SLIP LINED
SI SPUN IRON	
ST STEEL	
UN UNKNOWN	
PE POLYETHYLENE	

Kirsty Williams

From: Lunt, John <John.Lunt@uuplc.co.uk>
Sent: 02 October 2015 10:02
To: Kirsty Williams
Cc: Wastewater Developer Services
Subject: (UU ref: DE1495) Moss Lane, Maghull
Attachments: mg_info.txt

Hi Kirsty,

In reply, I can confirm that UU would have no objection in principle to the drainage strategy proposed below.

If I can be of any further help at all then please don't hesitate to get in touch.

Regards,

John

John Lunt
Developer Query Engineer
Developer Services and Planning
Operational Services
United Utilities

T; 01925 679411 (Int; 79411)
unitedutilities.com

From: Kirsty Williams [<mailto:kirstywilliams@betts-associates.co.uk>]
Sent: 21 September 2015 09:49
To: Wastewater Developer Services
Subject: Moss Lane, Maghull

To Whom it May Concern,

Please find attached a copy of the Pre-Dev Enquiry form for your review regarding a proposed residential development in Southport. We have previously been in contact regarding any historic flood information you had for the site/neighbouring areas as we are completing and FRA, and as part of the FRA we are looking at the potential surface water and foul water management strategies for the site (such are detailed in brief below). As the proposals are outline at present we are looking for an agreement in principle to the proposed strategy (attached) so that we might progress with the approach further.

Foul Water:

The foul water flows generated by the development site are proposed to outfall to the public foul water gravity sewer (225mm dia.) to the north-west of site. The proposed point of connection from site would be at UU Manhole Ref. 9801 (or alternative downstream location). It is assumed that a pumped solution will be likely, based on the existing ground levels; however further investigation during detailed design will be required to confirm such. Consents to discharge to the public sewer network will be required from United Utilities prior to approval, furthermore any downstream capacity constraints on the system should be established through early consultations; the preferred point(s) of connection and discharge rates should be discussed and agreed.

Surface Water:

Should infiltration be deemed not feasible following soakaway testing to BRE365, then the next sought outfall in the hierarchical approach, for the management of surface water run-off should be to mimic the existing regime and discharge to watercourse on the eastern boundary (Three Pools Waterway). Detailed design will be required to confirm feasibility of the strategy following more detailed levels and layout review. Consents to outfall and

agreement of the discharge rate(s) will be required from the Environment Agency and some discussion may be required with the Lead Local Flood Authority (SC); therefore early discussion is advised. Appropriate easements must be incorporated into the design and discussed with the EA at an early stage.

Kind Regards

Kirsty Williams

Graduate Flood Risk Analyst

Betts Associates Ltd

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

T - 01244 288178

kirstywilliams@betts-associates.co.uk

www.betts-associates.co.uk

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APPENDIX G: LPA/LLFA CORRESPONDENCE

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Kirsty Williams

From: Kirsty Williams
Sent: 02 September 2015 16:20
To: 'Flooding'
Subject: FRA: MOSS LANE, SOUTHPORT
Attachments: redsouthportpolicymap_publicationdraftfinal.pdf; LOCATION PLAN.pdf

To whom it may concern,

LAND AT MOSS LANE, SOUTHPORT, PR9 7QT

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment for the above site (location plan attached), including details of historical flooding; this would be greatly appreciated. Furthermore we have identified that the site is allocated for residential housing and are enquiring any additional information which may be available to review regarding the sites sequential/exception test outcomes.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Kirsty Williams
Graduate Flood Risk Analyst

Betts Associates Ltd
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

kirstywilliams@betts-associates.co.uk
www.betts-associates.co.uk

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APPENDIX H: SURFACE WATER RUN-OFF CALCULATIONS

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Old Marsh Farm Barns
Welsh Road
Sealand Flintshire ...

Moss Lane
Southport



Date 10.09.15
File

Designed by KW
Checked by RDN

Micro Drainage

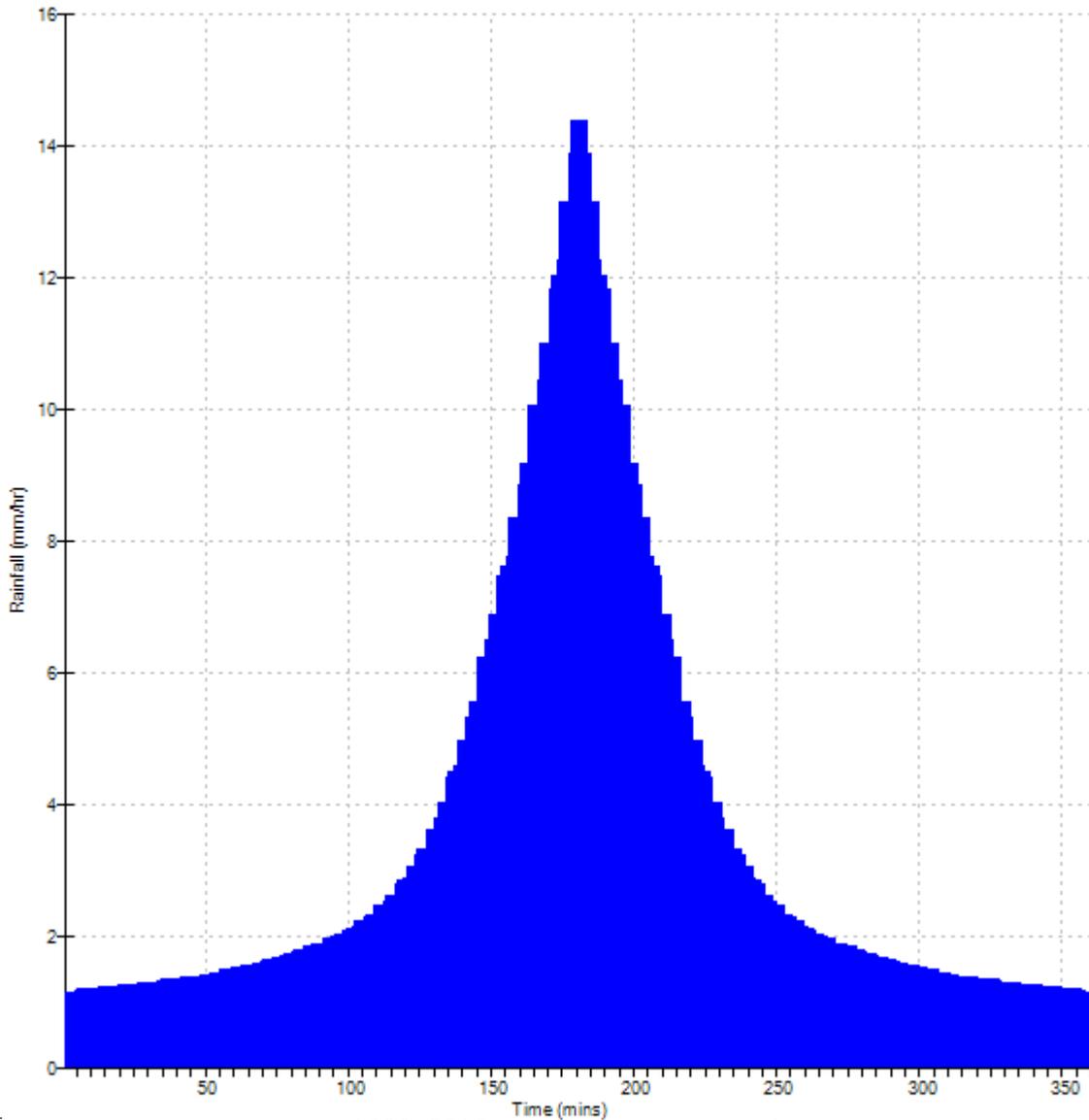
Network 2013.1.1

Rainfall profile

Storm duration (mins) 360

FEH Data

C(1km)	-0.025
D1(1km)	0.343
D2(1km)	0.317
D3(1km)	0.341
E(1km)	0.288
F(1km)	2.478
Peak Intensity (mm/hr)	14.395
Ave. Intensity (mm/hr)	3.672
Return Period (years)	1



Old Marsh Farm Barns
Welsh Road
Sealand Flintshire ...

Moss Lane
Southport



Date 10.09.15
File

Designed by KW
Checked by RDN

Micro Drainage

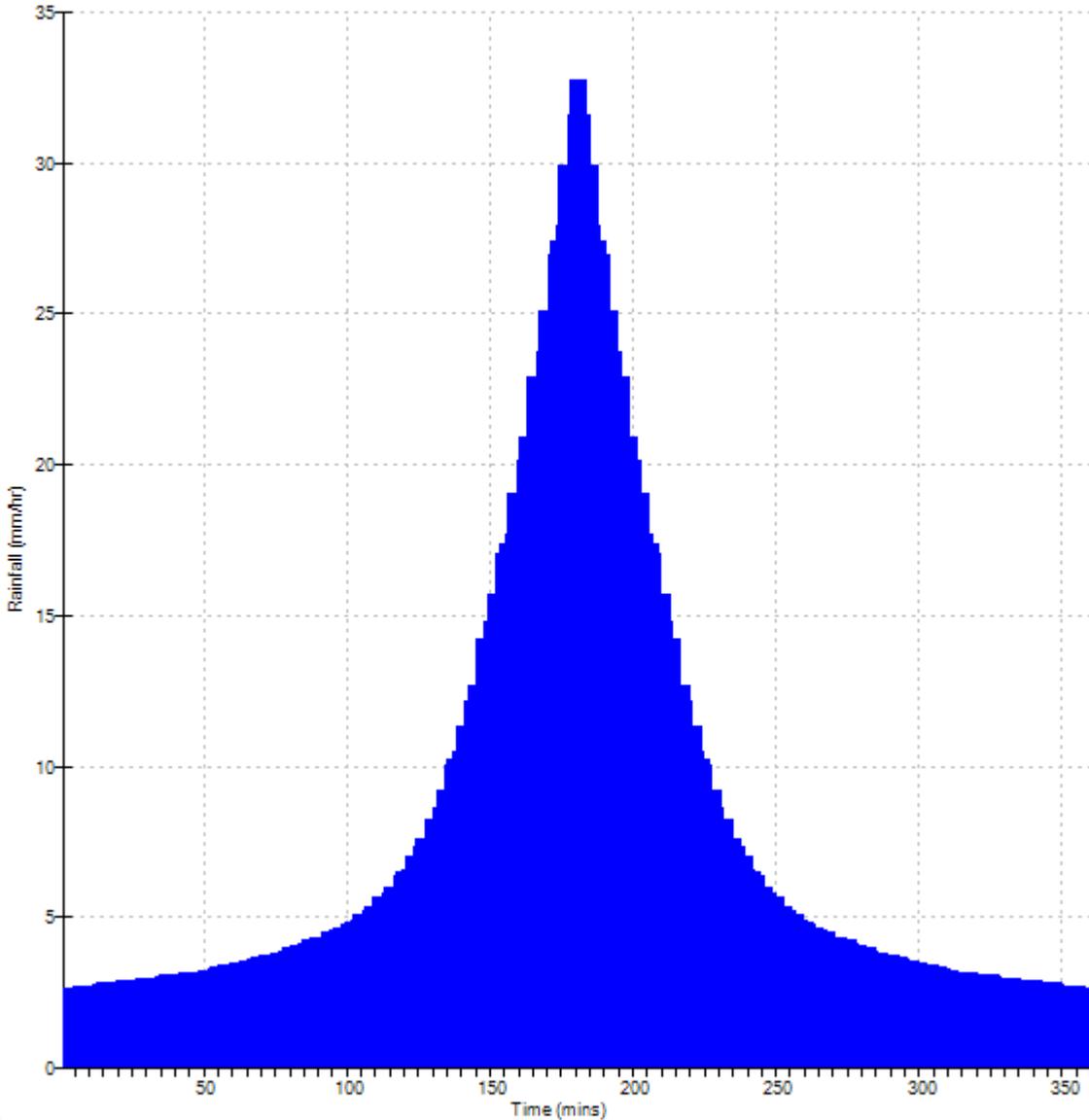
Network 2013.1.1

Rainfall profile

Storm duration (mins) 360

FEH Data

C(1km)	-0.025
D1(1km)	0.343
D2(1km)	0.317
D3(1km)	0.341
E(1km)	0.288
F(1km)	2.478
Peak Intensity (mm/hr)	32.786
Ave. Intensity (mm/hr)	8.364
Return Period (years)	30



Old Marsh Farm Barns
Welsh Road
Sealand Flintshire ...

Moss Lane
Southport



Date 10.09.15
File

Designed by KW
Checked by RDN

Micro Drainage

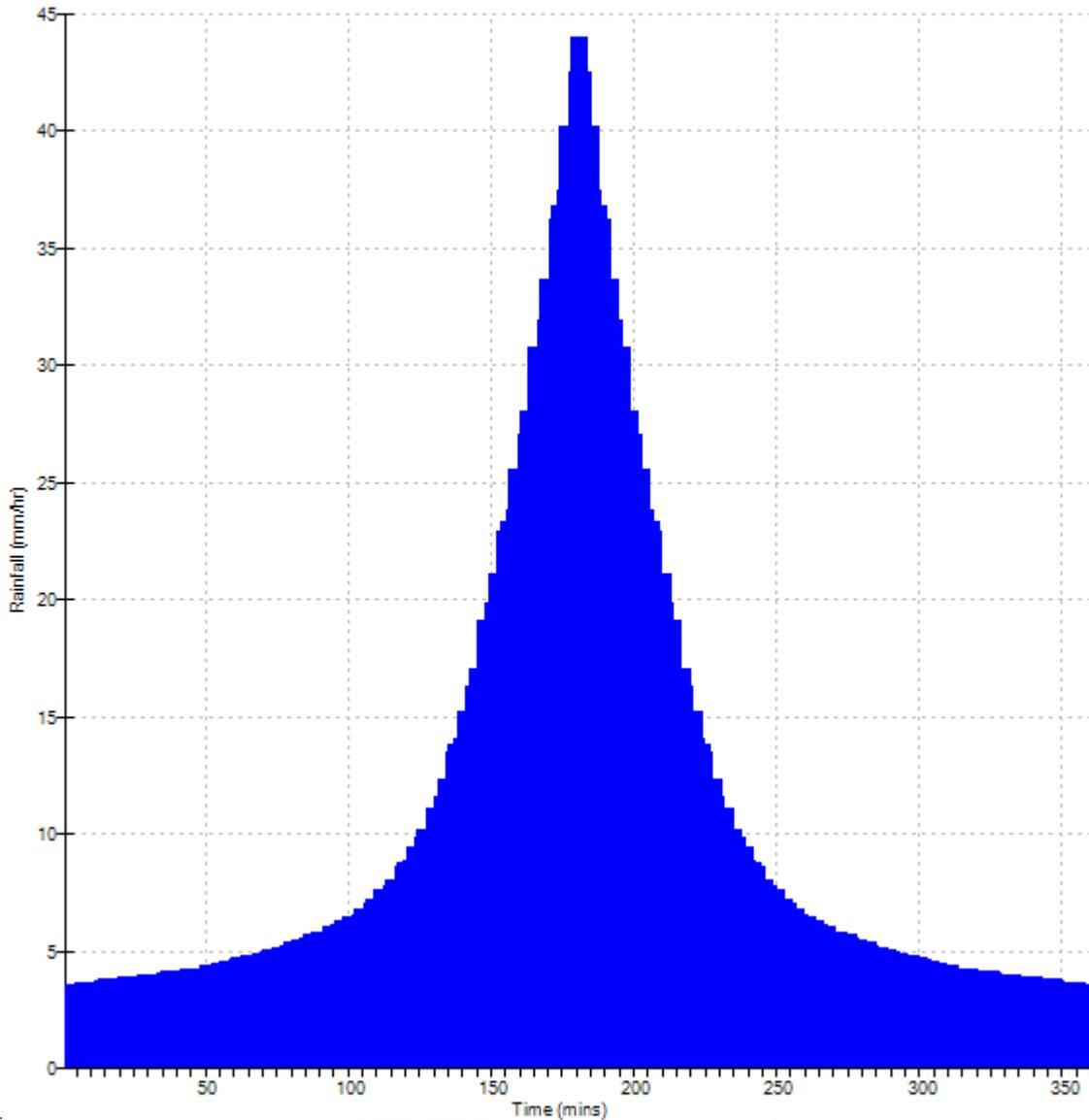
Network 2013.1.1

Rainfall profile

Storm duration (mins) 360

FEH Data

C(1km) -0.025
D1(1km) 0.343
D2(1km) 0.317
D3(1km) 0.341
E(1km) 0.288
F(1km) 2.478
Peak Intensity (mm/hr) 44.066
Ave. Intensity (mm/hr) 11.241
Return Period (years) 100



Old Marsh Farm Barns
Welsh Road
Sealand Flintshire ...

Moss Lane
Southport



Date 17.09.15
File

Designed by KW
Checked by RDN

Micro Drainage

Source Control 2013.1.1

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.300
Area (ha)	17.968	Urban	0.000
SAAR (mm)	864	Region Number	Region 10

Results 1/s

QBAR Rural 41.9
QBAR Urban 41.9

Q1 year 36.4

Q1 year 36.4
Q30 years 71.0
Q100 years 87.1

Old Marsh Farm Barns
Welsh Road
Sealand Flintshire ...

Moss Lane
Southport



Date 17.09.15
File

Designed by KW
Checked by RDN

Micro Drainage

Source Control 2013.1.1

Greenfield Runoff Volume

FEH Data

Return Period (years)	1
Storm Duration (mins)	360
Site Location	GB 337150 417450 SD 37150 17450
C (1km)	-0.025
D1 (1km)	0.343
D2 (1km)	0.317
D3 (1km)	0.341
E (1km)	0.288
F (1km)	2.478
Areal Reduction Factor	1.00
Area (ha)	17.968
SAAR (mm)	864
CWI	120.442
SPR Host	19.010
URBEXT (1990)	0.0950

Results

Percentage Runoff (%) 20.92
Greenfield Runoff Volume (m³) 828.075

Old Marsh Farm Barns
Welsh Road
Sealand Flintshire ...

Moss Lane
Southport



Date 17.09.15
File

Designed by KW
Checked by RDN

Micro Drainage

Source Control 2013.1.1

Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
Site Location	GB 337150 417450 SD 37150 17450
C (1km)	-0.025
D1 (1km)	0.343
D2 (1km)	0.317
D3 (1km)	0.341
E (1km)	0.288
F (1km)	2.478
Areal Reduction Factor	1.00
Area (ha)	17.968
SAAR (mm)	864
CWI	120.442
SPR Host	19.010
URBEXT (1990)	0.0950

Results

Percentage Runoff (%)	25.22
Greenfield Runoff Volume (m³)	3056.632

SURFACE WATER RUN-OFF CALCULATION SHEET

Development	Moss Lane, Southport
Project No.	HYD008



Revision	1.1	Completed by	KW
Date	18.09.15	Checked by	RDN

Areas		Catchment Characteristics	
Total Site	18.926 ha	SAAR	864 mm
Development Area (for SW Strategy)	18.926 ha	SPR	19.01 %
Existing Impermeable	0.958 ha	i_1	14.4 mm/hr
Existing Impermeable (for SW Strategy)	0.958 ha (5%)	i_{30}	32.8 mm/hr
Existing Pervious	17.968 ha	i_{100}	44.1 mm/hr
Existing Pervious (for SW Strategy)	17.968 ha	d_1	12.7 mm
Proposed Impermeable (total)	7.570 ha (40%)	d_{100}	64.4 mm
Proposed Impermeable (domestic only)	ha		

Run-off Rates				Volumes			
<i>Pre-development</i>				<i>Pre-development</i>			
Impermeable	1yr	38.3 l/s		Impermeable	1yr	121.7 cu.m	
	30yr	87.2 l/s			100yr	617.0 cu.m	
Pervious	100yr	117.3 l/s		Pervious	1yr	828.1 cu.m	
	50mm/hr	133.1 l/s			100yr	3056.6 cu.m	
	1yr	36.4 l/s		Total	1yr	949.7 cu.m	
	30yr	71.0 l/s			100yr	3673.6 cu.m	
Total	100yr	87.1 l/s		<i>Post-development</i>			
	QBar	41.9 l/s		Impermeable (total)	1yr	961.4 cu.m	
	1yr	74.7 l/s			100yr+CC	6337.6 cu.m	
30yr	158.2 l/s		Impermeable (domestic only)	1yr	cu.m		
100yr	204.4 l/s			100yr+CC	cu.m		
<i>Post-development</i>				Reduction (total)	-73%	-2664.0 cu.m	
Impermeable (total)	1yr	302.7 l/s			Reduction (domestic only)		cu.m
	30yr	689.4 l/s					
	100yr+CC	1204.6 l/s					
Impermeable (domestic only)	1yr	l/s					
	30yr	l/s					
	100yr+CC	l/s					

Quick storage Estimate								
		low	high	mean	Imp. Area (ha)	Max. Discharge (l/s)	Rainfall	CC
Return Period	1yr	559	1055	807	7.570	59.8	FEH	0
Return Period	30yr	1534	2387	1961	7.570	126.6	FEH	0
Return Period	100yr+CC	3178	4561	3870	7.570	163.5	FEH	30%
Return Period	1yr			0	7.570		FSR	0
Return Period	30yr			0	7.570		FSR	0
Return Period	100yr+CC			0	7.570		FSR	30%

APPENDIX I: IMPERMEABLE AREAS PLANS

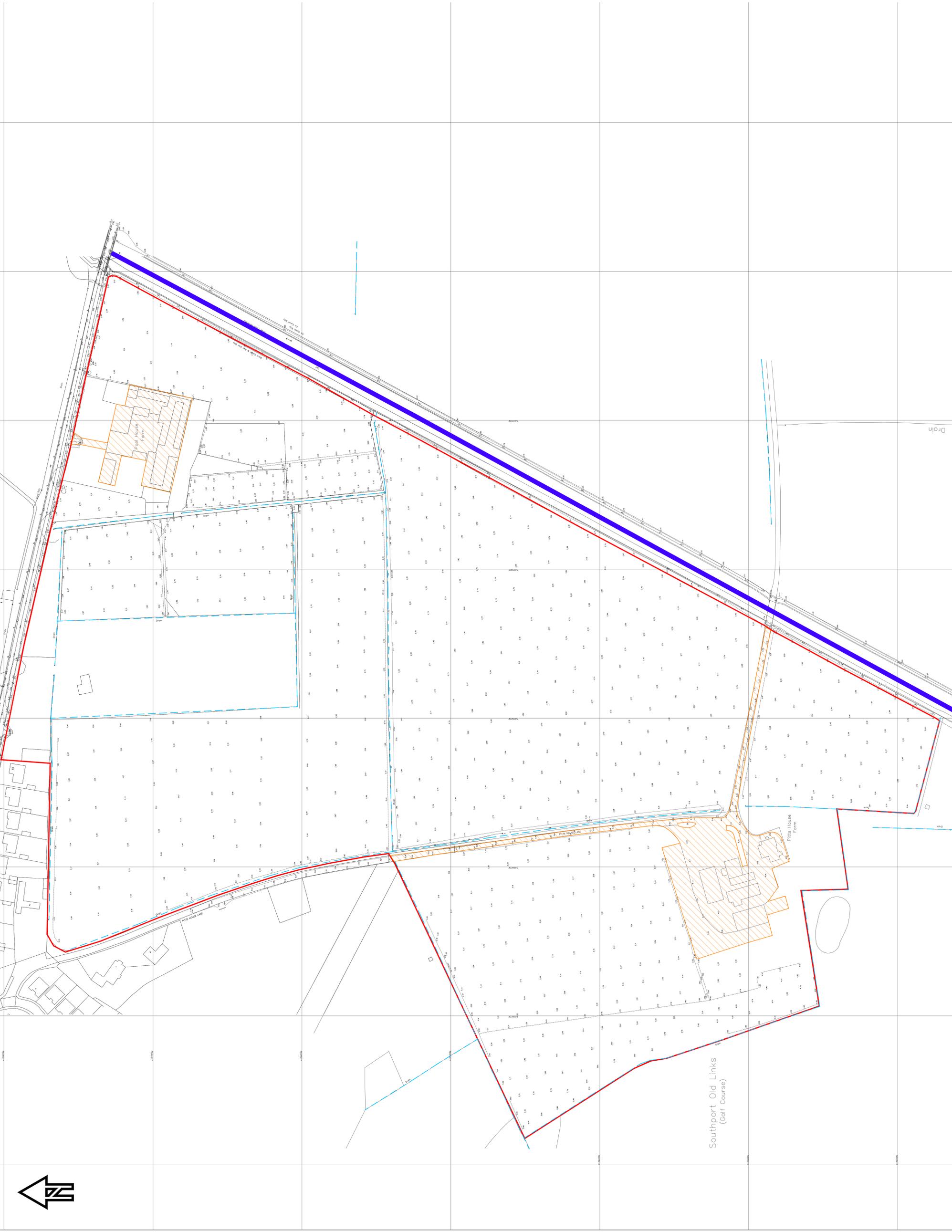
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DO NOT SCALE

LEGEND:

- SITE BOUNDARY
- LAND DRAINAGE
- THREE POUNDS WATERWAY (EA MAIN RIVER)
- ▨ PRE-DEVELOPMENT IMPERMEABLE AREAS (0.558ha)

TOTAL SITE AREA - 18.959ha



REV		DATE	BY	DESCRIPTION	CHK
A		18/09/15	AM	PRELIMINARY ISSUE FOR REVIEW	AM
DRAWING STATUS: PRELIMINARY					
<p>BETTS ASSOCIATES CIVIL AND ENVIRONMENTAL ENGINEERS 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 421, 423, 425, 427, 429, 431, 433, 435, 437, 439, 441, 443, 445, 447, 449, 451, 453, 455, 457, 459, 461, 463, 465, 467, 469, 471, 473, 475, 477, 479, 481, 483, 485, 487, 489, 491, 493, 495, 497, 499, 501, 503, 505, 507, 509, 511, 513, 515, 517, 519, 521, 523, 525, 527, 529, 531, 533, 535, 537, 539, 541, 543, 545, 547, 549, 551, 553, 555, 557, 559, 561, 563, 565, 567, 569, 571, 573, 575, 577, 579, 581, 583, 585, 587, 589, 591, 593, 595, 597, 599, 601, 603, 605, 607, 609, 611, 613, 615, 617, 619, 621, 623, 625, 627, 629, 631, 633, 635, 637, 639, 641, 643, 645, 647, 649, 651, 653, 655, 657, 659, 661, 663, 665, 667, 669, 671, 673, 675, 677, 679, 681, 683, 685, 687, 689, 691, 693, 695, 697, 699, 701, 703, 705, 707, 709, 711, 713, 715, 717, 719, 721, 723, 725, 727, 729, 731, 733, 735, 737, 739, 741, 743, 745, 747, 749, 751, 753, 755, 757, 759, 761, 763, 765, 767, 769, 771, 773, 775, 777, 779, 781, 783, 785, 787, 789, 791, 793, 795, 797, 799, 801, 803, 805, 807, 809, 811, 813, 815, 817, 819, 821, 823, 825, 827, 829, 831, 833, 835, 837, 839, 841, 843, 845, 847, 849, 851, 853, 855, 857, 859, 861, 863, 865, 867, 869, 871, 873, 875, 877, 879, 881, 883, 885, 887, 889, 891, 893, 895, 897, 899, 901, 903, 905, 907, 909, 911, 913, 915, 917, 919, 921, 923, 925, 927, 929, 931, 933, 935, 937, 939, 941, 943, 945, 947, 949, 951, 953, 955, 957, 959, 961, 963, 965, 967, 969, 971, 973, 975, 977, 979, 981, 983, 985, 987, 989, 991, 993, 995, 997, 999, 1001, 1003, 1005, 1007, 1009, 1011, 1013, 1015, 1017, 1019, 1021, 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APPENDIX J: STORMWATER STORAGE ESTIMATES

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STORMWATER STORAGE ESTIMATES

FEH

Micro Drainage		Variables		
<ul style="list-style-type: none"> Variables <li style="background-color: #f4a460;">Results Design Overview 2D Overview 3D Vt 	FEH Rainfall	Cv (Summer)	0.750	
	Return Period (years)	1	Cv (Winter)	0.840
	Site Location		Impemeable Area (ha)	7.570
	GB 337150 417450 SD 37150 1745	...	Maximum Allowable Discharge (l/s)	59.8
	C (1km)	-0.025	D3 (1km)	0.341
	D1 (1km)	0.343	E (1km)	0.288
	D2 (1km)	0.317	F (1km)	2.478
			Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
			Climate Change (%)	0

Micro Drainage		Results
<ul style="list-style-type: none"> Variables <li style="background-color: #f4a460;">Results Design Overview 2D Overview 3D Vt 	<p>Global Variables require approximate storage of between 559 m³ and 1055 m³.</p> <p>These values are estimates only and should not be used for design purposes.</p>	

 Variables Results Design Overview 2D Overview 3D Vt	Variables	
	FEH Rainfall	Cv (Summer) 0.750
	Return Period (years) 30	Cv (Winter) 0.840
	Site Location	Impemeable Area (ha) 7.570
	GB 337150 417450 SD 37150 1745 ...	Maximum Allowable Discharge (l/s) 126.6
	C (1km) -0.025 D3 (1km) 0.341	Infiltration Coefficient (m/hr) 0.00000
	D1 (1km) 0.343 E (1km) 0.288	Safety Factor 2.0
	D2 (1km) 0.317 F (1km) 2.478	Climate Change (%) 0

 Variables Results Design Overview 2D Overview 3D Vt	Results
	<p>Global Variables require approximate storage of between 1534 m³ and 2387 m³.</p> <p>These values are estimates only and should not be used for design purposes.</p>

 Variables Results Design Overview 2D Overview 3D Vt	Variables	
	FEH Rainfall	Cv (Summer) 0.750
	Return Period (years) 100	Cv (Winter) 0.840
	Site Location	Impemeable Area (ha) 7.570
	GB 337150 417450 SD 37150 1745 ...	Maximum Allowable Discharge (l/s) 163.5
	C (1km) -0.025 D3 (1km) 0.341	Infiltration Coefficient (m/hr) 0.00000
	D1 (1km) 0.343 E (1km) 0.288	Safety Factor 2.0
	D2 (1km) 0.317 F (1km) 2.478	Climate Change (%) 30

 Variables Results Design Overview 2D Overview 3D Vt	Results
	<p>Global Variables require approximate storage of between 3178 m³ and 4561 m³.</p> <p>These values are estimates only and should not be used for design purposes.</p>