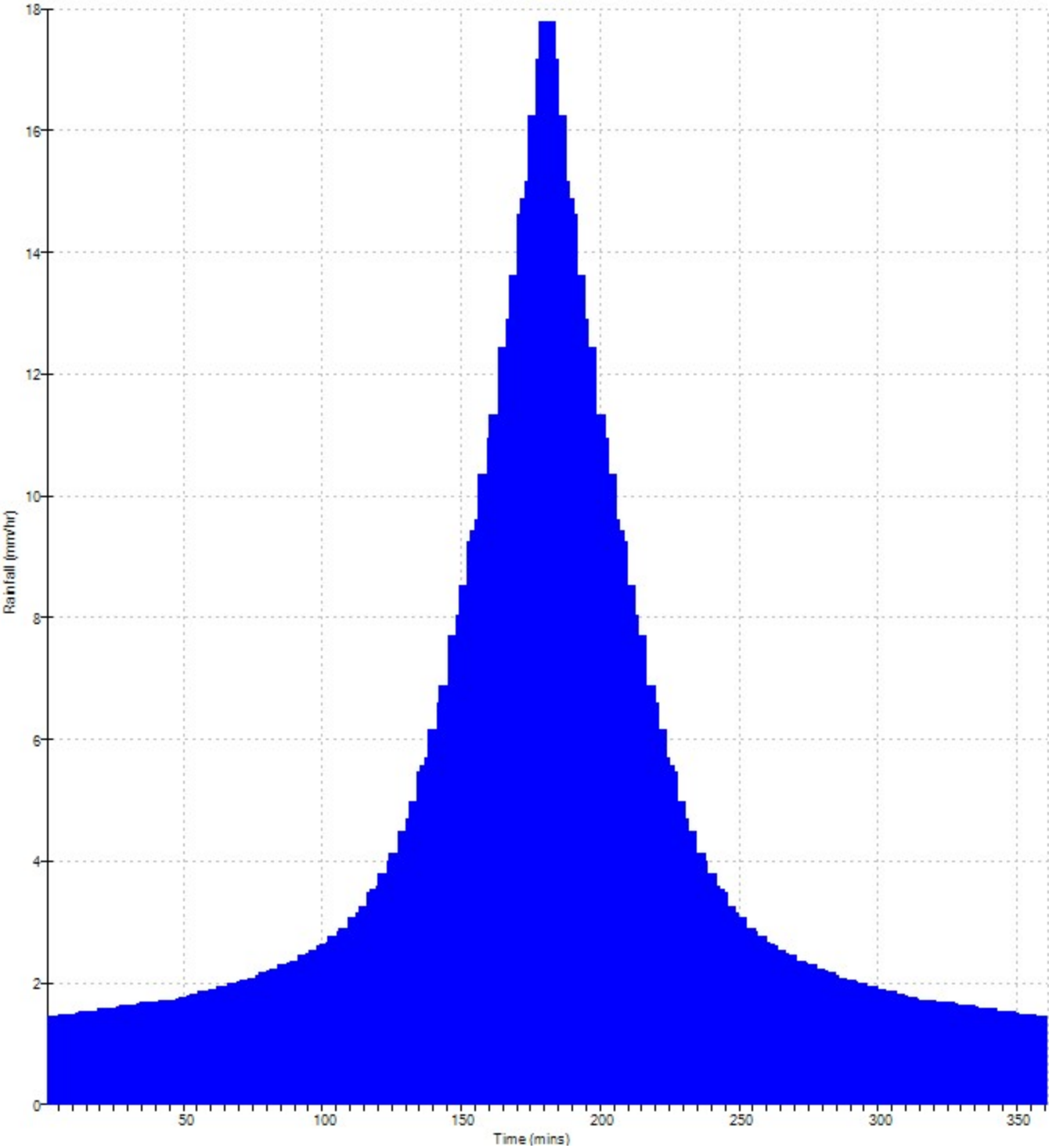


Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location	GB 386015 413468 SD 86015 13468
Data Type	Point
Peak Intensity (mm/hr)	17.795
Ave. Intensity (mm/hr)	4.539
Return Period (years)	2.0



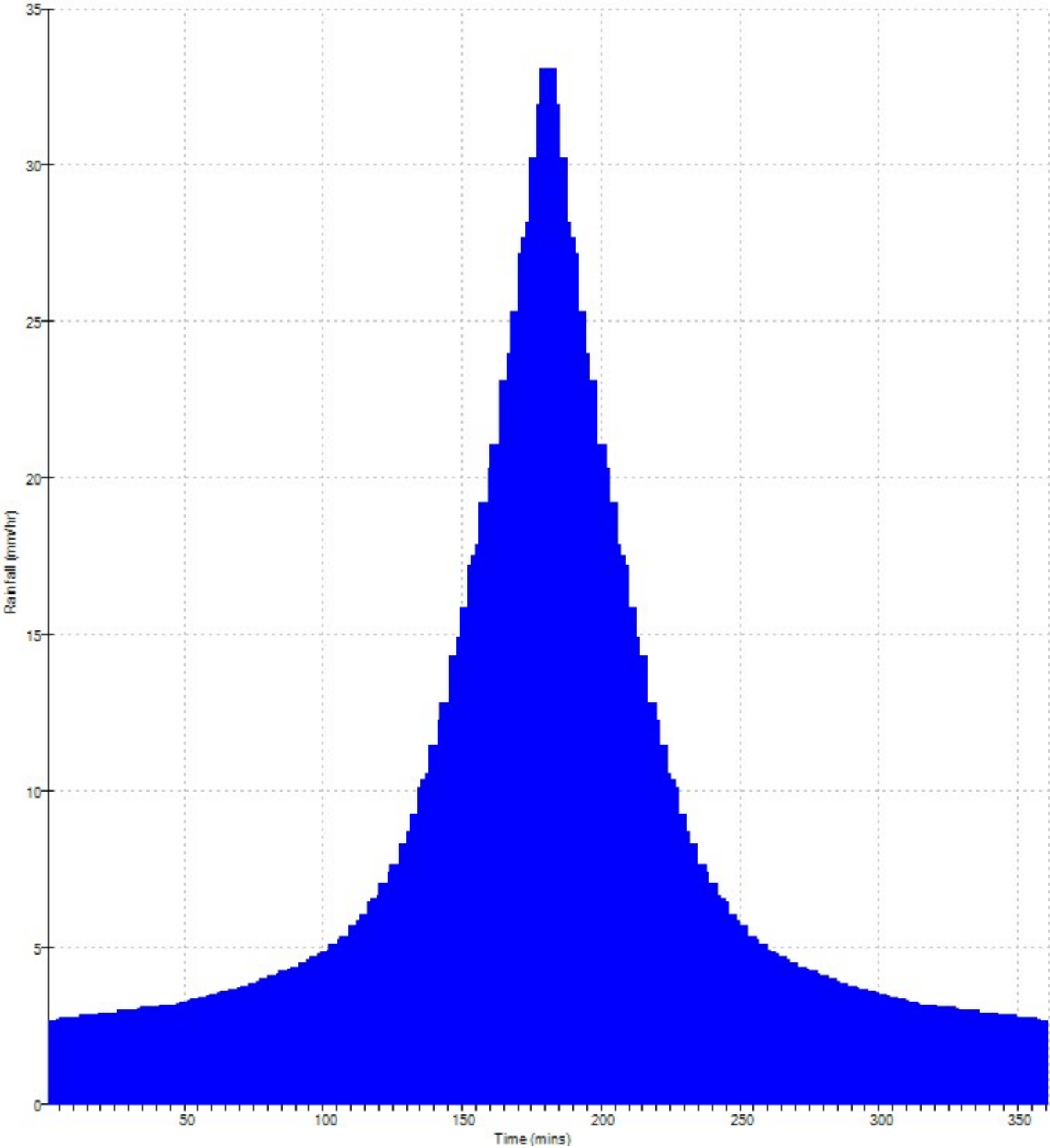
Betts Associates Ltd		Page 1
6 Old Marsh Farm Barns	Greenvale	
Welsh Road, Sealand	Bamford	
Flintshire, CH5 2LY		
Date 28/11/2024	Designed by HB	
File	Checked by KH	
Innovyze	Network 2020.1.3	

Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version	2013
Site Location	GB 386015 413468 SD 86015 13468
Data Type	Point
Peak Intensity (mm/hr)	33.095
Ave. Intensity (mm/hr)	8.443
Return Period (years)	30.0

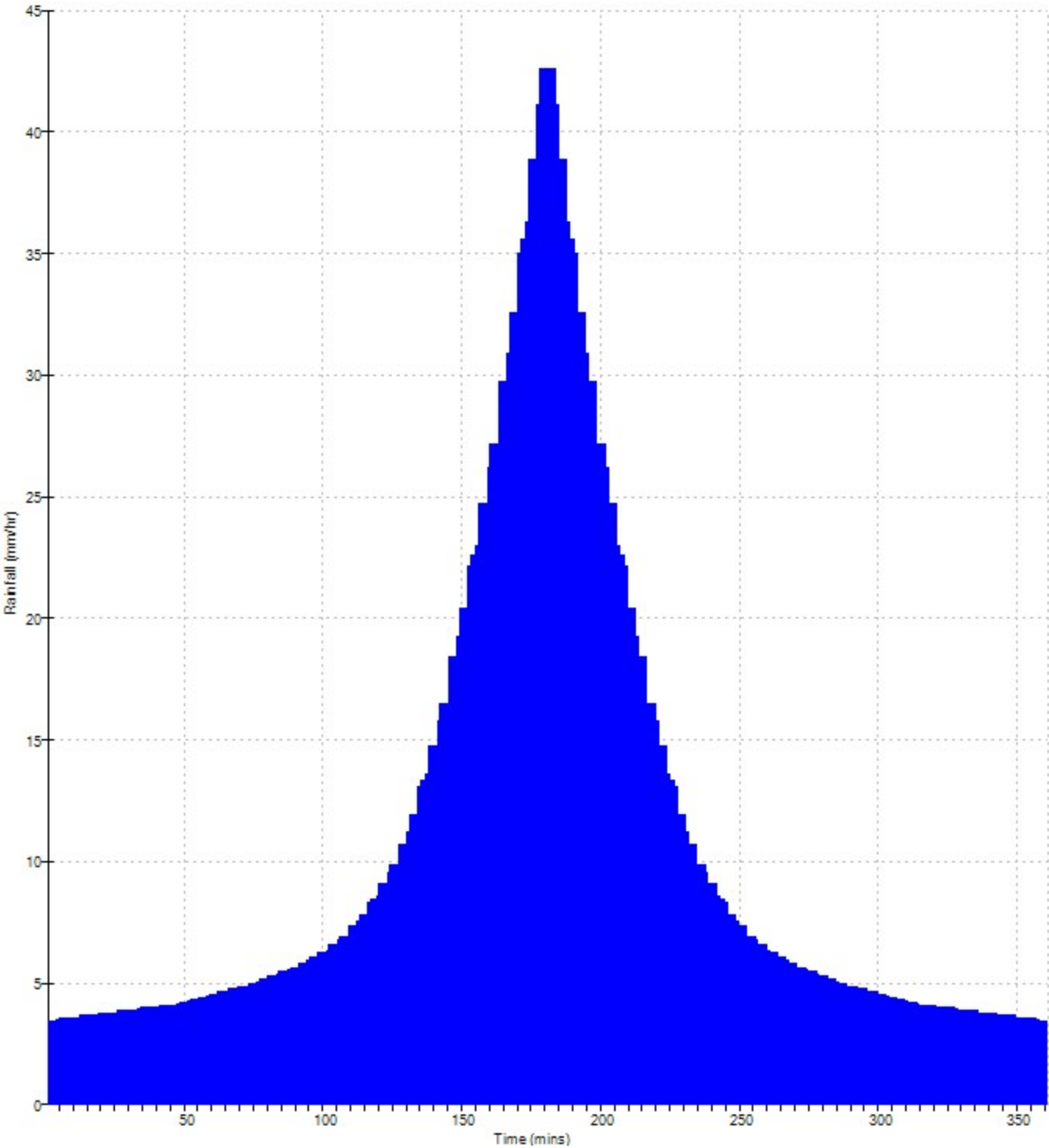


Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version	2013
Site Location	GB 386015 413468 SD 86015 13468
Data Type	Point
Peak Intensity (mm/hr)	42.594
Ave. Intensity (mm/hr)	10.866
Return Period (years)	100.0



Betts Associates Ltd		Page 1
Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY	Greenvale Bamford	
Date 28/03/2025 File	Designed by SM Checked by HB	
Micro Drainage Source Control 2020.1		

Greenfield Runoff Volume

FEH Data

Return Period (years)	2
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 386015 413468 SD 86015 13468
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	2.695
SAAR (mm)	1174
CWI	123.754
SPR Host	36.700
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	36.39
Greenfield Runoff Volume (m³)	267.102

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Betts Associates Ltd		Page 1																										
Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY	Greenvale Bamford																											
Date 28/03/2025 File	Designed by SM Checked by HB																											
Micro Drainage Source Control 2020.1																												
<u>Greenfield Runoff Volume</u> FEH Data <table> <tr> <td>Return Period (years)</td> <td>30</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>360</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 386015 413468 SD 86015 13468</td> </tr> <tr> <td>Data Type</td> <td>Point</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.00</td> </tr> <tr> <td>Area (ha)</td> <td>2.695</td> </tr> <tr> <td>SAAR (mm)</td> <td>1174</td> </tr> <tr> <td>CWI</td> <td>123.754</td> </tr> <tr> <td>SPR Host</td> <td>36.700</td> </tr> <tr> <td>URBEXT (1990)</td> <td>0.0000</td> </tr> </table> Results <table> <tr> <td>Percentage Runoff (%)</td> <td>38.75</td> </tr> <tr> <td>Greenfield Runoff Volume (m³)</td> <td>528.952</td> </tr> </table>			Return Period (years)	30	Storm Duration (mins)	360	FEH Rainfall Version	2013	Site Location	GB 386015 413468 SD 86015 13468	Data Type	Point	Areal Reduction Factor	1.00	Area (ha)	2.695	SAAR (mm)	1174	CWI	123.754	SPR Host	36.700	URBEXT (1990)	0.0000	Percentage Runoff (%)	38.75	Greenfield Runoff Volume (m³)	528.952
Return Period (years)	30																											
Storm Duration (mins)	360																											
FEH Rainfall Version	2013																											
Site Location	GB 386015 413468 SD 86015 13468																											
Data Type	Point																											
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Area (ha)	2.695																											
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CWI	123.754																											
SPR Host	36.700																											
URBEXT (1990)	0.0000																											
Percentage Runoff (%)	38.75																											
Greenfield Runoff Volume (m³)	528.952																											
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Betts Associates Ltd		Page 1
Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY	Greenvale Bamford	
Date 28/03/2025 File	Designed by SM Checked by HB	
Micro Drainage Source Control 2020.1		

Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 386015 413468 SD 86015 13468
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	2.695
SAAR (mm)	1174
CWI	123.754
SPR Host	36.700
URBEXT (1990)	0.0000

Results

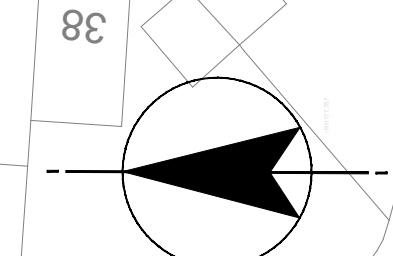
Percentage Runoff (%)	40.69
Greenfield Runoff Volume (m³)	715.004

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APPENDIX J: DRAINAGE APPRAISAL (WAIN HOMES)

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NOTES:
All information on this drawing is copyright ©.
All sizes to be verified on site.
All dimensions to be scaled on this drawing.
All dimensions to be scaled on this drawing unless otherwise stated.
All dimensions on this drawing in millimetres unless otherwise stated.



DESIGN NOTE
OVERHEAD POWER LINE EXCLUSION
ZONE (EXACT POSITION TBC)

DESIGN NOTE
SILT FOREBAY

DESIGN NOTE
UNITED UTILITIES 3M MAINTENANCE
TRACK

DESIGN NOTE
ONLINE ATTENUATION BASIN 1 TO CATER
FOR ALL STORMS UP TO AND INCLUDING
THE 1:100YR+40%CC+10%UC VOLUME: 386m³
(TO ADOPTABLE STANDARDS)

DESIGN NOTE
LOW FLOW CHANNEL APPROX 1:400

DESIGN NOTE
FW PUMPING STATION TO SERVE THE FULL
DEVELOPMENT. THE RISING MAIN IS TO
OUTFALL INTO PROPOSED MANHOLE THEN
VIA GRAVITY INTO THE EXISTING FW SEWER

DESIGN NOTE
S24 HYDROBRAKE MANHOLE
MAXIMUM DISCHARGE RATE 50.00L/S

DESIGN NOTE
SILT FOREBAY

DESIGN NOTE
ONLINE ATTENUATION BASIN 2 TO CATER
FOR ALL STORMS UP TO AND INCLUDING
THE 1:100YR+40%CC+10%UC VOLUME:
1076m³ (TO ADOPTABLE STANDARDS)

DESIGN NOTE
UNITED UTILITIES 3M MAINTENANCE
TRACK

DESIGN NOTE
LOW FLOW CHANNEL APPROX 1:400

DESIGN NOTE
DESIGN MAIN TO DISCHARGE INTO NEW
MANHOLE AND DISCHARGE VIA GRAVITY
INTO THE EXISTING SEWER IN GREENVALE

DESIGN NOTE
EXISTING 300Ø SW SEWER

DESIGN NOTE
S24 HYDROBRAKE MANHOLE
MAXIMUM DISCHARGE RATE 16.90L/S
AS PER FLOOD RISK ASSESSMENT

DESIGN NOTE
DIVERTED SW SEWER
SECTION 185 TO BE APPROVED WITH
JUU BEFORE COMMENCEMENT ONSITE

- NOTES:
- Do Not Scale from this drawing
 - This drawing is to be read in conjunction with all other drawings and specifications, Architects, and specialist drawings and details.
 - All dimensions are in metres unless otherwise noted.
 - Any discrepancies noted are to be reported to the Engineer immediately.

KEY:

- 0.9 FV Retaining wall
- 0.45 FVE Flag on Edge
- 0.25 FV Post and Gravel Board
- 0.85 U8 Underbuild
- 0.85 U8 Tanking
- 0.85 U8 Step in Slab
- 0.85 U8 Channel Drain (ACD)
- 0.85 U8 Steps
- 0.85 U8 FFL
- 0.85 U8 Sewer to be Abandoned
- 0.85 U8 Existing Combined Sewer
- 0.85 U8 Existing FW Sewer
- 0.85 U8 Existing SW Sewer
- 0.85 U8 Existing Culvert
- 0.85 U8 Rising Main
- 0.85 U8 Diverted FW Sewer
- 0.85 U8 Proposed Easement

NOTE:
The location of existing sewers and apparatus is shown on this drawing for information only. It is to be determined before the detailed design is commenced. Works will not proceed until the location of the information provided by the statutory undertakers.

REV	DATE	DESCRIPTION	BY
A	21.03.25	Issue for construction	CML



Project:	GREENVALE BAMFORD ROCHDALE
Drawing Title:	ROAD AND SEWER APPRAISAL
Drawing No:	G-B-R-APP01
Drawing Status:	Preliminary
Scale:	1:500
Revision:	A
Date:	21.03.25
Drawn by:	CML

APPENDIX K: QUICK STORAGE ESTIMATES

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QUICK STORAGE ESTIMATES

GREENVALE, BAMFORD

1 YEAR RETURN PERIOD STORM EVENT

Variables	
FEH Rainfall	Cv (Summer) 1.000
Return Period (years) 2	Cv (Winter) 1.000
Version 2013	Impervious Area (ha) 1.752
Point	Maximum Allowable Discharge (l/s) 21.0
Site GB 386015 413468 SD 86015 13468	Infiltration Coefficient (m/hr) 0.00000
	Safety Factor 2.0
	Climate Change (%) 0

Results	
Global Variables require approximate storage of between 183 m³ and 370 m³.	
These values are estimates only and should not be used for design purposes.	

30 YEAR RETURN PERIOD STORM EVENT

Variables	
FEH Rainfall	Cv (Summer) 1.000
Return Period (years) 30	Cv (Winter) 1.000
Version 2013	Impervious Area (ha) 1.752
Point	Maximum Allowable Discharge (l/s) 21.0
Site GB 386015 413468 SD 86015 13468	Infiltration Coefficient (m/hr) 0.00000
	Safety Factor 2.0
	Climate Change (%) 0

Results	
Global Variables require approximate storage of between 519 m³ and 822 m³.	
These values are estimates only and should not be used for design purposes.	

QUICK STORAGE ESTIMATES

GREENVALE, BAMFORD

100 YEAR RETURN PERIOD STORM EVENT + 45% CLIMATE CHANGE

Micro Drainage		Variables		
Variables Results Design Overview 2D Overview 3D Vt	FEH Rainfall		Cv (Summer)	1.000
	Return Period (years) 100		Cv (Winter)	1.000
	Version 2013	Point	Impermeable Area (ha)	1.752
	Site GB 386015 413468 SD 86015 13468		Maximum Allowable Discharge (l/s)	21.0
			Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
			Climate Change (%)	45

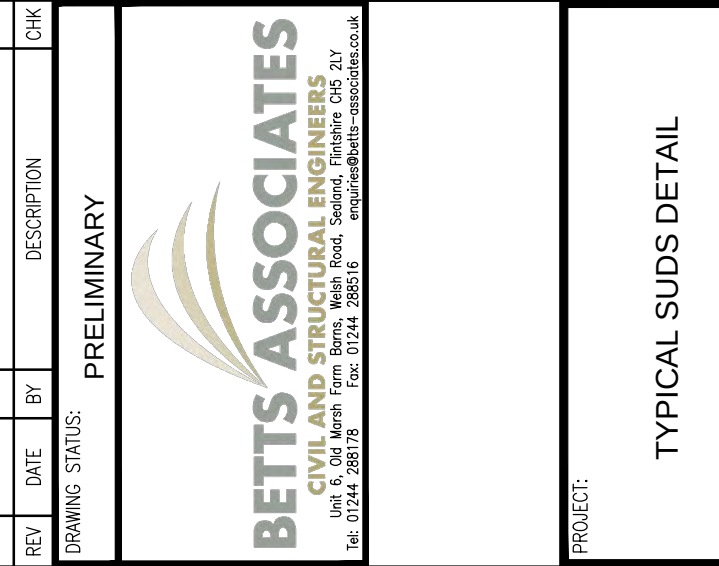
Micro Drainage		Results
Variables	Global Variables require approximate storage of between 1214 m³ and 1978 m³. These values are estimates only and should not be used for design purposes.	

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APPENDIX L: SUDS EXAMPLES

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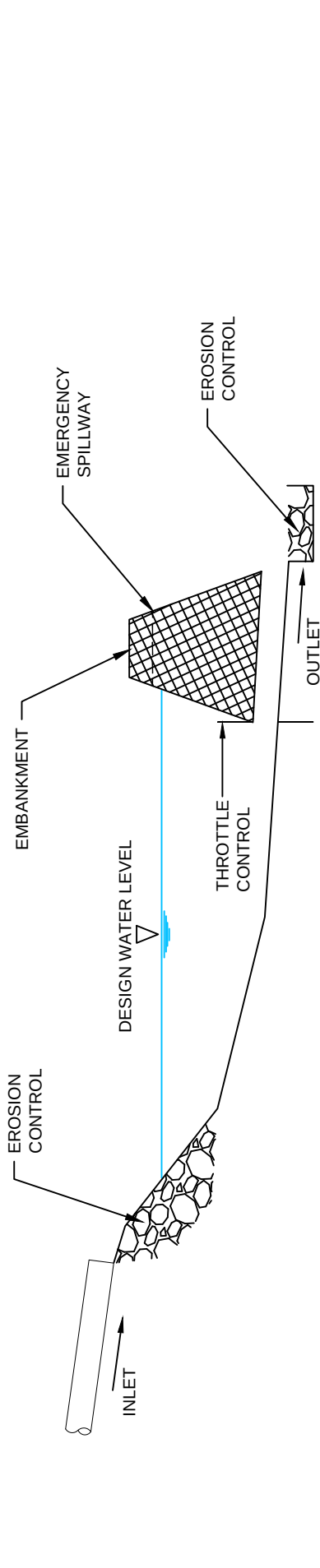
DO NOT SCALE



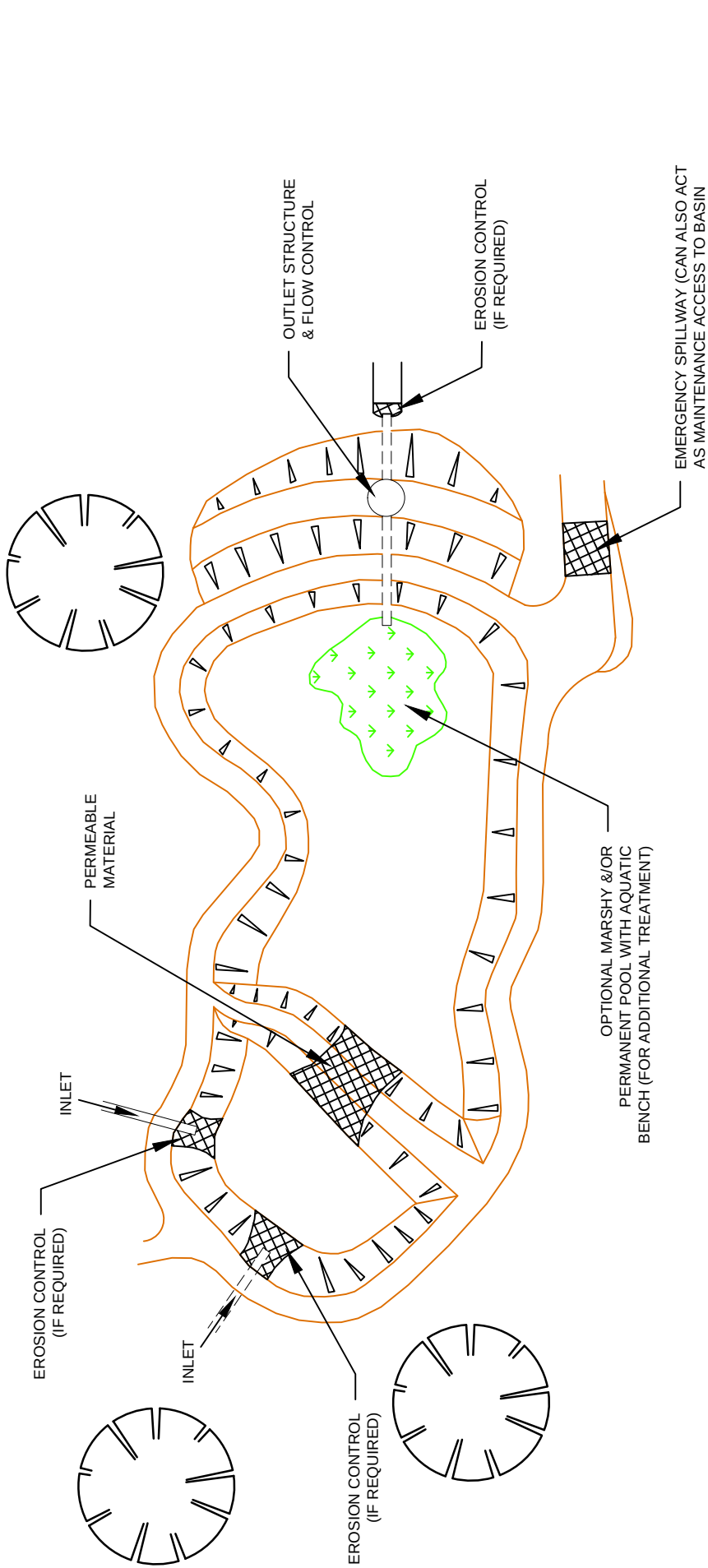
TITLE: BIORETENTION APPLICATIONS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS		DRAWING No: 112	REV: A

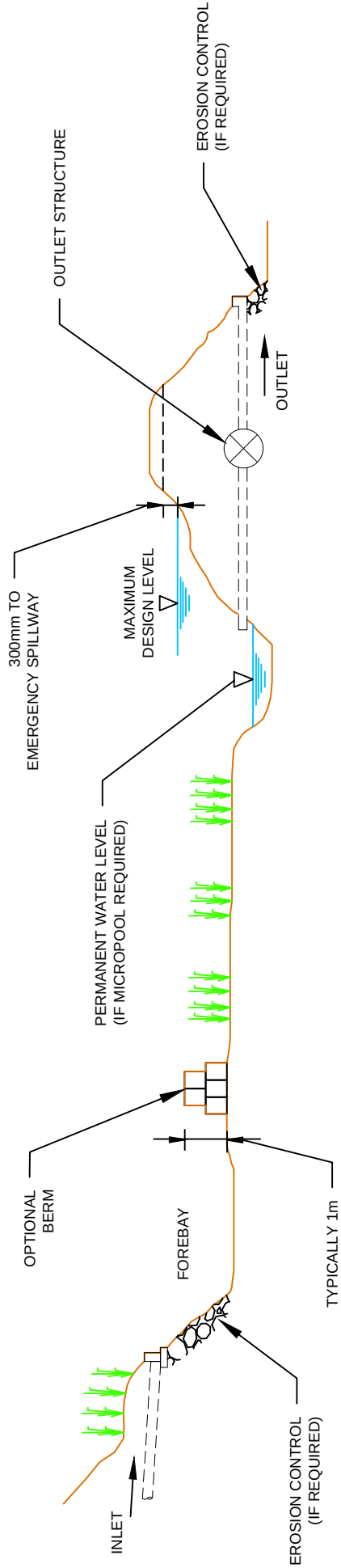
DO NOT SCALE



SCHEMATIC OF DETENTION
BASIN PROFILE



PLAN VIEW



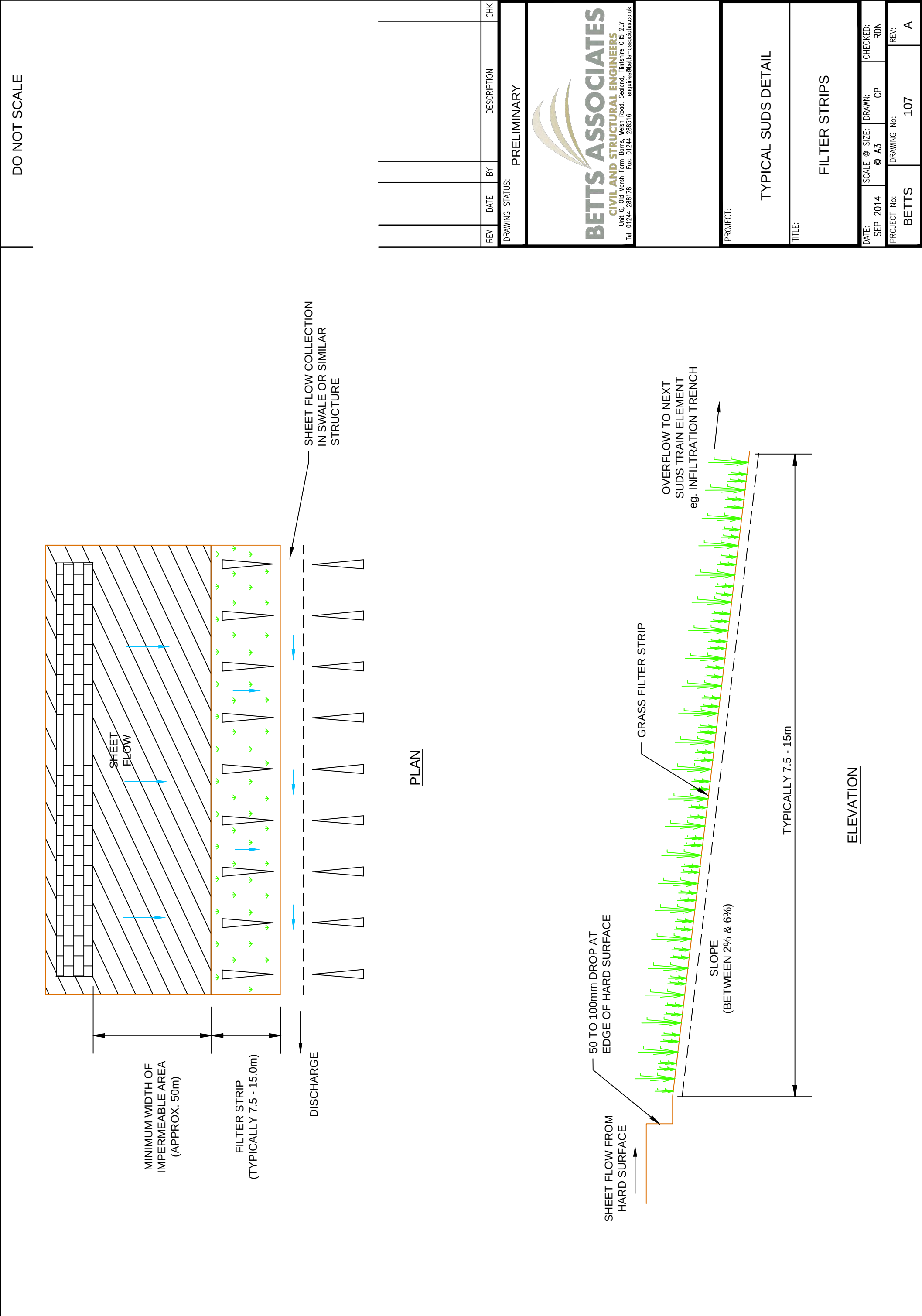
ELEVATION

REV	DATE	BY	DESCRIPTION	CHK
DRAWING STATUS: PRELIMINARY				

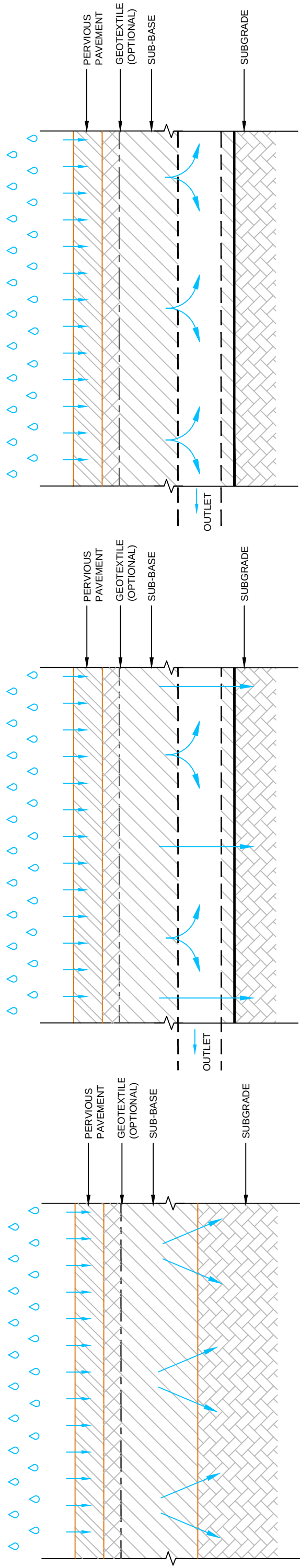


BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT:	TYPICAL SUDS DETAIL				
TITLE:	DETENTION BASINS				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	PROJECT No: BETTS	DRAWING No: 110
REV: A					



	DO NOT SCALE
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TYPE A: TOTAL INFILTRATION

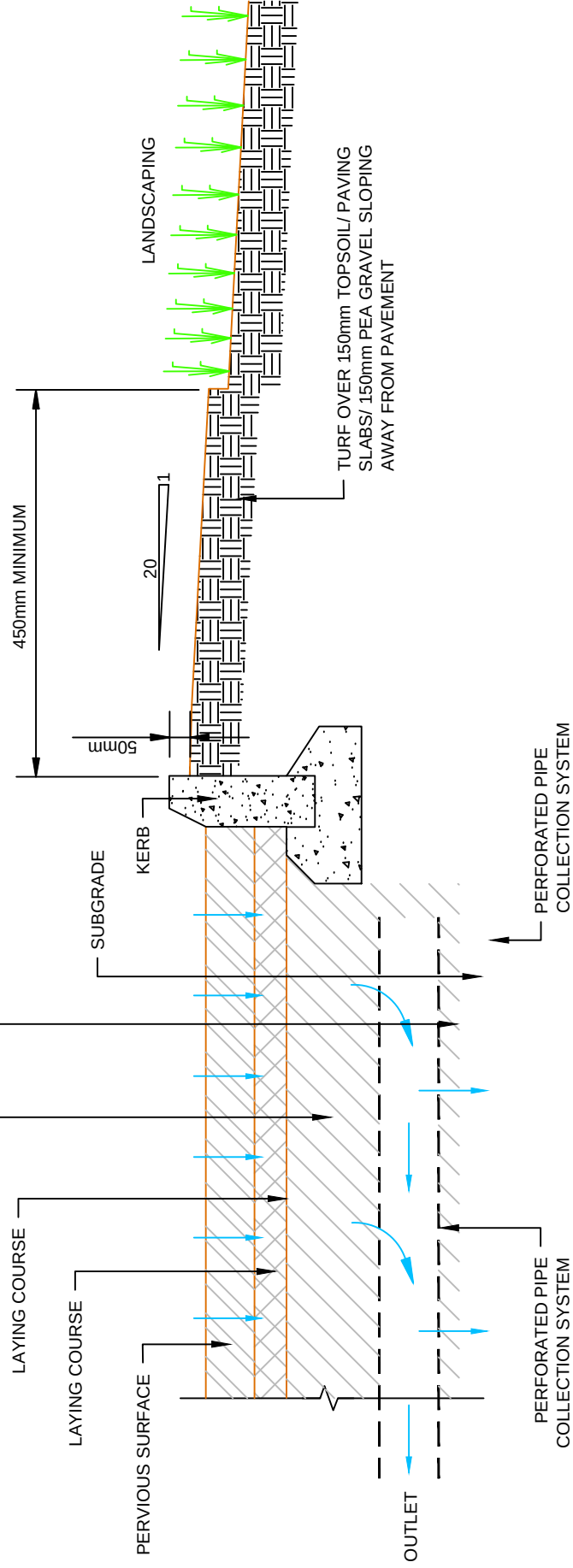
TYPE B: PARTIAL INFILTRATION

TYPE C: NO INFILTRATION

REV	DATE	BY	DESCRIPTION	CHK

AGGREGATE SUB-BASE (MAY BE REPLACED WITH GEOCELLULAR BLOCKS)

— GEOTEXTILE (OPTIONAL - TYPES A & B) OR GEOMEMBRANE (TYPE C)



LANDSCAPING DETAIL

PRELIMINARY



PROJECT:

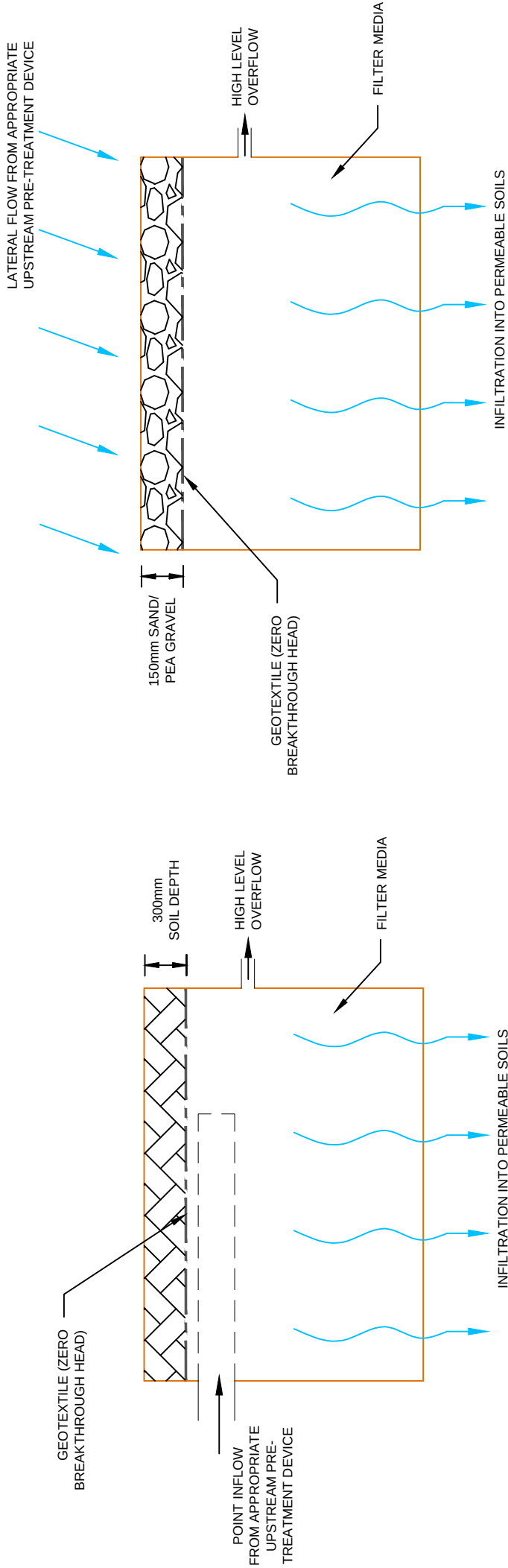
TYPICAL SUDS DETAIL

TITLE:

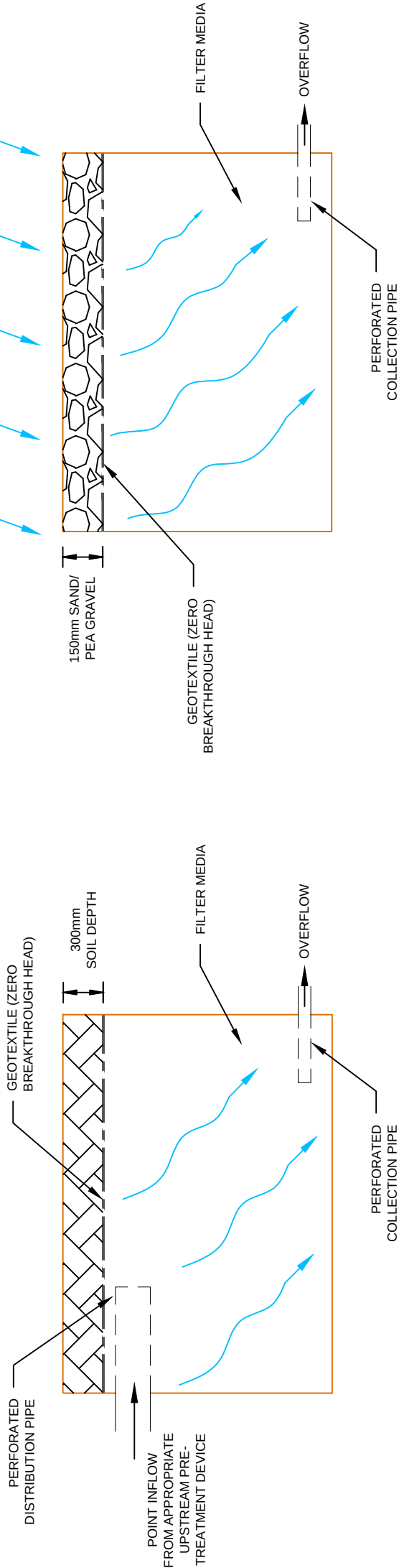
PERVIOUS PAVEMENTS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS		DRAWING No: 105	REV: A

DO NOT SCALE



INFILTRATION TRENCH SCHEMATICS



FILTER TRENCH SCHEMATICS

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY



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CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Borris, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT:

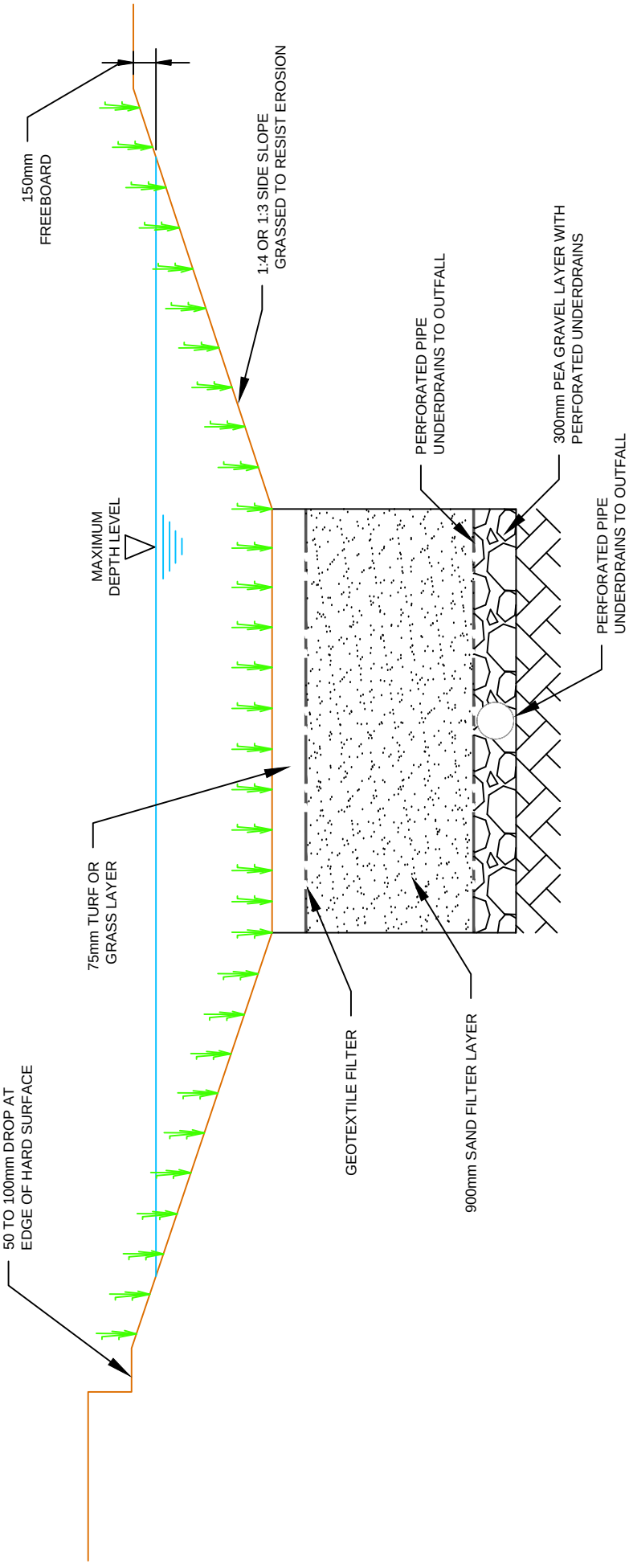
TYPICAL SUDS DETAIL

TITLE:

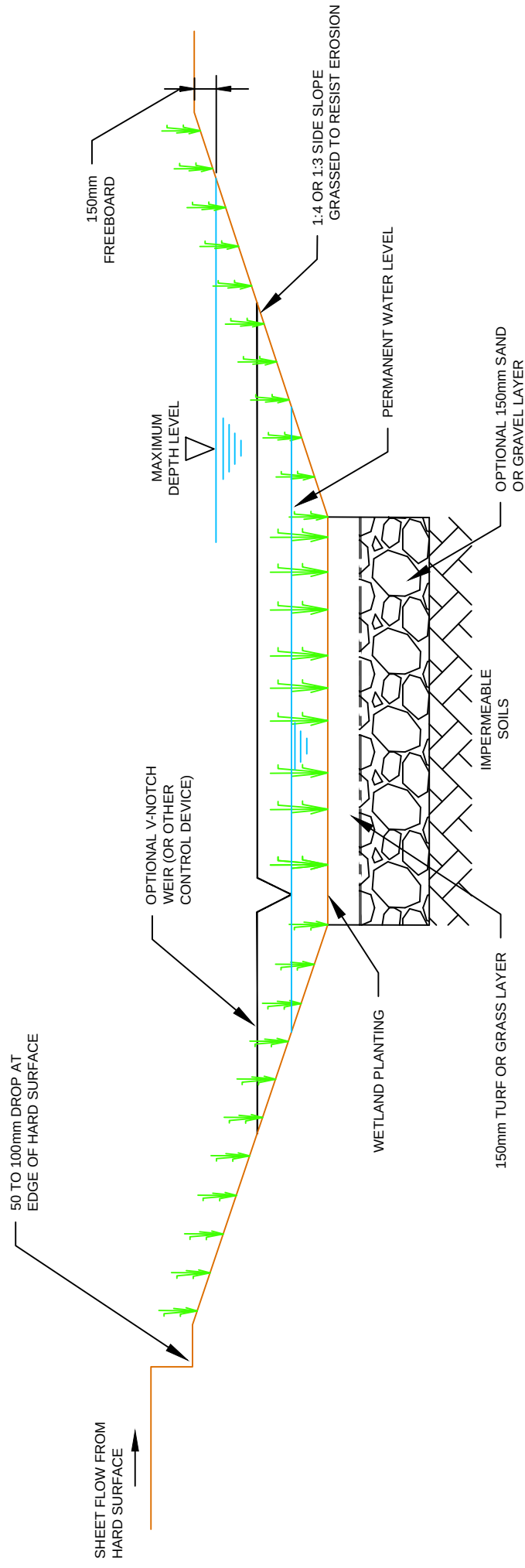
TRENCHES

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS		DRAWING No: 105	
REV:		A	

DO NOT SCALE



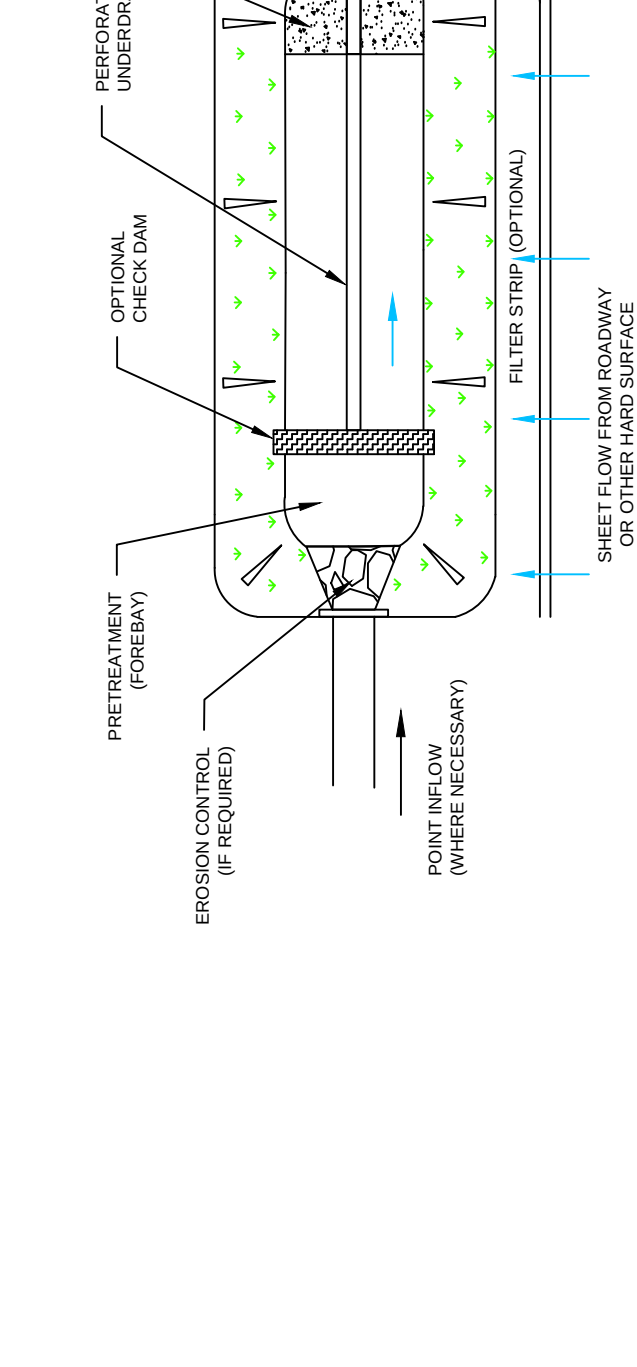
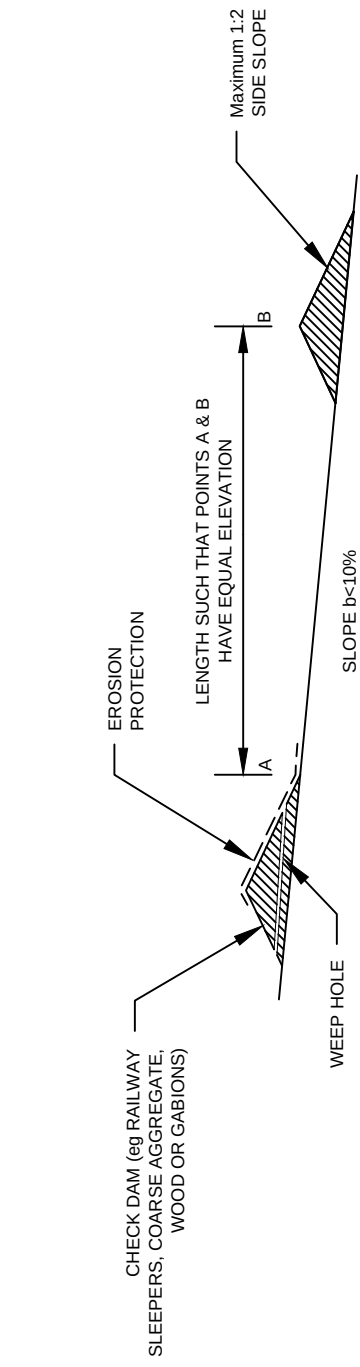
DRY SWALE



WET SWALE

[illegible]

	DO NOT SCALE
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[illegible]

APPENDIX M: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns, and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

This report was prepared by Betts Hydro Ltd for the sole and exclusive use of the titled client in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

This document has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Betts Hydro Ltd must be sought.

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