Our Reference: 2024-055

Flood Risk and Drainage Solutions Ltd
144 New Lane
Oswaldtwistle
Lancashire
BB5 3QW
[redacted]

Date: 14/10/24

Drainage Impact Assessment to Support the Proposed Residential Development
Land at Barrowbridge House, Barrow, Clitheroe

Introduction

Flood Risk and Drainage Solutions Ltd have been commissioned by Simon Gill to provide a Detailed Drainage Design for the proposed residential development on land associated with Barrowbridge House in Barrow, Clitheroe.

Existing Site

The existing site comprises of builder's yard including 2No steel framed shed buildings, located lo the west of Barrowbridge House, access is provided via a road to the west of Cockerill Ter from the east corner of the site.

- Total redline boundary = 0.222Ha

Proposed Development Site

Development Proposals

Development proposals comprise of the demolition of the existing buildings to make way for the erection of 4No new detached dwelling with associated parking provisions

- Existing impermeable area comprising of roof area and hardstanding = 0.222Ha
- Post development the impermeable area of the site has reduced to 0.112Ha and comprises of roof area and driveway.

Existing Drainage

The existing site currently discharges surface water into the watercourse to the west via an existing 150mm surface water pipe.

Foul from the site currently discharges into the public foul sewer located in the rear ally of the properties on Cockerill Ter to the south east of the site via an existing 100mm foul pipe.

Hierarchy of Surface Water Disposal

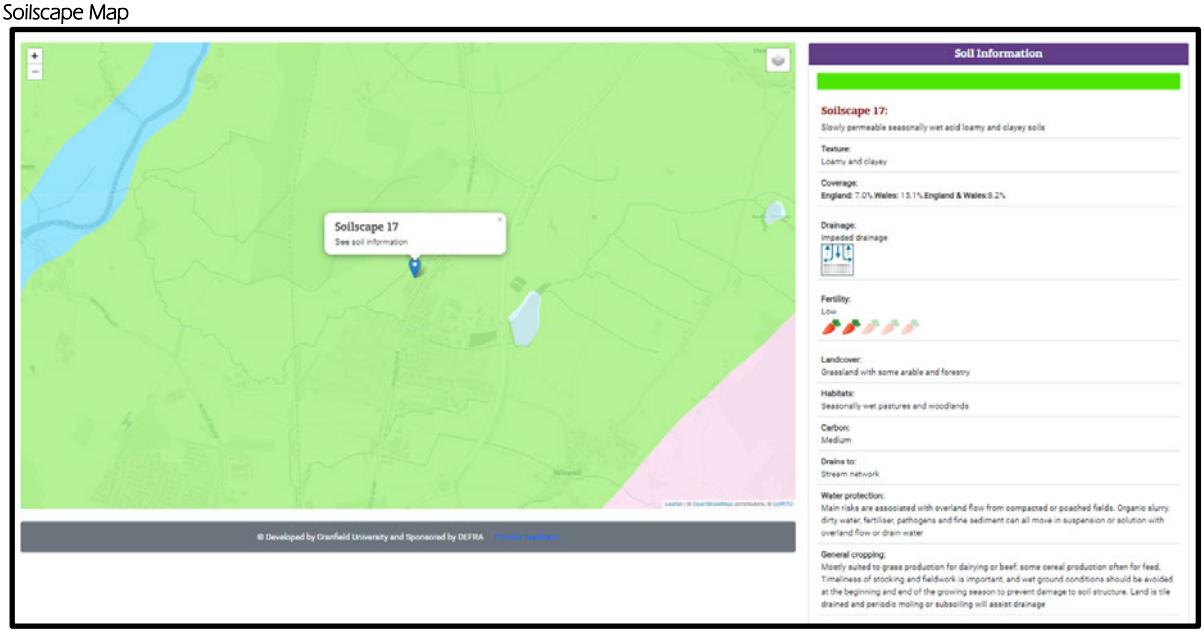
The hierarchy for disposal of surface water from new developments is outlined within the Building Regulations Approved Document H and specifies the following methods in order of preference:

- Infiltration via soakaway or other suitable infiltration device
- Discharge to watercourse
- Discharge to public surface water sewer
- Discharge to public combined sewer

Infiltration

Soilscape maps identify that the underlying ground on which the proposed development is to be sited comprises of 'Naturally wet very acid sandy and loamy soils'.

Soilscape Map



Borehole logs taken from the site identify the presence of clay down beyond 10m BGL.

Taking the above into consideration the use of soakaways is not considered to be viable for surface water disposal.

Watercourse

Due to the fact that infiltration methods are not deemed feasible, surface water from the proposed development has been directed to watercourse reusing the existing outfall as per the existing situation.

Existing Runoff Rates

Existing runoff rates have been estimated using the Modified Rational Method based on the roof and the areas of hardstanding which accounts for 0.222Ha.

- 2.74 x 0.222 x 50 = 30.4l/s

Allowable Discharge Rates

Flows from the site have been restricted to the existing brownfield runoff rate with a reduction of 30% compared to the existing situation, as shown below:

- 30.4 x 0.70 = 21.3l/s

Proposed Surface Water Drainage Strategy

Surface water flows from the application site are to be collected via a network of rainwater down pipes and gullies, before discharging into the watercourse located west of the site reusing the existing outfall, with flows restricted to no more than 21.3l/s via means of an orifice flow control chamber.

Flows in excess of this will be attenuated within the piped network.

Flow Control

- *Orifice flow control chamber or similar*
- *Aperture diameter = 0.098m*
- *Chamber Dia = 1.2m*

Proposed Surface Water Discharge Rates (Normal Conditions)

The proposed surface water drainage strategy has been modelled using FLOW Software for the 1 year, 30 year and 100 year + 40% climate change and 10% urban creep events, the results are tabulated below for reference.

Proposed Discharge Rates

Return Period	Discharge Rates l/s
1 Year	7.5
30 Year	15.9
100 Year + 40% Climate Change + 10% Urban Creep	21.3

Exceedance Route

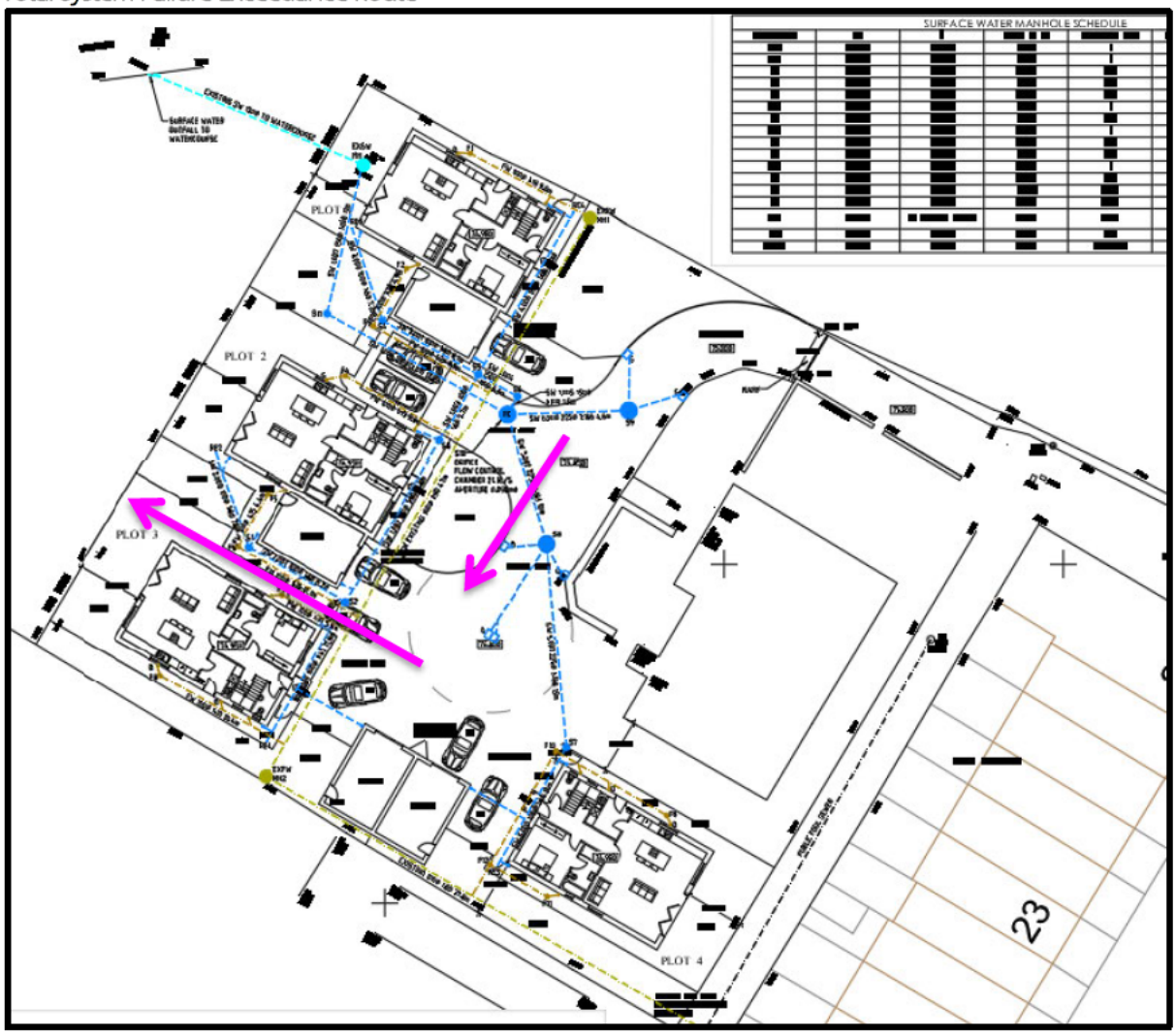
The drainage network has been modelled and can accommodate the 100 year + 40% climate change + 10% urban creep event and is shown to have sufficient capacity to accommodate flows below ground level with no flooding.

As such there are no exceedance routes with the risk to the proposed development and surrounding developments being low.

Total System Failure

In the unlikely event of total system failure surface water flows are expected to flow south and then east out of the site onto grassed open space, where it will make its way into the watercourse.

Total System Failure Exceedance Route



Management/Maintenance

Following development, the drainage network serving the site will remain private, the land owner/developer will be responsible for the management and maintenance of the drainage network.

Foul Flows

Foul flows from the proposed development are to be connected into the public sewer network within the rear alleyway of properties located on Cockerill Ter reusing the existing connection.

We trust that the above is acceptable and look forward to hearing from you in due course; however, should you have any queries, please do not hesitate to contact me.

Yours Sincerely,

[redacted]

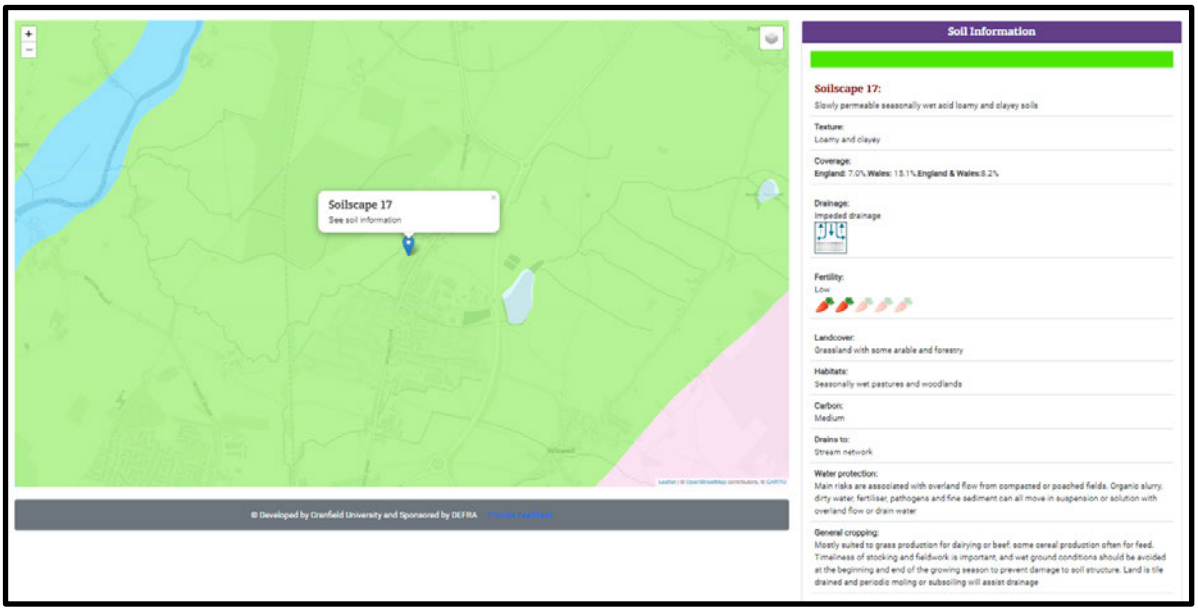
Chris Vose BSc

Managing Director
Flood Risk and Drainage Solutions Ltd

Attachments

- Desk Top Ground Conditions
- Proposed Drainage Layout Drawing and Manhole Schedule
- Typical Drainage Details Drawing
- Modelled Surface Water Network Simulation Report

Desk Top Ground Conditions


Soilscape 17
See soil information
© Developed by Cranfield University and Sponsored by DEFRA
Soil Information
Soilscape 17:
Slowly permeable seasonally wet acid loamy and clayey soils
Texture:
Loamy and clayey
Coverage:
England: 7.0%,Wales: 15.1%,England & Wales:8.2%
Drainage:
Impeded drainage
Fertility:
Low
Landcover:
Grassland with some arable and forestry
Habitats:
Seasonally wet pastures and woodlands
Carbon:
Medium
Drains to:
Stream network
Water protection:
Main risks are associated with overland flow from compacted or poached fields. Organic slurry, dirty water, fertiliser, pathogens and fine sediment can all move in suspension or solution with overland flow or drain water
General cropping:
Mostly suited to grass production for dairying or beef, some cereal production often for feed. Timeliness of stocking and fieldwork is important, and wet ground conditions should be avoided at the beginning and end of the growing season to prevent damage to soil structure. Land is tile drained and periodic moling or subsoiling will assist drainage

Institute of Geological Sciences

Name and Number of Shaft or Borehole :

BH. Raw's Greenscar Barrow.

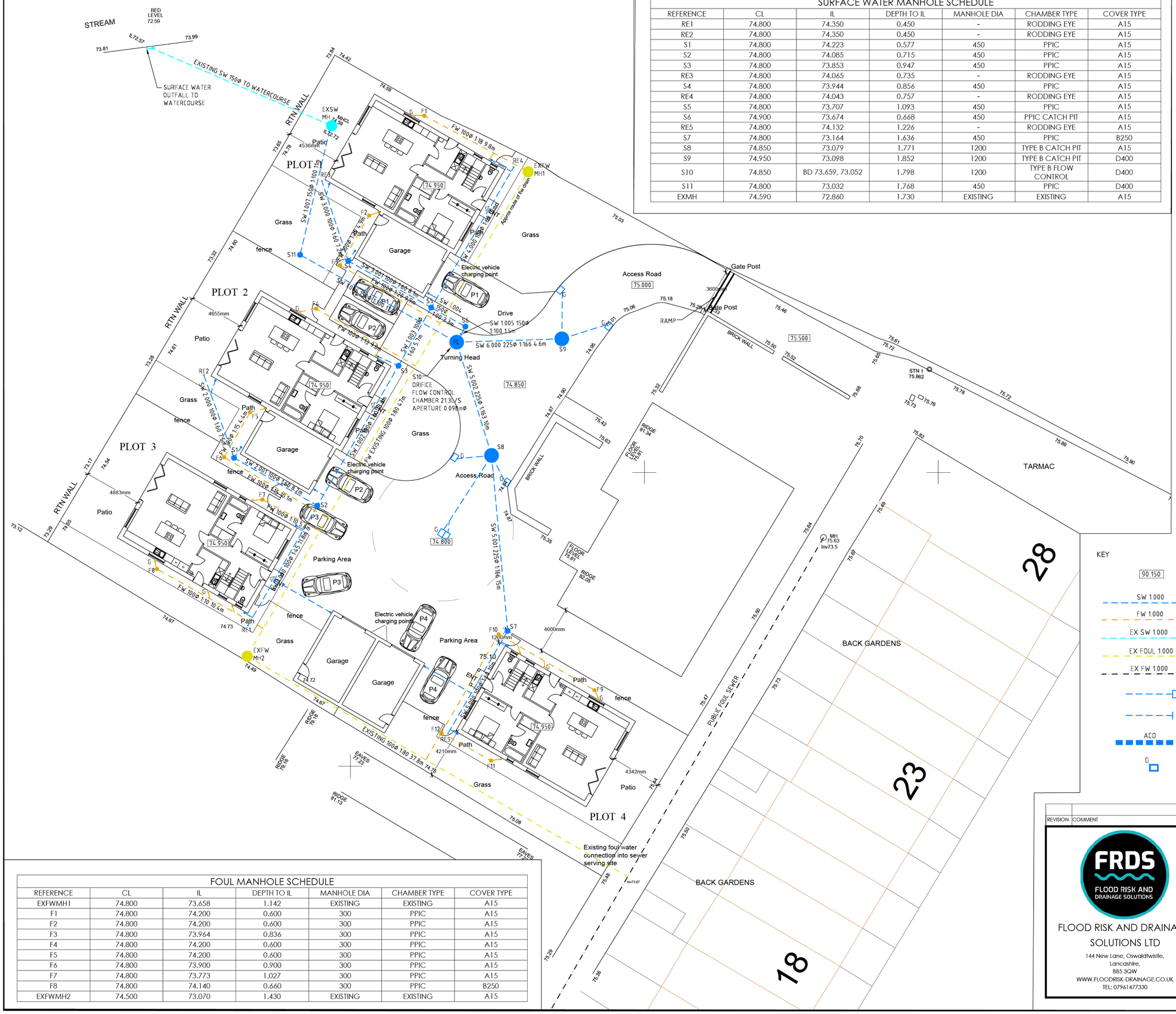
6-in or 1:10 000 Map Registration No.
SD 73 NW /4

National Grid Reference
7373 3848

Page

Geological Classification	Description of Strata	Thickness metres	Depth metres
	Brought Forward		
	Clay & bld. boulders.	1.83	1.83
	Clay boulders & gravel	1.22	3.05
	Clay & boulders	10.36	13.41
	Clay & limestones	1.83	15.24
	Grey rock & grey shale	4.27	19.51
	Hard grey shale	2.13	21.64
	Grey shale & limestone	1.53	23.17
	Limestones	3.96	27.13
	Shale & limestone	2.13	29.26
	Hard limestones	9.15	38.41
	Black shale	7.31	45.72

Proposed Drainage Layout Drawing and Manhole Schedule



SURFACE WATER MANHOLE SCHEDULE

REFERENCE	CL	IL	DEPTH TO IL	MANHOLE DIA	CHAMBER TYPE	COVER TYPE
RE1	74.800	74.350	0.450	-	RODDING EYE	A15
RE2	74.800	74.350	0.450	-	RODDING EYE	A15
S1	74.800	74.223	0.577	450	PPIC	A15
S2	74.800	74.085	0.715	450	PPIC	A15
S3	74.800	73.853	0.947	450	PPIC	A15
RE3	74.800	74.065	0.735	-	RODDING EYE	A15
S4	74.800	73.944	0.856	450	PPIC	A15
RE4	74.800	74.043	0.757	-	RODDING EYE	A15
S5	74.800	73.707	1.093	450	PPIC	A15
S6	74.900	73.674	0.668	450	PPIC CATCH PIT	A15
RE5	74.800	74.132	1.226	-	RODDING EYE	A15
S7	74.800	73.164	1.636	450	PPIC	B250
S8	74.850	73.079	1.771	1200	TYPE B CATCH PIT	A15
S9	74.950	73.098	1.852	1200	TYPE B CATCH PIT	D400
S10	74.850	BD 73.659, 73.052	1.798	1200	TYPE B FLOW CONTROL	D400
S11	74.800	73.032	1.768	450	PPIC	D400
EXMH	74.590	72.860	1.730	EXISTING	EXISTING	A15

FOUL MANHOLE SCHEDULE

REFERENCE	CL	IL	DEPTH TO IL	MANHOLE DIA	CHAMBER TYPE	COVER TYPE
EXFWMH1	74.800	73.658	1.142	EXISTING	EXISTING	A15
F1	74.800	74.200	0.600	300	PPIC	A15
F2	74.800	74.200	0.600	300	PPIC	A15
F3	74.800	73.964	0.836	300	PPIC	A15
F4	74.800	74.200	0.600	300	PPIC	A15
F5	74.800	74.200	0.600	300	PPIC	A15
F6	74.800	73.900	0.900	300	PPIC	A15
F7	74.800	73.773	1.027	300	PPIC	A15
F8	74.800	74.140	0.660	300	PPIC	B250
EXFWMH2	74.500	73.070	1.430	EXISTING	EXISTING	A15

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9. FLOATATION CALCULATIONS OF ANY ATTENUATION STRUCTURES SHOULD BE PROVIDED BY A CIVIL ENGINEER OR MANUFACTURE.

SURFACE WATER

SURFACE WATER FROM THE SITE TO DISCHARGE INTO THE WATERCOURSE LOCATED AT THE NORTH WEST OF THE SITE REUSING AN EXISTING 150Ø OUTFALL.

FLOWS TO BE RESTRICTED TO NO MORE THAN 21.3L/S VIA A FLOW CONTROL CHAMBER DURING THE 1 IN 100 YEAR + 40% CLIMATE CHANGE + 10% URBAN CREEP EVENT.

FLOW CONTROL DETAILS
- ORIFICE PLATE
- APERTURE = 0.098mØ

ATTENUATION PROVIDED WITHIN THE PIPED NETWORK.

FOUL

FOUL TO DISCHARGE INTO THE PUBLIC FOUL SEWER LOCATED AT THE EAST OF THE SITE REUSING THE EXISTING 100Ø FOUL CONNECTION

KEY

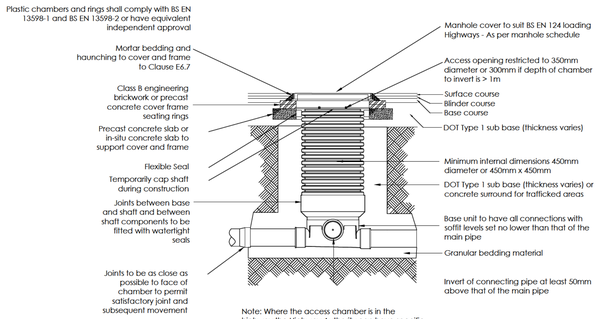
90.150	PROPOSED LEVELS
SW 1.000	PROPOSED SURFACE WATER DRAIN
FW 1.000	PROPOSED FOUL DRAIN
EX SW 1.000	EXISTING PRIVATE SURFACE WATER SEWER
EX FOUL 1.000	EXISTING PRIVATE FOUL SEWER
EX FW 1.000	EXISTING PUBLIC FOUL SEWER
	PROPOSED SURFACE WATER OUTFALL
	PROPOSED SURFACE WATER RODDING EYE
ACO	PROPOSED SURFACE WATER ACO CHANNEL
G	PROPOSED SURFACE WATER GULLY

REVISION	COMMENT	DATE	BY

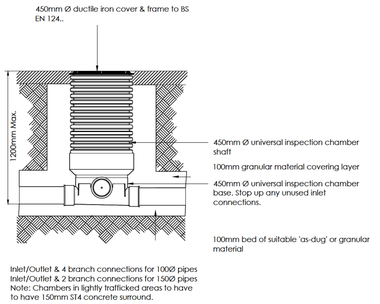
FLOOD RISK AND DRAINAGE SOLUTIONS LTD
144 New Lane, Oswaldtwistle, Lancashire, BB5 3QW
WWW.FLOODRISK-DRAINAGE.CO.UK
TEL: 07961477330

CLIENT: SIMON GILL	DATE: 14/10/2024
	STATUS:
PROJECT: SITE AT BARROWBRIDGE HOUSE, BARROW	DRAWN BY: CV
	SCALE: 1:150
DRAWING TITLE: PROPOSED SURFACE WATER/FOUL DRAINAGE & MH SCHEDULE	SIZE: A1
DRAWING REFERENCE: 2024-055-01	REVISION:

Typical Drainage Details Drawing

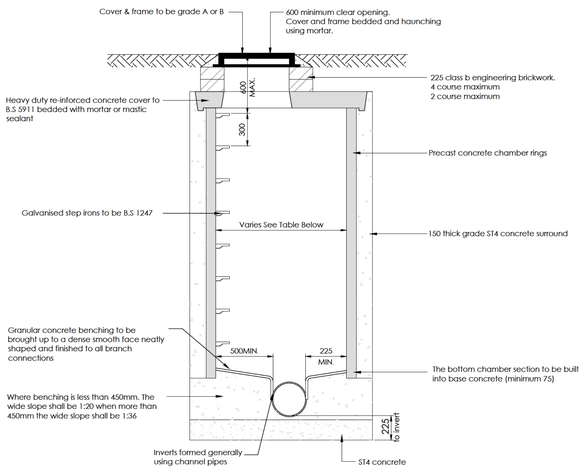


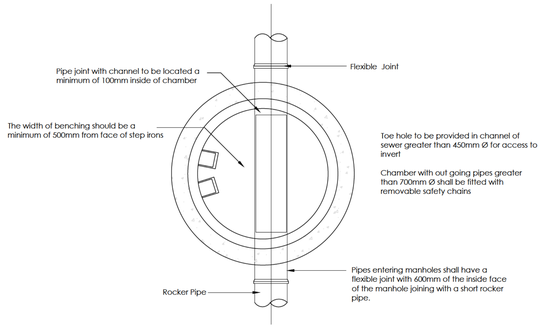
Typical Inspection Chamber Max. 3m Deep Non Entry Scale 1:20



Typical Polypropylene Inspection Chamber Max. 1.2m Deep Scale 1:20

(for use in soft areas driveways and parking bays only)



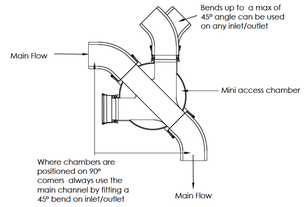


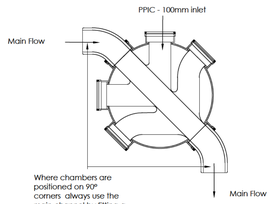
Typical Manhole Detail - Type B Scale 1:20

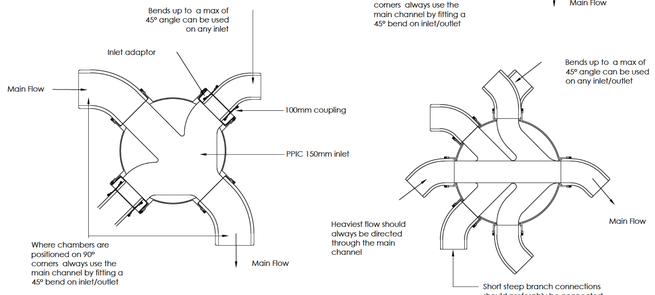
(1.35m - 3m Deep with Step Irons)

Notes:
Double width step rungs to be Type D Class 1 complying to BS EN 13101:2002 spaced at 250mm centers cast in vertical alignment.

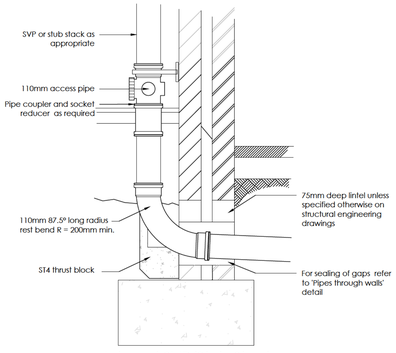
Manhole covers shall/must have a clear opening of 600mm and shall be Class D400 to BS EN 124 with 150mm deep frames in highways.



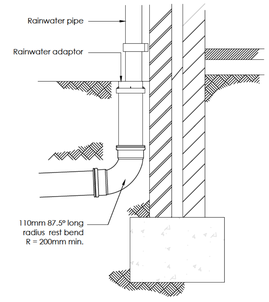




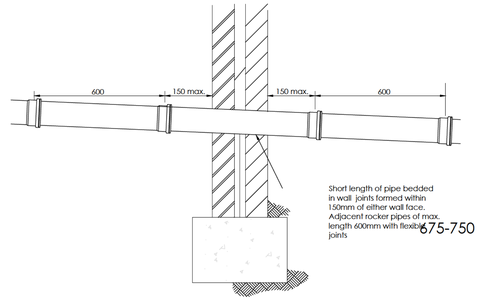
Mini Access Chamber & PPIC Installation Details Scale 1:10



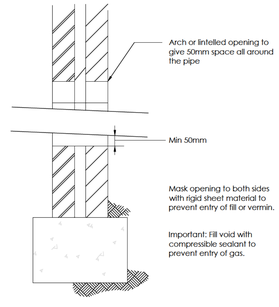
Internal SVP/Stub Stack Connection Through External Wall to Drain Scale 1:10



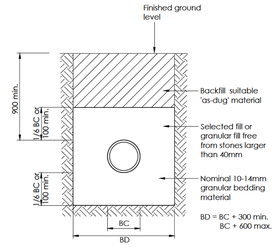
External RWP to Drain Scale 1:10



Pipes Through Walls (a) Scale 1:10

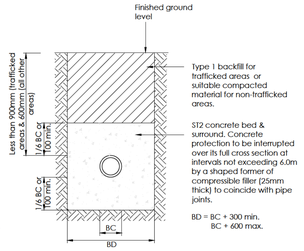


Pipes Through Walls (b) Scale 1:10



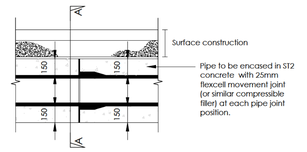
Typical Trench Detail Scale 1:10

NOTE: To be used where cover depth:
- >0.6m fields & gardens
- >0.9m lightly trafficked areas e.g. light roads & drives

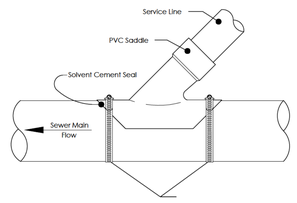


Shallow Trench Detail Scale 1:10

NOTE: To be used where cover depth:
- <0.6m fields & gardens
- <0.9m lightly trafficked areas e.g. light roads & drives



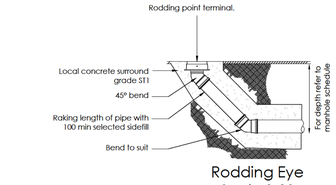
Joints for Concrete Encased Pipes Scale 1:10



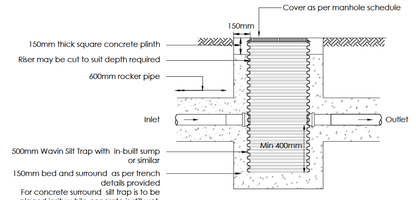
PVC Main

Notes:
1) PVC solvent cement shall be used for saddle.
2) Truss saddle shall be used with truss pipe.
3) In line WYE fitting to be provided with new construction.

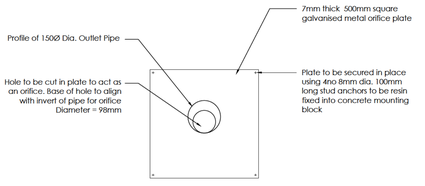
Saddle Connection Scale 1:10



Rodding Eye Scale 1:20



Typical Silt Trap Scale 1:20



Orifice Plate Detail Scale 1:10

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Extract from Table A2 WIS 4-08-02

Processed granular bedding & sidefill materials for flexible pipes

Pipe nominal bore (mm) (see note D)	Nominal Maximum particle size (mm)	Materials specified in British Standards (see note A)
100	10	10mm nominal single size
Over 100 to 150	15	10 or 14mm nominal single size or 14mm to 5mm graded
Over 150 to 300	20	10-14mm or 20mm nominal single size or 14-5mm graded or 20-5mm graded
Over 300 to 500	20	14 or 20mm nominal single size or 14-5mm graded or 20-5mm graded
Over 500	40	14 or 20mm or 40mm nominal single size or 14-5mm graded or 20-5mm graded or 40-5mm graded

Notes:
- A. Processed granular materials to include aggregates and air cooled blast furnace slag to BS EN 12620:220 + A1 2008 and lightweight aggregates to BS EN 13101:2002.
- B. -
- C. For the purpose of this table PE pipe of 630mm OD can be regarded as having nominal bores of over 550mm irrespective of wall thickness.
- D. Nominal bore is used in preference to DN because of the different nominal size classifications for flexible pipes.

Minimum Recommended Trench Widths for Structured Wall Pipes in Poor Ground Conditions.

Native soil modulus between 3 & 4 MPA
Typical soil Classifications: Very loose gravel loose sand medium dense clayey silty sand firm clay

Nominal pipe diameter (mm)	150	225	300	375	450	525	600	750	900
Minimum trench width (mm)*	450	525	600	750	900	1050	1200	1500	1800

* A vertical trench face has been assumed to allow a modulus of 7MPA to be achieved for the pipe bedding and sidefill material.

Other assumed values:
Depth of cover = 6m (max)
Traffic loading = main road
Pipe stiffness = SN8

Note: Where the native soil modulus is below 3MPA or the depth of cover exceeds 6m guidance should be sought from the pipe manufacturer regarding structural design and installation details.

REVISION	COMMENT	DATE	BY

FRDS FLOOD RISK AND DRAINAGE SOLUTIONS

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Lancashire
BB5 3QW
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TEL: 07961477330

CLIENT: SIMON GILL	DATE: 14/10/2024
	STATUS:
PROJECT: SITE AT BARROWBRIDGE HOUSE, BARROW	DRAWN BY: CV
	SCALE: AS SHOWN
DRAWING TITLE: TYPICAL DRAINAGE DETAILS	SIZE: A0
DRAWING REFERENCE: 2024-055-02	REVISION:

Modelled Surface Water Network Simulation Report

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	150.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	14.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	0.350
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Depth (m)	Notes
✓	RE1	0.014	4.00	74.800	Manhole	Adoptable	100	0.450	
✓	RE2	0.006	4.00	74.800	Manhole	Adoptable	100	0.450	
✓	S1	0.002	4.00	74.800	Manhole	Adoptable	450	0.577	
✓	S2	0.002	4.00	74.800	Manhole	Adoptable	450	0.715	
✓	S3	0.005	4.00	74.800	Manhole	Adoptable	450	0.947	
✓	RE3	0.006	4.00	74.800	Manhole	Adoptable	100	0.735	
✓	S4	0.002	4.00	74.800	Manhole	Adoptable	450	0.856	
✓	RE4	0.005	4.00	74.800	Manhole	Adoptable	100	0.757	
✓	S5	0.002	4.00	74.800	Manhole	Adoptable	450	1.093	Auto-design is off
✓	RE5	0.014	4.00	74.800	Manhole	Adoptable	100	0.668	Auto-design is off
✓	S6			74.900	Manhole	Adoptable	450	1.226	
✓	S7	0.000		74.800	Manhole	Adoptable	450	1.636	Auto-design is off
✓	S8	0.054	4.00	74.850	Manhole	Adoptable	1200	1.771	Auto-design is off
✓	S9		4.00	74.950	Manhole	Adoptable	1200	1.852	
✓	S10			74.850	Manhole	Adoptable	1200	1.798	
✓	S11			74.800	Manhole	Adoptable	450	1.768	
✓	EXMH			74.590	Manhole	Adoptable	450	1.730	

Links (Input)

	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
✓	1.000	RE1	S2	11.800	0.600	Colebrook-White	74.350	74.085	0.265	44.5	100	Circular	4.17	28.6
✓	2.000	RE2	S1	7.500	0.600	Colebrook-White	74.350	74.223	0.127	59.1	100	Circular	4.12	28.7
✓	2.001	S1	S2	8.200	0.600	Colebrook-White	74.223	74.085	0.138	59.4	100	Circular	4.26	28.4
?	1.002	S2	S3	13.800	0.600	Colebrook-White	74.085	73.853	0.232	59.5	100	Circular	4.49	27.9
?	1.003	S3	S5	5.700	0.600	Colebrook-White	73.853	73.757	0.096	59.4	100	Circular	4.59	27.8
?	3.000	RE3	S4	7.200	0.600	Colebrook-White	74.065	73.944	0.121	59.5	100	Circular	4.12	28.7
?	3.001	S4	S5	8.100	0.600	Colebrook-White	73.944	73.809	0.135	60.0	100	Circular	4.26	28.4
?	4.000	RE4	S5	14.000	0.600	Colebrook-White	74.043	73.810	0.233	60.0	100	Circular	4.23	28.4
?	1.004	S5	S6	3.300	0.600	Colebrook-White	73.707	73.674	0.033	100.0	150	Circular	4.64	27.5
?	1.005	S6	S10	1.500	0.600	Colebrook-White	73.674	73.659	0.015	100.0	150	Circular	4.67	27.6
?	5.000	RE5	S7	10.000	0.600	Colebrook-White	74.132	73.963	0.169	59.2	100	Circular	4.17	28.6
?	5.001	S7	S8	14.100	0.600	Colebrook-White	73.164	73.079	0.085	165.9	225	Circular	4.40	28.1
?	5.002	S8	S10	4.400	0.600	Colebrook-White	73.079	73.052	0.027	163.0	225	Circular	4.47	28.0
?	6.000	S9	S10	4.600	0.600	Colebrook-White	73.098	73.070	0.028	166.0	225	Circular	4.08	28.8
?	1.006	S10	S11	2.000	0.600	Colebrook-White	73.052	73.032	0.020	100.0	150	Circular	4.70	27.5
?	1.007	S11	EXMH	17.200	0.600	Colebrook-White	73.032	72.860	0.172	100.0	150	Circular	4.98	27.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	14.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	10	0

Node S10 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.400	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	21.3		
Invert Level (m)	73.052	Diameter (m)	0.098		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1	10	74.377	0.027	1.4	0.0167	0.0000	OK
15 minute winter	RE2	10	74.369	0.019	0.6	0.0051	0.0000	OK
15 minute winter	S1	10	74.244	0.021	0.8	0.0049	0.0000	OK
15 minute winter	S2	10	74.123	0.038	2.4	0.0081	0.0000	OK
15 minute winter	S3	10	73.897	0.044	2.9	0.0117	0.0000	OK
15 minute winter	RE3	10	74.084	0.019	0.6	0.0032	0.0000	OK
15 minute winter	S4	10	73.966	0.022	0.8	0.0045	0.0000	OK
15 minute winter	RE4	10	74.060	0.017	0.5	0.0024	0.0000	OK
15 minute winter	S5	10	73.764	0.057	4.3	0.0111	0.0000	OK
15 minute winter	RE5	10	74.161	0.029	1.4	0.0125	0.0000	OK
15 minute winter	S6	11	73.732	0.058	4.2	0.0092	0.0000	OK
15 minute winter	S7	13	73.245	0.081	2.1	0.0129	0.0000	OK
15 minute winter	S8	12	73.246	0.167	6.6	0.2900	0.0000	OK
15 minute winter	S9	12	73.246	0.148	0.9	0.1675	0.0000	OK
15 minute winter	S10	12	73.246	0.194	8.4	0.2189	0.0000	SURCHARGED
15 minute winter	S11	12	73.103	0.071	7.6	0.0113	0.0000	OK
15 minute winter	EXMH	12	72.928	0.068	7.5	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE1	1.000	S2	1.4	0.654	0.154	0.0257	
15 minute winter	RE2	2.000	S1	0.6	0.536	0.076	0.0084	
15 minute winter	S1	2.001	S2	0.8	0.409	0.100	0.0161	
15 minute winter	S2	1.002	S3	2.4	0.786	0.301	0.0415	
15 minute winter	S3	1.003	S5	2.8	0.881	0.357	0.0182	
15 minute winter	RE3	3.000	S4	0.6	0.526	0.076	0.0082	
15 minute winter	S4	3.001	S5	0.8	0.630	0.100	0.0101	
15 minute winter	RE4	4.000	S5	0.5	0.551	0.062	0.0124	
15 minute winter	S5	1.004	S6	4.2	0.692	0.238	0.0203	
15 minute winter	RE5	5.000	S7	1.4	0.746	0.177	0.0187	
15 minute winter	S6	1.005	S10	4.3	0.752	0.241	0.0085	
15 minute winter	S7	5.001	S8	1.9	0.158	0.046	0.3102	
15 minute winter	S8	5.002	S10	4.7	0.438	0.115	0.1493	
15 minute winter	S9	6.000	S10	-0.9	-0.185	-0.023	0.1402	
15 minute winter	S10	Orifice	S11	7.6				
15 minute winter	S11	1.007	EXMH	7.5	0.944	0.422	0.1368	4.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1	10	74.392	0.042	3.3	0.0263	0.0000	OK
15 minute winter	RE2	10	74.379	0.029	1.4	0.0079	0.0000	OK
15 minute winter	S1	10	74.256	0.033	1.9	0.0076	0.0000	OK
15 minute winter	S2	10	74.149	0.064	5.7	0.0139	0.0000	OK
15 minute winter	S3	10	73.933	0.080	6.9	0.0213	0.0000	OK
15 minute winter	RE3	10	74.094	0.029	1.4	0.0049	0.0000	OK
15 minute winter	S4	10	73.979	0.035	1.9	0.0072	0.0000	OK
15 minute winter	RE4	10	74.070	0.027	1.2	0.0038	0.0000	OK
15 minute winter	S5	10	73.807	0.100	10.3	0.0195	0.0000	OK
15 minute winter	RE5	10	74.179	0.047	3.3	0.0201	0.0000	OK
30 minute winter	S6	21	73.783	0.109	8.8	0.0173	0.0000	OK
30 minute winter	S7	21	73.779	0.615	2.8	0.0978	0.0000	SURCHARGED
30 minute winter	S8	21	73.779	0.700	12.1	1.2187	0.0000	SURCHARGED
30 minute winter	S9	21	73.777	0.679	2.4	0.7678	0.0000	SURCHARGED
30 minute winter	S10	21	73.777	0.725	17.9	0.8196	0.0000	SURCHARGED
30 minute winter	S11	21	73.151	0.119	15.9	0.0189	0.0000	OK
30 minute winter	EXMH	21	72.970	0.110	15.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE1	1.000	S2	3.3	0.802	0.363	0.0497	
15 minute winter	RE2	2.000	S1	1.4	0.673	0.178	0.0156	
15 minute winter	S1	2.001	S2	1.9	0.498	0.241	0.0313	
15 minute winter	S2	1.002	S3	5.7	0.933	0.720	0.0833	
15 minute winter	S3	1.003	S5	6.7	1.059	0.855	0.0362	
15 minute winter	RE3	3.000	S4	1.4	0.657	0.178	0.0154	
15 minute winter	S4	3.001	S5	1.9	0.802	0.242	0.0191	
15 minute winter	RE4	4.000	S5	1.2	0.713	0.152	0.0234	
15 minute winter	S5	1.004	S6	10.2	0.840	0.576	0.0402	
15 minute winter	RE5	5.000	S7	3.3	0.935	0.419	0.0353	
15 minute winter	S6	1.005	S10	10.1	0.937	0.570	0.0162	
15 minute winter	S7	5.001	S8	2.8	0.166	0.070	0.5608	
30 minute winter	S8	5.002	S10	9.3	0.469	0.230	0.1750	
15 minute winter	S9	6.000	S10	-3.5	-0.215	-0.088	0.1829	
30 minute winter	S10	Orifice	S11	15.9				
30 minute winter	S11	1.007	EXMH	15.9	1.101	0.894	0.2477	17.0

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	RE1	22	74.594	0.244	5.5	0.1686	0.0000	FLOOD RISK
30 minute winter	RE2	23	74.574	0.224	2.4	0.0673	0.0000	FLOOD RISK
30 minute winter	S1	23	74.571	0.348	3.2	0.0818	0.0000	FLOOD RISK
30 minute winter	S2	23	74.565	0.480	8.9	0.1060	0.0000	FLOOD RISK
30 minute winter	S3	22	74.482	0.629	8.9	0.1730	0.0000	SURCHARGED
30 minute winter	RE3	22	74.435	0.370	2.4	0.0692	0.0000	SURCHARGED
30 minute winter	S4	22	74.432	0.488	3.1	0.1024	0.0000	SURCHARGED
30 minute winter	RE4	22	74.430	0.387	2.9	0.0592	0.0000	SURCHARGED
30 minute winter	S5	22	74.426	0.719	12.7	0.1431	0.0000	SURCHARGED
30 minute winter	RE5	22	74.441	0.309	5.5	0.1450	0.0000	SURCHARGED
30 minute winter	S6	22	74.415	0.741	11.3	0.1177	0.0000	SURCHARGED
30 minute winter	S7	22	74.413	1.249	5.2	0.1986	0.0000	SURCHARGED
30 minute winter	S8	22	74.413	1.334	23.5	2.4032	0.0000	SURCHARGED
30 minute winter	S9	22	74.407	1.309	3.7	1.4802	0.0000	SURCHARGED
30 minute winter	S10	22	74.407	1.355	23.9	1.5321	0.0000	SURCHARGED
30 minute winter	S11	23	73.270	0.238	21.4	0.0378	0.0000	SURCHARGED
30 minute winter	EXMH	23	72.992	0.132	21.3	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE1	1.000	S2	5.9	0.882	0.650	0.0923	
15 minute winter	RE2	2.000	S1	2.7	0.765	0.342	0.0587	
30 minute summer	S1	2.001	S2	3.0	0.522	0.386	0.0642	
15 minute winter	S2	1.002	S3	7.5	0.956	0.952	0.1080	
15 minute winter	S3	1.003	S5	8.2	1.052	1.046	0.0446	
15 minute winter	RE3	3.000	S4	2.7	0.770	0.349	0.0563	
15 minute winter	S4	3.001	S5	3.5	0.874	0.453	0.0634	
15 minute winter	RE4	4.000	S5	2.3	0.789	0.290	0.1095	
15 minute summer	S5	1.004	S6	13.0	0.891	0.735	0.0581	
15 minute winter	RE5	5.000	S7	6.4	1.065	0.808	0.0782	
15 minute summer	S6	1.005	S10	12.7	0.987	0.713	0.0264	
15 minute winter	S7	5.001	S8	-4.6	0.171	-0.114	0.5608	
15 minute winter	S8	5.002	S10	23.1	0.595	0.569	0.1750	
15 minute summer	S9	6.000	S10	-6.7	-0.205	-0.168	0.1829	
30 minute winter	S10	Orifice	S11	21.4				
30 minute winter	S11	1.007	EXMH	21.3	1.214	1.203	0.2930	33.4