

Section Images

St James Church of England Primary
School ,
Greenarce Street ,
Clitheroe ,
BB7 1ED

Engineer:
DM

Date:
26/03/24

Reference:



Observation [11]:
MF



Observation [12]:
MAIN DRAIN

Section Information

St James Church of England Primary School ,
Greenarce Street ,
Clitheroe ,
BB7 1ED

Engineer:
DM

Date:
26/03/24

Reference:

Section Video:
mh12_br1_z

Start:
MH12 BR1

Direction:
Downstream

End:
REST BEND

Material:
Vitrified Clay (VC)

Pipeline Size:
100

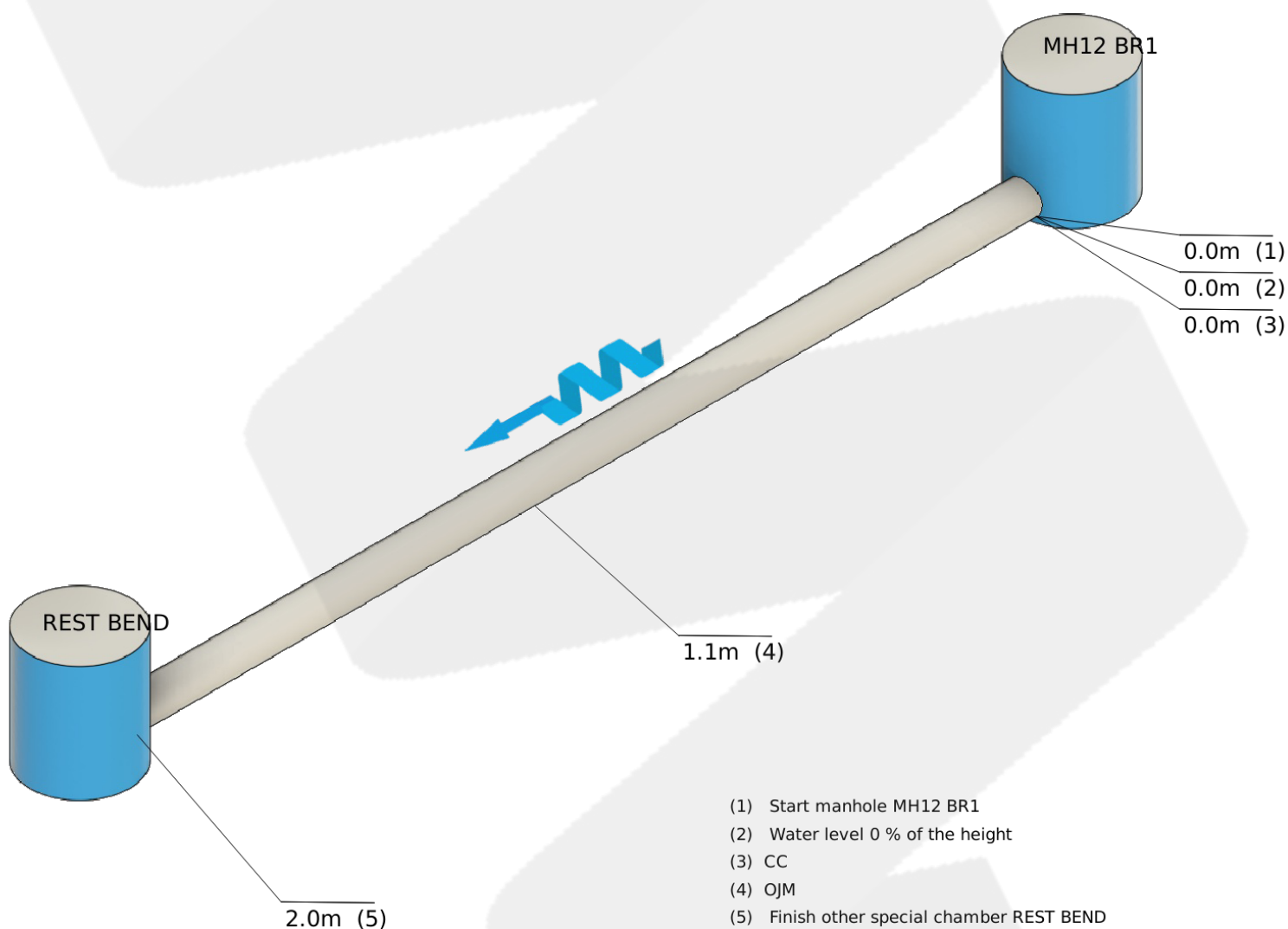
Duty:
Combined (C)

Invert Depth:
01.00

Date:
2024-03-26

Time:
12:14

Comments:



Section Information

St James Church of England Primary
School ,
Greenarce Street ,
Clitheroe ,
BB7 1ED

Engineer:
DM

Date:
26/03/24

Reference:

Additional Information

Invert Depth

01.00

End Depth

.

Method of Inspection

Direct Inspection (A)

Pre-Cleaned

Yes (Y)

Pipeline Length Reference

Pipe Shape

Circular (C)

Section Images

St James Church of England Primary
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Greenarce Street ,
Clitheroe ,
BB7 1ED

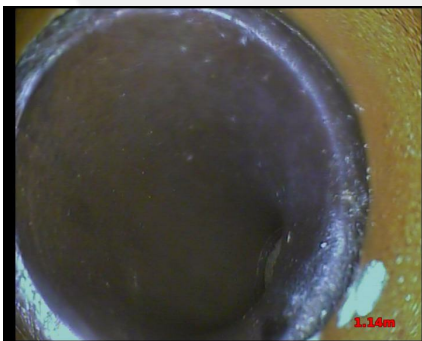
Engineer:
DM

Date:
26/03/24

Reference:



Observation [3]:
CC



Observation [4]:
OJM

Section Information

St James Church of England Primary School ,
Greenarce Street ,
Clitheroe ,
BB7 1ED

Engineer:
DM

Date:
26/03/24

Reference:

Section Video:
mh12_br2_gully

Start:
MH12 BR2

Direction:
Upstream

End:
GULLY

Material:
Vitrified Clay (VC)

Pipeline Size:
100

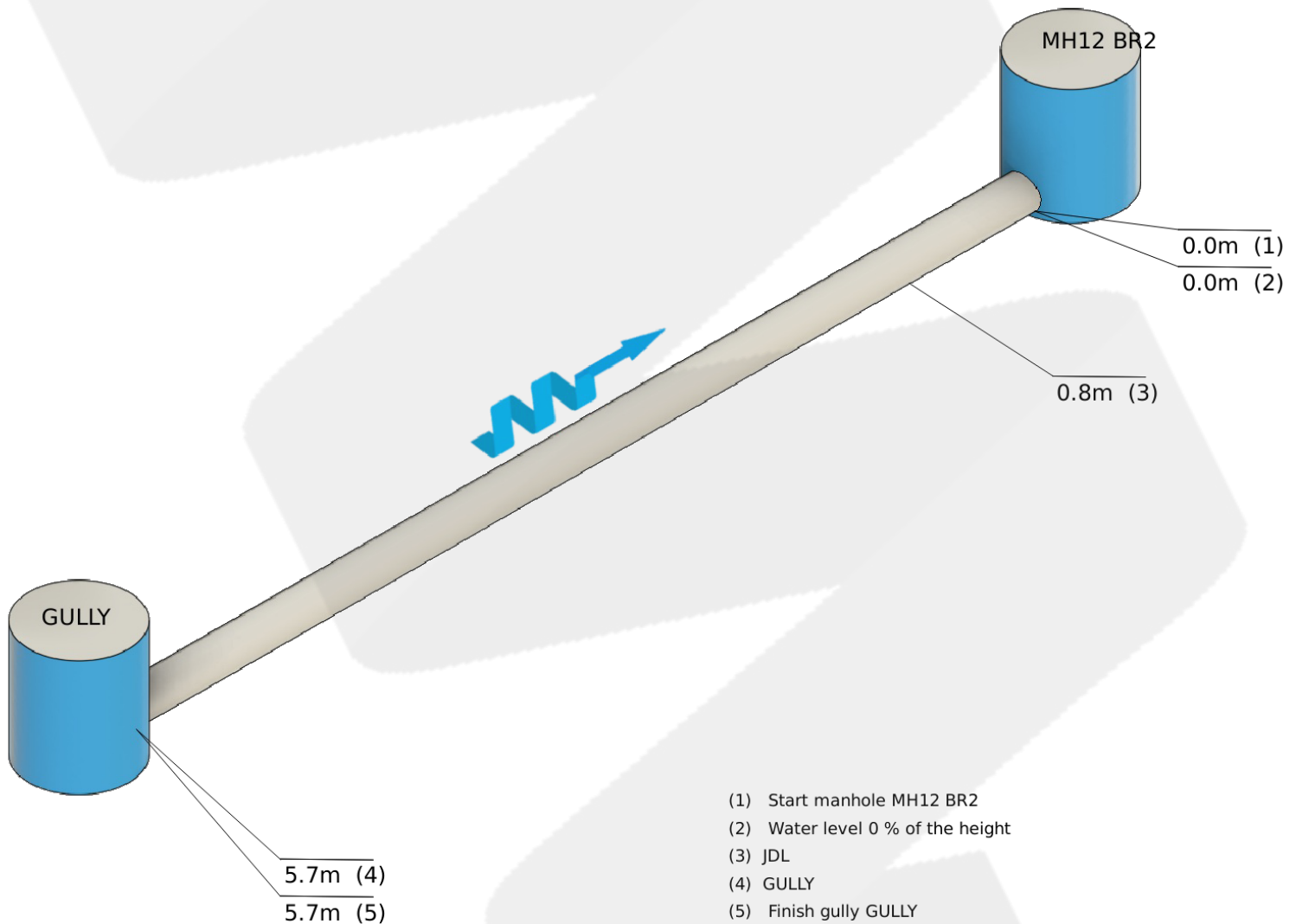
Duty:
Combined (C)

Invert Depth:
01.00

Date:
2024-03-26

Time:
12:16

Comments:



Section Information

St James Church of England Primary
School ,
Greenarce Street ,
Clitheroe ,
BB7 1ED

Engineer:
DM

Date:
26/03/24

Reference:

Additional Information

Invert Depth

01.00

End Depth

.

Method of Inspection

Direct Inspection (A)

Pre-Cleaned

Yes (Y)

Pipeline Length Reference

Pipe Shape

Circular (C)

Section Images

St James Church of England Primary
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Greenarce Street ,
Clitheroe ,
BB7 1ED

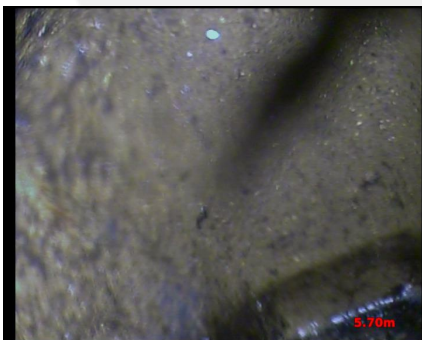
Engineer:
DM

Date:
26/03/24

Reference:



Observation [3]:
JDL



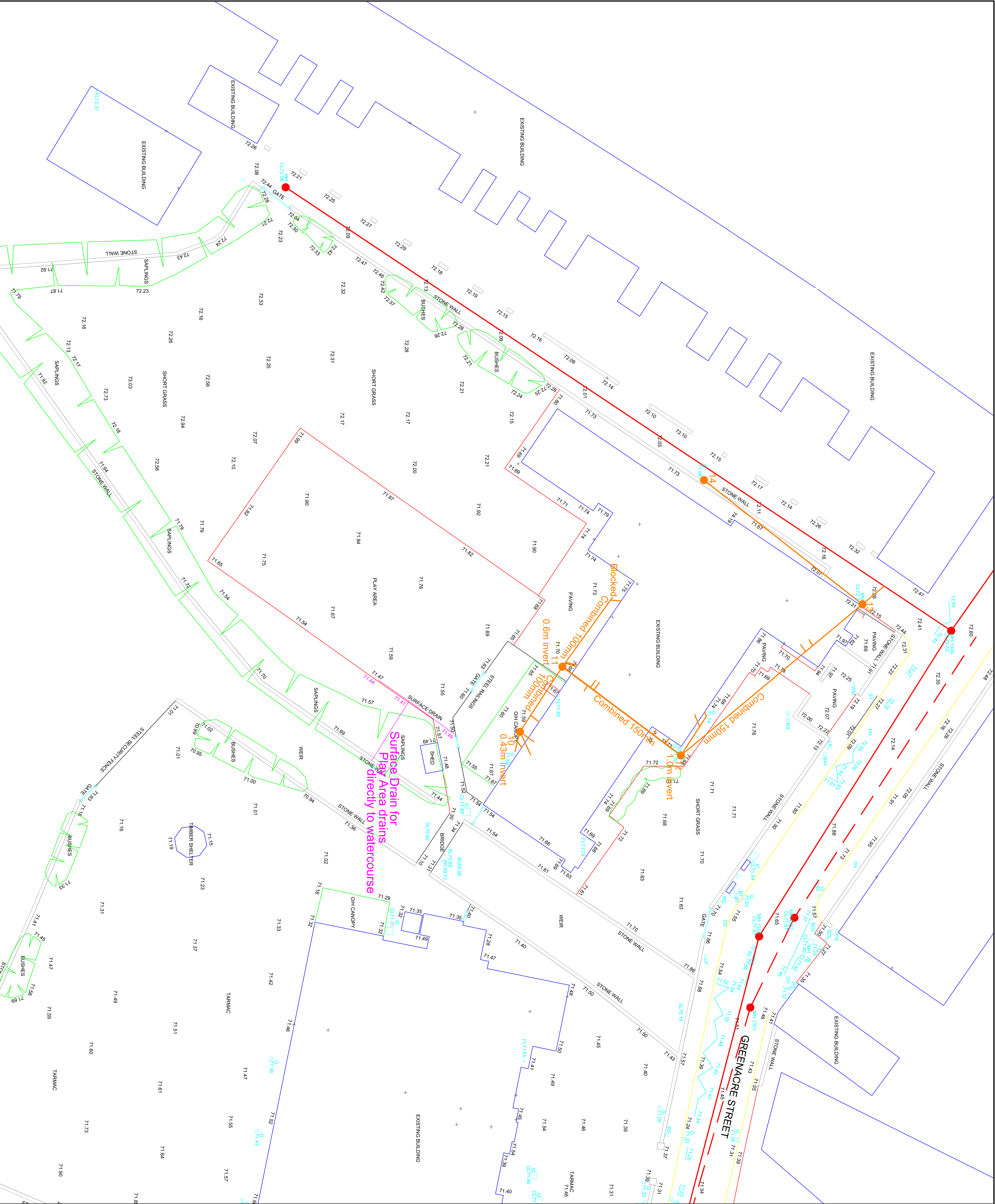
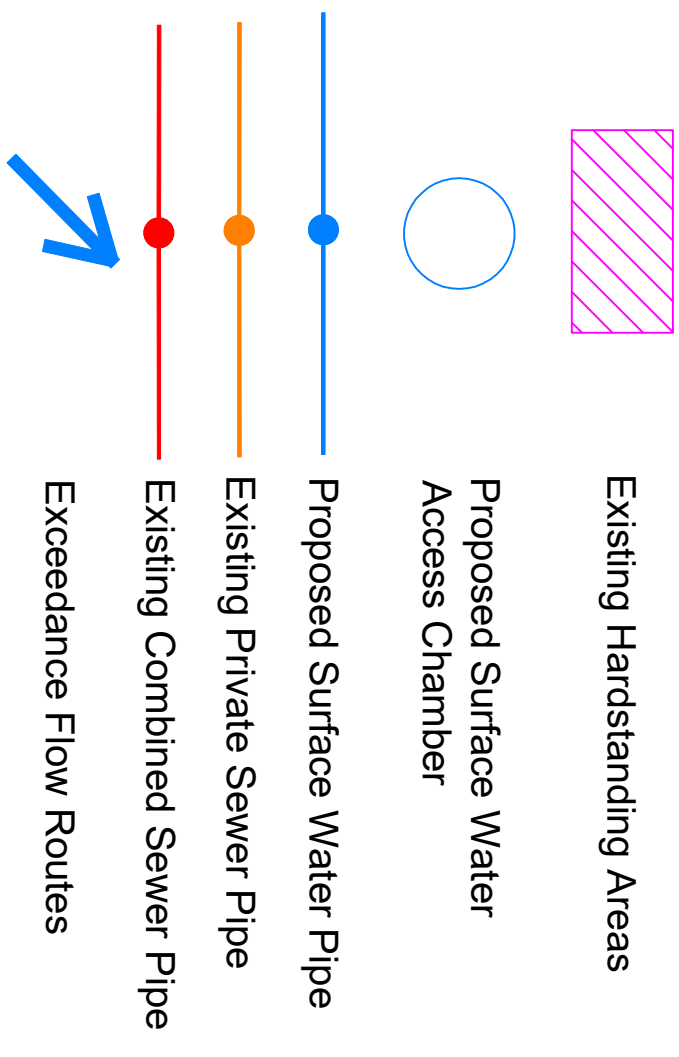
Observation [4]:
GULLY

C Existing Site Drainage Layout

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KEY:



Rev.	Initial Design	30/04/24	MW	MW	PB	MB
P01	Modifications	Date	Drawn	Designed	Checked	Approved

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144 (0)397 637900
info@jbaconsulting.com

The Old School House
3 TADCASTER
North Yorkshire
LS24 3HA
United Kingdom
www.jbaconsulting.com

Office at: Galsworthy, Edinburgh, Glasgow, London, Manchester, Newcastle upon Tyne, Newport, Swansea, Stirling, Telford, Thirsk, Warrington and Wymington

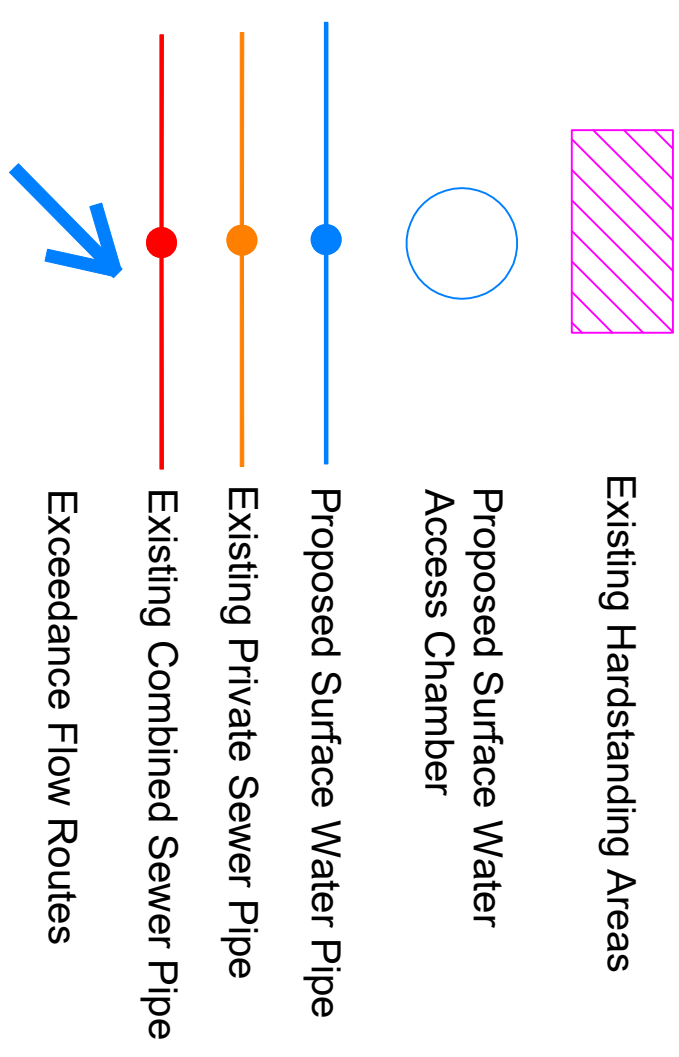
St James' CofE Primary School, Clitheroe
Cassidy & Ashton Architects and Building Surveyors
Existing Drainage Plan

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		Checked: E. Parker	30/04/24
		Approved: M. Bentley	30/04/24
Digital File Name:	MTN-JBAU-ZZ-00-DR-C-0001	Rev.:	Sheet No.:
Drawing Number:	P01	Rev.:	1 of 1
		Sheet No.:	S3

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KEY:



100m²
= Impermeable area assigned to Microdrainage model pipe number.

1,000
= Microdrainage model pipe number.

Rev.	Initial Design	30/04/24	MW	MW	PB	MB
P01	Modifications	Date	Drawn	Designed	Checked	Approved

JBA consulting

The Old School House
53-55 TADCASTER STREET
NORTH YORKSHIRE
LS24 3HA
United Kingdom
www.jbaconsulting.com
t +44 (0)1937 637900
f +44 (0)1937 637901
e info@jbaconsulting.com

St James' CofE Primary School, Clitheroe
Cassidy & Ashton Architects and Building Surveyors
Existing Handstanding Areas Plan

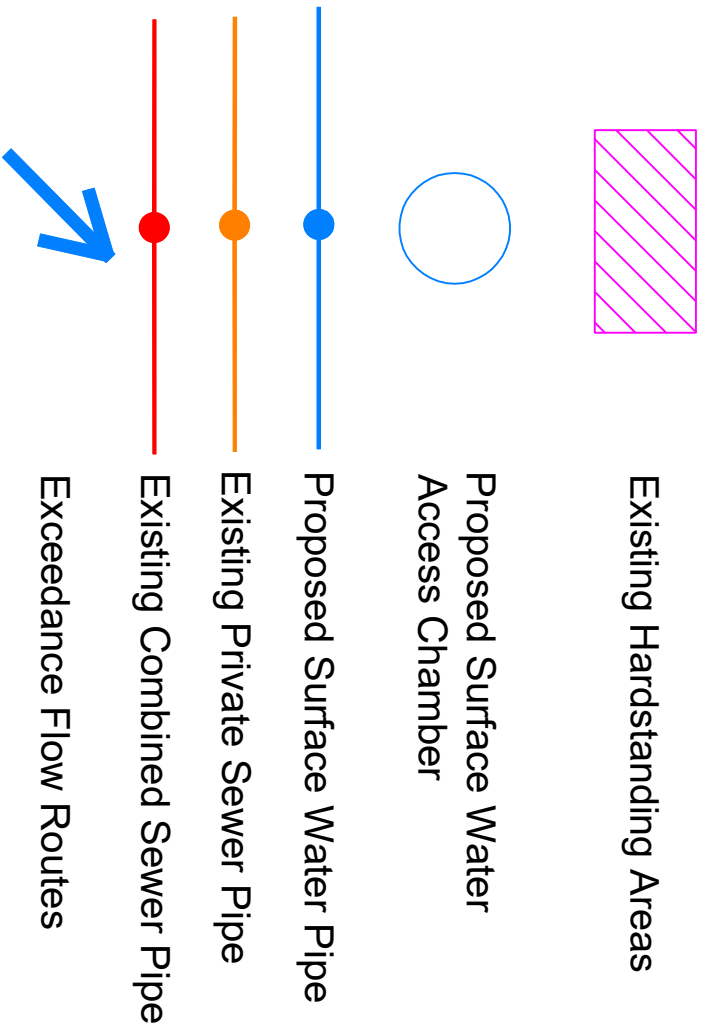
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		Approved: M Bentley	30/04/24
Digital File Name:	MTN-JBAU-ZZ-00-DR-C-0002		
Drawing Number:	P01	Rev.:	Sheet No.: 1 of 1
			Status: S3

D Schematic Drainage Plans

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KEY:



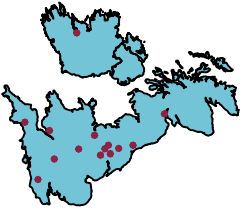
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1,000
= Microdrainage model pipe number.

Rev.	Initial Design	Modifications	Date	Drawn	Designed	Checked	Approved
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The Old School House
5 TADCASTER
North Yorkshire
LS24 3HA
United Kingdom
www.jbaconsulting.com
t +44 (0)1937 637900
e info@jbaconsulting.com



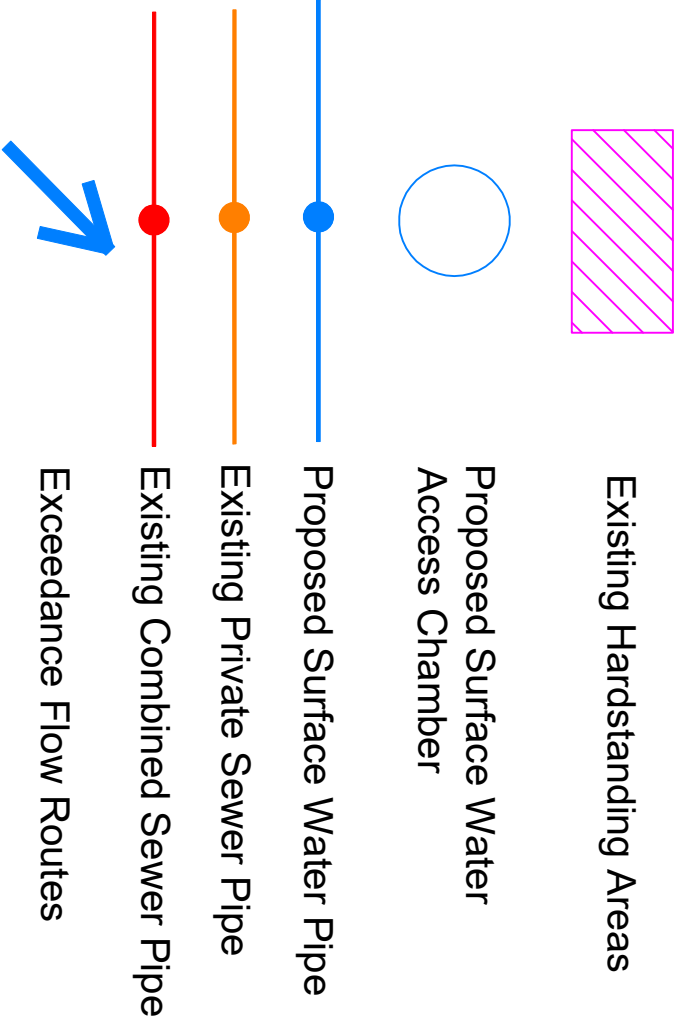
St James' CofE Primary School, Clitheroe
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Proposed Phase 1 Drainage Plan

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Rev.	Initial Design	30/04/24	MW	MW	PB	MB
Modifications	Date	Drawn	Designed	Checked	Approved	
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JBA Consulting

The Old School House
5 TADCASTER
North Yorkshire
LS24 3HA
United Kingdom
www.jbaconsulting.com
t +44 (0)1937 637900
e info@jbaconsulting.com

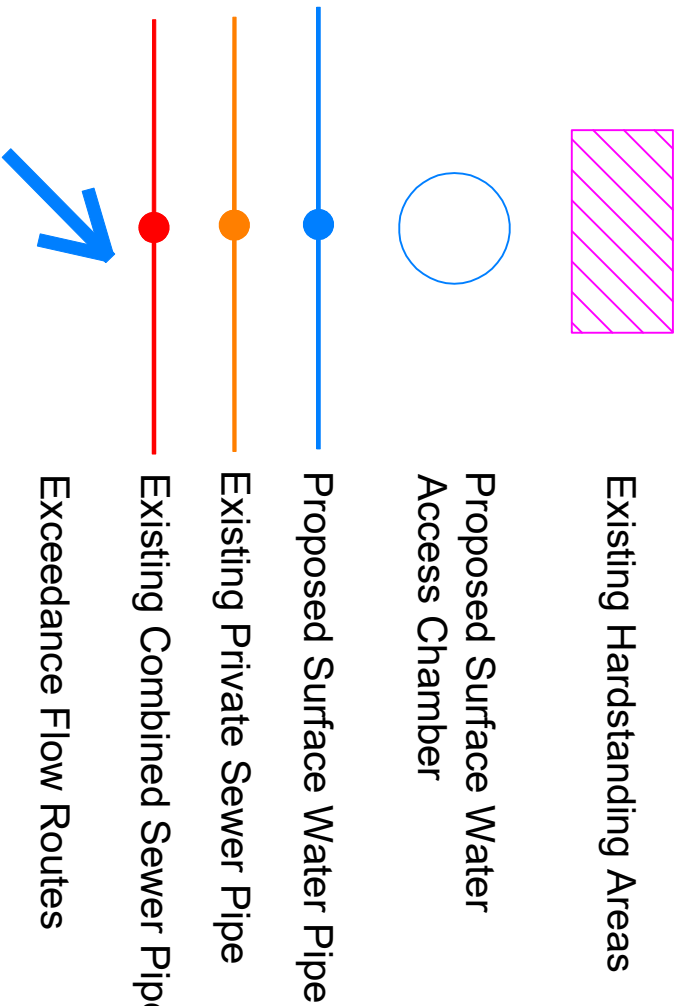
St James' CofE Primary School, Clitheroe
Cassidy & Ashton Architects and Building Surveyors
Proposed Phase 1 Handstanding Area Plan

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1,000 = Microdrainage model pipe number.

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The Old School House
53-55 TADCASTER
North Yorkshire
LS24 3HA
United Kingdom
www.jbaconsulting.com
t +44 (0)1937 637900
e info@jbaconsulting.com

Office: 6, Galloway Drive, Edinburg, South Yorkshire, United Kingdom, Newcastle upon Tyne, Newport, Swansea, Stirling, Tinsford, Thirsk, Walsingham and Wymington

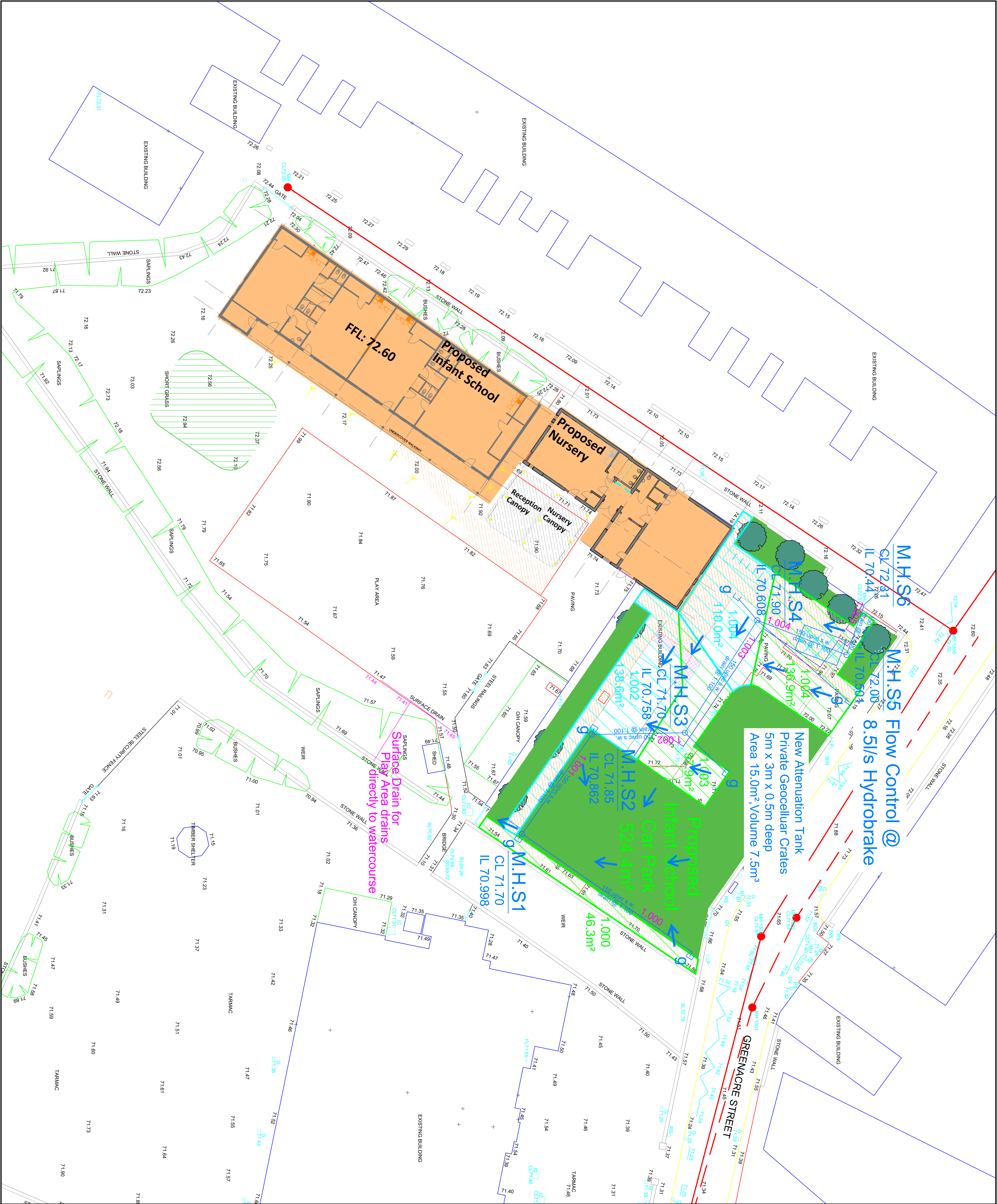
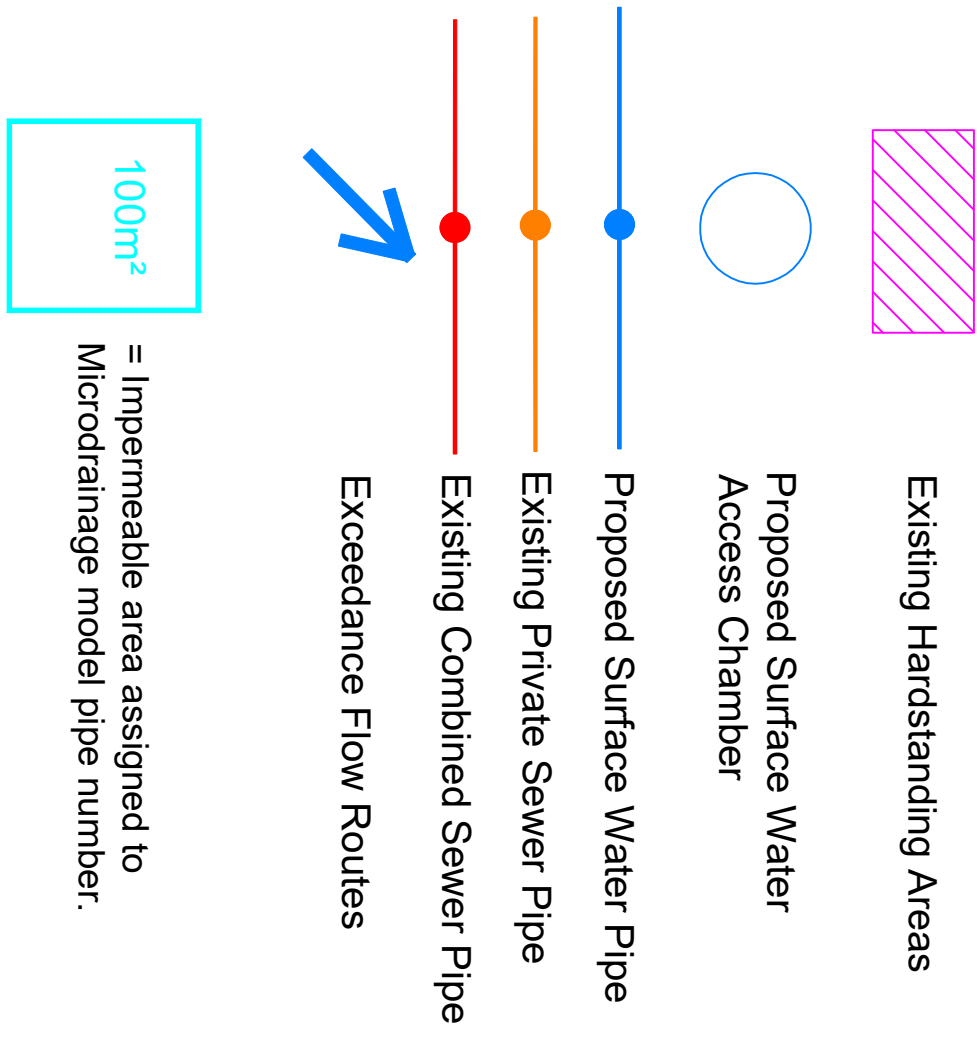
for
St James' CofE Primary School, Clitheroe
Cassidy & Ashton Architects and Building Surveyors
Proposed Phase 2 Drainage Plan

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Drawing Number:	P01	Rev.:	1 of 1
		Sheet No.:	S3
		Status:	

St James' CofE Primary School, Clitheroe
Cassidy & Ashton Architects and Building Surveyors
Proposed Phase 2 Handstanding Area Plan

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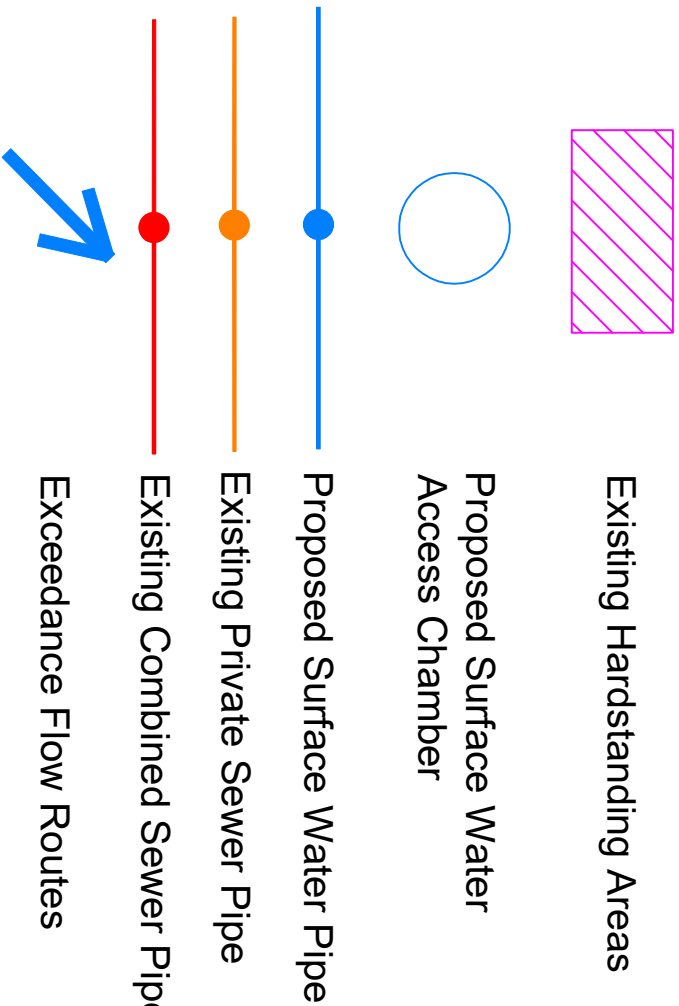
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53-55 TADCASTER
North Yorkshire
LS24 3HA
United Kingdom
www.jbaconsulting.com
t +44 (0)1937 637900
e info@jbaconsulting.com

Office: 6, Garsell Drive, Edgworth, South Ribblesdale, Lancashire, Newcastle upon Tyne, Newport, Swansea, Strop, Tadcaster, Thirsk, Walsingham and Wymington

for _____

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1,000 = Microdrainage model pipe number.

Rev.	Initial Design	Modifications	Date	Drawn	Designed	Checked	Approved
P01			30/04/24	MW	MW	PB	MB

JBA Consulting

The Old School House
3 The Quadrant
Tadcaster
North Yorkshire
LS24 3HA
United Kingdom
www.jbaconsulting.com
t +44 (0)1937 637900
e info@jbaconsulting.com

Office: 4, Galloway Drive, Edinburgh, EH10 6JH, Scotland, UK
Surrey, Sussex, Yorkshire, Wales, Wiltshire and Wymondley

for
St James' CofE Primary School, Clitheroe
Cassidy & Ashton Architects and Building Surveyors
Proposed Finalised Drainage Plan

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Drawing Number:	P01	Rev.:	Sheet No.: 1 of 1
			Status: S3
0007			

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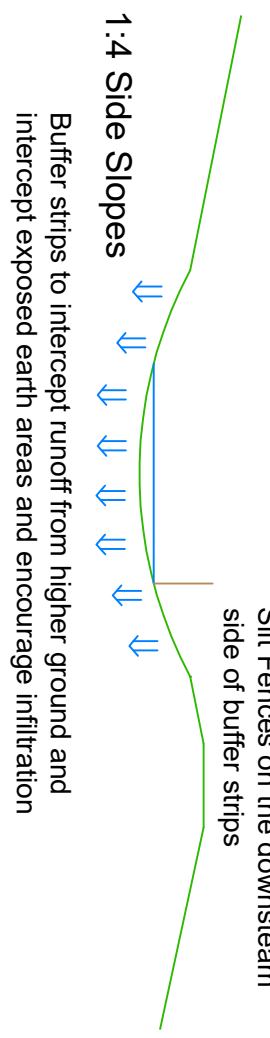
Design of Construction Phase Buffer Strips

Buffer strips to intercept runoff from higher ground and intercept exposed earth areas and encourage infiltration. The buffer strips will be located on the downslope side of the proposed landscaping batters.

Silt Fences to be located on the downstream side of buffer strips to retain runoff within the buffer strip, allowing soils and runoff to be reused on site.

2.0m buffer strip width, 1:4 side slopes, ~0.50m depth

Typical Construction Buffer Strip



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Modifications	Date	Drawn	Designed	Checked	Approved	
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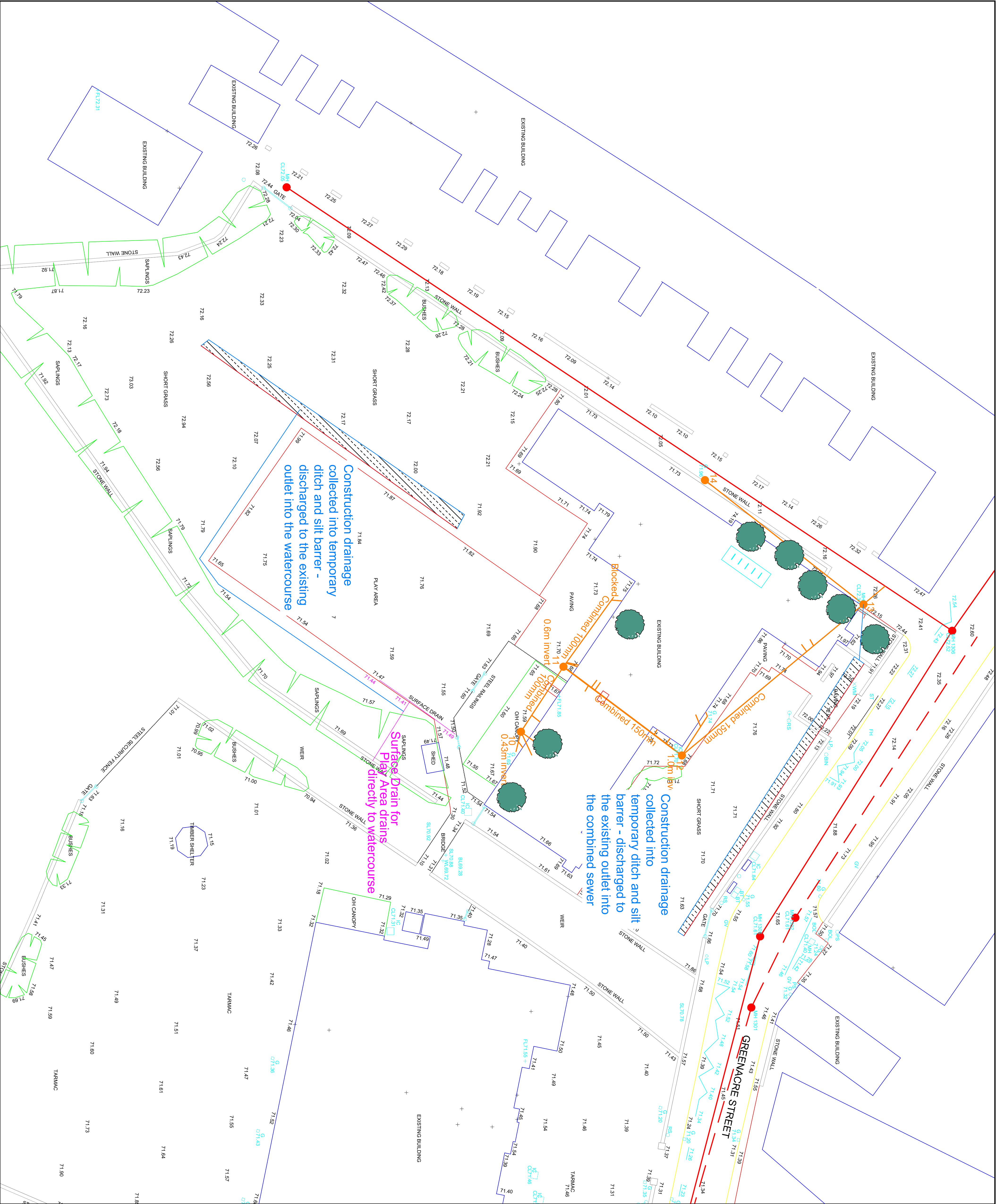
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3 The Old School House
3 TADCASTER
North Yorkshire
LS24 3HA
United Kingdom
www.jbaconsulting.com
t +44 (0)1937 637900
e info@jbaconsulting.com

for

St James' CofE Primary School, Clitheroe
Cassidy & Ashton Architects and Building Surveyors
Preliminary Construction Phase Drainage Plan

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Drawing Number:	P01	Rev.:	Sheet No.: 1 of 1
			Status: S3



E MicroDrainage Calculations

JBA Consulting	Page 1
The Old School House St. Joseph's Street Tadcaster LS24 9HA	
Date 26/04/2024 10:39	
File NEW_INFANT_SCHOOL_MD.MDX	
Designed by jflownw	Checked by
Micro Drainage	Network 2020.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	1999
Site Location GB 374150 441300 SD 74150 41300	
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.036	4-8	0.032

Total Area Contributing (ha) = 0.068

Total Pipe Volume (m³) = 3.905

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
----	---------------	-------------	----------------	----------------	----------------	--------------------	-----------	-------------	-------------	--------------	----------------

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
----	-----------------	----------------	--------------	------------------	----------------------	---------------	-------------------	--------------	--------------	---------------

JBA Consulting

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St. Joseph's Street
Tadcaster LS24 9HA

Date 26/04/2024 10:39
File NEW_INFANT_SCHOOL_MD.MDX

Micro Drainage

Designed by jflownw
Checked by

Network 2020.1

Page 2



Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
1.000	23.174	0.232	99.9	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit		
1.001	10.135	0.101	100.3	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit		
2.000	9.877	0.149	66.3	0.004	5.00	0.0	0.600	o	100	Pipe/Conduit		
1.002	5.465	0.055	99.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		
3.000	18.276	0.233	78.4	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit		
1.003	29.935	0.299	100.1	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit		
4.000	14.142	0.141	100.3	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit		
4.001	7.131	0.071	100.4	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit		
1.004	14.004	0.028	500.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
1.005	38.650	0.155	249.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.38	71.350	0.008	0.0	0.0	0.0	1.01	17.8	1.4
1.001	50.00	5.55	71.118	0.024	0.0	0.0	0.0	1.00	17.7	4.3
2.000	50.00	5.17	71.166	0.004	0.0	0.0	0.0	0.95	7.4	0.7
1.002	50.00	5.64	71.017	0.028	0.0	0.0	0.0	1.01	17.8	5.1
3.000	50.00	5.35	71.195	0.000	0.0	0.0	0.0	0.87	6.8	0.0
1.003	50.00	6.14	70.962	0.040	0.0	0.0	0.0	1.00	17.7	7.2
4.000	50.00	5.23	71.200	0.012	0.0	0.0	0.0	1.00	17.7	2.2
4.001	50.00	5.35	71.059	0.028	0.0	0.0	0.0	1.00	17.7	5.1
1.004	50.00	6.54	70.663	0.068	0.0	0.0	0.0	0.58	23.0	12.3
1.005	50.00	7.33	70.635	0.068	0.0	0.0	0.0	0.82	32.7	12.3

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	MHS1	72.250	71.350	0.750	Open Manhole	1200
1.001	o	150	MHS2	72.250	71.118	0.982	Open Manhole	1200
2.000	o	100	MHS4	71.750	71.166	0.484	Open Manhole	1200
1.002	o	150	MHS3	71.700	71.017	0.533	Open Manhole	1200
3.000	o	100	MHS6	71.750	71.195	0.455	Open Manhole	1200
1.003	o	150	MHS5	71.900	70.962	0.788	Open Manhole	1200
4.000	o	150	MHS7	72.200	71.200	0.850	Open Manhole	1200
4.001	o	150	MHS8	72.150	71.059	0.941	Open Manhole	1200
1.004	o	225	MHS9	72.200	70.663	1.312	Open Manhole	1200
1.005	o	225	MHS10	72.500	70.635	1.640	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	23.174	99.9	MHS2	72.250	71.118	0.982	Open Manhole	1200
1.001	10.135	100.3	MHS3	71.700	71.017	0.533	Open Manhole	1200
2.000	9.877	66.3	MHS3	71.700	71.017	0.583	Open Manhole	1200
1.002	5.465	99.4	MHS5	71.900	70.962	0.788	Open Manhole	1200
3.000	18.276	78.4	MHS5	71.900	70.962	0.838	Open Manhole	1200
1.003	29.935	100.1	MHS9	72.200	70.663	1.387	Open Manhole	1200
4.000	14.142	100.3	MHS8	72.150	71.059	0.941	Open Manhole	1200
4.001	7.131	100.4	MHS9	72.200	70.988	1.062	Open Manhole	1200
1.004	14.004	500.1	MHS10	72.500	70.635	1.640	Open Manhole	1200
1.005	38.650	249.4	OUTFALL	71.600	70.480	0.895	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.008	0.008	0.008
1.001	-	-	100	0.016	0.016	0.016
2.000	-	-	100	0.004	0.004	0.004
1.002	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.012	0.012	0.012
4.000	-	-	100	0.012	0.012	0.012
4.001	-	-	100	0.016	0.016	0.016
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.068	0.068	0.068

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	OUTFALL	71.600	70.480	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs		0	Number of Storage Structures
Number of Online Controls		1	Number of Time/Area Diagrams
Number of Offline Controls		0	Number of Real Time Controls

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 374150 441300 SD 74150 41300
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Summer Storms	Yes
Winter Storms	Yes

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<u>Synthetic Rainfall Details</u> Cv (Summer) 1.000 Cv (Winter) 0.840 Storm Duration (mins) 30		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: MHS10, DS/PN: 1.005, Volume (m³): 2.6

Unit Reference	MD-SHE-0096-3500-0500-3500
Design Head (m)	0.500
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	96
Invert Level (m)	70.635
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.5
Flush-Flo™	0.162	3.5
Kick-Flo®	0.359	3.0
Mean Flow over Head Range	-	2.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	1.200	5.2	3.000	8.1	7.000	12.1
0.200	3.5	1.400	5.6	3.500	8.7	7.500	12.6
0.300	3.3	1.600	6.0	4.000	9.2	8.000	13.0
0.400	3.2	1.800	6.3	4.500	9.8	8.500	13.4
0.500	3.5	2.000	6.7	5.000	10.3	9.000	13.8
0.600	3.8	2.200	7.0	5.500	10.7	9.500	14.1
0.800	4.3	2.400	7.3	6.000	11.2		
1.000	4.8	2.600	7.5	6.500	11.7		

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Storage Structures for Storm

Cellular Storage Manhole: MHS10, DS/PN: 1.005

Invert Level (m) 70.635 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	49.0	0.0	0.500	49.0	0.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 1999
Site Location GB 374150 441300 SD 74150 41300
C (1km) -0.025
D1 (1km) 0.398
D2 (1km) 0.385
D3 (1km) 0.430
E (1km) 0.299
F (1km) 2.444
Cv (Summer) 1.000
Cv (Winter) 1.000

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, 4320, 5760,
7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 50, 50

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
									(m)
1.000	MHS1	15 Summer	1	+0%	30/15 Summer				71.376
1.001	MHS2	15 Summer	1	+0%	30/15 Summer				71.164
2.000	MHS4	15 Summer	1	+0%	30/15 Summer				71.186
1.002	MHS3	15 Summer	1	+0%	30/15 Summer				71.069
3.000	MHS6	15 Summer	1	+0%	30/15 Summer				71.195
1.003	MHS5	15 Summer	1	+0%	30/15 Summer				71.019
4.000	MHS7	15 Summer	1	+0%	100/15 Summer				71.233
4.001	MHS8	15 Summer	1	+0%	30/15 Summer				71.111
1.004	MHS9	15 Summer	1	+0%	30/15 Summer				70.785
1.005	MHS10	120 Summer	1	+0%	30/15 Summer				70.725

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

FEH

FEH Rainfall Version

1999

Site Location GB 374150 441300 SD 74150 41300

C (1km)

-0.025

D1 (1km)

0.398

D2 (1km)

0.385

D3 (1km)

0.430

E (1km)

0.299

F (1km)

2.444

Cv (Summer)

1.000

Cv (Winter)

1.000

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, 4320, 5760,
7200, 8640, 10080

Return Period(s) (years)

1, 30, 100

Climate Change (%)

0, 50, 50

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
									(m)
1.000	MHS1	15 Summer	30	+50%	30/15 Summer				71.513
1.001	MHS2	15 Summer	30	+50%	30/15 Summer				71.490
2.000	MHS4	15 Summer	30	+50%	30/15 Summer				71.431
1.002	MHS3	15 Summer	30	+50%	30/15 Summer				71.417
3.000	MHS6	15 Summer	30	+50%	30/15 Summer				71.346
1.003	MHS5	15 Summer	30	+50%	30/15 Summer				71.364
4.000	MHS7	15 Summer	30	+50%	100/15 Summer				71.300
4.001	MHS8	15 Summer	30	+50%	30/15 Summer				71.263
1.004	MHS9	120 Summer	30	+50%	30/15 Summer				71.107
1.005	MHS10	120 Summer	30	+50%	30/15 Summer				71.100

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall ModelFEH

FEH Rainfall Version1999

Site Location GB 374150 441300 SD 74150 41300

C (1km)-0.025

D1 (1km)0.398

D2 (1km)0.385

D3 (1km)0.430

E (1km)0.299

F (1km)2.444

Cv (Summer)1.000

Cv (Winter)1.000

Margin for Flood Risk Warning (mm) 300.0

DVD Status OFF

Analysis TimestepFine

Inertia Status OFF

DTS StatusON

Profile(s)Summer and Winter

Duration(s) (mins)15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years)1, 30, 100

Climate Change (%)0, 50, 50

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
									(m)
1.000	MHS1	15 Summer	100	+50%	30/15 Summer				71.919
1.001	MHS2	15 Summer	100	+50%	30/15 Summer				71.880
2.000	MHS4	15 Summer	100	+50%	30/15 Summer				71.746
1.002	MHS3	15 Summer	100	+50%	30/15 Summer				71.698
3.000	MHS6	15 Summer	100	+50%	30/15 Summer				71.626
1.003	MHS5	15 Summer	100	+50%	30/15 Summer				71.652
4.000	MHS7	15 Summer	100	+50%	100/15 Summer				71.495
4.001	MHS8	15 Summer	100	+50%	30/15 Summer				71.417
1.004	MHS9	120 Summer	100	+50%	30/15 Summer				71.315
1.005	MHS10	120 Summer	100	+50%	30/15 Summer				71.307

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Micro Drainage Network 2020.1																																																		
STORM SEWER DESIGN by the Modified Rational Method Design Criteria for Storm Pipe Sizes STANDARD Manhole Sizes STANDARD FEH Rainfall Model <table><tr><td>Return Period (years)</td><td>100</td></tr><tr><td>FEH Rainfall Version</td><td>1999</td></tr><tr><td>Site Location GB 374150 441300 SD 74150 41300</td><td></td></tr><tr><td>C (1km)</td><td>-0.025</td></tr><tr><td>D1 (1km)</td><td>0.398</td></tr><tr><td>D2 (1km)</td><td>0.385</td></tr><tr><td>D3 (1km)</td><td>0.430</td></tr><tr><td>E (1km)</td><td>0.299</td></tr><tr><td>F (1km)</td><td>2.444</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>1.000</td></tr><tr><td>PIMP (%)</td><td>100</td></tr><tr><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Minimum Backdrop Height (m)</td><td>0.200</td></tr><tr><td>Maximum Backdrop Height (m)</td><td>1.500</td></tr><tr><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Min Vel for Auto Design only (m/s)</td><td>1.00</td></tr><tr><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Inverts Time Area Diagram for Storm <table><tr><td>Time (mins)</td><td>Area (ha)</td><td>Time (mins)</td><td>Area (ha)</td></tr><tr><td>0-4</td><td>0.047</td><td>4-8</td><td>0.007</td></tr></table> Total Area Contributing (ha) = 0.054 Total Pipe Volume (m³) = 1.395			Return Period (years)	100	FEH Rainfall Version	1999	Site Location GB 374150 441300 SD 74150 41300		C (1km)	-0.025	D1 (1km)	0.398	D2 (1km)	0.385	D3 (1km)	0.430	E (1km)	0.299	F (1km)	2.444	Maximum Rainfall (mm/hr)	50	Maximum Time of Concentration (mins)	30	Foul Sewage (l/s/ha)	0.000	Volumetric Runoff Coeff.	1.000	PIMP (%)	100	Add Flow / Climate Change (%)	0	Minimum Backdrop Height (m)	0.200	Maximum Backdrop Height (m)	1.500	Min Design Depth for Optimisation (m)	1.200	Min Vel for Auto Design only (m/s)	1.00	Min Slope for Optimisation (1:X)	500	Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.047	4-8	0.007
Return Period (years)	100																																																	
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Add Flow / Climate Change (%)	0																																																	
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Min Vel for Auto Design only (m/s)	1.00																																																	
Min Slope for Optimisation (1:X)	500																																																	
Time (mins)	Area (ha)	Time (mins)	Area (ha)																																															
0-4	0.047	4-8	0.007																																															
Network Design Table for Storm <table><tr><td>PN</td><td>Length</td><td>Fall</td><td>Slope</td><td>I.Area</td><td>T.E.</td><td>Base</td><td>k</td><td>HYD</td><td>DIA</td><td>Section</td><td>Type</td><td>Auto</td></tr><tr><td></td><td>(m)</td><td>(m)</td><td>(1:X)</td><td>(ha)</td><td>(mins)</td><td>Flow (l/s)</td><td>(mm)</td><td>SECT</td><td>(mm)</td><td></td><td></td><td>Design</td></tr></table> Network Results Table <table><tr><td>PN</td><td>Rain</td><td>T.C.</td><td>US/IL</td><td>E I.Area</td><td>E Base</td><td>Foul</td><td>Add Flow</td><td>Vel</td><td>Cap</td><td>Flow</td></tr><tr><td></td><td>(mm/hr)</td><td>(mins)</td><td>(m)</td><td>(ha)</td><td>Flow (l/s)</td><td>(l/s)</td><td>(l/s)</td><td>(m/s)</td><td>(l/s)</td><td>(l/s)</td></tr></table>			PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section	Type	Auto		(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)			Design	PN	Rain	T.C.	US/IL	E I.Area	E Base	Foul	Add Flow	Vel	Cap	Flow		(mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(l/s)	(l/s)	(m/s)	(l/s)	(l/s)
PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section	Type	Auto																																						
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)			Design																																						
PN	Rain	T.C.	US/IL	E I.Area	E Base	Foul	Add Flow	Vel	Cap	Flow																																								
	(mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(l/s)	(l/s)	(m/s)	(l/s)	(l/s)																																								
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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	23.202	0.232	100.0	0.005	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	13.600	0.136	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	10.441	0.104	100.4	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	14.979	0.150	99.9	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	10.726	0.107	100.2	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	6.018	0.060	100.3	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.38	71.230	0.005	0.0	0.0	0.0	1.00	17.8	0.9
1.001	50.00	5.61	70.998	0.005	0.0	0.0	0.0	1.00	17.8	0.9
1.002	50.00	5.78	70.862	0.019	0.0	0.0	0.0	1.00	17.7	3.4
1.003	50.00	6.03	70.758	0.029	0.0	0.0	0.0	1.01	17.8	5.2
1.004	50.00	6.21	70.608	0.040	0.0	0.0	0.0	1.00	17.7	7.2
1.005	50.00	6.31	70.501	0.054	0.0	0.0	0.0	1.00	17.7	9.7

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: MHS5, DS/PN: 1.005, Volume (m³): 1.9

Unit Reference	MD-SHE-0142-8500-0500-8500
Design Head (m)	0.500
Design Flow (l/s)	8.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	142
Invert Level (m)	70.501
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	8.5
Flush-Flo™	0.214	8.5
Kick-Flo®	0.390	7.6
Mean Flow over Head Range	-	6.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	1.200	12.8	3.000	19.9	7.000	29.9
0.200	8.5	1.400	13.8	3.500	21.4	7.500	31.0
0.300	8.3	1.600	14.7	4.000	22.8	8.000	32.0
0.400	7.7	1.800	15.6	4.500	24.1	8.500	33.0
0.500	8.5	2.000	16.4	5.000	25.4	9.000	34.0
0.600	9.3	2.200	17.1	5.500	26.5	9.500	34.9
0.800	10.6	2.400	17.9	6.000	27.7		
1.000	11.8	2.600	18.6	6.500	28.8		

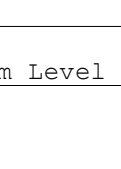
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Storage Structures for Storm

Cellular Storage Manhole: MHS5, DS/PN: 1.005

Invert Level (m) 70.501 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	15.0	0.0	0.500	15.0	0.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000	Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0	MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0	Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500	Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000	

Number of Input Hydrographs 0	Number of Storage Structures 1
Number of Online Controls 1	Number of Time/Area Diagrams 0
Number of Offline Controls 0	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location GB 374150 441300 SD 74150 41300	
C (1km)	-0.025
D1 (1km)	0.398
D2 (1km)	0.385
D3 (1km)	0.430
E (1km)	0.299
F (1km)	2.444
Cv (Summer)	1.000
Cv (Winter)	1.000

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, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	GULLEY	15 Summer	1	+0%	100/15 Summer				71.250
1.001	MHS1	15 Summer	1	+0%	30/15 Summer				71.019
1.002	MHS2	15 Summer	1	+0%	30/15 Summer				70.902
1.003	MHS3	15 Summer	1	+0%	30/15 Summer				70.807
1.004	MHS4	15 Summer	1	+0%	30/15 Summer				70.667
1.005	MHS5	30 Summer	1	+0%	30/15 Summer				70.601

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)			Time (mins)	Flow (l/s)		
1.000	GULLEY	-0.130	0.000	0.04			0.7	OK	
1.001	MHS1	-0.129	0.000	0.05			0.7	OK	
1.002	MHS2	-0.110	0.000	0.16			2.5	OK	
1.003	MHS3	-0.101	0.000	0.23			3.7	OK	
1.004	MHS4	-0.091	0.000	0.32			5.1	OK	
1.005	MHS5	-0.050	0.000	0.34		13	5.1	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm			
Simulation Criteria			
Areal Reduction Factor 1.000		Additional Flow - % of Total Flow 0.000	
Hot Start (mins) 0		MADD Factor * 10m³/ha Storage 2.000	
Hot Start Level (mm) 0		Inlet Coefficient 0.800	
Manhole Headloss Coeff (Global) 0.500		Flow per Person per Day (l/per/day) 0.000	
Foul Sewage per hectare (l/s) 0.000			
Number of Input Hydrographs 0		Number of Storage Structures 1	
Number of Online Controls 1		Number of Time/Area Diagrams 0	
Number of Offline Controls 0		Number of Real Time Controls 0	
Synthetic Rainfall Details			
Rainfall Model		FEH	
FEH Rainfall Version		1999	
Site Location GB 374150 441300 SD 74150 41300			
C (1km)		-0.025	
D1 (1km)		0.398	
D2 (1km)		0.385	
D3 (1km)		0.430	
E (1km)		0.299	
F (1km)		2.444	
Cv (Summer)		1.000	
Cv (Winter)		1.000	
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, 4320, 5760, 7200, 8640, 10080	
Return Period(s) (years)		1, 30, 100	
Climate Change (%)		0, 50, 50	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)			
1.000	GULLEY	-0.104	0.000	0.21			3.5		OK	
1.001	MHS1	0.070	0.000	0.23			3.8		SURCHARGED	
1.002	MHS2	0.203	0.000	0.59			9.4		SURCHARGED	
1.003	MHS3	0.277	0.000	0.83			13.6		SURCHARGED	
1.004	MHS4	0.337	0.000	1.26			20.0		SURCHARGED	
1.005	MHS5	0.410	0.000	0.61		20	9.0		SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)			
1.000	GULLEY	0.271	0.000	0.27			4.6		FLOOD RISK	
1.001	MHS1	0.484	0.000	0.28			4.5		FLOOD RISK	
1.002	MHS2	0.609	0.000	0.69			10.9		FLOOD RISK	
1.003	MHS3	0.668	0.000	1.04			17.1		FLOOD RISK	
1.004	MHS4	0.662	0.000	1.62			25.8		SURCHARGED	
1.005	MHS5	0.707	0.000	0.74		24	10.9		SURCHARGED	

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Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.co
m
www.jbaconsulting.com
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Jeremy Benn
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