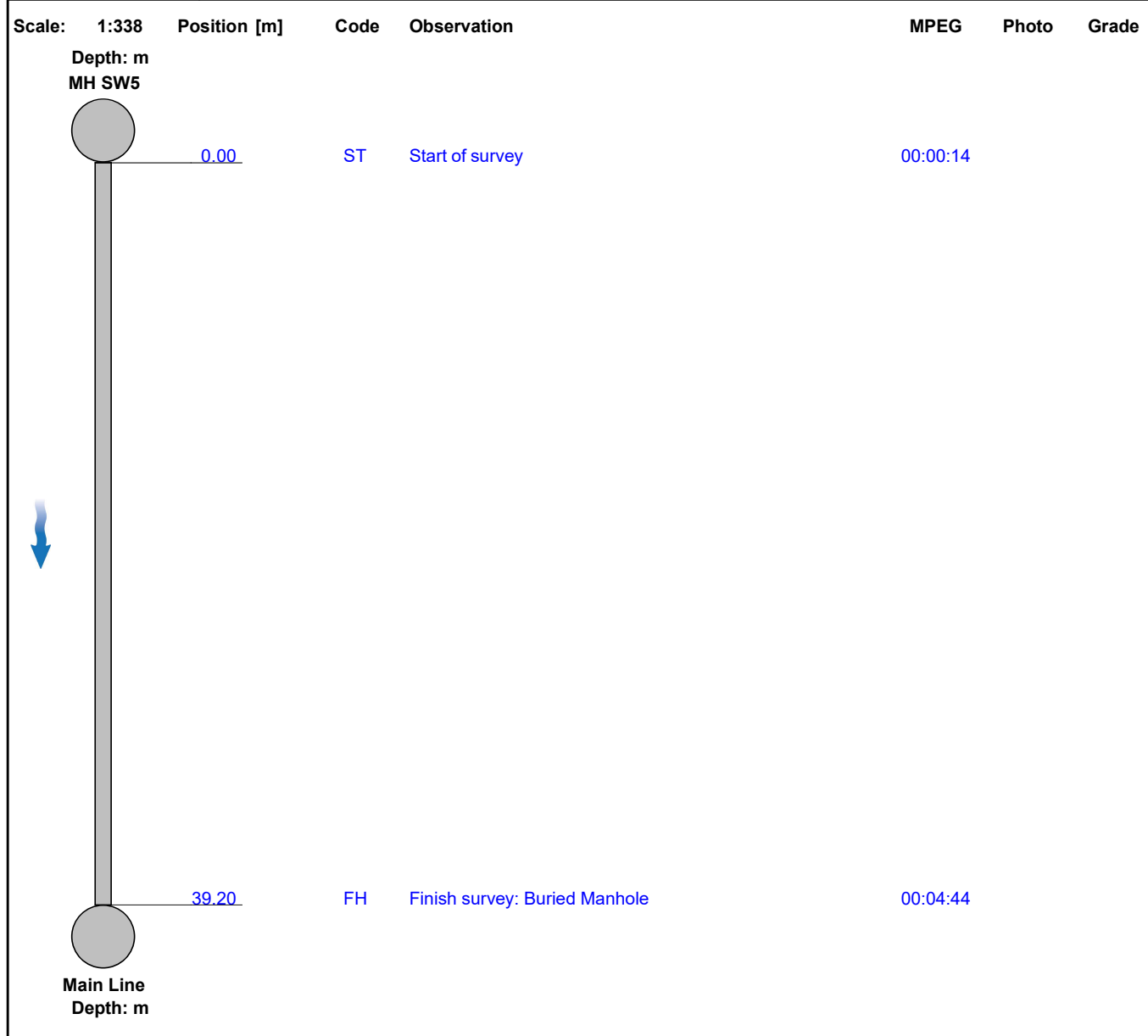


Section Inspection - 04/11/2020 - MH SW5X

Section 2	Inspection 1	Date 04/11/20	Time 13:55	Client's Job Ref 30586	Weather Dry	Pre Cleaned No	PLR MH SW5X
Operator L Hilton		Vehicle PK65 HFB		Camera P494 Tractor	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Site Area 1	Inspection Direction:	Downstream	Upstream Node:	MH SW5
Road:	Sneakeyat Road	Inspected Length:	39.20 m	Upstream Pipe Depth:	
Location:	Footpath or verge	Total Length:	39.20 m	Downstream Node:	MAIN LINE
Surface Type:	Unknown	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:		Dia/Height:	225 mm		
Flow Control:		Pipe Material:	Vitrified clay		
Year Constructed:	Not Specified	Lining:	No Lining		
Inspection Purpose:	Sample survey to determine asset condition	Lining Material:	No Lining		

Comments:
Recommendations: None specified



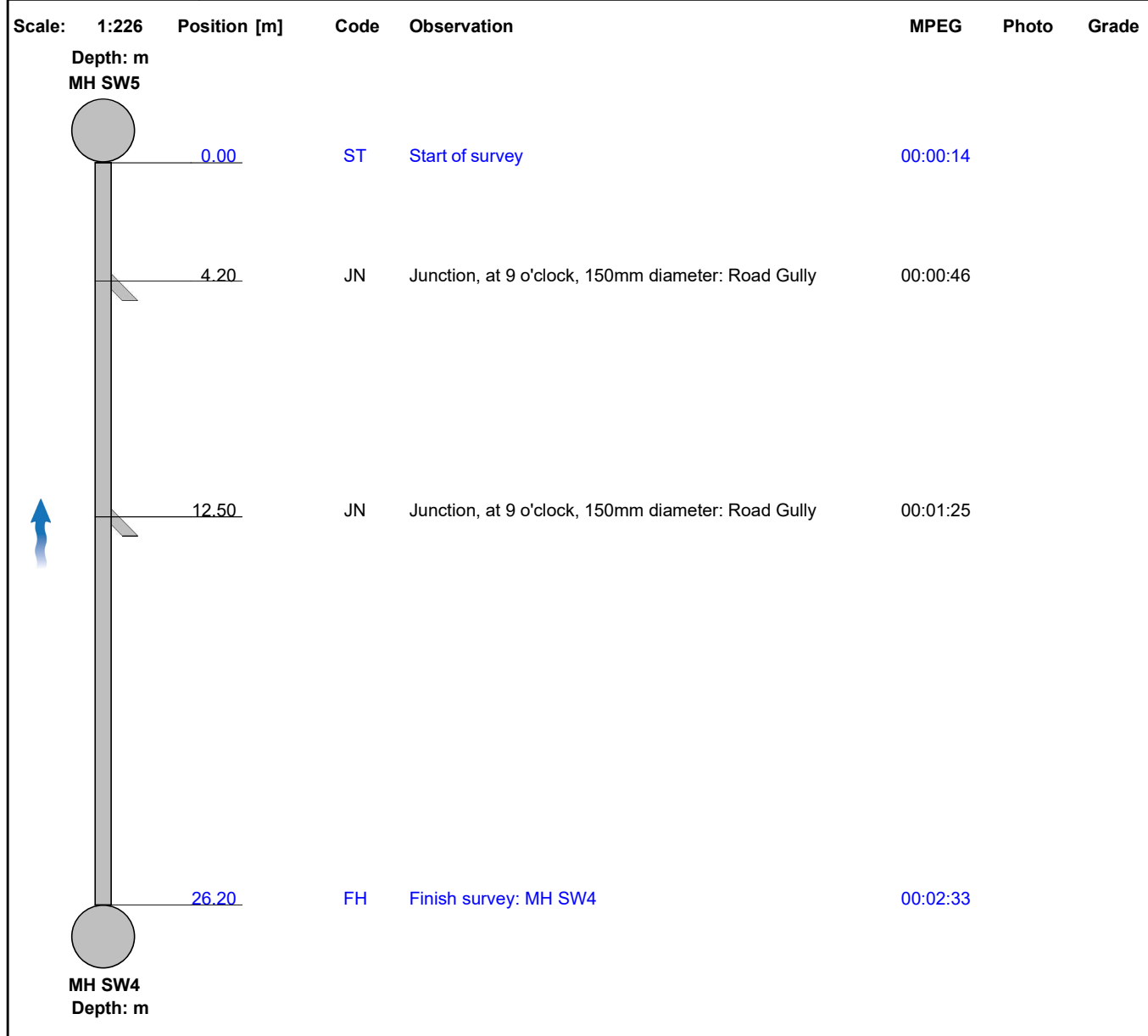
Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Inspection - 04/11/2020 - MH SW4X

Section 3	Inspection 1	Date 04/11/20	Time 14:49	Client's Job Ref 30586	Weather Dry	Pre Cleaned No	PLR MH SW4X
Operator L Hilton		Vehicle PK65 HFB		Camera P494 Tractor	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Site Area 1	Inspection Direction:	Upstream	Upstream Node:	MH SW4
Road:	Sneakeyat Road	Inspected Length:	26.20 m	Upstream Pipe Depth:	
Location:	Footpath or verge	Total Length:	26.20 m	Downstream Node:	MH SW5
Surface Type:	Unknown	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water			Pipe Shape:	Circular
Type of Pipe:				Dia/Height:	225 mm
Flow Control:				Pipe Material:	Vitrified clay
Year Constructed:	Not Specified			Lining:	No Lining
Inspection Purpose:	Sample survey to determine asset condition			Lining Material:	No Lining

Comments:
Recommendations: None specified



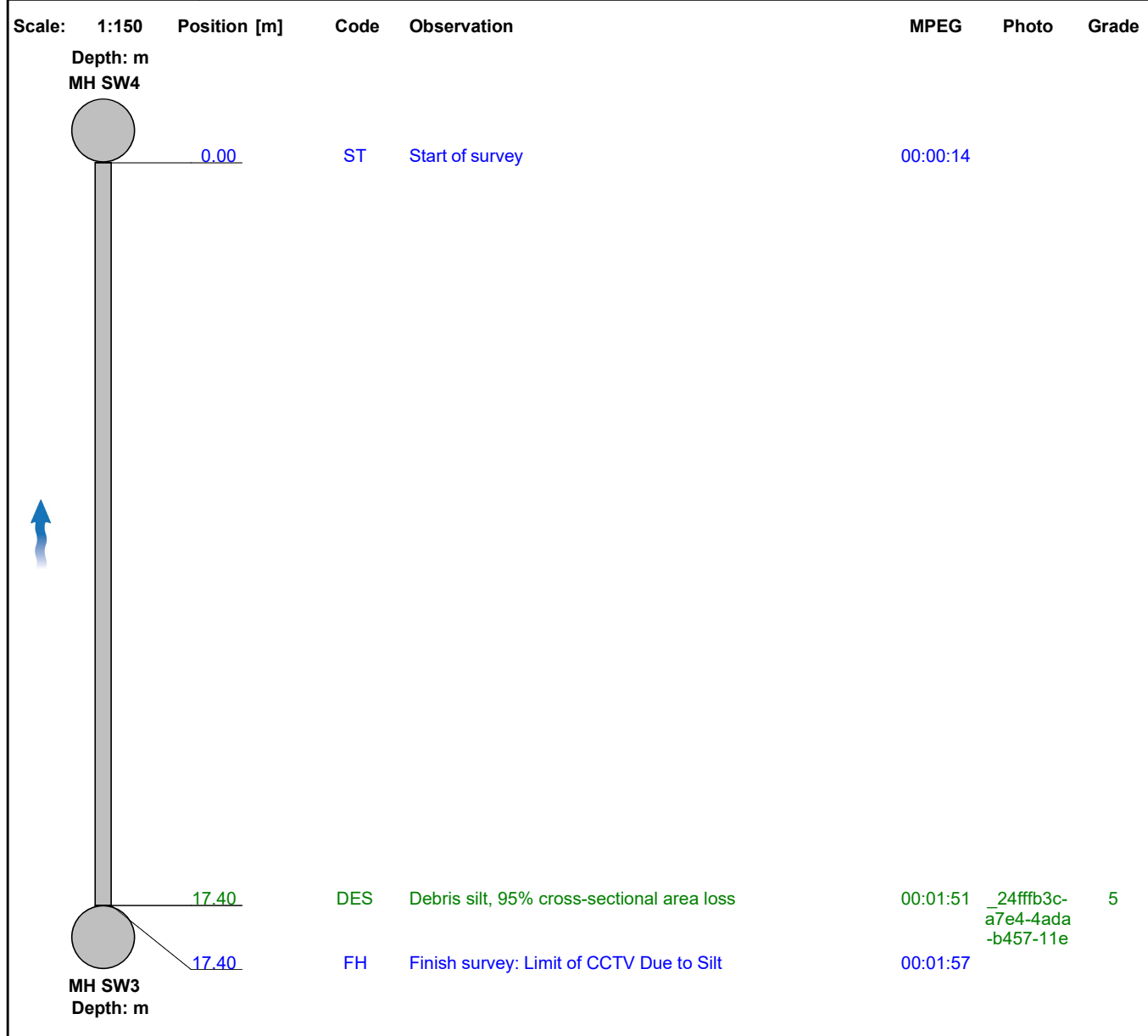
Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Inspection - 04/11/2020 - MH SW3X

Section 4	Inspection 1	Date 04/11/20	Time 14:55	Client's Job Ref 30586	Weather Dry	Pre Cleaned No	PLR MH SW3X
Operator L Hilton		Vehicle PK65 HFB		Camera P494 Tractor	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Site Area 1	Inspection Direction:	Upstream	Upstream Node:	MH SW3
Road:	Sneakyeat Road	Inspected Length:	17.40 m	Upstream Pipe Depth:	
Location:	Footpath or verge	Total Length:	17.40 m	Downstream Node:	MH SW4
Surface Type:	Unknown	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:		Dia/Height:	225 mm		
Flow Control:		Pipe Material:	Vitrified clay		
Year Constructed:	Not Specified	Lining:	No Lining		
Inspection Purpose:	Sample survey to determine asset condition	Lining Material:	No Lining		

Comments:
Recommendations: None specified



Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	1	10.0	0.6	10.0	5.0

Section Pictures - 04/11/2020 - MH SW3X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
4	Upstream	MH SW3X	30586	



_24fffb3c-a7e4-4ada-b457-11e457c9573c.jpg, 00:01:51, 17.40
m

Debris silt, 95% cross-sectional area loss



Manhole Record Card

Number	<input type="text" value="MHSW1"/>	Date Of Survey	<input type="text" value="04/11/2020"/>
Status	<input type="text" value="PR"/>	Function	<input type="text" value="S"/>
		Type	<input type="text"/>

Cover Details:

Square Recta
 Double Triang
 Single Triangl
 Circular
 Multiple
 Hinged
 Lockable

CoverLevel
 Cover Load Class

Cover	<input type="text" value="600"/> X <input type="text" value="400"/>	Chamber	<input type="text" value="0"/> X <input type="text" value="0"/>	EvidenceOfSurcharge	<input type="checkbox"/>
Shaft	<input type="text" value="0"/> X <input type="text" value="0"/>	ShaftDepth	<input type="text" value="0"/>	ToxicAtmosphere	<input type="checkbox"/>
Brick	<input checked="" type="checkbox"/>	Precast Concrete	<input type="checkbox"/>	PVC	<input type="checkbox"/>
Reducing Slab	<input type="checkbox"/>	Taper	<input type="checkbox"/>	Side Entry	<input type="checkbox"/>
		No.RegCourses	<input type="text"/>	Segments	<input type="checkbox"/>
		No.Land	<input type="text" value="0"/>	Step Irons	<input checked="" type="checkbox"/>
		Ladder	<input type="checkbox"/>		

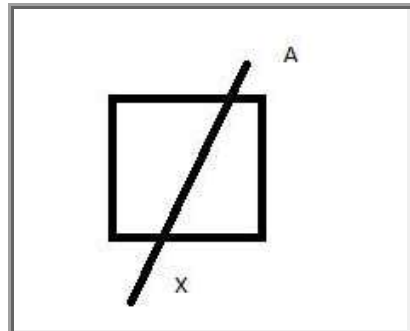
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	<input type="text" value="OK"/>	Shaft	<input type="text" value="OK"/>
Irons/Ladder	<input type="text" value="OK"/>	Chamber	<input type="text" value="OK"/>
Benching/Channel	<input type="text" value="OK"/>		

Pipe	Invert L	Depth	Fr	UpstreamRe	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-2.150	2.15	MHSW			C			300		CON	
X	-2.170	2.17		MHSW2		C			300		CON	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	<input type="text" value="MHSW3"/>	Date Of Survey	<input type="text" value="04/11/2020"/>
Status	<input type="text" value="PR"/>	Function	<input type="text" value="S"/>
		Type	<input type="text" value="M"/>

Cover Details:

Square Recta Double Triang Single Triangl Circular Multiple Hinged Lockable

CoverLevel Cover Load Class

Cover	<input type="text" value="600"/> X <input type="text" value="600"/>	Chamber	<input type="text" value="0"/> X <input type="text" value="0"/>	EvidenceOfSurcharge	<input type="checkbox"/>
Shaft	<input type="text" value="0"/> X <input type="text" value="0"/>	ShaftDepth	<input type="text" value="0"/>	ToxicAtmosphere	<input type="checkbox"/>
Brick	<input checked="" type="checkbox"/>	Precast Concrete	<input type="checkbox"/>	PVC	<input type="checkbox"/>
Reducing Slab	<input type="checkbox"/>	Taper	<input type="checkbox"/>	Side Entry	<input type="checkbox"/>
		No.RegCourses	<input type="text"/>	Segments	<input type="checkbox"/>
		No.Land	<input type="text" value="0"/>	Step Irons	<input checked="" type="checkbox"/>
		Ladder	<input type="checkbox"/>		

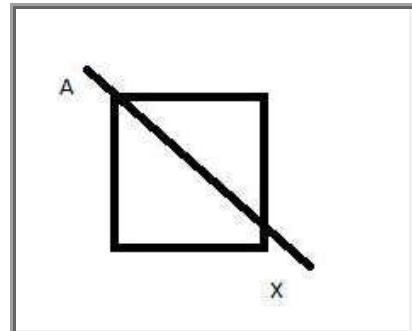
PlanPhoto



LocationPhoto



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Chamber Conditions:

Cover	<input type="text" value="OK"/>	Shaft	<input type="text" value="OK"/>
Irons/Ladder	<input type="text" value="OK"/>	Chamber	<input type="text" value="OK"/>
Benching/Channel	<input type="text" value="OK"/>		

Pipe	Invert L	Depth	Fr	UpstreamRe	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-1.710	1.71	MHSW2			C			300		CON	
X	-1.720	1.72		MH		C			300		CON	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	<input type="text" value="MHSW1"/>	Date Of Survey	<input type="text" value="04/11/2020"/>
Status	<input type="text" value="PR"/>	Function	<input type="text" value="S"/>
		Type	<input type="text" value="M"/>

Cover Details:

Square Recta Double Triang Single Triangl Circular Multiple Hinged Lockable

CoverLevel Cover Load Class

Cover	<input type="text" value="600"/> X <input type="text" value="600"/>	Chamber	<input type="text" value="0"/> X <input type="text" value="0"/>	EvidenceOfSurcharge	<input type="checkbox"/>
Shaft	<input type="text" value="0"/> X <input type="text" value="0"/>	ShaftDepth	<input type="text" value="0"/>	ToxicAtmosphere	<input type="checkbox"/>
Brick	<input type="checkbox"/>	Precast Concrete	<input checked="" type="checkbox"/>	PVC	<input type="checkbox"/>
Reducing Slab	<input type="checkbox"/>	Taper	<input type="checkbox"/>	Side Entry	<input type="checkbox"/>
		No.Land	<input type="text" value="0"/>	Step Irons	<input checked="" type="checkbox"/>
		Segments	<input type="checkbox"/>	No.RegCourses	<input type="text"/>
		Ladder	<input type="checkbox"/>		

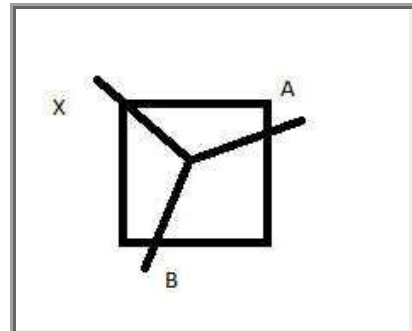
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	<input type="text" value="OK"/>	Shaft	<input type="text" value="OK"/>
Irons/Ladder	<input type="text" value="OK"/>	Chamber	<input type="text" value="OK"/>
Benching/Channel	<input type="text" value="OK"/>		

Pipe	Invert L	Depth	Fr	Upstream	Re	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-1.250	1.25	ACO				C				150	VC	
B	-1.250	1.25	GULLY				C				150	VC	
X	-1.290	1.29			MHSW2		C				150	VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	<input type="text" value="MHSW5"/>	Date Of Survey	<input type="text" value="04/11/2020"/>
Status	<input type="text" value="PR"/>	Function	<input type="text" value="S"/>
		Type	<input type="text" value="M"/>

Cover Details:

Square Recta Double Triang Single Triangl Circular Multiple Hinged Lockable

CoverLevel Cover Load Class

Cover	<input type="text" value="600"/> X <input type="text" value="600"/>	Chamber	<input type="text" value="0"/> X <input type="text" value="0"/>	EvidenceOfSurcharge	<input type="checkbox"/>
Shaft	<input type="text" value="0"/> X <input type="text" value="0"/>	ShaftDepth	<input type="text" value="0"/>	ToxicAtmosphere	<input type="checkbox"/>
Brick	<input type="checkbox"/>	Precast Concrete	<input type="checkbox"/>	PVC	<input type="checkbox"/>
Reducing Slab	<input type="checkbox"/>	Taper	<input type="checkbox"/>	Side Entry	<input type="checkbox"/>
		No.Land	<input type="text" value="0"/>	Step Irons	<input checked="" type="checkbox"/>
		Segments	<input type="checkbox"/>	No.RegCourses	<input type="text"/>
		Ladder	<input type="checkbox"/>		

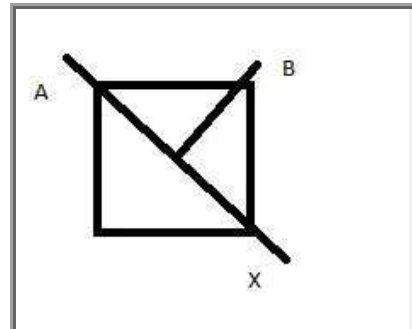
PlanPhoto



LocationPhoto



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Chamber Conditions:

Cover	<input type="text" value="OK"/>	Shaft	<input type="text" value="OK"/>
Irons/Ladder	<input type="text" value="OK"/>	Chamber	<input type="text" value="OK"/>
Benching/Channel	<input type="text" value="OK"/>		

Pipe	Invert L	Depth	Fr	UpstreamRe	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-1.820	1.82	MH			C			150		VC	
B	-1.870	1.87	MHSW4			C			225		VC	
X	-1.900	1.90			BMH	C			225		VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	<input type="text" value="MHFW1"/>	Date Of Survey	<input type="text" value="04/11/2020"/>
Status	<input type="text" value="PR"/>	Function	<input type="text" value="F"/>
		Type	<input type="text" value="M"/>

Cover Details:

Square Recta Double Triang Single Triangl Circular Multiple Hinged Lockable

CoverLevel Cover Load Class

Cover	<input type="text" value="600"/> X <input type="text" value="600"/>	Chamber	<input type="text" value="0"/> X <input type="text" value="0"/>	EvidenceOfSurcharge	<input type="checkbox"/>
Shaft	<input type="text" value="0"/> X <input type="text" value="0"/>	ShaftDepth	<input type="text" value="0"/>	ToxicAtmosphere	<input type="checkbox"/>
Brick	<input type="checkbox"/>	Precast Concrete	<input checked="" type="checkbox"/>	PVC	<input type="checkbox"/>
Reducing Slab	<input type="checkbox"/>	Taper	<input type="checkbox"/>	Side Entry	<input type="checkbox"/>
		No.Land	<input type="text" value="0"/>	Step Irons	<input checked="" type="checkbox"/>
		Segments	<input type="checkbox"/>	No.RegCourses	<input type="text"/>
		Ladder	<input type="checkbox"/>		

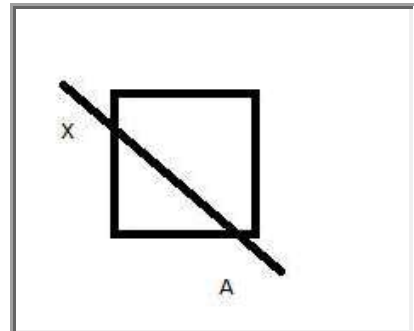
PlanPhoto



LocationPhoto



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Chamber Conditions:

Cover	<input type="text" value="OK"/>	Shaft	<input type="text" value="OK"/>
Irons/Ladder	<input type="text" value="OK"/>	Chamber	<input type="text" value="OK"/>
Benching/Channel	<input type="text" value="OK"/>		

Pipe	Invert L	Depth	Fr	UpstreamRe	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-2.870	2.87				C			225		VC	
X	-2.900	2.90		MH		C			225		VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	<input type="text" value="MHSW4"/>	Date Of Survey	<input type="text" value="04/11/2020"/>
Status	<input type="text" value="PR"/>	Function	<input type="text" value="S"/>
		Type	<input type="text" value="M"/>

Cover Details:

Square Recta Double Triang Single Triangl Circular Multiple Hinged Lockable

CoverLevel Cover Load Class

Cover	<input type="text" value="600"/> X <input type="text" value="600"/>	Chamber	<input type="text" value="0"/> X <input type="text" value="0"/>	EvidenceOfSurcharge	<input type="checkbox"/>
Shaft	<input type="text" value="0"/> X <input type="text" value="0"/>	ShaftDepth	<input type="text" value="0"/>	ToxicAtmosphere	<input type="checkbox"/>
Brick	<input type="checkbox"/>	Precast Concrete	<input checked="" type="checkbox"/>	PVC	<input type="checkbox"/>
Reducing Slab	<input type="checkbox"/>	Taper	<input type="checkbox"/>	Side Entry	<input type="checkbox"/>
		No.Land	<input type="text" value="0"/>	Step Irons	<input checked="" type="checkbox"/>
		Segments	<input type="checkbox"/>	No.RegCourses	<input type="text"/>
		Ladder	<input type="checkbox"/>		

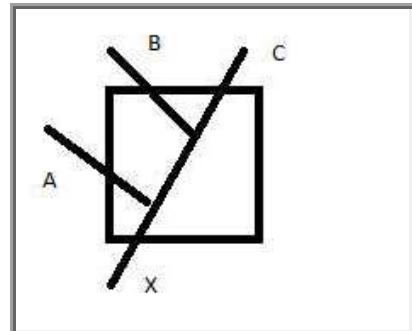
PlanPhoto



LocationPhoto



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Chamber Conditions:

Cover	<input type="text" value="OK"/>	Shaft	<input type="text" value="OK"/>
Irons/Ladder	<input type="text" value="OK"/>	Chamber	<input type="text" value="OK"/>
Benching/Channel	<input type="text" value="OK"/>		

Pipe	Invert L	Depth	Fr	Upstream	Re	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-1.350	1.35					C			100		VC	
B	-1.340	1.34					C			150		VC	
C	-1.490	1.49	MHSW3				C			225		VC	
X	-1.510	1.51		MHSW5			C			225		VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	<input type="text" value="MHSW2"/>	Date Of Survey	<input type="text" value="04/11/2020"/>
Status	<input type="text" value="PR"/>	Function	<input type="text" value="S"/>
		Type	<input type="text" value="M"/>

Cover Details:

Square Recta Double Triang Single Triangl Circular Multiple Hinged Lockable

CoverLevel Cover Load Class

Cover	<input type="text" value="600"/> X <input type="text" value="600"/>	Chamber	<input type="text" value="0"/> X <input type="text" value="0"/>	EvidenceOfSurcharge	<input type="checkbox"/>
Shaft	<input type="text" value="0"/> X <input type="text" value="0"/>	ShaftDepth	<input type="text" value="0"/>	ToxicAtmosphere	<input type="checkbox"/>
Brick	<input type="checkbox"/>	Precast Concrete	<input checked="" type="checkbox"/>	PVC	<input type="checkbox"/>
Reducing Slab	<input type="checkbox"/>	Taper	<input type="checkbox"/>	Side Entry	<input type="checkbox"/>
		No.Land	<input type="text" value="0"/>	Step Irons	<input checked="" type="checkbox"/>
		Segments	<input type="checkbox"/>	No.RegCourses	<input type="text"/>
		Ladder	<input type="checkbox"/>		

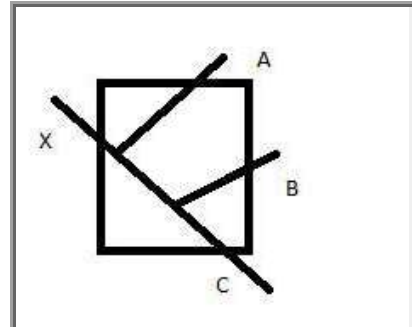
PlanPhoto



LocationPhoto



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Chamber Conditions:

Cover	<input type="text" value="OK"/>	Shaft	<input type="text" value="OK"/>
Irons/Ladder	<input type="text" value="OK"/>	Chamber	<input type="text" value="OK"/>
Benching/Channel	<input type="text" value="OK"/>		




Pipe	Invert L	Depth	Fr	Upstream	Re	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-2.450	2.45	MH				C			150		VC	
B	-2.450	2.45					C			150		VC	
C	-2.480	2.48	MHSW1				C			150		VC	
X	-2.520	2.52			MHSW3		C			150		VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.

Appendix E: - Trial Hole Investigation Logs

TRIAL PIT LOG

LOCATION ID:	PROJECT No:	2020.22 1		
TPO 1 SITE 1	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN		
	CLIENT	NORTHERN TRUST		
	PLANT		START & END DATE	04.11.20
GROUND LEVEL (m AOD)				

STRATA					SAMPLES			IN-SITU TESTS			
GROUND WATER STRIKE	BACKFILL	LEVEL (m AOD)	DESCRIPTION	LEGEND	DEPTH (m BGL)	TYPE	FROM (m)	TO (m)	TYPE	DEPTH (m)	RESULT
			Grass over general fill material comprising LIMESTONE bricks/concrete and general builders waste (Hardcore) mixed with Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		0.15						
			Thin layer Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		0.70						
			Hole Terminated at 1.20m BGL		1.20						

REMARKS

Reason for Termination:
Target depth reached.

Groundwater Notes:
No groundwater encountered.

Other Remarks:

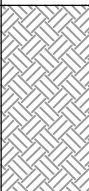
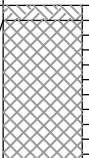


GRAHAM SCHOFIELD ASSOCIATES
Consulting Civil and Structural Engineers

Suite 3 Balfour Court
Off Hough Lane
Leyland
PR25 2TF
tel: (01772) 459383
email: reception@gsa72.co.uk

GSA

TRIAL PIT LOG

LOCATION ID:	PROJECT No:	2020.221		
TPO2 SITE 1	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN		
	CLIENT	NORTHERN TRUST		
	PLANT		START & END DATE	04.11.20
GROUND LEVEL (m AOD)				

STRATA					SAMPLES			IN-SITU TESTS			
GROUND WATER STRIKE	BACKFILL	LEVEL (m AOD)	DESCRIPTION	LEGEND	DEPTH (m BGL)	TYPE	FROM (m)	TO (m)	TYPE	DEPTH (m)	RESULT
			Grass over soft dark brown sandy slightly CLAY with abundant rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse. (Topsoil)		0.10						
			General Fill material comprising LIMESTONE bricks/concrete and general builders waste (Hardcore) mixed with Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		1.10						
			Thin layer Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		1.30						
			Hole Terminated at 1.30m BGL								

REMARKS

Reason for Termination:
Target depth reached.

Groundwater Notes:
No groundwater encountered.

Other Remarks:

GRAHAM SCHOFIELD ASSOCIATES
Consulting Civil and Structural Engineers
 Suite 3 Balfour Court
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 Leyland
 PR25 2TF
 tel: (01772) 459383
 email: reception@gsa72.co.uk

GSA

Appendix F: - HR Wallingford Greenfield Runoff Rate Estimation for Sites

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1188	1188
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes
(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?


Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	2.95	2.95
1 in 1 year (l/s):	2.57	2.57
1 in 30 years (l/s):	5.01	5.01
1 in 100 year (l/s):	6.13	6.13
1 in 200 years (l/s):	6.99	6.99

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix G: - Proposed Drainage Strategy and Calculations

Graham Schofield Associates		Page 1
72 Balcarres Road Leyland Lancashire PR25 3ED	Northern Trust Proposed Commercial Units Sneckyeat Industrial Estate	
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Block 2 SW

Pipe Sizes STANDARD Manhole Sizes STANDARD






FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	16.000	Add Flow / Climate Change (%)	0
Ratio R	0.260	Minimum Backdrop Height (m)	0.600
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	250

Designed with Level Soffits

Network Design Table for Block 2 SW

« - Indicates pipe capacity < flow

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
S21.000	66.019	0.440	150.0	0.045	5.00	0.0	0.600	o	150	Pipe/Conduit	
S21.001	17.126	0.114	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S21.002	14.062	0.094	150.0	0.030	0.00	0.0	0.600	o	150	Pipe/Conduit	
S22.000	52.401	0.513	102.1	0.160	5.00	0.0	0.600	o	225	Pipe/Conduit	
S21.003	6.921	0.047	147.3	0.000	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)
S21.000	41.14	6.35	97.660	0.045	0.0	0.0	0.0	0.82	14.5	5.0
S21.001	40.26	6.69	97.220	0.045	0.0	0.0	0.0	0.82	14.5	5.0
S21.002	39.58	6.98	97.106	0.075	0.0	0.0	0.0	0.82	14.5	8.0
S22.000	42.96	5.68	97.525	0.160	0.0	0.0	0.0	1.29	51.4	18.6
S21.003	39.26	7.12	97.012	0.235	0.0	0.0	0.0	0.83	14.6«	25.0

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Manhole Schedules for Block 2 SW

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2RE1	98.350	0.690	Open Manhole	250	S21.000	97.660	150				
S22	98.350	1.130	Open Manhole	600	S21.001	97.220	150	S21.000	97.220	150	
S23	98.350	1.244	Open Manhole	600	S21.002	97.106	150	S21.001	97.106	150	
S25	98.725	1.200	Open Manhole	600	S22.000	97.525	225				
S26	98.850	1.838	Open Manhole	1200	S21.003	97.012	150	S21.002	97.012	150	
								S22.000	97.012	225	
S2SW4	98.400	1.435	Open Manhole	1200		OUTFALL		S21.003	96.965	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2RE1	299047.289	516136.933	299047.289	516136.933	Required	
S22	298990.652	516170.855	298990.652	516170.855	Required	
S23	298999.361	516185.600	298999.361	516185.600	Required	
S25	299051.345	516170.633	299051.345	516170.633	Required	
S26	299006.489	516197.721	299006.489	516197.721	Required	
S2SW4	299000.565	516201.299			No Entry	

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PIPELINE SCHEDULES for Block 2 SW

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)
S21.000	o	150	S2RE1	98.350	97.660	0.540	Open Manhole	250
S21.001	o	150	S22	98.350	97.220	0.980	Open Manhole	600
S21.002	o	150	S23	98.350	97.106	1.094	Open Manhole	600
S22.000	o	225	S25	98.725	97.525	0.975	Open Manhole	600
S21.003	o	150	S26	98.850	97.012	1.688	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)
S21.000	66.019	150.0	S22	98.350	97.220	0.980	Open Manhole	600
S21.001	17.126	150.0	S23	98.350	97.106	1.094	Open Manhole	600
S21.002	14.062	150.0	S26	98.850	97.012	1.688	Open Manhole	1200
S22.000	52.401	102.1	S26	98.850	97.012	1.613	Open Manhole	1200
S21.003	6.921	147.3	S2SW4	98.400	96.965	1.285	Open Manhole	1200

Free Flowing Outfall Details for Block 2 SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S21.003	S2SW4	98.400	96.965	96.965	1200	0

Simulation Criteria for Block 2 SW

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	0.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	16.000	Storm Duration (mins)	30
Ratio R	0.260		

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Online Controls for Block 2 SW

Hydro-Brake® Optimum Manhole: S26, DS/PN: S21.003, Volume (m³): 4.4

Unit Reference MD-SHE-0079-3000-1250-3000
 Design Head (m) 1.250
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 79
 Invert Level (m) 97.012
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.250	3.0	Kick-Flo®	0.702	2.3
Flush-Flo™	0.344	2.9	Mean Flow over Head Range	-	2.6

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)	Depth (m)	Flow (l/s)
0.100	2.2	0.800	2.4	2.000	3.7	4.000	5.1	7.000	6.7
0.200	2.7	1.000	2.7	2.200	3.9	4.500	5.4	7.500	6.9
0.300	2.9	1.200	2.9	2.400	4.1	5.000	5.7	8.000	7.1
0.400	2.9	1.400	3.2	2.600	4.2	5.500	6.0	8.500	7.3
0.500	2.8	1.600	3.4	3.000	4.5	6.000	6.2	9.000	7.5
0.600	2.6	1.800	3.5	3.500	4.8	6.500	6.5	9.500	7.7

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Storage Structures for Block 2 SW

Cellular Storage Manhole: S26, DS/PN: S21.003

Invert Level (m) 97.012 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)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	180.0	0.0	1.800	0.0	0.0	3.600	0.0	0.0
0.200	180.0	0.0	2.000	0.0	0.0	3.800	0.0	0.0
0.400	180.0	0.0	2.200	0.0	0.0	4.000	0.0	0.0
0.500	180.0	0.0	2.400	0.0	0.0	4.200	0.0	0.0
0.600	180.0	0.0	2.600	0.0	0.0	4.400	0.0	0.0
0.700	180.0	0.0	2.800	0.0	0.0	4.600	0.0	0.0
0.800	180.0	0.0	3.000	0.0	0.0	4.800	0.0	0.0
0.801	0.0	0.0	3.200	0.0	0.0	5.000	0.0	0.0
1.600	0.0	0.0	3.400	0.0	0.0			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 2 SW

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status OFF
 Inertia Status OFF

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, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S21.000	S2RE1	15 Winter	1	+0%	100/15 Summer				97.717	-0.093
S21.001	S22	15 Winter	1	+0%	100/15 Summer				97.276	-0.094
S21.002	S23	15 Winter	1	+0%	30/15 Summer				97.179	-0.077
S22.000	S25	15 Winter	1	+0%	100/15 Summer				97.612	-0.138
S21.003	S26	360 Winter	1	+0%	2/240 Winter				97.131	-0.031

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Level Exceeded Status
S21.000	S2RE1	0.000	0.28			4.0	OK
S21.001	S22	0.000	0.30			4.0	OK
S21.002	S23	0.000	0.47			6.3	OK
S22.000	S25	0.000	0.31			15.2	OK
S21.003	S26	0.000	0.19		149	2.4	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 2 SW

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status OFF
 Inertia Status OFF

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, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S21.000	S2RE1	15 Winter	2	+0%	100/15 Summer				97.726	-0.084
S21.001	S22	15 Winter	2	+0%	100/15 Summer				97.285	-0.085
S21.002	S23	15 Winter	2	+0%	30/15 Summer				97.191	-0.064
S22.000	S25	15 Winter	2	+0%	100/15 Summer				97.625	-0.125
S21.003	S26	240 Winter	2	+0%	2/240 Winter				97.162	0.000

PN	US/MH Name	Flooded		Half Drain Pipe			Status	Level Exceeded
		Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Flow		
S21.000	S2RE1	0.000	0.37			5.2	OK	
S21.001	S22	0.000	0.38			5.1	OK	
S21.002	S23	0.000	0.61			8.1	OK	
S22.000	S25	0.000	0.40			19.5	OK	
S21.003	S26	0.000	0.21		136	2.6	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 2 SW

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status OFF
 Inertia Status OFF

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, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S21.000	S2RE1	15 Winter	30	+0%	100/15 Summer				97.757	-0.053
S21.001	S22	360 Winter	30	+0%	100/15 Summer				97.336	-0.034
S21.002	S23	360 Winter	30	+0%	30/15 Summer				97.333	0.077
S22.000	S25	15 Winter	30	+0%	100/15 Summer				97.672	-0.078
S21.003	S26	360 Winter	30	+0%	2/240 Winter				97.329	0.167

PN	US/MH Name	Flooded		Half Drain		Pipe	Level Exceeded
		Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	
S21.000	S2RE1	0.000	0.68			9.7	OK
S21.001	S22	0.000	0.15			2.1	OK
S21.002	S23	0.000	0.25			3.4	SURCHARGED
S22.000	S25	0.000	0.73			36.2	OK
S21.003	S26	0.000	0.23		230	2.9	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 2
SW

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status OFF
 Inertia Status OFF

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, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S21.000	S2RE1	15 Winter	100	+40%	100/15 Summer				98.281	0.471
S21.001	S22	480 Winter	100	+40%	100/15 Summer				97.732	0.362
S21.002	S23	480 Winter	100	+40%	30/15 Summer				97.730	0.474
S22.000	S25	15 Winter	100	+40%	100/15 Summer				98.163	0.413
S21.003	S26	480 Winter	100	+40%	2/240 Winter				97.727	0.565

PN	US/MH Name	Flooded		Half Drain		Pipe	Level Exceeded
		Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	
S21.000	S2RE1	0.000	1.18			16.8	FLOOD RISK
S21.001	S22	0.000	0.21			2.9	SURCHARGED
S21.002	S23	0.000	0.37			4.9	SURCHARGED
S22.000	S25	0.000	1.31			64.6	SURCHARGED
S21.003	S26	0.000	0.23		416	2.9	SURCHARGED

Technical Specification

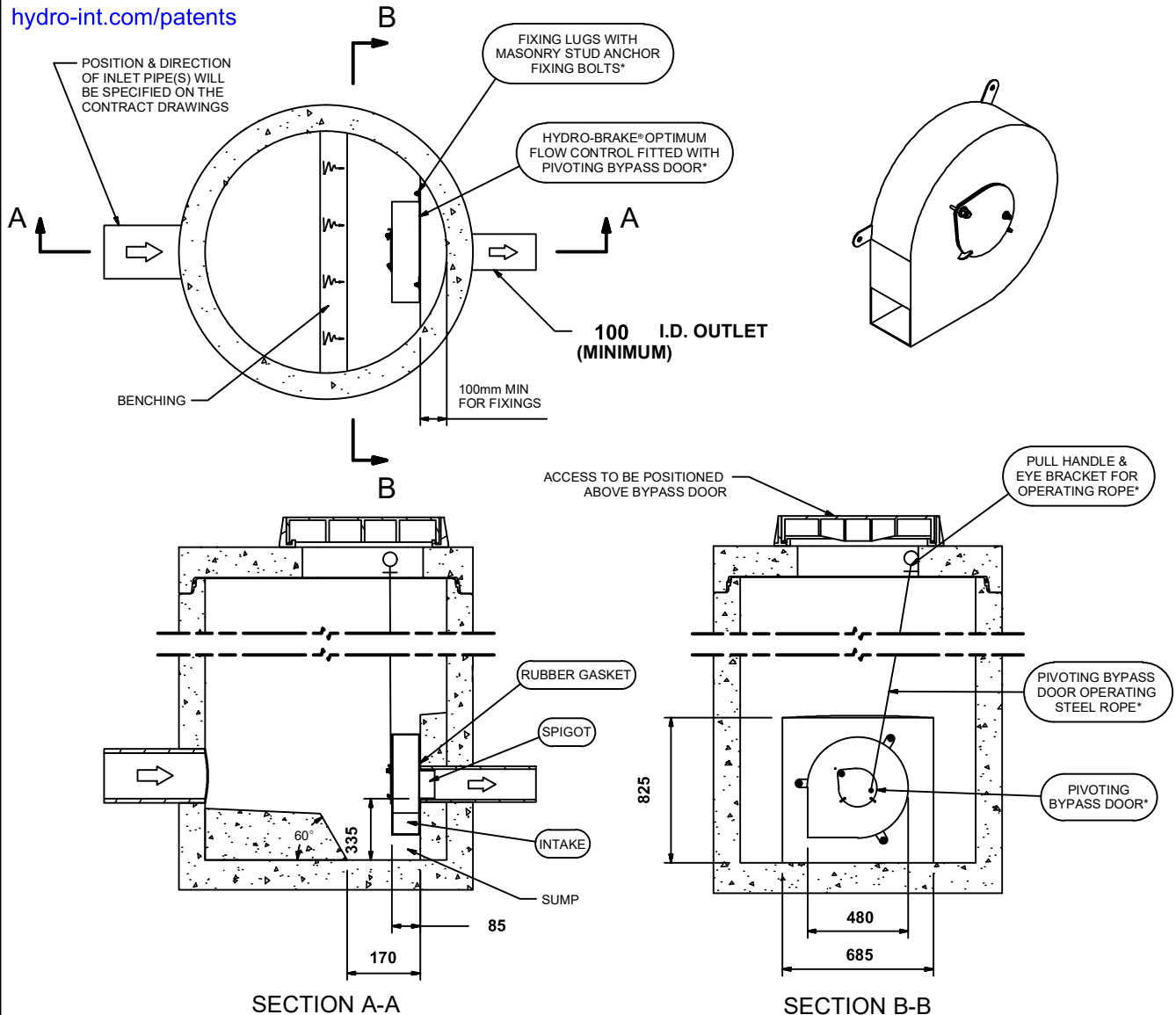
Control Point	Head (m)	Flow (l/s)
Primary Design	1.250	3.000
Flush-Flo™	0.344	2.863
Kick-Flo®	0.702	2.304
Mean Flow		2.558

Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet



hydro-int.com/patents



IMPORTANT: ○ LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW
 CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



The head/flow characteristics of this SHE-0079-3000-1250-3000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro
International®

DATE 1/7/2021 4:05 PM

SITE Sneckyeat Industrial Estate

DESIGNER Oliver Clark

REF 2020.221

SHE-0079-3000-1250-3000

Hydro-Brake® Optimum

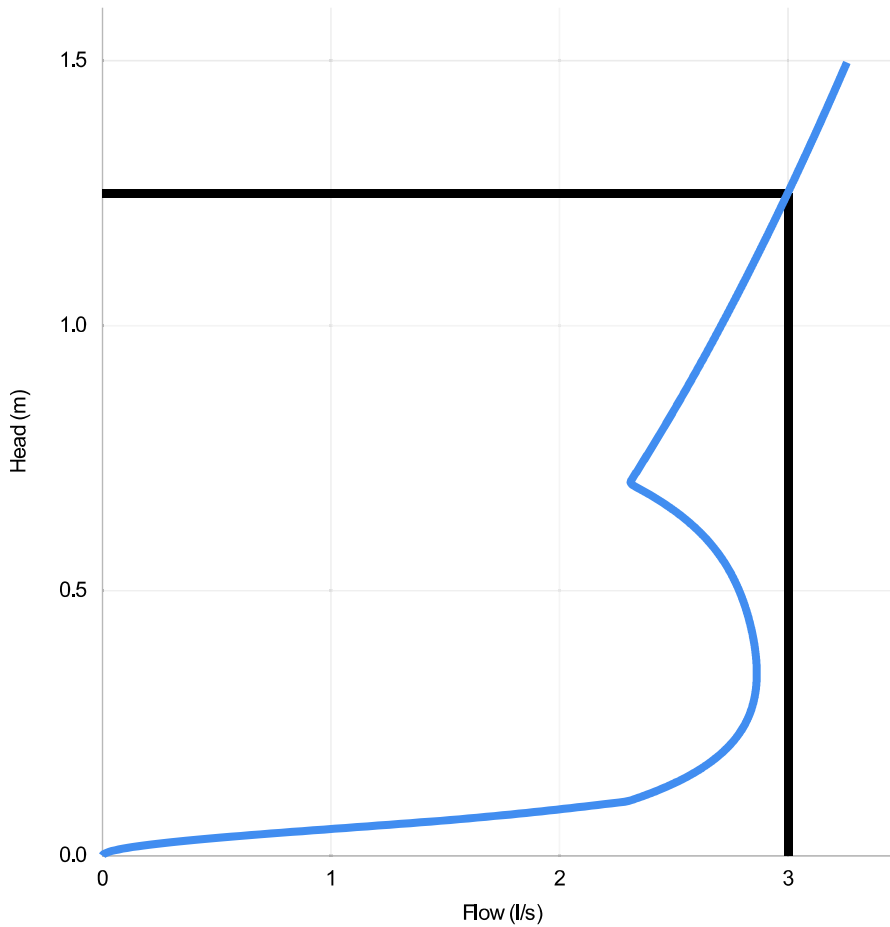
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.250	3.000
Flush-Flo	0.344	2.863
Kick-Flo®	0.702	2.304
Mean Flow		2.558



PT/329/0412

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Head (m)	Flow (l/s)
0.000	0.000
0.043	0.770
0.086	1.970
0.129	2.463
0.172	2.647
0.216	2.759
0.259	2.824
0.302	2.855
0.345	2.863
0.388	2.856
0.431	2.838
0.474	2.809
0.517	2.768
0.560	2.711
0.603	2.630
0.647	2.517
0.690	2.361
0.733	2.350
0.776	2.411
0.819	2.471
0.862	2.530
0.905	2.587
0.948	2.642
0.991	2.696
1.034	2.749
1.078	2.801
1.121	2.852
1.164	2.902
1.207	2.950
1.250	2.998

DESIGN ADVICE

The head/flow characteristics of this SHE-0079-3000-1250-3000 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.



The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.



DATE	07/01/2021 16:05
Site	Sneckyeat Industrial Estate
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