M & P Gadsden
Consulting Engineers Ltd

Drainage Strategy

Proposed Development

at Old Ironworks Site, Devonshire Road,

Millom, Cumbria

On Behalf of As If By Magic

Document Reference	**CN 19343**
Version	**V2**
Date Released	**26th March 2020**
Prepared By:	**Michael Gadsden BSc (Hons), MSc** 
Checked:	**Mark Gadsden BSc(Hons), CEng, MICE, MCIHT** 

1. Introduction

M&P Gadsden Consulting Engineers have been appointed to undertake the necessary drainage design work in support of the planning application for a proposed development at The Old Ironworks Site, Devonshire Road, Millom. The development (a revision of approval 4/16/2340/0F1) will include an assembly building, individual residential cabins, caravans, proprietors residence, restaurant, toilet blocks and offsite parking. A list of the appendices enclosed with this report are as follows:

- Appendix A - Drainage scheme drawings (including Hydro International drawings)
- Appendix B – Surface Water Maintenance Plan
- Appendix C – United Utilities Correspondence (July 2019 re: 4/16/2340/0F1)
- Appendix D – Proposed Drainage Design and Run Off Calculations

The Non-Statutory Technical Standards for Sustainable Drainage Systems published in March 2015 has been used as a basis for the design along with best practice guidance from Ciria SuDS Manual (C753).

2. Surface Water Discharge Destination

Planning Policy guidance suggests the following preferred hierarchy for surface water discharge: -

1. Into the ground (Infiltration)
2. To a surface water body;
3. To a surface water sewer;
4. To a combined sewer.

Seven percolation tests were undertaken from 17/09/2018 to 19/09/2018 by As If By Magic under the instruction of M & P Gadsden Consulting Engineers Ltd. Three holes were tested to the west of the highway, three on the eastern side of the main site and one in the proposed new car park area. The three to the west of the site remained full and therefore no percolation value was calculated and soakaways were discounted in this area. Of the three holes to the east, one remained full and the other two provided varying results. The test hole on the proposed new car park area provided results suitable to use infiltration techniques in this area. Soakaways were considered within the eastern side of the site however these were later discounted after a site walkover on a dry day, with several large

areas of standing water on the surface of the site. However parking areas will be permeable as they only serve a relatively small area and this more closely replicates the current situation.

There is an open watercourse to the west of the site running from north to south in the adjacent site, which discharges into Crook Pool. There is a United Utilities adopted surface water sewer within the site that runs along the existing highway on the northern boundary from east to west. It then turns through 90 degrees with the ex07-isting highway and runs from north to south before a further 90 degree turn just before the junction between the existing highway and Devonshire Road. From here the sewer runs from east to west across the application site into the adjacent field where it discharges into the watercourse.

It is proposed that all units will be served by geocellular attenuation baskets designed to attenuate for storms up to and including 1 in 100 years plus 40% climate change. The discharge will be restricted to 6l/s as agreed by United Utilities previously and will discharge into the existing surface water sewer, which in turn discharges into the open watercourse (refer to Appendix C).

The existing highway is to be removed; this will result in a reduction of impermeable area of approximately 800m^2 once the development is complete.

3. Technical Standards for SuDS

The Non-Statutory Technical Standards for Sustainable Drainage Systems has 14 points that have to be satisfied if they are applicable (S1 – S14).

- S1 – Uncontrolled surface water discharge - N/A
- S2 – Greenfield development runoff rate – The geocellular baskets will attenuate for up to a 1 in 100 year + 40% climate change rainfall event with a flow control restricting the discharge to the agreed rate with United Utilities.
- S3 – N/A
- S4 – Greenfield development volume control – The surface water is being throttled by a hydrobrake with a restricted discharge, the runoff volume will be reduced in comparison to the existing as the impermeable areas of the site are being reduced.
- S5 – Brownfield development volume control – N/A
- S6 – Volume control where S4 & S5 are not possible – N/A
- S7 – Flood risk within development (30 year storm) - the drainage system does not flood any part of the site during a 30 year storm condition. This is achieved using attenuation in the form a geocellular attenuation baskets.

- S8 – Flood risk within development (100 year storm) - no flooding will occur in any part of a building or utility plant during 100 year storm condition. This is achieved using attenuation in the form a geocellular attenuation baskets.
- S9 – Flood risk within development (exceedance routes) - the technical standards suggest "where practicable" exceedance routes for storms in excess of 100 years should be provided. In the event of a storm in excess of 100 years + 40% climate change, the flood would occur at the silt trap manholes or flow control manhole, before overspilling into the existing highway, Devonshire Road and ultimately ending up in the watercourse, Crook Pool.
- S10 – Structural Integrity - all drainage works have been specified in accordance with Sewers For Adoption.
- S11 - Structural Integrity - all drainage works have been specified in accordance with Sewers For Adoption.
- S12 – Pumping - N/A
- S13 – Construction (connection) – N/A.
- S14 – Construction (damage) – N/A

4. Foul Drainage

Foul drainage for the proposed development is to be served by UPVC pipes and discharge into the existing foul network present on site.

5. Maintenance

As If By Magic will be responsible for future management and maintenance of the surface water drainage system. Such maintenance will include removing debris, grass cuttings, litter and other items from gullies to downspouts and inspection chambers on a regular basis (or when required), to prevent blockages and allow water to enter the system.

The geocellular attenuation baskets require maintenance such as cleaning or replacing baskets and geotextile membrane surround if the performance deteriorates.

6. Conclusion

The proposed development can be drained effectively in line with the Non-Statutory Technical Standards for Sustainable Drainage Systems guidance. It is our professional opinion that the site is suitable for development from a drainage perspective.

Appendix A

M & P Gadsden
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NOTES

Rev.	Date.	Notes.	Init.

Client: As If By Magic,
Project: Drainage Design for Proposed Development @ Old Ironworks Site, Devonshire Road, Millom.

Notes.

Drawing Title. EXISTING DRAINAGE LAYOUT

Status. PLANNING

Date.	Drawn.	Scale.
25/01/2020	RB	1:500 - A1

Drawing No. 19343_PL01_01

Revision.

Drainage Strategy:

Surface Water:

All units to be served by geocellular attenuation baskets (see dwg 19343_PL01_04.1 and 04.2 for details) designed to attenuate for storms up to and including 100 year + 40% climate change return period. Attenuation of 68.4m³ with flow restricted to 6 l/s 100 year + 40% climate change return period, (118mm orifice - See Hydro International drawings for SHE-0118-6000-0800-6000) before discharging into existing UU adopted surface water sewer.

Foul Drainage:

Foul drainage to discharge into existing United Utilities foul network.

Maintenance:

Private foul and surface water (including attenuation baskets) drainage to be maintained by As If By Magic. See maintenance pack.

General Notes:

All work undertaken in accordance with sewers for adoption 6th edition "A Design & Construction Guide For Developers"

All new foul and surface water drains to be 150mm Ø unless specified.

Minimum gradients for surface water pipes:

- 1:100 for 100mm Ø
- 1:150 for 150mm Ø

Minimum gradients for foul drainage pipes:

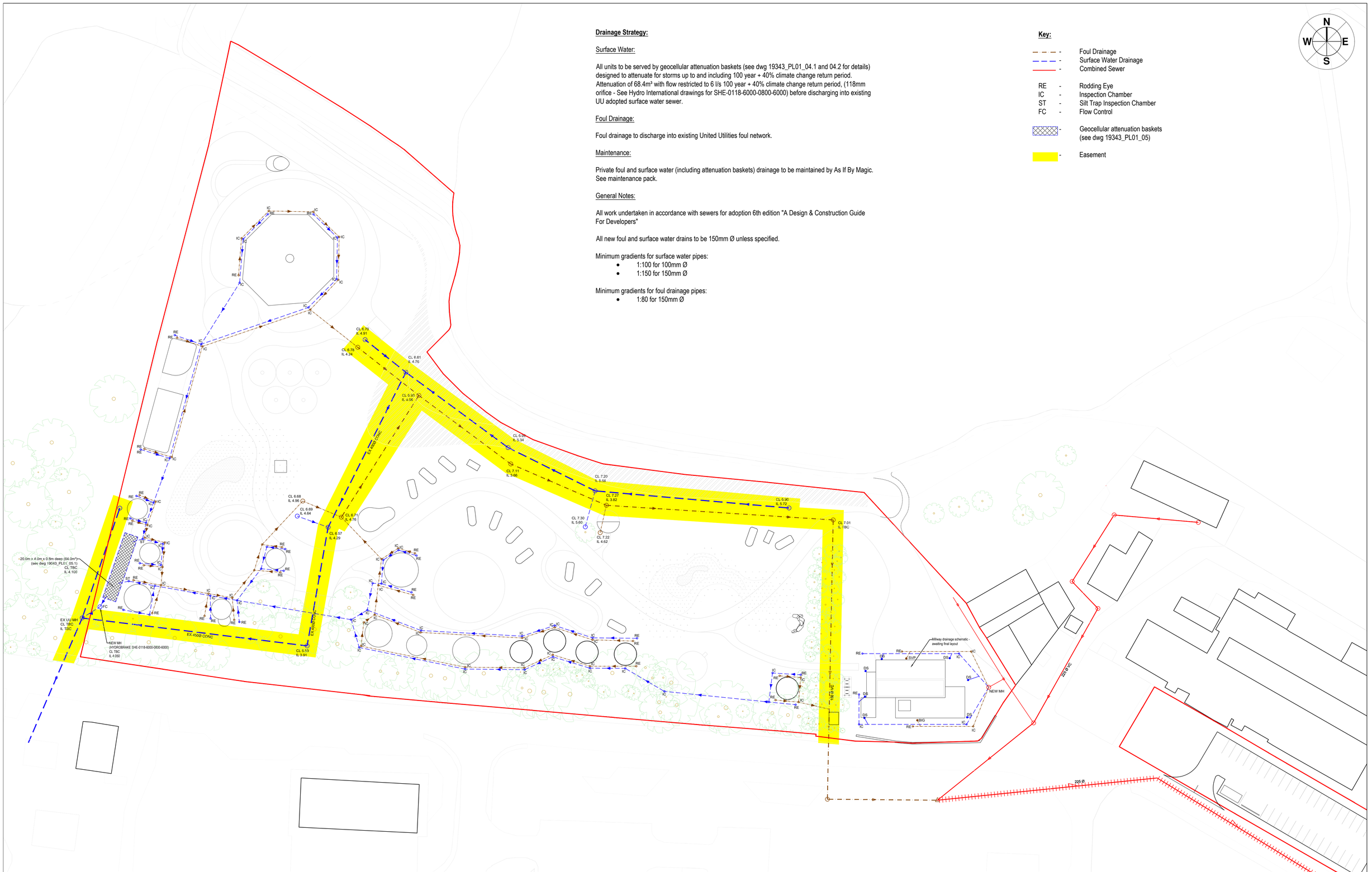
- 1:80 for 150mm Ø

Key:

- Foul Drainage
- Surface Water Drainage
- Combined Sewer

RE - Rodding Eye
IC - Inspection Chamber
ST - Silt Trap Inspection Chamber
FC - Flow Control

- Geocellular attenuation baskets (see dwg 19343_PL01_05)
- Easement



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Rev.	Date.	Notes.	Init.
A	26-03-20	Amended Layout	RB

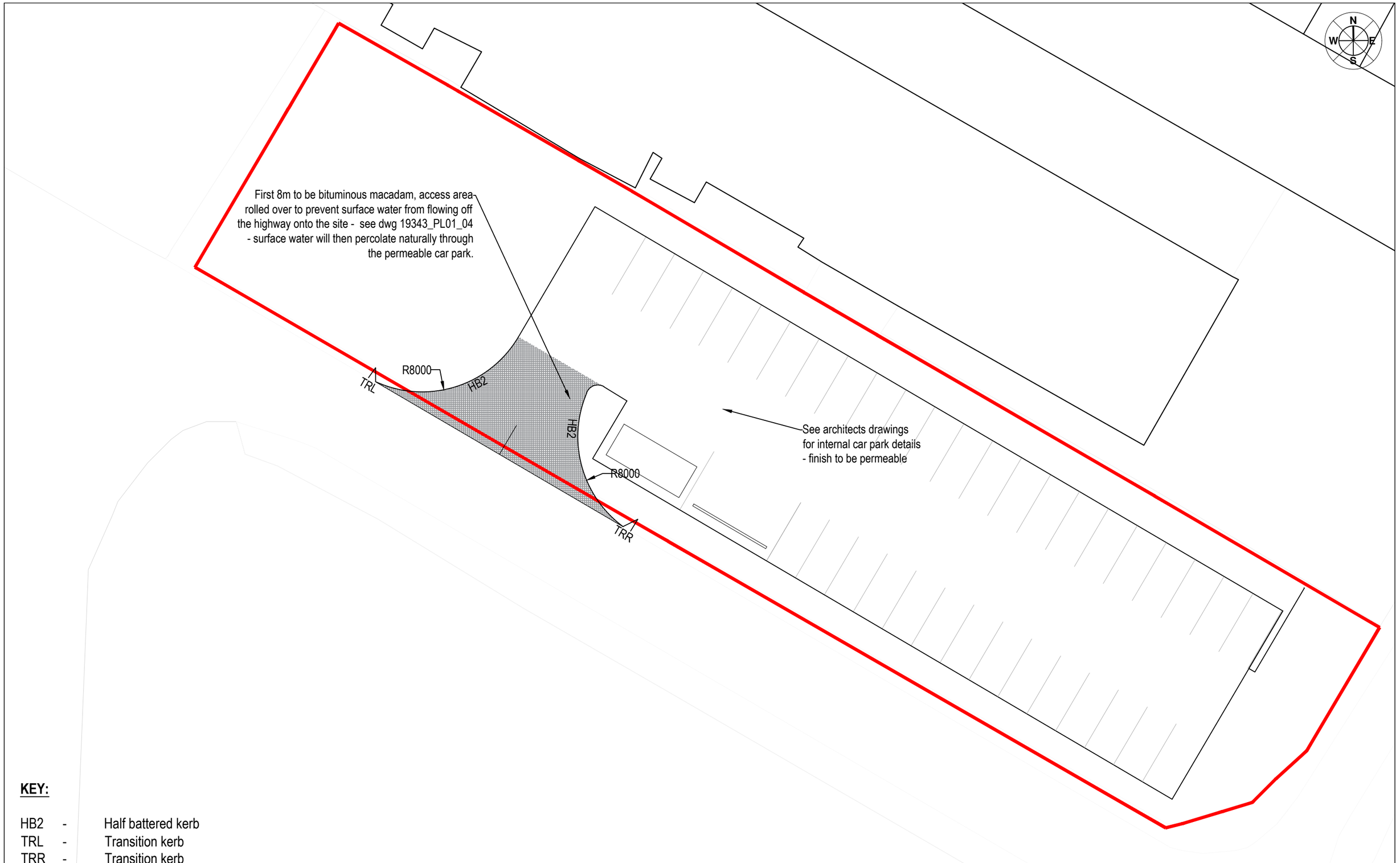
Client: As If By Magic,
Project: Drainage Design for Proposed Development @ Old Ironworks Site, Devonshire Road, Millom.

Drawing Title.
PROPOSED DRAINAGE LAYOUT

Status.
PLANNING

Date.	Drawn.	Scale.
25/01/2020	RB	1:500 - A1

Drawing No. 19343_PL01_02
Revision. A



KEY:

HB2	-	Half battered kerb
TRL	-	Transition kerb
TRR	-	Transition kerb

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A	26-03-20	Amended Layout	RB

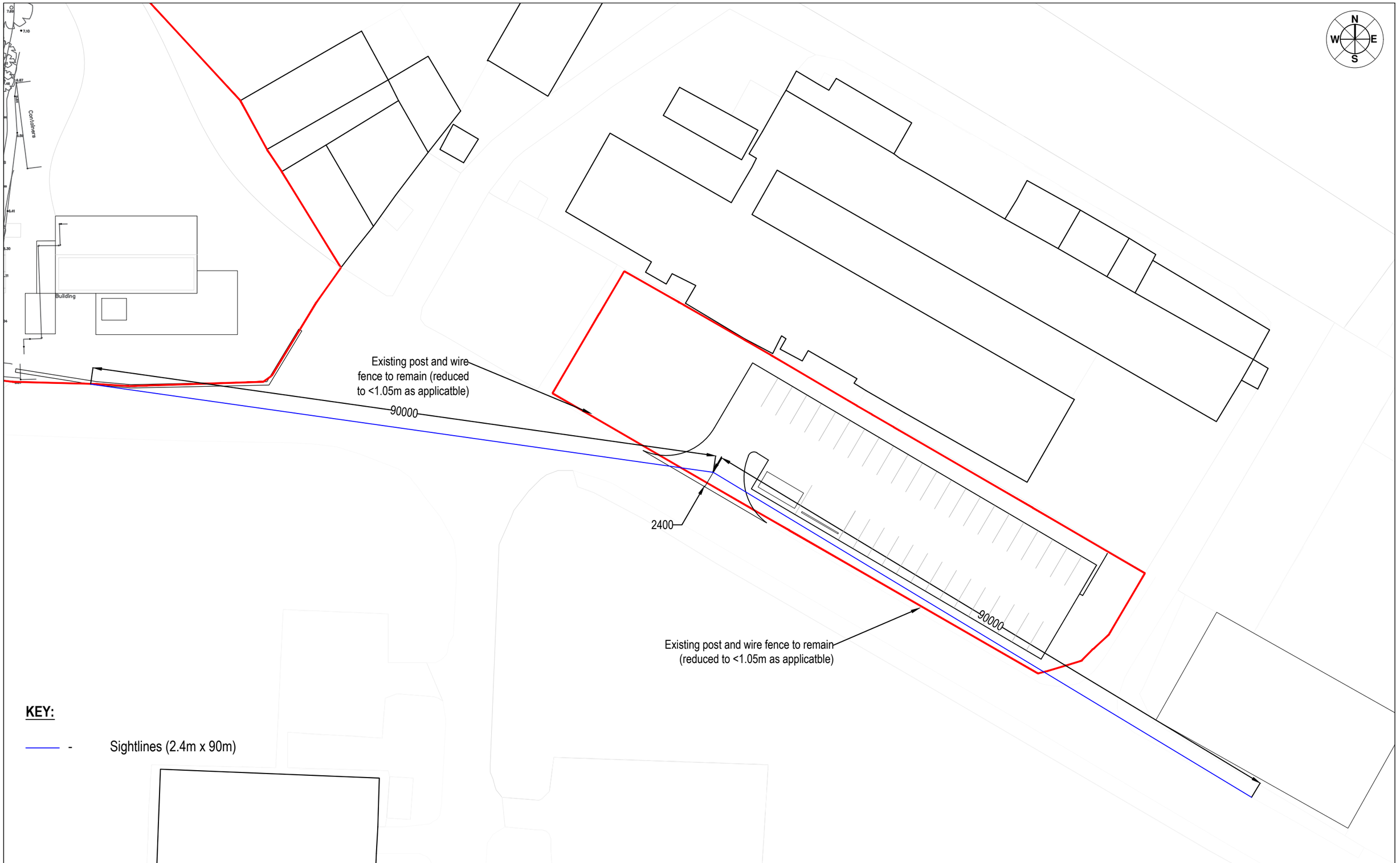
Client: As If By Magic,
Project: Drainage Design for Proposed Development @ Old Ironworks Site, Devonshire Road, Millom.

Drawing Title. PROPOSED ROAD LAYOUT

Status. PLANNING

Date. 25/01/2020 | Drawn. RB | Scale. 1:250 - A3

Drawing No. 19343_PL01_03 | Revision. A



KEY:

——— - Sightlines (2.4m x 90m)

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A	26-03-20	Amended Layout	RB

Client: As If By Magic,
Project: Drainage Design for Proposed Development @ Old Ironworks Site, Devonshire Road, Millom.

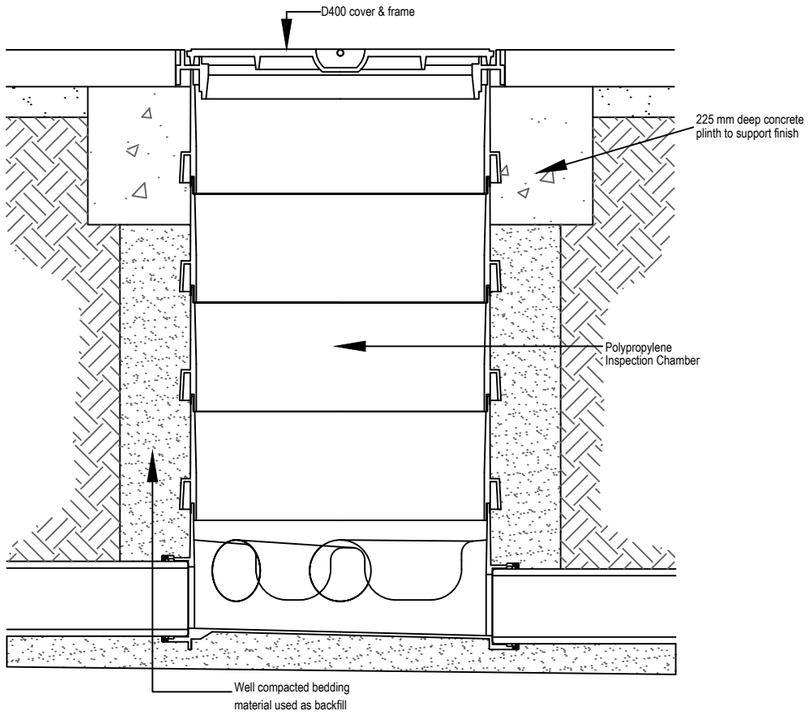
Drawing Title. PROPOSED SIGHTLINES

Status. PLANNING

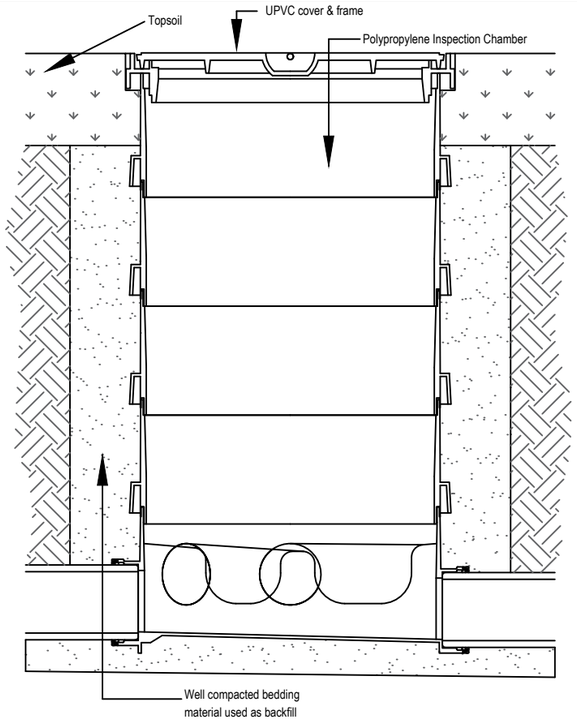
Notes.

Date.	Drawn.	Scale.
25/01/2020	RB	1:500 - A3

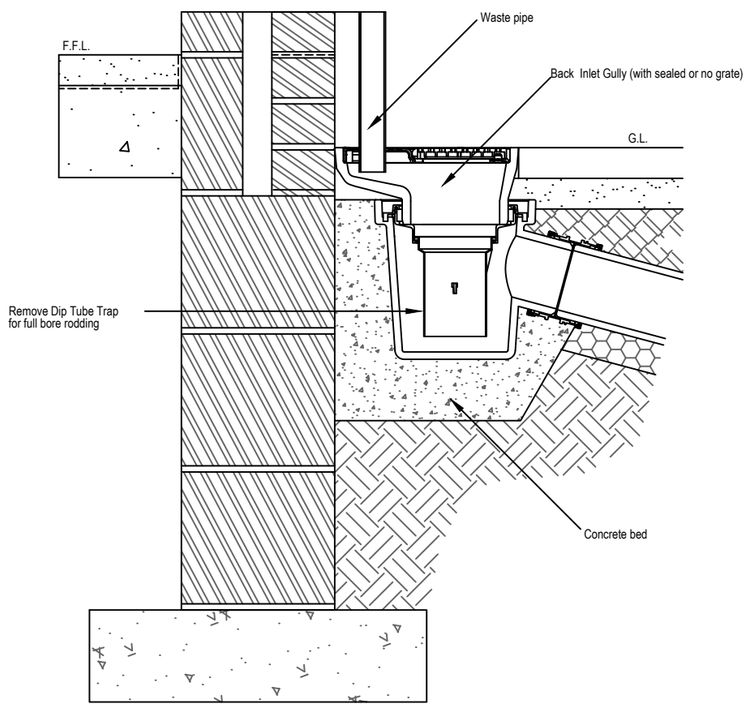
Drawing No.	Revision.
19343_PL01_04	A



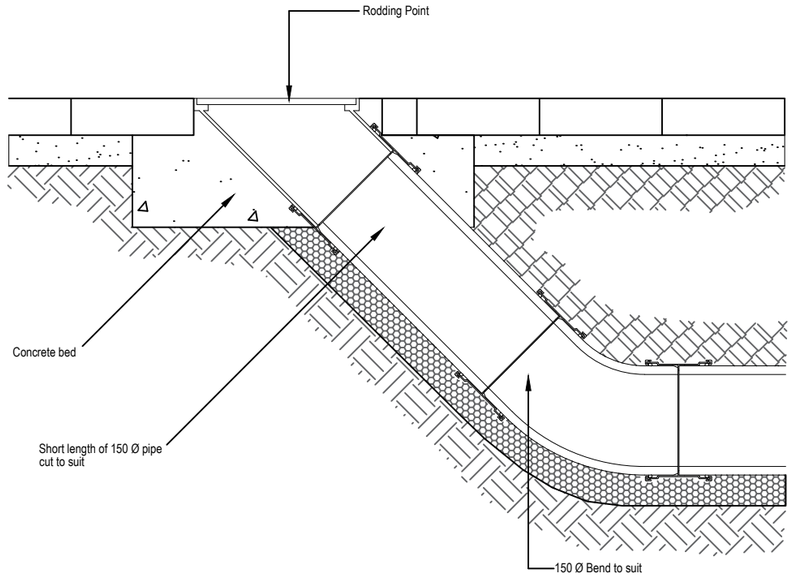
Typical Inspection Chamber Sited in driveways / hard landscaped areas with standard round cover



Typical Inspection Chamber Sited in soft landscaped areas with standard round cover



Typical Back Inlet Gulley Detail



Typical Rodding Eye Detail

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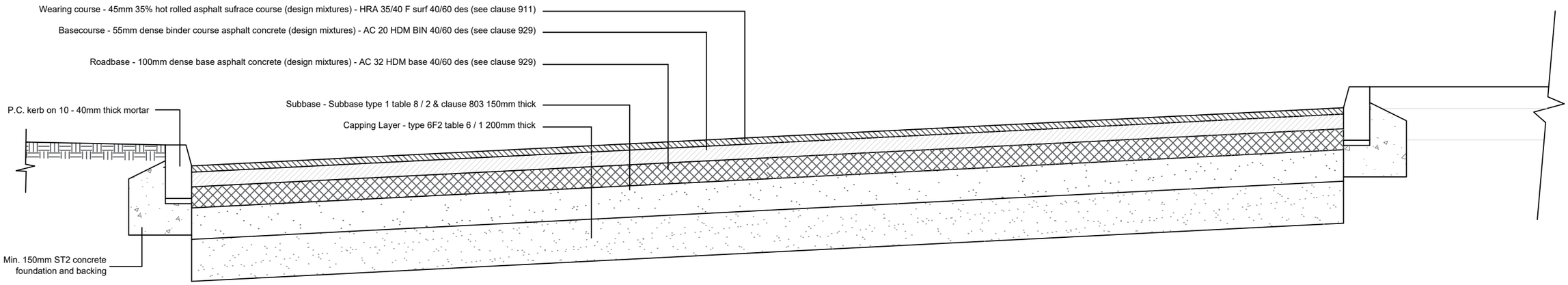
Drawing Title. TYPICAL CONSTRUCTION DETAILS (2)

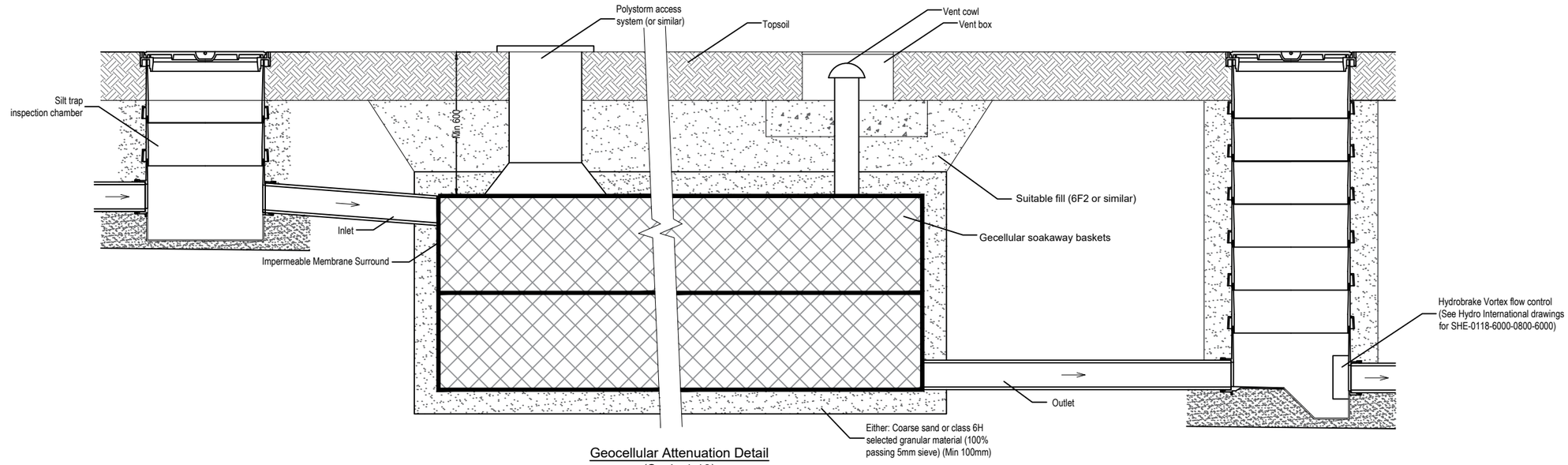
Status. PLANNING

Date. 25/01/2020 | Drawn. RB | Scale. 1:10 - A3

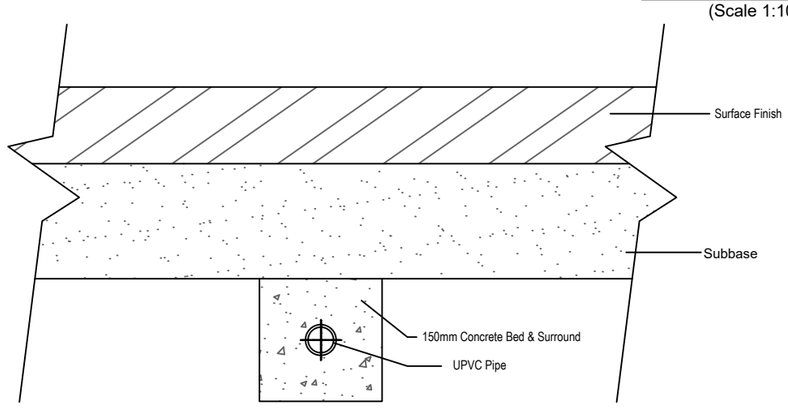
Drawing No. 19343_PL01_05.2 | Revision.



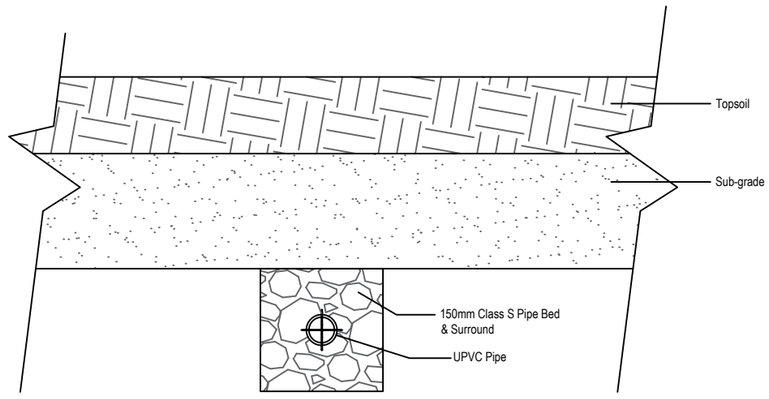
Car Park Entrance Construction Detail



Geocellular Attenuation Detail
(Scale 1:10)



Type 1 Pipe Detail
(<1m deep in vehicle areas)
(<0.6m deep in grassed areas)



Type 2 Pipe Detail
(>1m deep in vehicle areas)
(>0.6m deep in grassed areas)

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Rev.	Date.	Notes.	Init.

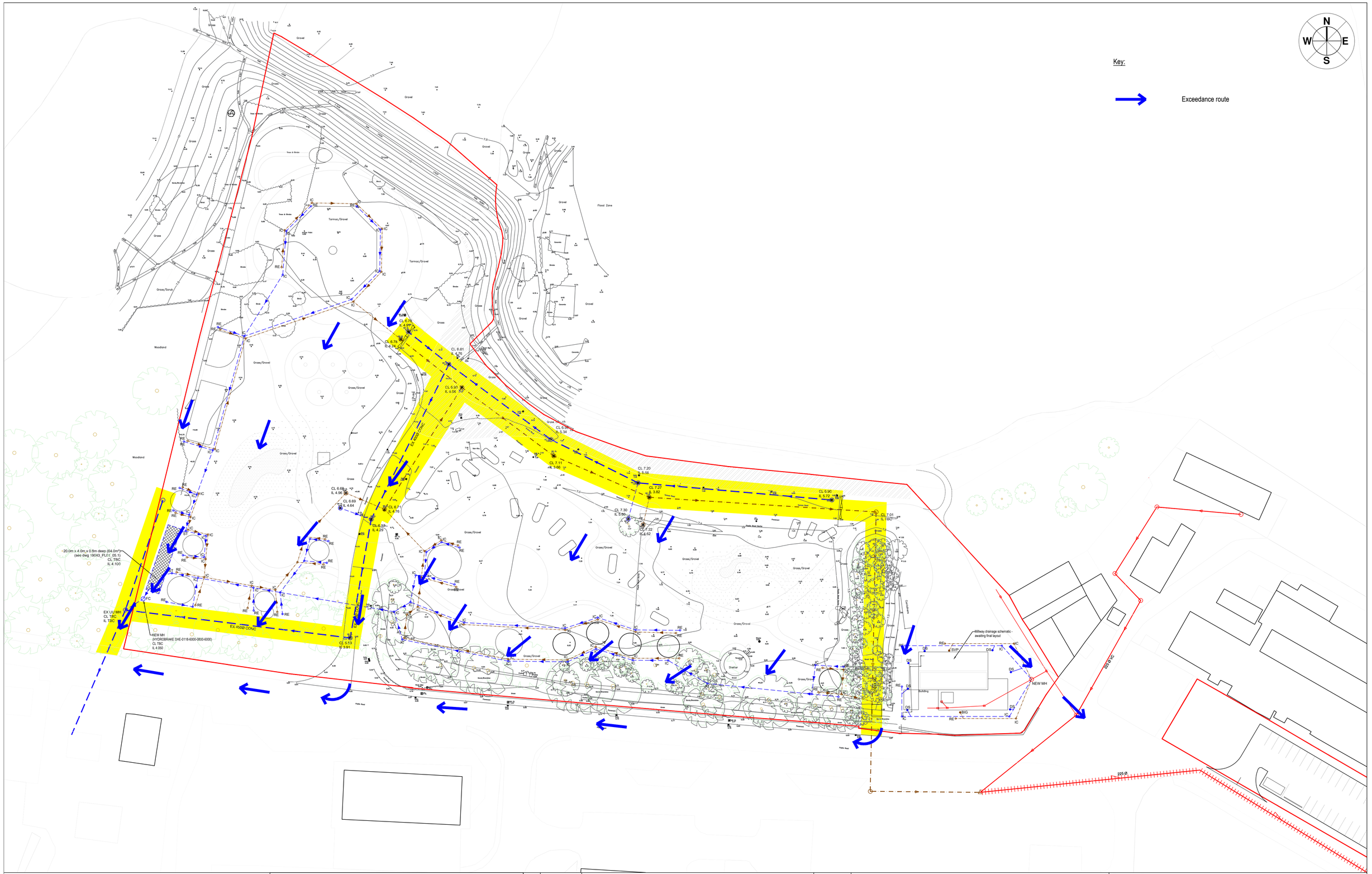
Client: As If By Magic,
Project: Drainage Design for Proposed Development @ Old Ironworks Site, Devonshire Road, Millom.

Drawing Title.
TYPICAL CONSTRUCTION DETAILS (1)

Status.
PLANNING

Date.	Drawn.	Scale.
25/01/2020	RB	1:20 - A3

Drawing No. 19343_PL01_05.1
Revision.



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Client: As If By Magic,
Project: Drainage Design for Proposed Development @ Old Ironworks Site, Devonshire Road, Millom.

Drawing Title.
EXCEEDANCE ROUTE

Status.
DRAFT

Date.	Drawn.	Scale.
25/01/2020	RB	1:500 - A1

Drawing No. 19343_PL01_06
Revision. A

Appendix B

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M & P Gadsden
Consulting Engineers Ltd

Sustainable Drainage Maintenance Plan

Development at Old Ironworks Site, Devonshire Road, Millom, Cumbria

1.0 Introduction

Sustainable drainage systems or SuDS are an environmentally friendly approach to managing rainfall that uses the landscape. SuDS aim to: -

- Control the flow, volume and frequency of water leaving a development site
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces
- Provide attractive surroundings for the community
- Create opportunities for wildlife

2.0 Surface water drainage & SuDS serving this development

Surface water from all units are served by geocellular attenuation baskets throttled to restrict the discharge rate before entering the adopted sewer. As the site owner you are responsible for maintenance and upkeep of the system serving the site.

The attenuation baskets are key to draining surface water from the site and the system should therefore be maintained regularly. The area in which it is located should remain as originally constructed.

Silt traps and trapped gullies protect the system from silting and blocking up as well as enhancing water quality. These features are key to ensuring the systems longevity. SuDS features should not be interfered with in any fashion without the prior approval of the Lead Local Flood Authority (Cumbria County Council).

3.0 Management & Maintenance

The surface water drainage and SuDs requiring management and maintenance for this site are summarised in Table 1 below: -

Table 1 – Householder Maintenance Schedule

Maintenance Item	Regularity	Action	Purpose	Diagram
Gullies to downspouts	Monthly	Remove litter, grass cuttings and other vegetation from the gulley grate	Prevent grate/cover becoming blocked allowing water to get away	
Gullies to downspouts	Annually	Remove debris, grass cuttings etc from inside the gulley itself. This can be easily done by lifting the cover and cleaning out the gulley by hand wearing a suitable pair of gloves	Prevent the trap filling up and debris entering the soakaway system	
Geocellular Attenuation Baskets	Quarterly or As Required	-Visually inspect to assess silt build up and jet as required.	Prevent silt/sediment build up affecting the efficiency of the system, water quality and attenuation capacity	
Permeable Parking Areas (either paved or chippings)	Monthly	Remove litter, grass cuttings and other vegetation from the surface	Prevent blockages within the openings that allowing water to get away	
Permeable Parking Areas (either paved or chippings)	As required	- Lift paving, replace sub-base layer below and reinstate - Replace clogged geotextile membrane	On failure or deterioration of performance to ensure adequate infiltration (and voids in sub-base)	

Silt Trap Manhole and Inspection Chambers	Quarterly	-Remove silt from base of silt trap manhole	Prevent silt trap filling up and debris entering the system	
Hydrobrake Manhole	Monthly	- Visually inspect to assess silt build up and clean as necessary	Prevent the orifice from blocking and system failure	

Appendix C

From: Wong , Josephine <Josephine.Wong@uuplc.co.uk>
Sent: 29 July 2019 13:16
To: Mike Gadsden <Mike@mpg-consulting.co.uk>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: FW: OLD IRONWORKS SITE, DEVONSHIRE ROAD, MILLOM Consultation on Application to Discharge Conditions UU ref: 4200026360

Good afternoon, Mike

Copeland Planning ref: 4/16/2340/0F1
Proposal: OLD IRONWORKS SITE, DEVONSHIRE ROAD, MILLOM Consultation on Application to Discharge Conditions
UU References: DC/19/1383, 4200026360

As discussed this afternoon, surface water from the whole development can drain to the 450mm diameter surface water sewer crossing the site at a maximum pass forward flow of 6 l/s for any storm event.

Please submit the revised drainage layout and the Drainage Strategy Report for our assessment.

Should you have any query, please feel free to contact me.

Many thanks.

Josephine Wong
Wastewater Development Engineer
Developer Services
Network Delivery
United Utilities
T: 01925 679 406 (internal 79406)
Email: josephine.wong@uuplc.co.uk
unitedutilities.com

Appendix D

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Rob Bruce
Site name:	Millway
Site location:	Devonshire Road, Millom

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	54.20762° N
Longitude:	3.25359° W

Reference:	6508389
Date:	2018-12-20T07:32:04

Methodology	IH124

Site characteristics

Total site area (ha)	0.1864

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	4	4
HOST class	---	---
SPR/SPRHOST	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm)	1040	1040
Hydrological region	10	10
Growth curve factor: 1 year	0.87	0.87
Growth curve factor: 30 year	1.7	1.7
Growth curve factor: 100 year	2.08	2.08

Notes:

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

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

Where flow rates are less than 5.0 l/s consents are usually set at 5.0l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

(3) Is SPR/SPRHOST ≤ 0.3?

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	1.43	1.43
1 in 1 year (l/s)	1.24	1.24
1 in 30 years (l/s)	2.43	2.43
1 in 100 years (l/s)	2.97	2.97

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	17.700	Add Flow / Climate Change (%)	0
Ratio R	0.288	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	75	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)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.099	4-8	0.046

Total Area Contributing (ha) = 0.145

Total Pipe Volume (m³) = 1.789

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	35.000	0.350	100.0	0.145	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	10.000	0.100	100.0	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	50.81	5.45	5.150	0.145	0.0	0.0	0.0	1.31	52.0	20.0
1.001	50.36	5.57	4.100	0.145	0.0	0.0	0.0	1.31	52.0	20.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	6.300	1.150	Open Manhole	1200	1.000	5.150	225				
S2	6.300	2.200	Open Manhole	400	1.001	4.100	225	1.000	4.800	225	700
OUTFALL	50.000	46.000	Open Manhole	1200		OUTFALL		1.001	4.000	225	

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	225	S1	6.300	5.150	0.925	Open Manhole	1200
1.001	o	225	S2	6.300	4.100	1.975	Open Manhole	400

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	35.000	100.0	S2	6.300	4.800	1.275	Open Manhole	400
1.001	10.000	100.0	OUTFALL	50.000	4.000	45.775	Open Manhole	1200

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)
1.001	OUTFALL	50.000	4.000	47.350	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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)	19.000	Storm Duration (mins)	30
Ratio R	0.200		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S2, DS/PN: 1.001, Volume (m³): 1.6

Unit Reference	MD-SHE-0118-6000-0800-6000
Design Head (m)	0.800
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	118
Invert Level (m)	4.100
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	6.0	Kick-Flo®	0.543	5.0
Flush-Flo™	0.244	6.0	Mean Flow over Head Range	-	5.1

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	4.2	0.800	6.0	2.000	9.2	4.000	12.8	7.000	16.7
0.200	5.9	1.000	6.7	2.200	9.6	4.500	13.5	7.500	17.3
0.300	5.9	1.200	7.2	2.400	10.0	5.000	14.2	8.000	17.8
0.400	5.8	1.400	7.8	2.600	10.4	5.500	14.9	8.500	18.3
0.500	5.4	1.600	8.3	3.000	11.2	6.000	15.5	9.000	18.9
0.600	5.3	1.800	8.8	3.500	12.0	6.500	16.1	9.500	19.4

Storage Structures for Storm

Cellular Storage Manhole: S2, DS/PN: 1.001

Invert Level (m) 4.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	80.0	0.0	0.800	80.0	0.0	0.801	0.0	0.0

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 Coeffiecient	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)	19.000
Region	England and Wales	Ratio R	0.200
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status ON
DTS 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)	100
Climate Change (%)	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)	Flooded Volume (m³)
1.000	S1	15 Winter	100	+40%	100/15 Summer				5.599	0.224	0.000
1.001	S2	180 Winter	100	+40%	100/15 Summer				4.879	0.554	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	1.28		62.8	SURCHARGED	
1.001	S2	0.14		5.9	SURCHARGED	

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.800	6.000
Flush-Flo	0.244	5.976
Kick-Flo®	0.543	5.016
Mean Flow		5.134

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

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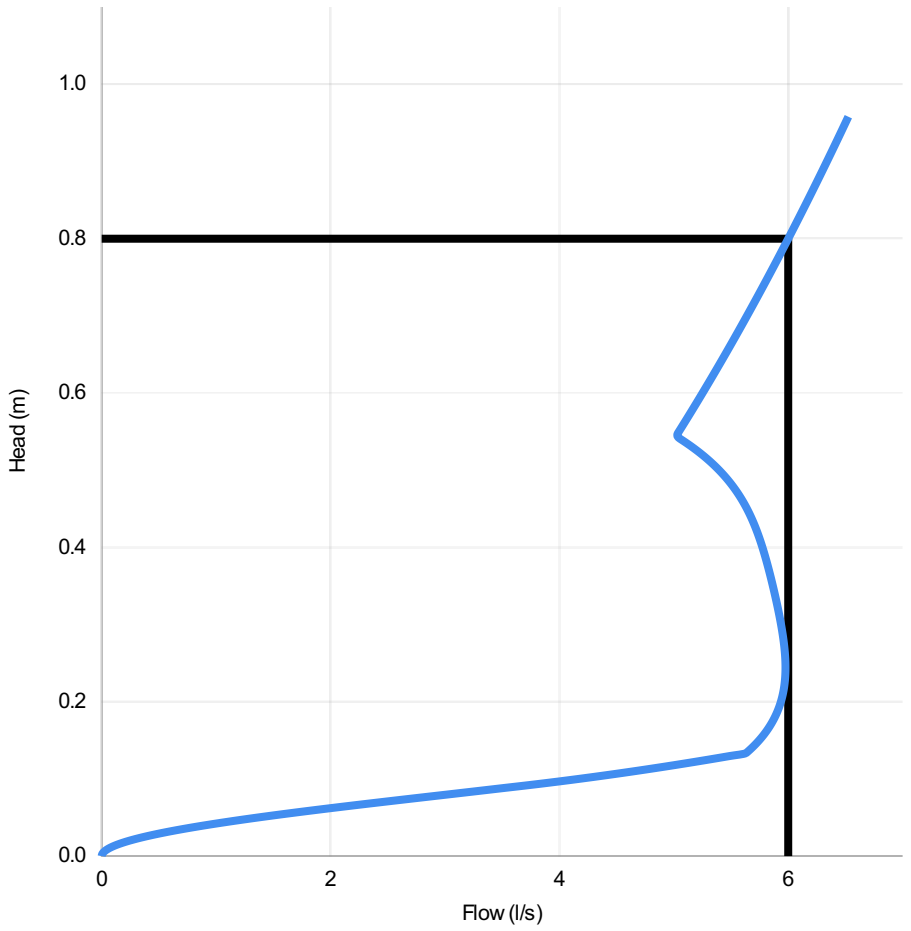

Head (m)	Flow (l/s)
0.000	0.000
0.028	0.449
0.055	1.624
0.083	3.194
0.110	4.669
0.138	5.666
0.166	5.826
0.193	5.920
0.221	5.966
0.248	5.976
0.276	5.962
0.303	5.933
0.331	5.895
0.359	5.852
0.386	5.802
0.414	5.744
0.441	5.668
0.469	5.565
0.497	5.419
0.524	5.214
0.552	5.051
0.579	5.166
0.607	5.279
0.634	5.388
0.662	5.496
0.690	5.600
0.717	5.703
0.745	5.804
0.772	5.903
0.800	6.000

DESIGN ADVICE

The head/flow characteristics of this SHE-0118-6000-0800-6000 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	25/01/2020 20:27
Site	As If By Magic
DESIGNER	Michael Gadsden
Ref	19343

SHE-0118-6000-0800-6000

Hydro-Brake Optimum®

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.800	6.000
Flush-Flo™	0.244	5.976
Kick-Flo®	0.543	5.016
Mean Flow		5.134

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

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

WRc Approved PT/329/0412

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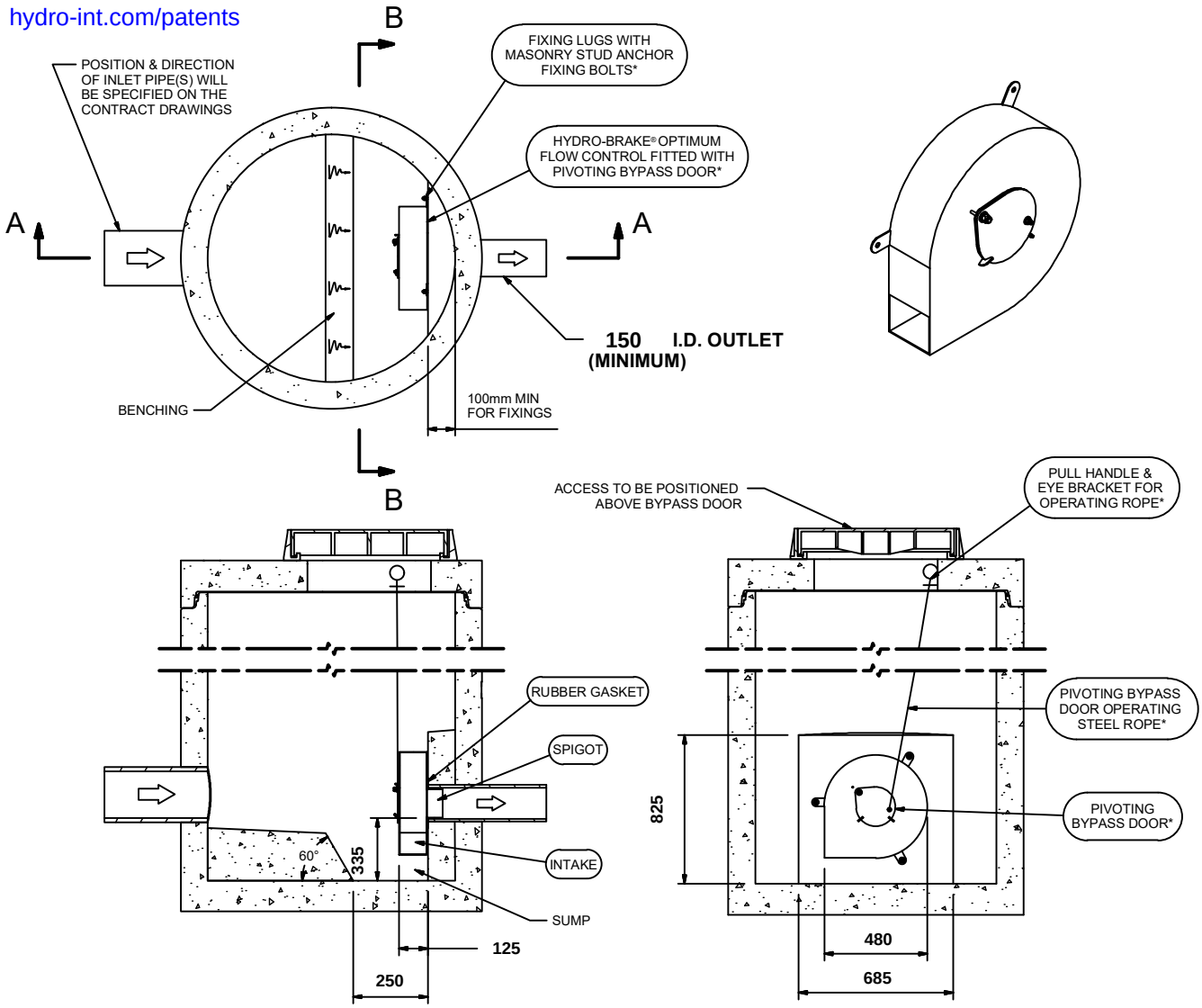

SECTION A-A

SECTION B-B

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-0118-6000-0800-6000 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®

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SITE	As If By Magic
DESIGNER	Michael Gadsden
REF	19343

SHE-0118-6000-0800-6000
Hydro-Brake® Optimum

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