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FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

Client:	Jim Pigott
Site Address:	Pigotts Autoparts, Sheriff Hutton Road, Strensall, YO32 5XH
Project Number:	21273
Report Reference (Revision):	FRA01 (A)
Date:	January 2024

CONTENTS

APPENDICES

Revision	Date	Author	Checked by;	Comments
-	03.11.21	George Dermentzoglou	Seb Reid	Initial issue
	29.01.24	George Dermentzoglou	Andy Walker	Section 12 & Appendices C and D updated

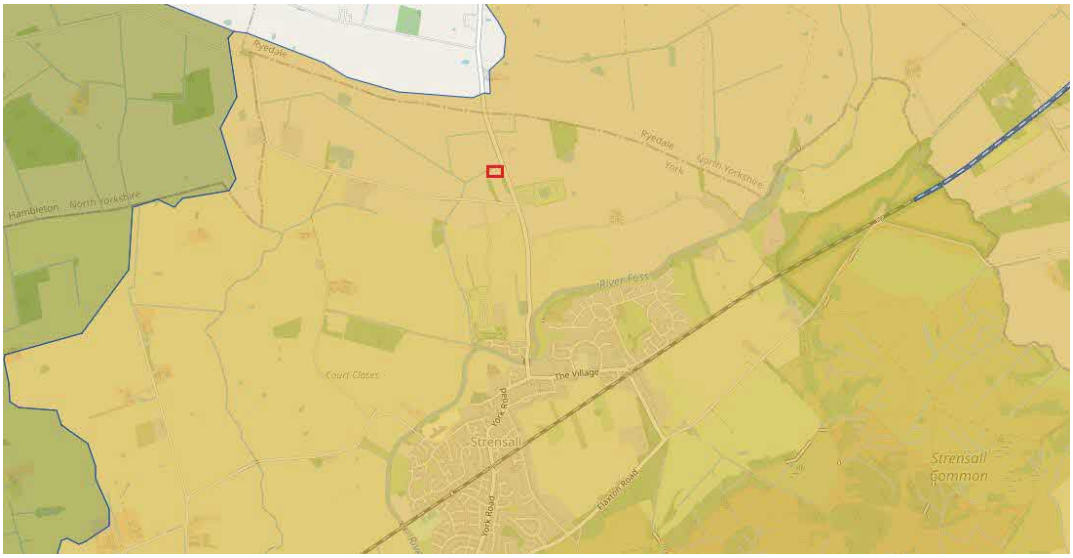
1.0 INTRODUCTION

1.1 Dudley's Consulting Engineers have prepared this site-specific Flood Risk Assessment and Drainage Strategy for a proposed residential development located 1km north of Strensall, in North Yorkshire.

1.2 The assessment investigates the potential flood risk impacts of the proposed redevelopment in accordance with the National Planning Policy Framework (NPPF) and supporting Planning Practice Guidance. This FRA is considered proportionate to the degree of flood risk and to the scale, nature and location of the development, and has been prepared in accordance with non-statutory technical standards for sustainable drainage, published March 2015, planning policy guidance, NPPF climate change allowances updated in 2022, and is compliant with updates to NPPF Policy, which was recently revised in December 2023.

2.0 CONSULTATION AND EVIDENCE

2.1 The development is located within the Foss Internal Drainage Board area as shown in the image below. Historically, the site discharges unrestricted into an existing ditch, along the northern boundary, which then discharges into River Foss at a location 1km to the south.



2.2 Planning policy requires that the site be developed in accordance with NPPF requirements in terms of flood risk management, climate change allowances and reduced runoff from the development. City of York Council SuDS Guidance states that for minor developments (less than 10 residential properties) a higher discharge rate than the greenfield can be proposed to achieve the minimum 75mm orifice for the flow control unit, which results to a flow rate of 3.0 l/s.

2.3 On the above basis, a climate change factor of 40%, a reduction of the existing runoff to 3.0 l/s and an attenuation system to ensure that runoff from the site in the 1:100 + climate change event is managed and stored within the site, will be considered in the drainage strategy.

3.0 SITE DESCRIPTION

3.1 The existing site is an autoparts, car sales and scrap yard located about 1km north of Strensall. It is bounded with Sheriff Hutton Road to the east, an existing drain and greenfields to the north, and greenfield areas to the west and south. A location site map view can be found below.

3.2 The site is overall flat with couple of buildings and most of the area is covered with scrap vehicles. Along the north boundary of the site there is an existing ditch which is under the Foss Internal Drainage Board ownership. There are three existing connections from the site into this ditch and the adjacent ditch on the east boundary. One connection for the treated foul water to the ditch at the north and two connections for the surface water to the ditch at the east.

3.3 The existing site Topographic Survey is included in Appendix A. The plan shows that the existing ground levels are around 19.40 - 19.60 to the east and 19.20 - 19.40 to the west of the site. The survey does not indicate any levels of the existing ditch at the eastern boundary and the IDB ditch at the northern boundary however, is assumed that the eastern ditch discharges into the main ditch at the northeast corner of the site.

3.4 For the purposes of the proposed drainage strategy, the existing bed levels of the drain and ditch have been assumed using lidar data which indicated the invert levels for the 2no proposed locations.

4.0 SITE PROPOSALS

4.1 The proposed development layout can be found in Appendix C. The proposals include the erection of 6no dwellings, 3 large and 3 small, with associated car parking bays. The existing entrance will be retained with a new access road to be constructed. Please refer to the snapshot below.

4.2 The car parking bays and part of the turning head are proposed to be permeable paving construction, with either porous tarmac or block paving finish. The total site area is 5,000m^2 with an impermeable area of 1,250m^2 including plots and surrounding paths, of which 230m^2 will be permeable pavement. The remainder area will be soft landscape with proposed and existing trees.

4.3 A 9.0m wide easement is proposed from the top of the ditch embankment along the northern boundary of the site in accordance with the Foss Internal Drainage Board Byelaws and Guidance.

5.0 FLOOD RISK VULNERABILITY

5.1 The Flood Risk Vulnerability Classification has been determined in accordance with Planning Practice Guidance, Flood Risk and Coastal Change. For multi-occupancy sites, the Flood Risk Vulnerability should be based upon the most vulnerable part of the site.

5.2 The Flood Risk Vulnerability Classification is **'**More Vulnerable**'**. This classification includes 'Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.

6.0 FLOOD ZONE COMPATABILITY

6.1 The Flood Zone Compatibility has been reviewed in accordance with Planning Practice Guidance, Flood Risk and Coastal Change, paragraph 067.

Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Key:

✓Development is appropriate

✗Development should not be permitted

6.2 The site is located within Flood Zone 1 with a very low risk of flooding, as it is indicated in the Environment Agency Flood Zone map which can be found in Appendix B.

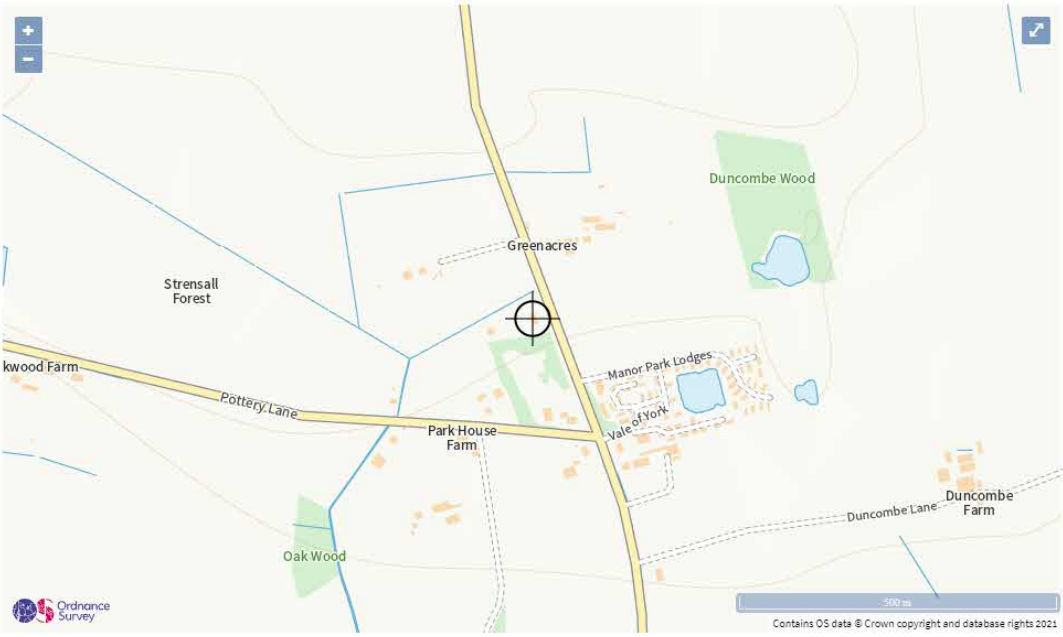
6.3 The vulnerability classification is 'More Vulnerable'. The scheme proposal therefore does not require an Exception Test in accordance with Planning Practice Guidance.

7.0 FLUVIAL FLOODING (RIVERS AND SEA)

7.1 Fluvial flooding occurs when high flows exceed the capacity of the river channel and spill out onto the floodplain, usually after a period of prolonged or heavy rainfall.

7.2 The Environment Agency Flood Map (rivers and sea) shows that the development is located in a 'very low' area having a less than 1 in 1,000 annual probability of river flooding. It is shown as 'clear' on the map below.

7.3 Therefore, there is very low flooding risk from the adjacent rivers and watercourses.



Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

8.0 PLUVIAL FLOODING (SURFACE WATER)

8.1 The Environment Agency Flood Map showing Risk of Flooding from Surface Water is shown below. This type of flooding can be difficult to predict, much more so than river or sea flooding as it is hard to forecast exactly where or how much rain will fall in any storm.

8.2 The map indicates that the site generally has a 'very low' chance of flooding from surface water indicating a probability of flooding is less than 1 in 1,000. The site has no flow paths across the site shown on EA mapping and any potential risk is located within the drain and ditch embankments.

8.3 The proposed redevelopment should ensure that surface water is managed across the site preventing ponding or flooding due to surface water. As the existing ground levels are to be retained, the risk of flooding to the proposed development is deemed to be unchanged.

Extent of flooding from surface water

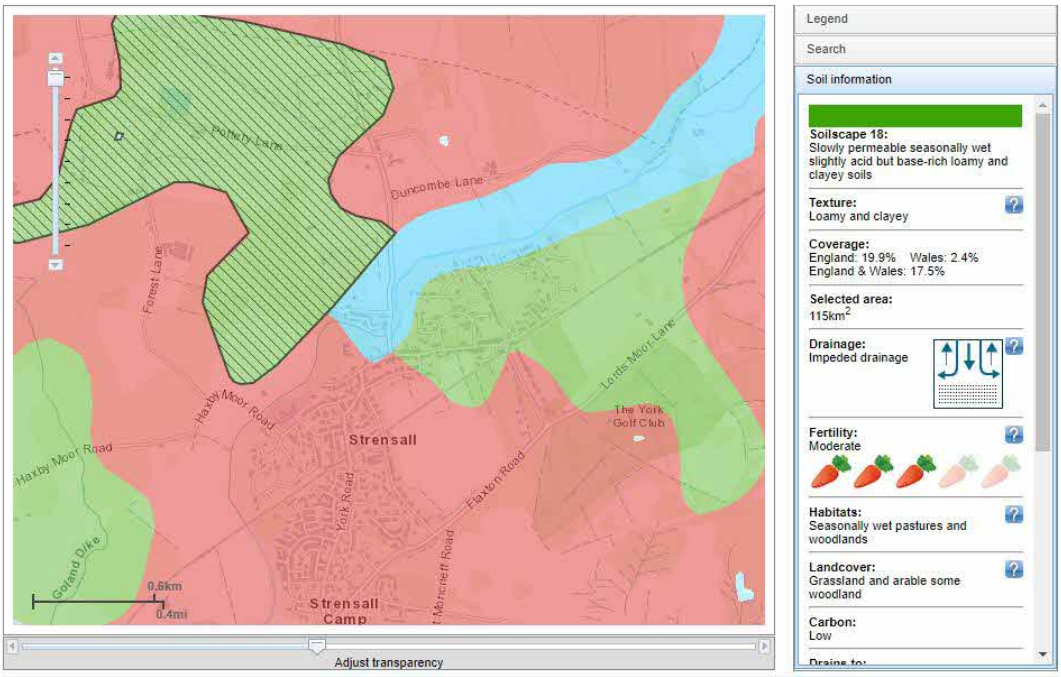
High Medium Low Very low Location you selected

9.0 GROUNDWATER FLOODING

9.1 Groundwater flooding occurs when water levels in the ground rise above surface levels this is more likely to occur in low lying areas.

9.2 The geology maps available from the British Geological Survey show that the solid geology underlying the site is Mercia mudstone formation with clay and silty deposits.

9.3 Cranfield University Soilscapes map below shows that the site is located in loamy and clayey soils with impeded drainage which indicates a very slow infiltration into the ground.



9.4 The effects of ground water flooding on the site are considered to be low. This is based on the requirement that the development is above ground level and that water will be directed away from the development.

10.0 EXISTING SEWERS FLOODING

10.1 Flooding caused by the existing sewer network occurs when the network is over capacity or there is a blockage in the system.

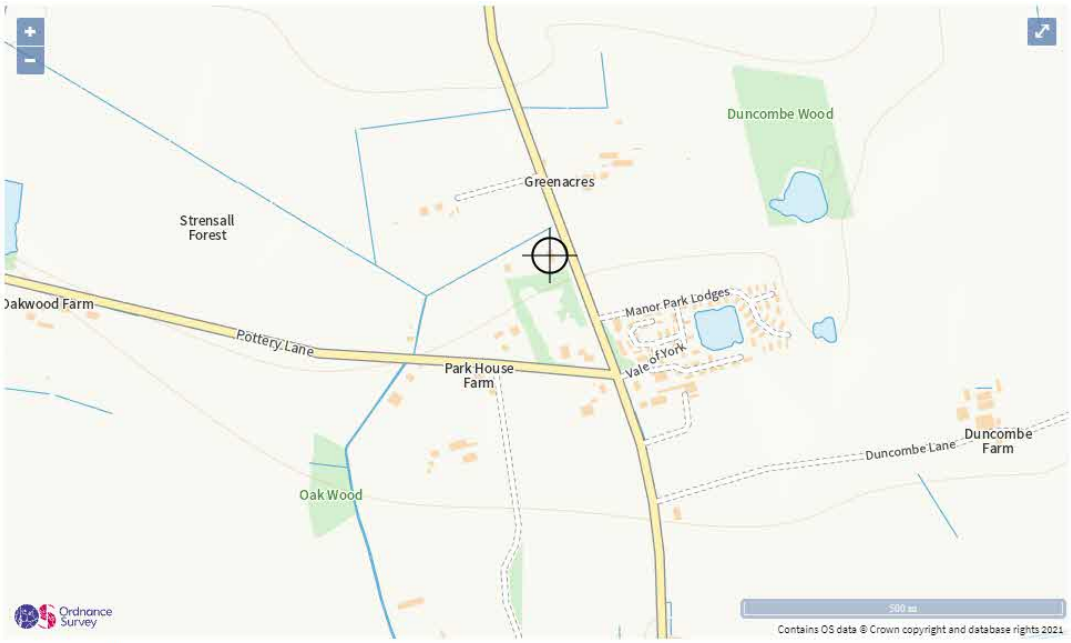
10.2 No existing adoptable sewers are recorded in the area and all the existing private drainage network is to be removed to allow the construction of the new development. Therefore, there is no risk of flooding from any sewers around the site.

11.0 FLOODING FROM RESERVOIRS

11.1 Reservoir flooding is unlikely to happen and if so, measures are in place to monitor and protect reservoirs in event of an unlikely catastrophic event. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly and essential safety work is carried out. These laws are being currently reviewed and it is expected that the requirements for monitoring and maintenance will become more stringent.

11.2 However, in the unlikely event that a reservoir dam failed, a large volume of water would escape at once and flooding could happen with little or no warning.

11.3 The Environment Agency Flood Map showing Risk of Flooding from Reservoirs is shown below. The development is out of a reservoir failure flood path therefore the risk is considered minimum.



Extent of flooding from reservoirs

Maximum extent of flooding Location you selected

12.0 DRAINAGE ASSESSMENT

Proposed Foul Water Network

12.1 The proposed foul water network will need to accommodate foul flows from building toilets and kitchens. Prior to the discharge into the existing ditch, the flows will be treated in a foul water treatment plant, which will be located at the top of the site, and tanker access will be provided via the adjacent car parking bays.

12.2 The proposed foul water network will be private, and the proposed design can be found in 'Drainage Strategy and Calculations' in Appendix D.

Proposed Surface Water Network

12.3 The surface water discharge will follow the ground, watercourse, sewer, hierarchy in accordance with the principles laid down in CIRIA Report 697 'The SUDS Manual' 2016 and in accordance with local and national planning policy. The site wide drainage strategy has considered the potential for discharge in accordance with the aforementioned hierarchy.

12.4 Discharge into a soakaway is unlikely to be feasible due to the existing ground conditions and the impeded drainage which does not provide sufficient infiltration.

12.5 There is no surface, foul or combined public sewer in the wider area.

12.6 Therefore, the discharge into the existing ditch is the preferred option. There are three existing outfall points, which are proposed to be abandoned. A new singly combined outfall, along with a new headwall, is proposed for the discharge of surface water for the development.

12.7 Prior to the discharge of the surface water into the ditch, a flow control unit will restrict the runoff rate at 3.0l/s, which has been sized based on the requirement of a min 75mm orifice.

12.8 An underground geocellular storage tank is proposed to cater for the 1 in 100 years + 40% climate change critical storm event, with a total volume of 22.8m^3.

12.9 To manage water quality and to comply with SuDS requirements, permeable paving is proposed for the car parking bays, which will manage the water collection and improve the water quality.

12.10 The surface water system will remain private and will be maintained by a management company, appointed by the landowner, in accordance with the manufacturers specifications and guidance.

12.11 There is low risk of potential pollution from the proposed development and use of the site and therefore a hydrodynamic vortex separator is proposed to comply with the CIRIA SuDS Manual.

12.12 A drainage design has been produced on the above basis and can be found in Appendix D.

13.0 CONCLUSION AND RECOMMENDATIONS

13.1 The site is located within a Flood Zone 1 which comprises land assessed as having less than a 1 in 1,000 year annual probability of flooding due to rivers.

13.2 The site has a 'very low' chance of flooding from surface water indicating a probability of flooding is less than 1 in 1000 and flood risk has been managed within the design of the development.

13.3 The effects of ground water flooding on the site are low. This is based on the requirement that the development is above ground level and that the risk to the site is low.

13.4 There is no risk from existing sewers or in the event of a reservoir failure.

13.5 The foul water drainage system will discharge into the existing ditch after being treated into the proposed package treatment works.

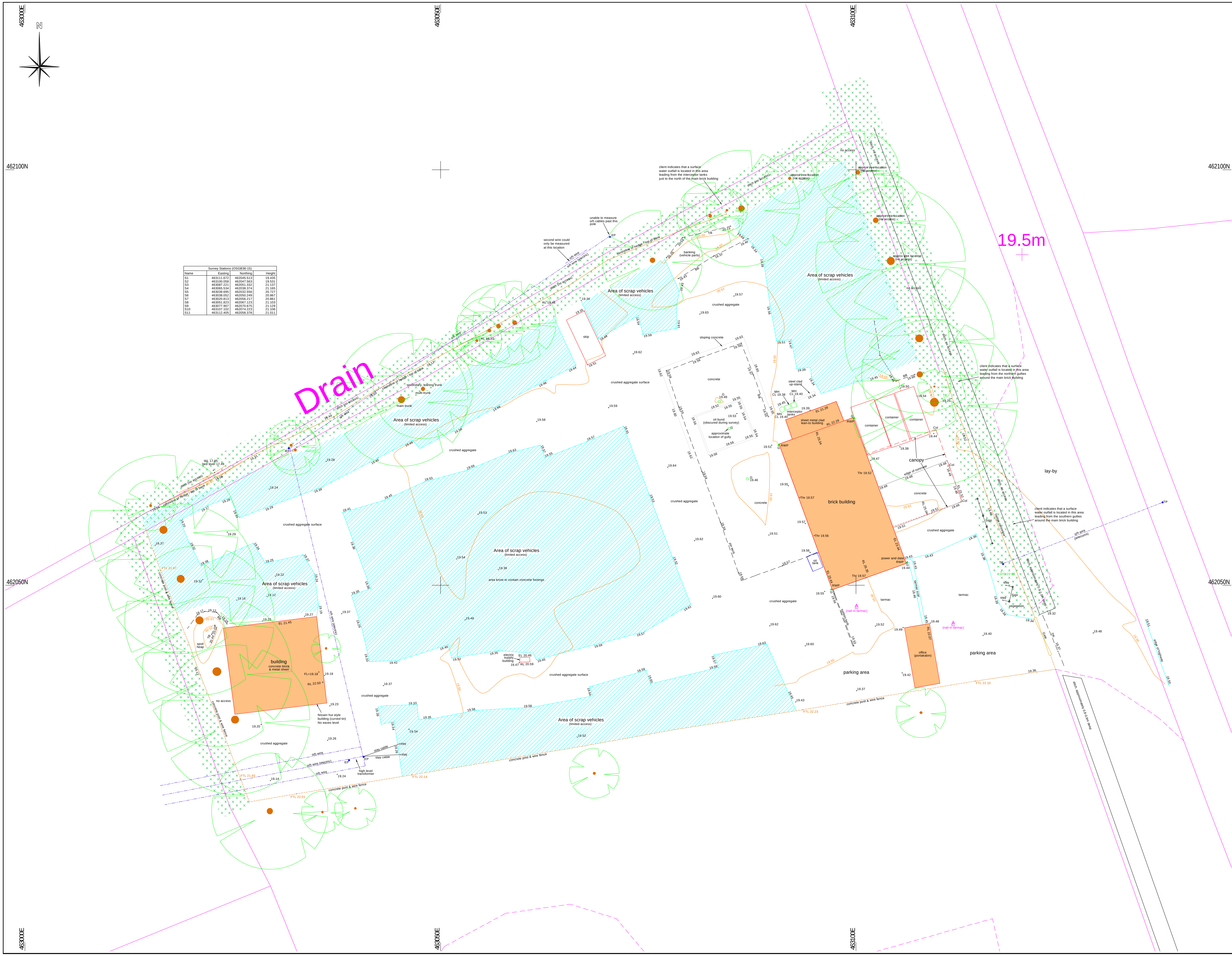
13.6 The surface water system will discharge into the existing ditch after being attenuated on site and the runoff rate is restricted at 3.0 l/s in the flow control unit.

13.7 A single combined outfall is proposed, as per Foss IDB request, with a new headwall to be constructed. A bespoke permit for the discharge of surface and foul water must be obtained.

13.8 All the above proposals are indicated in the 'Proposed Drainage Strategy' plan in Appendix D.

George Dermentzoglou
M.Eng. Civil Engineer GMICE
On behalf of Dudleys Consulting Engineers

APPENDIX A – TOPOGRAPHICAL SURVEY



Survey Stations (OSGB36-15)			
Name	Easting	Northing	Height
S1	463111.672	462045.513	19.435
S2	463100.058	462047.563	19.531
S3	463087.221	462051.332	21.137
S4	463065.534	462038.374	21.165
S5	463039.695	462032.556	20.727
S6	463038.052	462050.249	20.867
S7	463020.813	462056.217	20.861
S8	463051.823	462067.123	21.103
S9	463077.907	462070.675	21.129
S10	463107.102	462074.223	21.106
S11	463112.405	462058.378	21.011

Topographical Survey Legend

Fence annotation
B/W Barbed wire
C/B Closed boarded
C/I Corrugated iron
C/L Chain link
C/P Concrete panel
H/R Hand rail
I/R Iron railings
O/B Open boarded
P/C Post & chain
P/R Post & rail
P/W Post & wire
W/M Wire mesh

Details added using OS Ordnance Survey data
Fence
Gate
Stile
50.00 Spot level
STN1 50.00 Survey control station (Coordinated point)
Tree
Bush

Levels defining edge of carriageway are observed at channel (bottom of kerb) unless otherwise stated.

Notes:

- This site is largely obscured by scrap vehicles. The survey should be carefully checked for it's accuracy and completeness of detail once the site is cleared.
- There are drainage ditches to the north and east of the site which cannot be accessed due to vegetation and other obstructions.
- There appears to be no foul water drainage on site and such facilities are provided by way of chemical toilet.
- Surface water from the roof of the brick building to the east of site is discharged into the east ditch. We were unable to locate the outfalls and this information has been provided by the site owner.
- The site owner has told us that the three manholes to the north of the main brick building are an oil interceptor and that it then discharges into the ditch to the north of the site. We have been unable to confirm this or locate any outfalls due to vegetation and other obstructions.
- All critical details should be checked on site following a site clearance.

Levels related to Ordnance Survey Datum (OSGM15) using GPS

Coordinates related to Ordnance Survey grid (OSBG36) using GPS

This Topographical Survey has been produced using an orthographic coordinate grid, site centred around S1

Please note due to obstructions such as parked cars & vegetation First Point Surveys cannot guarantee all pertinent information has been surveyed.

FIRST POINT SURVEYS
Land, Building & Underground Utility Surveyor s
2, Stoneacre ▪Grimbald Crag Close ▪Knaresborough ▪HG5 8PJ
Tel: 01423 869351 & 01423 883371
info@FirstPointSurveys.co.uk ▪ www.FirstPointS

TITLE

Topographical Survey

Pigotts Auto Parts
Sheriff Hutton Road
Strensall
York YO32 5XH

DATE	DRAWN BY	CHKD. BY
August 2021	MIH	ELH

DRG NO	PLOT SCALE
6838 / 01	1: 200 @ A1

REV	AMENDMENT	DATE	BY	CHKD.

APPENDIX B – ENVIRONMENT AGENCY FLOOD MAP

Environment Agency

Flood map for planning

Your reference
Piggots Cars

Location (easting/northing)
463066/462049

Scale
1:2500

Created
30 Sep 2021 15:17

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

APPENDIX C – PROPOSED SITE LAYOUT

REV	DESCRIPTION	DATE	INT.
A	NO. OF DWELLINGS REDUCED TO 7. EASEMENT ADDED	28.09.21	R.K.
B	AREAS OF PUBLIC PLANTING INCREASED. ROAD LAYOUT ALTERED	01.10.21	R.K.
C	VOLUMES OF HOUSES + CARS SPECIFIED.	15.10.21	R.K.
D	LANDSCAPING UPDATED	10.12.21	R.K.
E	SITE ENTRANCE AMENDED. PLAN AMENDED TO SHOW TURNING HEAD FOR PANTECHNICON. PLOT 1 REVISED. BIN COLLECTION AREA TO SITE ENTRANCE	08.02.21	R.K.
F	ON-STREET LAYBY DETAILED	25.02.22	R.K.
G	BIN STORE RELOCATED - NEW ROAD/PATH/SERVICE STRIP LAYOUT UPDATED	28.02.22	R.K.
H	CROSSOVER OMITTED. DROPPED KERB FOR WHEELIE BINS, PATH TO FRONT OF 2 & 3 OMITTED	28.02.22	R.K.
I	**SCHEME REDESIGNED**	**19.08.22**	**PB**
J	PLOT 2 REDUCED IN FOOTPRINT	22.08.22	PB
K	EXISTING ACCESS RETAINED	15.09.22	PB
L	HIGHWAYS OFFICERS COMMENTS [EMAIL 14-10-2022] INTEGRATED ONTO PLAN	14-10-22	PB
M	BIN COLLECTION POINT RELOCATED	02-11-22	PB

SITE PLAN AS PROPOSED
1:200

Total volumetric of proposed dwellings:

Plot 1 - 696m3
Plot 2 - 721m3
Plot 3 - 673m3
Plot 4 - 246m3
Plot 5 - 246m3
Plot 6 - 174m3

Total volume - 2756m3

Total Gross Internal Floor Areas of proposed dwellings:

PLOT 1 - 5 Bedroom 2 storey Dwelling (195m2 GIA)
PLOT 2 - 5 Bedroom 2 storey Dwelling (234m2 GIA)
PLOT 3 - 4 Bedroom 2 storey Dwelling (172m2 GIA)
PLOT 4 - 2 Bedroom Dwelling (74.4m2 GIA)
PLOT 5 - 2 Bedroom Dwelling (74.4m2 GIA)
PLOT 6 - 1 Bedroom Dwelling (38.6m2 GIA)

Total GIA - 788.4m2

0 10 20 30 40
SCALE BAR 1:200

PROJECT	DRAWING TITLE	DRAWN BY	CHECKED
Pigotts Auto Parts,	Site Plan & Elevation as Proposed	Kennedy	Butler
		DATE: Feb 2022	SCALE: 1:200 @A1
		JOB No.: 660	DRAWING No.: 01-PL REV.: M

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APPENDIX D – DRAINAGE STRATEGY AND CALCULATIONS

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DRAINAGE STRATEGY AND CALCULATIONS

Client:	Jim Pigott
Site Address:	Pigotts Autoparts, Sheriff Hutton Road, Strensall, YO32 5XH
Project Number:	21273
Report Reference (Revision):	CALC01 (A)
Date:	January 2024

Author:	George Dermentzoglou	Date:	January 2024
Checker:	Andy Walker	Date:	January 2024

dudleys
Structural & Civil Consultants

Ref No.	21237-CALC01(A)	Sheet No.	i
Calcs By:	George D	Date	January 2024

CLIENT:	Jim Pigott
PROJECT TITLE:	Pigotts Autoparts
ARCHITECT:	Paul Butler Architects

DESIGN PHILOSOPHY:

The existing site is an autoparts, car sales and scrap yard located about 1km north of Strensall. To the east of the site is Sheriff Hutton Road, to the north is an existing ditch and to the west and south greenfield land. The site is overall flat with couple of buildings and most of the area covered with scrap vehicles. Along the north boundary of the site there is an existing ditch which is under the Foss Internal Drainage Board responsibility. This ditch flows towards southwest and eventually discharges into River Foss. There are three existing connection points from the site into this ditch and the ditch along the eastern site boundary.

The proposals include the demolition of all the existing buildings and structures, and the construction of 3 large and 3 small dwellings with associated car parking bays and an access road via the existing entrance.

Soakaways have been identified as not being suitable solution for surface water disposal due to the loamy and clayey ground conditions and impeded drainage, which results to a very slow ground infiltration.

No surface or other public sewers have been identified in the wider area.

Following the above, surface water is proposed to discharge into the existing ditch, replicating how the site drains, with a single combined connection via a new headwall to be constructed at the ditch embankment.

An underground attenuation geocellular tank, with a total storage volume of 22.8m^3, is proposed to cater for the 1 in 100 years + 40% climate change critical storm event with no above ground flooding.

A flow control will be provided, downstream of the tank, to restrict the flow to 3.0 l/s prior to discharging into the ditch. The reason behind this minimum rate is to achieve a minimum 75mm orifice for the flow control unit, which is a requirement for minor developments (less than 10 residential properties).

A hydrodynamic vortex separator is proposed to reduce any pollution hazard from the site even though the risk from the proposed residential use is considered very low in accordance with the CIRIA SuDS Manual.

The proposed permeable pavement construction at the car parking bays will allow the management of the surface water flows and will also provide a benefit on the water quality discharging into the existing ditch.

The surface water system will remain private and will be maintained by a competent management company, appointed by the developer, in accordance with the manufacturers recommendations and guidance.

The proposed foul water will be treated in a package plant, located at the top of the site, with tanker access via the parking bays, before discharging into the ditch via a single combined outfall and a new headwall.

A consultation with the Foss IDB is required to obtain a bespoke permit, which will allow the construction of the new headwall within the 9m easement zone and the discharge of surface and foul water into the ditch.

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Structural & Civil Consultants

Ref No.	21237-CALC01(A)	Sheet No.	ii
Calcs By:	George D	Date	January 2024

CODES OF PRACTICE:

Proposed Outfalls	Discharge Outfall Point	SW -> Existing Ditch (north boundary) FW -> Existing Ditch (north boundary)
	Soakaways Viable / Rate	Not viable due to the previous site use and the ground conditions
	Watercourse Discharge Available	Existing ditch along northern boundary
	Surface Water Sewer	None
	Combined Sewer	None
	Invert Level of Outfall	Around 18.0m, to be confirmed on site
Drainage Assessment	Scenarios to be Tested	1:1, 1:30, 1:100, 1:100 + 40% CC
	Proposed FFLs	Plots 1-3: 20.000 - Plots 4-6: 19.750
	Total Site Area	5,000 m^2 / 0.500 ha
	Existing Impermeable Area	2,650 m^2 / 0.265 ha
	Proposed Impermeable Area	1,250 m^2 / 0.125 ha
	Attenuation Storage Method	SDS Geolight 400 Geocellular Tank 16.0m x 2.0m x 0.75m deep (95% voids)
	Proposed Attenuation Storage Volume	22.8 m^3 for up to 1:100 year + 40% CC
	Flow Control Unit	Hydrobrake - Flow: 3.0 l/s - Head: 1.2m (min 75mm orifice)
Hydraulic Assessment	M5-60 / R	17.000 / 0.400
	MADD	0.0
	Global Time of Entry	5 mins
	Summer / Winter Coeffs	1.0 / 1.0
SuDS	Water Quality Methods Used	Permeable paving, Vortex Separator
	Hydrocarbon Interceptor	Vortex Separator
	Silt Capture	Yes, in Flow Control MH and Separator
	Ponds / Swales	No
	Permeable Pavement	Yes, at the car parking bays
Information Provided	21273-DCE-XX-XX-D-C-103-P1 - Proposed Impermeable Areas 21273-DCE-XX-XX-D-C-100-P2 - Proposed Drainage Strategy Surface Water Hydraulic Calculations V2 Hydrodynamic Vortex Separator Technical Specification Attenuation Tank Technical Specification Hydrobrake Flow Control Technical Specification	

NORTH

DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.

ABNORMAL HAZARD REFERENCE

GENERAL NOTES

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL ARCHITECT'S DRAWINGS AND ENGINEER'S DRAWINGS AND SPECIFICATIONS.
2. PLEASE DO NOT SCALE FROM THIS DRAWING.
3. IF A DISCREPANCY IS IDENTIFIED ON THIS DRAWING, PLEASE INFORM DUDLEYS CONSULTING ENGINEERS LTD.
4. CONTRACTOR IS TO CHECK ALL DRAWINGS AND REPORT ANY DISCREPANCIES IMMEDIATELY.
5. ALL FFL AND EXTERNAL LEVELS ARE PROPOSED. THE FINAL LEVELS TO BE CONFIRMED BY THE ARCHITECT.
6. THIS DRAWING IS BASED OFF THE FOLLOWING INFORMATION:
   a. 6838 / 01 - TOPOGRAPHICAL SURVEY BY FIRST POINT SURVEYS DATED AUGUST 2021
   b. 01-PL REVISION M - SITE LAYOUT PLAN BY PAUL BUTLER ARCHITECTS DATED NOVEMBER 2022

KEY

- SITE AND PLOT BOUNDARIES
- PROPOSED IMPERMEABLE AREAS SITE TOTAL AREA: 0.125ha
- PROPOSED SURFACE WATER SEWER
- PROPOSED COMBINED OUTFALL SEWER

PLOT 1
PLOT 2
PLOT 3
PLOT 4
PLOT 5
PLOT 6

RE 1.00 0.0021ha
SW 1.01 0.0021ha
RE 1.04 0.0060ha
SW 1.02 0.0039ha
SW 1.03 0.0019ha
RE 2.00 0.0032ha
SW 2.01 0.010ha
RE 3.04 0.0034ha
SW 3.00 0.0031ha
SW 3.02 0.0015ha
SW 3.01 0.0015ha
SW 3.01 0.0068ha
SW 6.01 0.0508ha
SW 6.02 0.0063ha
SW 4.00 0.0031ha
SW 4.01 0.0032ha
RE 5.00 0.0029ha
RE 5.01 0.0026ha
SW 6.00 0.0108ha

19.5m

DATE	REVISION DESCRIPTION	BY	CHK.	REV.
26.01.24	PRELIMINARY ISSUE	OB	GD	P1

DUDLEYS CONSULTING ENGINEERS
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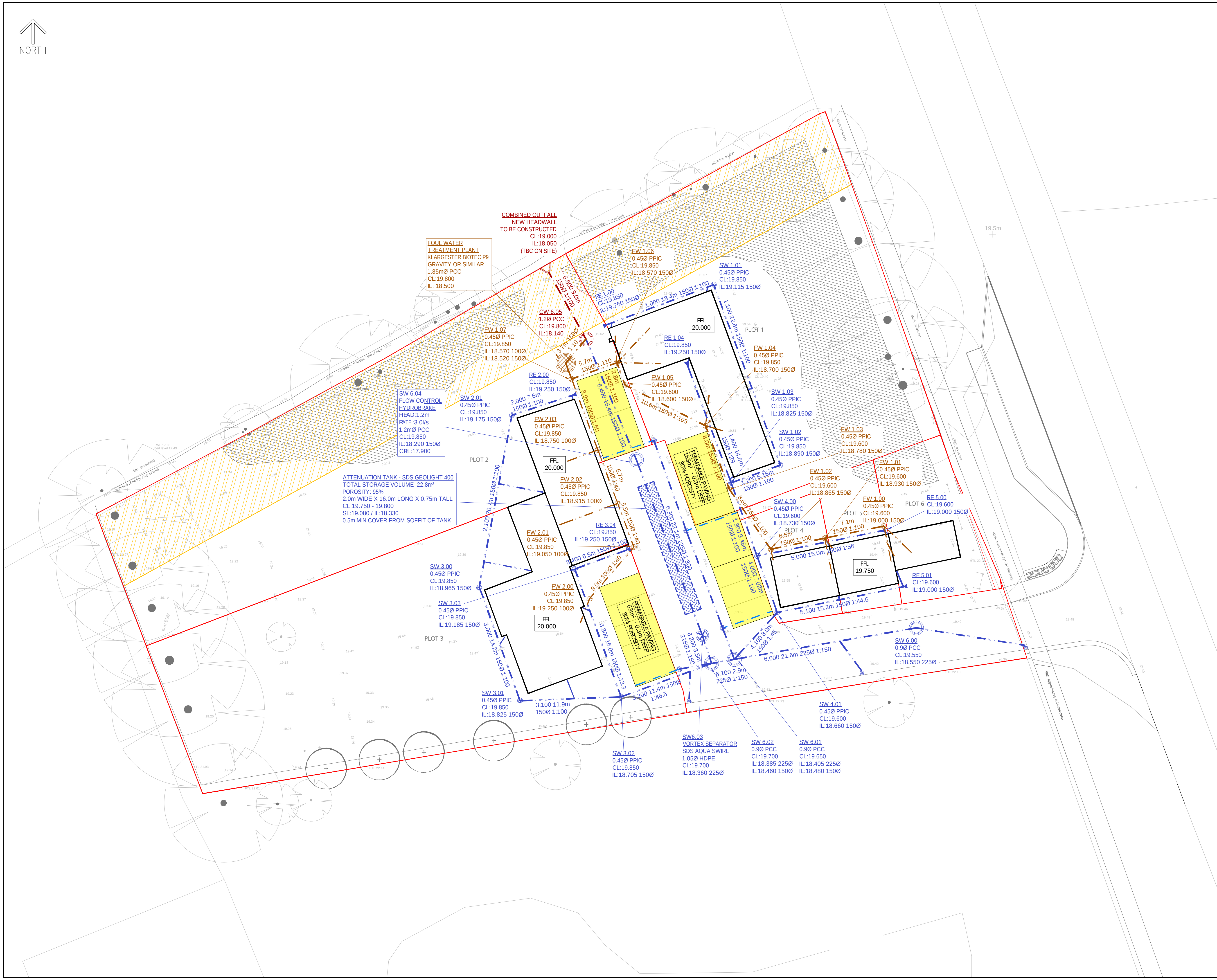
Leeds, LS18 5LJ
0113 258 3611
info@dudleys.co.uk

PROJECT
PIGOTTS AUTOPARTS
SHERIFF HUTTON ROAD
STRENSALL, YO32 5XH

TITLE
PROPOSED IMPERMEABLE AREAS

SCALE	PAPER	STATUS
1:200	A1	PRELIMINARY

DRAWING NO.	REV.
21273-DCE-XX-XX-D-C-103	P1



NORTH
COMBINED OUTFALL
NEW HEADWALL
TO BE CONSTRUCTED
CL:19.000
IL:18.050
(TBC ON SITE)
FOUL WATER
TREATMENT PLANT
KLARGESTER BIOTEC P9
GRAVITY OR SIMILAR
1.85mØ PCC
CL:19.800
IL: 18.500
FW 1.06
0.45Ø PPIC
CL:19.850
IL:18.570 150Ø
SW 1.01
0.45Ø PPIC
CL:19.850
IL:19.115 150Ø
RE 1.00
CL:19.850
IL:19.250 150Ø
CW 6.05
1.2Ø PCC
CL:19.800
IL:18.140
FW 1.07
0.45Ø PPIC
CL:19.850
IL:18.570 100Ø
IL:18.520 150Ø
RE 1.04
CL:19.850
IL:19.250 150Ø
FW 1.04
0.45Ø PPIC
CL:19.850
IL:18.700 150Ø
PLOT 1
FFL
20.000
SW 6.04
FLOW CONTROL
HYDROBRAKE
HEAD:1.2m
RATE:3.0l/s
1.2mØ PCC
CL:19.850
IL:18.290 150Ø
CRL:17.900
RE 2.00
CL:19.850
IL:19.250 150Ø
SW 2.01
0.45Ø PPIC
CL:19.850
IL:19.175 150Ø
FW 1.05
0.45Ø PPIC
CL:19.600
IL:18.600 150Ø
SW 1.03
0.45Ø PPIC
CL:19.850
IL:18.825 150Ø
SW 1.02
0.45Ø PPIC
CL:19.850
IL:18.890 150Ø
FW 1.03
0.45Ø PPIC
CL:19.600
IL:18.780 150Ø
FW 2.03
0.45Ø PPIC
CL:19.850
IL:18.750 100Ø
PLOT 2
FFL
20.000
PERMEABLE PAVING
165m² - 0.3m DEEP
30% POROSITY
FW 1.01
0.45Ø PPIC
CL:19.600
IL:18.930 150Ø
FW 1.02
0.45Ø PPIC
CL:19.600
IL:18.865 150Ø
ATTENUATION TANK - SDS GEOLIGHT 400
TOTAL STORAGE VOLUME 22.8m³
POROSITY: 95%
2.0m WIDE X 16.0m LONG X 0.75m TALL
CL:19.750 - 19.800
SL:19.080 / IL:18.330
0.5m MIN COVER FROM SOFFIT OF TANK
FW 2.02
0.45Ø PPIC
CL:19.850
IL:18.915 100Ø
SW 4.00
0.45Ø PPIC
CL:19.600
IL:18.730 150Ø
FW 1.00
0.45Ø PPIC
CL:19.600
IL:19.000 150Ø
RE 5.00
CL:19.600
IL:19.000 150Ø
PLOT 5
PLOT 6
PLOT 4
FW 2.01
0.45Ø PPIC
CL:19.850
IL:19.050 100Ø
RE 3.04
CL:19.850
IL:19.250 150Ø
FFL
19.750
SW 3.00
0.45Ø PPIC
CL:19.850
IL:18.965 150Ø
FW 2.00
0.45Ø PPIC
CL:19.850
IL:19.250 100Ø
RE 5.01
CL:19.600
IL:19.000 150Ø
SW 3.03
0.45Ø PPIC
CL:19.850
IL:19.185 150Ø
PERMEABLE PAVING
63m² - 0.3m DEEP
30% POROSITY
FFL
20.000
PLOT 3
SW 6.00
0.9Ø PCC
CL:19.550
IL:18.550 225Ø
SW 3.01
0.45Ø PPIC
CL:19.850
IL:18.825 150Ø
SW 4.01
0.45Ø PPIC
CL:19.600
IL:18.660 150Ø
SW 3.02
0.45Ø PPIC
CL:19.850
IL:18.705 150Ø
SW6.03
VORTEX SEPARATOR
SDS AQUA SWIRL
1.05Ø HDPE
CL:19.700
IL:18.360 225Ø
SW 6.02
0.9Ø PCC
CL:19.700
IL:18.385 225Ø
IL:18.460 150Ø
SW 6.01
0.9Ø PCC
CL:19.650
IL:18.405 225Ø
IL:18.480 150Ø

DO NOT SCALE

DESIGNERS HAZARD IDENTIFICATION

IT IS ASSUMED THAT ALL WORKS WILL BE UNDERTAKEN BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT. IN ADDITION TO THE HAZARDS TYPICALLY ASSOCIATED WITH THE TYPES OF CONSTRUCTION DETAILED ON THIS DRAWING, ANY KNOWN ABNORMAL HAZARDS SPECIFIC TO THIS SCHEME HAVE BEEN IDENTIFIED.

ABNORMAL HAZARD REFERENCE

GENERAL NOTES

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL ARCHITECT'S DRAWINGS AND ENGINEER'S DRAWINGS AND SPECIFICATIONS.
2. PLEASE DO NOT SCALE FROM THIS DRAWING.
3. IF A DISCREPANCY IS IDENTIFIED ON THIS DRAWING, PLEASE INFORM DUDLEYS CONSULTING ENGINEERS LTD.
4. CONTRACTOR IS TO CHECK ALL DRAWINGS AND REPORT ANY DISCREPANCIES IMMEDIATELY.
5. ALL FFL AND EXTERNAL LEVELS ARE PROPOSED. THE FINAL LEVELS TO BE CONFIRMED BY THE ARCHITECT.
6. THIS DRAWING IS BASED OFF THE FOLLWING INFORMATION:
   a. 6838 / 01 - TOPOGRAPHICAL SURVEY BY FIRST POINT SURVEYS DATED AUGUST 2021
   b. 01-PL REVISION M - SITE LAYOUT PLAN BY PAUL BUTLER ARCHITECTS DATED NOVEMBER 2022

DRAINAGE NOTES

7. ALL COVER AND INVERT LEVELS ARE IN METRES TO ORDNANCE DATUM.
8. SURFACE WATER TO DISCHARGE INTO THE EXISTING DITCH VIA AN ATTENUATION TANK & FLOW CONTROL.
9. FOUL WATER TO DISCHARGE INTO THE EXISTING DITCH VIA A FOUL WATER TREATMENT PLANT.
10. A SINGLE COMBINED OUTFALL / HEADWALL WILL BE PROVIDED AT THE DITCH EMBANKMENT.
11. ALL MANHOLES TO BE CONSTRUCTED AS NOTED AND INSTALLED IN ACCORDANCE WITH MANUFACTURES SPECIFICATION.
12. ALL PIPES TO BE PVC OR SIMILAR AND INSTALLED TO SOFFIT LEVEL.
13. SEWERS TO BE LAID IN CLASS "S" BEDDING (150mm GRANULAR BED AND SURROUND).

KEY

- SITE AND PLOT BOUNDARIES
- 9m EASEMENT ZONE FROM TOP OF DITCH BANK
- PROPOSED SURFACE WATER SEWER
- PROPOSED FOUL WATER SEWER
- PROPOSED COMBINED WATER SEWER
- PROPOSED PERMEABLE PAVING AT CAR PARKING BAYS
- 100Ø PERFORATED PIPE WRAPPED IN GEOTEXTILE
- PROPOSED GULLY

DATE	REVISION DESCRIPTION	BY	CHK.	REV.
26.01.24	DRAINAGE REDESIGNED TO SUIT LATEST SITE LAYOUT & PREVIOUS PLANNING COMMENTS	OB	GD	P2
03.11.21	PRELIMINARY ISSUE	GD	SR	P1

DUDLEYS CONSULTING ENGINEERS
Tithe House
35 Town Street
Leeds, LS18 5LJ
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PROJECT
PIGOTTS AUTOPARTS
SHERIFF HUTTON ROAD
STRENSALL, YO32 5XH

TITLE
PROPOSED DRAINAGE STRATEGY

SCALE	PAPER	STATUS
1:200	A1	PRELIMINARY

DRAWING NO.	REV.
21273-DCE-XX-XX-D-C-100	P2

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	x
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE1.00	0.002	5.00	19.850	230	463074.568	462079.138	0.600
SW1.01	0.002	5.00	19.850	450	463087.152	462083.837	0.735
SW1.02	0.004	5.00	19.850	450	463094.999	462062.603	0.960
SW1.03	0.002	5.00	19.850	450	463089.200	462060.528	1.025
RE1.04	0.006	5.00	19.850	230	463084.044	462074.383	0.600
RE2.00	0.003	5.00	19.850	230	463070.592	462070.855	0.600
SW2.01	0.010	5.00	19.850	450	463063.382	462068.477	0.675
SW3.00	0.003	5.00	19.850	450	463059.533	462048.178	0.885
SW3.01	0.002	5.00	19.850	450	463064.354	462034.871	1.025
SW3.02	0.008	5.00	19.850	450	463076.234	462035.318	1.145
SW3.03			19.850	450	463070.796	462050.375	0.665
RE3.04	0.003	5.00	19.850	230	463077.762	462052.933	0.600
SW4.00	0.003	5.00	19.600	450	463092.239	462051.905	0.870
SW4.01	0.003	5.00	19.600	450	463094.623	462045.255	0.940
RE5.00	0.003	5.00	19.600	230	463106.941	462054.874	0.600
RE5.01	0.003	5.00	19.600	230	463109.483	462048.291	0.600
SW6.00	0.011	5.00	19.550	900	463110.997	462043.450	1.000
SW6.01	0.051	5.00	19.650	900	463089.557	462039.744	1.245
SW6.02	0.006	5.00	19.700	900	463086.890	462039.261	1.315
SW6.03			19.700	1050	463085.799	462042.567	1.340
SW6.04			19.850	1200	463078.035	462063.234	1.560
CW6.05			19.800	1200	463072.116	462077.451	1.660
HEADWALL			19.000		463067.710	462085.345	0.950

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE1.00	SW1.01	13.433	0.600	19.250	19.115	0.135	99.5	150	5.22	45.8
1.100	SW1.01	SW1.02	22.638	0.600	19.115	18.890	0.225	100.6	150	5.60	44.4
1.200	SW1.02	SW1.03	6.159	0.600	18.890	18.825	0.065	94.8	150	5.70	44.0
1.300	SW1.03	SW4.00	9.460	0.600	18.825	18.730	0.095	100.0	150	5.86	43.5
1.400	RE1.04	SW1.03	14.800	0.600	19.250	18.825	0.425	34.8	150	5.14	46.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.007	17.8	0.3	0.450	0.585	0.002	0.0	14	0.387
1.100	1.001	17.7	0.6	0.585	0.810	0.004	0.0	20	0.473
1.200	1.032	18.2	1.3	0.810	0.875	0.008	0.0	27	0.592
1.300	1.005	17.8	2.5	0.875	0.720	0.016	0.0	38	0.709
1.400	1.711	30.2	1.0	0.450	0.875	0.006	0.0	18	0.781

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	RE2.00	SW2.01	7.600	0.600	19.250	19.175	0.075	101.3	150	5.13	46.2
2.100	SW2.01	SW3.00	20.700	0.600	19.175	18.965	0.210	98.6	150	5.47	44.9
3.000	SW3.00	SW3.01	14.200	0.600	18.965	18.825	0.140	101.4	150	5.71	44.0
3.100	SW3.01	SW3.02	11.900	0.600	18.825	18.705	0.120	99.2	150	5.90	43.3
3.200	SW3.02	SW6.02	11.400	0.600	18.705	18.460	0.245	46.5	150	6.03	42.9
3.300	SW3.03	SW3.02	16.000	0.600	19.185	18.705	0.480	33.3	150	5.26	45.6
3.400	RE3.04	SW3.03	6.500	0.600	19.250	19.185	0.065	100.0	150	5.11	46.2
4.000	SW4.00	SW4.01	7.020	0.600	18.730	18.660	0.070	100.0	150	5.97	43.1
4.100	SW4.01	SW6.01	8.000	0.600	18.660	18.480	0.180	44.4	150	6.06	42.8
5.000	RE5.00	SW4.00	14.999	0.600	19.000	18.730	0.270	55.6	150	5.18	45.9
5.100	RE5.01	SW4.01	15.200	0.600	19.000	18.660	0.340	44.7	150	5.17	46.0
6.000	SW6.00	SW6.01	21.600	0.600	18.550	18.405	0.145	149.0	225	5.34	45.4
6.100	SW6.01	SW6.02	2.900	0.600	18.405	18.385	0.020	145.0	225	6.10	42.6
6.200	SW6.02	SW6.03	3.500	0.600	18.385	18.360	0.025	140.0	225	6.16	42.5
6.300	SW6.03	SW6.04	22.100	0.600	18.360	18.290	0.070	315.7	225	6.66	40.9
6.400	SW6.04	CW6.05	15.400	0.600	18.290	18.140	0.150	102.7	150	6.92	40.1
6.500	CW6.05	HEADWALL	9.040	0.600	18.140	18.050	0.090	100.4	150	7.07	39.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	0.998	17.6	0.5	0.450	0.525	0.003	0.0	17	0.434
2.100	1.012	17.9	2.1	0.525	0.735	0.013	0.0	35	0.681
3.000	0.997	17.6	2.5	0.735	0.875	0.016	0.0	38	0.710
3.100	1.009	17.8	2.8	0.875	0.995	0.018	0.0	40	0.737
3.200	1.479	26.1	4.5	0.995	1.090	0.029	0.0	42	1.108
3.300	1.750	30.9	0.5	0.515	0.995	0.003	0.0	13	0.640
3.400	1.005	17.8	0.5	0.450	0.515	0.003	0.0	17	0.437
4.000	1.005	17.8	3.4	0.720	0.790	0.022	0.0	45	0.780
4.100	1.513	26.7	4.3	0.790	1.020	0.028	0.0	41	1.115
5.000	1.352	23.9	0.5	0.450	0.720	0.003	0.0	15	0.536
5.100	1.509	26.7	0.5	0.450	0.790	0.003	0.0	14	0.583
6.000	1.069	42.5	1.8	0.775	1.020	0.011	0.0	31	0.530
6.100	1.083	43.1	13.9	1.020	1.090	0.090	0.0	87	0.967
6.200	1.103	43.8	19.2	1.090	1.115	0.125	0.0	104	1.067
6.300	0.730	29.0	18.5	1.115	1.335	0.125	0.0	131	0.773
6.400	0.991	17.5	18.1	1.410	1.510	0.125	0.0	129	1.123
6.500	1.002	17.7	17.9	1.510	0.800	0.125	0.0	125	1.139

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	13.433	99.5	150	Circular	19.850	19.250	0.450	19.850	19.115	0.585
1.100	22.638	100.6	150	Circular	19.850	19.115	0.585	19.850	18.890	0.810
1.200	6.159	94.8	150	Circular	19.850	18.890	0.810	19.850	18.825	0.875
1.300	9.460	100.0	150	Circular	19.850	18.825	0.875	19.600	18.730	0.720

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1.00	230	Manhole	Adoptable	SW1.01	450	Manhole	Adoptable
1.100	SW1.01	450	Manhole	Adoptable	SW1.02	450	Manhole	Adoptable
1.200	SW1.02	450	Manhole	Adoptable	SW1.03	450	Manhole	Adoptable
1.300	SW1.03	450	Manhole	Adoptable	SW4.00	450	Manhole	Adoptable

Pipeline Schedule

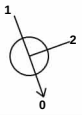
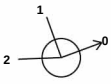
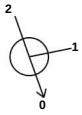
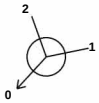
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.400	14.800	34.8	150	Circular	19.850	19.250	0.450	19.850	18.825	0.875
2.000	7.600	101.3	150	Circular	19.850	19.250	0.450	19.850	19.175	0.525
2.100	20.700	98.6	150	Circular	19.850	19.175	0.525	19.850	18.965	0.735
3.000	14.200	101.4	150	Circular	19.850	18.965	0.735	19.850	18.825	0.875
3.100	11.900	99.2	150	Circular	19.850	18.825	0.875	19.850	18.705	0.995
3.200	11.400	46.5	150	Circular	19.850	18.705	0.995	19.700	18.460	1.090
3.300	16.000	33.3	150	Circular	19.850	19.185	0.515	19.850	18.705	0.995
3.400	6.500	100.0	150	Circular	19.850	19.250	0.450	19.850	19.185	0.515
4.000	7.020	100.0	150	Circular	19.600	18.730	0.720	19.600	18.660	0.790
4.100	8.000	44.4	150	Circular	19.600	18.660	0.790	19.650	18.480	1.020
5.000	14.999	55.6	150	Circular	19.600	19.000	0.450	19.600	18.730	0.720
5.100	15.200	44.7	150	Circular	19.600	19.000	0.450	19.600	18.660	0.790
6.000	21.600	149.0	225	Circular	19.550	18.550	0.775	19.650	18.405	1.020
6.100	2.900	145.0	225	Circular	19.650	18.405	1.020	19.700	18.385	1.090
6.200	3.500	140.0	225	Circular	19.700	18.385	1.090	19.700	18.360	1.115
6.300	22.100	315.7	225	Circular	19.700	18.360	1.115	19.850	18.290	1.335
6.400	15.400	102.7	150	Circular	19.850	18.290	1.410	19.800	18.140	1.510
6.500	9.040	100.4	150	Circular	19.800	18.140	1.510	19.000	18.050	0.800

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.400	RE1.04	230	Manhole	Adoptable	SW1.03	450	Manhole	Adoptable
2.000	RE2.00	230	Manhole	Adoptable	SW2.01	450	Manhole	Adoptable
2.100	SW2.01	450	Manhole	Adoptable	SW3.00	450	Manhole	Adoptable
3.000	SW3.00	450	Manhole	Adoptable	SW3.01	450	Manhole	Adoptable
3.100	SW3.01	450	Manhole	Adoptable	SW3.02	450	Manhole	Adoptable
3.200	SW3.02	450	Manhole	Adoptable	SW6.02	900	Manhole	Adoptable
3.300	SW3.03	450	Manhole	Adoptable	SW3.02	450	Manhole	Adoptable
3.400	RE3.04	230	Manhole	Adoptable	SW3.03	450	Manhole	Adoptable
4.000	SW4.00	450	Manhole	Adoptable	SW4.01	450	Manhole	Adoptable
4.100	SW4.01	450	Manhole	Adoptable	SW6.01	900	Manhole	Adoptable
5.000	RE5.00	230	Manhole	Adoptable	SW4.00	450	Manhole	Adoptable
5.100	RE5.01	230	Manhole	Adoptable	SW4.01	450	Manhole	Adoptable
6.000	SW6.00	900	Manhole	Adoptable	SW6.01	900	Manhole	Adoptable
6.100	SW6.01	900	Manhole	Adoptable	SW6.02	900	Manhole	Adoptable
6.200	SW6.02	900	Manhole	Adoptable	SW6.03	1050	Manhole	Adoptable
6.300	SW6.03	1050	Manhole	Adoptable	SW6.04	1200	Manhole	Adoptable
6.400	SW6.04	1200	Manhole	Adoptable	CW6.05	1200	Manhole	Adoptable
6.500	CW6.05	1200	Manhole	Adoptable	HEADWALL		Junction	

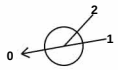
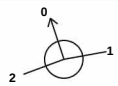
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1.00	463074.568	462079.138	19.850	0.600	230				
						0	1.000	19.250	150
SW1.01	463087.152	462083.837	19.850	0.735	450	1	1.000	19.115	150
									
						0	1.100	19.115	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW1.02	463094.999	462062.603	19.850	0.960	450		1	1.100	18.890	150
							0	1.200	18.890	150
SW1.03	463089.200	462060.528	19.850	1.025	450		1	1.400	18.825	150
							2	1.200	18.825	150
							0	1.300	18.825	150
RE1.04	463084.044	462074.383	19.850	0.600	230		0	1.400	19.250	150
RE2.00	463070.592	462070.855	19.850	0.600	230		0	2.000	19.250	150
SW2.01	463063.382	462068.477	19.850	0.675	450		1	2.000	19.175	150
							0	2.100	19.175	150
SW3.00	463059.533	462048.178	19.850	0.885	450		1	2.100	18.965	150
							0	3.000	18.965	150
SW3.01	463064.354	462034.871	19.850	1.025	450		1	3.000	18.825	150
							0	3.100	18.825	150
SW3.02	463076.234	462035.318	19.850	1.145	450		1	3.300	18.705	150
							2	3.100	18.705	150
							0	3.200	18.705	150
SW3.03	463070.796	462050.375	19.850	0.665	450		1	3.400	19.185	150
							0	3.300	19.185	150
RE3.04	463077.762	462052.933	19.850	0.600	230		0	3.400	19.250	150
SW4.00	463092.239	462051.905	19.600	0.870	450		1	5.000	18.730	150
							2	1.300	18.730	150
							0	4.000	18.730	150
SW4.01	463094.623	462045.255	19.600	0.940	450		1	5.100	18.660	150
							2	4.000	18.660	150
							0	4.100	18.660	150
RE5.00	463106.941	462054.874	19.600	0.600	230		0	5.000	19.000	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE5.01	463109.483	462048.291	19.600	0.600	230		0	5.100	19.000	150
SW6.00	463110.997	462043.450	19.550	1.000	900		0	6.000	18.550	225
SW6.01	463089.557	462039.744	19.650	1.245	900		1	6.000	18.405	225
							2	4.100	18.480	150
							0	6.100	18.405	225
SW6.02	463086.890	462039.261	19.700	1.315	900		1	6.100	18.385	225
							2	3.200	18.460	150
							0	6.200	18.385	225
SW6.03	463085.799	462042.567	19.700	1.340	1050		1	6.200	18.360	225
							0	6.300	18.360	225
SW6.04	463078.035	462063.234	19.850	1.560	1200		1	6.300	18.290	225
							0	6.400	18.290	150
CW6.05	463072.116	462077.451	19.800	1.660	1200		1	6.400	18.140	150
							0	6.500	18.140	150
HEADWALL	463067.710	462085.345	19.000	0.950			1	6.500	18.050	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	960
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960

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

Node SW6.04 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	18.290	Product Number	CTL-SHE-0079-3000-1200-3000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node SW6.04 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.290
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	340

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	32.0	0.0	0.750	32.0	0.0	0.751	0.0	0.0

Node SW6.01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.150
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	92

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	165.0	0.0	0.300	165.0	0.0	0.301	0.0	0.0

Node SW6.02 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	19.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	64

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	63.0	0.0	0.300	63.0	0.0	0.301	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE1.00	11	19.264	0.014	0.3	0.0006	0.0000	OK
15 minute winter	SW1.01	11	19.134	0.019	0.6	0.0030	0.0000	OK
15 minute summer	SW1.02	11	18.915	0.025	1.2	0.0041	0.0000	OK
15 minute summer	SW1.03	11	18.862	0.037	2.3	0.0059	0.0000	OK
15 minute summer	RE1.04	11	19.268	0.018	0.9	0.0007	0.0000	OK
15 minute summer	RE2.00	10	19.267	0.017	0.5	0.0007	0.0000	OK
15 minute summer	SW2.01	10	19.208	0.033	2.0	0.0052	0.0000	OK
15 minute summer	SW3.00	11	19.002	0.037	2.4	0.0060	0.0000	OK
15 minute summer	SW3.01	11	18.865	0.040	2.7	0.0064	0.0000	OK
15 minute summer	SW3.02	11	18.746	0.041	4.3	0.0065	0.0000	OK
15 minute summer	SW3.03	11	19.198	0.013	0.5	0.0020	0.0000	OK
15 minute summer	RE3.04	10	19.268	0.018	0.5	0.0007	0.0000	OK
15 minute summer	SW4.00	11	18.775	0.045	3.1	0.0072	0.0000	OK
15 minute summer	SW4.01	11	18.700	0.040	4.0	0.0064	0.0000	OK
15 minute summer	RE5.00	10	19.015	0.015	0.5	0.0006	0.0000	OK
15 minute summer	RE5.01	10	19.014	0.014	0.5	0.0006	0.0000	OK
15 minute summer	SW6.00	10	18.580	0.030	1.7	0.0192	0.0000	OK
15 minute summer	SW6.01	11	18.524	0.119	13.0	0.0756	0.0000	OK
15 minute summer	SW6.02	11	18.512	0.127	18.1	0.0810	0.0000	OK
60 minute summer	SW6.03	45	18.503	0.143	12.3	0.1239	0.0000	OK
60 minute summer	SW6.04	45	18.503	0.213	12.3	6.7103	0.0000	SURCHARGED
60 minute summer	CW6.05	46	18.181	0.041	2.8	0.0465	0.0000	OK
60 minute summer	HEADWALL	46	18.090	0.040	2.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE1.00	1.000	SW1.01	0.3	0.299	0.017	0.0137	
15 minute winter	SW1.01	1.100	SW1.02	0.6	0.369	0.033	0.0359	
15 minute summer	SW1.02	1.200	SW1.03	1.1	0.431	0.063	0.0165	
15 minute summer	SW1.03	1.300	SW4.00	2.3	0.590	0.130	0.0370	
15 minute summer	RE1.04	1.400	SW1.03	0.9	0.523	0.030	0.0338	
15 minute summer	RE2.00	2.000	SW2.01	0.5	0.242	0.026	0.0149	
15 minute summer	SW2.01	2.100	SW3.00	1.9	0.608	0.106	0.0649	
15 minute summer	SW3.00	3.000	SW3.01	2.4	0.654	0.133	0.0511	
15 minute summer	SW3.01	3.100	SW3.02	2.6	0.691	0.149	0.0456	
15 minute summer	SW3.02	3.200	SW6.02	4.3	0.991	0.163	0.0535	
15 minute summer	SW3.03	3.300	SW3.02	0.5	0.213	0.015	0.0370	
15 minute summer	RE3.04	3.400	SW3.03	0.5	0.504	0.026	0.0060	
15 minute summer	SW4.00	4.000	SW4.01	3.1	0.759	0.176	0.0290	
15 minute summer	SW4.01	4.100	SW6.01	4.0	1.042	0.149	0.0324	
15 minute summer	RE5.00	5.000	SW4.00	0.5	0.211	0.019	0.0395	
15 minute summer	RE5.01	5.100	SW4.01	0.5	0.263	0.017	0.0349	
15 minute summer	SW6.00	6.000	SW6.01	1.6	0.157	0.039	0.2634	
15 minute summer	SW6.01	6.100	SW6.02	12.9	0.583	0.300	0.0644	
15 minute summer	SW6.02	6.200	SW6.03	18.0	0.785	0.410	0.0803	
60 minute summer	SW6.03	6.300	SW6.04	12.3	0.629	0.423	0.7243	
60 minute summer	SW6.04	Hydro-Brake®	CW6.05	2.8				
60 minute summer	CW6.05	6.500	HEADWALL	2.8	0.728	0.159	0.0349	12.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1.00	11	19.270	0.020	0.7	0.0009	0.0000	OK
15 minute summer	SW1.01	11	19.143	0.028	1.4	0.0045	0.0000	OK
15 minute summer	SW1.02	11	18.930	0.040	2.9	0.0064	0.0000	OK
120 minute summer	SW1.03	98	18.901	0.076	2.5	0.0120	0.0000	OK
15 minute summer	RE1.04	10	19.277	0.027	2.2	0.0011	0.0000	OK
15 minute summer	RE2.00	11	19.275	0.025	1.1	0.0011	0.0000	OK
15 minute summer	SW2.01	10	19.228	0.053	4.8	0.0084	0.0000	OK
15 minute summer	SW3.00	11	19.026	0.061	5.8	0.0097	0.0000	OK
120 minute summer	SW3.01	98	18.900	0.075	2.9	0.0120	0.0000	OK
120 minute summer	SW3.02	98	18.900	0.195	4.7	0.0311	0.0000	SURCHARGED
15 minute summer	SW3.03	11	19.204	0.019	1.1	0.0031	0.0000	OK
15 minute summer	RE3.04	10	19.277	0.027	1.1	0.0011	0.0000	OK
120 minute summer	SW4.00	98	18.901	0.171	3.5	0.0271	0.0000	SURCHARGED
120 minute summer	SW4.01	98	18.901	0.241	4.5	0.0382	0.0000	SURCHARGED
15 minute summer	RE5.00	11	19.022	0.022	1.1	0.0009	0.0000	OK
15 minute summer	RE5.01	11	19.021	0.021	1.1	0.0009	0.0000	OK
120 minute summer	SW6.00	96	18.900	0.350	2.4	0.2227	0.0000	SURCHARGED
120 minute summer	SW6.01	100	18.900	0.495	12.8	0.3150	0.0000	SURCHARGED
120 minute summer	SW6.02	100	18.900	0.515	17.7	0.3278	0.0000	SURCHARGED
120 minute summer	SW6.03	100	18.900	0.540	17.2	0.4677	0.0000	SURCHARGED
120 minute summer	SW6.04	96	18.899	0.609	16.9	19.2096	0.0000	SURCHARGED
60 minute winter	CW6.05	34	18.182	0.042	2.9	0.0475	0.0000	OK
30 minute winter	HEADWALL	20	18.091	0.041	2.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1.00	1.000	SW1.01	0.7	0.383	0.039	0.0251	
15 minute summer	SW1.01	1.100	SW1.02	1.4	0.459	0.079	0.0692	
15 minute summer	SW1.02	1.200	SW1.03	2.8	0.535	0.155	0.0328	
120 minute summer	SW1.03	1.300	SW4.00	2.5	0.616	0.141	0.1253	
15 minute summer	RE1.04	1.400	SW1.03	2.2	0.519	0.072	0.0664	
15 minute summer	RE2.00	2.000	SW2.01	1.1	0.305	0.062	0.0286	
15 minute summer	SW2.01	2.100	SW3.00	4.7	0.772	0.265	0.1271	
15 minute summer	SW3.00	3.000	SW3.01	5.8	0.821	0.331	0.1008	
120 minute summer	SW3.01	3.100	SW3.02	2.9	0.707	0.162	0.1575	
120 minute summer	SW3.02	3.200	SW6.02	4.7	0.904	0.179	0.2007	
15 minute summer	SW3.03	3.300	SW3.02	1.1	0.273	0.036	0.0703	
15 minute summer	RE3.04	3.400	SW3.03	1.1	0.643	0.062	0.0112	
120 minute summer	SW4.00	4.000	SW4.01	3.5	0.796	0.197	0.1236	
120 minute summer	SW4.01	4.100	SW6.01	4.5	0.955	0.168	0.1408	
15 minute summer	RE5.00	5.000	SW4.00	1.1	0.242	0.046	0.0785	
15 minute summer	RE5.01	5.100	SW4.01	1.1	0.297	0.041	0.1117	
120 minute summer	SW6.00	6.000	SW6.01	1.4	0.136	0.032	0.8591	
120 minute summer	SW6.01	6.100	SW6.02	12.0	0.518	0.279	0.1153	
120 minute summer	SW6.02	6.200	SW6.03	17.2	0.640	0.393	0.1392	
120 minute summer	SW6.03	6.300	SW6.04	16.9	0.637	0.581	0.8789	
120 minute summer	SW6.04	Hydro-Brake®	CW6.05	2.9				
60 minute winter	CW6.05	6.500	HEADWALL	2.9	0.736	0.165	0.0359	32.5

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1.00	10	19.274	0.024	1.0	0.0010	0.0000	OK
120 minute winter	SW1.01	118	19.186	0.071	0.8	0.0113	0.0000	OK
120 minute winter	SW1.02	118	19.186	0.296	1.2	0.0470	0.0000	SURCHARGED
120 minute winter	SW1.03	118	19.186	0.361	2.4	0.0573	0.0000	SURCHARGED
15 minute summer	RE1.04	10	19.281	0.031	2.9	0.0013	0.0000	OK
15 minute summer	RE2.00	11	19.279	0.029	1.4	0.0012	0.0000	OK
15 minute summer	SW2.01	10	19.236	0.061	6.2	0.0097	0.0000	OK
120 minute winter	SW3.00	116	19.186	0.221	2.5	0.0351	0.0000	SURCHARGED
120 minute winter	SW3.01	116	19.186	0.361	2.5	0.0574	0.0000	SURCHARGED
120 minute winter	SW3.02	116	19.186	0.481	4.1	0.0764	0.0000	SURCHARGED
15 minute summer	SW3.03	11	19.207	0.022	1.4	0.0035	0.0000	OK
15 minute summer	RE3.04	10	19.280	0.030	1.4	0.0013	0.0000	OK
120 minute winter	SW4.00	118	19.186	0.456	3.2	0.0724	0.0000	SURCHARGED
120 minute winter	SW4.01	116	19.186	0.526	4.0	0.0836	0.0000	SURCHARGED
120 minute winter	RE5.00	118	19.186	0.186	0.9	0.0078	0.0000	SURCHARGED
120 minute winter	RE5.01	118	19.186	0.185	0.8	0.0078	0.0000	SURCHARGED
120 minute winter	SW6.00	116	19.185	0.635	1.6	0.4041	0.0000	SURCHARGED
120 minute winter	SW6.01	116	19.185	0.780	11.5	2.2746	0.0000	SURCHARGED
120 minute winter	SW6.02	116	19.185	0.800	14.9	0.5090	0.0000	SURCHARGED
120 minute winter	SW6.03	116	19.185	0.825	14.4	0.7146	0.0000	SURCHARGED
120 minute winter	SW6.04	116	19.184	0.894	14.0	23.8268	0.0000	SURCHARGED
15 minute summer	CW6.05	12	18.182	0.042	2.9	0.0475	0.0000	OK
60 minute winter	HEADWALL	31	18.091	0.041	2.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1.00	1.000	SW1.01	1.0	0.421	0.054	0.0309	
120 minute winter	SW1.01	1.100	SW1.02	0.7	0.375	0.040	0.2919	
120 minute winter	SW1.02	1.200	SW1.03	1.2	0.450	0.066	0.1084	
120 minute winter	SW1.03	1.300	SW4.00	2.4	0.623	0.136	0.1665	
15 minute summer	RE1.04	1.400	SW1.03	2.9	0.553	0.095	0.1158	
15 minute summer	RE2.00	2.000	SW2.01	1.4	0.322	0.079	0.0345	
15 minute summer	SW2.01	2.100	SW3.00	6.1	0.820	0.342	0.1544	
120 minute winter	SW3.00	3.000	SW3.01	2.2	0.650	0.125	0.2500	
120 minute winter	SW3.01	3.100	SW3.02	2.5	0.682	0.142	0.2095	
120 minute winter	SW3.02	3.200	SW6.02	4.0	0.879	0.153	0.2007	
15 minute summer	SW3.03	3.300	SW3.02	1.4	0.285	0.045	0.1525	
15 minute summer	RE3.04	3.400	SW3.03	1.4	0.689	0.079	0.0133	
120 minute winter	SW4.00	4.000	SW4.01	3.2	0.762	0.179	0.1236	
120 minute winter	SW4.01	4.100	SW6.01	3.7	0.910	0.139	0.1408	
120 minute winter	RE5.00	5.000	SW4.00	-0.7	0.198	-0.027	0.2641	
120 minute winter	RE5.01	5.100	SW4.01	0.6	0.237	0.023	0.2676	
120 minute winter	SW6.00	6.000	SW6.01	1.4	0.129	0.034	0.8591	
120 minute winter	SW6.01	6.100	SW6.02	11.2	0.506	0.260	0.1153	
120 minute winter	SW6.02	6.200	SW6.03	14.4	0.613	0.327	0.1392	
120 minute winter	SW6.03	6.300	SW6.04	14.0	0.748	0.481	0.8789	
120 minute winter	SW6.04	Hydro-Brake®	CW6.05	2.9				
15 minute summer	CW6.05	6.500	HEADWALL	2.9	0.736	0.165	0.0359	25.7

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	RE1.00	172	19.398	0.148	0.3	0.0062	0.0000	OK
180 minute winter	SW1.01	172	19.398	0.283	2.4	0.0449	0.0000	SURCHARGED
180 minute winter	SW1.02	172	19.398	0.508	2.6	0.0807	0.0000	SURCHARGED
180 minute winter	SW1.03	172	19.398	0.573	2.4	0.0911	0.0000	SURCHARGED
180 minute winter	RE1.04	172	19.398	0.148	0.9	0.0062	0.0000	OK
180 minute winter	RE2.00	172	19.398	0.148	0.4	0.0062	0.0000	OK
180 minute winter	SW2.01	172	19.398	0.223	1.9	0.0354	0.0000	SURCHARGED
180 minute winter	SW3.00	172	19.398	0.433	2.3	0.0688	0.0000	SURCHARGED
180 minute winter	SW3.01	172	19.398	0.573	2.6	0.0911	0.0000	SURCHARGED
180 minute winter	SW3.02	172	19.398	0.693	3.9	0.1102	0.0000	SURCHARGED
180 minute winter	SW3.03	172	19.398	0.213	0.4	0.0338	0.0000	SURCHARGED
180 minute winter	RE3.04	172	19.398	0.148	0.4	0.0062	0.0000	OK
180 minute winter	SW4.00	172	19.398	0.668	2.9	0.1062	0.0000	FLOOD RISK
180 minute winter	SW4.01	172	19.398	0.738	3.3	0.1173	0.0000	FLOOD RISK
180 minute winter	RE5.00	172	19.398	0.398	0.4	0.0167	0.0000	FLOOD RISK
180 minute winter	RE5.01	172	19.398	0.398	0.5	0.0167	0.0000	FLOOD RISK
180 minute winter	SW6.00	172	19.398	0.848	1.6	0.5392	0.0000	FLOOD RISK
180 minute winter	SW6.01	172	19.398	0.993	10.4	12.9191	0.0000	FLOOD RISK
180 minute winter	SW6.02	172	19.398	1.013	13.5	4.3884	0.0000	SURCHARGED
180 minute winter	SW6.03	172	19.397	1.037	12.8	0.8984	0.0000	SURCHARGED
180 minute winter	SW6.04	172	19.397	1.107	12.5	24.0667	0.0000	SURCHARGED
30 minute winter	CW6.05	219	18.182	0.042	2.9	0.0475	0.0000	OK
30 minute winter	HEADWALL	219	18.091	0.041	2.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	RE1.00	1.000	SW1.01	0.3	0.293	0.017	0.2361	
180 minute winter	SW1.01	1.100	SW1.02	-1.8	0.365	-0.104	0.3985	
180 minute winter	SW1.02	1.200	SW1.03	-2.0	0.422	-0.111	0.1084	
180 minute winter	SW1.03	1.300	SW4.00	2.1	0.562	0.117	0.1665	
180 minute winter	RE1.04	1.400	SW1.03	0.9	0.475	0.030	0.2602	
180 minute winter	RE2.00	2.000	SW2.01	0.4	0.232	0.023	0.1336	
180 minute winter	SW2.01	2.100	SW3.00	1.9	0.615	0.106	0.3644	
180 minute winter	SW3.00	3.000	SW3.01	2.3	0.640	0.129	0.2500	
180 minute winter	SW3.01	3.100	SW3.02	2.4	0.645	0.134	0.2095	
180 minute winter	SW3.02	3.200	SW6.02	3.5	0.828	0.135	0.2007	
180 minute winter	SW3.03	3.300	SW3.02	0.4	0.205	0.013	0.2817	
180 minute winter	RE3.04	3.400	SW3.03	0.4	0.474	0.023	0.1143	
180 minute winter	SW4.00	4.000	SW4.01	2.5	0.711	0.143	0.1236	
180 minute winter	SW4.01	4.100	SW6.01	2.9	0.826	0.107	0.1408	
180 minute winter	RE5.00	5.000	SW4.00	0.6	0.192	0.027	0.2641	
180 minute winter	RE5.01	5.100	SW4.01	0.9	0.202	0.034	0.2676	
180 minute winter	SW6.00	6.000	SW6.01	1.3	0.123	0.032	0.8591	
180 minute winter	SW6.01	6.100	SW6.02	10.1	0.464	0.235	0.1153	
180 minute winter	SW6.02	6.200	SW6.03	12.8	0.554	0.293	0.1392	
180 minute winter	SW6.03	6.300	SW6.04	12.5	0.705	0.431	0.8789	
180 minute winter	SW6.04	Hydro-Brake®	CW6.05	2.9				
30 minute winter	CW6.05	6.500	HEADWALL	2.9	0.736	0.165	0.0359	47.9

SDS
Water Infrastructure Systems

SDS Aqua-Swirl™

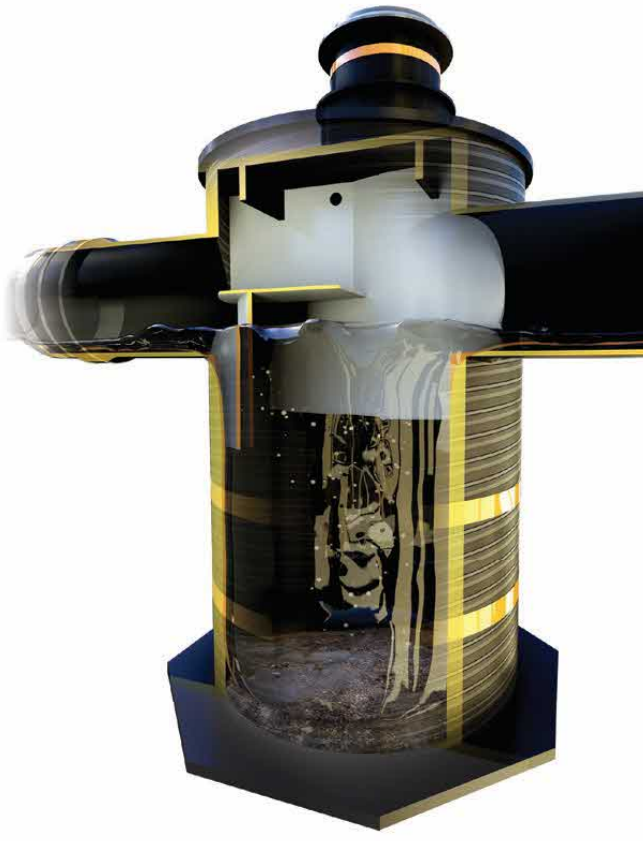
Hydrodynamic Vortex Separator

SDS Aqua-Swirl™is a custom engineered, flow through water quality device that utilises hydrodynamic separation technology to maximise the removal of sediment, debris and free floating oil within surface water runoff.

SYMBiotIC™

When connected to a SDS SYMBiotIC™system, SDS Aqua-Swirl™ provides real time data on a broad range of key operating factors such as pollutant loads and silt capture level.

- BBA HAPAS approved
- HDPE plastic construction
- No moving parts
- Sealed baffle
- Large debris storage chamber
- Lifting supports
- Compact dimensions
- Available in 9 different sizes
- Bespoke sizing available



SDS Aqua-Swirl™is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume.

The treatment flow rate of the SDS Aqua-Swirl™ system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution train.

SDS Ltd, Clearwater House, Castlemills, Biddisham, Somerset, BS26 2RE
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E: info@sdslimited.com

Features	Benefits
Available with performance monitoring via SDS SYMBiotIC™.	Provides bespoke suite of operating data, such as silt levels and pollutants, viewable via a secure web portal dashboard with live notifications via email and text.
BBA HAPAS certified.	Approved for installation under roads and pavements; adoptable by the Highways Agency.
Manufactured from HDPE high strength plastic Weholite.	Offers a durable, light weight and low cost alternative to concrete. Easy and quick to install resulting in substantial cost savings.
Specialised sealed baffle.	Delivers the most effective performance of any vortex separator.
Internal bypass with pollution retention.	Able to treat localised rain and larger storm events while retaining captured pollutants.
NJDEP verified performance.	Verification accepted by UK Government environmental regulators (as cited in the CIRIA C753 SuDS Manual).
Single swirl chamber.	Simplifies inspection and maintenance facilities with no special equipment required.
Compact dimensions.	Reduces ground excavation and product installation costs.
Small footprint design.	Can be retro-fitted with minimal disruption to existing infrastructure utilities or surface features, extending the ability to meet new regulations.
Certified installation lifting supports.	Easy installation without the need for large, expensive cranes.
Suitable for use during site construction programme.	Can be put into operation prior to completion of the site build, with the inclusion of a planned maintenance schedule.
Available in 9 different standard sizes and also bespoke.	Provides greater design flexibility and assists the removal of sediments at a greater rate than comparable systems.

SPECIFICATIONS

SDS Aqua-Swirl™ Model No.	Maximum ID pipe connection (mm) BYP[1]	Chamber Internal Diameter (mm)	Water Quality Treatment Flow Rate NJDEP (l/s) Fine	Water Quality Treatment Flow Rate (l/s) OK110 Coarse	Oil/debris storage capacity litres	Sediment storage capacity m^3	Aqua-Swirl™ Weight kg
AS-2	375	750	16	30	136	0.3	300
AS-3	500	1050	31	53	416	0.6	700
AS-4	600	1200	40	77	644	0.8	1000
AS-5	750	1500	63	120	1382	1.3	1100
AS-6	900	1800	91	173	1439	1.8	1400
AS-7	1050	2100	123	235	1987	2.5	1700
AS-8	1200	2400	161	307	2612	3.3	2200
AS-9	1350	2800	220	418	3596	4.4	2600
AS-10	1500	3000	252	480	4164	5.1	3100

[1]BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.

Notes:
Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.
The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.
For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0819

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SDS
Water Infrastructure Systems

SDS GEOlight®

Stormwater Management System

Product Profile

SDS GEOlight® is an ultra lightweight honeycombed modular structure made from recycled PVC. The ready to install units are preformed to provide an underground stormwater storage facility, for the application of stormwater attenuation or infiltration.

The high void rate (>95%), high compressive strength (to 1000KN/m²) and low resistance to water flow makes SDS GEOlight® an ideal material for cost efficient and maintainable underground water storage during storm conditions.

SDS GEOlight® Benefits

- High compressive strength – can be located under all roads, car parks and amenity area surfaces.
- Reduced excavation costs – the very high void rate (95%) minimises the required volume of earthworks.
- Speed of installation –1000m³ reservoir, completed in one week.
- Light and easy to handle.
- Excellent hydraulic characteristics.
- The honeycomb structure is highly permeable, offering low resistance to water flow.
- SDS GEOlight®'s unique lateral and vertical filling arrangement requires a minimum amount of pipework and stone.
- Depth of tank invert reduced by using patented lateral supply.
- Simplified distribution pipe network, easy maintenance – dispensing with costly and complicated pipework configurations.
- Modular format offers design flexibility to overcome topographical contraints and architectural requirements.
- Greatly reduces the risk of flooding when used as stormwater storage.
- Can also be used for water recycling and combining with irrigation systems.
- Can virtually eliminate pollution when used in combination with specialist separation and filtration technology such as SDS Aqua-Swirl™ and SDS Aqua-Filter™.
- Design service available, including calculations.

APPLiCATiOn S

RETAiL

in FRASTRUCTURE

in DUSTRiAL

RESiDEn TiAL

COMMERCiAL

PUBLiC SECTOR

SDS Ltd, Clearwater House, Castlemills, Biddisham, Somerset, BS26 2RE
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SDS GEOlight® 400	SDS GEOlight® 600	SDS GEOlight® 800
APPLICATIONS		
Stormwater Management		
Attenuation / Infiltration		
Bacterial filter-bed for biological treatment		
Hydrocarbon Separation		
Filtration and Separation Units		
SPECIFICATIONS		
Material	Recycled Rigid PVC	
Colour	Dark grey to black	
Standard length of a block	2000 mm	2000 mm	2000 mm
Standard width of a block	500 mm	500 mm	500 mm
Standard height of a block*	750 mm	750 mm	750 mm
*Other block sizes available on request		
Void Ratio	> 95%	> 95%	> 95%
Compressive Strength	420 kN/m²	610 kN/m²	800 kN/m²
ADVANTAGES		
Highly cost effective		
Reduced excavation costs		
High void capacity		
Good UV resistance		
Good hydrocarbon resistance		

GEO DS/1021

SDS Ltd, Clearwater House, Castlemills,
Biddisham, Somerset, BS26 2RE

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Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.500	3.000
Flush-Flo™	0.329	2.578
Kick-Flo®	0.671	2.076
Mean Flow		2.415

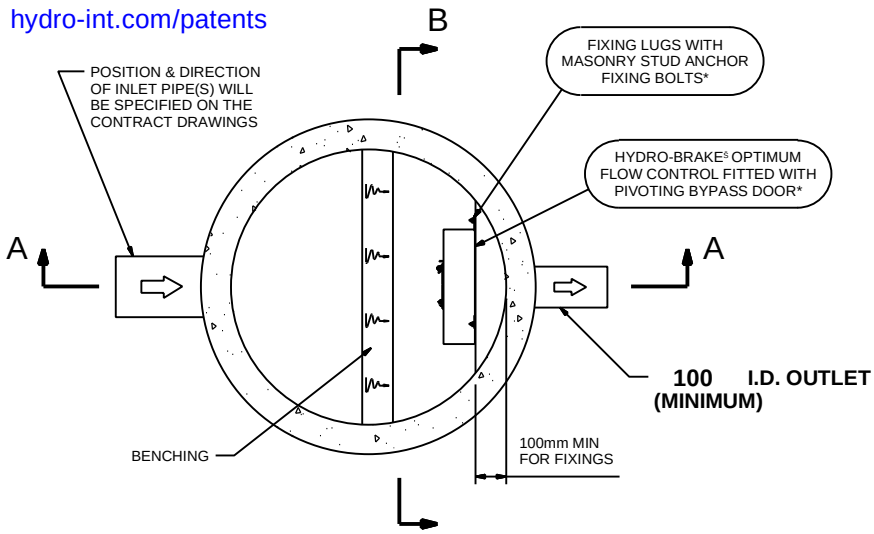
Hydro-Brake® Optimum Flow Control including:

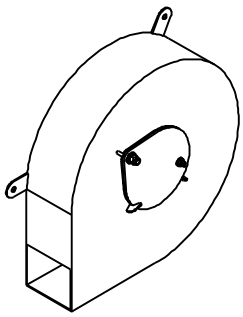
‡ 3 mm grade 304L stainless steel
‡ Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
‡ Beed blasted finish to maximise corrosion resistance
‡ Stainless steel fixings
‡ Rubber gasket to seal outlet

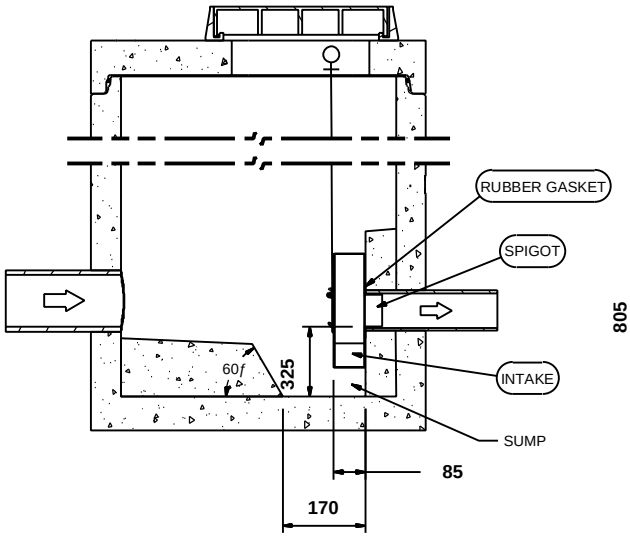
BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

WRc Approved PT/329/0412

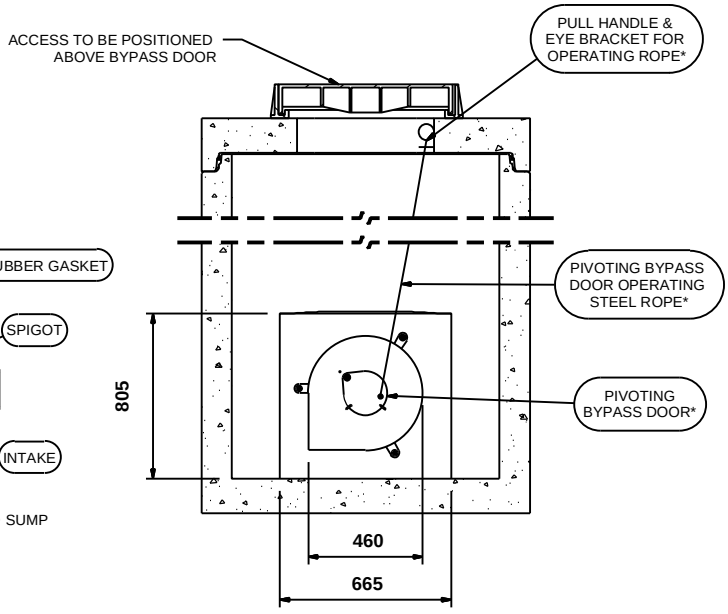
hydro-int.com/patents







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-0075-3000-1500-3000 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	11/1/2021 10:40 AM
SITE	Piggots
DESIGNER	Seb Reid
REF	S1.05

SHE-0075-3000-1500-3000
Hydro-Brake® Optimum

seb.reid@dudleys.co.uk

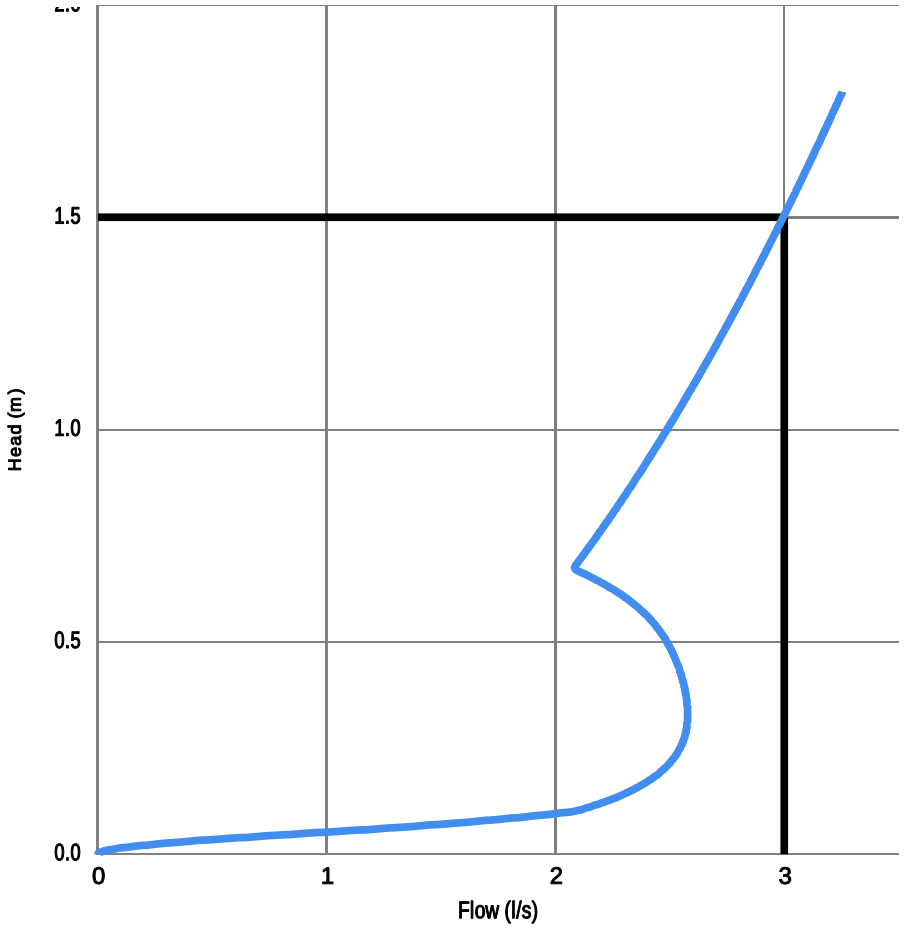
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.500	3.000
Flush-Flo	0.329	2.578
Kick-Flo®	0.671	2.076
Mean Flow		2.415

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.052	0.997
0.103	2.104
0.155	2.352
0.207	2.486
0.259	2.553
0.310	2.577
0.362	2.574
0.414	2.554
0.466	2.520
0.517	2.467
0.569	2.386
0.621	2.261
0.672	2.084
0.724	2.148
0.776	2.216
0.828	2.282
0.879	2.346
0.931	2.408
0.983	2.468
1.034	2.526
1.086	2.583
1.138	2.639
1.190	2.693
1.241	2.746
1.293	2.798
1.345	2.849
1.397	2.898
1.448	2.947
1.500	2.995

DESIGN ADVICE

The head/flow characteristics of this SHE-0075-3000-1500-3000 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	01/11/2021 10:40
Site	Piggots
DESIGNER	Seb Reid
Ref	S1.05

SHE-0075-3000-1500-3000

Hydro-Brake Optimum®