FERNBROOK
CONSULTING ENGINEERS

Flood Risk Assessment
& Sustainable Drainage Strategy

Moorlands Farm, West End

December 2023

Prepared for

Country Homes

FERNBROOK

Project Number: 23260
Doc Number: 23260-FCE-XX-XX-RP-D-0001

Rev	Issue Purpose	Author	Checked	Approved	Date
P01	Issued for information	DR	CR	DR	02.11.23
P02	Issued for information	DR	CR	DR	07.12.23

This report has been prepared for the exclusive use of Country Homes. It should not be reproduced in whole or in part, or relied upon by third parties, without the express written authority of Fernbrook Consulting Engineers (FCE).

Prepared by:
Fernbrook Consulting Engineers
Unit 302, 40 Bowling Green Lane
London
EC1R 0NE

E: info@fernbrook.co
W: fernbrook.co

Contents

1. INTRODUCTION 2
2. POLICY REVIEW 3
3. BASELINE CONDITIONS 4
4. FLOOD RISK ASSESSMENT 5
5. SURFACE WATER MANAGEMENT 7
6. FOUL DRAINAGE 10
7. CONCLUSION 11

Tables

Table 1-1 Site Details 2
Table 5-1 Brownfield runoff rate 7
Table 5-2 Drainage Hierarchy Assessment 7
Table 5-3 SuDS Hierarchy 8
Table 5-4 Comparison of runoff rates 8
Table 5-5 Simple Index Method 9
Table 5-6 SuDS Management Plan 9
Table 6-1 Foul flows 10

Figures

Figure 1.1 Site Location Plan
Figure 1.2 Proposed Development Plan
Figure 3.1 Hydrology
Figure 3.2 British Geological Survey data
Figure 3.3 Southern Water Sewer Records
Figure 4.1 EA Flood map for planning
Figure 4.2 EA Flood risk from surface water
Figure 4.3 Groundwater Vulnerability Map

Appendices

Appendix A – Proposed Development Plan
Appendix B – Topographical Survey
Appendix C – Geological Information
Appendix D – Southern Water Sewer Records
Appendix E – Drainage Calculations & Drawings
Appendix F – Treatment Mitigation Information
Appendix G – Drainage Maintenance Plan

1. Introduction

1.1 Fernbrook Consulting Engineers has been appointed by Country Homes to provide a Flood Risk Assessment and Sustainable Drainage Strategy for the proposed development Moorlands Farm, West End, Southampton.

1.2 This report has been prepared with specific reference to the requirements of National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG). This report also takes into consideration requirements of the Local Flood Risk Management Strategy, the Non-statutory technical standards for sustainable drainage systems, and CIRIA C753 The SuDS Manual.

Site Characteristics

1.3 The site is located between Hedge End and West End in Southampton and sits to the north-west of Hedge End industrial estate, alongside the M27. The Site's location is illustrated in **Figure 1.1** below.

Table 1-1 Site Details

Site Address	Moorlands Farm, Botley Road, West End, SO30 3HD
Grid Reference	448172mE, 114502mN (SU 48172 14502)
Site Area (ha)	0.938
Existing use	Agriculture
Access	Botley Road

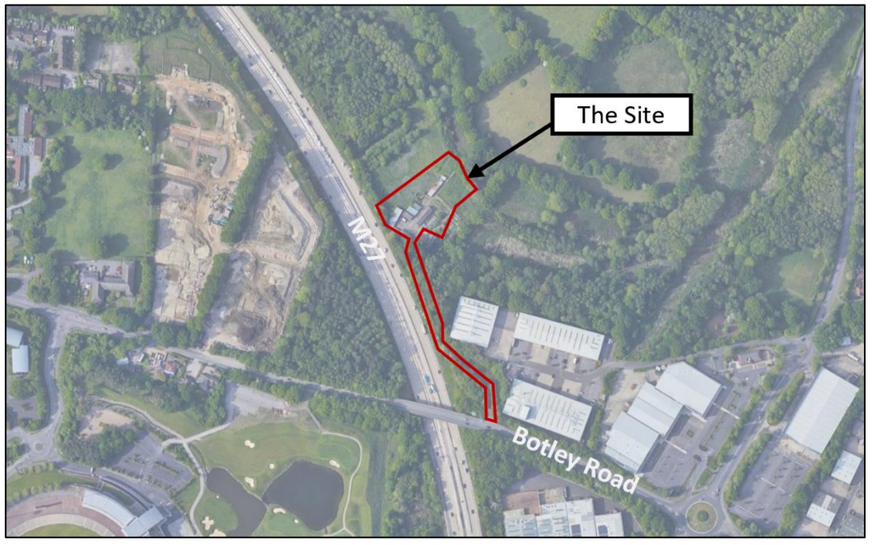


Figure 1.1 Site Location Plan

Development Proposals

1.4 The development proposals are comprised of the demolition of all existing buildings and detailed planning approval for light industrial floorspace [Use Class E(g)(ii) & E(g)(iii)] and estate office (Use Class E(g)(i).

1.5 An excerpt of the proposed development plan is included in **Figure 1.2** below, and the full plan is included in **Appendix A**.

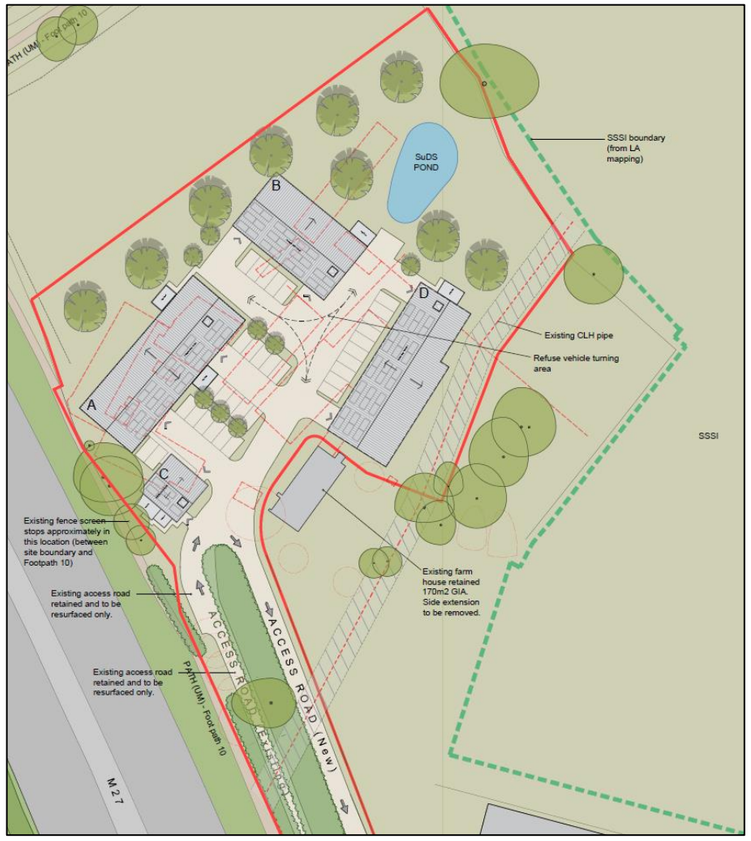


Figure 1.2 Proposed Development Plan

2. Policy Review

National Planning Policy Framework

2.1 The National Planning Policy Framework (NPPF) sets out policies to ensure that flood risk is considered during the planning process to prevent inappropriate development in areas at risk of flooding and to direct development away from areas at high risk. The Planning Practice Guidance is the on-line technical guidance to the NPPF, providing guidance and links to current documents.

2.2 All land in England and Wales is classified into three main Flood Zones, which refer to the probability of river or sea flooding (ignoring the existence of defences). The three Flood Zones are:

- Flood Zone 1 (Low Probability) – less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%);
- Flood Zone 2 (Medium Probability) – having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) in any year or having between a 1 in 200 and 1 in 1000 annual probability of sea flooding in any year (0.5% - 0.1%);
- Flood Zone 3a (High Probability) – having a 1 in 100 or greater annual probability of river flooding (≥1%) or having a 1 in 200 or greater annual probability of sea flooding (≥0.5%);
- Flood Zone 3b (the Functional Floodplain) – having a 1 in 20 or greater annual probability of river flooding. The zone comprises land where water flows to be stored in times of flood.

2.3 The NPPF states that "inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

Flood and Water Management Act

2.4 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with the UK Government's response to Sir Michael Pitt's Review of the Summer 2007 floods.

2.5 The Lead Local Flood Authority (LLFA) for the site is Hampshire County Council. All LLFAs have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from surface run-off, groundwater and ordinary watercourses (i.e. non-main rivers).

2.6 Relevant to any site, the FWMA will encourage the uptake of sustainable drainage systems (SuDS) by removing the automatic right to connect to sewers and providing for Lead Local Flood Authorities to adopt SuDS for new developments.

2.7 The development proposals will adhere to the Act through the provision of SuDS as a fundamental element of the surface water drainage system. Furthermore, the developer is committed to work with the relevant stakeholders, such as the EA and Hampshire County Council (as LLFA), in implementing the requirements of the FWMA where necessary.

Sustainable Drainage Systems: Non-statutory technical standards

2.8 The Non-statutory technical standards for sustainable drainage systems were published in March 2015. This document sets out non-statutory technical standards for sustainable drainage systems. They should be used in conjunction with the Planning Practice Guidance (PPG).

2.9 The LPA may set local requirements for planning permission that have the effect of more stringent requirements than the non-statutory technical standards.

2.10 In addition, SuDS should be designed in accordance with CIRIA 753 SuDS Manual, which represents current best practice.

2.11 The Non-Statutory Technical Standards for Sustainable Drainage Systems: Best Practice Guidance was published by Local Authority SuDS Officer Organisation (LASOO) in July 2015 to provide an interpretation of the technical standard.

Eastleigh Borough Submitted Local Plan 2016-2036 (April 2022)

2.12 The principles of 'sustainable development' are central to national planning policies, and they underpin the Council's approach to planning in the Borough. The following policies have been reviewed in the preparation of this document:

- S1 (Delivering sustainable development);
- S9 (Green Infrastructure)
- DM2 (Environmentally sustainable development);
- DM3 (Adaption to climate change);
- DM5 (Managing flood risk);
- DM6 (Sustainable surface Water management and watercourse management);
- DM8 (Pollution);
- DM10 (Water and waste water);

The following SPDs are also of note:

- Biodiversity (December 2009);
- Environmentally Sustainable Development (March 2009).

3. Baseline Conditions

Topography

3.1 Based on the Site Survey by KND Surveys, ref. H16 07, the developable area of the site appears to fall in a south-easterly direction from 32.92m AOD in the north-west to 29.39m AOD in the south-east. Refer to **Appendix B** for the Site Survey drawing.

Hydrology

3.2 There are a number of waterbodies in close proximity to the site, including a pond north of the site and the Moorgreen Stream, a tributary of the River Hamble flowing along the site's east boundary. Refer to **Figure 3.1** below.

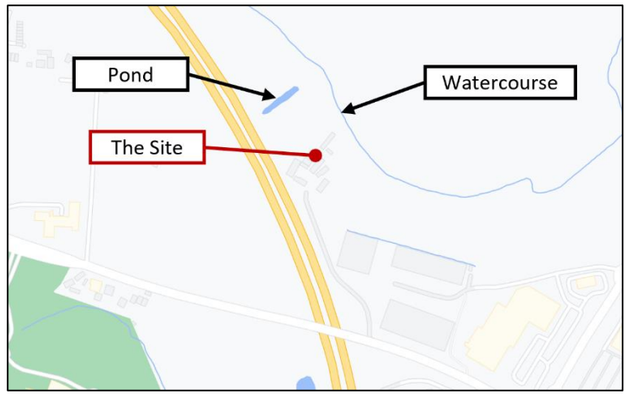


Figure 3.1 Hydrology

Geology

3.3 Based on the British Geological Survey online data, the site appears to be underlain by Earnley Sand Formation (Sand, Silt, and Clay) bedrock, with no superficial deposits. Refer to **Figure 3.2** to below, and **Appendix C** for Geological information.

Figure 3.2 British Geological Survey data

3.4 Based on Defra's MAGIC map application, the site is not located in a Source Protection Zone.

Existing Sewer Infrastructure

3.5 Based on the Southern Water Sewer Records, there appears to be a public sewer network west of the M27, although no sewers in close proximity to the site. Refer to **Figure 3.3** below for an extract of the sewer records, and **Appendix D** for the full records.

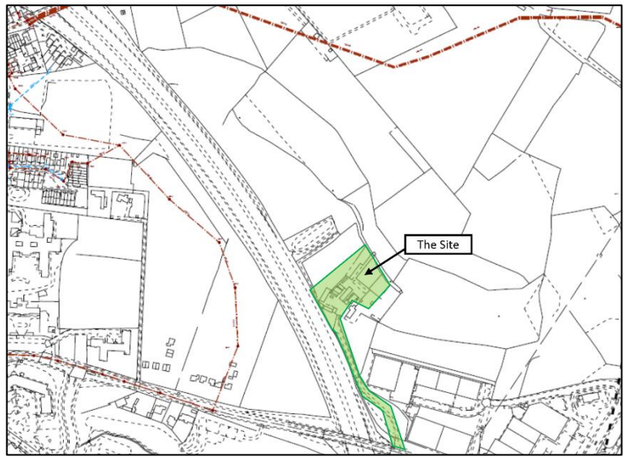


Figure 3.3 Southern Water Sewer Records

4. Flood Risk Assessment

Tidal / Fluvial Flooding

4.1 Based on the EA Flood map for planning, the site appears to be located in Flood Zone 1, refer to **Figure 4.1** below.

Figure 4.1 EA Flood map for planning

4.2 Areas within Flood Zone 1 are considered to have a less than 1 in 1,000 year annual probability of flooding (0.1%). Therefore, the risk of tidal/fluvial flooding is assessed as low.

Pluvial Flooding

4.3 Based on the EA long term flood risk information, the majority of the site appears to be at very low risk of surface water flooding, refer to **Figure 4.2** below.

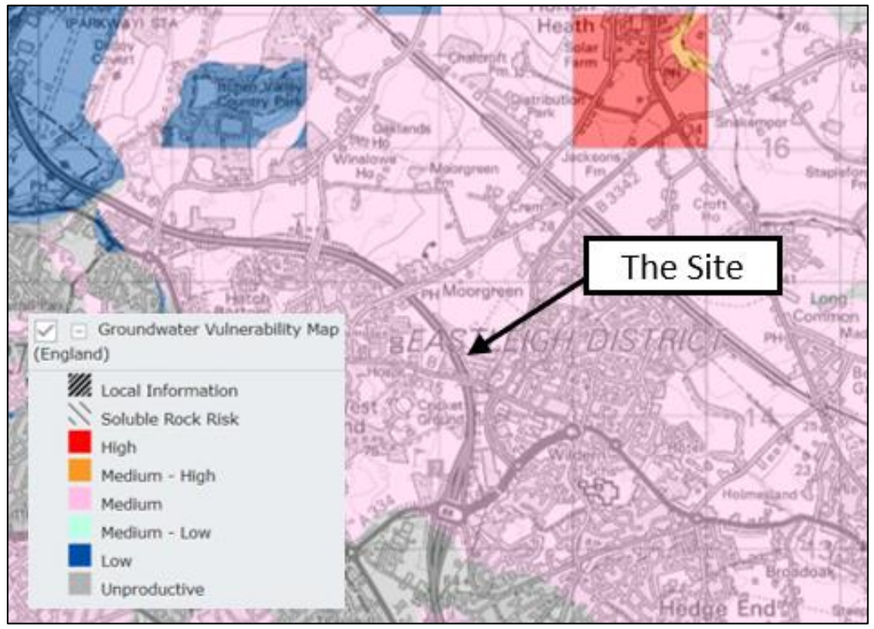
Figure 4.2 EA Flood risk from surface water

4.4 There appears to be a risk of flooding associated with the watercourse adjacent to the site's east boundary, however flooding appears to stay in channel. Therefore, the risk of surface water flooding is assessed as low.

Groundwater Flooding

4.5 Based on Defra's MAGIC Map application, the site appears to have a medium vulnerability to groundwater. Refer to **Figure 4.3** below.

Figure 4.3 Groundwater Vulnerability Map



4.6 The site's underlying geology will be confirmed at detailed design through intrusive geotechnical site investigations, which will also set out the strategy to mitigate groundwater flood risk. All structures will be designed and built in accordance with best practice. Therefore, the risk of groundwater flooding is assessed as low.

Flooding from Sewers

4.7 Based on Southern Water's sewer records, there does not appear to be any public sewers in close proximity to the site. Therefore, the risk of flooding from sewer surcharge is assessed as low.

Artificial Sources

4.8 The site is not located in an area at risk of flooding from artificial sources. Therefore, the risk of flooding from reservoirs, lakes, and artificial sources is assessed as low.

5. Surface Water Management

5.1 This surface water drainage strategy has been developed based on the Non-statutory Technical Guidance for Sustainable Drainage Systems, CIRIA Guidance C753 "The SuDS Manual", and Hampshire County Council's "Information for developers on SuDS - Principals and Application" – taking into account the spatial and environmental constraints of the site.

5.2 The NPPF requires that to allow for predicted impacts of climate change on surface water runoff, the following increases to rainfall intensity should be allowed for:

- 2015 to 2039: +5% (10% Upper end);
- 2040 to 2069: +10% (20% Upper end); and
- 2070 to 2115: +20% (40% Upper end).

5.3 Therefore, under the NPPF an allowance of 20% for the effects of climate change will achieve the policy requirements for the proposed commercial development.

Pre-development surface water run-off conditions

5.4 The existing site area is 0.938 ha, and approximately 0.298 ha is comprised of impermeable area (32%). It is assumed that surface water runoff from the existing impermeable areas is currently conveyed to the watercourse unrestricted via a network of land drains.

5.5 To ensure that pre-development runoff rates are not exceeded, the brownfield runoff rates from the site were determined using the Wallingford procedure rational method for an assumed critical 5-minute storm: Q = 2.78 x C x i x A

Where: Q = Peak discharge (l/s)
C = Dimensionless Runoff coefficient
i = Rainfall intensity (mm/hr)
A = Contributing impermeable areas (ha)

5.6 Refer to **Table 5-1** below, and **Appendix E** for calculations.

Table 5-1 Brownfield runoff rate

Rainfall event	Runoff rate (l/s)
Q1	42.4
Q30	94.3
Q100	120.0

Post-development surface water runoff

5.7 In accordance with the Building Act 2000 Clause H3.3 surface water run off not collected for re-use must be discharged in the following hierarchy:

1) To ground (infiltration techniques);
2) To a surface water body;
3) To a surface water sewer; or
4) To the combined sewer.

5.8 Refer to **Table 5-2** for an assessment of the drainage hierarchy.

Table 5-2 Drainage Hierarchy Assessment

Disposal method	Feasible	Comments
1st) Infiltration	×	The site appears to be underlain by sand over clay, with potential for high groundwater.
2nd) Watercourse	✓	There is an existing watercourse adjacent to the site's eastern boundary.
3rd) Surface Water sewer	×	No surface water sewers in close vicinity.
4th) Combined sewer	×	No combined sewers in close vicinity.

5.9 Based on the drainage hierarchy assessment, the proposed drainage strategy will seek to convey surface water to the Moorgreen Stream along the site's eastern boundary.

Sustainable Drainage Systems

5.10 The proposed strategy will seek to maximise the use of Sustainable Drainage Systems (SuDS) to increase the biodiversity, provide amenity, control discharge volumes, and manage water quality.

5.11 The opportunities and constraints for the use of SuDS within the site are assessed in **Table 5-3**. The assessment is based on the management train approach outlined in CIRIA C753 "The SuDS Manual".

Table 5-3 SuDS Hierarchy

SuDS Component	Feasible	Comment
Rain gardens / Filter trench	✓	Rain gardens could be incorporated adjacent to buildings to provide inception storage and improved bio-diversity.
Ponds / Basins	✓	Basins could be incorporated to provide water quality benefits.
Permeable Surfacing	✓	Opportunities to utilise permeable paving will be maximised in parking areas and service yards to improve the water quality of the surface water discharge.
Tanked systems	✓	Should attenuation be required this could be achieved by use of oversized sewers or geo-cellular storage attenuation below the surface.

5.12 Based on the SuDS Hierarchy, the most appropriate SuDS for this development are rain gardens, basins and permeable surfaces.

5.13 The proposed buildings and access roads will also be set back from the boundaries which will allow for native woodland and hedge buffer planting. The increased vegetation will contribute to the sustainable drainage strategy through water interception and infiltration while increasing evapotranspiration potential.

Peak Flow Control

5.14 The proposed drainage will be designed to ensure that flooding does not occur on any part of the site for the 1 in 30 year rainfall event, and any flooding up to the 1 in 100 year plus 20% for climate change will be contained on site.

5.15 Therefore, the proposed drainage strategy will seek to restrict surface water runoff to 50% of the existing 1 in 1 year runoff rate at 21 l/s using a vortex flow controls for all events up to the 1 in 100 year plus 25% climate change rainfall event.

5.16 Runoff will be restricted through the provision of 118m^3 attenuation storage within the attenuation basin.

5.17 The peak surface water run-off generated from the Site for the 1 year, 30 year and 100 year rainfall events, for the pre and post-development scenarios, is detailed in **Table 5-4** below. Refer to **Appendix E** for full MicroDrainage calculations.

Table 5-4 Comparison of runoff rates

Return Period	Existing Brownfield Rate (l/s)	Proposed Rate (l/s)	Reduction
1 in 1 year	42.4	21.0	-50%
1 in 30 year	94.3	21.0	-78%
1 in 100 year	120.0	21.0	-82%
1 in 100 year + 40% CC	-	21.0	-

5.18 Refer to drawing ***23260-MA-XX-XX-DR-D-0500*** for the Indicative Drainage Strategy illustrating how the Site could be drained in **Appendix E**.

5.19 In accordance with the Non-statutory Technical Guidance for Sustainable Drainage Systems, the post-development discharge rate does not exceed the rate of discharge from the development prior to redevelopment. Therefore, the risk of flooding from impermeable areas is assessed as low.

Urbanisation & Long Term Storage

5.20 Based on the industrial development proposals, it is unlikely that the buildings will be extended. Therefore, urban creep has not been considered.

5.21 The long term storage requirement can be provided within the permeable paving sub-base.

Overland Flow Routes

5.22 The site will be designed so that exceedance flows above the 1 in 100 year, including climate change rainfall event will be conveyed eastbound towards the Moorgreen Stream via the access roads across the site. Refer to drawing ***23260-MA-XX-XX-DR-D-0502*** for the Indicative Exceedance Flow Routes in **Appendix E**.

Water Quality Management

5.23 In accordance with Policy DM6 of the Local Plan Eastleigh Borough Council for sites of 1 hectare or more, or within 100m of the River Itchen SAC or Solent Maritime SAC, SuDS schemes should include at least three above ground forms of naturalised filtration. The strategy includes rain gardens, permeable paving, a swale and an attenuation pond to provide filtration.

5.24 SuDS will be provided to form a management train in line with the best practice outlined in CIRIA C753 "The SuDS Manual". Source control techniques rain gardens and permeable paving could manage runoff and reduce the time of concentration within the pipe network, reducing the risk of sewer surcharge and flash flooding, and provide water quality benefits.

5.25 In line with CIRIA C753 The SuDS Manual, Tables 26.2 and 26.3, the pollution hazards indices associated with an industrial development are mitigated by the proposed SuDS. Refer to **Table 5-5** below for the Simple Index Method assessment, and **Appendix F** for Mitigation data.

Table 5-5 Simple Index Method

Pollution Hazard Indices			
Pollution hazard	**TSS**	**Metals**	**Hydrocarbons**
High – Industrial Estates	0.80	0.80	0.90
Pollution Mitigation Indices provided			
SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Permeable Paving/ Filter Trench	0.70	0.60	0.70
Basin	0.25	0.30	0.30
Downstream Defender	0.25	0.20	0.40
Sediment Forebay	0.25	0.25	0.30
Check	***+0.65***	***+0.55***	***+0.8***

Biodiversity

5.26 SuDS can make a significant contribution to the biodiversity and ecological value of an area through rain gardens, basins, swales, wetlands, trees and grassland. The basin and swale will include aquatic planting and specially designed areas for wildlife.

Amenity

5.27 In addition to creating habitats that encourage biodiversity, SuDS can simultaneously provide open space through the provision of swales and attenuation basins.

5.28 The swale and basin located around the site will create visually attractive green (vegetated and landscaped) and blue (water) corridors within the development to connect people to water. This in turn can improve the well-being of people working on site.

Maintenance

5.29 The maintenance of all SuDS components will be in accord with the best practices and the CIRIA C753 The SuDS Manual. The recommended Operation and Maintenance requirements for the proposed permeable paving, swale and basin are outlined in **Table 5-6**. Refer to **Appendix G** for a recommended SuDS Management Plan. The management plan will be undertaken by the site management team.

Table 5-6 SuDS Management Plan

Maintenance Task	Description	Frequency
Regular Maintenance		
Litter management	Pick up all litter in SuDS and landscape areas and remove from site	Monthly
Tree / Grass maintenance	Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ.	As required or monthly
Inlets and outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	Monthly
Hard surfaces	Sweep all paving regularly.	As required
Occasional tasks		
Inspection and control chambers	Annual inspection, remove silt and check free flow	Annually
Silt management	Inspect swales for silt accumulation	Annually
	Excavate silt, stack and dry within 10m of the SuDS feature, but outside the design profile where water flows, spread, rake and overseed.	As required
Remedial work		
Repairs	Inspect SuDS system regularly to check for damage or failure. Undertake remedial work as required.	As required

6. Foul Drainage

6.1 Based on the topographical survey, at present foul flows from the site appear to be conveyed to an existing cess pit, which is assumed to be emptied periodically.

6.2 Post-development foul flows from the offices and light industrial/storage units could be conveyed to a packaged sewerage treatment plant. Treated foul effluent could then be discharged to the Moorgreen Stream along the site's east boundary as there are no foul sewers in close proximity to the site.

6.3 The post-development foul flows have been assessed on the conservative assumption that Blocks A, B and D will be in Light Industrial use as a worst case scenario. However, it is possible that the space could be used for warehousing/storage, in which case foul flows will be lower.

6.4 Based on British Water Flows and Loads, the total treated effluent per day is 2.3m^3 / day based on serving 46no. people. This gives an equivalent peak foul flow of 1.12 l/s based on a proposed development comprised of 200m^2 Office space and 1179m^2 Light Industrial buildings.

6.5 Foul effluent could be treated by a WPL HiPAF compact system (or similar approved) to ensure that the effluent quality meets the requirements of BS EN 12566 for Biological Oxygen Demand (BOD), Suspended Solids (SS), and Ammonia (NH3-N). Refer to **Table 6-1** below for a foul flows from the development and Appendix E for treatment plant specification.

Table 6-1 Foul flows

Block	Use	Area (m^2)	Population	Peak (l/s)	Flow (m^3/day)	BOD (kg)
A	Light Industrial	450	15	0.309	0.75	0.375
B	Light Industrial	300	10	0.206	0.50	0.250
C	Office	180	6	0.309	0.30	0.150
D	Light Industrial	429	15	0.295	0.75	0.375
Total		**1179**	**46**	**1.12**	**2.3**	**1.15**

6.6 Refer to drawing ***23260-MA-XX-XX-DR-D-0500*** for the Indicative Drainage Strategy illustrating how foul flows could be drained in **Appendix E**.

7. Conclusion

7.1 Fernbrook Consulting Engineers has been appointed by Country Homes to provide a Flood Risk Assessment and Sustainable Drainage Strategy for the proposed development Moorlands Farm, West End, Southampton, SO30 3HD.

7.2 The development proposals are comprised of the demolition of all existing buildings and detailed planning approval for light industrial floorspace [Use Class E(g)(ii) & E(g)(iii)] and estate office (Use Class E(g)(i).

7.3 The Site is situated within Flood Zone 1. Areas within Flood Zone 1 are considered to have a less than 1 in 1,000 year annual probability of flooding (0.1%). All other sources of flood risk have been assessed as low.

7.4 The proposed drainage strategy will seek to discharge surface water runoff to the existing watercourse adjacent to the site's eastern boundary. Runoff will be restricted to 50% of the existing 1 in 1 year brownfield runoff rate at 21 l/s for all rainfall events up to the 1 in 100 year plus 25% climate change rainfall event.

7.5 The drainage strategy will provide 118m^3 attenuation storage, in addition to an attenuation basins and permeable surfacing to provide inception storage and water quality benefits.

7.6 The basin will include aquatic planting and specially designed areas for wildlife which will increase the local biodiversity.

7.7 The swales and basins located around the site will create visually attractive green (vegetated and landscaped) and blue (water) corridors within the development to connect people to water and provide amenity spaces improving the well-being of people working on site.

7.8 In conclusion, this report demonstrates that the proposals are consistent with the aims of the NPPF and its Planning Practice Guidance, along with the aims of the Local Flood Risk Management Strategy. Surface water runoff can be adequately managed without increasing the risk of flooding on site or elsewhere.

APPENDIX A – PROPOSED DEVELOPMENT PLAN

DRAWN BY	CHECKED	DRWG NO
NWM	JM	D01

KEY

- CLH_PS Pipe
- 6m wide easement above pipe
- Existing trees
- Existing RPAs
- Demolition/trees to be removed
- Outline of previously approved application (F/18/84683)
- New trees
- Sheltered cycle parking
- Refuse storage (23 x 1100 litre bins)
- Public Path (Foot Path 10)
- Traffic Direction

PRELIMINARY

t. 01962842228
e. architects@radleyhouse.co.uk
w. www.radleyhouse.co.uk

20 Staple Gardens | Winchester | SO23 8SR

JOB | Moorlands Farm

DWG | As Proposed Site Plan

S | 1:100@A2

D | DEC 2023 No. | 7912_D01

APPENDIX B – TOPOGRAPHICAL SURVEY

APPENDIX C – GEOLOGICAL INFORMATION

109

COUNTY OF HAMPSHIRE
SOIL SURVEY FOR SOUTH COAST ROAD
CONTRACT 2 - WEST END TO PARK GATE

SU41SE/15

RECORD OF BOREHOLE No. 59

Type of Boring: shell and auger
Dia. of boring: 6in to 15ft
Lining tubes: 6in to 12ft 6in

SU 4808.1449

Ground level: 107.4' OD
Date started: 25-7-68
Date completed: 25-7-68

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
25-7-68						1'6"	105.9'	Topsoil
	nil		2'0"	D				
3'6"	2'6"	seepage	3'0"-4'6"	U4 (65)				GRAVEL in a matrix of grey-brown sandy clay
	2'6"		6'0"	D		6'6"	100.9'	Firm brown and grey sandy CLAY
	7'0"	sealed				8'0"	99.4'	
	7'0"		7'6"-9'0"	U4 (68)				
	7'0"		12'0"	D				Stiff dark grey sandy CLAY
15'0"	12'6"	nil	13'6"-15'0"	U4 (56)				
	12'6"							

END OF BOREHOLE
Depth: 15ft
Elevation: 92.4' OD

Key
- ▼ denotes ground water first encountered
- U4( ) .. 4 in. dia. undisturbed sample
- U1½( ) .. 1½ in. .. .. "
- D .. disturbed sample
- B .. bulk sample
- W .. water sample
- S( ) .. standard penetration test
- C( ) .. cone penetration test
- (24) .. number of blows
- · .. sample not recovered
- I .. rotary core drilling

Remarks

Scale: 1 in. = 8 Ft.

FIG. 69

---

109 + hand

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

(For Survey use only)
6-inch Map Registered No.
SU41SE/15

Name of Shaft or Bore given by Geological Survey:

Name and Number given by owner: No. 59

Nat. Grid Reference: SU 4808 1449

For whom made: Min.of Transpt. S.E. R.C.U. Hampshire SubUnit

Town or Village: West End County: Hampshire

Exact site: (Attach a tracing from a map, or a sketch-map, if possible.)

1" N.S.Map No.	1" O.S.Map No.	Confidential or not
315		

Purpose for which made: Road construction

Ground Level at ~~shaft~~ bore relative to O.D. 107.4' If not ground level give O.D. of beginning of shaft bore –

Made by: Date of sinking: July 1968

Information from: Ministry of Transport Report Date received:

Examined by:

SPECIMEN NUMBERS AND ADDITIONAL NOTES

(For Survey use only) Geological Classification	Description of Strata	Thickness Ft.	Thickness In.	Depth Ft.	Depth In.
	Topsoil	1	6	1	6
	Gravel in a matrix of grey-brown sandy clay	5	-	6	6
	Firm brown and grey sandy clay	1	6	8	-
	Stiff dark grey sandy clay	7	-	15	-
	END OF BOREHOLE AT 15'0"				

(54423) Wt.17837/P2.154 2m. 10/64 C.W.B.Ltd. Gp.863

APPENDIX D – SOUTHERN WATER SEWER RECORDS

Order received: 9 November 2020
Order completed: 10 November 2020

Drainage and water enquiry
Residential

Order reference: LS/U1551127
Your reference: 10819660:22701

Search address:
Moorlands Farm Botley Road
Southampton
Hampshire
SO30 3HD

Ordered by:
InfoTrack LTD
customer.liaison@infotrack.co.uk 91 Waterloo Road
Lambeth
London
SE1 8RT

For enquiries regarding the information provided in this report, please contact the LandSearch team:

Tel: 0845 270 0212
0330 303 0276 (individual consumers)

Email: searches@southernwater.co.uk

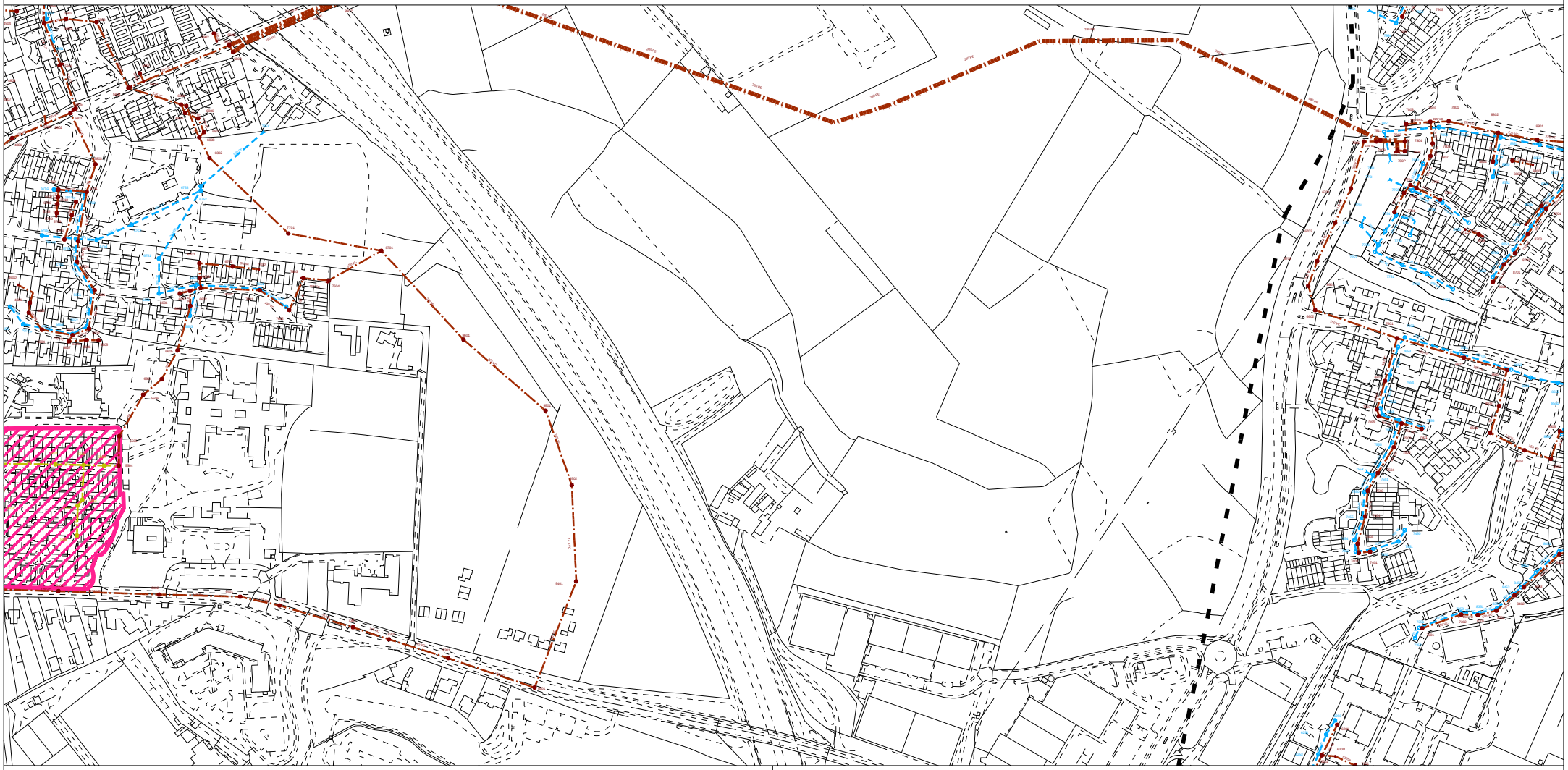
Web: www.southernwater.co.uk

LandSearch
Southern Water Services
Southern House
Capstone Road
Chatham
Kent
ME5 7QA

CON29DW
DRAINAGE AND WATER ENQUIRY

Southern Water

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

Southern Water

O.S. REF: SU4814NW	Scale: 1:5000	Printed By: RD	Date: 10-11-2020
Sewer Plot		Moorlands Farm Botley Road	
WARNING: BAC pipes are constructed of Bonded Asbestos Cement		Requested By:	
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement			

Land Searches
Map Legend

Sewer

Pipe Line Styles/Colours

- Foul Sewer
- Foul Rising Main
- Foul Syphon Sewer
- Foul Vacuum Sewer
- Foul Trunk Sewer
- Foul Tank Sewer
- Surface Water Sewer
- Surface Water Rising Main
- Surface Water Syphon Sewer
- Surface Water Trunk Sewer
- Surface Water Tank Sewer
- Culverted Watercourse
- Combined Sewer
- Combined Rising Main
- Combined Syphon Sewer
- Combined Trunk Sewer
- Combined Tank Sewer
- Treated Effluent
- Treated Effluent Rising Main
- Sludge Rising Main
- Flow Direction Arrows (All Styles)
- As above line styles but decommissioned
- (Yellow) As above line styles but private
- Access Shaft – Personnel Only

Boundary Line Styles/Colours

- Catchment Boundary
- Sub-Catchment Boundary
- Section 104 Agreement Area
- Building Over Agreement Area

Materials

AK	Alkathene	GRP	Glass Reinforced Plastic
BAC	Bonded Asbestos Cement *	MAC	Masonry in regular courses
BRE	Brick (Engineering)	MAR	Masonry in random courses
BRC	Brick (Common)	PE	Polyethyelene
CC	Concrete Box Culvert	PF	Pitch Fibre
CI	Cast Iron	PP	Polypropylene
CO	Concrete (In-Situ)	PVC	Polyvinyl Chloride
CP	Concrete (Pre-Cast)	RPM	Reinforced Plastic Matrix
CSB	Concrete Segments (Bolted)	SI	Spun Iron
CSU	Concrete Segments (Un-Bolted)	ST	Steel
DI	Ductile Iron	VC	Vitrified Clay
GRC	Glass Reinforced Concrete	UNK	Unknown*

*Warning
BAC Pipes are constructed of Bonded Asbestos Cement
UNK Pipes are may be constructed of Bonded Asbestos Cement

Symbols

Surface	Foul	Combined	
4350	4300	4300	Label Ellipse
			Manhole
			Dummy/S.24 Manhole
			Manhole Backdrop
CP	n/a	n/a	Catchpit
S	n/a	n/a	Soakaway
BP	n/a	n/a	Balancing Pond
RE	RE	RE	Rodding Eye
WO	WO	WO	Washout
HB	HB	HB	Flushing Chamber Mn-E
FC	FC	FC	Flushing Chamber No-E
FC	FC	FC	Hatch Box
LH	LH	LH	Lamphole
IC	IC	IC	Interceptor Chamber
BS	BS	BS	Blind Shaft
ST	ST	ST	Storm Tank
VC	VC	VC	Vortex Chamber
VT	VT	VT	Vent
VE	VE	VE	Vent Column
?	?	?	Other/Unknown
PK	PK	PK	Penstock
CC	n/a	CC	Cascade
			Change Node
PS	PS	PS	Pumping Station
n/a	PS	PS	Micro Pumping Station
AV	AV	AV	Air Valve
			Valve
n/a			Reflux Valve
n/a	AFD	AFD	Anti-Flood Device
B	B	B	Blank End
			Head of Public Sewer
	n/a	n/a	Inlet
			Outfall
n/a	CSO	CSO	Storm Overflow
n/a	WWTW	WWTW	Treatment Works

Other symbols or text may be visible which are not shown here.
These are used for Southern Water operational guidance only.

Node Referencing System

4300

- Hundred metre easting identifier
- Hundred metre northing identifier
- Sewer type Identifier:
  - 0-4 = Foul/Combined
  - 5-9 = Surface Water
- Next sequential node/node identifier

APPENDIX E – DRAINAGE CALCULATIONS & DRAWINGS

FERNBROOK
CONSULTING ENGINEERS

PROJECT	MOORLANDS FARM, WEST END		
SUBJECT	PRELIMINARY DRAINAGE CALCULATIONS		
JOB NO.	23260	**PAGE NO.**	1
DATE	31/10/23	**REV NO.**	P01
PREPARED	DR	**CHECKED**	CR

EXISTING SITE INFORMATION

Total Site Area	0.938	ha
Impermeable Area	0.298	ha
PIMP	32	%

MODIFIED RATIONALE METHOD

$$Q_n = 2.78\ CiA$$

where:

C	*Runoff Coefficients*	=	1	(in this case 1 as using impermeable area)
i_n	*Rainfall Intensity for n return period (mm/hr)*			
A	*Impermeable Area (Ha)*			
Q_n	*Runoff for n return period (l/s)*			

Rainfall Intensity

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. For the 5 min duration.

i_1	50.8	*mm/hr*
i_{10}	94.9	*mm/hr*
i_{30}	113.02	*mm/hr*
i_{100}	143.9	*mm/hr*

PRE-DEVELOPMENT SURFACE WATER RUNOFF

		C	i_n	*A*		Q_n	
Q_1	2.78	1	50.8	0.298	=	**42.08**	**l/s**
Q_{10}	2.78	1	94.9	0.298	=	**78.62**	**l/s**
Q_{30}	2.78	1	113.0	0.298	=	**93.63**	**l/s**
Q_{100}	2.78	1	143.9	0.298	=	**119.21**	**l/s**
$Q_{100+40\%\ CC}$	2.78	1	201.5	0.298	=	**166.90**	**l/s**

FERNBROOK
CONSULTING ENGINEERS

PROJECT	MOORLANDS FARM, WEST END		
SUBJECT	PRELIMINARY DRAINAGE CALCULATIONS		
JOB NO.	23260	**PAGE NO.**	2
DATE	31/10/23	**REV NO.**	P01
PREPARED	DR	**CHECKED**	CR

Peak Factor 6.6

PROPOSED FOUL WATER LOADING

Development Typ	**No/Unit/Area**		**Hours**	**Flow Rates (l/day)**		**Peak Loading (l/s)**		**Loading (l/s)**
Commercial	450	m²	8	300	per 100m²	0.06875	per 100m²	0.309
Commercial	300	m²	8	300	per 100m²	0.06875	per 100m²	0.206
Offices	180	m²	8	750	per 100m²	0.171875	per 100m²	0.309
Commercial	429	m²	8	300	per 100m²	0.06875	per 100m²	0.295
								1.120

Block	PE	Flow (L/da	m3/day	BOD	N
A	15	750	0.75	375	75
B	10	500	0.5	250	50
C	6	300	0.3	150	30
D	15	750	0.75	375	75
			2.3	1150	230

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)	19.700	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.200	4-8	0.130

Total Area Contributing (ha) = 0.330

Total Pipe Volume (m³) = 7.103

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	40.797	0.270	151.1	0.045	4.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	16.547	0.180	91.9	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	45.111	0.350	128.9	0.095	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	19.984	0.100	199.8	0.090	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.004	25.663	0.150	171.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	50.00	4.83	30.000	0.045	0.0	0.0	0.0	0.82	14.4	6.1
2.001	50.00	5.00	29.730	0.145	0.0	0.0	0.0	1.64	116.0	19.6
2.002	50.00	5.55	29.550	0.240	0.0	0.0	0.0	1.38	97.8	32.5
2.003	50.00	5.85	29.200	0.330	0.0	0.0	0.0	1.11	78.4	44.7
2.004	50.00	6.41	29.100	0.330	0.0	0.0	0.0	0.77	13.5«	44.7

©1982-2020 Innovyze

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
2.005	8.908	0.100	89.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.005	50.00	6.54	28.950	0.330	0.0	0.0	0.0	1.07	18.8«	44.7

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)
2.005		29.850	28.850	0.000	0	0

©1982-2020 Innovyze

Online Controls for Storm

Orifice Manhole: 15, DS/PN: 2.004, Volume (m³): 2.6

Diameter (m) 0.120 Discharge Coefficient 0.600 Invert Level (m) 29.100

©1982-2020 Innovyze

Storage Structures for Storm

Tank or Pond Manhole: 15, DS/PN: 2.004

Invert Level (m) 29.150

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	45.0	1.100	186.0

©1982-2020 Innovyze

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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 Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.700 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
2.000	S1	15 Winter	1	+0%	30/15 Summer				30.071
2.001	S2	15 Winter	1	+0%	100/15 Summer				29.814
2.002	12	15 Winter	1	+0%	30/15 Winter				29.663
2.003	13	30 Winter	1	+0%	30/15 Summer				29.381
2.004	15	30 Winter	1	+0%	1/15 Summer				29.368
2.005	17	60 Winter	1	+0%	30/30 Winter				29.049

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
2.000	S1	-0.079	0.000	0.43			6.0	OK	
2.001	S2	-0.216	0.000	0.17			17.1	OK	
2.002	12	-0.187	0.000	0.30			27.4	OK	
2.003	13	-0.119	0.000	0.46			31.1	OK	
2.004	15	0.118	0.000	0.97			12.5	SURCHARGED	

©1982-2020 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
2.005	17	-0.051	0.000	0.76			12.6	OK	

©1982-2020 Innovyze

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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 Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.700 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
2.000	S1	15 Winter	30	+0%	30/15 Summer				30.191
2.001	S2	15 Winter	30	+0%	100/15 Summer				29.891
2.002	12	15 Winter	30	+0%	30/15 Winter				29.851
2.003	13	60 Winter	30	+0%	30/15 Summer				29.716
2.004	15	60 Winter	30	+0%	1/15 Summer				29.696
2.005	17	60 Winter	30	+0%	30/30 Winter				29.105

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
2.000	S1	0.041	0.000	1.03			14.4	SURCHARGED	
2.001	S2	-0.139	0.000	0.48			47.5	OK	
2.002	12	0.001	0.000	0.79			72.7	SURCHARGED	
2.003	13	0.216	0.000	0.76			52.1	SURCHARGED	
2.004	15	0.446	0.000	1.36			17.6	SURCHARGED	

©1982-2020 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
2.005	17	0.005	0.000	1.06			17.6	SURCHARGED	

©1982-2020 Innovyze

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet 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 Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.700 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
2.000	S1	15 Winter	100	+25%	30/15 Summer				31.026
2.001	S2	15 Winter	100	+25%	100/15 Summer				30.571
2.002	12	15 Winter	100	+25%	30/15 Winter				30.501
2.003	13	15 Winter	100	+25%	30/15 Summer				30.056
2.004	15	60 Winter	100	+25%	1/15 Summer				29.997
2.005	17	60 Winter	100	+25%	30/30 Winter				29.153

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
2.000	S1	0.876	0.000	1.32			18.5	SURCHARGED	
2.001	S2	0.541	0.000	0.63			61.9	SURCHARGED	
2.002	12	0.651	0.000	1.13			103.3	SURCHARGED	
2.003	13	0.556	0.000	2.08			141.7	SURCHARGED	
2.004	15	0.747	0.000	1.63			21.0	FLOOD RISK	

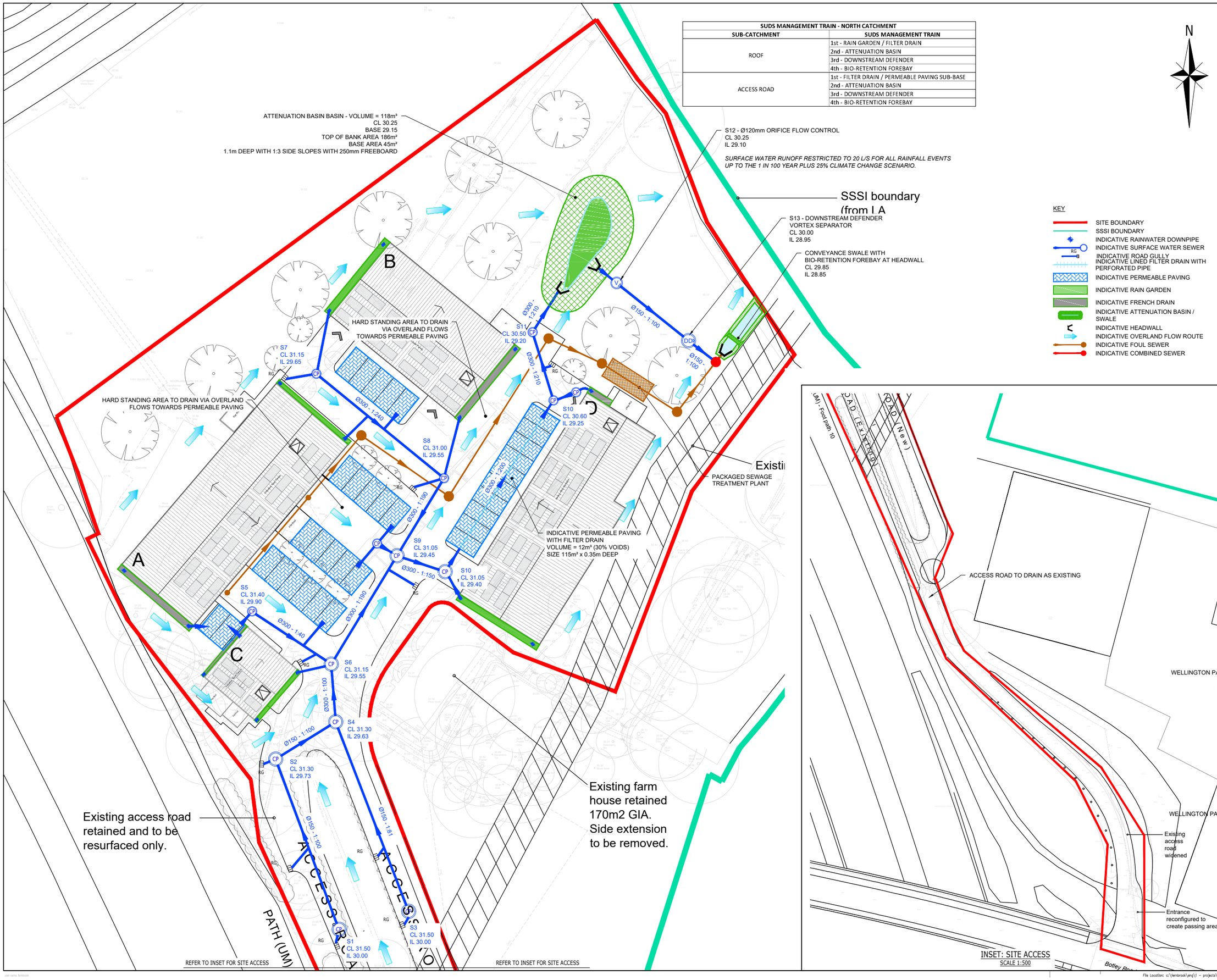
©1982-2020 Innovyze

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
2.005	17	0.053	0.000	1.27			21.0	SURCHARGED	

©1982-2020 Innovyze

SUDS MANAGEMENT TRAIN - NORTH CATCHMENT	
SUB-CATCHMENT	SUDS MANAGEMENT TRAIN
ROOF	1st - RAIN GARDEN / FILTER DRAIN
	2nd - ATTENUATION BASIN
	3rd - DOWNSTREAM DEFENDER
	4th - BIO-RETENTION FOREBAY
ACCESS ROAD	1st - FILTER DRAIN / PERMEABLE PAVING SUB-BASE
	2nd - ATTENUATION BASIN
	3rd - DOWNSTREAM DEFENDER
	4th - BIO-RETENTION FOREBAY



INSET: SITE ACCESS
SCALE 1:500

N

KEY

- SITE BOUNDARY
- SSSI BOUNDARY
- INDICATIVE RAINWATER DOWNPIPE
- INDICATIVE SURFACE WATER SEWER
- INDICATIVE ROAD GULLY
- INDICATIVE LINED FILTER DRAIN WITH PERFORATED PIPE
- INDICATIVE PERMEABLE PAVING
- INDICATIVE RAIN GARDEN
- INDICATIVE FRENCH DRAIN
- INDICATIVE ATTENUATION BASIN / SWALE
- INDICATIVE HEADWALL
- INDICATIVE OVERLAND FLOW ROUTE
- INDICATIVE FOUL SEWER
- INDICATIVE COMBINED SEWER

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
6. THIS DRAWING HAS BEEN BASED ON "AS PROPOSED SITE PLAN", DRAWING No. 7912_D01, DATED DECEMBER 2023 BY RADLEY HOUSE PARTNERSHIP.
7. THIS DRAWING HAS BEEN BASED ON "SITE SURVEY", DRAWING No. H16-07, BY KND SURVEYS , DATED 9th AUGUST 2007.
8. PROPOSED DRAINAGE WITHIN ROOT PROTECTION AREA TO BE CONSTRUCTED USING NO DIG TECHNIQUES IN ACCORDANCE WITH BS 5837. EXCAVATE/INSTALL DRAINAGE IN ROOT ZONES UNDER THE SUPERVISION OF A SUITABLY QUALIFIED ARBORICULTURALIST TO PREVENT ROOT DAMAGE.

CDM NOTES

THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

1. WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P02	FOR INFORMATION	DR	CR	DR	07.12.23
P01	FOR INFORMATION	DR	CR	DR	02.11.23

FERNBROOK
CONSULTING ENGINEERS
The Firsbury Business Centre
40 Bowling Green Lane
London
EC1R 0NE
info@fernbrook.co

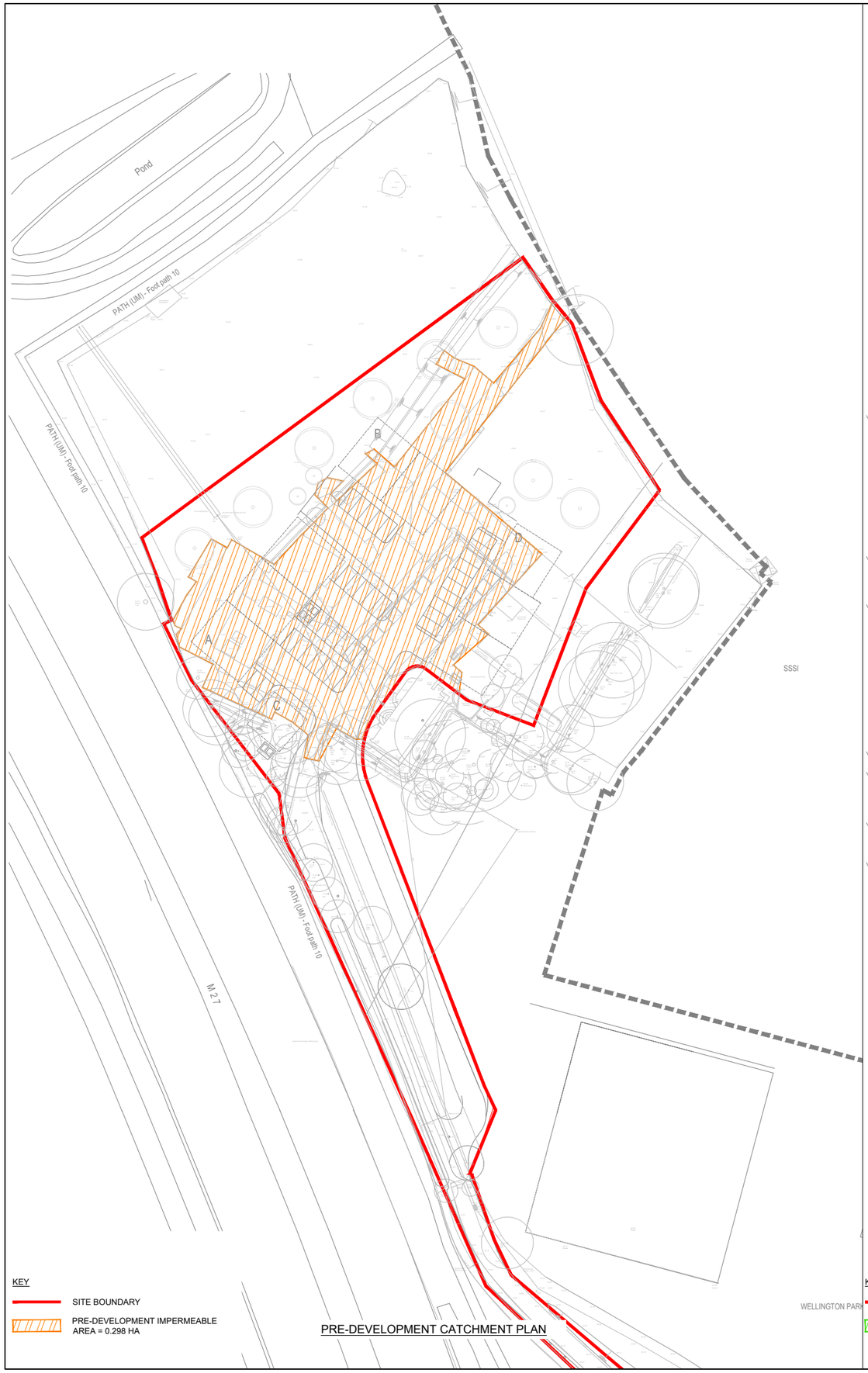
Client
COUNTRY HOMES

Project Title:
MOORLANDS FARM, WEST END

Drawing Title:
INDICATIVE SURFACE WATER & FOUL DRAINAGE STRATEGY

A1 Scale	Date	Designed by
1:250	NOV 23	DR
Drawn by	**Checked by**	**Approved by**
DR	CR	DR

Drawing Number	Rev
23260-FCE-XX-XX-DR-D-0500	P02

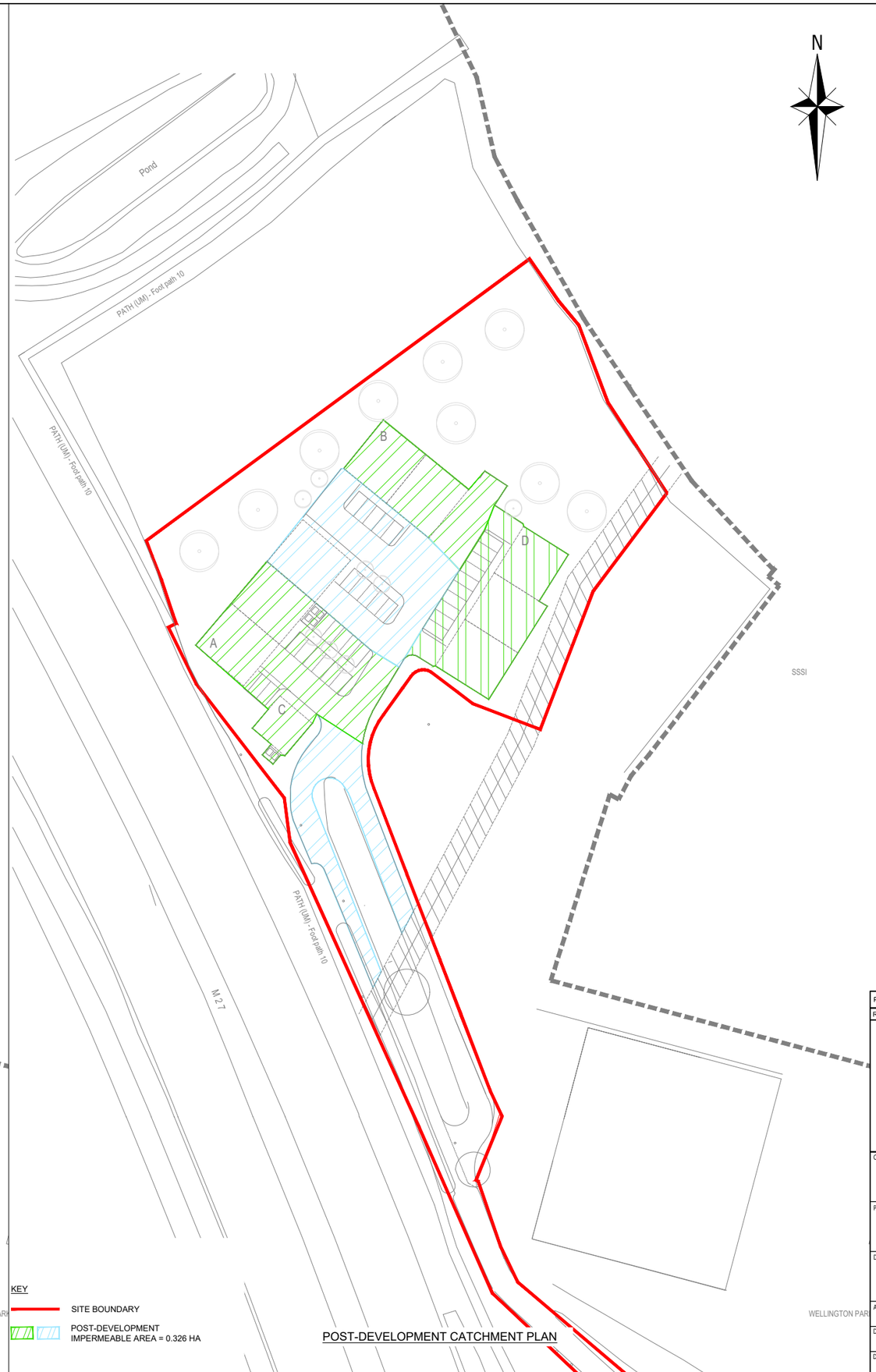


KEY

SITE BOUNDARY

PRE-DEVELOPMENT IMPERMEABLE AREA = 0.298 HA

PRE-DEVELOPMENT CATCHMENT PLAN



KEY

SITE BOUNDARY

POST-DEVELOPMENT IMPERMEABLE AREA = 0.326 HA

POST-DEVELOPMENT CATCHMENT PLAN

N

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
3. THIS DRAWING HAS BEEN BASED ON "FEASIBILITY SITE PLAN", DRAWING No. 7912_F21A, DATED OCTOBER 2023 BY RADLEY HOUSE PARTNERSHIP.
4. THIS DRAWING HAS BEEN BASED ON "SITE SURVEY", DRAWING No. H16-07, BY KND SURVEYS , DATED 9th AUGUST 2007.

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P01	FOR INFORMATION	DR	CR	DR	02.11.23

FERNBROOK
CONSULTING ENGINEERS

The Finsbury Business Centre
40 Bowling Green Lane
London
EC1R 0NE

info@fernbrook.co

Client

COUNTRY HOMES

Project Title:

MOORLANDS FARM, WEST END

Drawing Title:

INDICATIVE SURFACE WATER DRAINAGE CATCHMENT AREAS

A1 Scale	Date	Designed by
1:500	NOV 23	DR
Drawn by	**Checked by**	**Approved by**
DR	CR	DR

Drawing Number: 23260-FCE-XX-XX-DR-D-0501

Rev: P01

N

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
6. THIS DRAWING HAS BEEN BASED ON "FEASIBILITY SITE PLAN", DRAWING No. 7912_F21A, DATED OCTOBER 2023 BY RADLEY HOUSE PARTNERSHIP.
7. THIS DRAWING HAS BEEN BASED ON "SITE SURVEY", DRAWING No. H16-07, BY KND SURVEYS , DATED 9th AUGUST 2007.

KEY

SITE BOUNDARY

INDICATIVE OVERLAND FLOW ROUTE

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P01	FOR INFORMATION	DR	CR	DR	02.11.23

FERNBROOK
CONSULTING ENGINEERS
The Finsbury Business Centre
40 Bowling Green Lane
London
EC1R 0NE
info@fernbrook.co

Client: COUNTRY HOMES

Project Title: MOORLANDS FARM, WEST END

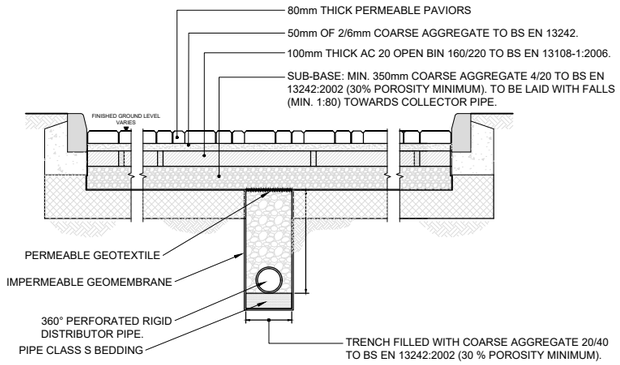
Drawing Title: INDICATIVE OVERLAND FLOW ROUTES

A1 Scale	Date	Designed by
1:250	NOV 23	DR
Drawn by	**Checked by**	**Approved by**
DR	CR	DR

Drawing Number: 23260-FCE-XX-XX-DR-D-0502 — Rev: P01

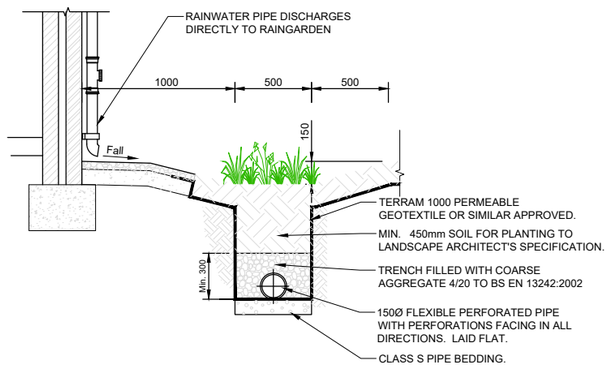
NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.



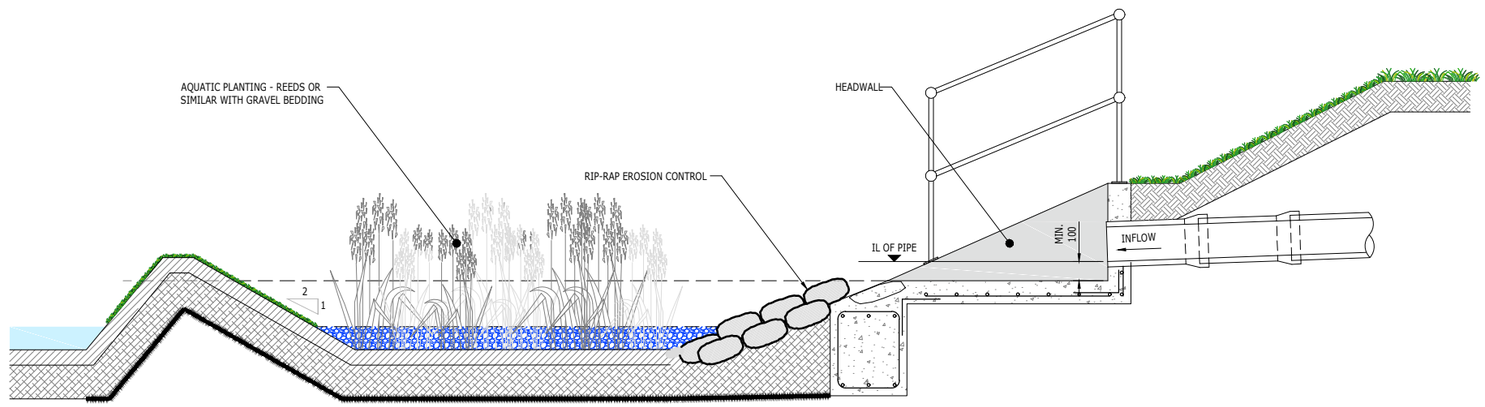
TYPICAL SECTION THROUGH PERMEABLE PAVING & FRENCH DRAIN

(SCALE 1:20)



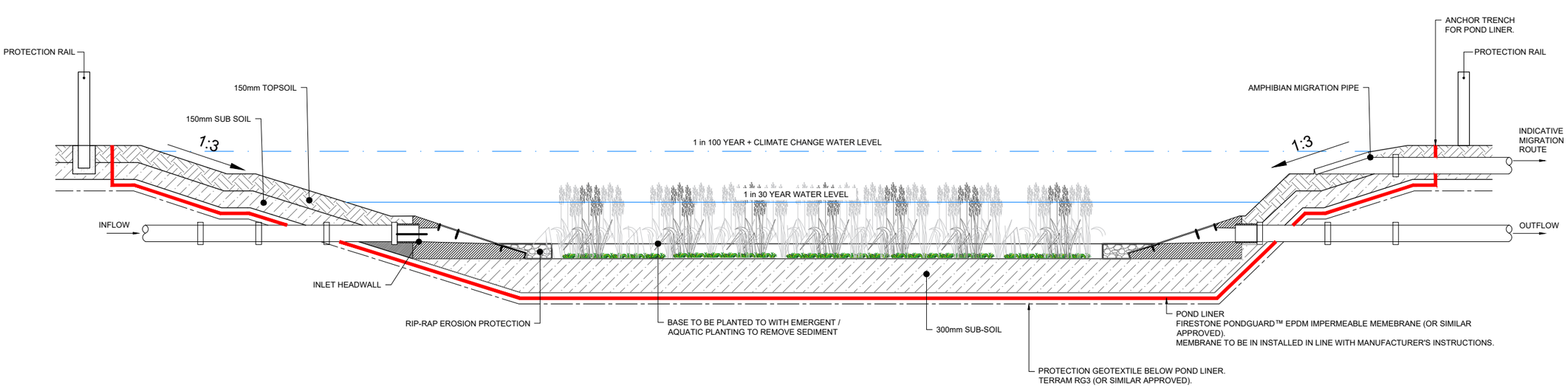
TYPICAL RAIN GARDEN DETAIL

(SCALE 1:20)



INDICATIVE DRAINAGE OUTFALL WITH SEDIMENT FOREBAY DETAIL

(1:50)



SURFACE WATER ATTENUATION BASIN
NOT TO SCALE

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P01	FOR INFORMATION	DR	CR	DR	02.11.23

FERNBROOK CONSULTING ENGINEERS
The Finsbury Business Centre
40 Bowling Green Lane
London
EC1R 0NE
info@fernbrook.co

Client: COUNTRY HOMES

Project Title: MOORLANDS FARM, WEST END

Drawing Title: INDICATIVE SUSTAINABLE DRAINAGE DETAILS

A1 Scale	Date	Designed by
NTS	NOV 23	DR
Drawn by	**Checked by**	**Approved by**
DR	CR	DR

Drawing Number: 23260-FCE-XX-XX-DR-D-0505 — Rev: P01

Uncontrolled Reference

File Location: c:\fernbrook\eng\1 - projects\1.2 - live\23260 - moorlands v3\4. technical\4.1 cad\4.1.1 drawings\21035-fce-xx-xx-dr-d-0505.dwg

WPL HiPAF®

High performance aerated filter packaged wastewater treatment plants

Three-stage system for safer processing

Each WPL HiPAF treatment plant includes a three-stage process - primary settlement, biological treatment (biozone) and final settlement. The segmented biozone process chambers in stage two eliminate the risk of process short-cuts and mitigates risks associated with variable loads.

Stage 1

Primary settlement

- Incoming wastewater enters the primary settlement stage where organic and inorganic matter settles
- The sludge is held in this section until it requires de-sludging
- A unique forward-feed arrangement uses an airlift to deposit wastewater into the biological treatment stage (biozone), which keeps peak flows from entering the system and prevents hydraulic surges

Stage 2

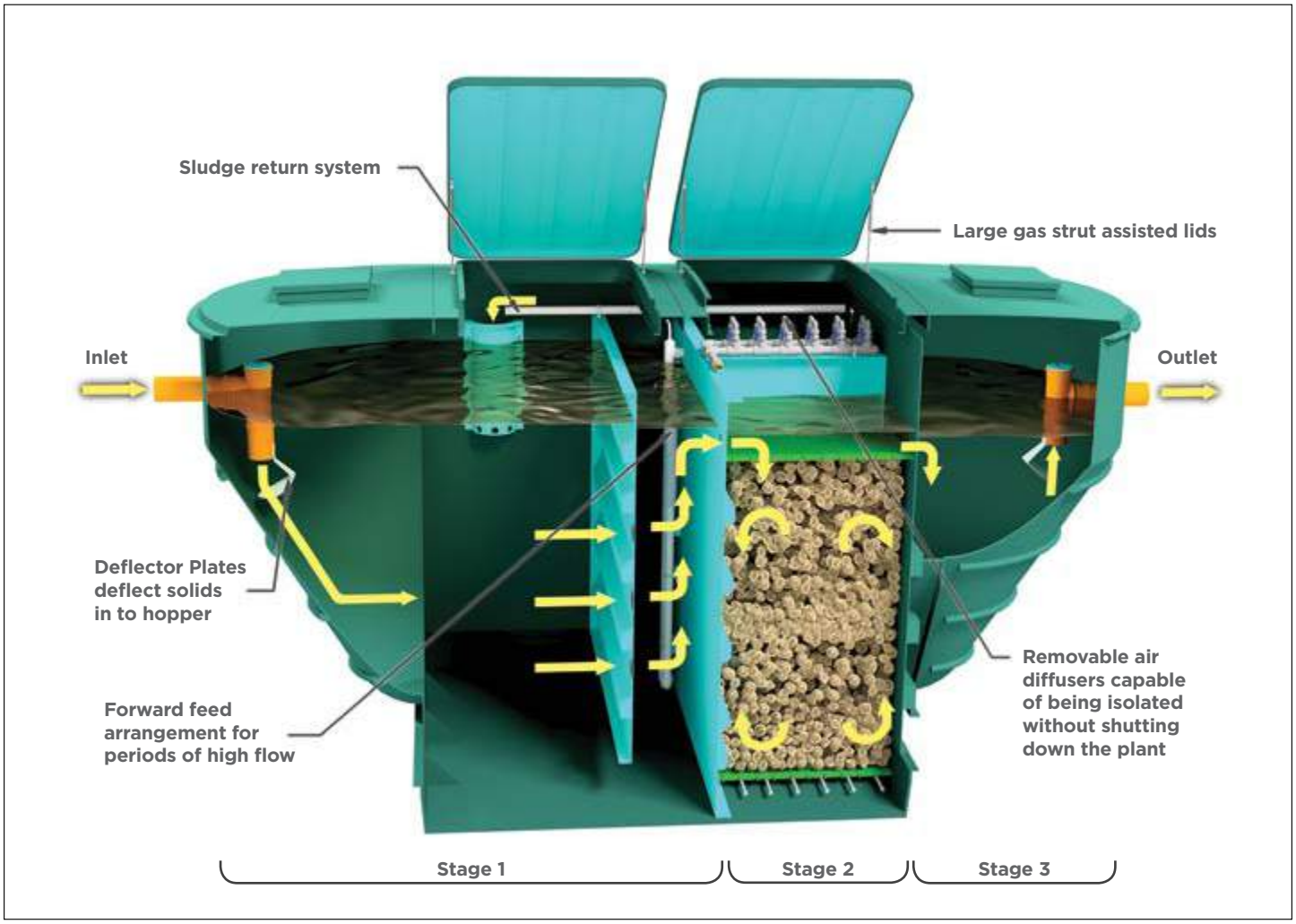
Biological treatment

- Settled liquor enters the biological section either by displacement or via the airlift
- High-voidage plastic media, contained between two floors within the biozone, encourages the growth of bacteria and other organisms which treat the wastewater
- Air required for the treatment process is delivered by air-blowers housed in a weatherproof kiosk
- The air also helps to scour the media bed, preventing the filter from blocking
- A series of diffusers installed beneath the media bed ensure an even distribution of air

Stage 3

Final settlement

- The treated wastewater (final effluent) enters the final settlement section
- Dead biomass (humus sludge) from the process settles out
- An airlift automatically transfers settled humus sludge back to the primary settlement section for co-settlement
- The final effluent is discharged through gravity displacement to either a watercourse or a sub-surface irrigation field



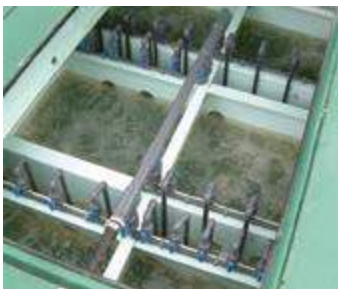
WPL HiPAF midi packaged sewage treatment plant illustration (above)

Internal Configuration

The internal sections of the plant can be accessed from the top of the unit to make servicing, maintenance and de-sludging easier. Plants are fitted-as-standard with large, stainless steel, gas strut assisted lids to give full access to the relevant parts of the plant.

Air is introduced to the WPL HiPAF unit by a series of air diffusers. Each diffuser is capable of being isolated and removed individually without the need to shut down the plant or affect air supply to the rest of the unit.

The complete absence of mechanical and electrical components within the hostile environment provides safe and clean working conditions on site.



Internal air diffusers (left) and large gas strut lids (right)

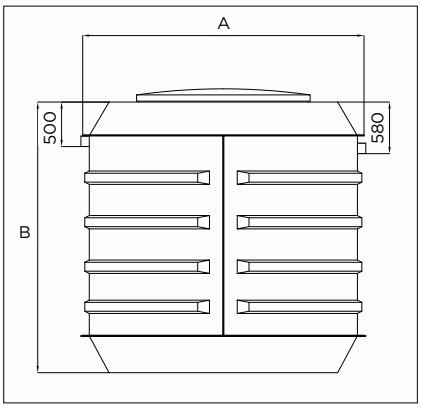
Technical Specification

Use the tables below as an indicative guide to selecting the right packaged treatment plant for your site. For advice on the modular system or more information on the range please contact WPL or a qualified contractor.

WPL HiPAF compact system 1 to 60 PE

Model PE	Standard Consent*	A Diameter (m)	B Height (m)	Inlet Invert (mm)	Outlet Invert (mm)
10	20:30:20	2.29	2.61	500	580
20	20:30:20	2.32	2.86	500	580
30	20:30:20	2.58	2.69	500	580
40	20:30:20	2.86	2.69	500	580
50	20:30:20	3.16	3.00	500	580
60	20:30:20	3.16	3.20	500	580

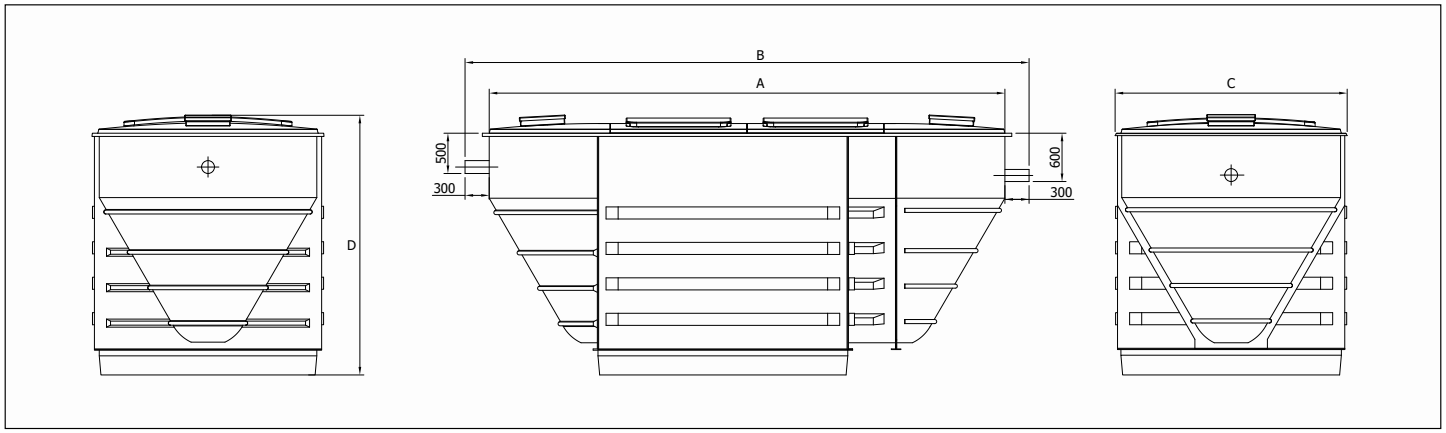
*Typical consent standards shown, tighter consent standards available to meet all requirements specified by the EA



WPL HiPAF midi system 60 to 300 PE

Model PE	Standard Consent**	A Length (m)	B Length w/pipes (m)	C Width (m)	D Height (m)	Inlet Invert (mm)	Outlet Invert (mm)	Weight (Tonne)
70	20:30:20	4.30	4.90	2.88	3.20	500	600	1.60
90	20:30:20	4.80	5.40	2.88	3.20	500	600	1.90
110	20:30:20	5.20	5.80	2.88	3.20	500	600	2.25
130	20:30:20	5.80	6.40	2.88	3.20	500	600	2.50
150	20:30:20	6.40	7.00	2.88	3.20	500	600	2.90
175	20:30:20	7.00	7.60	2.88	3.20	500	600	3.40
200	20:30:20	7.60	8.20	2.88	3.20	500	600	3.90

** Typical consent standards shown – tighter consent standards available to meet all requirements specified by the EA. For options above 200PE please contact WPL.



The tables are an indicative guide only. All applications are specified to comply with the British Water Code of Practice for Flows and Loads. Further technical information can be found on the WPL website, visit www.wplinternational.com.

WPL offers a complete in-house design and specification service. Each packaged treatment plant can be designed to site-specific requirements.

Each system is supplied with an installation manual and an operation and maintenance manual. Civil installation of the units can be arranged through a WPL recommended contractor.

WPL suggests that maintenance should only be undertaken by a reputable service company with British Water accredited service engineers.

Design parameters

Design Criteria	British Water's Flows and Loads 4
Peak flow treatment	Generally 3 dry weather flow
Invert depth	0.5m as standard, other invert depths available up to 1.5m
Discharge standards	The WPL HiPAF will typically attain BOD^5 20mg/l; SS 30mg/l; NH_4-N 20mg/l as standard. With biological treatment, stricter standards can be achieved, meeting BOD^5 10mg/l; SS 10mg/l; NH_4-N 2mg/l (with tertiary treatment). Higher standards are achievable. With the use of additional equipment WPL can produce effluent to meet phosphate standards when required.

Design options

- Inverts up to 1.5m with turret extensions
- Pumped inlet flow control
- Control panels are available to cater for single and three phase electrical supplies
- Alarm beacon for mechanical failure and loss of air pressure
- Duty/standby blowers with automatic changeover to ensure an uninterrupted air supply
- Energy-saving options such as variable speed drive blowers
- GSM telemetry for remote monitoring of the plant
- WPL Sand Filters/WPL Micro-screens can improve final effluent for strict consent requirements

Kiosk Options

Each WPL HiPAF treatment plant comes with a weatherproof kiosk to house the control panel and air blowers on site. The standard issue kiosk, which is acoustically-lined, houses a control panel, which automatically manages the operation of the plant; the air distribution manifold and one or more air blowers as required.

Features include thermostatic cut-off controls and air filtering monitoring which can alert the operator to loss of air pressure. Ten metres of high temperature resistant airline hose is supplied to connect blowers to the treatment plant – extra lengths can be supplied if the kiosk is sited further than 10m from the treatment unit.

APPENDIX F – TREATMENT MITIGATION INFORMATION

Design Data

Downstream Defender®

Advanced Hydrodynamic Vortex Separator

The Downstream Defender® is an advanced hydrodynamic vortex separator for the effective and reliable removal of fine particles, oils and other floatable debris from surface water runoff.

Its innovative design delivers high efficiency across a wide range of flows in a much smaller footprint than conventional or other swirl-type devices and it is the perfect choice for any catchment likely to convey high quantities of contamination.

1. Access for removal of floatables and sediments.
2. Inlet pipe.
3. Inlet chute.
4. Centre shaft.
5. Dip plate.
6. Centre cone.
7. Benching skirt.
8. Floatables and oil storage.
9. Isolated sediment storage zone.
10. Outlet pipe.

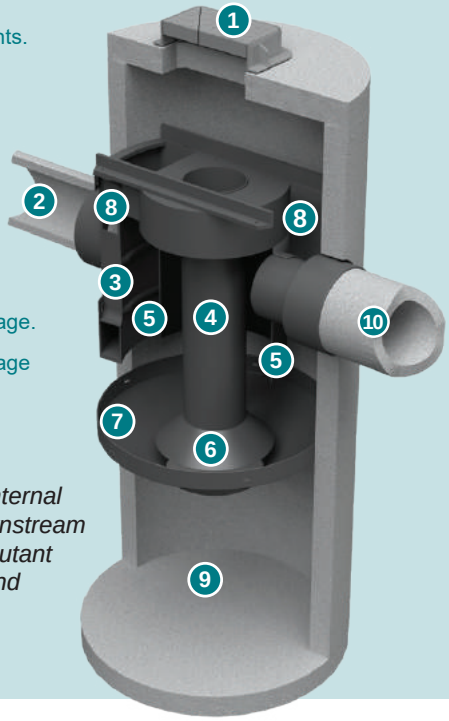


Figure 1 - The unique internal components of the Downstream Defender® enhance pollutant removal performance and prevent wash out.

Unique Flow Modifying Components

The Downstream Defender® consists of a choice of concrete or HDPE chamber with unique flow modifying internal components. It is these internal components that differentiate the Downstream Defender® from catchpits, sedimentation basins or sedimentation sumps. They facilitate advanced hydrodynamic vortex separation by reducing turbulence, lengthening the flow path to increase chamber residence time and introducing shear planes.

The internal components also ensure that the pollutant storage zones are isolated and protected from high flows that could cause pollutant re-entrainment or wash out.

Compared to devices that have poorly designed internal components, the Downstream Defender® captures and retains more of the annual pollutant load.

Watch a short video showing the Downstream Defender® components and operation at:

http://www.hydro-int.com/en-gb/products/downstream-defender-0

Repeatable, Reliable Performance

The Downstream Defender® delivers high removal of pollutants through advanced, hydrodynamic separation across a wide range of flows. The device has a proven track record of tackling an assortment of pollutants including:

Sediment (or Total Suspended Solids)

The Downstream Defender® is a highly effective sediment/TSS removal device. It can be sized in a number of ways to suit the application and level of protection required (see Table 1). **SuDS Mitigation Index = 0.5.**

Gross Pollutants

100% removal of floatable debris, such as food wrappers, Styrofoam cups and drinks cartons

Liquid Hydrocarbons

Effective spill containment device that meets the BS EN 858-1:2002 Class I and Class II effluent targets at low flow rates. Note these systems are not considered oil separators according to the BS EN 858-1 and must not be used in applications where full certification is required. **SuDS Mitigation Index = 0.8.**

Sediment Bound Hydrocarbons (including Polycylic Aromatic Hydrocarbons - PAHs)

PAHs have low solubility in water and are readily adsorbed onto sediment particles. Effective removal of sediment particles will also ensure the removal of many PAHs.

Sediment Bound Heavy Metals and Nutrients

Heavy Metals

Nutrients

As an efficient device for removal of fine sediment, the Downstream Defender® is also effective for the removal of sediment bound pollutants. **SuDS Mitigation Index (Metals) = 0.4.**

Tel: +44 (0)1275 337955
stormtrain@hydro-int.com

Design Data
Downstream Defender®
Advanced Hydrodynamic Vortex Separator

No Risk of Pollutant Wash Out

The Downstream Defender® has been specially designed to isolate the pollutant storage zones and is proven to prevent pollutant wash out.

Sizing

The Downstream Defender® can be sized for different treatment goals and objectives.

For design purposes, the selected model's Treatment Flow Rate should be greater than or equal to the site's Water Quality Flow Rate.

The hydraulic capacity of the selected model should be considered with respect to the peak discharge flow rate from the site.

Model Diameter (m)	Treatment Flow Rate - Fine (l/s) [a]	Treatment Flow Rate - Coarse (l/s) [b]	Hydraulic Capacity (l/s) [c]	Minimum Oil Storage Capacity (l)	Minimum Sediment Storage Capacity (m^3) [e]	Maximum Headloss at Treatment Flow Rate - Coarse (mm)
1.2	30	38	120	270	0.38	150
1.8	69	85	270	1300	1.04	225
2.55	138	171	542	2450	3.23	300
3.0	190	237	750	4550	3.81	375

Notes:
a) Treatment Flow Rate - Fine is based on an annualised removal efficiency of >50% of all particles up to 1000 microns with a mass-median particle size (D_{50}) of 75 microns and a specific gravity of 2.65.
b) Treatment Flow Rate - Coarse is based on an annualised removal efficiency of >80% of all particles between 50 and 1000 microns with a mass-median particle size (D_{50}) of 146 microns and a specific gravity of 2.65.
c) Maximum flow rate that can pass through the chamber with a maximum headloss of 500mm.
d) Alternative sizing based on different sediment grades available on request.
e) Additional sediment storage capacity can be provided to extend maintenance intervals if required.

Table 1 - Downstream Defender® design information.

Expert Design Service

Hydro International's professional engineers are on hand to provide free support with the correct sizing and selection of the Downstream Defender® within each drainage design.

We can also provide estimated maintenance intervals, whole life cost estimates and predicted pollutant removal performance.

Call the StormTrain® Hotline on: 01275 337955 or email stormtrain@hydro-int.com

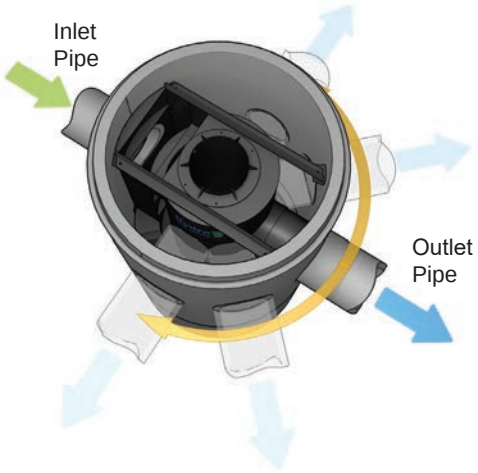
Design Data
Downstream Defender®
Advanced Hydrodynamic Vortex Separator

Setting Out

The Downstream Defender® can accommodate a change in pipe direction to suit site specific requirements. Combined with the high rate internal bypass, this helps to avoid the need for additional manholes on site. Head loss across the chamber is kept to a minimum (see Table 1). The inlet and outlet pipes should be sized in accordance with Table 2 (opposite), and a minimum of 90 degrees between inlet and outlet is required.

Inlet and outlet pipe connections are at the same invert level.

Additional manhole sections can be provided to extend the chamber to meet site cover and invert levels or provide additional pollutant storage where required.



Easy to Install

The Downstream Defender® is delivered to site as a near finished manhole with internal components already installed. Installation is therefore similar to any other manhole installation on site. Full installation guidelines are available.

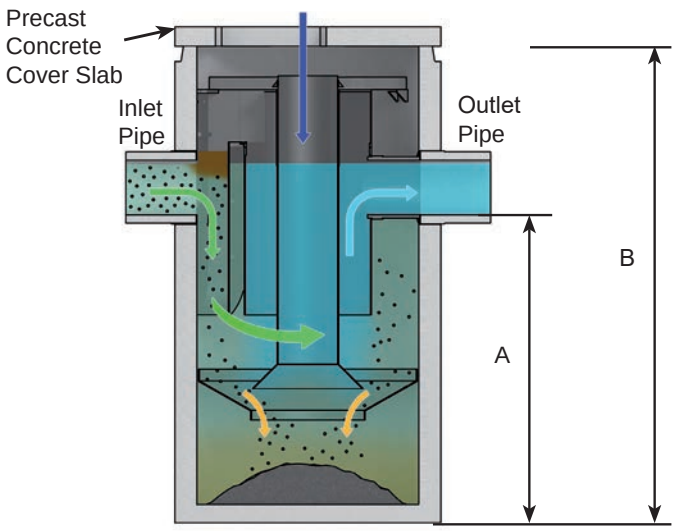
We can provide structural concrete systems for simple plug-and-play installation or choice of lightweight single and twin wall plastic chambers.

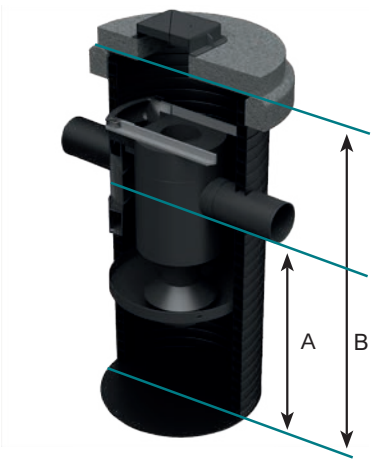
Easy to Maintain

Maintenance of the Downstream Defender® is simple, safe and cost-effective. Maintenance is carried out from the surface, using a standard vacuum tanker and personnel are not required to enter the device.

With a large capacity to store sediments and oils (see Table 1), and with a proven ability to prevent wash out, maintenance intervals can be years rather than months - depending on site conditions. The unit can also be fitted with a Hydro-Logic™ Smart Monitoring system to alert the site operator when maintenance is required and provide peace of mind that the unit is operating normally at other times.

Additional pollutant storage can be built into the chamber to extend maintenance intervals if required.





Tel: +44 (0)1275 337955
stormtrain@hydro-int.com

Dimensions and Weights

General arrangement drawings of all units are available for download from:
http://www.hydro-int.com/en-gb/products/downstream-defender-0

Model	Material	Chamber Diameter - Internal (mm)	Chamber Diameter - External (mm)	Inlet and Outlet ID (mm)	Depth to invert (m) (A) (1)	Chamber Depth (m) (B) (2)	Max Component Lift Weight (kg)
PQL1320.1000	Concrete	1200	1460	300	1.92	2.80	2500
PQL1320.1030	Concrete	1800	2160	450	2.51	4.05	8000
PQL1320.1060	Concrete	2550	2850	600	2.84	4.95	9500
PQL1320.1090	Concrete	3000	3350	750	3.10	5.20	14000
PQL1320.1020	HDPE Single Wall	1200	1360	300	1.41	2.20	200
PQL1320.1050	HDPE Single Wall	1800	1950	450	2.11	3.41	400
PQL1320.1080	HDPE Single Wall	2550	2770	600	2.94	4.78	900
PQL1320.1110	HDPE Single Wall	3000	3220	750	3.13	5.3	1300
PQL1320.1025	HDPE Twin Wall	1200	1500	300	1.57	2.25	400
PQL1320.1055	HDPE Twin Wall	1800	2200	450	2.33	3.80	700

Notes:
1) Minimum depth to invert shown. Depth to invert can be increased if required.
2) Minimum chamber depth shown. Additional sediment storage capacity or increased depth to invert can be provided if required.

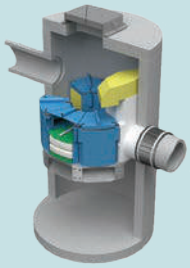
Table 2 - Downstream Defender® unit types, dimensions and weights.

The Hydro StormTrain® Series of Surface Water Treatment Devices

The Downstream Defender® is one of the Hydro StormTrain® Series of surface water treatment devices. Each device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific needs of a site or combined to form a management train. They can be used alongside natural SuDS features to protect, enable or enhance them.

First Defense®
Vortex Separator

Downstream Defender®
Advanced Hydrodynamic
Vortex Separator



Up-Flo™ Filter
Fluidised Bed Up Flow
Filtration System

Hydro Biofilter™
Biofiltration System

Tel: +44 (0)1275 337955 stormtrain@hydro-int.com

Hydro International
Shearwater House, Clevedon Hall Estate, Victoria Road, Clevedon, BS21 7RD

hydro-int.com/stormtrain

APPENDIX G – DRAINAGE MAINTENANCE PLAN

SuDS MANAGEMENT PLAN

This long-term Management Plan of the Sustainable Drainage System should be implemented at **Moorlands Farm, West End, Southampton, SO30 3HD** to ensure that the drainage network functions as designed. This plan is intended to cover all on-site drainage structures. The Site Management Team should oversee and implement the SuDS Management Plan and designate a qualified person who will be responsible for the proper operation and maintenance of the foul and stormwater structures.

Stormwater Runoff Quality

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, catchpit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas.

Drainage System

Maintenance and cleaning of gullies, stormwater manholes, and SuDS components will assure adequate performance. This maintenance program is outlined below;

Maintenance Program

The Site Management Team will conduct the operation and maintenance plan set forth in this document. The Site Management will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms (attached) should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file at the property and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Council upon request.

Concurrent with inspection and cleaning, all litter shall be picked up and removed from the parking areas, external bin store, wetland areas, and soft landscaping.

Regular maintenance should include;

1. Inspect permeable paving inlets/outlets and remove any debris every 6 months or as determined to be reasonable based on experience with the installed systems to ensure that the system continues to work as intended and is free of debris; quarterly, inspect inspection chambers and manholes; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.
2. Inspection of external bin store for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the stormwater management system.
3. Attenuation storage tank inlets, and roof gully outlets and vents and overflows should be checked annually and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes inspection and identification of any areas that are not operating correctly monthly for the first 3 months and then every 6 months after.

Winter Maintenance Program

Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

Fertiliser Use

Only slow-release organic low-phosphorous fertilisers will be used in any landscaped areas in order to limit the amount of nutrients that could enter the stormwater system.

Maintenance Task	Description	Frequency
Regular Maintenance		
Litter management	Pick up all litter in suds and landscape areas and remove from site	Monthly
Landscaped & Vegetated Areas	Trim plants and grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ	As required or monthly
Inlets and outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	Monthly
Hard surfaces	Sweep all paving regularly. Sweep and suction brush permeable paving in autumn after leaf fall.	Annually
Occasional tasks		
Inspection and control chambers	Annual inspection, remove silt and check free flow	Annually
Remedial work		
	Inspect suds system regularly to check for damage or failure. Undertake remedial work as required.	As required

Drainage Operation and Maintenance Log

Site Maintenance Supervisor:_____ Date:_____

☐ Routine ☐ Response to rainfall event __ in ☐ Other:_____

BMP	Frequency	Date Performed	Comments
Inlets/outlets and Manholes	Monthly Inspections		
	Maintenance Quarterly and as necessary		
Pavement Areas (parking, driveways, service areas)	Monthly Sweeping		
	Rubbish & Litter Removal as Necessary		
Landscaped & Vegetated Areas	Maintenance as necessary		
Attenuation Tanks	Inspect and identify areas not operating property every 3 months (for the first 3 months) and every 6 months after		
	Full bi-annual inspection		