



TECHNICAL NOTE

PROJECT	:	Land adjacent Sefter School House, Sefter Road, Pagham
NOTE REF.	:	Acl673/21023/TN
NOTE TITLE	:	Additional Information requested by the LLFA
AUTHOR	:	Tafari Lewis
APPROVED	:	Tafari Lewis
DATE	:	11 th August 2022

1.0 Introduction

This file note has been produced to provide additional information to Arun District Council (ADC) as lead local flood authority (LLFA) on drainage and flood risk for the proposed development of land adjacent Sefter School House, Sefter Road in Pagham.

A Drainage Strategy and SuDS Statement (DS) was produced by Adama Consulting Limited (ACL) in October 2021 (report ref; Acl598/21023/DS Issue 5) which was submitted supplementary to a discharge of conditions application to ADC under reference P/15/22/DOC.

A further technical note was produced by ACL in response to an ADC, LLFA consultee response to the DS in March 2022 .

This file note has been produced in response to the LLFA request for further information as detailed within the consultee response annexed within **Appendix A**.

The file note shall provide clarification of the information requested by the LLFA by reviewing each point raised and responding accordingly.

2.0 Additional Information

Condition 9

Comment:

“A 1:80 gradient has been applied to the permeable paving sub-base within the drainage calculations. Nonetheless, the slope across the paving appears to be steeper than this value. The applicant should provide justification for why a 1:80 gradient has been selected within the calculations, to ensure that any differences between the calculations and design levels will not impact on the hydraulic performance of the permeable paving system.”

Response:

The 1:80 gradient represents the vertical alignment of the access which has been reflected within the design calculations. The slope across the paving takes into account existing topography. Noting the LLFA concerns the formation design levels of the paving system have been adjusted on the drainage layout annexed within **Appendix B** to ensure that the hydraulic performance of the system is not compromised.

Comment:

"The design of the pond / basin should include a freeboard of at least 150mm, preferably 300mm or more (in accordance with C753)."

Response:

Noted. The top of bank levels has been adjusted to 4.70m to allow a minimum freeboard of 150mm within the hydraulic calculations. The actual top of bank due to the required earthworks for construction purposes will be in the region of 4.8m to 4.9m as illustrated on the external levels layout drawing in **Appendix B**.

This provides in excess of 300mm freeboard within the pond from the peak water level to the top of embankment.

Comment:

"Regarding the geo-cellular storage, there is a note on both the drainage layout plan and section detail of the storage tank which states "Polypipe Civils (or similar approved)". At DOC stage we require certainty that specifications will be followed, as any changes to the specification may impact associated calculations. As there is no mechanism for enforcing further review of such changes, which could result in significant changes to the design if different crates are approved, please can the applicant remove the "or similar approved" section of this comment from the drawings."

Response:

Noted. Reference to similar approved products has been omitted from the drainage layout and section details. Full manufacturer details for the scheme have been included within the drawing updates in **Appendix B**.

Comment:

"The results of groundwater monitoring have not been provided; the technical note report states that these results are included within Appendix B, however, section 4.3 of the report included within Appendix B confirms "the results of the on-going groundwater monitoring will be issued under separate cover". We request that this separate document containing the remaining elements of the groundwater monitoring be submitted so they can be reviewed."

Response:

Ashdown Site Investigation Limited undertook In Situ Infiltration testing and groundwater monitoring between November 2020 and March 2021 which can be found in **Appendix C**.

Comment:

“Greenfield runoff rates have been based on ReFH2 method. The applicant should provide details of the catchment descriptors used within the analysis and confirm whether adjusted catchment descriptors have been applied. Justification for the catchment descriptors used within the calculations should also be provided”.

Response:

FEH 2013 data has been obtained and a revised greenfield run-off assessment undertaken to assess the implications on the as designed discharge rate for the site.

Findings are based upon an ReFH2 assessment utilizing the FEH 2013 catchment data and inputting the sites gross area of 0.267ha for both summer and winter seasons and are summarized in table 1 below.

Event	Winter Flow (l/s)	Summer Flow (l/s)
1 in 1 year	0.4	0.6
1 in 2 year	0.4	0.7
1 in 30 years	0.9	1.6
1 in 100 years	1.2	2.0

Table 1: Summary of FEH 2013 Greenfield runoff rates

The findings summarised above confirm runoff from the site to be negligible. The catchment descriptors utilized within the greenfield assessment above are presented on the ReFH2 outputs in **Appendix D**.

Comment:

“If the drainage calculations only account for runoff draining from impermeable surfaces, then the calculations should use a CV of 1.0.

The requirement to use CV 1.0 is based on recent clarifications from HR Wallingford which suggest the values of 0.84 and 0.75 often used are in error and confirm that a value of CV = 1 should be used in situations where runoff from only the impermeable areas is considered.

It is noted that CV 1.0 is only considered applicable to the sizing of the SuDS, and pipework may still be designed to lower values.”

Response:

The hydraulic calculations have been adjusted to reflect a winter CV value of 1.0. The summer CV value of 0.75 has been retained.

The resultant increase in CV has identified negligible flooding on the network at nodes 3.000 and 4.000 (i.e. less than 0.050m³). This is within an acceptable limit as flooding does not pose a risk to occupants as surface water within this areas drains overland to soft landscape areas.

The updated calculations are presented in **Appendix D**.

Comment:

“The surcharge scenario calculations appear to be based on the 120 minute critical event and a surcharged depth of 0.19m. Justification for the 0.19m surcharged depth should be provided. If possible, a graphical output of the surcharged flows out of the drainage system should also be provided. If ReFH2 has been used to derive expected surcharge depths within the adjacent watercourse, then details of the ReFH2 calculations including hydrograph outputs should be provided.

In the absence of a suitable analysis of expected surcharging depths within the adjacent watercourse, please model a reasonable worst case surcharged outfall, with a fixed surcharged water level set equal to the top of bank level at the outlet (as previously requested).”

Response:

Cadmap conducted a survey of the ditch in March 2022. The updated survey indicates a bank level of 2.95m A.O.D and standing water within the watercourse as 3.09m A.O.D near the proposed hydrobrake control.

Connectivity via gravity is feasible at this location and as such the drainage scheme outfalls were reviewed accordingly. The network model has been reassessed assuming surcharging of the outfall to the top of bank level (circa 4.9m aod) in the absence of modelled data for the watercourse.

The revised modelling with the surcharged outfall indicates negligible flooding on the network when subjected to the peak 1 in 100 year storm event with additional 40% allowance for climate change as illustrated within the updated calculations annexed in Appendix B.

Comment:

“The type of membrane surrounding the permeable paving sub-base / specification should be specified on the drawings.”.

Response:

Marshalls M380 tanking membrane has been specified. Pavement details are included within Appendix B.

Comment:

“The pond has a note which states; “To be coordinated with landscaping proposals.” This should confirm that the only details that still need co-ordinating are the planting scheme, as other details leave the pond open to partial redesign, e.g. if landscaping takes precedence over drainage - shallower side slopes or smaller forbay”.

Response:

Acknowledged. Note omitted and updated to say wetland planting (species and type) to be confirmed by landscape architects.

Comment:

“All inlets into the pond must have headwalls. The inlet pipe from gully to the north west of the pond needs an outfall headwall on the drainage layout plan”.

Response:

Acknowledged. We have now shown an Althon inlet swale headwall for the gully connection and included details for the same in Appendix B.

Condition 10

Comment:

“Land Drainage Consent has been granted therefore we have no further comments on this condition and Condition 10 can be discharged.”

Response:

Acknowledged.

Condition 11

Comment:

“The maintenance and management plan states that a swale will be used for pretreatment within the pond. This differs from the section drawings of the pond, which show a sediment forbay. The applicant should clarify whether a swale or forbay is to be used within the pond. It is noted that the maintenance schedule (cited directly below this statement) refers to the forbay

Response:

There is no swale pretreatment within the pond. A forebay is to be used as noted on the maintenance plan.

Comment:

“The maintenance of the tank is stated to be dependent on the maintenance frequencies specified by the manufacturer. These details should be provided (unless they do not differ from the submitted information).

Response:

Noted. The updated maintenance management schedule incorporating the above comments has been annexed within **Appendix E**.

Comment:

“Inspection of the flow control device for the 3 months following installation should specify whether this period is to cover autumn, as discussed in the control chamber table. If inspection through the autumn is required, this should be specified in the text above. If this is not required and the monthly inspection period can occur at any time during the year, then this should be specified in the table. This is to avoid confusion between the text and associated table over the frequency of maintenance and for how long monthly inspections must be carried out.”

Response:

Acknowledged. Updated accordingly

Comment:

“Please detail how maintenance will be funded, i.e. will a charge be levied on residents? If so how will this be applied? If not, who will be paying for the ongoing maintenance?”

Response:

The developer will be appointing a management company to manage and maintain the drainage and SuDS features associated with this development. This will be funded by an annual charge levied to the residents / occupants of the scheme by way of an agreement between the developer and occupants of the site.

Final details of the arrangements between the occupants of the site and the management company (including levied charges) are to be confirmed by the developer .

Comment:

“Please add to maintenance of ponds the annual removal of tree saplings”

Response:

Acknowledged. Included within regular maintenance

Comment:

“Please detail inspection, greasing and movement of bypass doors on Hydro-Brake and frequency of this”.

Response:

Acknowledged. Included within regular maintenance

Comment:

“Please include maintenance of gullies and pipes.”

Response:

Acknowledged. Included within maintenance plan

Comment:

“Please include maintenance of the ordinary watercourse, for which the developer will have riparian responsibility for. Please include a layout plan which clearly defines the watercourse extents.”

Response:

Acknowledged. Included within maintenance plan

Comment:

“Ideally contact details for the Environment Agency (EA) should be provided to ensure maintenance personnel know which EA office to contact. If the contact information is updated by the EA during the lifetime of the development, the contact details should be updated to reflect this.”

Response:

Acknowledged. Included within maintenance plan

3.0 Conclusion

The findings within this technical conclude sufficient information has now been provided to address the points raised by the LLFA in respects to conditions 9 and 11.

List of Appendices

Appendix A	LLFA Consultee Response
Appendix B	Updated Drawings
Appendix C	Winter Groundwater monitoring
Appendix D	Hydraulic Calculations and Modelling
Appendix E	Maintenance and Management

Appendix A

LLFA Consultee Response

At this stage we **would not recommend discharge of conditions** until the following comments are addressed.

Condition 9 –

- 1) A 1:80 gradient has been applied to the permeable paving sub-base within the drainage calculations. Nonetheless, the slope across the paving appears to be steeper than this value. The applicant should provide justification for why a 1:80 gradient has been selected within the calculations, to ensure that any differences between the calculations and design levels will not impact on the hydraulic performance of the permeable paving system.
- 2) The design of the pond / basin should include a freeboard of at least 150mm, preferably 300mm or more (in accordance with C753).
- 3) Regarding the geo-cellular storage, there is a note on both the drainage layout plan and section detail of the storage tank which states “Polypipe Civils (or similar approved)”. At DOC stage we require certainty that specifications will be followed, as any changes to the specification may impact associated calculations. As there is no mechanism for enforcing further review of such changes, which could result in significant changes to the design if different crates are approved, please can the applicant remove the “or similar approved” section of this comment from the drawings.
- 4) The results of groundwater monitoring have not been provided; the technical note report states that these results are included within Appendix B, however, section 4.3 of the report included within Appendix B confirms *“the results of the on-going groundwater monitoring will be issued under separate cover”*. We request that this separate document containing the remaining elements of the groundwater monitoring be submitted so they can be reviewed.
- 5) Greenfield runoff rates have been based on ReFH2 method. The applicant should provide details of the catchment descriptors used within the analysis and confirm whether adjusted catchment descriptors have been applied. Justification for the catchment descriptors used within the calculations should also be provided.
- 6) If the drainage calculations only account for runoff draining from impermeable surfaces, then the calculations should use a CV of 1.0.
 - The requirement to use CV 1.0 is based on recent clarifications from HR Wallingford which suggest the values of 0.84 and 0.75 often used are in error and confirm that a value of CV = 1 should be used in situations where runoff from only the impermeable areas is considered.
 - It is noted that CV 1.0 is only considered applicable to the sizing of the SuDS, and pipework may still be designed to lower values.
- 7) The surcharge scenario calculations appear to be based on the 120 minute critical event and a surcharged depth of 0.19m. Justification for the 0.19m surcharged depth should be provided. If possible, a graphical output of the surcharged flows out of the drainage system should also be provided. If ReFH2

has been used to derive expected surcharge depths within the adjacent watercourse, then details of the ReFH2 calculations including hydrograph outputs should be provided.

- In the absence of a suitable analysis of expected surcharging depths within the adjacent watercourse, please model a reasonable worst case surcharged outfall, with a fixed surcharged water level set equal to the top of bank level at the outlet (as previously requested).
- 8) The type of membrane surrounding the permeable paving sub-base / specification should be specified on the drawings.
- 9) The pond has a note which states; "To be co-ordinated with landscaping proposals." This should confirm that the only details that still need co-ordinating are the planting scheme, as other details leave the pond open to partial redesign, e.g. if landscaping takes precedence over drainage - shallower side slopes or smaller forbay.
- 10) All inlets into the pond must have headwalls. The inlet pipe from gully to the north west of the pond needs an outfall headwall on the drainage layout plan.

The applicant should note that, the drainage report relies on the 1m easement being unachievable to justify not proceeding with infiltration SuDS. Across the coastal plain within Arun District the 1m easement has been waved and does not apply. Nonetheless, as the results provided suggest groundwater at depths of 0.6m BGL, which is extremely shallow, it only leaves 600mm for any infiltration SuDS and any associated cover. In this case, there is sufficient justification as to why shallow groundwater levels will prohibit infiltration SuDS being used to drain this site.

Condition 10 –

- Land Drainage Consent has been granted therefore we have no further comments on this condition and Condition 10 can be discharged.

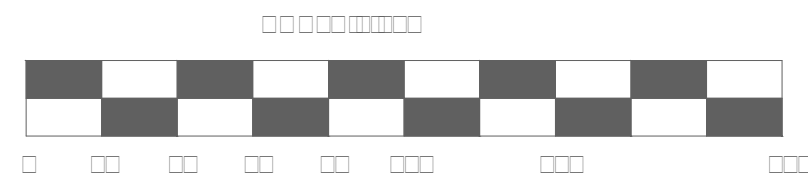
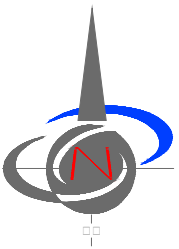
Condition 11 –

- 11) The maintenance and management plan states that a swale will be used for pretreatment within the pond. This differs from the section drawings of the pond, which show a sediment forbay. The applicant should clarify whether a swale or forbay is to be used within the pond. It is noted that the maintenance schedule (cited directly below this statement) refers to the forbay.
- 12) The maintenance of the tank is stated to be dependent on the maintenance frequencies specified by the manufacturer. These details should be provided (unless they do not differ from the submitted information).

- 13) Inspection of the flow control device for the 3 months following installation should specify whether this period is to cover autumn, as discussed in the control chamber table. If inspection through the autumn is required, this should be specified in the text above. If this is not required and the monthly inspection period can occur at any time during the year, then this should be specified in the table. This is to avoid confusion between the text and associated table over the frequency of maintenance and for how long monthly inspections must be carried out.
- 14) Please detail how maintenance will be funded, i.e. will a charge be levied on residents? If so how will this be applied? If not, who will be paying for the ongoing maintenance?
- 15) Please add to maintenance of ponds the annual removal of tree saplings.
- 16) Please detail inspection and replacement of liners.
- 17) Please detail inspection, greasing and movement of bypass doors on Hydro-Brake and frequency of this.
- 18) Please include maintenance of gullies and pipes.
- 19) Please include maintenance of the ordinary watercourse, for which the developer will have riparian responsibility for. Please include a layout plan which clearly defines the watercourse extents.
- 20) Ideally contact details for the Environment Agency (EA) should be provided to ensure maintenance personnel know which EA office to contact. If the contact information is updated by the EA during the lifetime of the development, the contact details should be updated to reflect this.

Appendix B

Updated Drawings

[illegible]

LEVELS KEY:

FFL 5.450

28.85 +
Ex 28.85 +

Rdpc / Tank

2C

450Rw

450gb

Direction of fall to driveway

Landscaped banking / terracing (Max 1:3)

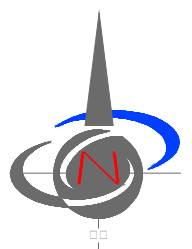
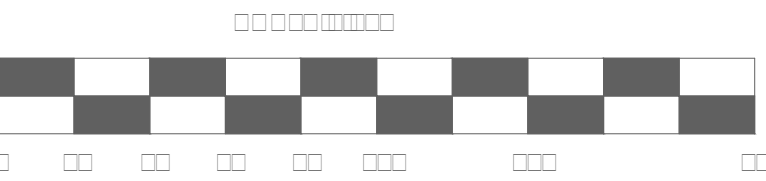
Access / garden gradients

Denotes requirement for steps with No of risers:
280mm tread / 150mm risings

PART M LEVEL THRESHOLD TO ALL ENTRANCES / ACCESS TO DWELLINGS.

KERB TYPES:

- EF EF Edging laid flush
- BN Bulfnosed kerbs with 25mm upstand. Reduced to 10mm at entrance paths to plots
- HB Half Batter kerbs with 125mm upstand
- Drop kerb
- OK Channel kerb laid flush with carriageway surface

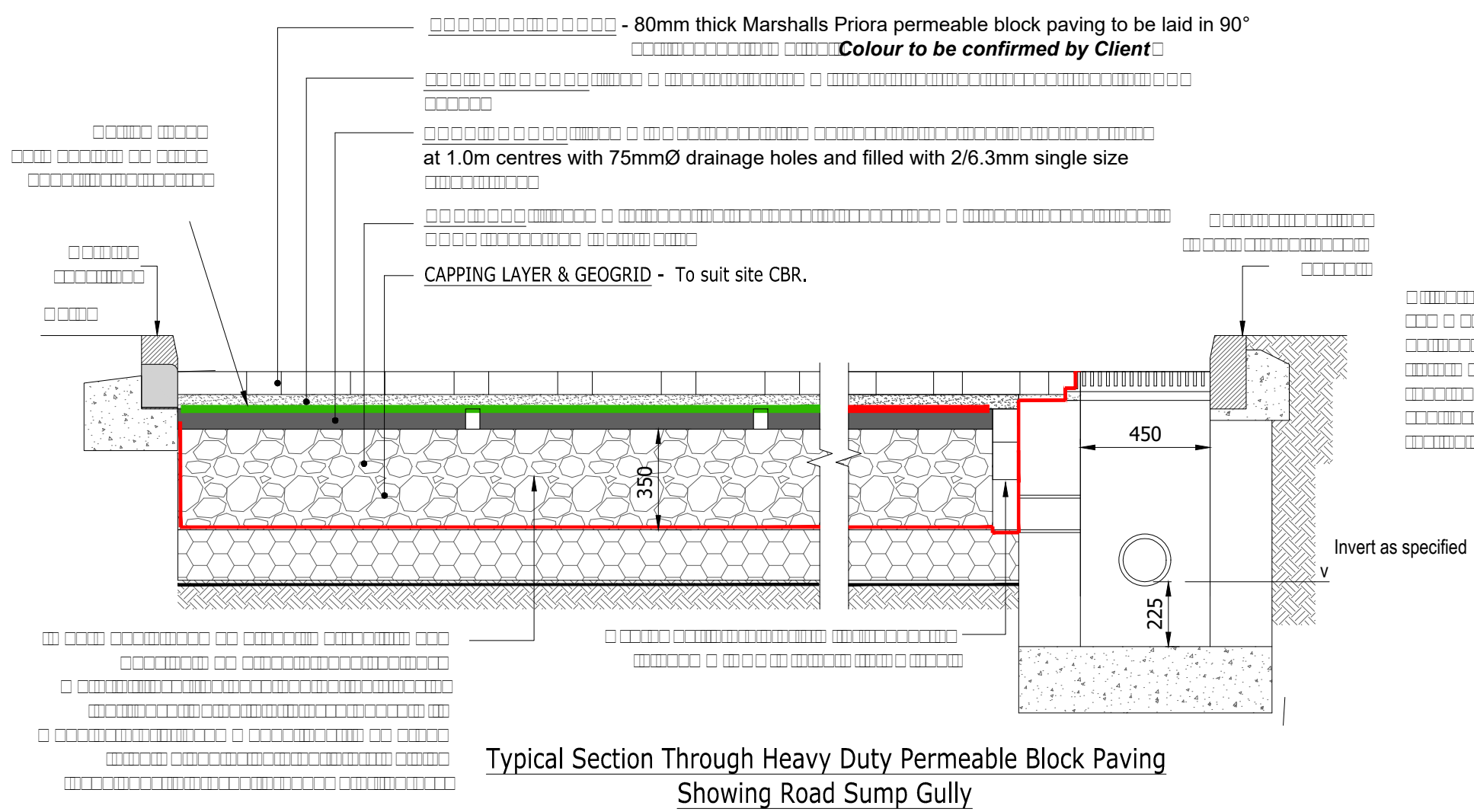
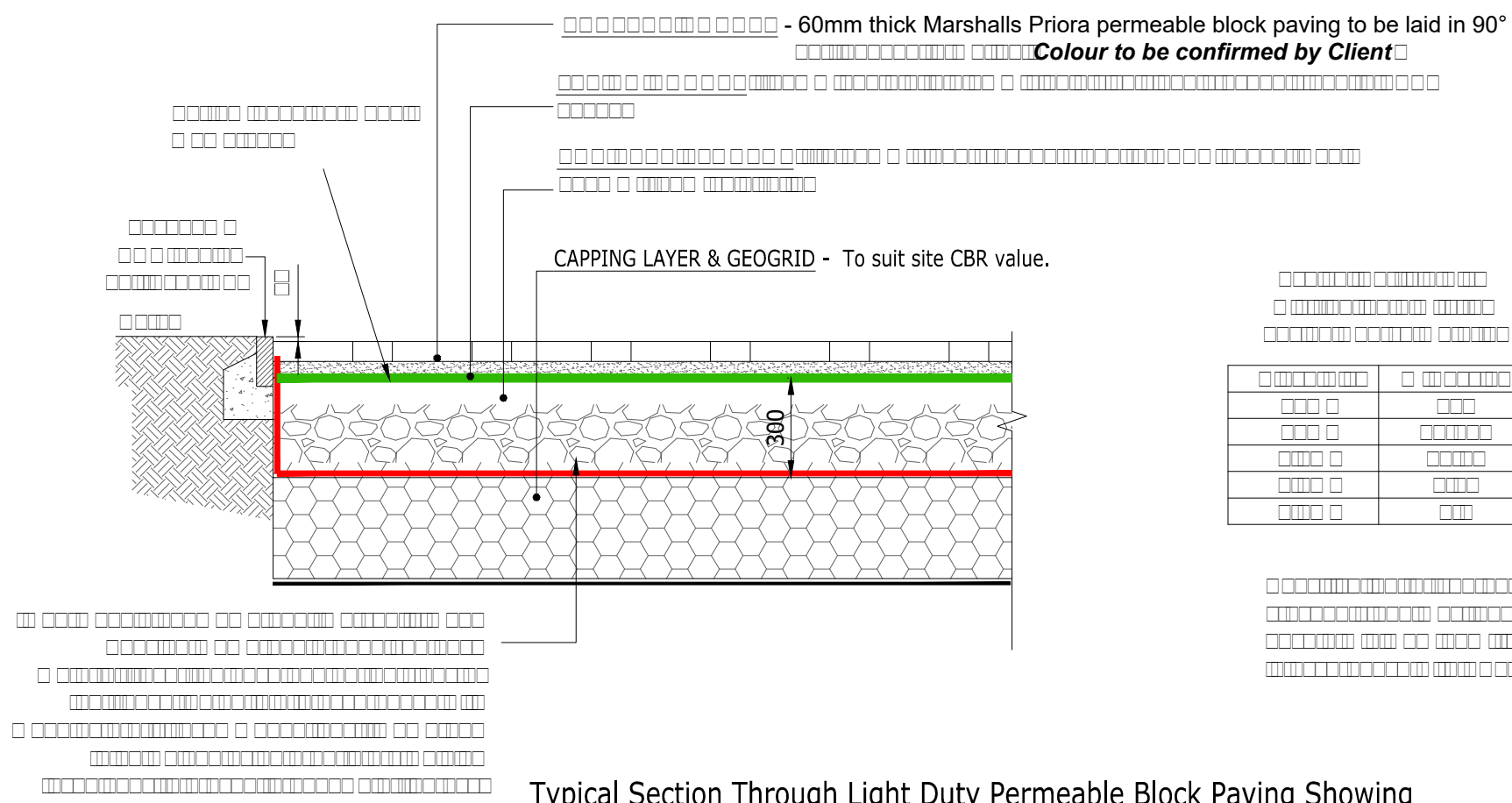


© This drawing and the building works depicted are the copyright of Adama Consulting Limited and may not be reproduced without the written permission of Adama Consulting Limited.

ADAMA CONSULTING

Civil & Infrastructure Engineering Design

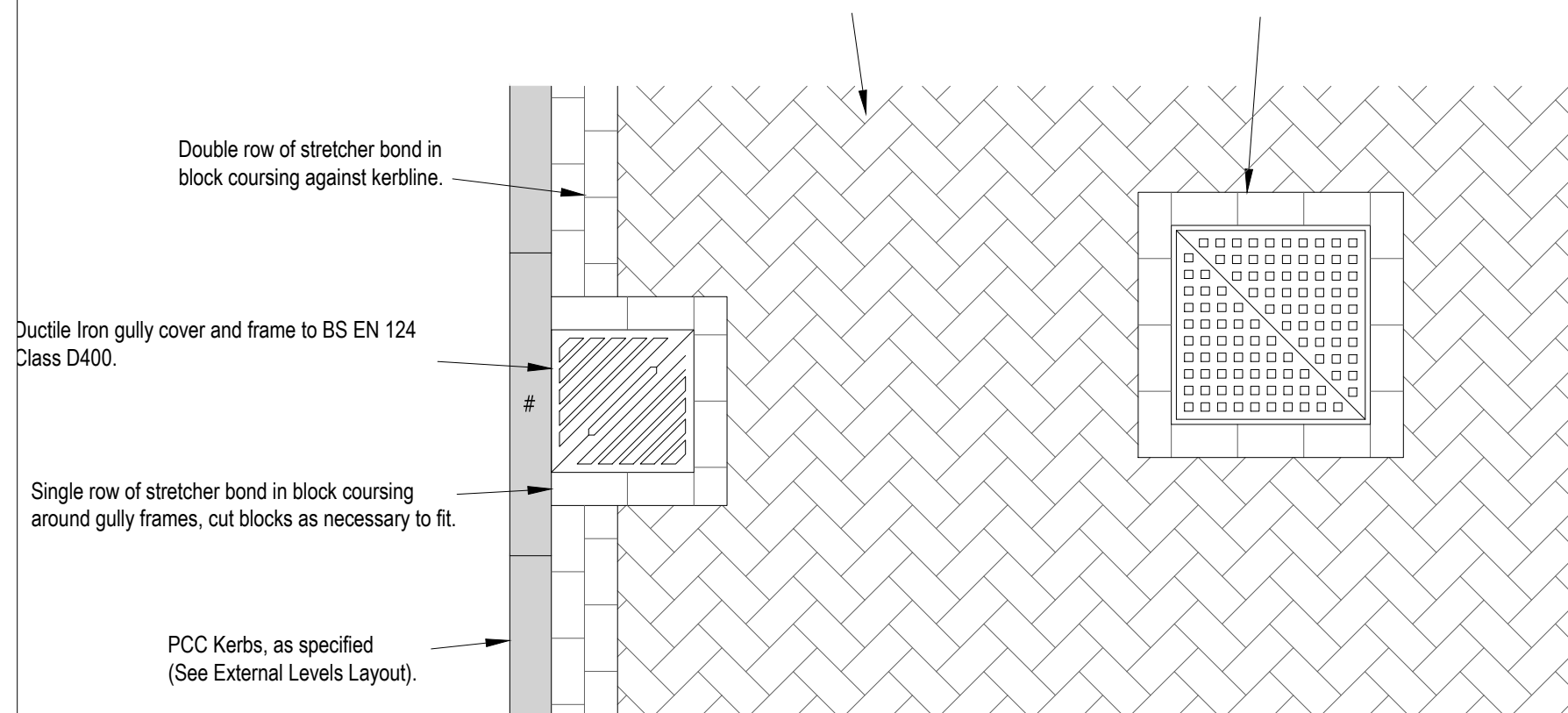
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----



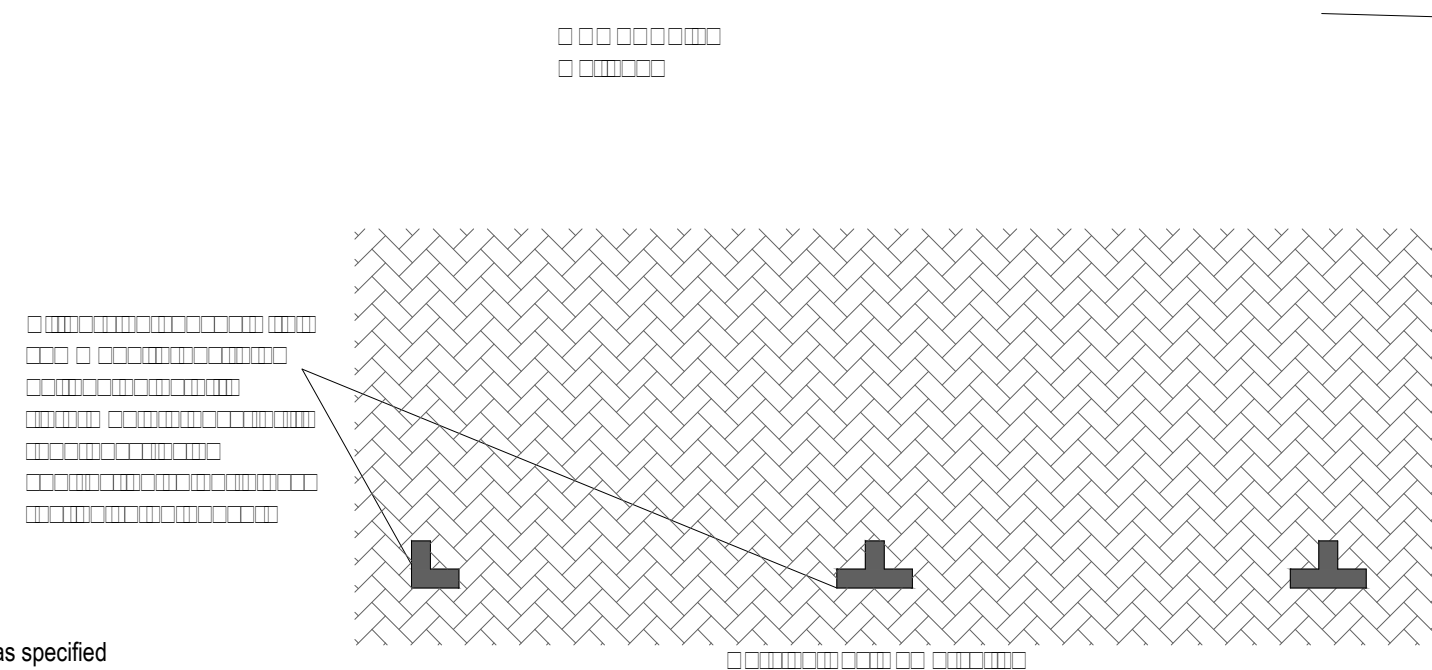
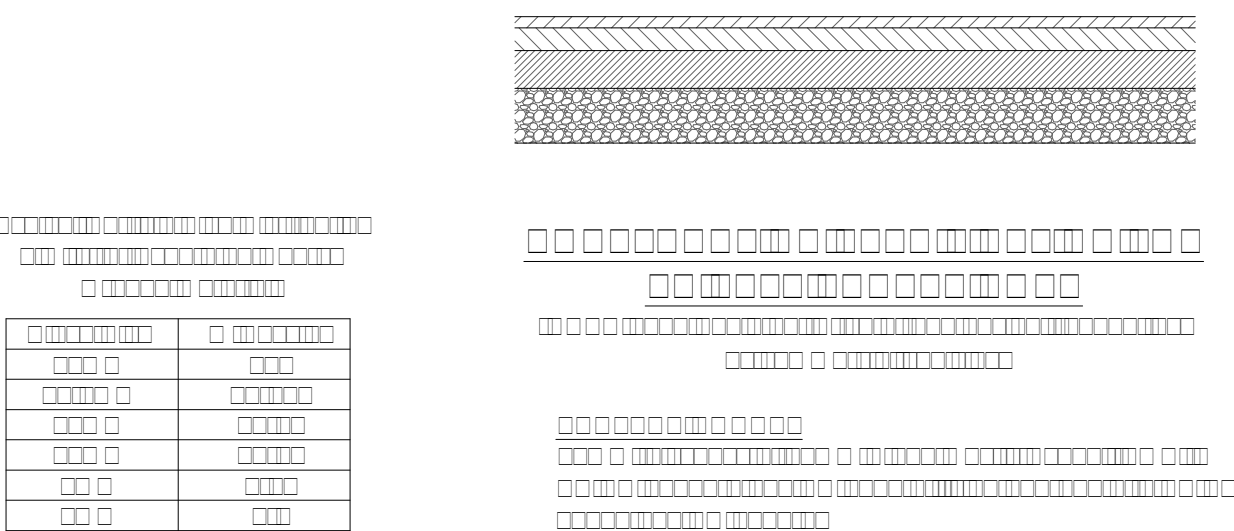
Marshalls Table & Capping Layer Thickness

Subgrade CBR Value	Capping Layer Thickness Type C Systems (mm)			
	Open Graded Crushed Rock or MOT Type 1		Capping Material	
	Without M15 Grid	With M15 Grid	Without M15 Grid	With M15 Grid
5%	--	--	--	--
4%	100	--	150	--
3%	125	100	225	150
2%	175	125	350	225
1%	300	175	600	350

paving, laid in 45° herringbone



Typical Arrangement of Block Paving Around Gullies & Manholes (Service Covers)



Kerb Detail-Type HB2

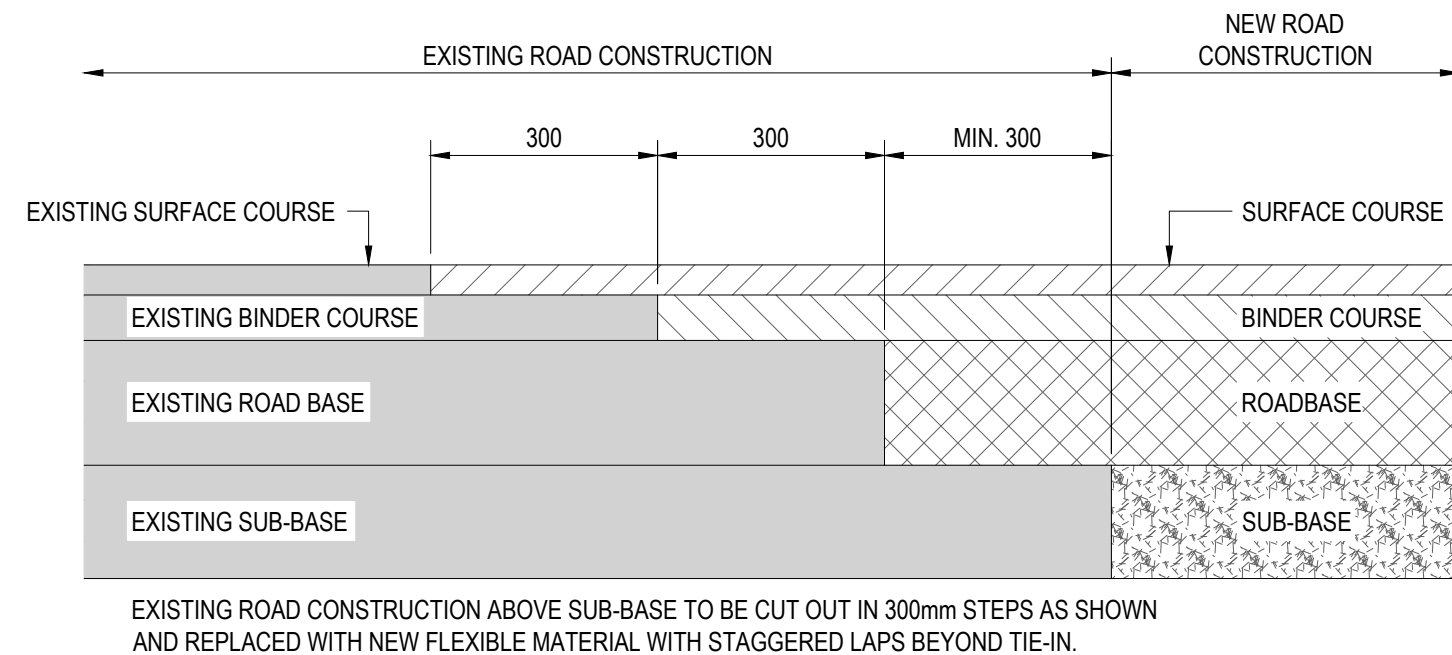
Kerb Detail-Type BN (Dropped)

Dropper Kerb Type DL1 (& DR1 handed) (N.T.S.)

Edging Type EF

Channel Kerb Detail-Type CS2

Kerb & Edging Details



Typical Tie-in Detail

© This drawing and the building works depicted are the copyright of Adama Consulting Limited and may not be reproduced without the written consent of Adama Consulting Limited.

ADAMA CONSULTING

Civil & Infrastructure Engineering Design

GENERAL TOLERANCES

All dimensions in millimetres, unless otherwise stated

PIPE Ø RANGE	TOLERANCE +
≤ 300	5
> 300 to 750	10
≥ 750 NON-RXL	20
≥ 750 RXL	+50 / -30

ANGLES	+ 1°30'
TYPICAL BENCHING SLOPE	1.9° - 5.7°
EXTERNAL BASE FLANGE	50 + 20
ALL OTHER DIMENSIONS	+50 / -30

- NOTES:
- Standard spigots in accordance with ES23
 - All dimensions annotated with * indicate points of intersection
 - If applicable, dimensions annotated with KD# are key BIM dimensions
 - Remove all burrs and break sharp edges
 - Spark test all joints that require leak-tightness
 - Team leader inspection points identified by: 1 2 3

GENERAL NOTES

- This drawing details Polypipe Civils proposed offering, reflecting our interpretation of the information provided.
- Polypipe bespoke Ridgistorm-XL chambers are complete pre-formed units.
- Polypipe products to be installed in accordance with Polypipe Civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will take ultimate ownership of the installation.
- Site conditions may require specific installation requirements. The installer should verify that the proposed installation method is acceptable, giving due consideration to the requirements of the relevant approving and adopting authorities, before construction activities commence.
- Advice on any system requirements specific to the proposed Ridgistorm XL system should be sought from Polypipe Civils.
- All PE stub connections will require adaptors (to be supplied by Contractor / Developer).

DRAWING NOTES

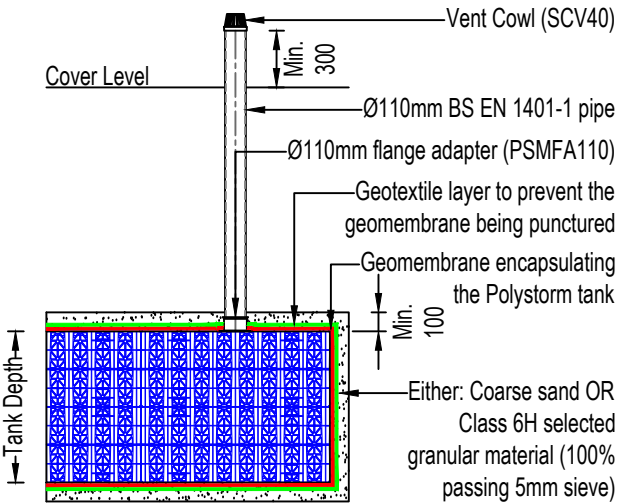
- Drawings should not be scaled, refer to figured dimensions only.
- All dimensions in millimetres, unless otherwise stated.
- All dimensions are nominal and may vary within manufacturing or construction tolerances.
- All site temporary and enabling works by others.
- This drawing is intended for guidance only. Confirmation of the information contained within this document should be sought from the consulting engineers before final design or construction activities commence.

COVER SLAB THICKNESS

- Where cover slabs are applicable, the slab thickness (shown in red) has been assumed and therefore needs to be confirmed by others.

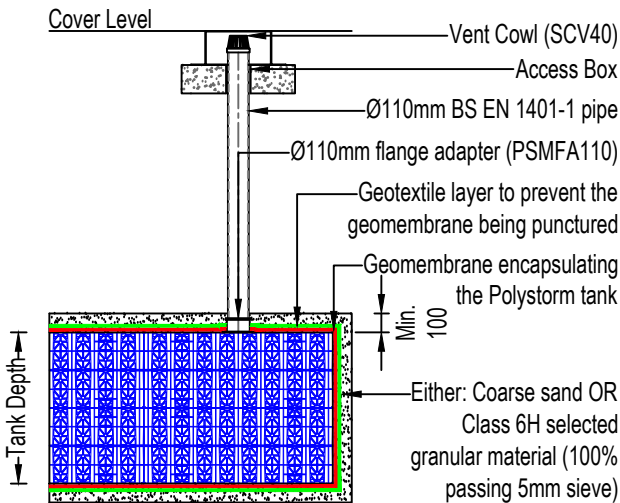
REV		AMENDMENT	DATE

STATUS		
PRELIMINARY		
SHEET SIZE	SHEET NO.	DRAWN BY
A3	1 of 1	DR
SCALE	DATE	
AS SHOWN	21/03/22	
DRAWING NO.	REV.	
79482_DR_D1	-	



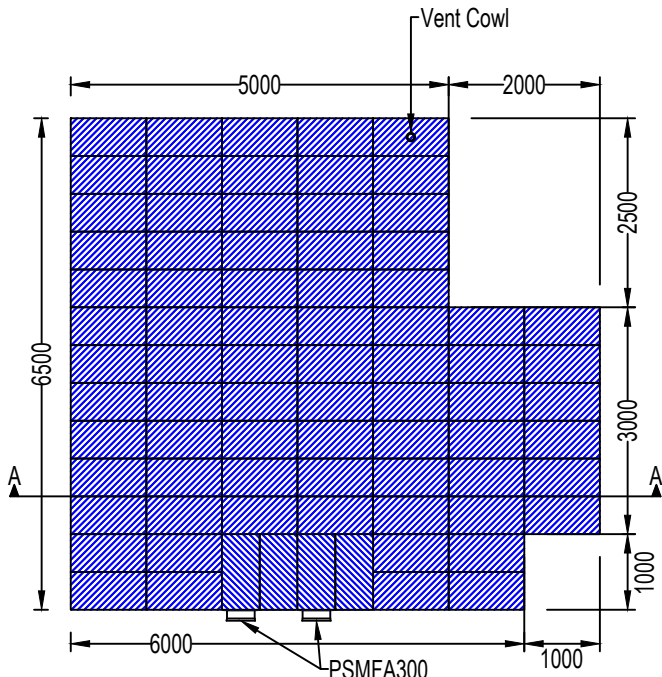
ATTENUATION TANK VENTILATION SYSTEM - OPTION 1)

Scale (1:40)



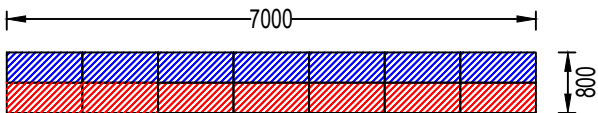
ATTENUATION TANK VENTILATION SYSTEM - OPTION 2)

Scale (1:40)



Polystorm Attenuation Tank - Plan View

Scale (1:100)



Polystorm Attenuation Tank - A-A Section

Scale (1:100)

PROPOSED POLYSTORM STRUCTURE

Plan Area	39.5m²
Tank Volume	31.6m³
Storage	30.02m³
Polystorm-R Units	79 (PSM1A)
Polystorm-Deep Units	79 (PSM5)

LEGEND:

- Polystorm-R Units (PSM1A)
- Polystorm-Deep Units (PSM5)

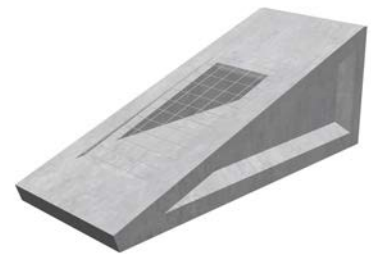
Swale Inlet Headwall Range

Up to 300mm Pipework

Althon swale and pond inlet headwalls up to 300mm are fibre reinforced precast concrete open inlets allowing surface water runoff to enter SUDS features, or to act as an outlet or overflow. The profile of the inlet 1:3 (18 Degrees) is the same as the surrounding ground in accordance with guidelines for the construction and adoption of swales and ponds. There is a recess formed in either side to key the unit into the slope of the swale or pond and prevent it slipping.

We can provide our swale and pond inlets with stainless steel or galvanised steel bar or mesh gratings. The grilles are fixed to the inlet with 4 No anti-tamper bolts, when the bottom two bolts are removed the grating hinges for ease of maintenance. The grating is located in an 8mm deep recess in the face of the unit to protect it from damage during routine maintenance i.e. mowing.

We are also able to factory fit inline non – return valves such as Wastop valves to our Swale Inlet units



150 Swale Inlet Headwall

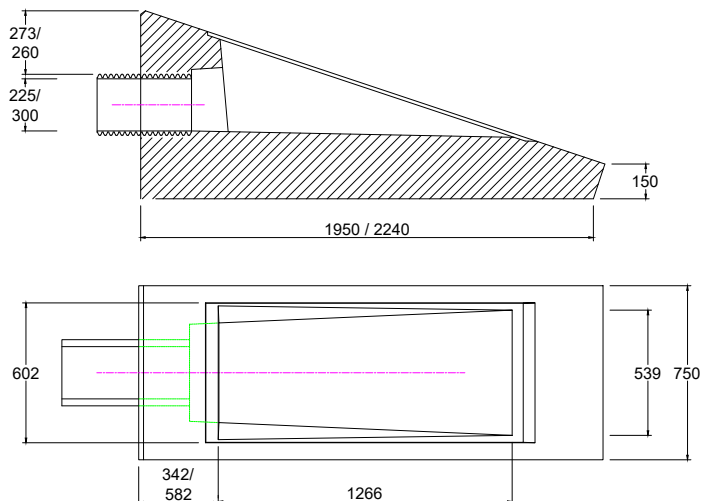


225 Swale Inlet Headwall

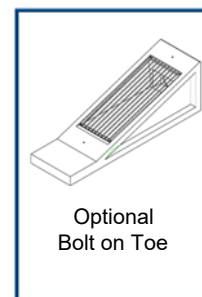
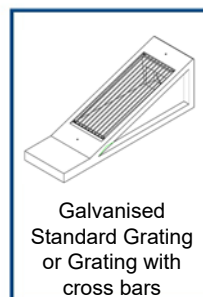
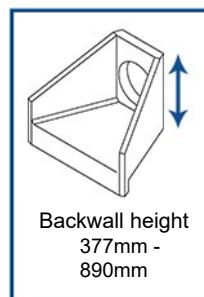
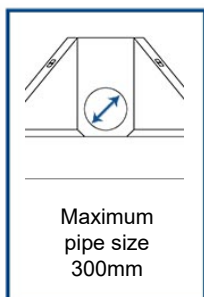
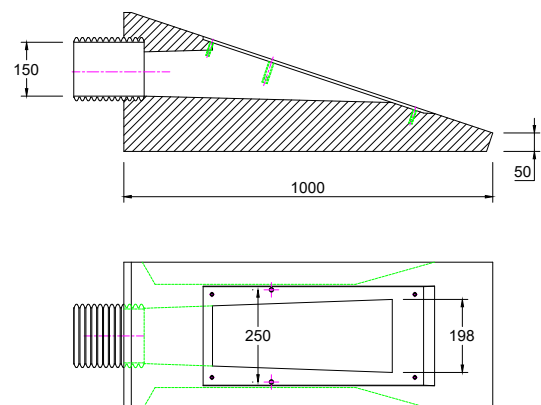


300 Swale Inlet Headwall

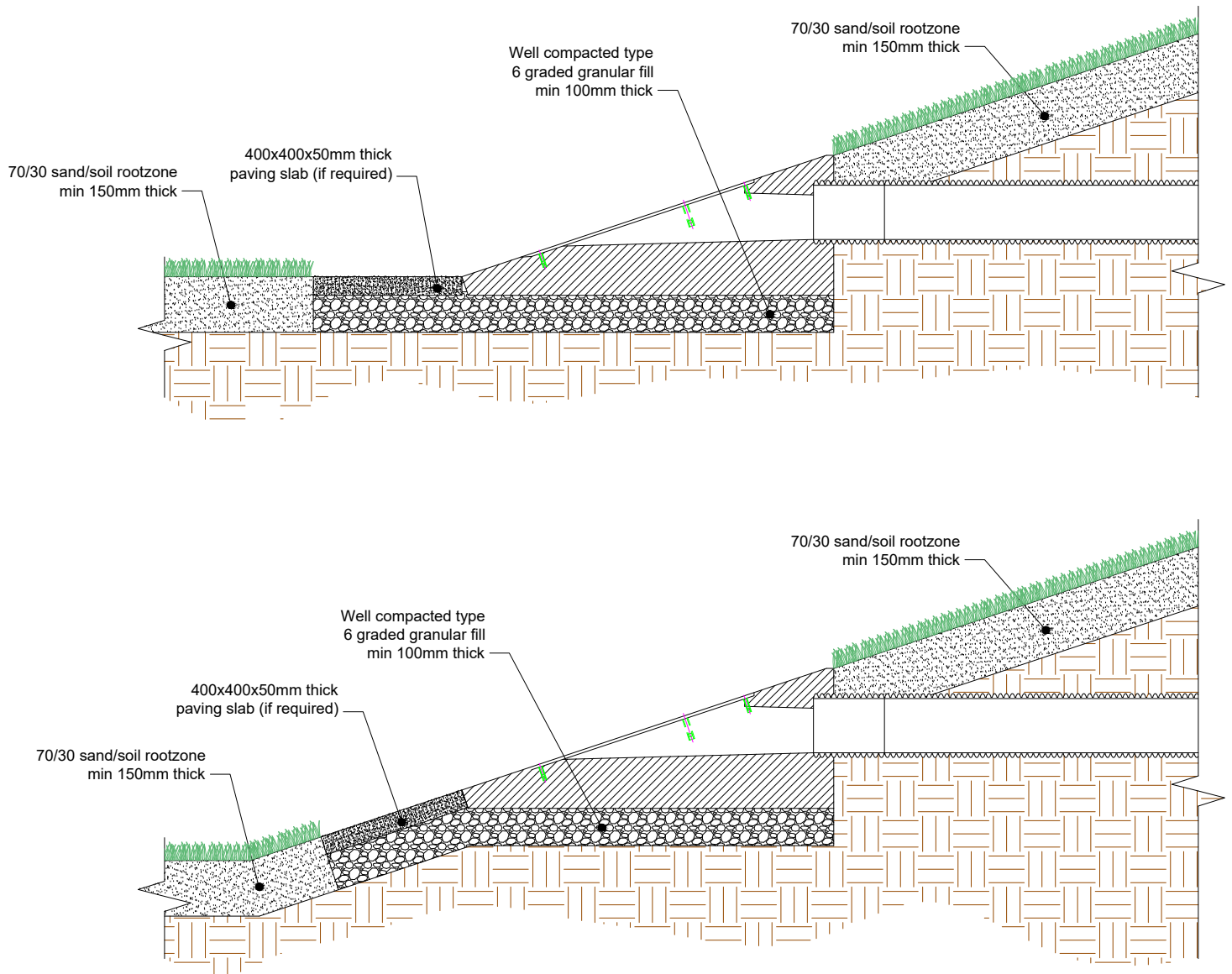
225 / 300 Swale Inlet Headwall



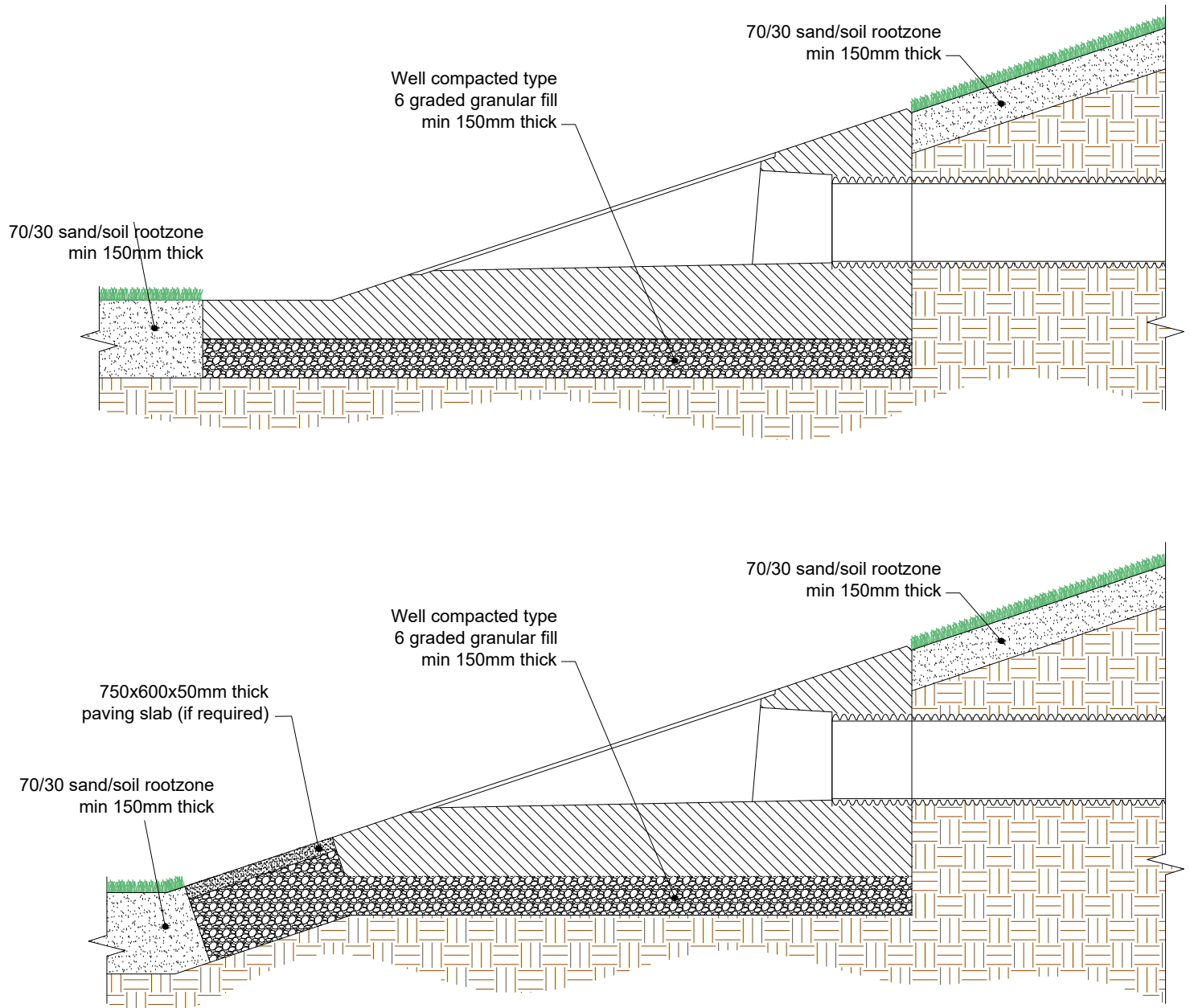
150 Swale Inlet Headwall



Installation Guide 150mm Swale/Pond



Installation Guide 225mm & 300mm Swale/Pond



Appendix C

Winter Groundwater Monitoring



**Sefter Road
Pagham
West Sussex**

In Situ Infiltration Test Report

Report Beneficiary:

Basing Partners Ltd
Basing Park
Privett
Alton
Hampshire
GU34 3NS

Project Reference: P14913

Report Reference: R14572

Document Control			
Issue No.	Status	Issue Date	Notes
1	Final	11 th March 2021	
Report Section		Prepared By	Approved By
In Situ Infiltration Testing		Rebecca Webb BSc FGS	Steven McSwiney BA mod Geol MSc FGS

Head Office
Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
Tel: 01273 483119
www.ashdownsi.co.uk

Limitations

This report was prepared specifically for the Client's project and may not be appropriate to alternative schemes. The copyright for the report and licence for its use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned.

TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	SITE CONTEXT	2
2.1	Site Details	2
2.2	Geological and Hydrogeological Information	2
3.	SITE WORKS	3
4.	GROUND CONDITIONS	4
4.1	Stratigraphy	4
4.2	Stability	4
4.3	Groundwater Conditions and Stability	4
5.	STORMWATER INFILTRATION SYSTEMS	5

FIGURES AND APPENDICES

Figure 1	Site Location Plan
Figure 2	Site Plan
Exploratory Hole Notes	
Exploratory Hole Records	
Summary of Trial Pit Falling Head Soakage Test Results	

1. INTRODUCTION

Ashdown Site Investigation Ltd was requested to undertake in situ infiltration testing and groundwater monitoring at Sefter Road, Pagham, West Sussex to assist others with the design of a sustainable drainage system (SuDS) for the proposed development.

The specific objectives of the works were to:

- a) Establish the expected geology and hydrogeology at the site;
- b) Investigate the shallow ground and groundwater conditions at the test locations; and
- c) Undertake in situ soakage testing and provide infiltration rates to assist others in undertaking design of SuDS.

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q10314Rev1, dated 24th November 2020. The instruction to proceed was received on behalf of the client.

2. SITE CONTEXT

2.1 Site Details

The site comprises an irregular shaped plot of land located at Sefter Road, Pagham, West Sussex, and is centred on the approximate Ordnance Survey national grid reference SZ 8953 9949. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively.

2.2 Geological and Hydrogeological Information

2.2.1 Expected Geology and Aquifer Designation

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Strata and Aquifer Designation

Type	Stratum	Aquifer Designation
Superficial	Raised Beach Deposits	Secondary A Aquifer
	River Terrace Deposits	Secondary A Aquifer
Bedrock	London Clay Formation	Unproductive Strata

The Raised Beach Deposits consist of marine sand, silt, and pebbly sand, with sandy gravel and 'clean' flint shingle. For the most part the deposit is either bedded or chaotic and may be in the form of dunes, sheets or banks. These deposits are above the level of the present shoreline as a result of earth movement or a general fall in sea level.

The River Terrace Deposits generally comprise well graded sandy fine to coarse gravel. Locally sand or gravel strata may predominate. Lenses of clay, silt and localised peat may be present. Gravels normally include a high proportion of subangular flint and chert and Lower Greensand rock types.

The London Clay Formation comprises a blue grey silty clay, which tends to weather to brown near to the upper surface. With depth, the clay becomes very stiff/hard, is frequently fissured and can contain some inclusions and beds of weak mudstone and siltstone.

2.2.2 Groundwater Source Protection Zones

The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.

3. SITE WORKS

Three trial pits, designated TP01 to TP03, were excavated by hand to a depth of 0.80m below ground level. In addition, a dynamic sampler borehole, denoted WS01, was drilled to a depth of 5.00m to facilitate installation of a groundwater monitoring standpipe. The fieldwork was carried out on 27th November 2020 and 22nd February 2021. The exploratory hole locations, specified by others, are shown on Figure 2.

Descriptions of the strata encountered and comments on groundwater conditions encountered at the test pit positions are shown in the exploratory hole records given in the appendices, together with notes to assist in their interpretation.

Falling head soakage testing was undertaken in the trial pits in general accordance with BRE guidance¹. The pits were backfilled with single size gravel to maintain pit stability during testing and the fall in water level during the tests was recorded using data loggers placed in standpipes installed in the pits. The pits were filled with water on three separate occasions.

The results of the groundwater monitoring from the datalogger installed within borehole WS01 on 27th November 2020 will be issued under separate cover on completion of the monitoring period: this is due to complete at the end of March 2021.

¹ Section 3.2.3 of Building Research Establishment (BRE) Digest 365, 2016.
Sefter Road, Pagham, West Sussex

4. GROUND CONDITIONS

4.1 Stratigraphy

4.1.1 Surface Covering

No specific surface materials were recorded within the exploratory holes.

4.1.2 Made Ground

Made ground, generally comprising clayey sandy gravel and /or gravelly sandy silty clay, was recorded to depths of between 0.20m and 0.60 below ground level at the trial pit positions, and to a depth of 0.90m at the borehole. The gravel fraction comprised variable quantities of brick, concrete, flint, wood, plastic, metal, tile, slate and charcoal-like material.

4.1.3 River Terrace Deposits

Underlying the made ground, the exploratory holes progressed into undisturbed slightly gravelly sandy clays with subordinate horizons of gravelly sands.

These soils, considered to represent the River Terrace Deposits indicated on the published geological map, were recorded to the full depth of the exploratory holes.

4.2 Stability

The shallow trial pits remained dry during excavation, however borehole WS01 was noted to be unstable during drilling and temporary steel casing was installed to maintain hole stability.

4.3 Groundwater Conditions and Stability

Groundwater was recorded at a depth of 0.61m on completion of the standpipe installation within borehole WS01 in November 2020. The results of the on-going groundwater monitoring will be issued under separate cover.

During the trial pitting works groundwater was noted at a depth of 0.72m within trial pit TP02. However, during the soakage testing this trial pit was noted to have drained dry between each fill and on completion.

Both trial pits TP01 and TP03 were dry on completion of excavation, although during the soakage testing the water level within trial pit TP01 never fell to the base of the pit which may be due to slow draining soils or a high water table.

It is noted that groundwater levels should be expected to fluctuate seasonally.

5. STORMWATER INFILTRATION SYSTEMS

In-situ infiltration testing² was carried out in each of the trial pits.

For the majority of the tests the soil infiltration rate (f) was calculated by dividing the volume of water lost between 75% and 25% of the initial test depth (H₀) by the sum of the average surface area of the sides of the trial pit in contact with the water during the test monitoring period, and its base area. This figure was then divided by the test duration (time taken for the water level to fall between 75% and 25% of the initial test depth) to give the soil infiltration rate in metres per second.

However, during the first two tests performed within trial pit TP01 the water level within the test pit did not fall below 25% of the initial test depth (H₀) prior to refilling, due to the slow draining soils encountered. Therefore, for these tests the soil infiltration rate has been calculated by dividing the volume of water lost during the test by the product of the average surface area of the trial pit in contact with water during the test period and the test duration in seconds.

The infiltration rates derived from the tests are summarised in the following table.

Table 2. Calculated Infiltration Rates

Exploratory Hole	Test Response Zone Depth (m)		Stratum	Infiltration Rate (f) (m/sec)	Head of Water (% of H ₀)
	Top	Bottom			
TP01 Test 1	0.10	0.80	Made Ground and River Terrace Deposits	2.8×10^{-7}	100-31
TP01 Test 2	0.12	0.80	Made Ground and River Terrace Deposits	2.6×10^{-7}	100-30
TP01 Test 3	0.13	0.80	Made Ground and River Terrace Deposits	8.5×10^{-8}	75-25
TP02 Test 1	0.10	0.80	Made Ground and River Terrace Deposits	3.1×10^{-6}	75-25
TP02 Test 2	0.10	0.80	Made Ground and River Terrace Deposits	3.9×10^{-6}	75-25
TP02 Test 3	0.23	0.80	Made Ground and River Terrace Deposits	4.5×10^{-6}	75-25
TP03 Test 1	0.28	0.80	Made Ground and River Terrace Deposits	1.1×10^{-5}	75-25
TP03 Test 2	0.14	0.80	Made Ground and River Terrace Deposits	8.9×10^{-6}	75-25
TP03 Test 3	0.12	0.80	Made Ground and River Terrace Deposits	9.4×10^{-6}	75-25

The value 'f' is equivalent to the soil infiltration coefficient 'q' quoted in the Construction Industry Research and Information Association (CIRIA) Report 156.

The results from the infiltration tests indicate that the Made Ground and River Terrace Deposits soils possess negligible to poor infiltration characteristics. The results from the infiltration tests should be provided to engineers responsible for the design of the drainage system.

² Conducted in general accordance with the requirements of BRE 365, Soakaway Design.

R14572

To comply with building regulations³, point discharging infiltration systems (conventional ring or trench soakaways) are required to be constructed a minimum of 5.0m away from proposed or existing buildings.

Ashdown Site Investigation Ltd.

³ The Building Regulations 2010; Part H; Drainage and Waste Disposal
Sefter Road, Pagham, West Sussex

FIGURES AND APPENDICES

Figure 1 Site Location Plan

Figure 2 Site Plan

Exploratory Hole Notes

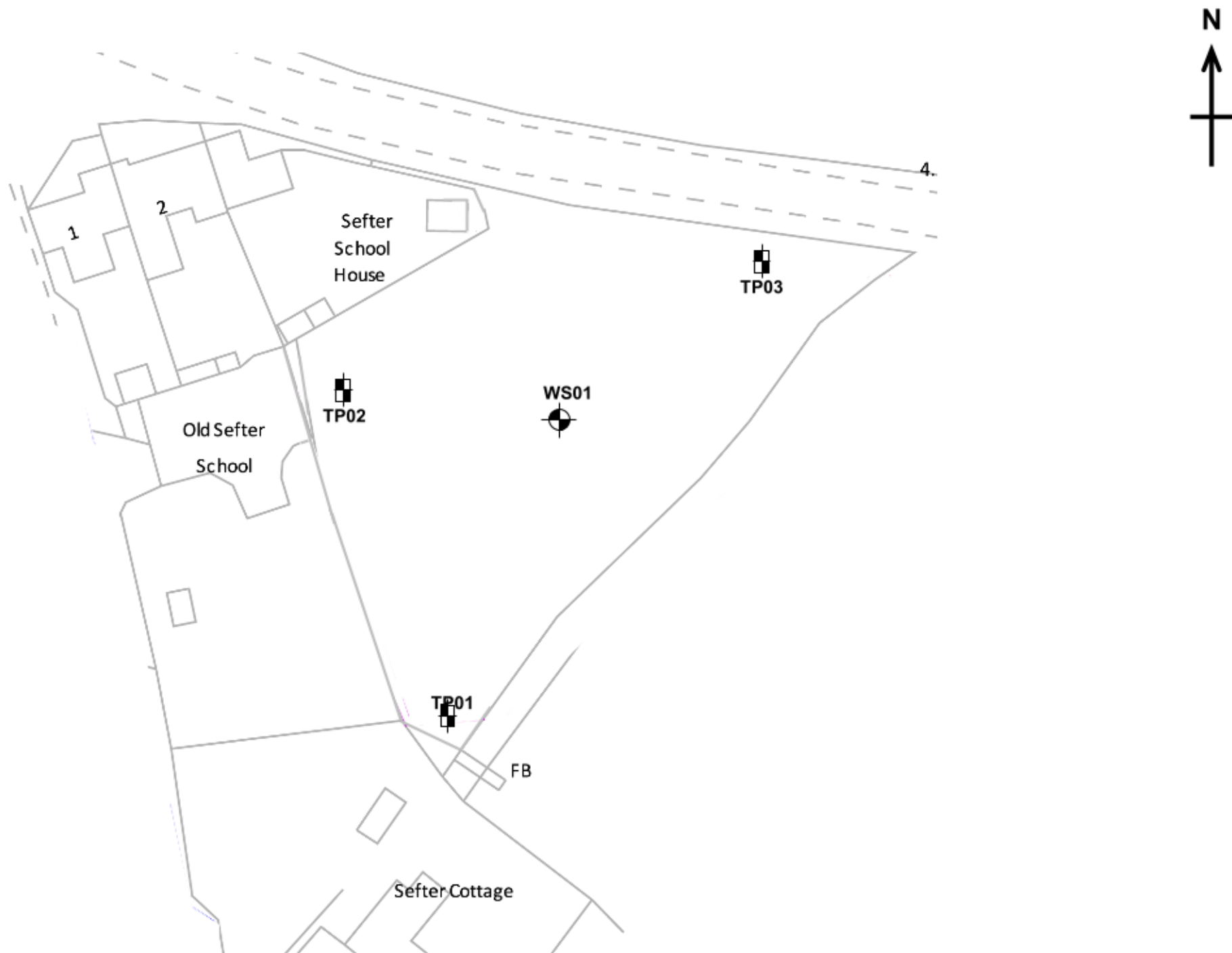
Exploratory Hole Records

Summary of Trial Pit Falling Head Soakage Test Results



© OpenStreetMap contributors, CC BY-SA

ASHDOWN SITE INVESTIGATION L I M I T E D	Site Location Plan	Site Name	Figure No.	Project Reference
		Seftor Road, Pagham, West Sussex	1	P14913



ASHDOWN SITE INVESTIGATION L I M I T E D	Site Plan	Site Name	Figure No.	Project Reference
		Sefter Road, Pagham, West Sussex	2	P14913

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U	'Undisturbed' Sample: - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
U _o	Sample not obtained
U*	Full penetration of sample not obtained
Pi	Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D	Disturbed Sample
R	Root Sample
B	Bulk Disturbed Sample
W	Water Sample
J	Jar Sample (sample taken in amber glass jar fitted with gas tight lid)
T	Tub Sample
Vi	Vial Sample

In situ Testing

S	Standard penetration test (SPT): Using the split spoon sampler.
C	Standard Penetration Test (SPT): using a solid cone instead of the sampler - conducted usually in coarse grained soils or weak rocks.
V	Shear Vane Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
H	Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m ²) shown within the Vane/Pen Test and N Value column.
P	Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP	Cable Percussion Borehole
WLS	Dynamic Sampler Borehole using windowless sampler tubes
WS	Dynamic Sampler Borehole using window sampler tubes
TP	Trial Pit excavated using mechanic excavator
HDP	Trial Pit excavated using hand tools

2 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

3 Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

4 Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk.

Site Name: Sefter Road, Pagham, West sussex

Job Number: P14913

Start Date: 27/11/2020

End Date: 27/11/2020

Borehole Number: **WS01**

Sheet 1 of 1

Standpipe		Samples and In Situ Testing		Dynamic Probe		Legend	Depth	Stratum Description				
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	0	5	10	15	20	25	30		
											0.00	MADE GROUND: Brown clayey sandy subangular to subrounded fine to coarse gravel of brick, concrete and flint.
D	0.50										0.40	MADE GROUND: Grey slightly gravelly slightly sandy clay. Gravel is subangular to subrounded fine to coarse brick and flint.
											0.90	Brown gravelly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse flint. (River Terrace Deposits)
D	1.50										1.80	Brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint. (River Terrace Deposits) with band of sand between 2.00m and 2.70m depth.
												becoming grey below 2.70m depth.
D	2.80											with bands of sand below 3.00m depth.
D	3.10											
D	4.10											
											5.00	End of borehole at 5.00m

Remarks
Groundwater: Groundwater at 0.61m depth on completion of borehole.

Stability: Borehole cased to 3.00m depth.
 Borehole collapsing on completion.

Notes: Standpipe installed to 5.00m depth; 5.00m to 2.00m slotted pipe with gravel surround; 2.00m to ground level plain pipe with bentonite seal; completed with end cap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: BA

End Date: 22/02/2021

Sheet 1 of 1

Remarks Groundwater: Trial pit dry on completion. Stability: Trial pit stable on completion. Notes: n/a	Excavation Method: TP
	Pit Length: 0.90m
	Pit Width: 0.30m
	Made By: KS

Site Name: Sefter Road, Pagham, West sussex

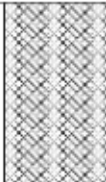
Job Number: P14913

Start Date: 22/02/2021

End Date: 22/02/2021

Trial Pit Number: **TP03**

Sheet 1 of 1

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
D	0.30				0.00	MADE GROUND: Brown gravelly sandy clay. Gravel is angular to subrounded fine to coarse flint, brick, tile, slate, concrete, plastic and charcoal-like material.
D	0.70				0.60	Light brown slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse flint. (River Terrace Deposits)
					0.80	End of trial pit at 0.80m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: n/a

Excavation Method: TP

Pit Length: 0.90m

Pit Width: 0.35m

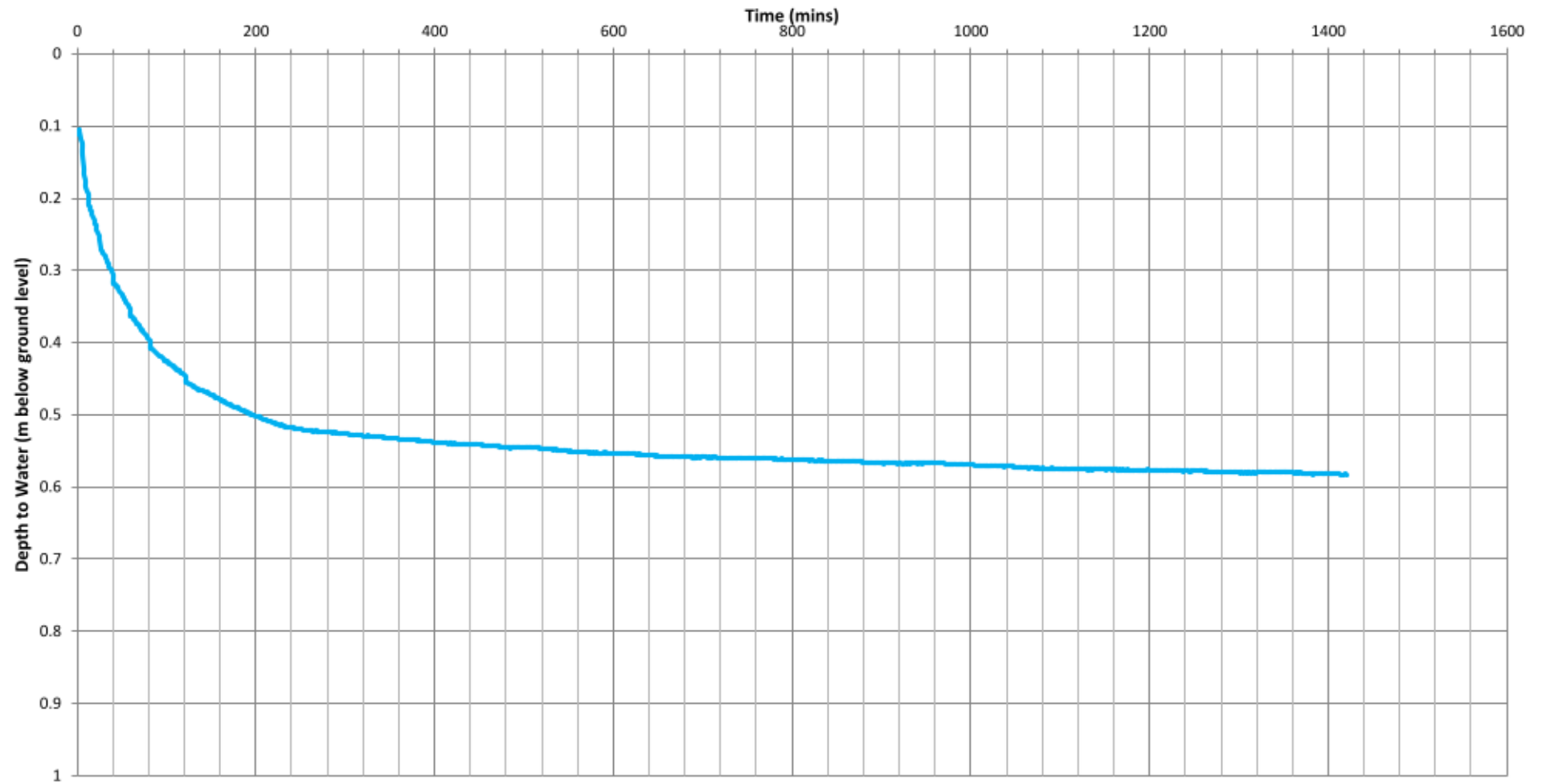
Made By: KS

Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Report No. P14913

Trial Pit Falling Head Soakage Test Results - TP01 Test 1

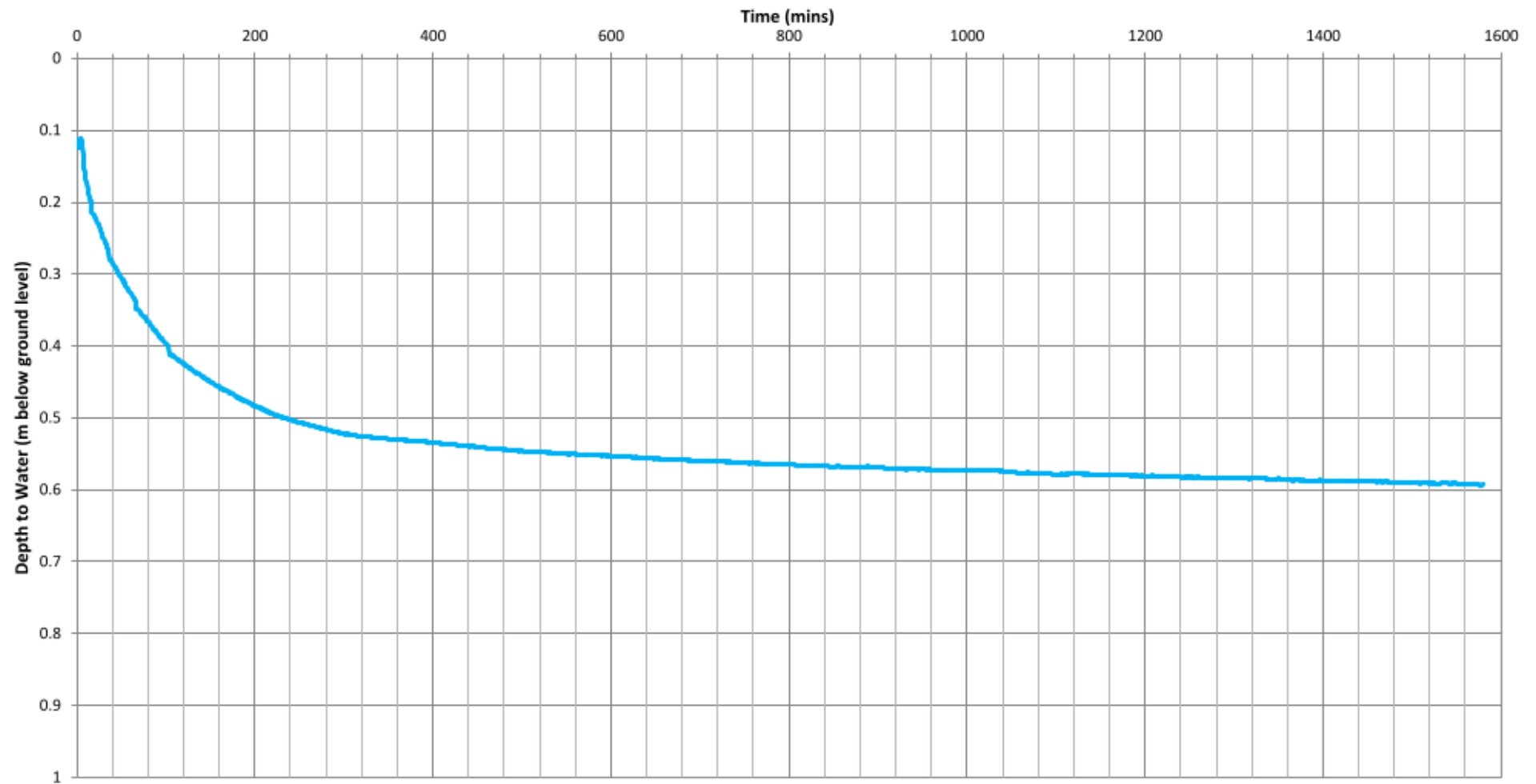


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP01 Test 2

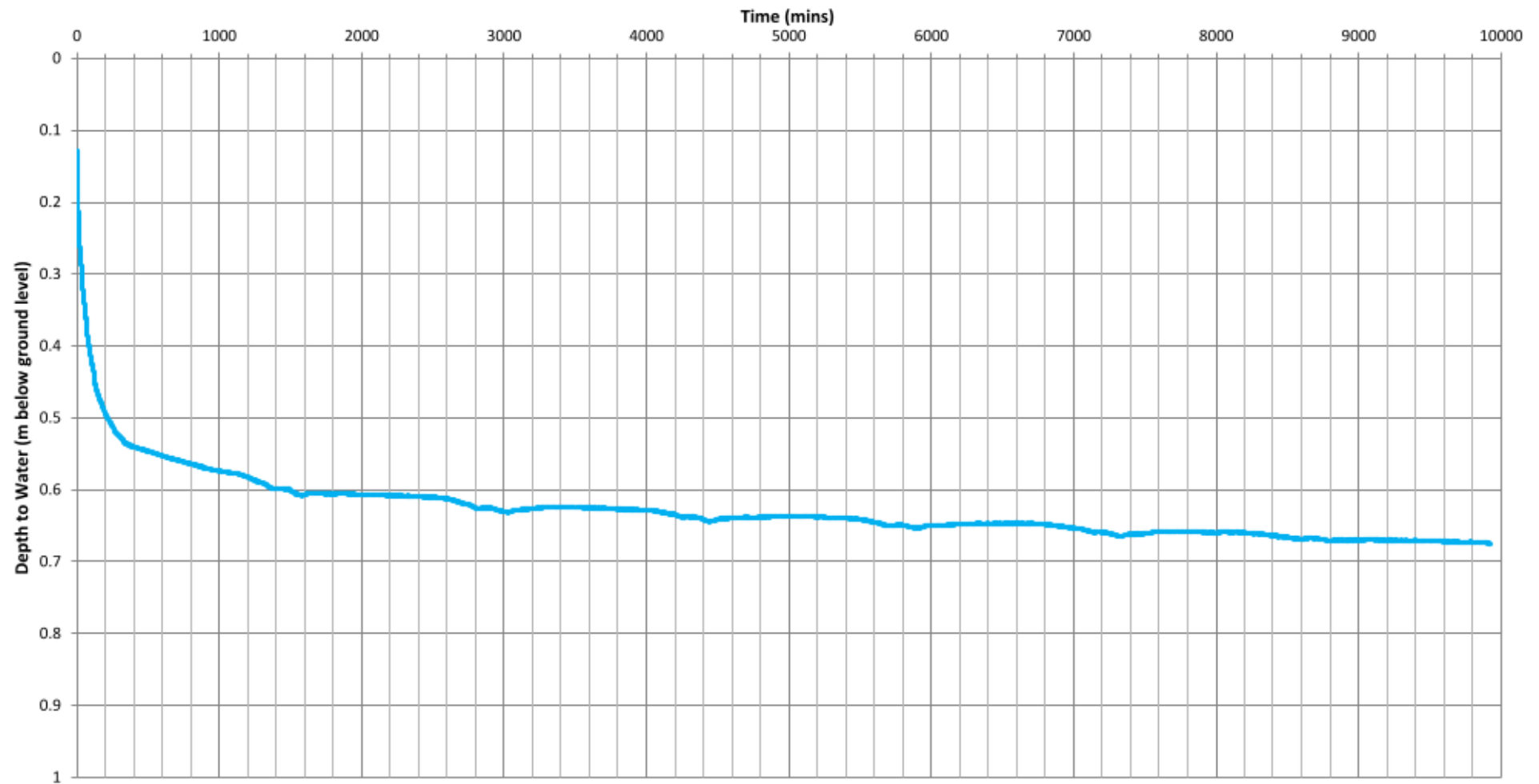


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP01 Test 3

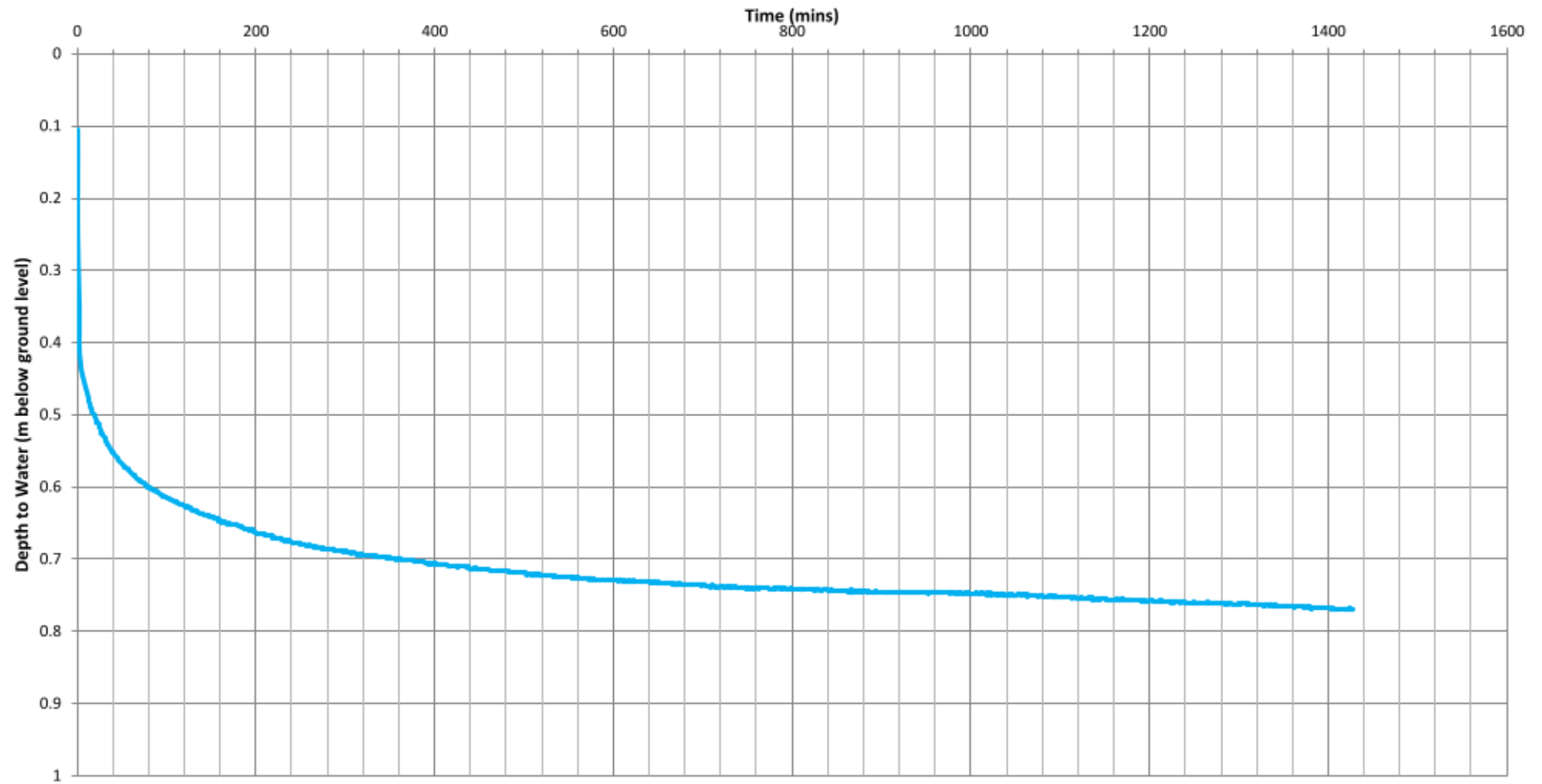


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Report No. P14913

Trial Pit Falling Head Soakage Test Results - TP02 Test 1

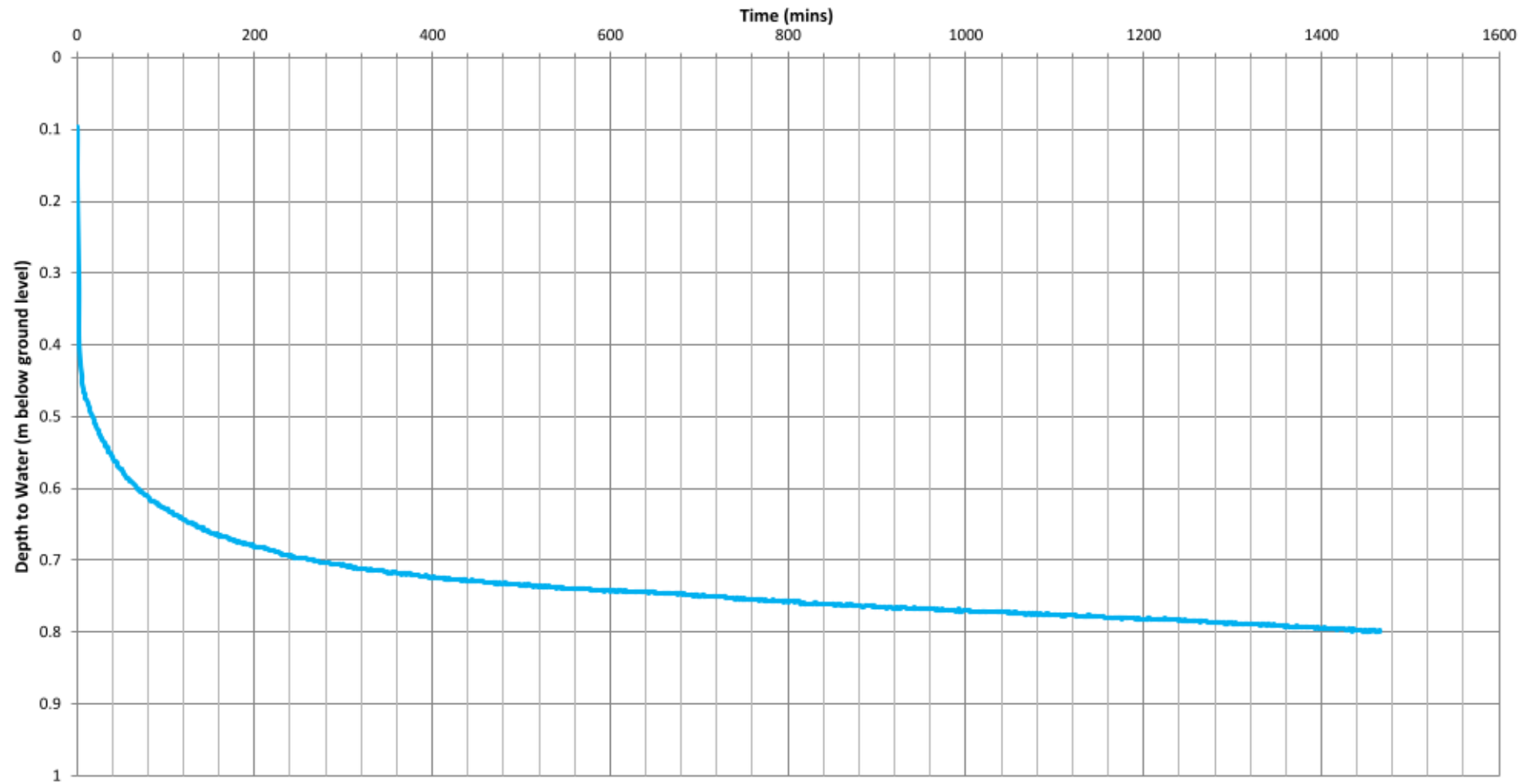


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP02 Test 2

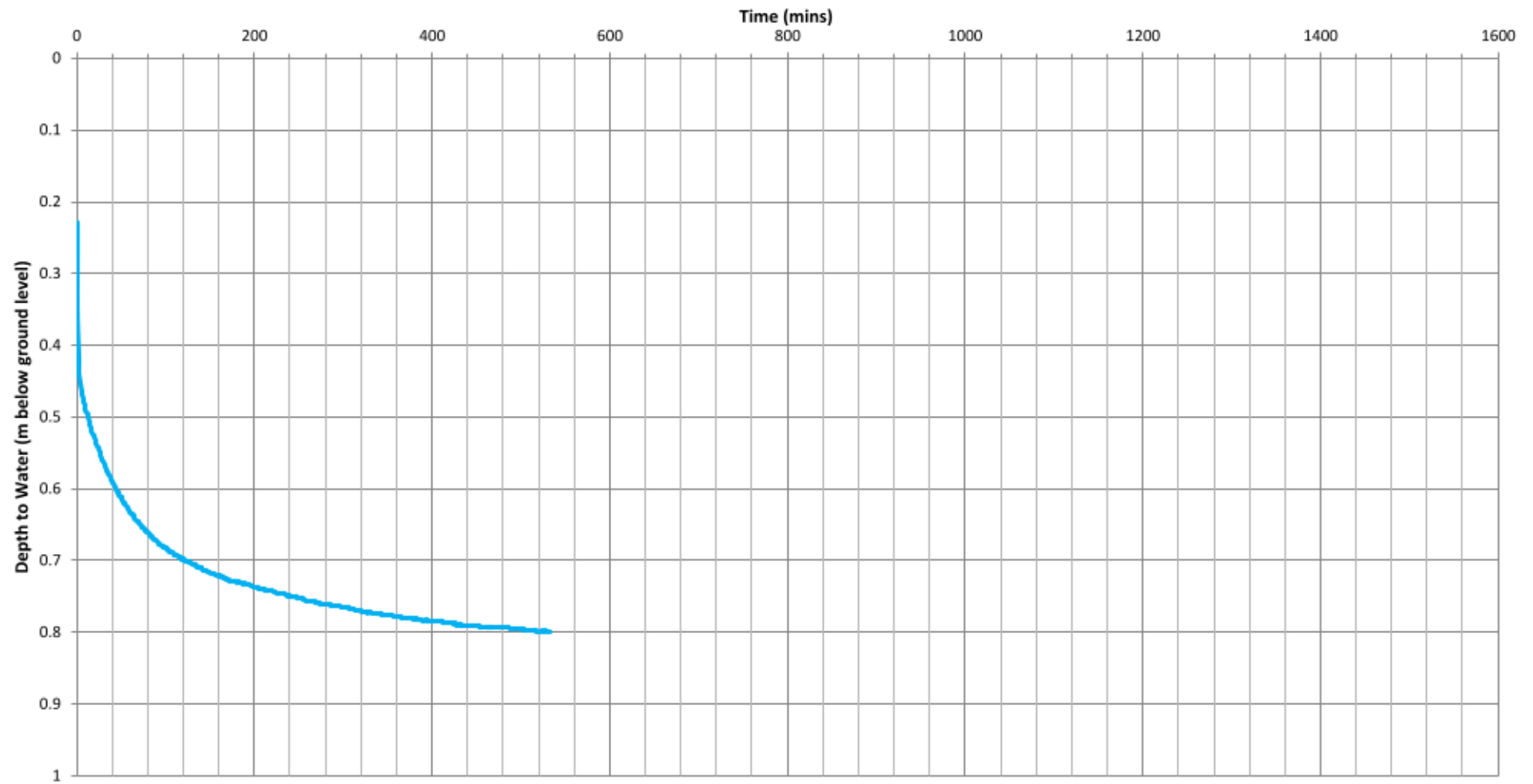


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP02 Test 3

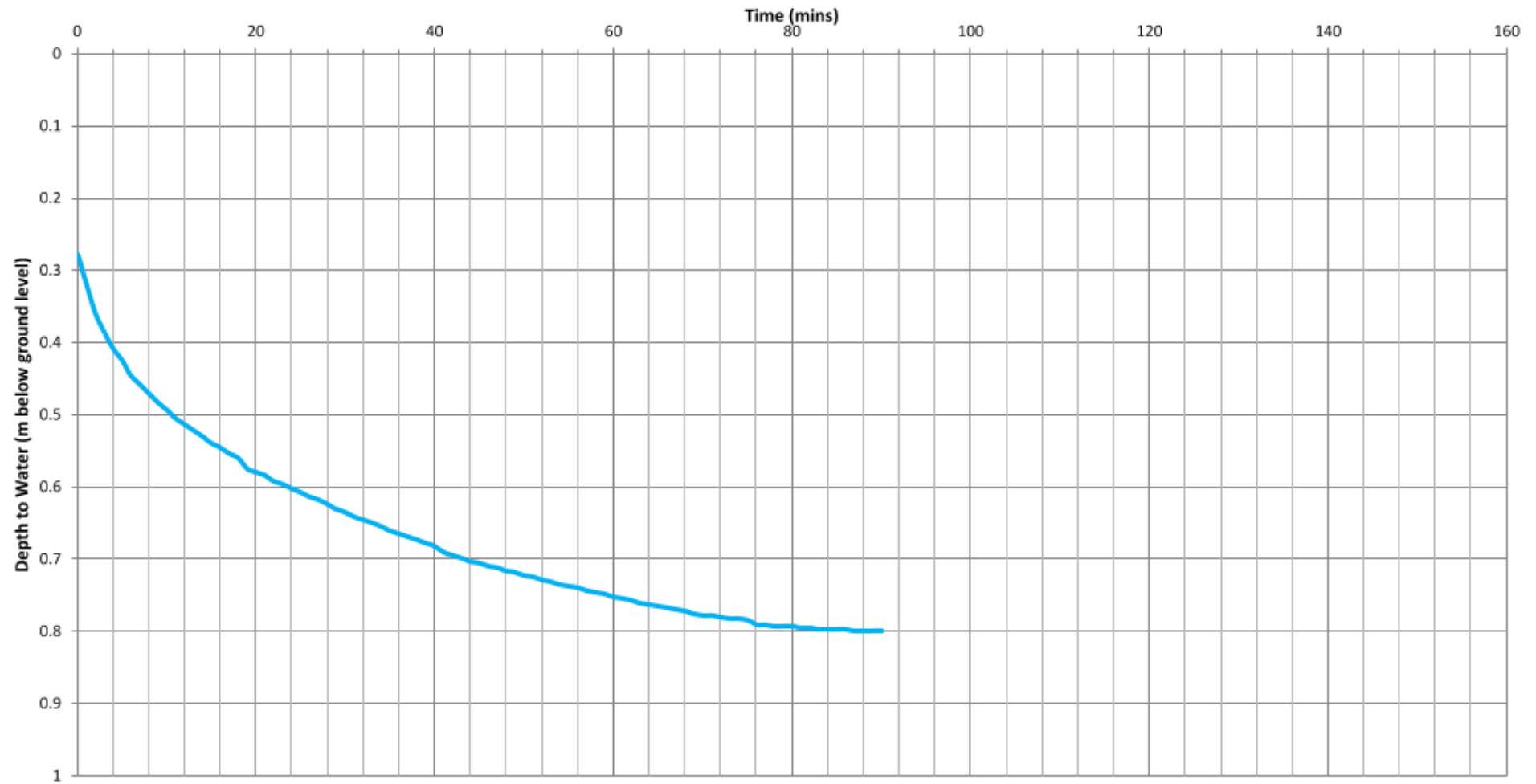


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Report No. P14913

Trial Pit Falling Head Soakage Test Results - TP03 Test 1

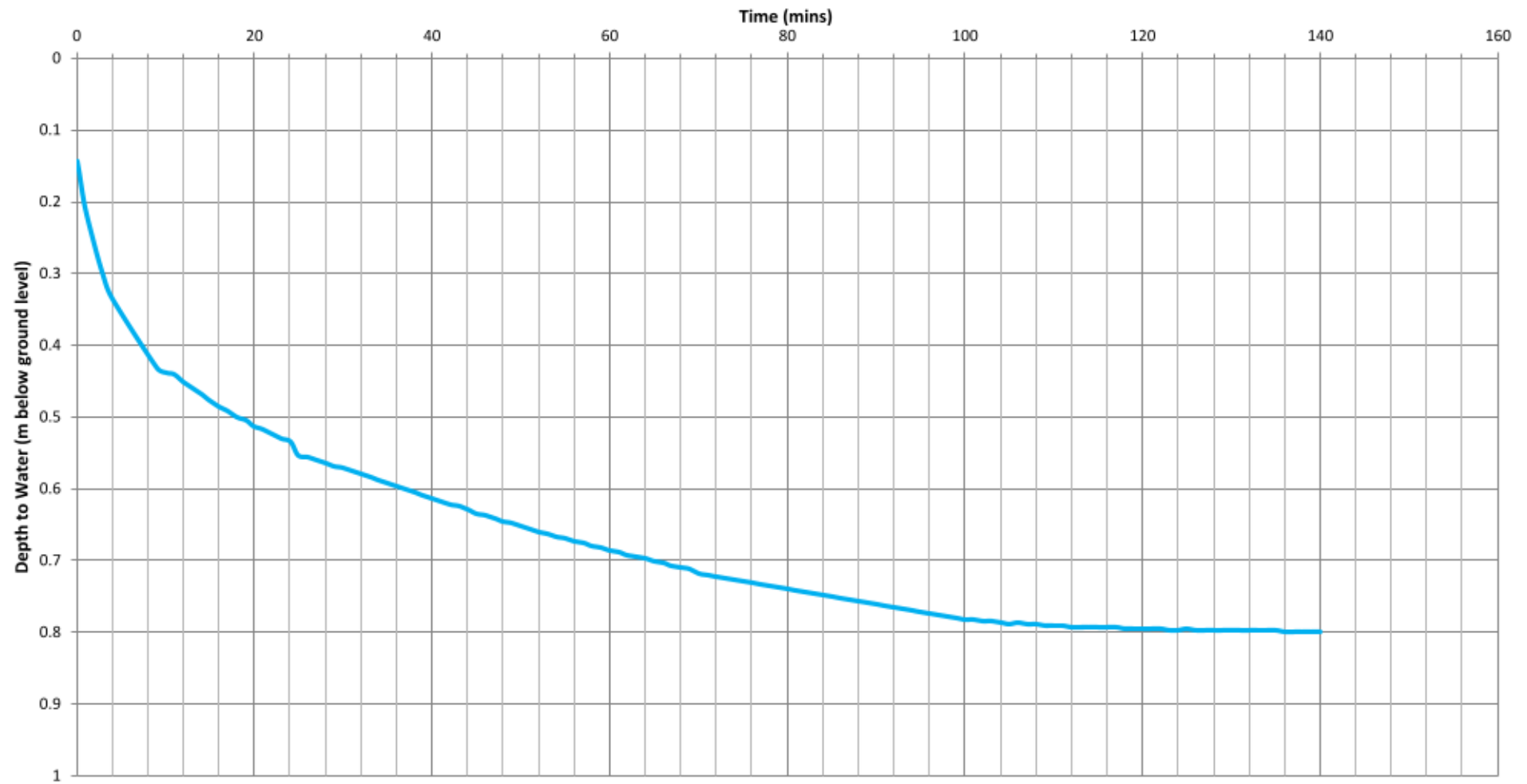


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP03 Test 2

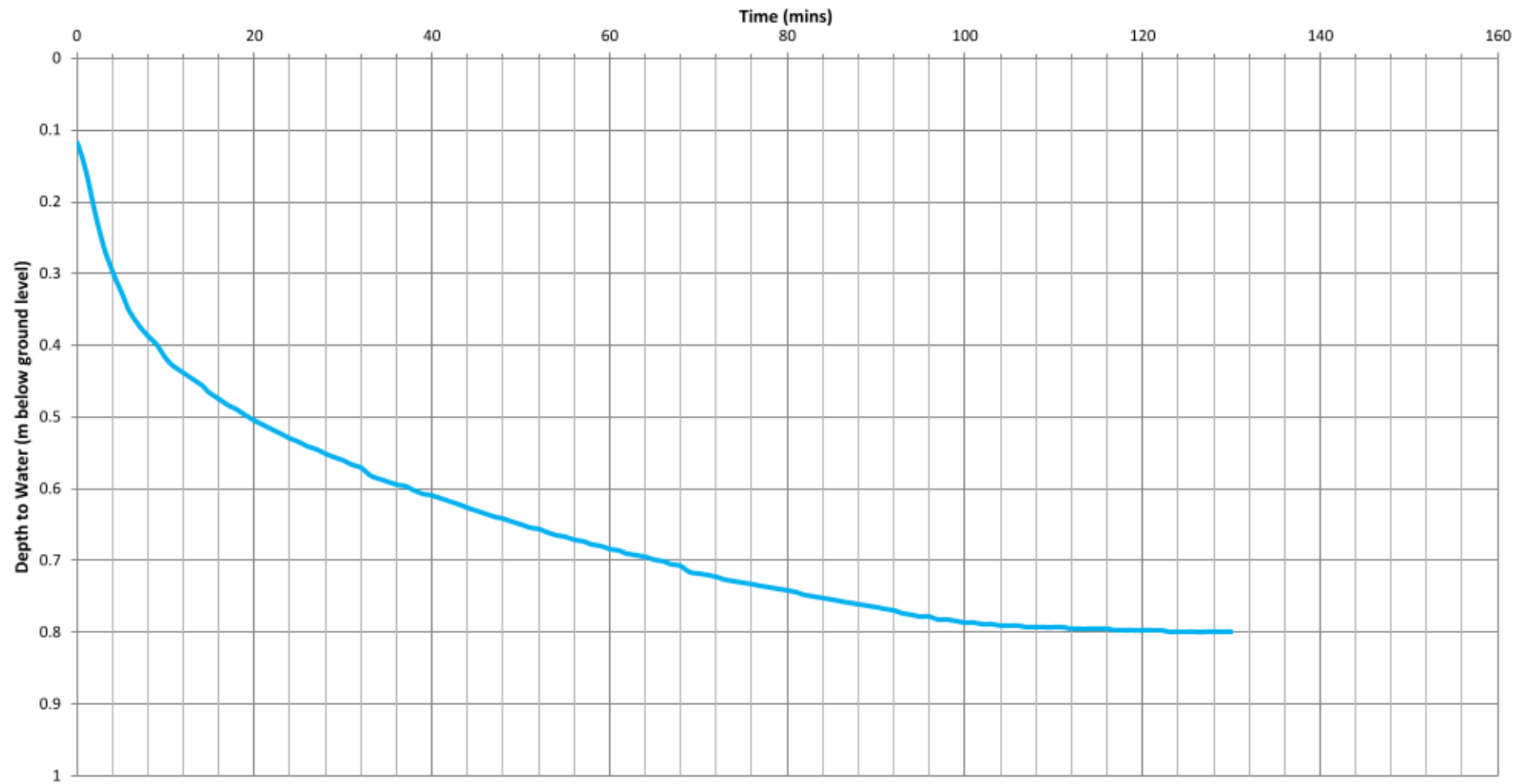


Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex

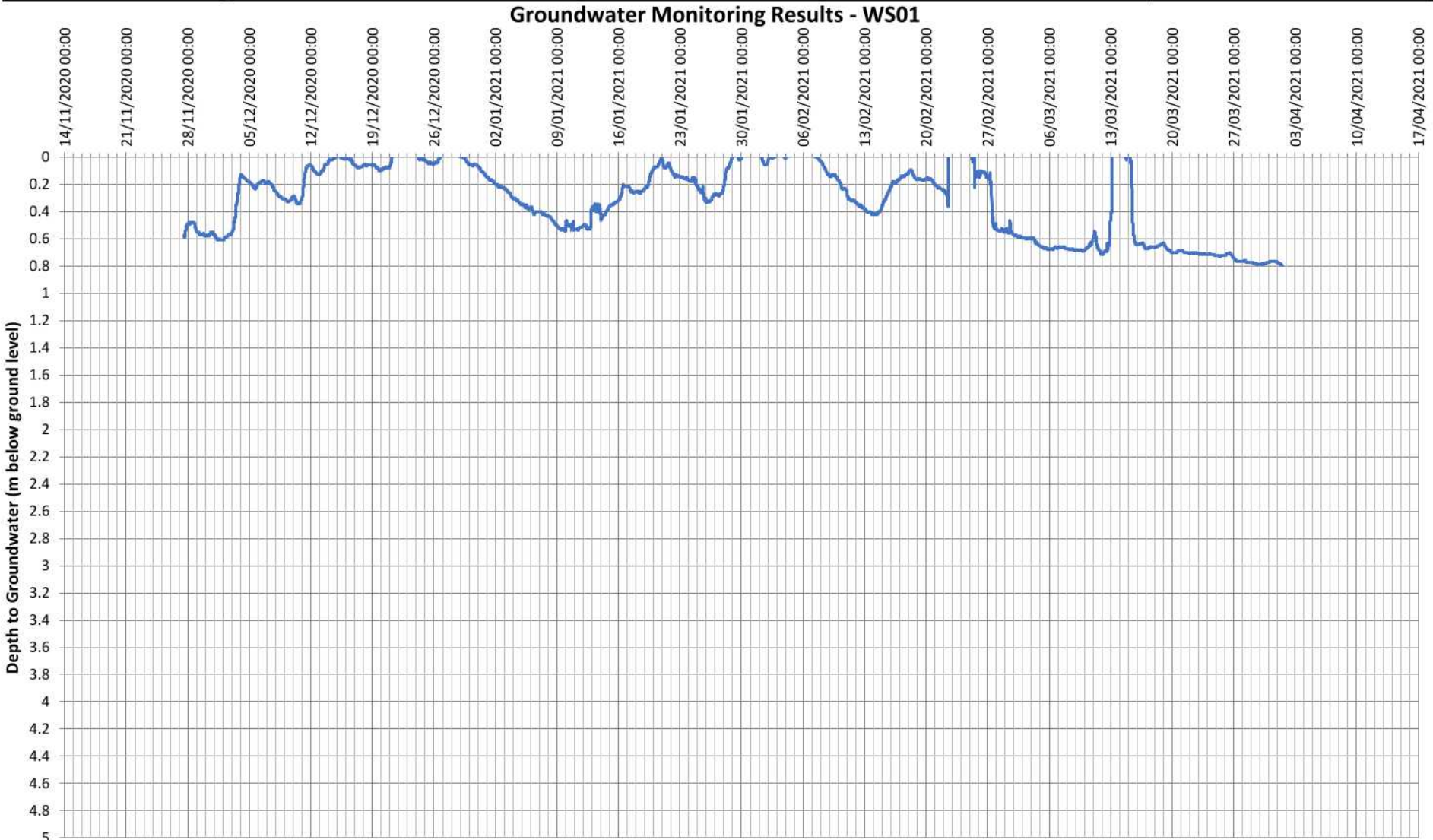
Project No. P14913

Trial Pit Falling Head Soakage Test Results - TP03 Test 3



Ashdown Site Investigation Limited

Site: Sefter Road, Pagham, West Sussex	Report No. P14913
--	-------------------



Appendix D

Hydraulic Calculations and Modelling

Adama Consulting Ltd		Page 1
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefter School House Sefter Road, Pagham Greenfield - FEH 2013 winter	
Date 10/03/2022 File	Designed by TGL Checked by MTD	
Micro Drainage Source Control 2020.1		

ReFH2 Rural Runoff Peak Flows

Input

Return Period (Years)	100
FEH Rainfall Version	2013
Site Location	GB 489700 99200 SZ 89700 99200
Data Type	Catchment
Season	Winter
Country	England/Wales/Northern Ireland
Area (ha)	0.267
SAAR (mm)	716
BFIHOST	0.696
FARL	1.000
SPRHOST	29.480
URBEXT (2000)	0.0330

Results

Return Period (Years)	Rural (l/s)	Urban (l/s)
User	1.2	1.2
Q1	0.4	0.4
Q2	0.4	0.5
Q5	0.6	0.6
Q10	0.7	0.8
Q30	0.9	1.0
Q50	1.0	1.1
Q75	1.1	1.2
Q100	1.2	1.2
Q200	1.4	1.4
Q1000	2.0	2.1

©1982-2020 Innovyze

Adama Consulting Ltd		Page 1																																																												
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefter School House Sefter Road, Pagham Greenfield - FEH 2013 summer																																																													
Date 10/03/2022 File	Designed by TGL Checked by MTD																																																													
Micro Drainage		Source Control 2020.1																																																												
<u>ReFH2 Rural Runoff Peak Flows</u> Input <table> <tr> <td>Return Period (Years)</td> <td>100</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 489700 99200 SZ 89700 99200</td> </tr> <tr> <td>Data Type</td> <td>Catchment</td> </tr> <tr> <td>Season</td> <td>Summer</td> </tr> <tr> <td>Country</td> <td>England/Wales/Northern Ireland</td> </tr> <tr> <td>Area (ha)</td> <td>0.267</td> </tr> <tr> <td>SAAR (mm)</td> <td>716</td> </tr> <tr> <td>BFIHOST</td> <td>0.696</td> </tr> <tr> <td>FARL</td> <td>1.000</td> </tr> <tr> <td>SPRHOST</td> <td>29.480</td> </tr> <tr> <td>URBEXT (2000)</td> <td>0.0330</td> </tr> </table> Results <table> <thead> <tr> <th>Return Period (Years)</th> <th>Rural (l/s)</th> <th>Urban (l/s)</th> </tr> </thead> <tbody> <tr> <td>User</td> <td>2.0</td> <td>2.0</td> </tr> <tr> <td>Q1</td> <td>0.6</td> <td>0.6</td> </tr> <tr> <td>Q2</td> <td>0.7</td> <td>0.7</td> </tr> <tr> <td>Q5</td> <td>1.0</td> <td>1.0</td> </tr> <tr> <td>Q10</td> <td>1.2</td> <td>1.2</td> </tr> <tr> <td>Q30</td> <td>1.5</td> <td>1.6</td> </tr> <tr> <td>Q50</td> <td>1.7</td> <td>1.8</td> </tr> <tr> <td>Q75</td> <td>1.8</td> <td>1.9</td> </tr> <tr> <td>Q100</td> <td>2.0</td> <td>2.0</td> </tr> <tr> <td>Q200</td> <td>2.3</td> <td>2.4</td> </tr> <tr> <td>Q1000</td> <td>3.5</td> <td>3.6</td> </tr> </tbody> </table>			Return Period (Years)	100	FEH Rainfall Version	2013	Site Location	GB 489700 99200 SZ 89700 99200	Data Type	Catchment	Season	Summer	Country	England/Wales/Northern Ireland	Area (ha)	0.267	SAAR (mm)	716	BFIHOST	0.696	FARL	1.000	SPRHOST	29.480	URBEXT (2000)	0.0330	Return Period (Years)	Rural (l/s)	Urban (l/s)	User	2.0	2.0	Q1	0.6	0.6	Q2	0.7	0.7	Q5	1.0	1.0	Q10	1.2	1.2	Q30	1.5	1.6	Q50	1.7	1.8	Q75	1.8	1.9	Q100	2.0	2.0	Q200	2.3	2.4	Q1000	3.5	3.6
Return Period (Years)	100																																																													
FEH Rainfall Version	2013																																																													
Site Location	GB 489700 99200 SZ 89700 99200																																																													
Data Type	Catchment																																																													
Season	Summer																																																													
Country	England/Wales/Northern Ireland																																																													
Area (ha)	0.267																																																													
SAAR (mm)	716																																																													
BFIHOST	0.696																																																													
FARL	1.000																																																													
SPRHOST	29.480																																																													
URBEXT (2000)	0.0330																																																													
Return Period (Years)	Rural (l/s)	Urban (l/s)																																																												
User	2.0	2.0																																																												
Q1	0.6	0.6																																																												
Q2	0.7	0.7																																																												
Q5	1.0	1.0																																																												
Q10	1.2	1.2																																																												
Q30	1.5	1.6																																																												
Q50	1.7	1.8																																																												
Q75	1.8	1.9																																																												
Q100	2.0	2.0																																																												
Q200	2.3	2.4																																																												
Q1000	3.5	3.6																																																												
©1982-2020 Innovyze																																																														

Adama Consulting Ltd		Page 1								
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013									
Date 11/08/2022 File 21-023 SW Network - Sur...	Designed by TGL Checked by MTD									
Micro Drainage Network 2020.1.3										
<u>Time Area Diagram for 21-023 SW Network - Surcharged.sws</u> <table><thead><tr><th>Time (mins)</th><th>Area (ha)</th><th>Time (mins)</th><th>Area (ha)</th></tr></thead><tbody><tr><td>0-4</td><td>0.099</td><td>4-8</td><td>0.040</td></tr></tbody></table> Total Area Contributing (ha) = 0.139 Total Pipe Volume (m³) = 7.210			Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.099	4-8	0.040
Time (mins)	Area (ha)	Time (mins)	Area (ha)							
0-4	0.099	4-8	0.040							
©1982-2020 Innovyze										

Adama Consulting Ltd											Page 2																																																																																																																																																																																																																																																																																																																																			
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ						Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013																																																																																																																																																																																																																																																																																																																																								
Date 11/08/2022 File 21-023 SW Network - Sur...						Designed by TGL Checked by MTD																																																																																																																																																																																																																																																																																																																																								
Micro Drainage						Network 2020.1.3																																																																																																																																																																																																																																																																																																																																								
<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Network Design Table for 21-023 SW Network - Surcharged.sws</u> # - Indicates pipe length does not match coordinates « - Indicates pipe capacity < flow <table><tr><th>PN</th><th>Length (m)</th><th>Fall (m)</th><th>Slope (1:X)</th><th>I.Area (ha)</th><th>T.E. (mins)</th><th>Base Flow (l/s)</th><th>k (mm)</th><th>HYD SECT</th><th>DIA (mm)</th><th>Section Type</th><th>Auto Design</th></tr><tr><td>1.000</td><td>16.291</td><td>0.272</td><td>59.9</td><td>0.005</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>1.001</td><td>8.273</td><td>0.138</td><td>59.9</td><td>0.005</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>2.000</td><td>7.578</td><td>0.126</td><td>60.1</td><td>0.005</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>2.001</td><td>8.841</td><td>0.354</td><td>25.0</td><td>0.005</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>150</td><td>Pipe/Conduit</td><td></td></tr><tr><td>1.002</td><td>3.899</td><td>0.376</td><td>10.4</td><td>0.003</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>150</td><td>Pipe/Conduit</td><td></td></tr><tr><td>1.003</td><td>29.036</td><td>0.155</td><td>187.3</td><td>0.000</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>300</td><td>Pipe/Conduit</td><td></td></tr><tr><td>3.000</td><td>4.499</td><td>0.075</td><td>60.0</td><td>0.007</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>3.001</td><td>7.791</td><td>0.130</td><td>59.9</td><td>0.008</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr><tr><td>3.002</td><td>7.513</td><td>0.150</td><td>50.1</td><td>0.008</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>150</td><td>Pipe/Conduit</td><td></td></tr><tr><td>3.003</td><td>13.826</td><td>0.357</td><td>38.7</td><td>0.005</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>150</td><td>Pipe/Conduit</td><td></td></tr><tr><td>4.000</td><td>8.565</td><td>0.142</td><td>60.3</td><td>0.007</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>150</td><td>Pipe/Conduit</td><td></td></tr><tr><td>4.001</td><td>13.217</td><td>0.170</td><td>77.7</td><td>0.008</td><td>0.00</td><td>0.0</td><td>0.600</td><td>o</td><td>150</td><td>Pipe/Conduit</td><td></td></tr><tr><td>5.000</td><td>4.499</td><td>0.075</td><td>60.0</td><td>0.006</td><td>5.00</td><td>0.0</td><td>0.600</td><td>o</td><td>100</td><td>Pipe/Conduit</td><td></td></tr></table> <u>Network Results Table</u> <table><tr><th>PN</th><th>Rain (mm/hr)</th><th>T.C. (mins)</th><th>US/IL (m)</th><th>Σ I.Area (ha)</th><th>Σ Base Flow (l/s)</th><th>Foul (l/s)</th><th>Add Flow (l/s)</th><th>Vel (m/s)</th><th>Cap (l/s)</th><th>Flow (l/s)</th></tr><tr><td>1.000</td><td>50.00</td><td>5.27</td><td>4.780</td><td>0.005</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.00</td><td>7.8</td><td>0.7</td></tr><tr><td>1.001</td><td>50.00</td><td>5.41</td><td>4.508</td><td>0.010</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.00</td><td>7.8</td><td>1.4</td></tr><tr><td>2.000</td><td>50.00</td><td>5.13</td><td>4.850</td><td>0.005</td><td>0.0</td><td>0.0</td><td>0.0</td><td>0.99</td><td>7.8</td><td>0.7</td></tr><tr><td>2.001</td><td>50.00</td><td>5.20</td><td>4.674</td><td>0.010</td><td>0.0</td><td>0.0</td><td>0.0</td><td>2.02</td><td>35.8</td><td>1.4</td></tr><tr><td>1.002</td><td>50.00</td><td>5.43</td><td>4.320</td><td>0.023</td><td>0.0</td><td>0.0</td><td>0.0</td><td>3.15</td><td>55.6</td><td>3.1</td></tr><tr><td>1.003</td><td>50.00</td><td>5.85</td><td>3.794</td><td>0.023</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.15</td><td>81.0</td><td>3.1</td></tr><tr><td>3.000</td><td>50.00</td><td>5.08</td><td>4.850</td><td>0.007</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.00</td><td>7.8</td><td>0.9</td></tr><tr><td>3.001</td><td>50.00</td><td>5.21</td><td>4.775</td><td>0.015</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.00</td><td>7.8</td><td>2.0</td></tr><tr><td>3.002</td><td>50.00</td><td>5.29</td><td>4.595</td><td>0.023</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.42</td><td>25.2</td><td>3.1</td></tr><tr><td>3.003</td><td>50.00</td><td>5.44</td><td>4.445</td><td>0.028</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.62</td><td>28.7</td><td>3.8</td></tr><tr><td>4.000</td><td>50.00</td><td>5.11</td><td>4.400</td><td>0.007</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.30</td><td>22.9</td><td>0.9</td></tr><tr><td>4.001</td><td>50.00</td><td>5.30</td><td>4.258</td><td>0.015</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.14</td><td>20.2</td><td>2.0</td></tr><tr><td>5.000</td><td>50.00</td><td>5.08</td><td>4.850</td><td>0.006</td><td>0.0</td><td>0.0</td><td>0.0</td><td>1.00</td><td>7.8</td><td>0.8</td></tr></table>													PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design	1.000	16.291	0.272	59.9	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit		1.001	8.273	0.138	59.9	0.005	0.00	0.0	0.600	o	100	Pipe/Conduit		2.000	7.578	0.126	60.1	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit		2.001	8.841	0.354	25.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit		1.002	3.899	0.376	10.4	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit		1.003	29.036	0.155	187.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit		3.000	4.499	0.075	60.0	0.007	5.00	0.0	0.600	o	100	Pipe/Conduit		3.001	7.791	0.130	59.9	0.008	0.00	0.0	0.600	o	100	Pipe/Conduit		3.002	7.513	0.150	50.1	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit		3.003	13.826	0.357	38.7	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit		4.000	8.565	0.142	60.3	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit		4.001	13.217	0.170	77.7	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit		5.000	4.499	0.075	60.0	0.006	5.00	0.0	0.600	o	100	Pipe/Conduit		PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	1.000	50.00	5.27	4.780	0.005	0.0	0.0	0.0	1.00	7.8	0.7	1.001	50.00	5.41	4.508	0.010	0.0	0.0	0.0	1.00	7.8	1.4	2.000	50.00	5.13	4.850	0.005	0.0	0.0	0.0	0.99	7.8	0.7	2.001	50.00	5.20	4.674	0.010	0.0	0.0	0.0	2.02	35.8	1.4	1.002	50.00	5.43	4.320	0.023	0.0	0.0	0.0	3.15	55.6	3.1	1.003	50.00	5.85	3.794	0.023	0.0	0.0	0.0	1.15	81.0	3.1	3.000	50.00	5.08	4.850	0.007	0.0	0.0	0.0	1.00	7.8	0.9	3.001	50.00	5.21	4.775	0.015	0.0	0.0	0.0	1.00	7.8	2.0	3.002	50.00	5.29	4.595	0.023	0.0	0.0	0.0	1.42	25.2	3.1	3.003	50.00	5.44	4.445	0.028	0.0	0.0	0.0	1.62	28.7	3.8	4.000	50.00	5.11	4.400	0.007	0.0	0.0	0.0	1.30	22.9	0.9	4.001	50.00	5.30	4.258	0.015	0.0	0.0	0.0	1.14	20.2	2.0	5.000	50.00	5.08	4.850	0.006	0.0	0.0	0.0	1.00	7.8	0.8
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design																																																																																																																																																																																																																																																																																																																																			
1.000	16.291	0.272	59.9	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
1.001	8.273	0.138	59.9	0.005	0.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
2.000	7.578	0.126	60.1	0.005	5.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
2.001	8.841	0.354	25.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
1.002	3.899	0.376	10.4	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
1.003	29.036	0.155	187.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
3.000	4.499	0.075	60.0	0.007	5.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
3.001	7.791	0.130	59.9	0.008	0.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
3.002	7.513	0.150	50.1	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
3.003	13.826	0.357	38.7	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
4.000	8.565	0.142	60.3	0.007	5.00	0.0	0.600	o	150	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
4.001	13.217	0.170	77.7	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
5.000	4.499	0.075	60.0	0.006	5.00	0.0	0.600	o	100	Pipe/Conduit																																																																																																																																																																																																																																																																																																																																				
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)																																																																																																																																																																																																																																																																																																																																				
1.000	50.00	5.27	4.780	0.005	0.0	0.0	0.0	1.00	7.8	0.7																																																																																																																																																																																																																																																																																																																																				
1.001	50.00	5.41	4.508	0.010	0.0	0.0	0.0	1.00	7.8	1.4																																																																																																																																																																																																																																																																																																																																				
2.000	50.00	5.13	4.850	0.005	0.0	0.0	0.0	0.99	7.8	0.7																																																																																																																																																																																																																																																																																																																																				
2.001	50.00	5.20	4.674	0.010	0.0	0.0	0.0	2.02	35.8	1.4																																																																																																																																																																																																																																																																																																																																				
1.002	50.00	5.43	4.320	0.023	0.0	0.0	0.0	3.15	55.6	3.1																																																																																																																																																																																																																																																																																																																																				
1.003	50.00	5.85	3.794	0.023	0.0	0.0	0.0	1.15	81.0	3.1																																																																																																																																																																																																																																																																																																																																				
3.000	50.00	5.08	4.850	0.007	0.0	0.0	0.0	1.00	7.8	0.9																																																																																																																																																																																																																																																																																																																																				
3.001	50.00	5.21	4.775	0.015	0.0	0.0	0.0	1.00	7.8	2.0																																																																																																																																																																																																																																																																																																																																				
3.002	50.00	5.29	4.595	0.023	0.0	0.0	0.0	1.42	25.2	3.1																																																																																																																																																																																																																																																																																																																																				
3.003	50.00	5.44	4.445	0.028	0.0	0.0	0.0	1.62	28.7	3.8																																																																																																																																																																																																																																																																																																																																				
4.000	50.00	5.11	4.400	0.007	0.0	0.0	0.0	1.30	22.9	0.9																																																																																																																																																																																																																																																																																																																																				
4.001	50.00	5.30	4.258	0.015	0.0	0.0	0.0	1.14	20.2	2.0																																																																																																																																																																																																																																																																																																																																				
5.000	50.00	5.08	4.850	0.006	0.0	0.0	0.0	1.00	7.8	0.8																																																																																																																																																																																																																																																																																																																																				
©1982-2020 Innovyze																																																																																																																																																																																																																																																																																																																																														

Adama Consulting Ltd										Page 3	
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ					Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013						
Date 11/08/2022 File 21-023 SW Network - Sur...					Designed by TGL Checked by MTD						
Micro Drainage					Network 2020.1.3						
<u>STORM SEWER DESIGN by the Modified Rational Method</u>											
<u>Network Design Table for 21-023 SW Network - Surcharged.sws</u>											
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
5.001	7.815	0.375	20.8	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
5.002	7.548	0.262	28.8	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.004	2.956	0.050	59.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.005	3.137	0.249	12.6	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	4.792	0.392	12.2	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	4.395	0.416	10.6	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	20.374#	0.085	239.7	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	11.040#	0.036	306.7	0.003	0.00	0.0	0.600	o	375	Pipe/Conduit	
8.000	3.390	0.015	226.0	0.000	5.00	0.0	0.600	oo	300	Double Pipe	
1.006	3.498	0.035	99.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	6.817#	0.068	100.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
<u>Network Results Table</u>											
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)	
5.001	50.00	5.15	4.775	0.012	0.0	0.0	0.0	1.70	13.3	1.6	
5.002	50.00	5.22	4.350	0.019	0.0	0.0	0.0	1.88	33.3	2.6	
3.004	50.00	5.47	4.088	0.062	0.0	0.0	0.0	1.31	23.2	8.4	
3.005	50.00	5.49	4.038	0.067	0.0	0.0	0.0	2.85	50.4	9.1	
6.000	50.00	5.03	4.181	0.006	0.0	0.0	0.0	2.90	51.2	0.8	
7.000	50.00	5.02	4.205	0.020	0.0	0.0	0.0	3.12	55.1	2.7	
1.004	50.00	6.19	3.639	0.136	0.0	0.0	0.0	1.01	71.5	18.4	
1.005	50.00	6.37	3.554	0.139	0.0	0.0	0.0	1.03	113.7	18.8	
8.000	50.00	5.05	3.533	0.000	0.0	0.0	0.0	1.04	147.3	0.0	
1.006	50.00	6.43	3.518	0.139	0.0	0.0	0.0	1.01	17.8«	18.8	
1.007	50.00	6.54	3.408	0.139	0.0	0.0	0.0	1.00	17.7«	18.8	
<u>Surcharged Outfall Details for 21-023 SW Network - Surcharged.sws</u>											
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)					
1.007	Watercourse	4.900	3.340	0.000	0	0					
©1982-2020 Innovyze											

Adama Consulting Ltd				Page 4			
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013			
Date 11/08/2022 File 21-023 SW Network - Sur...				Designed by TGL Checked by MTD			
Micro Drainage				Network 2020.1.3			
<u>Surcharged Outfall Details for 21-023 SW Network - Surcharged.sws</u>							
Datum (m) 3.090 Offset (mins) 0							
Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	1.800	21	1.800	41	1.800	61	1.800
2	1.800	22	1.800	42	1.800	62	1.800
3	1.800	23	1.800	43	1.800	63	1.800
4	1.800	24	1.800	44	1.800	64	1.800
5	1.800	25	1.800	45	1.800	65	1.800
6	1.800	26	1.800	46	1.800	66	1.800
7	1.800	27	1.800	47	1.800	67	1.800
8	1.800	28	1.800	48	1.800	68	1.800
9	1.800	29	1.800	49	1.800	69	1.800
10	1.800	30	1.800	50	1.800	70	1.800
11	1.800	31	1.800	51	1.800	71	1.800
12	1.800	32	1.800	52	1.800	72	1.800
13	1.800	33	1.800	53	1.800	73	1.800
14	1.800	34	1.800	54	1.800	74	1.800
15	1.800	35	1.800	55	1.800	75	1.800
16	1.800	36	1.800	56	1.800	76	1.800
17	1.800	37	1.800	57	1.800	77	1.800
18	1.800	38	1.800	58	1.800	78	1.800
19	1.800	39	1.800	59	1.800	79	1.800
20	1.800	40	1.800	60	1.800	80	1.800
						81	1.800
						82	1.800
						83	1.800
						84	1.800
						85	1.800
						86	1.800
						87	1.800
						88	1.800
						89	1.800
						90	1.800
						91	1.800
						92	1.800
						93	1.800
						94	1.800
						95	1.800
						96	1.800
						97	1.800
						98	1.800
						99	1.800
						100	1.800
						101	1.800
						102	1.800
						103	1.800
						104	1.800
						105	1.800
						106	1.800
						107	1.800
						108	1.800
						109	1.800
						110	1.800
						111	1.800
						112	1.800
						113	1.800
						114	1.800
						115	1.800
						116	1.800
						117	1.800
						118	1.800
						119	1.800
						120	1.800
©1982-2020 Innovyze							

Adama Consulting Ltd		Page 5
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefton School House Surcharged Outfall - Rev B Storm Network - FEH 2013	
Date 11/08/2022 File 21-023 SW Network - Sur...	Designed by TGL Checked by MTD	
Micro Drainage Network 2020.1.3		

Online Controls for 21-023 SW Network - Surcharged.sws

Hydro-Brake® Optimum Manhole: S3-Ctrl, DS/PN: 1.006, Volume (m³): 4.3

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	3.518
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

©1982-2020 Innovyze

Adama Consulting Ltd		Page 7
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013	
Date 11/08/2022	Designed by TGL	
File 21-023 SW Network - Sur...	Checked by MTD	
Micro Drainage		Network 2020.1.3

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	Re1	0.029	0.126	0.000	0.155
1.001	SD1	0.039	0.062	0.000	0.101
2.000	Re2	0.028	0.057	0.000	0.085
2.001	SD2	0.115	0.148	0.000	0.264
1.002	SD3	0.156	0.054	0.000	0.210
1.003	S1	1.696	1.968	0.000	3.664
3.000	Re3	0.028	0.033	0.000	0.062
3.001	SD4	0.032	0.059	0.000	0.091
3.002	SD5	0.040	0.127	0.000	0.166
3.003	SD6	0.123	0.236	0.000	0.360
4.000	Re4	0.029	0.147	0.000	0.176
4.001	SD7	0.036	0.227	0.000	0.264
5.000	Re5	0.028	0.033	0.000	0.062
5.001	SD8	0.032	0.059	0.000	0.091
5.002	SD9	0.053	0.127	0.000	0.180
3.004	SD10	0.161	0.044	0.000	0.205
3.005	SD11	0.147	0.041	0.000	0.187
6.000	SD12	0.141	0.070	0.000	0.211
7.000	Sg	0.152	0.063	20.026	20.241
1.004	S2	1.462	1.350	0.000	2.812
1.005	Pond	1.718	1.062	75.878	78.657
8.000	CS-Tank	0.230	0.341	30.033	30.604
1.006	S3-Ctrl	2.926	0.045	0.000	2.971
1.007	S4	0.254	0.116	0.000	0.371
Total		9.659	6.598	125.936	142.192

Adama Consulting Ltd		Page 8
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefton School House Surcharged Outfall - Rev B Storm Network - FEH 2013	
Date 11/08/2022 File 21-023 SW Network - Sur...	Designed by TGL Checked by MTD	
Micro Drainage Network 2020.1.3		

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for 21-023 SW Network - Surcharged.sws

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 489700 99200 SZ 89700 99200
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	2	+0%				
1.001	SD1	15 Winter	2	+0%	100/15 Winter			
2.000	Re2	15 Winter	2	+0%				
2.001	SD2	15 Winter	2	+0%				
1.002	SD3	15 Winter	2	+0%	100/120 Winter			
1.003	S1	120 Winter	2	+0%	30/120 Winter			
3.000	Re3	15 Winter	2	+0%	100/15 Summer	100/15 Winter		
3.001	SD4	15 Winter	2	+0%	100/15 Summer			
3.002	SD5	15 Winter	2	+0%	100/15 Summer			
3.003	SD6	15 Winter	2	+0%	100/15 Summer			
4.000	Re4	15 Winter	2	+0%	100/15 Summer	100/15 Winter		
4.001	SD7	15 Winter	2	+0%	100/15 Summer			
5.000	Re5	15 Winter	2	+0%	100/15 Winter			
5.001	SD8	15 Winter	2	+0%	100/15 Winter			
5.002	SD9	15 Winter	2	+0%	100/15 Summer			
3.004	SD10	15 Winter	2	+0%	30/15 Summer			

©1982-2020 Innovyze

Adama Consulting Ltd								Page 9		
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013						
Date 11/08/2022 File 21-023 SW Network - Sur...				Designed by TGL Checked by MTD						
Micro Drainage				Network 2020.1.3						
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for 21-023 SW Network - Surcharged.sws</u>										
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Re1	4.804	-0.076	0.000	0.13			1.0	OK	
1.001	SD1	4.542	-0.066	0.000	0.25			1.8	OK	
2.000	Re2	4.875	-0.075	0.000	0.14			1.0	OK	
2.001	SD2	4.698	-0.126	0.000	0.06			1.8	OK	
1.002	SD3	4.353	-0.117	0.000	0.11			4.1	OK	
1.003	S1	3.904	-0.190	0.000	0.02			1.7	OK	
3.000	Re3	4.881	-0.069	0.000	0.21			1.4	OK	1
3.001	SD4	4.818	-0.057	0.000	0.38			2.7	OK	
3.002	SD5	4.639	-0.106	0.000	0.19			4.1	OK	
3.003	SD6	4.489	-0.106	0.000	0.19			4.9	OK	
4.000	Re4	4.426	-0.124	0.000	0.07			1.4	OK	1
4.001	SD7	4.297	-0.111	0.000	0.15			2.7	OK	
5.000	Re5	4.878	-0.072	0.000	0.18			1.2	OK	
5.001	SD8	4.804	-0.071	0.000	0.18			2.2	OK	
5.002	SD9	4.384	-0.116	0.000	0.12			3.4	OK	
3.004	SD10	4.190	-0.048	0.000	0.79			11.1	OK	
©1982-2020 Innovyze										

Adama Consulting Ltd								Page 10																																																																																																															
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ					Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013																																																																																																																		
Date 11/08/2022 File 21-023 SW Network - Sur...					Designed by TGL Checked by MTD																																																																																																																		
Micro Drainage					Network 2020.1.3																																																																																																																		
<u>2 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for 21-023 SW Network - Surcharged.sws</u>																																																																																																																							
<table><thead><tr><th></th><th>US/MH</th><th></th><th>Return</th><th>Climate</th><th>First (X)</th><th>First (Y)</th><th>First (Z)</th><th>Overflow</th><th>Water</th></tr><tr><th>PN</th><th>Name</th><th>Storm</th><th>Period</th><th>Change</th><th>Surcharge</th><th>Flood</th><th>Overflow</th><th>Act.</th><th>Level</th></tr><tr><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>(m)</th></tr></thead><tbody><tr><td>3.005</td><td>SD11</td><td>15</td><td>Winter</td><td>2</td><td>+0%</td><td>30/120</td><td>Winter</td><td></td><td>4.102</td></tr><tr><td>6.000</td><td>SD12</td><td>15</td><td>Winter</td><td>2</td><td>+0%</td><td>100/60</td><td>Winter</td><td></td><td>4.198</td></tr><tr><td>7.000</td><td>Sg</td><td>15</td><td>Winter</td><td>2</td><td>+0%</td><td>100/60</td><td>Winter</td><td></td><td>4.236</td></tr><tr><td>1.004</td><td>S2</td><td>120</td><td>Winter</td><td>2</td><td>+0%</td><td>30/30</td><td>Winter</td><td></td><td>3.904</td></tr><tr><td>1.005</td><td>Pond</td><td>120</td><td>Winter</td><td>2</td><td>+0%</td><td>30/30</td><td>Winter</td><td></td><td>3.903</td></tr><tr><td>8.000</td><td>CS-Tank</td><td>120</td><td>Winter</td><td>2</td><td>+0%</td><td>2/120</td><td>Winter</td><td></td><td>3.903</td></tr><tr><td>1.006</td><td>S3-Ctrl</td><td>120</td><td>Winter</td><td>2</td><td>+0%</td><td>2/15</td><td>Summer</td><td></td><td>3.903</td></tr><tr><td>1.007</td><td>S4</td><td>120</td><td>Winter</td><td>2</td><td>+0%</td><td>2/15</td><td>Summer</td><td></td><td>3.903</td></tr></tbody></table>											US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level										(m)	3.005	SD11	15	Winter	2	+0%	30/120	Winter		4.102	6.000	SD12	15	Winter	2	+0%	100/60	Winter		4.198	7.000	Sg	15	Winter	2	+0%	100/60	Winter		4.236	1.004	S2	120	Winter	2	+0%	30/30	Winter		3.904	1.005	Pond	120	Winter	2	+0%	30/30	Winter		3.903	8.000	CS-Tank	120	Winter	2	+0%	2/120	Winter		3.903	1.006	S3-Ctrl	120	Winter	2	+0%	2/15	Summer		3.903	1.007	S4	120	Winter	2	+0%	2/15	Summer		3.903
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water																																																																																																														
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level																																																																																																														
									(m)																																																																																																														
3.005	SD11	15	Winter	2	+0%	30/120	Winter		4.102																																																																																																														
6.000	SD12	15	Winter	2	+0%	100/60	Winter		4.198																																																																																																														
7.000	Sg	15	Winter	2	+0%	100/60	Winter		4.236																																																																																																														
1.004	S2	120	Winter	2	+0%	30/30	Winter		3.904																																																																																																														
1.005	Pond	120	Winter	2	+0%	30/30	Winter		3.903																																																																																																														
8.000	CS-Tank	120	Winter	2	+0%	2/120	Winter		3.903																																																																																																														
1.006	S3-Ctrl	120	Winter	2	+0%	2/15	Summer		3.903																																																																																																														
1.007	S4	120	Winter	2	+0%	2/15	Summer		3.903																																																																																																														
<table><thead><tr><th></th><th>US/MH</th><th>Depth</th><th>Volume</th><th>Flow /</th><th>Overflow</th><th>Half Drain</th><th>Pipe</th><th></th><th>Level</th></tr><tr><th>PN</th><th>Name</th><th>(m)</th><th>(m³)</th><th>Cap.</th><th>(l/s)</th><th>Time</th><th>Flow</th><th>Status</th><th>Exceeded</th></tr><tr><th></th><th></th><th></th><th></th><th></th><th></th><th>(mins)</th><th>(l/s)</th><th></th><th></th></tr></thead><tbody><tr><td>3.005</td><td>SD11</td><td>-0.086</td><td>0.000</td><td>0.38</td><td></td><td></td><td>11.9</td><td>OK</td><td></td></tr><tr><td>6.000</td><td>SD12</td><td>-0.133</td><td>0.000</td><td>0.03</td><td></td><td></td><td>1.2</td><td>OK</td><td></td></tr><tr><td>7.000</td><td>Sg</td><td>-0.119</td><td>0.000</td><td>0.09</td><td></td><td>4</td><td>3.5</td><td>OK</td><td></td></tr><tr><td>1.004</td><td>S2</td><td>-0.035</td><td>0.000</td><td>0.15</td><td></td><td></td><td>9.4</td><td>OK</td><td></td></tr><tr><td>1.005</td><td>Pond</td><td>-0.026</td><td>0.000</td><td>0.07</td><td></td><td></td><td>5.7</td><td>OK</td><td></td></tr><tr><td>8.000</td><td>CS-Tank</td><td>0.070</td><td>0.000</td><td>0.01</td><td></td><td>140</td><td>1.0</td><td>SURCHARGED</td><td></td></tr><tr><td>1.006</td><td>S3-Ctrl</td><td>0.235</td><td>0.000</td><td>0.17</td><td></td><td></td><td>1.9</td><td>SURCHARGED</td><td></td></tr><tr><td>1.007</td><td>S4</td><td>0.345</td><td>0.000</td><td>0.22</td><td></td><td></td><td>3.3</td><td>SURCHARGED</td><td></td></tr></tbody></table>											US/MH	Depth	Volume	Flow /	Overflow	Half Drain	Pipe		Level	PN	Name	(m)	(m³)	Cap.	(l/s)	Time	Flow	Status	Exceeded							(mins)	(l/s)			3.005	SD11	-0.086	0.000	0.38			11.9	OK		6.000	SD12	-0.133	0.000	0.03			1.2	OK		7.000	Sg	-0.119	0.000	0.09		4	3.5	OK		1.004	S2	-0.035	0.000	0.15			9.4	OK		1.005	Pond	-0.026	0.000	0.07			5.7	OK		8.000	CS-Tank	0.070	0.000	0.01		140	1.0	SURCHARGED		1.006	S3-Ctrl	0.235	0.000	0.17			1.9	SURCHARGED		1.007	S4	0.345	0.000	0.22			3.3	SURCHARGED	
	US/MH	Depth	Volume	Flow /	Overflow	Half Drain	Pipe		Level																																																																																																														
PN	Name	(m)	(m³)	Cap.	(l/s)	Time	Flow	Status	Exceeded																																																																																																														
						(mins)	(l/s)																																																																																																																
3.005	SD11	-0.086	0.000	0.38			11.9	OK																																																																																																															
6.000	SD12	-0.133	0.000	0.03			1.2	OK																																																																																																															
7.000	Sg	-0.119	0.000	0.09		4	3.5	OK																																																																																																															
1.004	S2	-0.035	0.000	0.15			9.4	OK																																																																																																															
1.005	Pond	-0.026	0.000	0.07			5.7	OK																																																																																																															
8.000	CS-Tank	0.070	0.000	0.01		140	1.0	SURCHARGED																																																																																																															
1.006	S3-Ctrl	0.235	0.000	0.17			1.9	SURCHARGED																																																																																																															
1.007	S4	0.345	0.000	0.22			3.3	SURCHARGED																																																																																																															
©1982-2020 Innovyze																																																																																																																							

Adama Consulting Ltd		Page 11
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefton School House Surcharged Outfall - Rev B Storm Network - FEH 2013	
Date 11/08/2022 File 21-023 SW Network - Sur...	Designed by TGL Checked by MTD	
Micro Drainage Network 2020.1.3		

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for 21-023 SW Network - Surcharged.sws

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 489700 99200 SZ 89700 99200
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	Re1	15 Winter	30	+0%				
1.001	SD1	15 Winter	30	+0%	100/15 Winter			
2.000	Re2	15 Winter	30	+0%				
2.001	SD2	15 Winter	30	+0%				
1.002	SD3	15 Winter	30	+0%	100/120 Winter			
1.003	S1	120 Winter	30	+0%	30/120 Winter			
3.000	Re3	15 Winter	30	+0%	100/15 Summer	100/15 Winter		
3.001	SD4	15 Winter	30	+0%	100/15 Summer			
3.002	SD5	15 Winter	30	+0%	100/15 Summer			
3.003	SD6	15 Winter	30	+0%	100/15 Summer			
4.000	Re4	15 Winter	30	+0%	100/15 Summer	100/15 Winter		
4.001	SD7	15 Winter	30	+0%	100/15 Summer			
5.000	Re5	15 Winter	30	+0%	100/15 Winter			
5.001	SD8	15 Winter	30	+0%	100/15 Winter			
5.002	SD9	15 Winter	30	+0%	100/15 Summer			
3.004	SD10	15 Winter	30	+0%	30/15 Summer			

©1982-2020 Innovyze

Adama Consulting Ltd		Page 12
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013	
Date 11/08/2022 File 21-023 SW Network - Sur...	Designed by TGL Checked by MTD	
Micro Drainage Network 2020.1.3		

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for 21-023 SW Network - Surcharged.sws

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Overflow		Half Drain	Pipe	Status
		Level (m)	Depth (m)	Volume (m³)	Cap.	(l/s)	Time (mins)	Flow (l/s)	
1.000	Re1	4.817	-0.063	0.000	0.28			2.1	OK
1.001	SD1	4.565	-0.043	0.000	0.61			4.4	OK
2.000	Re2	4.888	-0.062	0.000	0.30			2.1	OK
2.001	SD2	4.711	-0.113	0.000	0.14			4.4	OK
1.002	SD3	4.373	-0.097	0.000	0.26			10.1	OK
1.003	S1	4.190	0.096	0.000	0.04			3.2	SURCHARGED
3.000	Re3	4.897	-0.053	0.000	0.44			3.0	OK
3.001	SD4	4.851	-0.024	0.000	0.92			6.6	OK
3.002	SD5	4.668	-0.077	0.000	0.47			10.2	OK
3.003	SD6	4.518	-0.077	0.000	0.48			12.5	OK
4.000	Re4	4.439	-0.111	0.000	0.15			3.0	OK
4.001	SD7	4.398	-0.010	0.000	0.35			6.5	OK
5.000	Re5	4.893	-0.057	0.000	0.38			2.6	OK
5.001	SD8	4.821	-0.054	0.000	0.43			5.3	OK
5.002	SD9	4.406	-0.094	0.000	0.30			8.5	OK
3.004	SD10	4.373	0.135	0.000	1.93			27.0	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	Re1	
1.001	SD1	
2.000	Re2	
2.001	SD2	
1.002	SD3	
1.003	S1	
3.000	Re3	1
3.001	SD4	
3.002	SD5	
3.003	SD6	
4.000	Re4	1
4.001	SD7	
5.000	Re5	
5.001	SD8	
5.002	SD9	
3.004	SD10	

Adama Consulting Ltd								Page 13																																																																																																															
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ					Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013																																																																																																																		
Date 11/08/2022 File 21-023 SW Network - Sur...					Designed by TGL Checked by MTD																																																																																																																		
Micro Drainage					Network 2020.1.3																																																																																																																		
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for 21-023 SW Network - Surcharged.sws</u>																																																																																																																							
<table><tr><th></th><th>US/MH</th><th></th><th></th><th>Return</th><th>Climate</th><th>First (X)</th><th>First (Y)</th><th>First (Z)</th><th>Overflow</th><th>Water</th></tr><tr><th>PN</th><th>Name</th><th>Storm</th><th>Period</th><th>Change</th><th></th><th>Surcharge</th><th>Flood</th><th>Overflow</th><th>Act.</th><th>Level</th></tr><tr><td>3.005</td><td>SD11</td><td>120</td><td>Winter</td><td>30</td><td>+0%</td><td>30/120</td><td>Winter</td><td></td><td></td><td>4.191</td></tr><tr><td>6.000</td><td>SD12</td><td>15</td><td>Winter</td><td>30</td><td>+0%</td><td>100/60</td><td>Winter</td><td></td><td></td><td>4.206</td></tr><tr><td>7.000</td><td>Sg</td><td>15</td><td>Winter</td><td>30</td><td>+0%</td><td>100/60</td><td>Winter</td><td></td><td></td><td>4.252</td></tr><tr><td>1.004</td><td>S2</td><td>120</td><td>Winter</td><td>30</td><td>+0%</td><td>30/30</td><td>Winter</td><td></td><td></td><td>4.191</td></tr><tr><td>1.005</td><td>Pond</td><td>120</td><td>Winter</td><td>30</td><td>+0%</td><td>30/30</td><td>Winter</td><td></td><td></td><td>4.189</td></tr><tr><td>8.000</td><td>CS-Tank</td><td>120</td><td>Winter</td><td>30</td><td>+0%</td><td>2/120</td><td>Winter</td><td></td><td></td><td>4.197</td></tr><tr><td>1.006</td><td>S3-Ctrl</td><td>240</td><td>Winter</td><td>30</td><td>+0%</td><td>2/15</td><td>Summer</td><td></td><td></td><td>4.224</td></tr><tr><td>1.007</td><td>S4</td><td>120</td><td>Winter</td><td>30</td><td>+0%</td><td>2/15</td><td>Summer</td><td></td><td></td><td>4.187</td></tr></table>											US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	PN	Name	Storm	Period	Change		Surcharge	Flood	Overflow	Act.	Level	3.005	SD11	120	Winter	30	+0%	30/120	Winter			4.191	6.000	SD12	15	Winter	30	+0%	100/60	Winter			4.206	7.000	Sg	15	Winter	30	+0%	100/60	Winter			4.252	1.004	S2	120	Winter	30	+0%	30/30	Winter			4.191	1.005	Pond	120	Winter	30	+0%	30/30	Winter			4.189	8.000	CS-Tank	120	Winter	30	+0%	2/120	Winter			4.197	1.006	S3-Ctrl	240	Winter	30	+0%	2/15	Summer			4.224	1.007	S4	120	Winter	30	+0%	2/15	Summer			4.187
	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water																																																																																																													
PN	Name	Storm	Period	Change		Surcharge	Flood	Overflow	Act.	Level																																																																																																													
3.005	SD11	120	Winter	30	+0%	30/120	Winter			4.191																																																																																																													
6.000	SD12	15	Winter	30	+0%	100/60	Winter			4.206																																																																																																													
7.000	Sg	15	Winter	30	+0%	100/60	Winter			4.252																																																																																																													
1.004	S2	120	Winter	30	+0%	30/30	Winter			4.191																																																																																																													
1.005	Pond	120	Winter	30	+0%	30/30	Winter			4.189																																																																																																													
8.000	CS-Tank	120	Winter	30	+0%	2/120	Winter			4.197																																																																																																													
1.006	S3-Ctrl	240	Winter	30	+0%	2/15	Summer			4.224																																																																																																													
1.007	S4	120	Winter	30	+0%	2/15	Summer			4.187																																																																																																													
<table><tr><th></th><th>US/MH</th><th>Depth</th><th>Volume</th><th>Flow /</th><th>Overflow</th><th>Half Drain</th><th>Pipe</th><th></th><th>Level</th></tr><tr><th>PN</th><th>Name</th><th>(m)</th><th>(m³)</th><th>Cap.</th><th>(l/s)</th><th>Time</th><th>Flow</th><th>Status</th><th>Exceeded</th></tr><tr><td>3.005</td><td>SD11</td><td>0.003</td><td>0.000</td><td>0.31</td><td></td><td></td><td>9.5</td><td>SURCHARGED</td><td></td></tr><tr><td>6.000</td><td>SD12</td><td>-0.125</td><td>0.000</td><td>0.07</td><td></td><td></td><td>2.6</td><td>OK</td><td></td></tr><tr><td>7.000</td><td>Sg</td><td>-0.103</td><td>0.000</td><td>0.21</td><td></td><td>5</td><td>8.4</td><td>OK</td><td></td></tr><tr><td>1.004</td><td>S2</td><td>0.252</td><td>0.000</td><td>0.31</td><td></td><td></td><td>19.2</td><td>SURCHARGED</td><td></td></tr><tr><td>1.005</td><td>Pond</td><td>0.260</td><td>0.000</td><td>0.14</td><td></td><td></td><td>11.7</td><td>SURCHARGED</td><td></td></tr><tr><td>8.000</td><td>CS-Tank</td><td>0.364</td><td>0.000</td><td>0.02</td><td></td><td>295</td><td>1.8</td><td>SURCHARGED</td><td></td></tr><tr><td>1.006</td><td>S3-Ctrl</td><td>0.556</td><td>0.000</td><td>0.17</td><td></td><td></td><td>1.9</td><td>SURCHARGED</td><td></td></tr><tr><td>1.007</td><td>S4</td><td>0.629</td><td>0.000</td><td>0.27</td><td></td><td></td><td>4.1</td><td>SURCHARGED</td><td></td></tr></table>											US/MH	Depth	Volume	Flow /	Overflow	Half Drain	Pipe		Level	PN	Name	(m)	(m³)	Cap.	(l/s)	Time	Flow	Status	Exceeded	3.005	SD11	0.003	0.000	0.31			9.5	SURCHARGED		6.000	SD12	-0.125	0.000	0.07			2.6	OK		7.000	Sg	-0.103	0.000	0.21		5	8.4	OK		1.004	S2	0.252	0.000	0.31			19.2	SURCHARGED		1.005	Pond	0.260	0.000	0.14			11.7	SURCHARGED		8.000	CS-Tank	0.364	0.000	0.02		295	1.8	SURCHARGED		1.006	S3-Ctrl	0.556	0.000	0.17			1.9	SURCHARGED		1.007	S4	0.629	0.000	0.27			4.1	SURCHARGED											
	US/MH	Depth	Volume	Flow /	Overflow	Half Drain	Pipe		Level																																																																																																														
PN	Name	(m)	(m³)	Cap.	(l/s)	Time	Flow	Status	Exceeded																																																																																																														
3.005	SD11	0.003	0.000	0.31			9.5	SURCHARGED																																																																																																															
6.000	SD12	-0.125	0.000	0.07			2.6	OK																																																																																																															
7.000	Sg	-0.103	0.000	0.21		5	8.4	OK																																																																																																															
1.004	S2	0.252	0.000	0.31			19.2	SURCHARGED																																																																																																															
1.005	Pond	0.260	0.000	0.14			11.7	SURCHARGED																																																																																																															
8.000	CS-Tank	0.364	0.000	0.02		295	1.8	SURCHARGED																																																																																																															
1.006	S3-Ctrl	0.556	0.000	0.17			1.9	SURCHARGED																																																																																																															
1.007	S4	0.629	0.000	0.27			4.1	SURCHARGED																																																																																																															
©1982-2020 Innovyze																																																																																																																							

Adama Consulting Ltd				Page 14			
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ				Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013			
Date 11/08/2022				Designed by TGL			
File 21-023 SW Network - Sur...				Checked by MTD			
Micro Drainage				Network 2020.1.3			
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws</u>							
<u>Simulation Criteria</u>							
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 3							
Number of Online Controls 1 Number of Time/Area Diagrams 0							
Number of Offline Controls 0 Number of Real Time Controls 0							
<u>Synthetic Rainfall Details</u>							
Rainfall Model FEH							
FEH Rainfall Version 2013							
Site Location GB 489700 99200 SZ 89700 99200							
Data Type Catchment							
Cv (Summer) 0.750							
Cv (Winter) 1.000							
Margin for Flood Risk Warning (mm) 300.0							
Analysis Timestep 2.5 Second Increment (Extended)							
DTS Status OFF							
DVD Status ON							
Inertia Status ON							
Profile(s) Summer and Winter							
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440							
Return Period(s) (years) 2, 30, 100							
Climate Change (%) 0, 0, 40							

Adama Consulting Ltd						Page 15		
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ			Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013					
Date 11/08/2022 File 21-023 SW Network - Sur...			Designed by TGL Checked by MTD					
Micro Drainage			Network 2020.1.3					
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws</u>								
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	Re1	4.830	-0.050	0.000	0.50		3.7	OK
1.001	SD1	4.627	0.019	0.000	1.05		7.6	SURCHARGED
2.000	Re2	4.902	-0.048	0.000	0.53		3.8	OK
2.001	SD2	4.724	-0.100	0.000	0.25		7.7	OK
1.002	SD3	4.543	0.073	0.000	0.09		3.4	SURCHARGED
1.003	S1	4.543	0.449	0.000	0.04		3.2	SURCHARGED
3.000	Re3	5.430	0.480	0.045	0.77		5.2	FLOOD
3.001	SD4	5.407	0.532	0.000	1.34		9.6	FLOOD RISK
3.002	SD5	5.192	0.447	0.000	0.68		14.7	FLOOD RISK
3.003	SD6	5.123	0.528	0.000	0.68		17.8	FLOOD RISK
4.000	Re4	5.000	0.450	0.029	0.25		5.0	FLOOD
4.001	SD7	4.990	0.582	0.000	0.54		10.0	FLOOD RISK
5.000	Re5	5.194	0.244	0.000	0.62		4.2	FLOOD RISK
5.001	SD8	5.166	0.291	0.000	0.67		8.2	FLOOD RISK
5.002	SD9	5.006	0.506	0.000	0.43		12.4	SURCHARGED
3.004	SD10	4.954	0.716	0.000	2.86		40.0	FLOOD RISK
	US/MH Name	Level Exceeded						
1.000	Re1							
1.001	SD1							
2.000	Re2							
2.001	SD2							
1.002	SD3							
1.003	S1							
3.000	Re3	1						
3.001	SD4							
3.002	SD5							
3.003	SD6							
4.000	Re4	1						
4.001	SD7							
5.000	Re5							
5.001	SD8							
5.002	SD9							
3.004	SD10							
©1982-2020 Innovyze								

Adama Consulting Ltd								Page 16	
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ					Land adj Sefter School House Surcharged Outfall - Rev B Storm Network - FEH 2013				
Date 11/08/2022 File 21-023 SW Network - Sur...					Designed by TGL Checked by MTD				
Micro Drainage					Network 2020.1.3				
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for 21-023 SW Network - Surcharged.sws</u>									

Appendix E

Maintenance and Management



TECHNICAL NOTE

PROJECT	:	Land adjacent Sefter School House, Sefter Road, Pagham
NOTE REF.	:	Acl602-21023-B
NOTE TITLE	:	SuDS Maintenance and Management
AUTHOR	:	Tafari Lewis
APPROVED	:	Tafari Lewis
DATE	:	11 th August 2022

1.0 INTRODUCTION

The purpose of this file note is to ensure that the adopting authority / management company is entrusted with a robust inspection and maintenance programme to ensure the optimum operational efficiency of the surface water drainage network is maintained for the lifetime of the development.

2.0 MAINTENANCE & MANAGEMENT

This plan is developed in direct reference to CIRIA C753 The SuDS Manual.

Adopting authorities may have their own specific maintenance requirements which may not be as per the information provided within this document.

This section of the file note will review the following aspects:

- Who is to maintain / Adopt the SuDS and associated features
- Indicate a Maintenance Management Plan which reviews the activities to be undertaken, frequency and inspections
- Actions required in the case of a network blockage or pollution incident.

The following provides an indication of the intentions for adoption and maintenance for the drainage as detailed on drawing 21-023-400 Revision D entitled Below Ground Drainage Layout.

There are three main SuDS components associated with the surface water drainage strategy on this scheme:

Attenuation Pond

Located and aimed to function as part of the public open space, a detention pond is proposed to treat and attenuate flows above the 1 in 30 year event. Storm water is temporarily stored in the pond during the 1:100 year peak surface flow events (with climate change allowance) prior to discharging into the downstream network.

Attenuation Modular Storage Tanks

An offline attenuation storage tank has been specified within the scheme. Storm water is temporarily stored in the attenuation crates during the 1:100 year peak surface flow events (with climate change allowance) prior to controlled release into the downstream drainage system

Porous Pavements

Type C permeable pavements (no infiltration) are located within private driveways and the shared access. These areas allow surface water to drain through a stone sub-base, slowing, collecting and filtering surface water flows.

Maintenance refers to the inspections required to identify performance issues and plan maintenance as required, operation and maintenance of the drainage system, landscape management and waste management associated with contaminated silt and other waste materials resulting from maintenance.

CIRIA C753 The SuDS Manual provides information in Chapter 32 for the Operation and maintenance of SuDS. The maintenance activities are broadly defined as regular, occasional and remedial maintenance. It is noted that some scenarios may require one-off maintenance activities. The SuDS Manual defines maintenance as –

- Regular Maintenance: consists of basic tasks carried out to a frequent and predictable schedule, including inspections/monitoring, silt or oil removal if required more frequently than once a year, vegetation management, sweeping or surfaces and litter / debris removal.
- Occasional maintenance: comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks.
- Remedial maintenance: describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised with good design, constructions and regular maintenance activities.

Maintenance regimes are to be reviewed on an annual basis to ensure that the approach adopted is meeting its objectives. All those responsible for the maintenance operations should adhere to the relevant health and safety legislation for the activities listed within this report

(including lone working, if relevant). Method statements and risk assessments should always be completed prior to the undertaking of any works.

Adoption

It is proposed that surface water drainage including the attenuation pond, geo-cellular storage tank and porous pavements are to be the responsibility of the developers appointed management company. All surface water drainage on the development is to remain private.

Access

Access to SuDS elements is provided by the main access and parking areas which are under the control of the developer.

3.0 INDICATIVE MAINTENANCE MANAGEMENT PLAN

The information below is reproduced from Table 32.1 of CIRIA C753 The SuDS Manual and is used to indicate the maintenance and operation activities that each authority or management company is to apply –

Operation and maintenance activity	SuDS Component		
	Ponds	Modular Storage	Pervious Pavement
Regular Maintenance			
Inspection	■	■	■
Litter & Debris removal	■	□	■
Grass Cutting	■	□	□
Weed and Invasive plant control	□		□
Shrub Management (including Pruning)	□		□
Shoreline vegetation management	□		
Aquatic vegetation management	□		
Occasional Maintenance			
Sediment Management	■	■	■
Vegetation Replacement	□		
Vacuum sweeping and brushing			■
Remedial Maintenance			
Structure rehabilitation / repair	□	□	□
Infiltration surface reconditioning		□	□

Key

- will be required

- may be required

Extracts from Table 32.1 CIRIA C753 The SuDS Manual

Ponds

Ponds are basins that have a permanent pool of water. They can be created by using an existing natural depression, by excavating a new depression or by constructing embankments.

Each time it rains, the runoff entering the pond is detained and treated by setting out sediments and biological uptake until it is displaced by runoff from the next storm.

All ponds require a sediment forebay or other form of pre-treatment system. This is to remove the majority of incoming sediment from the runoff before it is more widely dispersed within the larger permanent pool.

Outlets are usually built into an embankment with easy access for maintenance.

Many of the specific maintenance activities for the pond will be undertaken as part of a general landscaping contract. Maintenance responsibility will be placed with the developers appointed management company. All maintenance should be carried out in accordance with CDM regulations (2015) and CIRIA C753

The table below gives a summary of the operation and maintenance requirements for a pond:

Maintenance schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass (public areas)	Monthly (during the growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season and autumn)
	Inspect marginal bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect waterbody for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay, treatment areas and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build up has occurred, to inform management disposal options.	Half Yearly
	Check hydrobrake	Half Yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay or treatment area	Every 1-5 years (or as required)
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years (or as required)
	Remove tree saplings	Annually
Occasional Maintenance	Remove sediment from the main body of the pond when pool volume is reduced by 20%	With effective pre-treatment this will only be required rarely (e.g. every 25 – 50 years)
Remedial Actions	Repair erosion or other damage	As required
	Replant, where necessary	As required

	Aerate pond when signs of eutrophication are detected	As required
	Re-align rip-rap (geomembrane) or repair other damage.	As required
	Repair / rehabilitate inlets and outlets	As required
	Inspection and replacement of pond liner	As required

Modular Storage

Regular inspection and maintenance are required to ensure the effective long-term operation of the below ground modular storage system.

Catchpits are installed at the inlet to the tanks to allow for removal of silt / debris as required. The tanks are utilised for the 1:100 year storm event and as such are envisaged to have minimal levels of silt due to the use of trapped gullies within the system.

The table below gives a summary of the operation and maintenance requirements for the modular storage tank –

MODULAR STORAGE	
Regular Maintenance	Frequency
Inspect and identify any areas that are not operating correctly	Monthly for 3 months after installation / regular usage
Debris and silt removal from catchment areas	Monthly
Removal of sediment from pre-treatment structures	Annually or as required
Remedial Works	Frequency
Repair / rehabilitation of inlets, outlets, overflows and vents	As required
Monitoring	Frequency
Inspect / check all inlets, inspection wells, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms
Inspection of surface above units for sag points or depressions which may indicate structural failure.	Annually
Survey inside of the tank for sediment build-up and removal as required	Every 5 years or as required

Permeable Surfaces

Permeable surfaces including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving and porous asphalt can be cleaned by suction brushing.

Regular inspection and maintenance is important for the effective operation of permeable pavements, they should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. In instances where jointing material is lost, this material should be replaced immediately.

Depending on the amount of usage and the environment that the permeable pavement has been exposed to, the laying course material may require either replacement or cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. If this situation should occur, the uplifting and cleaning (or replacing, depending on the costings of the activity) of the laying course may be considered. The laying course material, jointing and blocks may be reused (once cleaned), to aid in minimising costs.

Inspection and maintenance of the permeable surfaces will be dependent upon the manufacturers recommendations and installation as per manufacturers details.

The table below gives a summary of the operation and maintenance requirements for permeable paving –

PERMEABLE AND POROUS SURFACES	
Regular Maintenance	Frequency
Brush regularly and remove sweepings from all hard surfaces	Three times a year at end of winter, mid-summer and after autumnal leaf fall, or as required based upon site specific observations or as per manufacturers recommendations
Occasional Tasks	Frequency
Removal of weeds	As required
Stabilise and mow contributing and adjacent areas	As required
Remedial Works	Frequency
Remediate any landscaping which, through vegetation maintenance or soil slip has encroached upon the permeable surface	As required
Remedial work to any depressions, rutting, cracked or broken blocks considered to be detrimental to the structure or that pose a hazard to users	As required
Rehabilitation of surface and upper substructure by sweeping	As required if infiltration performance is reduced
Monitoring	Frequency
Initial Inspection	Monthly for 3 months after installation / regular usage
Inspection for evidence of poor operation and / or weed growth	3 monthly & 48 hours after large storms
Inspection of silt accumulation	Annually
Monitoring of inspection chambers	Annually
Inspection for depressions, ponding or rutting	Annually

Existing watercourse

Vegetation within the banks to the watercourse should typically be maintained at a height of 75mm – 150mm to prevent flattening during flow events.

Many of the specific maintenance activities for the watercourse will be undertaken as part of a general landscaping contract. Maintenance responsibility will be placed with the developers appointed management company. All maintenance should be carried out in accordance with CDM regulations (2015) and CIRIA C753

The table below gives a summary of the operation and maintenance requirements for the existing watercourse adjacent the development. The extents of the management companies responsibility should be read in conjunction with drawing –

EXISTING WATERCOURSE		
Maintenance schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass (to retain grass height within the specified design range)	Monthly (during the growing season)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water ponding is > 48 hours	Monthly (or as required)
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years then half yearly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate removal frequencies	Half yearly
	Inspect inlet for blockages	Monthly
Occasional Maintenance	Reseed areas of poor vegetation growth	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by reseedling or re-turfing	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build up of sediment on gravel trench (stone pitching at upstream inlet)	As required
	Remove and dispose of oils or petrol residues using safe standard practice	As required

Flow Control Chambers

The flow control chamber proposed for this site is a Hydro Brake which has no moving parts and are self-activating requiring minimal maintenance. The bypass disc is the only manually operated element and is applicable for use in the event of a blockage or issue with the drainage network. It is recommended that the chamber is inspected monthly for three months after installation and bi-annually thereafter to verify the condition and operation of the unit and check for blockages within the chamber or flow control device.

Any silt or debris found during inspections should be removed and cleaned out with the use of a sump vacuum cleaner.

The table below gives a summary of the operation and maintenance requirements for flow control devices –

CONTROL CHAMBERS	
Regular Maintenance	Frequency
Check there is no physical damage and that control is functioning. Ensure bypass arrangements are functional. Remove Debris and silt. Undertake inspection after autumnal leaf fall to ensure functionality of control and that there are no blockages	3 months following installation. Monthly through Autumn then bi-annually thereafter
Inspection, greasing and movement of bypass door on hydro brake	Annually
Remedial Works	Frequency
Repair physical damage if required / replace unit is damaged	As required
Monitoring	Frequency
Inspect chamber and flow control units to ensure that they are in good condition and operating as designed.	Annually and after large storms

Pipes and Gullies

PIPES AND GULLIES		
Maintenance schedule	Required Action	Frequency
Regular Maintenance	Remove sediment and debris from inspection chambers	Annually
	Remove any root ingress	As required
Occasional Maintenance	CCTV survey of drains to check alignment, cracking and joint displacement	10 year intervals

5.0 BLOCKAGES AND SPILLAGES

Blockage

In the event of a blockage within the drainage network, the key risk is that of flooding to the surrounding area. The extent and location of flooding is dependent upon the location of the blockage and the associated storm event.

If the blockage occurs at the flow control chamber, the bypass door can be operated to drain down the network such that works can be undertaken to remove the blockage.

In the event of a blockage elsewhere within the network, the network is to be drained down by use of suction equipment and the blockage removed.

Spillages

Due to the nature of the development, the likelihood of a spillage is minimal.

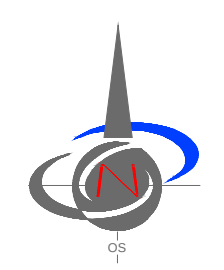
Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung.

Contact the Environment Agency immediately.

Sustainable Places
Environment Agency
Solent & South Downs Area
Guildbourne House
Chatsworth Road
Worthing
West Sussex
BN11 1LD

Tel: 03708 506 506



- NOTES:
- To be read in conjunction with the ACL SuDS Maintenance and Management Technical Note dated 11th August 2022.
 - All ditch maintenance to be to the satisfaction of the ADC Engineer.

- Extent of watercourse to be maintained by the developers appointed management company
- Extent of existing waterbody adjacent development

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION
FOR PLANNING PURPOSES ONLY

Rev.	Description	Dm	Ckd	Date
------	-------------	----	-----	------

Client



HHD
HARDEN BUILDERS & DEVELOPMENTS
www.hhd.co.uk

Project

Land adjacent Sefter School,
House, Sefter Road

Title

Watercourse
Maintenance Plan



ADAMA
CONSULTING
Civil & Infrastructure Engineering Design

Scale	1:200 on A1	Drawn	MD
Date	11/08/2022	Checked	TL
File	21-023-Acad-006	Drawing No	21-023-006
		Rev	-

