Park Farm, Lower End, Alvescot, OX18 2QA
Surface Water Drainage Technical Note

1.0 Introduction

1.1 This Technical Note has been prepared by Glanville Consultants on behalf of Park Lane Developments (Oxfordshire) Limited to accompany planning applications for the proposed residential development of the land at Park Farm, Alvescot.

1.2 The Local Planning Authority (LPA), West Oxfordshire District Council (WODC), permitted applications 19/01267/FUL and 20/01119/FUL at the above site subject to planning conditions. Application 19/01267/FUL relates to the demolition of a barn and erection of a dwelling, whilst 20/01119/FUL relates to the erection of five new dwellings on adjoin land under the same owner's control. This document has been prepared with the aim of discharging both condition 11 of application 19/01267/FUL and condition 9 of application 20/01119/FUL with regards to surface water drainage. The conditions state:

Condition 11, 19/01267/FUL
"Prior to any ground works commencing on site, a full surface water drainage scheme shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall include details of the size, position and construction of the drainage scheme, and results of soakage tests carried out at the site to demonstrate the infiltration rate. Three tests should be carried out for each soakage pit as per BRE 365, with the lowest infiltration rate (expressed in m/s) used for design. The development shall be carried out in accordance with the approved details prior to the first occupation of the development hereby approved. Development shall not take place until an exceedance flow routing plan for flows above the 1 in 100 year + 30% CC event has been submitted to and approved in writing by the Local Planning Authority."

Condition 9, 20/01119/FUL
"That, prior to the commencement of development, a full surface water drainage plan shall be submitted to and approved in writing by the Local Planning Authority. The plan shall include details of the size, position and construction of the drainage scheme and results of soakage tests carried out at the site to demonstrate the infiltration rate. Three tests should be carried out for each soakage pit as per BRE 365, with the lowest infiltration rate (expressed in m/s) used for design. The development shall be carried out in accordance with the approved details prior to the first occupation of the development hereby approved. Development shall not take place until an exceedance flow routing plan for flows above the 1 in 100 year + 40% CC event has been submitted to and approved in writing by the Local Planning Authority."

2.0 Background and Proposals

2.1 The site is located along the western extents of the village of Alvescot, Oxfordshire, which is approximately 2.4km south of Carterton. The site is situated to the west of the village and is currently accessed via a track leading from Lower End.

2.2 The site is bound by undeveloped land to the north and west, and existing residential development to the east and south. The site is currently used as a livery yard with fields to the west and a number of barns located to the east.

2.3 In 2019, planning permission was granted under application reference 19/01267/FUL for the demolition of a barn and erection of a dwelling, subject to planning conditions.

2.4 In 2020, planning permission was granted under application reference 20/01119/FUL for the erection of five new dwellings, subject to planning conditions.

2.5 This Technical Note relates to both applications, which are adjoining and share the same access to Lower End. Planning drawings for both proposals are included in Appendix A.

2.6 The proposed drainage layout and associated drainage details drawing are provided in Appendix B.

3.0 Surface Water Drainage

Existing Surface Water Drainage

3.1 Currently the site consists predominantly of agricultural buildings and the associated hardstanding, which drain into the ditch located in the north-west of the site at an uncontrolled rate. This ditch flows in the westerly direction where it eventually discharges into Clanfield Brook.

Existing Brownfield and Greenfield runoff

3.2 The site is classed as a brownfield site, therefore, using the Modified Rational Method, the brownfield runoff rate for the site was calculated as 11.82l/s.

3.3 The greenfield run-off rate has also been calculated in accordance with the methodology provided in DEFRA document "Interim Code of Practice for Sustainable Drainage Systems" (ICoPS). Results show a value related to the mean annual flood flow from the site (i.e., QBAR) of approximately 0.30l/s for the total impermeable area of the site.

3.4 Brownfield and Greenfield runoff calculations are provided in Appendix C.

Sustainable Drainage Systems

3.5 All developments present opportunities to incorporate Sustainable Drainage Systems (SuDS), which might include infiltration drainage or attenuation of flows to protect watercourses. The choice of system is dependent upon the ground conditions and site-specific characteristics.

3.6 The use of SuDS attempts to match or provide betterment to the discharge rates of the existing site.

3.7 All SuDS will be designed in accordance with CIRIA Report C753 'The SuDS Manual' (2015) following the SuDS "Management Train" approach to ensure that the proposed drainage strategy mimics, and where possible, improves upon the surface water drainage regime of the existing site as closely as possible.

Surface Water Drainage Constraints

3.8 The Planning Policy Guidance to the National Planning Policy Framework (NPPF) and Part H of The Building Regulations outline a hierarchy for the disposal of surface water drainage from new development. Firstly, the guidance recommends that surface water runoff should discharge to soakaway or other infiltration system where practical. Where infiltration is not feasible then regulations state that disposal to a local watercourse should be investigated. It is only when these other means of discharge are not practicable, that discharge should be made to the local sewer.

3.9 A site investigation was undertaken in March 2021 by Listers. During the site investigation, Listers made an attempt in performing a series of infiltration tests for the site. In total, five trial pits were excavated for the tests across the site. However, due to high groundwater, which was encountered at the depths varying from 1.00m below ground level (bgl) to 0.80m bgl, the infiltration testing was not performed. Therefore, the disposal of runoff from the site via infiltration was deemed unfeasible.

3.10 With such high groundwater levels it would not be possible to achieve a 1.00m buffer between the bottom of the infiltration features and the top of groundwater level, which is the requirement of The SuDS Manual. This, along with the clay-nature of the soils encountered make any type of infiltration technique unfeasible for disposal of runoff from the site.

3.11 Relevant extracts from the site investigation report are provided in Appendix D.

Proposed Surface Water Drainage Strategy

3.12 Following the hierarchy of surface water disposal provided in the NPPF, it is proposed to discharge runoff from the site into the nearest watercourse, which is the ditch located in the north-western corner of the site, at a controlled rate.

3.13 As discussed in Section 2.3 of this technical note, the greenfield runoff rate for the site is 0.30 l/s. Due to the limitations of the flow control mechanisms, it will not be possible to discharge runoff from the site at such a low flow rate without an unacceptable risk of blockage within the system. It is therefore proposed to restrict discharge from the site to 2.0 l/s, an almost 6x (times) reduction in flow rate or 'betterment' when compared to the existing unrestricted discharge rate. The outfall has a relatively shallow invert level, and as such the sub-base storage and piped network within the site must be kept very shallow in order to drain by gravity to this point. Due to site and boundary constraints, levels across the site are not proposed to be raised significantly above existing and as such deeper storage features cannot be incorporated which could still drain by gravity to the outfall. The volume of sub-base storage provided has been maximised within these constraints in order to restrict to the lowest discharge rate possible, which has been calculated at 2.0 l/s for the 1 in 100 year plus 40% climate change event. This is in accordance with Standard S3 of the Non-Statutory Technical Standards for Sustainable Drainage Systems.

3.14 Given that the ditch was found to be relatively shallow (circa 1.00m deep), a conventional piped network is unsuitable for runoff disposal from the site. Therefore, shallow storage features in the form of a deepened sub-base were designed to attenuate runoff and discharge it into the ditch at a controlled rate.

3.15 The proposed roads and driveways within the site will be constructed of permeable block paving and gravel. Runoff will permeate through these surfaces into the deepened sub-base where it will be attenuated and conveyed towards the flow control chamber located downstream (north of the site). Runoff will then enter the flow control chamber via a series of distribution tanks. A HydroBrake will be installed within the flow control chamber to restrict the flow to the design flow rate.

3.16 The use of permeable block paving will also provide treatment to runoff prior to discharging it into the local watercourse, which will result in significant betterment to the existing situation.

3.17 A conventional piped network will be used to convey runoff from the roof of the proposed buildings into the deepened sub-base via distribution tanks.

3.18 The existing access road serving the proposed development will be upgraded, and will drain as per the existing situation to a drainage ditch along its northern edge.

3.19 The proposed surface water drainage network has been designed to accommodate runoff during the 1 in 100 year event including a 40% increase in rainfall intensity as a result of the climate change.

3.20 Drainage calculations are included in Appendix E.

3.21 The proposed plots will be raised above the ground level to provide protection against exceedance flows. The exceedance flow routing plan showing the direction of the flows above the design event is provided in Appendix F.

Maintenance Plan

3.22 All drainage serving a single property will be owned and maintained by the property owner. All of the shared drainage features will be maintained by a private management company. A SuDS maintenance and management plan is provided in Appendix G.

3.23 All SuDS features will be installed during construction of the development and will be maintained thereafter throughout the lifetime of the development.

4.0 Summary and Conclusions

4.1 This Technical Note provides the information required to discharge conditions 11 and 9 of planning applications 19/01267/FUL and 20/01119/FUL relating to residential development at Park Farm, Lower End, Alvescot, and demonstrates that a suitable surface water drainage strategy is provided for the proposed development which does not increase flood risk to the site or elsewhere.

4.2 This surface water drainage strategy implements the use of SuDS features, such as permeable paving, providing treatment to runoff prior to discharging it into the local watercourse.

Appendix A

Proposed Site Plans

tsh architects

Park Farm, Lower End Alvescot	July 2018
	1:500 @A1
	2016028
Site plan	P50B

Do not scale dimensions from this drawing

The survey information shown on this drawing is based on a survey prepared by a third party and TSH Architects accept no responsibility for the accuracy or completeness of the survey

These drawings have been amended to attain Record drawing status based on information received from the Main Contractor.

Note: Detailed design information for Various components / constructions are indicated on separate specialist sub-contractor drawings, & may supersede the information shown on this drawing.

Rev	Date	Description
D	01/06/2020	Annotation for garages added
B	13/03/20	Changes to client requirements
A	27/02/20	Changes to site layout and boundary.

tsh architects

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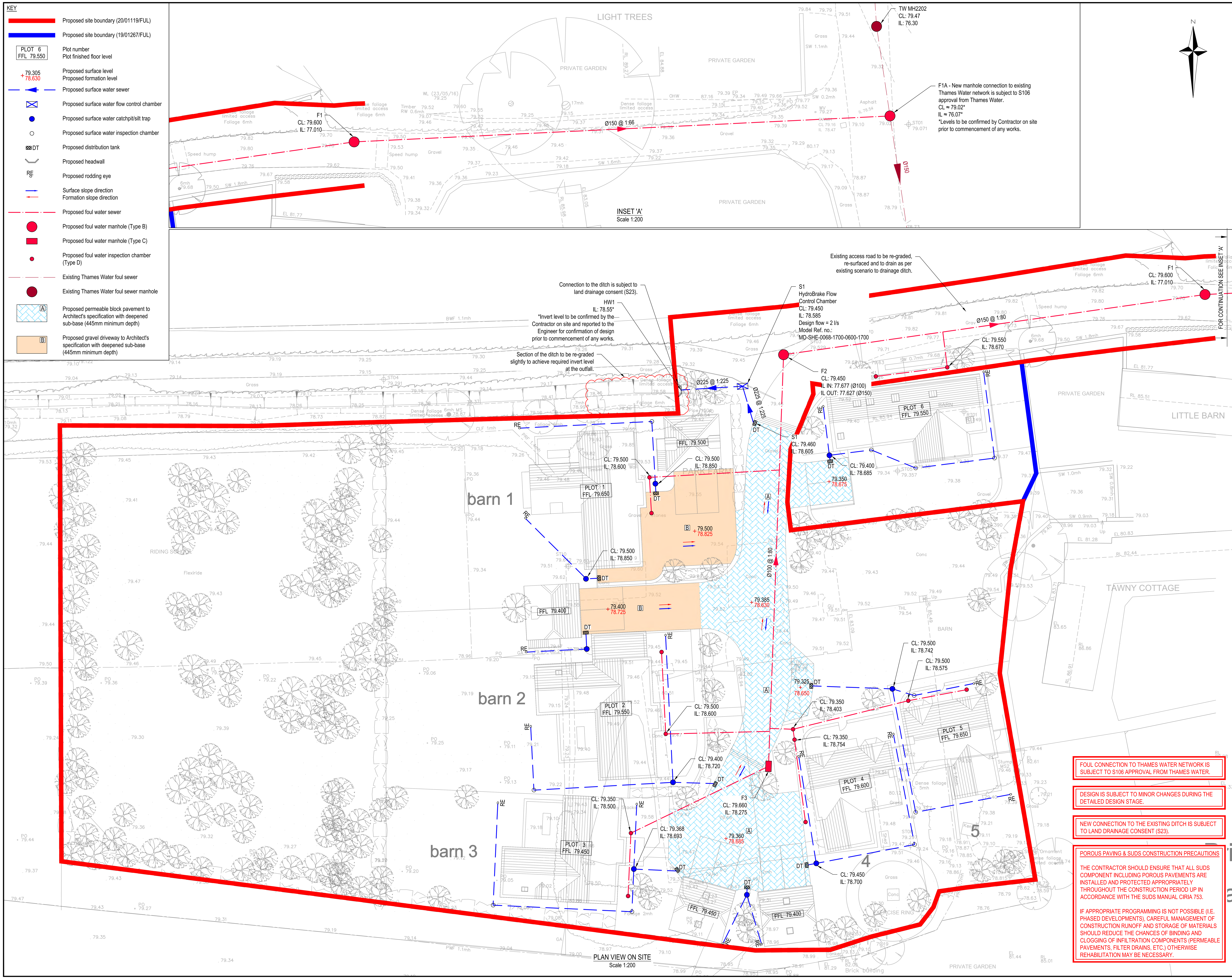
tsharchitects.co.uk

Park Farm	Date:	March 2020
Alvescot	Scale:	1:200@A1
	Status:	Planning
Proposed Site Plan	Drawn:	SG
Plots 1-5		
2016028 - A -00- 00 - P40	Revision:	D

Appendix B

Proposed Drainage Layout and Drainage Details



FOUL CONNECTION TO THAMES WATER NETWORK IS SUBJECT TO S106 APPROVAL FROM THAMES WATER.

FOUL CONNECTION TO THAMES WATER NETWORK IS SUBJECT TO S106 APPROVAL FROM THAMES WATER.

DESIGN IS SUBJECT TO MINOR CHANGES DURING THE DETAILED DESIGN STAGE.

NEW CONNECTION TO THE EXISTING DITCH IS SUBJECT TO LAND DRAINAGE CONSENT (S23).

POROUS PAVING & SUDS CONSTRUCTION PRECAUTIONS

THE CONTRACTOR SHOULD ENSURE THAT ALL SUDS COMPONENT INCLUDING POROUS PAVEMENTS ARE INSTALLED AND PROTECTED APPROPRIATELY THROUGHOUT THE CONSTRUCTION PERIOD UP IN ACCORDANCE WITH THE SUDS MANUAL CIRIA 753.

IF APPROPRIATE PROGRAMMING IS NOT POSSIBLE (I.E. PHASED DEVELOPMENTS), CAREFUL MANAGEMENT OF CONSTRUCTION RUNOFF AND STORAGE OF MATERIALS SHOULD REDUCE THE CHANCES OF BINDING AND CLOGGING OF INFILTRATION COMPONENTS (PERMEABLE PAVEMENTS, FILTER DRAINS, ETC.) OTHERWISE REHABILITATION MAY BE NECESSARY.

NOTES

1. This drawing to be read in conjunction with all relevant documents and specifications.
2. Dimensions are scalable for 'Planning' purposes only.
3. Any discrepancies found between information shown on this or any other drawing shall be reported to the Engineer immediately and prior to works commencing on site.
4. All adoptable drainage works to be constructed as detailed in the Code for Adoption Section Guidance in relation to the adoption of sewerage assets by sewerage companies in England published by Water UK or as stipulated in Thames Water's local practice document accompanying this guidance.
5. All private drainage works to be constructed as detailed in Building Regulations Part H and Part M(1).
6. This drawing details all below ground drainage up to finish floor level. For details of drainage above finish floor levels refer to Architect's drawings.
7. Refer to Architects drawings for rain water pipe (RWP) and soil vent pipe (SVP) locations.
8. All rainwater downpipes to be provided with above ground roddable access points.
9. All RWP connections to be 100mm at minimum gradient of 1 in 100 unless noted otherwise on the drawing.
10. All RWP connections to have a minimum 600mm depth of cover unless noted otherwise on the drawing.
11. All stack connections under buildings to be 100mmØ at minimum gradient of 1 in 40 (SVP) or 1 in 30 (S/S) unless noted otherwise on the drawing.
12. Invert levels of the soil vent pipe/stub stack outfall chambers to be set 750mm below the served plot finished floor levels unless noted otherwise on the drawing.
13. All foul water lateral connections to main sewer to be 100mmØ laid at a minimum gradient of 1 in 80 unless noted otherwise on the drawing. All surface water lateral connections to main sewer to be 150mmØ laid at a minimum gradient of 1 in 125 unless noted otherwise on the drawing.
14. All pipework shall join at soffit level unless otherwise stated on the drawing.
15. New connections are to be made with appropriate lengths of rocker pipes & couplings.
16. It is to the contractor's responsibility to ensure that all services that are affected by the works are located prior to works commencing. Trial holes are to be dug, if necessary.
17. Invert levels of existing chambers have been taken from third party information and should be confirmed onsite prior to commencement of drainage works. Any discrepancies in the levels of the drainage should be reported immediately to the Engineer.
18. Existing drainage that will serve no purpose post development is to be either removed or suitably stopped up by end capping or by infilling with concrete with no hindrance to the retained system.
19. All manhole / inspection chamber covers to be installed parallel to final kerbs, edgings, paving joints or building lines as appropriate.
20. Cover levels are approximate only. All covers to be set flush with finished surface.
21. The minimum depth of cover to the crown of gravity pipes without class Z concrete protection should be as follows:
   - Domestic gardens and pathways without any possibility of vehicular access - 0.35m
   - Domestic driveways and parking areas not subject to vehicle loading in excess of 7.5 tonnes - 0.5m
   - Domestic driveways and parking areas with limited access to vehicle loading in excess of 7.5 tonnes - 0.9m.
   - All access roads and other parking areas - 1.2m.
28. Invert level of the existing ditch has been taken from third party information and should be confirmed onsite prior to commencement of drainage works. Any discrepancies in the levels of the drainage should be reported immediately to the Engineer.
29. Buried concrete to be Design Sulphate Class DS-2 and ACEC AC-3z.
30. The contractor is to ensure that porous sub-base formation have a suitable fall (Min. 1:500) to the collector distribution tanks.
31. For drainage standard details refer to drawing 8210205-1401.

Rev.	Description	Date	Chkd
P3	Junction connection to Thames Water network replaced with manhole connection.	24/05/2021 A. Persins	CS
P2	Foul sewer network added.	12/05/2021 A. Persins	CS

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Client : Park Lane Developments (Oxfordshire) Limited

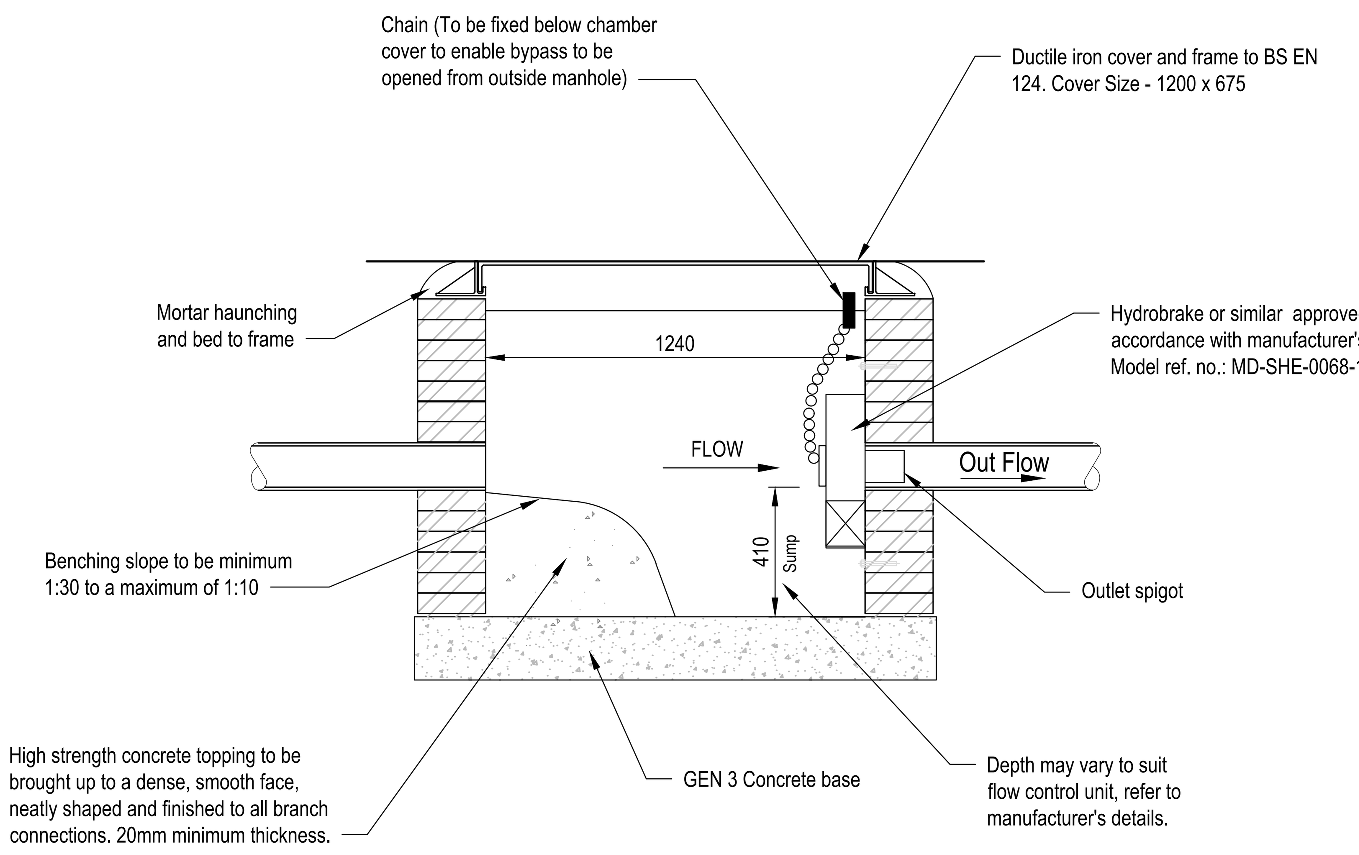
Project : Land at Park Farm, Lower End Alvescot, OX18 2QA

Title : Proposed Drainage Layout

Project Engineer :	A. Persins	Scale :	1:200 @ A1
Project Director :	J. Hanlon	Date :	March 2021
Status :	PRELIMINARY		

Drawing No. 8210205-1201 Rev P3

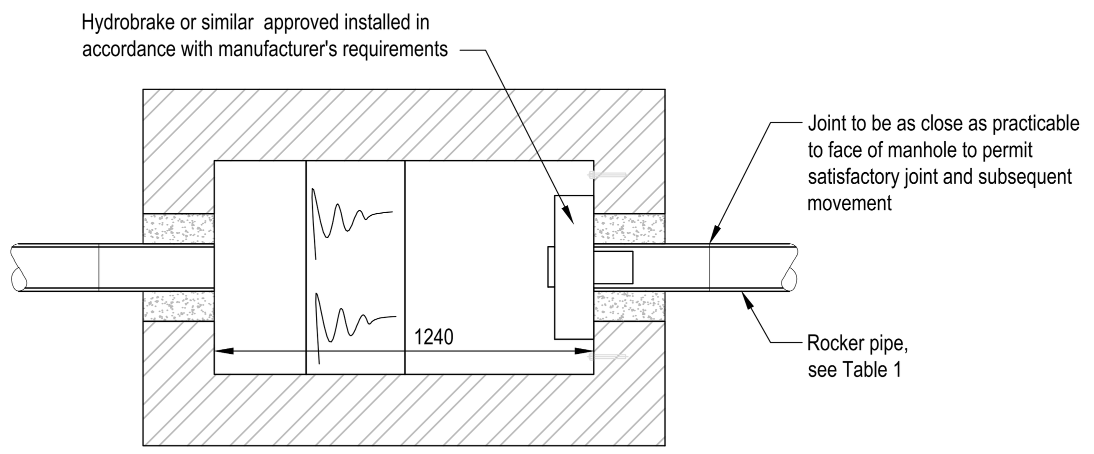
NOTES
1. This drawing to be read in conjunction with all relevant documents and specifications.
2. Dimensions are scalable for 'Planning' purposes only.
3. Any discrepancies found between information shown on this or any other drawing shall be reported to the Engineer immediately and prior to works commencing on site.



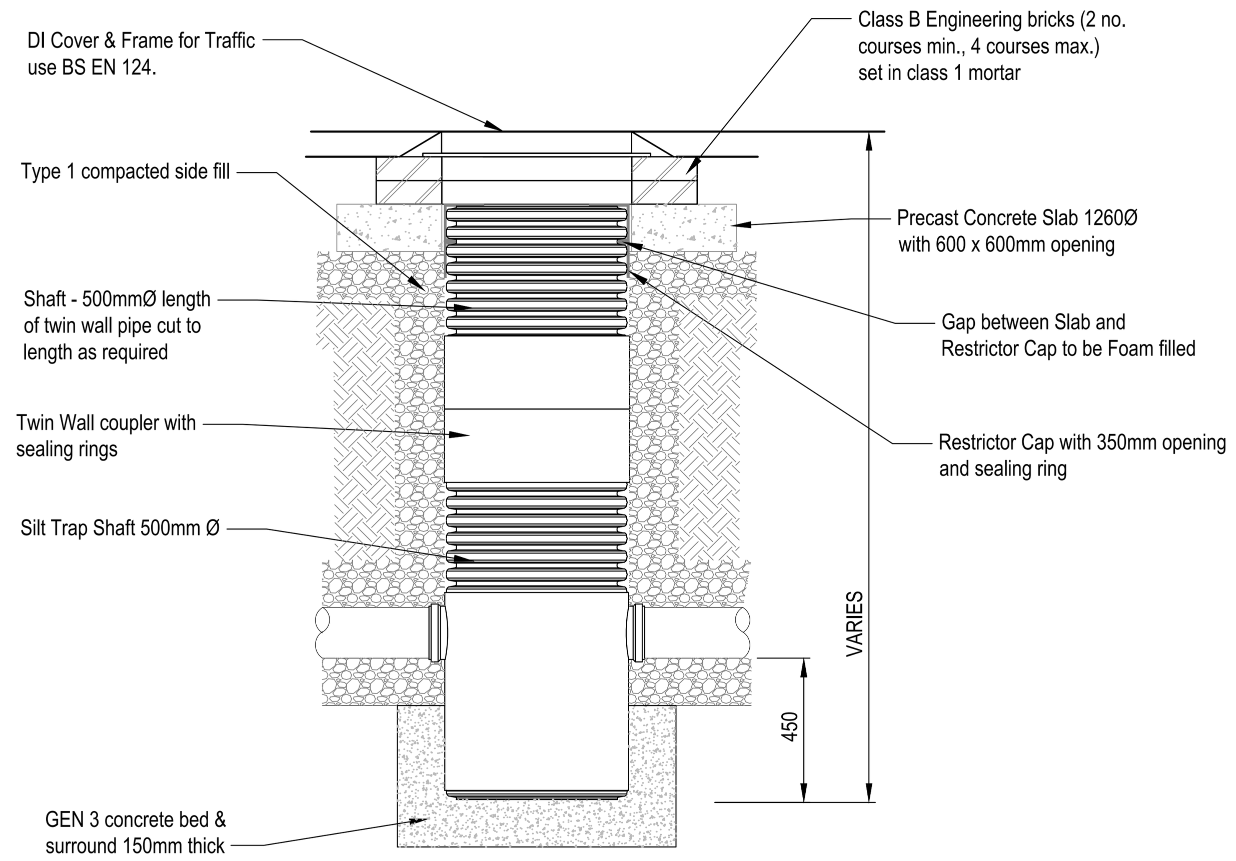
NOTES
1. Inverts formed generally using channel pipes.
2. Chamber width shall be increased, for pipes larger than 225mm Ø, to give 225mm benching each side with the brickwork corbelled down to suit cover.

Table 1 - Rocker pipe effective lengths

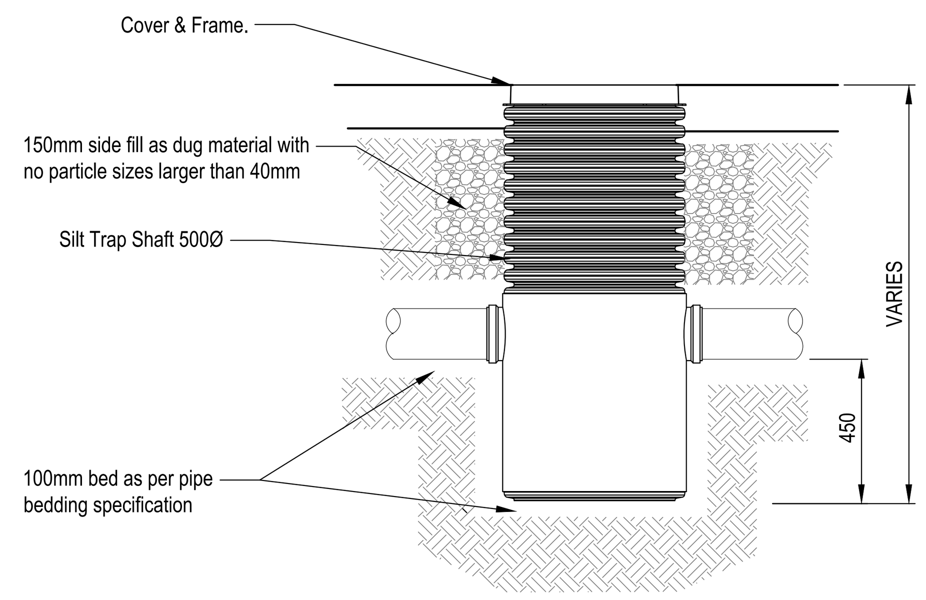
PIPE DIA. (mm)	EFFECTIVE LENGTH OF ROCKER PIPE (m)
150 to 600	0.6
675 to 750	1.0
825 to over	1.25



HYDROBRAKE MANHOLE DETAILS
Scale: 1:20

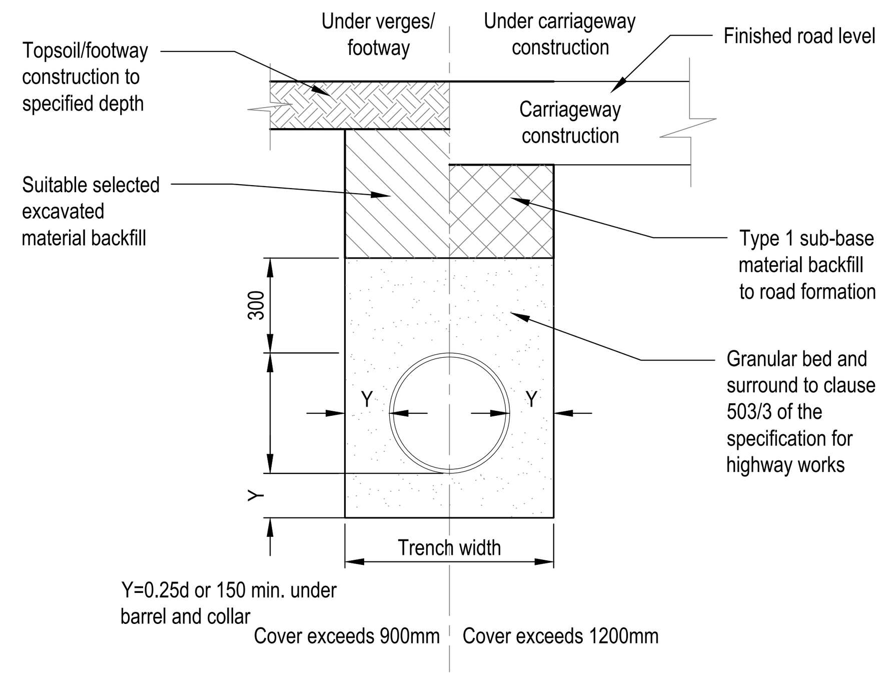


SILT TRAP LOCATED IN TRAFFICKED AREA

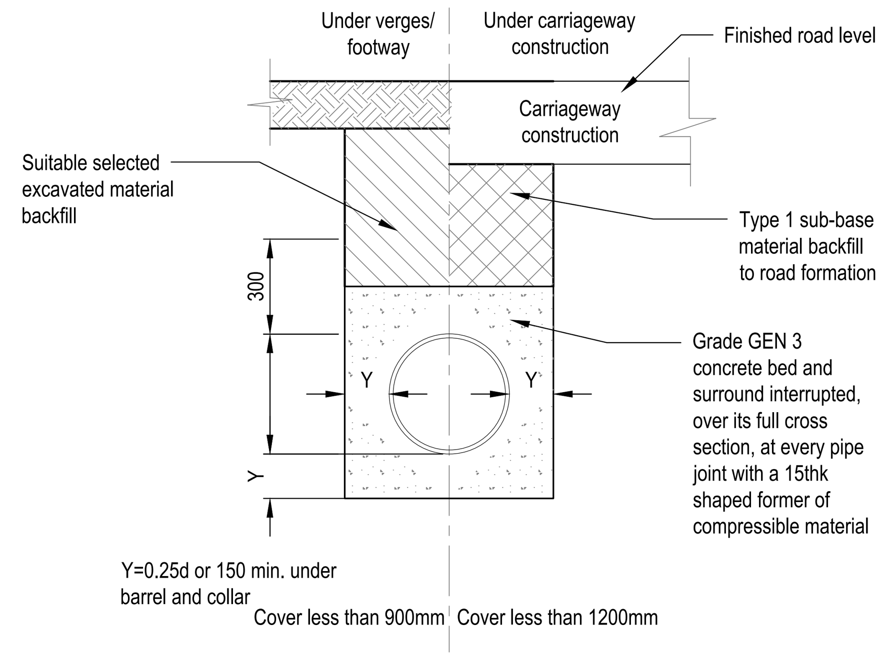


SILT TRAP LOCATED IN NON-TRAFFICKED AREA

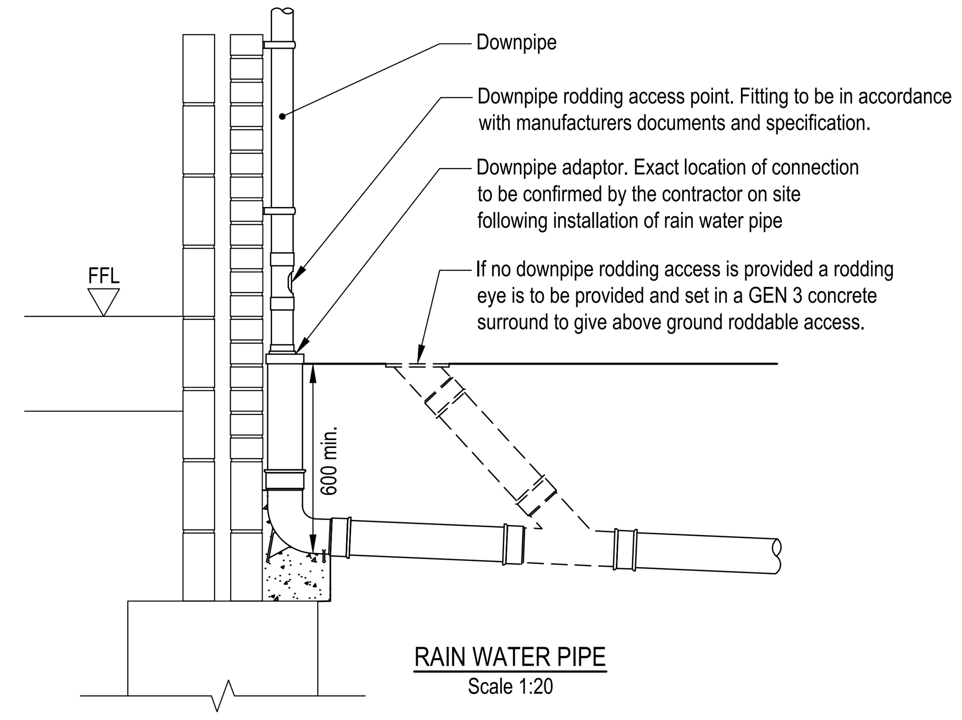
TYPICAL CATCHPIT / SILT TRAP DETAIL
Scale 1:20



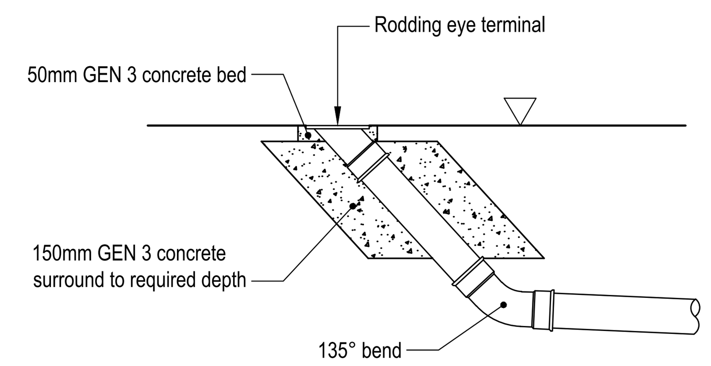
PIPE BEDDING - TYPE S
GRANULAR SURROUND
Scale 1:20



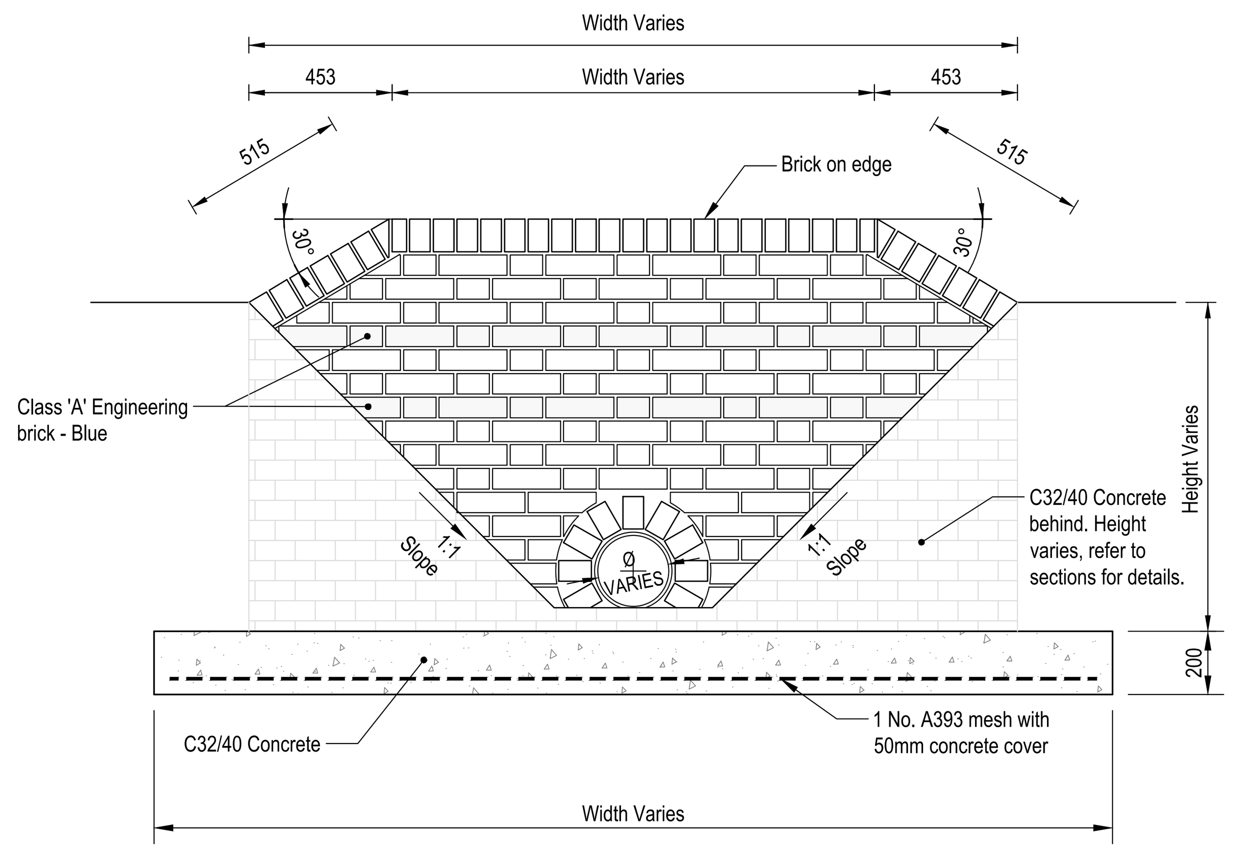
PIPE BEDDING - TYPE Z
CONCRETE SURROUND
Scale 1:20

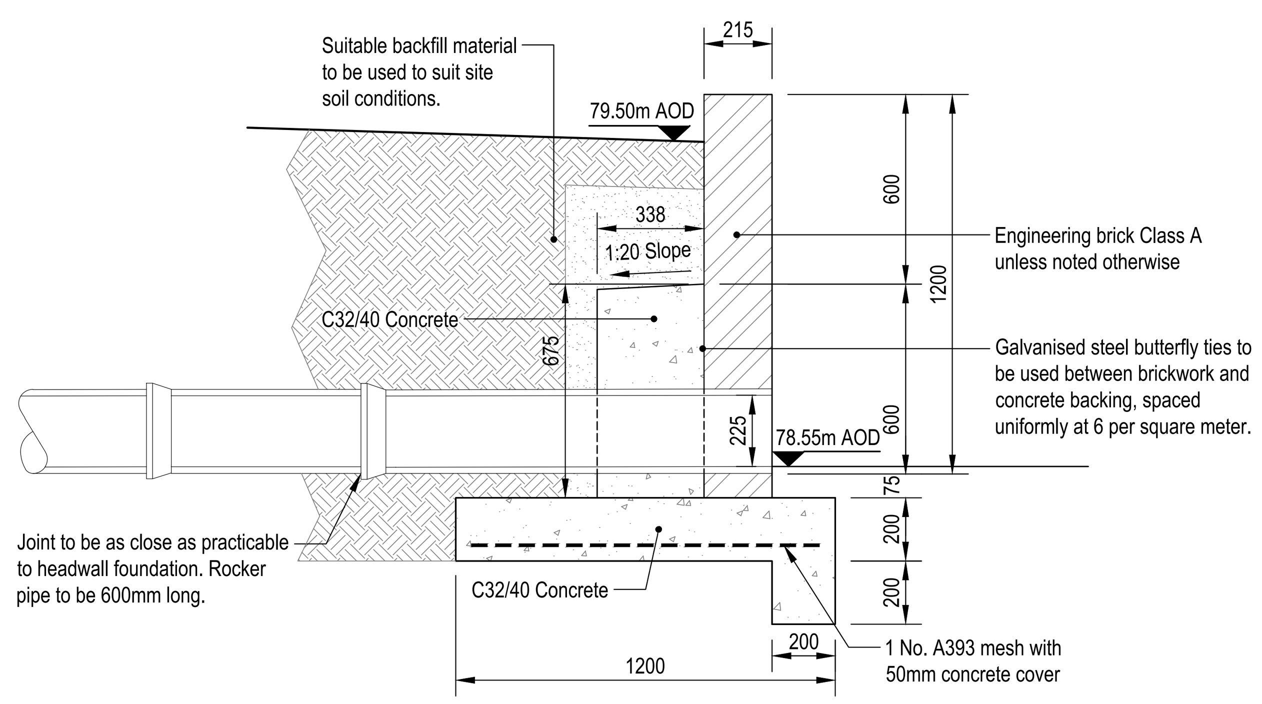


RAIN WATER PIPE
Scale 1:20

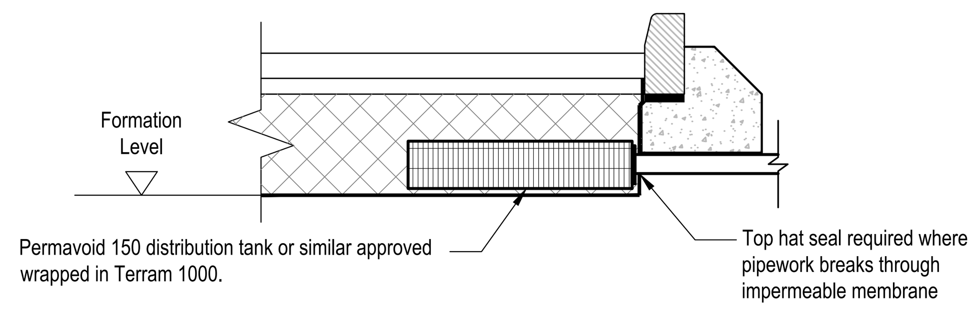


RODDING EYE
Scale 1:20

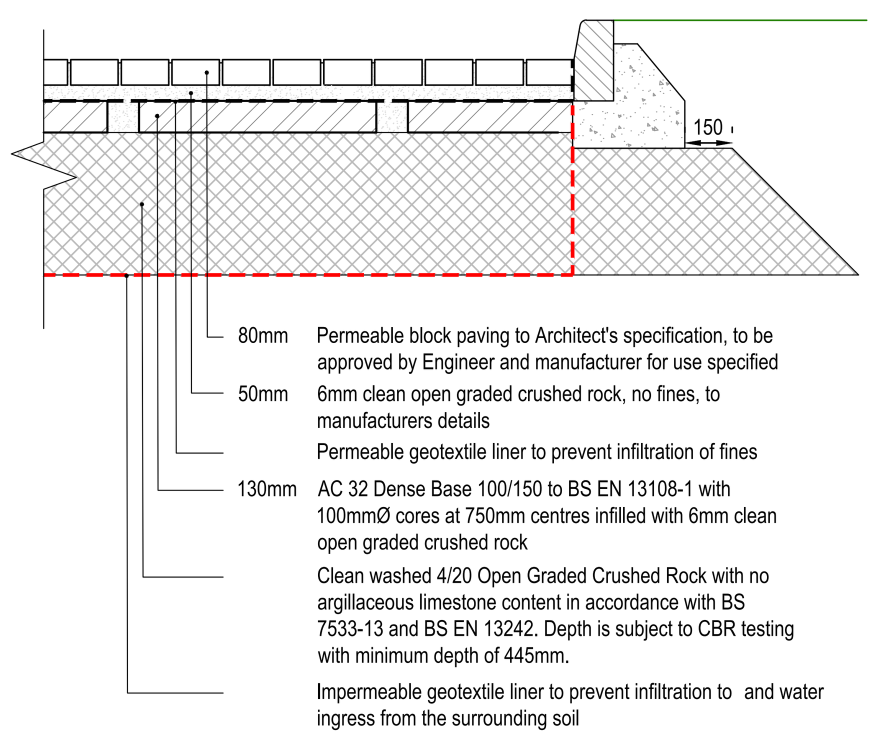




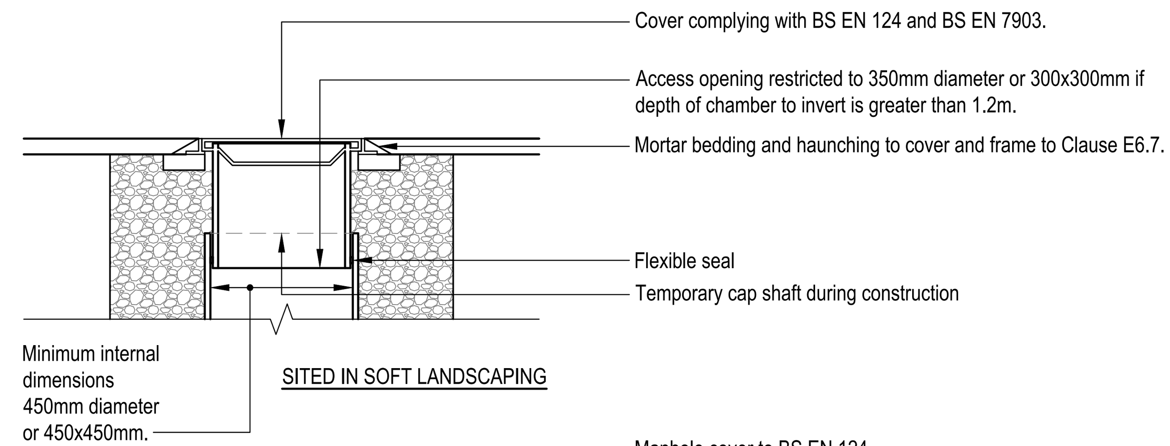
TYPICAL BRICK HEADWALL DETAIL
NTS

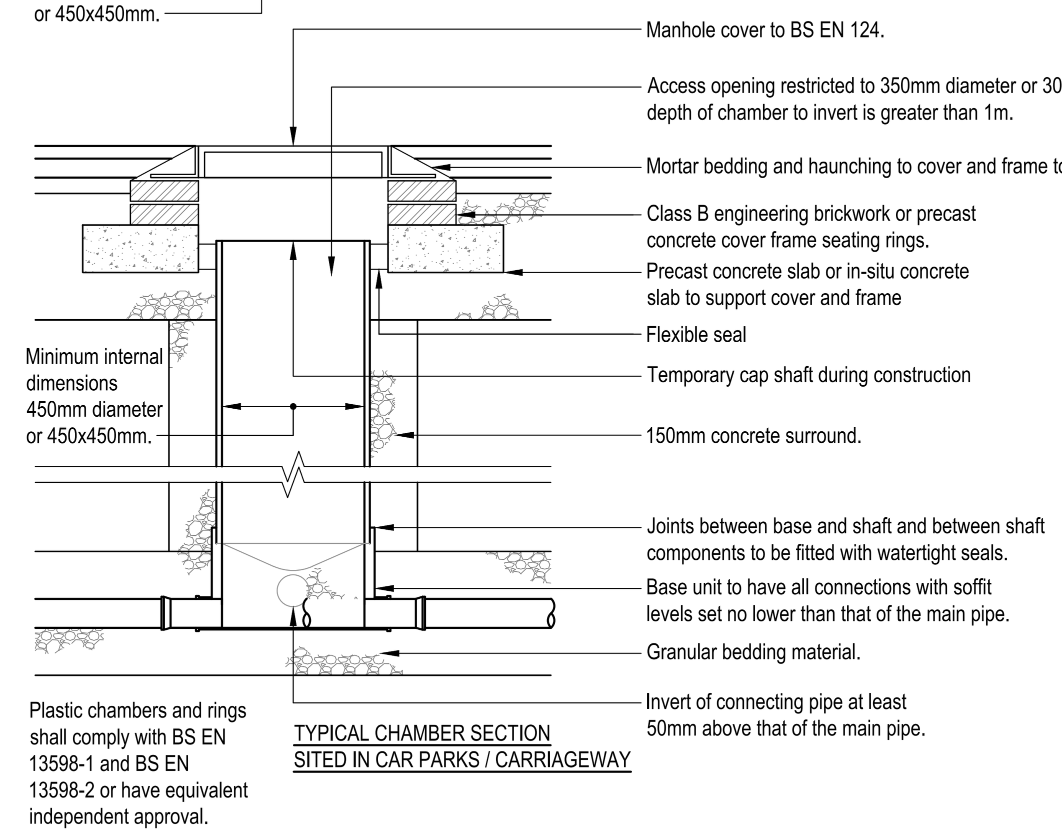


TYPICAL SECTION THROUGH DISTRIBUTION
TANK WITHIN SUB-BASE
Scale 1:20



TYPICAL SECTION THROUGH
PERMEABLE PAVING
Scale 1:20





TYPICAL INSPECTION CHAMBER
Scale: 1:20

Rev.	Description	Date	Chkd
P1	PRELIMINARY issue.	14/04/2021 A. Persins	CS

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Client : Park Lane Developments (Oxfordshire) Limited

Project : Land at Park Farm, Lower End Alvescot, OX18 2QA

Title : Drainage Construction Details

Project Engineer : A. Persins
Scale : As Shown @ A1
Project Director : J. Hanlon
Date : April 2021
Status : PRELIMINARY

Drawing No. 8210205-1401
Rev P1

Appendix C

Brownfield and Greenfield Runoff Calculations

Calculations

Glanville

Job Title:	Lower Alrescot	Job No.	8210205
Date:	09.04.21.		
Member/Location:		Sheet No.	1 of 1
Engineer:	A. Persins	Checked/Approved:	
Revision:	A1		

Brownfield runoff calculations

1. Use Modified Rational Method:

$Q = 2.78\, C\, i\, A$, where $C = 1$

$i = 50$ mm/hr

$A = 0.085$ ha*

*existing roof area. Measured from topo.

Q - Brownfield runoff (l/s)

$\therefore Q = 2.78 \times 1 \times 50 \times 0.085$

$\therefore Q = \underline{\underline{11.815 \text{ l/s}}}$

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	0.085	Urban	0.000
SAAR (mm)	701	Region Number	Region 1

Results	**l/s**
QBAR Rural	0.3
QBAR Urban	0.3
Q100 years	0.7
Q1 year	0.2
Q30 years	0.5
Q100 years	0.7

Appendix D

Extracts from Site Investigation Report

EXPLORATION AND TESTING

Eight exploratory holes were formed at the site, comprising: three continuous tube sampler boreholes (CT01 to CT03); and five mechanically-excavated trial pits (TP01 to TP05); in-situ testing (including Standard Penetration Tests), and these were supplemented by geotechnical and chemical laboratory testing.

The trial pits were formed on the 26th January 2021, and the boreholes on the 8th February 2021.

The positions of the exploratory holes are shown on the Exploratory Hole Location Plans in Appendix A. The logs and field test results are provided in Appendix B and the laboratory test reports in Appendix C.

Engineering and geoenvironmental conclusions given in this report are based on data obtained from these sources, but it should be noted that variations, which affect these conclusions, may inevitably occur between and beyond the test locations. Also, water levels may vary seasonally and with other factors.

SAMPLING STRATEGY

The investigation was designed to provide a spread of information across the site, within the restrictions of access and services. Four of the trial pits (TP01, TP02, TP04 and TP05) were positioned, at the request of Emma Kirby Design, at proposed soakaway locations, with the intention of conducting infiltration tests. The fifth trial pit, TP03, was position alongside the oil tank to allow inspection of the ground for evidence of petroleum hydrocarbon contamination from that potential source as well as migration that may have occurred from the former haulage yard to the south. Access, for exploratory holes, to the inside of the buildings was not attempted.

METHODOLOGY

Prior to commencement of excavation, in order to minimise the dangers from/to buried services, the proposed locations were scanned using a Cable Avoidance Tool. The hardstanding at borehole locations was broken-out using a hand-held pneumatic breaker and, for the trial pit, a pneumatic pick attachment to the excavator. At the borehole locations, a service avoidance pit was dug, using hand tools, to a depth of around 1.2m bgl (below ground level).

The continuous tube sample boreholes were put down using hand-tools and an Archway Competitor Dart rig to a target depth of 6.00m bgl but, due to ground conditions, achieved depths of between 4.50m and 5.20m. The boreholes were advanced using a plastic-lined steel tube sampling system, driven into the ground by a top-drive percussive hammer. A near continuous, 85mm to 45mm diameter, core sample was recovered of the sampled materials to allow examination and sub-sampling. Standard Penetration Tests (SPTs) were performed at 1.0m intervals. On completion, the boreholes were backfilled with arisings.

The trial pits were excavated with a tracked mechanical excavator, to depths of between 1.05m and 1.75m. A log was made of the arisings and samples collected for subsequent laboratory testing. Hand vane tests were conducted on recovered blocks of soil (where the block size was sufficient) and the average of three tests at each depth is reported on the log. The planned infiltration tests were not conducted as significant groundwater inflows were encountered at relatively shallow depth. On completion, the pits were backfilled with arisings.

GROUNDWATER

Groundwater was encountered, in the trial pit excavations, at, in general, less than 1m depth, and deeper within the boreholes (where groundwater is usually slower to develop), as summarised below:

Hole ref.	Strike Depth (m)	Stratum	Standing Level (m)	Comment
CT01	3.00	Kellaways Formation	-	Dry on completion
CT02	1.50	Superficial Clay	0.95	
CT03	-	-	-	Not encountered
TP01	0.95	Superficial Clay	-	Moderate inflow
TP02	0.80	Superficial Clay	-	Moderate to fast inflow
TP03	1.00	Kellaways Formation	-	Slow inflow
TP04	0.65	Superficial Clay	-	Moderate to fast inflow
TP05	1.00	Kellaways Formation	-	Slow to moderate inflow

OBSERVED SOIL CONTAMINATION

There was no evidence, either visual or olfactory, of potential contamination in any of the exploratory holes.

INFILTRATION TESTING

Infiltration testing was planned to be undertaken in all five of the trial pits at proposed soakaway locations, but, following shallow groundwater strikes in each, the tests were not performed.

SULPHATE AND pH TESTS

The results of the laboratory pH and water-soluble sulphate tests on samples of soil are summarised below:

Stratum	Water-soluble Sulphate (mg/l)	pH (pH units)	No. tested
Superficial Clay	10 to 290	6.5 to 8.5	6
Kellaways Formation	40 & 1,270	5.4 & 8.0	2

DESICCATION

There are various techniques for assessing soil desiccation, including visual assessment based on the depth of root penetration and visible signs of desiccation, such as a dry appearance or friable state, and comparison of water contents with the Atterberg Limits.

The indicators are summarised below in terms of the indicated possible soil desiccation depths:

If a ground-bearing floor slab is to be adopted, then all pre-existing building foundations, Fill, Made Ground and disturbed or desiccated soil should be removed from beneath any proposed ground-bearing floor area and the exposed surface should be proof-rolled to expose any excessively soft or compressible zones, which should also be removed. Coarse-grained backfill should then be placed in layers and subjected to controlled compaction.

Suspended

In accord with NHBC guidelines: if it is required to deepen the main foundations below 1.50m depth, such as on account of trees or shrubs, then ground floor slab to that building should be suspended.

A void should be left below the floor slab to accommodate future moisture content-related soil movements. This may be achieved by use of a proprietary compressible material such as Clayboard or Cellcore.

ACCESS ROADS AND PARKING

In preparation for areas of pavement, the formation should be subject to inspection and heavy proof-rolling and any areas of very soft, very loose, very hard, organic, or otherwise unsuitable materials should be removed and replaced with suitable, well-compacted, coarse-grained fill.

Some areas of the site have peripheral mature vegetation. The presence of trees will mean that there is potential for ongoing desiccation issues which may affect the pavement surfacing within influencing distance. Thus, safeguarding against desiccation in this regard could be considered, such as lime cement stabilisation, which can limit the effects of shrinkage and swelling through desiccation, by altering the properties of the clay. Alternatively, it could be accepted that some seasonal movements may occur which could be accommodated through flexible surface finishes.

The structural design of a road or hardstanding is based on the strength of the subgrade, which is assessed on the California Bearing Ratio (CBR) scale. With reference to Transport and Road Research Laboratory, Report LR1132, and laboratory classification tests, the following CBR value is recommended for preliminary design purposes (on the basis of the recommendations for formation preparation, above):

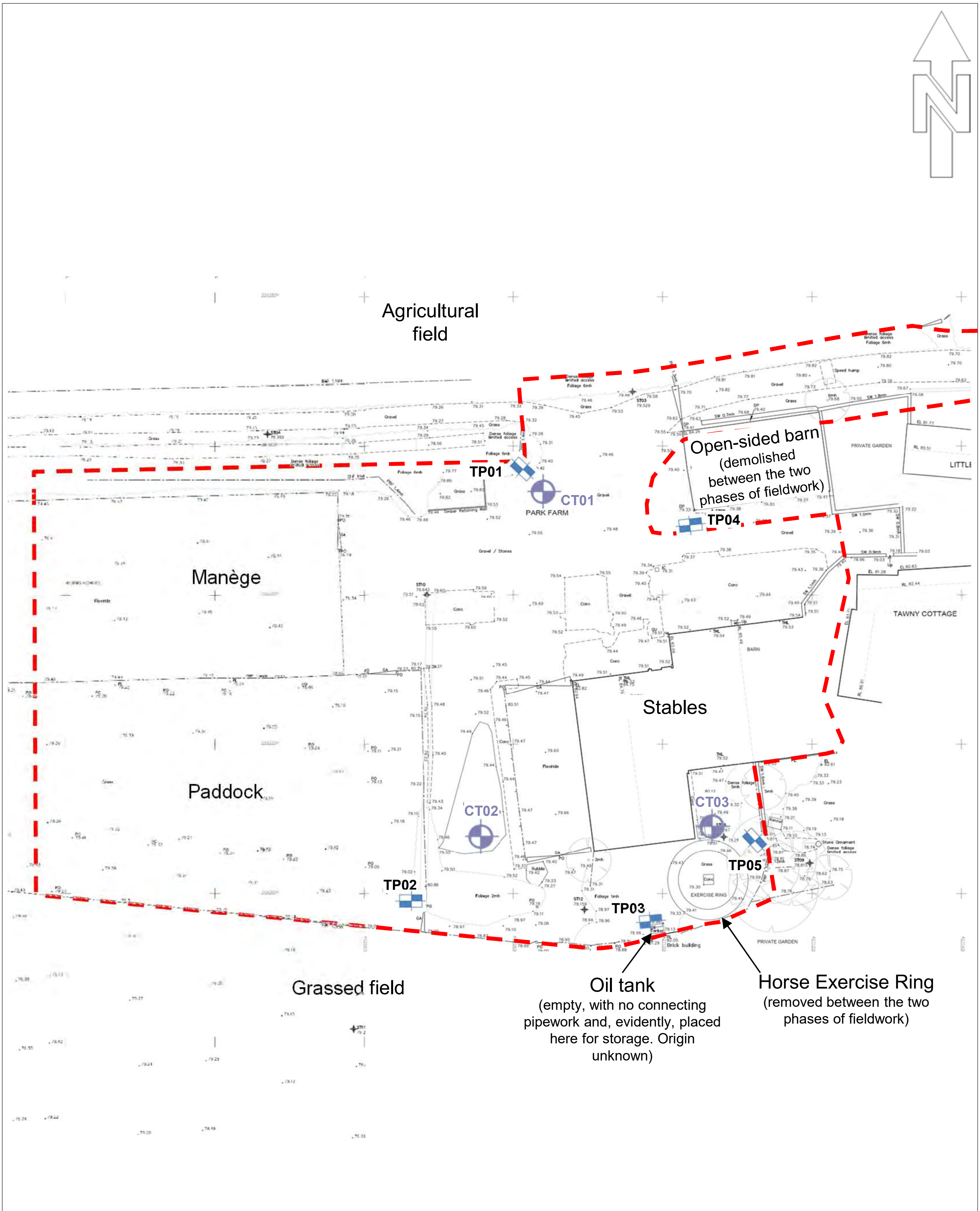
- Superficial Clay: 2.0%

These values are based on equilibrium soil conditions, a thin pavement construction, high water table and poor construction conditions. The site conditions should be reassessed at the time of construction and the CBR/pavement design updated accordingly, if considered necessary.

However, these soils are potentially frost-susceptible and, for prevention of frost damage, all material within a suitable thickness of the surface should be non-frost-susceptible.

INFILTRATION MEASURES

The high groundwater and clay soils encountered strongly indicates that an alternative form of drainage (to the use of soakaways) will have to be adopted.



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Extracts from Glanville's drawing, 8160487/4101, dated 26/05/2016

Key:

Mechanically-Excavated Trial Pit

Continuous Tube-Sampler Borehole

Approximate Site Boundary

Title: Exploratory Hole Location Plan – Existing Layout

Site: Park Farm, Alvescot, Oxfordshire OX18 2QA

Scale: NTS **Job Number**: 21.01.007 **Drawn By**: MX

Appendix E

Drainage Calculations

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.099	4-8	0.072

Total Area Contributing (ha) = 0.170

Total Pipe Volume (m^3) = 1.907

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	56.238	0.112	502.1	0.093	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S2.000	15.928	0.277	57.5	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S1.001	15.892	0.079	201.2	0.065	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	7.12	78.693	0.093	0.0	0.0	0.0	0.44	7.8«	12.6
S2.000	50.00	5.20	78.970	0.012	0.0	0.0	0.0	1.33	23.5	1.7
S1.001	50.00	7.41	78.585	0.170	0.0	0.0	0.0	0.92	36.5	23.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	79.368	0.675	Junction		S1.000	78.693	150				
S2	79.500	0.530	Open Manhole	1200	S2.000	78.970	150				
S2	79.460	0.879	Open Manhole	1200	S1.001	78.585	225	S1.000	78.581	150	
								S2.000	78.693	150	33
S	79.000	0.494	Open Manhole	0		OUTFALL		S1.001	78.506	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	427089.537	204201.748			No Entry	
S2	427083.546	204244.168	427083.546	204244.168	Required	
S2	427091.852	204257.938	427091.852	204257.938	Required	
S	427076.114	204260.145			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	79.368	78.693	0.525	Junction	
S2.000	o	150	S2	79.500	78.970	0.380	Open Manhole	1200
S1.001	o	225	S2	79.460	78.585	0.650	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	56.238	502.1	S2	79.460	78.581	0.729	Open Manhole	1200
S2.000	15.928	57.5	S2	79.460	78.693	0.617	Open Manhole	1200
S1.001	15.892	201.2	S	79.000	78.506	0.269	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.004	0.004	0.004
	User	-	100	0.004	0.004	0.008
	User	-	100	0.015	0.015	0.024
	User	-	100	0.010	0.010	0.034
	User	-	100	0.010	0.010	0.044
	User	-	100	0.018	0.018	0.063
	User	-	100	0.030	0.030	0.093
2.000	User	-	100	0.012	0.012	0.012
1.001	User	-	100	0.005	0.005	0.005
	User	-	100	0.017	0.017	0.021
	User	-	100	0.004	0.004	0.026
	User	-	100	0.014	0.014	0.040
	User	-	100	0.004	0.004	0.044
	User	-	100	0.022	0.022	0.065
				Total	Total	Total
				0.170	0.170	0.170

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1.000	S1	150	0.525	0.729	Unclassified				Junction
S2.000	S2	150	0.380	0.617	Unclassified	1200	0	0.380	Unclassified
S1.001	S2	225	0.269	0.650	Unclassified	1200	0	0.650	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.001	S	79.000	78.506	78.510	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S2, DS/PN: S1.001, Volume (m^3): 2.2

Unit Reference	MD-SHE-0068-1700-0600-1700
Design Head (m)	0.600
Design Flow (l/s)	1.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	68
Invert Level (m)	78.585
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	1.7
Flush-Flo™	0.178	1.7
Kick-Flo®	0.393	1.4
Mean Flow over Head Range	-	1.5

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	2.3	3.000	3.6	7.000	5.3
0.200	1.7	1.400	2.5	3.500	3.8	7.500	5.5
0.300	1.6	1.600	2.7	4.000	4.1	8.000	5.7
0.400	1.4	1.800	2.8	4.500	4.3	8.500	5.8
0.500	1.6	2.000	2.9	5.000	4.5	9.000	6.0
0.600	1.7	2.200	3.1	5.500	4.7	9.500	6.2
0.800	1.9	2.400	3.2	6.000	4.9		
1.000	2.1	2.600	3.3	6.500	5.1		

Storage Structures for Storm

Porous Car Park Manhole: S1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	55.0
Max Percolation (l/s)	152.8	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	78.693	Cap Volume Depth (m)	0.445

Porous Car Park Manhole: S2, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	33.3	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	78.825	Cap Volume Depth (m)	0.445

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 100
Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	360 Winter	100	+40%	100/15 Summer				79.138
S2.000	S2	360 Winter	100	+40%	100/120 Winter				79.191
S1.001	S2	15 Summer	100	+40%	100/15 Summer				79.451

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.295	0.000	0.17			1.3	FLOOD RISK*	
S2.000	S2	0.071	0.000	0.02		370	0.5	SURCHARGED	
S1.001	S2	0.641	0.000	0.06			2.0	FLOOD RISK	

Time Area Diagram for Storm

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.099	4-8	0.072

Total Area Contributing (ha) = 0.170

Total Pipe Volume (m^3) = 1.907

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	56.238	0.112	502.1	0.093	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S2.000	15.928	0.277	57.5	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S1.001	15.892	0.079	201.2	0.065	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	7.12	78.693	0.093	0.0	0.0	0.0	0.44	7.8«	12.6
S2.000	50.00	5.20	78.970	0.012	0.0	0.0	0.0	1.33	23.5	1.7
S1.001	50.00	7.41	78.585	0.170	0.0	0.0	0.0	0.92	36.5	23.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	79.368	0.675	Junction		S1.000	78.693	150				
S2	79.500	0.530	Open Manhole	1200	S2.000	78.970	150				
S2	79.460	0.879	Open Manhole	1200	S1.001	78.585	225	S1.000	78.581	150	
								S2.000	78.693	150	33
S	79.000	0.494	Open Manhole	0		OUTFALL		S1.001	78.506	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	427089.537	204201.748			No Entry	
S2	427083.546	204244.168	427083.546	204244.168	Required	
S2	427091.852	204257.938	427091.852	204257.938	Required	
S	427076.114	204260.145			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	79.368	78.693	0.525	Junction	
S2.000	o	150	S2	79.500	78.970	0.380	Open Manhole	1200
S1.001	o	225	S2	79.460	78.585	0.650	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	56.238	502.1	S2	79.460	78.581	0.729	Open Manhole	1200
S2.000	15.928	57.5	S2	79.460	78.693	0.617	Open Manhole	1200
S1.001	15.892	201.2	S	79.000	78.506	0.269	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.004	0.004	0.004
	User	-	100	0.004	0.004	0.008
	User	-	100	0.015	0.015	0.024
	User	-	100	0.010	0.010	0.034
	User	-	100	0.010	0.010	0.044
	User	-	100	0.018	0.018	0.063
	User	-	100	0.030	0.030	0.093
2.000	User	-	100	0.012	0.012	0.012
1.001	User	-	100	0.005	0.005	0.005
	User	-	100	0.017	0.017	0.021
	User	-	100	0.004	0.004	0.026
	User	-	100	0.014	0.014	0.040
	User	-	100	0.004	0.004	0.044
	User	-	100	0.022	0.022	0.065
				Total	Total	Total
				0.170	0.170	0.170

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1.000	S1	150	0.525	0.729	Unclassified				Junction
S2.000	S2	150	0.380	0.617	Unclassified	1200	0	0.380	Unclassified
S1.001	S2	225	0.269	0.650	Unclassified	1200	0	0.650	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.001	S	79.000	78.506	78.510	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S2, DS/PN: S1.001, Volume (m³): 2.2

Unit Reference	MD-SHE-0068-1700-0600-1700
Design Head (m)	0.600
Design Flow (l/s)	1.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	68
Invert Level (m)	78.585
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.600	1.7
Flush-Flo™	0.178	1.7
Kick-Flo®	0.393	1.4
Mean Flow over Head Range	-	1.5

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	2.3	3.000	3.6	7.000	5.3
0.200	1.7	1.400	2.5	3.500	3.8	7.500	5.5
0.300	1.6	1.600	2.7	4.000	4.1	8.000	5.7
0.400	1.4	1.800	2.8	4.500	4.3	8.500	5.8
0.500	1.6	2.000	2.9	5.000	4.5	9.000	6.0
0.600	1.7	2.200	3.1	5.500	4.7	9.500	6.2
0.800	1.9	2.400	3.2	6.000	4.9		
1.000	2.1	2.600	3.3	6.500	5.1		

Storage Structures for Storm

Porous Car Park Manhole: S1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	55.0
Max Percolation (l/s)	152.8	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	78.693	Cap Volume Depth (m)	0.445

Porous Car Park Manhole: S2, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	33.3	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	78.825	Cap Volume Depth (m)	0.445

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 5, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	120 minute 1 year Winter I+0%	79.368	78.796	-0.047	0.000	0.20
S2.000	S2	1440 minute 1 year Winter I+0%	79.500	78.909	-0.211	0.000	0.00
S1.001	S2	15 minute 1 year Winter I+0%	79.460	78.881	0.071	0.000	0.05

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1		8.132	9.461	1.6	OK*
S2.000	S2		2.673	0.000	0.0	OK
S1.001	S2		1.414	5.476	1.7	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 5, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	120 minute 5 year Winter I+0%	79.368	78.857	0.014	0.000	0.21
S2.000	S2	1440 minute 5 year Winter I+0%	79.500	78.947	-0.173	0.000	0.00
S1.001	S2	15 minute 5 year Winter I+0%	79.460	79.045	0.235	0.000	0.05

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1		18.157	9.431	1.6	SURCHARGED*
S2.000	S2		4.111	0.000	0.0	OK
S1.001	S2		1.737	5.556	1.7	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 5, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	180 minute 30 year Winter I+0%	79.368	78.955	0.112	0.000	0.21
S2.000	S2	1440 minute 30 year Winter I+0%	79.500	78.972	-0.148	0.000	0.00
S1.001	S2	15 minute 30 year Summer I+0%	79.460	79.223	0.413	0.000	0.05

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1		34.376	10.553	1.6	SURCHARGED*
S2.000	S2		5.032	1.185	0.1	OK
S1.001	S2		1.964	5.702	1.7	FLOOD RISK

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

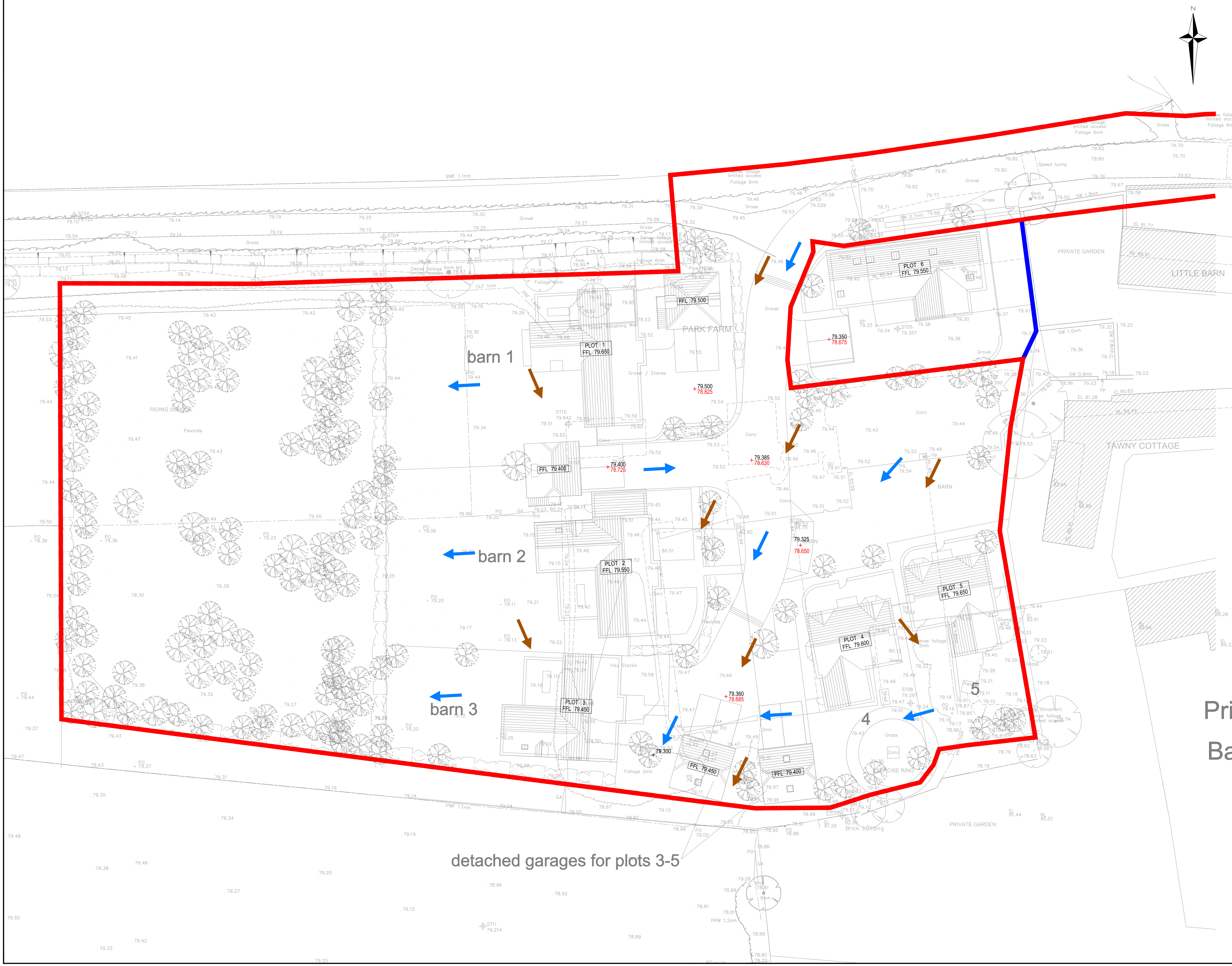
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 5, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	360 minute 100 year Winter I+40%	79.368	79.138	0.295	0.000	0.17
S2.000	S2	360 minute 100 year Winter I+40%	79.500	79.191	0.071	0.000	0.02
S1.001	S2	15 minute 100 year Summer I+40%	79.460	79.451	0.641	0.000	0.06

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1		72.202	18.730	1.3	FLOOD RISK*
S2.000	S2		13.169	1.877	0.5	SURCHARGED
S1.001	S2		2.222	5.391	2.0	FLOOD RISK

Appendix F

Exceedance Flow Route Plan



NOTES

1. This drawing to be read in conjunction with all relevant documents and specifications.
2. Dimensions are scalable for 'Planning' purposes only.
3. Any discrepancies found between information shown on this or any other drawing shall be reported to the Engineer immediately and prior to works commencing on site.

KEY

- Proposed site boundary (20/01119/FUL) (red line)
- Proposed site boundary (19/01267/FUL) (blue line)
- PLOT 6 / FFL 79.550 — Plot number / Plot finished floor level
- + 79.305 / 78.630 — Proposed surface level / Proposed formation level
- Existing exceedance flow route (brown arrow)
- Proposed exceedance flow route (blue arrow)

Rev.	Description	Date	Chkd
P1	PRELIMINARY issue.	14/04/2021 A. Persins	CS

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Client : Park Lane Developments (Oxfordshire) Limited

Project : Land at Park Farm, Lower End Alvescot, OX18 2QA

Title : Exceedance Flow Route Plan

Project Engineer :	A. Persins	Scale :	1:200 @ A1
Project Director :	J. Hanlon	Date :	April 2021
Status :	PRELIMINARY		

Drawing No. 8210205-1901 Rev P1

Appendix G

SuDS Maintenance Plan

PARK FARM, LOWER END, ALVESCOT, OX18 2QA
SUDS MAINTENANCE AND MANAGEMENT PLAN

Table 1: Permeable paving – Typical Maintenance Activities

Maintenance Activity	Inspection Frequency
Check the surface and ensure it is free from debris, dirt and the like. Clean as required.	Typically, monthly or as required
Inspect joints and carry out weed control.	Typically, 3-4 times per year or as required
Ensure paving dewaters after rain and between storms. Check joints for sedimentation, mechanically clean or jet wash and sweep surface free from silt, etc.	Typically, annually or as required
Inspect blocks for depressions, rutting or deterioration and replace as required.	As required
Check pre-treatment structures (Catchpits) for sediment and remove.	Monthly in the first year and then annually

Table 2: Conventional Pipe Network – Typical Maintenance Activities

Maintenance Activity	Inspection Frequency
Inspect and remove any sediment, debris and silt from silt traps and catchpit chambers	Regular (monthly or as required)
Inspect pipework for blockages or root ingress, guttering.	Regular (monthly or as required)
Clear pipework of blockages	As required

Table 3: Privately Owned Ditch at the Outfall – Typical Maintenance Activities

Maintenance Activity	Inspection Frequency
Remove litter and debris	Regular (monthly or as required)
Cut grass	Regular (monthly during growing season or as required)
Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Inspect inlets, outlets and overflows for blockages, and clear if required	Regular (monthly or as required)
Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when 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 silt removal frequencies	Half yearly
Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required