PROPERTY & CONSTRUCTION CONSULTANTS

RIDGE

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15th October 2021

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Solihull Business Park
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108 DORRIDGE ROAD, SURFACE WATER DRAINAGE STRATEGY
108 Dorridge Road, Dorridge, Solihull, B93 8BP

SCOPE

The purpose of this document is to propose a surface water drainage strategy scheme in support of condition 8 of planning approval reference **PL/2021/01119/PPFL** for the demolition of the existing dwelling and construction of a new dwelling at 108 Dorridge Road, Dorridge. The site location is displayed enclosed in the red-line boundary in Figure 1 below.

Figure 1: Proposed Site Location

CATCHMENT AREAS

As indicated by the green and blue hatch in Figure 2 below, the impermeable catchment area of the existing plot totals 350sq.m, with the proposed impermeable catchment area plan in Figure 3 presented by the orange and purple hatch equalling 430sq.m. The proposed development introduces a replacement dwelling with a larger roof area as well as an increased impermeable driveway, adding an overall 80sq.m of impermeable surface to the existing premises.

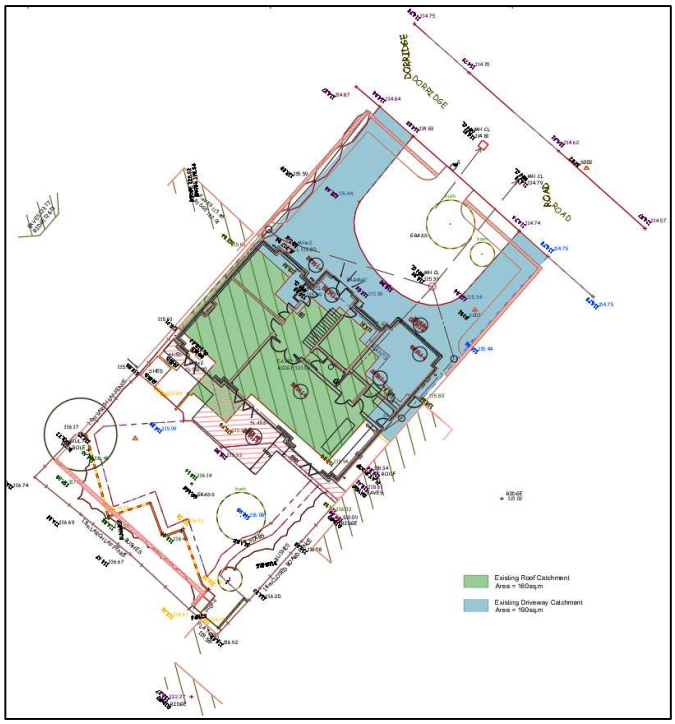


Figure 2: Existing Catchment Area Plan

Figure 3: Proposed Catchment Area Plan

PREDEVELOPMENT DISCHARGE RATE

Based on a rainfall intensity of 50mm / hr, the predevelopment runoff is estimated to be in the region of **5 l/s.**

350sq.m x 0.014 = 4.9 l/s

DISCHARGE METHODS

The Non-statutory technical standards for sustainable drainage systems requires that developments should aim to discharge runoff as high up the following hierarchy of drainage options as reasonably practicable:

- Into the ground (Infiltration)
- To a surface water body
- To a surface water sewer, highway drain or another drainage system
- To a combined sewer

The potential for making use of each discharge option has been considered as follows:

1. Into the Ground (Infiltration)

The below excerpt has been extracted from the Geotechnical Investigation report undertaken by Ground Investigation Specialists Limited in September 2021 which discusses the potential for soakaways through analysing the ground conditions via infiltration tests. It was concluded that the use of soakaways are not a suitable method of discharging the surface water due to the low permability of the encountered clay.

6.2 Soakaways

Trial pit TP1 was excavated to a depth of 1.1 m to undertake a soil infiltration test and exposed made ground comprising topsoil to a depth of 0.5 m, onto light grey and brown mottled very clayey silty gravelly sand.

The excavation was filled with water to a depth of 0.66 m and allowed to drain for just over 3 hours, after which time the water level had not fallen by any measurable amount.

This result is unsurprising given the high clay content of the soils encountered at shallow depth across the site and above the water table. Given the low permeability of the soils encountered, soakaways are not considered to be a suitable means of disposal for surface water from the proposed development and an alternative drainage scheme will be required.

Figure 4: Geotechnical Investigation Soakaways Extract

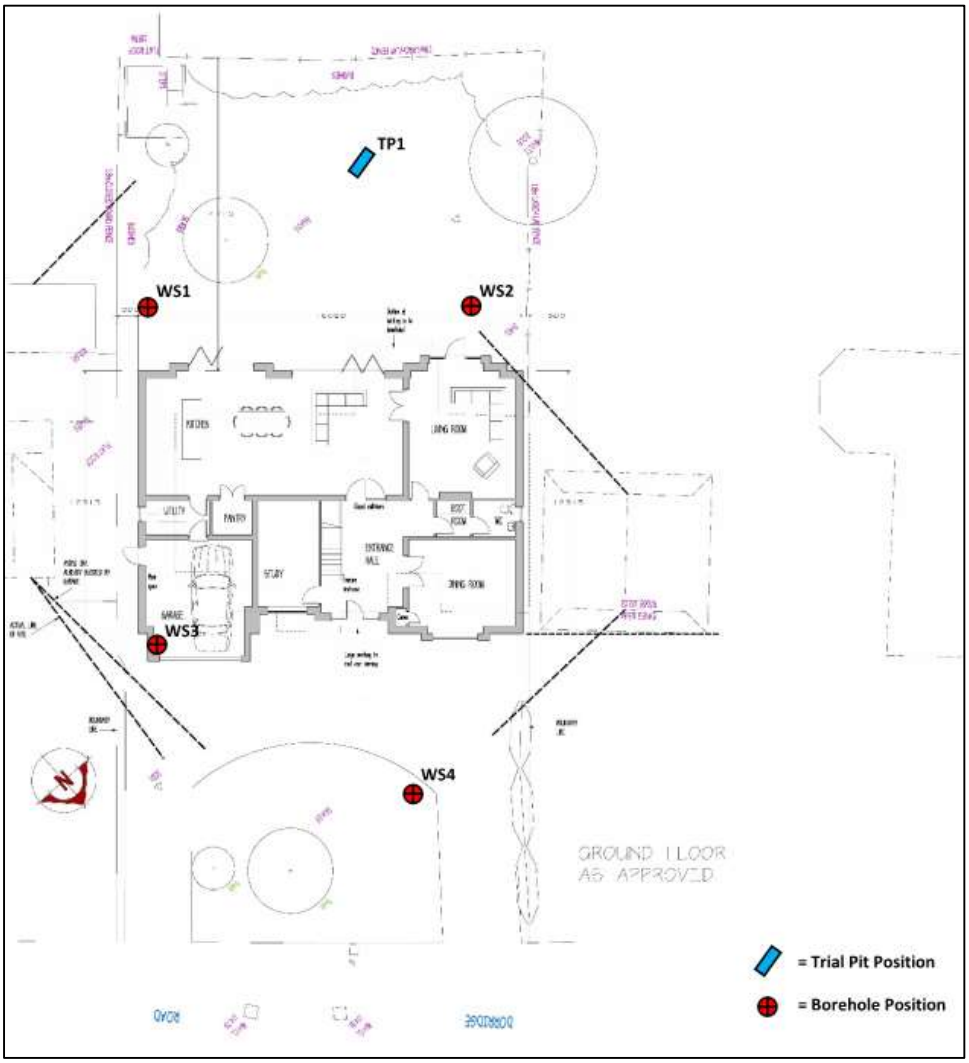


Figure 5: Trial Pit and Borehole Locations GI Extract

2. To a Surface Water Body

There are no surface water bodies within reasonable proximity to the site location remcving the possibility to utilise this method.

3. To a Surface Water Sewer

Connection to the existing 300Ø Severn Trent Water (STW) surface water sewer running down Dorridge Road, as shown in Figure 6, is proposed. Currently the existing connection has not been located, Hence a new direct connection is proposed subject to an S106 connection application by client / contractor. The full STW sewer map can be found in the appendicies. Discharge will be restricted to 2l/s which is a >50% betterment ove the existing condition and therefore aligns with Severn Trent Water Ltd's standard requirements should infiltration not be possible. During construction further infiltration is proposed for the drive area and should partial testing infiltration prove feasible, the discharge rate will be reduced accordingly.

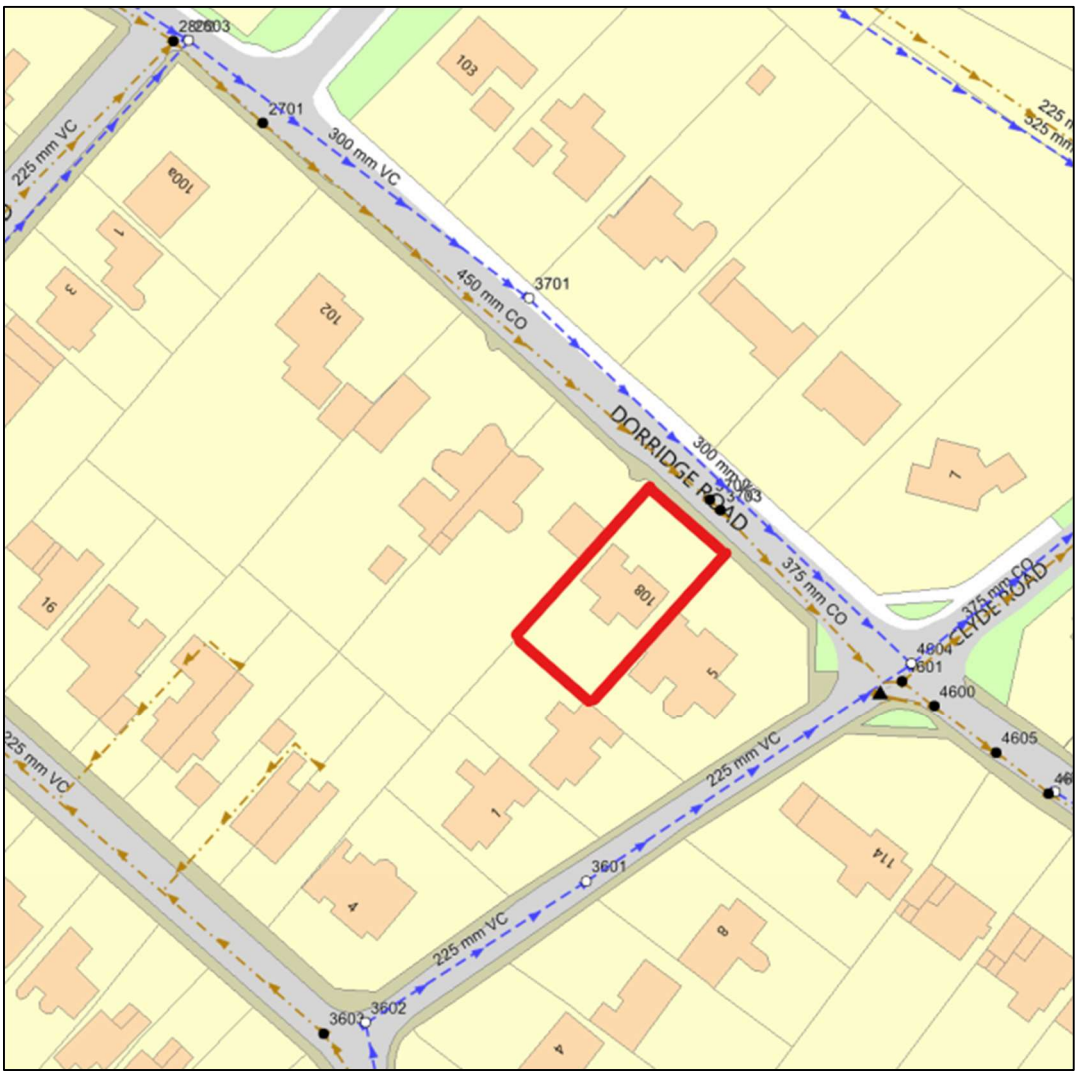


Figure 6: Severn Trent Water Sewer Map Extract

4. To a Combined Sewer

Due to a suitable discharge method higher up the hierarchy, this method is not required.

PRELIMINARY SW STORAGE CALCULATIONS

An initial preliminary storage calculation was computed for the proposed attenuation tank using MicroDrainage software and the output can be seen in the figure below.

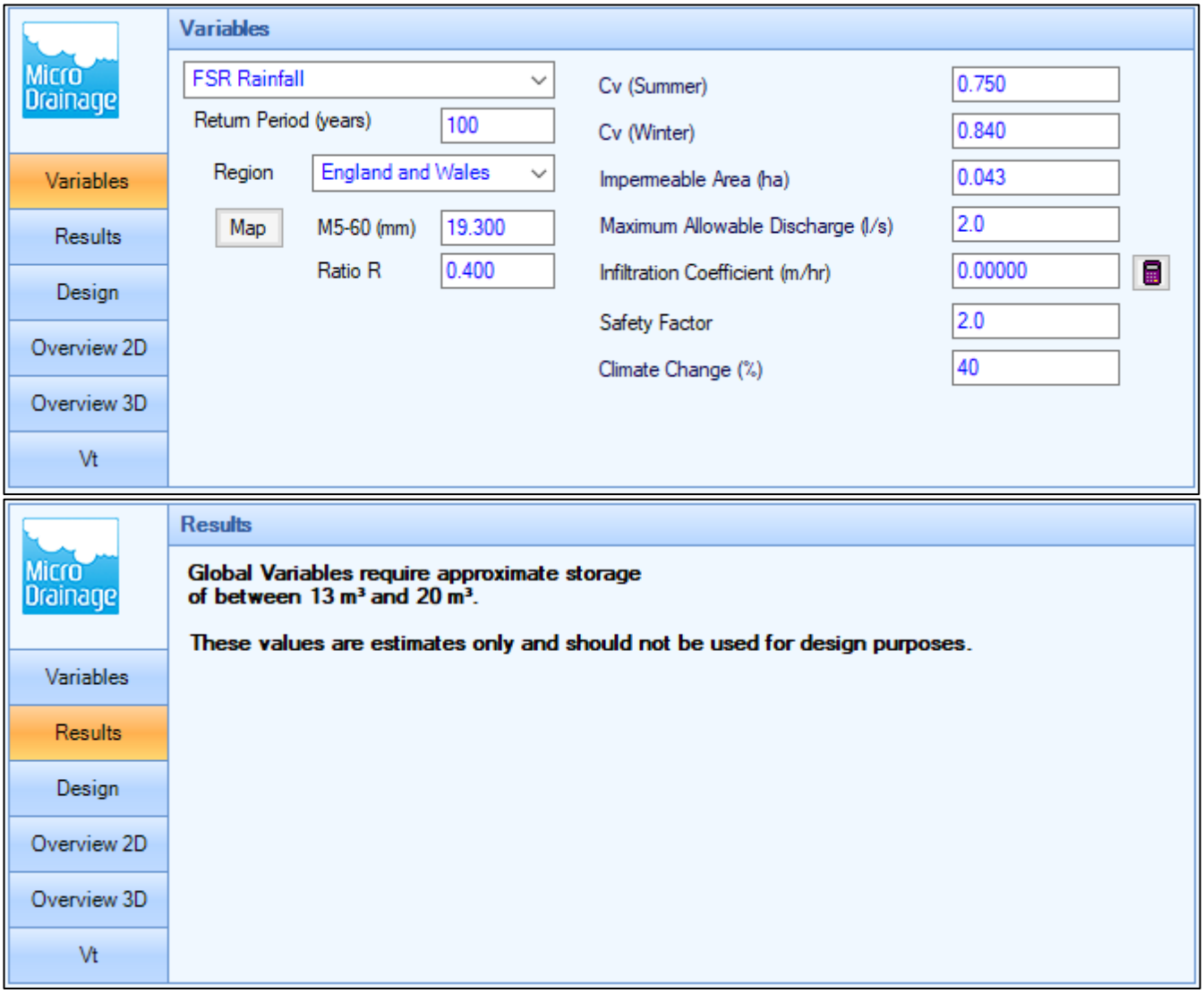


Figure 7: Storage Estimate MicroDrainage Software Output

A median value was calculated between the output results as the most conservative equalling a requirement of 16.5cu.m storage for the proposed development with 430sq.m of impermeable area.

It is proposed to provide this storage using a combination of permeable pavement and below ground cellular storage .

PROPOSED SURFACE WATER DRAINAGE STRATEGY

The site plan below indicates the proposed drainage arrangement for the new dwelling and associated driveway. The full drainage layout can be found within the appendices.

As can be seen, the proposed roof water will be collected via rainwater pipes and will connect into a proposed below-ground drainage system conveying the discharge around the building to a 7.8cu.m cellular attenuation tank located beneath the driveway (dimensions 6.5 x 3 x 0.4mdp). Linear drainage channels have been introduced at the threshold of the garage door and level threshold patio doors at the rear of the property, to mitigate the potential of any surface water entering the proposed dwelling. The driveway will be constructed as a tanked permeable pavement (Type C) with a 320mm deep Type 3 sub-base. Discharge from the permeable pavement will be restricted to 0.5l/s by way of an orifice chamber and cascaded into the final outfall chamber. Calculations are included in the appendices. Should infiltration beneath the drive be possible, the required storage volumes of both the permeable pavement and the cellular attenuation tank will be re-calculated.

In order to achieve the proposed discharge rate of 2l/s from the property, a flow control chamber has been introduced at the outfall of the cellular attenuation tank to restrict the flow to the required flow rate. The site has been designed with the intention to connect into the existing 300Ø Severn Trent Water surface water sewer running down Dorridge Road, via a 'saddle connection' at an approximate invert level of 112.755. This connection is subject to a direct S106 connection application to be carried out by the client / contractor.

It has been assumed that any additional surface water arising from an exceedance event would occur on the driveway and will discharge off site onto Dorridge Road where it would be chanelled via the kerbs into existing road gullies and flow into the existing underground surface water pipe network.

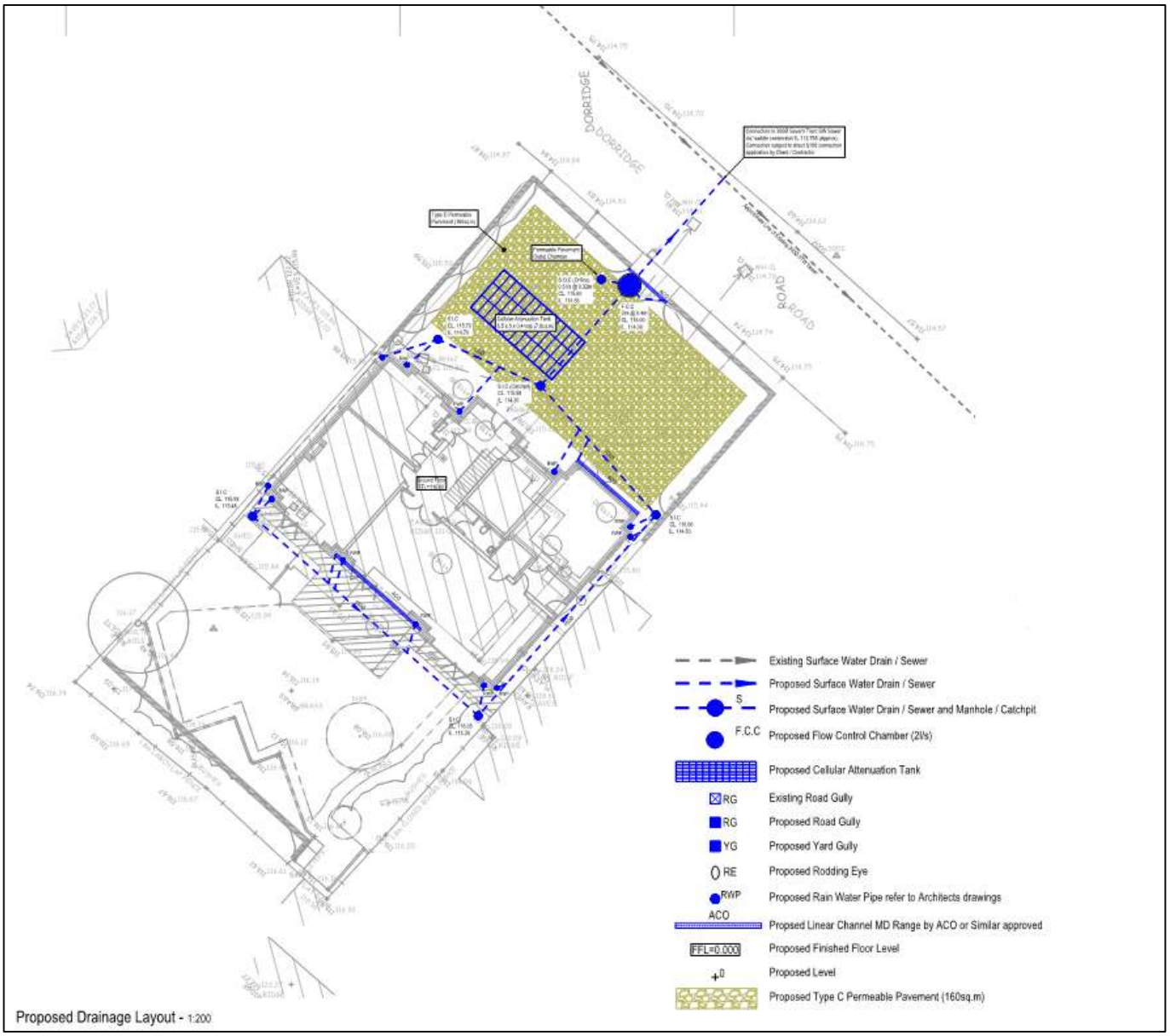


Figure 8: Proposed Surface Water Drainage Layout

CASCADE CALCULATIONS

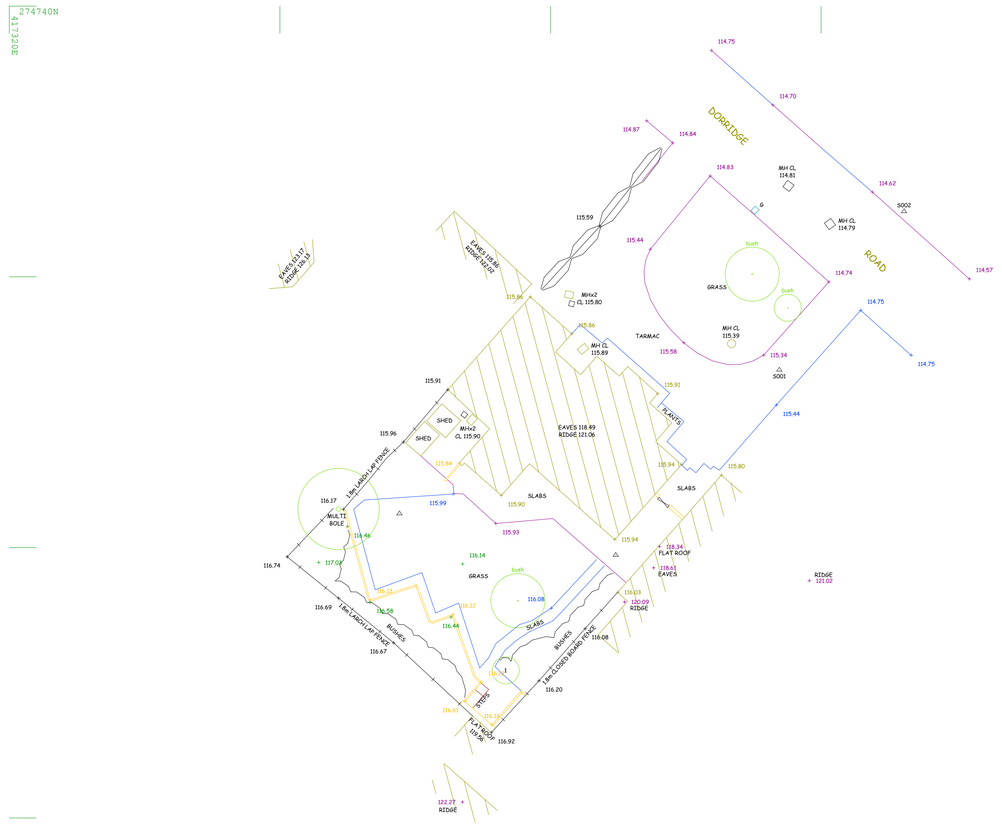
Cascade calculations are included in the appendices and show no flooding in the 100yr + 40% climate change rainfall event.

VERIFICATION

During construction a photographic record will be kept by the contractor and an inspection will be undertaken upon completion to ensure that the installation is acceptable.

APPENDICES

APPENDIX A – TOPOGRAPHICAL SURVEY



Station	Easting	Northing	Level
S001	417376.915	274713.157	115.379
S002	417386.131	274724.829	114.740

NOTES

CO-ORDINATES AND LEVELS RELATE TO ORDNANCE SURVEY DATUM OBTAINED USING GPS EQUIPMENT

PROJECT

108 DORRIDGE ROAD,
DORRIDGE.

CLIENT

CROSS & CRAIG ASSOCIATES

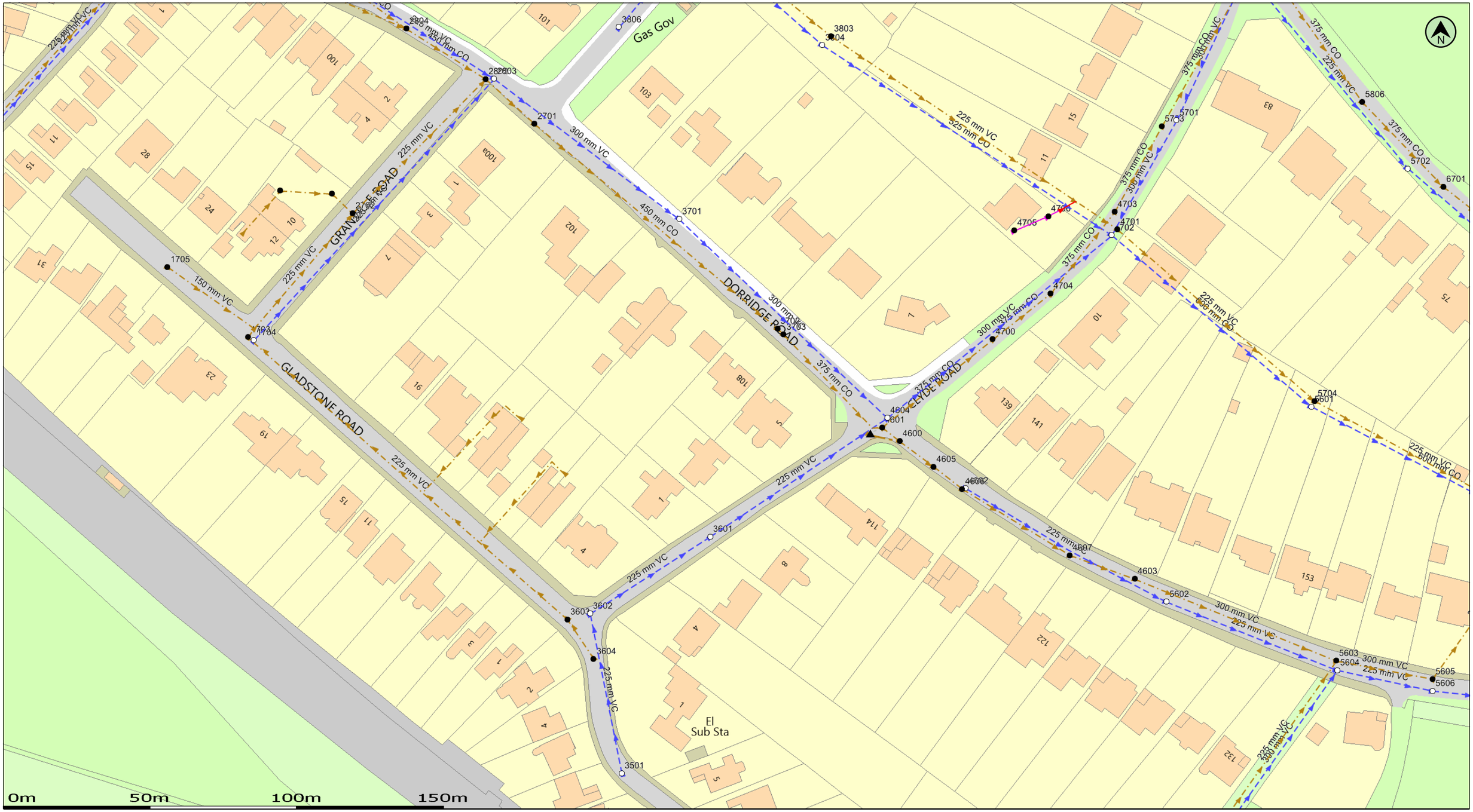
DRAWING

LAND SURVEY

OAKLEY
BUILDING SURVEYORS
23 NEWROAD, WATER ORTON,
BIRMINGHAM, B46 1QP.
Tel 07973 326867

SCALE	DRG No	REV
1:200 (A1)	4735-01	
DATE		
JAN 20		

APPENDIX B – SEVERN TRENT WATER SEWER RECORDS



(c) Crown copyright and database rights 2021 Ordnance Survey 100031673 | Date: 07/10/21 | Scale: 1:1250 | Map Centre: 417365,274699 | Data updated: 14/09/21 | Our Ref: 668999 - 1 | Wastewater Plan A3

- Public Foul Gravity/Lateral Drain
- Public Combined Gravity/Lateral Drain
- Public Surface Water Gravity/Lateral Drain
- Pressure Foul
- Pressure Combined
- Pressure Surface Water
- Highway Drain
- Overflow Pipe
- Disposal Pipe
- Culverted Water Course
- Pumping Station
- Fitting
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Section 104 sewers are shown in green
- Private sewers are shown in magenta

rgardner@ridge.co.uk
5016532 Dorridge Rd

SEVERN TRENT

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as “STW Apparatus” in these general conditions and precautions.

b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.

c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.

d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.

e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).

f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.

2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).

3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.

5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.

6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.

7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.

8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.

9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.

10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.

11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.

12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.

13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,

14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.

16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4705	C	-	0	0
4706	C	-	0	0
	F			
	F			
1703	F	119.98	115.53	4.45
1705	F	120.22	119.47	0.75
2701	F	115.35	112.17	3.18
2702	F	118.11	0	0
2802	F	115.82	112.24	3.58
2804	F	116.43	112.3	4.14
3603	F	120.58	117.87	2.71
3604	F	120.6	118.25	2.35
3702	F	114.8	111.82	2.98
3703	F	114.77	111.17	3.6
3803	F	113.37	111.32	2.05
4600	F	-	0	0
4601	F	114.42	110.76	3.66
4603	F	112.44	109.31	3.13
4605	F	-	0	0
4606	F	-	0	0
4607	F	-	0	0
4700	F	-	110.76	0
4701	F	111.29	109.29	2
4703	F	111.36	109.97	1.39
4704	F	111.72	110.25	1.47
5603	F	110.71	108.38	2.33
5605	F	110.15	108.02	2.13
5703	F	112.29	109.7	2.59
5704	F	110.94	109.26	1.68
5806	F	113.24	108.71	4.53
6701	F	112.59	108.44	4.15
1704	S	119.91	117.71	2.2
2803	S	115.77	113.8	1.97
3501	S	121.61	119.92	1.69
3601	S	117.83	116.08	1.76
3602	S	120.31	118.81	1.5
3701	S	115.02	113.14	1.88
3804	S	113.39	0	0
3806	S	114.43	113.01	1.42
4602	S	113.85	112.17	1.68
4604	S	114.39	112.37	2.03
4702	S	111.36	109.17	2.19
5601	S	110.94	108.29	2.65
5602	S	112.13	110.37	1.76
5604	S	110.82	109.09	1.73
5606	S	110.14	108.42	1.72
5701	S	112.45	110.5	1.95
5702	S	112.99	112.09	0.9

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

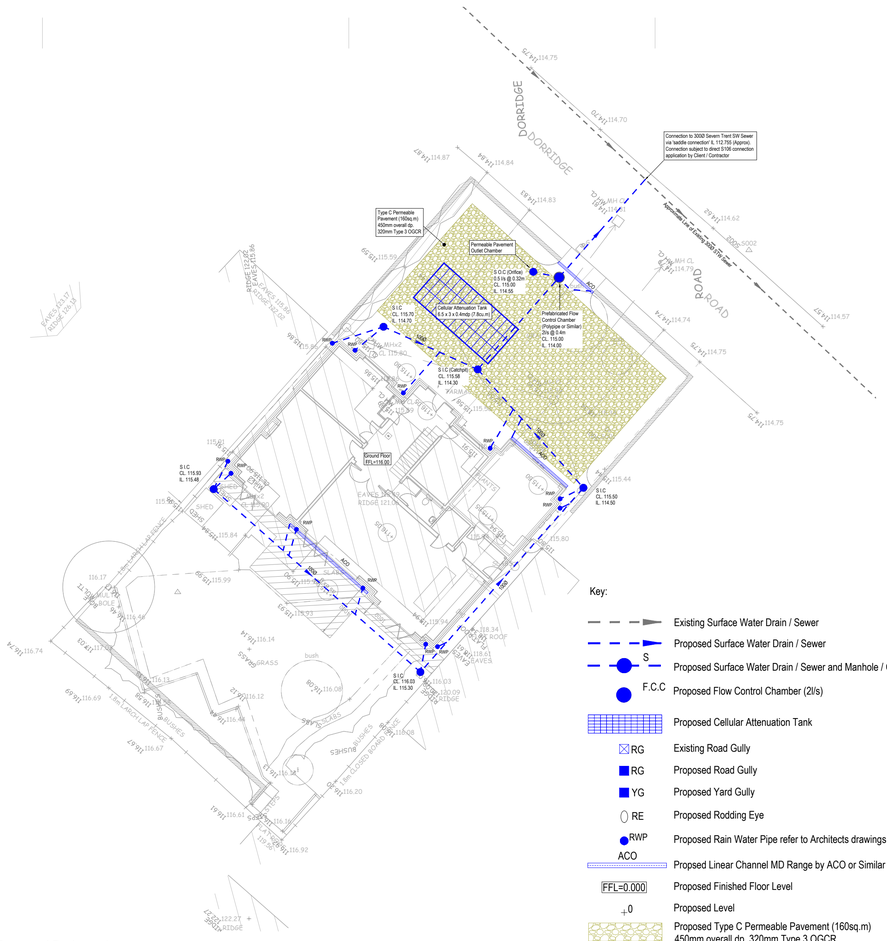
APPENDIX C – PROPOSED BELOW GROUND DRAINAGE LAYOUT

NOTES

1. This drawing shall be read in conjunction with the civil engineering specification, and all relevant Architect's and Engineer's drawings.
2. This document must not be altered, reproduced or distributed without prior written consent of the originator.
3. Do not scale from this document - use figured dimensions only. All dimensions must be checked on site prior to commencement of any related works.
4. Contractor to provide and have an approved method statement prior to works.
5. All setting out to be in accordance with the Architects drawings. Any discrepancies between Ridge and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
6. All levels are in metres above ordnance datum.
7. The Contractor is to comply full with CDM regulations in the course of constructing the works.
8. At the commencement of the works, the Contractor is to carry out trial pits and liaise with utility companies in order to establish the exact position of all existing utility plant in the vicinity of the works and take adequate precautions for their protection.
9. The Contractor is to refer to Health and Safety Executive 'Note 47 - Avoiding Danger from Underground Services' and 'Document G56 - Avoiding Danger from Overhead Electric Lines.'
10. Works on or adjacent to existing public highway will be executed in accordance with the Traffic Safety Code for Road Works and Traffic Signs Manual: Chapter 8.
11. The Contractor will ascertain the CBR value of the subgrade in order to determine the required sub-base / capping thickness. Prior to laying any material, the subgrade must be inspected and any soft spots removed and filled with 6F2 capping material.
12. Prior to the construction of any drainage works, the Contractor is to confirm the invert levels of existing manholes, drains and sewers. Any variations from the designed levels shown on the drawings must be reported to the Drainage Engineer in advance of construction works commencing. All new sewers and drains are to be laid in sequence starting from the outfall location.
13. All drainage to be installed in accordance with relevant Building Regulation documents and current Sewers for Adoption. Connections to public sewers are to be agreed and inspection by the Water Authority.
14. All drain and sewer pipes are Ø100mm and laid soffit to soffit, unless shown otherwise.
15. Invert to base of soil stack bends to be 450mm below lowest branch connection for up to three storey buildings: for buildings up to five storeys, the invert to the base of soil stack bends should not be less than 750mm. All foul and surface water drainage stacks are to have above ground rodding access. Refer to above ground drainage layout(s) by others.
16. All below ground connections are to match above ground outlet size, minimum Ø100mm. SVPs are to project 100mm above finished floor level.
17. All internal manholes and inspection chambers to have double sealed recessed covers to suit floor finishes as defined by the Architect.
18. All external covers in non-tarmac areas are to have recessed covers to suit the paving material.
19. A CCTV survey and report in WINCAN format for all new drainage will be required prior to 'as built' drawing being issued.
20. The Contractor is responsible for the traffic safety and management associated with the construction of the works. Works will not commence on the existing highway until their traffic management proposals have been agreed with Highway Authority.
21. Where the works involve the obstruction of a footway, the Contractor will provide an alternative safe footway properly signed, guarded and lit.
22. Where one-way traffic is unavoidable, traffic will be controlled by a proper system of vehicle-actuated traffic signals or manual stop / go signs and during the hours of darkness, by a proper system of vehicle-actuated traffic signals, all to the approval of Highway Authority.
23. 65mm Minimum thickness tactile paving, coloured buff will be incorporated at all pedestrian crossings in accordance with the Department for Transport and Regions document "Guidance on the Use of Tactile Paving Surfaces." (DETR No. 1998)
24. All signs and road markings will be in accordance with the "Traffic Signs Regulations and General Directions 2016". (TSRGD 2016)
25. All excavation and backfilling work in the existing highway to be in accordance with the provisions of the New Street Works Act 1991 or that specified on the working drawings.
26. All highways works to be carried out in accordance with Highway Authority's highway standards, to the satisfaction of the Highway Authority Section 278 Inspector and in accordance with the Specification for Highway Works.
27. Gullies, gully connections, drains, manholes, catch pit, soakaways, headwalls and other drainage structures intended to convey only highway water are to be constructed in accordance with the specification of Highway Authority and to the satisfaction of the Highway Inspector.
28. Where existing junctions and accesses are to remain in operation within the works during the construction process, the Contractor will ensure that access to these units remains available at all times.
29. Highways in the vicinity of the works must be kept free from mud, debris and dust falling from vehicles or wheels of vehicles connected with the works. Where the deposits of debris and mud are unavoidable, warning signs must be displayed whilst work is in progress and affected carriageways / footways must be regularly cleaned.

Source:

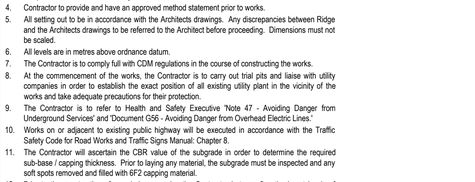
- Topographical survey by ?
  Drawing No. ? dated ?
- Architect's layout by ?
  Drawing No. ? dated ?

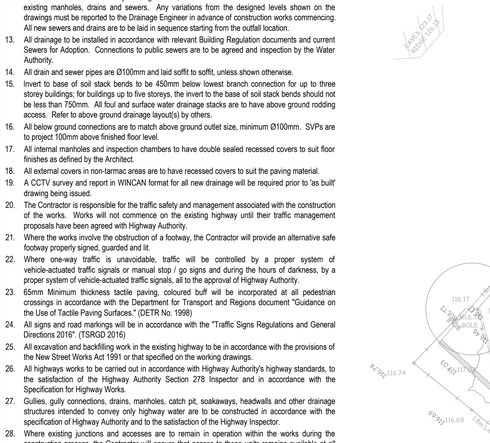


Proposed Drainage Layout - 1:200

Key:

- Existing Surface Water Drain / Sewer
- Proposed Surface Water Drain / Sewer
- S — Proposed Surface Water Drain / Sewer and Manhole / Catchpit
- F.C.C — Proposed Flow Control Chamber (2l/s)
- Proposed Cellular Attenuation Tank
- RG — Existing Road Gully
- RG — Proposed Road Gully
- YG — Proposed Yard Gully
- RE — Proposed Rodding Eye
- RWP — Proposed Rain Water Pipe refer to Architects drawings
- ACO — Propsed Linear Channel MD Range by ACO or Similar approved
- FFL=0.000 — Proposed Finished Floor Level
- 0 — Proposed Level
- Proposed Type C Permeable Pavement (160sq.m) 450mm overall dp. 320mm Type 3 OGCR





Rocker Pipe Details:	
Nominal Diameter (mm)	Effective (Maximum) Length (m)
150 to 600	0.60
675 to 750	1.00
Over 750	1.25

Typical Flexible Access Chamber Detail - Type 4

MAXIMUM DEPTH FROM GROUND LEVEL TO PIPE SOFFIT 2.0m (Non Entry)

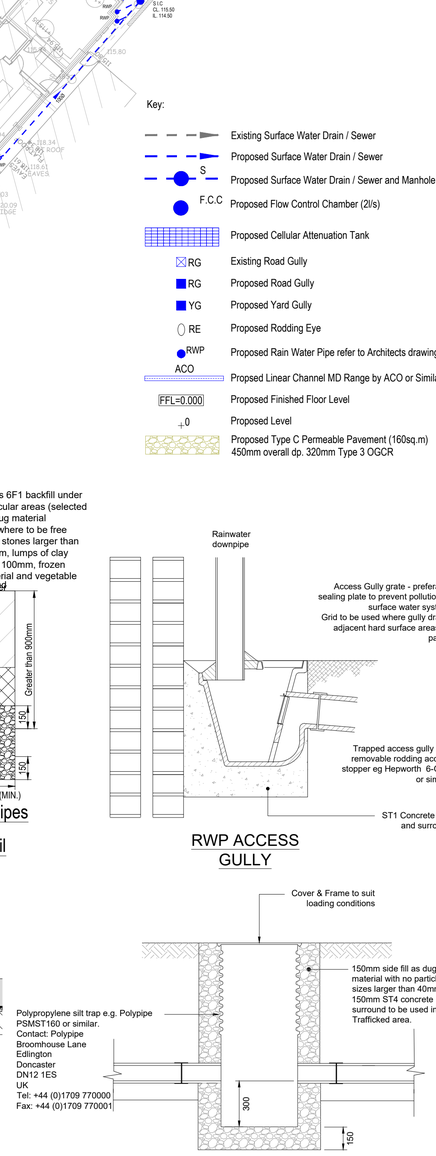
Plastic chambers and rings shall comply with BS EN 13598-1 and BS EN 13598-2 or have equivalent independent approval

Type S Pipe Bedding Detail

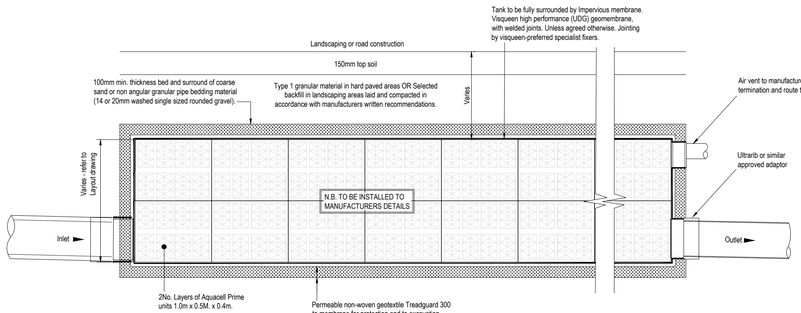
External Rainwater Pipe Detail

NTS

RWP ACCESS GULLY

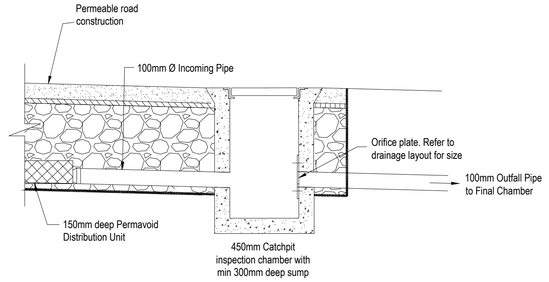


TYPICAL SILT TRAP MANHOLE DETAIL (S.ST)

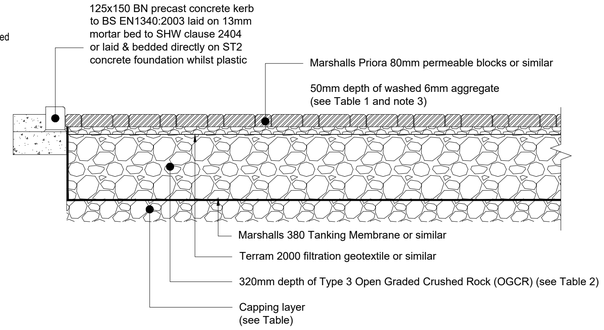


Geocellular Online Attenuation Tank

Refer also to manufacturer's instructions



SECTION THROUGH PERMEABLE PAVING OUTLET



Permeable Block Paving Construction

Marshall's Load Category 4 - Emergency Large Goods Vehicles (100 standard axles)

Table 2

Laying Course Grading Requirements	
Recommended BS EN 12620 aggregate grading (mm)	2/6.3
Recommended BS EN 12620 grading/tolerance category	Gc80/20
Sieve size (mm)	Percentage by mass passing ISO 565 sieve
31.5	
20	
14	100
10	98 to 100
6.3	80 to 99
4	
2	0 to 20
1	0 to 5
0.063	0 to 2

OGCR Sub-Base Grading Requirements		
Recommended BS EN 12620 aggregate grading (mm)	4/20	
Recommended BS EN 12620 grading/tolerance category	Gc80/20	GTc20/15
Sieve size (mm)	Percentage by mass passing ISO 565 sieve	
31.5	98 to 100	
20	90 to 99	
14		
10	25 to 70	
6.3		
4	0 to 15	
3.15		
2	0 to 5	

Table 3

Subgrade CBR Value	Capping Layer Thickness (mm)
5%	-
4%	100
3%	125
2%	175
1%	300

Notes:

1. For CBR's of <5% incorporation of subgrade improvement layers are required. (See Table 3)
2. The Open Graded Crushed Rock shall be in accordance with BS 7533-13:2009
3. Sound clean non friable sub-base material, free from clay or any other deleterious material. Sub-base grading to BS EN 13242:2002 as shown in table 1.
4. Should an alternative material be proposed it is the responsibility of the originator of the alternative material to prove its suitability.
5. The pavement must be protected at all times during and after construction from any activity or material to prove its suitability.

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CDM REGULATIONS 2015
SIGNIFICANT OR NON-OBVIOUS RISKS AND RISKS WHICH ARE DIFFICULT TO MANAGE ARE IDENTIFIED ON THIS DRAWING USING THE FOLLOWING SYMBOL IDENTIFIED TO THE RIGHT WITH BRIEF ACCOMPANYING TEXT. FOR FURTHER DETAILS OF THE RISKS IDENTIFIED BY DESIGNERS, REFERENCE SHOULD BE MADE TO CDM HAZARD REGISTER.

N

2 0 2 4 6 8 10 m
SCALE 1:200

REV	DESCRIPTION	DATE	BY	CHKD
P2	Amended to Client Requirements	15/10/2021	MM	RG
P1	First Issue	08/10/2021	MM	RG

ORIGINATOR:

RIDGE

THE COWYARDS
BLENHEIM PARK
OXFORD ROAD
WOODSTOCK, OX20 1QR

TEL: 01993 815000
WWW.RIDGE.CO.UK

CLIENT:

Mr S Mattine

IN ASSOCIATION WITH:

Cross and Craig Associates Ltd

PROJECT:

108 Dorridge Road
Dorridge, B93 8BP

TITLE:

Below Ground Surface Water Drainage Layout and Details

ENG/TECH:	CSE:	ICSE:	SCALE:	As Shown	@ A1
MM	RG		STATUS ISSUE:	Information	

STATUS: INFORMATION

UNLESS ISSUED FOR CONSTRUCTION - WORKS AT CLIENT/CONTRACTORS RISK

ISO 19650 STATUS: S2 - Suitable for Information

PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
5016532	RDG	XX	ST	PL	C	0501	P2

APPENDIX D – CASCADE CALCULATIONS

Cascade Summary of Results for pp.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	tank.SRCX	(None)

Half Drain Time : 112 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	114.804	0.254	0.0	0.4	0.4	2.8	Flood Risk
30 min Summer	114.846	0.296	0.0	0.4	0.4	3.8	Flood Risk
60 min Summer	114.875	0.325	0.0	0.5	0.5	4.6	Flood Risk
120 min Summer	114.888	0.338	0.0	0.5	0.5	5.0	Flood Risk
180 min Summer	114.888	0.338	0.0	0.5	0.5	5.0	Flood Risk
240 min Summer	114.885	0.335	0.0	0.5	0.5	4.9	Flood Risk
360 min Summer	114.873	0.323	0.0	0.5	0.5	4.5	Flood Risk
480 min Summer	114.859	0.309	0.0	0.5	0.5	4.1	Flood Risk
600 min Summer	114.846	0.296	0.0	0.4	0.4	3.8	Flood Risk
720 min Summer	114.833	0.283	0.0	0.4	0.4	3.5	Flood Risk
960 min Summer	114.808	0.258	0.0	0.4	0.4	2.9	Flood Risk
1440 min Summer	114.766	0.216	0.0	0.4	0.4	2.0	Flood Risk
2160 min Summer	114.718	0.168	0.0	0.3	0.3	1.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.351	0.0	3.1	24
30 min Summer	86.314	0.0	4.4	37
60 min Summer	54.074	0.0	5.7	64
120 min Summer	32.762	0.0	7.0	104
180 min Summer	24.128	0.0	7.8	136
240 min Summer	19.312	0.0	8.4	170
360 min Summer	14.018	0.0	9.2	238
480 min Summer	11.175	0.0	9.8	306
600 min Summer	9.366	0.0	10.2	372
720 min Summer	8.105	0.0	10.6	436
960 min Summer	6.446	0.0	11.3	564
1440 min Summer	4.660	0.0	12.1	808
2160 min Summer	3.364	0.0	13.0	1160

Cascade Summary of Results for pp.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
2880 min Summer	114.683	0.133	0.0	0.3	0.3	0.8	O K
4320 min Summer	114.638	0.088	0.0	0.2	0.2	0.3	O K
5760 min Summer	114.612	0.062	0.0	0.2	0.2	0.2	O K
7200 min Summer	114.597	0.047	0.0	0.2	0.2	0.1	O K
8640 min Summer	114.587	0.037	0.0	0.1	0.1	0.1	O K
10080 min Summer	114.581	0.031	0.0	0.1	0.1	0.0	O K
15 min Winter	114.824	0.274	0.0	0.4	0.4	3.2	Flood Risk
30 min Winter	114.868	0.318	0.0	0.5	0.5	4.4	Flood Risk
60 min Winter	114.900	0.350	0.0	0.5	0.5	5.3	Flood Risk
120 min Winter	114.915	0.365	0.0	0.5	0.5	5.7	Flood Risk
180 min Winter	114.914	0.364	0.0	0.5	0.5	5.7	Flood Risk
240 min Winter	114.908	0.358	0.0	0.5	0.5	5.5	Flood Risk
360 min Winter	114.890	0.340	0.0	0.5	0.5	5.0	Flood Risk
480 min Winter	114.871	0.321	0.0	0.5	0.5	4.5	Flood Risk
600 min Winter	114.852	0.302	0.0	0.5	0.5	3.9	Flood Risk
720 min Winter	114.833	0.283	0.0	0.4	0.4	3.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2880 min Summer	2.667	0.0	13.6	1508
4320 min Summer	1.920	0.0	14.3	2208
5760 min Summer	1.519	0.0	14.8	2936
7200 min Summer	1.266	0.0	15.0	3648
8640 min Summer	1.090	0.0	15.2	4352
10080 min Summer	0.961	0.0	15.2	5128
15 min Winter	131.351	0.0	3.6	24
30 min Winter	86.314	0.0	5.0	37
60 min Winter	54.074	0.0	6.4	64
120 min Winter	32.762	0.0	8.0	116
180 min Winter	24.128	0.0	8.9	144
240 min Winter	19.312	0.0	9.5	184
360 min Winter	14.018	0.0	10.4	258
480 min Winter	11.175	0.0	11.1	330
600 min Winter	9.366	0.0	11.6	398
720 min Winter	8.105	0.0	12.0	464

Cascade Summary of Results for pp.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	114.798	0.248	0.0	0.4	0.4	2.7	Flood Risk
1440 min Winter	114.741	0.191	0.0	0.4	0.4	1.6	Flood Risk
2160 min Winter	114.680	0.130	0.0	0.3	0.3	0.7	O K
2880 min Winter	114.642	0.092	0.0	0.2	0.2	0.4	O K
4320 min Winter	114.604	0.054	0.0	0.2	0.2	0.1	O K
5760 min Winter	114.587	0.037	0.0	0.1	0.1	0.1	O K
7200 min Winter	114.579	0.029	0.0	0.1	0.1	0.0	O K
8640 min Winter	114.576	0.026	0.0	0.1	0.1	0.0	O K
10080 min Winter	114.574	0.024	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	6.446	0.0	12.7	594
1440 min Winter	4.660	0.0	13.8	832
2160 min Winter	3.364	0.0	14.8	1172
2880 min Winter	2.667	0.0	15.5	1508
4320 min Winter	1.920	0.0	16.4	2200
5760 min Winter	1.519	0.0	16.9	2944
7200 min Winter	1.266	0.0	17.3	3576
8640 min Winter	1.090	0.0	17.5	4280
10080 min Winter	0.961	0.0	17.6	5072

Cascade Rainfall Details for pp.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.005	4	8	0.005	8	12	0.005

Cascade Model Details for pp.SRCX

Storage is Online Cover Level (m) 115.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000
Membrane Percolation (mm/hr)	1000
Max Percolation (l/s)	44.4
Safety Factor	2.0
Porosity	0.30
Invert Level (m)	114.550
Width (m)	17.0
Length (m)	9.4
Slope (1:X)	17.0
Depression Storage (mm)	5
Evaporation (mm/day)	3
Membrane Depth (m)	130

Orifice Outflow Control

Diameter (m) 0.020 Invert Level (m) 114.550
Discharge Coefficient 0.600

Cascade Summary of Results for tank.SRCX

Upstream Structures	Outflow To	Overflow To
pp.SRCX	(None)	(None)

Half Drain Time : 45 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	114.462	0.262	0.0	1.6	1.6	4.8	O K
30 min Summer	114.520	0.320	0.0	1.7	1.7	5.9	O K
60 min Summer	114.550	0.350	0.0	1.8	1.8	6.5	O K
120 min Summer	114.556	0.356	0.0	1.8	1.8	6.6	O K
180 min Summer	114.542	0.342	0.0	1.8	1.8	6.3	O K
240 min Summer	114.524	0.324	0.0	1.8	1.8	6.0	O K
360 min Summer	114.487	0.287	0.0	1.6	1.6	5.3	O K
480 min Summer	114.456	0.256	0.0	1.5	1.5	4.7	O K
600 min Summer	114.431	0.231	0.0	1.5	1.5	4.3	O K
720 min Summer	114.409	0.209	0.0	1.4	1.4	3.9	O K
960 min Summer	114.376	0.176	0.0	1.3	1.3	3.3	O K
1440 min Summer	114.333	0.133	0.0	1.1	1.1	2.5	O K
2160 min Summer	114.296	0.096	0.0	0.9	0.9	1.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.351	0.0	8.8	19
30 min Summer	86.314	0.0	11.8	31
60 min Summer	54.074	0.0	15.0	50
120 min Summer	32.762	0.0	18.3	84
180 min Summer	24.128	0.0	20.3	118
240 min Summer	19.312	0.0	21.7	152
360 min Summer	14.018	0.0	23.7	216
480 min Summer	11.175	0.0	25.2	280
600 min Summer	9.366	0.0	26.4	344
720 min Summer	8.105	0.0	27.4	404
960 min Summer	6.446	0.0	29.0	526
1440 min Summer	4.660	0.0	31.4	768
2160 min Summer	3.364	0.0	33.9	1128

Cascade Summary of Results for tank.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
2880 min Summer	114.275	0.075	0.0	0.7	0.7	1.4	O K
4320 min Summer	114.255	0.055	0.0	0.6	0.6	1.0	O K
5760 min Summer	114.247	0.047	0.0	0.5	0.5	0.9	O K
7200 min Summer	114.242	0.042	0.0	0.4	0.4	0.8	O K
8640 min Summer	114.238	0.038	0.0	0.3	0.3	0.7	O K
10080 min Summer	114.235	0.035	0.0	0.3	0.3	0.7	O K
15 min Winter	114.495	0.295	0.0	1.7	1.7	5.5	O K
30 min Winter	114.562	0.362	0.0	1.9	1.9	6.7	O K
60 min Winter	114.596	0.396	0.0	1.9	1.9	7.3	O K
120 min Winter	114.594	0.394	0.0	1.9	1.9	7.3	O K
180 min Winter	114.569	0.369	0.0	1.9	1.9	6.8	O K
240 min Winter	114.541	0.341	0.0	1.8	1.8	6.3	O K
360 min Winter	114.488	0.288	0.0	1.6	1.6	5.3	O K
480 min Winter	114.447	0.247	0.0	1.5	1.5	4.6	O K
600 min Winter	114.415	0.215	0.0	1.4	1.4	4.0	O K
720 min Winter	114.389	0.189	0.0	1.3	1.3	3.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2880 min Summer	2.667	0.0	35.7	1476
4320 min Summer	1.920	0.0	38.2	2204
5760 min Summer	1.519	0.0	39.9	2928
7200 min Summer	1.266	0.0	41.2	3672
8640 min Summer	1.090	0.0	42.2	4392
10080 min Summer	0.961	0.0	43.0	5072
15 min Winter	131.351	0.0	9.9	19
30 min Winter	86.314	0.0	13.3	32
60 min Winter	54.074	0.0	16.9	52
120 min Winter	32.762	0.0	20.6	90
180 min Winter	24.128	0.0	22.8	126
240 min Winter	19.312	0.0	24.4	162
360 min Winter	14.018	0.0	26.6	230
480 min Winter	11.175	0.0	28.3	294
600 min Winter	9.366	0.0	29.7	360
720 min Winter	8.105	0.0	30.8	422

Cascade Summary of Results for tank.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	114.351	0.151	0.0	1.2	1.2	2.8	O K
1440 min Winter	114.306	0.106	0.0	0.9	0.9	2.0	O K
2160 min Winter	114.272	0.072	0.0	0.7	0.7	1.3	O K
2880 min Winter	114.255	0.055	0.0	0.6	0.6	1.0	O K
4320 min Winter	114.244	0.044	0.0	0.4	0.4	0.8	O K
5760 min Winter	114.238	0.038	0.0	0.3	0.3	0.7	O K
7200 min Winter	114.234	0.034	0.0	0.3	0.3	0.6	O K
8640 min Winter	114.231	0.031	0.0	0.2	0.2	0.6	O K
10080 min Winter	114.229	0.029	0.0	0.2	0.2	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	6.446	0.0	32.7	544
1440 min Winter	4.660	0.0	35.4	784
2160 min Winter	3.364	0.0	38.1	1148
2880 min Winter	2.667	0.0	40.2	1472
4320 min Winter	1.920	0.0	43.0	2208
5760 min Winter	1.519	0.0	45.1	2904
7200 min Winter	1.266	0.0	46.6	3616
8640 min Winter	1.090	0.0	47.8	4408
10080 min Winter	0.961	0.0	48.8	5080

Cascade Rainfall Details for tank.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.023

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.012	4	8	0.011

Cascade Model Details for tank.SRCX

Storage is Online Cover Level (m) 115.000

Cellular Storage Structure

Invert Level (m)	114.200
Infiltration Coefficient Base (m/hr)	0.00000
Infiltration Coefficient Side (m/hr)	0.00000
Safety Factor	2.0
Porosity	0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	19.5	0.0	0.401	0.0	0.0
0.400	19.5	0.0			

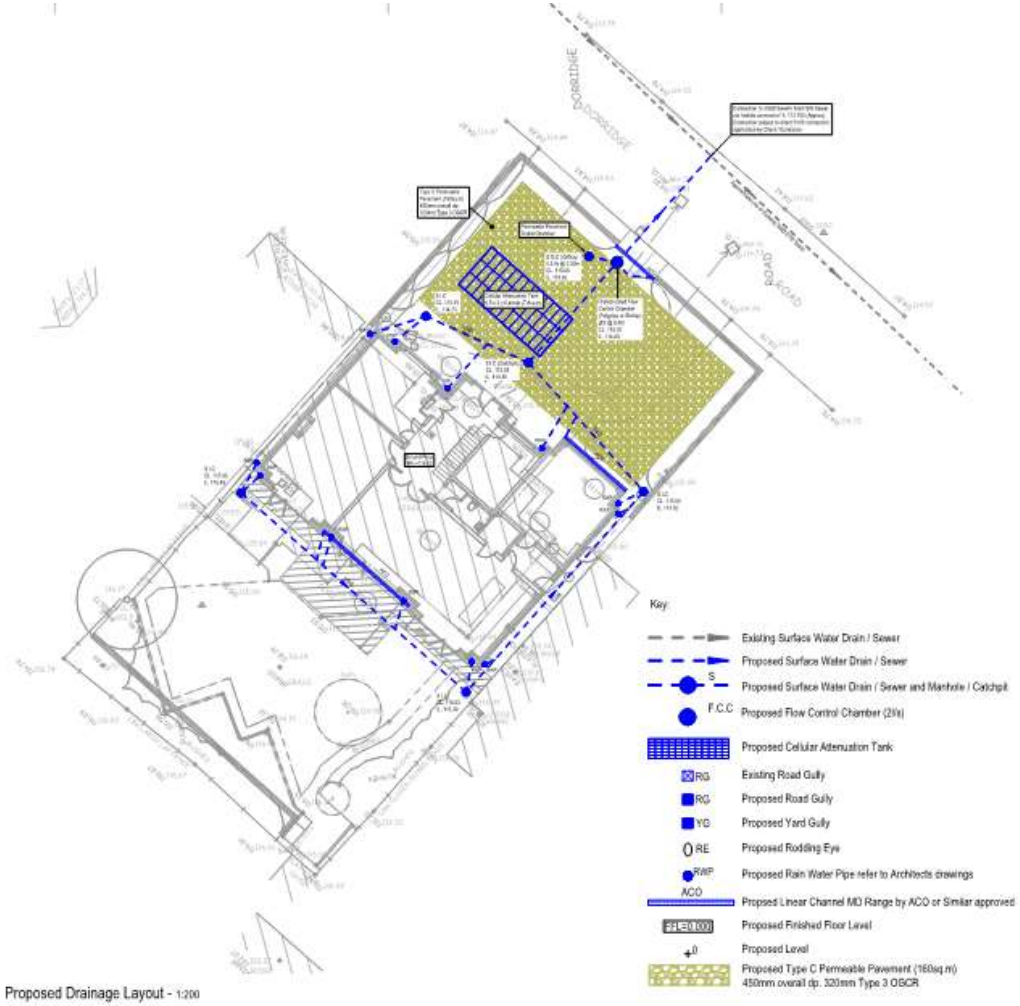
Orifice Outflow Control

Diameter (m)	0.039	Invert Level (m)	114.200
Discharge Coefficient	0.600		

APPENDIX E – MAINTENANCE SCHEDULE

Surface Water / SuDS - Maintenance Schedule (3 pages) – To be read in conjunction with drawing Number: C-0501 (extract included below)

Site Name: Replacement Dwelling at 108 Dorridge Road, Dorridge, Solihull, B93 8BP
Person responsible for inspections and maintenance: Homeowner or Private Maintenance Company To be Confirmed



Proposed Drainage Layout - 1:200

Site / Drainage layout

SuDSMS – Sept 2021

Surface Water / SuDS - Maintenance Schedule (3 pages) – To be read in conjunction with drawing Number: C-0501 (extract included below)

System Description

The rainwater from the proposed building is discharged into a below ground drainage system routed to a cellular attenuation tank beneath the driveway with a flow control chamber at the outfall restricting the flow to 2l/s. The driveway is constructed as an impermeable pavement and will drain into the main existing below ground drainage system.

Maintenance Schedule

SuDS/SW Element	Inspections/maintenance item and action taken	Frequency (Months)	Date undertaken	Next scheduled inspection	Initials
General Site Maintenance	**Regular Maintenance:** • Inspection of external paved surfaces • Clearance of gutters and downpipe filters. Access to gutters via mobile platform required. • Root trimming to drains if required by specialist contractor to be determined by CCTV survey.	1 12 5 years			
Channels and Gullies	**Regular Maintenance:** • Remove litter as required. • Remove silt and oil from channels and gully traps – Lift covers.	1 12			
Silt Chambers / Catch pits	**Regular Maintenance:** • Inspect chambers for silt build up and remove silt if discovered. Lift chamber covers for inspection.	12			

Surface Water / SuDS - Maintenance Schedule (3 pages) – To be read in conjunction with drawing Number: C-0501 (extract included below)

Non-Permeable Paved surfaces	**Routine maintenance:** • Remove debris and litter from the surface • Cut back vegetation to surrounding landscaping • Manual brushing	As required Routine landscaping maintenance 1			