DEVTEC PROPERTIES LTD

FIRS FARM, COPTHORNE COMMON ROAD, WEST SUSSEX, RH10 3LF

Flood Risk Assessment and Drainage Strategy

June 2025
(Revised December 2025)

eas ltd
Environmental Assessment Services Ltd

REPORT DATA SHEET

Requirement	**Data**
Report Reference	821/DevtecProperties/FirsFarm/Flood&Drainage
Date	June 2025
Client	Devtec Properties
Report type	Flood Risk Assessment and Drainage Strategy
Purpose	Planning
Revisions	July 2025, December 2025
Prepared by	Eur Ing Malcolm McKemey BSc (Hons), CEng, Cenv, MICE, MCIWEM, MIEnvSc  Signed
Approved by	Xanthe Lyford BSc (Hons)  Signed

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CONTENTS

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1. BACKGROUND, EXISTING SITE & PROPOSED DEVELOPMENT

1.1 The site lies within a mixed semi-rural area, located to the south of the A264 and some 2 km south of the village of Copthorne. There is a small industrial estate (Dukes Business Park) immediately to the south of the site. The Ordnance Survey Grid reference for the centre of the site is TQ 3342 3907. The site elevation is approximately + 95 m OD. See Figure 1 in Appendix A for the Site Location.

1.2 The site currently comprises a former farmyard containing seven buildings (former stables, barns, animal enclosures and a disused prefabricated residence), an area laid to lawn, a variety of paved areas and an access driveway. The site area is 4370 m^2. See Figure 2 in Appendix A for the existing site layout.

1.3 It is proposed to redevelop the site to provide 5 dwelling houses with associated amenity space and parking; hard and soft landscaping; cycle and refuse storage; change of use of land to residential garden for existing dwelling house and associated access works. See Figure 3 in Appendix A for the proposed development plan.

2. GEOLOGY & HYDROGEOLOGICAL CONSIDERATIONS

2.1 According to the BGS Geological Survey, the site lies on Cretaceous Upper Tunbridge Wells Sand (sandstone & siltstone) (UTWS). The DEFRA MAGIC site describes the soil at the site as "*slightly acid loamy & clayey soils with impeded drainage*". The UTWS is classified as a Secondary A aquifer. It is in a high groundwater vulnerability area but is not in a groundwater protection zone. Trial pits excavated on site revealed 0.15 m of friable loamy topsoil over silty clay (UTWS)

3. FLOOD RISK ASSESSMENT

3.1 The Environment Agency's Flood Map for Planning shows the site lying within Flood Zone 1 (low risk of fluvial flooding, less than 0.1% chance of flooding in any year).

3.2 The site is shown to be at very low risk of surface water flooding. An area to the south of the site is shown to be at some risk of surface water flooding.

3.3 Flooding from groundwater or reservoirs is considered unlikely in this area. There does not appear to be any history of sewer flooding at the site.

3.4 See Appendix B: for the Environment Agency's Flood Risk Maps.

4 EXISTING SITE DRAINAGE

4.1 The site was visited on Thursday 26 June 2025.

4.2 There appears to be no formal surface water drainage at the site beyond gutters and downpipes on the various buildings. The site drains by surface runoff following the fall of the land to the south and west, across the access road and through the adjacent field. Residents adjacent to the site stated that the location drains satisfactorily and has not flooded in their memory. There are no watercourses or ditches in the immediate vicinity of the site, this is largely due to the site being slightly elevated compared with the surrounding land.

4.3 There is a public foul sewer in the highway immediately to the north of the site. It is assumed that the existing residence adjacent to the site drains to this sewer. See Appendix F for the Southern Water sewer map for the site.

5 SURFACE WATER DRAINAGE OPTIONS

5.1 There is a general requirement that new drainage systems should be sustainable (SuDS) and that flow leaving the site should not exceed the Greenfield flow rate, including both surface water and sewage effluent.

5.2 The area of impermeable surface will be reduced by the proposed redevelopment. The existing area of impermeable surface is approximately 2100 m^2 and the redeveloped site impermeable surfacing will have an area of approximately 1400 m^2. This is largely due to the replacement of much of the farmyard surface with the gardens of three of the proposed houses. This represents betterment in terms of sustainability.

5.3 The Greenfield runoff rate for the site has been calculated using the UK SuDS tools, the results are shown in See Appendix C and summarised in Table 5.1 below:

TABLE 5.1
GREENFIELD RUNOFF RATES

Return period	Flow rates (l/s)
1 in 1 year	2.2
1 in 10 year	4.1
1 in 30 year	5.8
1 in 100 year	8.1
1 in 200 year	9.5

5.4 The current non-statutory guidance indicates that the maximum discharge permitted to leave the site from the drained area post development should not exceed the 1 in 1 year return period flow rate (2.2 l/s), or as near as practicable. See Appendix C for the HR Greenfield Flow Rate Tool Data.

5.5 The preferred sustainable (SuDS) surface water drainage options are:

i. Re-use (including rainwater harvesting).
ii. Discharge to soakaway (where no flow leaves the site).
iii. Attenuation storage with controlled flow to a watercourse.
iv. Attenuation storage with controlled flow to a sewer.

5.6 Rainwater harvesting for garden irrigation, and possibly lavatory flushing, should be considered.

5.7 Discharge to soakaway requires suitably permeable ground. To establish the suitability of ground for soakaway requires percolation testing. This was carried out at two locations across the site (see Figure 2). The test pits revealed a layer (150 mm) of friable topsoil over dense silty clay. Infiltration was minimal below the topsoil and indicated a permeability coefficient of $<1x10^{-6}$ m/s. This suggested that the underlying soil type is not suitable for drainage to soakaway.

5.8 The alternative to drainage to soakaway is drainage to attenuation storage where excess surface water is stored on site, either in a pond, gully, swale or underground attenuation storage unit. The surface water is allowed to discharge at a maximum of the Greenfield flow rate (2.2 l/s) via a flow-control vortex valve or orifice plate into a nearby watercourse (in this case there is no nearby watercourse or drainage ditch and discharge of surface water to the nearby foul sewer in the highway is unlikely to be an option). A hybrid solution with attenuation storage in an underground storage tank (AquaCell Core or similar) under the access road and controlled discharge via a seepage trench, to mirror the present drainage pattern, but with reduced peak flows, has been deemed appropriate in this instance. The use of permeable paving in the paved areas would further reduce the surface water runoff rate and make the development more sustainable.

5.9 The NPPF states: *"Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control the flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible facilitating improvements in water quality and biodiversity"* Additional SuDS measures to mitigate the impact of the development by decreasing the runoff flow rates and increasing sustainability could include a rain garden or pond.

5.10 An attenuation storage volume of 104 m^3 has been calculated using the MasterDrain drainage network model. An underground tank located beneath the east end of the access road would be suitable for the attenuation storage of surface water on this site.

5.11 The proposed drainage layout is shown in Figure 4. Please note that, in the absence of a topographical survey of the site, the levels given in the outline design are provisional. Output from the drainage design model can be seen in Appendix D.

5.12 **Design Storm**

5.12.1 The surface water drainage system has been designed for the 30-year return period event plus a 35% allowance for climate change and tested for surcharge for the 1 in 100-year return period event (1% Annual Exceedance Probability) plus a 45% allowance for climate change. See Appendix A, Figure 4 for the proposed drainage design and Appendix D for pipe and chamber layout and sizing of the attenuation storage from the MasterDrain model.

5.13 **Drainage Design Model**

5.13.1 The drainage has been designed to accommodate the 1 in 30 year storm event plus a 35% allowance for climate change and checked for surcharge against the 1 in 100-year return period storm event plus a 45% allowance for climate change. Attenuation storage has been designed to accommodate the 1 in 100-year return period storm event plus a 45% allowance for climate change. The flow control device in the flow control chamber will be a vortex valve set for a maximum flow rate of 2.2 l/s or a 52 mm diameter orifice plate.

5.13.2 The attenuation storage should be located not less than 5 m from the edge of the nearest building and 2.5 m from the nearest boundary. The attenuation storage can be in the form of swales, ponds or underground crates. In this case it is convenient to divide the attenuation storage into two parts on each side of the access driveway. See Figure 4 in Appendix A for the suggested drainage arrangement.

5.13.3 In the absence of any distinct watercourses, ditches or surface water sewers, the flow control devices will discharge to seepage trenches. These are level stone filled trenches resembling French drains that initially absorb the controlled flow and take advantage of the small amount of soakage in the topsoil. Once the trenches are full, the excess water will seep out at the controlled flow rate and discharge across the land to the southwest as per the existing situation, but at a lower flow rate.

5.13.4 The drainage arrangement has been designed using the MasterDrain network drainage model. The levels given in the design are provisional subject to a topographic survey of the site (with levels reduced to Ordnance Datum).

5.14 **Hydrogeological Data**

5.14.1 Hydrological data for the site as used in the MasterDrain model is given in Appendix D.

5.15 **Extreme Event**

5.15.1 An extreme event, which overwhelmed the drainage system, would probably result in water following the existing course and flowing west southwest across the surface of the ground as per the existing drainage pattern.

6 PROPOSED FOUL DRAINAGE

6.1 It is proposed to drain the foul sewage from the proposed residences into the foul sewer managed by Southern Water to the east of chamber 3101 in Copthorne Common Road, which lies to the north of the site. In order to connect to the foul water sewer, the developer will need to apply for a Wastewater Connection Application (Section 106).

6.2 Southern Water has not supplied any level information for their sewer in Copthorne Common Road and it is not possible to assess whether a gravity connection will be practicable or whether a small pumping station may be required at the site. We have assumed that a small pumping station will be required in the outline design for the suggested drainage arrangement

6.3 See Appendix F for the Southern Water Sewer Plans for the site and Figure 4 in Appendix A for the suggested drainage layout.

7. DRAINAGE DESIGN SUMMARY

7.1 No further detailed design of the drainage can be carried out until there is a topographical survey of the site (with levels reduced to Ordnance Datum). The invert levels of the public foul sewer in Copthorne Common Road and Southern Water chamber 3101 are also required to permit the detailed design of the foul sewerage.

7.2 The surface water chamber sizes, invert levels and pipe sizes from the MasterDrain model are summarised in Table 7.1 below:

TABLE 7.1
SURFACE WATER CHAMBERS

No.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
SW1	450	95.20	94.70	-	100
SW2	450	95.00	94.50	100	150
SW3	600	94.50	94.00	150	225
SW4	450	94.80	94.30	-	100
SW5	900	94.80	93.92	100 + 225	225
SW6	450	93.50	93.00	-	150
SW7	600	93.40	92.86	150	225
Atten	16000*	93.85	92.79	225 + 225	224
SW8	1200	93.60	92.69	225	100
Trench	N/A	93.20	92.20	100	-

*equivalent attenuation volume for use in the model

7.3 The foul sewerage chamber sizes, invert levels and pipe sizes are given in Table 7.2 below:

TABLE 7.2
FOUL SEWERAGE CHAMBERS

No.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
F1	450	94.50	94.00	-	100
F2	450	94.40	93.86	100	100
F3	450	94.00	93.50	-	100
F4	600	94.20	93.40	2 x 100	100
F5	450	94.50	94.00	-	100
F6	450	94.00	93.50	-	100
F7	600	94.40	93.20	3 x 100	100
F8	1200	93.70	92.87	100	Rising main
F9	900	96.00	95.50	Rising main	100
3101	Not known	Not known	Not known	100	225

8 OPERATION & MAINTENANCE OF THE SYSTEM

8.1 The drainage system will generally require minimal operational input once construction has been completed. However, it will require some regular maintenance.

8.2 Items requiring maintenance will include:

- The flow control chambers, particularly the flow control device. This will require regular removal of any debris likely to obstruct the orifice or vortex valve. Maintenance should be carried out at the time of year after most leaf fall has occurred.

- Any gullies, pipes and channels will need occasional removal of accumulated debris and silt.

- The sewage pumping station required to pump the foul sewage to the public foul sewer in Copthorne Common Road will require annual maintenance from a specialist contractor.

9. SUMMARY OF CONCLUSIONS

9.1 The site currently comprises a former farmyard containing seven buildings (former stables, barns, animal enclosures and a disused prefabricated residence), an area laid to lawn, a variety of paved areas and an access driveway.

9.2 It is proposed to redevelop the site to provide 5 dwellinghouses with associated amenity space and parking; hard and soft landscaping; cycle and refuse storage.

9.3 The proposed redevelopment includes change of use of land to residential garden for existing dwelling house and associated access works.

9.4 The underlying geology is Cretaceous Upper Tunbridge Wells Sand (UTWS) (sandstone & siltstone). There are no superficial deposits beyond a thin layer of topsoil. The UTWS is classified as a Secondary A aquifer. The site is in a high groundwater vulnerability area but is not in a groundwater source protection zone.

9.5 The Environment Agency's Flood Map for Planning shows the site lying within Flood Zone 1 (low risk of fluvial flooding, less than 0.1% chance of flooding in any year). The site is shown to be at very low risk of surface water flooding, an area to the south is shown at some risk of surface water flooding. Flooding from groundwater or reservoirs is considered unlikely in this area. There does not appear to be any history of sewer flooding at the site. See Appendix B.

9.6 The preferred sustainable drainage method is drainage to soakaway. This requires a suitably permeable underlying geology. The UTWS tends to have low permeability and this was confirmed by percolation testing conducted at the site on Thursday 26 June. The presence of self-sustaining ponds within the immediate area also tends to confirm this. The alternative SuDS preferred method for the draining surface water is drainage to attenuation storage with outflow limited to Greenfield flow discharged to an existing watercourse or drainage ditch.

9.7 The attenuation storage may be provided in the form of swales (depressions in the ground which are normally dry), freeboard in ponds or underground storage crates. Discharge control would be in the form of a vortex valve or orifice plate. See drainage design in Appendix A, Figure 4. In this case, underground storage crates beneath the east end of the access road would appear to be the only practicable option.

9.8 The use of permeable paving for the areas of hardstanding in the proposed redevelopment, and rainwater harvesting comprising water butts from drainpipe downpipes for use in garden watering and/or storing rainwater for lavatory flushing, would reduce the surface water runoff and would make the development more sustainable.

9.9 An extreme event overtopping the system would likely follow the existing flow pattern, draining across the surface of the ground over the access road to the fields to the west-southwest.

9.10 There are no significant ditches or watercourses within the vicinity to which the controlled flow may be discharged. This is partially due to the site being towards the top of a slope and flows from the north being intercepted by the highway drainage and flows across the site being minimal. The flow control devices will discharge to seepage trenches, having the appearance of French drains with horizontal upper profiles, which would allow extreme storm flows to seep out and mimic the existing, largely laminar, flow patterns, but at a lower flow.

9.11 Rainwater cannot magically be made to disappear, the flow can be intercepted and stored, to be released at a lower flow rate, flow can be temporarily trapped in permeable surfacing and rain gardens, making maximum use of any available soakage. Rainwater harvesting can provide temporary storage, at least until the harvesting tanks are full. Similarly, water will always flow downslope, and flow can be controlled and reduced, but not eliminated except by discharge to soakaway (not practicable in this case). Surface flow into the adjacent field will be much reduced by the proposed development. This field is in the same ownership as the site.

9.12 Foul sewage will be discharged to the public foul sewer in the highway. However, it is most likely that a small pumping station will be required to achieve this.

9.13 No further detailed design of the drainage can be carried out until there is a topographical survey of the site (with levels reduced to Ordnance Datum) and the invert level of the public foul sewer in the adjacent highway is known.

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APPENDIX A:

Figure 1: Site Location
Figure 2: Site as Existing and Testing Locations
Figure 3: Proposed Development
Figure 4: Suggested Drainage Arrangement
Figure 5: Constraints Plan

Scale as shown

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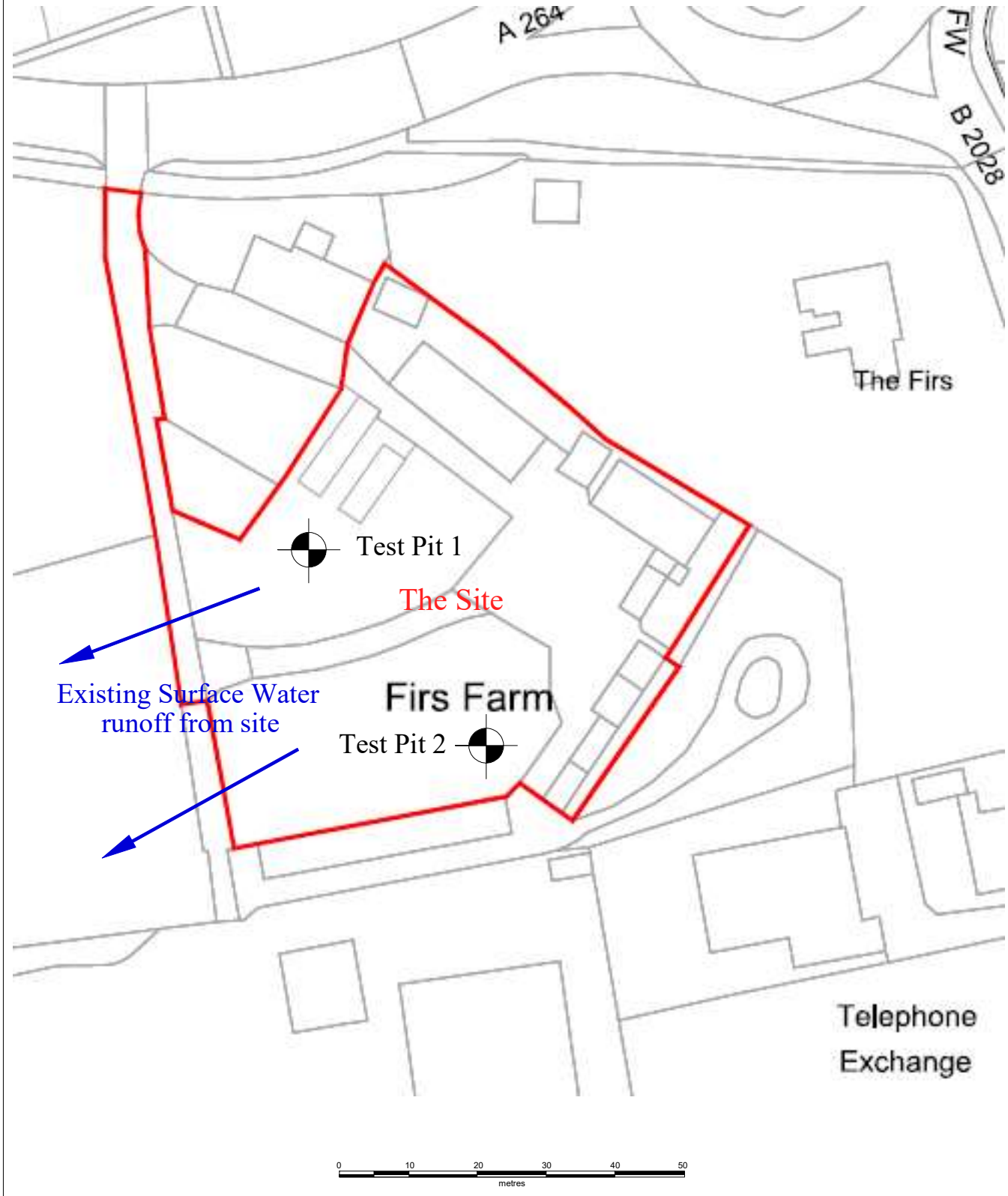
Figure 1: Site Location

June 2025



Scale as shown

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Figure 2: Site as Existing and Testing Locations

June 2025

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Figure 3: Proposed Development

July 2025

Scale as shown

N

0 10 20 30 40 50

metres

eas

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Figure 4: Suggested Drainage Arrangement

July 2025 Scale as shown

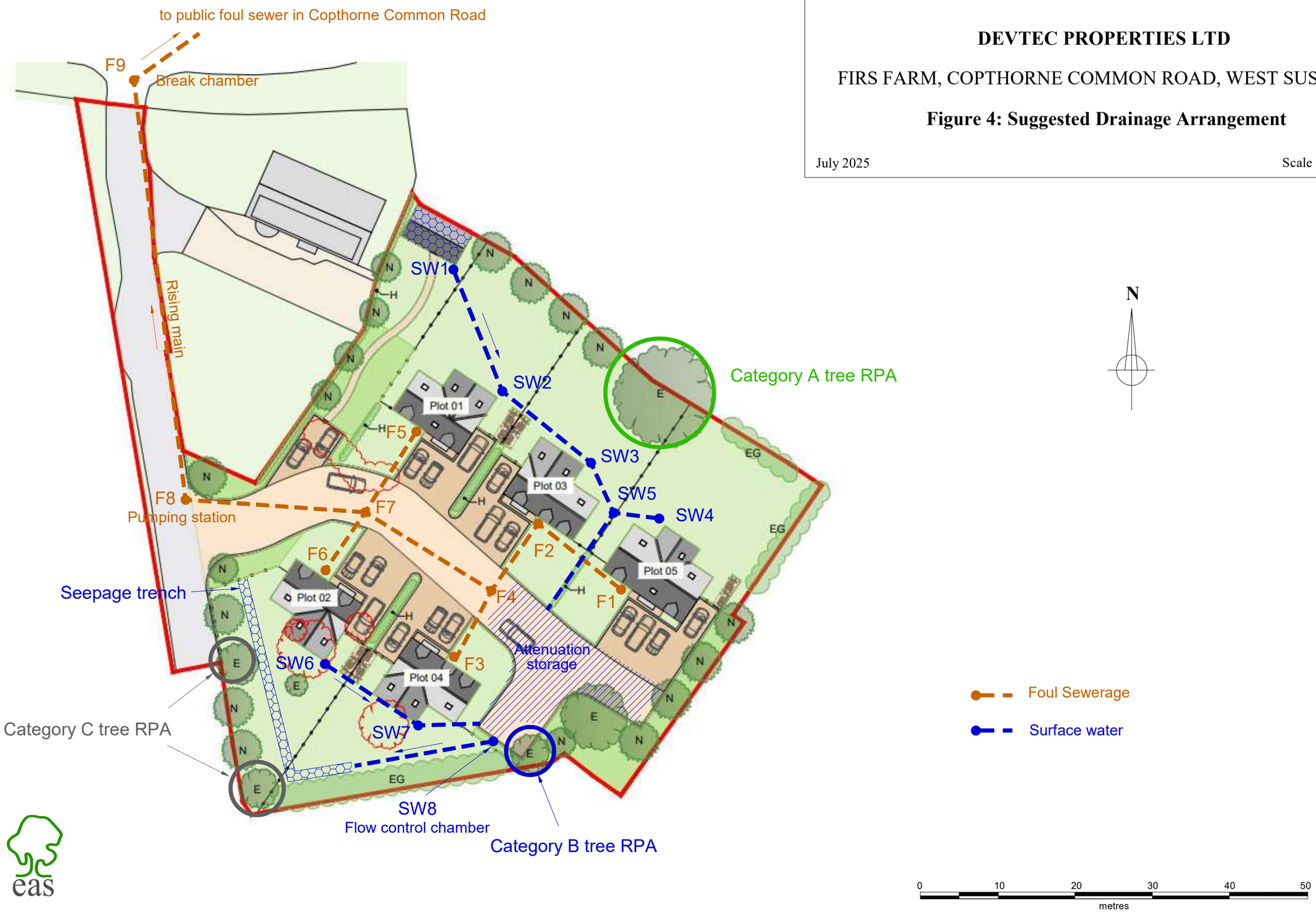

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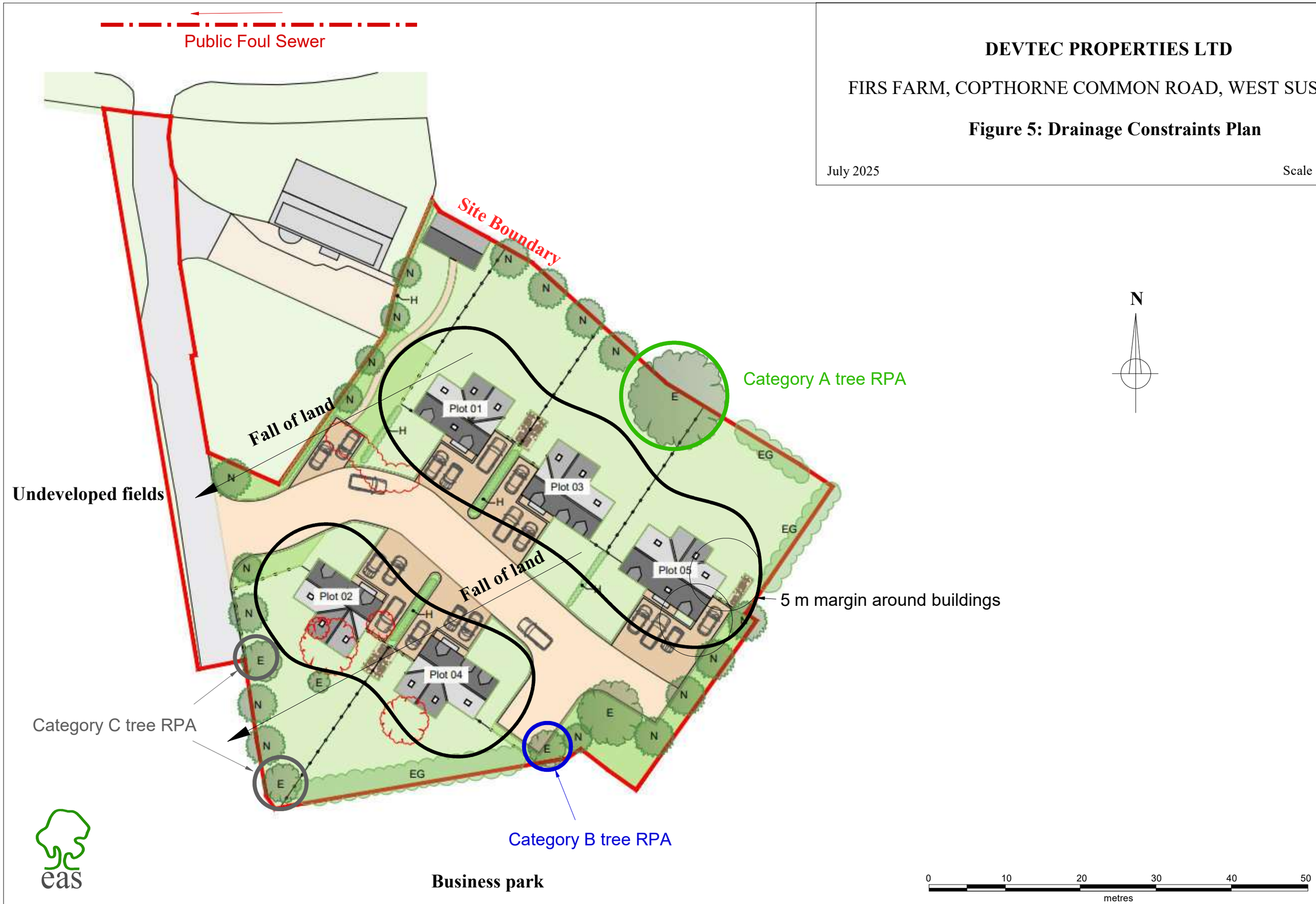
Figure 5: Drainage Constraints Plan

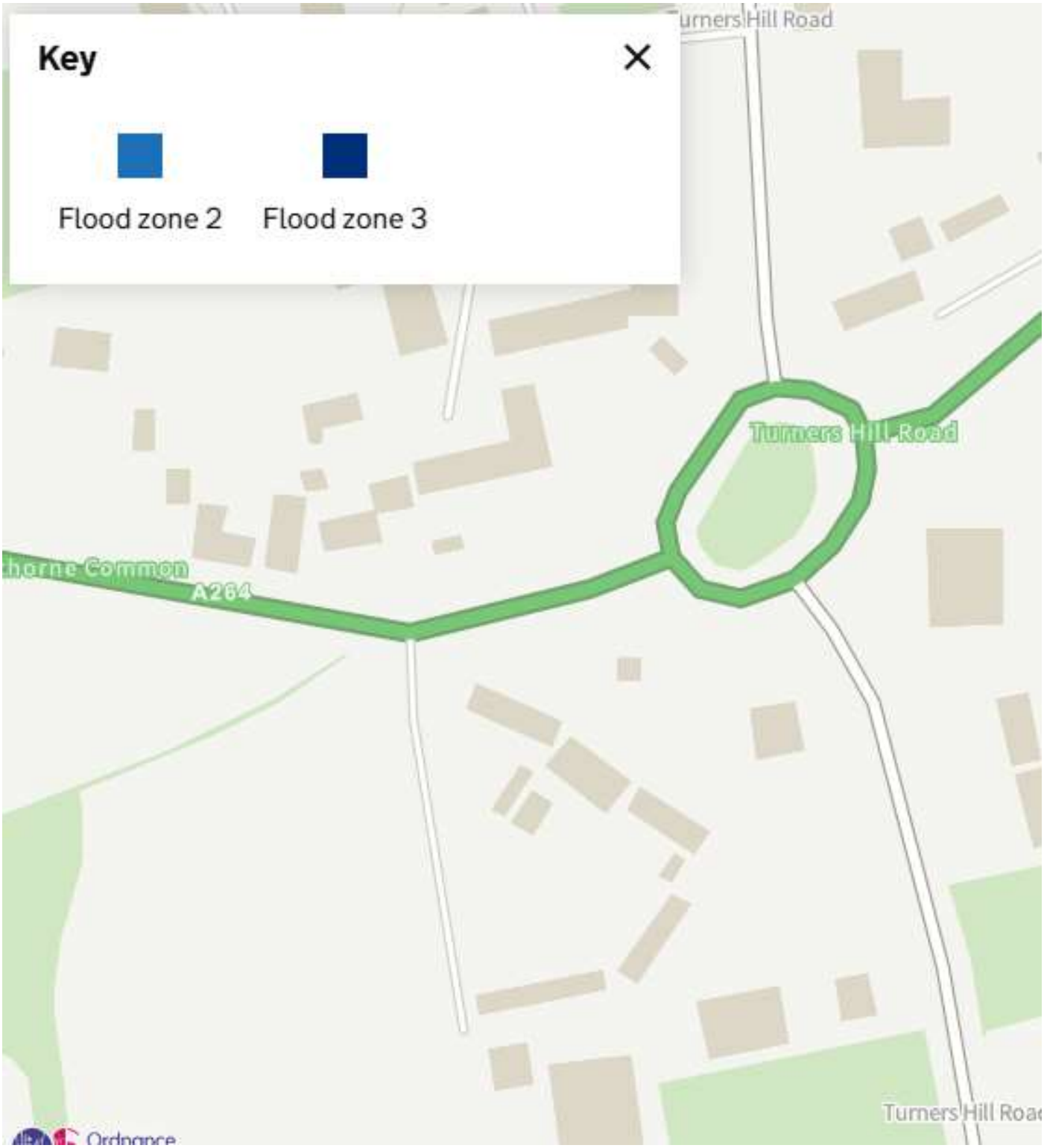
July 2025 Scale as shown



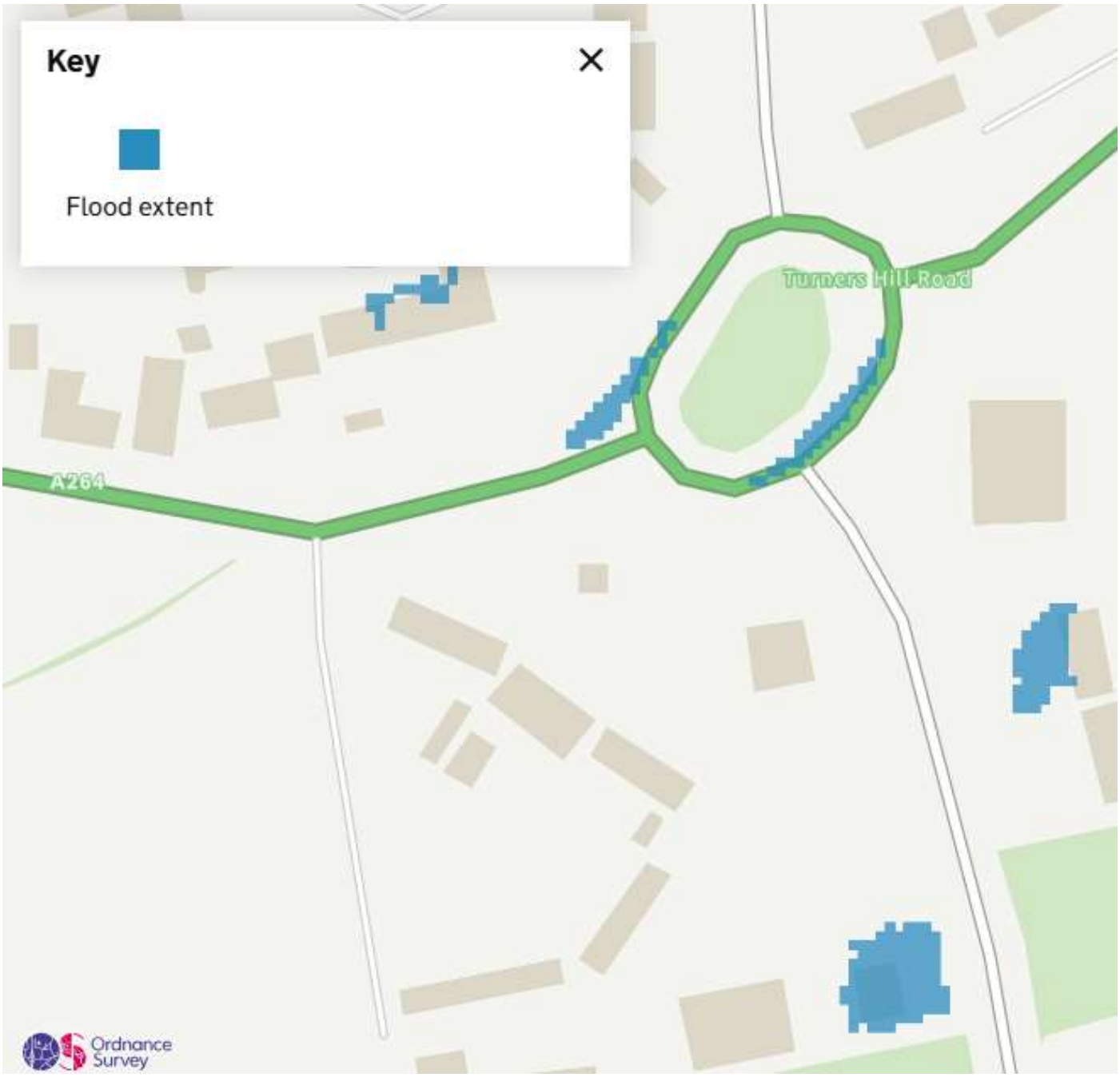
0 10 20 30 40 50
metres

APPENDIX B:

ENVIRONMENT AGENCY FLOOD RISK SUMMARY



Environment Agency Flood Map for Planning



Environment Agency Surface Water Flood Map

APPENDIX C:

HR WALLINGFORD GREENFIELD FLOW

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

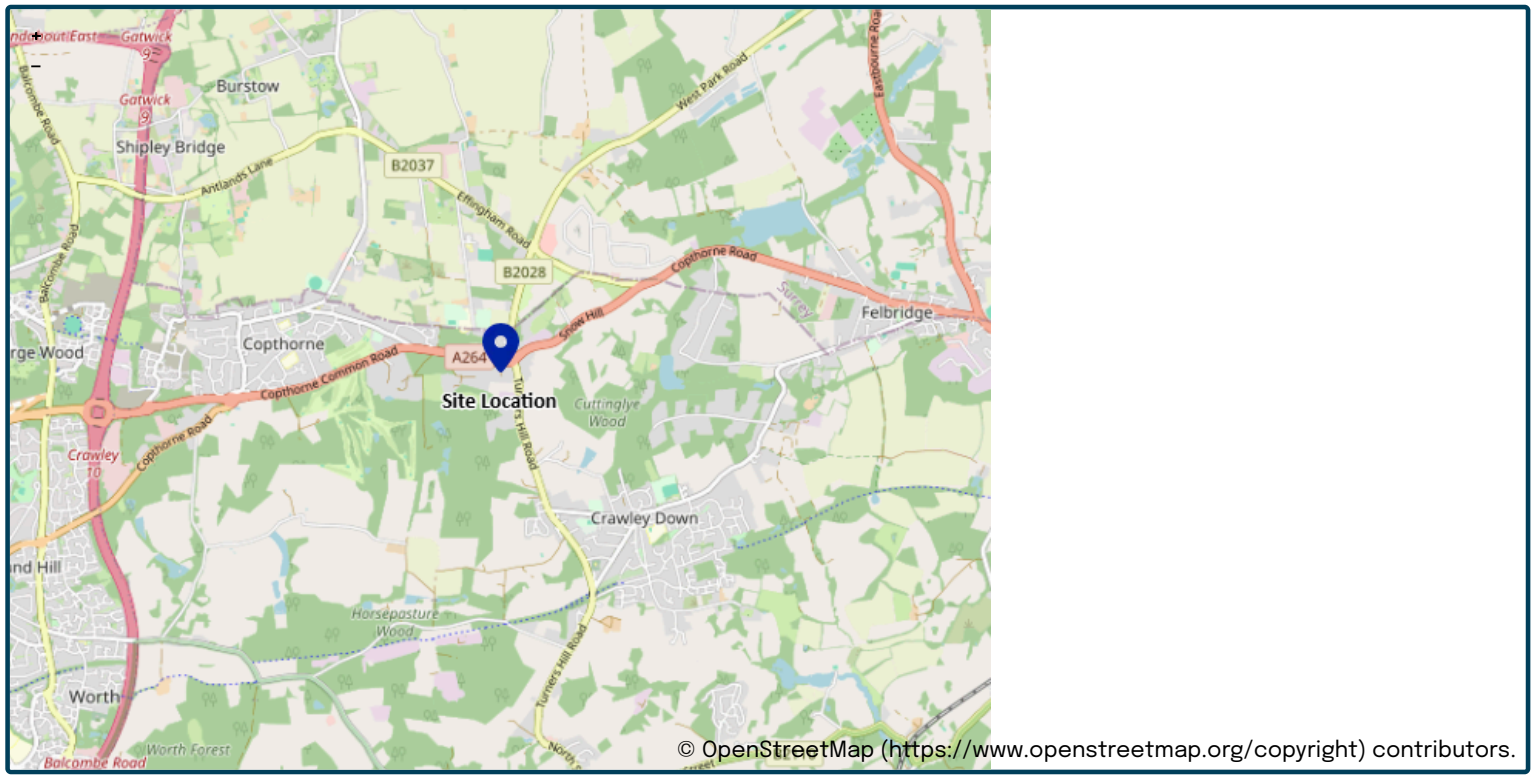
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	27/06/2025
Calculated by	MDM
Reference	821
Model version	2.0.1

Location

Site name	Firs Farm
Site location	Copthorne Common



Site easting	533414
Site northing	138904

Site details

Total site area (ha)	0.4367 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	819 mm		819
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	2.5 l/s		

Growth curve factors

	My value		Map value
Hydrological region	6		6
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	IH124
Flow rate 1 year (l/s)	2.2 l/s
Flow rate 2 year (l/s)	2.2 l/s
Flow rate 10 years (l/s)	4.1 l/s
Flow rate 30 years (l/s)	5.8 l/s
Flow rate 100 years (l/s)	8.1 l/s
Flow rate 200 years (l/s)	9.5 l/s

Disclaimer

APPENDIX D:

OUTPUT FROM DRAINAGE DESIGN SOFTWARE AND UNDERGROUND ATTENUATION STORAGE CALCULATIONS

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MasterDrain SW

Job No. 812A			
Sheet no. 1			
Date 16/07/25			
Project Firs Farm Revised	By MDM	Checked	Reviewed
Title Hydrograph storage analysis (Winter profile) for Copthorne			

Data:-

Location = Copthorne
M5-60 (mm) = 20
Soil index = 0.45
Return period = 100
UCWI = 0.0

Grid reference = TQ3139
r = 0.35
SAAR (mm/yr) = 820
WRAP = 4
Climate change = +45%

Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Percentage runoff = 95.0% (manual setting)

Imperv. area = 1400 m²
Total area = 1400 m²
Total runoff = 143.3 m³

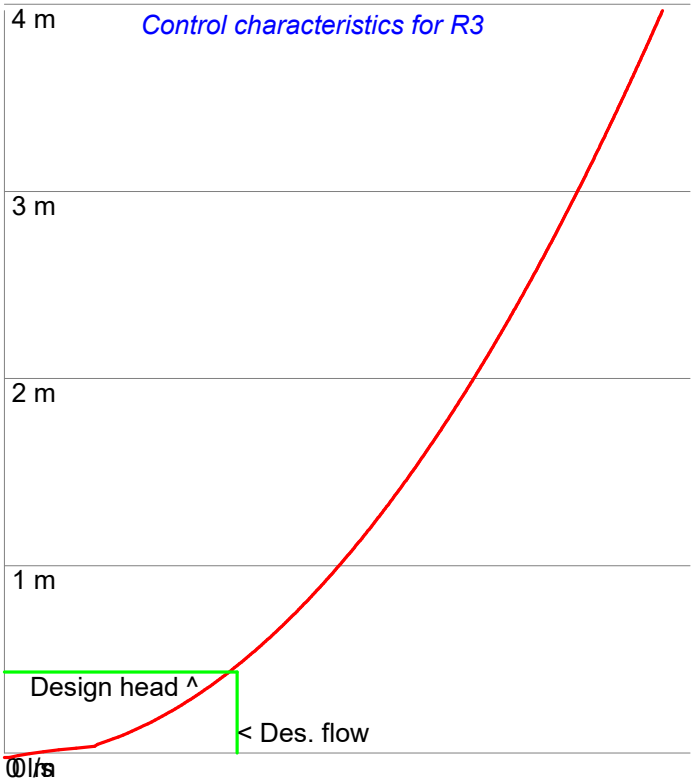
Pervious area = 0 m²
Equiv area = 1330 m² (Tot. area x % runoff).
Discharge rate = 2.200 l/s

Design Head = 0.5m
Control device = R3
Max. calc. depth = 0.5 m
Mean discharge = 0.98 l/s

Peak flow = 2.20 l/s
Orifice diam = 49.3 mm
Available depth = 0.0 m³

Available system storage = 0.00 m³ under a system plane at the design head level.
Offline storage = 0.0 m³
Total storage = 104.0 m³

Peak input flow =9.95 l/s

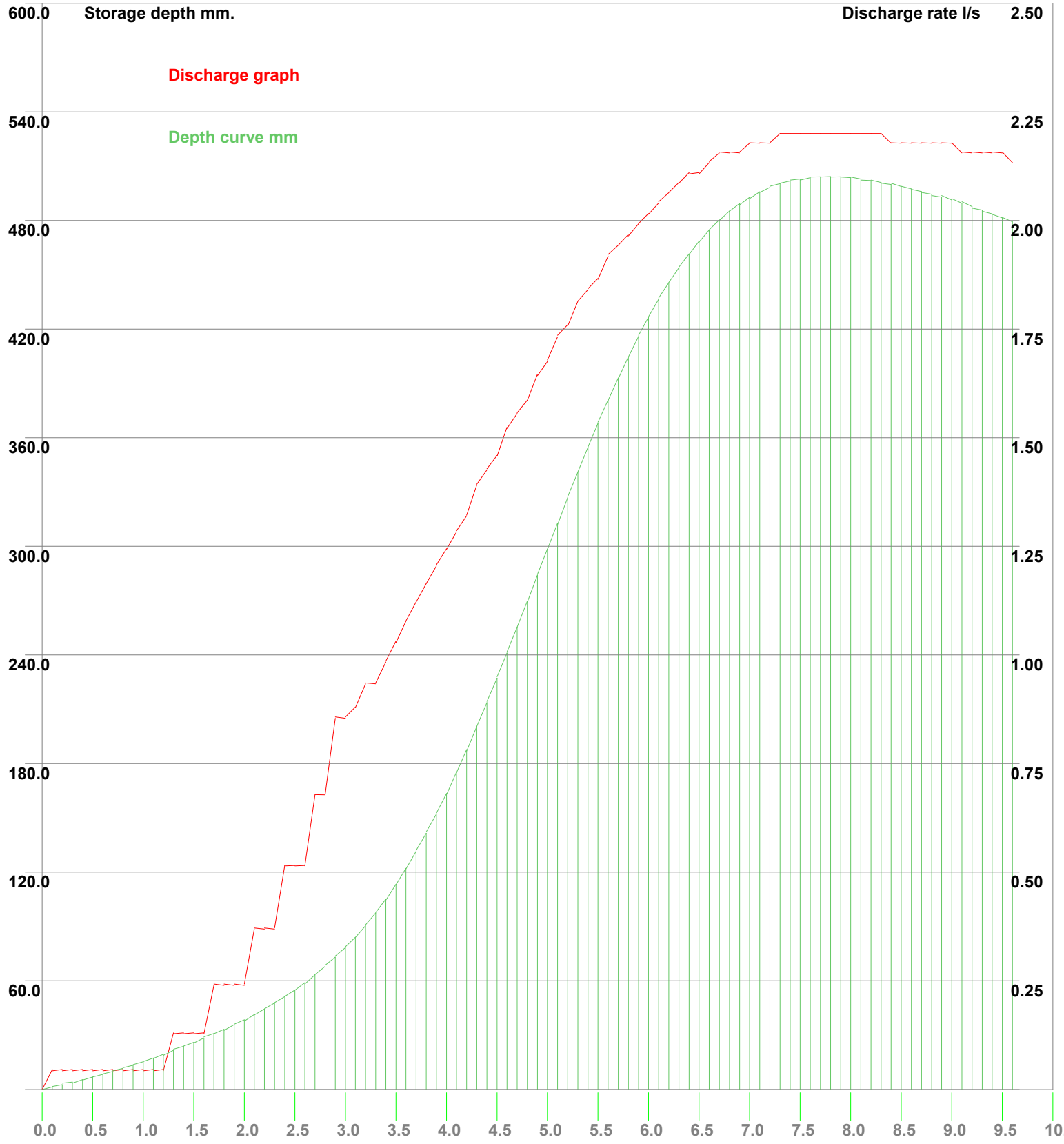


Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.01	0.05	2.01	4.41
0.05	0.52	2.05	4.45
0.10	0.98	2.10	4.51
0.15	1.20	2.15	4.56
0.20	1.39	2.20	4.61
0.25	1.56	2.25	4.67
0.30	1.70	2.30	4.72
0.35	1.84	2.35	4.77
0.40	1.97	2.40	4.82
0.45	2.09	2.45	4.87
0.50	2.20	2.50	4.92
0.55	2.31	2.55	4.97
0.60	2.41	2.60	5.02
0.65	2.51	2.65	5.06
0.70	2.60	2.70	5.11
0.75	2.69	2.75	5.16
0.80	2.78	2.80	5.21
0.85	2.87	2.85	5.25
0.90	2.95	2.90	5.30
0.95	3.03	2.95	5.34
1.00	3.11	3.00	5.39
1.05	3.19	3.05	5.43
1.10	3.26	3.10	5.48
1.15	3.34	3.15	5.52
1.20	3.41	3.20	5.57
1.25	3.48	3.25	5.61
1.30	3.55	3.30	5.65
1.35	3.61	3.35	5.69
1.40	3.68	3.40	5.74
1.45	3.75	3.45	5.78
1.50	3.81	3.50	5.82
1.55	3.87	3.55	5.86
1.60	3.94	3.60	5.90
1.65	4.00	3.65	5.94
1.70	4.06	3.70	5.98
1.75	4.12	3.75	6.02
1.80	4.17	3.80	6.06
1.85	4.23	3.85	6.10
1.90	4.29	3.90	6.14
1.95	4.34	3.95	6.18
2.00	4.40	4.00	6.22

MasterDrain SW

Environmental Assessment Services Ltd http://www.easltd.co.uk	London Rd, Hickstead Haywards Heath, West Sussex, RH17 5LZ Tel: 01444 882552 email: info@easltd.co.uk	Job No. 812A Sheet no. 2 Date 16/07/25	
Project Firs Farm Revised		By MDM	Checked / Reviewed
Title Hydrograph storage analysis (Winter profile) for Copthorne			

Storage curves for a 10 hours storm.



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Job No.	Sheet no.	Date	By	Checked	Reviewed
812A	3	16/07/25	MDM		

Project: Firs Farm Revised

Title: Hydrograph storage analysis (Winter profile) for Copthorne

Incremental rainfall figures.

Storm Mins	Storage Depth mm	Control Flow l/s	Storm Mins	Storage Depth mm	Control Flow l/s
6.0	1.4	0.05	306.0	312.8	1.73
12.0	2.7	0.05	312.0	327.0	1.76
18.0	4.0	0.05	318.0	341.0	1.81
24.0	5.4	0.05	324.0	354.7	1.84
30.0	6.8	0.05	330.0	368.0	1.87
36.0	8.4	0.05	336.0	380.8	1.92
42.0	9.9	0.05	342.0	393.1	1.94
48.0	11.6	0.05	348.0	404.8	1.97
54.0	13.4	0.05	354.0	416.0	1.99
60.0	15.3	0.05	360.0	426.6	2.02
66.0	17.4	0.05	366.0	436.5	2.04
72.0	19.5	0.05	372.0	445.5	2.06
78.0	21.7	0.13	378.0	453.9	2.09
84.0	23.8	0.13	384.0	461.6	2.11
90.0	26.1	0.13	390.0	468.5	2.11
96.0	28.5	0.13	396.0	474.7	2.13
102.0	30.9	0.24	402.0	480.3	2.16
108.0	33.3	0.24	408.0	485.2	2.16
114.0	35.8	0.24	414.0	489.3	2.16
120.0	38.4	0.24	420.0	492.8	2.18
126.0	41.4	0.37	426.0	495.8	2.18
132.0	44.4	0.37	432.0	498.3	2.18
138.0	47.7	0.37	438.0	500.3	2.20
144.0	51.3	0.52	444.0	501.8	2.20
150.0	55.0	0.52	450.0	502.9	2.20
156.0	59.0	0.52	456.0	503.7	2.20
162.0	63.4	0.68	462.0	504.1	2.20
168.0	68.0	0.68	468.0	504.2	2.20
174.0	73.1	0.85	474.0	504.1	2.20
180.0	78.4	0.85	480.0	503.6	2.20
186.0	84.1	0.88	486.0	502.9	2.20
192.0	90.5	0.93	492.0	502.0	2.20
198.0	97.5	0.93	498.0	501.0	2.20
204.0	105.1	0.98	504.0	499.9	2.18
210.0	113.3	1.03	510.0	498.7	2.18
216.0	122.1	1.08	516.0	497.4	2.18
222.0	131.5	1.12	522.0	496.0	2.18
228.0	141.5	1.16	528.0	494.5	2.18
234.0	152.1	1.20	534.0	492.9	2.18
240.0	163.4	1.24	540.0	491.3	2.18
246.0	175.3	1.28	546.0	489.5	2.16
252.0	187.7	1.32	552.0	487.6	2.16
258.0	200.5	1.39	558.0	485.7	2.16
264.0	213.6	1.43	564.0	483.6	2.16
270.0	227.2	1.46	570.0	481.5	2.16
276.0	241.2	1.52	576.0	479.3	2.13
282.0	255.3	1.56	582.0	477.0	2.13
288.0	269.7	1.59	588.0	474.8	2.13
294.0	284.1	1.65	594.0	472.5	2.13
300.0	298.5	1.68	600.0	470.2	2.13

Using the Get Max button causes the program to step through a series of storm durations until a maximum volume is obtained.
Each duration is sampled 600 times and the results recorded. The storm durations (hrs) are:-

0.25, 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 42, 48, 54, 60, 66, 72, 84, 96, 120, 150, 175, 200, 250, 300, 375, 500, 750, 1000, 1250, 1500, 1570, 2000, 2500, 3000, 3500, 4000

It should be noted that the six hour storm frequently requested rarely demonstrates the worst case for storage.

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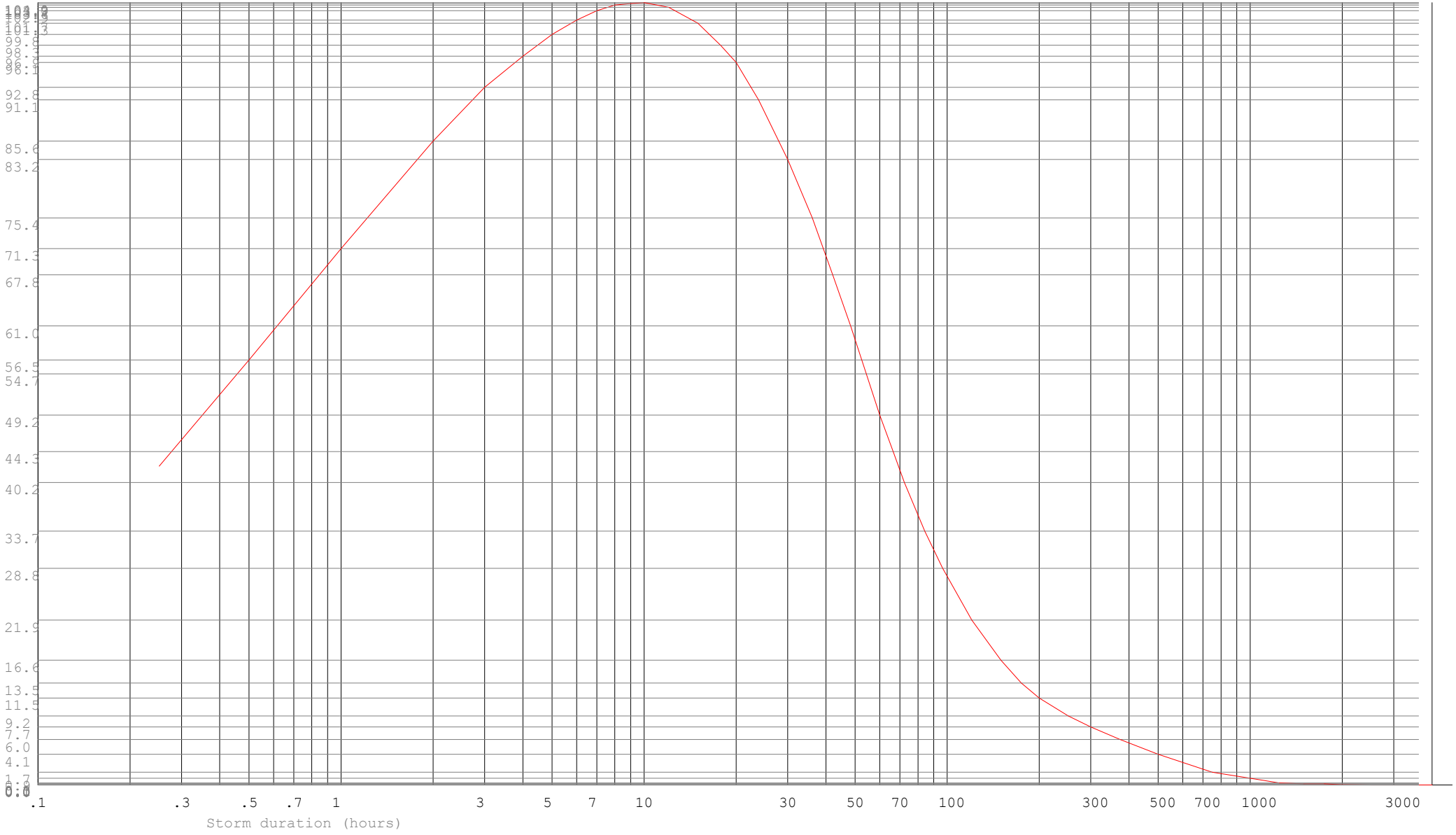
Job No.	Sheet no.	Date
812A	4	16/07/25

MasterDrain SW

Project	By	Checked	Reviewed
Firs Farm Revised	MDM		

Title: **Hydrograph storage analysis (Winter profile) for Copthorne**

Sequential storage volume at specific storm durations.



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Job No. 821A			
Sheet no. 1			
Date 16/07/25 16:39			
Project Firs Farm (Revised)	By MDM	Checked	Reviewed
Title Manhole printout for FIRS FARM REVISED.SW			

Manhole ref.	X ref	Y ref	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Exit Diam	Exit Crown	Exit Invert	Chamb const	Slab level	Cover Level	Dwnstr MH
SW1	62.33	84.5	circ	450	N/A	0.50		0.08	100	94.825	94.700	N/A	94.650	95.200	SW2
SW2	68.21	69.38	circ	450	N/A	0.50		0.08	150	94.675	94.500	N/A	94.450	95.000	SW3
SW3	79.81	59.98	circ	600	N/A	0.50		0.14	225	94.250	94.000	N/A	93.950	94.500	SW5
SW4	88.47	52.93	circ	450	N/A	0.50		0.08	100	94.425	94.300	N/A	94.250	94.800	SW5
SW5	82.60	53.37	circ	900	N/A	0.88		0.56	225	94.170	93.920	N/A	93.870	94.800	Atten
SW6	45.3	33.85	circ	450	N/A	0.50		0.08	150	93.175	93.000	N/A	92.950	93.500	SW7
SW7	57.19	26.21	circ	600	N/A	0.54		0.15	225	93.110	92.860	N/A	92.810	93.400	Atten
Atten	74.59	34.36	circ	16000	N/A	1.06		213.13	225	93.040	92.790	N/A	92.740	93.850	SW8
SW8	67.18	24.15	circ	1200	N/A	0.91		1.03	225	92.940	92.690	N/A	92.640	93.600	Trench

All manholes to be as per 'Sewers for Adoption'

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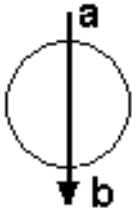
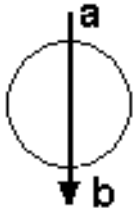
Job No.	821A
Sheet no.	2
Date	16/07/25 16:39
Project	Firs Farm (Revised)
Title	Manhole printout for FIRS FARM REVISED.SW

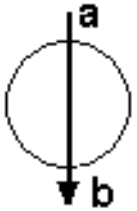
By	Checked	Reviewed
MDM		



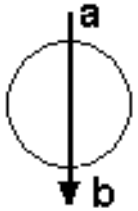
MH = SW1
a=head
b = 100



MH = SW2
a= 100
b = 150

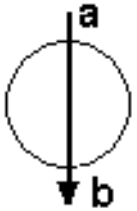


MH = SW3
a= 150
b = 225

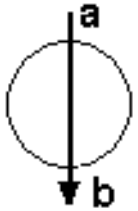


MH = SW4
a=head
b = 100

MH = SW5
a= 225
b = 225
c = 100
d = 225

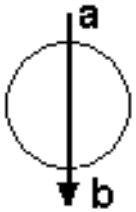


MH = SW6
a=head
b = 150



MH = SW7
a= 150
b = 225

MH = Atten
a= 225
b = 225
c = 225
d = 225



MH = SW8
a= 225
b = 225

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Job No. 821A			
Sheet no. 3			
Date 16/07/25 16:39			
Project Firs Farm (Revised)	By MDM	Checked	Reviewed
Title Manhole printout for FIRS FARM REVISED.SW			

These explanatory notes should be read in conjunction with the Manhole printout

1) Manhole ref - the reference for the manhole in question
2) Form - either circular or rectangular
3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
4) Rectangular width - if form is rectangular, this gives the width of the chamber
5) Chamber height - height of chamber from invert
6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
7) Manhole volume - cubic capacity of manhole chamber
8) Exit diameter - diameter of pipe leaving this manhole
9) Exit crown - crown level of pipe leaving this manhole
10) Exit invert - invert level of pipe leaving this manhole
11) Chamb const - manhole construction :-
    N/A - not specified
    Conc - concrete rings
    Poly - polypropylene rings surrounded by selected fill
    Poly/conc - polypropylene rings surrounded by concrete
    Brick - brick built with waterproof render
    In situ - concrete cast in situ
12) Slab level - surface level of base slab (if no sump, this is placed at 50mm below exit invert to allow levels manipulation).
13) Manhole diameters of 9999 have exceeded the sizes available in SfA
14) Manhole diameters may have to be modified due to the number of branches

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Job No.	Sheet no.	Date	By	Checked	Reviewed
821A	1	16/07/25	MDM		

Project

Title **Surcharge calcs (Sized at 30 yrs storm) for FIRS FARM REVISED.SW CCF = 45%**

Free flowing outlet
Return period = 100 yrs
Climate change factor = 45

PEAK hydrograph values printed
Storm duration = 30 mins
No offline storage

Mean rain intens. 122.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 478.24 mm/hr
Sample period = 15.0 secs.

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	EXCESS FLOW l/s	FLOODED VOL m^3	DRAINED AREA (m^2) x FACTOR	STATUS
1	I	1.01	SW1	6.7	1.9	100	450	94.70	94.73	95.20	0.29	0.03	0.00	0.000	33	OK
2	I	1.02	SW2	32.6	10.2	150	450	94.50	94.55	95.00	0.31	0.05	0.00	0.000	178	OK
3	I	1.03	SW3	54.8	18.5	225	600	94.00	94.08	94.50	0.34	0.08	0.00	0.000	322	OK
4	B	2.01	SW4	15.7	11.0	100	450	94.30	94.37	94.80	0.70	0.07	0.00	0.000	192	OK
5	I	1.04	SW5	123.1	29.6	225	900	93.92	93.99	94.80	0.24	0.07	0.00	0.000	514	OK
6	B	3.01	SW6	17.6	8.3	150	450	93.00	93.07	93.50	0.47	0.07	0.00	0.000	144	OK
7	B	3.02	SW7	31.1	16.6	225	600	92.86	92.98	93.40	0.53	0.12	0.00	0.000	289	OK
8	I	1.05	Atten‡	46.2	78.6	225	16000	92.79	93.02	93.85	1.70	0.23	32.42	0.000	1367	Surch.
9	I	1.06	SW8	70.2	78.6	225	1200	92.69	93.03	93.60	1.12	0.34	8.41	0.000	1367	Surch.

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MasterDrain SW

Job No. 821A			
Sheet no. 2			
Date 16/07/25			
Project	By MDM	Checked	Reviewed
Title **Surcharge calcs (Sized at 30 yrs storm) for FIRS FARM REVISED.SW CCF = 45%**			

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s) ‡ = flow restrictor.
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Upstrm Vol - upstream pipe vol to previous manhole(s)
16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level within 299mm of cover level
19) Status - Flooded - cover over-topped
20) § against diameter indicates throttle pipe used.

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

Flow restrictors

Manhole reference - Atten

Restrictor flowrate - 2.2 l/s

Flood volumes

Check that the upstream storage of the manhole is adequate to take the flood volume - see Upstrm Vol above.

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Job No.	Sheet no.	Date	By	Checked	Reviewed
821A	3	16/07/25	MDM		

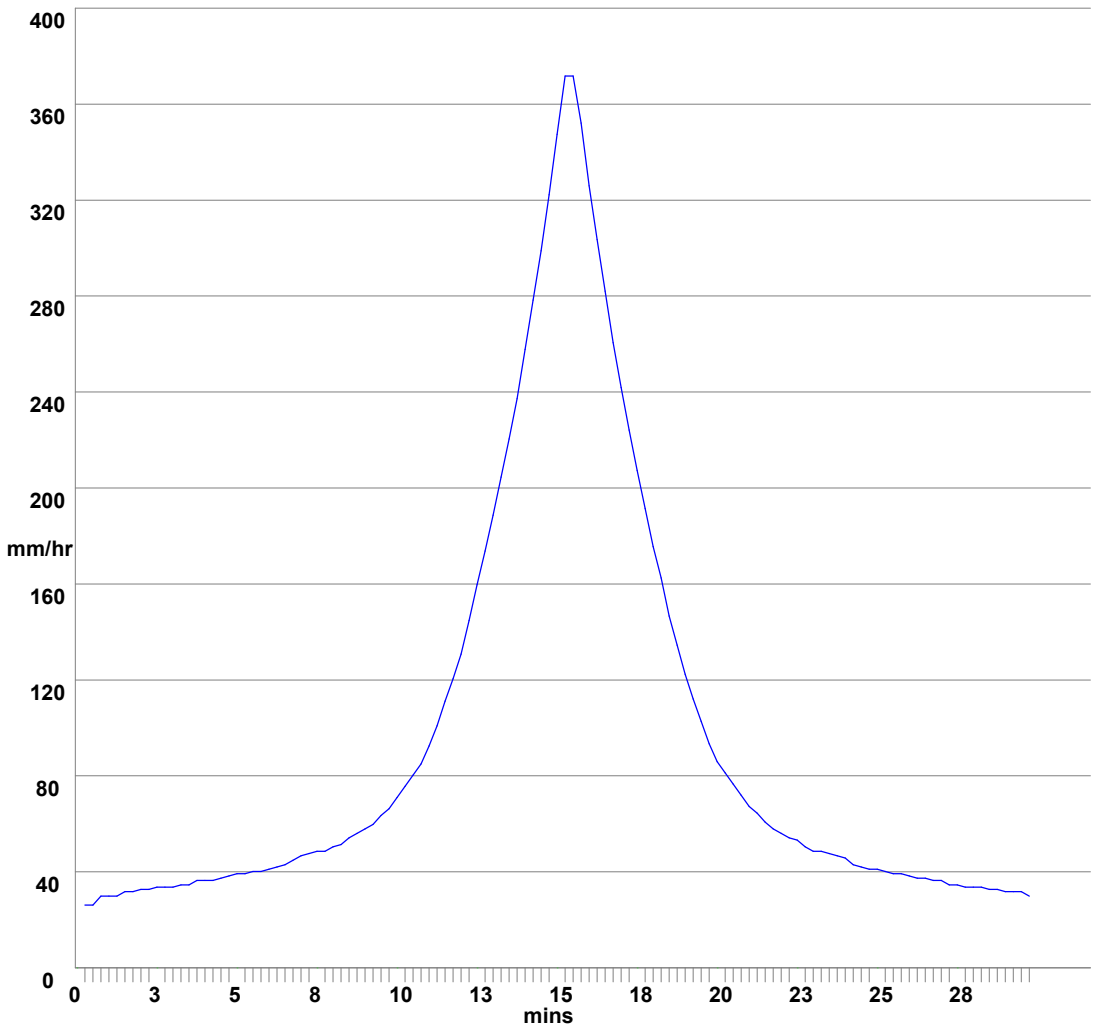
Project

Title **Surcharge calcs (Sized at 30 yrs storm) for FIRS FARM REVISED.SW CCF = 45%**

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:15	28.43	10:15	81.24	20:15	87.34
0:30	28.43	10:30	86.32	20:30	82.26
0:45	32.50	10:45	91.40	20:45	77.18
1:00	32.50	11:00	98.51	21:00	72.10
1:15	32.50	11:15	107.65	21:15	69.06
1:30	33.51	11:30	118.82	21:30	64.99
1:45	33.51	11:45	128.97	21:45	61.95
2:00	34.53	12:00	140.14	22:00	59.92
2:15	34.53	12:15	155.38	22:15	57.89
2:30	35.54	12:30	170.61	22:30	56.87
2:45	35.54	12:45	185.84	22:45	53.82
3:00	35.54	13:00	202.09	23:00	51.79
3:15	36.56	13:15	219.35	23:15	51.79
3:30	36.56	13:30	235.60	23:30	50.78
3:45	38.59	13:45	253.88	23:45	49.76
4:00	38.59	14:00	276.22	24:00	48.75
4:15	38.59	14:15	297.55	24:15	45.70
4:30	39.61	14:30	319.89	24:30	44.68
4:45	40.62	14:45	345.28	24:45	43.67
5:00	41.64	15:00	371.68	25:00	43.67
5:15	41.64	15:15	398.09	25:15	42.65
5:30	42.65	15:30	398.09	25:30	41.64
5:45	42.65	15:45	376.76	25:45	41.64
6:00	43.67	16:00	349.34	26:00	40.62
6:15	44.68	16:15	324.97	26:15	39.61
6:30	45.70	16:30	301.61	26:30	39.61
6:45	47.73	16:45	279.27	26:45	38.59
7:00	49.76	17:00	258.96	27:00	38.59
7:15	50.78	17:15	239.67	27:15	36.56
7:30	51.79	17:30	222.40	27:30	36.56
7:45	51.79	17:45	205.14	27:45	35.54
8:00	53.82	18:00	187.87	28:00	35.54
8:15	54.84	18:15	173.66	28:15	35.54
8:30	57.89	18:30	157.41	28:30	34.53
8:45	59.92	18:45	144.21	28:45	34.53
9:00	61.95	19:00	131.00	29:00	33.51
9:15	63.98	19:15	119.83	29:15	33.51
9:30	68.04	19:30	109.68	29:30	33.51
9:45	71.09	19:45	99.52	29:45	32.50
10:00	76.16	20:00	92.41	30:00	32.50

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 30 mins Profile - summer



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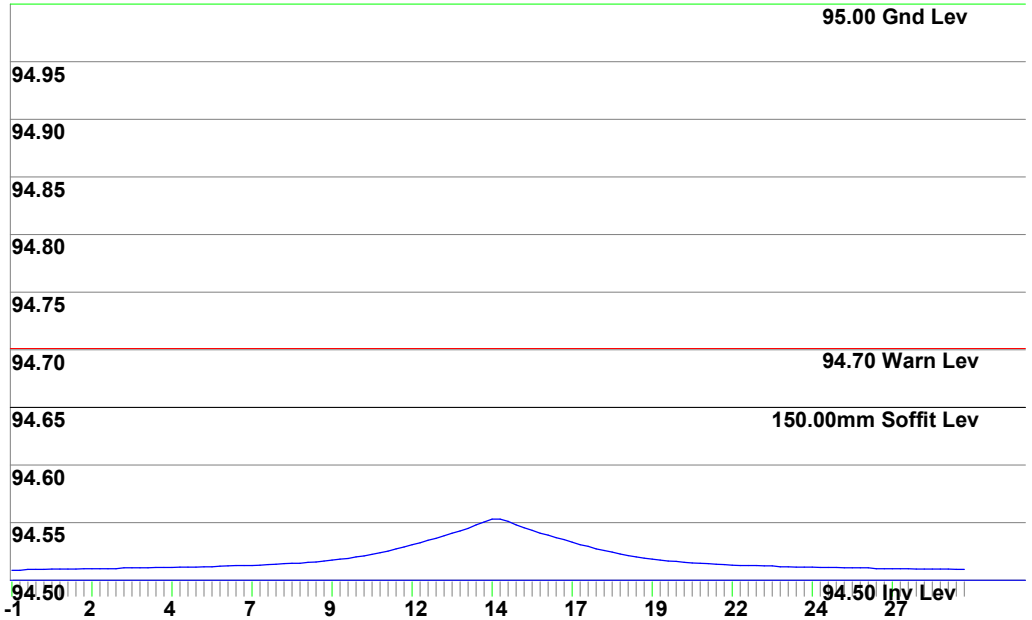
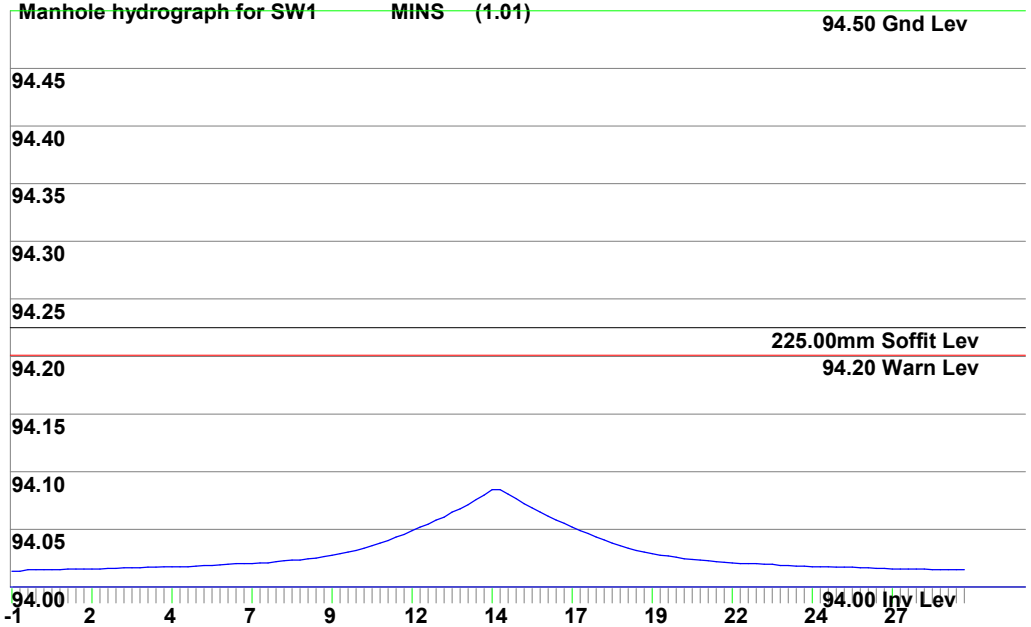
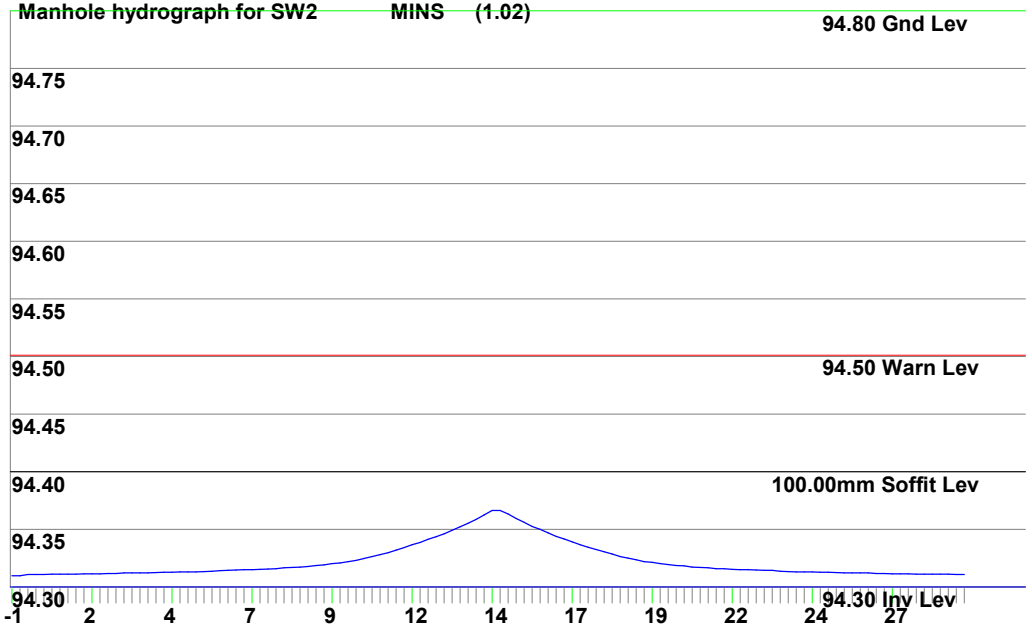
Job No.	821A
Sheet no.	4
Date	16/07/25
By	MDM
Checked	
Reviewed	

Project

Title **Surcharge calcs (Sized at 30 yrs storm) for FIRS FARM REVISED.SW CCF = 45%**







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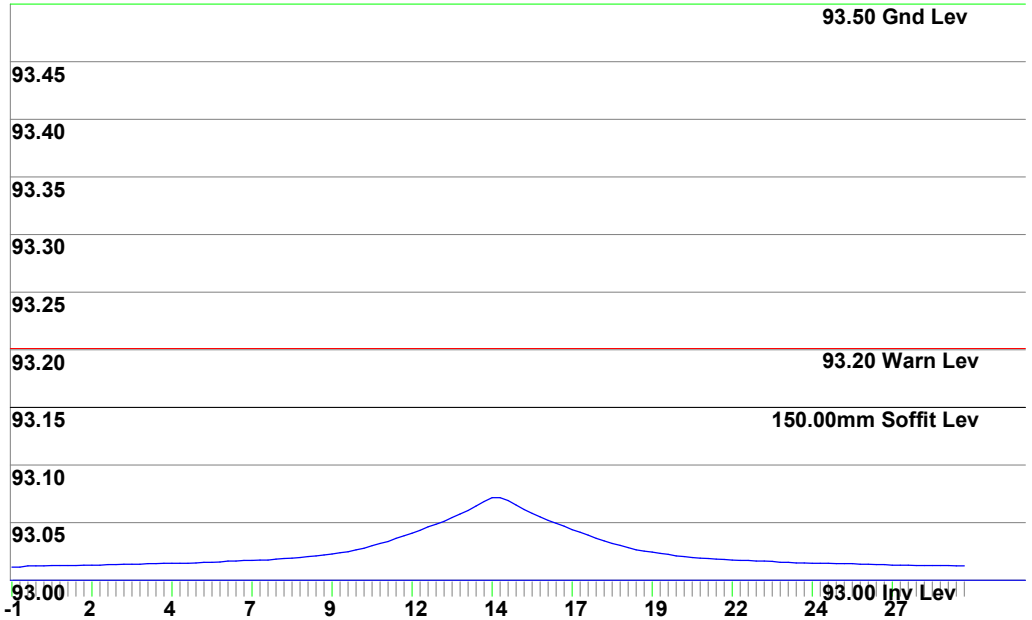
MasterDrain SW

Job No.	821A
Sheet no.	5
Date	16/07/25
By	MDM
Checked	
Reviewed	

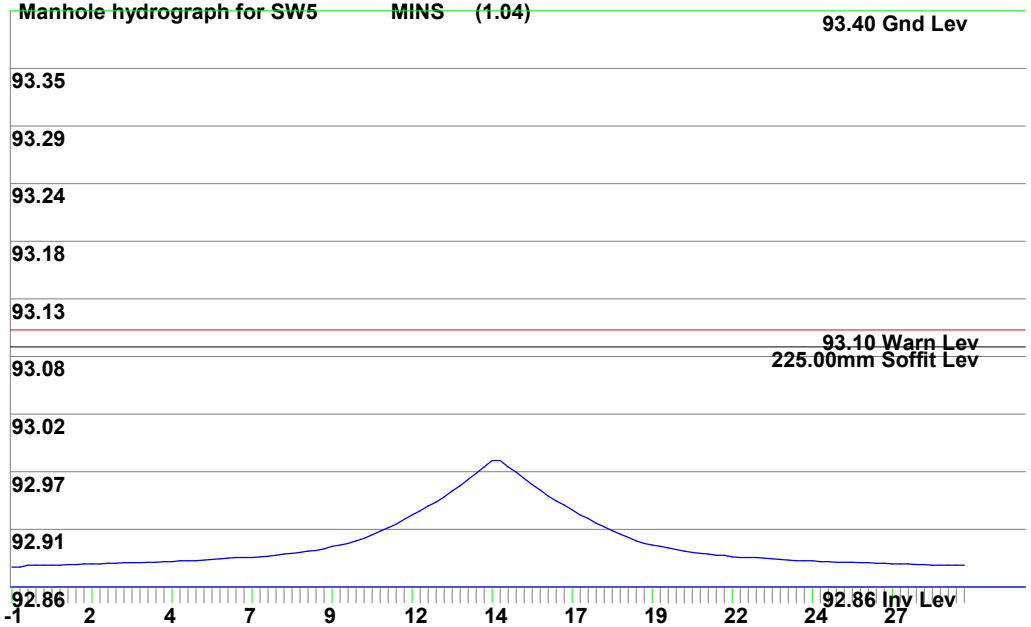
Project

Title **Surcharge calcs (Sized at 30 yrs storm) for FIRS FARM REVISED.SW CCF = 45%**

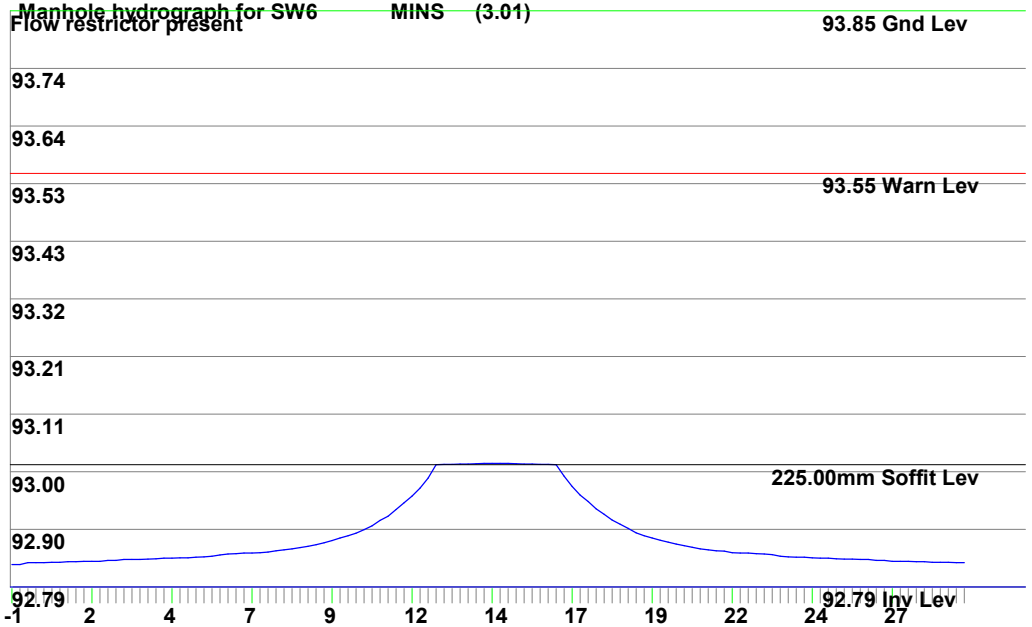
Manhole hydrograph for SW5 MINS (1.04)



Manhole hydrograph for SW6 MINS (3.01)
Flow restrictor present



Manhole hydrograph for SW7 MINS (3.02)



Manhole hydrograph for Atten MINS (1.05)

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Job No.	821A
Sheet no.	6
Date	16/07/25
By	MDM
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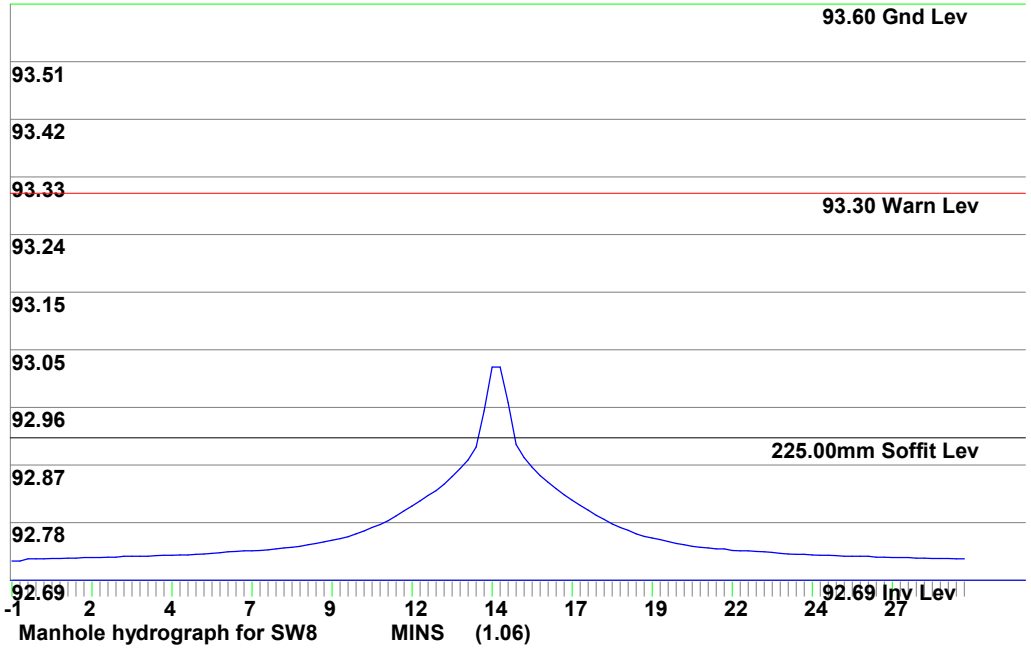
Reviewed	

Project

Title **Surcharge calcs (Sized at 30 yrs storm) for FIRS FARM REVISED.SW CCF = 45%**



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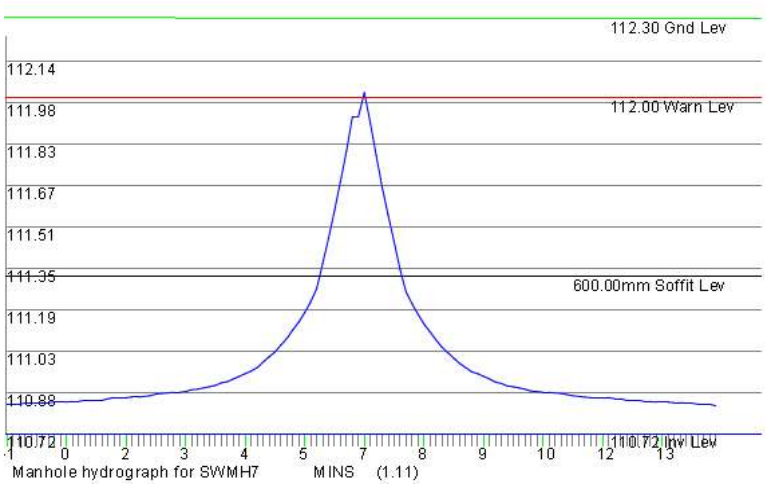
Job No.	821A
Sheet no.	7
Date	16/07/25
By	MDM
Checked	
Reviewed	

MasterDrain SW

Project

Title Surcharge calcs (Sized at 30 yrs storm) for FIRS FARM REVISED.SW CCF = 45%



1) Ground / cover level

2) Warning level - in this case, set at 300mm below cover level.

3) Soffit level of outflow pipe.

4) Invert level of chamber.

Notes

a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.

b) Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.

c) The top of the graph clips the warning level and would be marked thus on the printout.

d) In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.

e) The diagram above is a general one and is not part of the current calculation.

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MasterDrain
Foul 11.5

Job No.	821A
Sheet no.	0
Date	16/07/25
Project	Firs Farm (Revised
Title	Manhole printout for FIRS FARM REVISED.FL
By	MDM
Checked	
Reviewed	

Manhole ref.	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Ent. Diam	Ent. Crown	Ent. Invert	Exit Diam	Exit Crown	Exit Invert	Chamb const	Cover Level	Dwnstr MH
F1	circ	450	N/A	0.50		0.08	Head	----	----	100	94.125	94.000	N/A	94.500	F2
F2	circ	450	N/A	0.54		0.09	100	0.000	0.000	100	93.985	93.860	N/A	94.400	F4
F3	circ	450	N/A	0.50		0.08	Head	----	----	100	93.625	93.500	N/A	94.000	F4
F4	circ	600	N/A	0.80		0.23	100	0.000	0.000	100	93.525	93.400	N/A	94.200	F7
F5	circ	450	N/A	0.50		0.08	Head	----	----	100	94.125	94.000	N/A	94.500	F7
F6	circ	450	N/A	0.50		0.08	Head	----	----	100	93.625	93.500	N/A	94.000	F7
F7	circ	600	N/A	1.20		0.34	100	0.000	0.000	100	93.325	93.200	N/A	94.400	F8
F8	circ	1200	N/A	0.83		0.94	100	0.000	0.000	100	92.995	92.870	N/A	93.700	F9

All manholes to be as per 'Sewers for Adoption'

Levels calculated for level inverts

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Job No.	821A
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MasterDrain
Foul 11.5

Project	Firs Farm (Revised	By	Checked	Reviewed
Title	Manhole printout for FIRS FARM REVISED.FL	MDM		

These explanatory notes should be read in conjunction with the Manhole printout

1) Manhole ref - the reference for the manhole in question

2) Form - either circular or rectangular

3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres

4) Rectangular width - if form is rectangular, this gives the width of the chamber

5) Chamber height - height of chamber from invert

6) Shaft height - height of access shaft if applicable, from top of chamber to ground level

7) Manhole volume - cubic capacity of manhole chamber

8) Exit diameter - diameter of pipe leaving this manhole

9) Exit crown - crown level of pipe leaving this manhole

10) Exit invert - invert level of pipe leaving this manhole

11) Manhole diameters of 9999 have exceeded the sizes available in SfA

12) Manhole diameters may have to be modified due to the number of branches

APPENDIX E:

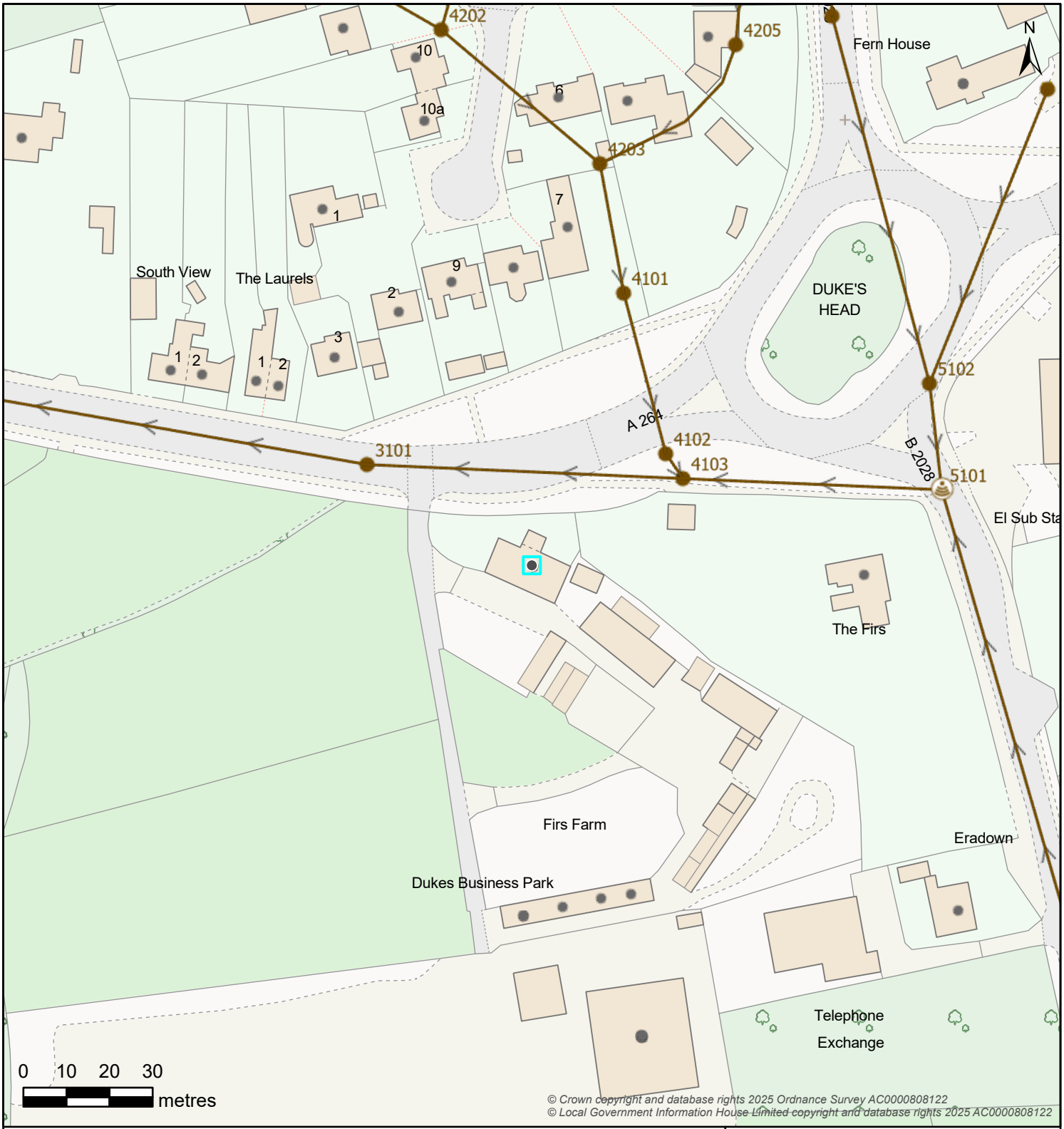
PHOTOGRAPHS

Photo 1: Test Hole 1.

Photo 2: Test Hole 2.

APPENDIX F

Southern Water Sewer Plan



Boundary Box	Break Pressure Tank	Capped End	Hydrant
Boundary Box	BPT Break Pressure Tank	Capped End	Emptying Plug; Fire Hydrant; WOH Washout Hydrant

Pressure Monitoring	Service Reservoir	Meter	Valve - Controllable
Logger	Covered; Tower	Meter	Open Valve; Closed Valve; Stop Tap

Site	Valve - Flow
Abstraction Point; Supply Works; Booster Station; Transfer Station; Surface Reservoir; Underground Source	AV Air Valve; NRV Non-Return Valve; WO Washout Empty Valve

Valve - Pressure	Pipe Bridge
PRV Pressure Reducing Valve; PSV Pressure Sustaining Valve	Pipe Bridge

Water Pipe	Water Area
Communication; Trunk; Decommissioned; Distribution; Raw; Discolouration; Non-Potable; Private	Water Supply Zone; District Meter Area

Map Title: SW Print

Printed By: Lia.Loversidge

Date Printed: 16/04/2025

Map Scale: 1250

WATER for LIFE from Southern Water

APPENDIX G

MSDC Flood & Drainage Checklist

Flood Risk and Drainage Information Check List – Application Stage

This checklist is designed to support applicants within the planning process provide the information required by the flood risk and drainage team for them to provide a consultation response. This is not the complete planning validation list, however much of the information is also included with the validation list.

The level of detail provided to address each information point should reflect the scale and complexity of the development.

Receipt of this information does not guarantee the flood risk and drainage team will support an application or does it prevent a request for further information. It does, however, ensure the team has sufficient information to undertake a full review and provide detailed consultation response.

Table 1 - Application details

Application number	DM/25/0708
Site address	EIRS FARM
Site co-ordinates	TQ 33623907
Site area in hectares	0.437
Existing site usage	FARM YARD/DIS
Proposed development description	RESIDENTIAL
Block plan	FL41 & FL42
Existing site plan	FL42
Proposed development plan	FL43

Table 2 - Flood Risk

Flood zone(s)	1
Surface water flood risk(s)	very low
Flood risk assessment provided	Yes / ~~No~~

The Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) states that a Flood Risk Assessment is required for all development:

- within flood zones 2, 3 or 3b
- within flood zone 1 with a site area of 1 hectare or more
- within areas with critical drainage problems
- within flood zone 1 where your LPA's SFRA shows it will be at risk of flooding from rivers or the sea in future
- that increases the vulnerability classification and is in flood zone 1 where your LPA's SFRA shows it is at risk from other sources of flooding

Mid Sussex District Council's Strategic Flood Risk Assessment (SFRA) utilises the latest flood maps from the Environment Agency to determine flood risk.

Surface Water Drainage

At application stage the applicant must show that surface water drainage can, in principle be achieved on the site. The minimum information required is shown in Table 3.

If an applicant wishes to avoid a drainage condition, then full detailed drainage design is required at application stage. Details of the information needed for a detailed drainage design are set out in the Discharge of Conditions checklist.

Table 3 - Surface water drainage - minimum information

Proposed means of drainage	ATTENUATION
Infiltration potential on site	ZERO
Drainage constraints plan *(showing any areas drainage cannot be located such as root protection zones, main sewer buffers etc)*	SEE ATTACHED
Acknowledgement of design criteria *(sized to cater for 1 in 100-year plus climate change storm, any off-site discharge restricted to the Greenfield QBar rate for all events up to and including the 1 in 100-year plus climate change storm)*	1 in 100 yr return period +45% CC
Water Authority's agreement in principle to connect surface water to public sewer. *(if applicable)*	N/A
Drainage strategy plan	FIG 4

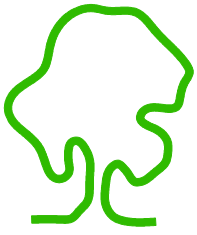
Foul Water Drainage

At application stage the applicant must show that foul water drainage can, in principle be achieved on the site.

If an applicant wishes to avoid a drainage condition, then full detailed drainage design is required at application stage. Details of the information needed for a detailed drainage design are set out in the Discharge of Conditions checklist.

Table 4 - Foul water drainage - minimum information

Proposed means of drainage	PUBLIC SEWER
Public sewer records plan	ATTACHED
Drainage constraints plan *(showing any areas drainage cannot be located such as root protection zones, main sewer buffers etc)*	SEE ATTACHED
Drainage strategy plan	FIG. 4
Outline on how non-mains drainage will meet Environment Agency's General Binding Rules for non-mains drainage. *(if applicable)*	N/A



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