MAGNUM PARTNERSHIP (RTW) LTD

MANOR COURT FARM, ASHURST ROAD,
TUNBRIDGE WELLS, TN3 9TB

Drainage Strategy

March 2022
(Revised November 2023)

eas ltd
Environmental Assessment Services Ltd

REPORT DATA SHEET

Requirement	**Data**
Report Reference	491/MP(RTW)/ManorCourtFarm/Drainage
Date	March 2022
Client	Magnum Partnership (RTW) Limited
Report type	Drainage Strategy
Purpose	Planning
Revisions	April 2022, June 2022, May 2023, June 2023, November 2023
Prepared by	Xanthe Lyford BSc (Hons) 
Approved by	Eur Ing Malcolm McKemey BSc (Hons), CEng, CEnv, MICE, MIEAust, MCIWEM, MIEnvSc 

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1. BACKGROUND, EXISTING SITE & PROPOSED DEVELOPMENT

1.1 The site currently comprises various former stables, barns and other buildings associated with agriculture, 3No. caravans, areas of hard-standing, soft landscaping and surrounding agricultural fields. The total site area is approximately 2 ha. The site is currently in agricultural, commercial, holiday let and residential use. The Ordnance Survey (OS) map reference for the centre of the site is TQ 5180 3893. The site elevation is approximately + 100 m OD. The site falls from southeast to northwest with a total fall of approximately 10 m. See Figure 1 for the site location and Figure 2 for the existing site layout.

1.2 According to the British Geological Survey (BGS), the site lies on Cretaceous Cuckfield Stone Bed - Sandstone and the eastern part of the site may partially lie on Cretaceous Grinstead Clay Member – Mudstone. The underlying bedrock is classified as Secondary A Aquifer with groundwater vulnerability rated as High. The site does not lie within a groundwater Source Protection Zone. The site is moderately hydrogeologically sensitive.

1.3 It is proposed to redevelop the site, converting 7 No. existing units to residential, including extensions to three of the units to create a total of 10 plots.

1.4 The proposed redevelopment will require both surface water and foul drainage. The proposed redevelopment will introduce new impermeable areas and it will be necessary to incorporate Sustainable Drainage System (SuDS) measures to ensure that surface water leaving the site does not exceed the Greenfield flow rate. Foul drainage from the proposed development will need to be treated and disposed of on-site as there is no public foul sewer within practicable reach. This report provides an evaluation of the SuDS options available in respect of the site and an outline strategy for drainage of foul and surface water arising from the proposed development.

2. FLOOD RISK ASSESSMENT

2.1 The site lies in Flood Zone 1, at low risk of flooding from fluvial sources.

2.2 The site is shown to be at very low risk of surface water flooding, apart from a low area in the northwest corner, which is shown to be at moderate risk.

2.3 The site is not at risk of flooding from reservoirs and there do not appear to be any other significant flood risks affecting the site.

2.4 The site lies within Flood Zone 1, but as it is more than 1 ha in area there would usually be a planning requirement for a site-specific Flood Risk Assessment. It is for the local planning authority to apply the Sequential Test, however, as the site is in Flood Zone 1 and already partly in residential use, it is assumed that the Sequential Test is satisfied. There are no specific flood related risks to buildings or proposed occupants and dry access and egress is available on to the nearby A264.

2.5 The surface water flood risk will require consideration, and site drainage from the proposed development should avoid increasing flood risk downstream.

3. EXISTING SITE DRAINAGE

3.1 The site was visited on Friday 4 March 2022. Formal surface water drainage at the site appears limited to roof drainage on buildings discharging via gutters and downpipes to the ground. No formal surface water drainage was apparent in the concrete or tarmac paved areas. Most of the site is laid to grass and drains as greenfield.

3.2 There are two large ponds or lakes on the eastern side of the site. The lakes are adjacent to one another, but not directly connected. The southern lake has a water level around 0.4 m above the water level of the northern lake. It appears that the water in the southern lake drains into the northern lake by seepage through the soil bank between the two lakes. The level in the northern lake is maintained by an outlet on the northern edge comprising a headwall with a 150 mm outlet pipe passing north under the A264 highway (Ashurst Road) and discharging into a deep valley on the far side of the road.

3.3 There is a large ditch on the west side of the site draining to a dry pond or depression in the northwest corner of the site. This dry pond/depression is the lowest point on the site and is some 1.5 m below the level of the adjacent A264 highway immediately to the north. No pipe discharging under the highway from the depression could be seen and no exit channel was apparent on the other side of the highway.

3.4 There are lavatories and washing facilities for the users of the caravan pitches and the existing small commercial offices/workshops, plus foul sewage from Manor Court Farmhouse. The foul sewage appears to be discharged to a package sewage treatment plant to the west of the site entrance. Presumably, the effluent from the treatment plant discharges to a drainage field under the adjacent grassed area, which may include the dry pond/depression.

3.5 The Greenfield runoff rate for the site has been calculated using the UK SuDS tools (See Appendix B). The results are summarised in Table 3.1 below:

TABLE 3.1
GREENFIELD RUNOFF RATES

Return period	Flow rates (l/s)
Qbar	6.48
1 in 1 year	5.58
1 in 30 year	14.91
1 in 100 year	20.68
1 in 200 year	24.24

3.6 The maximum discharge permitted to leave the site from the drained area, post development, should not exceed Qbar (6.48 l/s). The foul sewage should also be allowed for in the permitted off-site discharge flow rate. The foul sewage design flow from the proposed redevelopment has been estimated at 0.42 l/s (based on the Sewers for Adoption recommendations for residences).

4. PROPOSED SITE DRAINAGE

4.1 Surface water drainage is required for the proposed redevelopment.

4.2 The proposed redevelopment of the site will require the installation of a new drainage system. In line with current local planning authority policy, new development should seek to incorporate Sustainable Drainage Systems (SuDS).

4.3 Tunbridge Wells Borough Council require that the drainage design of the developed site should retain onsite flows up to the 1 in 100-year return period event, including a 45% allowance for climate change.

4.4 **Drainage to Soakaway**

4.4.1 Drainage to soakaway (infiltration) is the preferred solution in the SuDS hierarchy. Permeability for soakaway drainage was uncertain and required percolation testing to investigate the suitability.

4.4.2 Test holes for the percolation testing were located at the most probable practicable locations for soakaways i.e., close to and/or downhill from the locations to be drained.

4.4.3 Percolation testing was carried out at four locations across the site on 4th March 2022. The locations of the test holes are shown in Figure 2. Test hole logs are given in Appendix E. The results of the percolation testing are summarized in Table 4.1 below:

TABLE 4.1
INFILTRATION COEFFICIENTS (*f*)

Percolation Test Hole	***f* (m/s)**	**Vp (s/mm)**
1	8.852×10^{-6}	38
2	4.309×10^{-6}	77
3	3.032×10^{-7}	>100
4	$<1.00 \times 10^{-7}$	>100

4.4.4 The results showed the location of Test Hole 1 to be suitable for soakaway drainage, the location of Test Hole 2 was marginally suitable for soakaway drainage and the locations of Test Holes 3 and 4 were not suitable for soakaway drainage.

4.4.5 From the above, Plots 1, 2 and 3 may be drained to a soakaway located in the area north and west of Plot 1. A trench soakaway in this area is proposed and suitable soakaway size has been calculated (total length of 60 m x 2 m x 2 m deep) assuming a total impermeable area of 1059 m^2. See Figure 4 and MasterDrain model results in Appendix D and summarised in table 4.2 below.

TABLE 4.2 SURFACE WATER DRAINAGE CHAMBERS

Chamber No.	Chamber dia (mm)/type	Area drained (m2)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
SWA1	1200	-	96.1	95.20	250	300
SWA2	450	63.38	96.2	95.50	-	100
SWA3	450	75.44	96.3	95.50	100	100
SWA4	900	186.58	98.26	97.10	300	300
SWA5	900	276.55	98.50	97.40	300	300
SWA6	600	41.57	99.00	97.50	150	225
SWA7	900	234.57	99.05	98.30	300	300
SWA8	450	36.65	98.70	98.90	100	150
SWA9	450	27.59	99.45	98.50	-	100
SWA10	450	70.82	99.00	98.80	100	100
SWA11	450	151.27	99.90	99.40	-	100
SWA12	900	189.80	99.50	98.50	150	300
SWA13	900	208.63	100.25	99.55	225	225
SWA14	900	136.70	100.65	99.65	150	225
SWA15	600	282.26	101.25	100.00	-	150
SWA16	900	220.05	100.36	99.30	150	150
SWA17	600	237.96	100.45	99.55	150	150
SWA18	450	65.46	102.38	101.95	100	100
SWA19	450	62.13	102.38	102.10	-	100

4.4.6 The surface water drainage strategy will be drainage to soakaway. In addition, it is recommended that all new paved areas should be permeable. Hardstanding could be concrete blockwork laid on 50 mm of no-fines 2 – 6 mm angular bedding on permeable geotextile over 250 mm thick sub-base of no-fines 20 – 70 mm angular stone drainage blanket laid on permeable geotextile over natural ground (Marshalls design or equivalent). See Figure 5.

4.5 **Attenuation Storage**

4.5.1 The alternative to drainage to soakaway will be attenuation storage, where surface water flows, exceeding Qbar, are stored and only released at a rate limited to the equivalent Greenfield flow for the site (6.06 l/s). Flow control could be achieved using an orifice plate or a vortex valve.

4.5.2 Plots 4 – 10 will be drained to the ponds/lakes on the eastern edge of the site as these areas currently do. The ponds/lakes will provide effective attenuation storage. See Figure 4 and MasterDrain model results in Appendix D and summarised in table 4.3 below.

TABLE 4.3 SURFACE WATER DRAINAGE CHAMBERS

Chamber No.	Chamber dia (mm)/type	Area drained (m^2)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
SW1	1200	-	103.70	102.30	100	100
SW2	600	-	103.65	102.23	225	225
SW3	600	37.48	104.35	103.56	150	150
SW4	600	37.23	104.35	103.67	150	150
SW5	450	32.64	104.35	103.78	100	100
SW6	450	31.70	104.35	103.89	100	100
SW7	900	82.38	104.41	102.50	225	225
SW8	600	73.45	104.41	103.65	225	225
SW9	900	70.18	104.41	103.80	225	225
SW10	600	78.70	104.21	103.95	150	150
SW11	450	312.80	104.41	104.10	150	150
SW12	600	71.31	103.78	102.55	225	225
SW13	450	56.80	103.90	102.70	150	150
SW14	450	130.63	103.75	103.50	100	100
SW15	450	164.70	103.55	103.00	100	100
SW16	900	64.05	103.85	102.30	225	225
SW17	900	-	103.35	102.20	225	225
SW18	600	64.81	103.90	102.45	225	225
SW19	450	26.56	103.60	103.30	100	100
SW20	450	121.11	103.90	102.40	100	100
SW21	600	94.92	103.55	102.55	225	225
SW22	600	-	103.70	102.70	150	150
SW23	450	169.67	103.50	103.00	150	150
SW24	600	48.25	103.55	102.75	150	150
SW25	450	204.75	103.55	102.85	150	150
SW26	450	54.06	103.55	103.00	100	100

5. DRAINAGE DESIGN

5.1 **Design Philosophy**

5.1.1 Suitable infiltration rates for drainage to soakaway were found in the northwestern and central parts of the site and surface water from Plots 1, 2 and 3 of the redeveloped site will be drained to a trench soakaway in these areas.

5.1.2 Plots 4 – 10 will be drained to the ponds/lakes on the eastern edge of the site with attenuation storage provided within the ponds/lakes.

5.1.3 The proposed drainage design, including chamber invert and cover levels and pipe sizes are shown on the Opus Magnum Drawing No. P086 – 102 Revision B in Appendix B.

5.2 Design Storm

5.2.1 The surface water drainage system is usually designed for the 30-year return period event plus, 40% allowance for climate change, and tested for surcharge for the 1 in 100 return period event (1% Annual Exceedance Probability), plus a 45% allowance for climate change.

5.3 Hydrological Data

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

5.4 Design Layout

5.4.1 The drainage arrangement is shown in Appendix B and the arrangement, plus references to additional soakaway recommendations, are given in Figure 4.

5.5 Soakaway Sizing

5.5.1 The soakaway trench size has been calculated for the 1 in 100 return period event, plus a 45% allowance for climate change, using the MasterDrain model. The trench soakaway will comprise an excavated trench filled with 20 – 70 mm no fines stone wrapped in permeable geotextile membrane (Terram 1000 or similar). The results of the modelling are given in Appendix D.

5.6 Other SuDS Options

5.6.1 The principal SuDS option, which would limit the size of the soakaways, will be permeable paving laid over drainage blankets in the parking, patio and other hardstanding areas.

5.6.2 Other SuDS options will include rainwater harvesting for garden irrigation, rain gardens and green roofs. Any redundant areas of existing concrete surfacing could be removed, returned to grassland, or paved in gravel laid over permeable geotextile.

5.7 Extreme Event

5.7.1 An extreme event, which overwhelmed the drainage system, would result in water following the existing drainage pattern for the area with Plots 1 - 3 flowing northwest and into the existing ditches and the sink area on the south side of the highway, and the area of Plots 4 – 10 draining east into the ponds/lakes as per the existing situation.

6. FOUL DRAINAGE

6.1 The proposed redevelopment will require foul drainage.

6.2 The only permissible option where a public foul sewer is available within a reasonable distance of the site is to connect into it. In this case, there do not appear to be any public foul sewers within practicable reach of the site.

6.3 The site is presently drained to a Titan Biotec package sewage treatment plant to the west of the site entrance. The existing central lavatory facilities for the users of caravan/camping pitches at the site, and the buildings presently used as commercial premises, all drain to the existing package sewage treatment plant to the west of the farmhouse. The Titan Biotec sewage treatment plant is to be replaced by a new Klargester – BG – Biodisc 70 sewage treatment plant.

6.4 Under the General Binding Rules, a package sewage treatment plant should discharge treated effluent to a watercourse or a drainage field. In the absence of a suitable watercourse within easy reach, the sewage treatment plant will have to discharge to a drainage field. Using the MasterDrain Foul model and based on a total population of 40, the drainage field size will have a total area of 304 m^2. See Appendix D and Figure 4. It should be noted that a drainage field and a surface water soakaway should not be located within 15 m of each other.

6.5 The foul sewerage layout, including chamber invert and cover levels plus pipe sizes, is shown on Opus Magnum Drawing No. P086 – 102 Revision B in Appendix B and the arrangement plus additional drainage field recommendations are given in Figure 4 and summarised in table 6.1 below.

TABLE 6.1 FOUL WATER CHAMBERS

Chamber No.	Chamber dia (mm)/ type	Cover Level (mAOD)	Invert Level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
FW1	1200	98.22	97.00	100	150
FW2	600	98.75	97.60	100	100
FW3	450	99.00	98.10	100	100
FW4	450	99.35	98.30.	100	100
FW5	450	99.35	98.50	100	100
FW6	900	100.15	99.00	100	100
FW7	600	100.48	99.20	100	100
FW8	600	100.36	99.40	100	100
FW9	450	100.50	99.60	100	100
FW10	450	100.38	100.00	100	100
FW11	450	102.50	102.00	100	100
FW12	900	103.13	102.00	100	100
FW13	450	103.16	102.50	100	100
FW14	450	103.18	103.00	100	100
FW15	600	103.50	102.40	100	100
FW16	600	103.55	102.50	100	100
FW17	450	103.60	102.70	100	100
FW18	600	103.80	102.70	100	100
FW19	450	104.41	103.79	100	100
FW20	450	104.41	103.90	100	100

FW21	450	104.21	103.95	100	100
FW22	450	104.41	104.11	100	100
FW23	450	103.90	103.40	100	100
FW24	450	103.96	102.80	100	100
FW25	450	103.90	103.00	100	100
FW26	450	103.75	103.40	100	100

1

6.6 Under the General Binding Rules for sewage disposal, the proposed new sewage treatment plant will require an Environmental Permit from the Environment Agency.

7. OPERATION & MAINTENANCE OF THE SYSTEM

7.1 The surface water and foul drainage systems should require minimal operational input once construction has been completed. However, it will require regular maintenance.

7.2 Items requiring maintenance will include:

- The Klargester Biodisc 70 sewage treatment plant.
- Gullies, strip drains and channels.
- Chambers.
- Silt traps upstream of the soakaways.
- Any permeable paving

7.3 The new sewage treatment plant will require regular maintenance, at least annually. Post-redevelopment, the maintenance costs should be distributed amongst the residents.

7.4 An operation/maintenance manual is provided in Appendix F.

8. SUMMARY & CONCLUSIONS

8.1 According to the Environment Agency flood mapping, the site lies within Flood Zone 1, at low risk of flooding from fluvial sources. The surface water flood risk mapping shows the site to be at very low risk of surface water flooding. The site is not at risk of flooding from reservoirs.

8.2 The site lies on Cuckfield Stone Bed and Grinstead Clay Member. Percolation testing revealed the site to be suitable for drainage to soakaway, where the soakaways are located in the northwestern part of the site.

8.3 The SuDS surface water strategy for Plots 1, 2 and 3 should be disposal of surface water to soakaway. A suitable location for the soakaway will be to the west of Plot 1. (see Figure 4). The proposed trench soakaway design is given in Appendix D. The SuDS surface water strategy for Plots 4 – 10 will be discharge to the ponds/lakes on the eastern edge of the site, with attenuation storage provided within the ponds/lakes.

8.4 It would be beneficial to maximize SuDS features. This should include the use of concrete block permeable paving over drainage blankets in the parking areas, drives and patios. Any redundant hardcover should be removed and returned to grassland or soft landscaping to minimise impermeable areas on the site. The use of rain gardens should be considered.

8.5 Rainwater harvesting for lavatory flushing would be a possible option. The minimum should be the collection of roof water for garden irrigation.

8.6 The proposed development will require foul sewerage. There are no public foul sewers within a practicable distance of the site and connection to a public foul sewer is not an option.

8.7 The site foul sewage is presently drained to a Titan Biotec package sewage treatment plant to the west of the site entrance. The Titan Biotec sewage treatment plant is to be replaced by a new Klargester – BG – Biodisc 70 sewage treatment plant. The sewage treatment plant should discharge to a drainage field. It is assumed that the new plant will require an Environmental Permit from the Environment Agency.

9. RECOMMENDATIONS

9.1 It is recommended that a survey of the existing foul sewerage (particularly to identify the extent of the existing drainage field) is carried out the enable the new sewerage arrangement to be confirmed.

9.2 It is recommended that the permit status and maintenance arrangements for the existing sewage treatment plant should be investigated and confirmed.

9.3 It is recommended that, where practicable, consideration should be given to making all new hardstanding areas concrete block permeable paving laid on 50 mm of no-fines 2 – 6 mm angular bedding on permeable geotextile over 250 mm thick sub-base of no-fines 20 – 70 mm angular stone drainage blanket laid on permeable geotextile over natural ground (Marshalls design or equivalent). Redundant hardstanding areas should be returned to grass.

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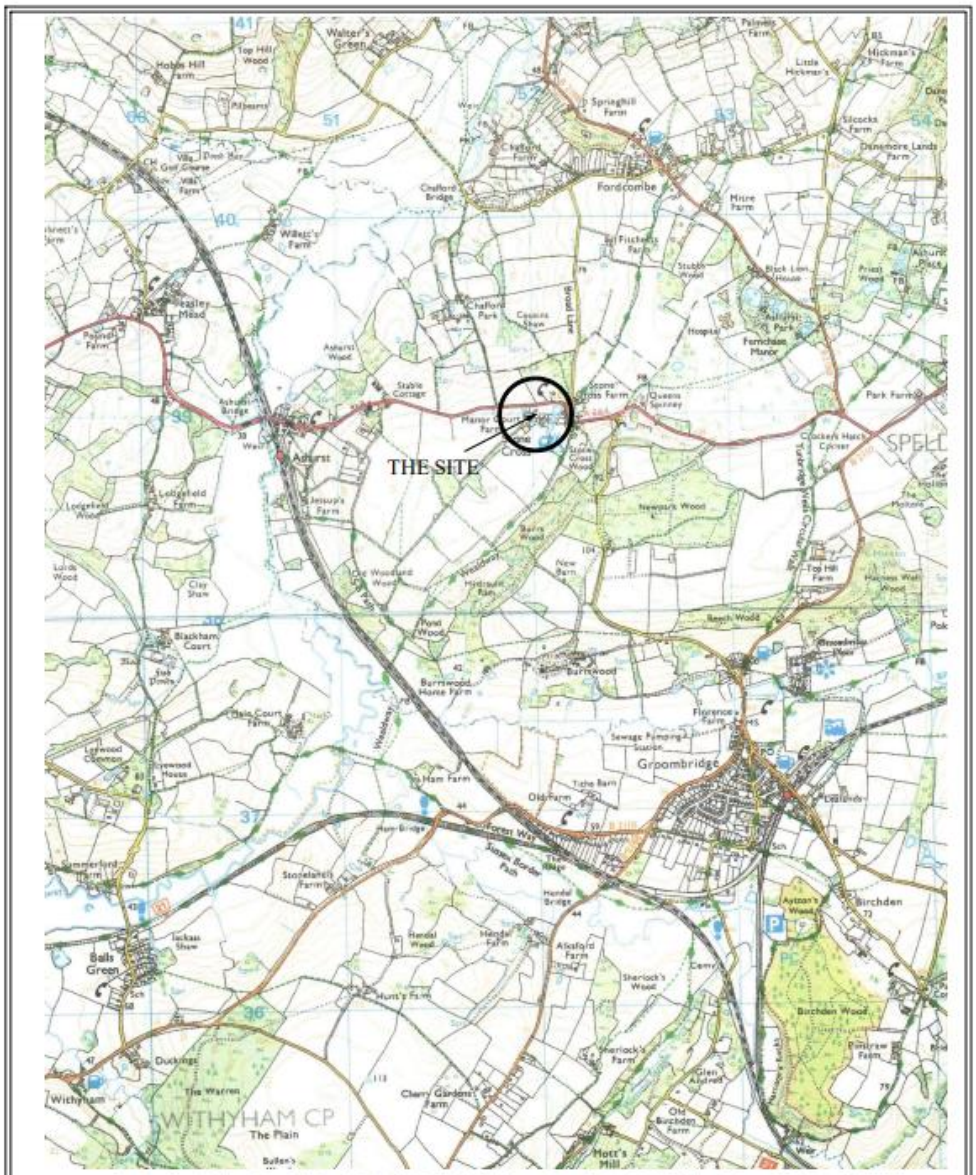
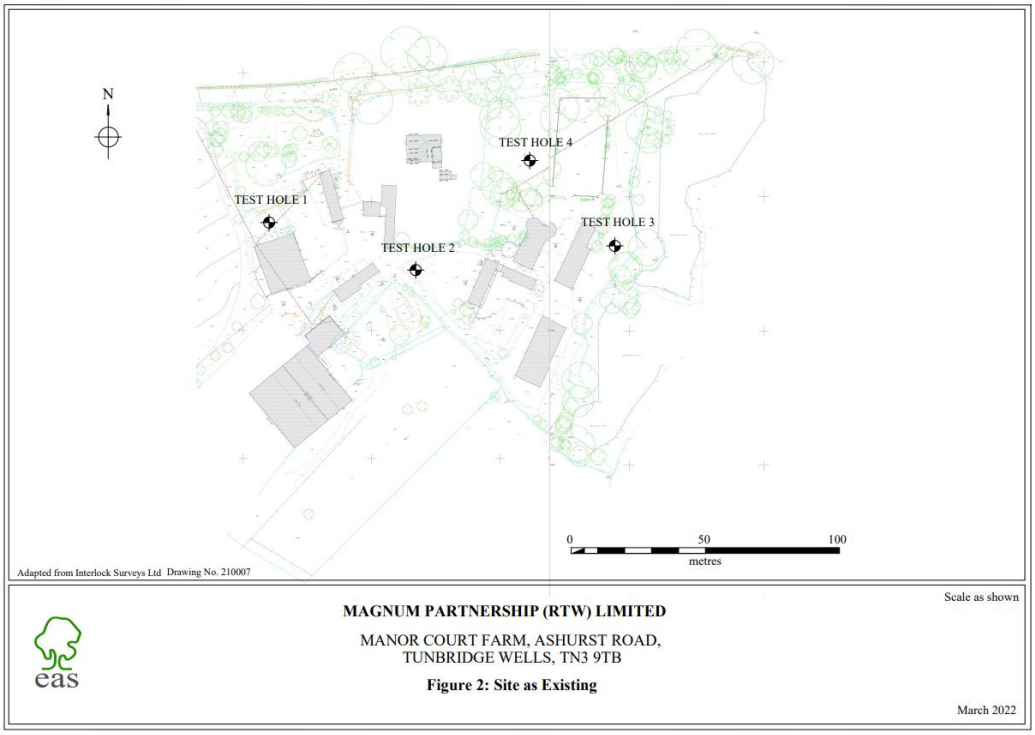
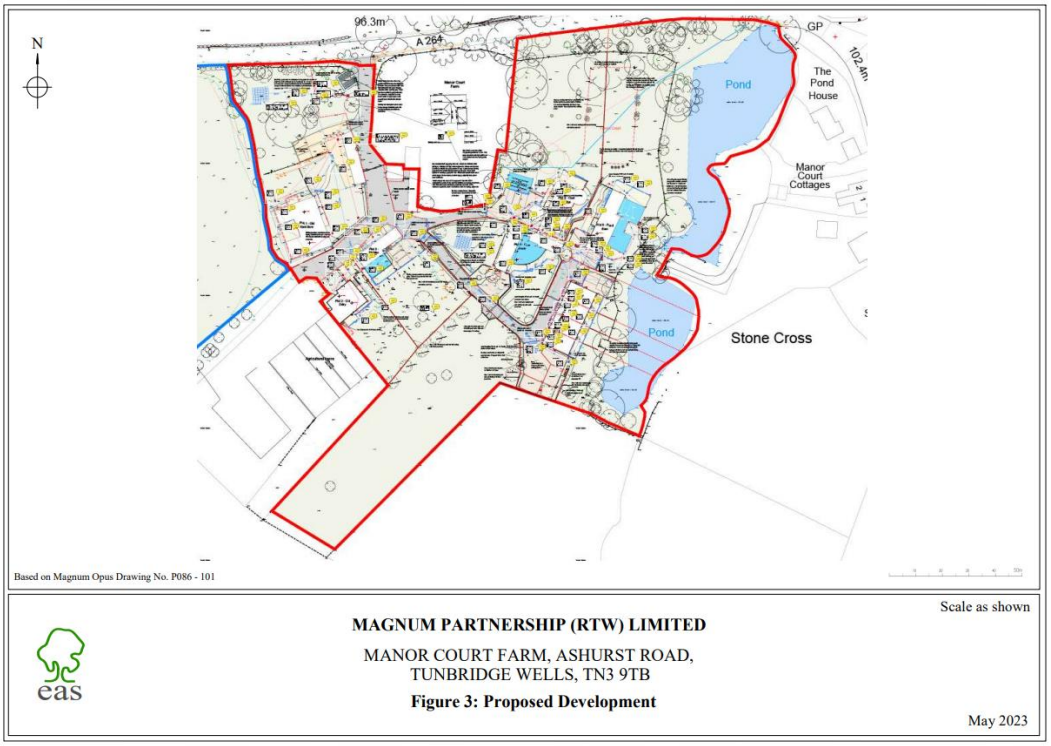
APPENDIX A

Figure 1: Site Location
Figure 2: Site as Existing
Figure 3: Proposed Development
Figure 4: Suggested Drainage Arrangement
Figure 5: Permeable Paving Details


THE SITE
Ashurst
Fordcombe
Groombridge
Withyham
Balls Green
WITHYHAM CP
Reproduced from the Ordnance Survey 1:25000 scale Explorer Map No. 136 & 147, with the permission of the Controller of Her Majesty's Stationery Office. License No. 100005508
Scale 1:25000
MAGNUM PARTNERSHIP (RTW) LIMITED
MANOR COURT FARM, ASHURST ROAD,
TUNBRIDGE WELLS, TN3 9TB
Figure 1: Site Location
March 2022


N
TEST HOLE 1
TEST HOLE 2
TEST HOLE 3
TEST HOLE 4
0
50
100
metres
Adapted from Interlock Surveys Ltd Drawing No. 210007
Scale as shown
MAGNUM PARTNERSHIP (RTW) LIMITED
MANOR COURT FARM, ASHURST ROAD,
TUNBRIDGE WELLS, TN3 9TB
Figure 2: Site as Existing
March 2022


N
96.3m
A 264
GP
102.4m
The Pond House
Pond
Manor Court Cottages
Pond
Stone Cross
Based on Magnum Opus Drawing No. P086 - 101
Scale as shown
MAGNUM PARTNERSHIP (RTW) LIMITED
MANOR COURT FARM, ASHURST ROAD,
TUNBRIDGE WELLS, TN3 9TB
Figure 3: Proposed Development
May 2023
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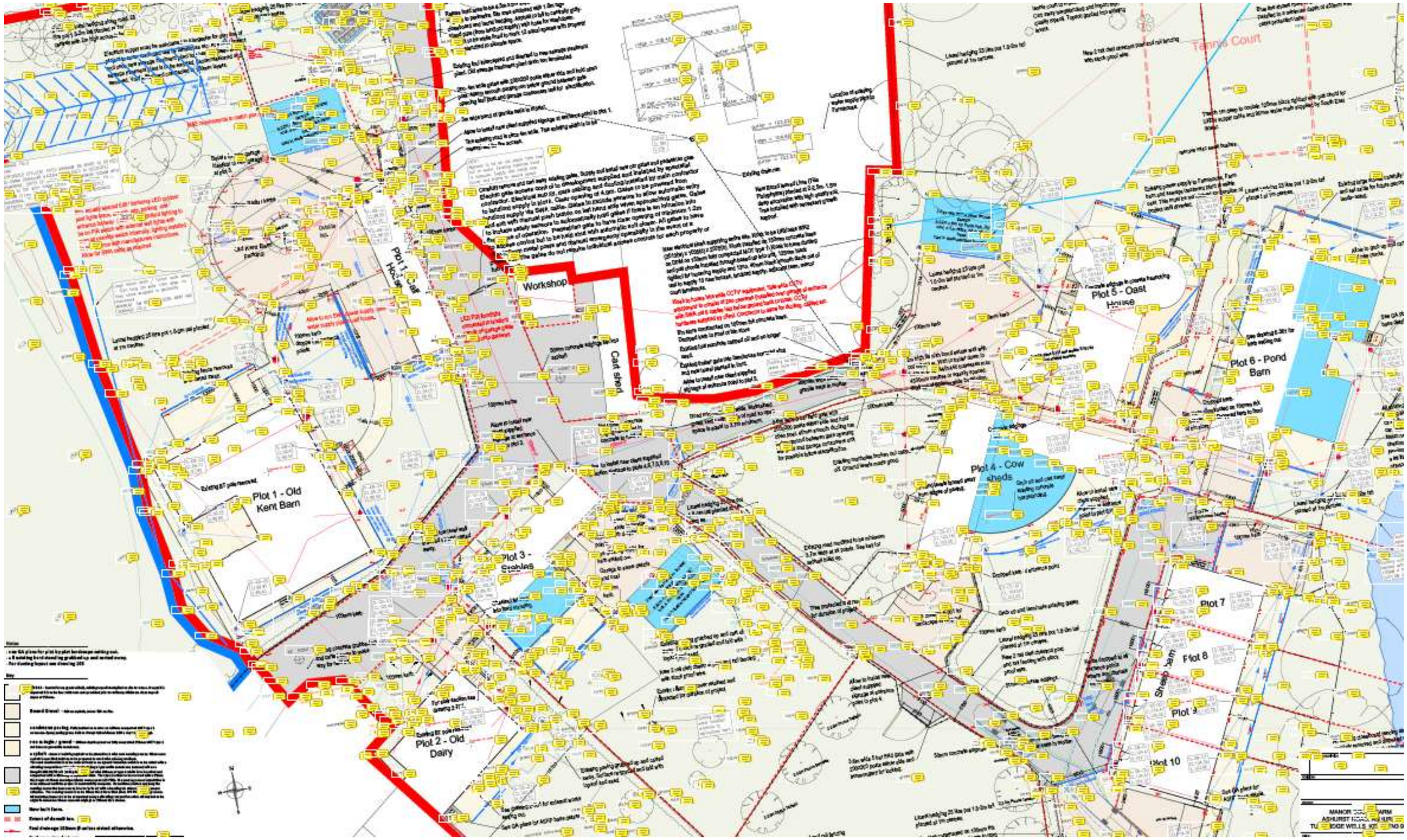

Scale as shown

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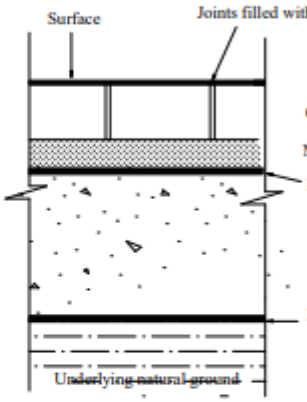
Figure 4: Suggested Drainage Arrangement

November 2023

PERMEABLE PAVING - TYPICAL SECTION



Block paving to be Marshalls or similar approved for permeable paving
Final design prepared by manufacturer based on CBR test on underlying soil
Bedding and sub-base to be compacted as specified
Permeable geotextile to be Terram T1000 or similar approved

Not to scale

eas

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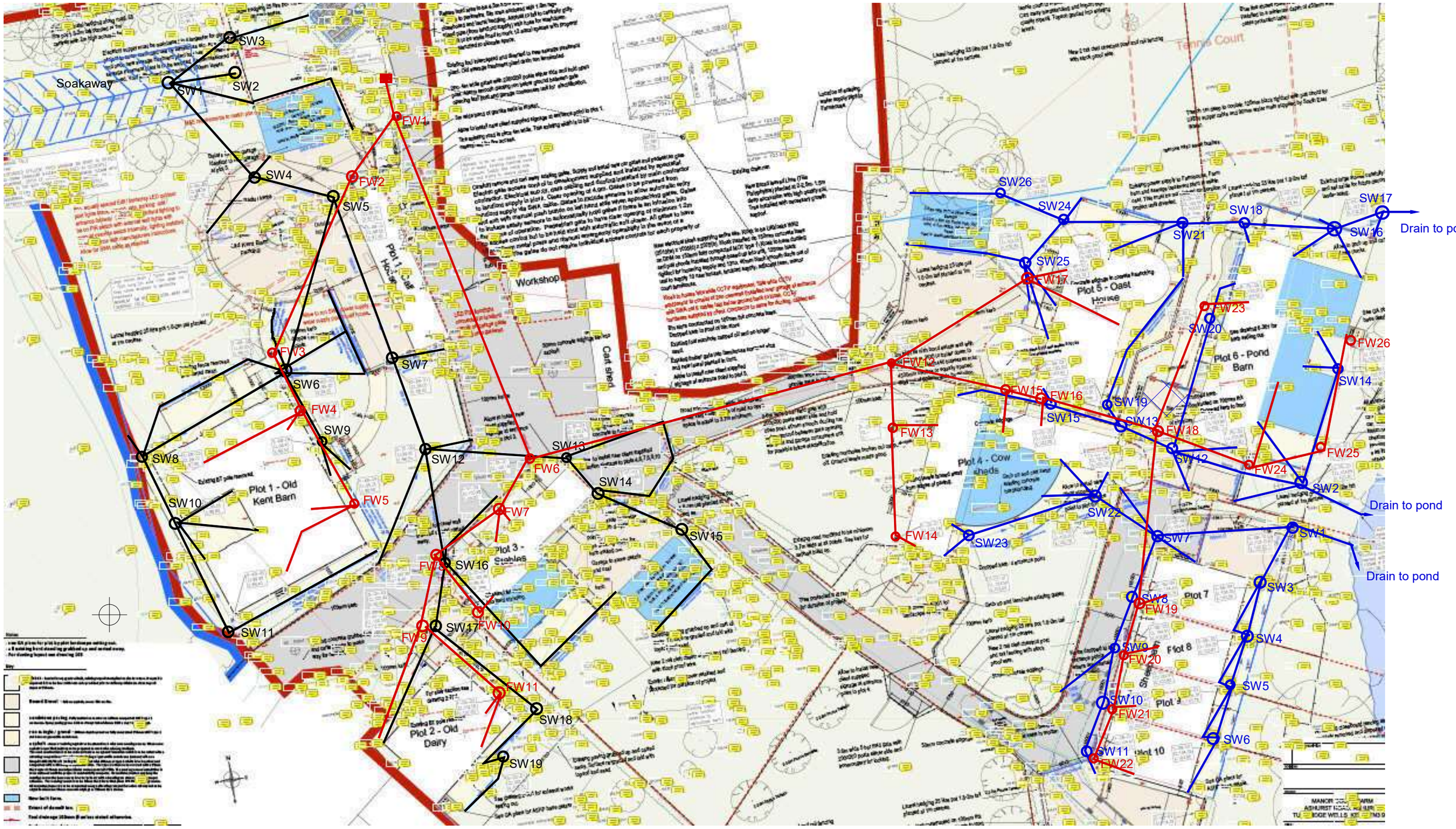
Figure 5: Permeable Paving Detail

March 2022

APPENDIX B

PROPOSED DRAINAGE LAYOUT



Appendix B: Proposed Drainage Layout (Scale as shown).

APPENDIX C:

HR WALLINGFORD GREENFIELD FLOW

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Malcolm McKemey
Site name:	Manor Court Farm
Site location:	Ashurst

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.

Site Details

Latitude:	51.13010° N
Longitude:	0.17173° E
Reference:	3749068493
Date:	Mar 08 2022 14:45

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 2

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	776	776
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	6.48	6.48
1 in 1 year (l/s):	5.51	5.51
1 in 30 years (l/s):	14.91	14.91
1 in 100 year (l/s):	20.68	20.68
1 in 200 years (l/s):	24.24	24.24

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX D:

OUTPUT FROM DRAINAGE DESIGN SOFTWARE

Environmental Assessment Services Ltd
http://www.easltd.co.uk

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MasterDrain SW

Job No.	491C
Sheet no.	1
Date	17/11/23
By	XL
Checked	
Reviewed	

Project: Manor Court Farm to soakaway

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%

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

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 184.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 721.28 mm/hr
Sample period = 7.5 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 m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW19	3.8	5.1	100	450	102.10	102.26	102.38	1.35	0.16	1.33	0.000	59	Warning
2	I	1.02	SW18	8.9	10.5	100	450	101.75	101.92	102.38	1.18	0.17	1.57	0.000	121	Surch.
3	I	1.03	SW17	39.9	30.1	150	600	99.55	99.66	100.45	0.75	0.11	0.00	0.000	347	OK
4	I	1.04	SW16	43.4	48.2	150	900	99.30	99.51	100.36	1.11	0.21	4.86	0.000	556	Surch.
5	B	2.01	SW15	32.0	23.2	150	600	100.00	100.10	101.25	0.73	0.10	0.00	0.000	268	OK
6	B	2.02	SW14	68.3	34.5	225	900	99.65	99.76	100.65	0.50	0.11	0.00	0.000	398	OK
7	B	2.03	SW13	135.0	51.7	225	900	99.55	99.64	100.25	0.38	0.09	0.00	0.000	596	OK
8	I	1.05	SW12	131.9	115.5	300	900	98.50	98.75	99.50	0.88	0.25	0.00	0.000	1333	OK
9	I	1.06	SW7	256.0	134.8	300	900	98.30	98.46	99.05	0.53	0.16	0.00	0.000	1556	OK
10	B	3.01	SW11	11.1	12.5	100	450	99.40	99.56	99.90	1.12	0.16	1.36	0.000	144	Surch.
11	B	3.02	SW10	27.3	18.3	100	450	98.80	98.86	99.00	0.67	0.06	0.00	0.000	211	Warning
12	B	3.03	SW8	21.9	21.3	150	450	97.90	98.04	98.70	0.97	0.14	0.00	0.000	246	OK
13	S1	4.01	SW9	16.9	2.3	100	450	98.50	98.52	99.45	0.13	0.02	0.00	0.000	26	OK
14	B	3.04	SW6	48.8	27.0	225	600	97.50	97.62	99.00	0.55	0.12	0.00	0.000	312	OK
15	I	1.07	SW5	162.4	184.6	300	900	97.40	97.96	98.50	1.14	0.56	22.19	0.000	2130	Surch.
16	I	1.08	SW4	456.4	199.9	300	900	97.10	97.24	98.26	0.44	0.14	0.00	0.000	2307	OK
17	B	5.01	SW3	11.3	6.2	100	450	95.50	95.55	96.30	0.55	0.05	0.00	0.000	72	OK
18	B	6.01	SW2	11.9	5.2	100	450	95.50	95.55	96.20	0.44	0.05	0.00	0.000	60	OK

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Job No. 491C			
Sheet no. 2			
Date 17/11/23			
Project Manor Court Farm to soakaway	By XL	Checked	Reviewed
Title Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%			

MasterDrain SW

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%)

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.	491C
Sheet no.	3
Date	17/11/23

MasterDrain SW

Project: Manor Court Farm to soakaway

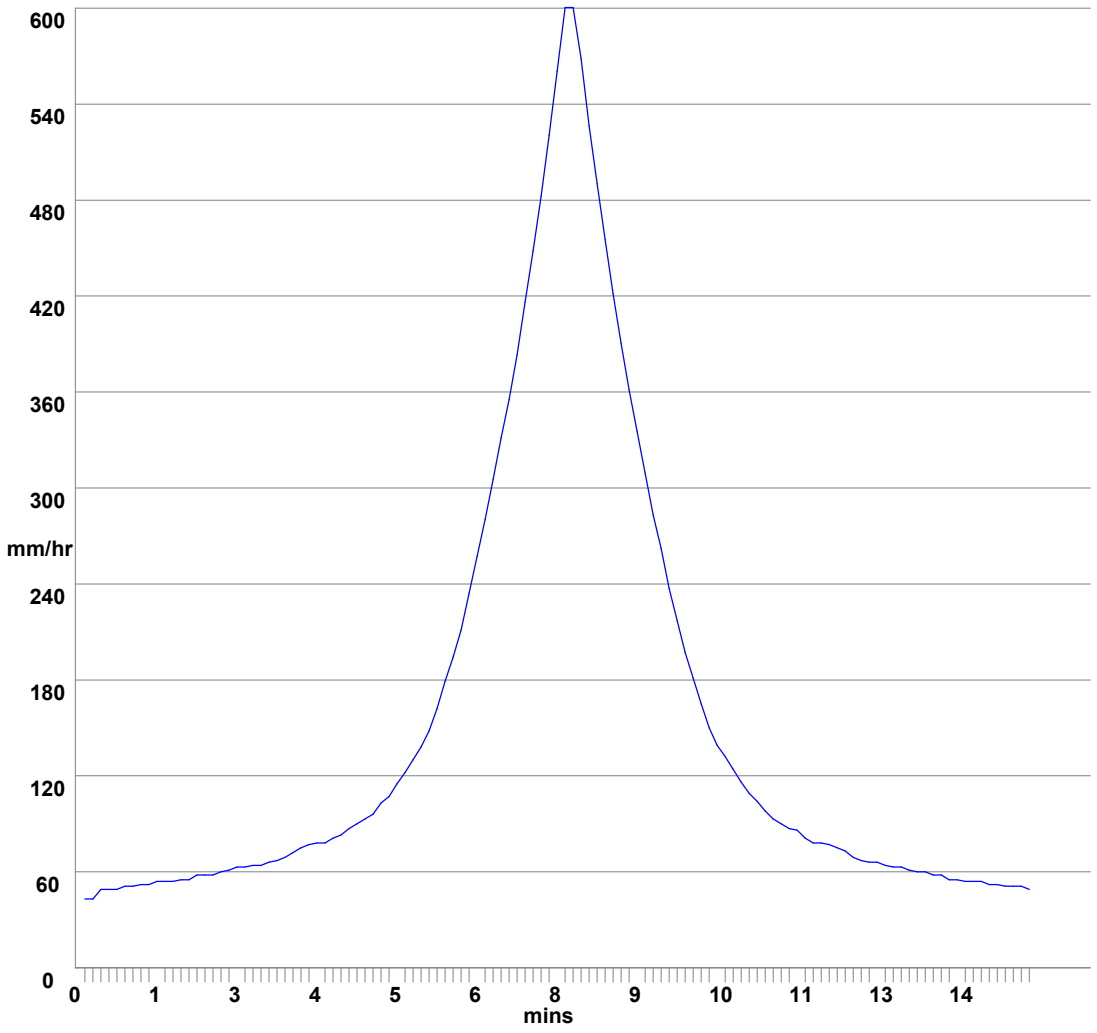
Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%

By	Checked	Reviewed
XL		

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	42.85	5:08	122.44	10:08	131.62
0:15	42.85	5:15	130.09	10:15	123.97
0:22	48.98	5:22	137.75	10:22	116.32
0:30	48.98	5:30	148.46	10:30	108.67
0:38	48.98	5:38	162.23	10:38	104.07
0:45	50.51	5:45	179.07	10:45	97.95
0:52	50.51	5:52	194.37	10:52	93.36
1:00	52.04	6:00	211.21	11:00	90.30
1:08	52.04	6:08	234.17	11:08	87.24
1:15	53.57	6:15	257.12	11:15	85.71
1:22	53.57	6:22	280.08	11:22	81.12
1:30	53.57	6:30	304.57	11:30	78.06
1:38	55.10	6:38	330.59	11:38	78.06
1:45	55.10	6:45	355.08	11:45	76.53
1:52	58.16	6:52	382.63	11:52	74.99
2:00	58.16	7:00	416.30	12:00	73.46
2:08	58.16	7:08	448.44	12:08	68.87
2:15	59.69	7:15	482.11	12:15	67.34
2:22	61.22	7:22	520.37	12:22	65.81
2:30	62.75	7:30	560.16	12:30	65.81
2:38	62.75	7:38	599.96	12:38	64.28
2:45	64.28	7:45	599.96	12:45	62.75
2:52	64.28	7:52	567.82	12:52	62.75
3:00	65.81	8:00	526.49	13:00	61.22
3:08	67.34	8:08	489.76	13:08	59.69
3:15	68.87	8:15	454.56	13:15	59.69
3:22	71.93	8:22	420.89	13:22	58.16
3:30	74.99	8:30	390.28	13:30	58.16
3:38	76.53	8:38	361.20	13:38	55.10
3:45	78.06	8:45	335.18	13:45	55.10
3:52	78.06	8:52	309.16	13:52	53.57
4:00	81.12	9:00	283.14	14:00	53.57
4:08	82.65	9:08	261.72	14:08	53.57
4:15	87.24	9:15	237.23	14:15	52.04
4:22	90.30	9:22	217.33	14:22	52.04
4:30	93.36	9:30	197.43	14:30	50.51
4:38	96.42	9:38	180.60	14:38	50.51
4:45	102.54	9:45	165.29	14:45	50.51
4:52	107.14	9:52	149.99	14:52	48.98
5:00	114.79	10:00	139.28	15:00	48.98

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - summer



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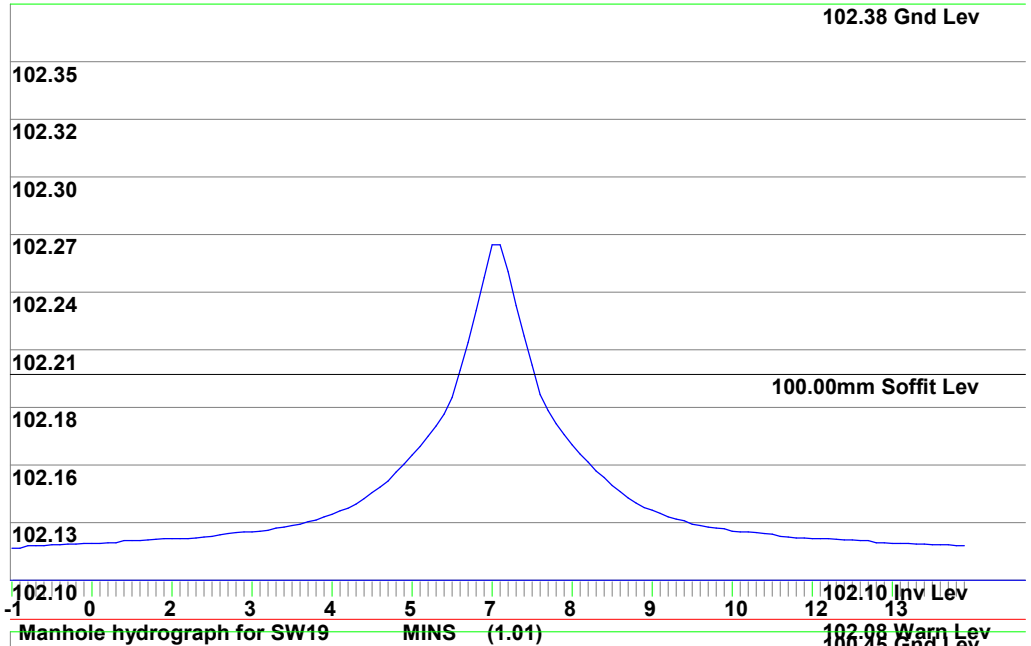
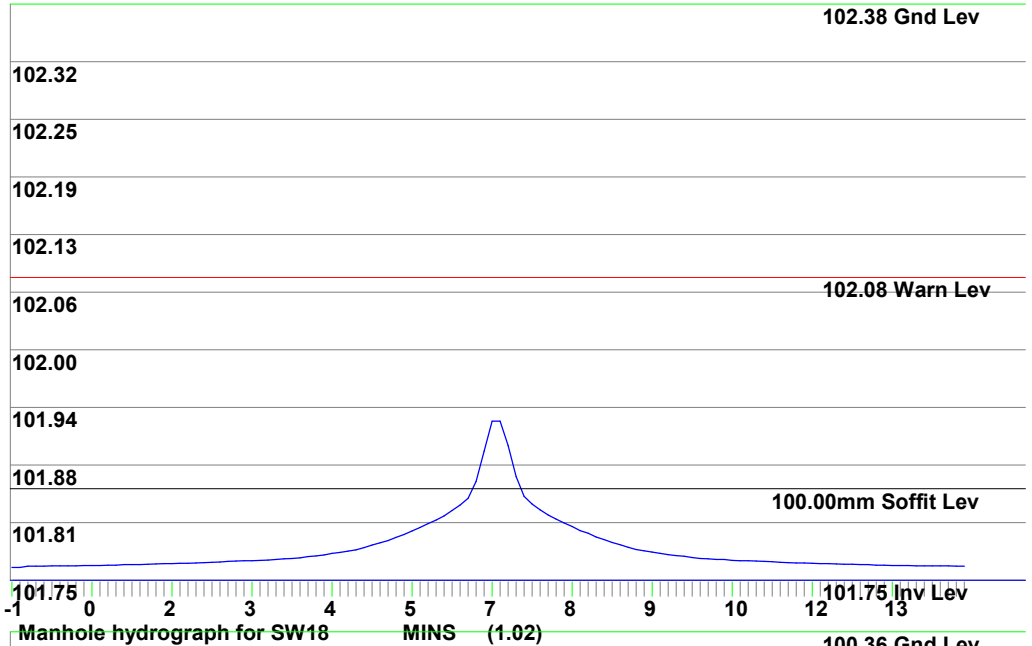
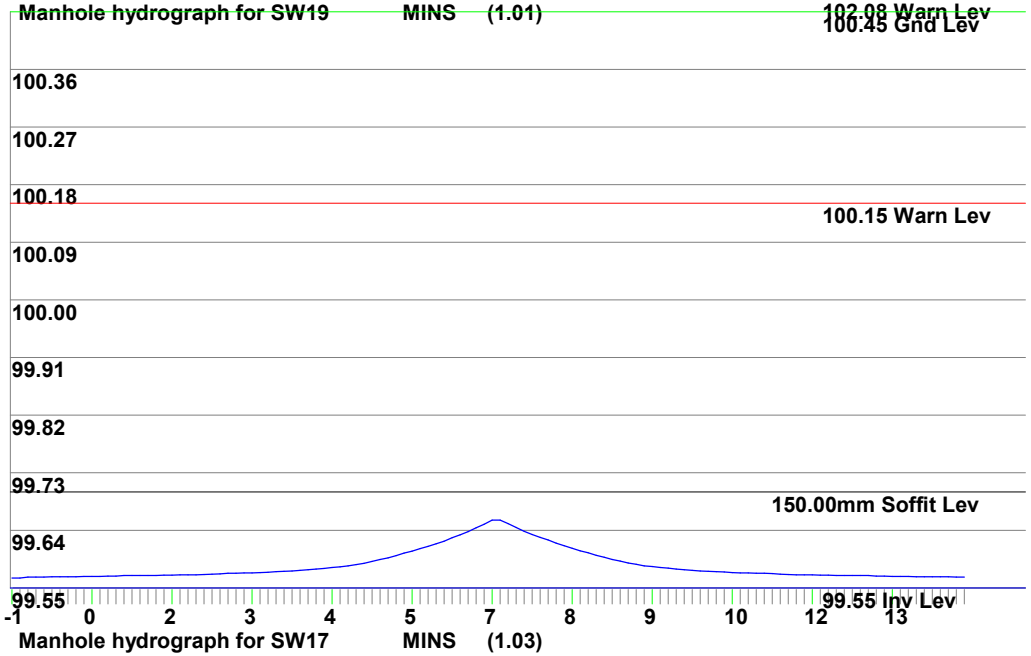
MasterDrain SW

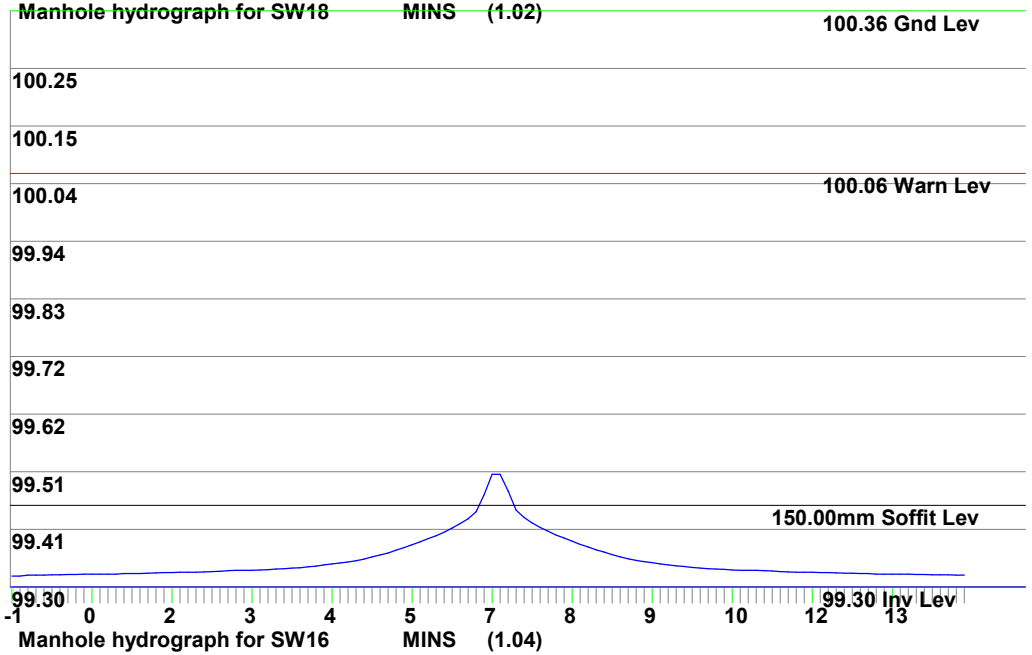
Project: Manor Court Farm to soakaway

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%









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Job No.	491C
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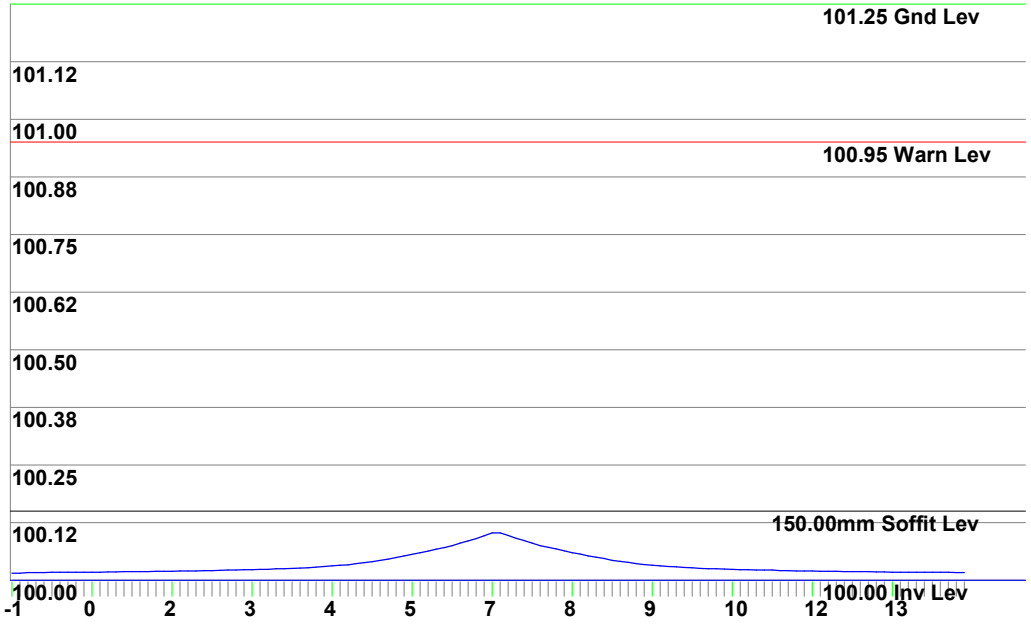
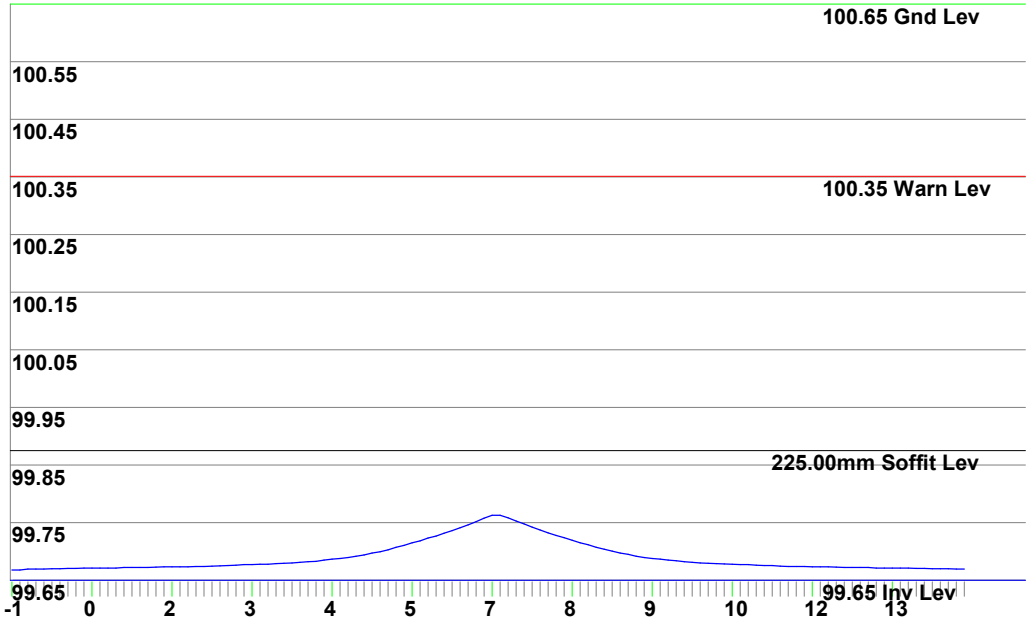
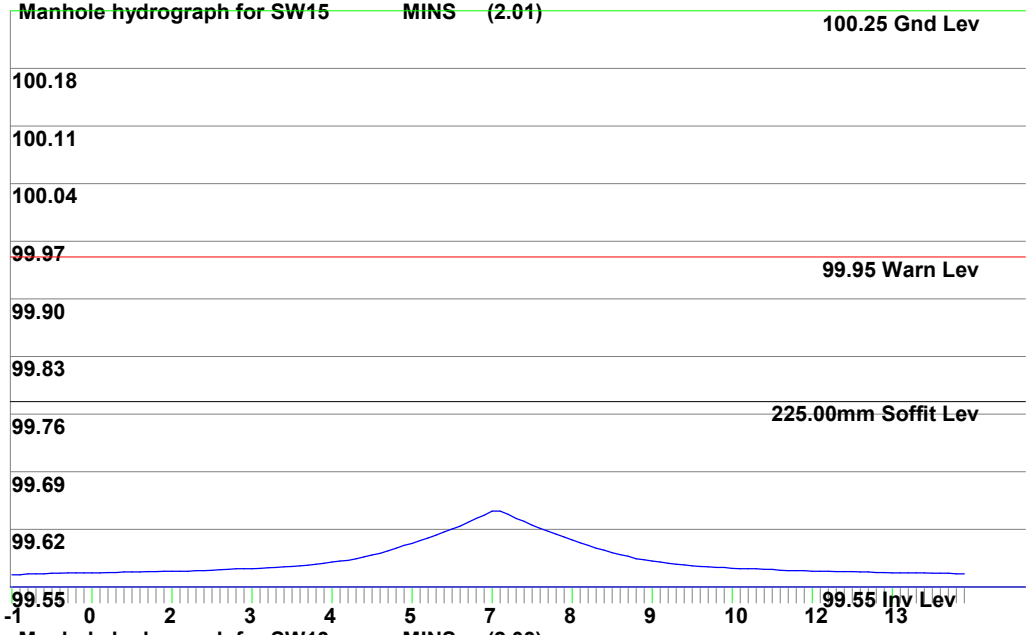
MasterDrain SW

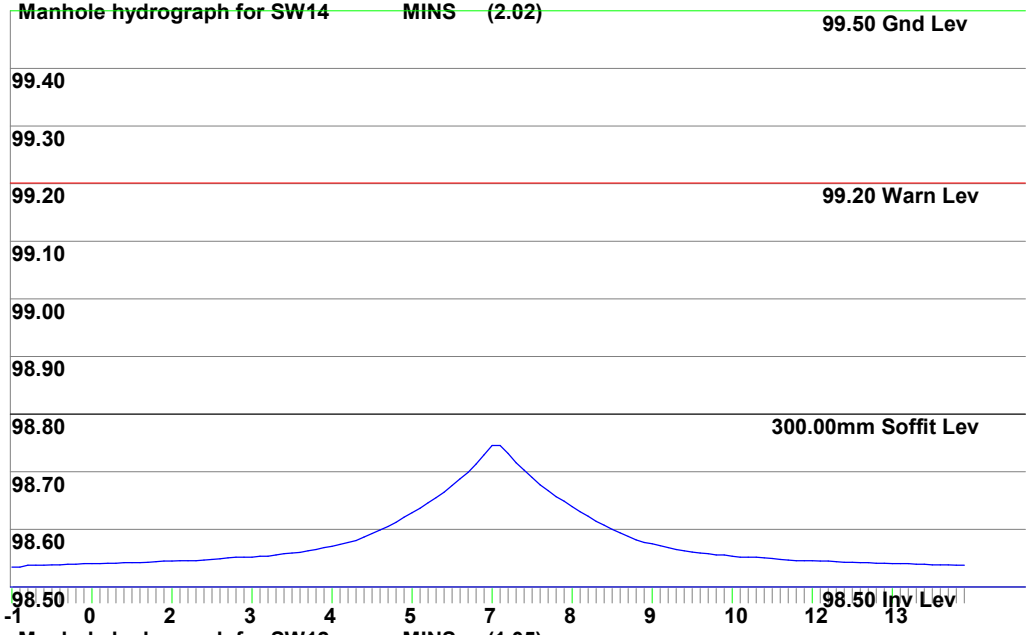
Project: Manor Court Farm to soakaway

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%









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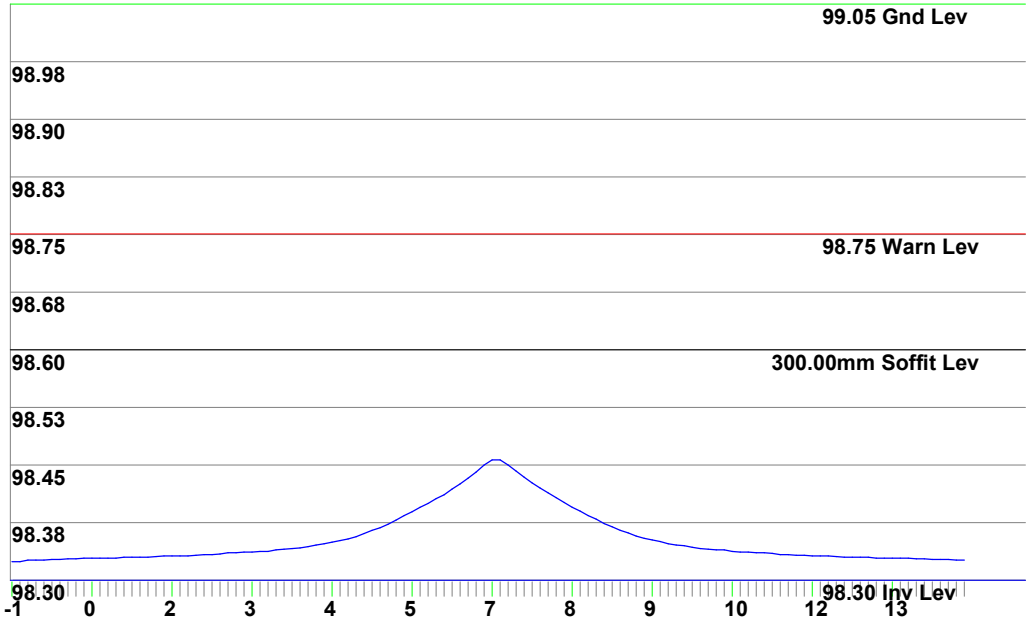
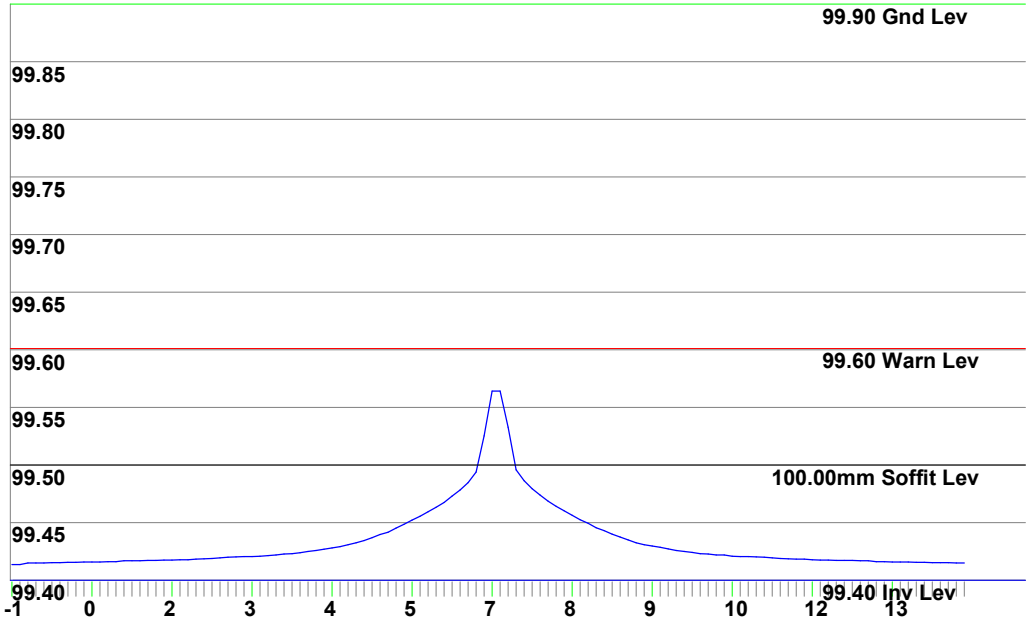
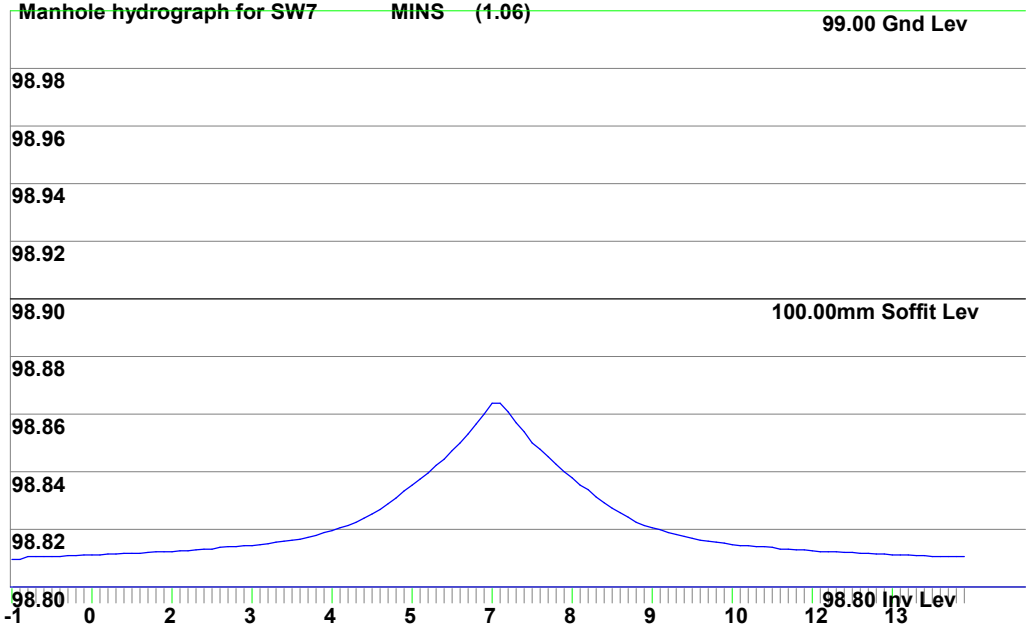
MasterDrain SW

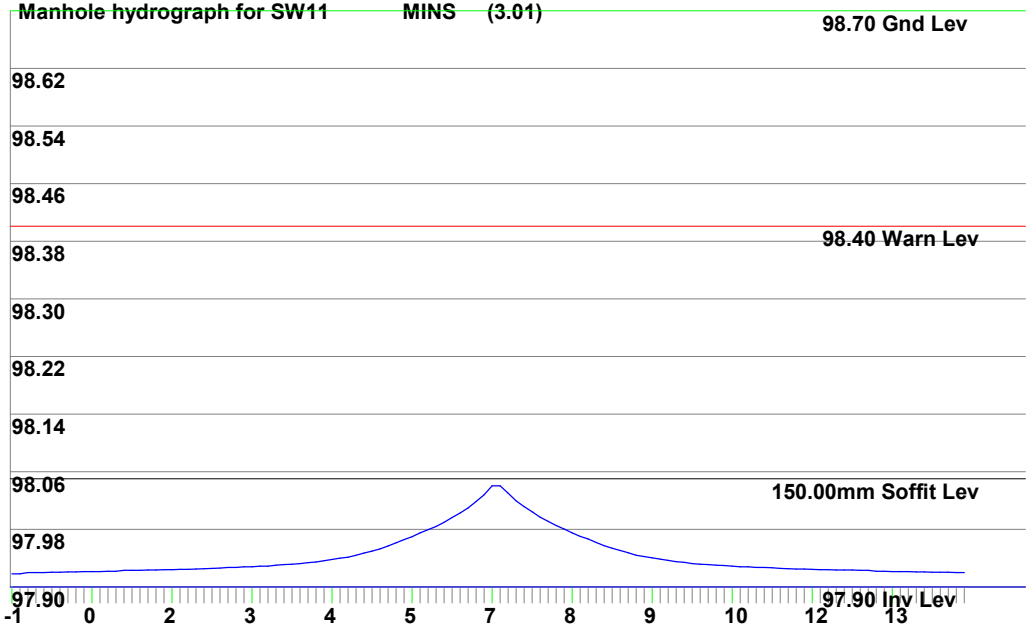
Project: Manor Court Farm to soakaway

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%









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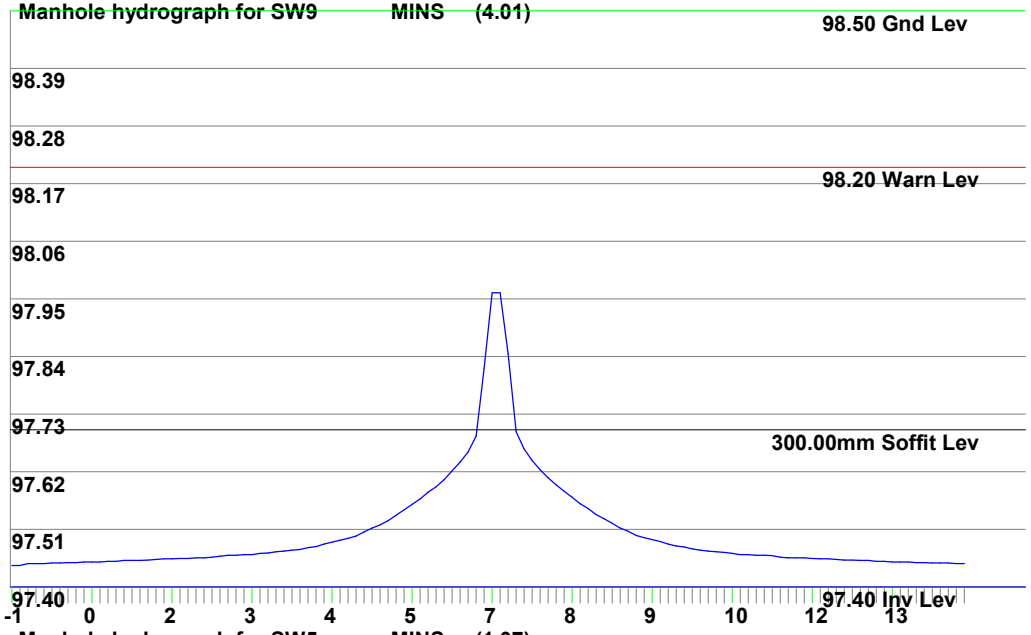
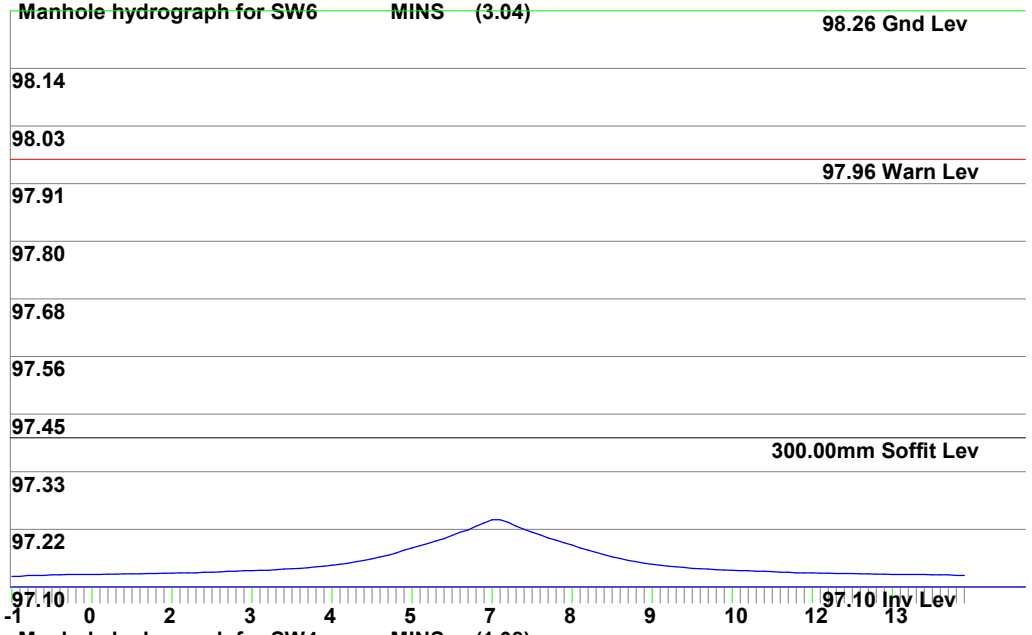
MasterDrain SW

Project: Manor Court Farm to soakaway

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%





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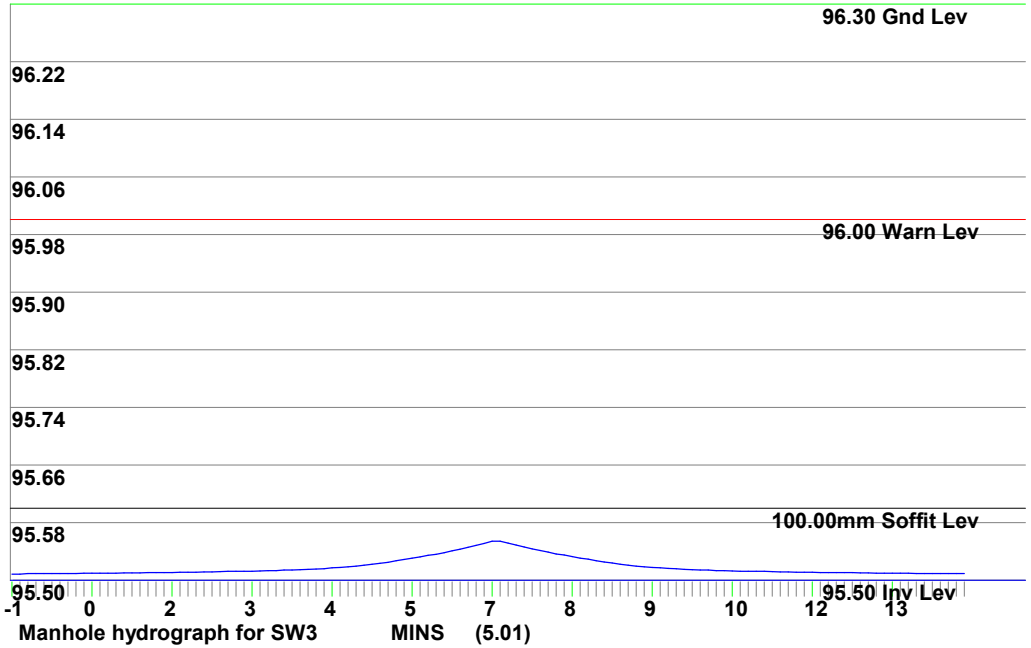
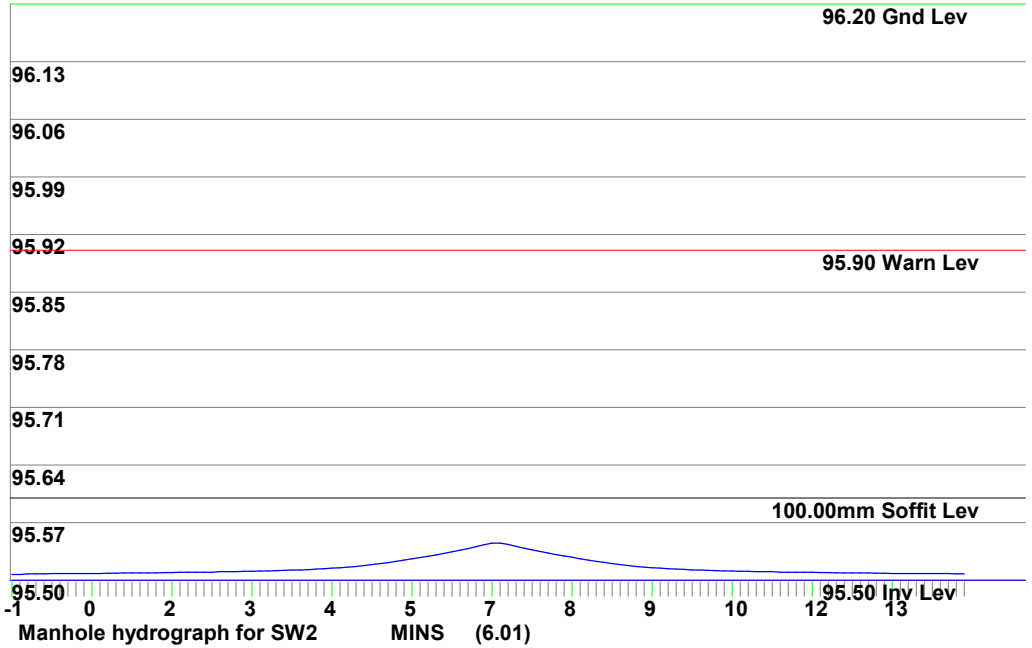
MasterDrain SW

Project: Manor Court Farm to soakaway

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.SW CCF = 45%





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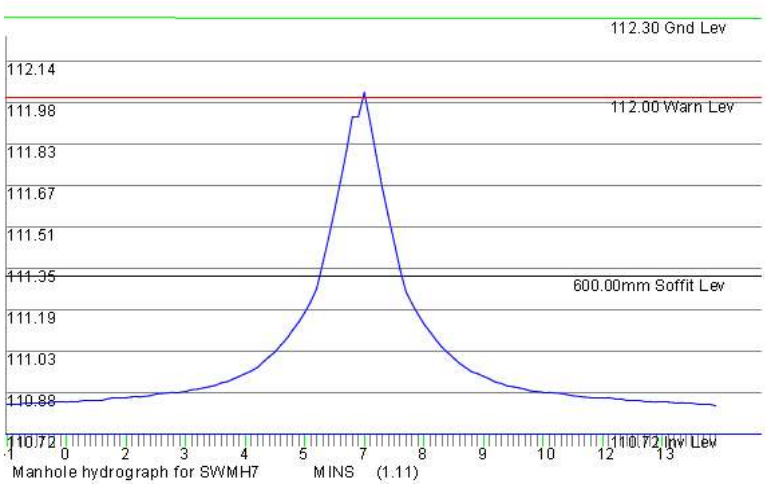
Job No.	491C
Sheet no.	9
Date	17/11/23

MasterDrain SW

Project	Manor Court Farm to soakaway	By: XL	Checked:	Reviewed:
Title	Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 3.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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Job No.	Sheet no.	Date	By	Checked	Reviewed
491C	1	17/11/23	XL		

MasterDrain SW

Project: Manor Court Farm discharge to pond

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 4.SW CCF = 45%

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

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 184.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 721.28 mm/hr
Sample period = 7.5 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 m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW26	10.7	4.4	100	450	103.00	103.04	103.55	0.41	0.04	0.00	0.000	51	OK
2	B	2.01	SW25	21.9	16.9	150	450	102.85	102.96	103.55	0.77	0.11	0.00	0.000	195	OK
3	I	1.02	SW24	21.4	25.3	150	600	102.75	103.00	103.55	1.18	0.25	3.88	0.000	292	Surch.
4	B	3.01	SW19	11.1	2.2	100	450	103.30	103.33	103.60	0.20	0.03	0.00	0.000	25	Warning
5	I	1.03	SW21	58.1	35.3	225	600	102.55	102.68	103.55	0.61	0.13	0.00	0.000	407	OK
6	I	1.04	SW18	64.0	40.6	225	600	102.45	102.59	103.90	0.63	0.14	0.00	0.000	469	OK
7	I	1.05	SW16	67.8	45.9	225	900	102.30	102.44	103.85	0.68	0.14	0.00	0.000	529	OK
8	I	1.06	SW17	83.5	45.9	225	900	102.20	102.32	103.35	0.55	0.12	0.00	0.000	529	OK

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Job No. 491C			
Sheet no. 2			
Date 17/11/23			
Project: Manor Court Farm discharge to pond	By XL	Checked	Reviewed
Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 4.SW CCF = 45%			

MasterDrain SW

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
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4) Pipe cap - full bore capacity of that pipe
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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%)

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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MasterDrain SW

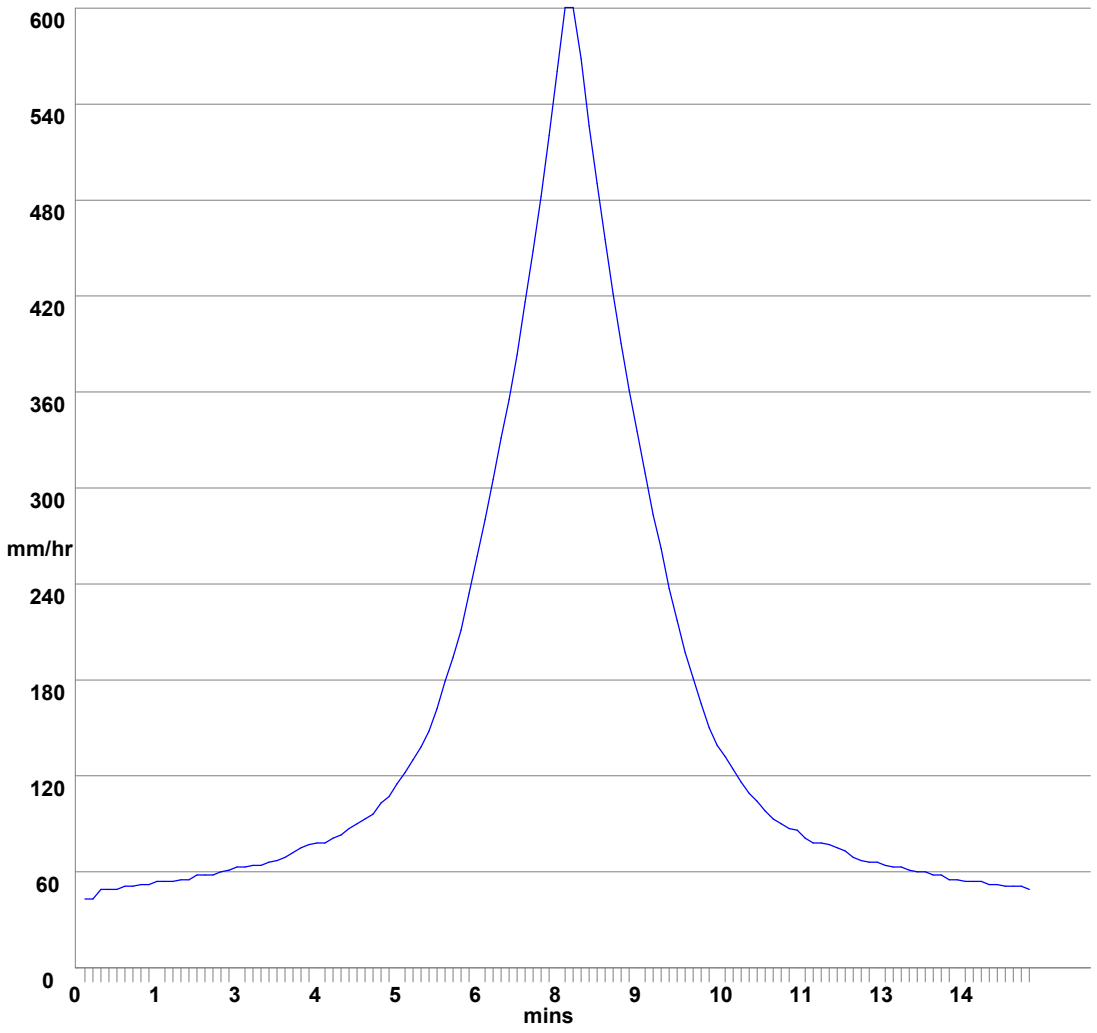
Project: Manor Court Farm discharge to pond

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 4.SW CCF = 45%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	42.85	5:08	122.44	10:08	131.62
0:15	42.85	5:15	130.09	10:15	123.97
0:22	48.98	5:22	137.75	10:22	116.32
0:30	48.98	5:30	148.46	10:30	108.67
0:38	48.98	5:38	162.23	10:38	104.07
0:45	50.51	5:45	179.07	10:45	97.95
0:52	50.51	5:52	194.37	10:52	93.36
1:00	52.04	6:00	211.21	11:00	90.30
1:08	52.04	6:08	234.17	11:08	87.24
1:15	53.57	6:15	257.12	11:15	85.71
1:22	53.57	6:22	280.08	11:22	81.12
1:30	53.57	6:30	304.57	11:30	78.06
1:38	55.10	6:38	330.59	11:38	78.06
1:45	55.10	6:45	355.08	11:45	76.53
1:52	58.16	6:52	382.63	11:52	74.99
2:00	58.16	7:00	416.30	12:00	73.46
2:08	58.16	7:08	448.44	12:08	68.87
2:15	59.69	7:15	482.11	12:15	67.34
2:22	61.22	7:22	520.37	12:22	65.81
2:30	62.75	7:30	560.16	12:30	65.81
2:38	62.75	7:38	599.96	12:38	64.28
2:45	64.28	7:45	599.96	12:45	62.75
2:52	64.28	7:52	567.82	12:52	62.75
3:00	65.81	8:00	526.49	13:00	61.22
3:08	67.34	8:08	489.76	13:08	59.69
3:15	68.87	8:15	454.56	13:15	59.69
3:22	71.93	8:22	420.89	13:22	58.16
3:30	74.99	8:30	390.28	13:30	58.16
3:38	76.53	8:38	361.20	13:38	55.10
3:45	78.06	8:45	335.18	13:45	55.10
3:52	78.06	8:52	309.16	13:52	53.57
4:00	81.12	9:00	283.14	14:00	53.57
4:08	82.65	9:08	261.72	14:08	53.57
4:15	87.24	9:15	237.23	14:15	52.04
4:22	90.30	9:22	217.33	14:22	52.04
4:30	93.36	9:30	197.43	14:30	50.51
4:38	96.42	9:38	180.60	14:38	50.51
4:45	102.54	9:45	165.29	14:45	50.51
4:52	107.14	9:52	149.99	14:52	48.98
5:00	114.79	10:00	139.28	15:00	48.98

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - summer



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By	XL
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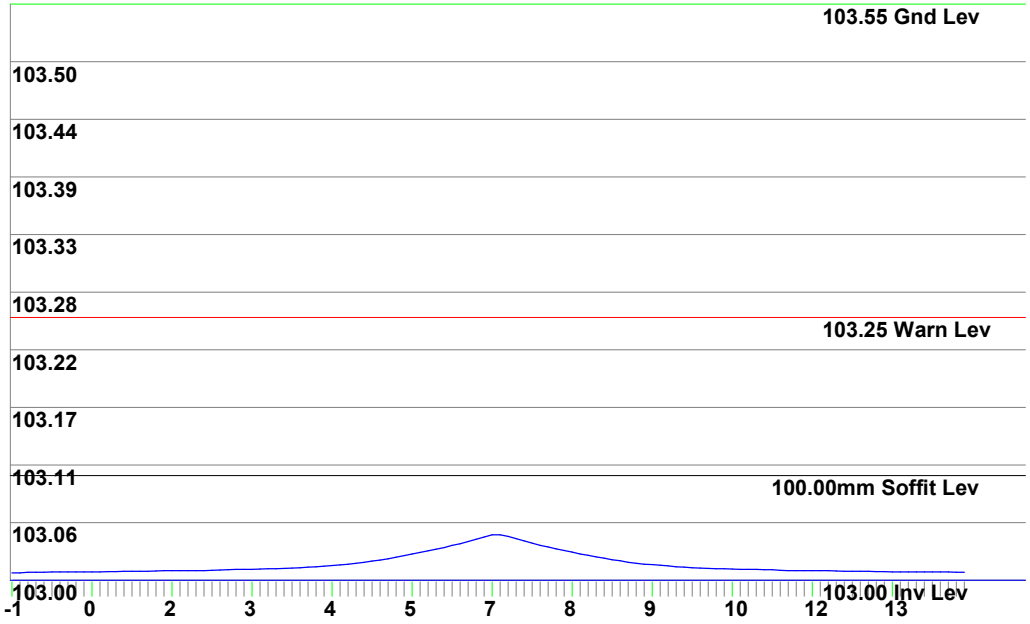
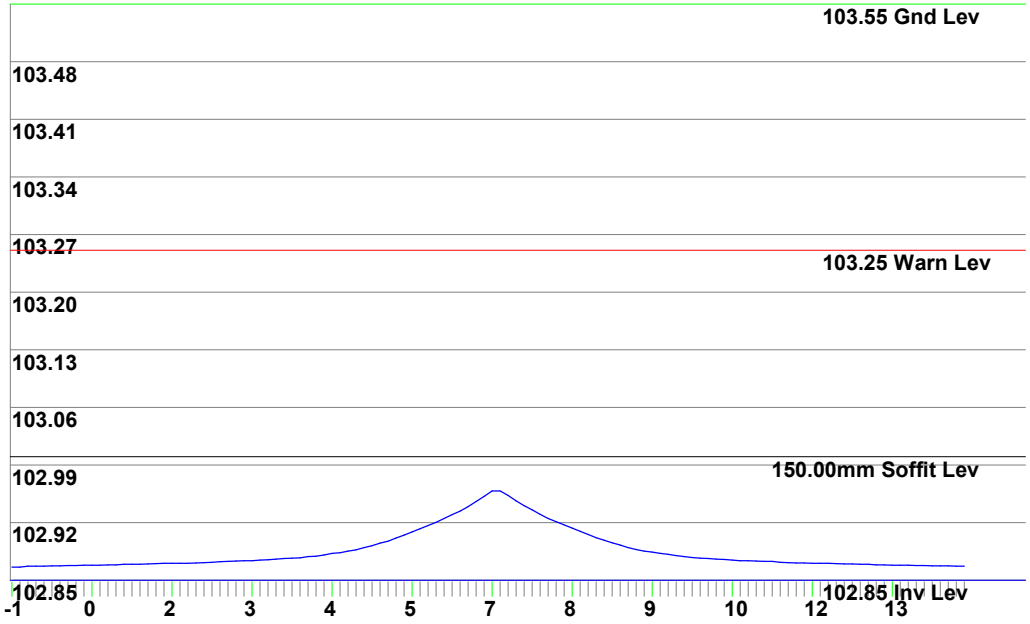
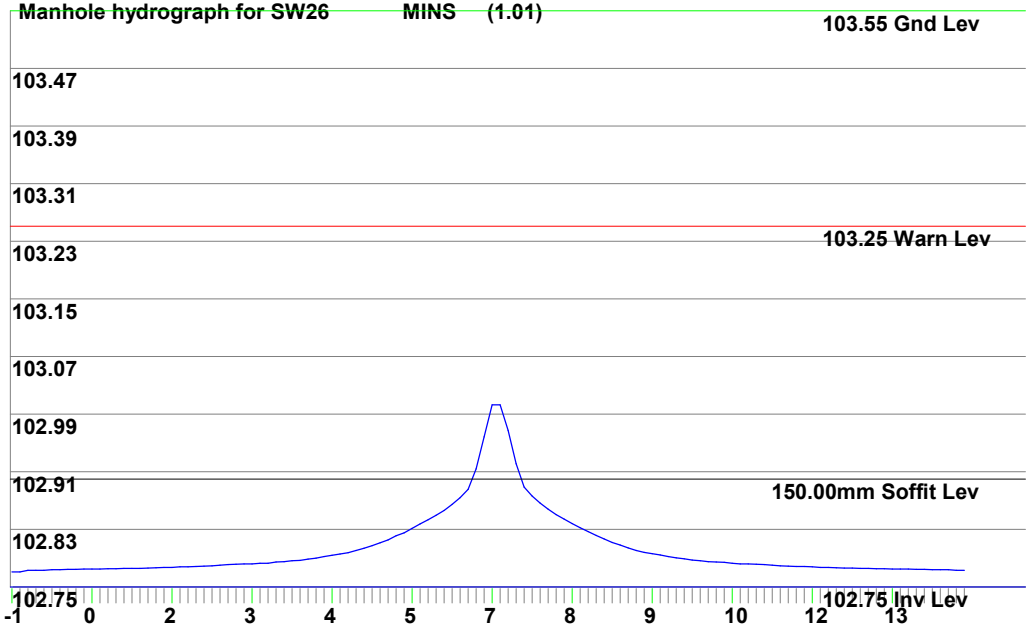
MasterDrain SW

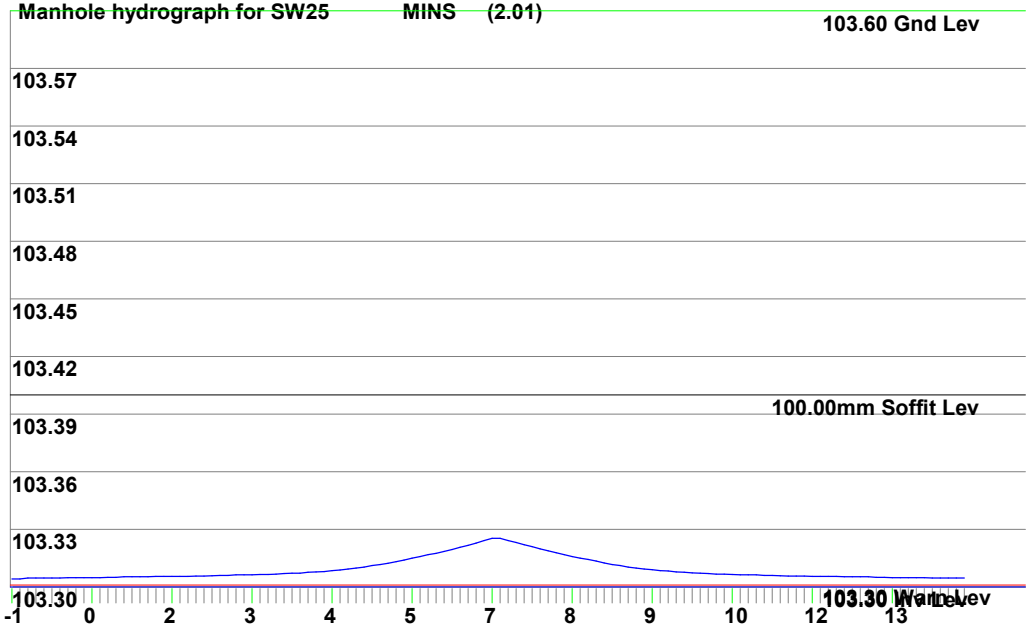
Project: Manor Court Farm discharge to pond

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 4.SW CCF = 45%









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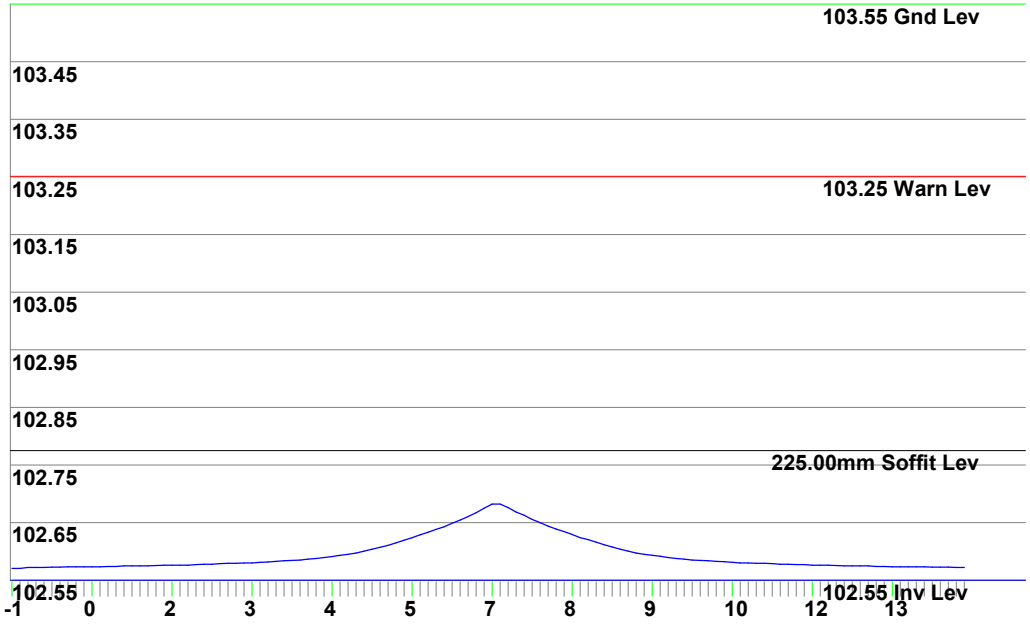
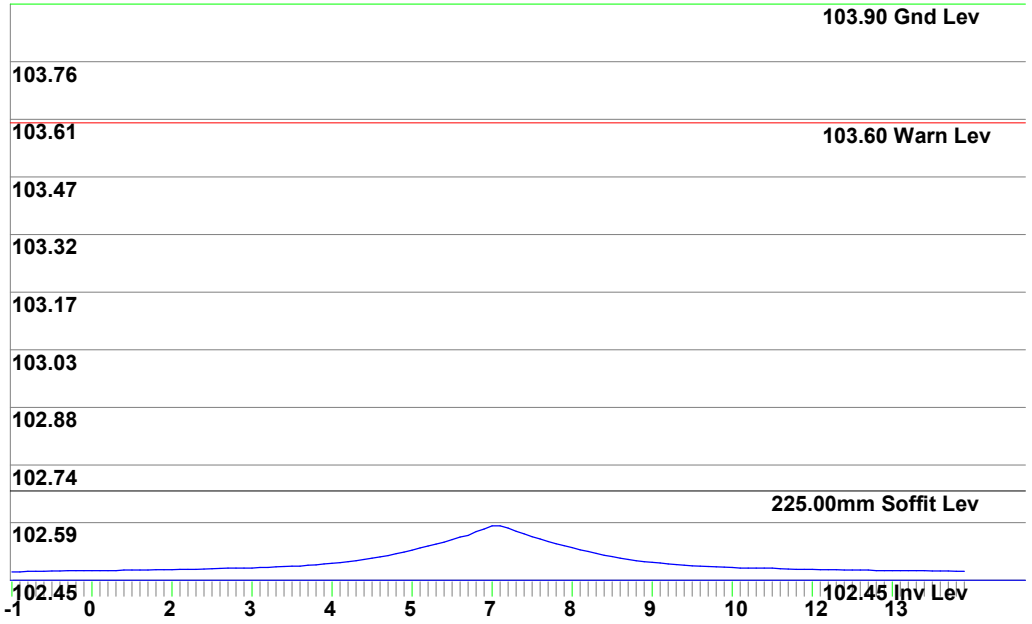
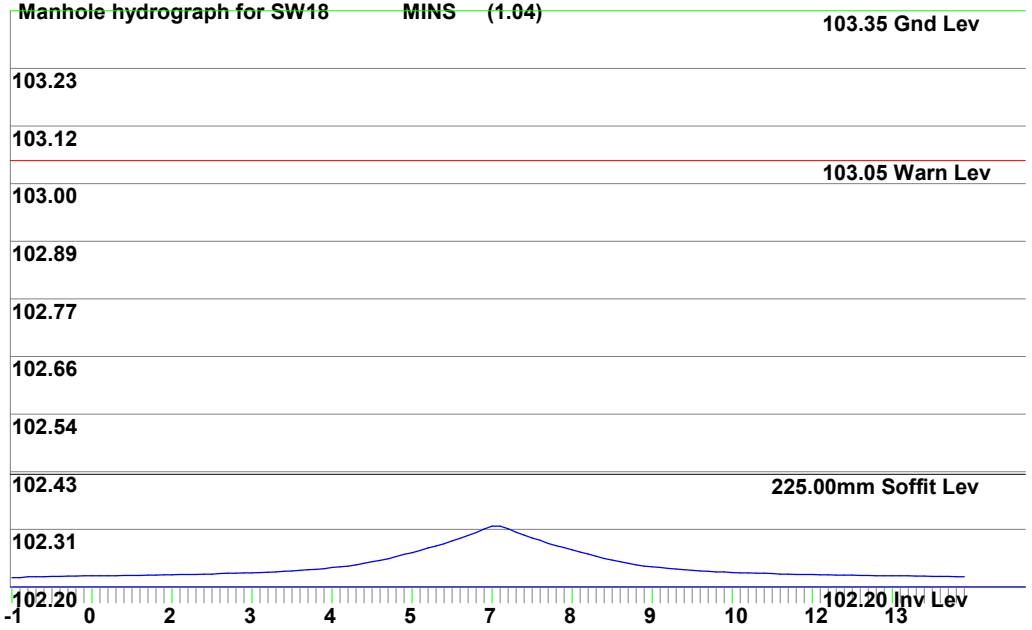
MasterDrain SW

Project: Manor Court Farm discharge to pond

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 4.SW CCF = 45%







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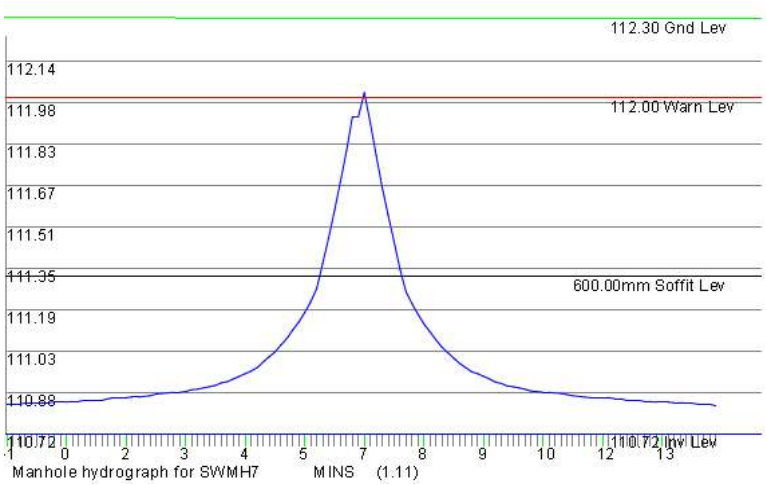
MasterDrain SW

Project Manor Court Farm discharge to pond

Title Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 4.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 SW

Project: Manor Court Farm discharge to pond 2A

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 5.SW CCF = 45%

By	Checked	Reviewed
XL		

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

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 184.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 721.28 mm/hr
Sample period = 7.5 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 m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW15	11.3	13.6	100	450	103.00	103.21	103.55	1.20	0.21	2.28	0.000	156	Surch.
2	I	1.02	SW13	27.2	18.2	150	450	102.70	102.80	103.90	0.67	0.10	0.00	0.000	210	OK
3	B	2.01	SW20	14.4	10.0	100	450	103.40	103.47	103.90	0.69	0.07	0.00	0.000	115	OK
4	I	1.03	SW12	66.6	34.1	225	600	102.55	102.67	103.78	0.51	0.12	0.00	0.000	393	OK
5	B	3.01	SW14	17.6	8.5	100	450	103.50	103.55	103.75	0.48	0.05	0.00	0.000	98	Warning
6	I	1.04	SW2	43.3	42.6	225	600	102.30	102.51	103.65	0.98	0.21	0.00	0.000	492	OK

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Job No. 491C			
Sheet no. 2			
Date 17/11/23			
Project: Manor Court Farm discharge to pond 2A	By XL	Checked	Reviewed
Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 5.SW CCF = 45%			

MasterDrain SW

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%)

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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491C	3	17/11/23	XL		

MasterDrain SW

Project: Manor Court Farm discharge to pond 2A

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 5.SW CCF = 45%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
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0:45	50.51	5:45	179.07	10:45	97.95
0:52	50.51	5:52	194.37	10:52	93.36
1:00	52.04	6:00	211.21	11:00	90.30
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2:00	58.16	7:00	416.30	12:00	73.46
2:08	58.16	7:08	448.44	12:08	68.87
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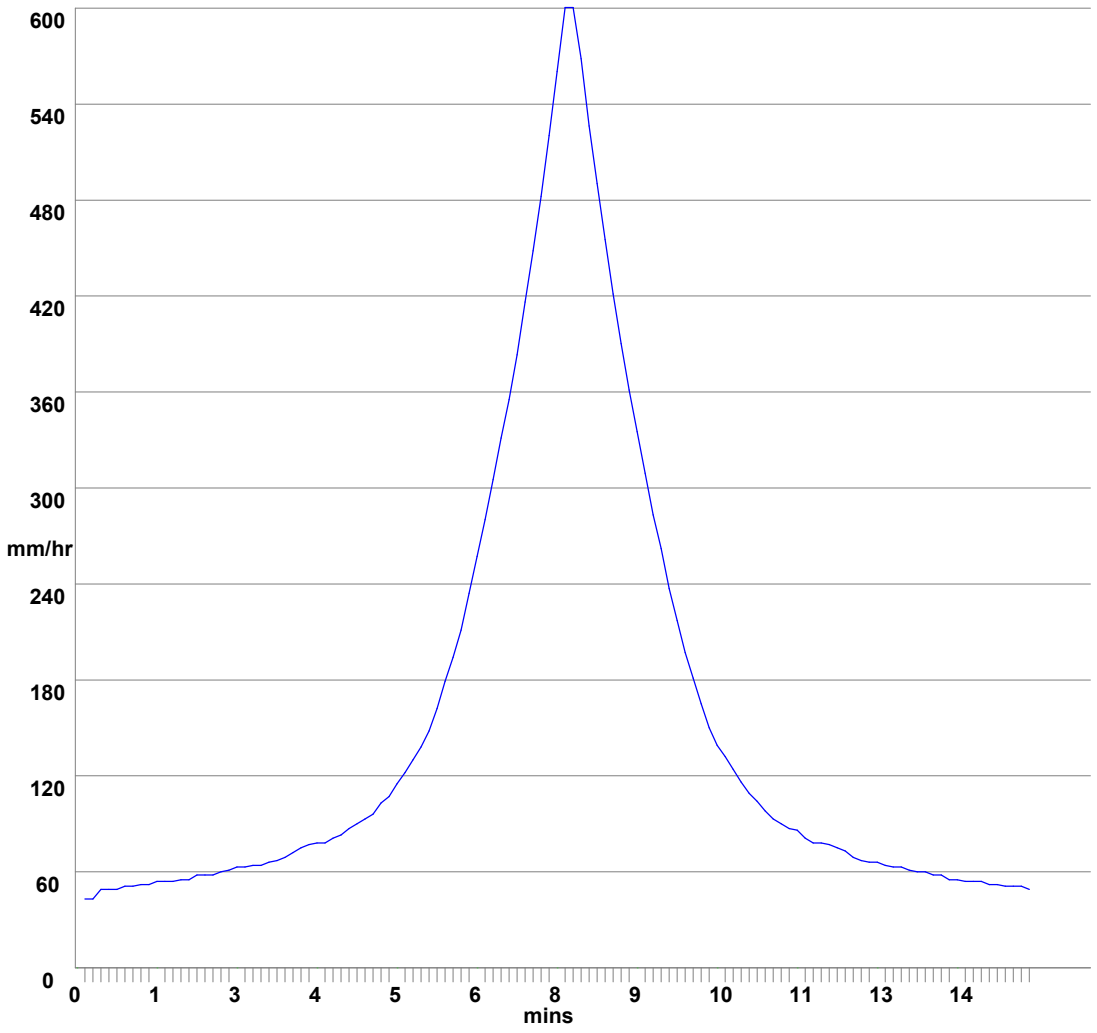
3:15	68.87	8:15	454.56	13:15	59.69
3:22	71.93	8:22	420.89	13:22	58.16
3:30	74.99	8:30	390.28	13:30	58.16
3:38	76.53	8:38	361.20	13:38	55.10
3:45	78.06	8:45	335.18	13:45	55.10
3:52	78.06	8:52	309.16	13:52	53.57
4:00	81.12	9:00	283.14	14:00	53.57
4:08	82.65	9:08	261.72	14:08	53.57
4:15	87.24	9:15	237.23	14:15	52.04
4:22	90.30	9:22	217.33	14:22	52.04
4:30	93.36	9:30	197.43	14:30	50.51
4:38	96.42	9:38	180.60	14:38	50.51
4:45	102.54	9:45	165.29	14:45	50.51
4:52	107.14	9:52	149.99	14:52	48.98
5:00	114.79	10:00	139.28	15:00	48.98

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - summer



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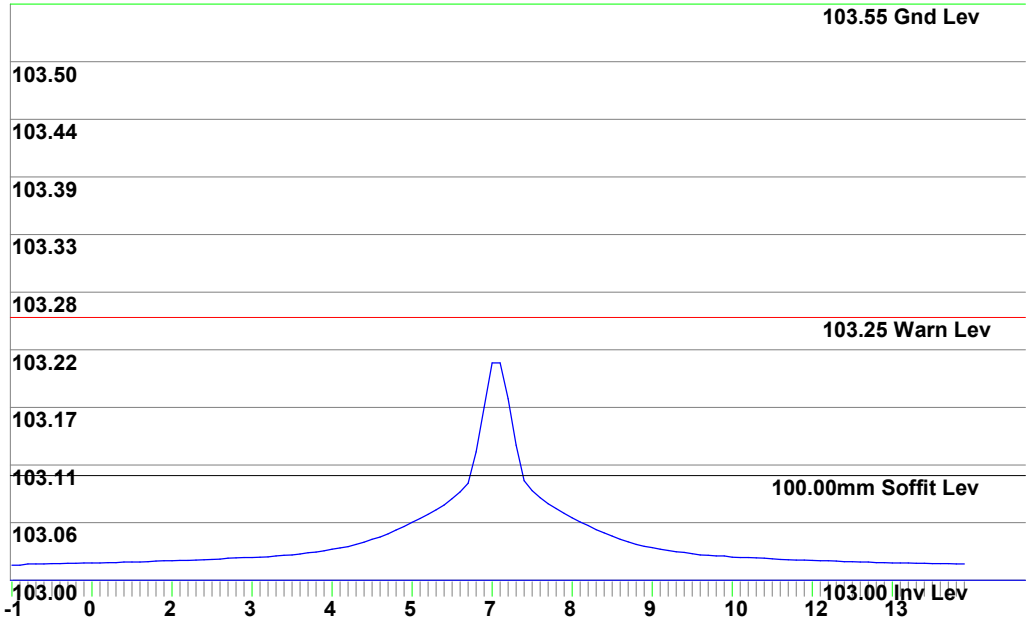
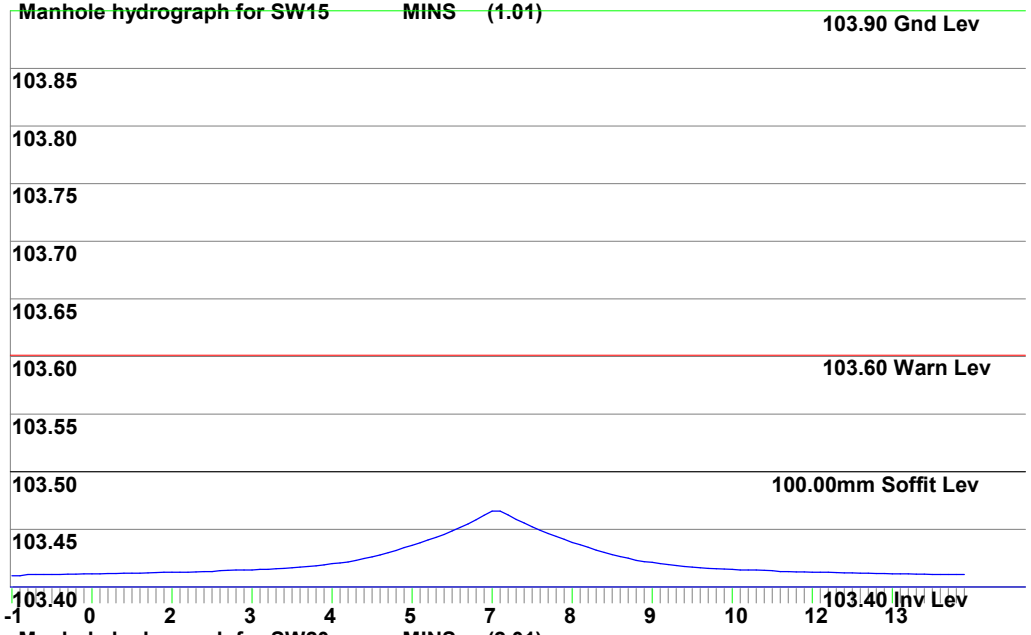
MasterDrain SW

Project: Manor Court Farm discharge to pond 2A

Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 5.SW CCF = 45%





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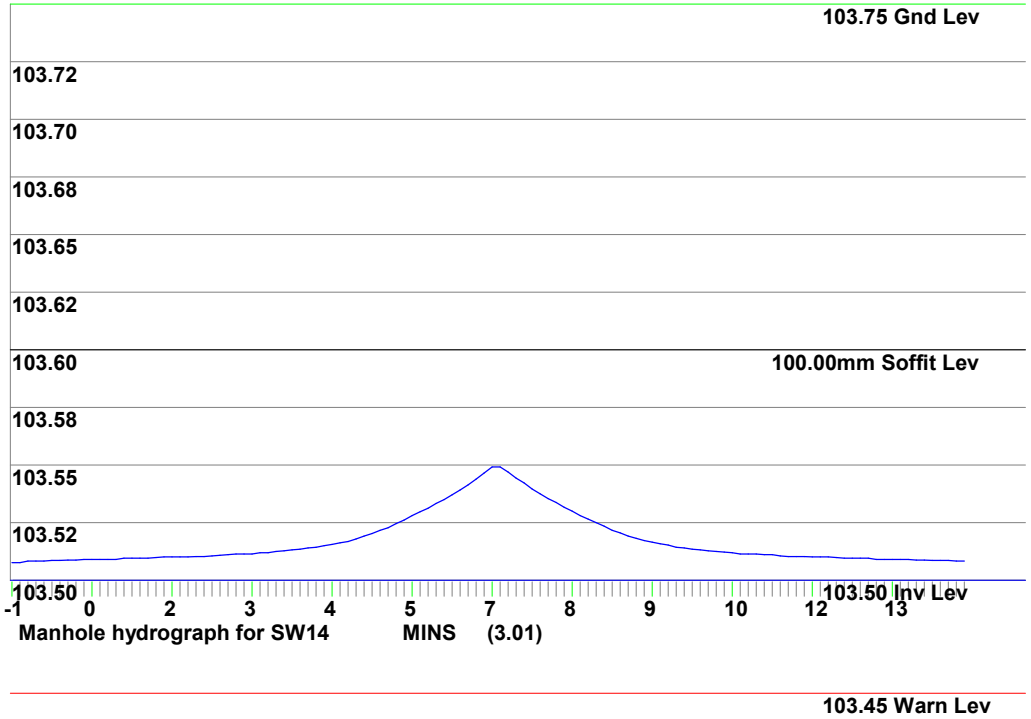
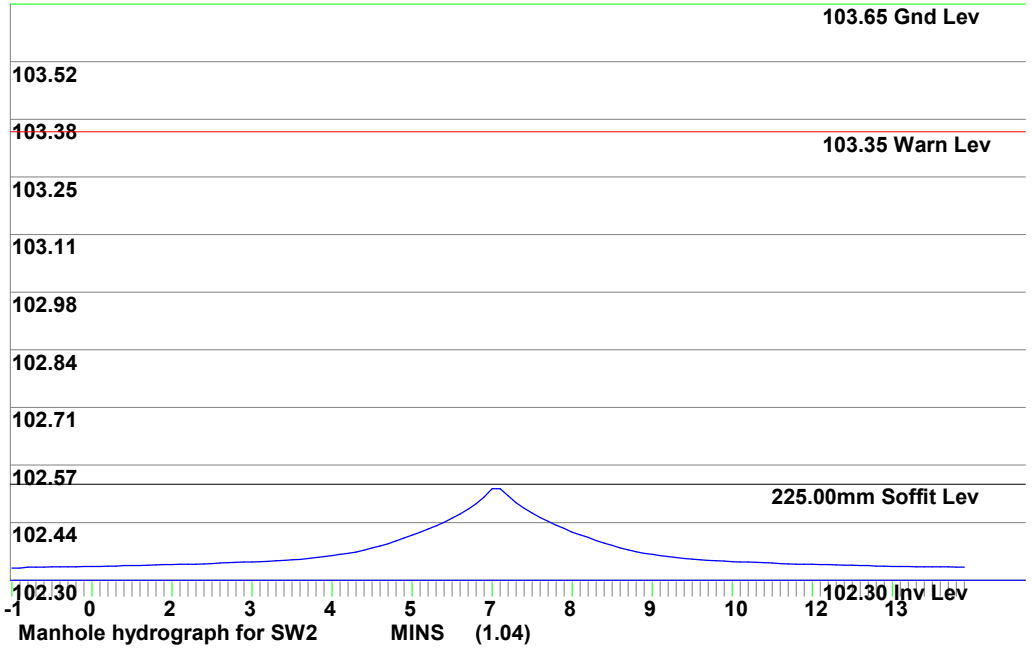
491C	5	17/11/23

MasterDrain SW

Project	By	Checked	Reviewed
Manor Court Farm discharge to pond 2A	XL		

Title: **Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 5.SW CCF = 45%**





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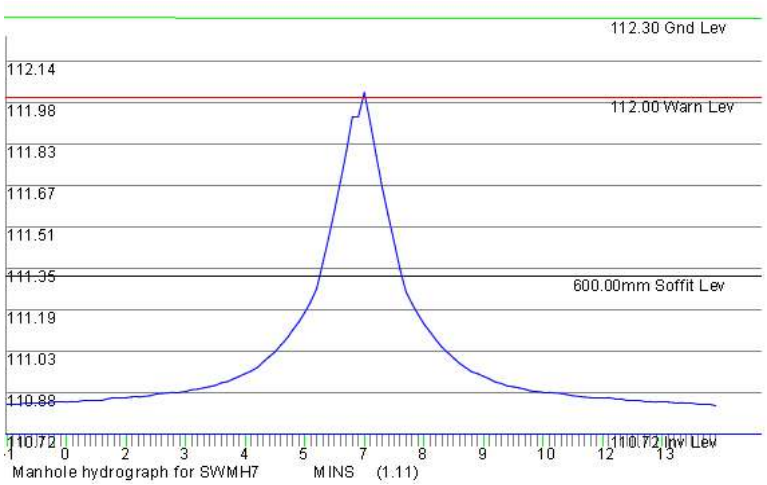
MasterDrain SW

Job No. 491C			
Sheet no. 6			
Date 17/11/23			
Project: Manor Court Farm discharge to pond 2A	By XL	Checked	Reviewed
Title: Surcharge calcs (Sized at 30 yrs storm) for MANOR COURT FARM 5.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.

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

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Job No.	Sheet no.	Date
491	1	30/11/23

MasterDrain
SW 16.54

Project	By	Checked	Reviewed
Manor Court Farm, Ashurst	XL		

Title: **Trench soakaway calculations for Ashurst**

Data:-

Location hydrological data (FSR):-

Location	= Ashurst	Grid reference	= TQ5138
M5-60 (mm)	= 26.2	r	= 0.35
Soil index	= 0.45	SAAR (mm/yr)	= 800
WRAP	= 4	Area = England and Wales	

Soil classification for WRAP type 4
Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Design data:-

Safety factor = 2.0 - Minor inconvenience (SF=2)
Fill porosity = 0.45 - Clean stone (porosity = 0.4 - 0.5)

Equivalent porosity (n1) = 0.45

Area drained = 1058 m²

Infiltration coefficient = 0.0318672 m/hr
Effective inf.coeff (q) = 0.0159336

Return period = 100 yrs

Climate change factor = 45%

Calculations :-

Perimeter of pit = (2 x Excavation Width)+(2 x Excavation Length)
Area of base = Excavation Width x Excavation Length
Infiltration area = (Area of base)+(Perimeter of pit x Hmax)
Temporary constant 'a'
= (Area of base / perimeter)-((AreaDrained x Rainfall depth /1000)/(Perimeter/Inf. coeff))
Temporary constant 'b' = (Perimeter/Inf. coeff) / (Area of base x porosity)
Hmax = a*((EXP(-1 x b x Duration of storm))-1)

Note: The Hmax calculation is iterated to a maximum value of Hmax.

Note: Duration of storm in hours, Rainfall depth in mm/hr x Climate Change factor.

Results :-

Emptying time to 50% volume = 11:04 (hr:min)
hMax (Depth) = 1.93 metres
Time to maximum = 0:08 hr:min
Rainfall at maximum = 16.66mm/hr
Width (m) = 2.0

Length (m) = 60.0

Total Infiltration area = 359.0m² (base area + sidewall area).

Total available volume = 104.06m³

N.B. The rainfall rates are calculated using the location specific values above in accordance with the Wallingford procedure. Formulae and methods from CIRIA 156.

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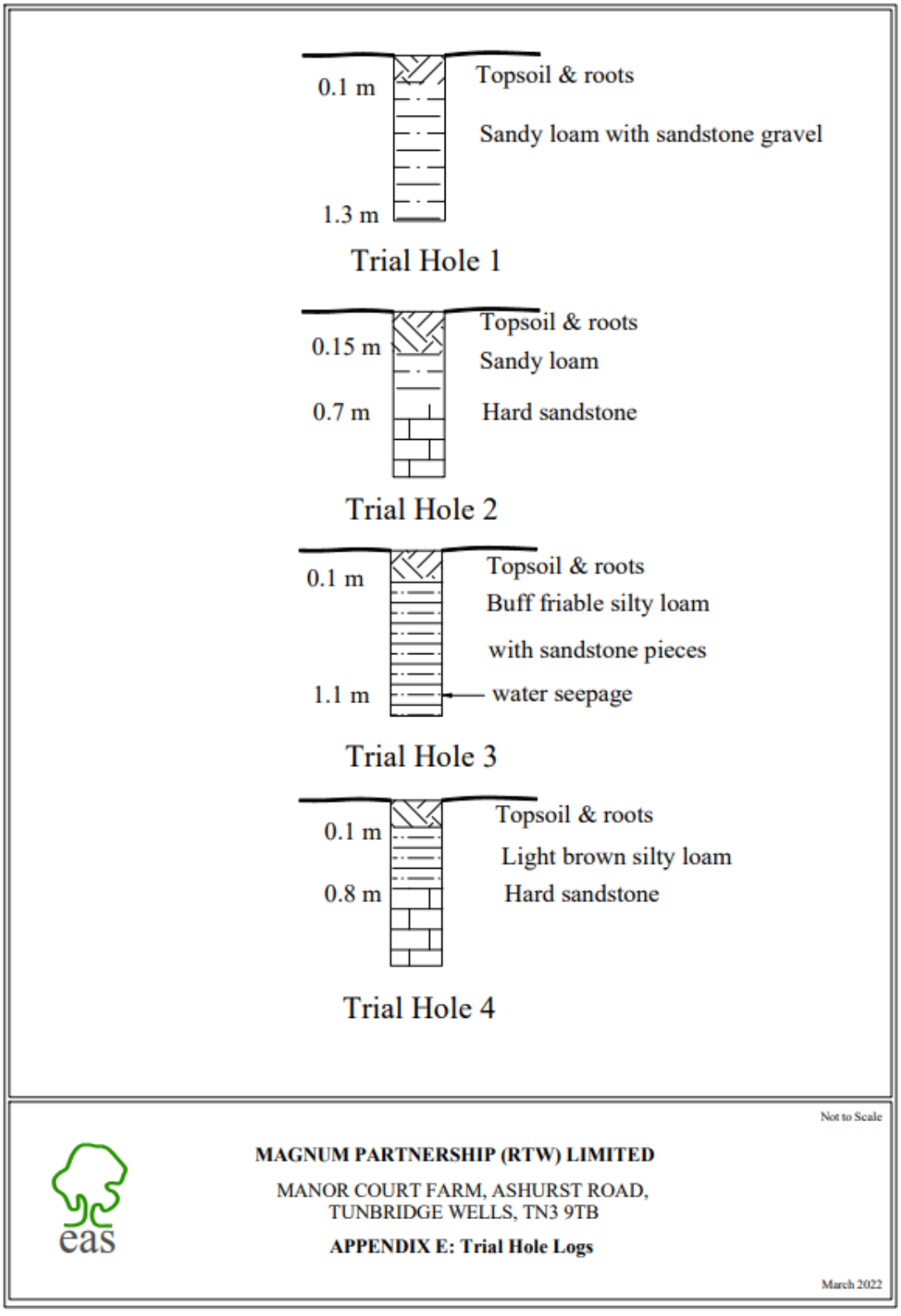
MasterDrain
SW 16.54

Project	Manor Court Farm, Ashurst	By	Checked / Reviewed
Title	Worst case soakaway times to empty.	XL	

APPENDIX E

TRIAL HOLE LOGS


0.1 m
Topsoil & roots
Sandy loam with sandstone gravel
1.3 m
Trial Hole 1
0.15 m
Topsoil & roots
Sandy loam
0.7 m
Hard sandstone
Trial Hole 2
0.1 m
Topsoil & roots
Buff friable silty loam
with sandstone pieces
1.1 m
water seepage
Trial Hole 3
0.1 m
Topsoil & roots
Light brown silty loam
0.8 m
Hard sandstone
Trial Hole 4
Not to Scale
eas
MAGNUM PARTNERSHIP (RTW) LIMITED
MANOR COURT FARM, ASHURST ROAD,
TUNBRIDGE WELLS, TN3 9TB
APPENDIX E: Trial Hole Logs
March 2022

APPENDIX F

OPERATION & MAINTENANCE MANUAL

DRAINAGE

OPERATION & MAINTENANCE MANUAL

1. OPERATION OF THE DRAINAGE SYSTEM

1.1 The surface water drainage system collects surface water from roofs and impermeable surfaced areas using gutters, downpipes, gullies, and strip/slot drains.

1.2 The collected water is discharged to a soakaway in the northern part of the site via a silt trap.

1.3 The soakaway may comprise crates (AquaCell or similar) wrapped in permeable geotextile or soakaway trenches filled with no-fines stone wrapped in permeable geotextile. The upstream chamber from the soakaway should be designed to act as a silt trap to minimise silt deposits in the soakaway.

1.4 All gullies and strip drains are manufactured pattern types. Any drainage blanket underlying permeable paving should comprise 20 – 70 mm no-fines stone (or recycled concrete aggregate) wrapped in permeable geotextile. Chambers will mostly be plastic pre-formed types.

1.5 The existing sewage treatment plant is to be replaced with a Klargester Biodisc sewage treatment plant as part of the proposed redevelopment and will require annual specialist maintenance.

1.6 Once the construction of the drainage system is complete, minimal operational input should be required beyond a specialist maintenance contract for the sewage treatment plant. A suggested schedule of maintenance is given below.

2. SCHEDULE OF MAINTENANCE

2.1 The drainage system will require regular maintenance to ensure that it is operating properly.

2.2 The maintenance should generally follow the following schedule, but this will probably be modified over time as it becomes apparent where more frequent or less frequent maintenance is indicated.

2.3 Outside of the schedule, a walk-over inspection of the drainage system should be carried out after any very severe storm/extended period of very heavy rainfall.

SCHEDULE OF MAINTENANCE

TIME	ACTION	COMMENT
On completion of construction		
3 months	Check all gullies, strip drains, surface water and foul sewer chambers and sewage treatment plant. Inspect the surface of the permeable paving and re-grit the joints as necessary.	Contractor's maintenance period.
12 months	Repeat checks and actions described above. Service the sewage treatment plant.	
In service		
Every year	Check all gullies, strip drains, surface water and foul sewer chambers. Clean out, de-silt and repair as necessary. Maintain the sewage treatment plant (specialist maintenance contract). Check and maintain the permeable paving as per the manufacturer's recommendations.	Work to be carried out in late winter after leaf fall has occurred.

3. RESPONSIBILITY FOR THE MAINTENANCE

3.1 Maintenance of the drainage systems will be the collective responsibility of the freeholders of the proposed development. This may be by forming a management committee or appointing one freeholder to be in charge of maintenance (who would then obtain contributions from the others).

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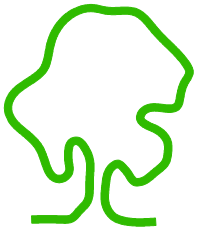

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