

OAKLANDS FARM – RELOCATED DWELLING DRAINAGE – FOR PLANNING DOC

Drainage Information for the Relocated Dwelling Only

Revision P1

For;
Fiona Bigwood,

Site Address
Oaklands Farm,
Slaugham Lane,
Warninglid,
RH17 5TJ.

Issued
14th November 2024

Our Reference
24-072



CREATIVE
STRUCTURES

DOCUMENT ISSUE REGISTER

Job	OAKLANDS FARM – RELOCATED DWELLING			
Document	DRAINAGE – FOR PLANNING DOC			
Issue	Date	Description	By	Checked
P1	25/09/2024	For DOC Approval	Philip Wainwright, <i>CEng, MStructE</i>	14/11/2024

REVISION NOTES

P1 – THIS ISSUE COVERS THE DRAINAGE FOR THE RELOCATED DWELLING ONLY AND IS AIMED AT DISCHARGING THE PLANNING CONDITION.

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SECTION A

PROJECT DETAILS

1) Local Authority:

MID-SUSSEX DC

2) Based on architectural drawings:

BY GOULD BAXTER

3) Parts of structure:

DRAINAGE ONLY

4) Design assumptions made in calculations:

a) *N/A*

PROJECT OVERVIEW & DESIGN PHILOSOPHY

Introduction

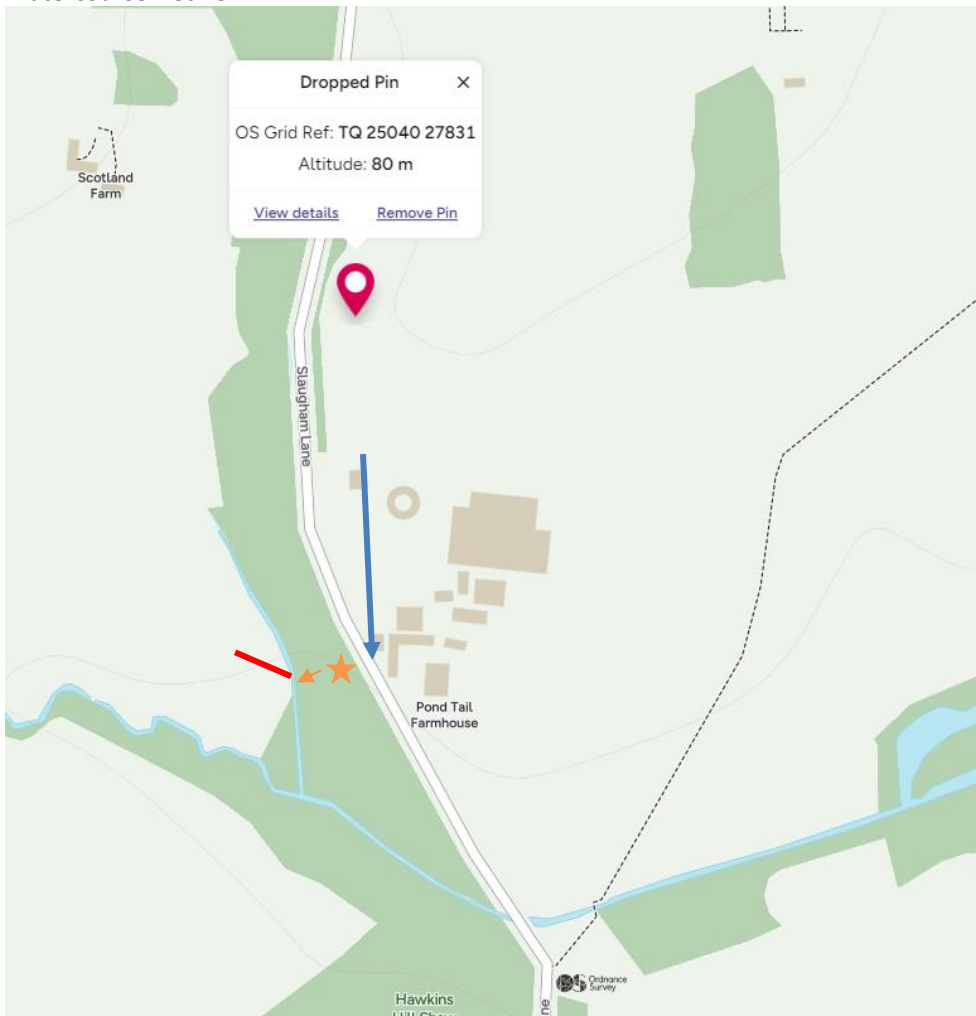
The proposals below are to be read in conjunction with the previously proposed EAS Ltd design(s) - as approved in January 2020, which is appended to this report.

The design covers the relocated main dwelling only. All catchment areas and occupation figures remain unchanged.

The foul treatment plant is relocated from the south-west of the stables to just north of the site access, which serves the relocated main dwelling and access driveway.

All calculations are as per the previous EAS Ltd designs as many of the agricultural buildings associated with those designs are already constructed.

Watercourse Network



The image above is taken from the Ordnance Survey (OS) website and shows the site location (red drop) with the stream/watercourse network to the West of Slaugham Lane.

The blue arrow shows the route of the attenuated flows from the new dwelling, with the orange star showing the existing chamber X and the orange arrow showing the positive connection from the chamber to the stream on the west of Slaugham Lane. The stream observed on site, which supports the flows for the wider Oaklands Farm and Pond Tail Farmhouse is shown in red.

Site Photos



Image 01 – Showing the existing Dwelling and the septic tank / foul treatment plant

It is added that the RWPs from this dwelling are broken and currently discharge on to the ground.

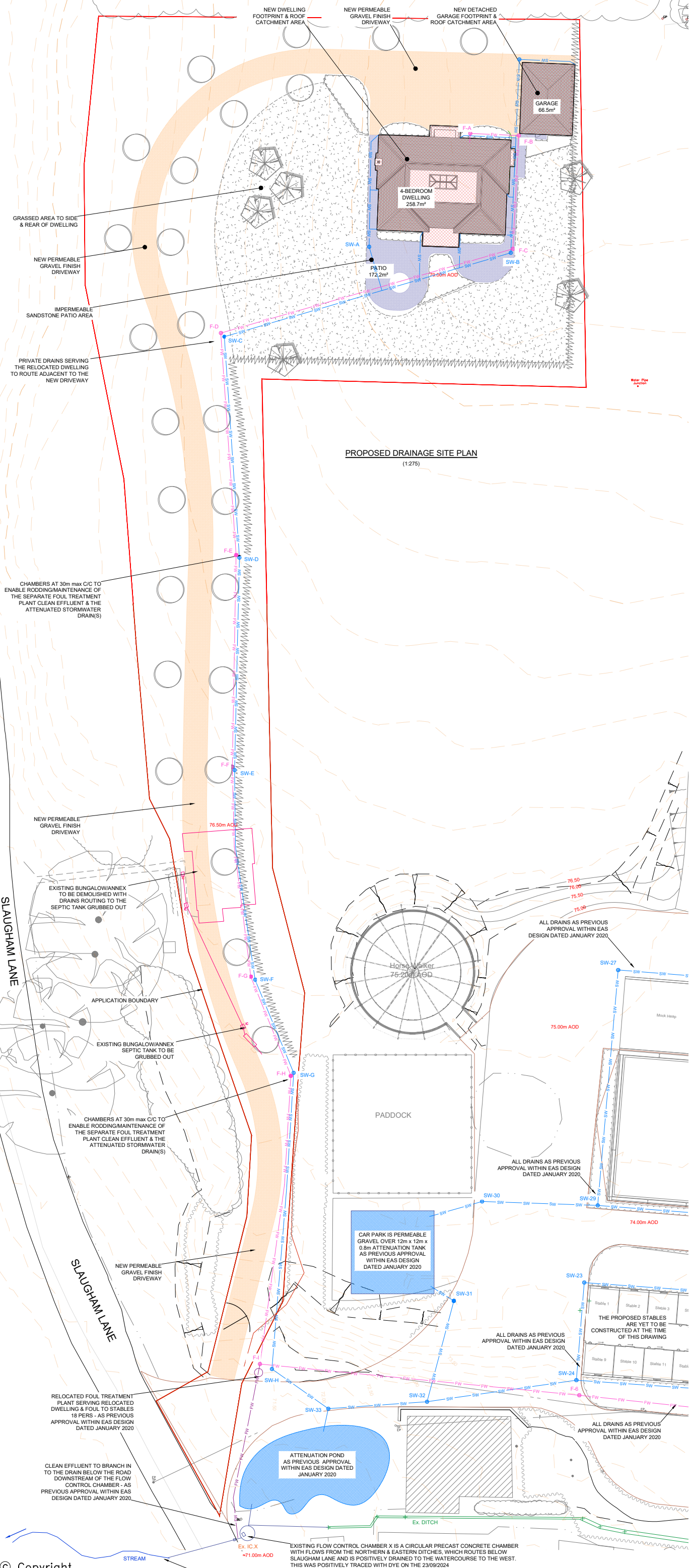


Image 02 –A view of the proposed dwelling location, looking East with the groundworks to the garage already progressed

SECTION B

DRAWINGS

- 24-072-51 PROPOSED SITE DRAINAGE PLAN
- 24-072-52 PROPOSED DRAINAGE DETAILS – SHEET 1 of 2
- 24-072-53 PROPOSED DRAINAGE DETAILS – SHEET 2 of 2



DRAINAGE DESIGN NOTES

THE PROPOSALS BELOW ARE TO BE READ IN CONJUNCTION WITH THE PREVIOUSLY PROPOSED EAS 1st DESIGN(S) - AS APPROVED IN JANUARY 2020.

THIS DRAWING COVERS THE RELOCATED MAIN DWELLING ONLY. ALL CATCHMENT AREAS AND OCCUPATION FIGURES REMAIN UNCHANGED.

THE FOUL TREATMENT PLANT IS RELOCATED FROM THE SOUTH-WEST OF THE STABLES TO JUST NORTH OF THE SITE ACCESS, WHICH SERVES THE RELOCATED MAIN DWELLING AND ACCESS DRIVEWAY.

ALL CALCULATIONS ARE AS PER THE PREVIOUS EAS 1st DESIGNS AS MANY OF THE AGRICULTURAL BUILDINGS ASSOCIATED WITH THOSE DESIGNS ARE ALREADY CONSTRUCTED.

MEMBER KEY:

- LOCAL DITCH NETWORK (PRIVATE)
- EXISTING BELOW GROUND DRAIN (PRIVATE)
- PROPOSED SURFACE WATER DRAIN
- PROPOSED FOUL WATER DRAIN
- PROPOSED CLEAN EFFLUENT DRAIN FROM FOUL TREATMENT PLANT
- PROPOSED FOUL WATER INSPECTION CHAMBER / FOUL TREATMENT PLANT
- PROPOSED SURFACE WATER INSPECTION CHAMBER / SILT TRAP / FLOW CONTROL DEVICE
- PROPOSED SURFACE WATER ATTENUATION TANK
- DENOTES AREA OF PERMEABLE ROADS AND HARDSTANDING FOR VEHICLE TRAFFIC - GRAVEL FINISH
- DENOTES ARE OF NON-PERMEABLE SANDSTONE PAVING, OR SIMILAR TO REAR PATIO(S) - 172.2m². THIS IS TO BE LAID TO FALLS TO THE GRASSED AREAS(S). 30% OF THIS HAS BEEN ALLOWED FOR WITHIN THE ATTENUATION CALCULATIONS (51m²+) FOR DOOR THRESHOLD DRAINS
- DENOTES ROOF CATCHMENT AREA(S) - 325.2m²
- SOIL AND VENT PIPE (LOCATIONS TBC)
- RAINFALL PIPE (LOCATIONS TBC)
- LEVELS

- NOTES:-**
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 - THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
 - THESE DRAWINGS CONSTITUTE A FULL DESIGN FOR BUILDING CONTROL APPROVAL. THEY ARE NOT CONSTRUCTION STAGE DRAWINGS UNTIL BUILDING CONTROL HAVE APPROVED THE DESIGN(S)
 - FOR THE FULL COMPREHENSIVE GENERAL NOTES SEE GENERAL NOTES DRAWING 99.
- WARNING IDENTIFICATION**
- COORDINATION HIGHLIGHT**
- STABILITY REQUIREMENT HIGHLIGHT**

- PLEASE NOTE : ALL COVER LEVELS TO BE CONFIRMED FOLLOWING CONFIRMATION OF ALL EXTERNAL LEVELS.
- MAIN CONTRACTOR TO CHECK EXISTING INVERT LEVELS IN ROAD PRIOR TO ANY DRAINAGE WORKS COMMENCING TO ENSURE THAT THE LEVELS AS STATED ON THIS DRAWING ARE CORRECT AND THAT THE PROPOSED DRAINAGE SCHEME WORKS
- MAIN CONTRACTOR TO CONFIRM AND ALLOW FOR REMOVAL OF ALL REDUNDANT DRAINS ON SITE AND CAPPING OFF TO LIVE DRAINS, ETC AS REQUIRED
- ALL RWP AND SVP'S TO HAVE RODDING EYES.
- ALL GAS, TELECOMMS, WATER etc UTILITY SERVICES TO BE DIVERTED/RELOCATED AS REQUIRED. SERVICES DESIGN BY OTHERS.
- DRAINAGE NOTES:**
- PIPEWORK TO BE UPVC-U PIPES & INSPECTION CHAMBERS TO BS EN 13598-1:2020
 - ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT 'H', BS EN 752:2017 AND TO THE SATISFACTION OF THE BUILDING CONTROL OFFICER
 - ALL ADOPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH 'SEWERS FOR ADOPTION' 7TH EDITION AND THE RELEVANT COUNCIL DESIGN GUIDE.
 - ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 80 UNLESS OTHERWISE STATED ON THE DRAWING.
 - ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
 - ALL PRIVATE SEWER PIPES TO BE 110 DIAMETER UNLESS OTHERWISE STATED ON THE DRAWING.
 - EXISTING SEWER PIPE(S), WHERE APPLICABLE TO BE RE-USED TO BE SURVEYED AND LEVELLED PRIOR TO THE COMMENCEMENT OF THE DRAINAGE WORKS AND REFURBISHED IF NECESSARY.
 - CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY. (ALL APPROVALS TO BE BY OTHERS)
 - ALL SEWER PIPE AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.
 - ALL SVP'S TO HAVE TELESCOPIC PIPES BETWEEN GF & IL OF PIPE.

REV	DESCRIPTION	DATE	BY
B1	FOR PLANNING DOC	14.11.2024	PW

PLANNING DOC

CREATIVE STRUCTURES

Client
FIONA BIGWOOD

Project
OAKLANDS FARM, SLAUGHAM LANE
WARNING LID, RH17 5TJ

Title
SITE DRAINAGE PLAN

Date	25.09.2024	Checked	14.11.2024
Scale	1:275 AT A1	Engineer	PW

Status: PLANNING

Project Number	Drawing Number	Revision
23-040	51	P1

FIGURE B.21
TYPICAL INSPECTION CHAMBER DETAIL - TYPE 4 (Flexible material detail)
Maximum depth from cover level to soffit of pipe 2 m, non-entry

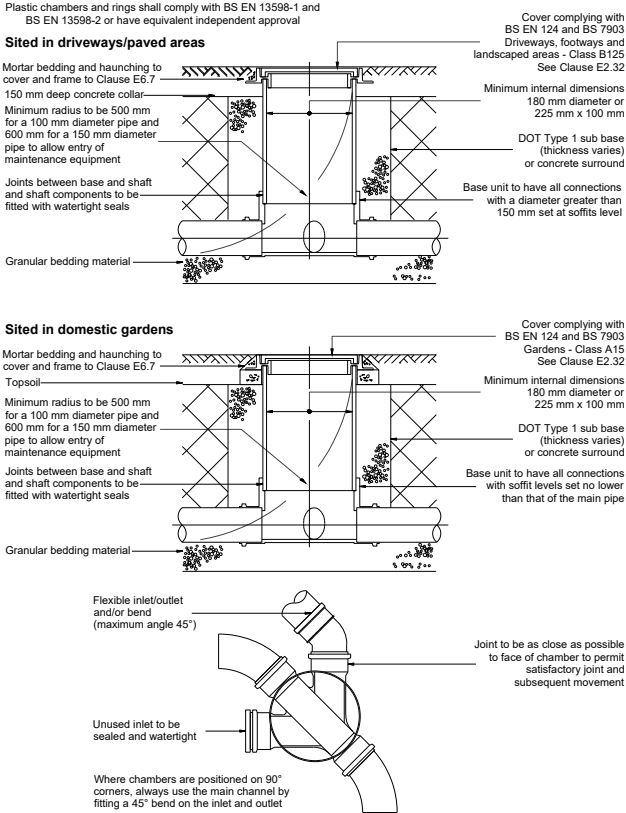
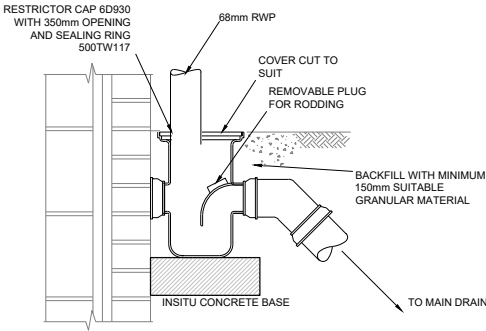
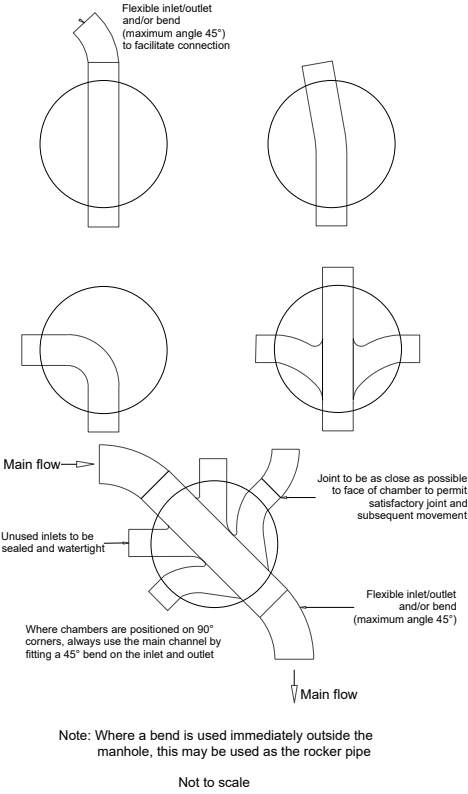
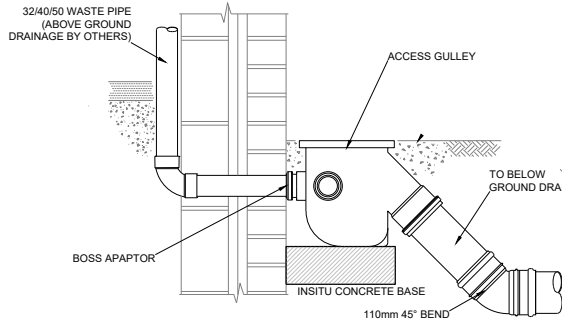


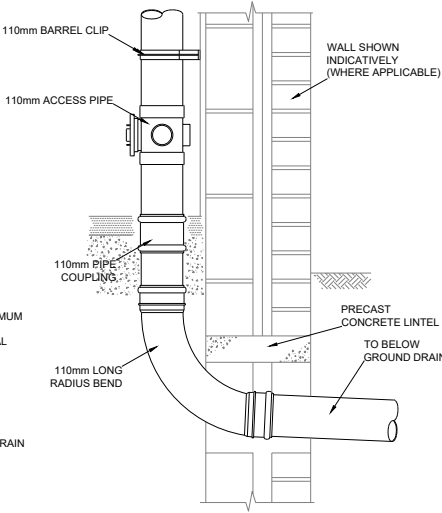
FIGURE B.20
ALTERNATIVE BASE LAYOUTS FOR CHAMBERS



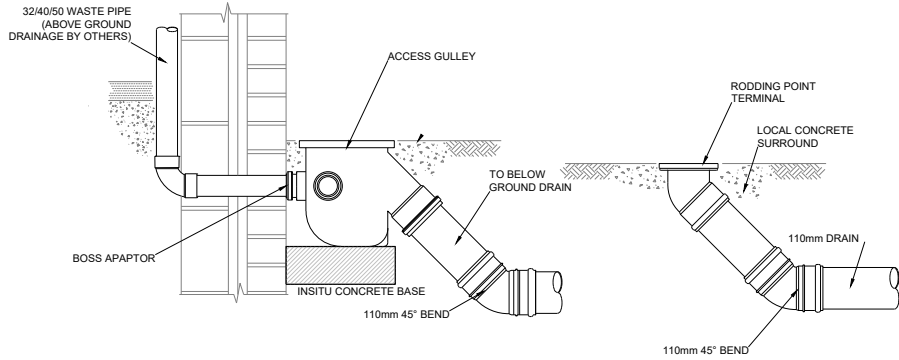
TYPICAL 68mm RWP CONNECTION
TO 110mm PVCu DRAIN VIA
RODABLE BOTTLE GULLEY
(1:10)



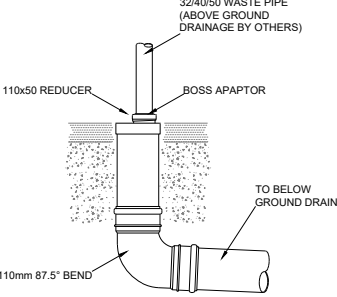
TYPICAL BACK
INLET CONNECTION
TO ACCESS GULLEY
(1:10)



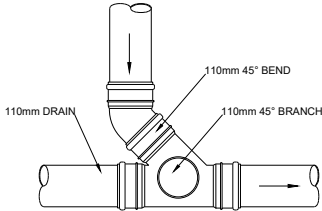
TYPICAL DETAIL
AT BASE OF SVP
(1:10)



TYPICAL HEAD OF DRAIN
RODDING POINT
(1:10)



TYPICAL SOIL/ STACK/STUB
WASTE CONNECTION TO DRAIN
(1:10)



TYPICAL 110mm
BRANCH CONNECTION
(1:10)

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 - FOR THE FULL COMPREHENSIVE GENERAL NOTES SEE GENERAL NOTES DRAWING 100.

WARNING IDENTIFICATION

⚠ PARTICULAR ATTENTION TO BE PAID WHERE THE HAZARD SYMBOL IS PLACED ON A DRAWING. THIS SYMBOL HIGHLIGHTS A PARTICULAR CONCERN IN RELATION TO THE DESIGN, SITE WORKING OR WHERE THE CONTRACTORS ATTENTION IS REQUIRED.

MEASURES TO MITIGATE RISK SHOULD BE CONSIDERED AT ALL STAGES OF DESIGN DEVELOPMENT AND CONSTRUCTION.

COORDINATION HIGHLIGHT

⚠ WHERE THE BLUE HIGHLIGHT SYMBOL IS PLACED ON A DRAWING PARTICULAR ATTENTION IS REQUIRED WITH REGARD TO COORDINATION.

STABILITY REQUIREMENT HIGHLIGHT

⚠ WHERE THE GREEN HIGHLIGHT SYMBOL IS PLACED ON A DRAWING THIS REFERS TO THIS ELEMENT OF THE DESIGN BEING CRITICAL TO THE STABILITY STRATEGY

REV	DESCRIPTION	DATE	BY
P1	FOR PLANNING DOC	14.11.2024	PW

PLANNING DOC



CREATIVE
STRUCTURES

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Client
FIONA BIGWOOD

Project
OAKLANDS FARM, SLAUGHAM LANE,
WARNINGLID, RH17 5TJ

Title
DRAINAGE DETAILS
SHEET 1 of 2

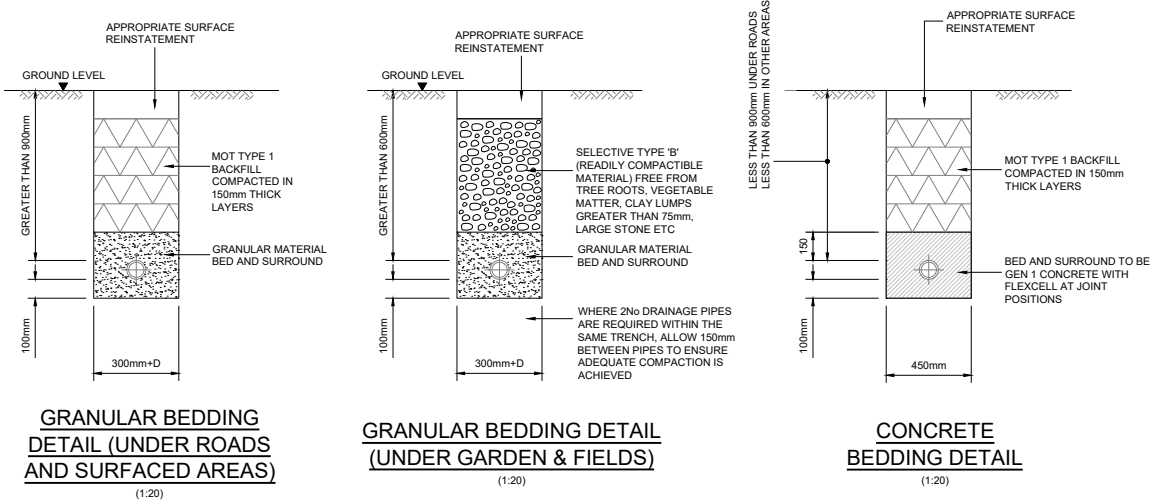
Date 25.09.2024 Checked 14.11.2024

Drawing Sheet Size A1

Scale 1:10 & 1:20 AT A1 Engineer PW

Status PLANNING

Project Number	Drawing Number	Revision
24-072	52	P1



MAINTENANCE NOTES			
1. THE OWNER OF THE DWELLING IS RESPONSIBLE FOR THE MAINTENANCE OF THE DWELLING'S DRAINAGE ARRANGEMENT.			
MAINTENANCE SCHEDULE - AS TAKEN FROM SUDS MANUAL, TABLE 21.3 FOR DOMESTIC FLOW CONTROL DEVICE <i>[THIS INFORMATION IS TO BE WRITTEN IN TO THE O&M MANUAL]</i>			
MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY	PERSON RESPONSIBLE FOR UNDERTAKING OR COMMISSIONING SUITABLE PROFESSIONAL
	INSPECT AND IDENTIFY ANY AREAS THAT ARE NOT OPERATING CORRECTLY. IF REQUIRE, TAKE REMEDIAL ACTION	MONTHLY FOR 3 MONTHS, THEN ANNUALLY	CLIENT / END USER / BUILDING OWNER
REGULAR MAINTENANCE (ATTENUATION TANKS & FLOW CONTROL DEVICE/CHAMBER)	REMOVE DEBRIS FROM THE CATCHMENT SURFACE (WHERE IT MAY CAUSE RISKS TO PERFORMANCE)	MONTHLY	CLIENT / END USER / BUILDING OWNER
	FOR SYSTEMS WHERE RAINFALL INFILTRATES IN TO THE TANK FROM ABOVE, CHECK SURFACE OF FILTER FOR BLOCKAGE BY SEDIMENT, ALGAE OR OTHER MATTER; REMOVE AND REPLACE SURFACE INFILTRATION MEDIUM AS NECESSARY	ANNUALLY	CLIENT / END USER / BUILDING OWNER
REMEDIATION ACTIONS (ALL SUDS PARTS)	REPAIR / REHABILITATE INLETS, OUTLETS, OVERFLOW AND VENTS	AS REQUIRED	CLIENT / END USER / BUILDING OWNER
REMEDIATION ACTIONS (FLOW CONTROL DEVICE)	REMOVE BLOCKAGES TO THE FLOW CONTROL DEVICE, AS REQUIRED BY FOLLOWING THE MAINTENANCE INSTRUCTIONS RELATING TO THAT PARTICULAR DEVICE, i.e. FOR TORNADO STYLE DEVICE, OPEN DOOR USING STAINLESS STEEL ROPE PROVIDED, FOR TYPHOON STYLE DEVICE PULL OUT UP-STAND PIPE TO ACTIVATE DRAIN DOWN, AND FOR HURRICANE STYLE DEVICE, USE THE LIFTING ROD TO DRAIN DOWN AND CLEAR BLOCKAGE(S).	AS REQUIRED	CLIENT / END USER / BUILDING OWNER
MONITORING	INSPECT / CHECK ALL INLETS, OUTLETS, VENTS AND OVERFLOWS TO ENSURE THAT THEY ARE IN GOOD CONDITION AND OPERATING AS DESIGNED	ANNUALLY	CLIENT / END USER / BUILDING OWNER
	SURVEY INSIDE OF TANK FOR SEDIMENT BUILD-UP AND REMOVE, IF NECESSARY	EVERY 5 YEARS, OR AS REQUIRED	CLIENT / END USER / BUILDING OWNER

MAINTENANCE SCHEDULE - AS TAKEN FROM SUDS MANUA C753, APPENDIX B, BOX-B2 FOR PERVIOUS PAVEMENTS

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY	PERSON RESPONSIBLE FOR UNDERTAKING OR COMMISSIONING SUITABLE PROFESSIONAL
REGULAR MAINTENANCE	CLEANING BRUSH REGULARLY AND REMOVE SWEEPINGS FROM ALL HARD SURFACE	MONTHLY	SITE OWNER (MAINTENANCE CONTRACT)
OCCASIONAL TANKS	BRUSH AND VACUUM PERMEABLE PAVING SURFACE ONCE A YEAR TO PREVENT SILT BLOCKAGE AND ENHANCE DESIGN LIFE	ANNUALLY	SITE OWNER (MAINTENANCE CONTRACT)
REMEDIATION WORK	MONITOR EFFECTIVENESS OF PERMEABLE PAVEMENT, AND WHEN WATER DOES NOT INFILTRATE IMMEDIATELY ADVISE THE CLIENT OF POSSIBLE NEED FOR REINSTATEMENT OF TOP LAYERS OR SPECIALIST CLEANING. RECENT EXPERIENCE SUGGESTS THAT WET WASHING AND SUCTION CLEANING WILL SUBSTANTIALLY REINSTATE PAVEMENT TO 90% EFFICIENCY	AS REQUIRED	SITE OWNER (MAINTENANCE CONTRACT)

MAINTENANCE SCHEDULE - AS TAKEN FROM SUDS MANUA C753, APPENDIX B, BOX-B2 FOR INLETS, OUTLETS & INSPECTION CHAMBERS

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY	PERSON RESPONSIBLE FOR UNDERTAKING OR COMMISSIONING SUITABLE PROFESSIONAL
REGULAR MAINTENANCE	INLETS, OUTLETS AND SURFACE CONTROL STRUCTURES INSPECT SURFACE STRUCTURES, REMOVING OBSTRUCTIONS AND SILT AS NECESSARY. CHECK THERE IS NO PHYSICAL DAMAGE. STRIM VEGETATION 1m MIN. SURROUND TO STRUCTURES AND KEEP HARD APRONS FREE FROM SILT AND DEBRIS INSPECTION CHAMBERS AND BELOW-GROUND CONTROL CHAMBERS REMOVE COVER AND INSPECT, ENSURING THAT WATER IS FOWING FREELY AND THAT THE EXIT ROUTE FOR WATER IS UNOBSTRUCTED. REMOVE DEBRIS AND SILT. UNDERTAKE INSPECTION AFTER LEAF FALL IN AUTUMN	MONTHLY (OR AS REQUIRED)	SITE OWNER (MAINTENANCE CONTRACT)
		MONTHLY	SITE OWNER (MAINTENANCE CONTRACT)
		ANNUALLY	SITE OWNER (MAINTENANCE CONTRACT)
OCCASIONAL TANKS	CHECK TOPSOIL LEVELS ARE 20mm ABOVE EDGES OF BASKETS AND CHAMBERS TO AVOID MOWER DAMAGE	ANNUALLY (OR AS REQUIRED)	SITE OWNER (MAINTENANCE CONTRACT)
REMEDIATION WORK	REPAIR PHYSICAL DAMAGE IF NECESSARY	AS REQUIRED	SITE OWNER (MAINTENANCE CONTRACT)

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- STABILITY REQUIREMENT HIGHLIGHT**
-  WHERE THE GREEN HIGHLIGHT SYMBOL IS PLACED ON A DRAWING THIS REFERS TO THIS ELEMENT OF THE DESIGN BEING CRITICAL TO THE STABILITY STRATEGY

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PLANNING DOC



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Client FIONA BIGWOOD		
Project OAKLANDS FARM, SLAUGHAM LANE, WARNINGLID, RH17 5TJ		
Title DRAINAGE DETAILS SHEET 2 of 2		
Date 25.09.2024	Checked 14.11.2024	
Drawing Sheet Size A1	Engineer PW	
Scale 1:10 & 1:20 AT A1		
Status PLANNING		
Project Number 24-072	Drawing Number 53	Revision P1

SECTION C

PREVIOUS EAS Ltd DESIGN (AS APPROVED IN JANUARY 2020)

MR ANDERS DAHL

**OAKLANDS FARM, SLAUGHAM LANE
WARNINGLID, WEST SUSSEX**

Drainage Design

December 2019



eas ltd

Environmental Assessment Services Ltd

London Road, Hickstead, Haywards Heath, West Sussex RH17 5LZ UK

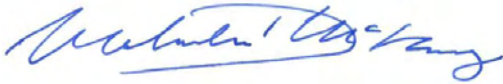
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REPORT DATA SHEET

Requirement	Data
Report Reference	OaklandsFarm/Drainage
Date	December 2019
Client	Mr Anders Dahl
Report type	Drainage Design
Purpose	Planning Condition 18/01520/FULL
Revisions	January 2020
Prepared by	Eur Ing Malcolm McKemey BSc (Hons), CEng, CEnv, MICE, MIEAust, MCIWEM, MIEEnvSc 
Approved by	Lucy Monday BSc (Hons), MCIWEM, MIEEnvSc, ACIEEM 

MR ANDERS DAHL

OAKLANDS FARM, SLAUGHAM LANE, WARNINGLID
WEST SUSSEX, RH17 5TJ

Drainage Design

December 2019

CONTENTS

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2. SURFACE WATER DRAINAGE
3. DRAINAGE DESIGN
4. DESIGN DETAILS
5. FOUL SEWERAGE
6. MAINTENANCE
7. SUMMARY OF CONCLUSIONS & RECOMMENDATIONS

APPENDIX A: FIGURES

- Figure 1: Site Location
Figure 2: Drainage Layout
Figure 3: Drainage Details

APPENDIX B: OUTPUT FROM DRAINAGE DESIGN SOFTWARE

APPENDIX C: HR WALLINGFORD ATTENUATION STORAGE MODEL

APPENDIX D: FOUL SEWERAGE DESIGN REPORT
By Moody Sewage Limited

APPENDIX E: MAINTENANCE MANAGEMENT PLAN

MR ANDERS DAHL

OAKLANDS FARM, SLAUGHAM LANE, WARNINGLID
WEST SUSSEX, RH17 5TJ

Drainage Design

December 2019

1. BACKGROUND, EXISTING SITE & PROPOSED DEVELOPMENT
 - 1.1 The site comprises part of a farm on the east side of Slaugham Lane, to the south of the centre of the settlement of Slaugham, near Warninglid in West Sussex. The site is being redeveloped as an equestrian centre.
 - 1.2 The site area is approximately 2 ha. The impermeable area requiring surface water drainage is approximately 4200 m². The Ordnance Survey (OS) map reference for the centre of the site is TQ 2508 2767. The site elevation is approximately +75 m OD. See Figure 1 for site location.
 - 1.3 Impermeable areas requiring surface water drainage comprise the roof areas of indoor schools, barns, stables, a house and other accommodation plus non-permeable paved access and hardstanding areas.
 - 1.4 A surface water drainage strategy and outline drainage design for the site based on attenuation storage has already been prepared by Clive Onions Limited Consulting Civil Engineer of Pensford, Bristol.
 - 1.5 The site was visited and percolation testing was carried out on Friday 22 November 2019.
2. SURFACE WATER DRAINAGE
 - 2.1 **Existing Site Drainage**
 - 2.1.1 The site has minimal formal drainage and presently drains down to the southwest corner via a number of converging ditches. These ditches drain into a watercourse that flows westwards through a culvert under Slaugham Lane, joins with another south flowing stream (Scotland Gill) and discharges into Canterbury Gill some 200 m to the south. Canterbury Gill flows east, back under Slaugham Lane, into a large lake (Mill Pond). Mill Pond outfalls into the River Ouse, which flows off to the east in the general direction of Cuckfield.
 - 2.1.2 Further description of the existing drainage is given in the Clive Onions Limited Flood Risk Assessment and Drainage Strategy Report.

- 2.1.3 The Greenfield runoff rate for the site has been calculated using the UK SuDS tools and the results are summarised in Table 2.1 below:

TABLE 2.1
GREENFIELD RUNOFF RATES

Return period	Flow rates (l/s)
Qbar	1.4
1 in 1 year	1.2
1 in 10 year	2.3
1 in 30 year	3.4
1 in 100 year	4.5

2.2 Proposed Site Drainage

- 2.2.1 The 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). Flows leaving the site should not exceed the Greenfield flow.
- 2.2.2 The underlying Tunbridge Wells Sand contains a high proportion of silt and clay and was deemed too impermeable for drainage to soakaway in the Clive Onions Limited drainage strategy report. However, Mid Sussex District Council requested that percolation testing should be carried out to confirm whether or not drainage to soakaway could be made to work, as this would always be the preferred sustainable drainage option. It is proposed to rely on attenuation storage, with discharge limited to a maximum of the Greenfield flow rate.
- 2.2.3 Three test holes were drilled at locations towards the lower (southwest) edge of the site (the practicable location for soakaways). The locations of the test holes are shown on the attached plan. The soils encountered in the test holes are summarised in Table 2.2 below:

TABLE 2.2
TEST HOLE DETAILS

Test Hole 1	Test Hole 2	Test Hole 3
0.15 m grey/brown organic topsoil with roots over light grey/buff Clay (Weald Clay/Upper Tunbridge Wells Sand)	0.25 m Made Ground of clay, stone and brick over light grey/buff Clay (Weald Clay/Upper Tunbridge Wells Sand)	0.1 m organic topsoil over 0.5 m Made Ground of clay, stones and concrete pieces over light grey/buff Clay (Weald Clay/Upper Tunbridge Wells Sand)

2.2.4 The conditions prior to and during the test period were fairly wet and followed a wet autumn. The risk of over-optimistic results was low.

2.2.5 The holes were filled with water and the fall of the water level was measured against time. Where test holes emptied, they would be re-filled with water and the exercise repeated. In this case, all three test holes failed to empty during the monitoring period. The infiltration coefficients (f) were calculated from the results of the tests:

Test Hole 1: $f = 7.028 \times 10^{-7}$ m/s

Test Hole 2: $f = 7.787 \times 10^{-7}$ m/s

Test Hole 3: $f = 4.701 \times 10^{-7}$ m/s

2.2.6 These infiltration coefficients are an order of magnitude too low for a practicable soakaway. It is concluded that the attenuation storage solution given in the Clive Onions Limited Flood Risk Assessment and Drainage Strategy Report is to be developed to detailed design.

2.2.7 The drainage strategy is based on a two-stage attenuation storage arrangement designed to accommodate the 100 year return period event plus a 40% allowance for climate change. The first stage provides attenuation storage in a “box” beneath the car parking area, which in turn discharges into an attenuation pond. Both box and pond will have controlled flow outlets.

2.2.8 The Clive Onions Limited Flood Risk Assessment and Drainage Strategy Report suggests discharge from the box limited to 1 l/s and the discharge from the pond limited to 2 l/s. However, the lowest flow practically achievable using a vortex valve is 2 l/s and 5 l/s using an orifice plate.

2.2.9 The very low flows originally proposed would also require an excessively large attenuation pond. It is therefore proposed to limit the discharge from the box to 2 l/s using a vortex valve and to limit the discharge from the pond to 5 l/s (vortex valve or orifice plate). The attenuation storage volume in the pond will be provided by 0.5 m of freeboard above the outlet invert. This is increased from the 0.3 m suggested in the Clive Onions Ltd report to further constrain the area required for the pond. The results of the percolation testing suggest that the pond may be unlined. This could be reviewed once operational.

2.2.10 The attenuation storage volume required for the box is 99 m³, and 180 m³ for the pond. The volumes were calculated using the HR Wallingford UK SuDS tool. See Appendix C. However, there is 24 m³ of storage available in the pipework and 21 m³ in the chambers, which will reduce the pond volume.

3 DRAINAGE DESIGN

3.1 Design Philosophy

3.1.1 The scheme is fundamentally attenuation storage with discharge limited to as near Greenfield flow (Q_{bar}) as can practicably be achieved.

- 3.1.2 The proposed drainage layout (as per the approved drainage strategy given in the Clive Onions Limited Flood Risk Assessment and Drainage Strategy Report) is shown in Figure 2.

3.2 Design Storm

- 3.2.1 The surface water drainage system has been designed for the 30 year return period event and tested for surcharge for the 1 in 100 return period event (1% Annual Exceedence Probability) plus 40% addition for climate change.
- 3.2.2 The design has been carried out using the MasterDrain Hydrology and MasterDrain Surface Water model software. See output in Appendix B.
- 3.2.3 Hydrological data used in the Masterdrain model is given in Appendix B and summarised in Table 3.1 below:

TABLE 3.1
FSR VALUES DERIVED FOR THE HYDROLOGICAL MODEL

LOCATION: Slaugham	OS GRID REFERENCE: TQ 2527
M5 60 = 19 mm	SAAR (mm/yr) = 830
r = 0.34	Soil = 0.45
HYDROLOGICAL AREA = 7	HYDROLOGICAL ZONE = 1
Soil classification for WRAP type 4: Clayey soils, low permeability	

- 3.2.4 Model inputs for the drainage network are given in Appendix B.

4. DESIGN DETAILS

- 4.1 The drainage layout is shown in Figure 2. The chamber and pipe details, including all pipe sizes, invert levels, cover levels, etc are given in the Masterdrain model output in Appendix B.
- 4.2 The attenuation storage box should be 12 m x 12 m x 0.8 m deep. The attenuation pond should have a surface area of 270 m² at outlet invert level. The extent of the pond will have to be established on site and may require some revision of the existing site entrance arrangement. Pond sides should be no steeper than 30 degrees from the horizontal and should shelve towards the centre of the pond, such that the deepest part of the pond is not more than 1 m below outlet invert level. See Figure 3 for the pond inlet and outlet details.
- 4.3 The flow control device for the attenuation box outlet is to be housed in Chamber SW31 and the flow control device for the pond outlet is to be housed in Chamber SW33.
- 4.4 The design was tested for the surcharge condition with the 1 in 100 year return period storm event plus a 40% allowance for climate change. The 15, 30, 45 and 60 minute duration storms were used and both winter and summer conditions were tested. The model predicted that surcharge would occur, but would remain within safe limits and not cause the chambers to flood. See Appendix B.

- 4.5 An extreme event, which overwhelmed the drainage system, would result in the pond overflowing and water flowing southwest across and/or along Slaugham Lane and into Scotland Gill and/or Canterbury Gill.

5. FOUL SEWERAGE

- 5.1 The proposed foul sewerage system is addressed in detail in the Moody Sewage Limited Feasibility Study report in Appendix D. This includes conclusions, recommendations and costings. The key points are summarised below.
- 5.2 The layout, levels etc. to be as given in George Baxter Associates Limited drawing No. G440 PL08 and shown in Figure 2.
- 5.3 The system sewage treatment works to be sized for a nominal population of 18.
- 5.4 The effluent from the treatment plant is to be piped to a discharge point immediately upstream of the culvert under Slaugham Lane and down stream of the attenuation pond and flow control device chamber (SW34). The last chamber before the effluent outfall be the foul sewerage system sampling chamber.
- 5.5 Under the current General Binding Rules, the proposed foul sewerage system will require an Environmental Permit. However, the site presently has a Consent to Discharge treated sewage effluent under the Water Act 1989. Ref: P2904, dated 1990.
- 5.6 Stable waste, comprising used horse bedding and droppings, will be stored undercover and protected from rainfall. The waste will be removed regularly by an appropriate contractor. Bacterial action in the waste will tend to generate heat and release any moisture as water vapour. The waste should remain generally dry while under cover and should not produce polluted run-off or liquor. The covered area will be drained to a 40 litre grease trap as a precautionary measure.

6. MAINTENANCE

- 6.1 The attenuation box, attenuation pond and their flow control chambers will require regular maintenance to preserve the efficient function of the drainage system for the life of the development.
- 6.2 The principal concerns addressed by the Maintenance Management Plan (see Appendix E) are siltation and debris blocking pipes, inlet gratings and filling gulley pots or chambers. Silt, mainly in the form of grit and dust will wash into the system during rainfall. This may be exacerbated when areas of disturbed/unvegetated soil are in the catchment.

- 6.3 It is recommended that accumulated litter and debris is removed regularly, especially after most autumn/winter leaf fall has occurred. The same applies to sediment accreting in the pond, which needs to be monitored and removed as necessary.
- 6.4 The inlet and outlet of the box and pond should be checked and cleaned frequently. Pond vegetation also requires consistent management.
- 6.5 Only half the pond should be cleaned out at any one time, to permit the preservation and regeneration of the habitat for wildlife.
- 6.6 The sewage treatment plant will require annual maintenance by an appropriately qualified specialist.
- 6.7 Maintenance will be the responsibility of the freeholder of the developed property.

7. SUMMARY OF CONCLUSIONS & RECOMMENDATIONS

- 7.1 The surface water drainage design is a sustainable system designed to control offsite flow to Greenfield flow rates, as far as is practicable.
- 7.2 Drainage to soakaway would be the preferred option, but percolation testing carried out on site revealed the underlying soils to be too impermeable for this solution and the system has been designed as two-stage attenuation storage with flow-controlled outlets.
- 7.3 The surface water drainage has been designed for the 1 in 30 year return period storm, but checked for surcharge for the 1 in 100 year return period storm plus 40% addition for climate change.
- 7.4 The attenuation storage has been sized for the 1 in 100 year return period storm plus 40% addition for climate change.
- 7.5 The detailed design follows the outline design prepared by Clive Onions Limited for the planning application.
- 7.6 The foul sewerage scheme design is given in Appendix D and follows the arrangement shown in George Baxter Associates Limited drawing No. G440 PL08 of August 2019 and shown in Figure 2.
- 7.7 The soiled horse bedding and droppings will be stored under cover before periodic removal by appropriate contractor. This should not generate liquid run-off. However, the covered area will be drained to a 40 litre grease trap as a precautionary measure.
- 7.8 The ditch between the culvert outfall on the west side of Slaughtam Lane and Scotland Gill has become poorly defined, allowing water to spread into woodland. This ditch should be cleaned out and re-defined as a matter of urgency.

APPENDIX A

FIGURES

Figure 1:	Site Location
Figure 2:	Drainage Layout
Figure 3:	Drainage Details



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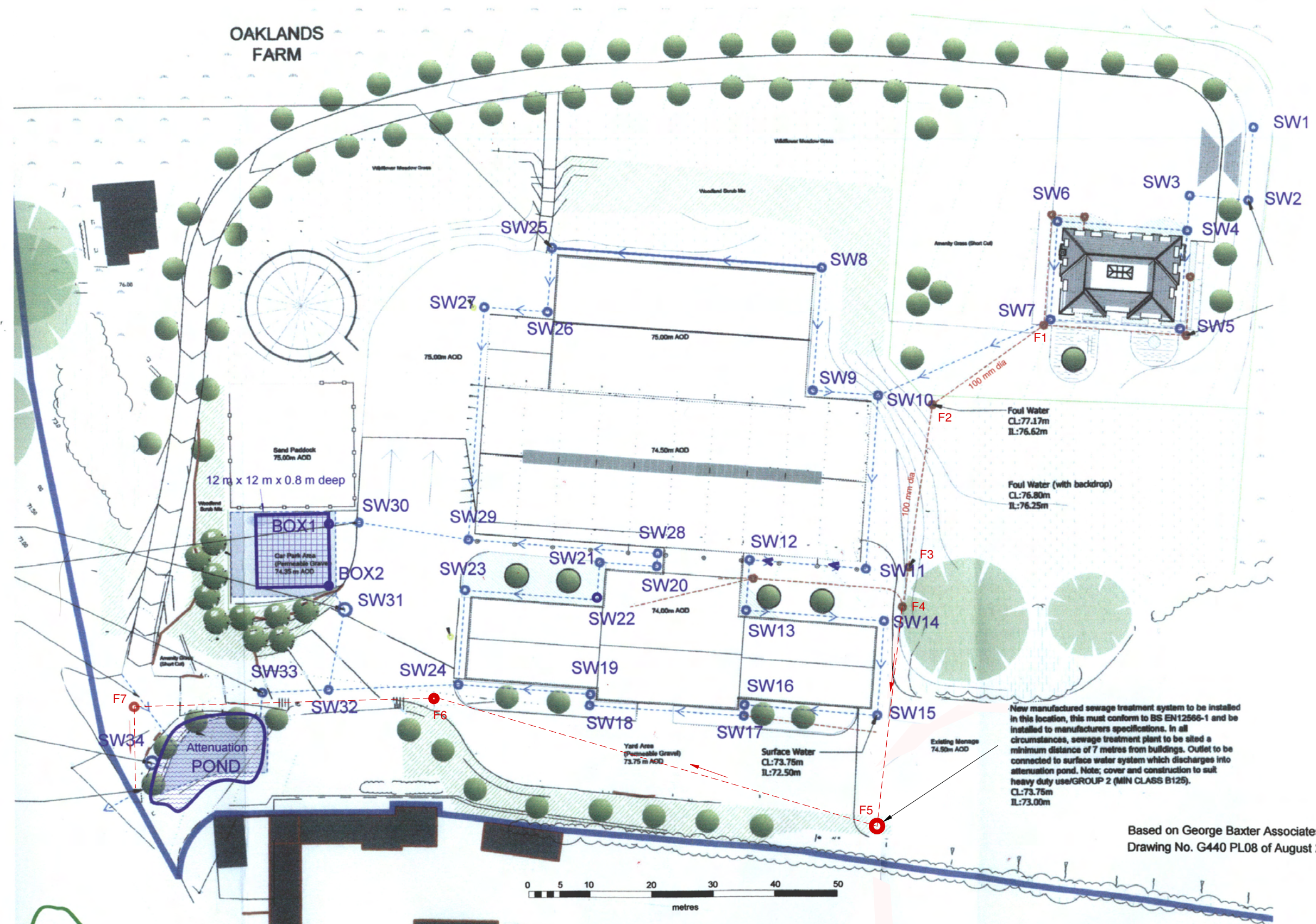
MR ANDERS DAHL

OAKLANDS FARM, SLAUGHAM LANE, WARNINGLID

Figure 1: Site Location

Scale 1:25000

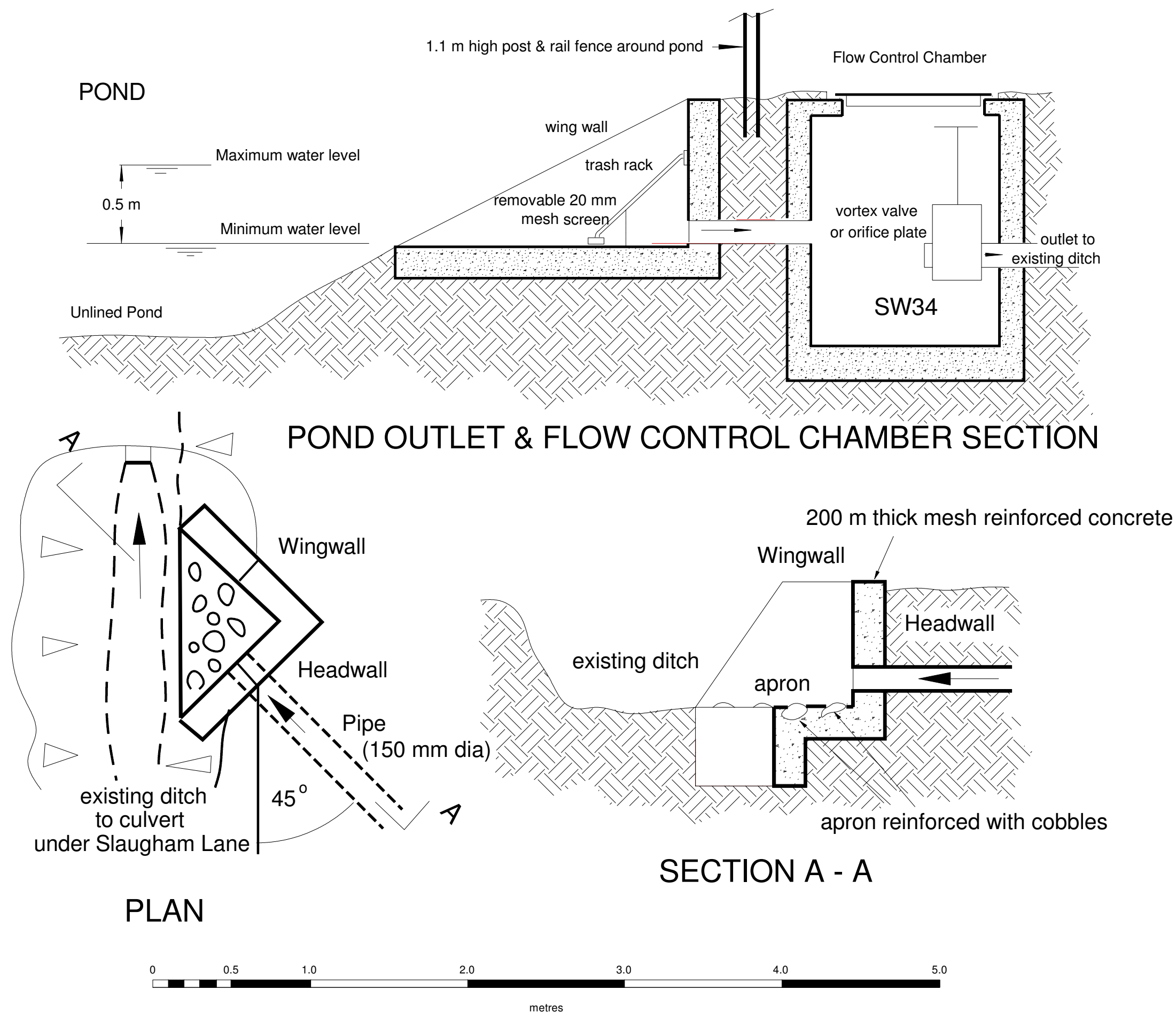
December 2019



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OAKLANDS FARM, SLAUGHAM LANE, WARNINGLID

Figure 2: Proposed Drainage Layout

January 2020



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OAKLANDS FARM
SLAUGHAM LANE
WARNINGLID

Figure 3
Drainage Details

Scale as shown

December 2019

APPENDIX B:
OUTPUT FROM DRAINAGE DESIGN SOFTWARE

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. GBA/AD		
Sheet no. 1		
Date 23/12/19 16:03		
By MDM	Checked	Reviewed

Project
Oaklands Farm Drainage

Title
Calculations (30 yrs storm) for SLAUGHAM IJ.SW

Entry No.	Section No.	Diam mm	Fall mm	Grad 1 in	Length m	Imperm. area	Perm area	Flow l/s	Pipe cap full l/s	Depth of flow %	H.M.D.	Veloc. m/s	Proport. vel. m/s	Time of flow m:s	Time of conc m:s	Rain mm/hr	System vol
1	1.01	150	99	148	14.8	155	0	5.2	14.5	38.8	0.84	0.82	0.73	0:18	4:48	113.5	
2	1.02	225	110	419	46.1	149	0	9.3	25.1	40.0	0.86	0.63	0.57	1:13	6:01	104.2	
3	1.03	225	70	80	5.6	182	0	14.7	58.1	30.5	0.69	1.46	1.14	0:04	6:05	103.7	
4	1.04	225	230	96	22.1	104	0	17.6	53.0	37.1	0.81	1.33	1.16	0:17	6:22	101.9	
5	1.05	225	229	74	17.0	112	0	20.7	60.4	37.9	0.82	1.52	1.34	0:11	6:33	100.7	
6	2.01	100	230	92	21.2	110	0	3.6	6.3	56.1	1.07	0.80	0.84	0:26	4:56	112.3	
7	1.06	225	1335	23	30.7	106	0	26.7	108.9	29.7	0.68	2.74	2.11	0:11	6:44	99.5	
8	3.01	100	49	404	20.2	28	0	0.9	2.9	34.1	0.76	0.38	0.31	0:54	5:24	108.7	
9	3.02	150	49	212	10.6	240	0	8.4	12.1	65.5	1.16	0.68	0.75	0:15	5:39	106.8	
10	1.07	300‡	400	70	28.1	343	0	43.9	132.9	36.6	0.80	1.88	1.62	0:15	6:59	98.0	
11	1.08	300‡	241	77	18.6	224	0	49.8	126.7	41.7	0.88	1.79	1.65	0:10	7:09	97.0	
12	1.09	300‡	410	20	8.2	224	0	56.0	249.5	27.7	0.64	3.53	2.62	0:02	7:12	96.8	
13	1.10	300‡	280	80	22.4	178	0	60.3	124.2	49.1	0.99	1.76	1.74	0:13	7:24	95.6	
14	1.11	300‡	466	33	15.4	146	0	64.1	194.0	36.6	0.80	2.74	2.37	0:06	7:30	95.1	
15	1.12	300‡	267	59	15.8	142	0	67.5	144.8	47.4	0.97	2.05	2.00	0:08	7:38	94.4	
16	1.13	300‡	30	44	1.3	94	0	70.1	167.9	43.9	0.92	2.37	2.24	0:01	7:38	94.4	
17	1.14	300	301	101	30.4	0	0	68.8	110.5	60.0	1.11	1.56	1.68	0:19	7:58	92.7	
18	1.15	300	29	60	1.8	0	0	68.8	143.6	48.7	0.98	2.03	2.01	0:01	7:59	92.6	
19	1.16	300	268	81	21.8	105	0	70.8	123.5	56.1	1.07	1.75	1.83	0:12	8:11	91.5	
20	4.01	100	119	70	8.4	74	0	2.5	7.2	37.9	0.82	0.92	0.81	0:09	4:39	114.8	
21	4.02	100	119	37	4.4	65	0	4.6	10.0	47.4	0.97	1.27	1.24	0:03	4:43	114.3	
22	4.03	150	270	79	21.4	77	0	7.0	20.0	38.3	0.83	1.13	1.00	0:19	5:02	111.6	
23	4.04	150	1266	12	15.2	66	0	9.2	51.6	23.5	0.56	2.92	1.98	0:05	5:07	110.9	
24	1.17	300	777	27	21.0	143	0	81.7	214.6	40.9	0.87	3.04	2.77	0:07	8:18	91.0	
25	5.01	150	129	82	10.6	211	0	7.1	19.6	39.2	0.84	1.11	0.99	0:10	4:40	114.7	
26	5.02	225	130	80	10.4	428	0	21.3	58.1	39.6	0.85	1.46	1.31	0:07	4:47	113.7	
27	5.03	225	481	79	38.0	230	0	28.0	58.5	48.7	0.98	1.47	1.45	0:26	5:13	110.1	
28	6.01	150	271	115	31.2	174	0	5.7	16.5	37.9	0.82	0.93	0.82	0:33	5:03	111.4	
29	5.04	225	231	77	17.8	208	0	45.5	59.2	71.9	1.19	1.49	1.68	0:12	5:25	108.6	
30	5.05	225	841	16	13.5	0	0	45.3	130.7	37.9	0.82	3.29	2.89	0:04	5:29	108.1	
31	5.06	100«	50	195	9.8	0	0	2.0*	4.3	47.8	0.97	0.55	0.54	0:18	5:47	105.9	
32	5.07	100	49	274	13.7	0	0	2.0	3.6	54.8	1.06	0.46	0.48	0:30	6:16	102.5	
33	5.08	100	1509	9	13.6	0	0	2.0	20.3	15.6	0.38	2.59	1.37	0:05	6:22	101.9	
34	1.18	300	129	83	10.8	0	0	83.2	122.0	64.6	1.15	1.73	1.89	0:06	8:24	90.5	
35	1.19	100	1427	8	11.4	0	0	5.0*	21.6	28.5	0.65	2.75	2.07	0:04	8:28	90.1	
36	1.20	100	201	53	10.7	0	0	5.0	8.3	58.3	1.09	1.06	1.12	0:10	8:38	89.3	

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		Sheet no. 2		
		Date 23/12/19 16:03		
Project Oaklands Farm Drainage	By MDM		Checked	Reviewed
Title Storage data for SLAUGHAM IJ.SW				

Storage data

Storage= Pipe	Section no. = 1.07	Diam (mm) = 300	Length (m) = 28.0556	Volume = 2.0m ³
Storage= Pipe	Section no. = 1.08	Diam (mm) = 300	Length (m) = 18.59875	Volume = 1.3m ³
Storage= Pipe	Section no. = 1.09	Diam (mm) = 300	Length (m) = 8.219026	Volume = 0.6m ³
Storage= Pipe	Section no. = 1.10	Diam (mm) = 300	Length (m) = 22.4072	Volume = 1.6m ³
Storage= Pipe	Section no. = 1.11	Diam (mm) = 300	Length (m) = 15.39252	Volume = 1.1m ³
Storage= Pipe	Section no. = 1.12	Diam (mm) = 300	Length (m) = 15.79489	Volume = 1.1m ³
Storage= Pipe	Section no. = 1.13	Diam (mm) = 300	Length (m) = 1.32382	Volume = 0.1m ³
Storage= Cell	Section no. = 5.06	Width (mm) = 12 Height (mm) = .8	Length (m) = 9.768812	Volume = 0.0m ³

Non-storage pipe volume = 16.7m³

Storage pipe volume = 7.8m³

Storage cell volume = 0.0m³ (Using 95% voids gives 0.0m³)

Storage volume in manholes = 1.0m³

Total storage = 8.8m³

Total system volume = 25.5m³

Note: Manhole volume is calculated for each manhole from the invert level to a level 300mm below the lowest system manhole ground level times the manhole area. Manhole reference level is 70.1m

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				Sheet no. 3		
				Date 23/12/19 16:03		
Project Oaklands Farm Drainage				By MDM	Checked	Reviewed
Title Storage data for SLAUGHAM IJ.SW						

Column heading definitions.

Input data - light blue areas on printout

Entry number - The file position (number) of this section's data. This is automatically calculated.

Section number - The reference number of this section, in the format XX.YY where XX is the run number and YY is the section number down that run.

Fall - The fall of this section along its length. This will be automatically calculated if not entered.*

Gradient - The gradient of this section as 1:XX. This is automatically calculated if not entered.*

Length - The length of this section between manhole centres.

* Refer to the workbook for methods of inputting gradient, fall or invert levels.

Output (calculated) data

Diameter - The calculated diameter (mm) for this section (yellow area on printout).

Flow l/s - The flow in litre/second along this section.

Pipe capacity full l/s - The capacity of the pipe running full (calculated using Colebrook-White) in litres/second.

Depth of flow% - The percentage depth of flow in this section for the given design parameters.

Hydraulic Mean Depth - The HMD in this section for the given design parameters.

Proportional area% - The proportional area of the pipe occupied by the flow.

Velocity m/s - The velocity of this section running full bore (calculated using Colebrook-White).

Proportional Velocity m/s - The calculated velocity of the actual flow (pipe full velocity x HMD).

Time of flow (s) - The time in seconds that is taken by the flow to traverse this section.

Time of Concentration (minutes) - A function of the time of flow plus the time of entry to give the actual rainfall intensity.

Rainfall intensity (mm/hr) - The calculated actual rainfall intensity used to derive the flow in this section

Pipe volume (m³) - The volume of this section.

System volume (m³) - The cumulative volume of the system, up to and including this section.

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						Sheet no. 4					
						Date 23/12/19 16:03					
Project Oaklands Farm Drainage						By MDM	Checked	Reviewed			
Title Data summary for printout											
Location Slaugham		Nat. Grid ref: TQ2527		M5-60 19		r 0.34		wrapx 4		SAAR 830	

Design data

Maximum rainfall rate allowed	= unlimited	Return period	= 30
Urban creep factor (%)	= 0	Growth period (years)	= 0
Minimum velocity (m/s)	= 1.00	Percentage gradient	= 80%
Pipe roughness factor (mm)	= 0.60	Maximum depth of flow	= 100%
Climate change factor	= 0		

System data

Final Rainfall rate (mm/hr)	= 89.34	Total flow rate (l/s)	= 5.0
Total fall of index run (m)	= 7.31	Total length of index run (m)	= 353.95
Total permeable area (Ha)	= 0.0	Total impermeable area (Ha)	= 0.4318
Time of concentration (mins)	= 8.64	Time of entry (mins)	= 4.5
Outfall diameter (mm)	= 100	Percentage impermeable area	= 100.00

Calculated variables

Routing coefficient (Cr)	= 1.3	Volumetric coefficient (Cv)	= 0.900
UCWI	= 89.17	Areal reduction factor	= 0.997

Notes:-

Default values for runoff used :-

Runoff factor for impervious areas = 90.0

Runoff factor for pervious areas = 40.0

Note 1 = Not applicable

Note 2 - Rainfall calculated using FSR data.

Note 3 - * against flow rate indicates upstream restrictor present (flow reduced if restrictor rate exceeded).

Note 4 - ‡ against diameter indicates preferred diameter used.

Note 5 - ¨ against diameter indicates preferred diameter too small and therefore not used.

Note 6 - § against diameter indicates throttle pipe used.

Note 7 - « against diameter indicates carrier pipe used in cellular storage.

Pipe sizes

The pipe definition file used for these calculations allows the following diameters:-

100	allowed	375	allowed	600	allowed	900	allowed	1200	allowed	1800	allowed
150	allowed	400	-----	700	allowed	1000	allowed	1350	allowed	1950	allowed
225	allowed	450	allowed	750	allowed	1050	allowed	1500	allowed	2100	-----
300	allowed	500	-----	800	allowed	1125	allowed	1650	allowed	2400	allowed

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				Sheet no. 1	
				Date 23/12/19 16:02	
Project Oaklands Farm Drainage		By MDM	Checked	Reviewed	
Title Manhole printout for SLAUGHAM IJ.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	230.73	131.3	circ	1200	N/A	0.60		0.68	150	76.575	76.400	N/A	76.350	77.000	SW2
SW2	239.69	119.53	circ	1200	N/A	0.70		0.79	225	76.550	76.300	N/A	76.250	77.000	SW3
SW3	193.56	120.12	circ	1200	N/A	0.81		0.92	225	76.440	76.190	N/A	76.140	77.000	SW4
SW4	192.96	114.54	circ	1200	N/A	0.88		1.00	225	76.370	76.120	N/A	76.070	77.000	SW6
SW6	171.01	117.13	circ	1200	N/A	1.61		1.82	225	76.140	75.890	N/A	75.840	77.500	SW7
SW5	192.16	98.57	circ	1200	N/A	1.11		1.26	100	76.015	75.890	N/A	75.840	77.000	SW7
SW7	171.01	100.17	circ	1200	N/A	1.84		2.08	225	75.910	75.660	N/A	75.610	77.500	SW10
SW8	133.69	108.75	circ	1200	N/A	0.60		0.68	100	74.525	74.400	N/A	74.350	75.000	SW9
SW9	132.3	88.6	circ	1200	N/A	0.65		0.74	150	74.525	74.350	N/A	74.300	75.000	SW10
SW10	142.87	87.83	circ	1800	N/A	0.70		1.78	300	74.625	74.300	N/A	74.250	75.000	SW11
SW11	140.68	59.86	circ	2100	N/A	0.60		2.08	300	74.225	73.900	N/A	73.850	74.500	SW12
SW12	122.12	61.06	circ	1800	N/A	0.84		2.14	300	73.985	73.660	N/A	73.610	74.500	SW13
SW13	121.32	52.88	circ	2100	N/A	0.75		2.60	300	73.575	73.250	N/A	73.200	74.000	SW14
SW14	143.67	51.28	circ	1500	N/A	0.78		1.38	300	73.295	72.970	N/A	72.920	73.750	SW15
SW15	142.67	35.92	circ	1500	N/A	1.25		2.21	300	72.825	72.500	N/A	72.450	73.750	SW16
SW16	126.92	37.11	circ	1500	N/A	1.52		2.69	300	72.555	72.230	N/A	72.180	73.750	SW17
SW17	126.34	35.92	circ	1500	N/A	1.55		2.74	300	72.525	72.200	N/A	72.150	73.750	SW18
SW18	95.98	37.59	circ	1200	N/A	1.85		2.09	300	72.225	71.900	N/A	71.850	73.750	SW19
SW19	96.14	39.37	circ	1200	N/A	1.88		2.13	300	72.195	71.870	N/A	71.820	73.750	SW24
SW20	105.75	59.86	circ	1200	N/A	0.60		0.68	100	73.525	73.400	N/A	73.350	74.000	SW21
SW21	97.38	60.46	circ	1200	N/A	0.72		0.81	100	73.405	73.280	N/A	73.230	74.000	SW22
SW22	96.78	56.07	circ	1200	N/A	0.84		0.95	150	73.335	73.160	N/A	73.110	74.000	SW23
SW23	75.43	56.07	circ	1200	N/A	1.46		1.65	150	73.065	72.890	N/A	72.840	74.350	SW24
SW24	74.43	40.91	circ	1200	N/A	2.15		2.43	300	71.925	71.600	N/A	71.550	73.750	SW32
SW25	89.99	111.74	circ	1200	N/A	0.80		0.90	150	74.375	74.200	N/A	74.150	75.000	SW26
SW26	89	101.17	circ	1200	N/A	0.93		1.05	225	74.320	74.070	N/A	74.020	75.000	SW27
SW27	78.62	102.17	circ	1200	N/A	1.06		1.20	225	74.190	73.940	N/A	73.890	75.000	SW29
SW28	107.15	62.26	circ	1200	N/A	0.77		0.87	150	73.905	73.730	N/A	73.680	74.500	SW29
SW29	76.03	64.25	circ	1200	N/A	1.04		1.18	225	73.710	73.460	N/A	73.410	74.500	SW30
SW30	58.47	67.25	circ	1200	N/A	1.12		1.27	225	73.480	73.230	N/A	73.180	74.350	BOX1
BOX1	45.89	62.46	circ	1200	N/A	1.95		2.21	100	72.525	72.400	N/A	72.350	74.350	BOX2
BOX2	N/A	N/A	circ	1200	N/A	2.00		2.26	100	72.475	72.350	N/A	72.300	74.350	SW31
SW31	55.87	53.08	circ	1200	N/A	1.70		1.92	100	72.425	72.300	N/A	72.250	74.000	SW32
SW32	53.48	39.71	circ	1800	N/A	2.27		5.78	300	71.155	70.830	N/A	70.780	73.100	SW33
SW33	42.7	39.7	circ	1200	N/A	1.70		1.92	100	70.825	70.700	N/A	70.650	72.400	POND
POND	35.15	31.13	circ	1200	N/A	1.20		1.36	100	69.325	69.200	N/A	69.150	70.400	SW34

All manholes to be as per 'Sewers for Adoption'

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		Sheet no. 3		
		Date 23/12/19 16:02		
Project Oaklands Farm Drainage		By MDM	Checked	Reviewed
Title Manhole printout for SLAUGHAM IJ.SW				

MH = SW25	MH = SW26	MH = SW27	MH = SW28	MH = SW29	MH = SW30	MH = BOX1	MH = BOX2
a= head	a= 150	a= 225	a= head	a= 225	a= 225	a= 225	a= 100
b = 150	b = 225	b = 225	b = 150	b = 225	b = 225	b = 100	b = 100
				c = 150			

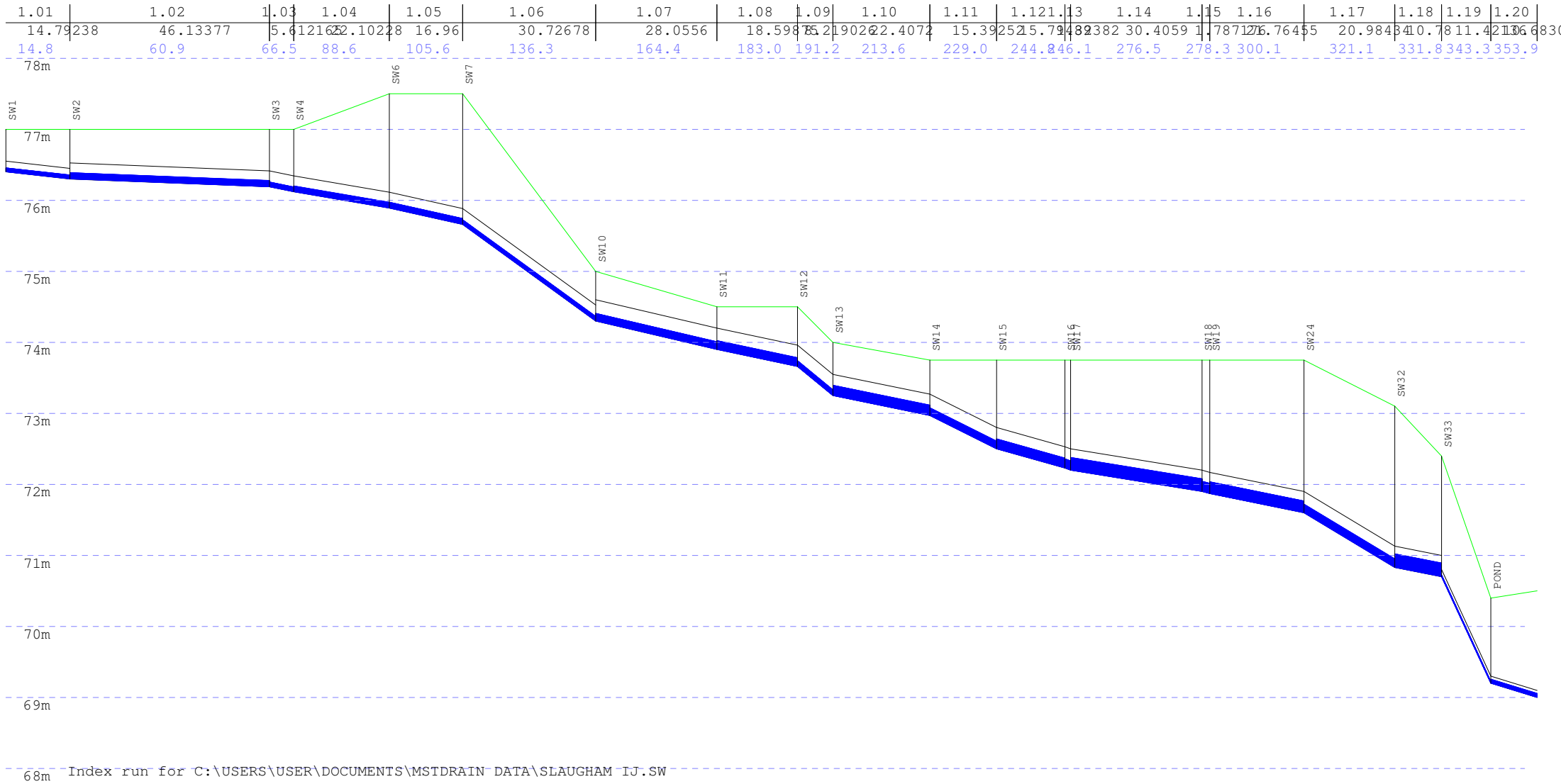
MH = SW31	MH = SW32	MH = SW33	MH = POND
a= 100	a= 300	a= 300	a= 100
b = 100	b = 300	b = 100	b = 100
	c = 100		

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Title Manhole printout for SLAUGHAM IJ.SW					

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

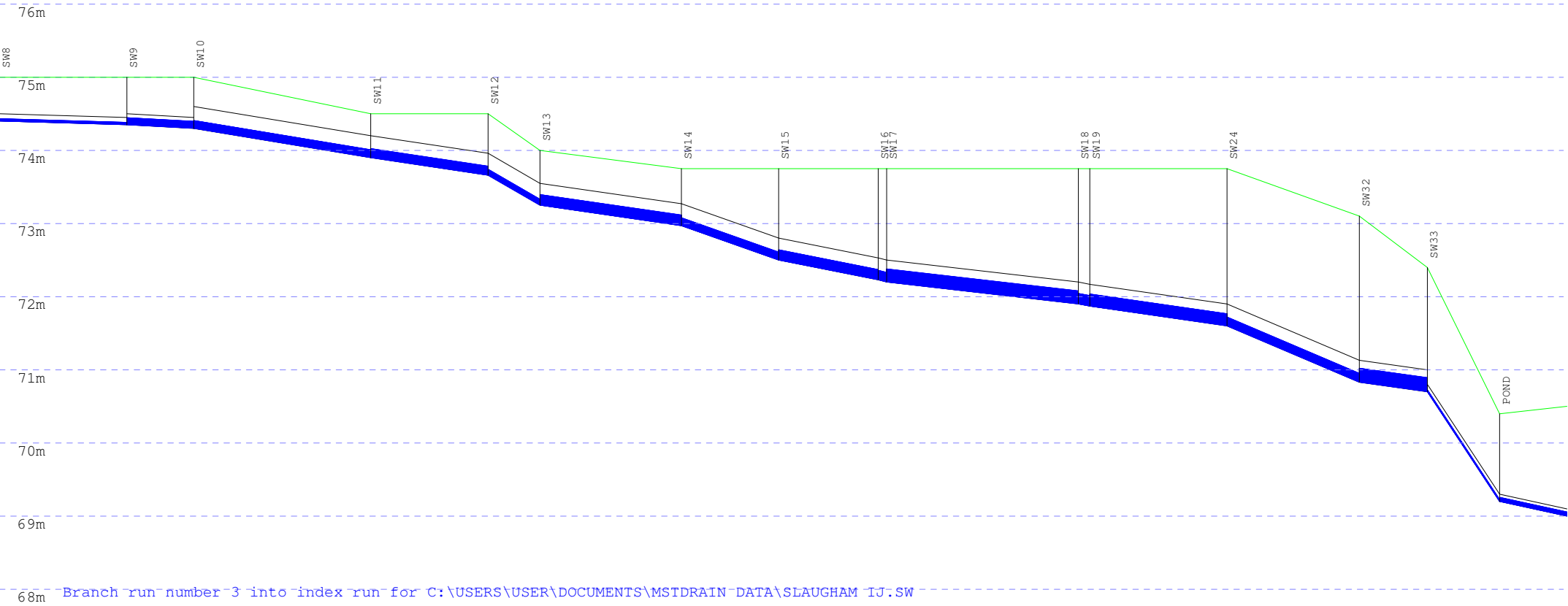
- 1) Manhole ref - the reference for the manhole in question
- 2) Form - either circular or rectangular
- 3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
- 4) Rectangular width - if form is rectangular, this gives the width of the chamber
- 5) Chamber 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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				Sheet no. 1		
				Date 23/12/19 15:51		
Project Oaklands Farm Drainage		By MDM		Checked	Reviewed	
Title Index run for SLAUGHAM IJ.SW						



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				Sheet no.		
		1				
		Date				
		23/12/19 15:57				
Project		By			Checked	Reviewed
Oaklands Farm Drainage						
Title		MDM				
Branch run number 3 into index run for SLAUGHAM IJ.SW						

3.01	3.02	1.07	1.08	1.09	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17	1.18	1.19	1.20
20.19788	10.59801	28.0556	18.59875	8.219026	22.4072	15.39252	15.79489	33.2382	30.4059	1.787176	21.76455	20.98434	10.78	11.42136	10.68307
20.2	30.8	58.9	77.5	85.7	108.1	123.5	139.3	140.6	171.0	172.8	194.5	215.5	226.3	237.7	248.4



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Sheet no.
1

Date
23/12/19 15:58

Project
Oaklands Farm Drainage

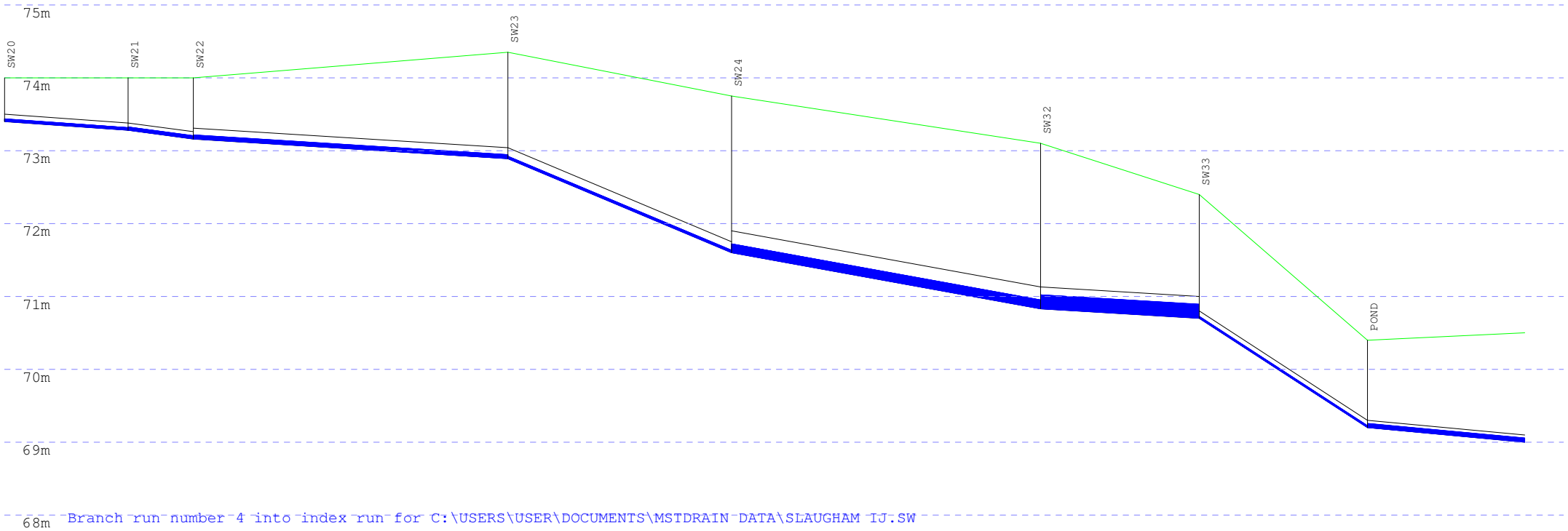
By
MDM

Checked

Reviewed

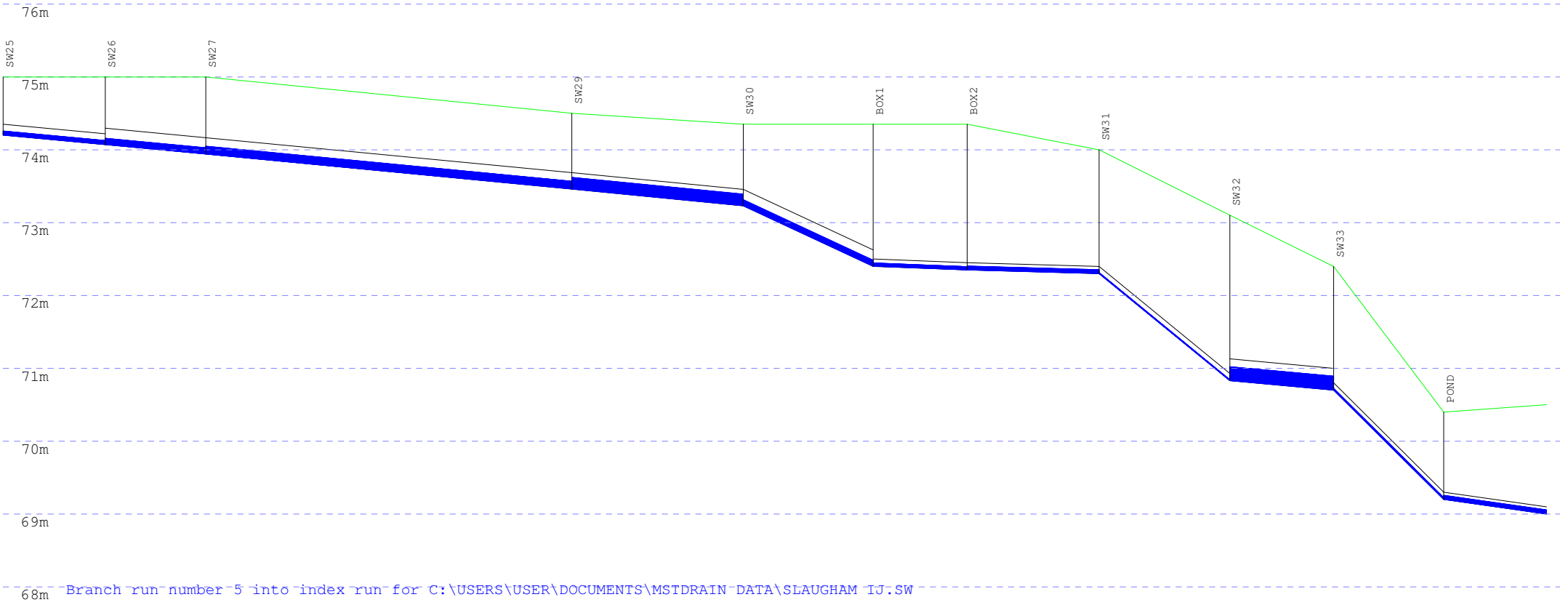
Title
Branch run number 4 into index run for SLAUGHAM IJ.SW

4.01	4.02	4.03	4.04	1.17	1.18	1.19	1.20
8.391478	4.430812	21.35	15.19294	20.98434	10.78	11.42136	10.68307
8.4	12.8	34.2	49.4	70.3	81.1	92.6	103.2



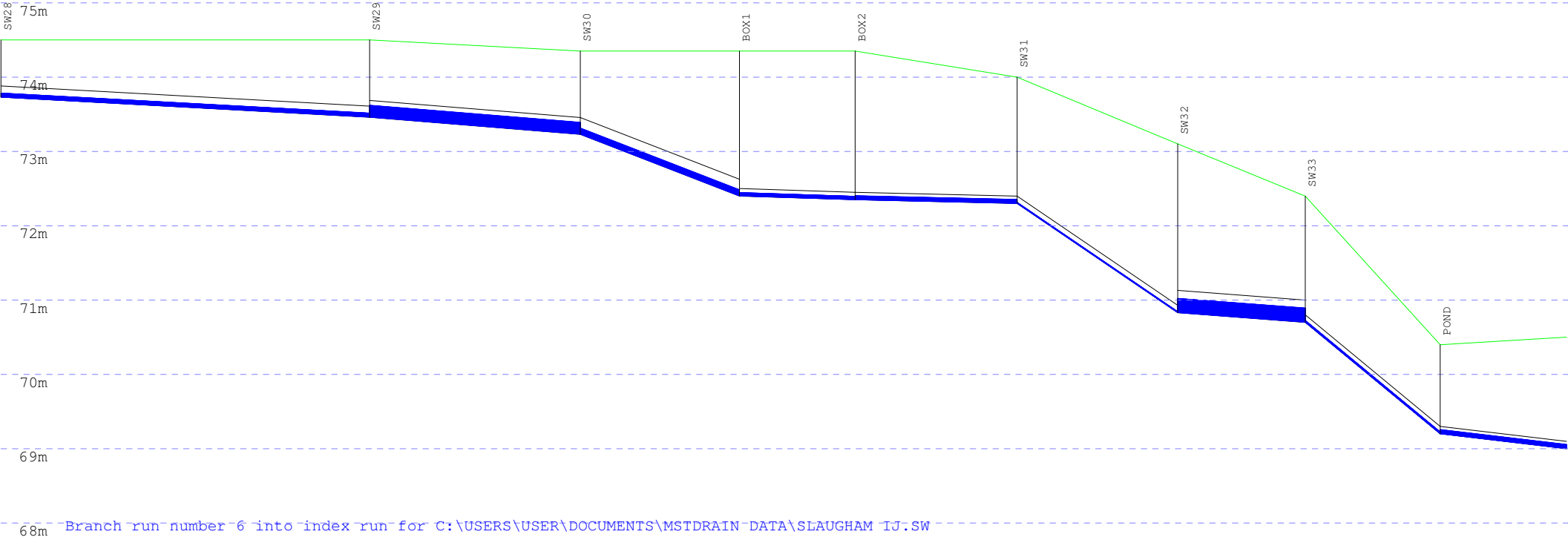
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				Sheet no. 1		
				Date 23/12/19 15:59		
Project Oaklands Farm Drainage				By MDM	Checked	Reviewed
Title Branch run number 5 into index run for SLAUGHAM IJ.SW						

5.01	5.02	5.03	5.04	5.05	5.06	5.07	5.08	1.18	1.19	1.20
10.61626	10.42806	38.00835	17.81442	13.46107	9.768812	13.7	13.58194	10.78	11.42136	10.68307
10.6	21.0	59.1	76.9	90.3	100.1	113.8	127.4	138.2	149.6	160.3



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Project	Oaklands Farm Drainage			By MDM	Checked	Reviewed
Title						

6.01	5.04	5.05	5.06	5.07	5.08	1.18	1.19	1.20
31.18356	17.81442	13.46107	9.768812	13.7	13.58194	10.78	11.42136	10.68307
31.2	49.0	62.5	72.2	85.9	99.5	110.3	121.7	132.4





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Date 23/12/19		
By MDM	Checked	Reviewed

Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

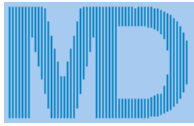
Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 60 mins
No offline storage

Mean rain intens. 54.00 mm/hr
Storm profile = winter
Using FSR data

Peak rain intens. 135.00 mm/hr
Sample period = 30.0 secs.

Entry	SECT. :	MANHOLE :	PIPE :	RATE :	PIPE :	CHAMBER :	INVERT:	WATER :	GRND :	SURCHARGE :		EXCESS :	FLOODED :	DRAINED :	STATUS	
No.	No. :	REF :	CAPACITY :	FLOW :	SIZE :	:DIAM/LxW :	LEVEL :	LEVEL :	LEVEL :	:	:	:	:	:AREA (m ²):		
:	:	:	l/s :	l/s :	mm :	mm :	m :	m :	m :	fract.	Depth	:	l/s :	m ³ :	:x FACTOR :	
1	I	1.01	SW1	14.5	5.7	150	1200	76.40	76.46	77.00	0.39	0.06	0.00	0.00	147	OK
2	I	1.02	SW2	25.1	11.2	225	1200	76.30	76.40	77.00	0.45	0.10	0.00	0.00	289	OK
3	I	1.03	SW3	58.1	17.9	225	1200	76.19	76.27	77.00	0.31	0.08	0.00	0.00	462	OK
4	I	1.04	SW4	53.0	21.8	225	1200	76.12	76.22	77.00	0.41	0.10	0.00	0.00	560	OK
5	I	1.05	SW6	60.4	25.9	225	1200	75.89	75.99	77.50	0.43	0.10	0.00	0.00	667	OK
6	B	2.01	SW5	6.3	4.1	100	1200	75.89	75.95	77.00	0.65	0.06	0.00	0.00	104	OK
7	I	1.06	SW7	108.9	33.9	225	1200	75.66	75.74	77.50	0.31	0.08	0.00	0.00	872	OK
8	B	3.01	SW8	2.9	1.0	100	1200	74.40	74.44	75.00	0.35	0.04	0.00	0.00	27	OK
9	B	3.02	SW9	12.1	9.9	150	1200	74.35	74.46	75.00	0.82	0.11	0.00	0.00	255	OK
10	I	1.07	SW10	132.9	56.4	300	1800	74.30	74.43	75.00	0.42	0.13	0.00	0.00	1453	OK
11	I	1.08	SW11	126.7	64.7	300	2100	73.90	74.05	74.50	0.51	0.15	0.00	0.00	1665	OK
12	I	1.09	SW12	249.5	72.9	300	1800	73.66	73.76	74.50	0.29	0.10	0.00	0.00	1878	OK
13	I	1.10	SW13	124.2	79.5	300	2100	73.25	73.43	74.00	0.64	0.18	0.00	0.00	2047	OK
14	I	1.11	SW14	194.0	84.9	300	1500	72.97	73.11	73.75	0.44	0.14	0.00	0.00	2186	OK
15	I	1.12	SW15	144.8	90.1	300	1500	72.50	72.68	73.75	0.62	0.18	0.00	0.00	2321	OK
16	I	1.13	SW16	167.9	93.6	300	1500	72.23	72.39	73.75	0.56	0.16	0.00	0.00	2410	OK
17	I	1.14	SW17	110.5	93.6	300	1500	72.20	72.44	73.75	0.85	0.24	0.00	0.00	2410	OK
18	I	1.15	SW18	143.6	93.6	300	1200	71.90	72.09	73.75	0.65	0.19	0.00	0.00	2410	OK
19	I	1.16	SW19	123.5	97.5	300	1200	71.87	72.09	73.75	0.79	0.22	0.00	0.00	2510	OK
20	B	4.01	SW20	7.2	2.7	100	1200	73.40	73.44	74.00	0.38	0.04	0.00	0.00	70	OK
21	B	4.02	SW21	10.0	5.1	100	1200	73.28	73.33	74.00	0.51	0.05	0.00	0.00	132	OK
22	B	4.03	SW22	20.0	8.0	150	1200	73.16	73.22	74.00	0.40	0.06	0.00	0.00	205	OK
23	B	4.04	SW23	51.6	10.4	150	1200	72.89	72.93	74.35	0.20	0.04	0.00	0.00	268	OK
24	I	1.17	SW24	214.6	113.2	300	1200	71.60	71.76	73.75	0.53	0.16	0.00	0.00	2914	OK
25	B	5.01	SW25	19.6	7.8	150	1200	74.20	74.26	75.00	0.40	0.06	0.00	0.00	200	OK
26	B	5.02	SW26	58.1	23.6	225	1200	74.07	74.17	75.00	0.41	0.10	0.00	0.00	607	OK
27	B	5.03	SW27	58.5	32.1	225	1200	73.94	74.06	75.00	0.55	0.12	0.00	0.00	826	OK
28	S1	6.01	SW28	16.5	6.4	150	1200	73.73	73.79	74.50	0.39	0.06	0.00	0.00	165	OK
29	B	5.04	SW29	59.2	46.2	225	1200	73.46	73.62	74.50	0.78	0.16	0.00	0.00	1188	OK



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Sheet no. 3		
Date 23/12/19		
By MDM	Checked	Reviewed

Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

Entry	SECT.:	MANHOLE :	PIPE :	RATE :	PIPE :	CHAMBER :	INVERT:	WATER :	GRND :	SURCHARGE		EXCESS :	FLOODED :	DRAINED :	STATUS	
No.	No. :	REF :	CAPACITY :	FLOW :	SIZE :	DIAM/LxW :	LEVEL :	LEVEL :	LEVEL :	:	:	FLOW :	VOL :	AREA (m²) :		
:	:	:	l/s :	l/s :	mm :	mm :	m :	m :	m :	fract.	Depth	l/s :	m³ :	x FACTOR :		
30	B	5.05	SW30	130.7	46.2	225	1200	73.23	73.32	74.35	0.35	0.09	0.00	0.00	1188	OK
31	B	5.06	BOX1‡	Cell	2.0	0.01x0.0	1200	72.40	72.45	74.35	1.00	0.05	0.00	0.00	0	OK
32	B	5.07	BOX2	3.6	46.2	100	1200	72.35	73.58	74.35	12.83	1.23	42.56	0.00	1188	Surch.
33	B	5.08	SW31	20.3	46.2	100	1200	72.30	73.08	74.00	2.27	0.78	25.82	0.00	1188	Surch.
34	I	1.18	SW32	122.0	159.3	300	1800	70.83	71.57	73.10	1.31	0.74	37.38	0.00	4102	Surch.
35	I	1.19	SW33‡	21.6	5.0	100	1200	70.70	70.73	72.40	0.23	0.03	0.00	0.00	0	OK
36	I	1.20	POND	8.3	5.0	100	1200	69.20	69.26	70.40	0.60	0.06	0.00	0.00	0	OK



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Date 23/12/19		
By MDM	Checked	Reviewed

Project	
Title	Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

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 5mm 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 - BOX1	Restrictor flowrate - 2 l/s
Manhole reference - SW33	Restrictor flowrate - 5 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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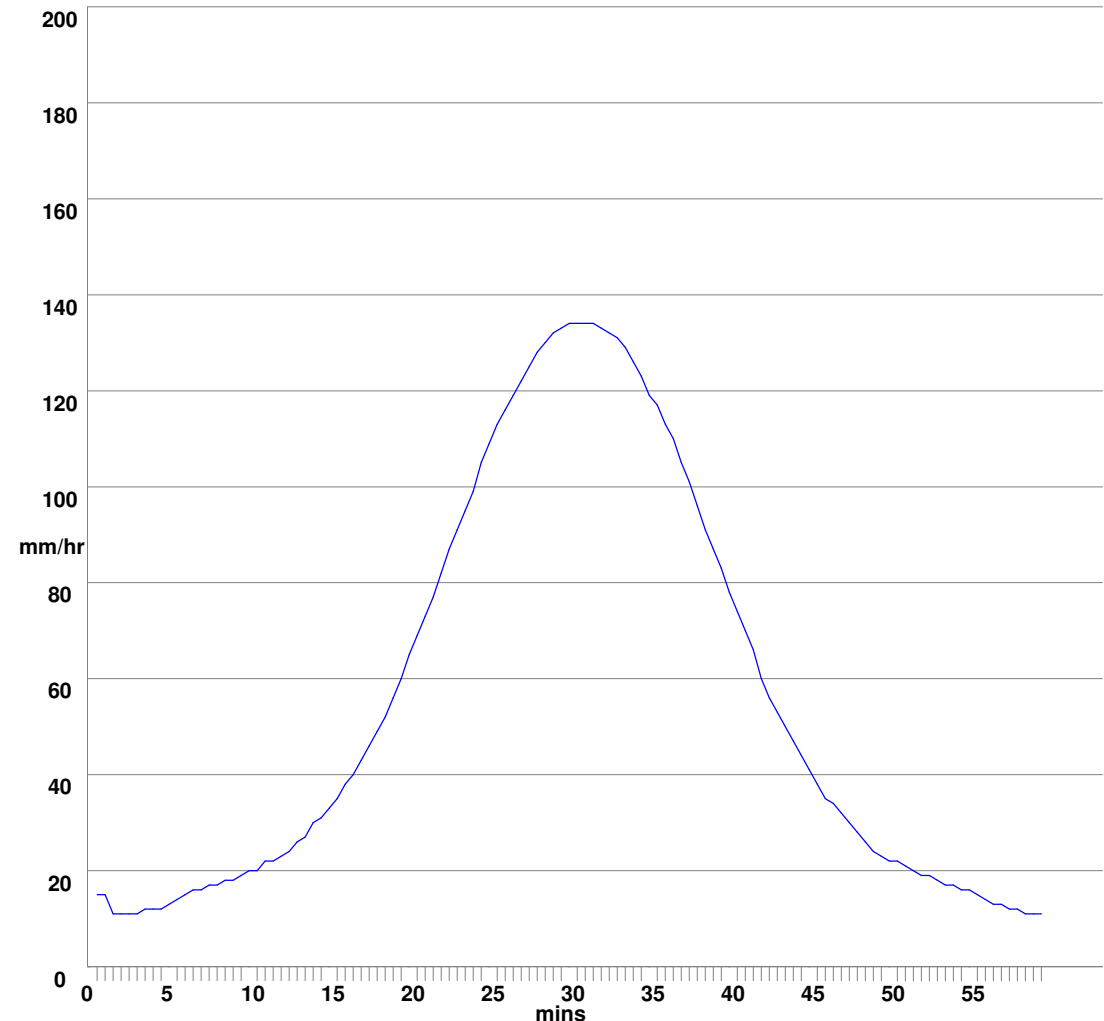
Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:30	14.52	20:30	68.84	40:30	73.68
1:00	14.52	21:00	73.14	41:00	69.91
1:30	10.76	21:30	76.90	41:30	65.61
2:00	10.76	22:00	81.74	42:00	60.23
2:30	10.76	22:30	86.58	42:30	56.47
3:00	10.76	23:00	90.89	43:00	53.24
3:30	11.83	23:30	94.65	43:30	50.01
4:00	11.83	24:00	99.49	44:00	46.79
4:30	12.37	24:30	104.87	44:30	44.10
5:00	13.44	25:00	108.63	45:00	40.87
5:30	13.98	25:30	112.93	45:30	37.64
6:00	14.52	26:00	115.62	46:00	35.49
6:30	15.60	26:30	118.85	46:30	33.88
7:00	16.13	27:00	122.08	47:00	32.27
7:30	16.67	27:30	124.77	47:30	29.58
8:00	17.21	28:00	127.99	48:00	27.96
8:30	17.75	28:30	130.14	48:30	26.35
9:00	18.28	29:00	132.30	49:00	24.20
9:30	18.82	29:30	133.37	49:30	22.59
10:00	19.90	30:00	133.91	50:00	22.05
10:30	20.44	30:30	134.45	50:30	21.51
11:00	21.51	31:00	134.45	51:00	20.97
11:30	21.51	31:30	133.91	51:30	19.90
12:00	22.59	32:00	133.37	52:00	19.36
12:30	24.20	32:30	132.30	52:30	18.82
13:00	25.81	33:00	130.68	53:00	17.75
13:30	27.43	33:30	128.53	53:30	17.21
14:00	29.58	34:00	125.84	54:00	17.21
14:30	31.19	34:30	122.62	54:30	16.13
15:00	33.34	35:00	119.39	55:00	15.60
15:30	34.96	35:30	116.70	55:30	14.52
16:00	37.64	36:00	113.47	56:00	13.98
16:30	40.33	36:30	109.71	56:30	13.44
17:00	43.02	37:00	105.41	57:00	12.91
17:30	46.25	37:30	100.57	57:30	11.83
18:00	49.48	38:00	95.73	58:00	11.83
18:30	52.17	38:30	91.42	58:30	11.29
19:00	55.93	39:00	87.12	59:00	10.76
19:30	59.69	39:30	83.36	59:30	10.76
20:00	64.53	40:00	77.98	60:00	10.76

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 60 mins Profile - winter





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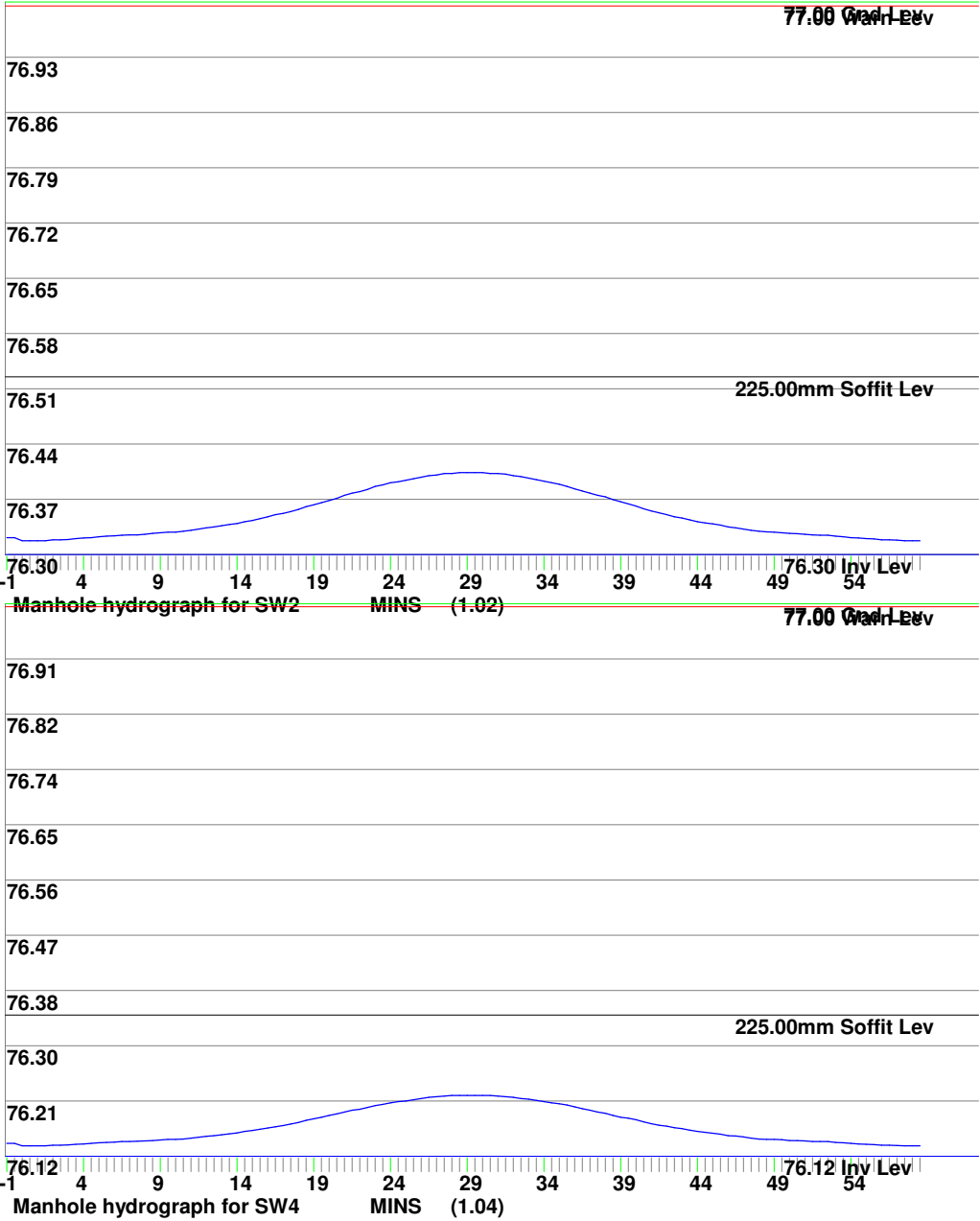
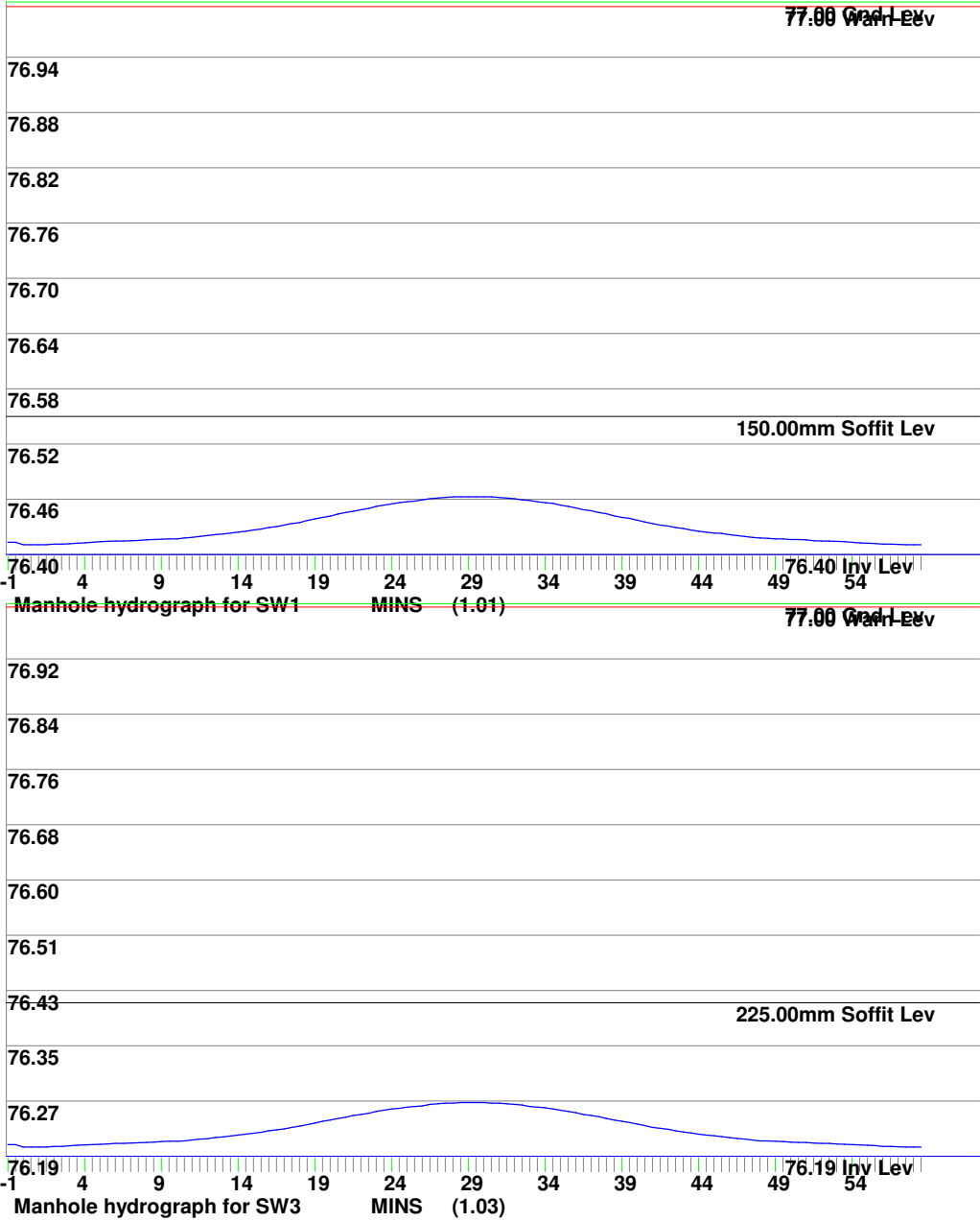
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Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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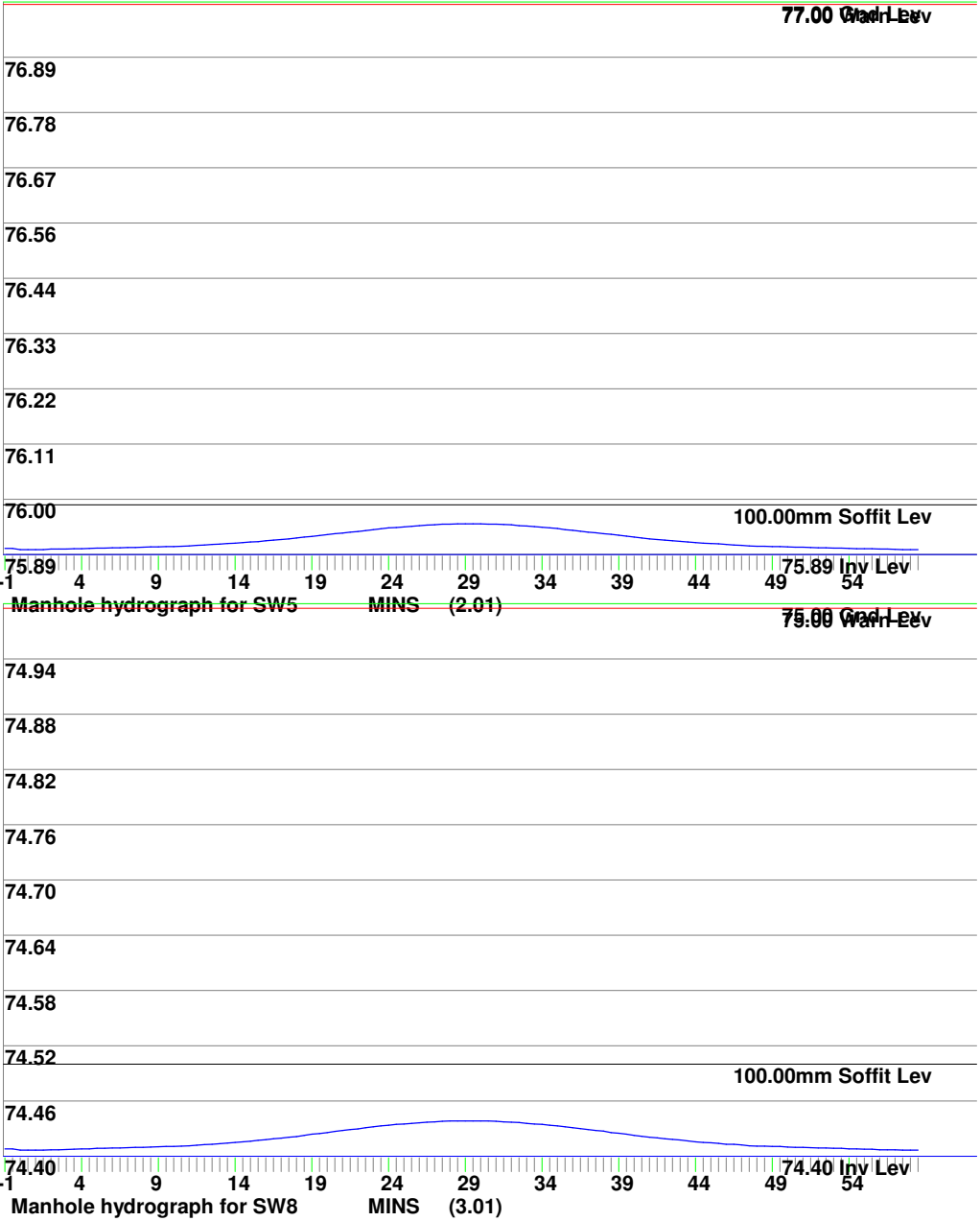
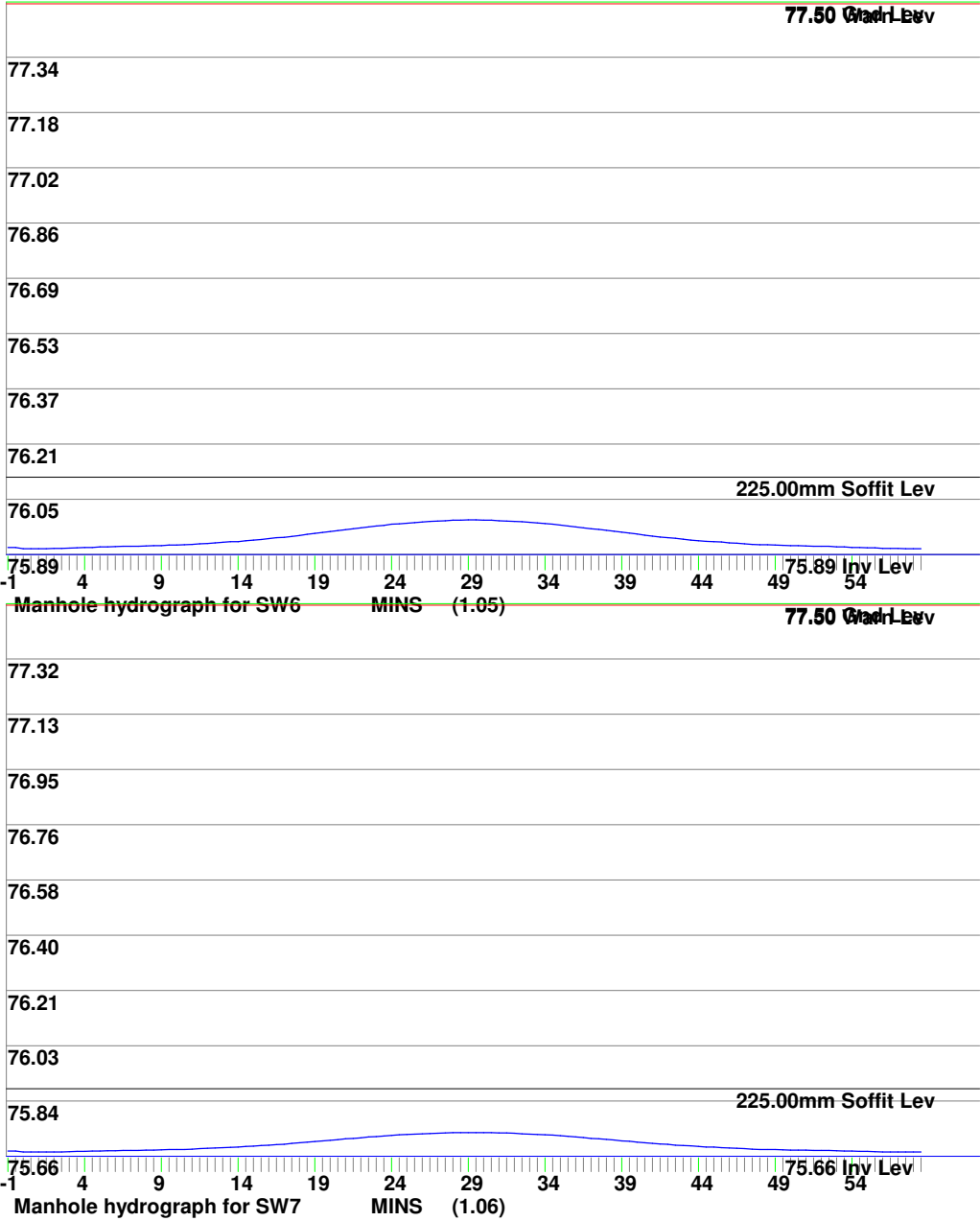
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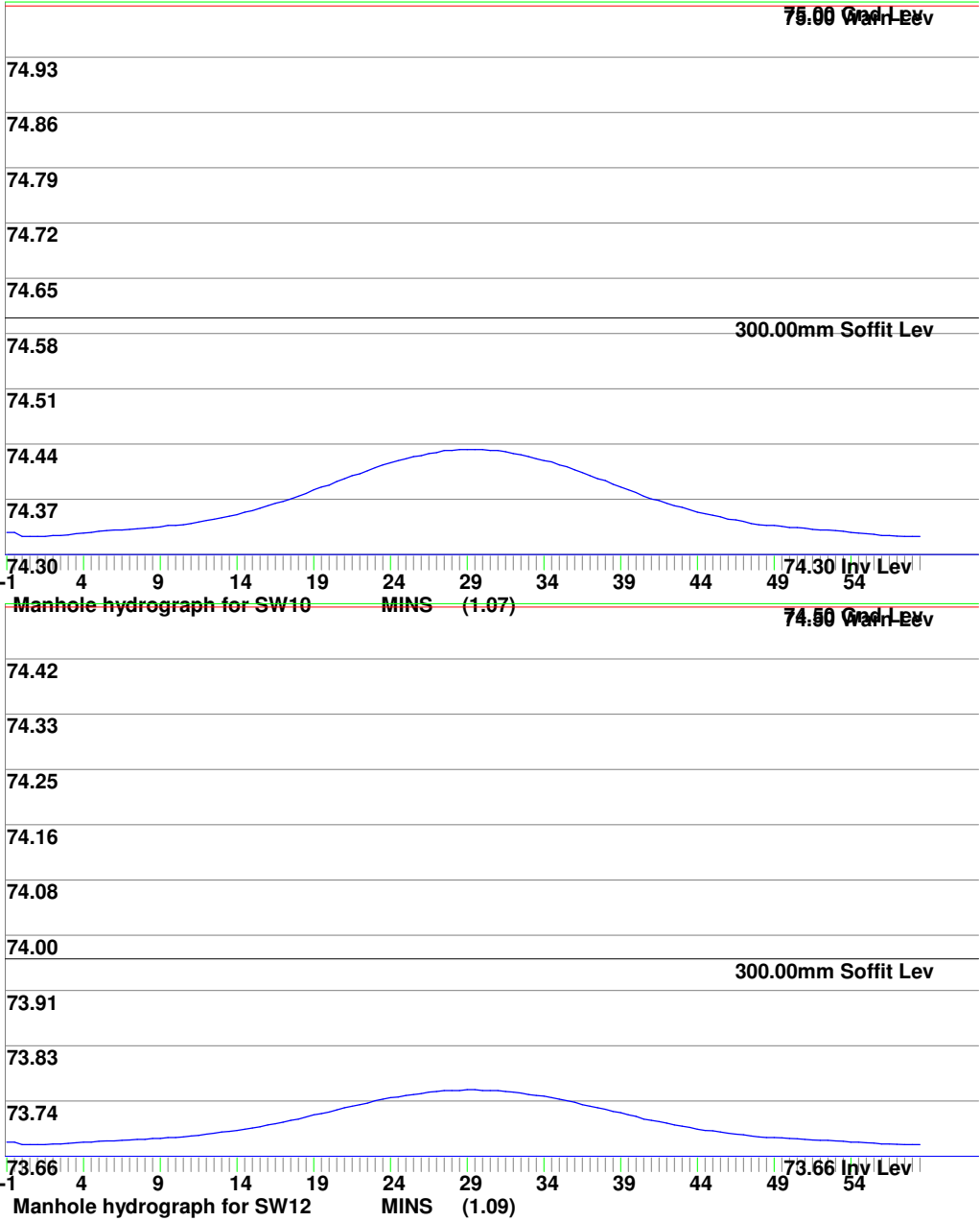
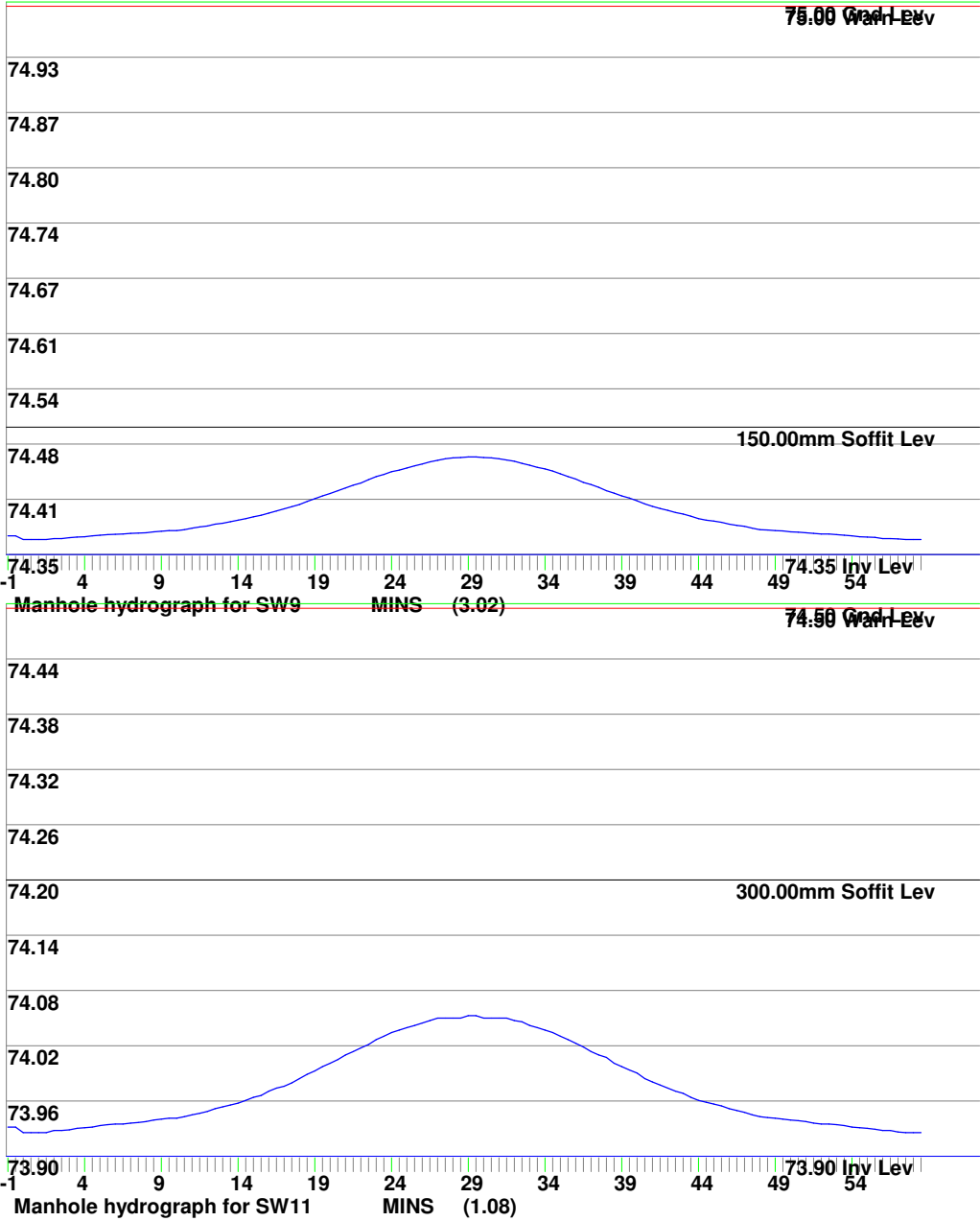
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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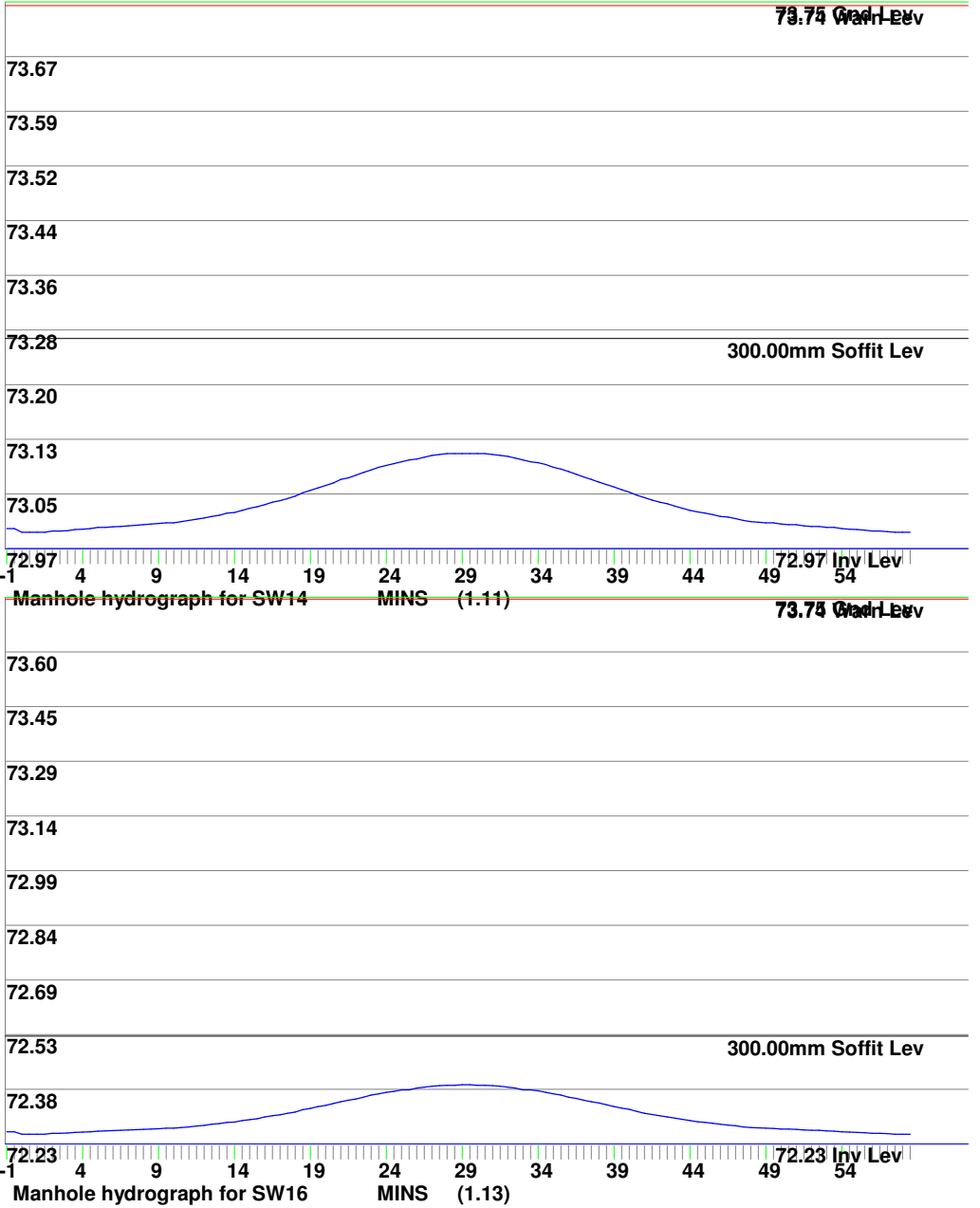
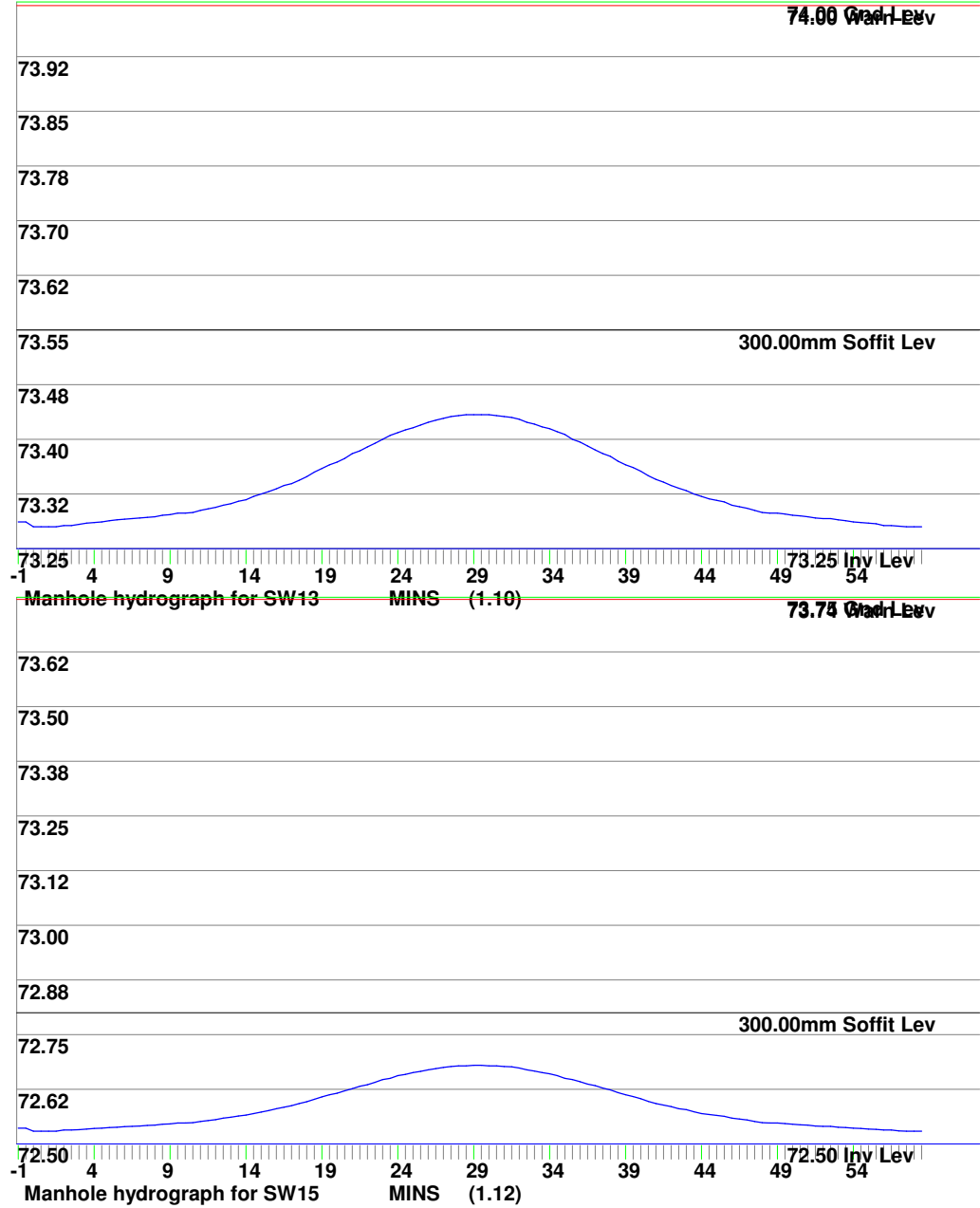
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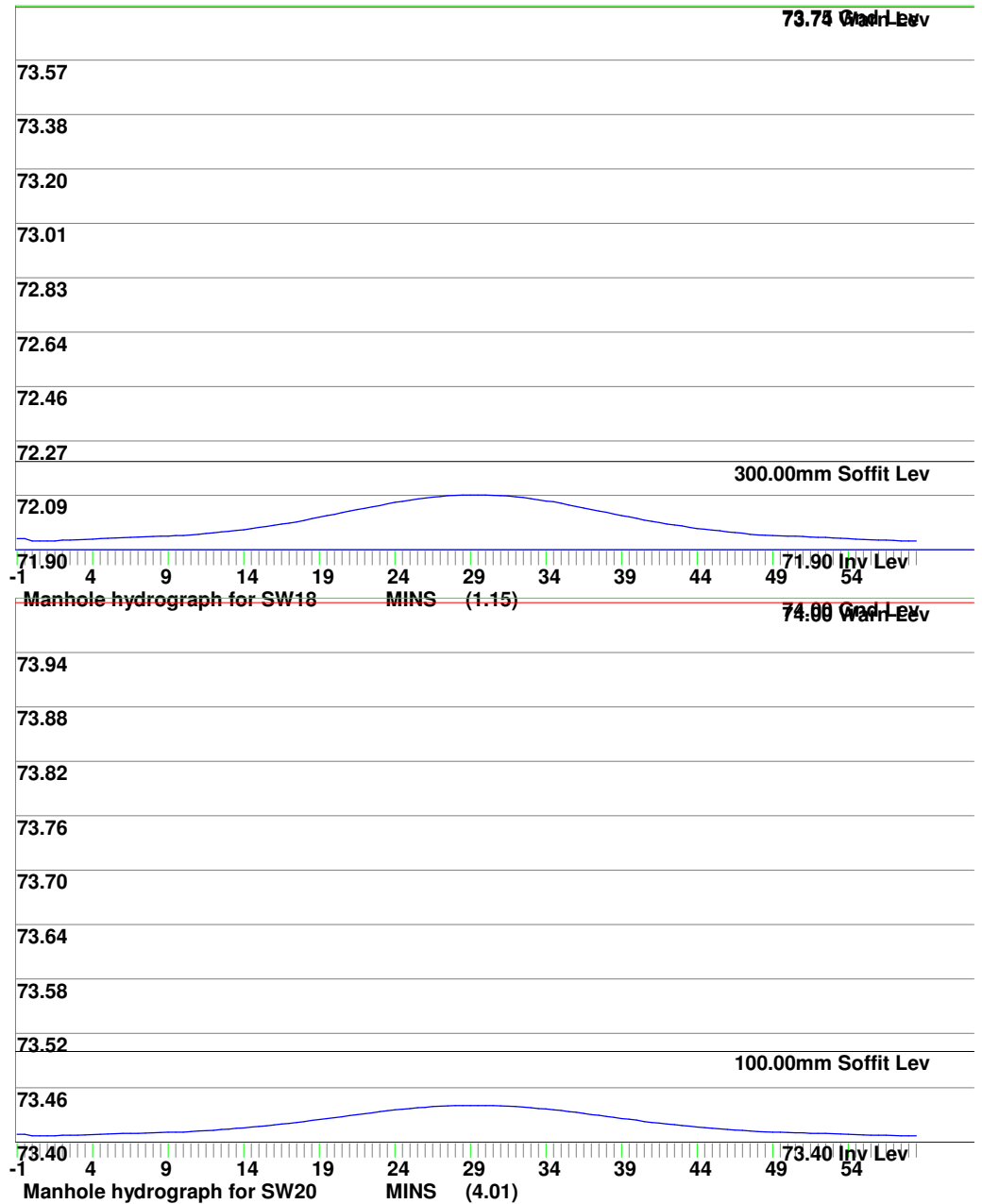
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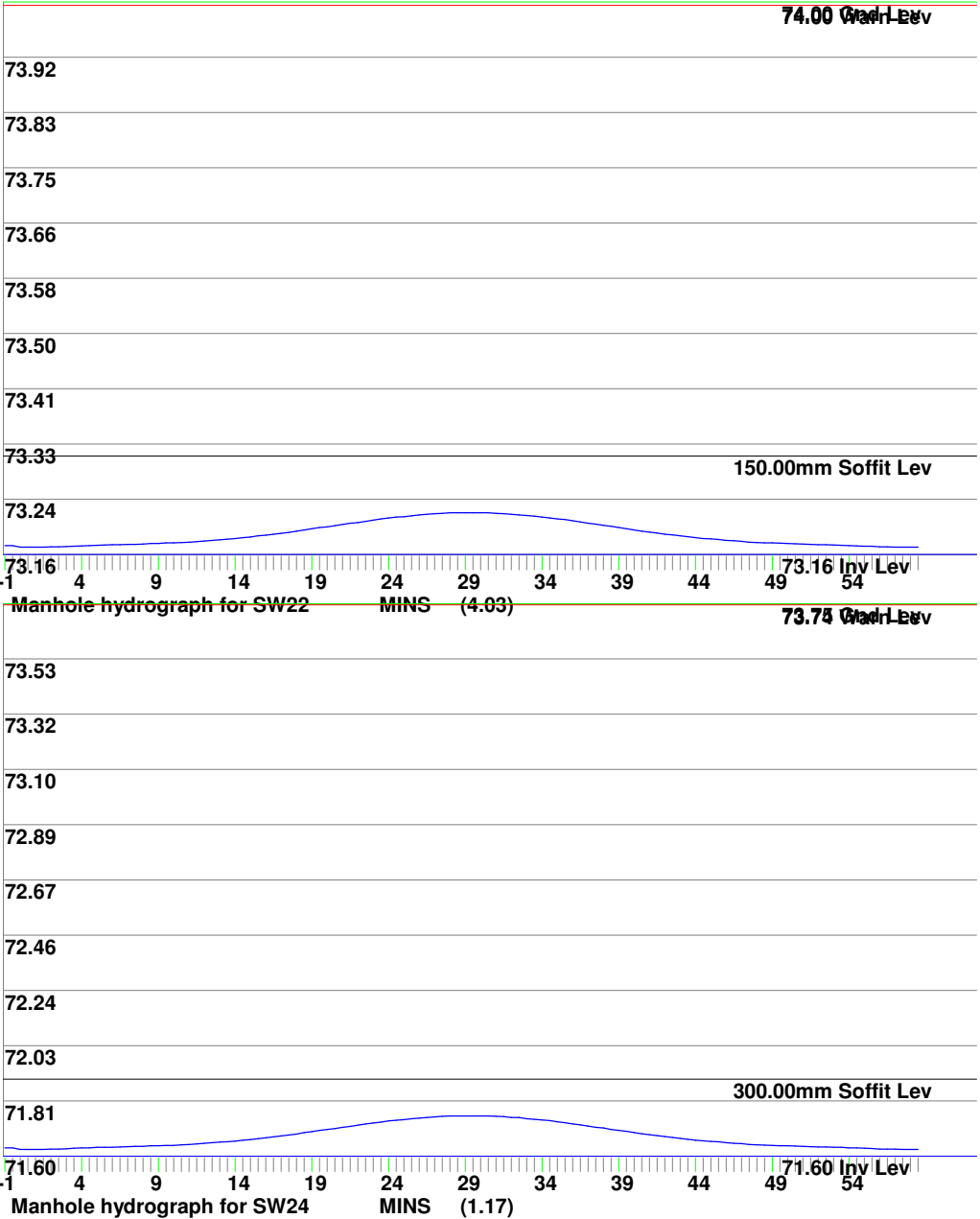
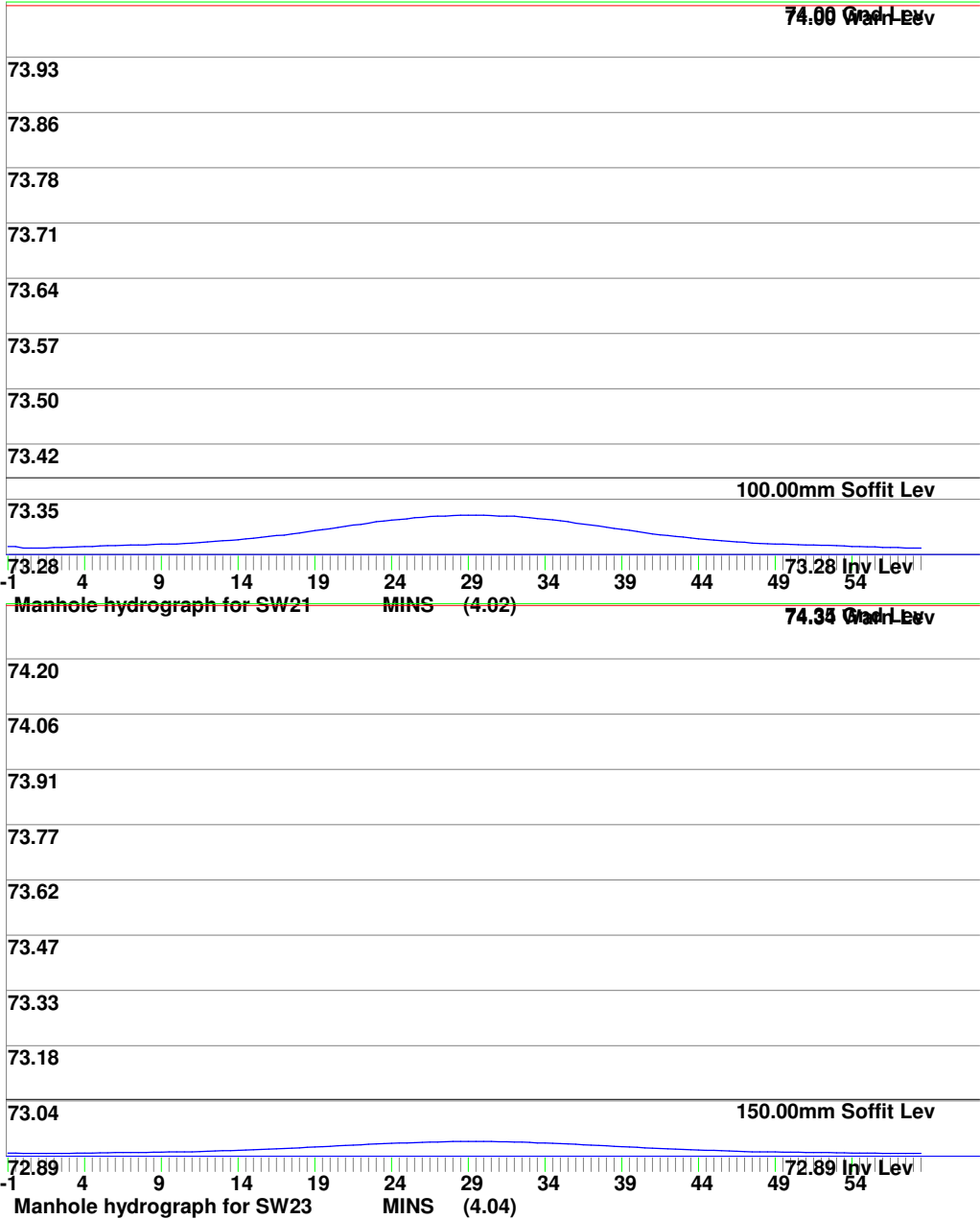
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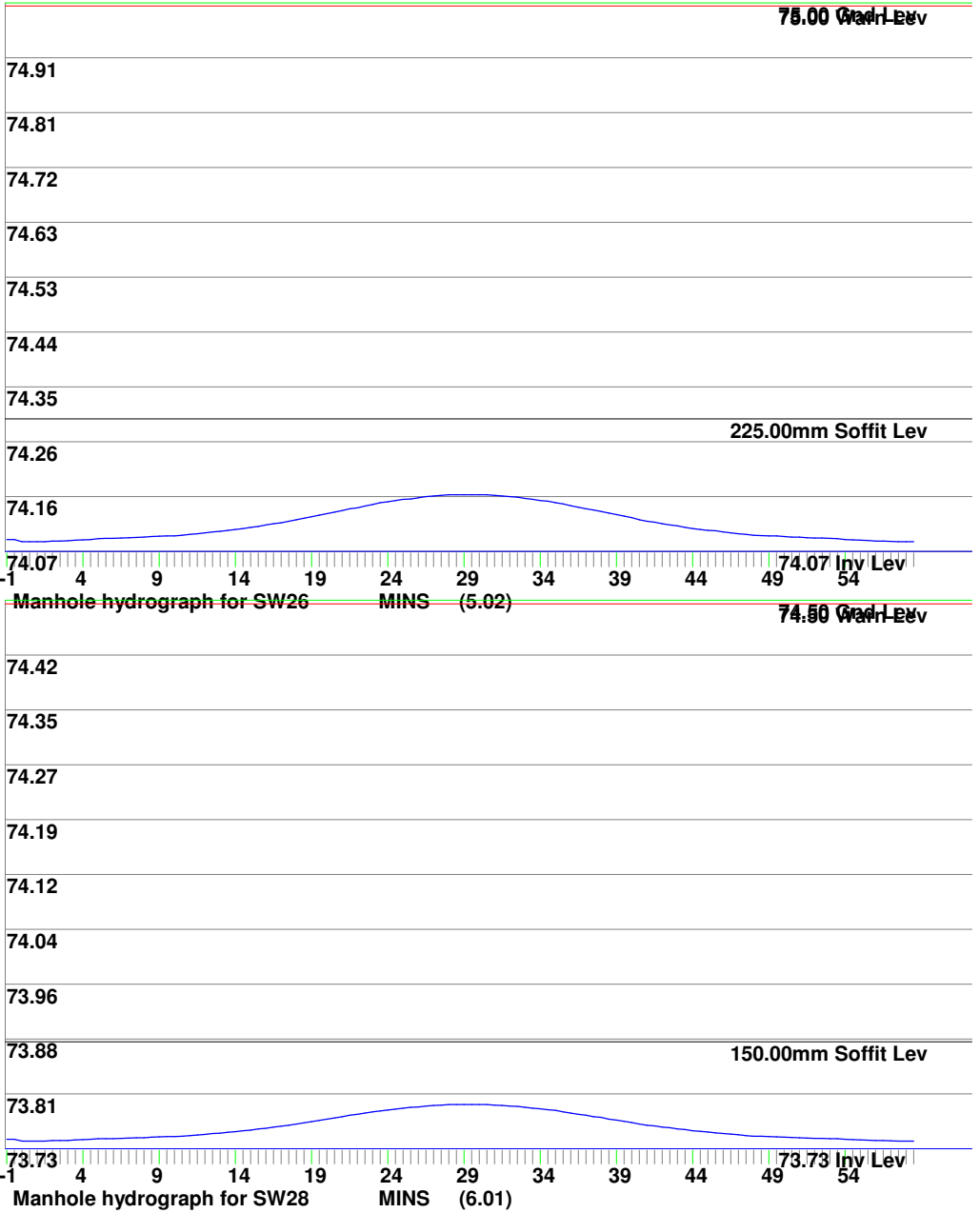
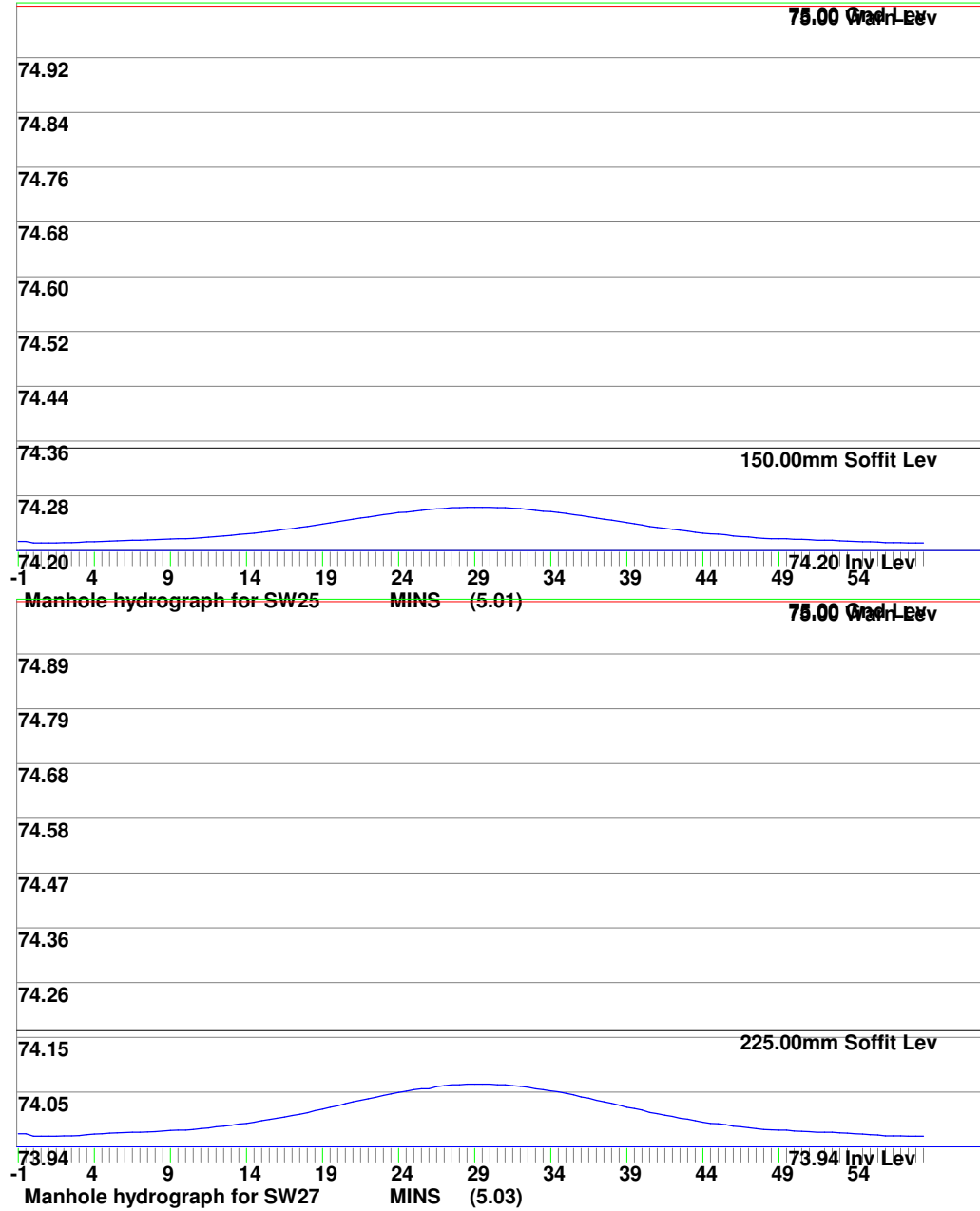
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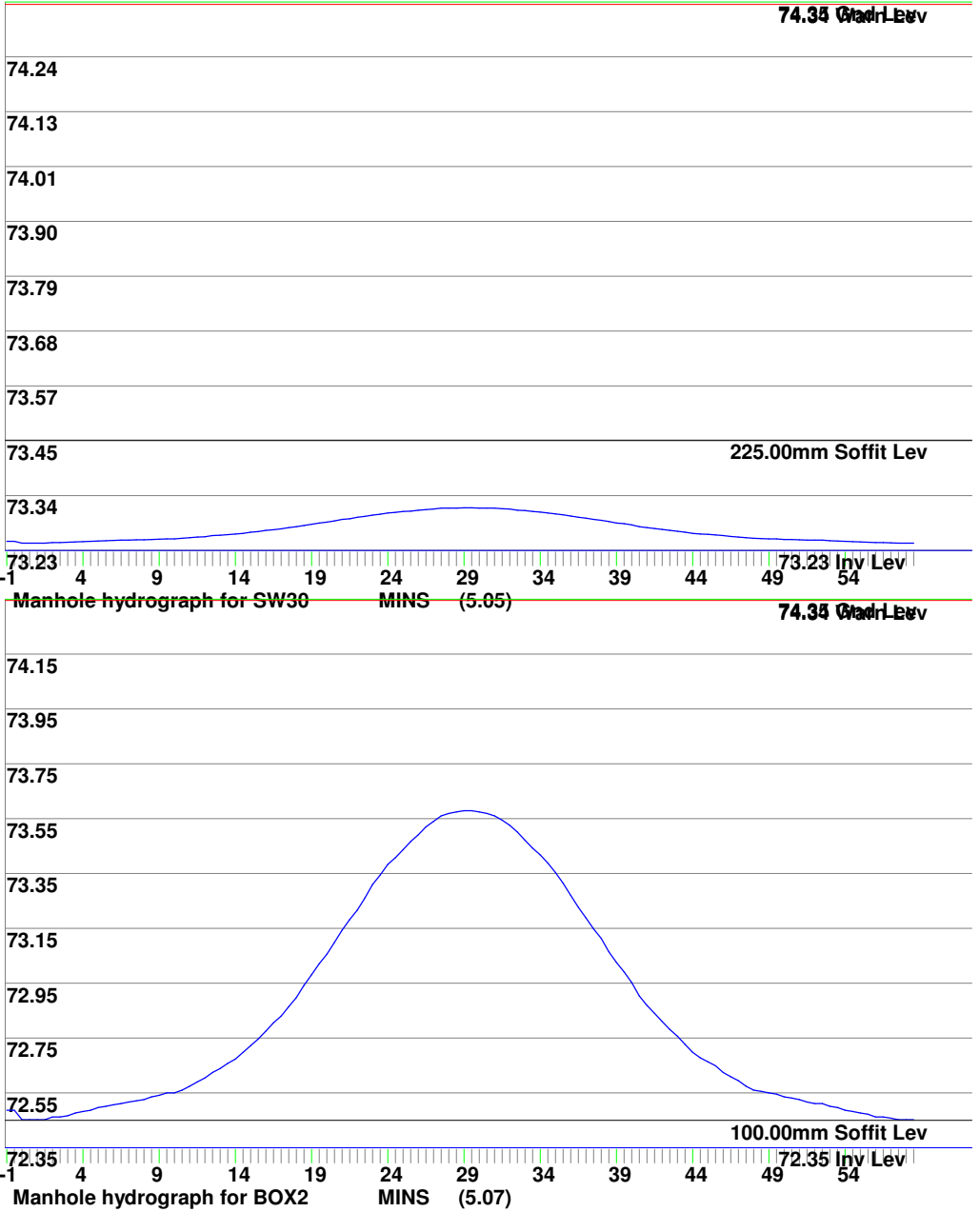
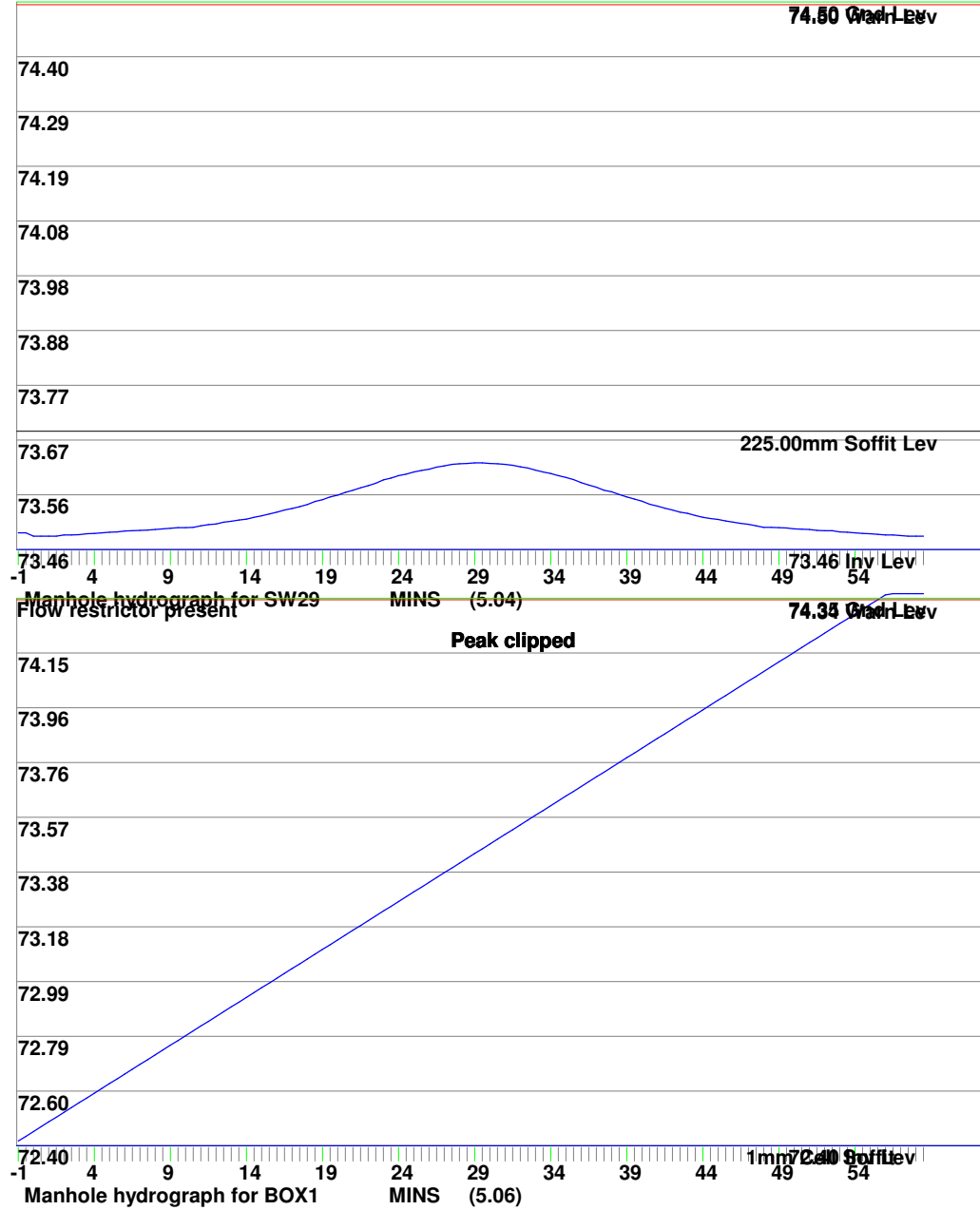
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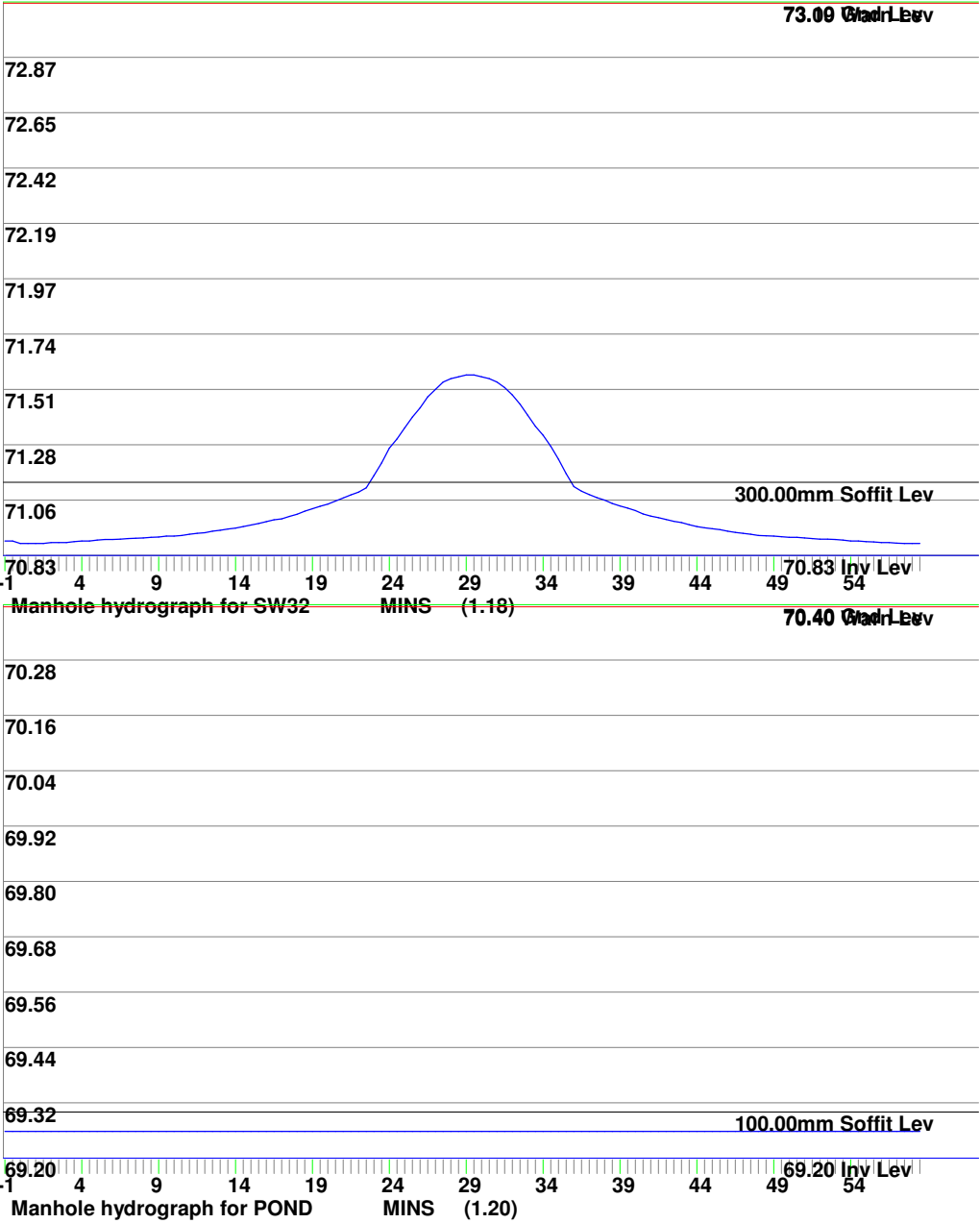
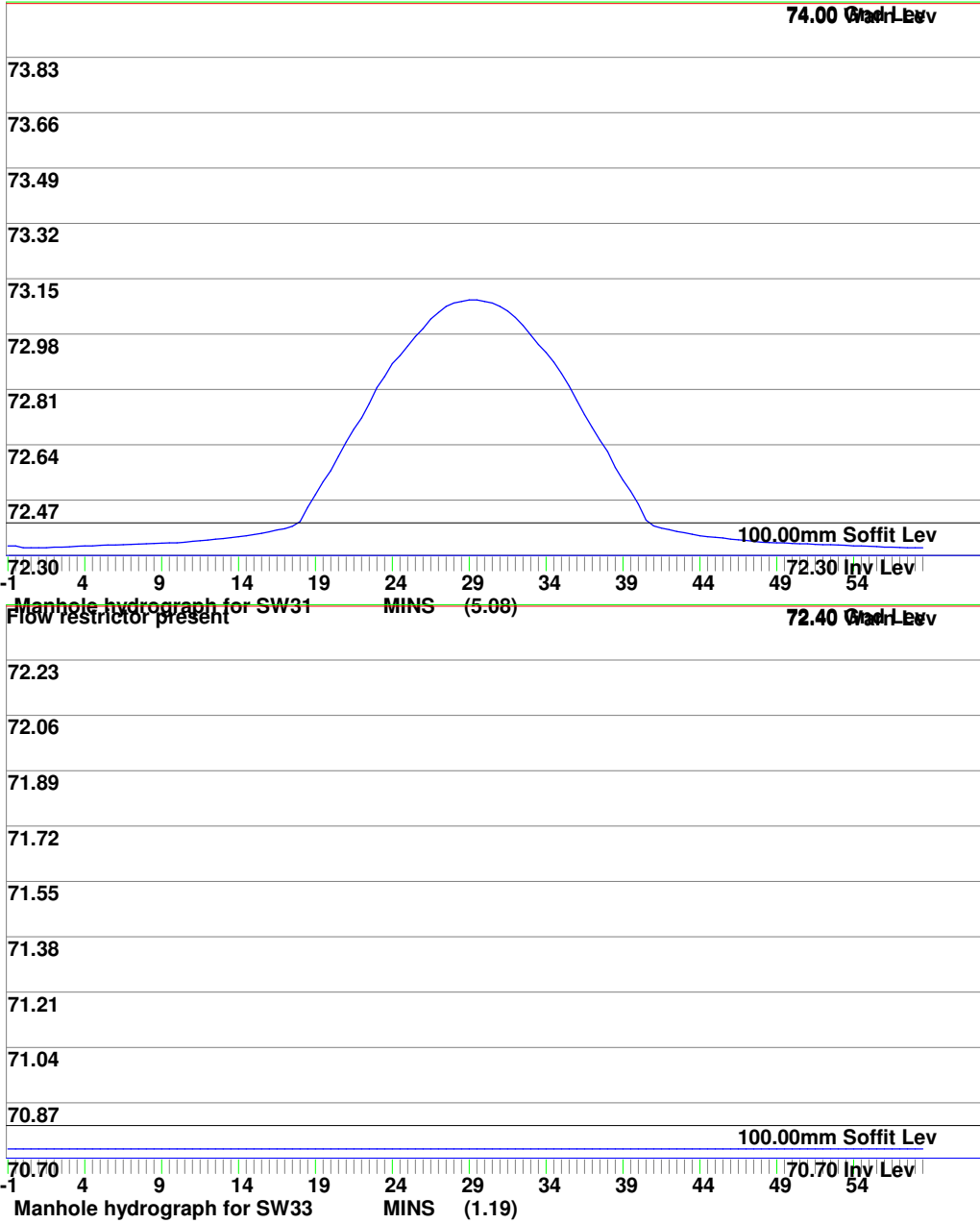
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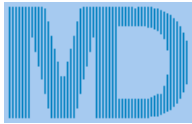
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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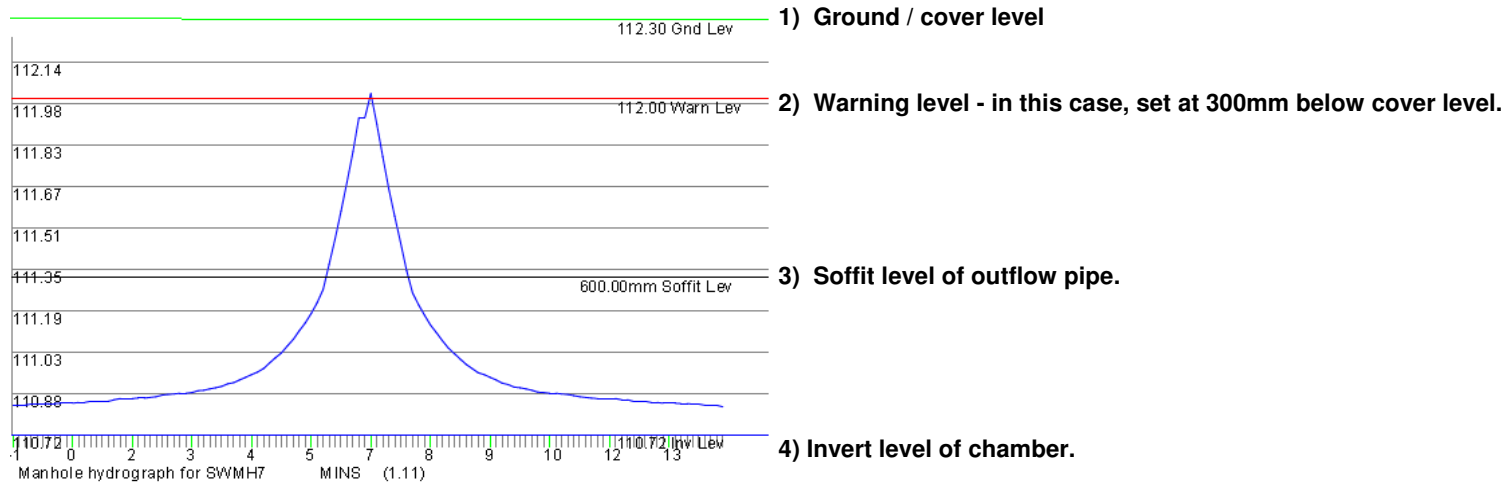
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**



Notes

- Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.
- 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.
- The top of the graph clips the warning level and would be marked thus on the printout.
- 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.
- The diagram above is a general one and is not part of the current calculation.



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Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 60 mins
No offline storage

Mean rain intens. 54.00 mm/hr
Storm profile = summer
Using FSR data

Peak rain intens. 211.68 mm/hr
Sample period = 30.0 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. Depth		EXCESS FLOW l/s	FLOODED VOL m³	DRAINED :AREA (m²): :x FACTOR :	STATUS	
1	I	1.01	SW1	14.5	9.0	150	1200	76.40	76.49	77.00	0.62	0.09	0.00	0.00	147	OK
2	I	1.02	SW2	25.1	17.6	225	1200	76.30	76.45	77.00	0.70	0.15	0.00	0.00	289	OK
3	I	1.03	SW3	58.1	28.1	225	1200	76.19	76.30	77.00	0.48	0.11	0.00	0.00	462	OK
4	I	1.04	SW4	53.0	34.1	225	1200	76.12	76.26	77.00	0.64	0.14	0.00	0.00	560	OK
5	I	1.05	SW6	60.4	40.6	225	1200	75.89	76.03	77.50	0.67	0.14	0.00	0.00	667	OK
6	B	2.01	SW5	6.3	6.4	100	1200	75.89	75.99	77.00	1.01	0.10	0.08	0.00	104	Surch.
7	I	1.06	SW7	108.9	53.1	225	1200	75.66	75.77	77.50	0.49	0.11	0.00	0.00	872	OK
8	B	3.01	SW8	2.9	1.6	100	1200	74.40	74.45	75.00	0.55	0.05	0.00	0.00	27	OK
9	B	3.02	SW9	12.1	15.5	150	1200	74.35	74.59	75.00	1.28	0.24	3.41	0.00	255	Surch.
10	I	1.07	SW10	132.9	88.5	300	1800	74.30	74.49	75.00	0.67	0.19	0.00	0.00	1453	OK
11	I	1.08	SW11	126.7	101.4	300	2100	73.90	74.12	74.50	0.80	0.22	0.00	0.00	1665	OK
12	I	1.09	SW12	249.5	114.4	300	1800	73.66	73.80	74.50	0.46	0.14	0.00	0.00	1878	OK
13	I	1.10	SW13	124.2	124.7	300	2100	73.25	73.55	74.00	1.00	0.30	0.45	0.00	2047	Surch.
14	I	1.11	SW14	194.0	133.1	300	1500	72.97	73.17	73.75	0.69	0.20	0.00	0.00	2186	OK
15	I	1.12	SW15	144.8	141.3	300	1500	72.50	72.78	73.75	0.98	0.28	0.00	0.00	2321	OK
16	I	1.13	SW16	167.9	146.8	300	1500	72.23	72.48	73.75	0.87	0.25	0.00	0.00	2410	OK
17	I	1.14	SW17	110.5	146.8	300	1500	72.20	73.12	73.75	1.33	0.92	36.33	0.00	2410	Surch.
18	I	1.15	SW18	143.6	146.8	300	1200	71.90	72.28	73.75	1.02	0.38	3.17	0.00	2410	Surch.
19	I	1.16	SW19	123.5	152.9	300	1200	71.87	72.95	73.75	1.24	1.08	29.40	0.00	2510	Surch.
20	B	4.01	SW20	7.2	4.3	100	1200	73.40	73.46	74.00	0.59	0.06	0.00	0.00	70	OK
21	B	4.02	SW21	10.0	8.0	100	1200	73.28	73.36	74.00	0.81	0.08	0.00	0.00	132	OK
22	B	4.03	SW22	20.0	12.5	150	1200	73.16	73.25	74.00	0.63	0.09	0.00	0.00	205	OK
23	B	4.04	SW23	51.6	16.3	150	1200	72.89	72.94	74.35	0.32	0.05	0.00	0.00	268	OK
24	I	1.17	SW24	214.6	177.4	300	1200	71.60	71.83	73.75	0.83	0.23	0.00	0.00	2914	OK
25	B	5.01	SW25	19.6	12.2	150	1200	74.20	74.29	75.00	0.62	0.09	0.00	0.00	200	OK
26	B	5.02	SW26	58.1	37.0	225	1200	74.07	74.21	75.00	0.64	0.14	0.00	0.00	607	OK
27	B	5.03	SW27	58.5	50.3	225	1200	73.94	74.12	75.00	0.86	0.18	0.00	0.00	826	OK
28	S1	6.01	SW28	16.5	10.1	150	1200	73.73	73.82	74.50	0.61	0.09	0.00	0.00	165	OK
29	B	5.04	SW29	59.2	72.4	225	1200	73.46	74.03	74.50	1.22	0.57	13.14	0.00	1188	Surch.



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Project	
Title	Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

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		EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS	
										fract.	Depth					
30	B	5.05	SW30	130.7	72.4	225	1200	73.23	73.35	74.35	0.55	0.12	0.00	0.00	1188	OK
31	B	5.06	BOX1‡	Cell	2.0	0.01x0.0	1200	72.40	72.45	74.35	1.00	0.05	0.00	0.00	0	OK
32	B	5.07	BOX2	3.6	72.4	100	1200	72.35	74.27	74.35	20.11	1.92	68.78	0.00	1188	Warning
33	B	5.08	SW31	20.3	72.4	100	1200	72.30	73.78	74.00	3.56	1.48	52.03	0.00	1188	Warning
34	I	1.18	SW32	122.0	249.8	300	1800	70.83	72.64	73.10	2.05	1.81	127.87	0.00	4102	Surch.
35	I	1.19	SW33‡	21.6	5.0	100	1200	70.70	70.73	72.40	0.23	0.03	0.00	0.00	0	OK
36	I	1.20	POND	8.3	5.0	100	1200	69.20	69.26	70.40	0.60	0.06	0.00	0.00	0	OK



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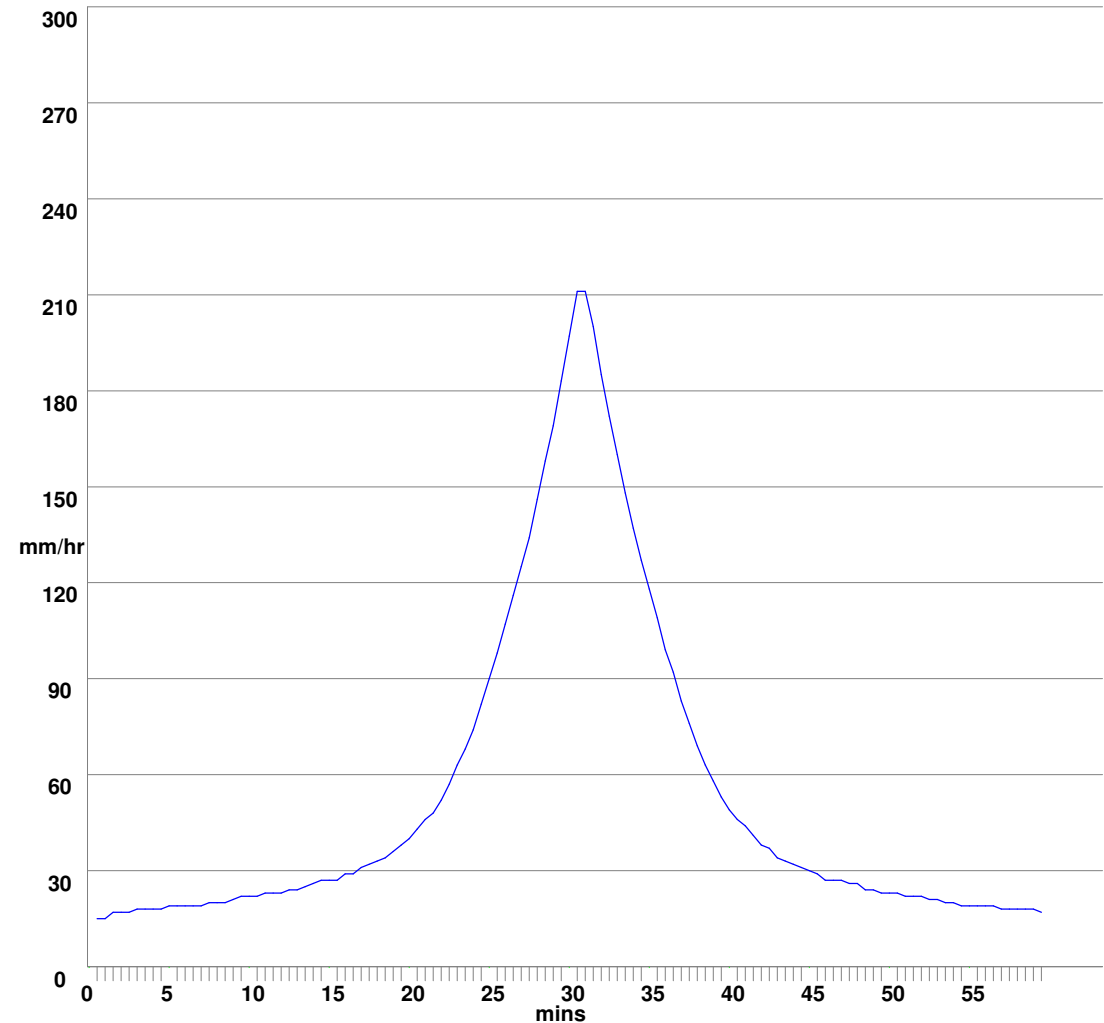
Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:30	15.06	20:30	43.02	40:30	46.25
1:00	15.06	21:00	45.71	41:00	43.56
1:30	17.21	21:30	48.40	41:30	40.87
2:00	17.21	22:00	52.17	42:00	38.18
2:30	17.21	22:30	57.01	42:30	36.57
3:00	17.75	23:00	62.92	43:00	34.42
3:30	17.75	23:30	68.30	43:30	32.80
4:00	18.28	24:00	74.21	44:00	31.73
4:30	18.28	24:30	82.28	44:30	30.65
5:00	18.82	25:00	90.35	45:00	30.12
5:30	18.82	25:30	98.41	45:30	28.50
6:00	18.82	26:00	107.02	46:00	27.43
6:30	19.36	26:30	116.16	46:30	27.43
7:00	19.36	27:00	124.77	47:00	26.89
7:30	20.44	27:30	134.45	47:30	26.35
8:00	20.44	28:00	146.28	48:00	25.81
8:30	20.44	28:30	157.57	48:30	24.20
9:00	20.97	29:00	169.40	49:00	23.66
9:30	21.51	29:30	182.85	49:30	23.12
10:00	22.05	30:00	196.83	50:00	23.12
10:30	22.05	30:30	210.81	50:30	22.59
11:00	22.59	31:00	210.81	51:00	22.05
11:30	22.59	31:30	199.52	51:30	22.05
12:00	23.12	32:00	185.00	52:00	21.51
12:30	23.66	32:30	172.09	52:30	20.97
13:00	24.20	33:00	159.72	53:00	20.97
13:30	25.28	33:30	147.89	53:30	20.44
14:00	26.35	34:00	137.14	54:00	20.44
14:30	26.89	34:30	126.92	54:30	19.36
15:00	27.43	35:00	117.77	55:00	19.36
15:30	27.43	35:30	108.63	55:30	18.82
16:00	28.50	36:00	99.49	56:00	18.82
16:30	29.04	36:30	91.96	56:30	18.82
17:00	30.65	37:00	83.36	57:00	18.28
17:30	31.73	37:30	76.37	57:30	18.28
18:00	32.80	38:00	69.37	58:00	17.75
18:30	33.88	38:30	63.46	58:30	17.75
19:00	36.03	39:00	58.08	59:00	17.75
19:30	37.64	39:30	52.70	59:30	17.21
20:00	40.33	40:00	48.94	60:00	17.21

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 60 mins Profile - summer





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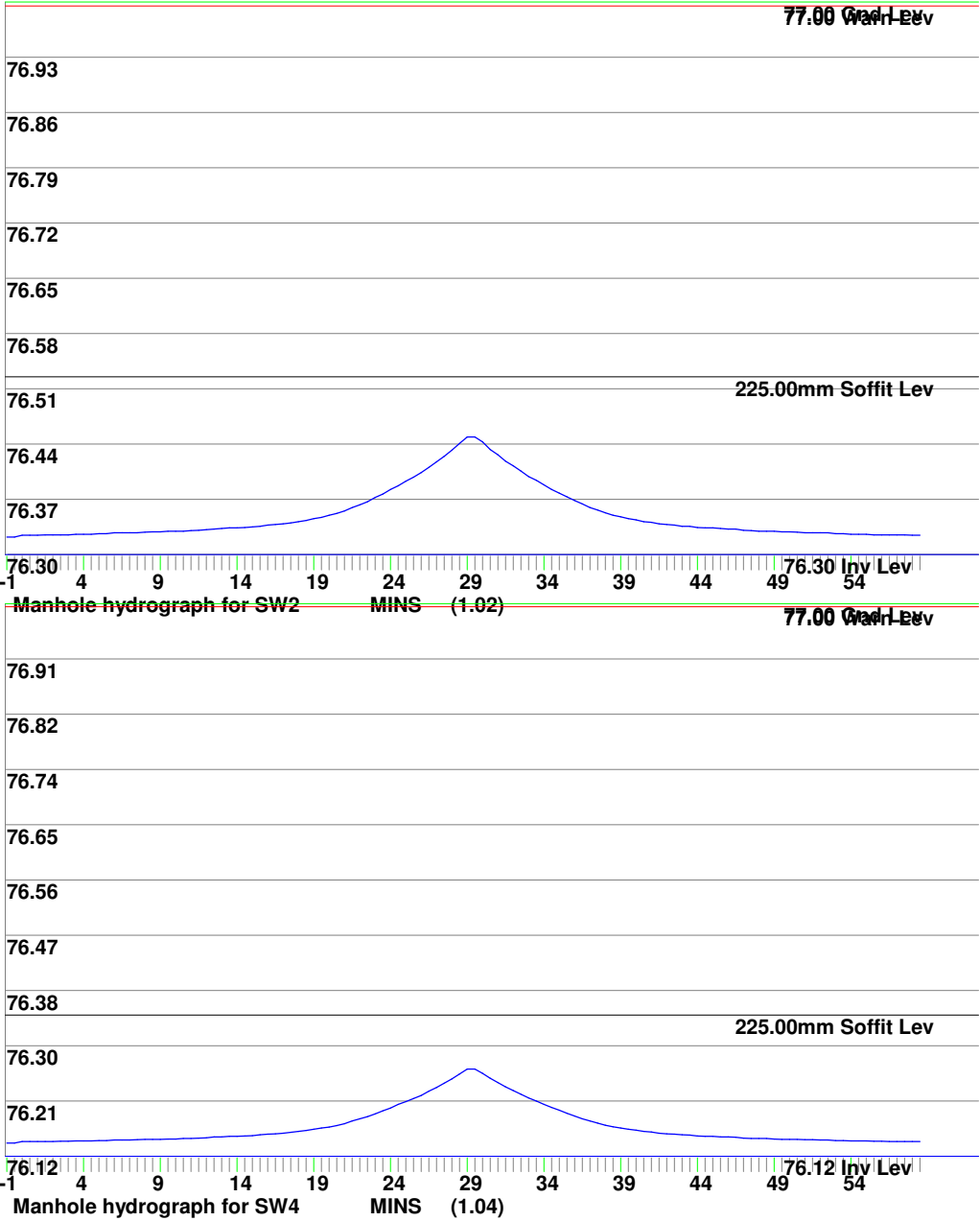
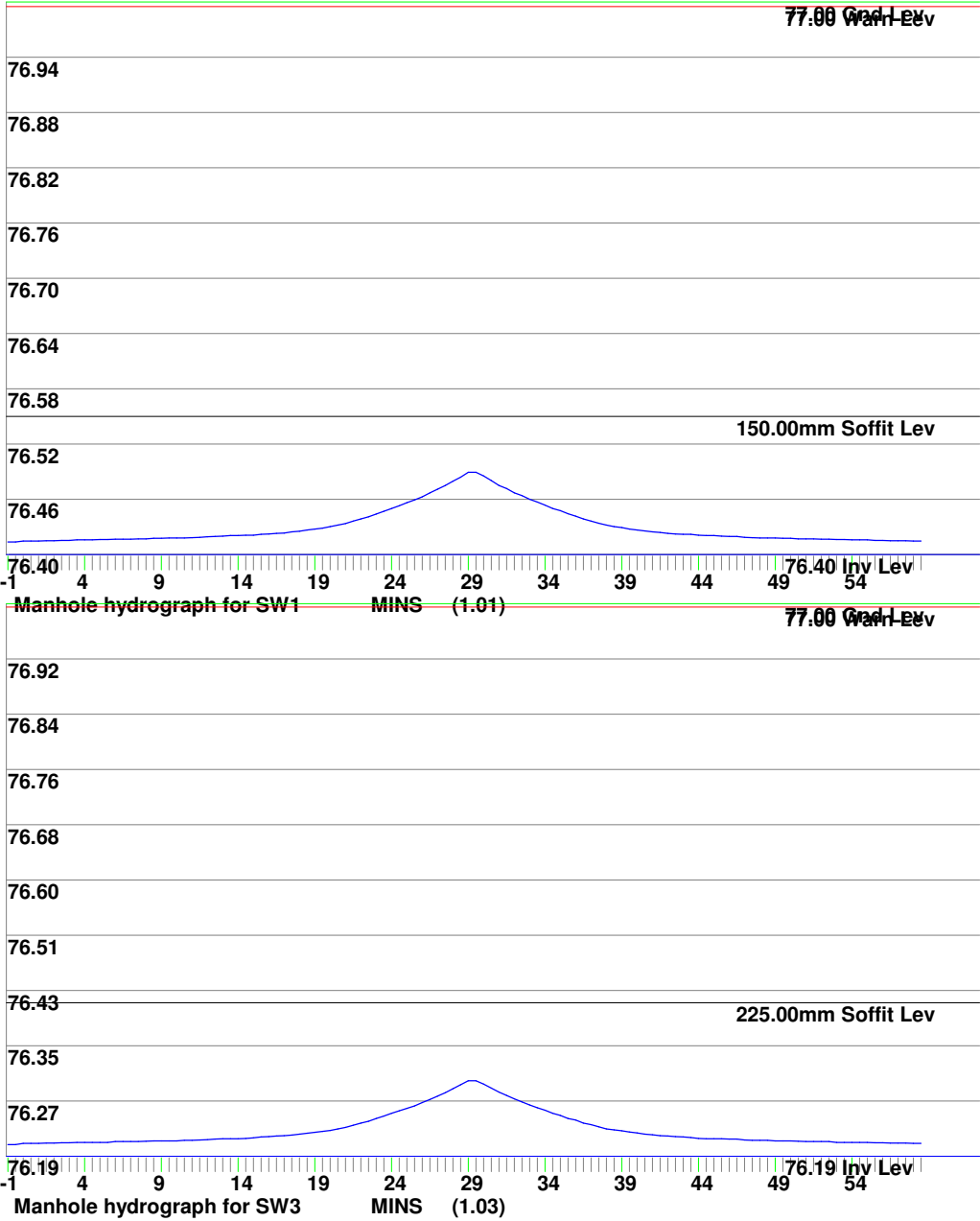
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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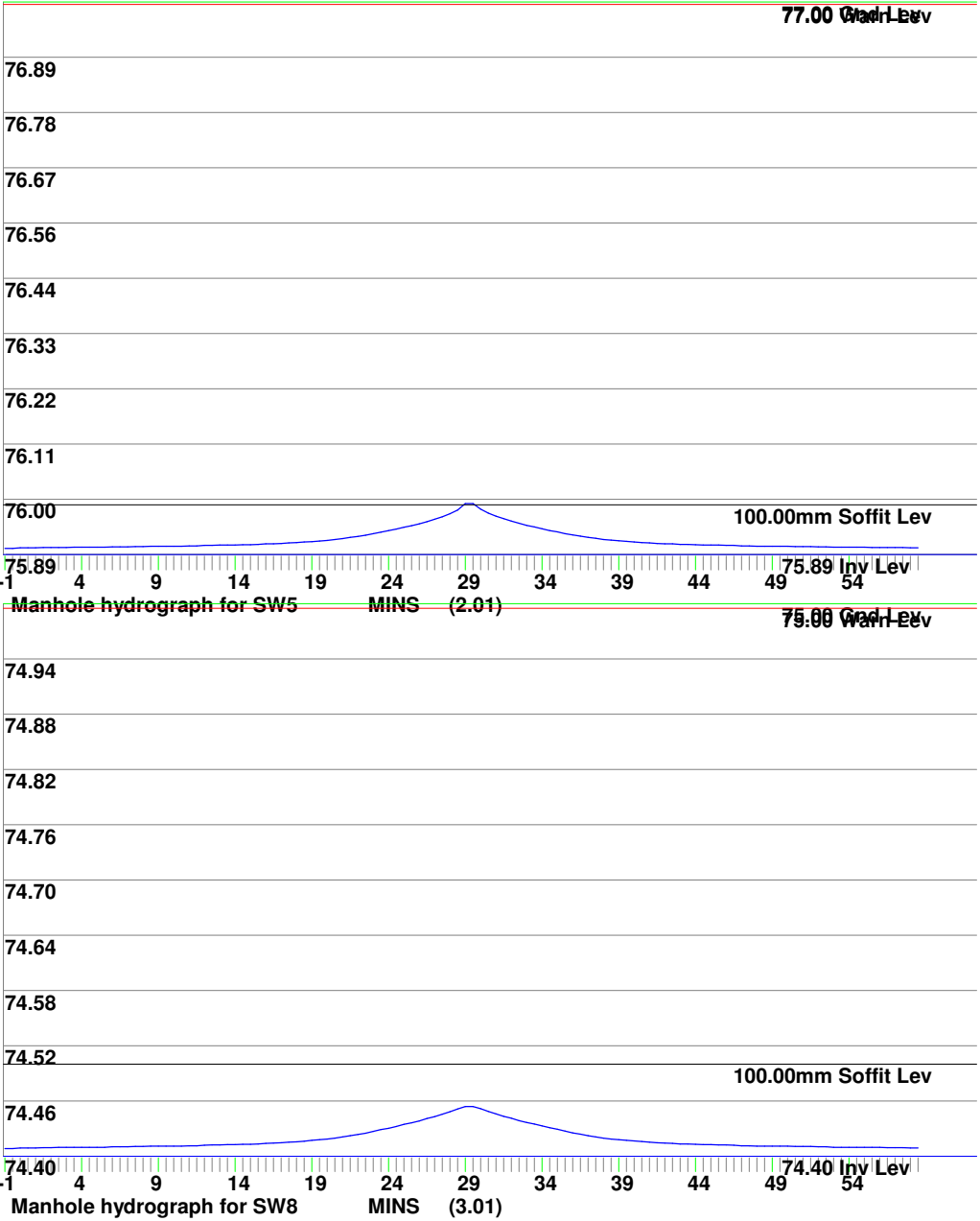
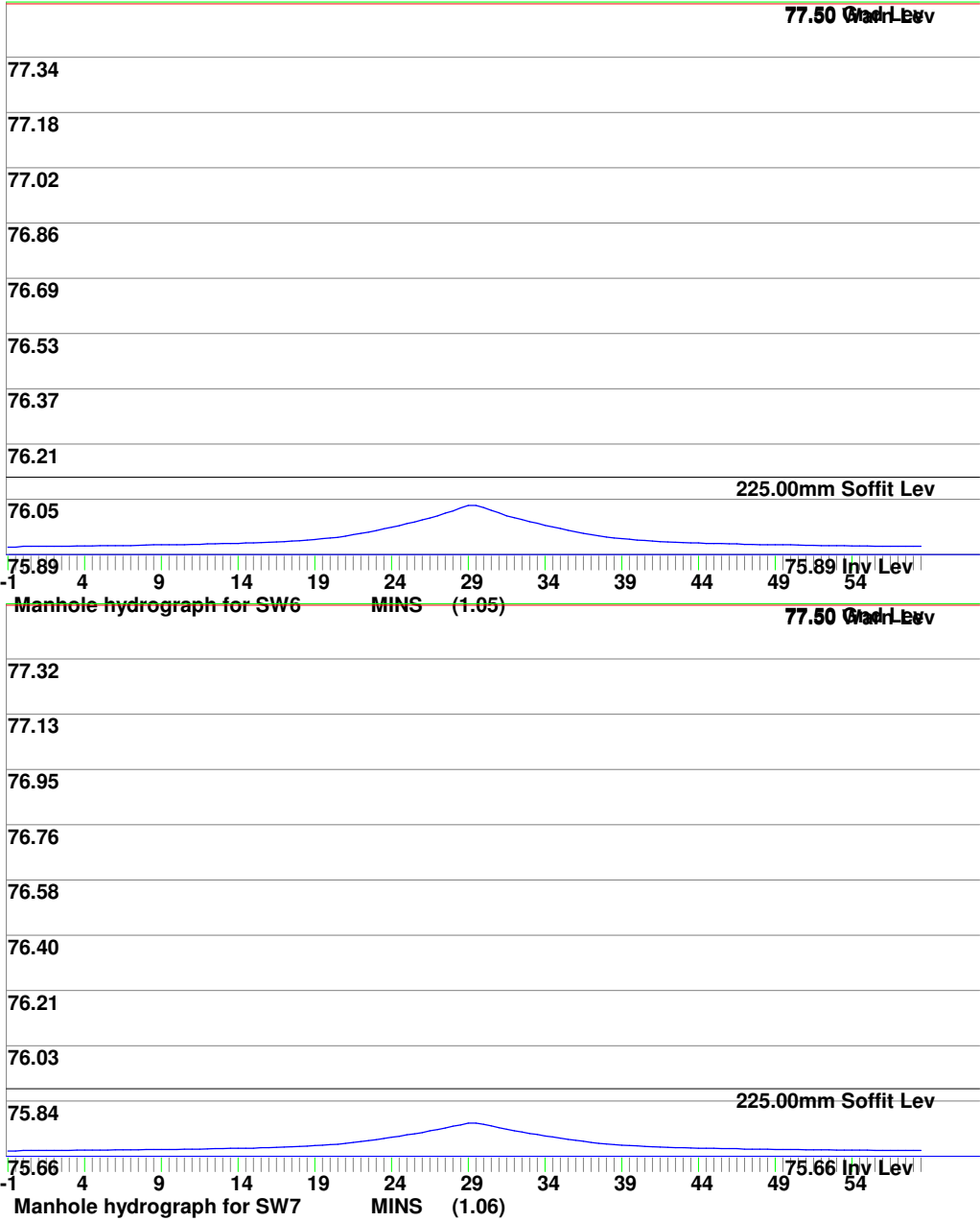
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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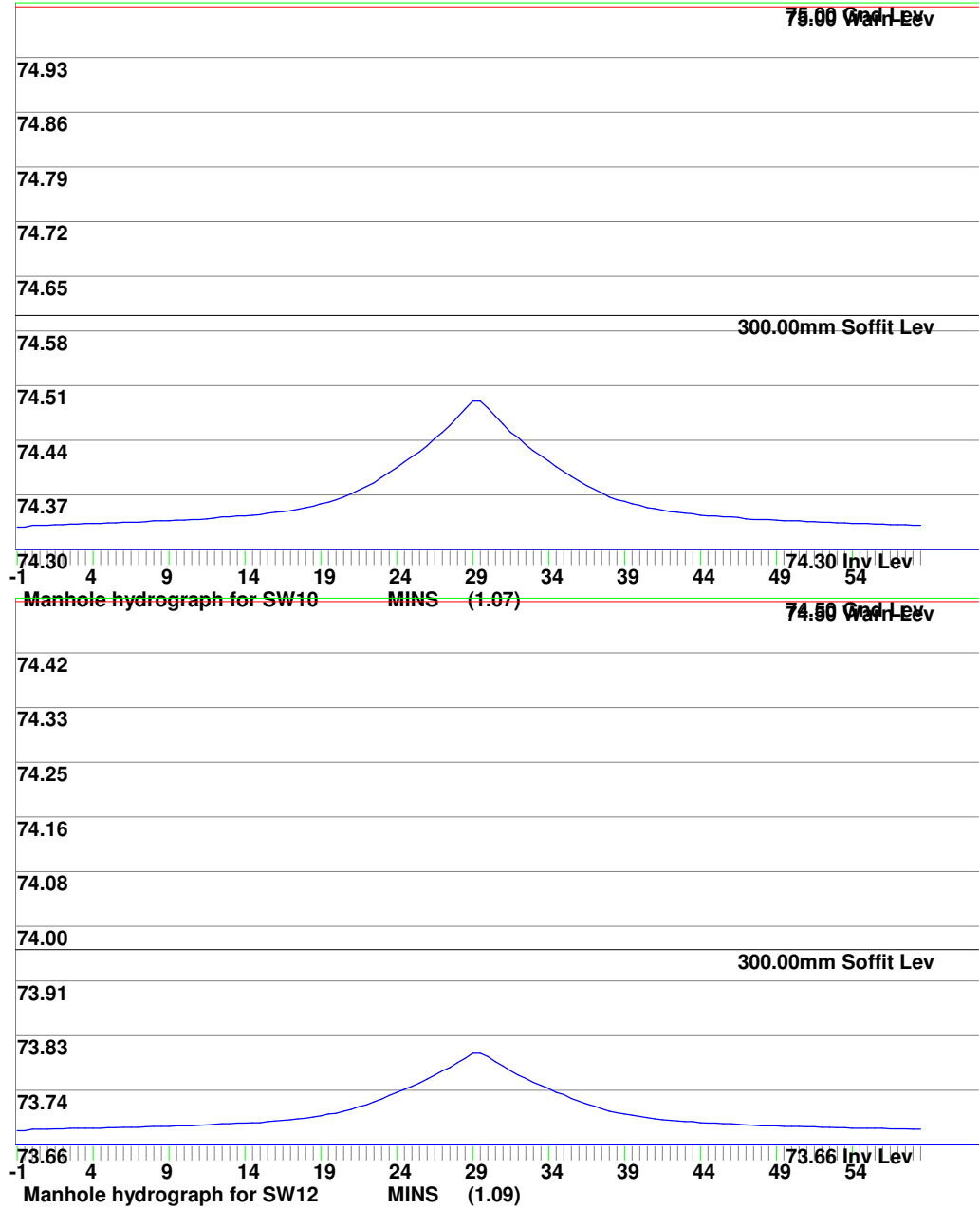
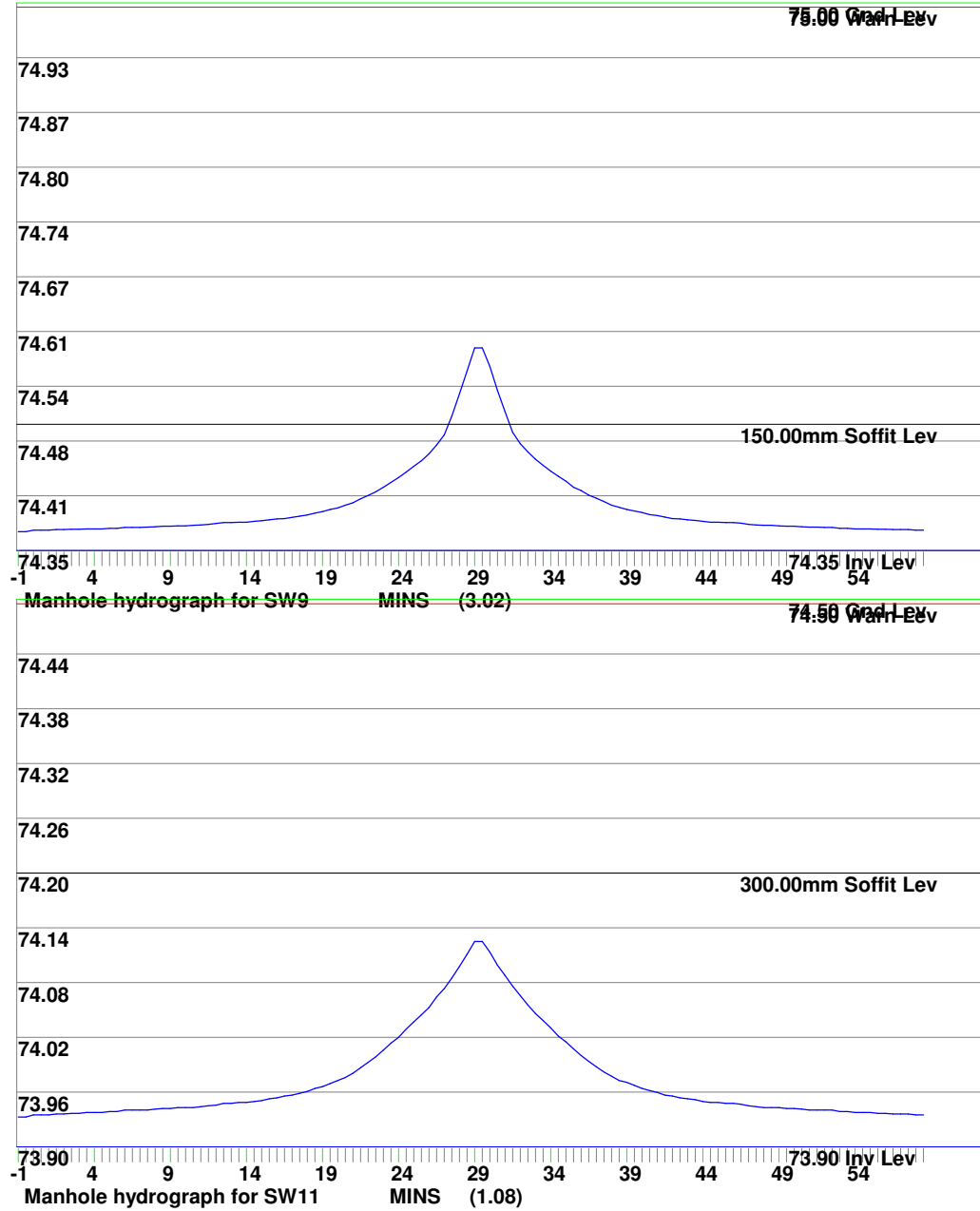
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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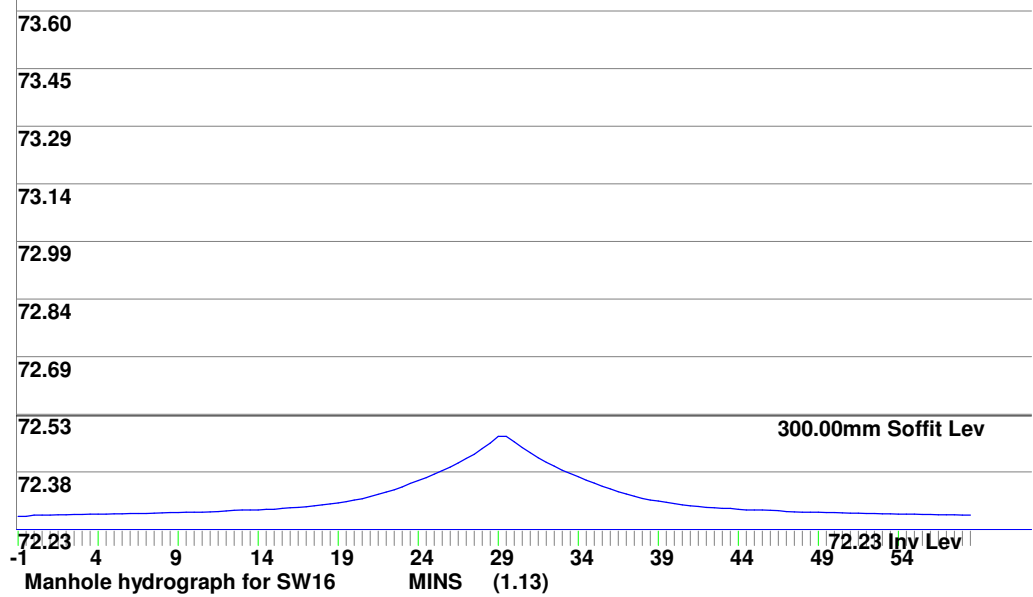
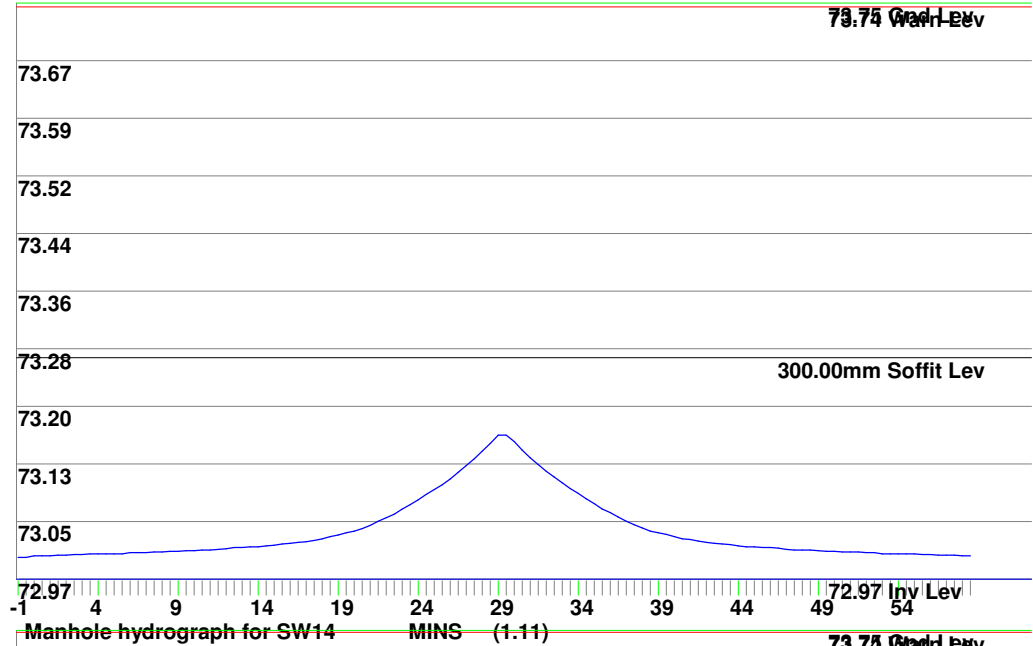
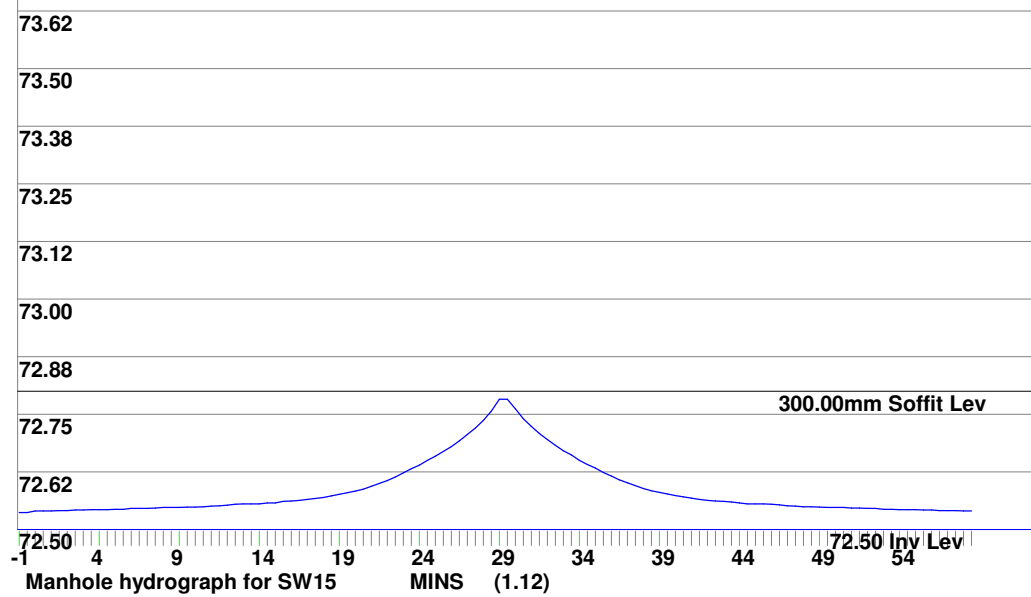
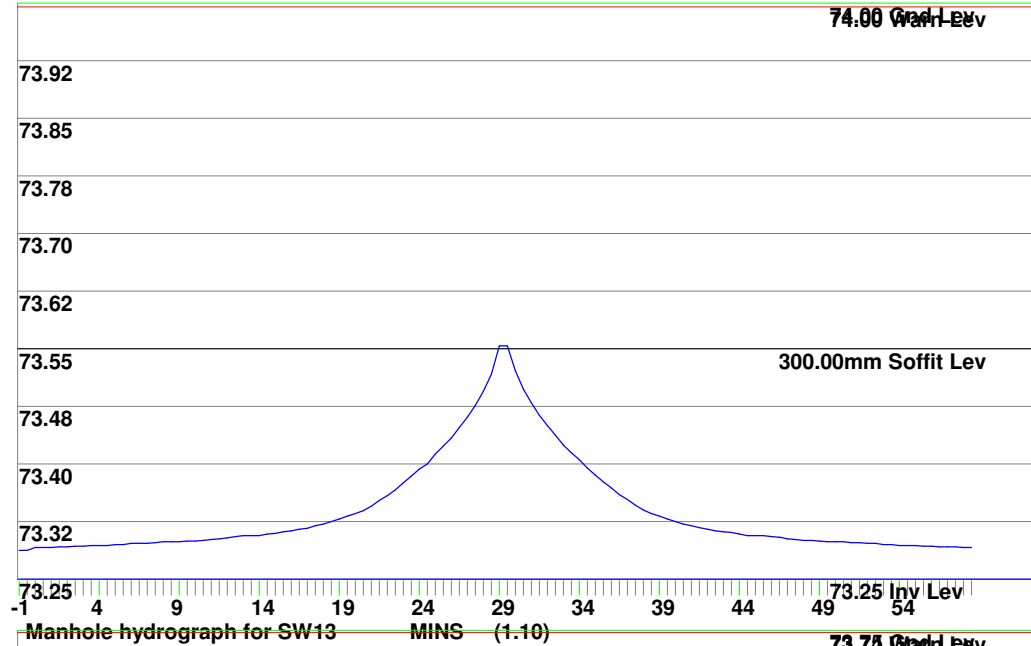
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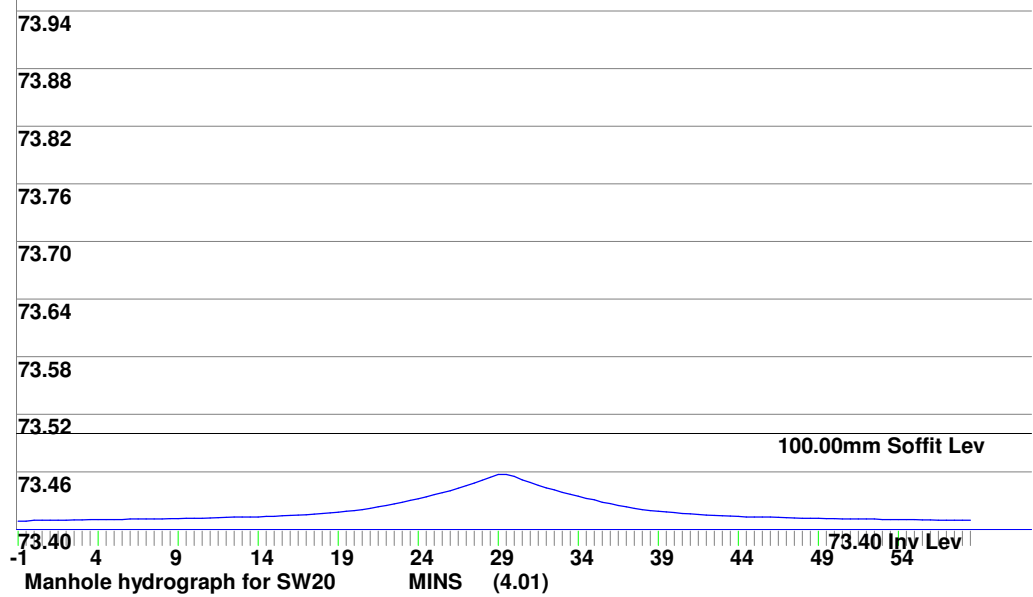
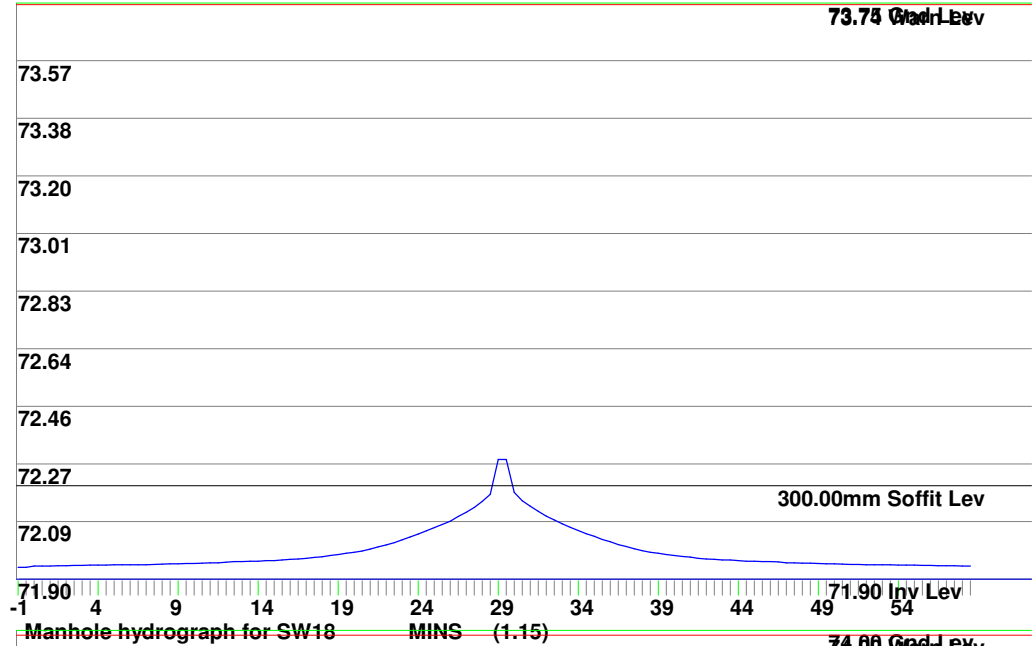
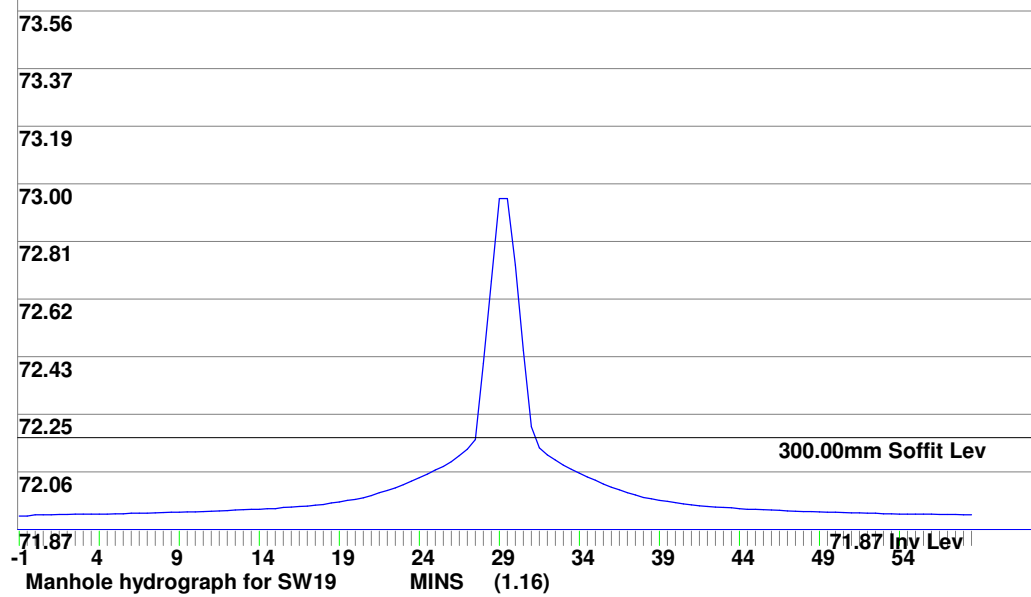
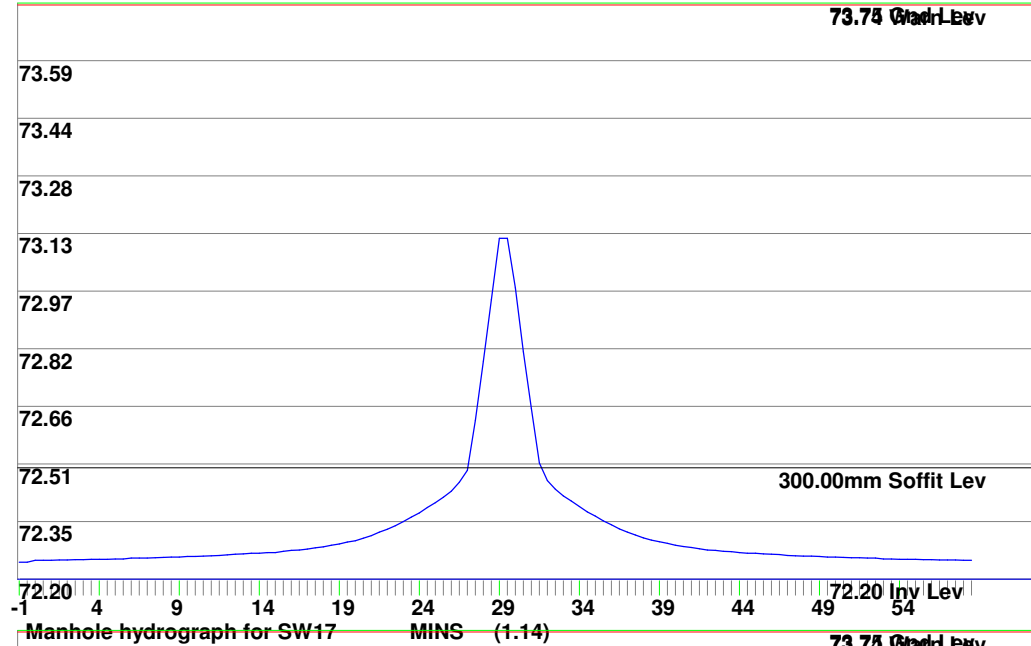
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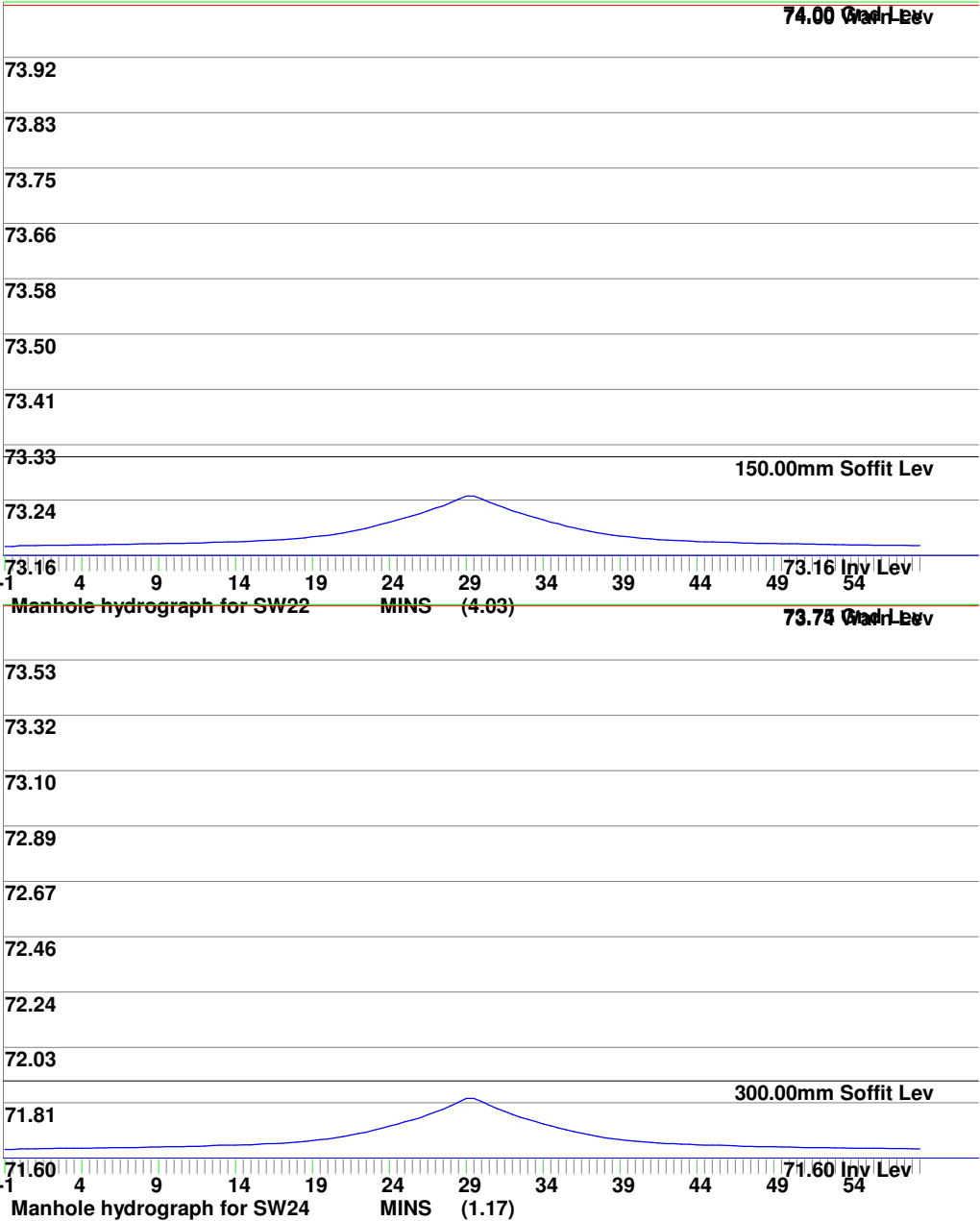
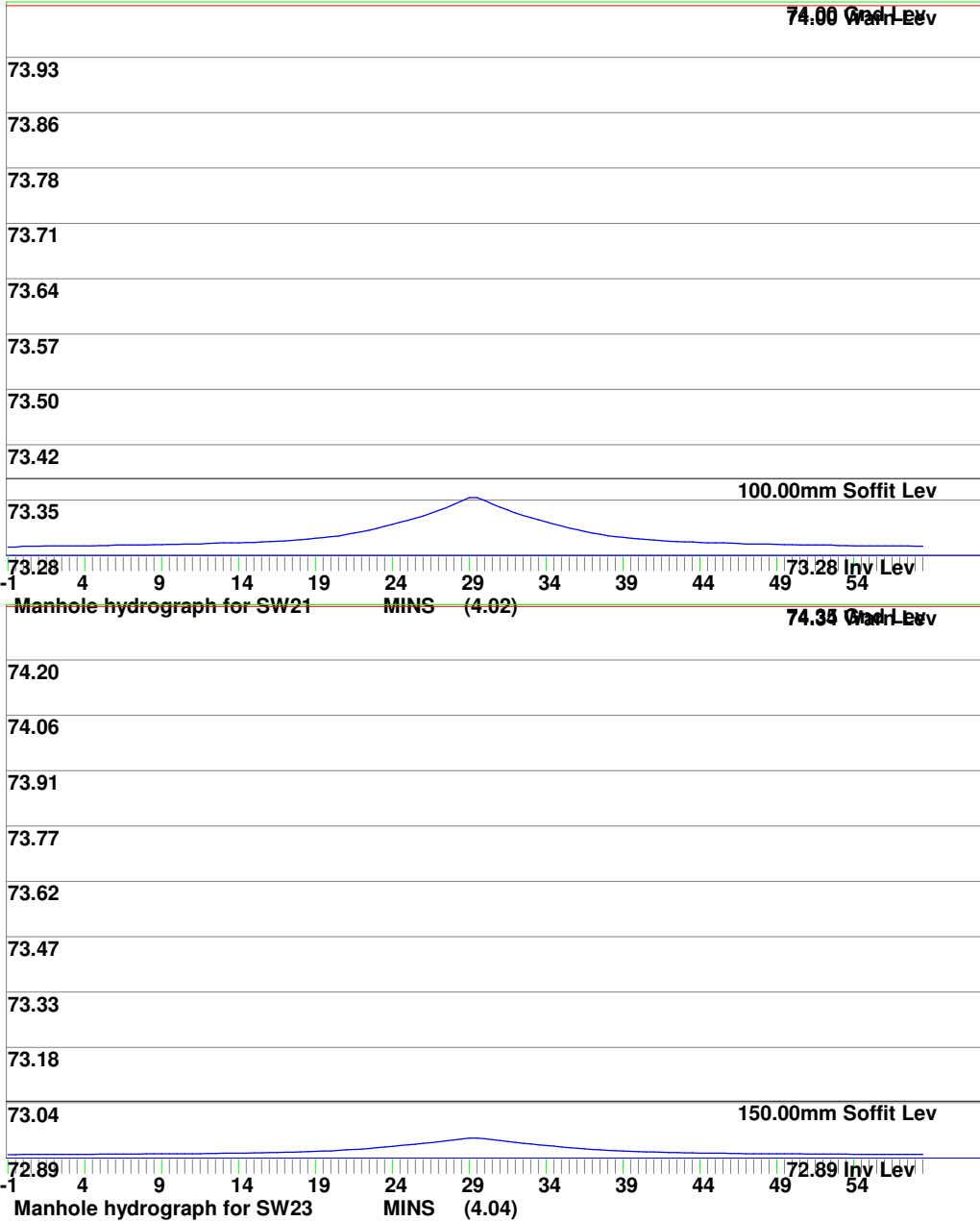
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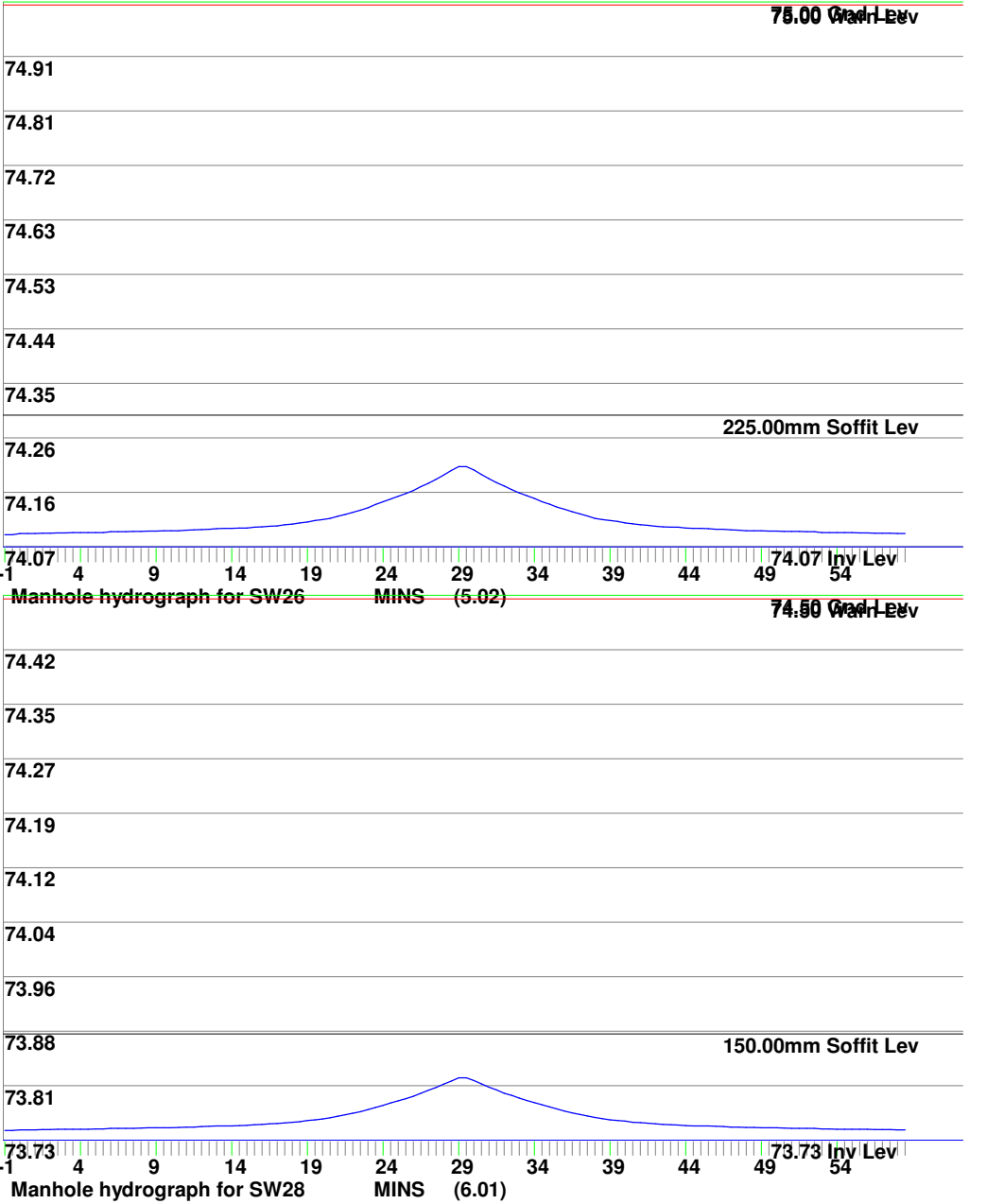
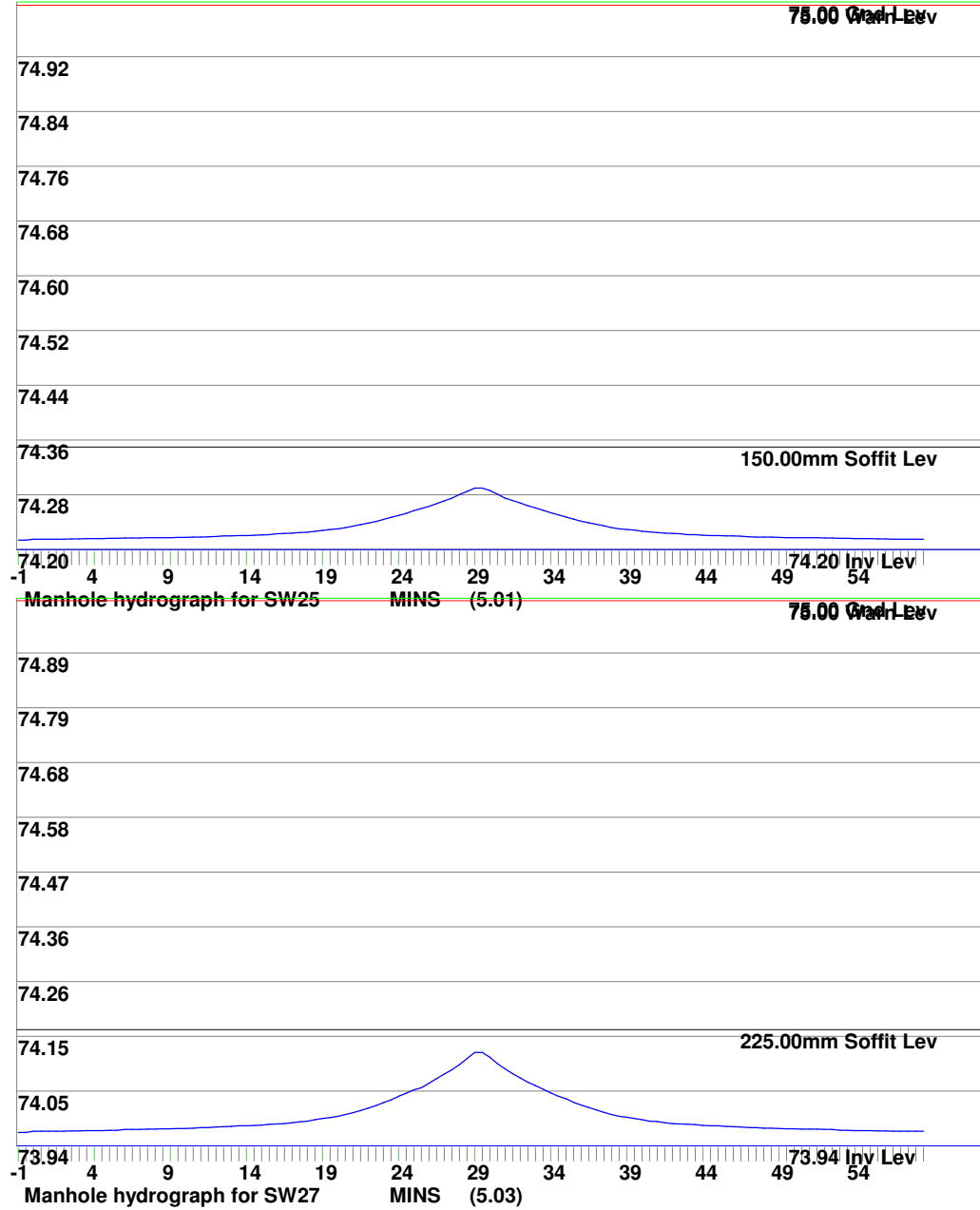
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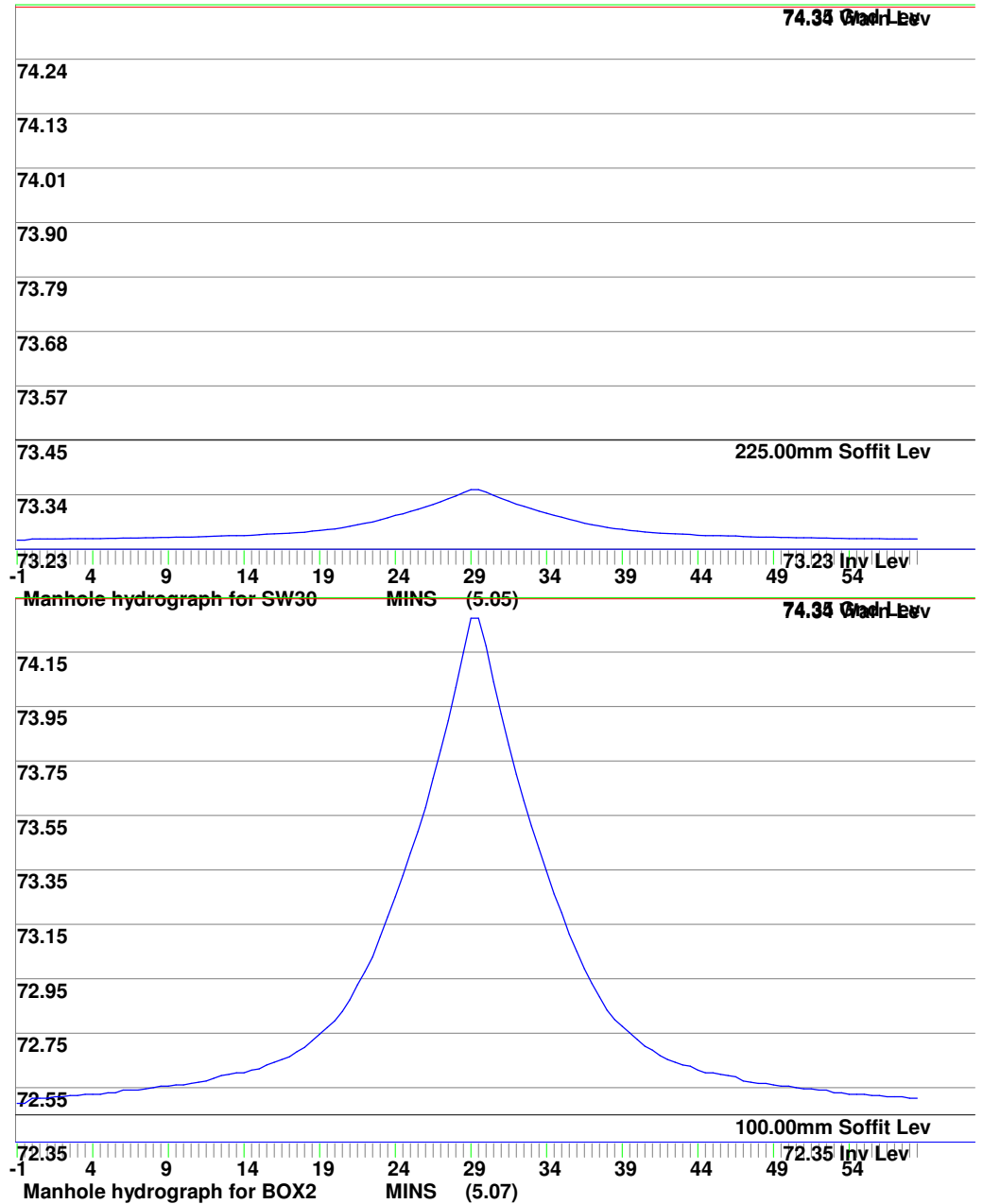
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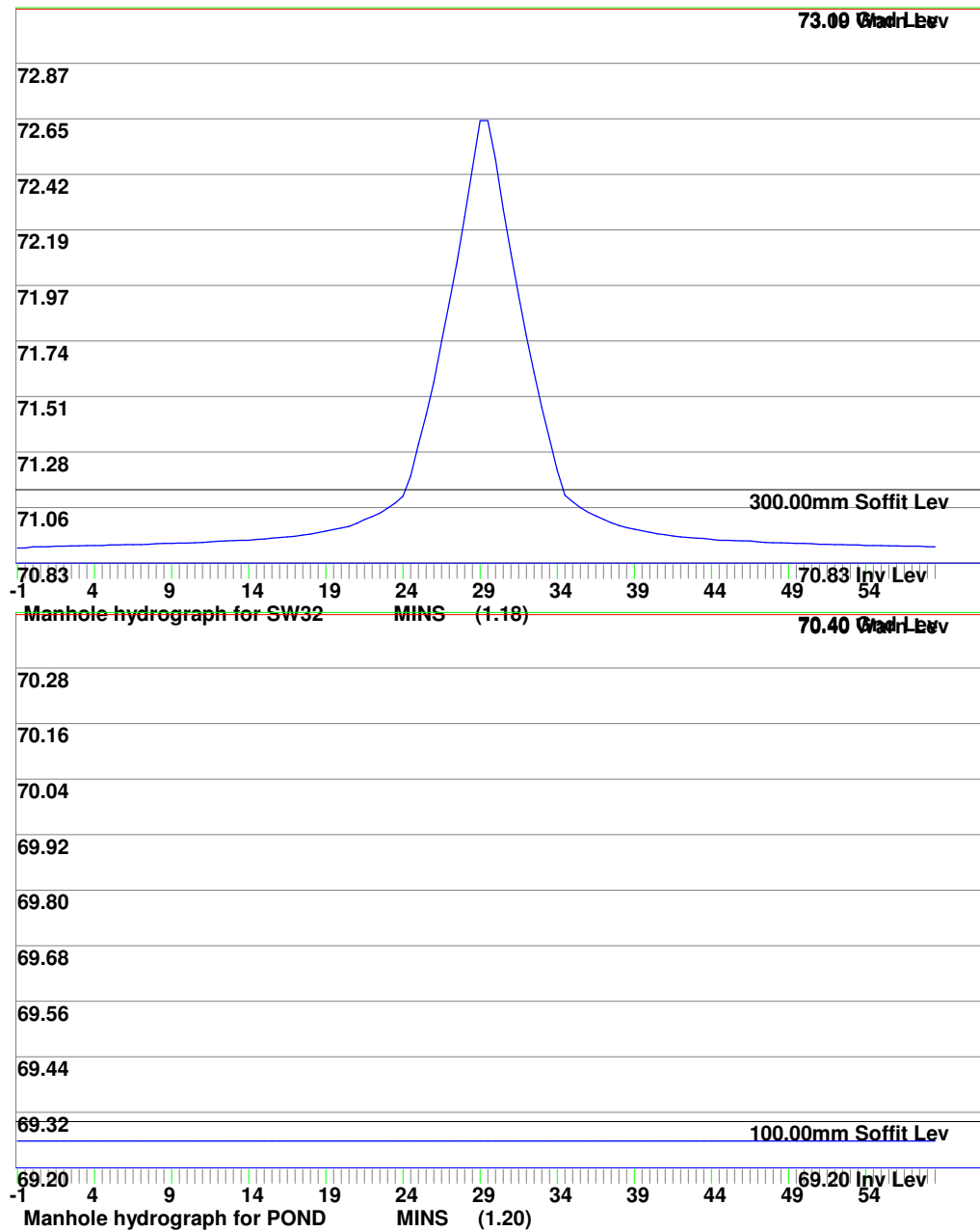
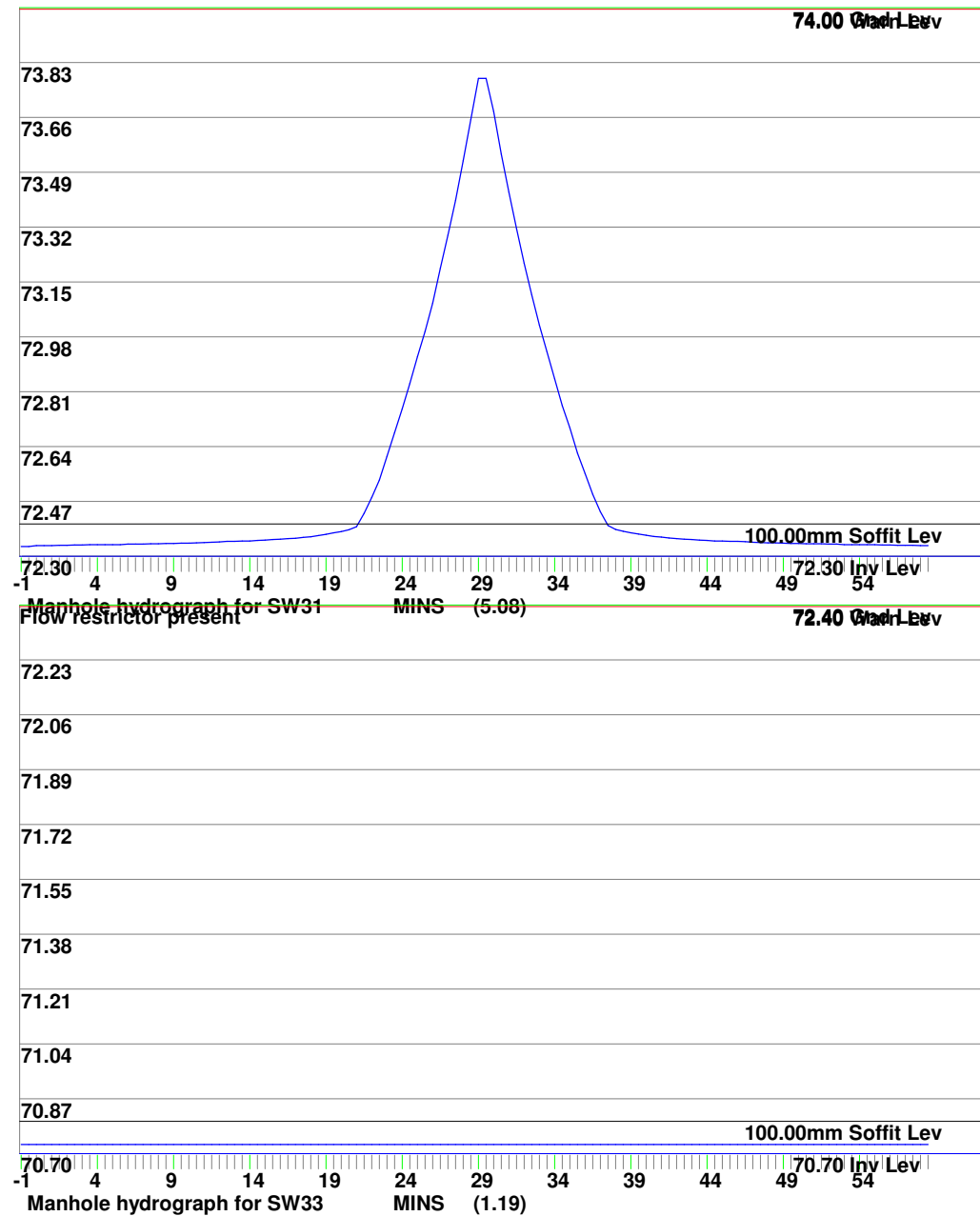
By **MDM**

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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

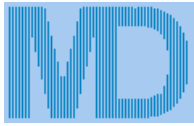
Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

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

Mean rain intens. 83.00 mm/hr
Storm profile = winter
Using FSR data

Peak rain intens. 207.50 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. Depth		EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS	
1	I	1.01	SW1	14.5	8.9	150	1200	76.40	76.49	77.00	0.61	0.09	0.00	0.00	147	OK
2	I	1.02	SW2	25.1	17.4	225	1200	76.30	76.45	77.00	0.69	0.15	0.00	0.00	289	OK
3	I	1.03	SW3	58.1	27.8	225	1200	76.19	76.30	77.00	0.48	0.11	0.00	0.00	462	OK
4	I	1.04	SW4	53.0	33.7	225	1200	76.12	76.26	77.00	0.64	0.14	0.00	0.00	560	OK
5	I	1.05	SW6	60.4	40.1	225	1200	75.89	76.03	77.50	0.66	0.14	0.00	0.00	667	OK
6	B	2.01	SW5	6.3	6.3	100	1200	75.89	75.99	77.00	1.00	0.10	0.00	0.00	104	Surch.
7	I	1.06	SW7	108.9	52.5	225	1200	75.66	75.77	77.50	0.48	0.11	0.00	0.00	872	OK
8	B	3.01	SW8	2.9	1.6	100	1200	74.40	74.45	75.00	0.54	0.05	0.00	0.00	27	OK
9	B	3.02	SW9	12.1	15.3	150	1200	74.35	74.54	75.00	1.27	0.19	3.23	0.00	255	Surch.
10	I	1.07	SW10	132.9	87.4	300	1800	74.30	74.49	75.00	0.66	0.19	0.00	0.00	1453	OK
11	I	1.08	SW11	126.7	100.3	300	2100	73.90	74.12	74.50	0.79	0.22	0.00	0.00	1665	OK
12	I	1.09	SW12	249.5	113.1	300	1800	73.66	73.80	74.50	0.45	0.14	0.00	0.00	1878	OK
13	I	1.10	SW13	124.2	123.2	300	2100	73.25	73.54	74.00	0.99	0.29	0.00	0.00	2047	OK
14	I	1.11	SW14	194.0	131.6	300	1500	72.97	73.16	73.75	0.68	0.19	0.00	0.00	2186	OK
15	I	1.12	SW15	144.8	139.7	300	1500	72.50	72.78	73.75	0.96	0.28	0.00	0.00	2321	OK
16	I	1.13	SW16	167.9	145.1	300	1500	72.23	72.47	73.75	0.86	0.24	0.00	0.00	2410	OK
17	I	1.14	SW17	110.5	145.1	300	1500	72.20	72.79	73.75	1.31	0.59	34.63	0.00	2410	Surch.
18	I	1.15	SW18	143.6	145.1	300	1200	71.90	72.22	73.75	1.01	0.32	1.48	0.00	2410	Surch.
19	I	1.16	SW19	123.5	151.1	300	1200	71.87	72.54	73.75	1.22	0.67	27.64	0.00	2510	Surch.
20	B	4.01	SW20	7.2	4.2	100	1200	73.40	73.46	74.00	0.59	0.06	0.00	0.00	70	OK
21	B	4.02	SW21	10.0	7.9	100	1200	73.28	73.35	74.00	0.80	0.07	0.00	0.00	132	OK
22	B	4.03	SW22	20.0	12.4	150	1200	73.16	73.25	74.00	0.62	0.09	0.00	0.00	205	OK
23	B	4.04	SW23	51.6	16.1	150	1200	72.89	72.94	74.35	0.31	0.05	0.00	0.00	268	OK
24	I	1.17	SW24	214.6	175.4	300	1200	71.60	71.83	73.75	0.82	0.23	0.00	0.00	2914	OK
25	B	5.01	SW25	19.6	12.1	150	1200	74.20	74.29	75.00	0.62	0.09	0.00	0.00	200	OK
26	B	5.02	SW26	58.1	36.5	225	1200	74.07	74.21	75.00	0.63	0.14	0.00	0.00	607	OK
27	B	5.03	SW27	58.5	49.7	225	1200	73.94	74.12	75.00	0.85	0.18	0.00	0.00	826	OK
28	S1	6.01	SW28	16.5	10.0	150	1200	73.73	73.82	74.50	0.60	0.09	0.00	0.00	165	OK
29	B	5.04	SW29	59.2	71.5	225	1200	73.46	73.85	74.50	1.21	0.39	12.30	0.00	1188	Surch.



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Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

Entry	SECT.:	MANHOLE :	PIPE :	RATE :	PIPE :	CHAMBER :	INVERT:	WATER :	GRND :	SURCHARGE		EXCESS :	FLOODED :	DRAINED :	STATUS	
No.	No. :	REF :	CAPACITY :	FLOW :	SIZE :	DIAM/LxW :	LEVEL :	LEVEL :	LEVEL :	:	:	FLOW :	VOL :	AREA (m²) :		
:	:	:	l/s :	l/s :	mm :	mm :	m :	m :	m :	fract.	Depth	l/s :	m³ :	x FACTOR :		
30	B	5.05	SW30	130.7	71.5	225	1200	73.23	73.35	74.35	0.55	0.12	0.00	0.00	1188	OK
31	B	5.06	BOX1#	Cell	2.0	0.01x0.0	1200	72.40	72.45	74.35	1.00	0.05	0.00	0.00	0	OK
32	B	5.07	BOX2	3.6	71.5	100	1200	72.35	73.35	74.35	19.88	1.00	67.94	0.00	1188	Surch.
33	B	5.08	SW31	20.3	71.5	100	1200	72.30	73.08	74.00	3.52	0.78	51.20	0.00	1188	Surch.
34	I	1.18	SW32	122.0	246.9	300	1800	70.83	71.87	73.10	2.02	1.04	124.99	0.00	4102	Surch.
35	I	1.19	SW33#	21.6	5.0	100	1200	70.70	70.73	72.40	0.23	0.03	0.00	0.00	0	OK
36	I	1.20	POND	8.3	5.0	100	1200	69.20	69.26	70.40	0.60	0.06	0.00	0.00	0	OK



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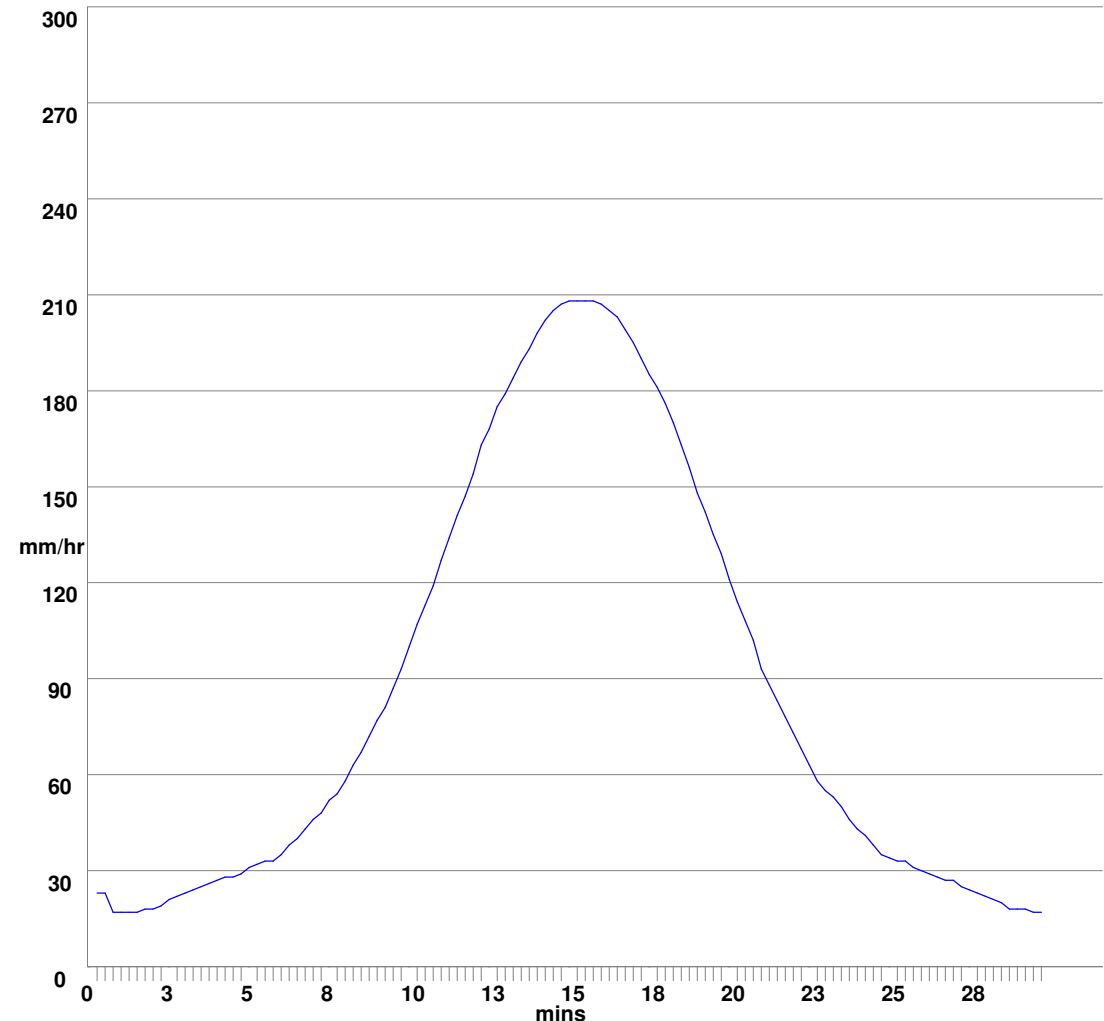
Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:15	22.51	10:15	106.69	20:15	114.19
0:30	22.51	10:30	113.36	20:30	108.36
0:45	16.67	10:45	119.19	20:45	101.69
1:00	16.67	11:00	126.70	21:00	93.36
1:15	16.67	11:15	134.20	21:15	87.52
1:30	16.67	11:30	140.87	21:30	82.52
1:45	18.34	11:45	146.70	21:45	77.52
2:00	18.34	12:00	154.20	22:00	72.52
2:15	19.17	12:15	162.54	22:15	68.35
2:30	20.84	12:30	168.37	22:30	63.35
2:45	21.67	12:45	175.04	22:45	58.35
3:00	22.51	13:00	179.21	23:00	55.01
3:15	24.17	13:15	184.21	23:15	52.51
3:30	25.01	13:30	189.21	23:30	50.01
3:45	25.84	13:45	193.38	23:45	45.84
4:00	26.67	14:00	198.38	24:00	43.34
4:15	27.51	14:15	201.71	24:15	40.84
4:30	28.34	14:30	205.05	24:30	37.51
4:45	29.17	14:45	206.72	24:45	35.01
5:00	30.84	15:00	207.55	25:00	34.17
5:15	31.67	15:15	208.38	25:15	33.34
5:30	33.34	15:30	208.38	25:30	32.51
5:45	33.34	15:45	207.55	25:45	30.84
6:00	35.01	16:00	206.72	26:00	30.01
6:15	37.51	16:15	205.05	26:15	29.17
6:30	40.01	16:30	202.55	26:30	27.51
6:45	42.51	16:45	199.21	26:45	26.67
7:00	45.84	17:00	195.05	27:00	26.67
7:15	48.34	17:15	190.05	27:15	25.01
7:30	51.68	17:30	185.04	27:30	24.17
7:45	54.18	17:45	180.88	27:45	22.51
8:00	58.35	18:00	175.88	28:00	21.67
8:15	62.51	18:15	170.04	28:15	20.84
8:30	66.68	18:30	163.37	28:30	20.00
8:45	71.68	18:45	155.87	28:45	18.34
9:00	76.68	19:00	148.37	29:00	18.34
9:15	80.85	19:15	141.70	29:15	17.50
9:30	86.69	19:30	135.03	29:30	16.67
9:45	92.52	19:45	129.20	29:45	16.67
10:00	100.02	20:00	120.86	30:00	16.67

Hydrograph profile derived from data in the Flood Studies Report

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





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SW

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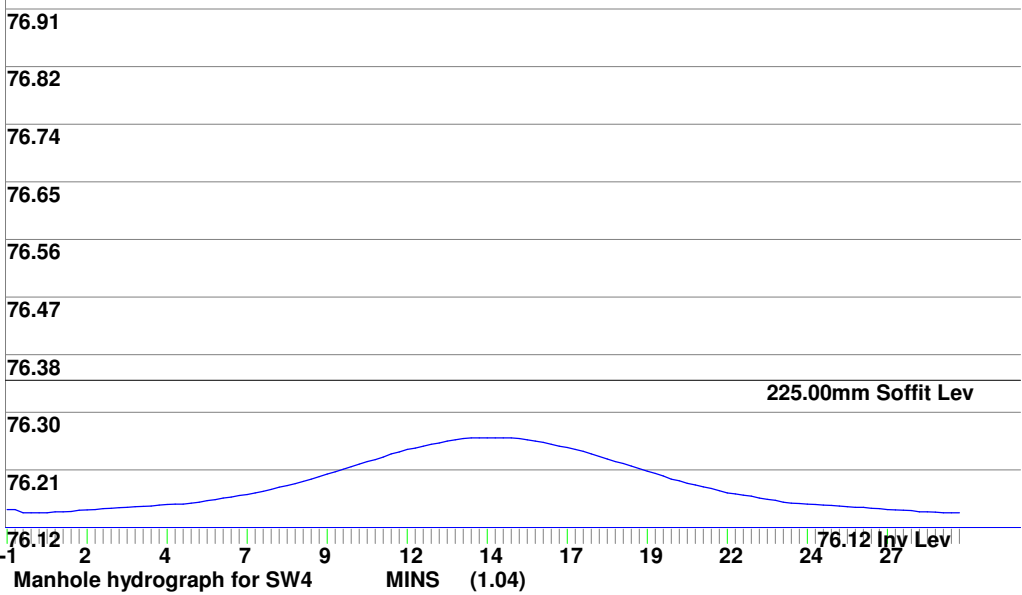
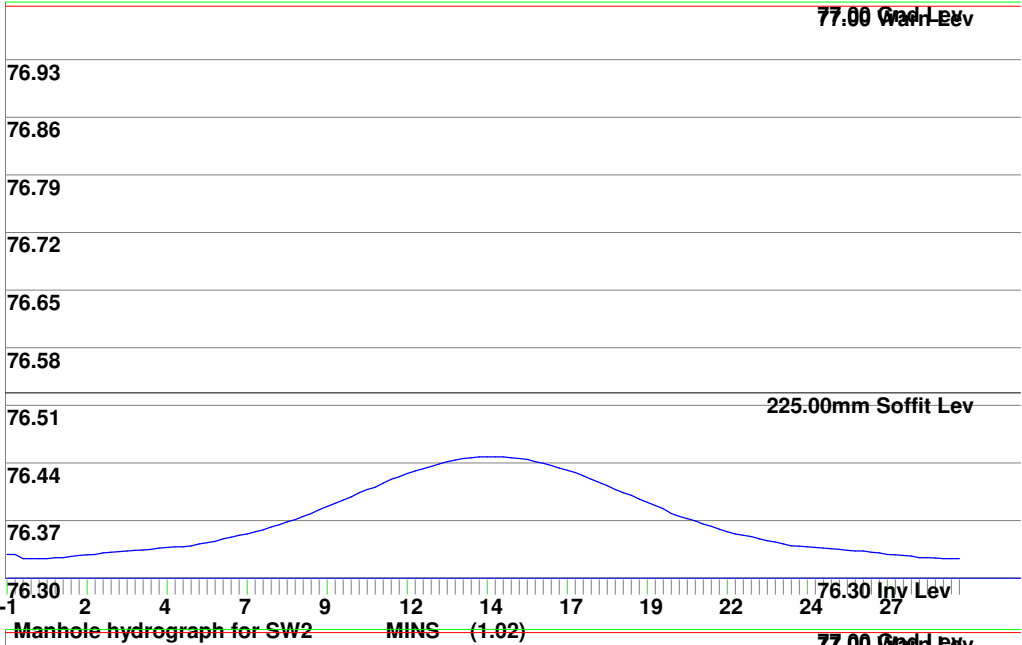
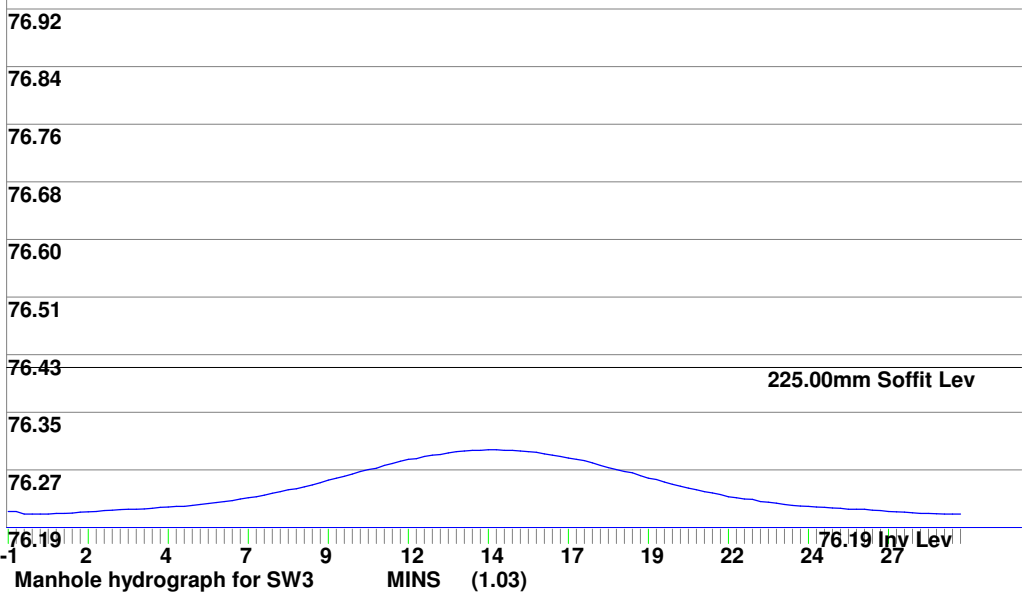
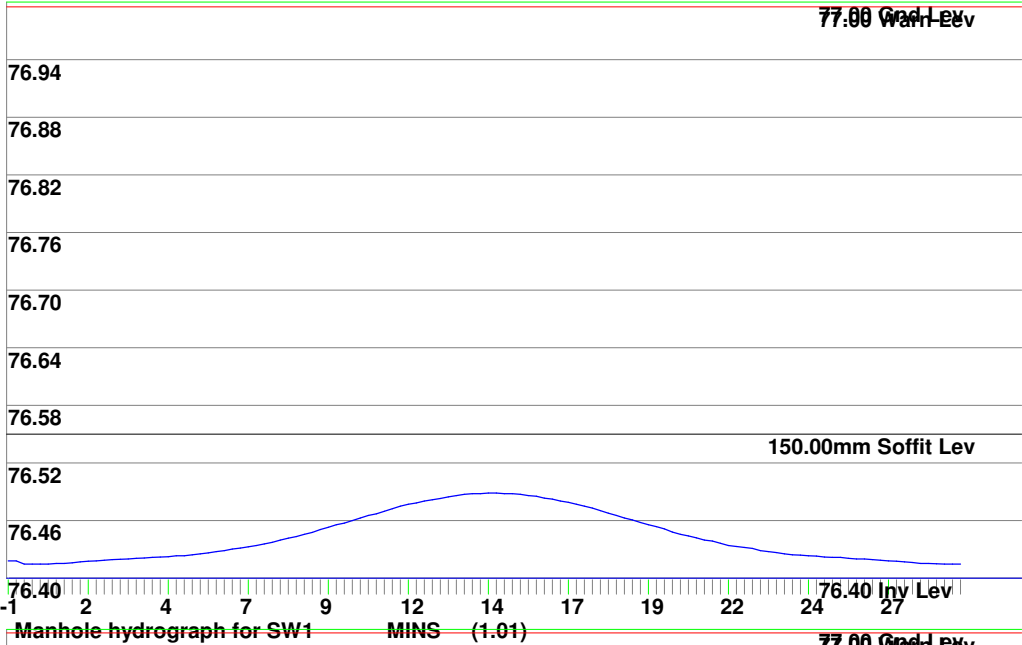
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Project

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SW

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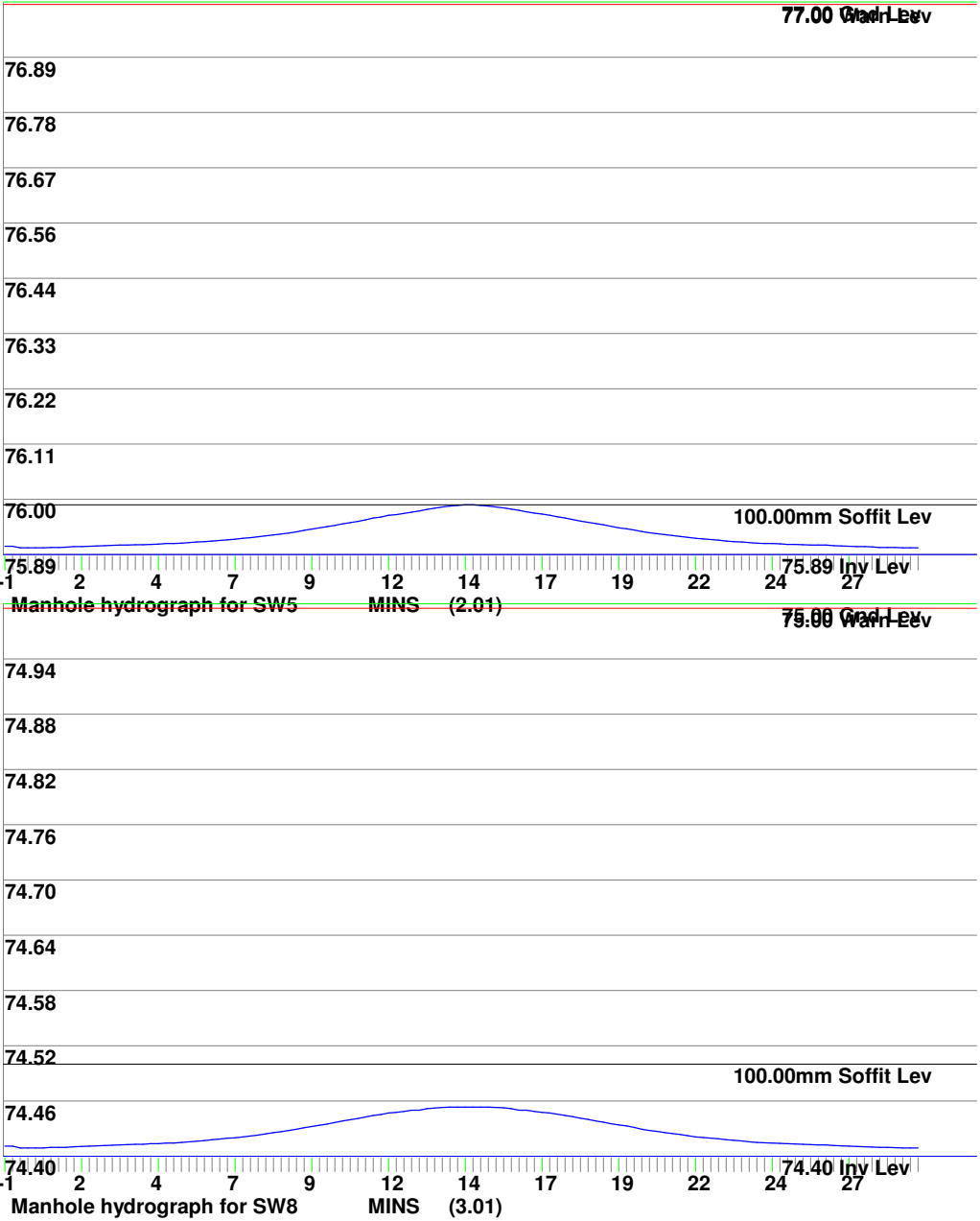
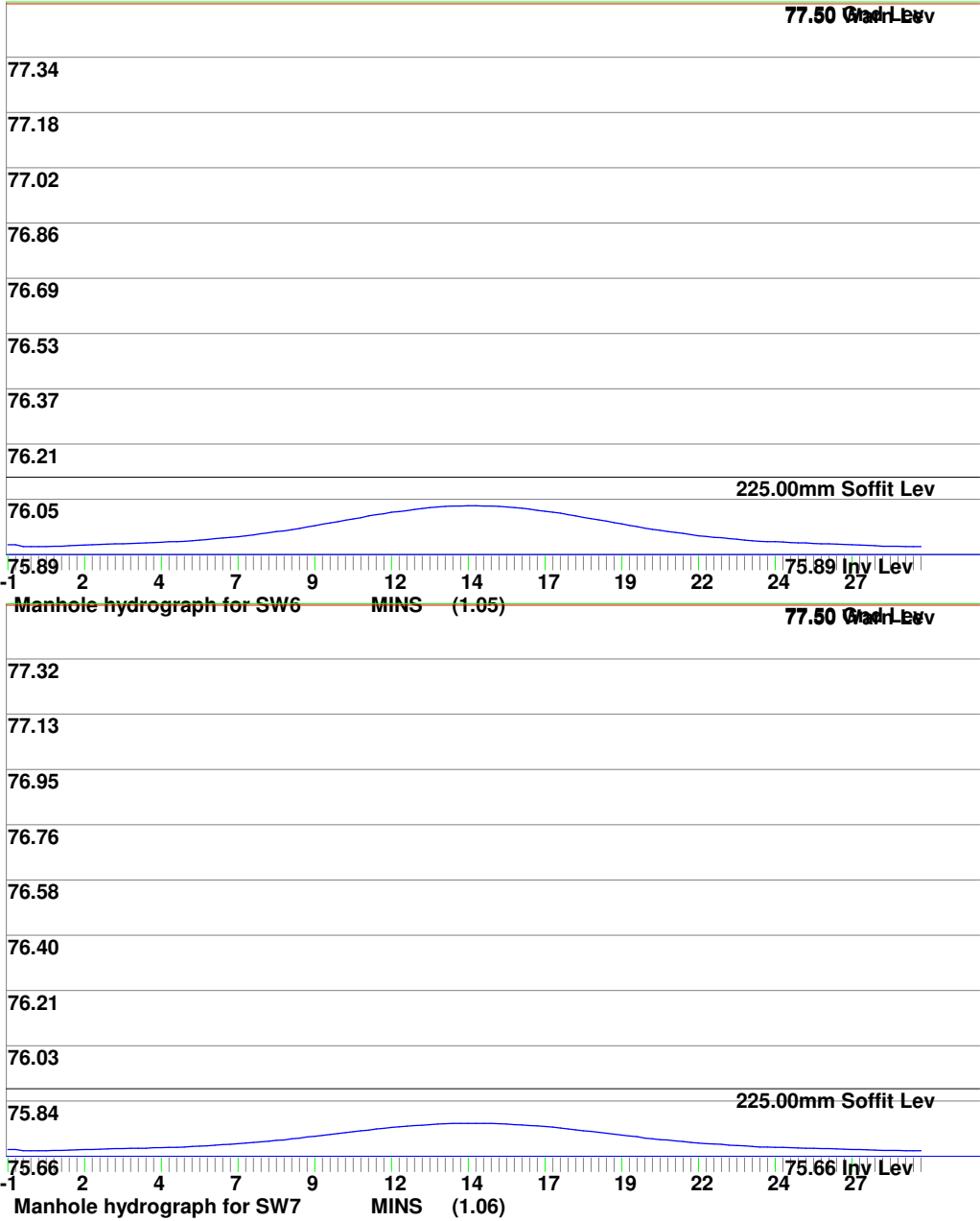
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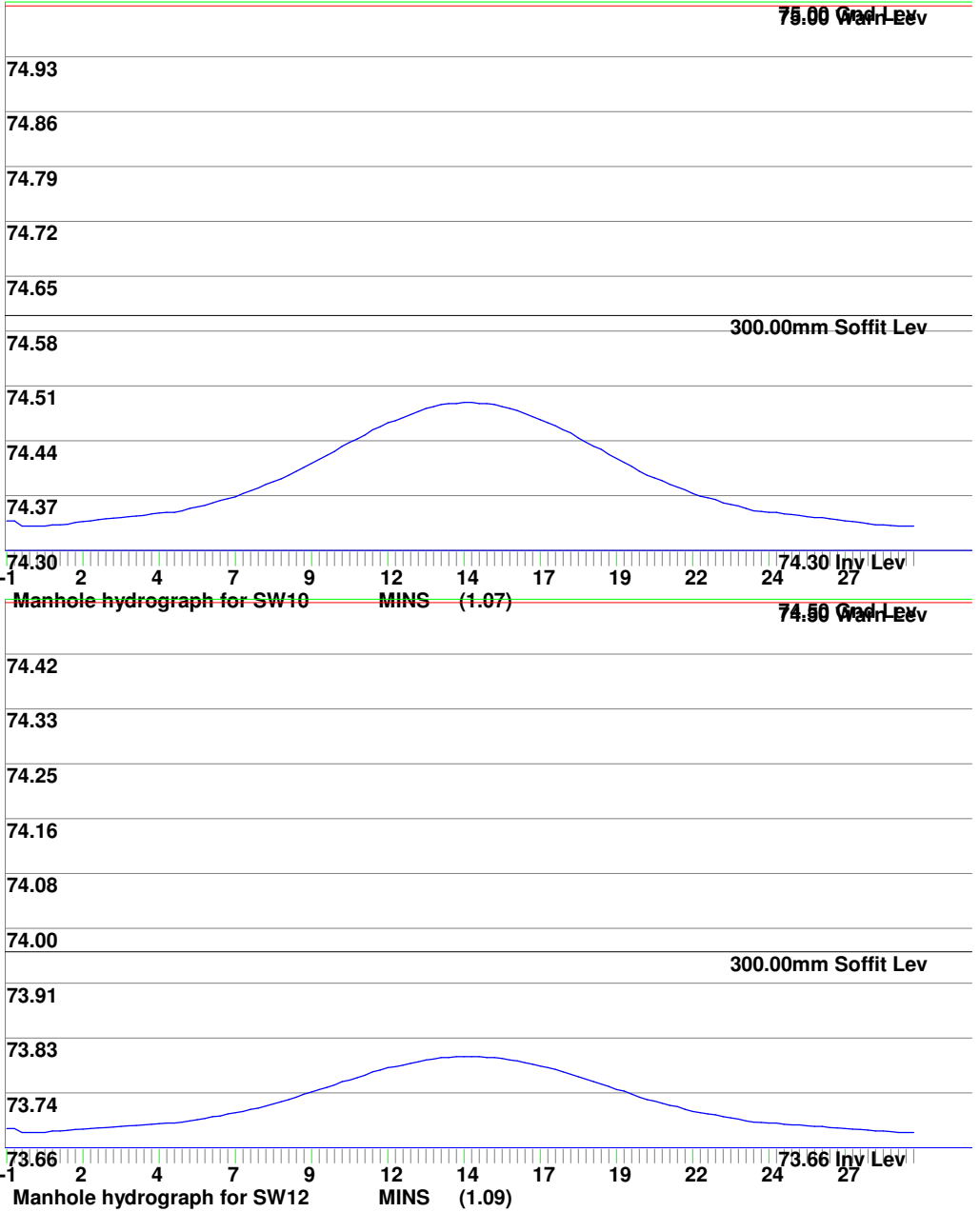
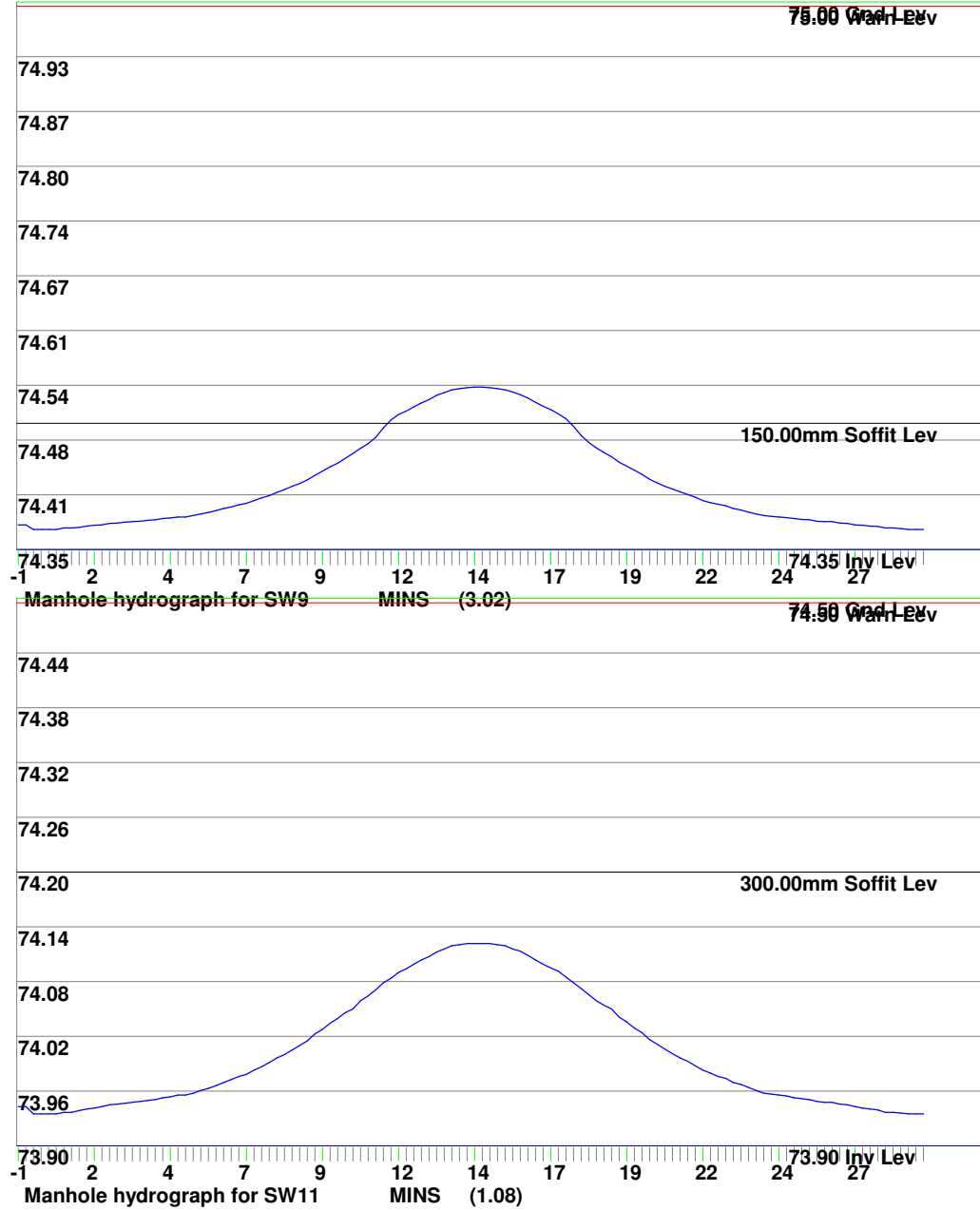
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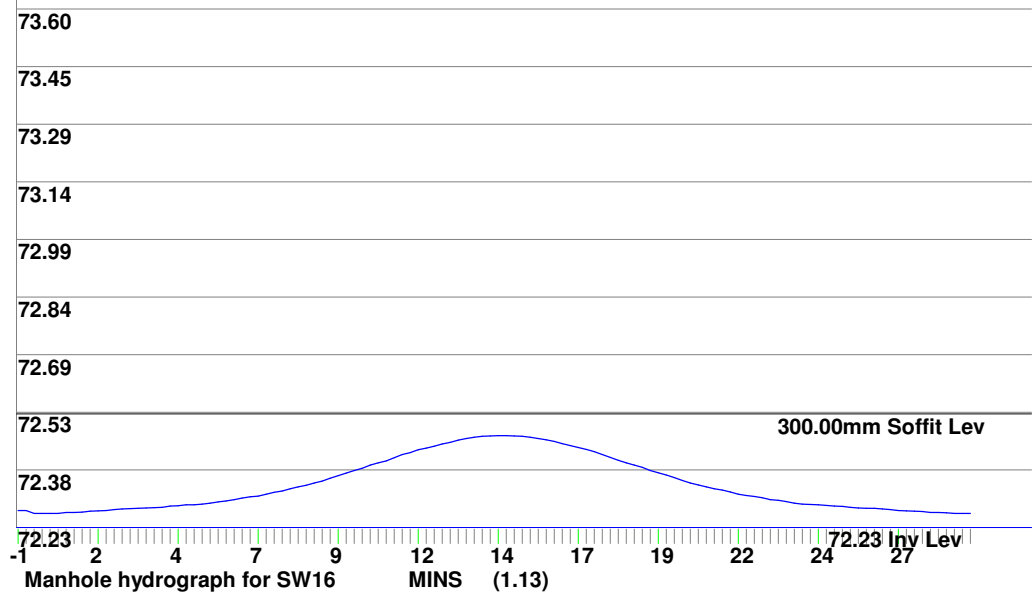
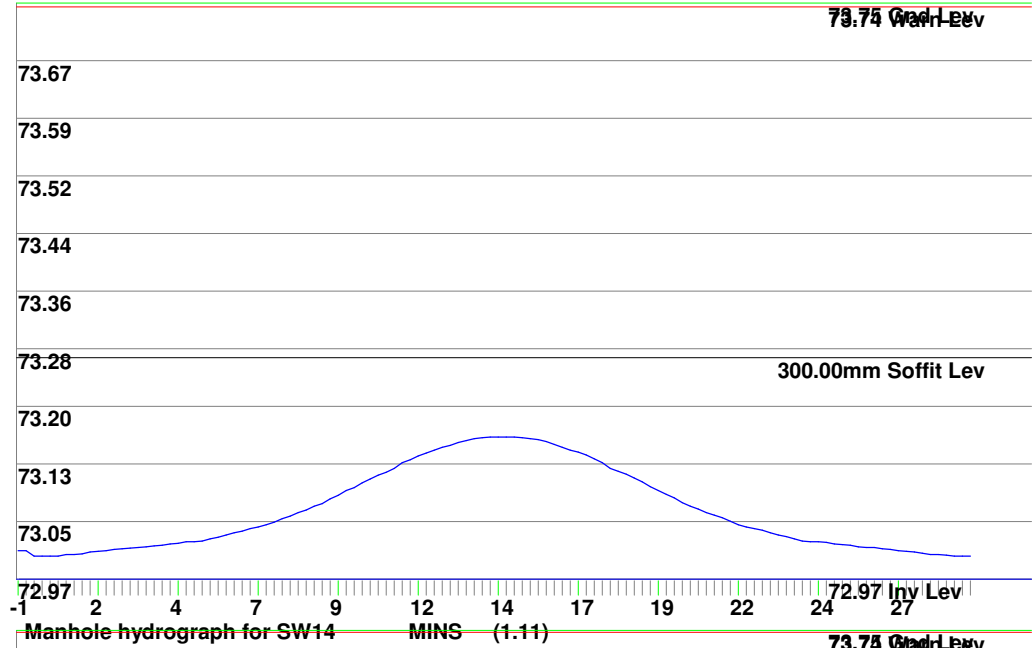
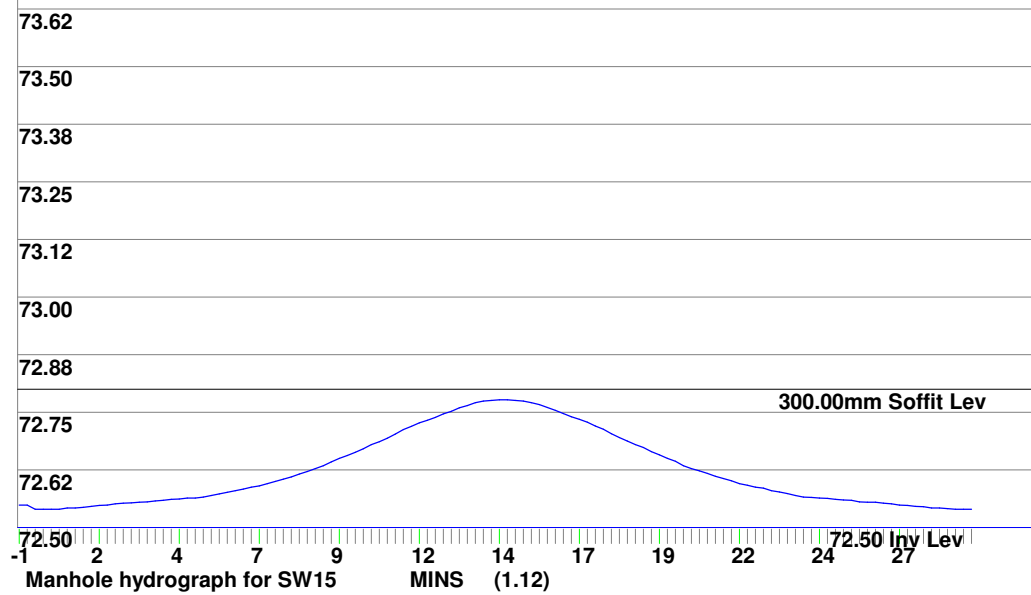
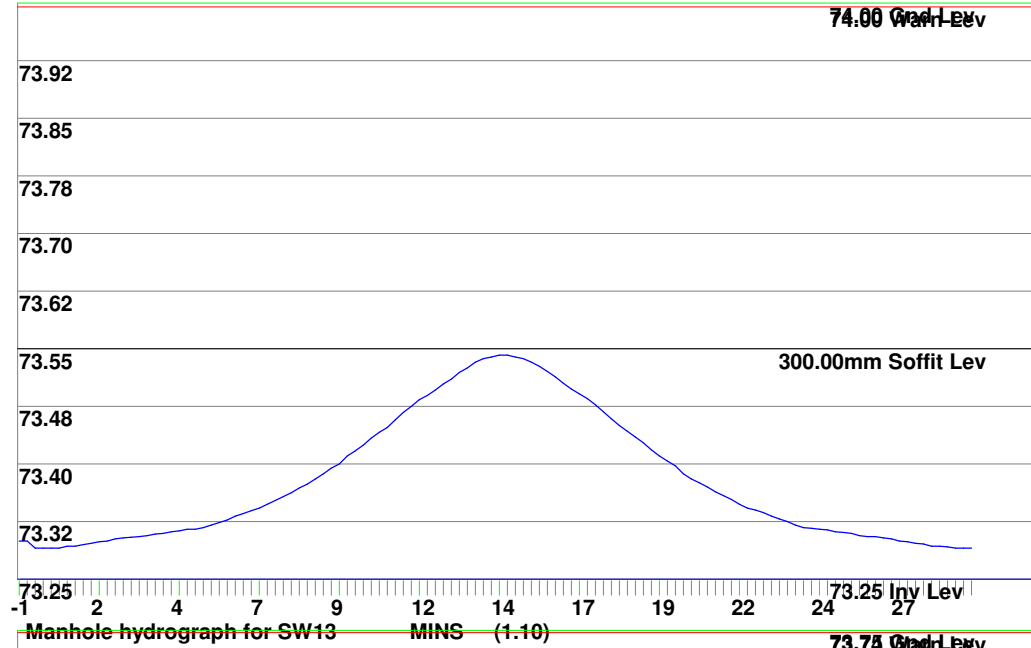
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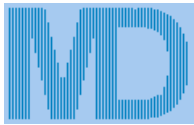
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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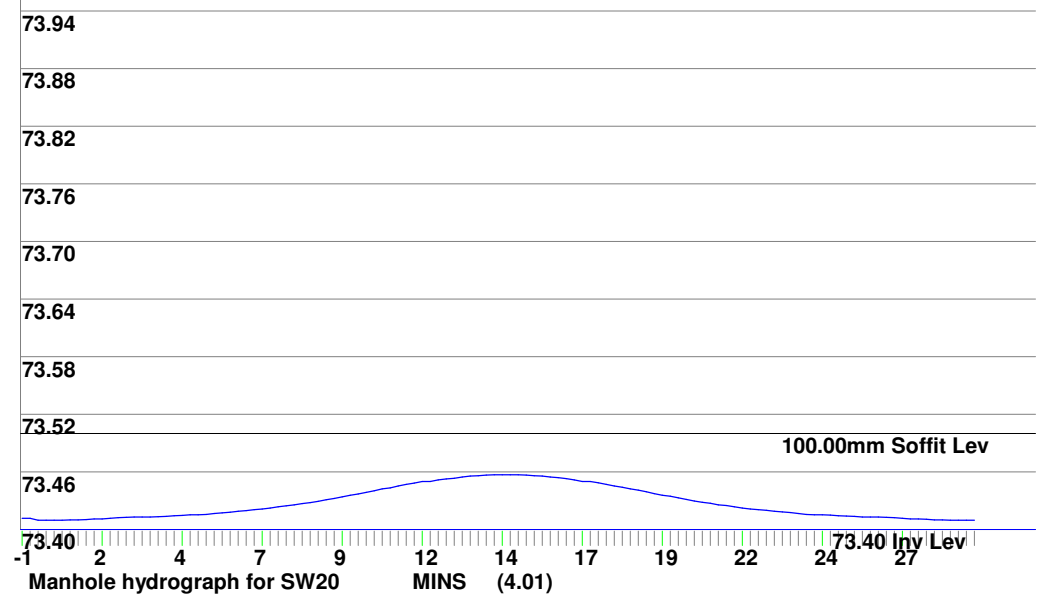
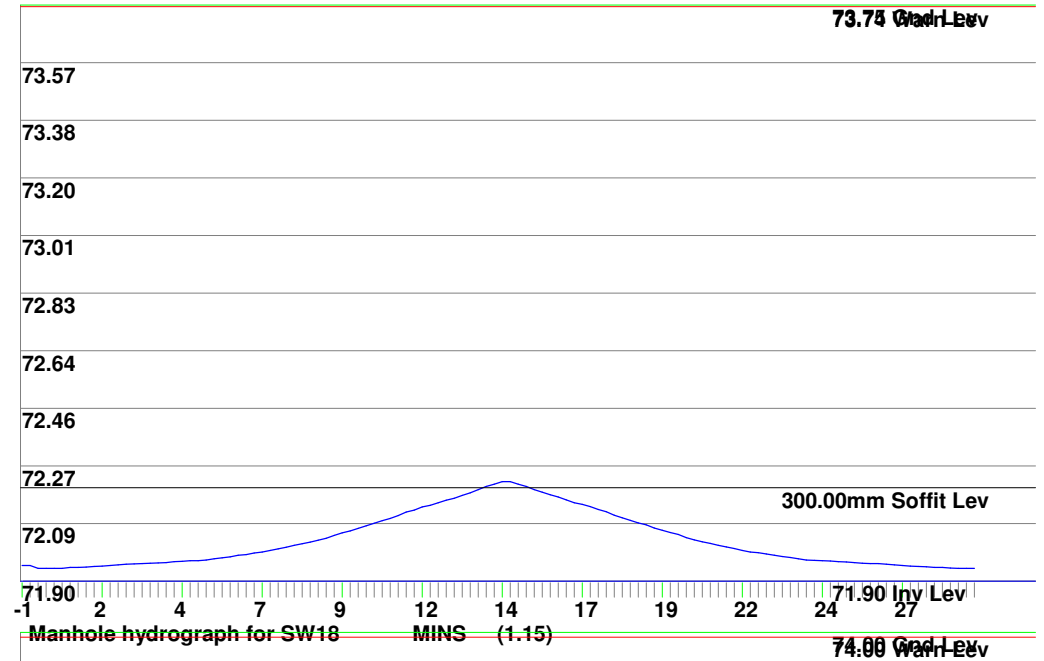
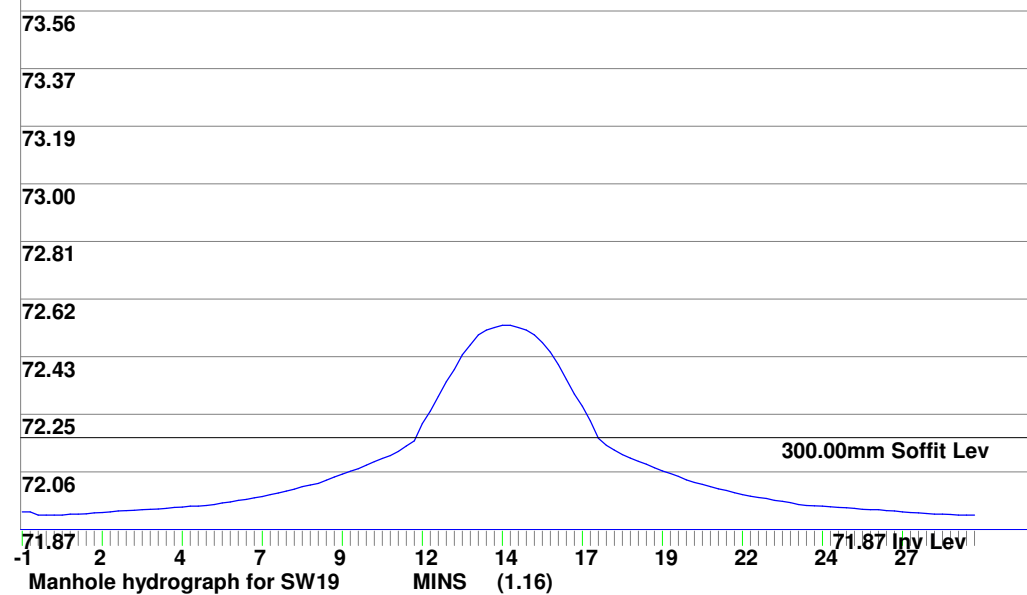
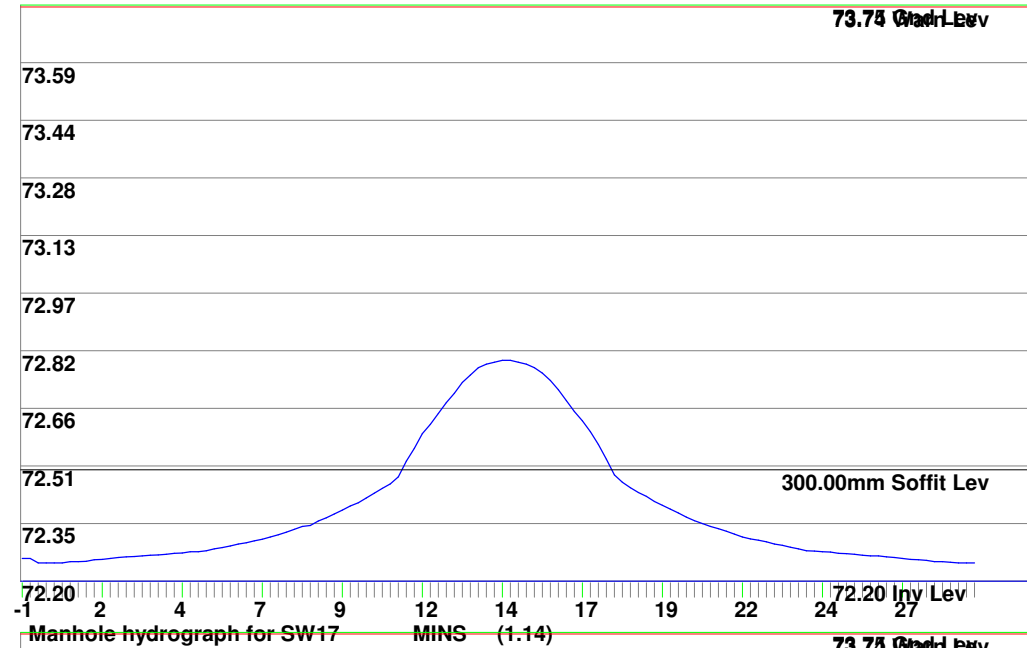
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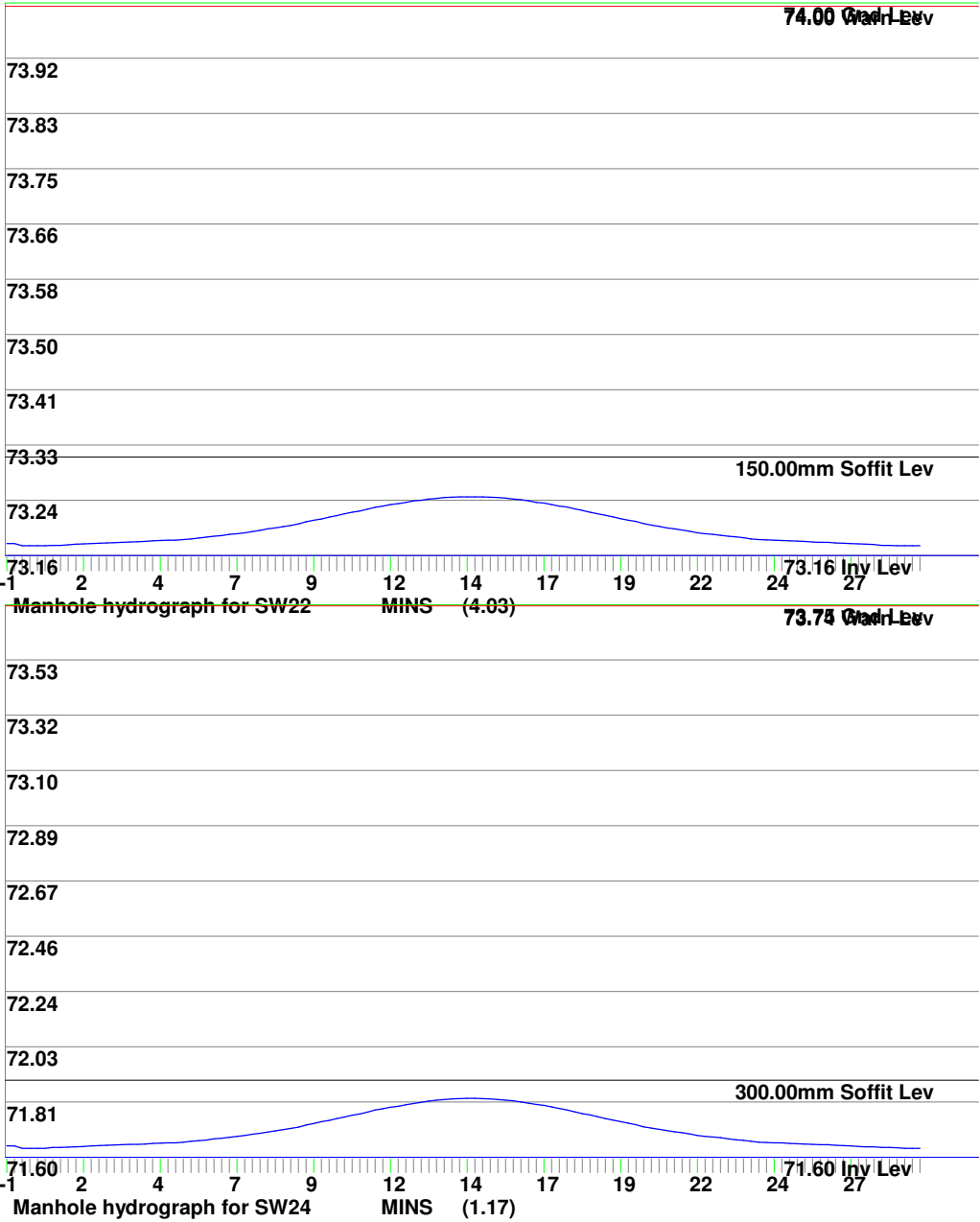
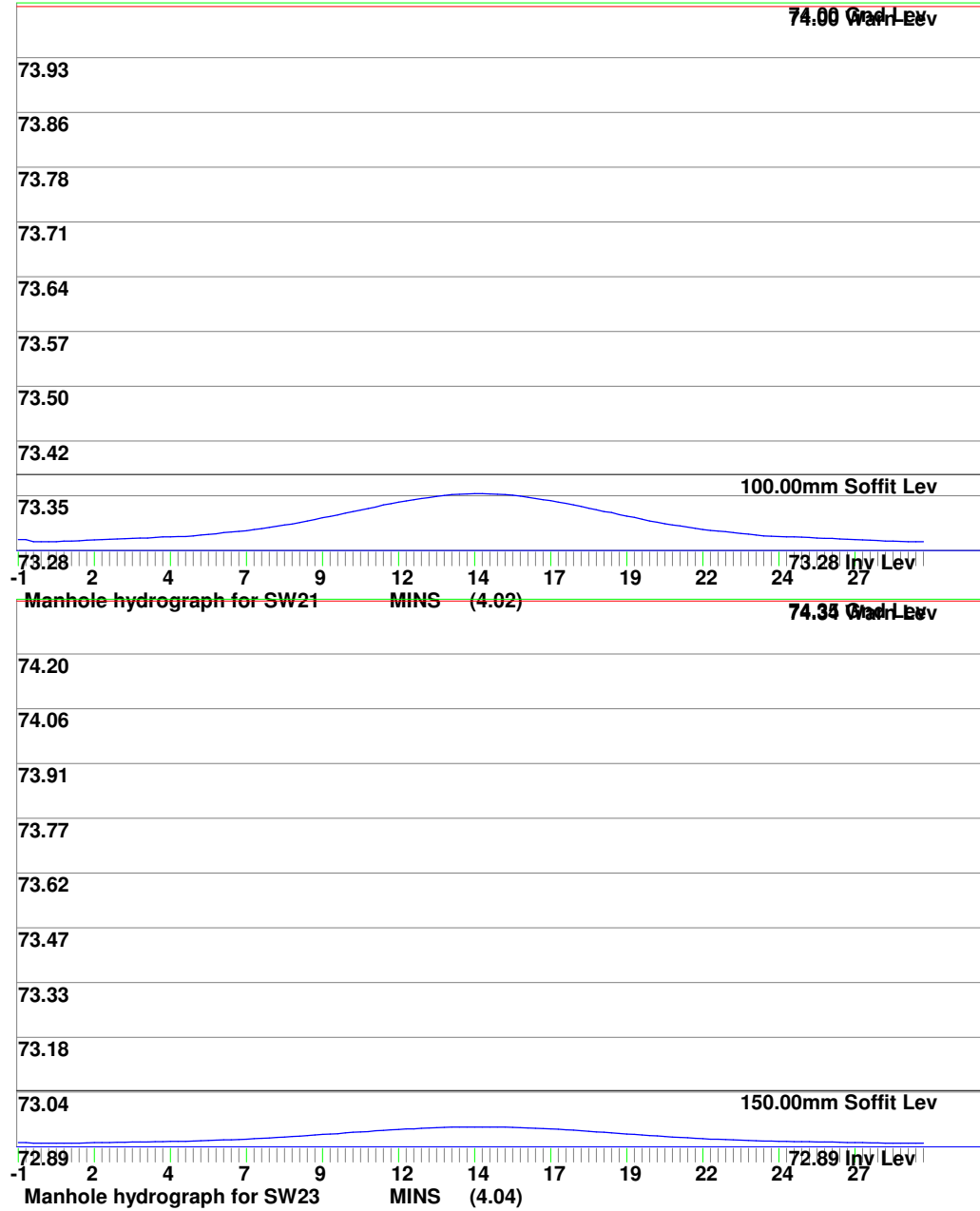
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Manhole hydrograph for SW24

MINS (1.17)



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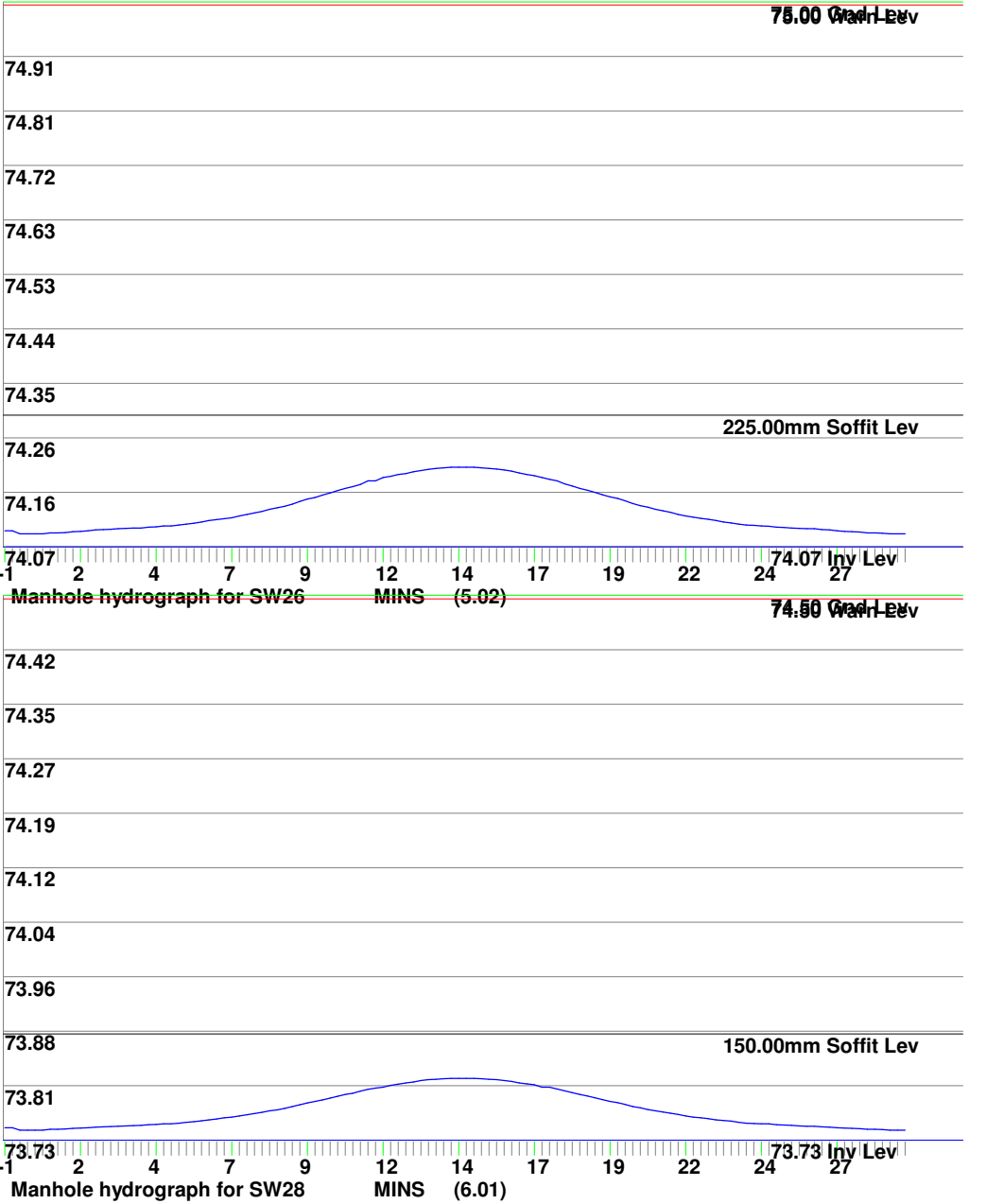
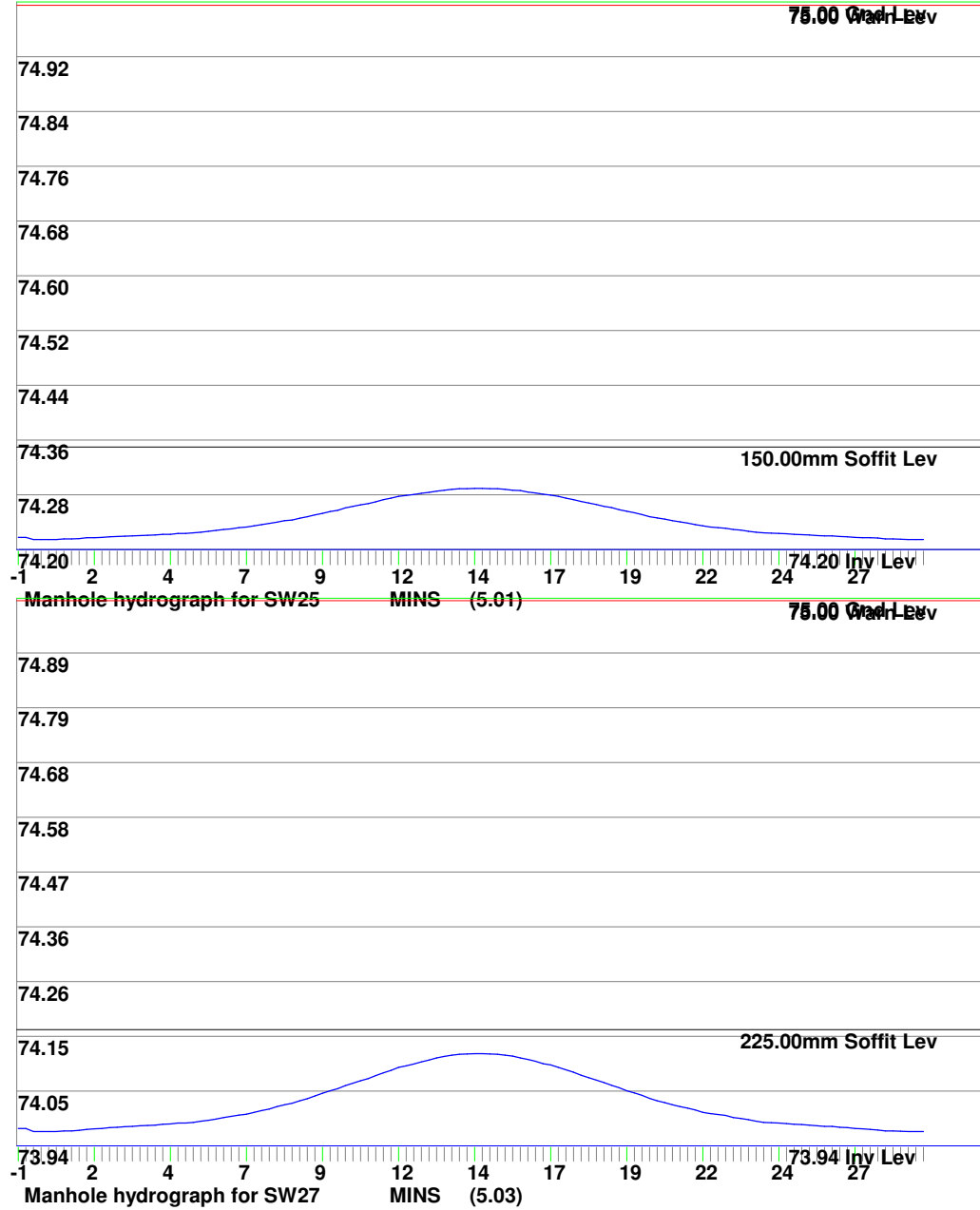
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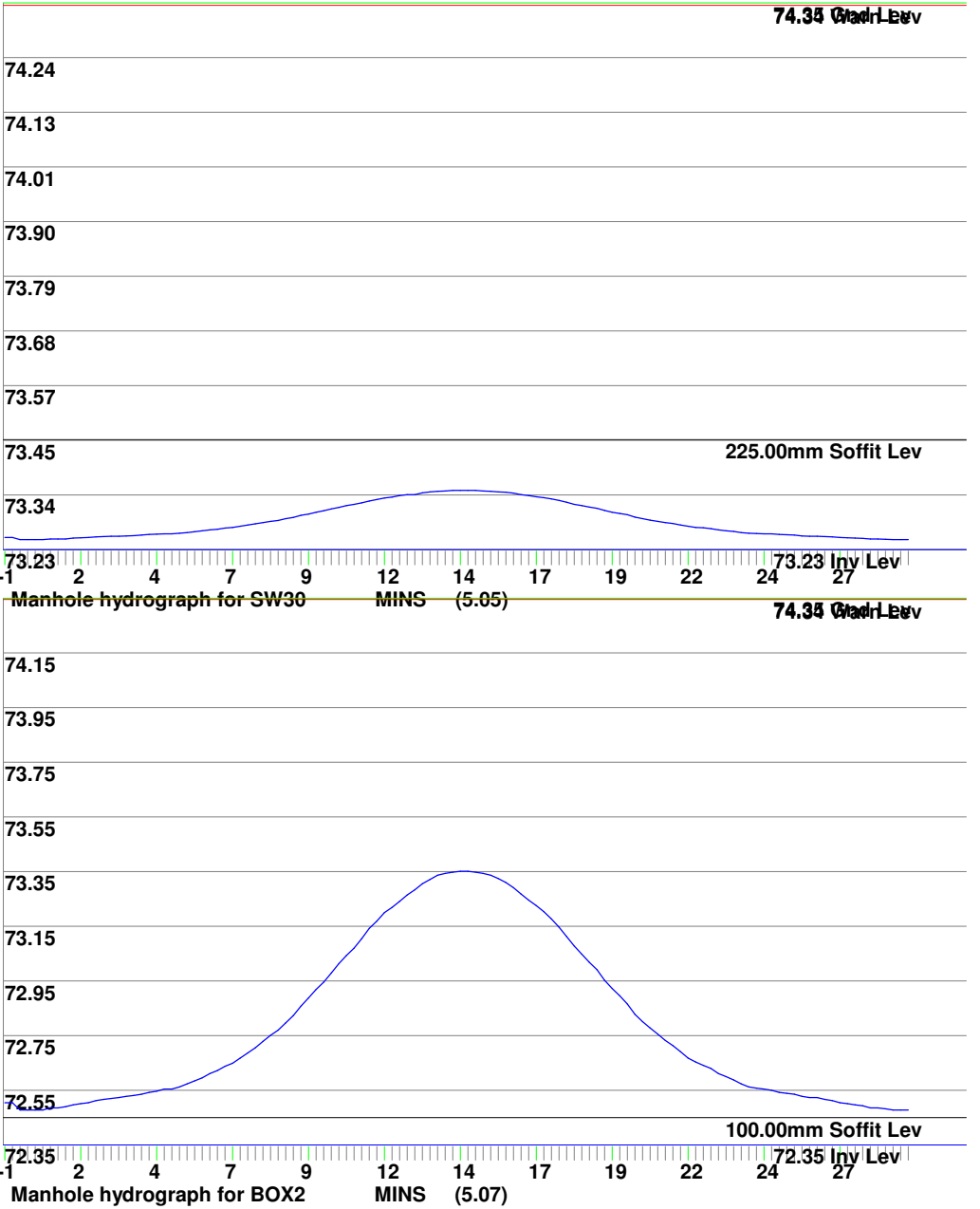
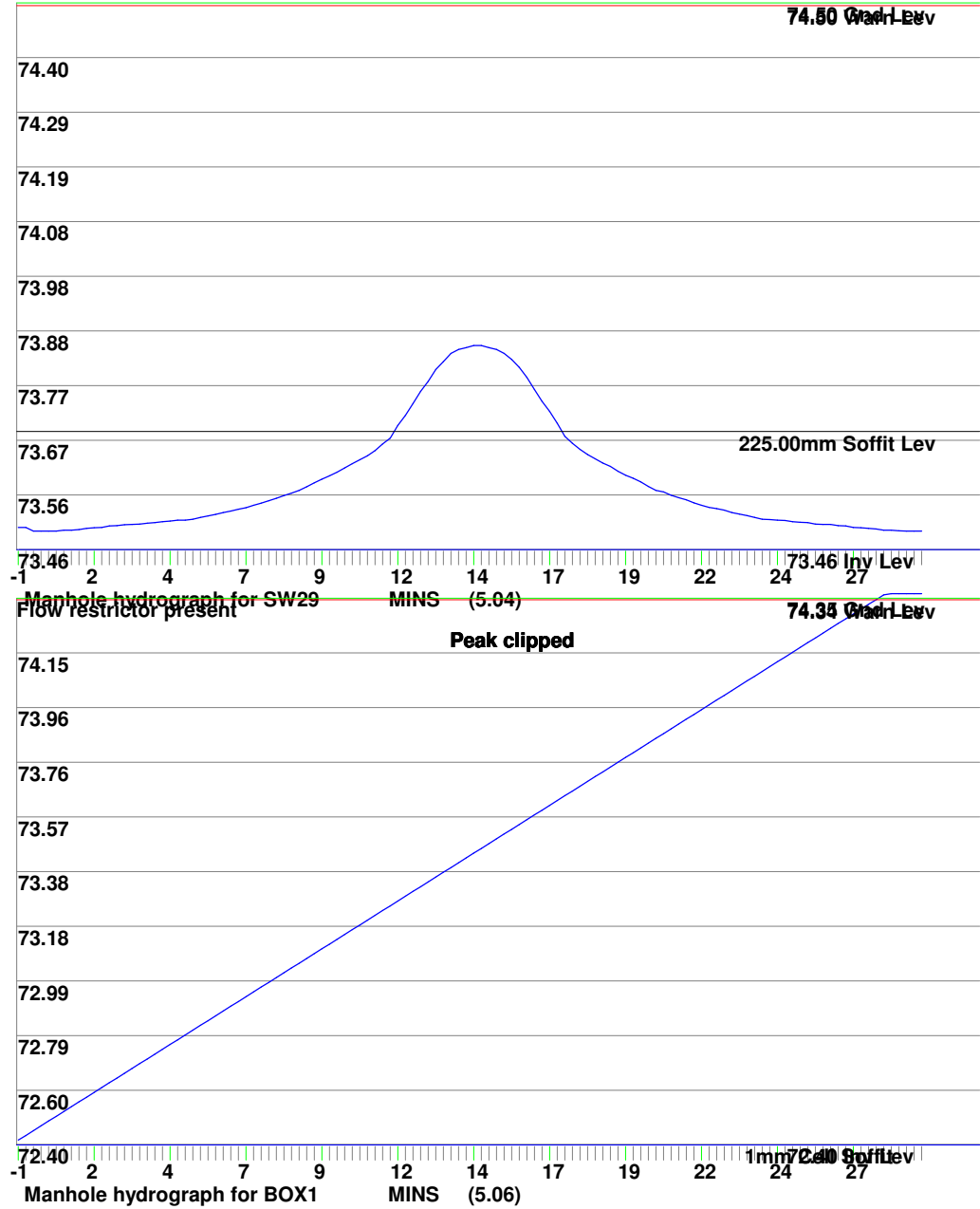
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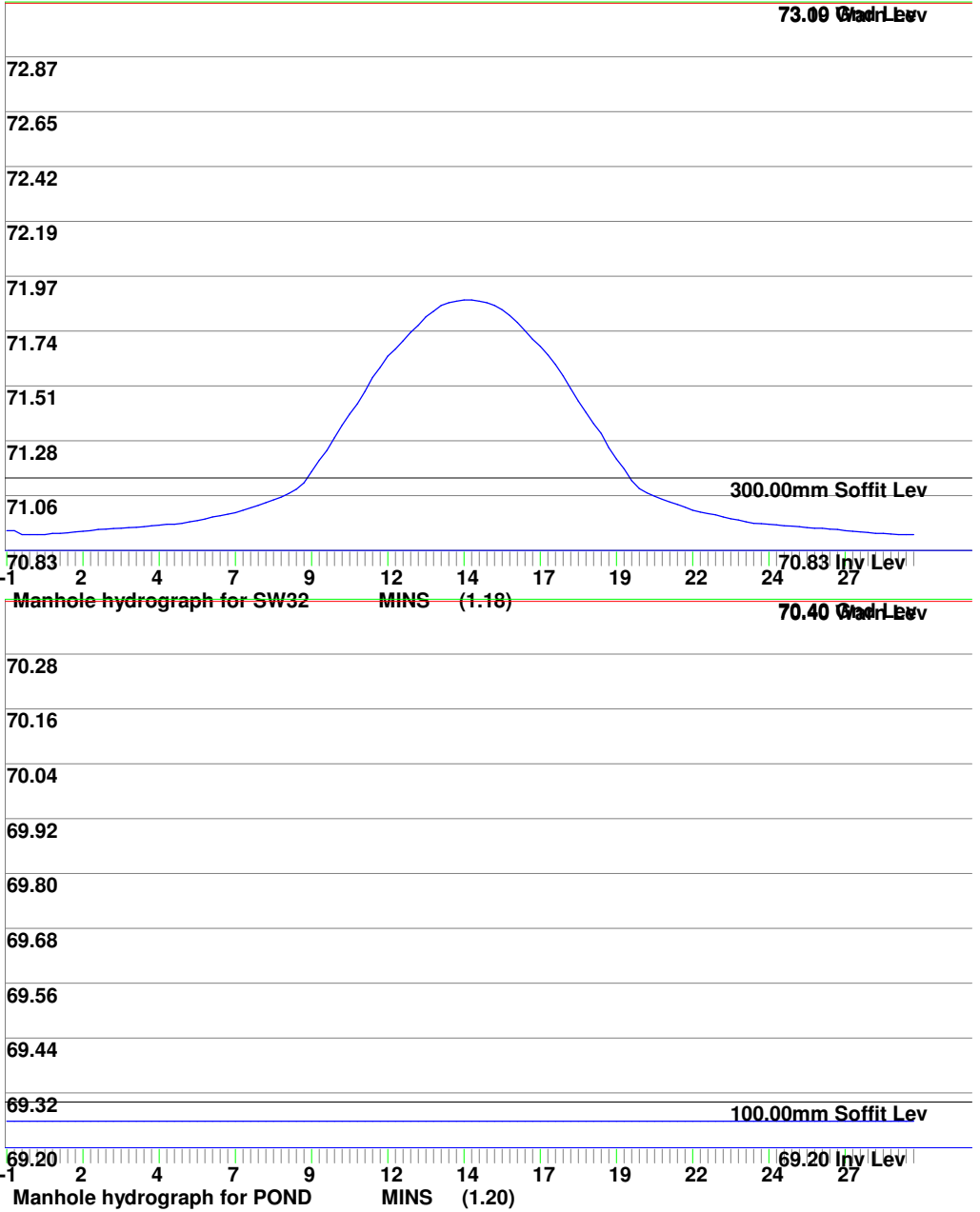
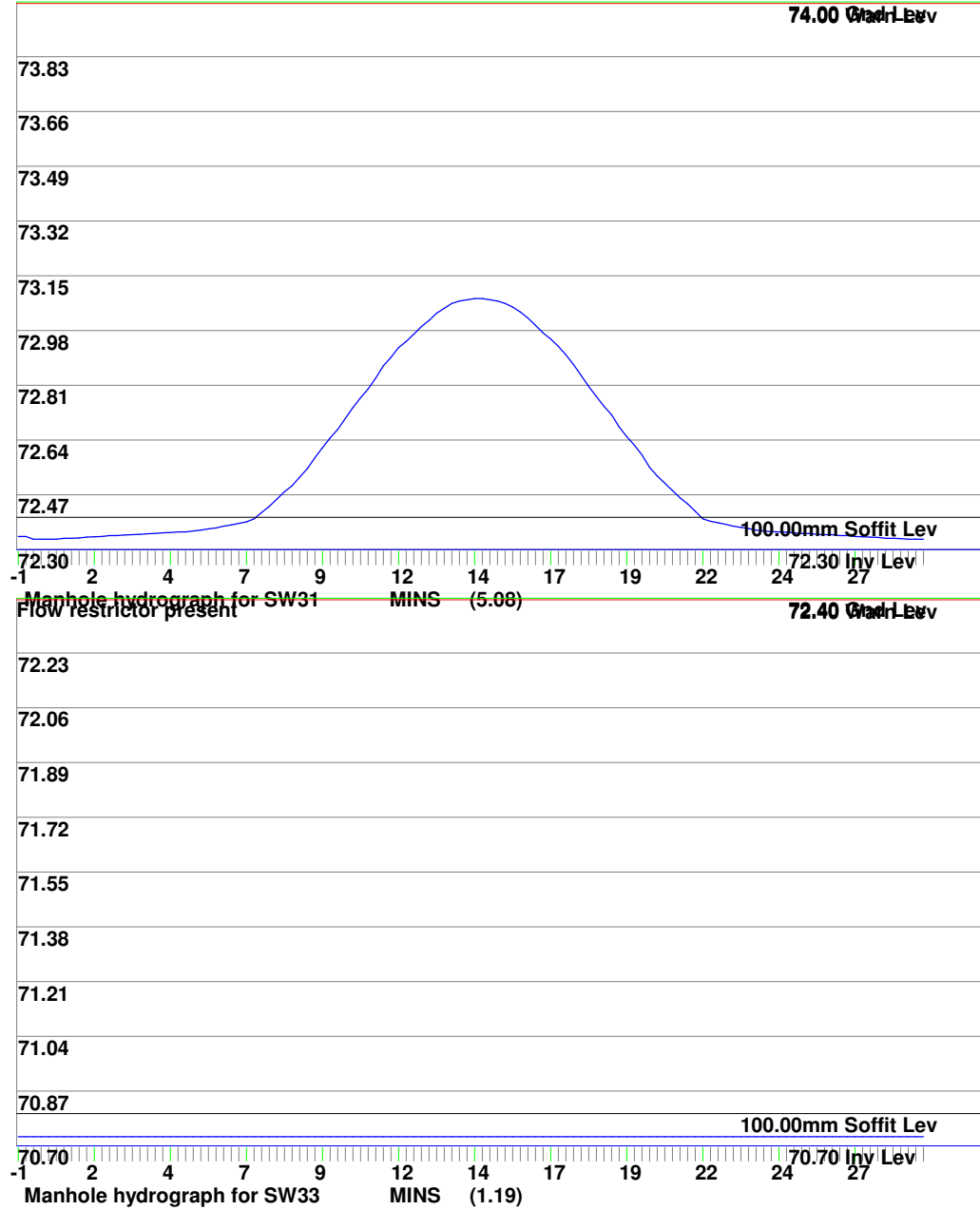
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

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

Mean rain intens. 83.00 mm/hr
Storm profile = summer
Using FSR data

Peak rain intens. 325.36 mm/hr
Sample period = 15.0 secs.

Entry	SECT.:	MANHOLE	PIPE	RATE	PIPE	CHAMBER	INVERT:	WATER	GRND	SURCHARGE		EXCESS	FLOODED	DRAINED	STATUS		
No.	No.:	REF	CAPACITY	FLOW	SIZE	:DIAM/LxW	LEVEL	LEVEL	LEVEL	:	:	:	:	:AREA (m²):	:		
:	:	:	l/s	l/s	mm	: mm	: m	: m	: m	:	fract.	Depth	:	l/s	m³	:x FACTOR:	
1	I	1.01	SW1	14.5	13.9	150	1200	76.40	76.54	77.00	0.96	0.14	:	0.00	0.00	147	OK
2	I	1.02	SW2	25.1	27.3	225	1200	76.30	76.55	77.00	1.09	0.25	:	2.18	0.00	289	Surch.
3	I	1.03	SW3	58.1	43.6	225	1200	76.19	76.35	77.00	0.75	0.16	:	0.00	0.00	462	OK
4	I	1.04	SW4	53.0	52.9	225	1200	76.12	76.34	77.00	1.00	0.22	:	0.00	0.00	560	OK
5	I	1.05	SW6	60.4	63.0	225	1200	75.89	76.15	77.50	1.04	0.26	:	2.51	0.00	667	Surch.
6	B	2.01	SW5	6.3	9.9	100	1200	75.89	76.04	77.00	1.57	0.15	:	3.58	0.00	104	Surch.
7	I	1.06	SW7	108.9	82.3	225	1200	75.66	75.82	77.50	0.76	0.16	:	0.00	0.00	872	OK
8	B	3.01	SW8	2.9	2.5	100	1200	74.40	74.48	75.00	0.85	0.08	:	0.00	0.00	27	OK
9	B	3.02	SW9	12.1	24.0	150	1200	74.35	74.66	75.00	1.99	0.31	:	11.93	0.00	255	Surch.
10	I	1.07	SW10	132.9	137.1	300	1800	74.30	74.62	75.00	1.03	0.32	:	4.23	0.00	1453	Surch.
11	I	1.08	SW11	126.7	157.2	300	2100	73.90	74.33	74.50	1.24	0.43	:	30.55	0.00	1665	Warning
12	I	1.09	SW12	249.5	177.3	300	1800	73.66	73.86	74.50	0.71	0.20	:	0.00	0.00	1878	OK
13	I	1.10	SW13	124.2	193.2	300	2100	73.25	73.85	74.00	1.56	0.60	:	69.01	0.00	2047	Warning
14	I	1.11	SW14	194.0	206.3	300	1500	72.97	73.37	73.75	1.06	0.40	:	12.33	0.00	2186	Surch.
15	I	1.12	SW15	144.8	219.1	300	1500	72.50	73.43	73.75	1.51	0.93	:	74.24	0.00	2321	Surch.
16	I	1.13	SW16	167.9	227.5	300	1500	72.23	73.04	73.75	1.36	0.81	:	59.63	0.00	2410	Surch.
17	I	1.14	SW17	110.5	227.5	300	1500	72.20	73.49	73.75	2.06	1.29	:	117.04	0.00	2410	Warning
18	I	1.15	SW18	143.6	227.5	300	1200	71.90	73.31	73.75	1.58	1.41	:	83.89	0.00	2410	Surch.
19	I	1.16	SW19	123.5	236.9	300	1200	71.87	73.68	73.75	1.92	1.81	:	113.46	0.00	2510	Warning
20	B	4.01	SW20	7.2	6.6	100	1200	73.40	73.49	74.00	0.92	0.09	:	0.00	0.00	70	OK
21	B	4.02	SW21	10.0	12.5	100	1200	73.28	73.41	74.00	1.25	0.13	:	2.49	0.00	132	Surch.
22	B	4.03	SW22	20.0	19.4	150	1200	73.16	73.30	74.00	0.97	0.14	:	0.00	0.00	205	OK
23	B	4.04	SW23	51.6	25.3	150	1200	72.89	72.96	74.35	0.49	0.07	:	0.00	0.00	268	OK
24	I	1.17	SW24	214.6	275.0	300	1200	71.60	72.70	73.75	1.28	1.10	:	60.44	0.00	2914	Surch.
25	B	5.01	SW25	19.6	18.9	150	1200	74.20	74.34	75.00	0.97	0.14	:	0.00	0.00	200	OK
26	B	5.02	SW26	58.1	57.3	225	1200	74.07	74.29	75.00	0.99	0.22	:	0.00	0.00	607	OK
27	B	5.03	SW27	58.5	77.9	225	1200	73.94	74.42	75.00	1.33	0.48	:	19.45	0.00	826	Surch.
28	S1	6.01	SW28	16.5	15.6	150	1200	73.73	73.86	74.50	0.94	0.13	:	0.00	0.00	165	OK
29	B	5.04	SW29	59.2	112.2	225	1200	73.46	74.39	74.50	1.89	0.93	:	52.94	0.00	1188	Warning



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Title	Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

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		EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS	
30	B	5.05	SW30	130.7	112.2	225	1200	73.23	73.41	74.35	0.86	0.18	0.00	0.00	1188	OK
31	B	5.06	BOX1‡	Cell	2.0	0.01x0.0	1200	72.40	72.45	74.35	1.00	0.05	0.00	0.00	0	OK
32	B	5.07	BOX2	3.6	112.2	100	1200	72.35	73.89	74.35	31.17	1.54	108.58	0.00	1188	Surch.
33	B	5.08	SW31	20.3	112.2	100	1200	72.30	73.62	74.00	5.51	1.32	91.84	0.00	1188	Surch.
34	I	1.18	SW32	122.0	387.2	300	1800	70.83	72.69	73.10	3.18	1.86	265.26	0.00	4102	Surch.
35	I	1.19	SW33‡	21.6	5.0	100	1200	70.70	70.73	72.40	0.23	0.03	0.00	0.00	0	OK
36	I	1.20	POND	8.3	5.0	100	1200	69.20	69.26	70.40	0.60	0.06	0.00	0.00	0	OK



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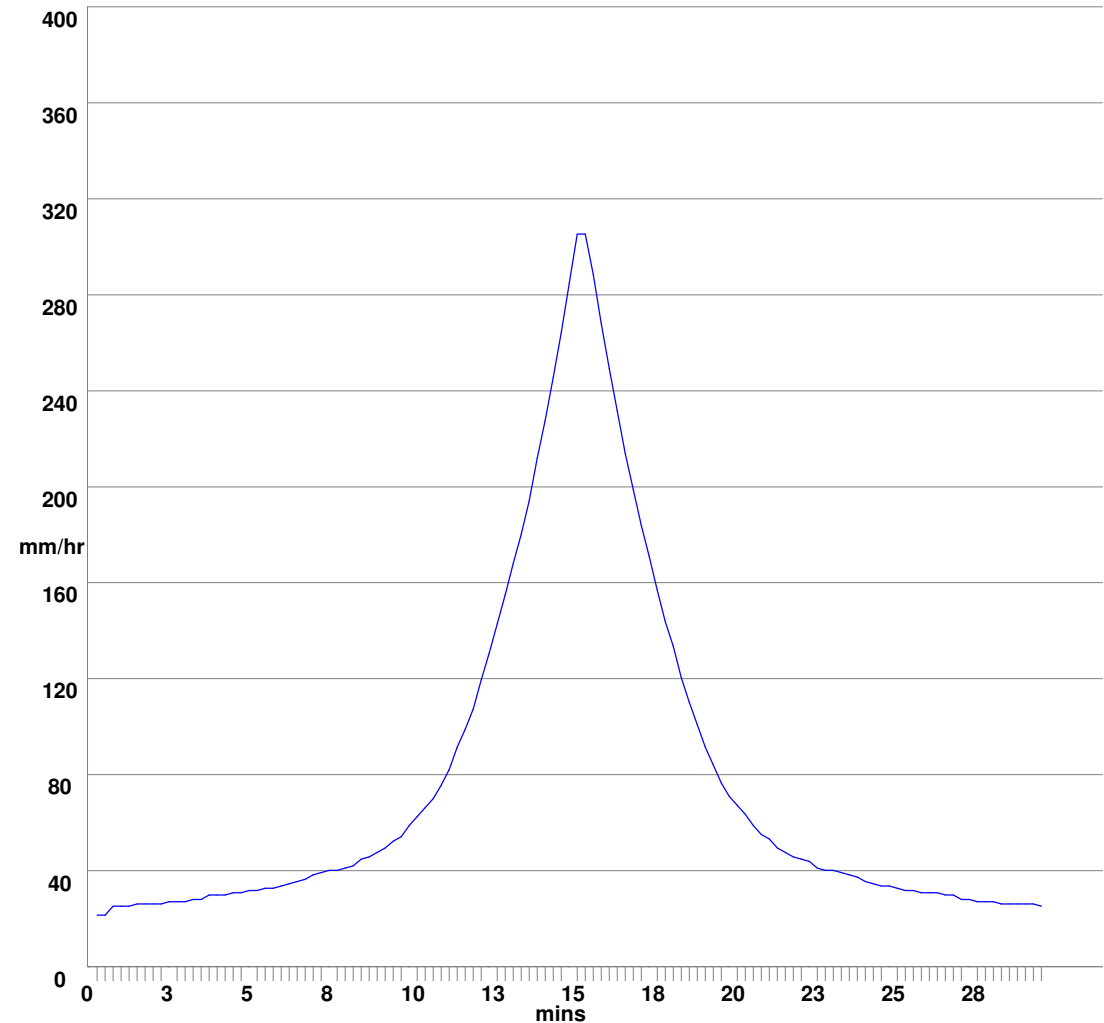
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Project	
Title	Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:15	23.34	10:15	66.68	20:15	71.68
0:30	23.34	10:30	70.85	20:30	67.52
0:45	26.67	10:45	75.02	20:45	63.35
1:00	26.67	11:00	80.85	21:00	59.18
1:15	26.67	11:15	88.35	21:15	56.68
1:30	27.51	11:30	97.52	21:30	53.35
1:45	27.51	11:45	105.86	21:45	50.85
2:00	28.34	12:00	115.03	22:00	49.18
2:15	28.34	12:15	127.53	22:15	47.51
2:30	29.17	12:30	140.03	22:30	46.68
2:45	29.17	12:45	152.54	22:45	44.18
3:00	29.17	13:00	165.87	23:00	42.51
3:15	30.01	13:15	180.04	23:15	42.51
3:30	30.01	13:30	193.38	23:30	41.68
3:45	31.67	13:45	208.38	23:45	40.84
4:00	31.67	14:00	226.72	24:00	40.01
4:15	31.67	14:15	244.22	24:15	37.51
4:30	32.51	14:30	262.56	24:30	36.68
4:45	33.34	14:45	283.40	24:45	35.84
5:00	34.17	15:00	305.07	25:00	35.84
5:15	34.17	15:15	326.74	25:15	35.01
5:30	35.01	15:30	326.74	25:30	34.17
5:45	35.01	15:45	309.24	25:45	34.17
6:00	35.84	16:00	286.73	26:00	33.34
6:15	36.68	16:15	266.73	26:15	32.51
6:30	37.51	16:30	247.56	26:30	32.51
6:45	39.18	16:45	229.22	26:45	31.67
7:00	40.84	17:00	212.55	27:00	31.67
7:15	41.68	17:15	196.71	27:15	30.01
7:30	42.51	17:30	182.54	27:30	30.01
7:45	42.51	17:45	168.37	27:45	29.17
8:00	44.18	18:00	154.20	28:00	29.17
8:15	45.01	18:15	142.53	28:15	29.17
8:30	47.51	18:30	129.20	28:30	28.34
8:45	49.18	18:45	118.36	28:45	28.34
9:00	50.85	19:00	107.53	29:00	27.51
9:15	52.51	19:15	98.36	29:15	27.51
9:30	55.85	19:30	90.02	29:30	27.51
9:45	58.35	19:45	81.69	29:45	26.67
10:00	62.51	20:00	75.85	30:00	26.67

Hydrograph profile derived from data in the Flood Studies Report

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





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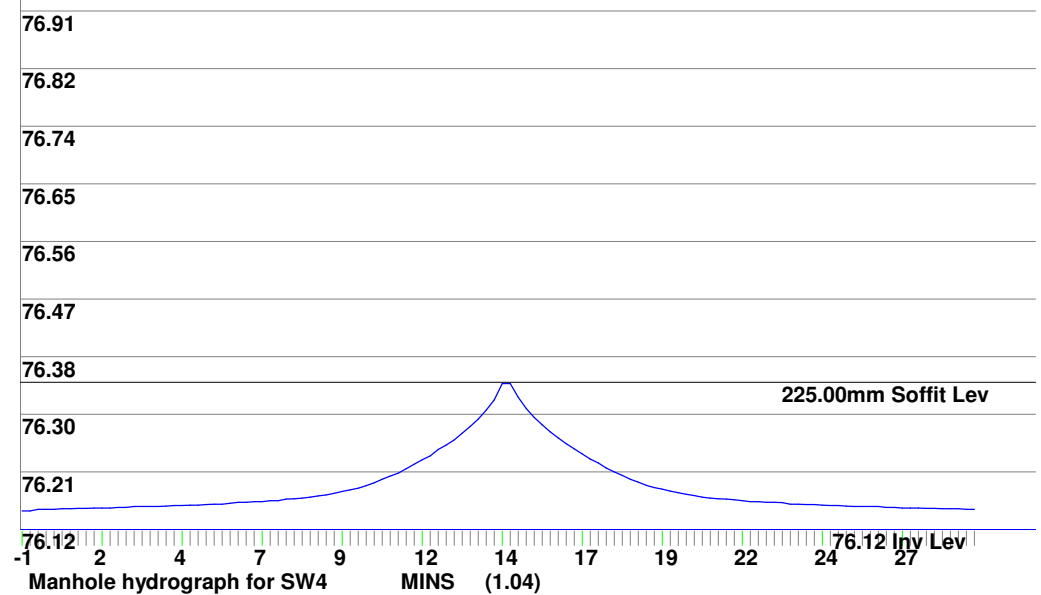
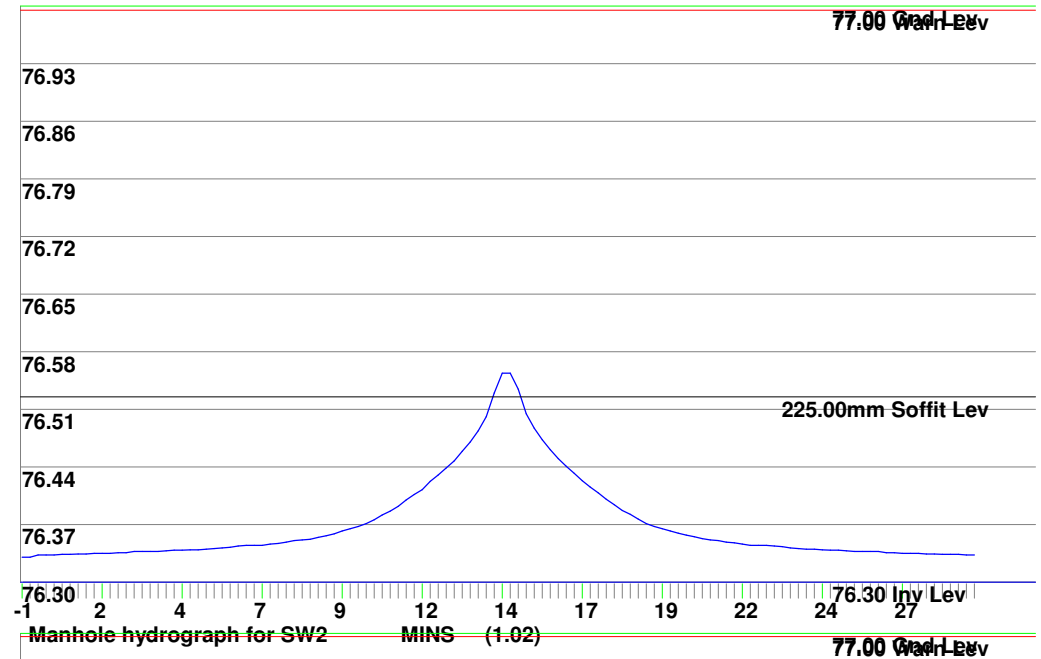
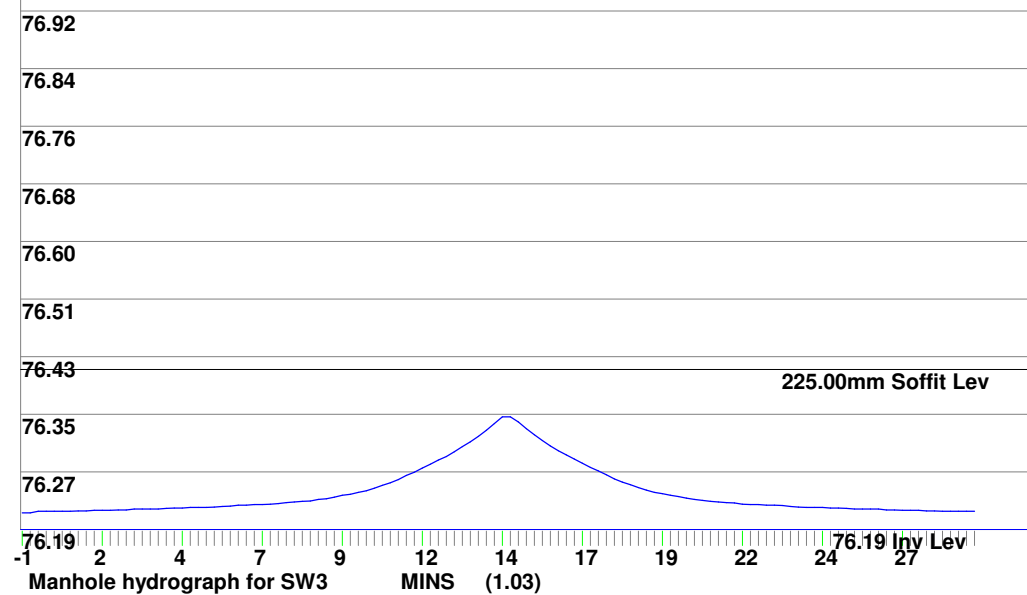
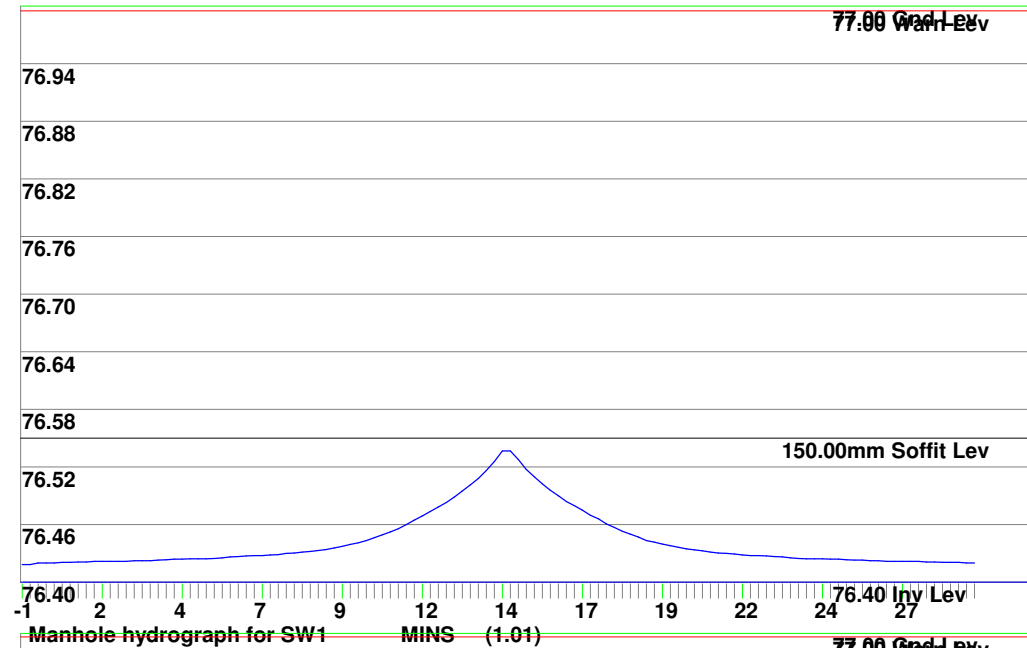
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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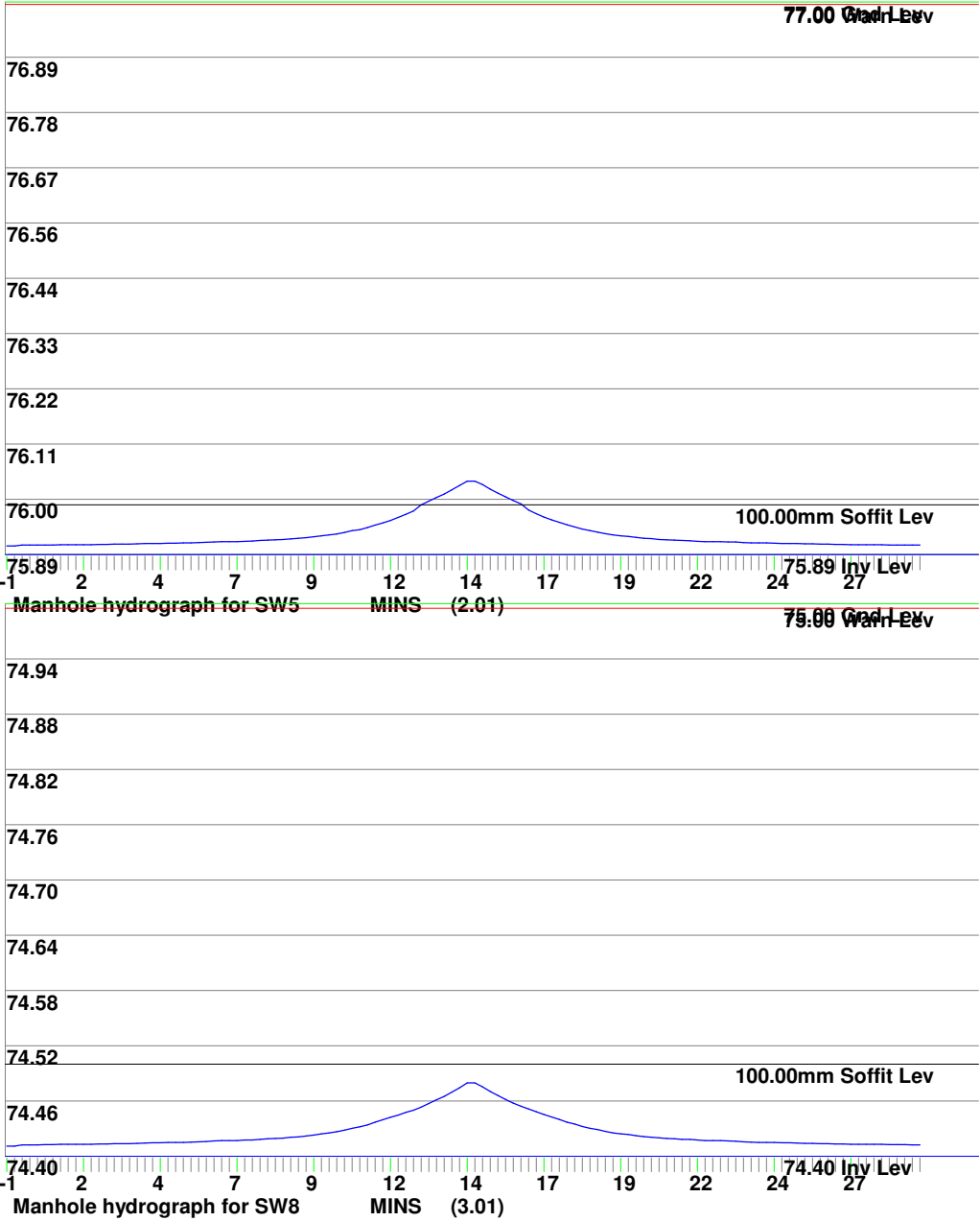
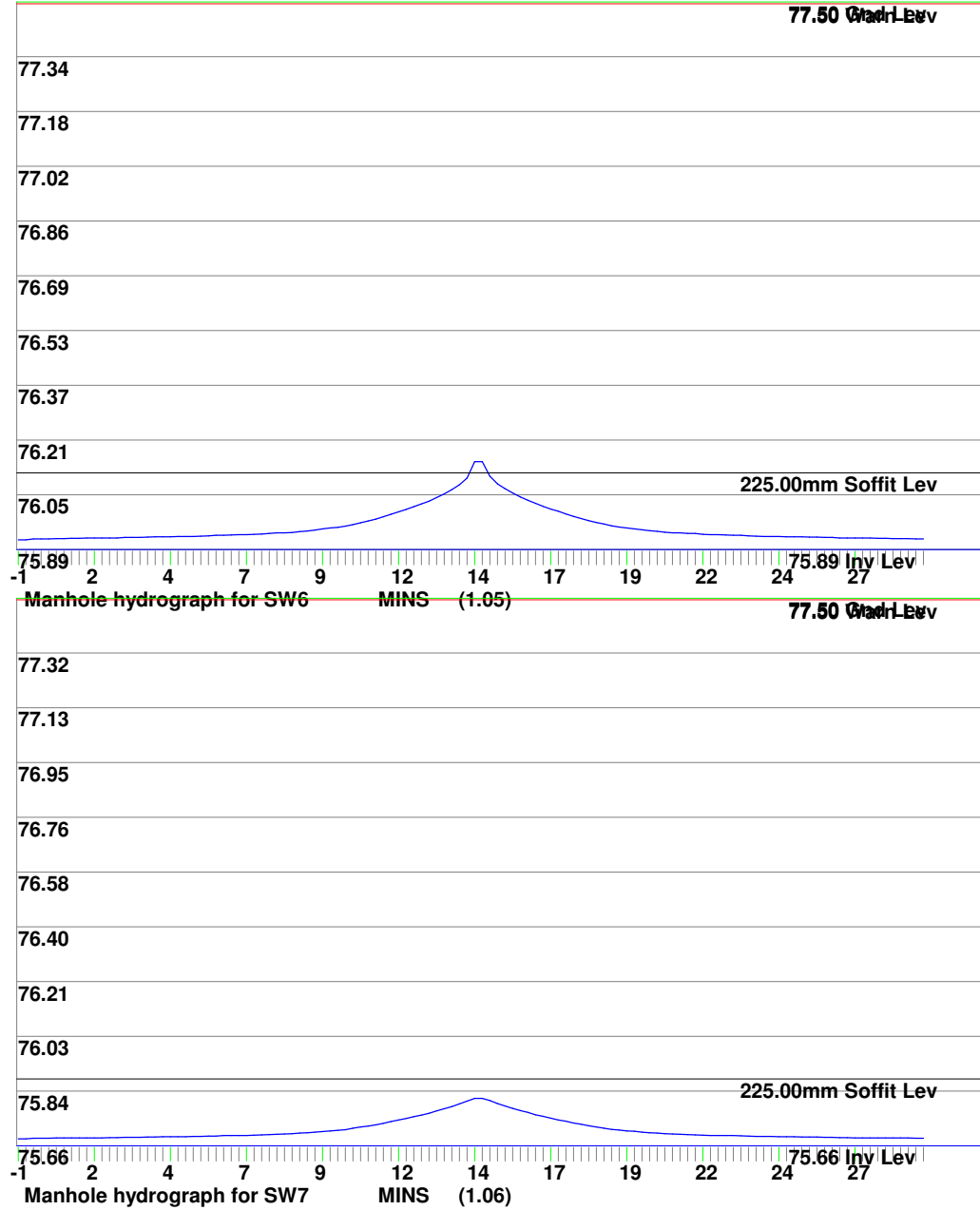
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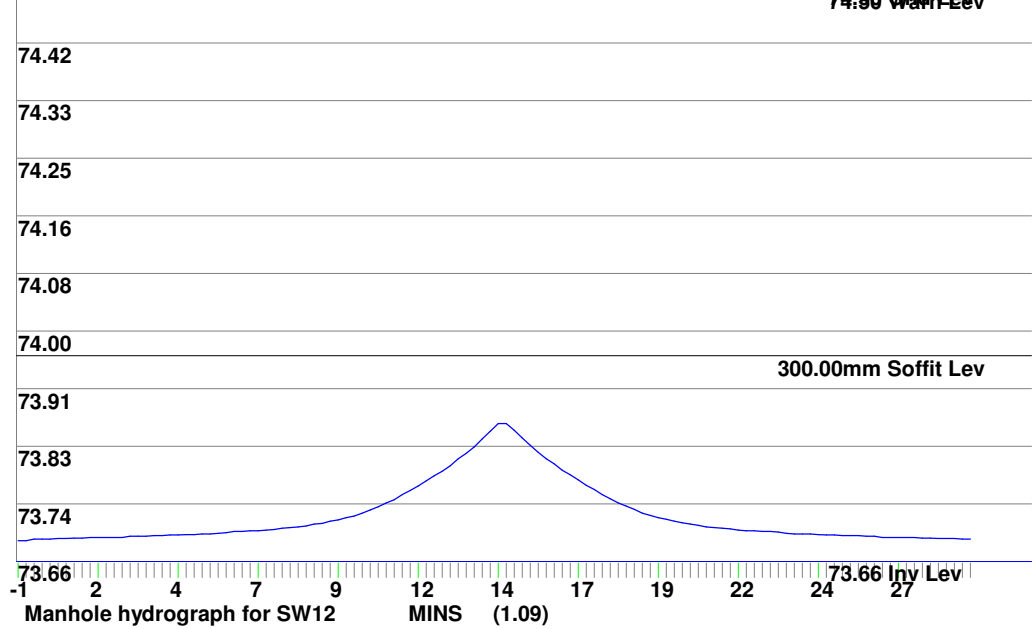
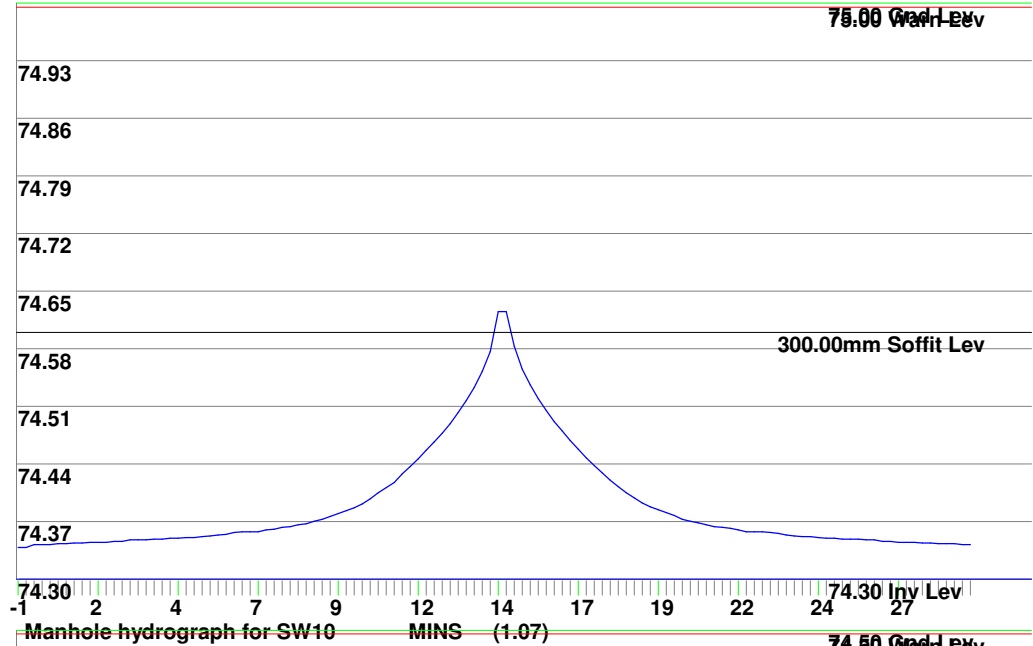
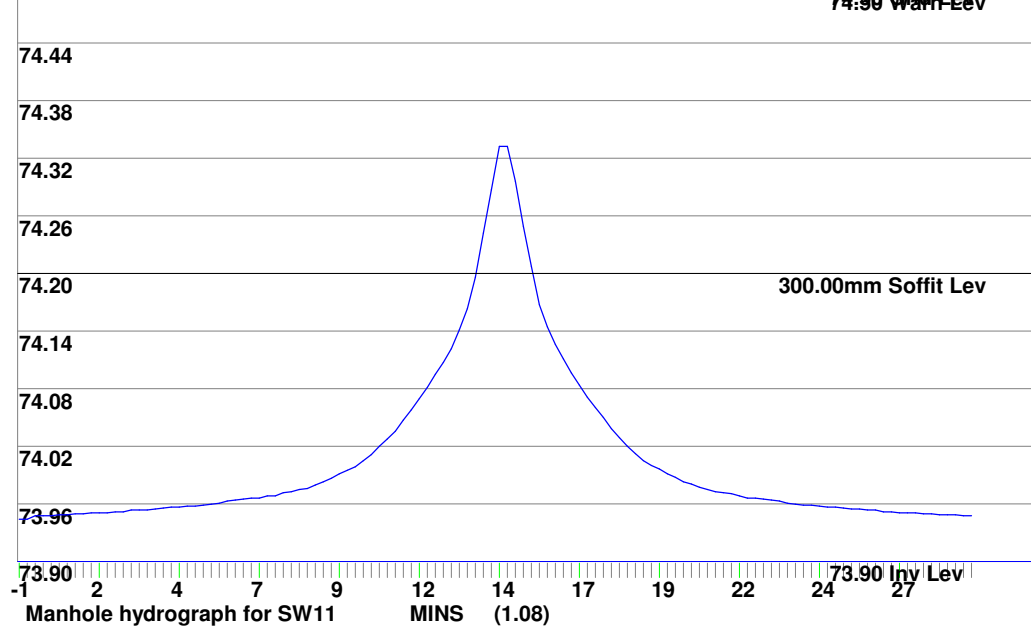
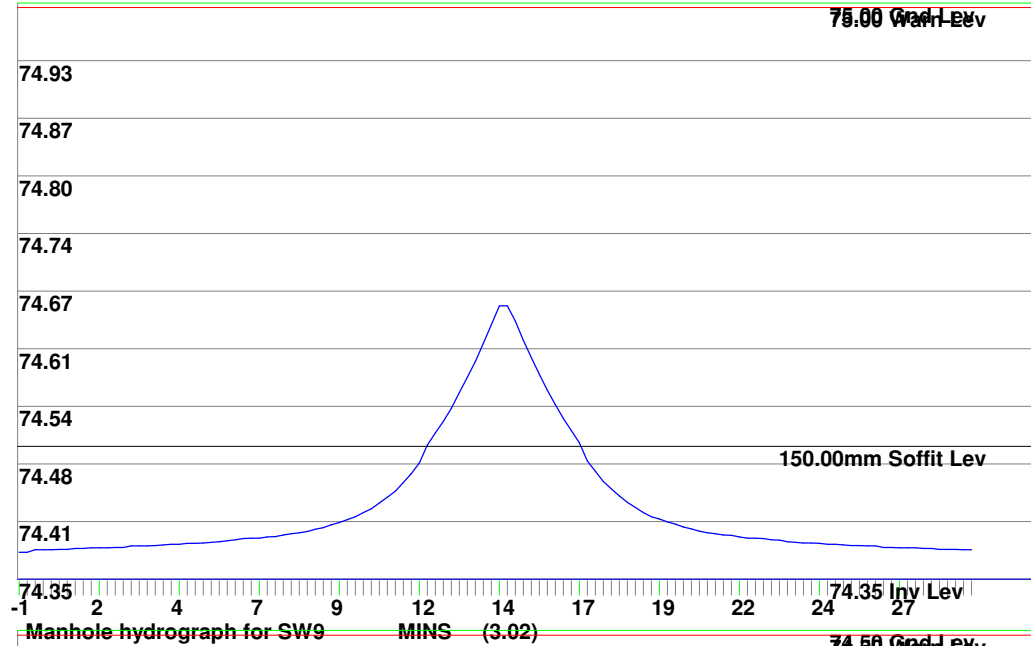
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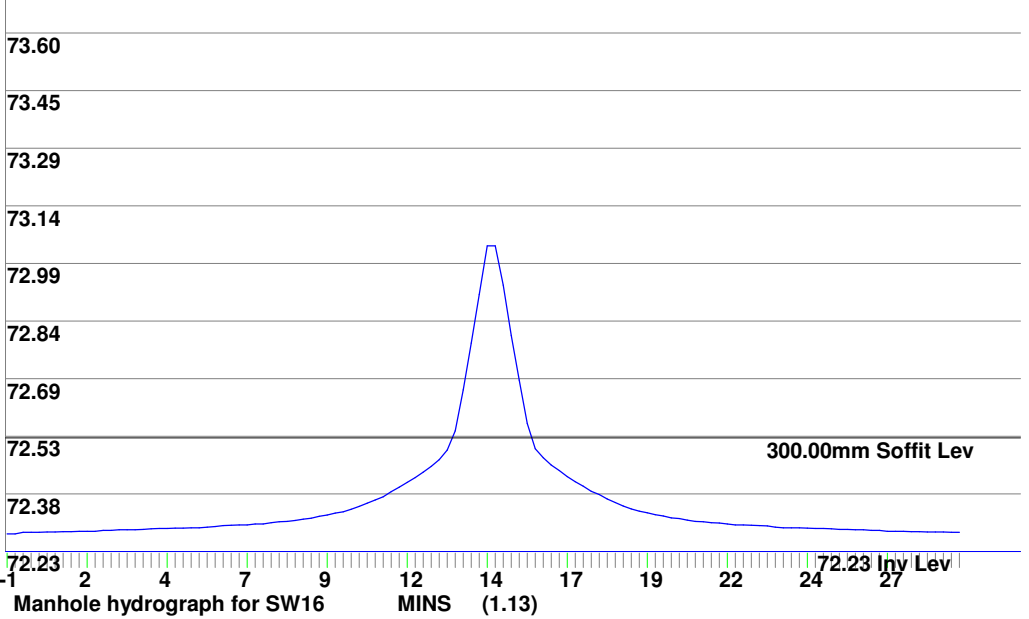
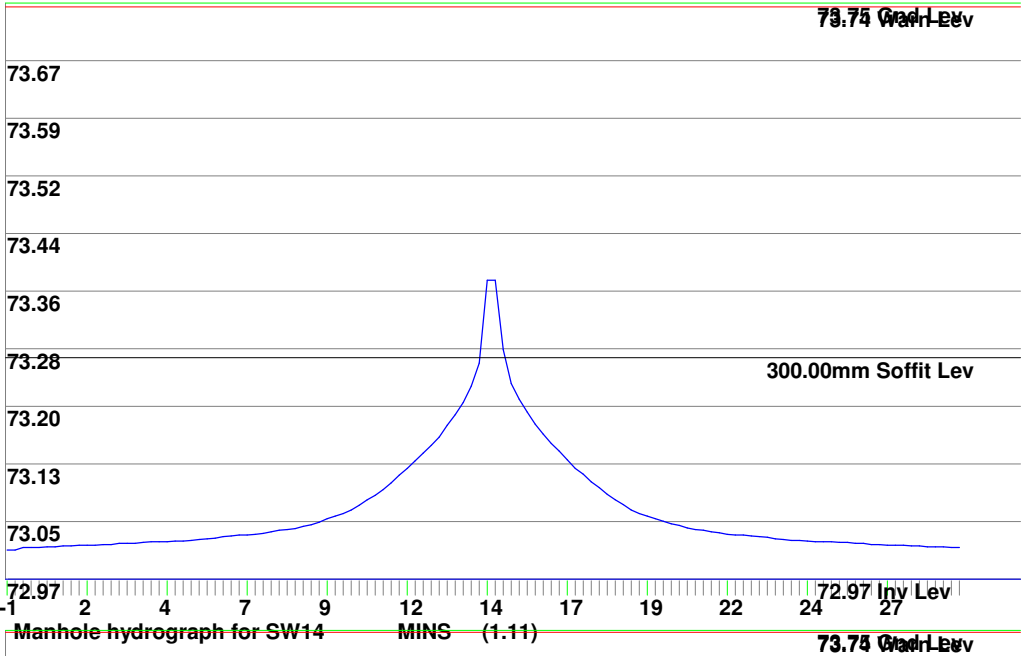
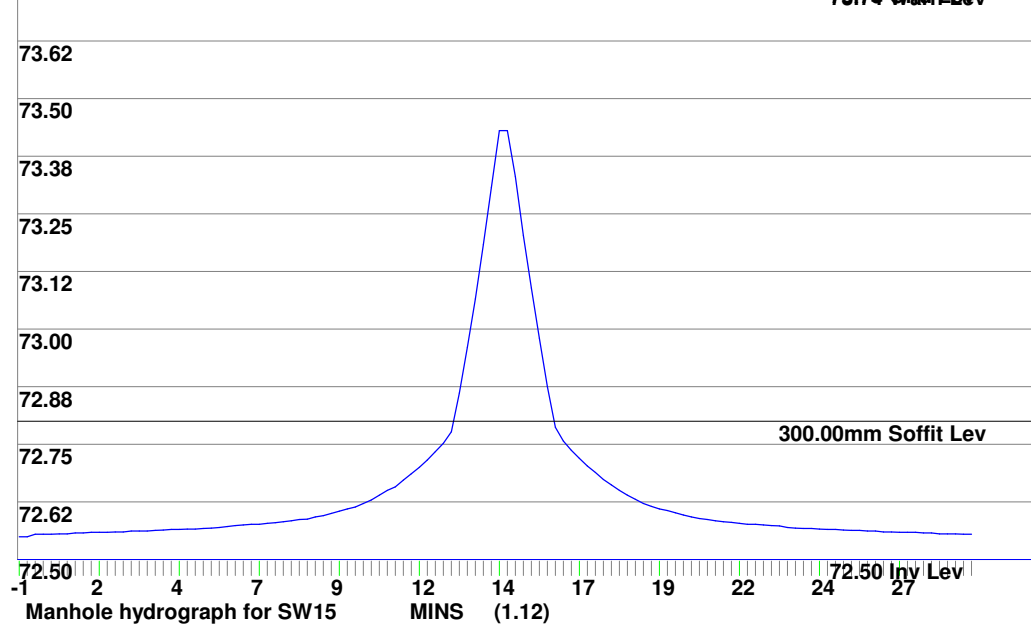
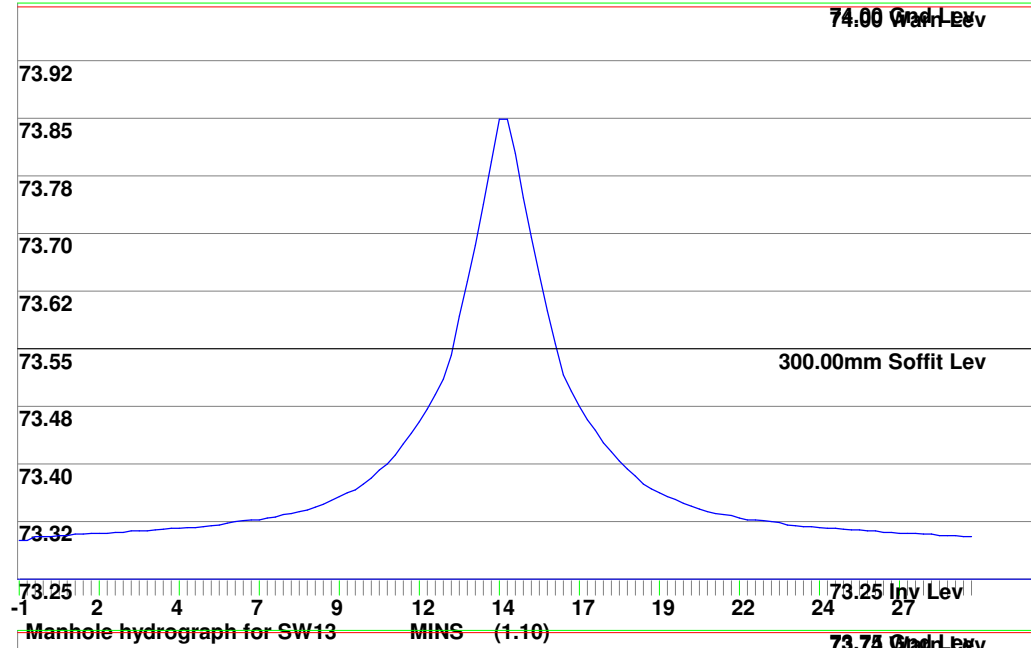
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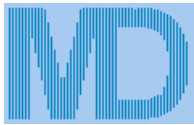
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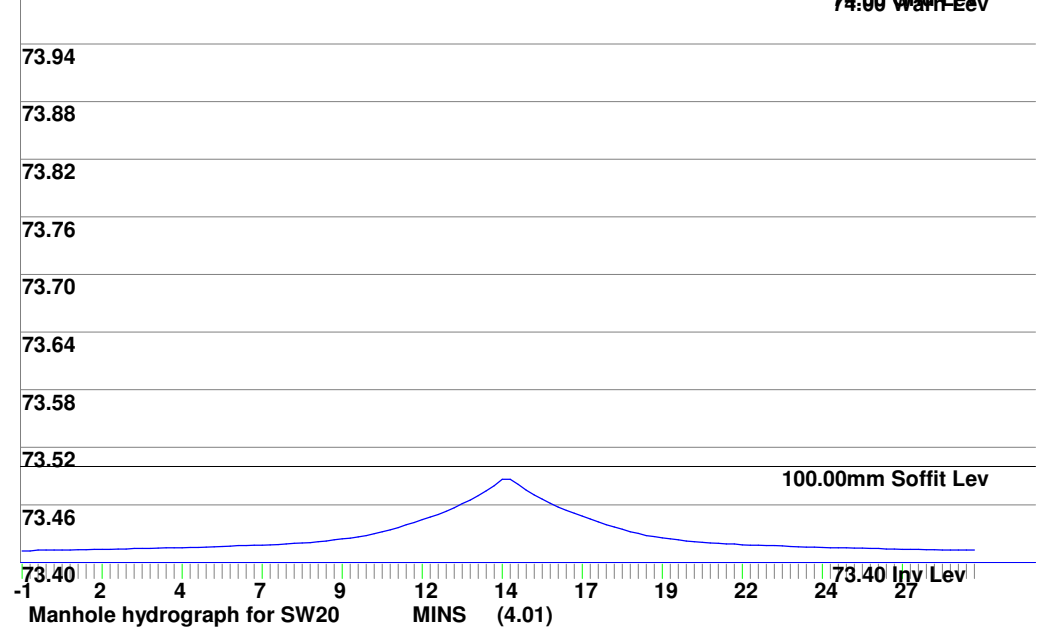
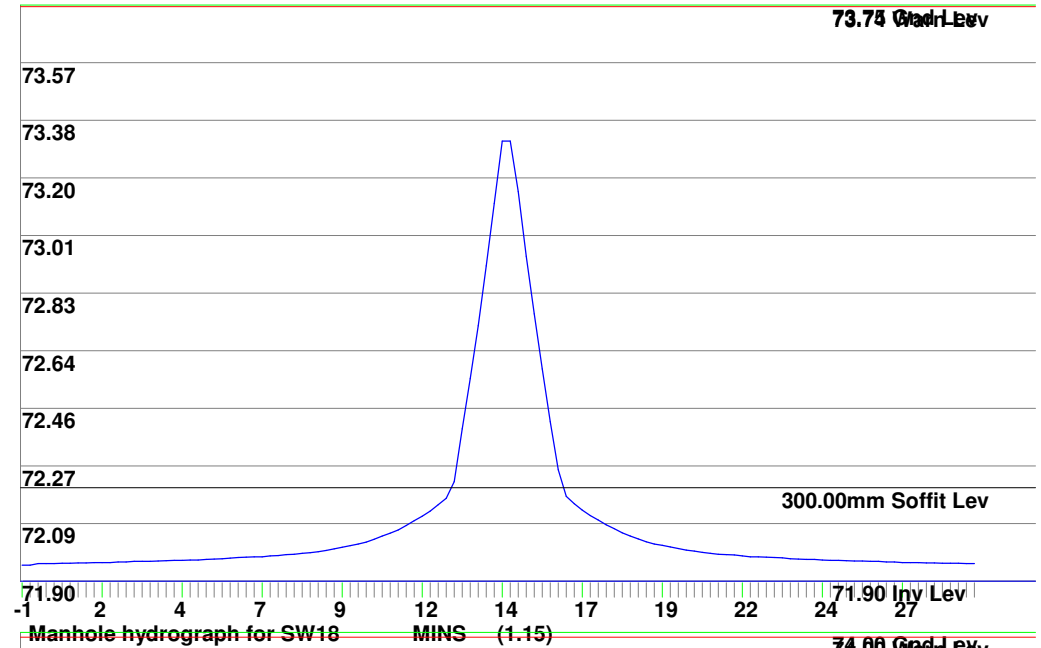
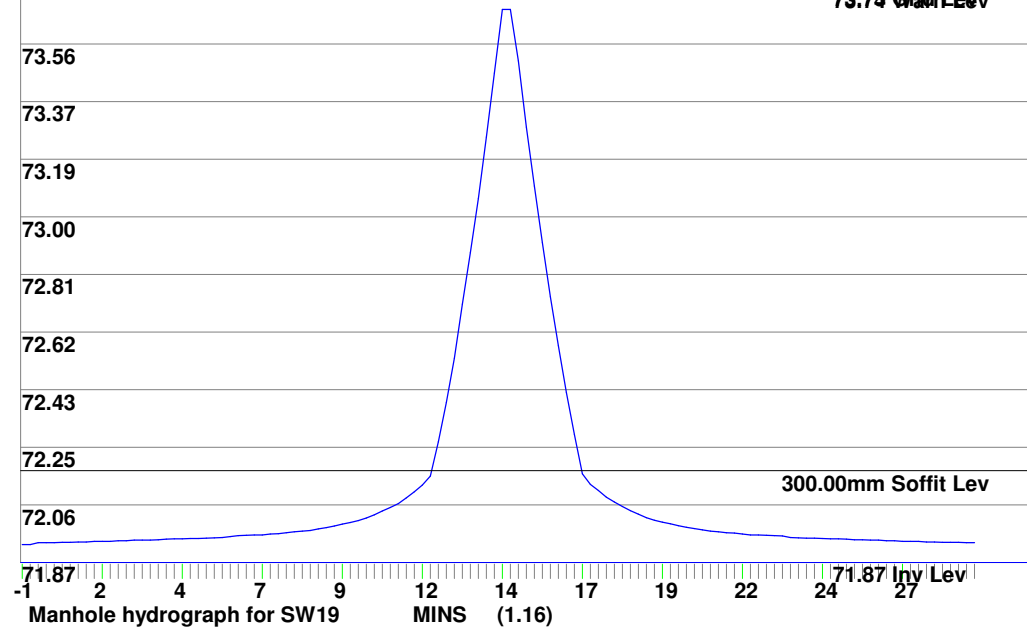
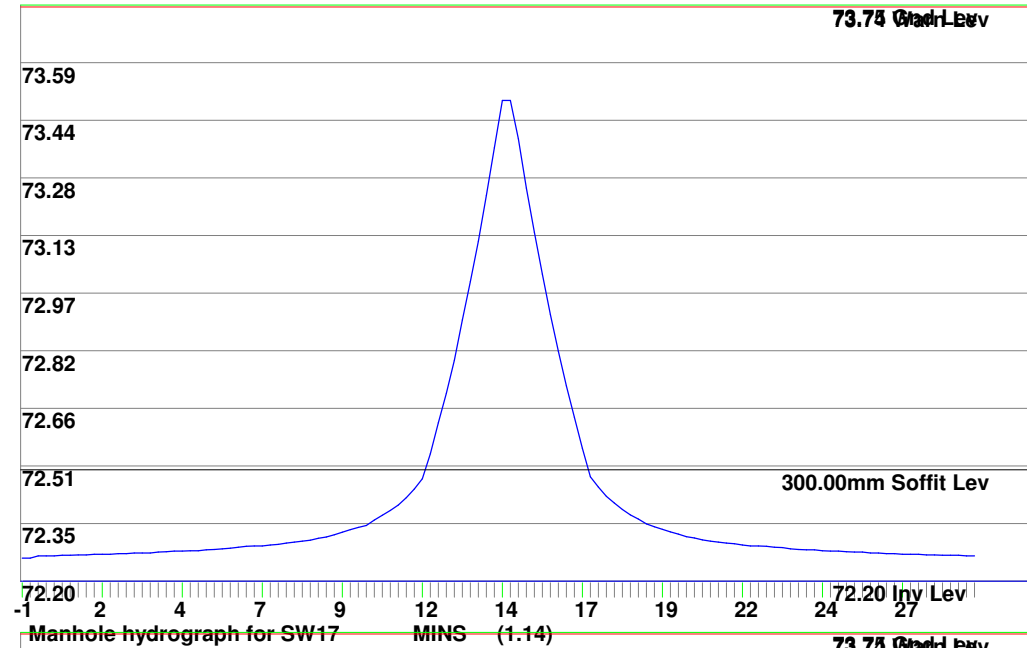
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





MasterDrain
SW

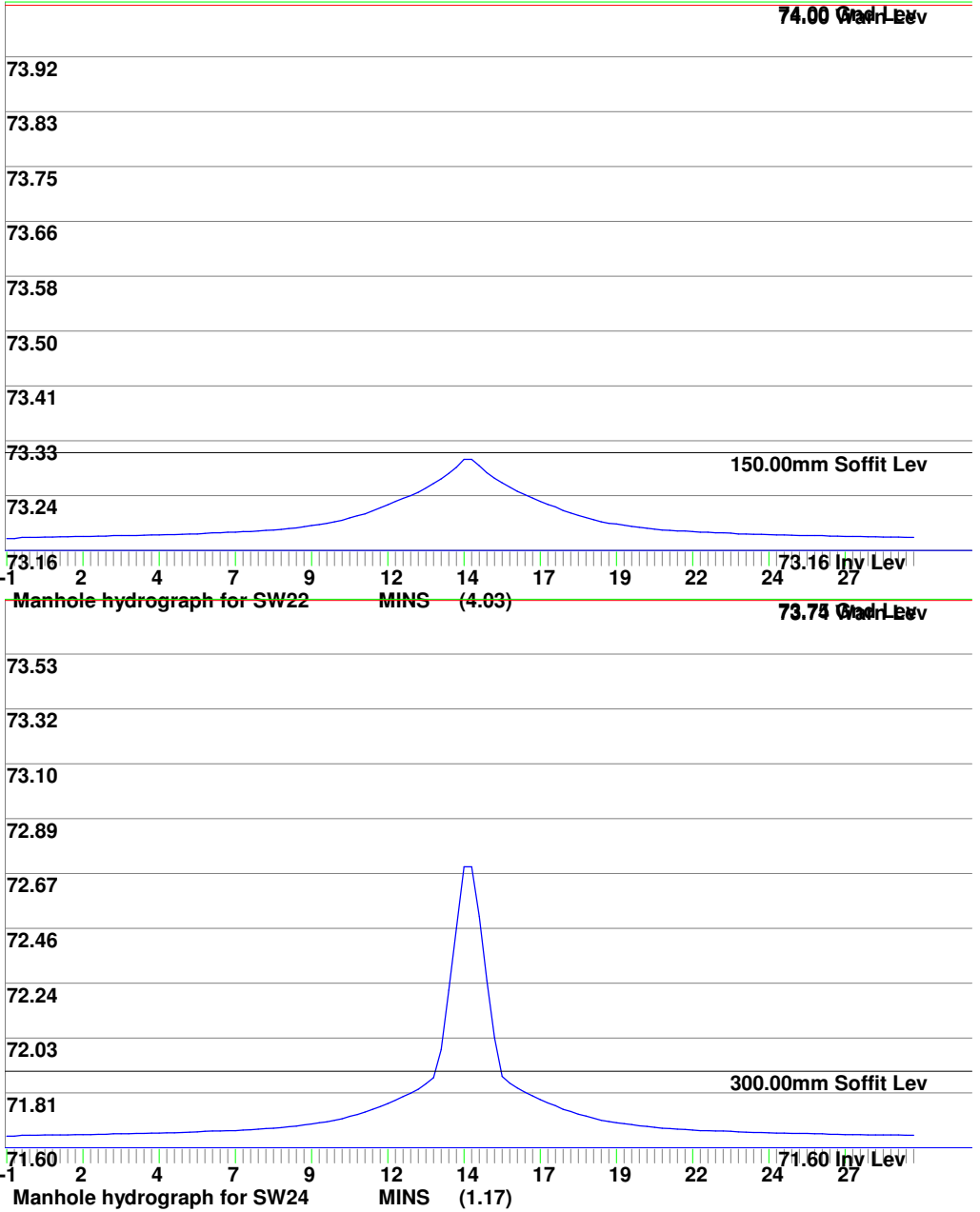
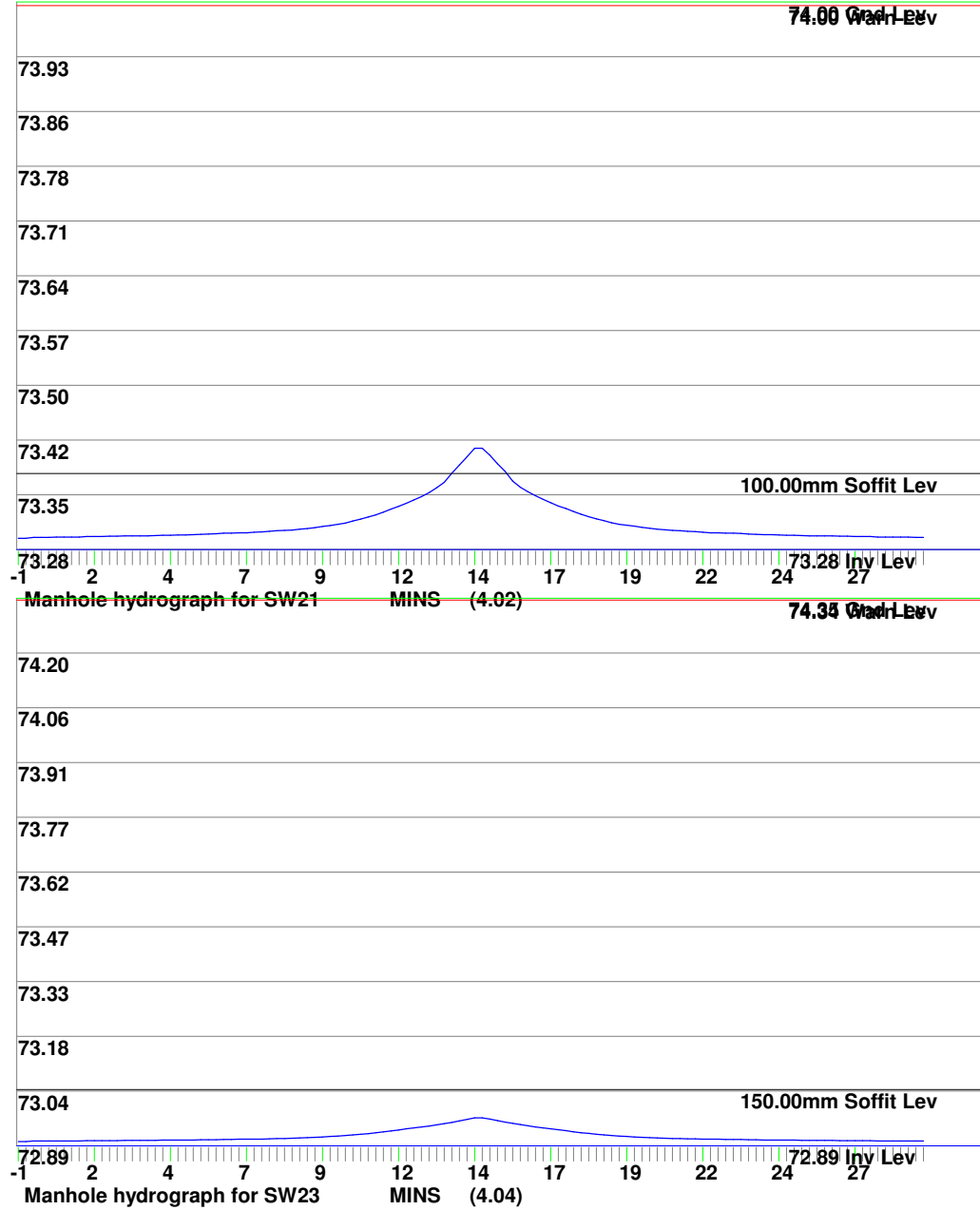
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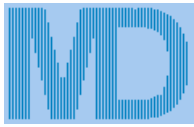
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Title	Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%





MasterDrain
SW

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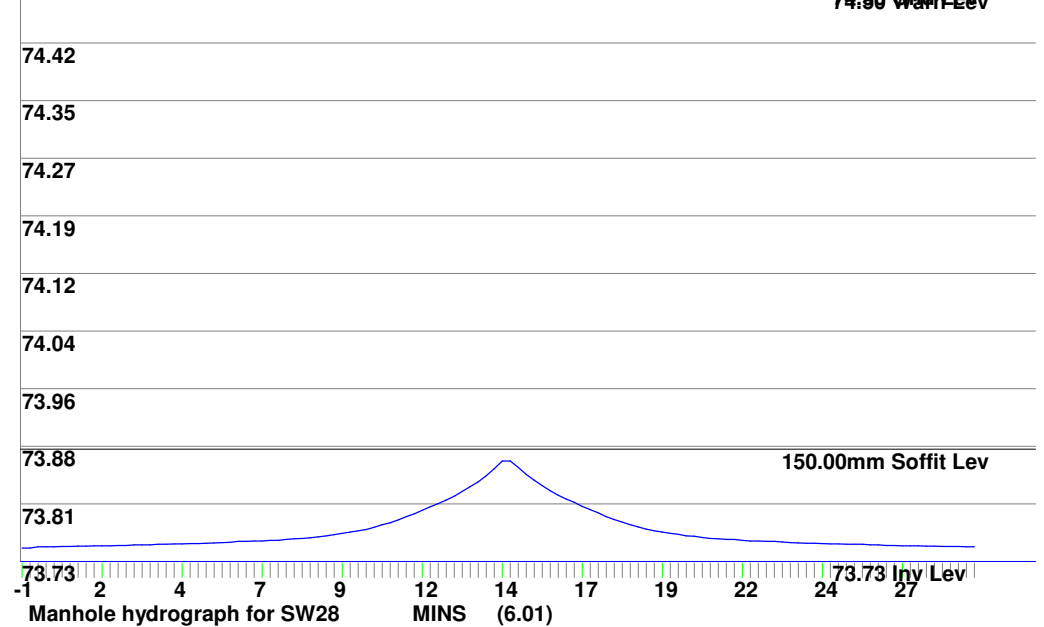
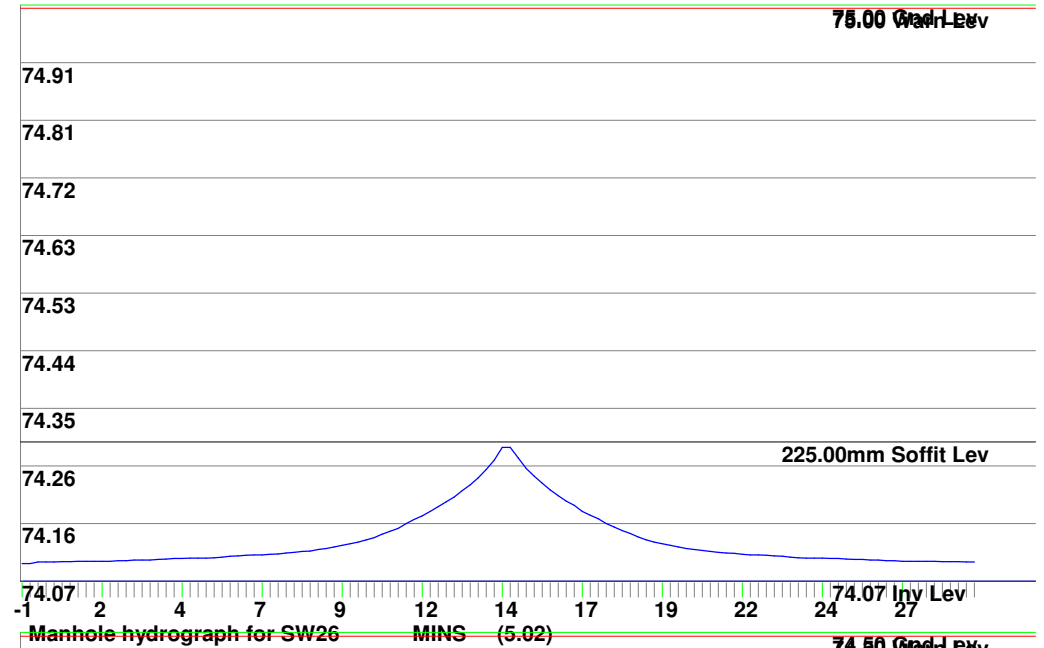
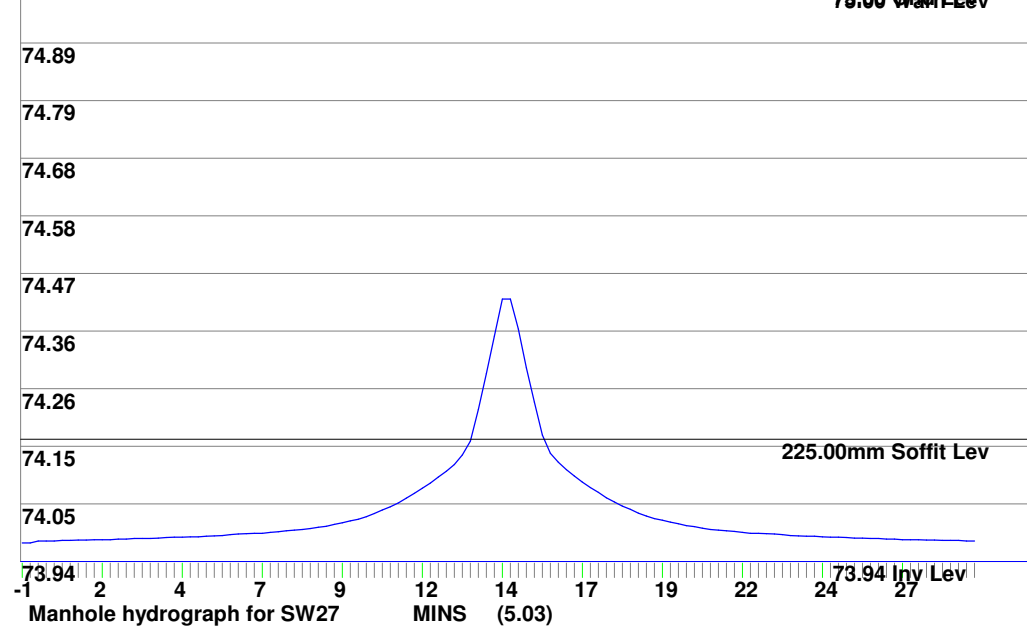
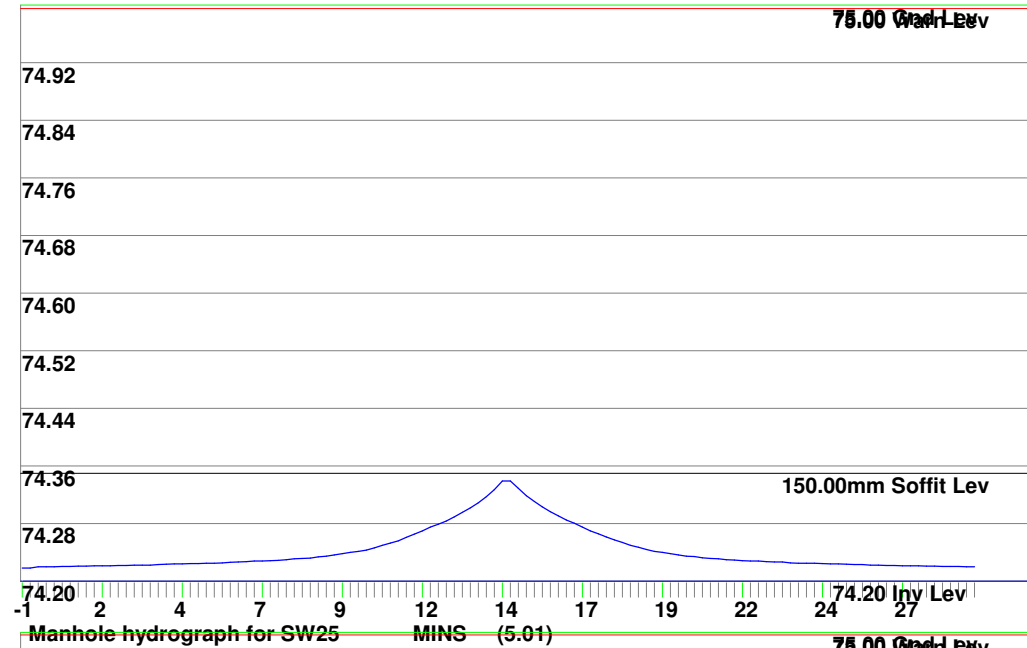
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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SW

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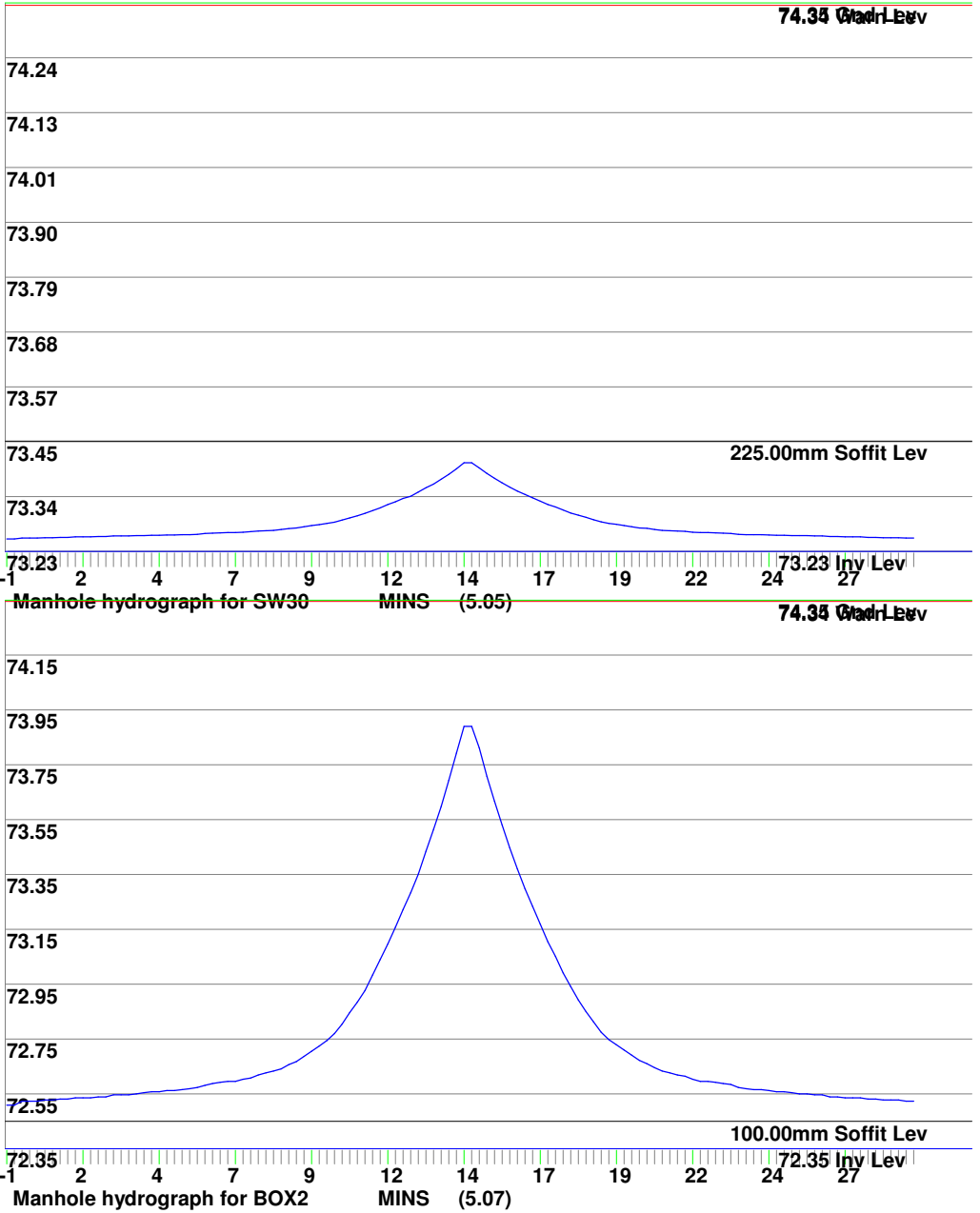
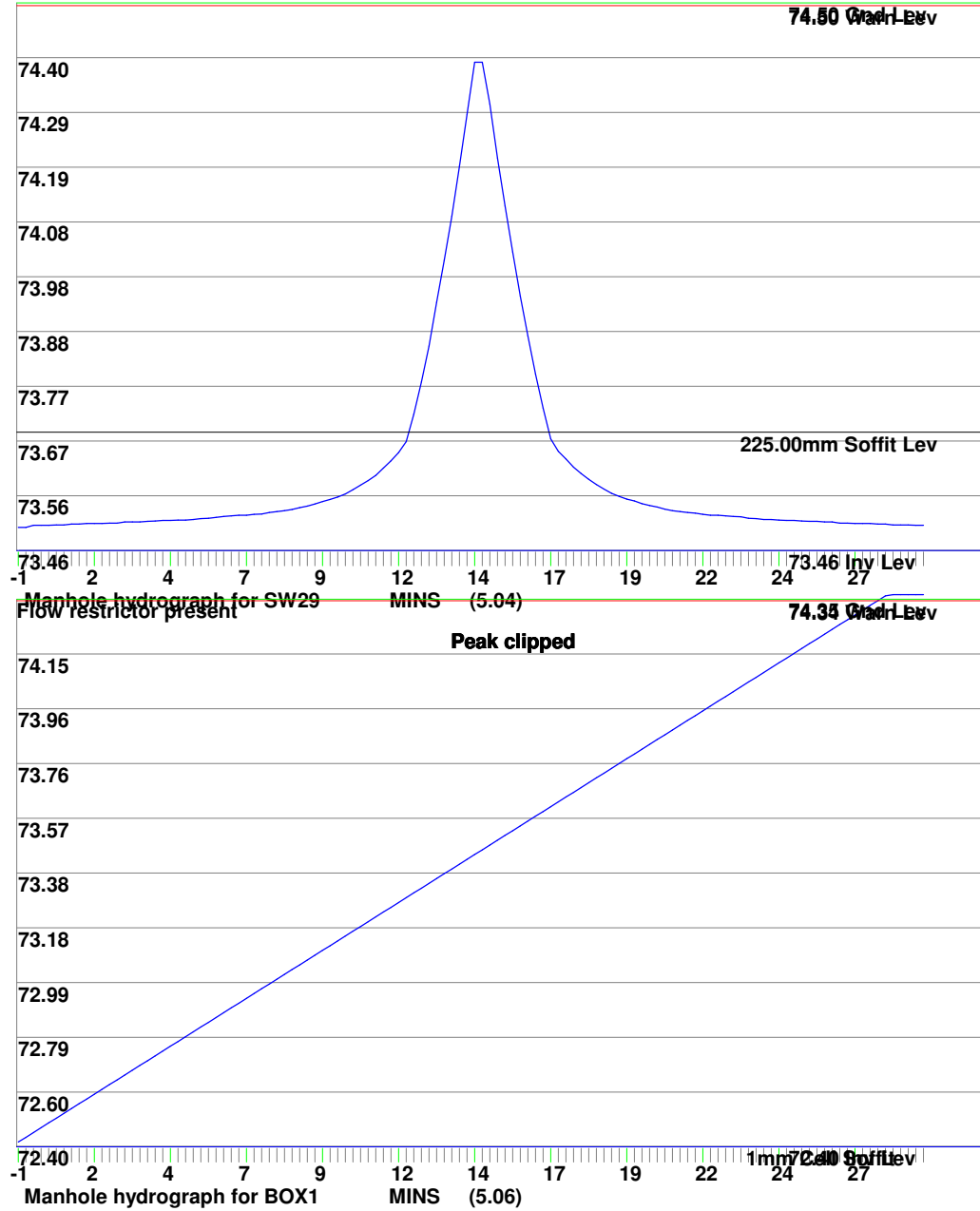
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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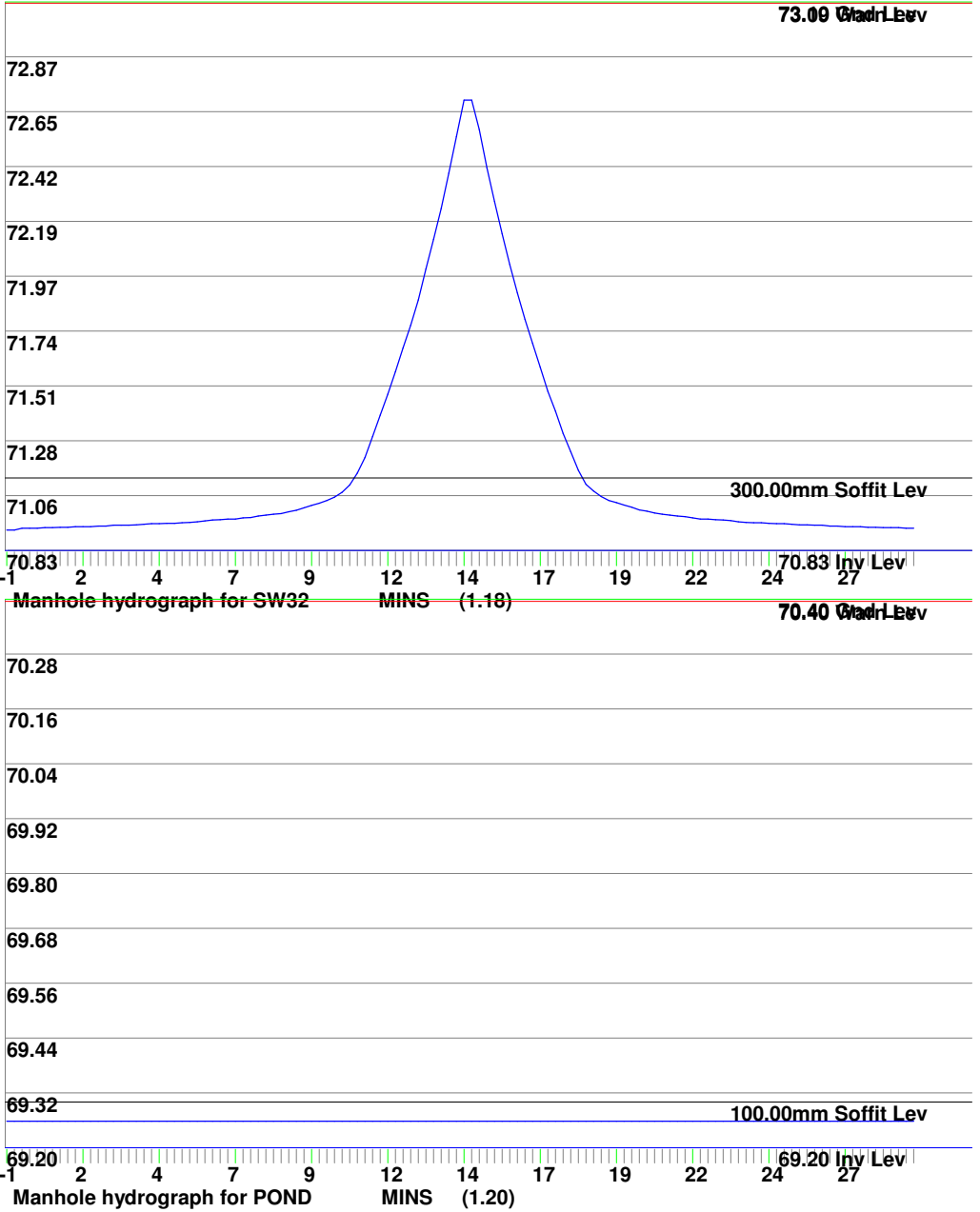
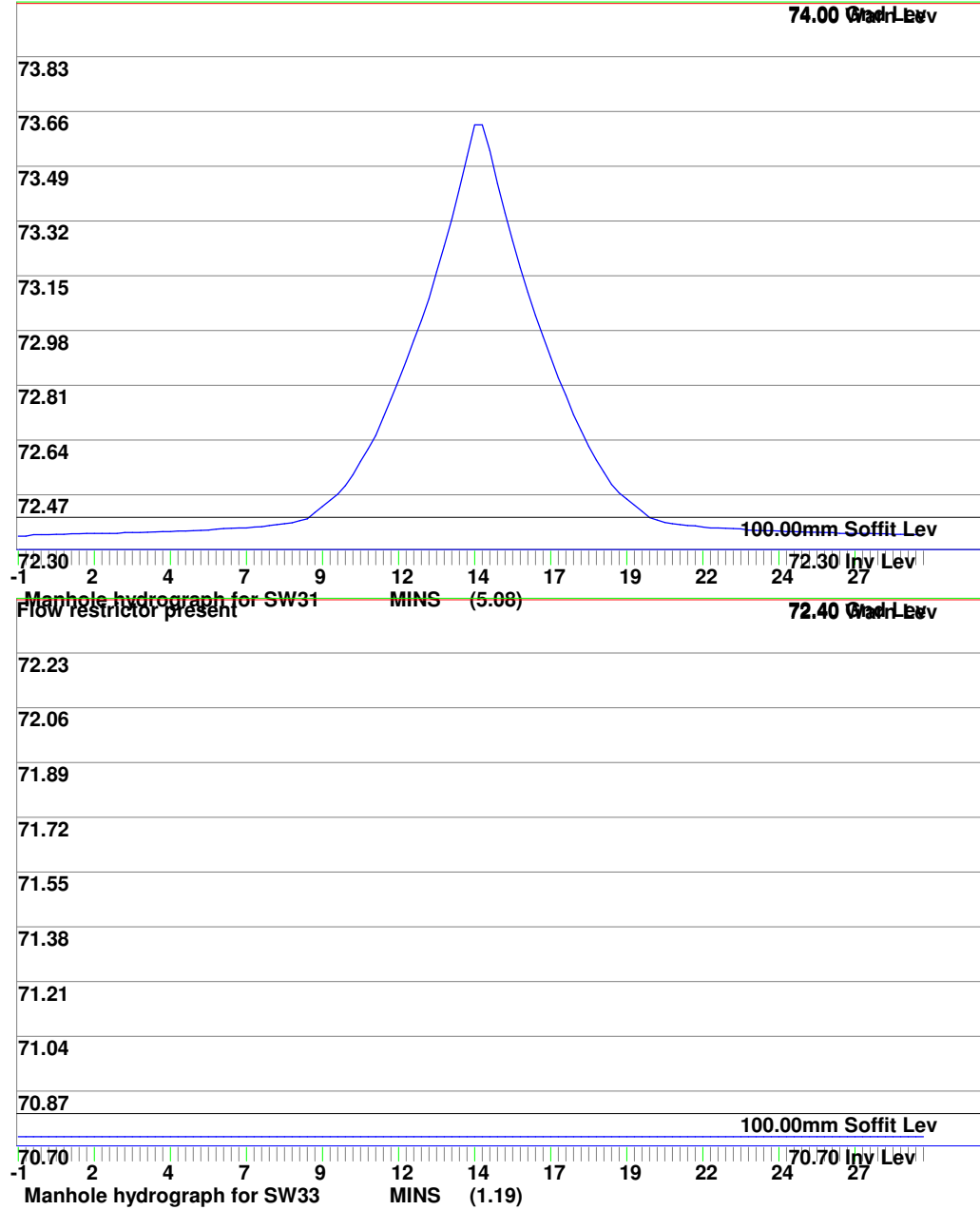
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Title	Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%	





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Project
Oaklands Farm Drainage

Title
Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

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

Mean rain intens. 123.00 mm/hr
Storm profile = winter
Using FSR data

Peak rain intens. 307.50 mm/hr
Sample period = 7.5 secs.

Entry	SECT.:	MANHOLE	PIPE	RATE	PIPE	CHAMBER	INVERT:	WATER	GRND	SURCHARGE		EXCESS	FLOODED	DRAINED	STATUS		
No.	No.:	REF	CAPACITY	FLOW	SIZE	:DIAM/LxW	LEVEL	LEVEL	LEVEL	:	:	FLOW	VOL	:AREA (m²):			
:	:	:	l/s	l/s	mm	:	mm	m	m	m	fract.	Depth	:	l/s		m³	:x FACTOR:
1	I	1.01	SW1	14.5	13.1	150	1200	76.40	76.53	77.00	0.90	0.13	:	0.00	0.00	147	OK
2	I	1.02	SW2	25.1	25.7	225	1200	76.30	76.53	77.00	1.03	0.23	:	0.65	0.00	289	Surch.
3	I	1.03	SW3	58.1	41.1	225	1200	76.19	76.34	77.00	0.71	0.15	:	0.00	0.00	462	OK
4	I	1.04	SW4	53.0	49.9	225	1200	76.12	76.32	77.00	0.94	0.20	:	0.00	0.00	560	OK
5	I	1.05	SW6	60.4	59.4	225	1200	75.89	76.10	77.50	0.98	0.21	:	0.00	0.00	667	OK
6	B	2.01	SW5	6.3	9.3	100	1200	75.89	76.01	77.00	1.48	0.12	:	3.02	0.00	104	Surch.
7	I	1.06	SW7	108.9	77.7	225	1200	75.66	75.81	77.50	0.71	0.15	:	0.00	0.00	872	OK
8	B	3.01	SW8	2.9	2.4	100	1200	74.40	74.47	75.00	0.80	0.07	:	0.00	0.00	27	OK
9	B	3.02	SW9	12.1	22.7	150	1200	74.35	74.57	75.00	1.88	0.22	:	10.59	0.00	255	Surch.
10	I	1.07	SW10	132.9	129.4	300	1800	74.30	74.58	75.00	0.97	0.28	:	0.00	0.00	1453	OK
11	I	1.08	SW11	126.7	148.4	300	2100	73.90	74.25	74.50	1.17	0.35	:	21.74	0.00	1665	Warning
12	I	1.09	SW12	249.5	167.4	300	1800	73.66	73.85	74.50	0.67	0.19	:	0.00	0.00	1878	OK
13	I	1.10	SW13	124.2	182.4	300	2100	73.25	73.68	74.00	1.47	0.43	:	58.18	0.00	2047	Surch.
14	I	1.11	SW14	194.0	194.8	300	1500	72.97	73.27	73.75	1.00	0.30	:	0.77	0.00	2186	Surch.
15	I	1.12	SW15	144.8	206.8	300	1500	72.50	73.06	73.75	1.43	0.56	:	61.96	0.00	2321	Surch.
16	I	1.13	SW16	167.9	214.8	300	1500	72.23	72.73	73.75	1.28	0.50	:	46.88	0.00	2410	Surch.
17	I	1.14	SW17	110.5	214.8	300	1500	72.20	72.94	73.75	1.94	0.74	:	104.30	0.00	2410	Surch.
18	I	1.15	SW18	143.6	214.8	300	1200	71.90	72.67	73.75	1.50	0.77	:	71.14	0.00	2410	Surch.
19	I	1.16	SW19	123.5	223.6	300	1200	71.87	72.83	73.75	1.81	0.96	:	100.18	0.00	2510	Surch.
20	B	4.01	SW20	7.2	6.3	100	1200	73.40	73.48	74.00	0.87	0.08	:	0.00	0.00	70	OK
21	B	4.02	SW21	10.0	11.8	100	1200	73.28	73.39	74.00	1.18	0.11	:	1.79	0.00	132	Surch.
22	B	4.03	SW22	20.0	18.3	150	1200	73.16	73.29	74.00	0.92	0.13	:	0.00	0.00	205	OK
23	B	4.04	SW23	51.6	23.9	150	1200	72.89	72.96	74.35	0.46	0.07	:	0.00	0.00	268	OK
24	I	1.17	SW24	214.6	259.6	300	1200	71.60	72.20	73.75	1.21	0.60	:	45.02	0.00	2914	Surch.
25	B	5.01	SW25	19.6	17.9	150	1200	74.20	74.33	75.00	0.91	0.13	:	0.00	0.00	200	OK
26	B	5.02	SW26	58.1	54.1	225	1200	74.07	74.27	75.00	0.93	0.20	:	0.00	0.00	607	OK
27	B	5.03	SW27	58.5	73.6	225	1200	73.94	74.27	75.00	1.26	0.33	:	15.08	0.00	826	Surch.
28	S1	6.01	SW28	16.5	14.7	150	1200	73.73	73.86	74.50	0.89	0.13	:	0.00	0.00	165	OK
29	B	5.04	SW29	59.2	105.9	225	1200	73.46	73.99	74.50	1.79	0.53	:	46.65	0.00	1188	Surch.



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Project
Oaklands Farm Drainage

Title
Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

Entry	SECT.:	MANHOLE	PIPE	RATE	PIPE	CHAMBER	INVERT:	WATER	GRND	SURCHARGE		EXCESS	FLOODED	DRAINED	STATUS	
No.	No.:	REF	CAPACITY	FLOW	SIZE	DIAM/LxW	LEVEL	LEVEL	LEVEL	:	:	FLOW	VOL	AREA (m²):		
:	:	:	l/s	l/s	mm	mm	m	m	m	:	fract.	Depth	l/s	m³	x FACTOR:	
30	B	5.05	SW30	130.7	105.9	225	1200	73.23	73.40	74.35	0.81	0.17	0.00	0.00	1188	OK
31	B	5.06	BOX1#	Cell	2.0	0.01x0.0	1200	72.40	72.45	74.35	1.00	0.05	0.00	0.00	0	OK
32	B	5.07	BOX2	3.6	105.9	100	1200	72.35	73.13	74.35	29.42	0.78	102.30	0.00	1188	Surch.
33	B	5.08	SW31	20.3	105.9	100	1200	72.30	72.97	74.00	5.21	0.67	85.55	0.00	1188	Surch.
34	I	1.18	SW32	122.0	365.5	300	1800	70.83	71.85	73.10	3.00	1.02	243.56	0.00	4102	Surch.
35	I	1.19	SW33#	21.6	5.0	100	1200	70.70	70.73	72.40	0.23	0.03	0.00	0.00	0	OK
36	I	1.20	POND	8.3	5.0	100	1200	69.20	69.26	70.40	0.60	0.06	0.00	0.00	0	OK



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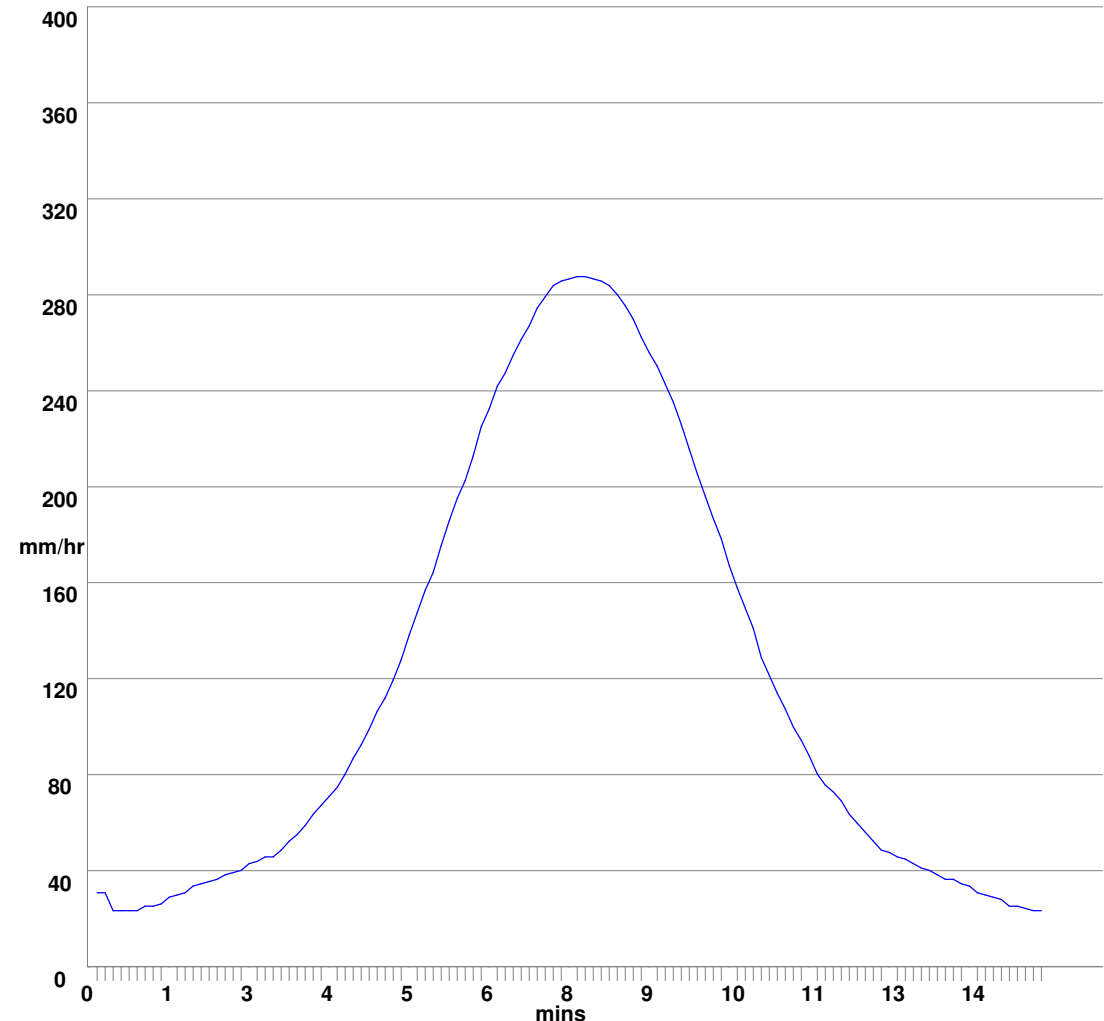
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Project Oaklands Farm Drainage
Title Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	33.31	5:08	157.92	10:08	169.02
0:15	33.31	5:15	167.79	10:15	160.39
0:22	24.67	5:22	176.43	10:22	150.52
0:30	24.67	5:30	187.53	10:30	138.18
0:38	24.67	5:38	198.63	10:38	129.54
0:45	24.67	5:45	208.50	10:45	122.14
0:52	27.14	5:52	217.14	10:52	114.74
1:00	27.14	6:00	228.24	11:00	107.34
1:08	28.38	6:08	240.58	11:08	101.17
1:15	30.84	6:15	249.22	11:15	93.76
1:22	32.08	6:22	259.09	11:22	86.36
1:30	33.31	6:30	265.25	11:30	81.43
1:38	35.78	6:38	272.66	11:38	77.73
1:45	37.01	6:45	280.06	11:45	74.02
1:52	38.25	6:52	286.23	11:52	67.86
2:00	39.48	7:00	293.63	12:00	64.15
2:08	40.71	7:08	298.57	12:08	60.45
2:15	41.95	7:15	303.50	12:15	55.52
2:22	43.18	7:22	305.97	12:22	51.82
2:30	45.65	7:30	307.20	12:30	50.58
2:38	46.88	7:38	308.44	12:38	49.35
2:45	49.35	7:45	308.44	12:45	48.12
2:52	49.35	7:52	307.20	12:52	45.65
3:00	51.82	8:00	305.97	13:00	44.41
3:08	55.52	8:08	303.50	13:08	43.18
3:15	59.22	8:15	299.80	13:15	40.71
3:22	62.92	8:22	294.86	13:22	39.48
3:30	67.86	8:30	288.70	13:30	39.48
3:38	71.56	8:38	281.29	13:38	37.01
3:45	76.49	8:45	273.89	13:45	35.78
3:52	80.19	8:52	267.72	13:52	33.31
4:00	86.36	9:00	260.32	14:00	32.08
4:08	92.53	9:08	251.68	14:08	30.84
4:15	98.70	9:15	241.81	14:15	29.61
4:22	106.10	9:22	230.71	14:22	27.14
4:30	113.50	9:30	219.61	14:30	27.14
4:38	119.67	9:38	209.74	14:38	25.91
4:45	128.31	9:45	199.87	14:45	24.67
4:52	136.95	9:52	191.23	14:52	24.67
5:00	148.05	10:00	178.89	15:00	24.67

Hydrograph profile derived from data in the Flood Studies Report

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





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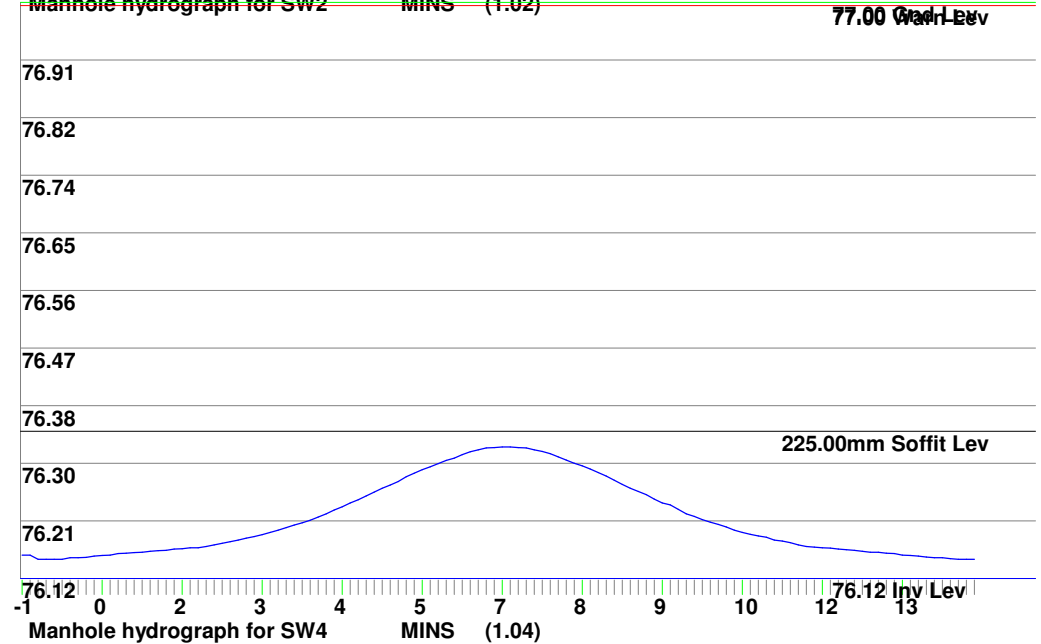
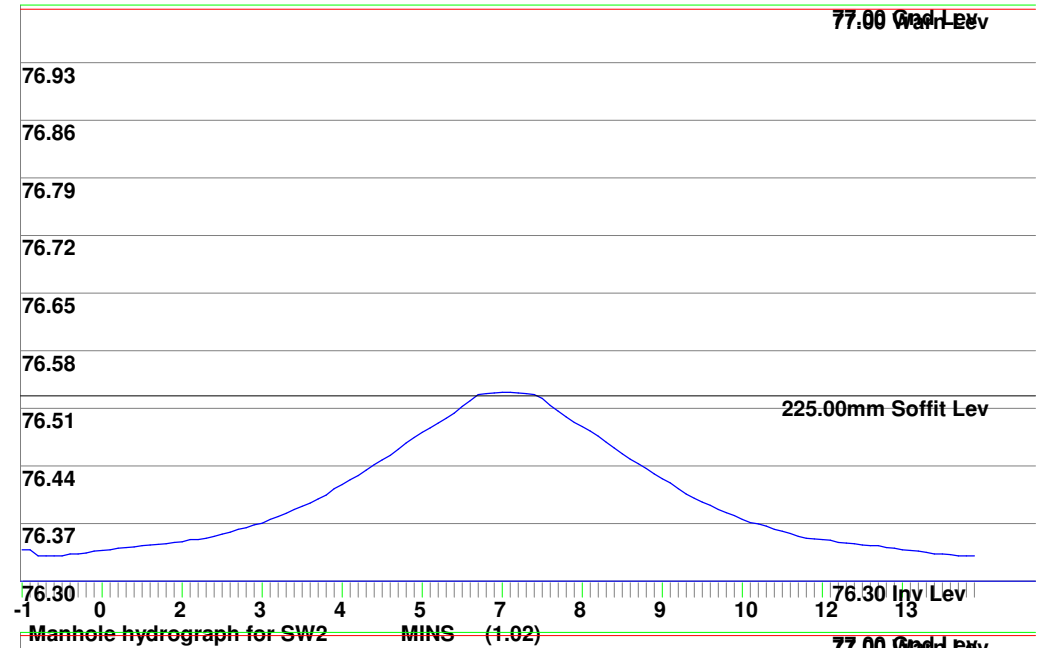
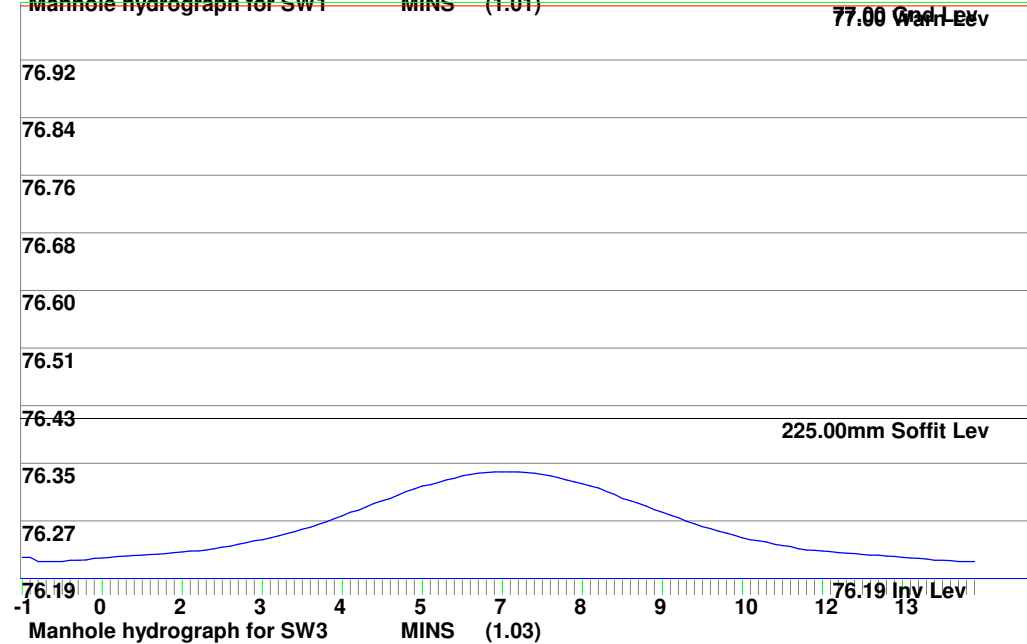
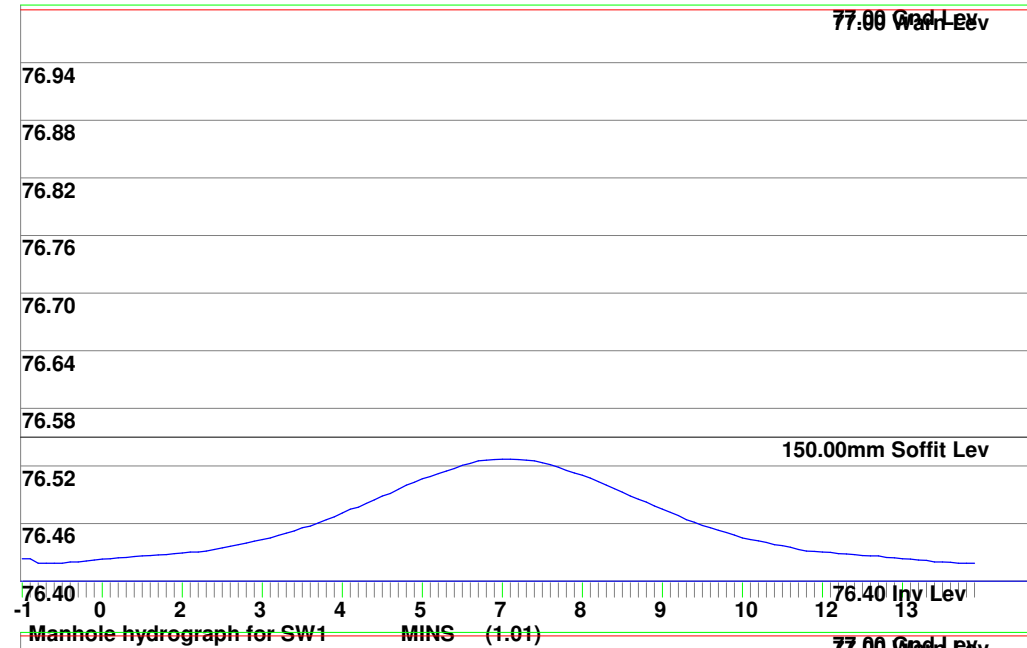
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SW**

Project	Oaklands Farm Drainage
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





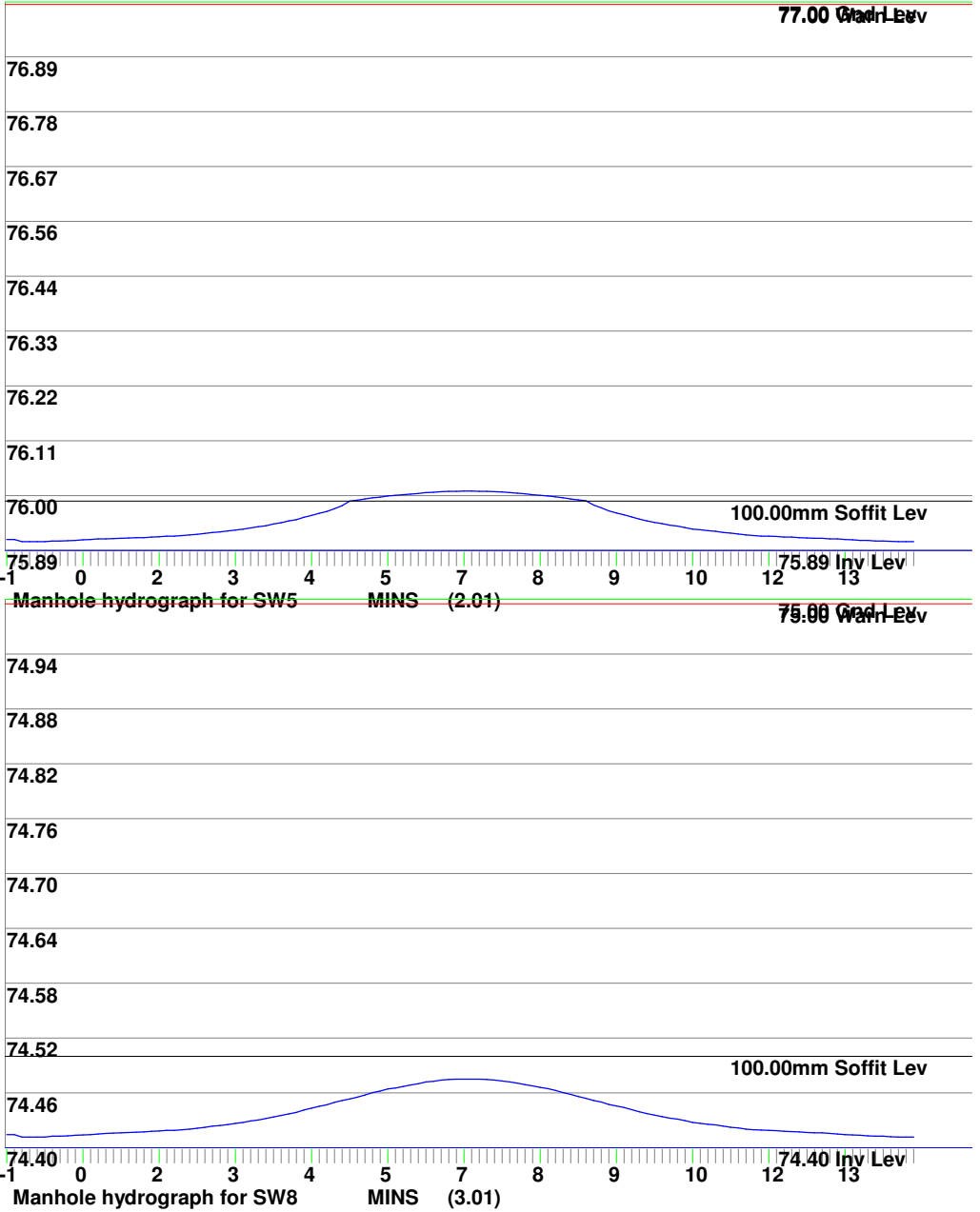
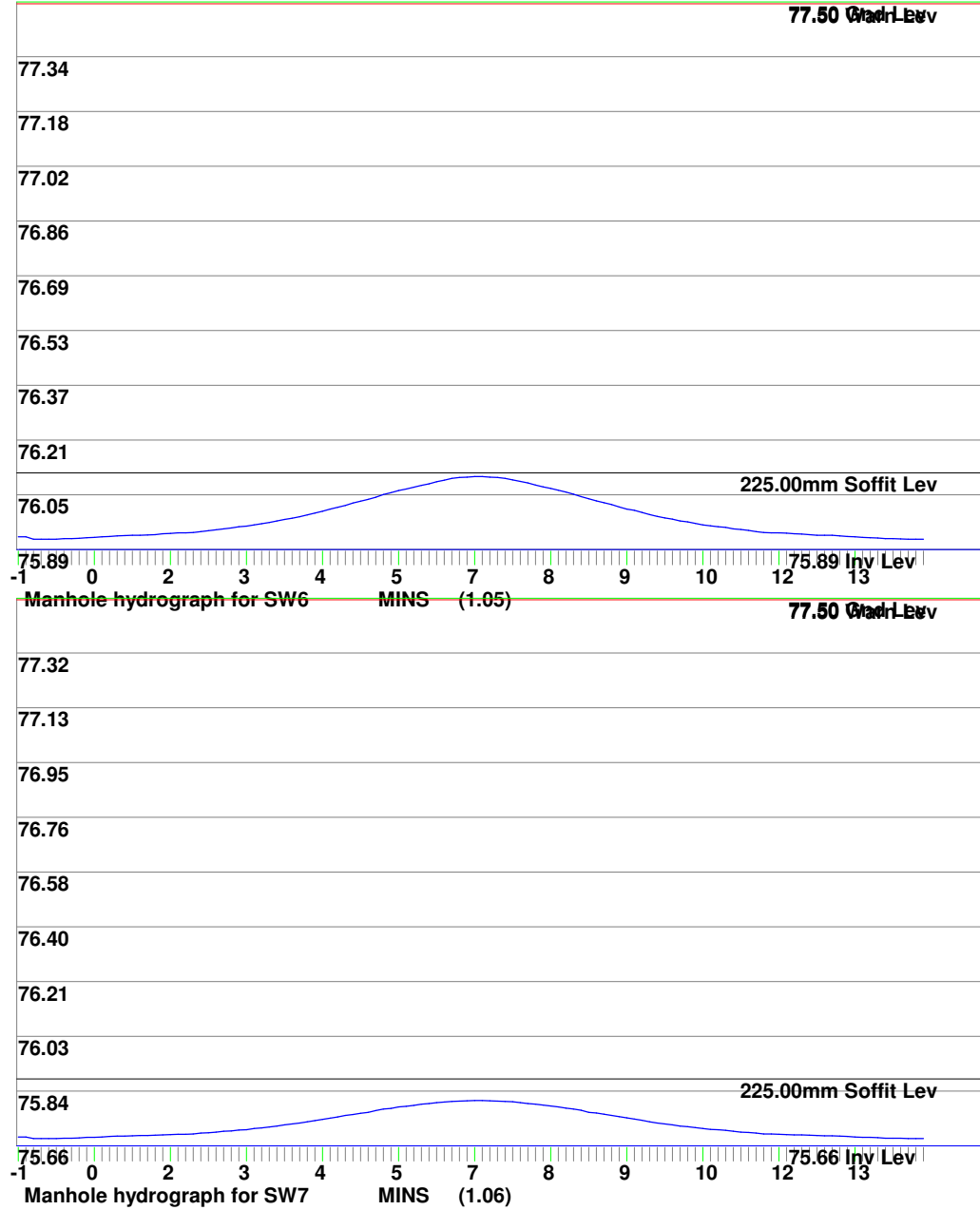
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Project **Oaklands Farm Drainage**
Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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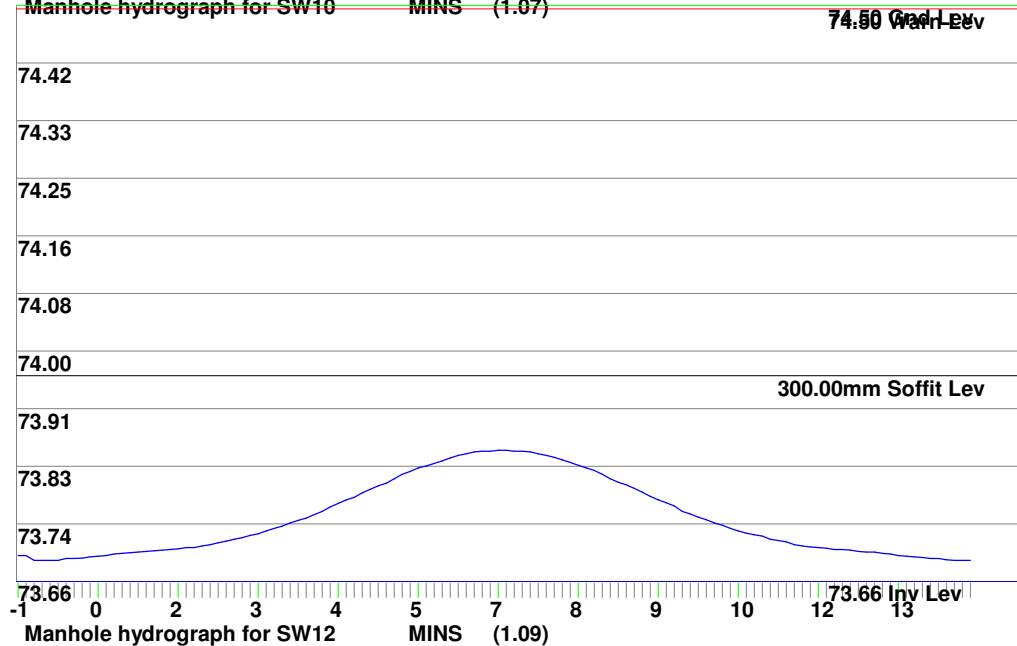
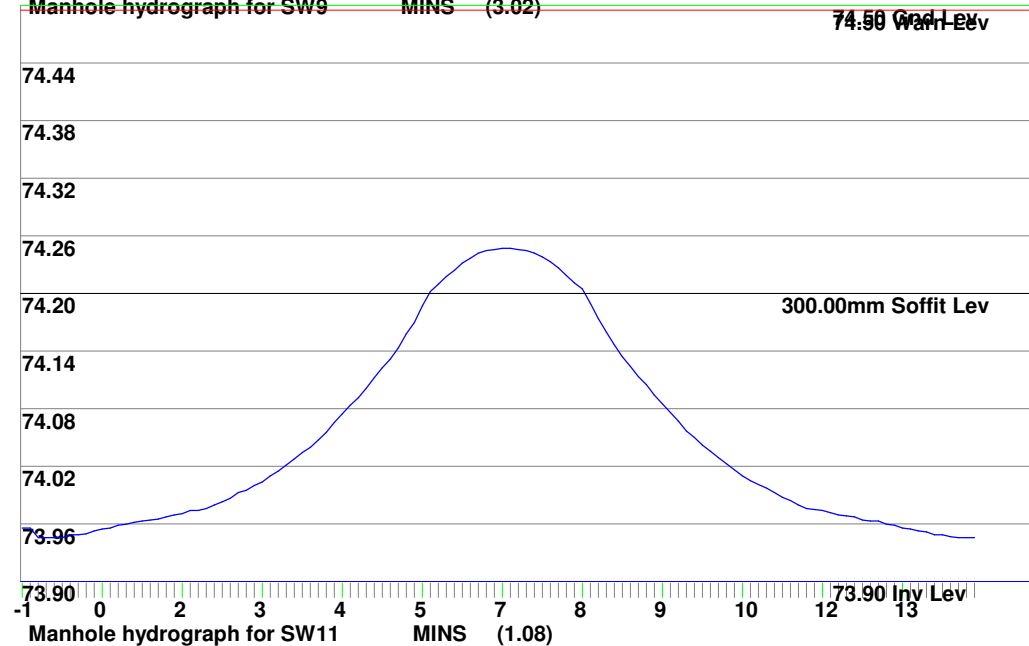
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Project	Oaklands Farm Drainage
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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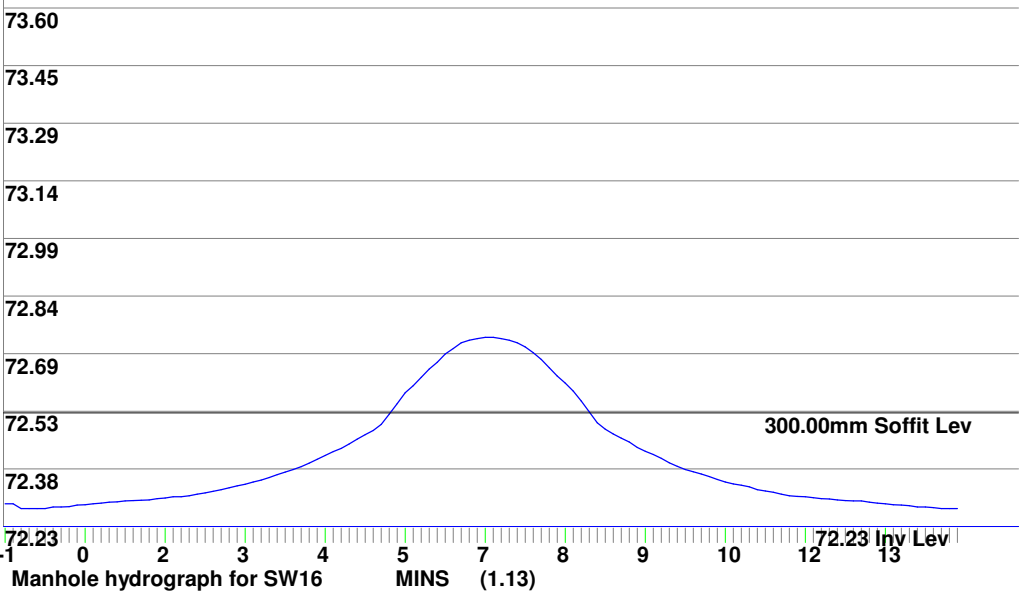
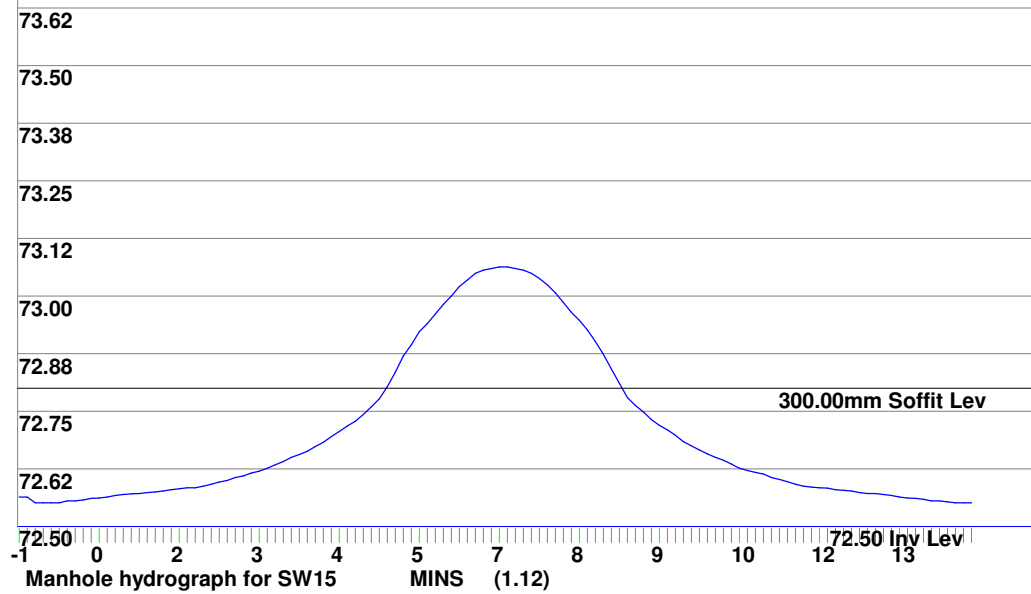
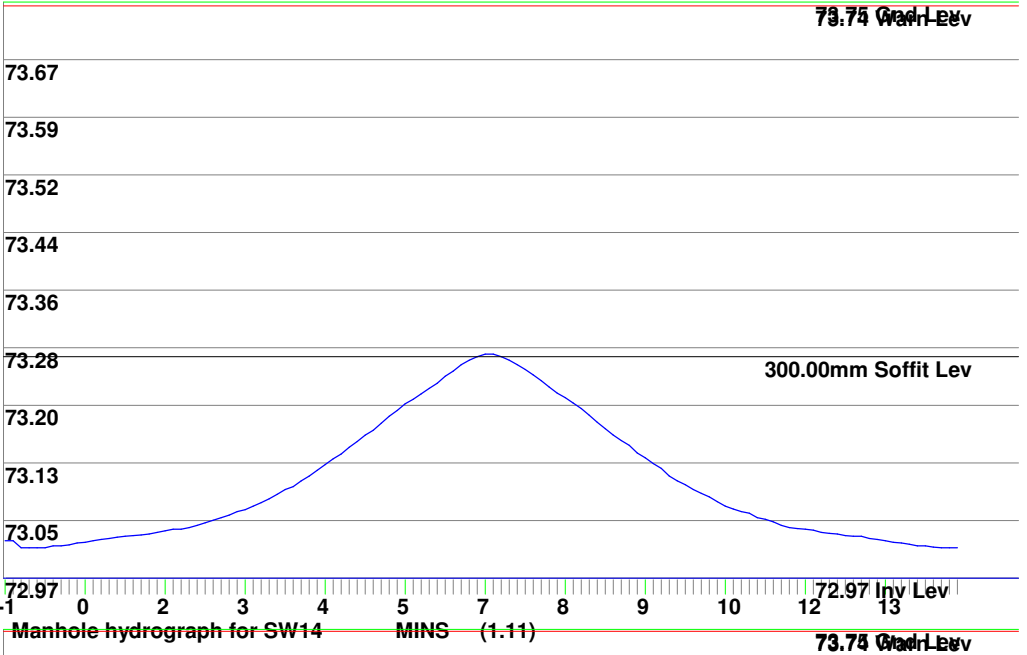
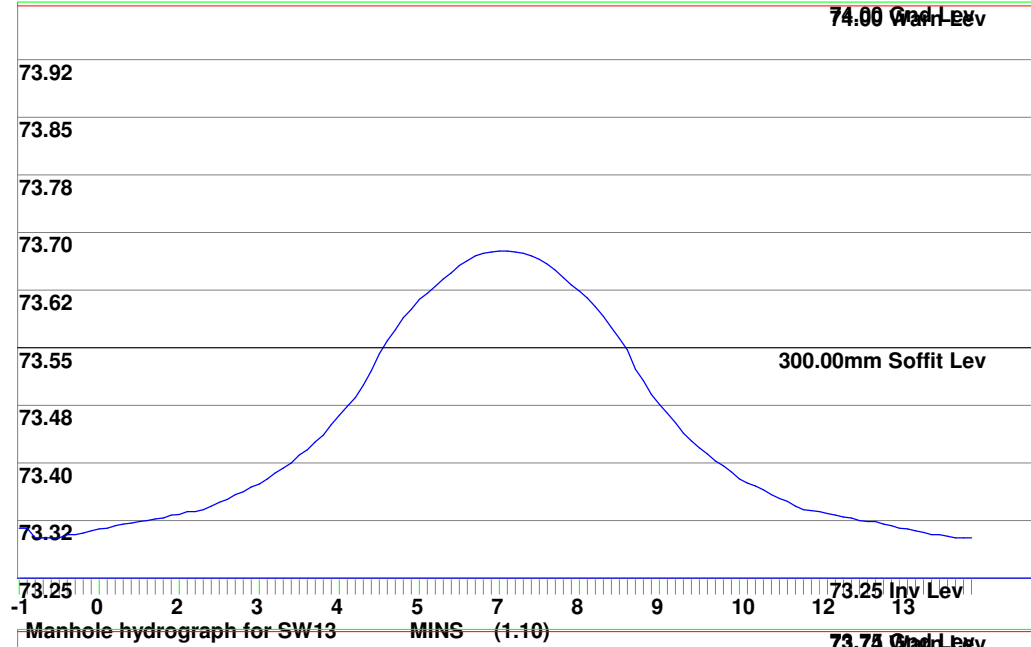
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Project Oaklands Farm Drainage	Title Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%





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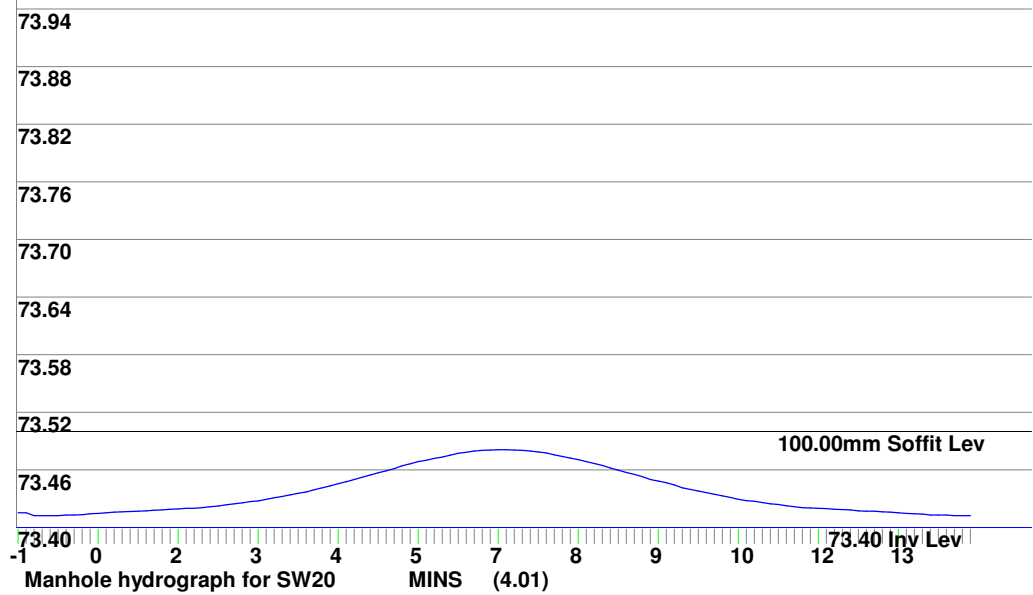
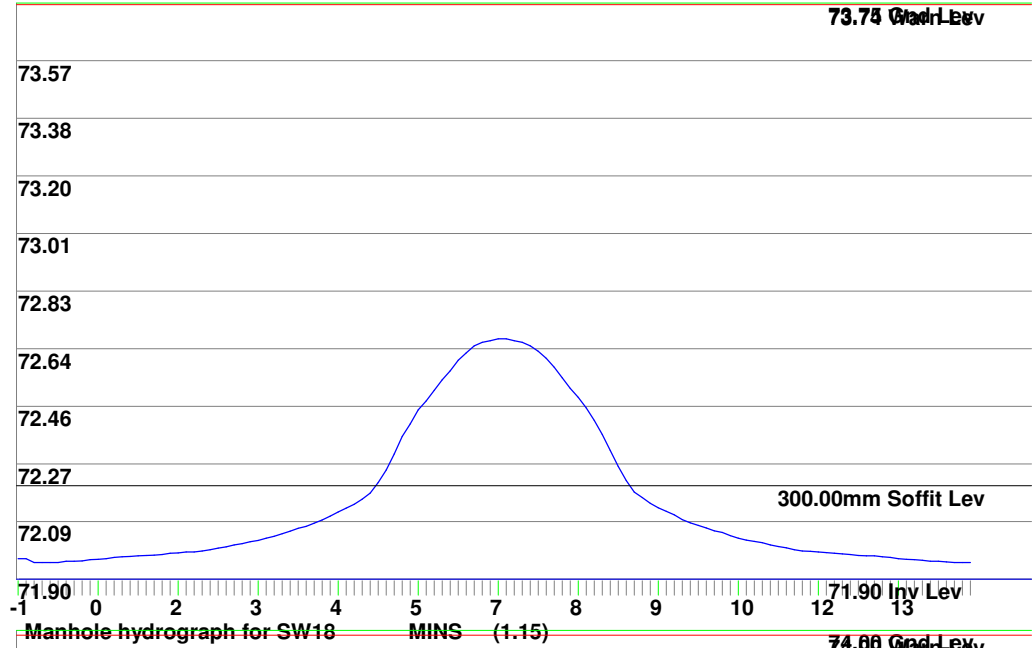
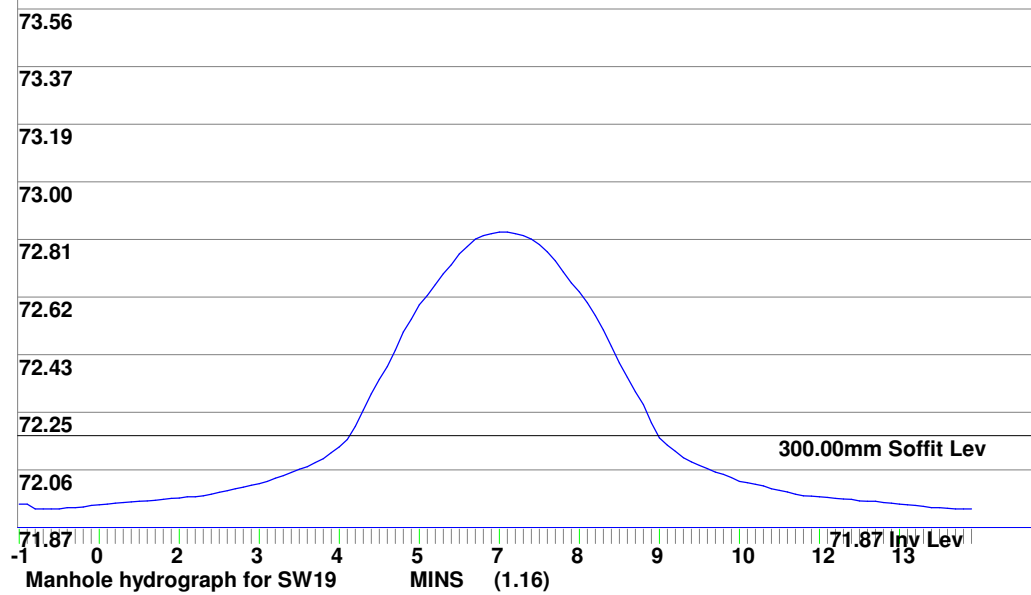
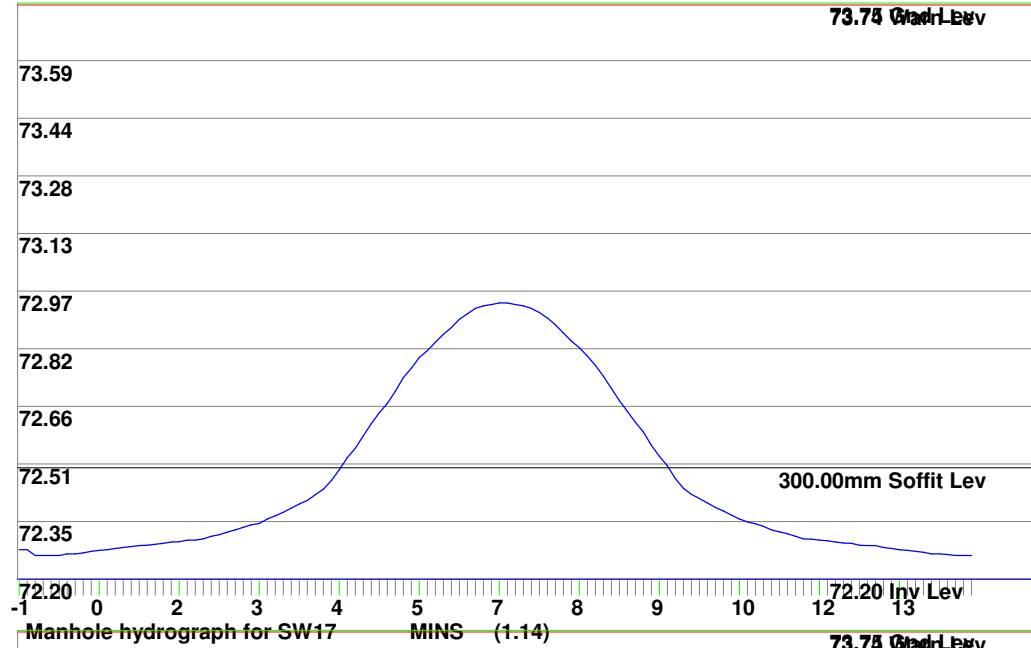
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Project Oaklands Farm Drainage	Title Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%





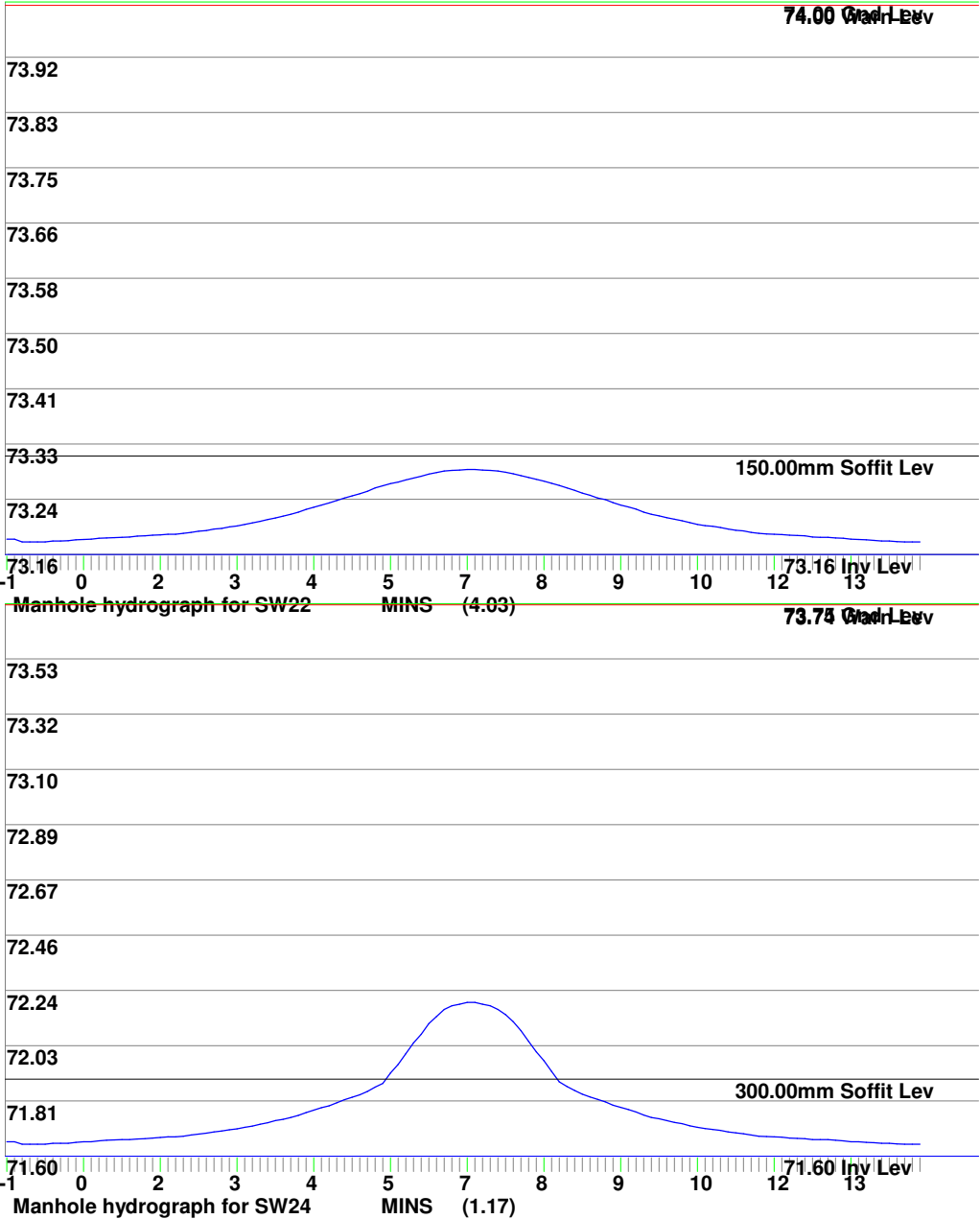
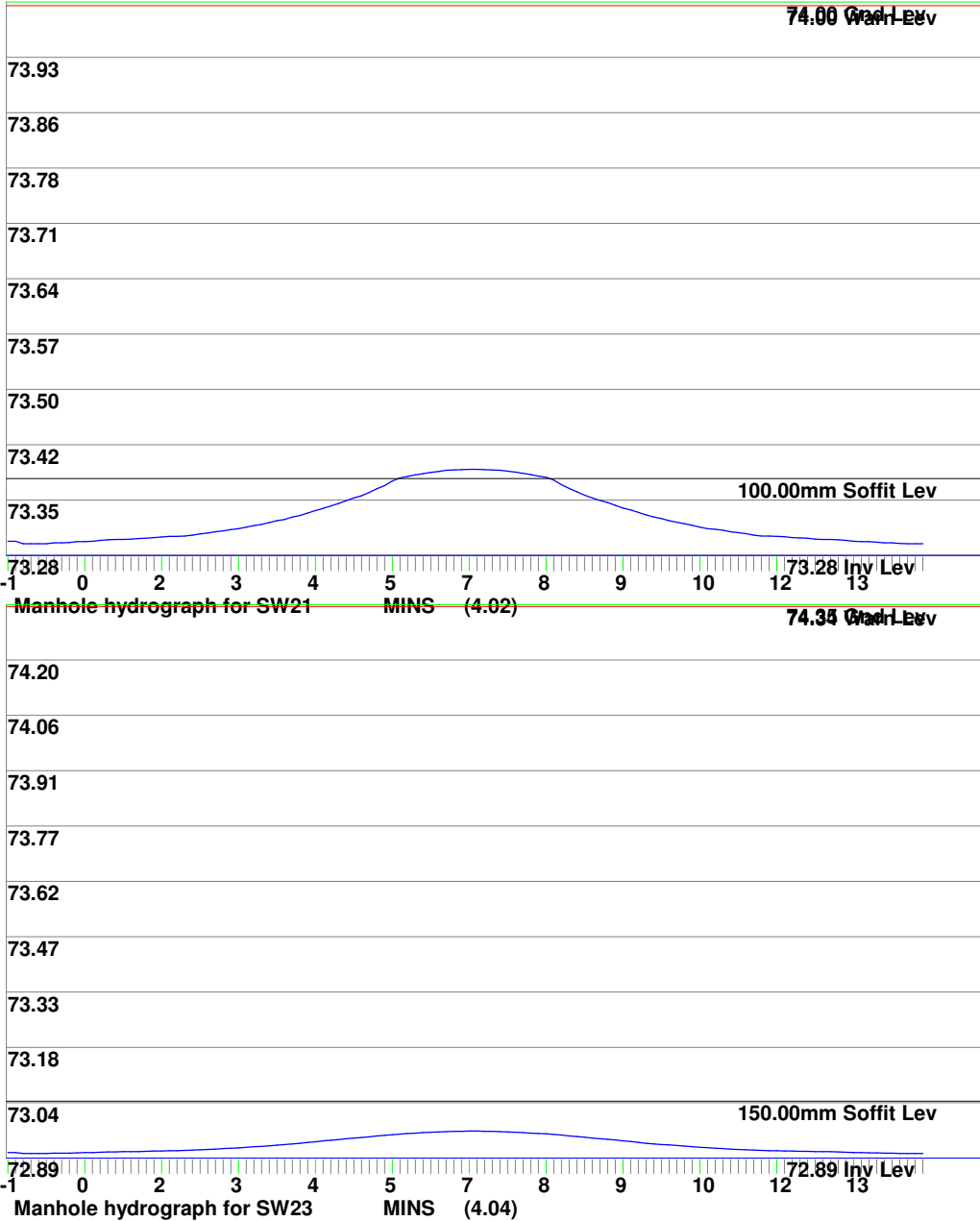
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Project **Oaklands Farm Drainage**
Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





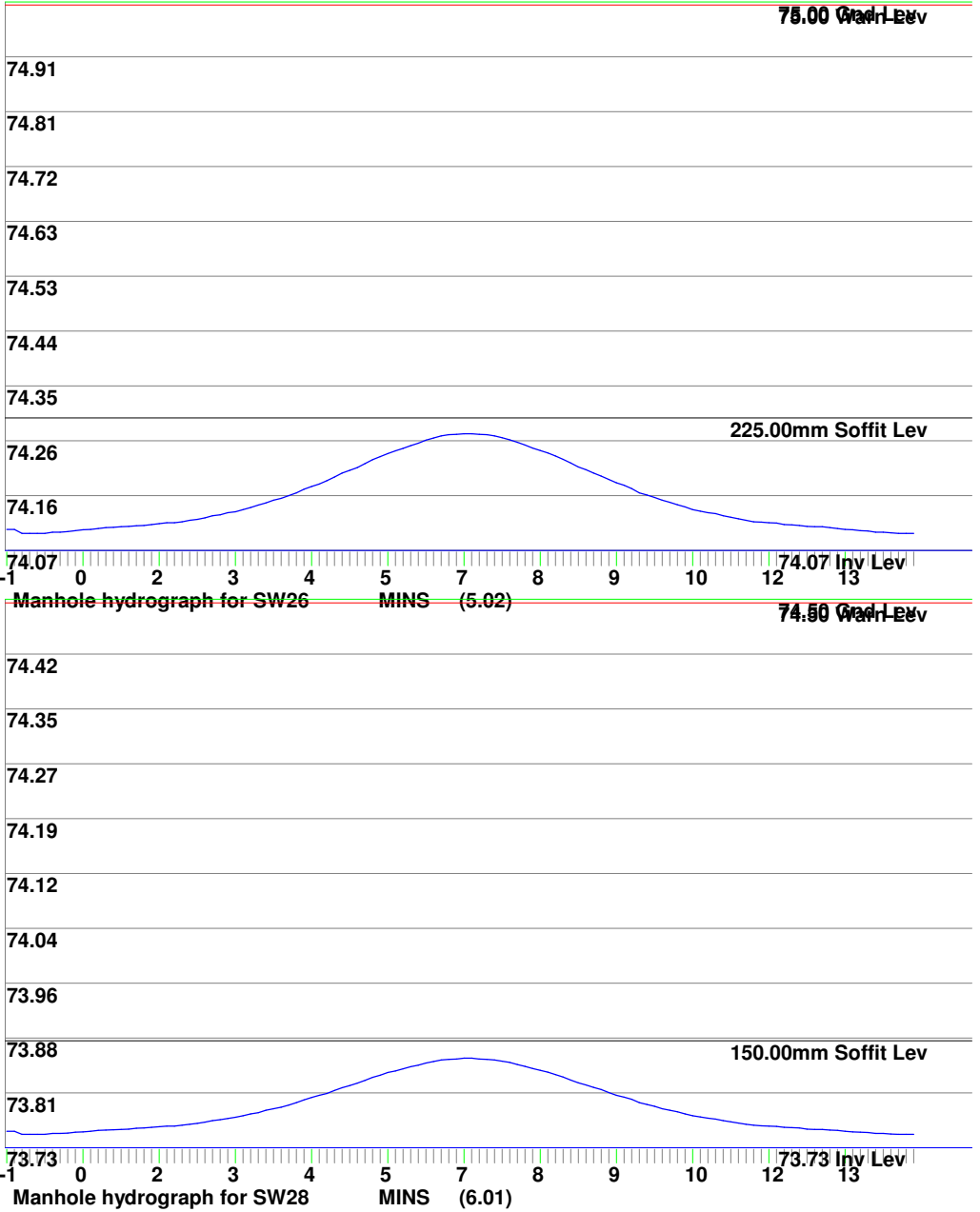
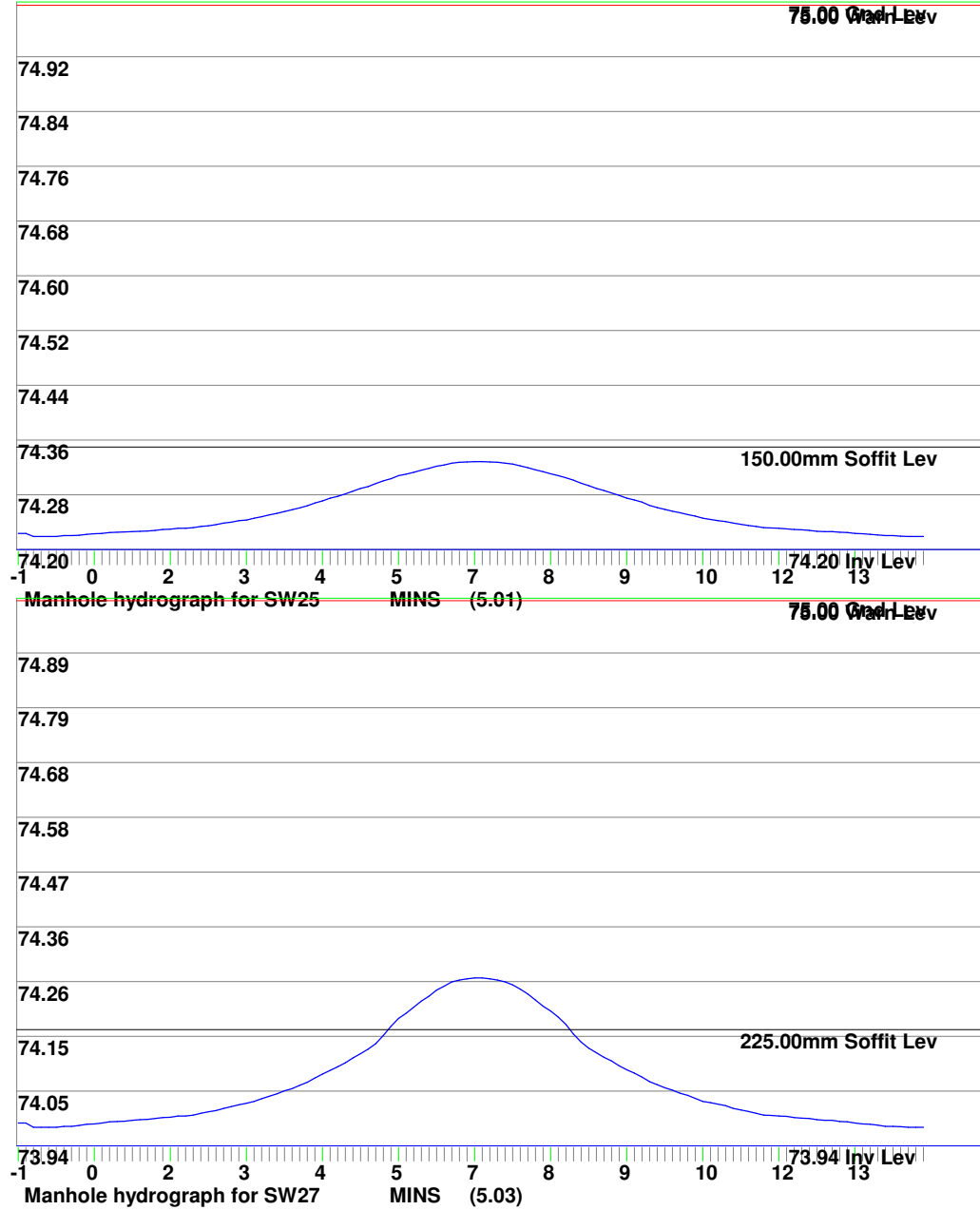
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Project **Oaklands Farm Drainage**
Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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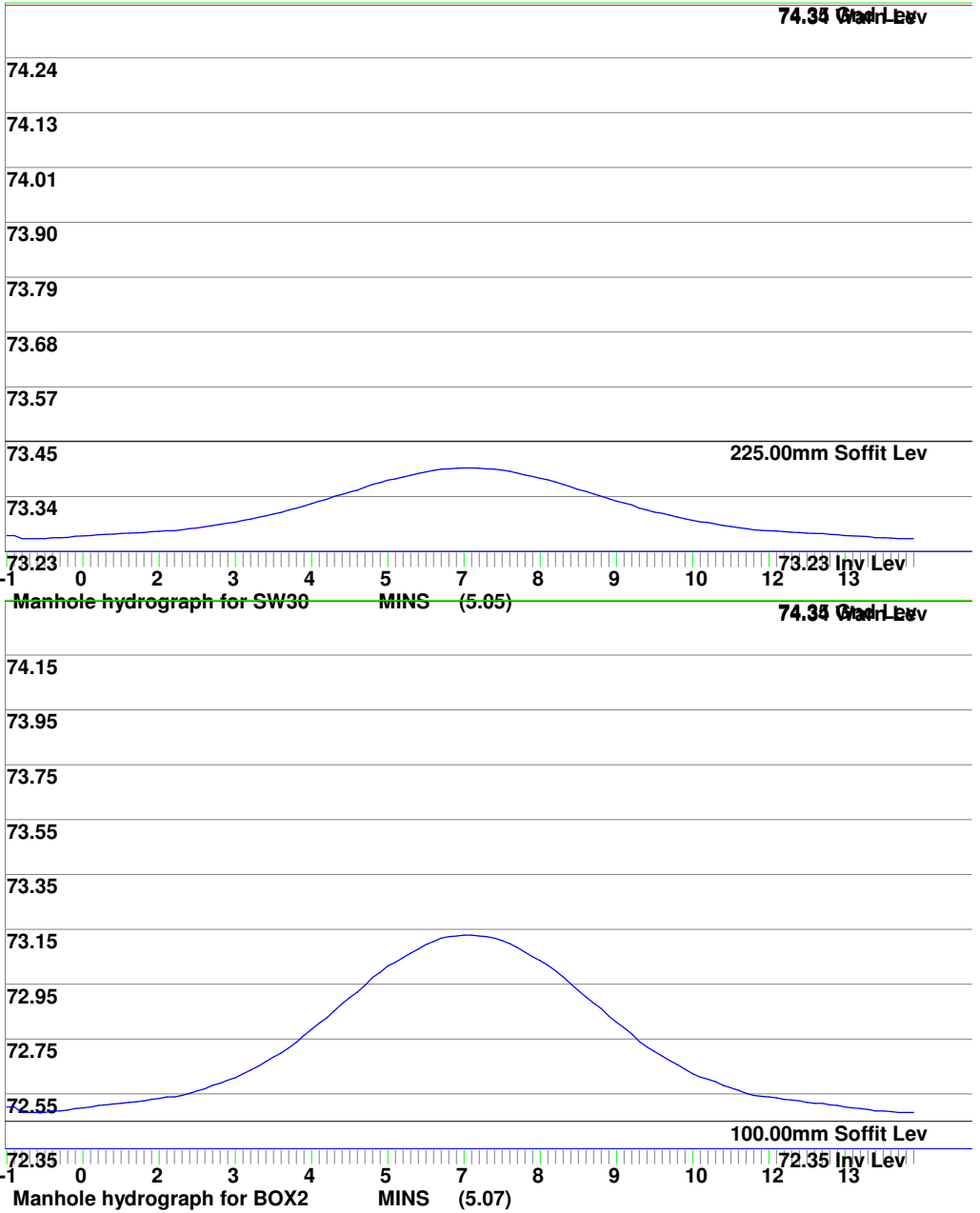
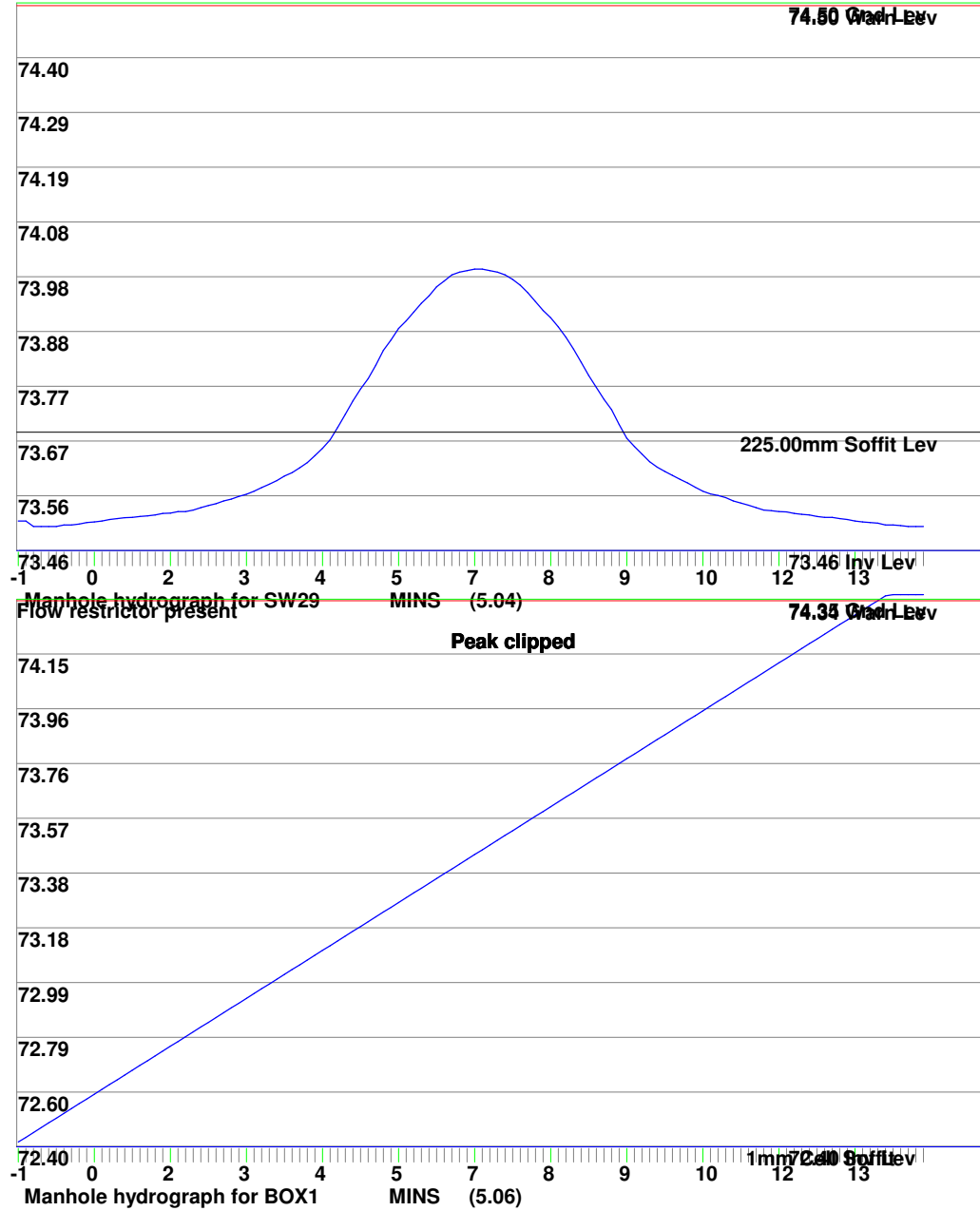
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Project Oaklands Farm Drainage	Title Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%





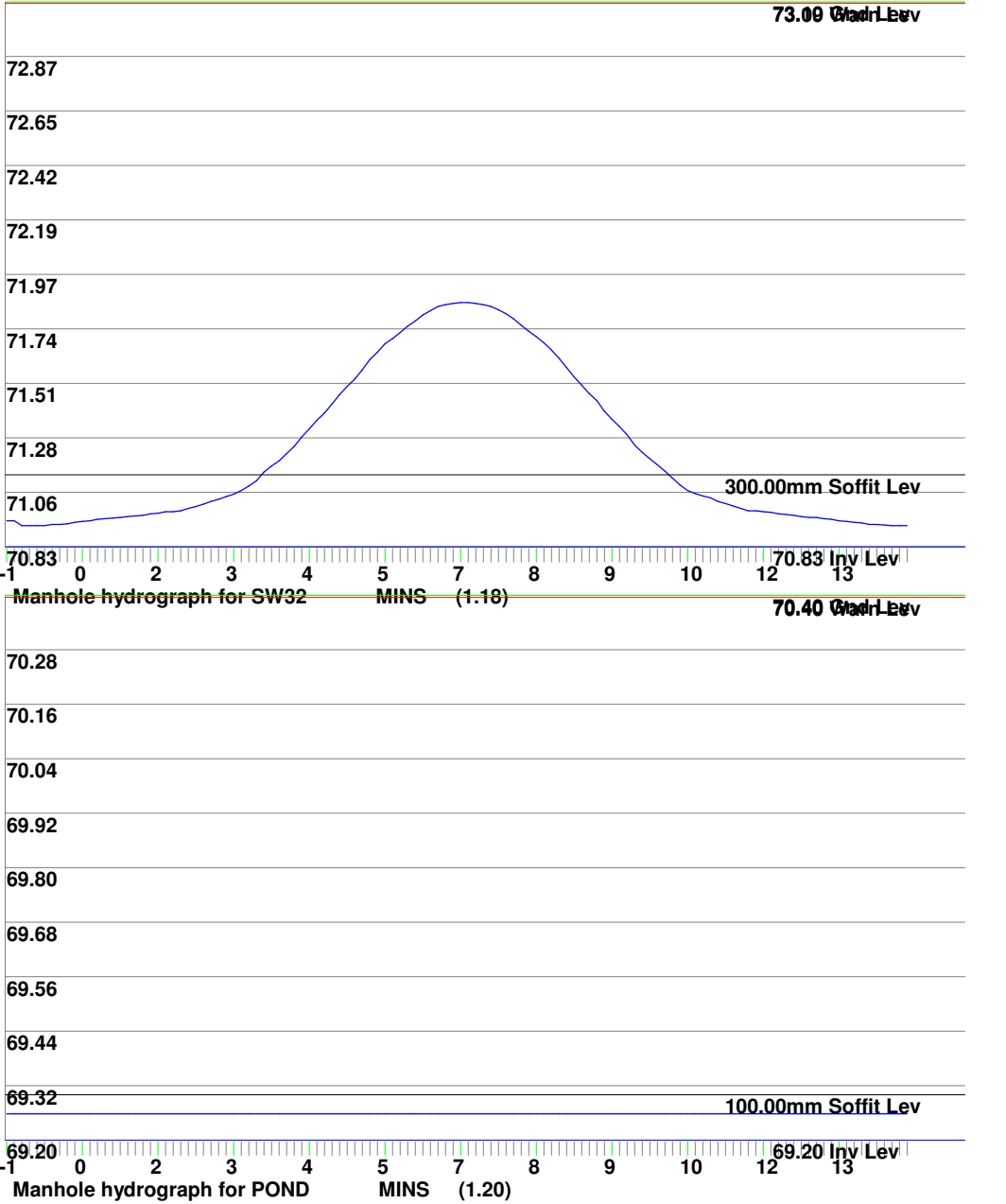
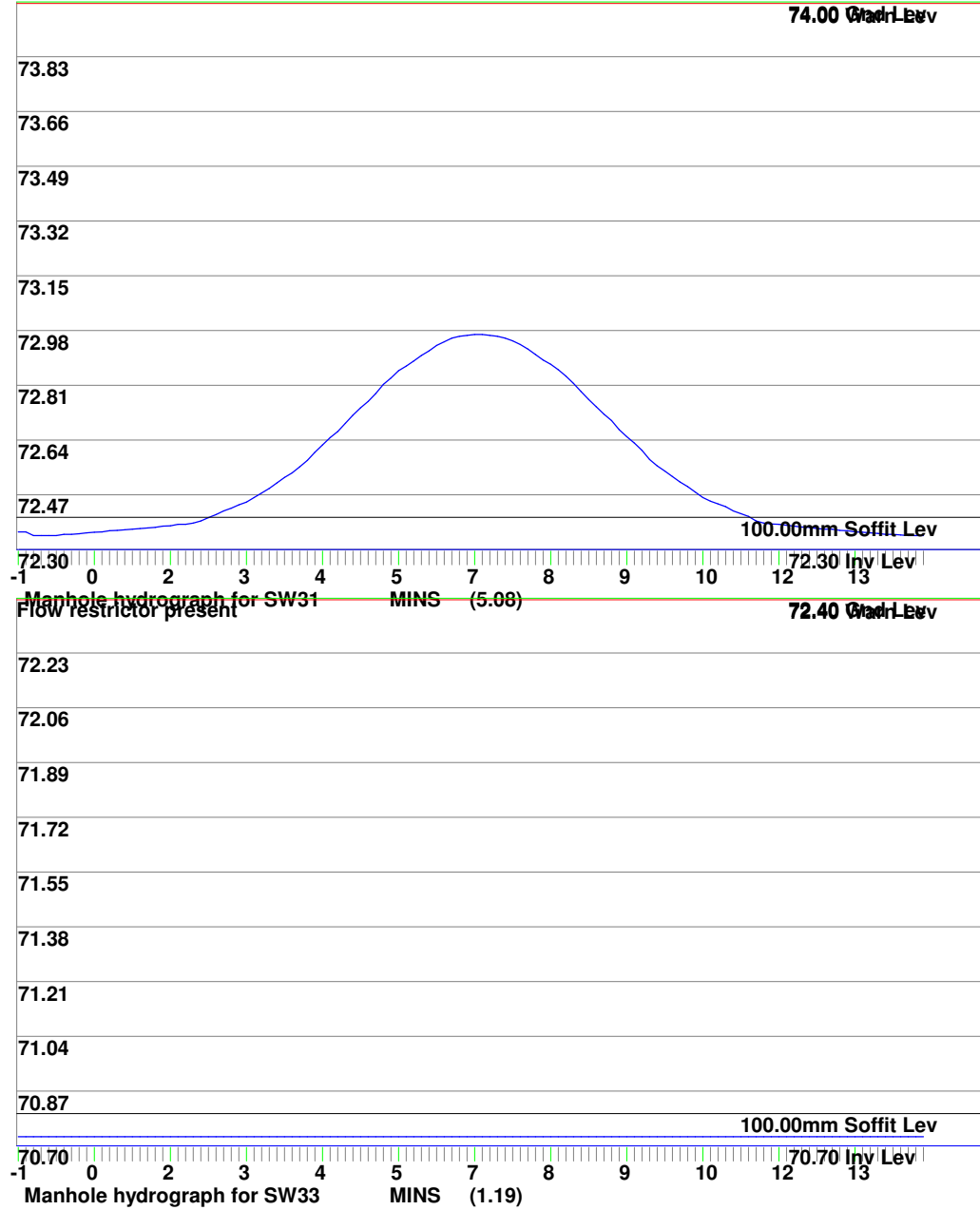
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Project Oaklands Farm Drainage
Title Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

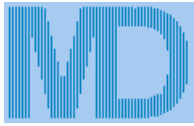
Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

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

Mean rain intens. 123.00 mm/hr
Storm profile = summer
Using FSR data

Peak rain intens. 482.16 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		EXCESS FLOW l/s	FLOODED VOL m³	DRAINED :AREA (m²): :x FACTOR :	STATUS	
										fract.	Depth					
1	I	1.01	SW1	14.5	20.6	150	1200	76.40	76.59	77.00	1.42	0.19	6.05	0.00	147	Surch.
2	I	1.02	SW2	25.1	40.3	225	1200	76.30	76.63	77.00	1.61	0.33	15.26	0.00	289	Surch.
3	I	1.03	SW3	58.1	64.5	225	1200	76.19	76.46	77.00	1.11	0.27	6.40	0.00	462	Surch.
4	I	1.04	SW4	53.0	78.3	225	1200	76.12	76.51	77.00	1.48	0.39	25.31	0.00	560	Surch.
5	I	1.05	SW6	60.4	93.2	225	1200	75.89	76.33	77.50	1.54	0.44	32.73	0.00	667	Surch.
6	B	2.01	SW5	6.3	14.6	100	1200	75.89	76.05	77.00	2.32	0.16	8.31	0.00	104	Surch.
7	I	1.06	SW7	108.9	121.8	225	1200	75.66	75.97	77.50	1.12	0.31	12.97	0.00	872	Surch.
8	B	3.01	SW8	2.9	3.7	100	1200	74.40	74.51	75.00	1.26	0.11	0.77	0.00	27	Surch.
9	B	3.02	SW9	12.1	35.6	150	1200	74.35	74.66	75.00	2.94	0.31	23.47	0.00	255	Surch.
10	I	1.07	SW10	132.9	202.9	300	1800	74.30	74.81	75.00	1.53	0.51	70.06	0.00	1453	Warning
11	I	1.08	SW11	126.7	232.7	300	2100	73.90	74.43	74.50	1.84	0.53	106.02	0.00	1665	Warning
12	I	1.09	SW12	249.5	262.4	300	1800	73.66	74.00	74.50	1.05	0.34	12.90	0.00	1878	Surch.
13	I	1.10	SW13	124.2	286.0	300	2100	73.25	73.90	74.00	2.30	0.65	161.80	0.00	2047	Warning
14	I	1.11	SW14	194.0	305.4	300	1500	72.97	73.74	73.75	1.57	0.77	111.40	0.00	2186	Warning
15	I	1.12	SW15	144.8	324.3	300	1500	72.50	73.56	73.75	2.24	1.06	179.42	0.00	2321	Warning
16	I	1.13	SW16	167.9	336.7	300	1500	72.23	73.25	73.75	2.01	1.02	168.86	0.00	2410	Surch.
17	I	1.14	SW17	110.5	336.7	300	1500	72.20	73.46	73.75	3.05	1.26	226.28	0.00	2410	Warning
18	I	1.15	SW18	143.6	336.7	300	1200	71.90	73.48	73.75	2.34	1.58	193.12	0.00	2410	Warning
19	I	1.16	SW19	123.5	350.7	300	1200	71.87	73.68	73.75	2.84	1.81	227.21	0.00	2510	Warning
20	B	4.01	SW20	7.2	9.8	100	1200	73.40	73.52	74.00	1.36	0.12	2.60	0.00	70	Surch.
21	B	4.02	SW21	10.0	18.4	100	1200	73.28	73.44	74.00	1.85	0.16	8.47	0.00	132	Surch.
22	B	4.03	SW22	20.0	28.7	150	1200	73.16	73.37	74.00	1.44	0.21	8.70	0.00	205	Surch.
23	B	4.04	SW23	51.6	37.4	150	1200	72.89	72.99	74.35	0.72	0.10	0.00	0.00	268	OK
24	I	1.17	SW24	214.6	407.1	300	1200	71.60	73.18	73.75	1.90	1.58	192.49	0.00	2914	Surch.
25	B	5.01	SW25	19.6	28.0	150	1200	74.20	74.41	75.00	1.43	0.21	8.40	0.00	200	Surch.
26	B	5.02	SW26	58.1	84.8	225	1200	74.07	74.47	75.00	1.46	0.40	26.70	0.00	607	Surch.
27	B	5.03	SW27	58.5	115.3	225	1200	73.94	74.54	75.00	1.97	0.60	56.86	0.00	826	Surch.
28	S1	6.01	SW28	16.5	23.1	150	1200	73.73	73.92	74.50	1.40	0.19	6.58	0.00	165	Surch.
29	B	5.04	SW29	59.2	166.0	225	1200	73.46	74.39	74.50	2.80	0.93	106.80	0.00	1188	Warning



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Project
Oaklands Farm Drainage

Title
Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

Entry	SECT.:	MANHOLE :	PIPE :	RATE :	PIPE :	CHAMBER :	INVERT:	WATER :	GRND :	SURCHARGE		EXCESS :	FLOODED :	DRAINED :	STATUS	
No.	No. :	REF :	CAPACITY :	FLOW :	SIZE :	DIAM/LxW :	LEVEL :	LEVEL :	LEVEL :	:	:	FLOW :	VOL :	AREA (m²) :		
:	:	:	l/s :	l/s :	mm :	mm :	m :	m :	m :	fract.	Depth	l/s :	m³ :	x FACTOR :		
30	B	5.05	SW30	130.7	166.0	225	1200	73.23	73.69	74.35	1.27	0.46	35.39	0.00	1188	Surch.
31	B	5.06	BOX1‡	Cell	2.0	0.01x0.0	1200	72.40	72.45	74.35	1.00	0.05	0.00	0.00	0	OK
32	B	5.07	BOX2	3.6	166.0	100	1200	72.35	73.53	74.35	46.13	1.18	162.44	0.00	1188	Surch.
33	B	5.08	SW31	20.3	166.0	100	1200	72.30	73.37	74.00	8.16	1.07	145.70	0.00	1188	Surch.
34	I	1.18	SW32	122.0	573.1	300	1800	70.83	72.46	73.10	4.70	1.63	451.17	0.00	4102	Surch.
35	I	1.19	SW33‡	21.6	5.0	100	1200	70.70	70.73	72.40	0.23	0.03	0.00	0.00	0	OK
36	I	1.20	POND	8.3	5.0	100	1200	69.20	69.26	70.40	0.60	0.06	0.00	0.00	0	OK



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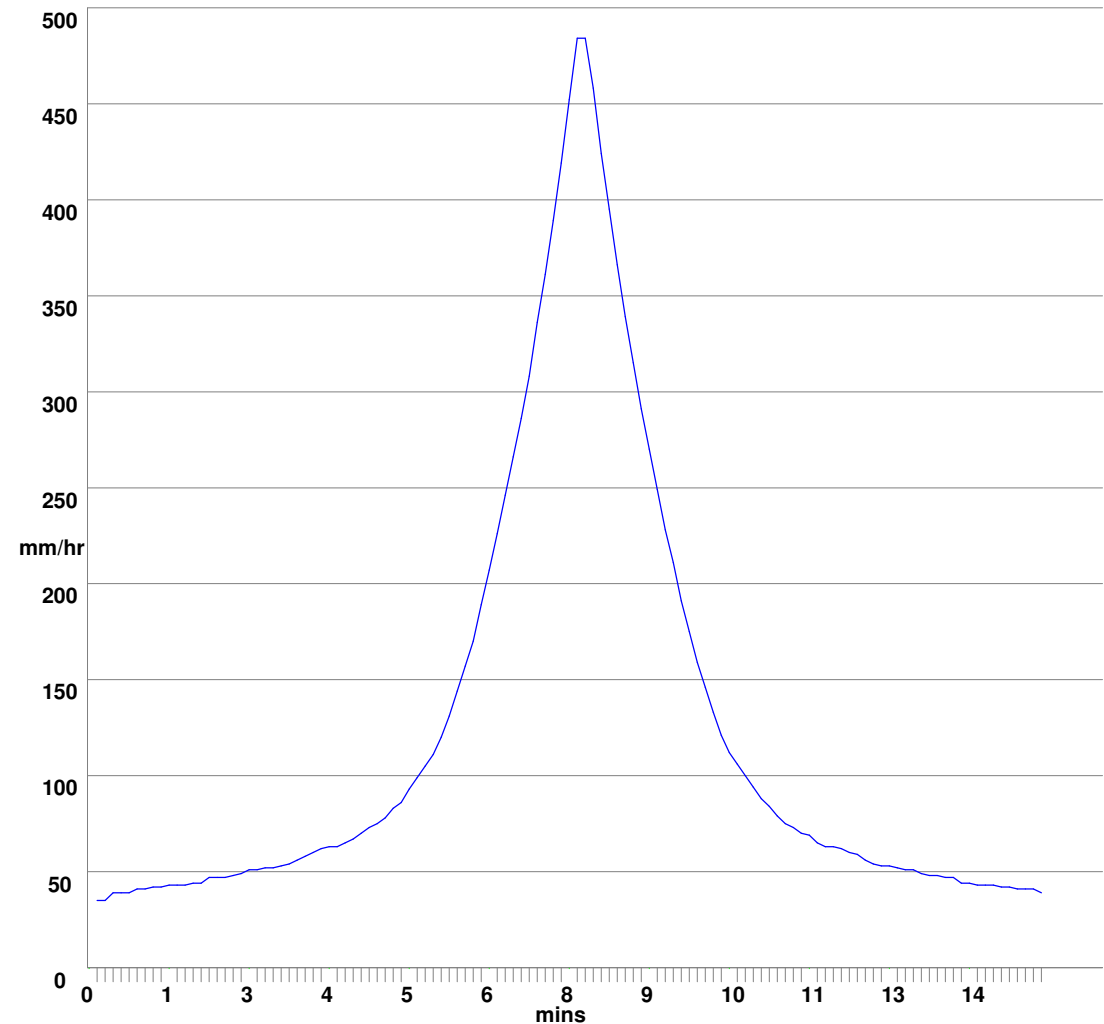
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Project Oaklands Farm Drainage
Title Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	34.54	5:08	98.70	10:08	106.10
0:15	34.54	5:15	104.87	10:15	99.93
0:22	39.48	5:22	111.04	10:22	93.76
0:30	39.48	5:30	119.67	10:30	87.60
0:38	39.48	5:38	130.78	10:38	83.89
0:45	40.71	5:45	144.35	10:45	78.96
0:52	40.71	5:52	156.69	10:52	75.26
1:00	41.95	6:00	170.26	11:00	72.79
1:08	41.95	6:08	188.76	11:08	70.32
1:15	43.18	6:15	207.27	11:15	69.09
1:22	43.18	6:22	225.78	11:22	65.39
1:30	43.18	6:30	245.52	11:30	62.92
1:38	44.41	6:38	266.49	11:38	62.92
1:45	44.41	6:45	286.23	11:45	61.69
1:52	46.88	6:52	308.44	11:52	60.45
2:00	46.88	7:00	335.58	12:00	59.22
2:08	46.88	7:08	361.49	12:08	55.52
2:15	48.12	7:15	388.63	12:15	54.28
2:22	49.35	7:22	419.47	12:22	53.05
2:30	50.58	7:30	451.55	12:30	53.05
2:38	50.58	7:38	483.63	12:38	51.82
2:45	51.82	7:45	483.63	12:45	50.58
2:52	51.82	7:52	457.72	12:52	50.58
3:00	53.05	8:00	424.41	13:00	49.35
3:08	54.28	8:08	394.80	13:08	48.12
3:15	55.52	8:15	366.42	13:15	48.12
3:22	57.99	8:22	339.28	13:22	46.88
3:30	60.45	8:30	314.60	13:30	46.88
3:38	61.69	8:38	291.16	13:38	44.41
3:45	62.92	8:45	270.19	13:45	44.41
3:52	62.92	8:52	249.22	13:52	43.18
4:00	65.39	9:00	228.24	14:00	43.18
4:08	66.62	9:08	210.97	14:08	43.18
4:15	70.32	9:15	191.23	14:15	41.95
4:22	72.79	9:22	175.19	14:22	41.95
4:30	75.26	9:30	159.15	14:30	40.71
4:38	77.73	9:38	145.58	14:38	40.71
4:45	82.66	9:45	133.24	14:45	40.71
4:52	86.36	9:52	120.91	14:52	39.48
5:00	92.53	10:00	112.27	15:00	39.48

Hydrograph profile derived from data in the Flood Studies Report

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





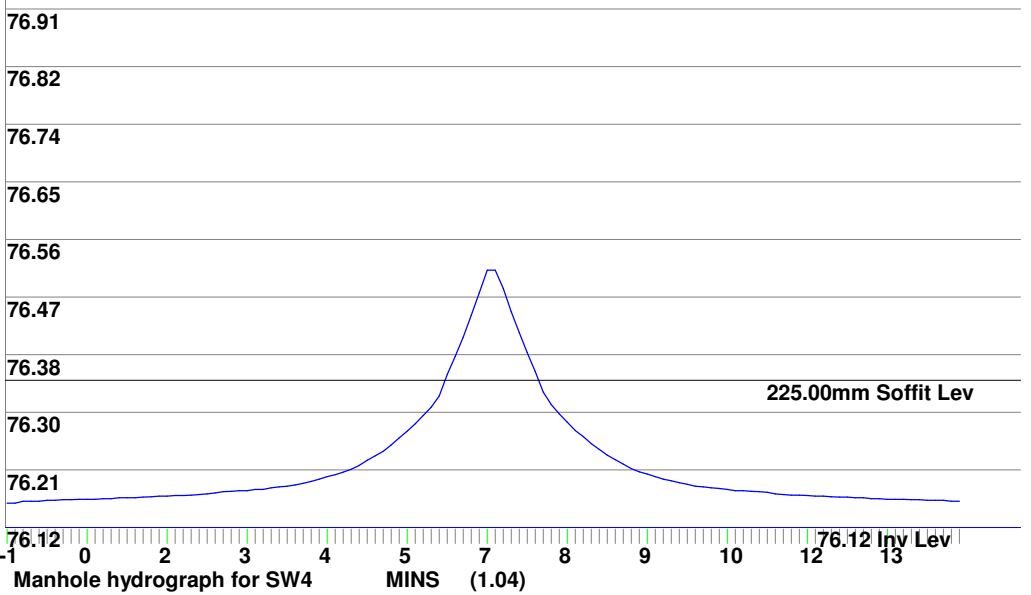
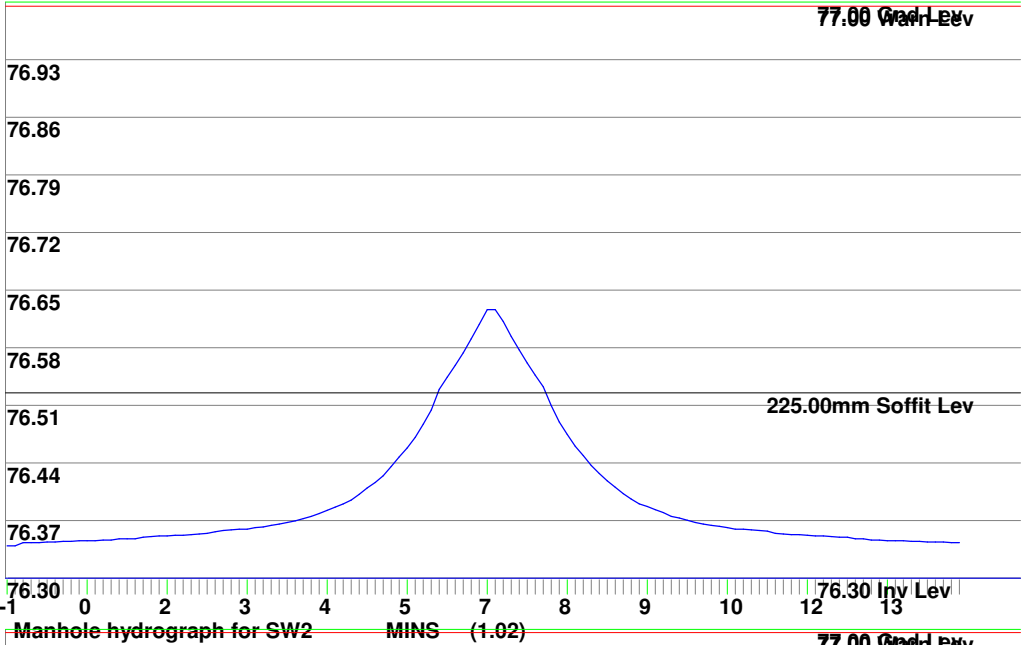
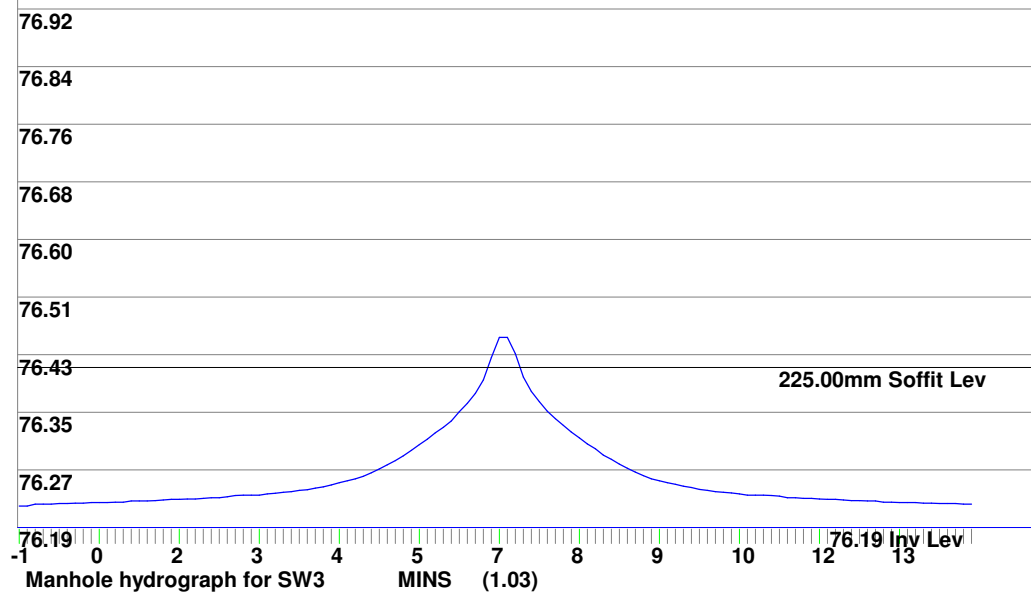
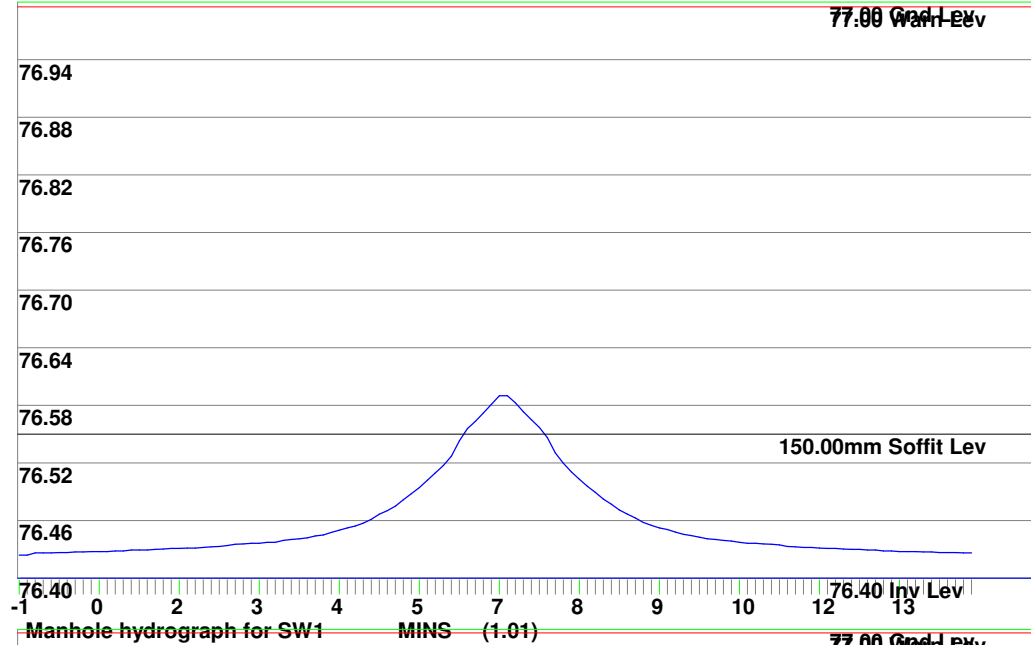
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





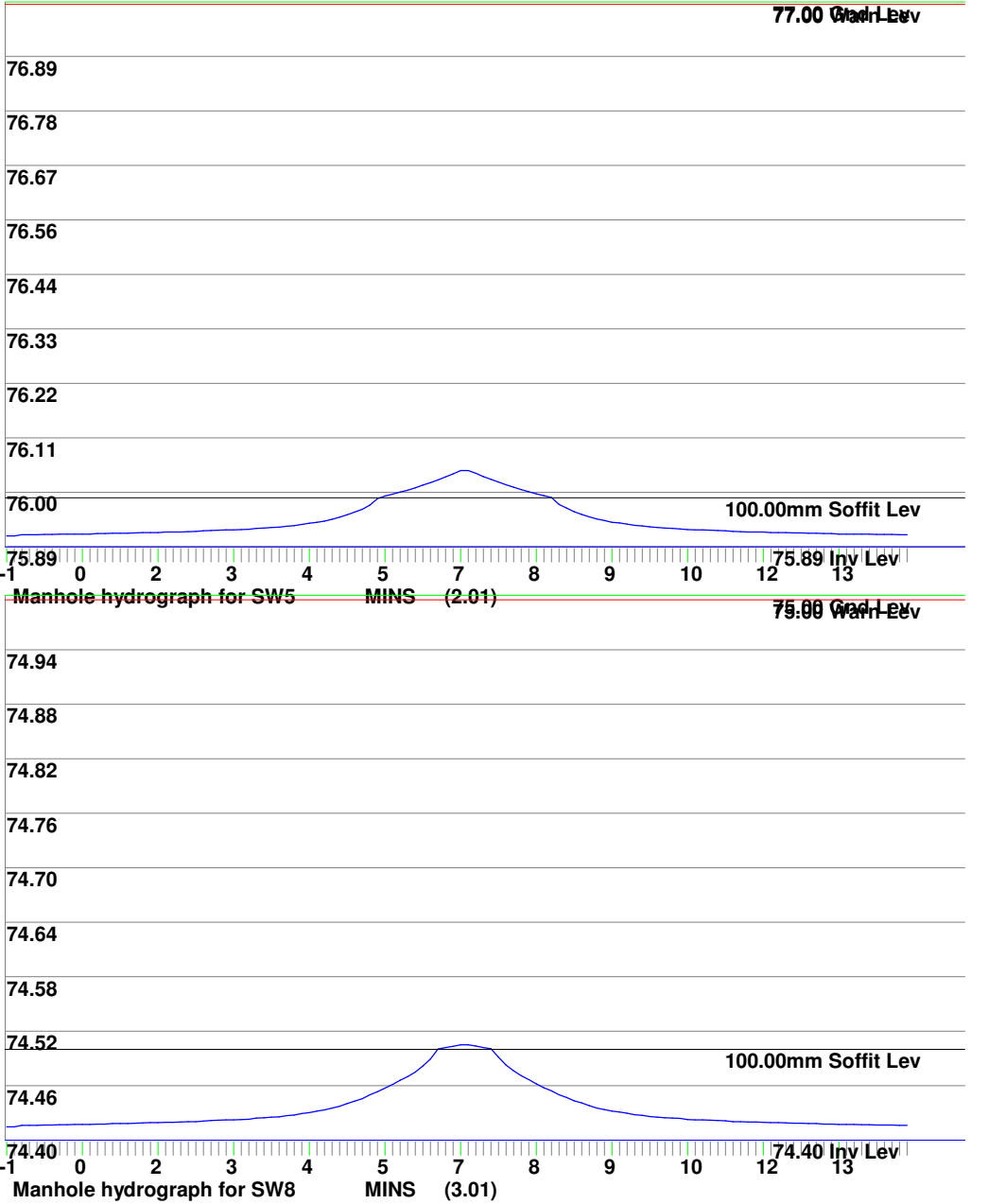
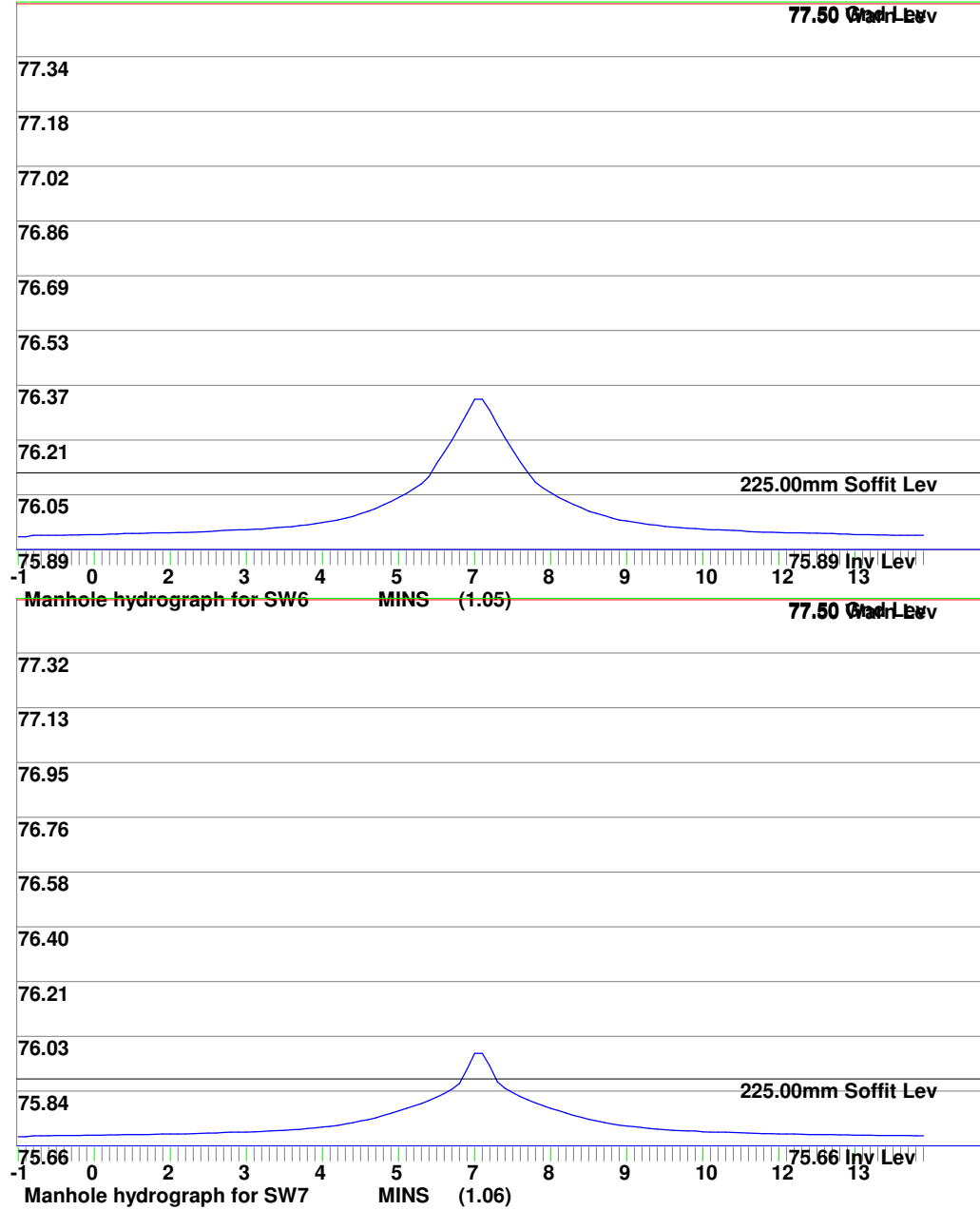
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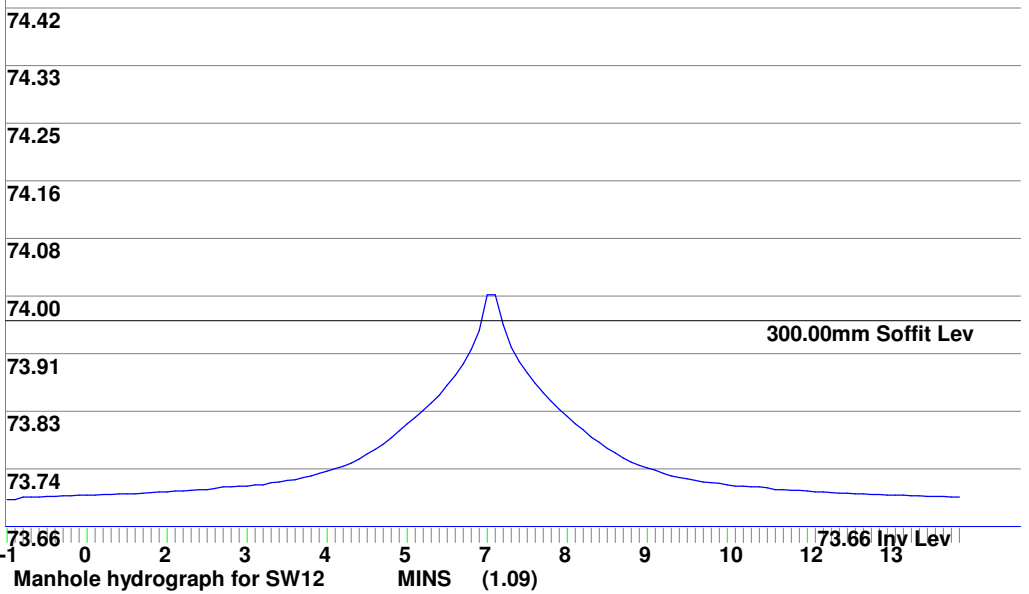
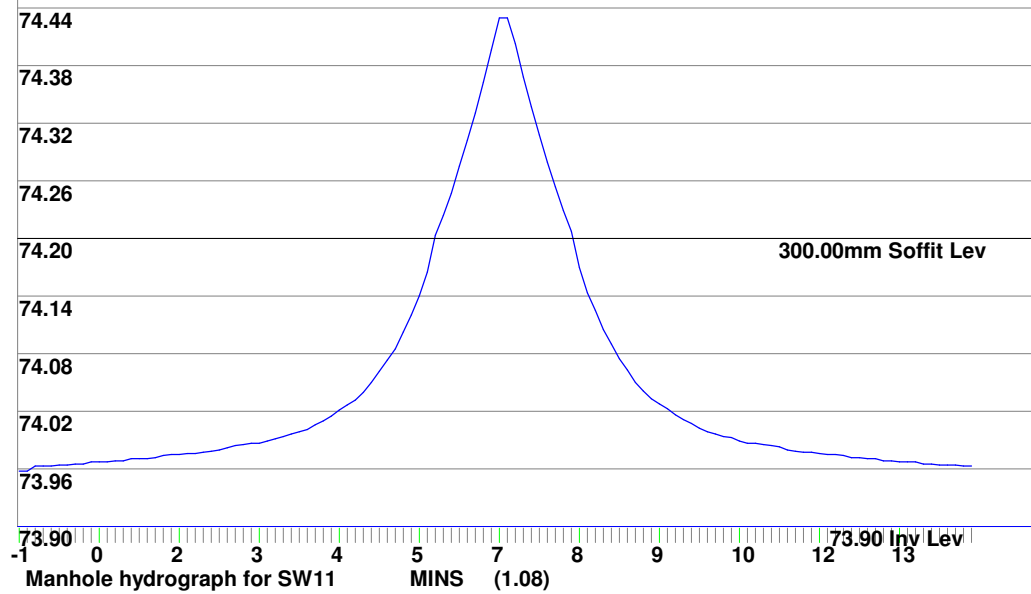
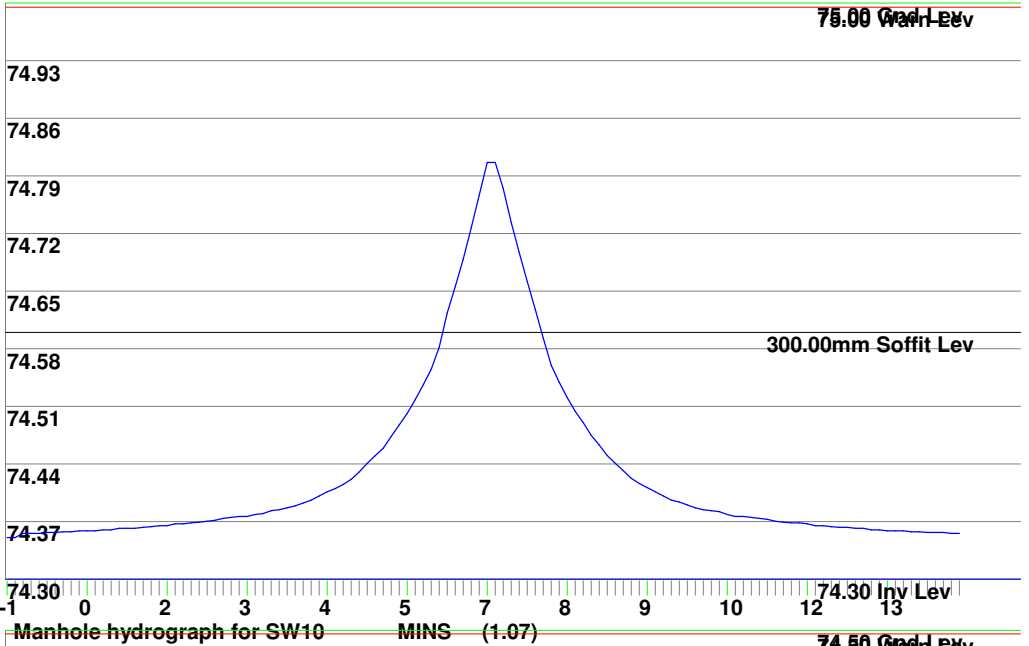
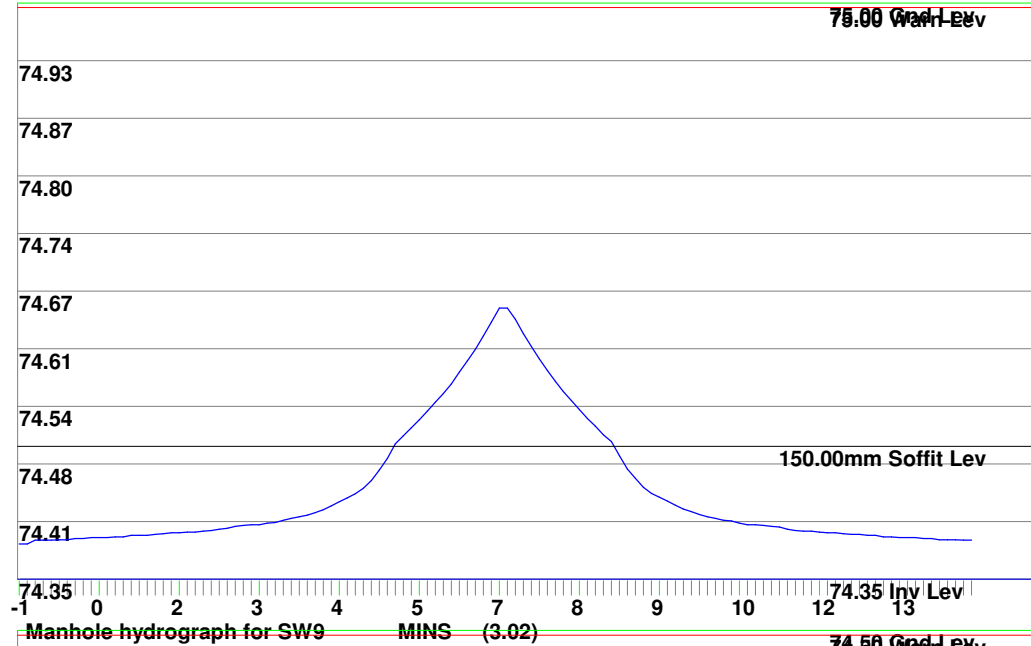
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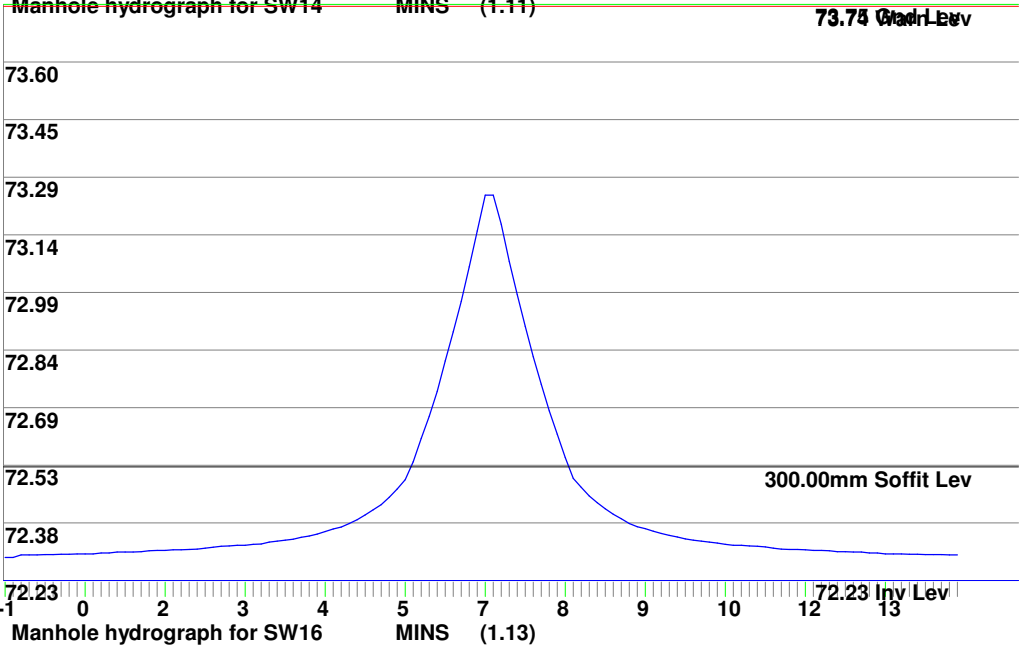
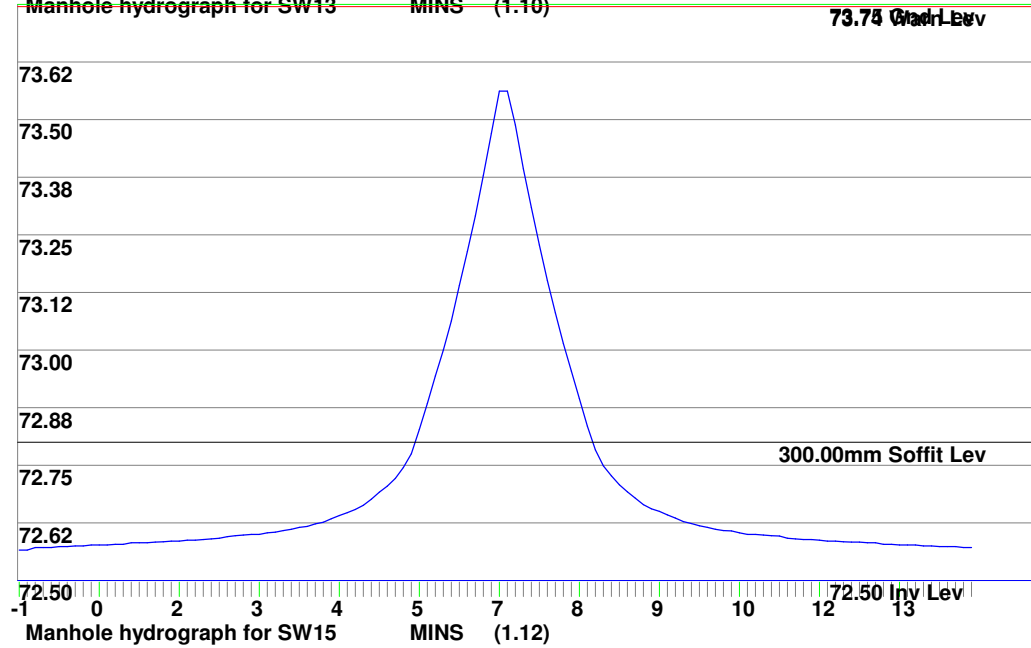
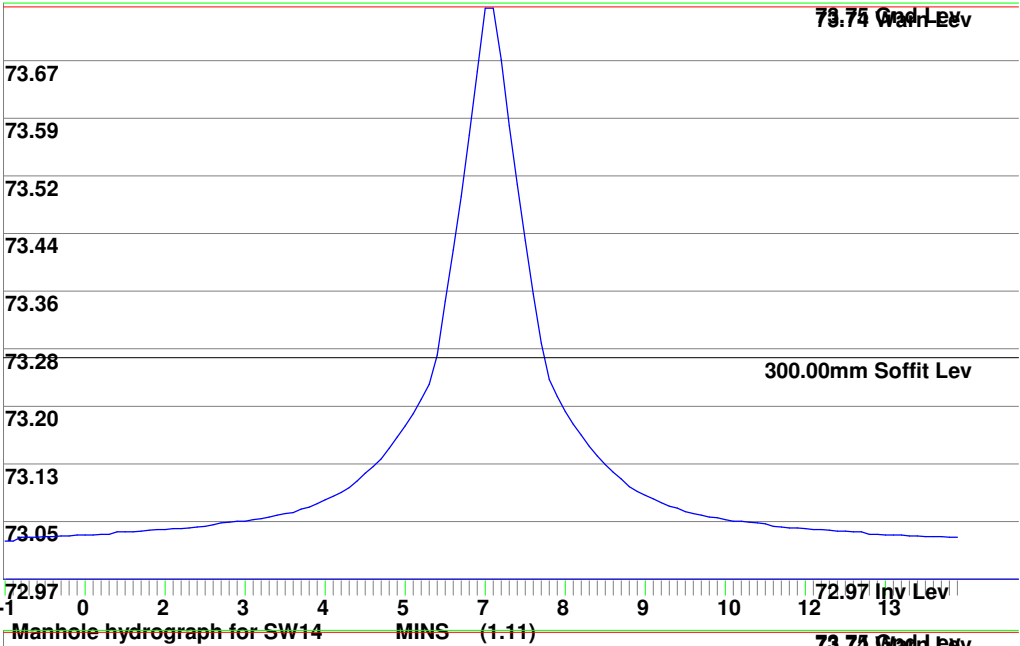
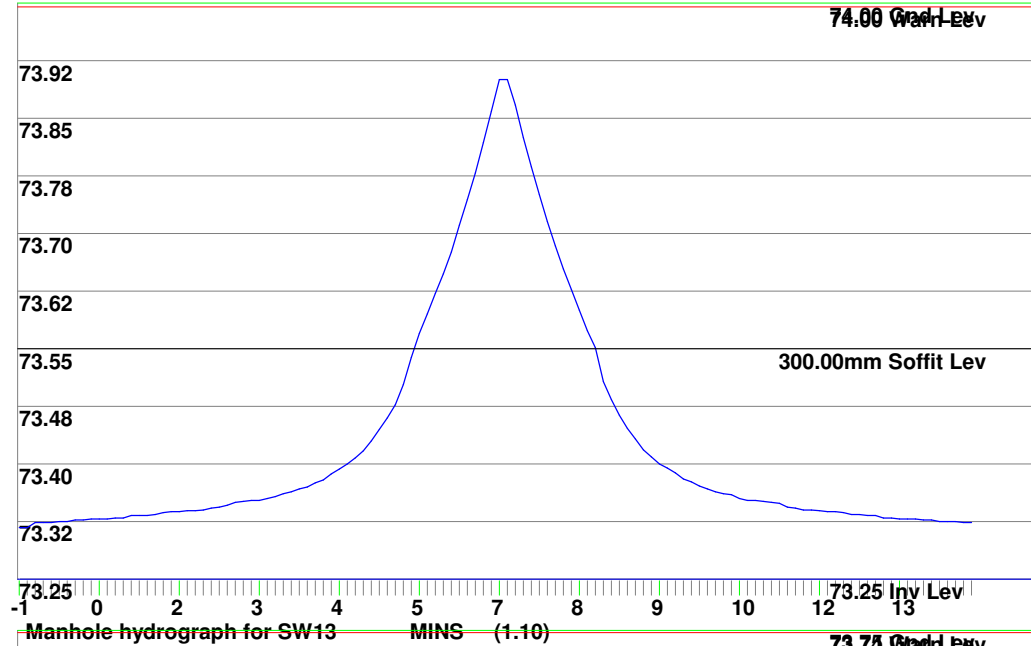
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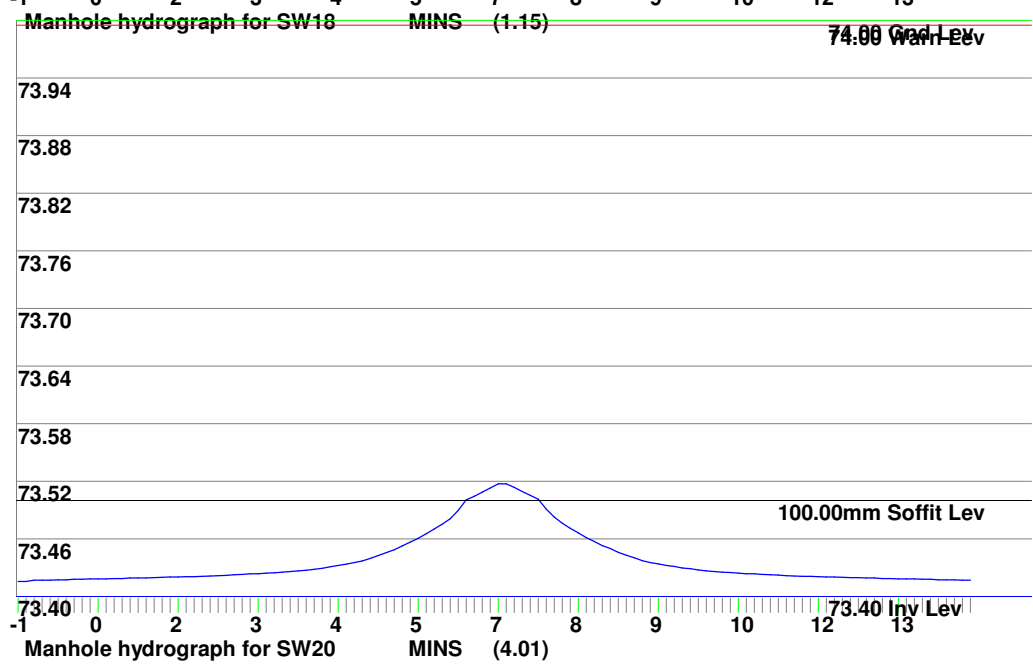
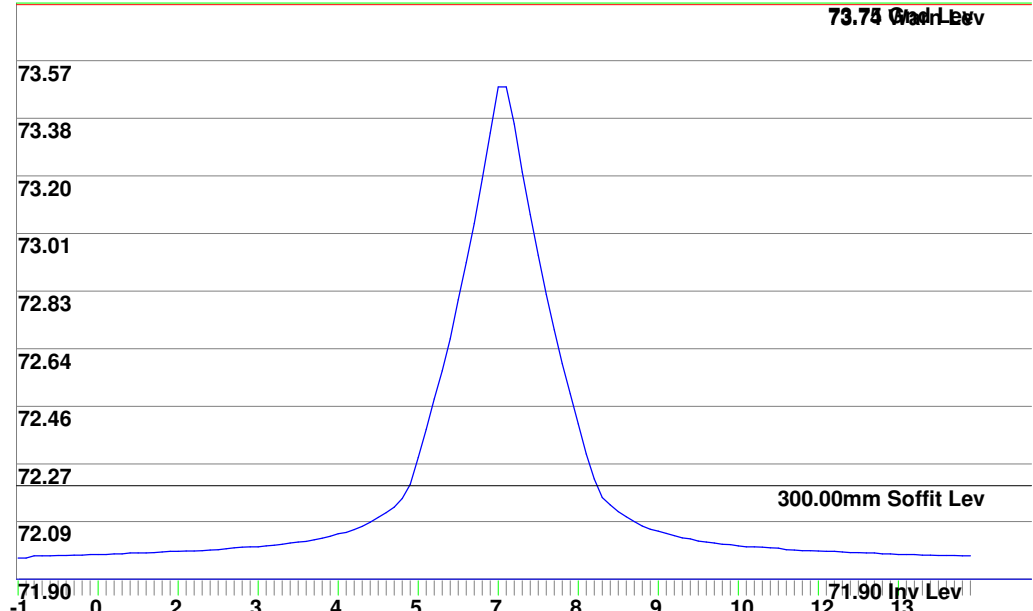
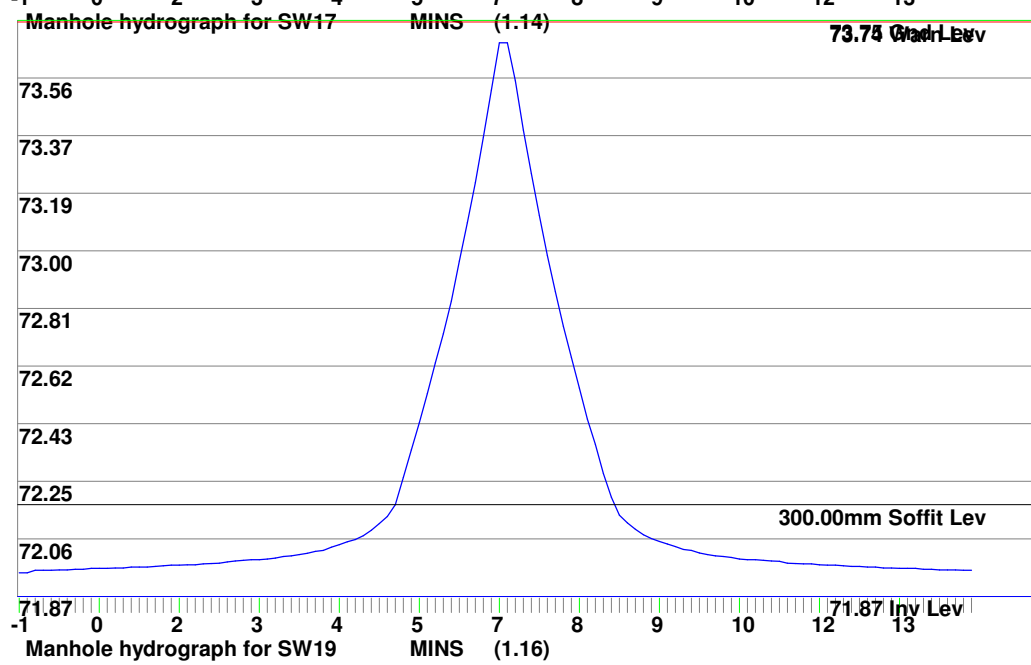
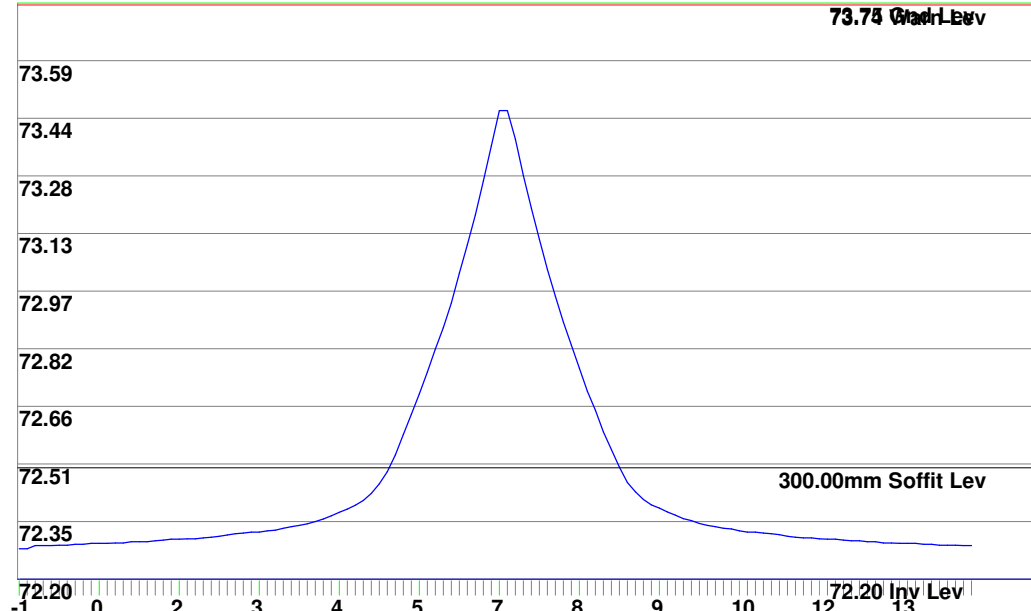
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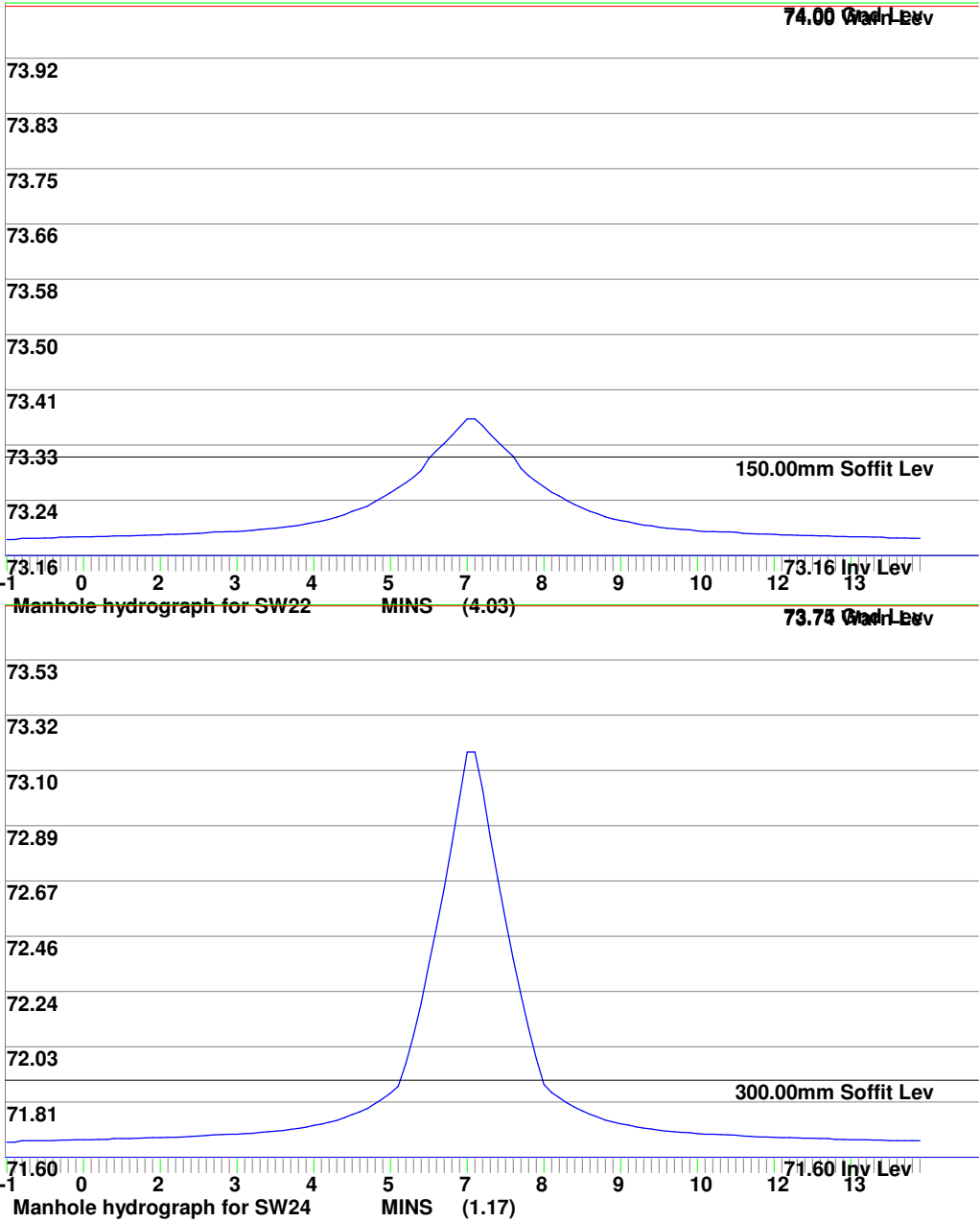
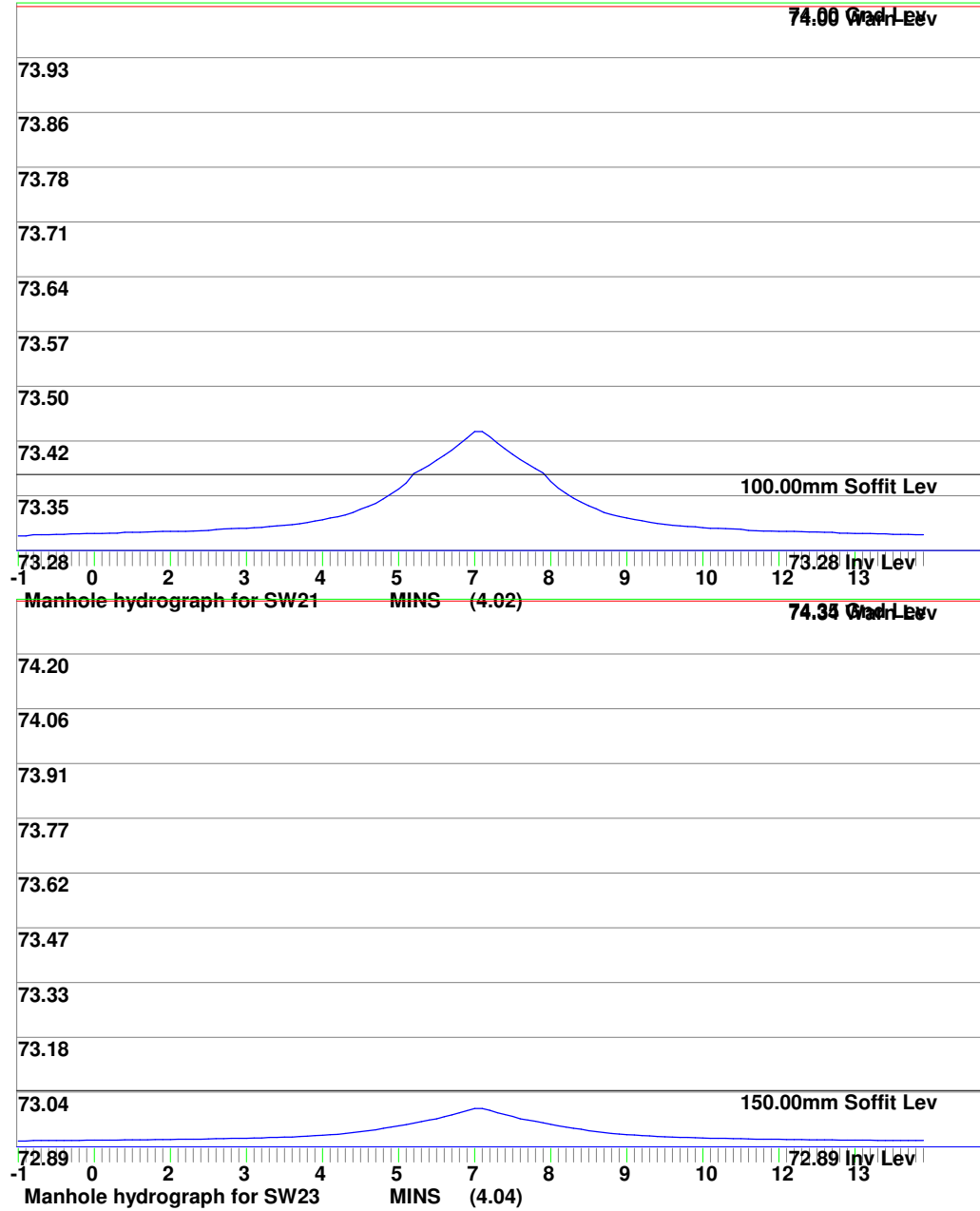
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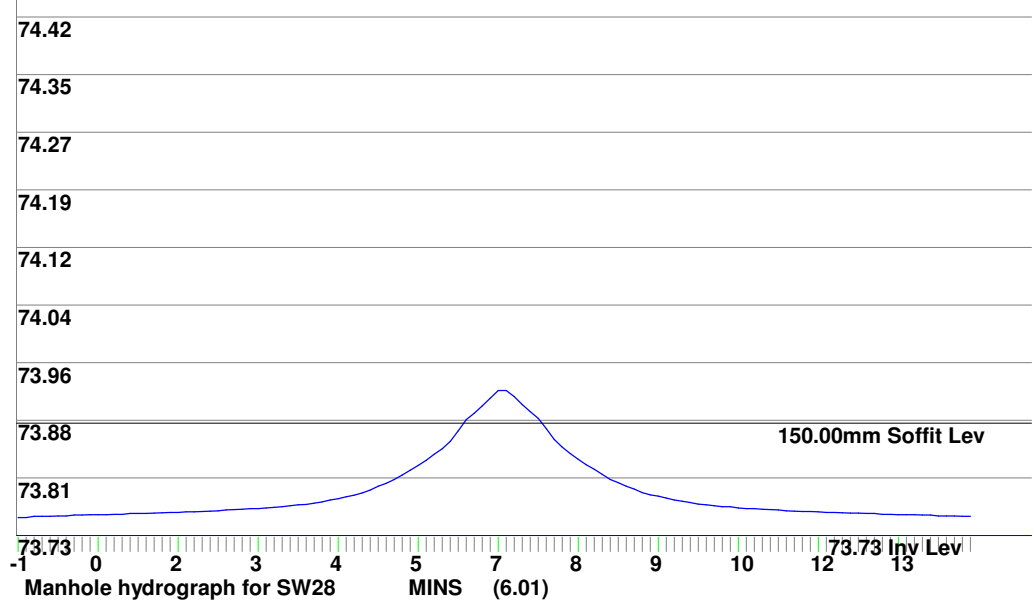
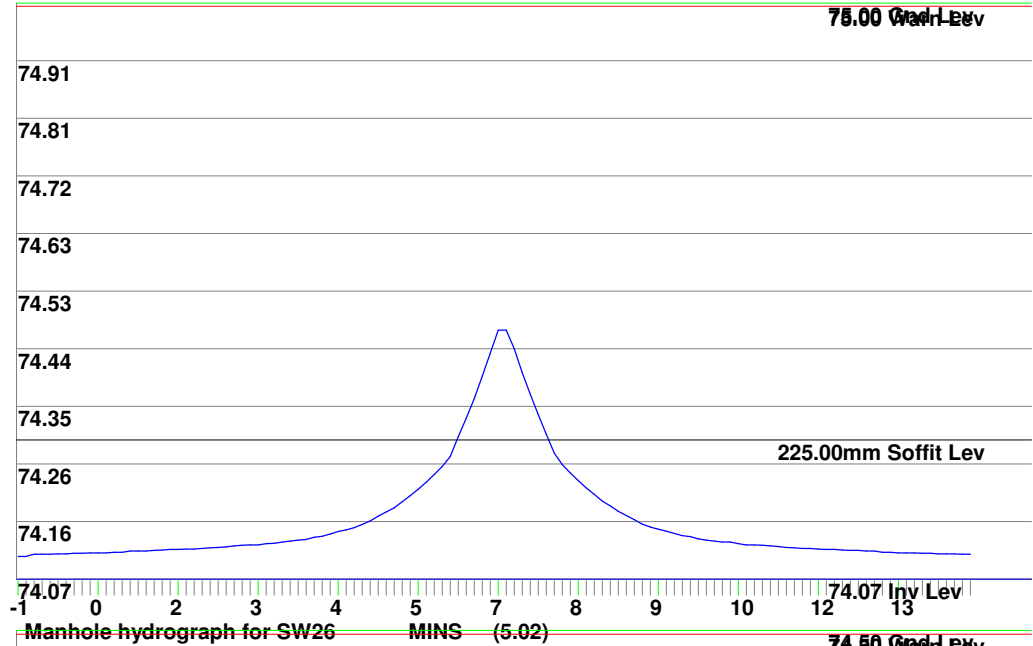
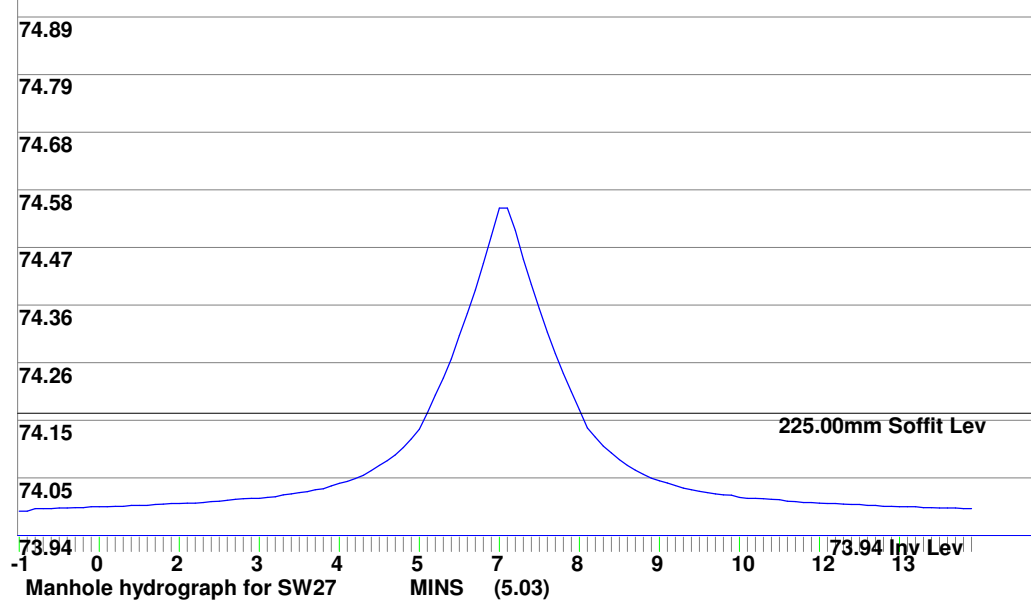
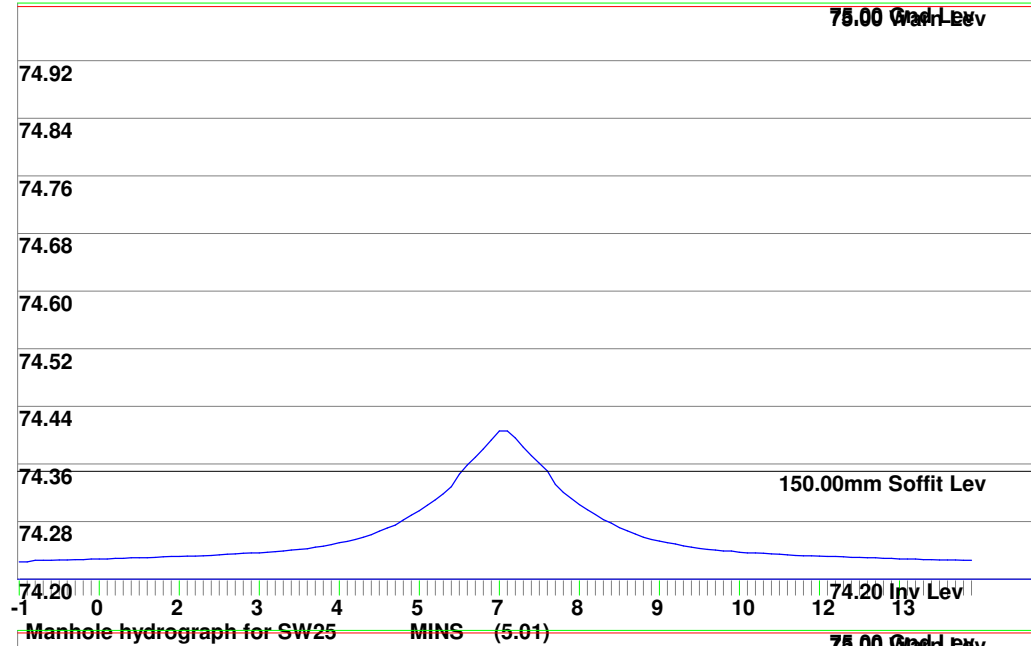
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Date 23/12/19		
By MDM	Checked	Reviewed

Project **Oaklands Farm Drainage**
Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





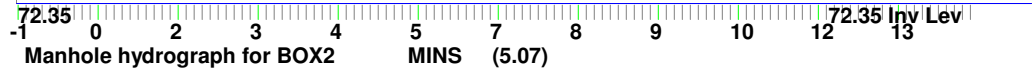
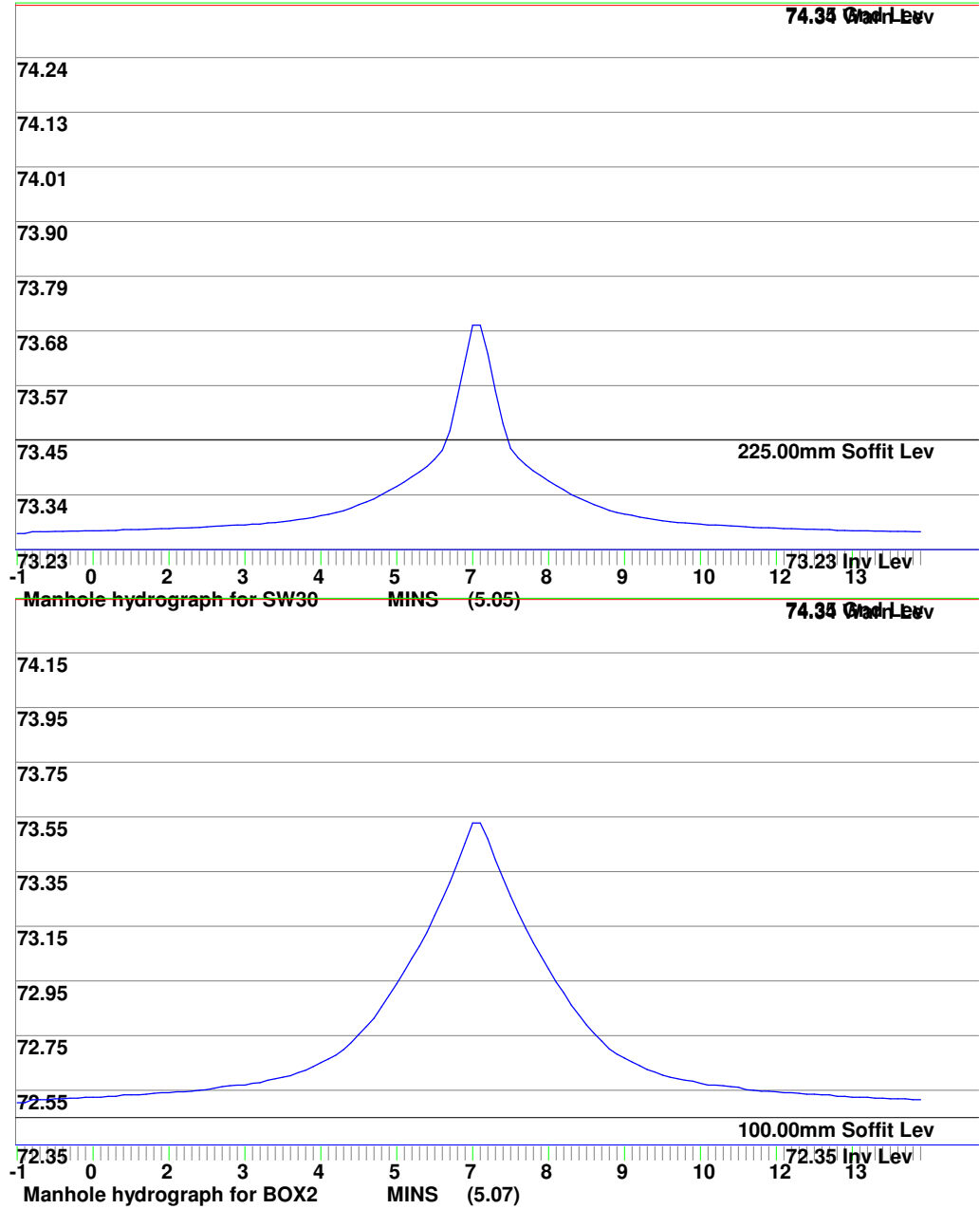
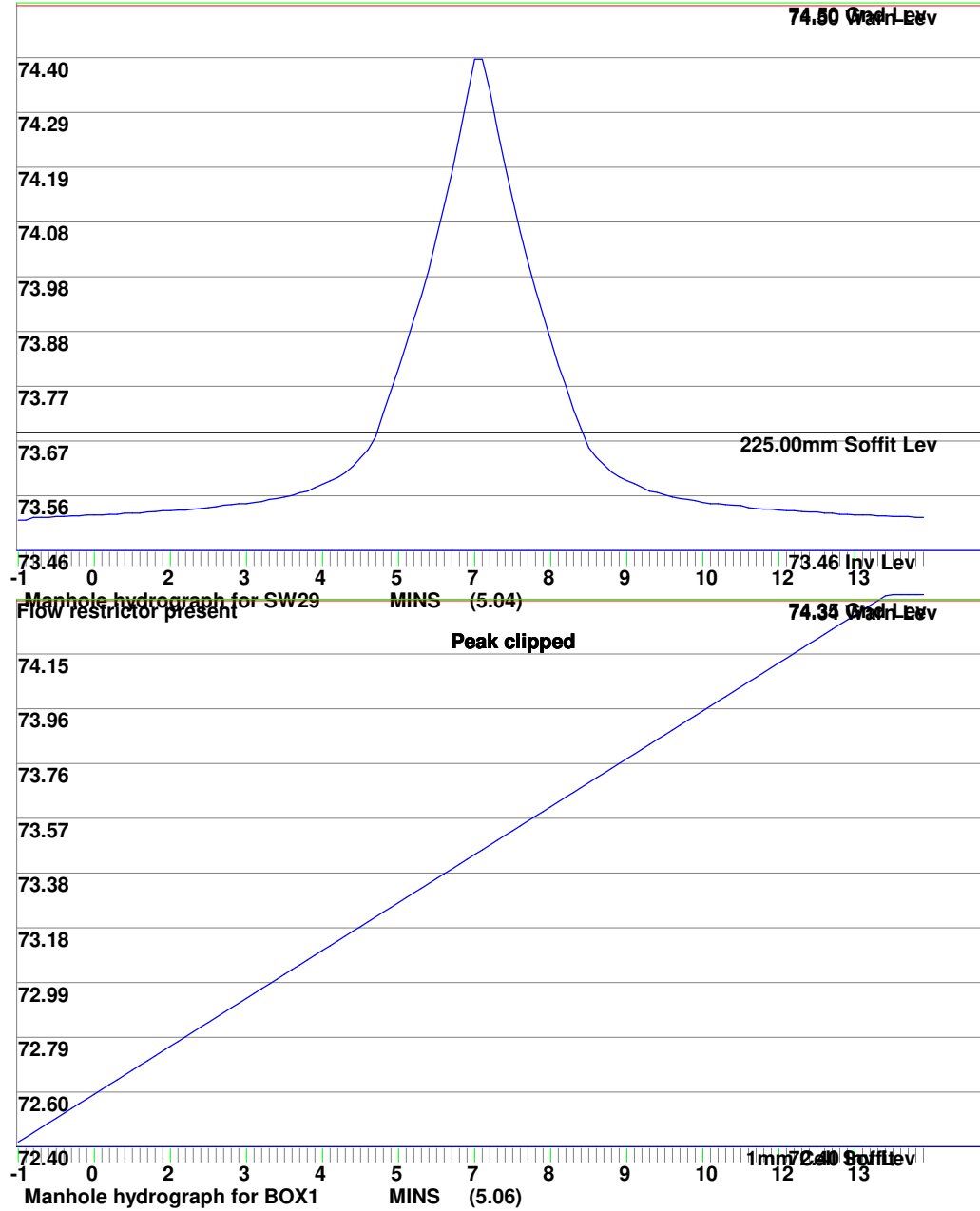
MasterDrain
SW

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. GBA/AD		
Sheet no. 13		
Date 23/12/19		
By MDM	Checked	Reviewed

Project **Oaklands Farm Drainage**
Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**





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Job No.	GBA/AD
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Sheet no.	14
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Date	23/12/19
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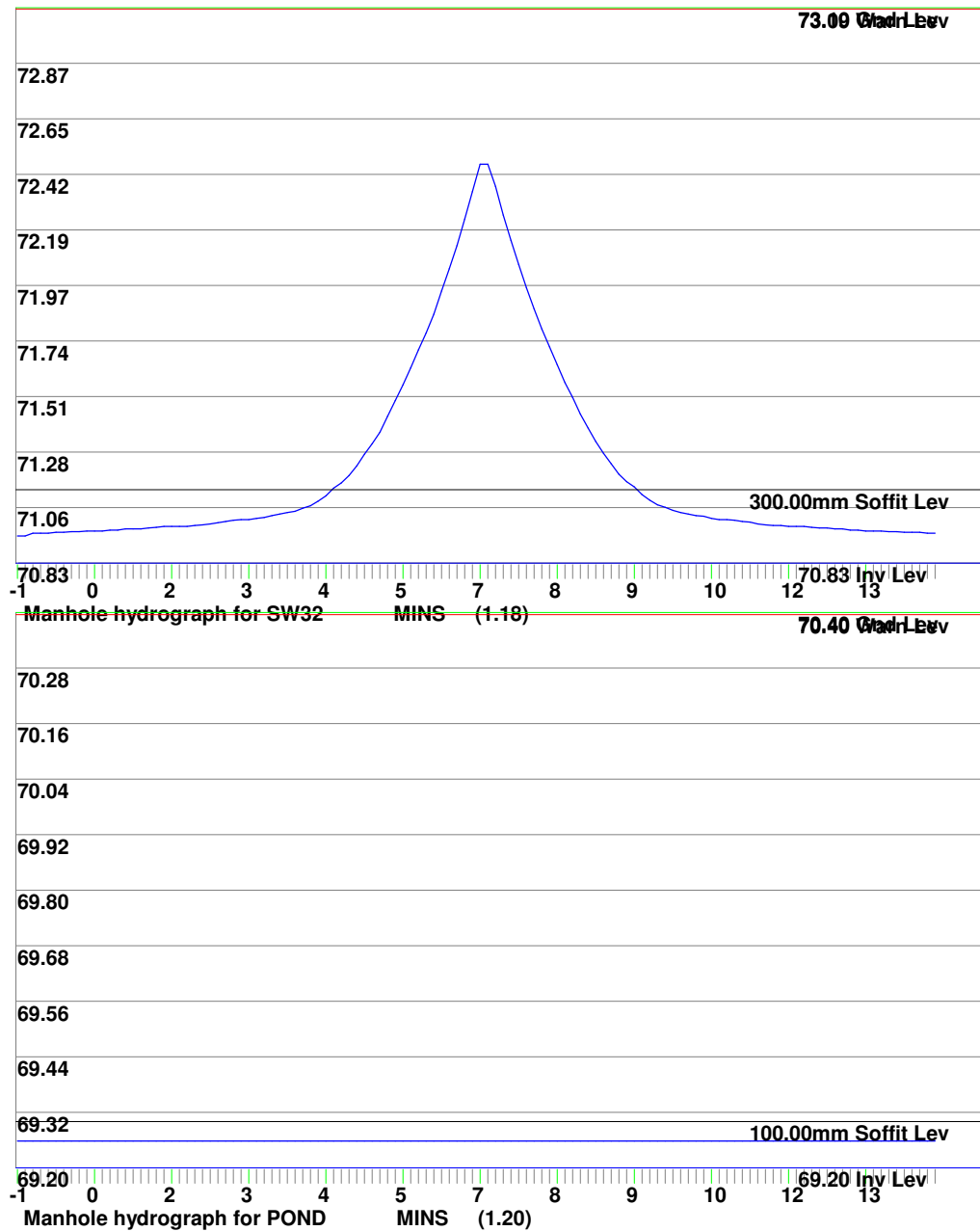
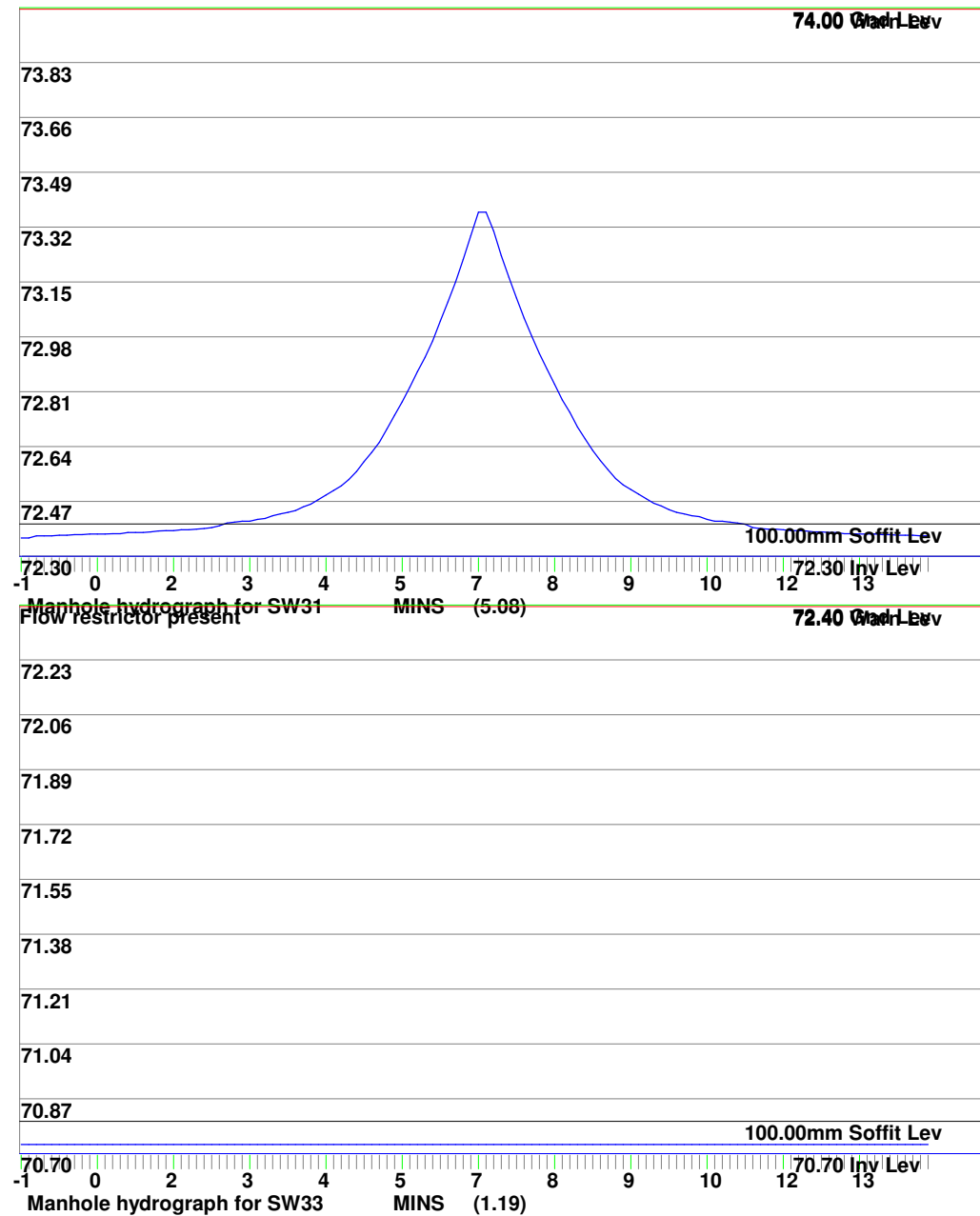
By	MDM
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	Checked
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Reviewed

Project	Oaklands Farm Drainage
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Title **Surcharge calcs (Sized at 30 yrs storm) for SLAUGHAM IJ.SW CCF = 40%**



APPENDIX C

HR WALLINGFORD ATTENUATION STORAGE MODEL



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by: Malcolm McKemey

Site name: Oaklands Farm

Site location: Slaugham

Site Details

Latitude: 51.03484° N

Longitude: 0.21722° W

Reference: 3548046496

Date: Dec 16 2019 10:05

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):	0.145
Significant public open space (ha):	0
Area positively drained (ha):	0.145
Impermeable area (ha):	0.145
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	100
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	100
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.14
Net impermeable area for storage volume design (ha):	0.14
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	98.56
FEH / FSR conversion factor:	1.28	1.28
SAAR (mm):	830	830
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	0.85	0.85
Q_{BAR} for net site area (l/s):	0.85	0.85

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2.7	2.7

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	99	99
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	99	99

This report was produced using the storage estimation 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 <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. 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 these data in the design or operational characteristics of any drainage scheme.



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by: Malcolm McKemey
 Site name: Oaklands Farm Attenuation Pond
 Site location: Slaughtam

Site Details
 Latitude: 51.03481° N
 Longitude: 0.21773° W

Reference: 1675103471
 Date: Dec 18 2019 17:02

This is an estimation of the storage volume requirements that are needed 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). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):	0.275
Significant public open space (ha):	0
Area positively drained (ha):	0.275
Impermeable area (ha):	0.275
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	100
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	100
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.28
Net impermeable area for storage volume design (ha):	0.28
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	3

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	3	3
1 in 30 years (l/s):	3.7	3.7
1 in 100 year (l/s):	5.2	5.2

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	—	63
Rainfall 100 yrs 12 hrs:	—	98.56
FEH / FSR conversion factor:	1.28	1.28
SAAR (mm):	830	830
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	1.62	1.62
Q_{BAR} for net site area (l/s):	1.62	1.62

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	152	152
Long term storage 1/100 years (m³):	29	29
Total storage 1/100 years (m³):	180	180

This report was produced using the storage estimation 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 <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. 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 these data in the design or operational characteristics of any drainage scheme.

APPENDIX D:
FOUL SEWERAGE DESIGN REPORT
By Moody Sewage Limited



POUND HILL,
POUND LANE,
UCKFIELD,
FRAMFIELD,
EAST SUSSEX,
TN22 5RR
01825 890294

THE SEWAGE FACILITIES AT

Oaklands Farm, Slaugham Lane, Warninglid, RH17 5TJ

1) CLIENT BRIEF

- a) To carry out a site survey with recommendation on the sewage facilities at Oaklands Farm, Slaugham Lane, Warninglid, RH17 5TJ.

2) SITE AND SYSTEM OVERVIEW

- a) The site consists of a working equestrian centre with various facilities currently on site.
- b) There is a proposal to develop the site. The management of waste from the development must be taken into consideration.
- c) The areas covered within the study are:-
 - i) Domestic waste from the proposed property.
 - ii) Waste from the W.C. facilities within the farm centre.
 - iii) Possible spillage / leakage from the dung pile.
- d) A detailed plan of the proposed layout has been supplied and will be used as the foundation for any design.
- e) Any existing facilities will not be taken into consideration.

3) FLOW AND LOADINGS

- a) It has been confirmed that the sewage produced from this location is classified as domestic from the property however the waste from the rest of the farm may be considered as commercial if the site is registered as a business.
- b) Surface water will be managed separately and will not pass into the foul sewers.
 - i) It is recommended that surface water is kept separate from the foul sewers.
- c) Using the information provided by the client, the Moody Sewage Ltd, British Waterways and Environment Agency models, the current flow rates and recommended design flow rates are based on:-
 - i) The development of the property to the north east of the site. The property flow will be based on a population equivalent of no more than 9 people. This generates:-
 - (a) 1,620 litres of sewage per day, 630 grams of Biochemical oxygen demand per day and 72 grams of ammonia per day.
 - ii) The toilet facilities also feeding the system will be based on 40 uses of the toilet per day. This generates:-
 - (1) 400 litres of sewage per day, 480 grams of Biochemical Oxygen Demand per day and 100 grams of ammonia per day.
- d) Therefore, the total loading of the system is based on:-
 - i) 2,020 litres of sewage per day containing:-
 - (1) 1,110 grams of Biochemical Oxygen Demand per day.
 - (2) 172 grams of ammonia per day.
- e) The population equivalent flow in terms of sewage flow rate is 11.
- f) The population equivalent flow in terms of sewage strength is 16.

4) CURRENT SITE STATUS

- a) The current methods of managing the sewage for this site have not been investigated however with the lack of any soakage into the ground and the presence of no sewage treatment plants, any discharges from any existing systems would therefore likely to be in breach of Environmental Laws.

The above breach(es) of Environmental Laws are a prosecutable offence, enforced by the Environment Agency. Prosecution can result in the waste producers or owners receiving significant fines if not resolved correctly.

5) SYSTEM AND SITE OBSERVATIONS

- a) The design of the site has been provided and outlines the scheme, development of the property, proposed locations and pipe runs.

b) Sewage Facilities

- i) The sewers from the property and any W.C. facilities is to be sited as per the plan PL08.
- ii) The treatment facilities are to be located to the south of the site with sewers traversing from the property past the stables and to the facility.
- iii) The treated effluent from the sewage treatment facility will then pass into the surface water system, through the retention pond before passing under the road and into the nearby ditch.

(1) Depending on final solution, it may be necessary to install a dedicated sample chamber between the sewage facility and the surface water pipe work and sewers.

- iv) The flow and loadings have determined that the proposed use of the site generates a stronger sewage than that of simple domestic application due to the facilities located within the farm.

(1) It is important that the biological loading of the sewage is taken into consideration rather than just the flow rate.

(2) If a system is based on the population equivalent flow of 11, a facility based on this will not produce a good and consistent effluent in line with Environmental Laws.

(3) The minimum “off the shelf” sized system should be in the region of 18 people.

- v) The receiving watercourse across the road, on inspection was not very defined and as a result any flow from the farm is currently passing into ditch across the east side of the road before simply passing out onto land.

(1) It is strongly recommended that the ditch across this side of the land is redefined so that water can travel freely and directly into the receiving river.

- vi) The following photograph shows the current state of the stream:-



vii) The point of discharge however appears acceptable however the Environment Agency may consider the discharge to be a commercial application with the merging of the toilets from the stables.

c) Stables Waste / dung pile

- i) The stable waste, namely the dung pile is to be located to the north of the site in a covered facility.
 - ii) Waste generated as a result of possible leaching or some run off should be simply caught before terminating into a sealed cess pool.
 - iii) The waste from such an application cannot go into the proposed sewage treatment plant as the biological demand for such run off is extremely strong.
 - iv) The waste in the cess pool will be removed periodically when it becomes full.
 - (1) The frequency of the emptying will be determined by the amount of surface water that is able to infiltrate the storage facility. The less infiltration will mean the less frequency of emptying.
 - v) Taking into consideration the nature of the covered area it is assumed that rain water will not be able to penetrate into the dung and therefore a vessel in the region of 3,800 litres should be more than adequate for any unlikely run off.
- d) It is assumed that a single phase power supply is available for any sewage management solution.

6) ENVIRONMENTAL PERMIT AND DISCHARGE INVESTIGATION

- a) The recommended point of discharge for this site is into the nearby stream, the Scotland Gill, through the proposed surface water system.

The Facts! - Environmental Permits

- Waste water, sewage management and discharges are governed by the Environmental Permitting Regulations 2014 and are enforced by the Environment Agency.
- You require by Law an Environmental Permit for the discharge of sewage or treated effluent from a septic tank or sewage treatment plant.
- There are exceptions to point 6.b as defined by the General Binding Rules for small sewage discharges, effective from 1st January 2015. This is applicable to everyone who has a septic tank or sewage treatment plant. An example of the General Binding Rules for small sewage discharges can be provided on request.

- b) A land and environmental search has been undertaken and has revealed that:
- i) The site is located over a vulnerable groundwater categorised as high.
 - ii) The discharge is into a constructed pond which will not have continuous flow all year round.
 - iii) The receiving ditch between the road and the stream will also not be flowing during the summer.
 - iv) There are no other Environmental Considerations for this site.
- c) At the time of checking the Environment Agency Public Registers, no permit appears to have been submitted to the Environment Agency for this site.
- d) It is recommended that an Environmental Permit is applied for to discharge into proposed location as it is not possible to adhere to the General Binding Rules for Small Sewage Discharges.

- i) An application to the Environment Agency can be completed by Moody Sewage as part of any contact sum and recommendation.

(1) The application fee of £125.00 remains the responsibility of the applicant.

e) Commercial application

- i) If it is determined by the Environment Agency that the activity within the farm is commercial, the combined management of the waste from both toilets on site and the property will therefore be subject to the standard application fee which is in the region of £2,800.00 together with an annual fee from the Environment Agency determined on application, typically being between £0.00 and £2,000.00.

7) SOLUTIONS

a) The following options are available:

- i) To supply and install a new high performance package treatment system. The budget cost for this works would be in the region of **£25,394.88 plus VAT @ 20.0%**



- ii) To supply and install a new bespoke, below ground biological digester filter treatment system. The budget cost for this works would be in the region of **£16,767.05 plus VAT @ 20.0%**



- iii) To supply and install a 3,800 litre cess pool ready or connection of the possible run off waste from the dung pile. The budget cost for this works would be in the region of **£6,443.25 plus VAT @ 20.0%**



8) OTHER CONSIDERATIONS

- i) A sample chamber will need to be installed between any treatment system and the surface water system. The necessity of a sample chamber depends on the system selected as to whether it could be incorporated into one of the surface water chambers.

9) CONCLUSION AND RECOMMENDATIONS

a) Taking all into considerations, the most suited solution would be:

- i) 7.a.ii - To supply and install a new bespoke, below ground biological digester filter treatment system.

b) This is because:

- i) The solution is capable of managing the recommended flow and loadings.
- ii) Maintenance of this system is minimal.
- iii) This option is economically advantageous compared to the other option.
- iv) The solution can be installed with minimal disturbance on site.
- v) A bespoke solution will allow the installation to completely below ground, and be the most aesthetically pleasing for the site.

c) An illustration for the cess pool can be supplied on request if this part of the project is to proceed.

d) Following competition, it is recommended the system is regularly serviced and emptied:

- i) As with all sewage treatment systems they should be regularly maintained. It is recommended that the system is serviced on a minimum quarterly basis at a cost of £38.00 plus VAT per visit, helping to ensure that the effluent is always of a good quality and that small problems do not escalate into larger, more expensive ones.
- ii) Tankering should be carried out at least annually to remove the buildup of heavy solids. Tankering will be charged at £120.00, no VAT for up to 900 gallons at current rates.

THE RECOMMENDED SOLUTION FROM MOODY SEWAGE LTD ARE FULLY GUARANTEED AND INDEMNITY BACKED. THIS MEANS AS LONG AS THE SYSTEM IS REGULARLY SERVICED AND EMPTIED THEN MOODY SEWAGE WILL GUARANTEE THE EFFLUENT QUALITY OF THAT SYSTEM. PLEASE SEE TERMS AND CONDITIONS FOR DETAILS.

APPENDIX E

MAINTENANCE MANAGEMENT PLAN

MAINTENANCE MANAGEMENT PLAN

1 **Initial maintenance:**

- 1.1 On completion of the development, all chambers and pipework for both the surface water and foul sewerage should be checked and de-silted as necessary. Any remaining areas of bare ground within the surface water drainage catchment should be planted/seeded or surfaced to minimise loose soil washing into the drainage system.
- 1.2 On the first late November/December following completion of the development (after most leaf fall has occurred), all gullies and chambers should be de-silted and cleared of debris. The flow control devices should be checked to ensure that they are working properly.

2 **Annual maintenance:**

- 2.1 Annual maintenance should generally be carried out after late November when most leaf fall will have occurred. If siltation and debris blockage is found to be excessive, more frequent maintenance may be indicated.
- 2.2 Annual maintenance will comprise:
 - Checking all chamber covers and frames for damage and fit.
 - Checking all gully gratings for damage and fit.
 - De-silting and removing debris from all chambers and gully pots.
 - Checking the inlet and outlet chambers on the underground box attenuation chamber for evidence of siltation.
 - Checking the pond and condition of the trash rack and screen at the inlet to the flow control chamber, clear and de-silt as necessary.
 - Checking that the flow control device is clean and functioning.
 - Maintenance of the sewage treatment plant as per the manufacturer's and or installer's recommendations. To be carried out by appropriately qualified specialist.

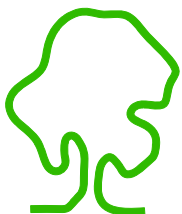
3 **Long-term maintenance:**

- 3.1 The pond may require occasional dredging, although as long as the specified freeboard is not compromised, it should remain effective. Only half the pond should be dredged in any year to preserve the pond habitat, flora and fauna and permit it to recolonize the dredged area.

4. **Responsibility for carrying out the Maintenance Management Plan:.**

- 4.1 The developer/contractor will be responsible for the initial maintenance and the annual maintenance up to the end of any maintenance or guarantee period.
- 4.2 After the end of the maintenance or guarantee period, it will become the responsibility of the freeholder of the property.
- 4.3 A record of all maintenance work carried out should be kept as part of the Maintenance Management Plan.

☆ ☆ ☆ ☆ ☆ ☆ ☆



eas ltd

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