



MasterDrain
SW

Muir Associates (UK) Limited

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Trinity Chambers,
18 Ivy Street,
Birkenhead CH41 5EF
Tel: 0151 650 1200 Mob: 07813 7770514
email: design@muir-associates.co.uk

Job No. 1132-22		
Sheet no. 1		
Date 21/11/22		
By MJ	Checked	Reviewed

Project
Knowsley East Hub

Title
Surface Water Drainage Design 1 in 30 + 0%

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

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

Mean rain intens. 72.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 180.00 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	S-MH-01	42.1	11.4	225	1200	43.85	43.93	44.80	0.27	0.07	0.00	0.000	527	OK
2	I	1.02	S-MH-02	77.8	34.2	300	1200	43.58	43.72	44.80	0.44	0.14	0.00	0.000	1579	OK
3	I	1.03	S-MH-03	78.4	45.6	300	1200	43.43	43.60	44.80	0.58	0.17	0.00	0.000	2106	OK
4	I	1.04	S-MH-04	78.0	45.6	300	1500	43.30	43.47	44.60	0.59	0.17	0.00	0.000	2106	OK
5	B	2.01	S-MH-09	184.0	23.1	450	1500	43.08	43.16	44.35	0.13	0.08	0.00	0.000	1065	OK
6	B	2.02	S-MH-10	184.9	77.1	450	1500	42.99	43.19	44.35	0.42	0.20	0.00	0.000	3560	OK
7	B	2.03	S-MH-12	398.2	77.1	450	1500	42.87	42.98	44.35	0.19	0.11	0.00	0.000	3560	OK
8	I	1.05	S-MH-05	227.8	122.8	450	1500	42.79	43.04	44.42	0.54	0.24	0.00	0.000	5666	OK
9	B	3.01	S-MH-13	42.1	11.4	225	1200	43.90	43.97	44.80	0.27	0.07	0.00	0.000	527	OK
10	B	3.02	S-MH-14	95.8	34.3	300	1200	43.70	43.82	44.80	0.36	0.12	0.00	0.000	1582	OK
11	B	3.03	S-MH-15	298.4	45.7	300	1200	43.47	43.54	44.92	0.15	0.06	0.00	0.000	2109	OK
12	I	1.06	S-MH-06‡	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07	S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08	S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Notes

Printout headings

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

Title box

Hydrograph data

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

Flow restrictors

Manhole reference - S-MH-06

Restrictor flowrate - 4.83 l/s



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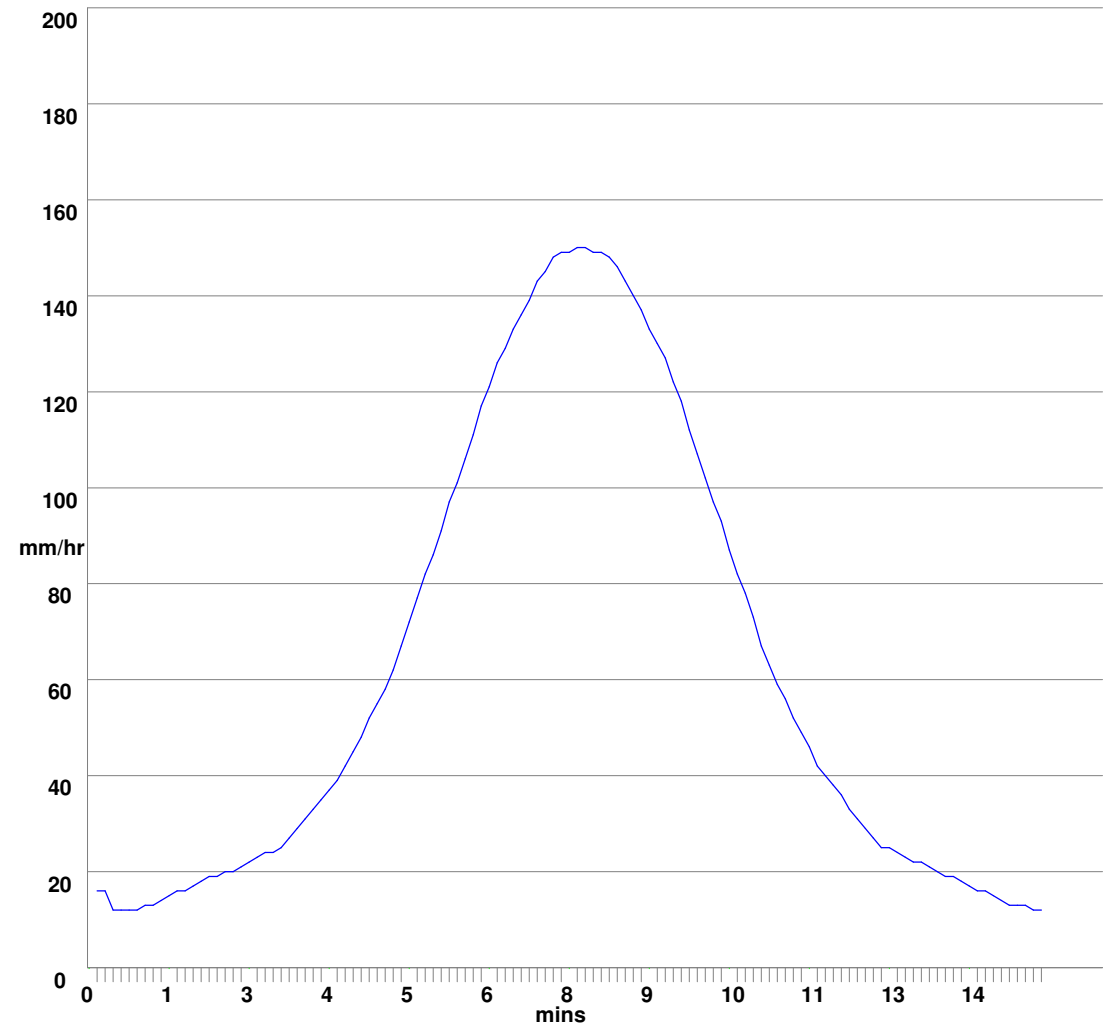
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Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	16.20	5:08	76.82	10:08	82.22
0:15	16.20	5:15	81.62	10:15	78.02
0:22	12.00	5:22	85.82	10:22	73.21
0:30	12.00	5:30	91.22	10:30	67.21
0:38	12.00	5:38	96.62	10:38	63.01
0:45	12.00	5:45	101.42	10:45	59.41
0:52	13.20	5:52	105.62	10:52	55.81
1:00	13.20	6:00	111.02	11:00	52.21
1:08	13.80	6:08	117.02	11:08	49.21
1:15	15.00	6:15	121.22	11:15	45.61
1:22	15.60	6:22	126.02	11:22	42.01
1:30	16.20	6:30	129.03	11:30	39.61
1:38	17.40	6:38	132.63	11:38	37.81
1:45	18.00	6:45	136.23	11:45	36.01
1:52	18.60	6:52	139.23	11:52	33.01
2:00	19.20	7:00	142.83	12:00	31.21
2:08	19.80	7:08	145.23	12:08	29.41
2:15	20.40	7:15	147.63	12:15	27.01
2:22	21.00	7:22	148.83	12:22	25.20
2:30	22.20	7:30	149.43	12:30	24.60
2:38	22.80	7:38	150.03	12:38	24.00
2:45	24.00	7:45	150.03	12:45	23.40
2:52	24.00	7:52	149.43	12:52	22.20
3:00	25.20	8:00	148.83	13:00	21.60
3:08	27.01	8:08	147.63	13:08	21.00
3:15	28.81	8:15	145.83	13:15	19.80
3:22	30.61	8:22	143.43	13:22	19.20
3:30	33.01	8:30	140.43	13:30	19.20
3:38	34.81	8:38	136.83	13:38	18.00
3:45	37.21	8:45	133.23	13:45	17.40
3:52	39.01	8:52	130.23	13:52	16.20
4:00	42.01	9:00	126.62	14:00	15.60
4:08	45.01	9:08	122.42	14:08	15.00
4:15	48.01	9:15	117.62	14:15	14.40
4:22	51.61	9:22	112.22	14:22	13.20
4:30	55.21	9:30	106.82	14:30	13.20
4:38	58.21	9:38	102.02	14:38	12.60
4:45	62.41	9:45	97.22	14:45	12.00
4:52	66.61	9:52	93.02	14:52	12.00
5:00	72.01	10:00	87.02	15:00	12.00

Hydrograph profile derived from data in the Flood Studies Report

Return period= 30 yrs Duration= 15 mins Profile - winter





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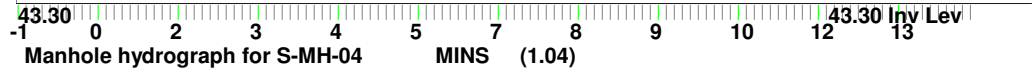
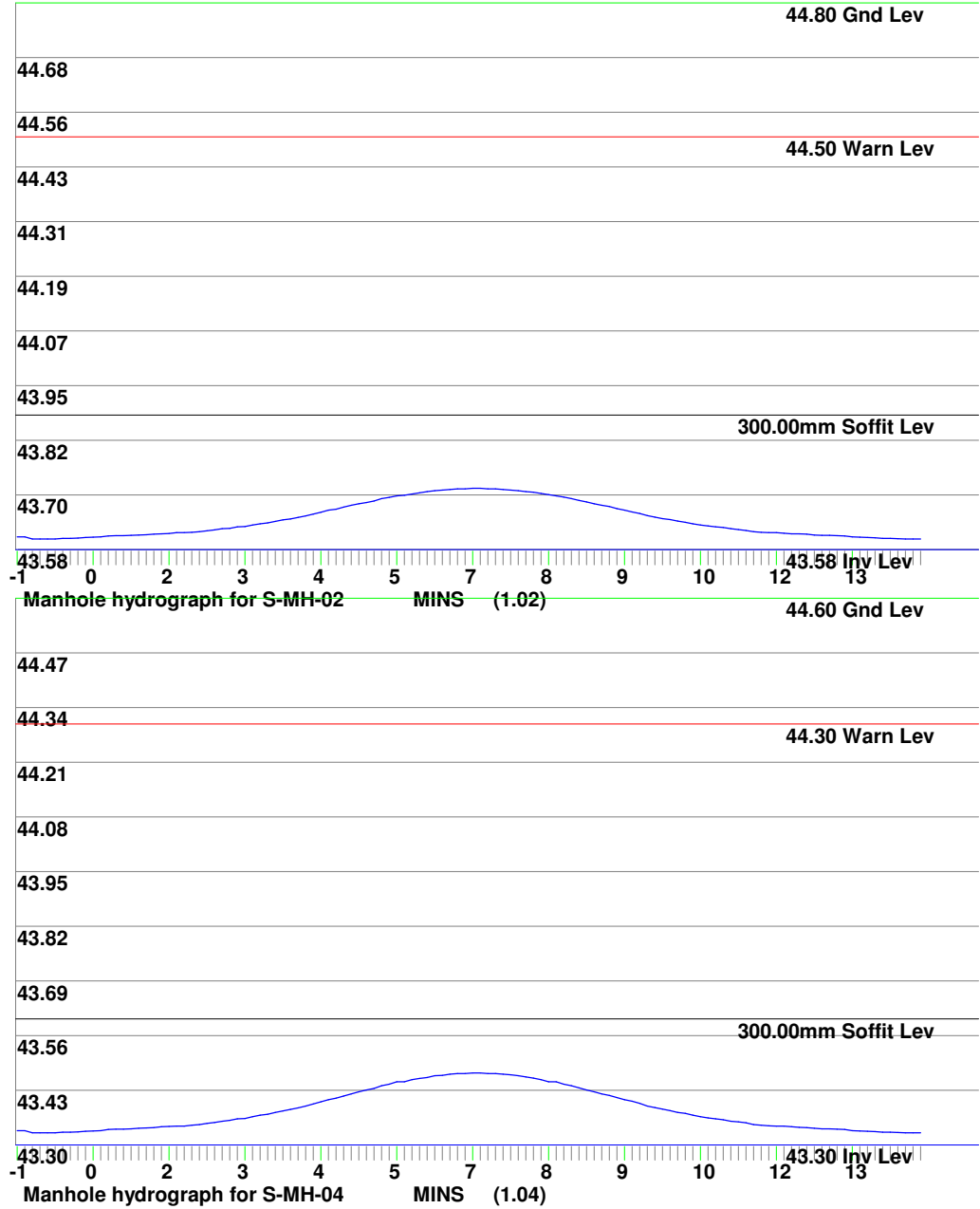
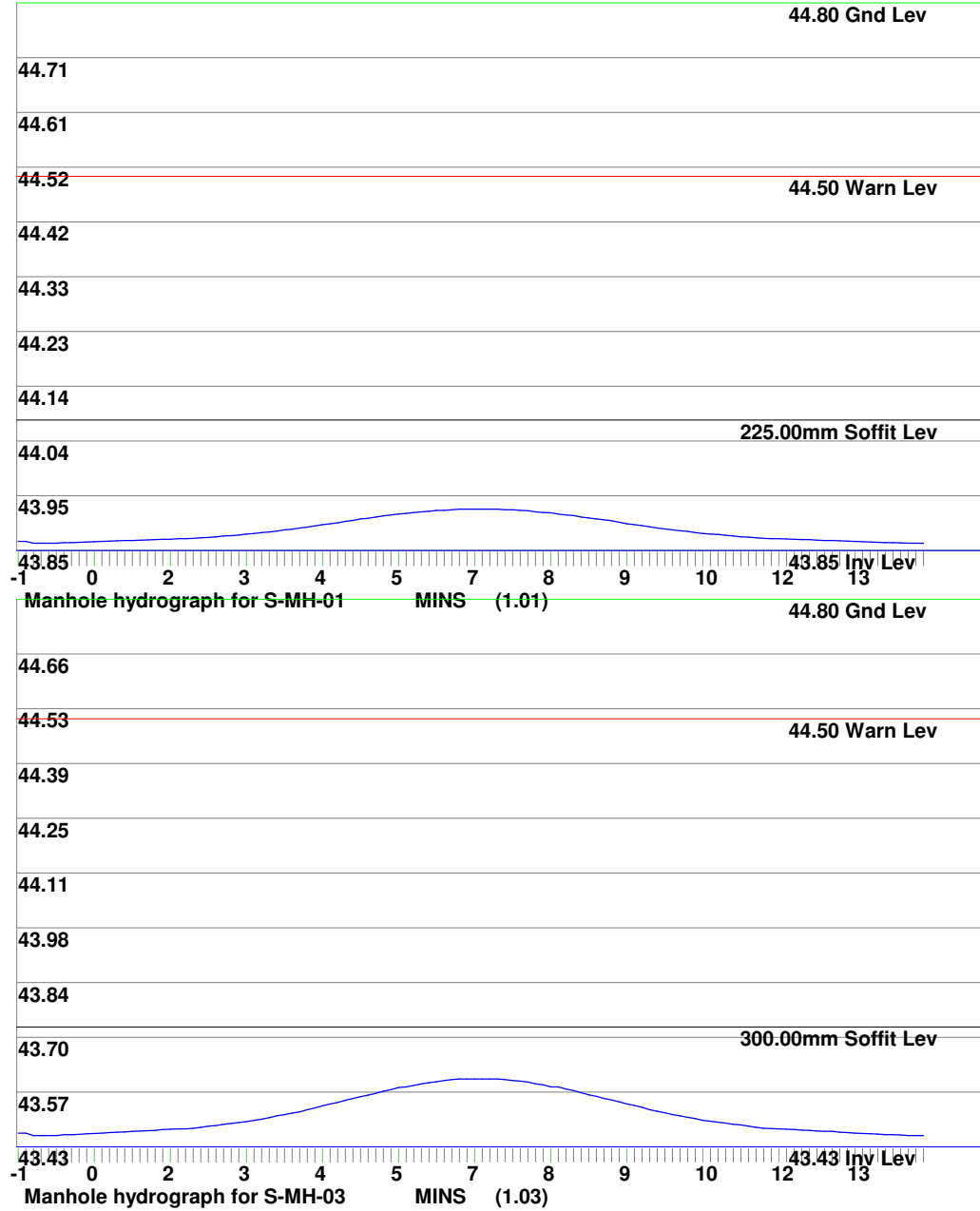
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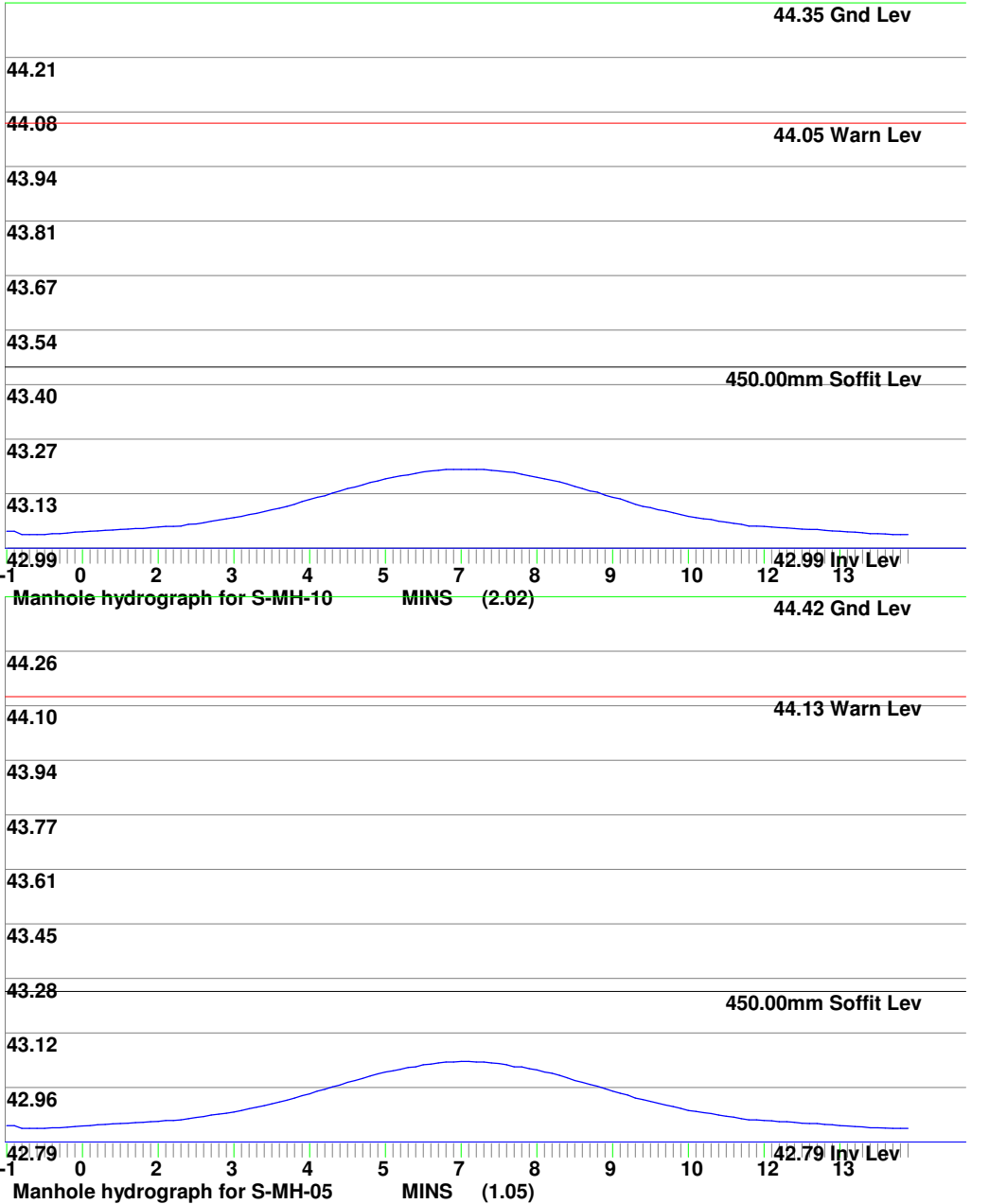
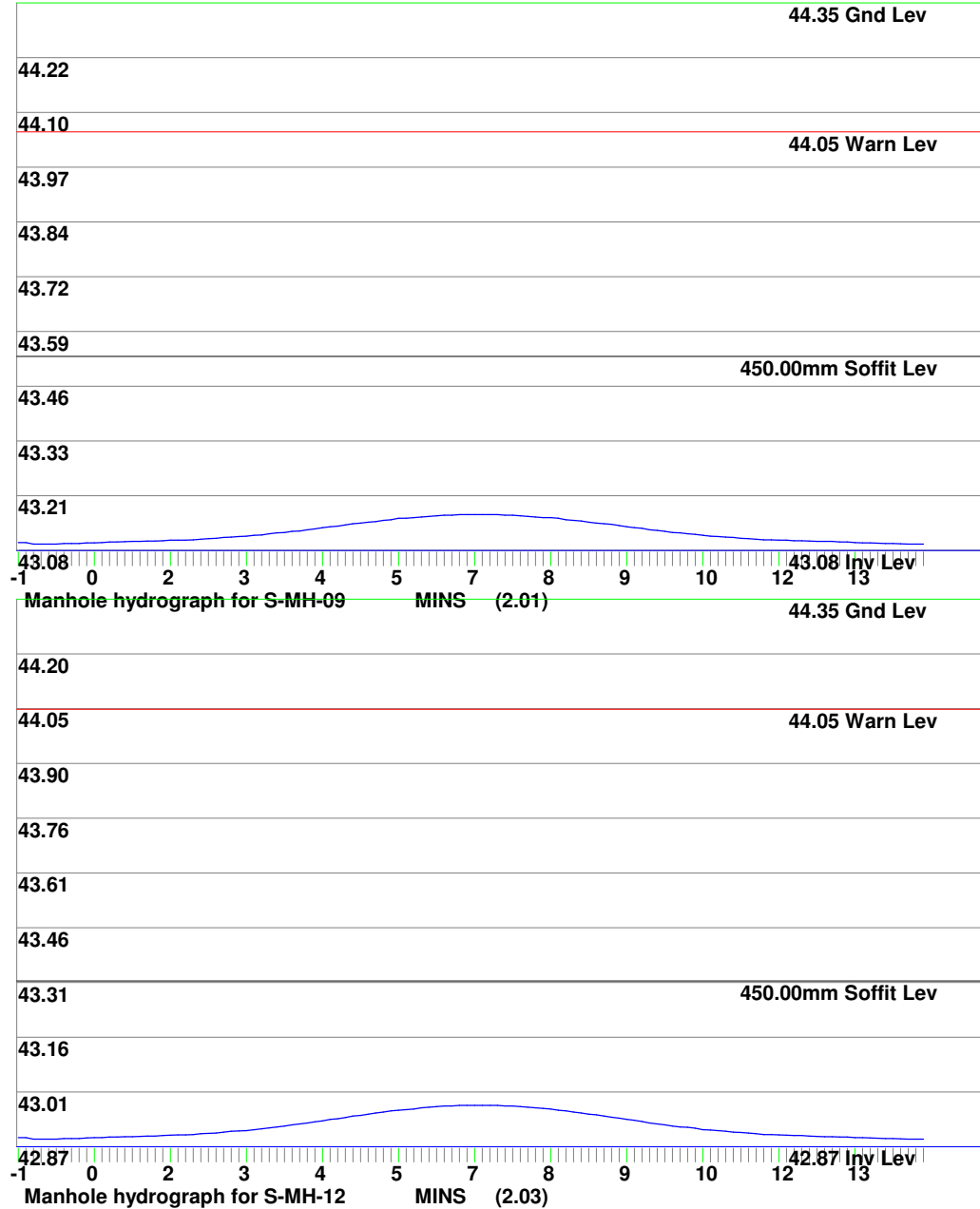
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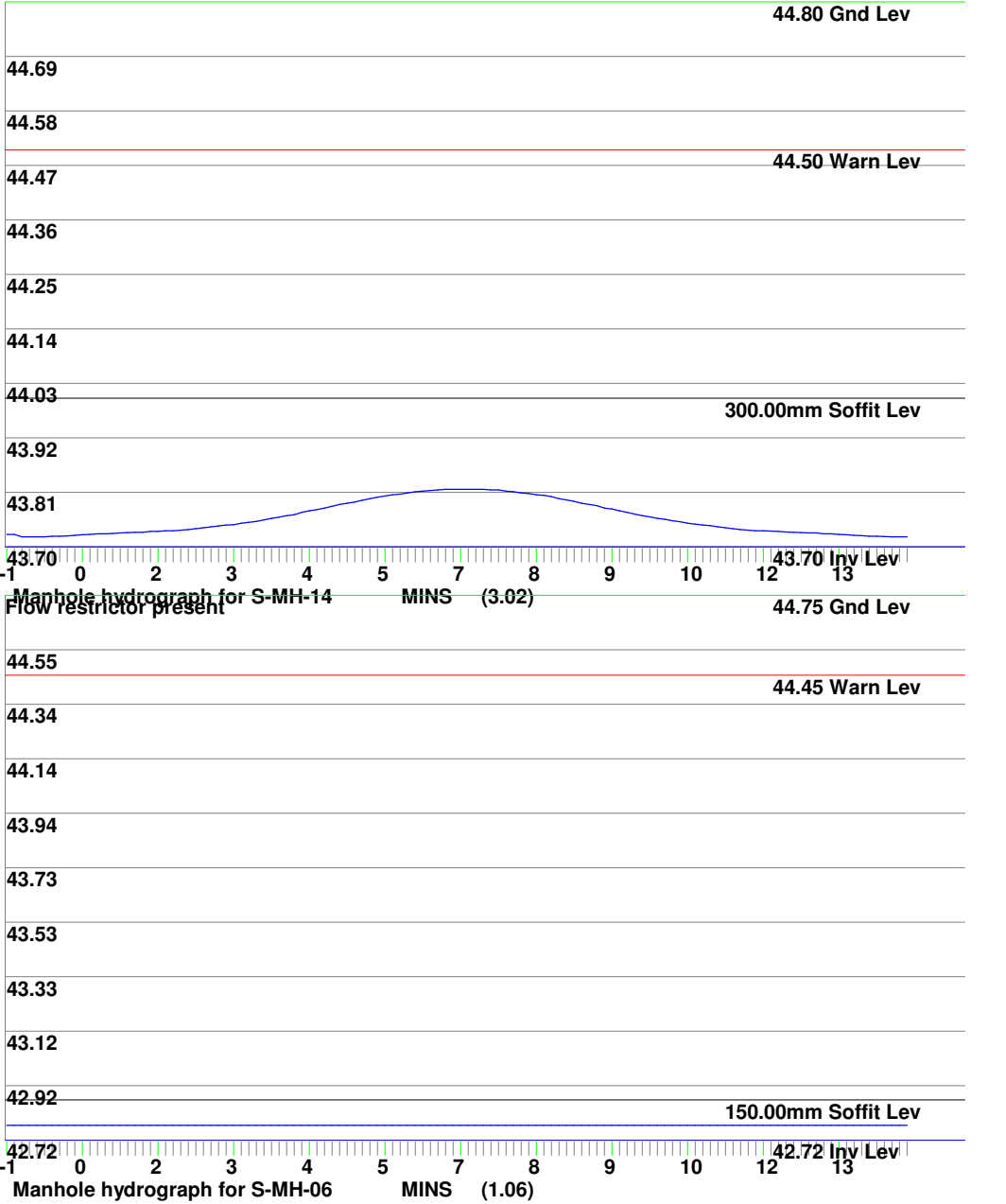
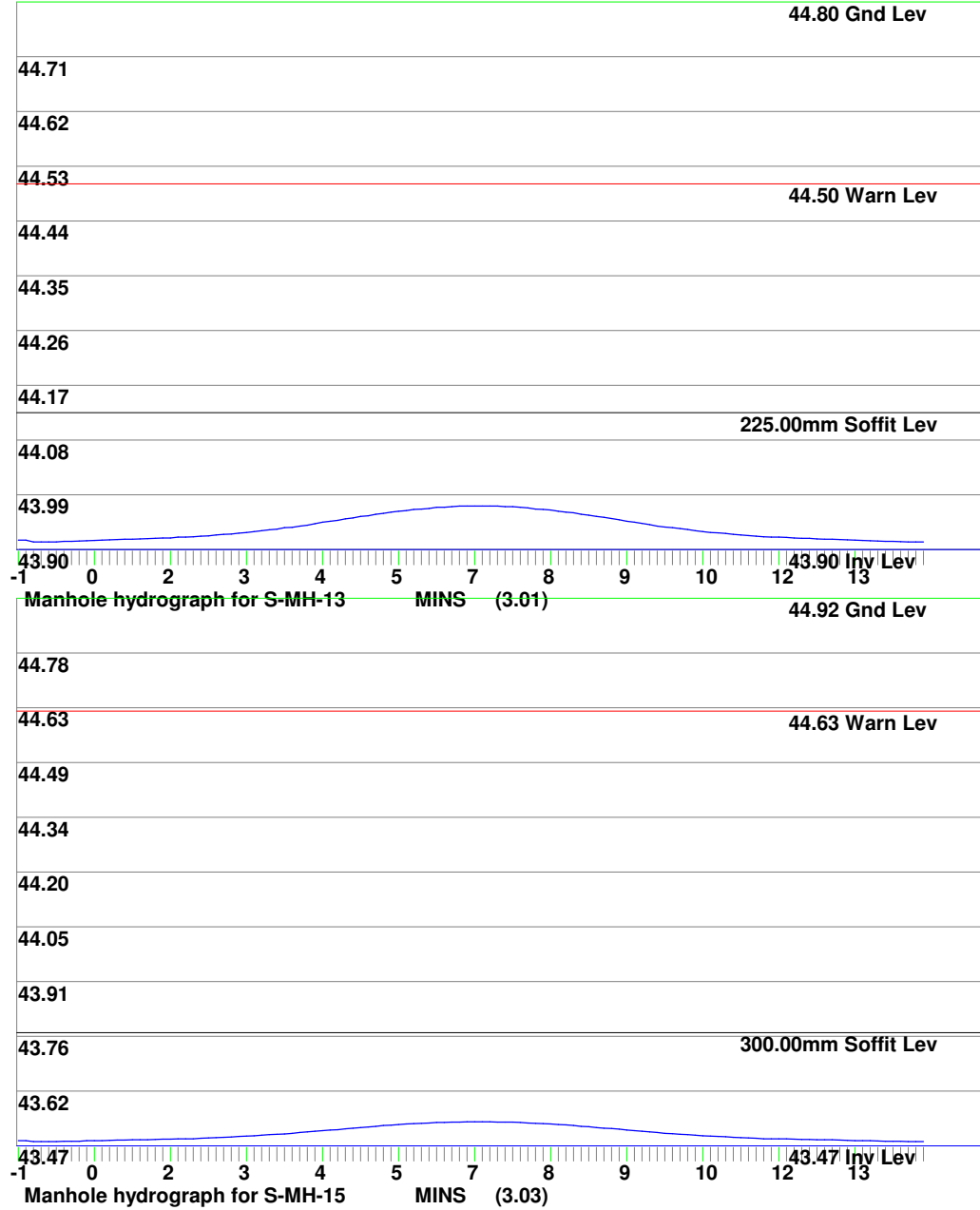
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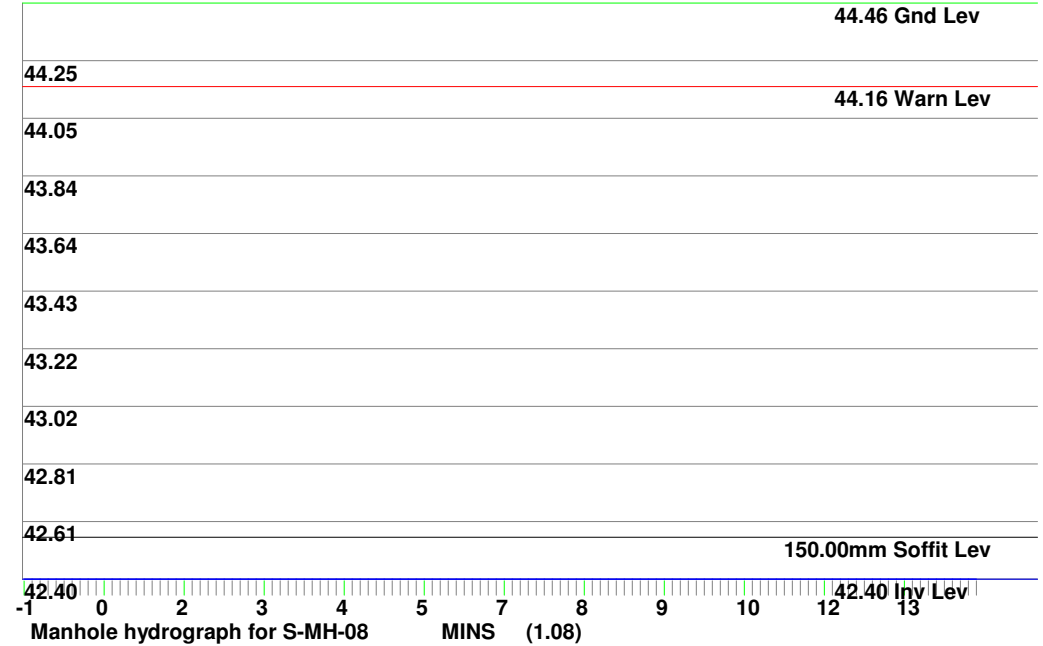
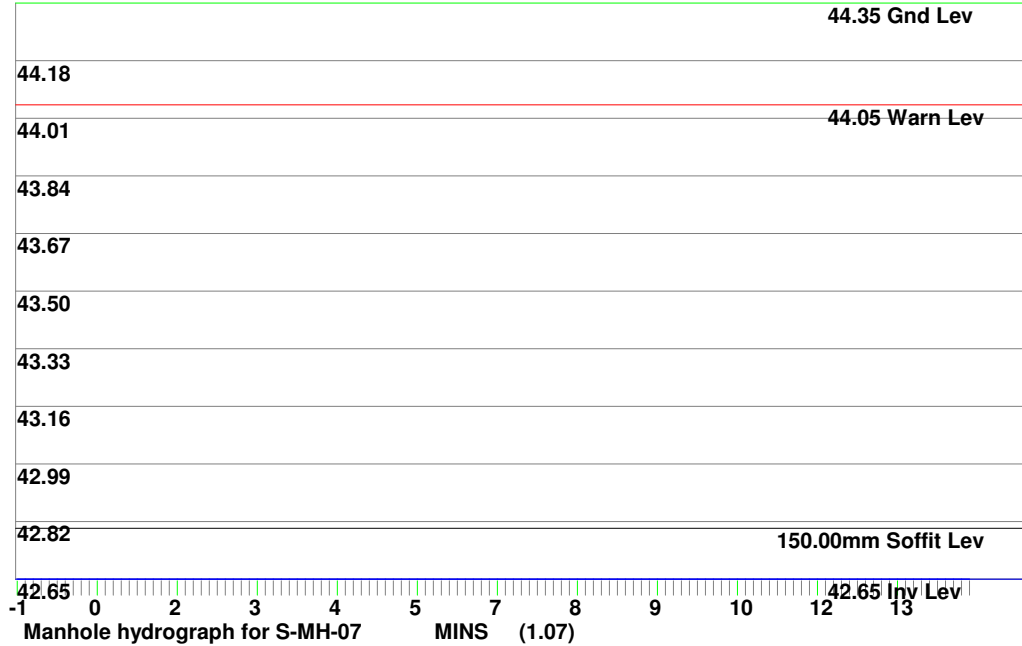
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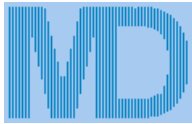
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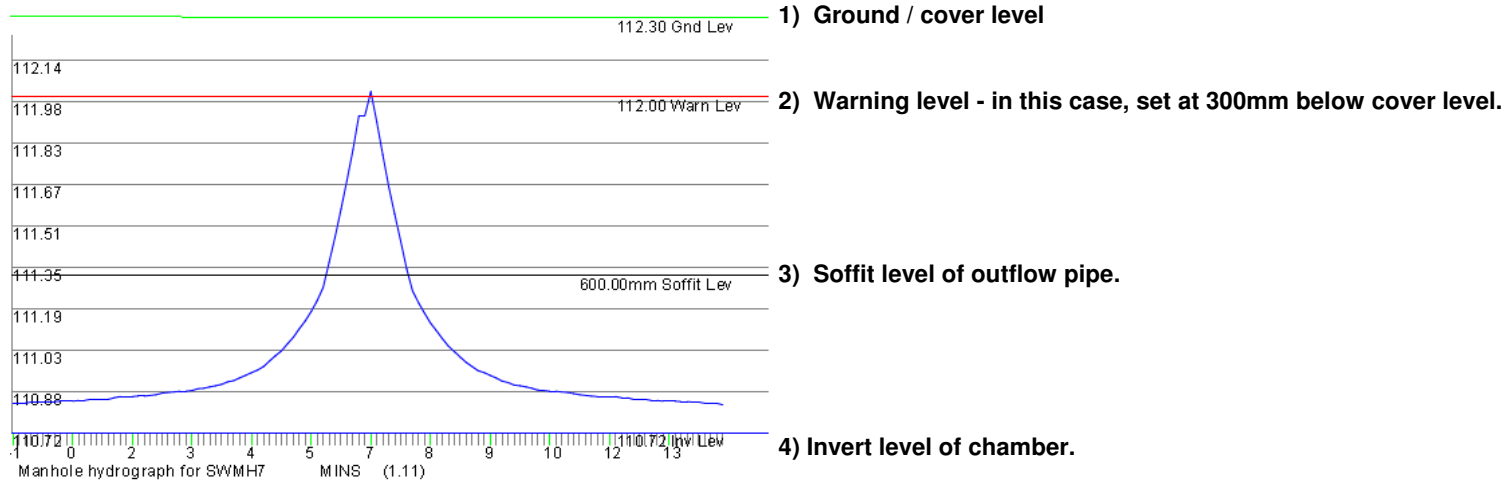
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Notes

- 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.