



MasterDrain  
SW

# Muir Associates (UK) Limited

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|                           |         |          |
|---------------------------|---------|----------|
| Job No.<br><b>1132-22</b> |         |          |
| Sheet no.<br><b>1</b>     |         |          |
| Date<br><b>21/11/22</b>   |         |          |
| By<br><b>MJ</b>           | Checked | Reviewed |

Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW CCF = 40%**

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

**PEAK hydrograph values printed**  
Storm duration = 180 mins  
No offline storage

Mean rain intens. 24.00 mm/hr  
Storm profile = Winter  
Using FSR data

Peak rain intens. 60.00 mm/hr  
Sample period = 90.0 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 |       | EXCESS FLOW l/s | FLOODED VOL m³ | DRAINED AREA (m²) :x FACTOR | STATUS |    |
|-----------|-----------|-------------|-------------------|---------------|--------------|---------------------|----------------|---------------|--------------|-----------|-------|-----------------|----------------|-----------------------------|--------|----|
|           |           |             |                   |               |              |                     |                |               |              | fract.    | Depth |                 |                |                             |        |    |
| 1         | I         | 1.01        | S-MH-01           | 42.1          | 3.8          | 225                 | 1200           | 43.85         | 43.89        | 44.80     | 0.09  | 0.03            | 0.00           | 0.000                       | 527    | OK |
| 2         | I         | 1.02        | S-MH-02           | 77.8          | 11.4         | 300                 | 1200           | 43.58         | 43.64        | 44.80     | 0.15  | 0.06            | 0.00           | 0.000                       | 1579   | OK |
| 3         | I         | 1.03        | S-MH-03           | 78.4          | 15.2         | 300                 | 1200           | 43.43         | 43.51        | 44.80     | 0.19  | 0.08            | 0.00           | 0.000                       | 2106   | OK |
| 4         | I         | 1.04        | S-MH-04           | 78.0          | 15.2         | 300                 | 1500           | 43.30         | 43.38        | 44.60     | 0.20  | 0.08            | 0.00           | 0.000                       | 2106   | OK |
| 5         | B         | 2.01        | S-MH-09           | 184.0         | 7.7          | 450                 | 1500           | 43.08         | 43.12        | 44.35     | 0.04  | 0.04            | 0.00           | 0.000                       | 1065   | OK |
| 6         | B         | 2.02        | S-MH-10           | 184.9         | 25.7         | 450                 | 1500           | 42.99         | 43.08        | 44.35     | 0.14  | 0.09            | 0.00           | 0.000                       | 3560   | OK |
| 7         | B         | 2.03        | S-MH-12           | 398.2         | 25.7         | 450                 | 1500           | 42.87         | 42.92        | 44.35     | 0.06  | 0.05            | 0.00           | 0.000                       | 3560   | OK |
| 8         | I         | 1.05        | S-MH-05           | 227.8         | 40.9         | 450                 | 1500           | 42.79         | 42.90        | 44.42     | 0.18  | 0.11            | 0.00           | 0.000                       | 5666   | OK |
| 9         | B         | 3.01        | S-MH-13           | 42.1          | 3.8          | 225                 | 1200           | 43.90         | 43.93        | 44.80     | 0.09  | 0.03            | 0.00           | 0.000                       | 527    | OK |
| 10        | B         | 3.02        | S-MH-14           | 95.8          | 11.4         | 300                 | 1200           | 43.70         | 43.75        | 44.80     | 0.12  | 0.05            | 0.00           | 0.000                       | 1582   | OK |
| 11        | B         | 3.03        | S-MH-15           | 298.4         | 15.2         | 300                 | 1200           | 43.47         | 43.51        | 44.92     | 0.05  | 0.03            | 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          | 4.7          | 150                 | 1200           | 42.65         | 42.71        | 44.35     | 0.32  | 0.05            | 0.00           | 0.000                       | 7775   | OK |
| 14        | I         | 1.08        | S-MH-08           | 18.6          | 4.7          | 150                 | 1200           | 42.40         | 42.45        | 44.46     | 0.25  | 0.05            | 0.00           | 0.000                       | 7775   | OK |



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| Sheet no.<br><b>2</b>     |         |          |
| Date<br><b>21/11/22</b>   |         |          |
| By<br><b>MJ</b>           | Checked | Reviewed |

Project

Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.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 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

### 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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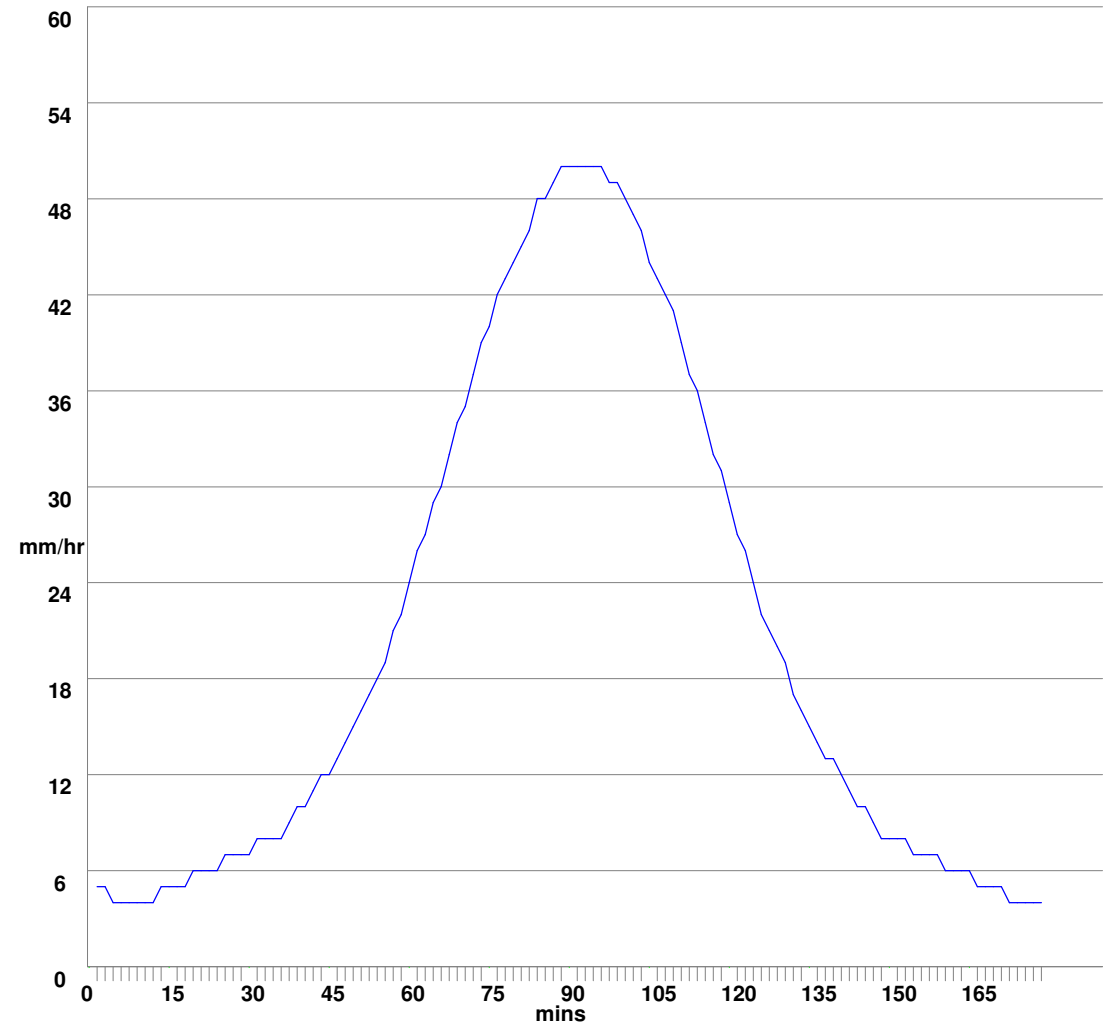
Project

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| Time<br>mins | Rain<br>mm/hr | Time<br>mins | Rain<br>mm/hr | Time<br>mins | Rain<br>mm/hr |
|--------------|---------------|--------------|---------------|--------------|---------------|
| 1:30         | 5.40          | 61:30        | 25.61         | 121:30       | 27.41         |
| 3:00         | 5.40          | 63:00        | 27.21         | 123:00       | 26.01         |
| 4:30         | 4.00          | 64:30        | 28.61         | 124:30       | 24.41         |
| 6:00         | 4.00          | 66:00        | 30.42         | 126:00       | 22.41         |
| 7:30         | 4.00          | 67:30        | 32.22         | 127:30       | 21.01         |
| 9:00         | 4.00          | 69:00        | 33.82         | 129:00       | 19.81         |
| 10:30        | 4.40          | 70:30        | 35.22         | 130:30       | 18.61         |
| 12:00        | 4.40          | 72:00        | 37.02         | 132:00       | 17.41         |
| 13:30        | 4.60          | 73:30        | 39.02         | 133:30       | 16.41         |
| 15:00        | 5.00          | 75:00        | 40.42         | 135:00       | 15.21         |
| 16:30        | 5.20          | 76:30        | 42.02         | 136:30       | 14.01         |
| 18:00        | 5.40          | 78:00        | 43.02         | 138:00       | 13.21         |
| 19:30        | 5.80          | 79:30        | 44.22         | 139:30       | 12.61         |
| 21:00        | 6.00          | 81:00        | 45.42         | 141:00       | 12.01         |
| 22:30        | 6.20          | 82:30        | 46.42         | 142:30       | 11.01         |
| 24:00        | 6.40          | 84:00        | 47.62         | 144:00       | 10.41         |
| 25:30        | 6.60          | 85:30        | 48.42         | 145:30       | 9.80          |
| 27:00        | 6.80          | 87:00        | 49.22         | 147:00       | 9.00          |
| 28:30        | 7.00          | 88:30        | 49.62         | 148:30       | 8.40          |
| 30:00        | 7.40          | 90:00        | 49.82         | 150:00       | 8.20          |
| 31:30        | 7.60          | 91:30        | 50.02         | 151:30       | 8.00          |
| 33:00        | 8.00          | 93:00        | 50.02         | 153:00       | 7.80          |
| 34:30        | 8.00          | 94:30        | 49.82         | 154:30       | 7.40          |
| 36:00        | 8.40          | 96:00        | 49.62         | 156:00       | 7.20          |
| 37:30        | 9.00          | 97:30        | 49.22         | 157:30       | 7.00          |
| 39:00        | 9.60          | 99:00        | 48.62         | 159:00       | 6.60          |
| 40:30        | 10.21         | 100:30       | 47.82         | 160:30       | 6.40          |
| 42:00        | 11.01         | 102:00       | 46.82         | 162:00       | 6.40          |
| 43:30        | 11.61         | 103:30       | 45.62         | 163:30       | 6.00          |
| 45:00        | 12.41         | 105:00       | 44.42         | 165:00       | 5.80          |
| 46:30        | 13.01         | 106:30       | 43.42         | 166:30       | 5.40          |
| 48:00        | 14.01         | 108:00       | 42.22         | 168:00       | 5.20          |
| 49:30        | 15.01         | 109:30       | 40.82         | 169:30       | 5.00          |
| 51:00        | 16.01         | 111:00       | 39.22         | 171:00       | 4.80          |
| 52:30        | 17.21         | 112:30       | 37.42         | 172:30       | 4.40          |
| 54:00        | 18.41         | 114:00       | 35.62         | 174:00       | 4.40          |
| 55:30        | 19.41         | 115:30       | 34.02         | 175:30       | 4.20          |
| 57:00        | 20.81         | 117:00       | 32.42         | 177:00       | 4.00          |
| 58:30        | 22.21         | 118:30       | 31.02         | 178:30       | 4.00          |
| 60:00        | 24.01         | 120:00       | 29.01         | 180:00       | 4.00          |

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs      Duration= 180 mins      Profile - winter





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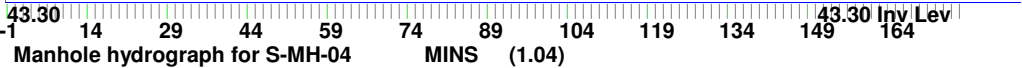
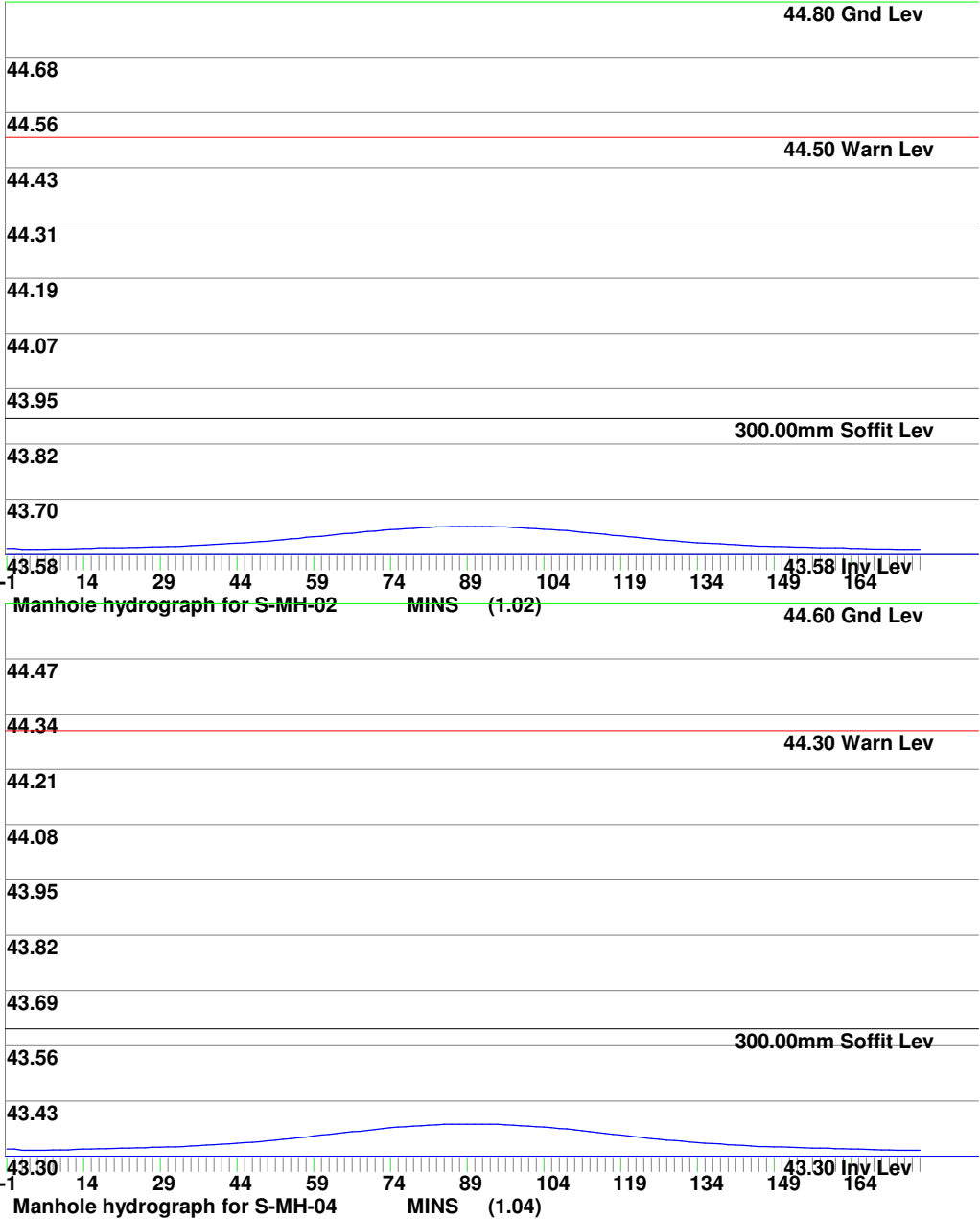
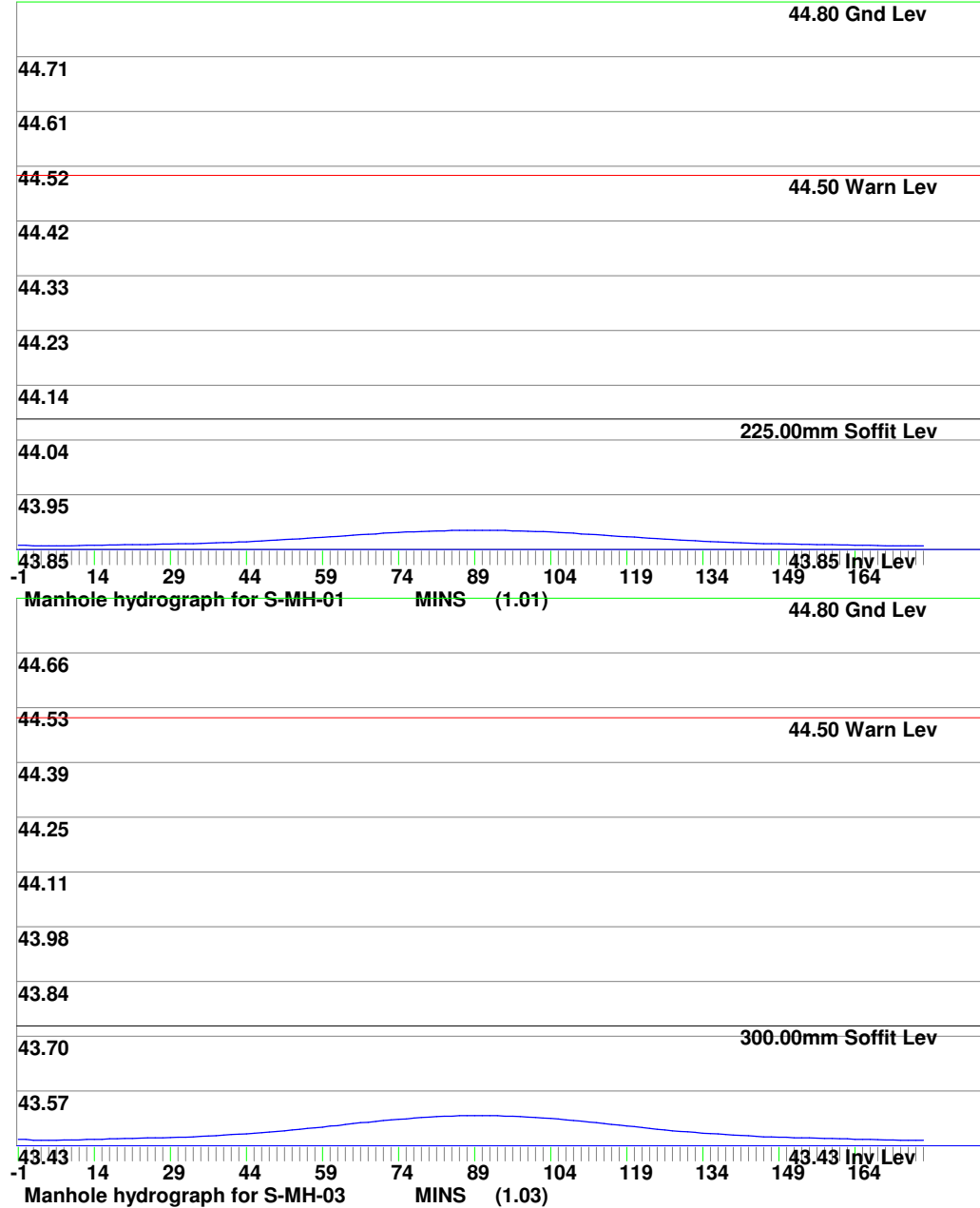
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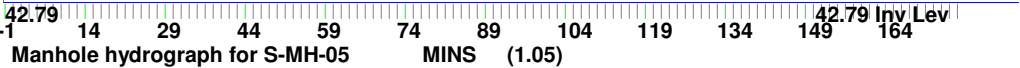
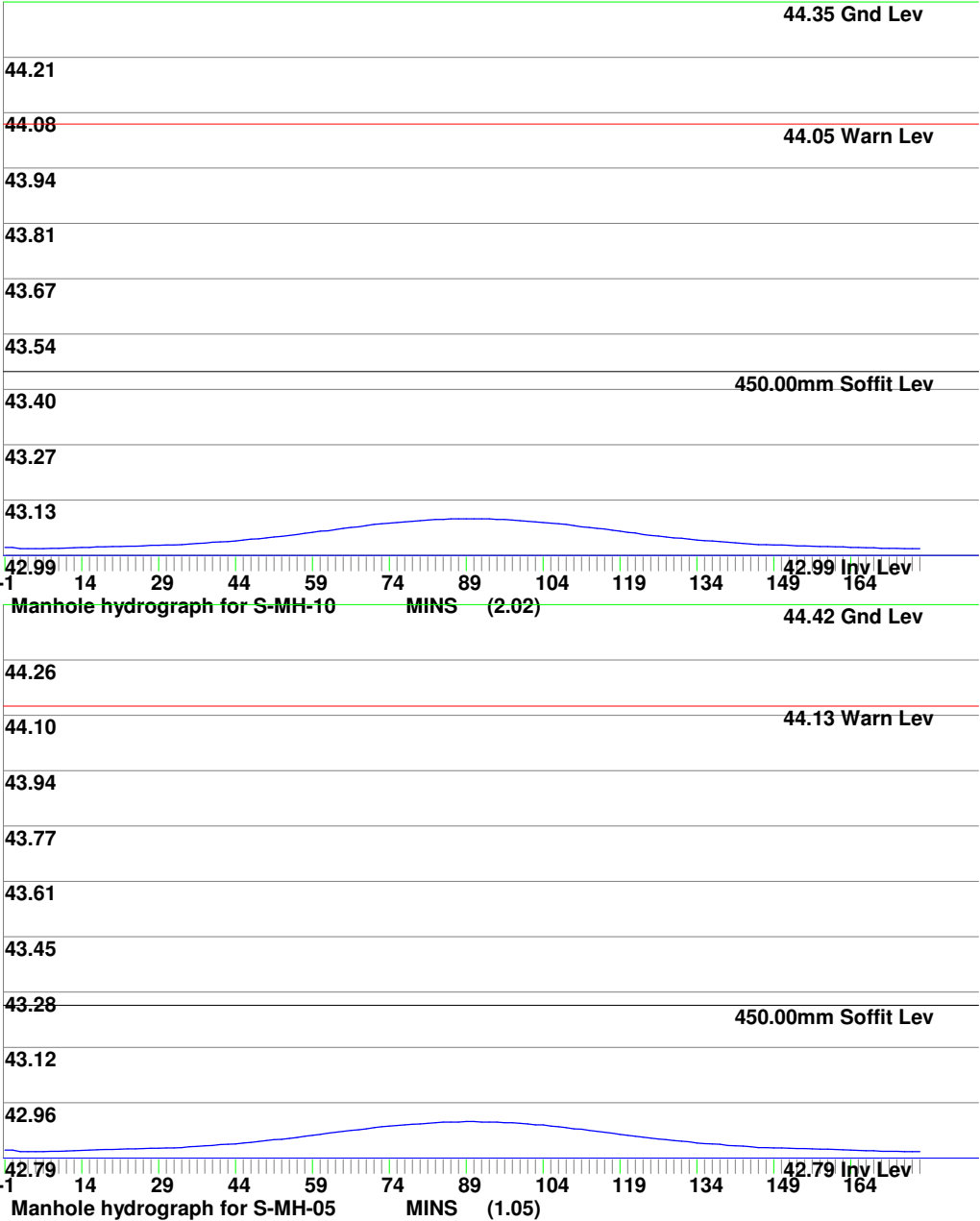
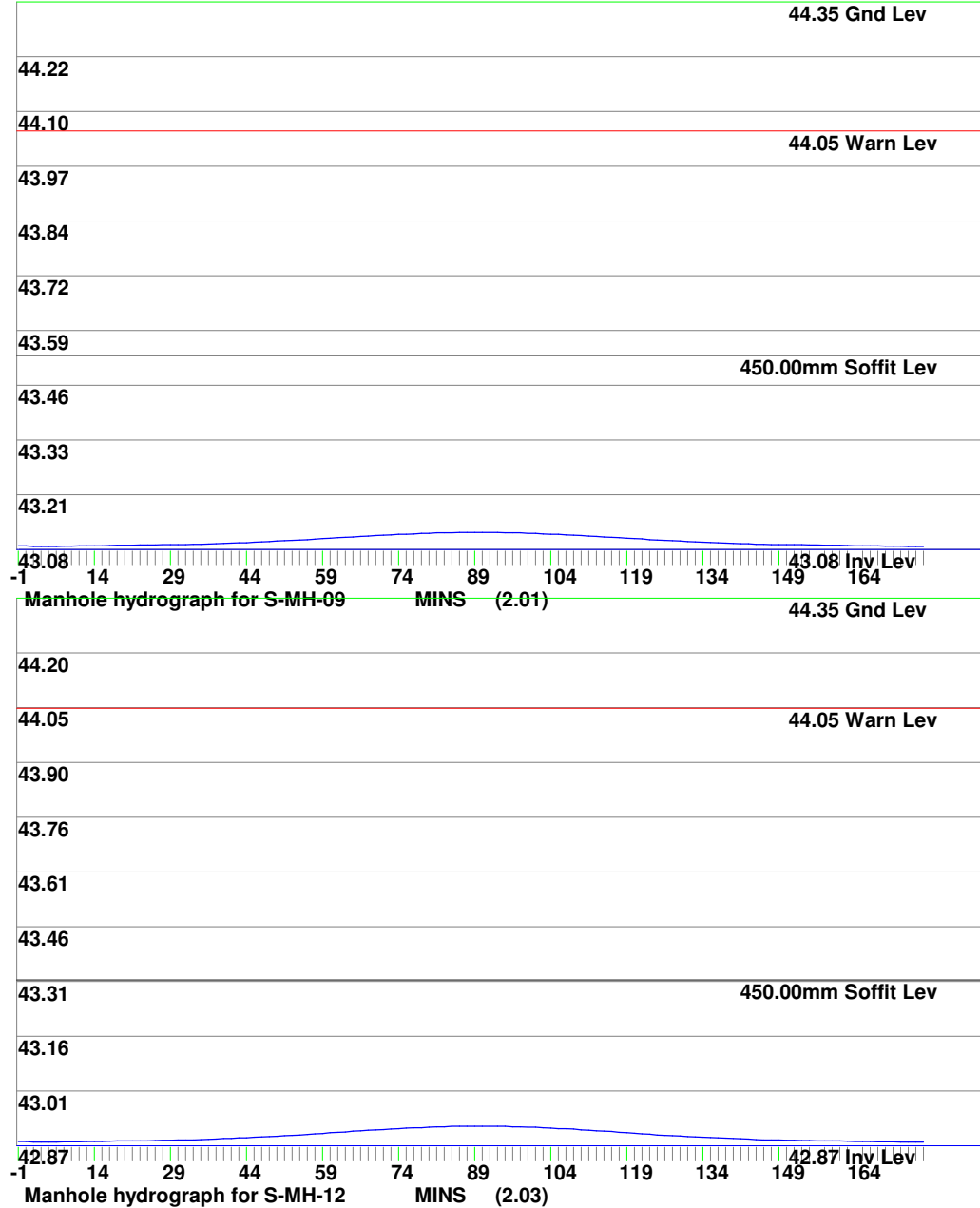
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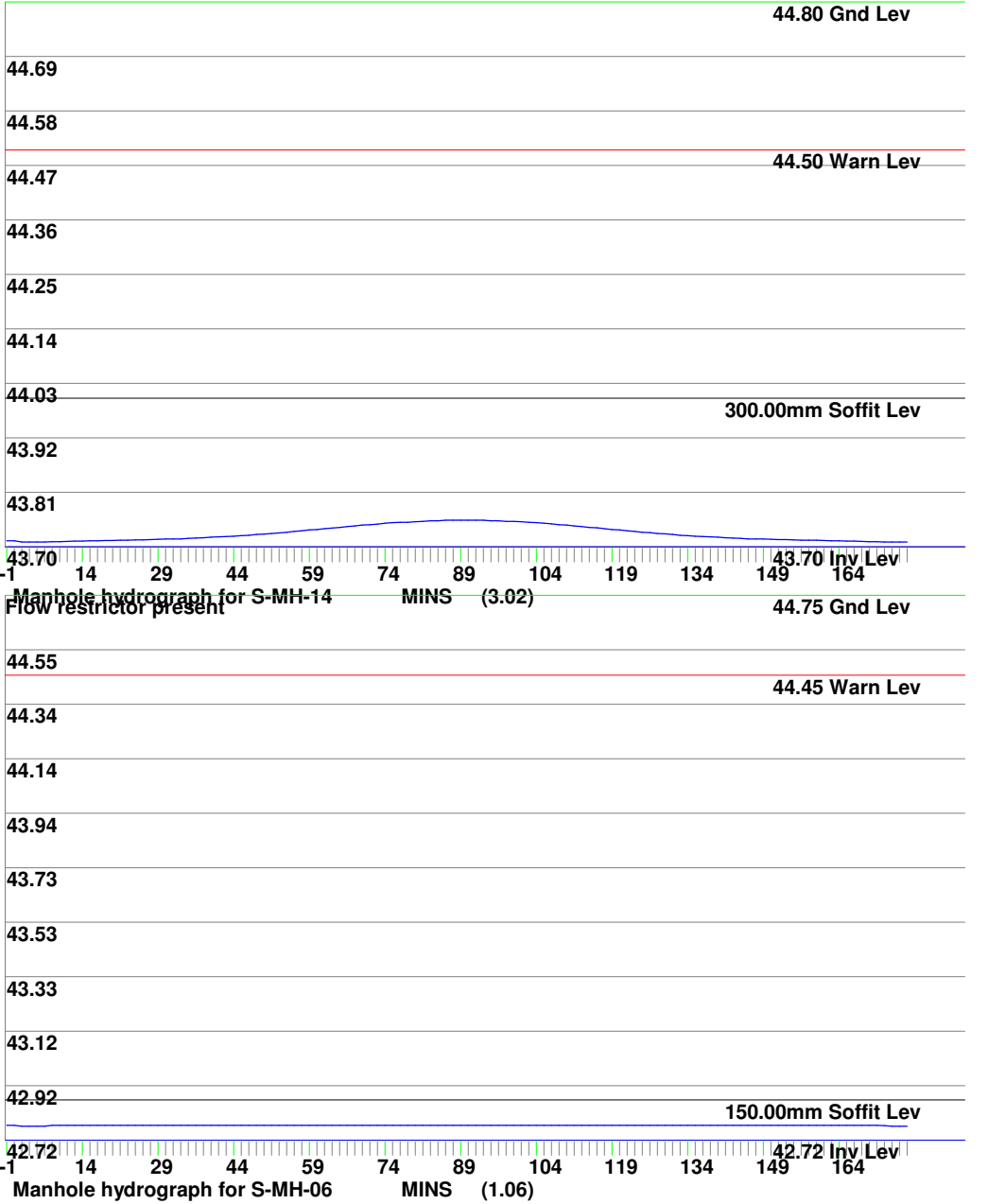
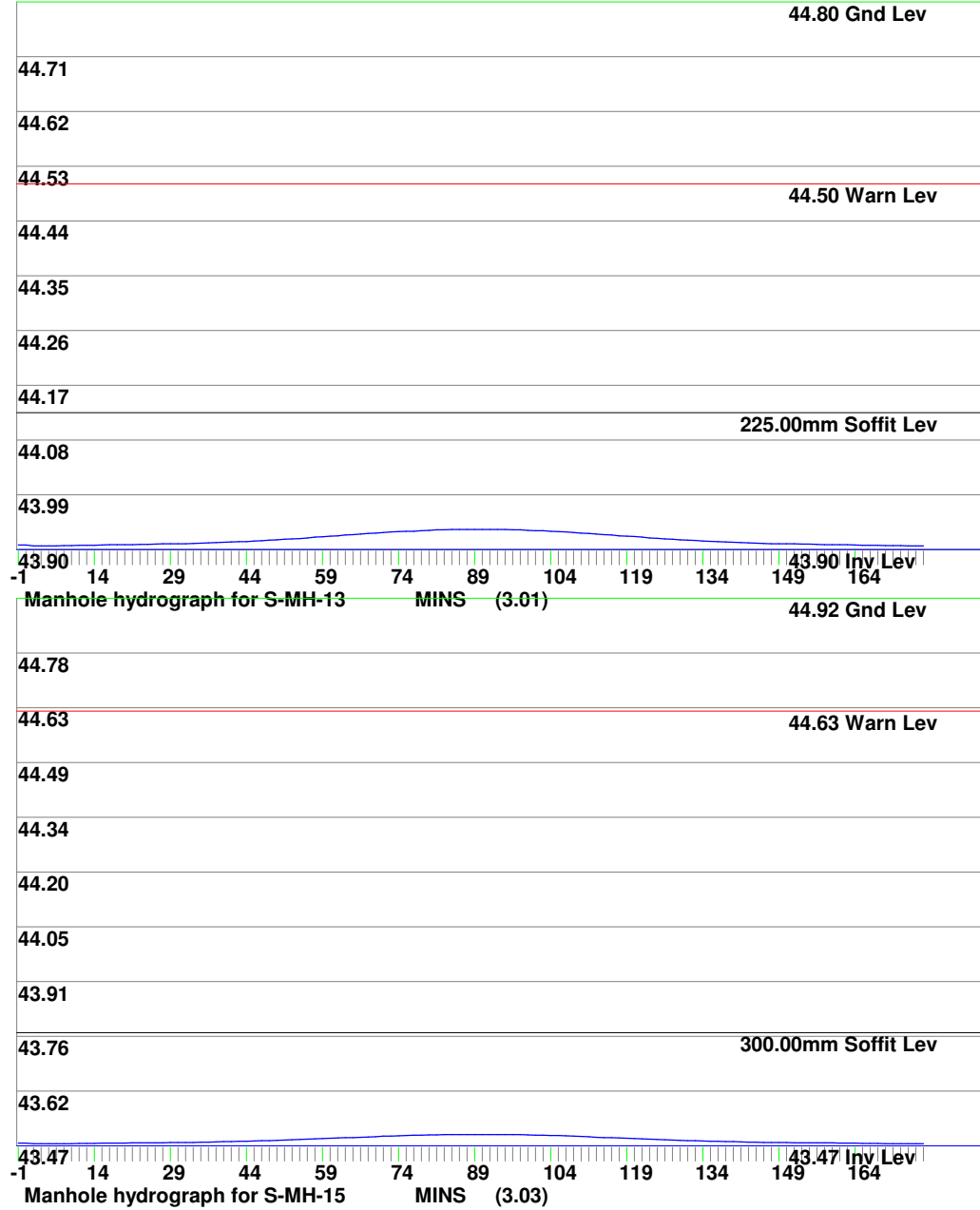
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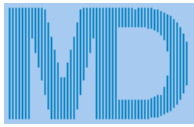
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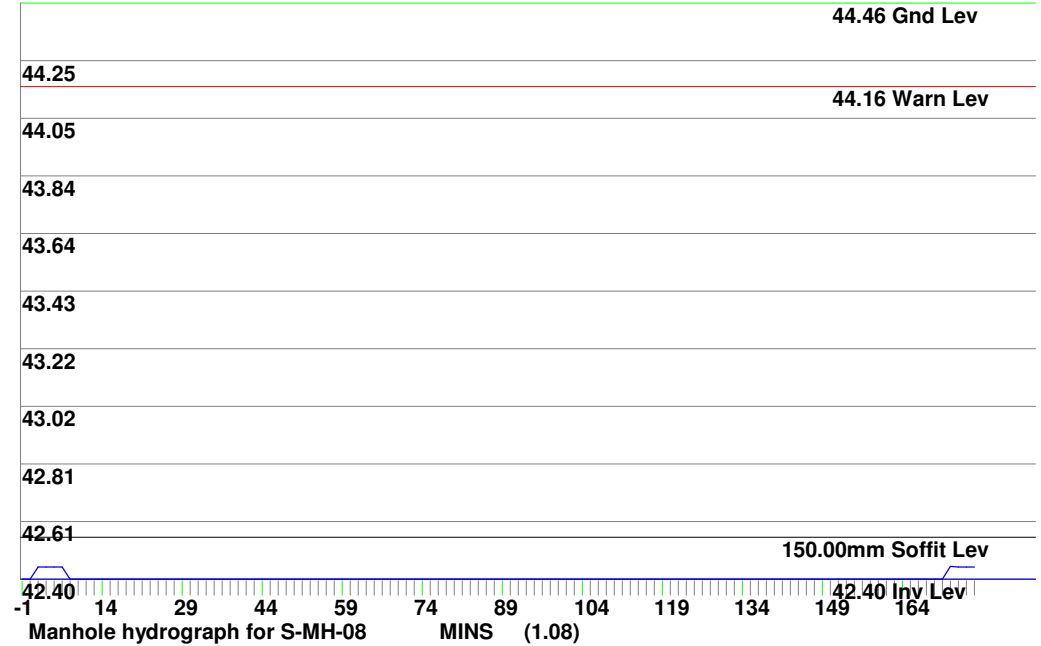
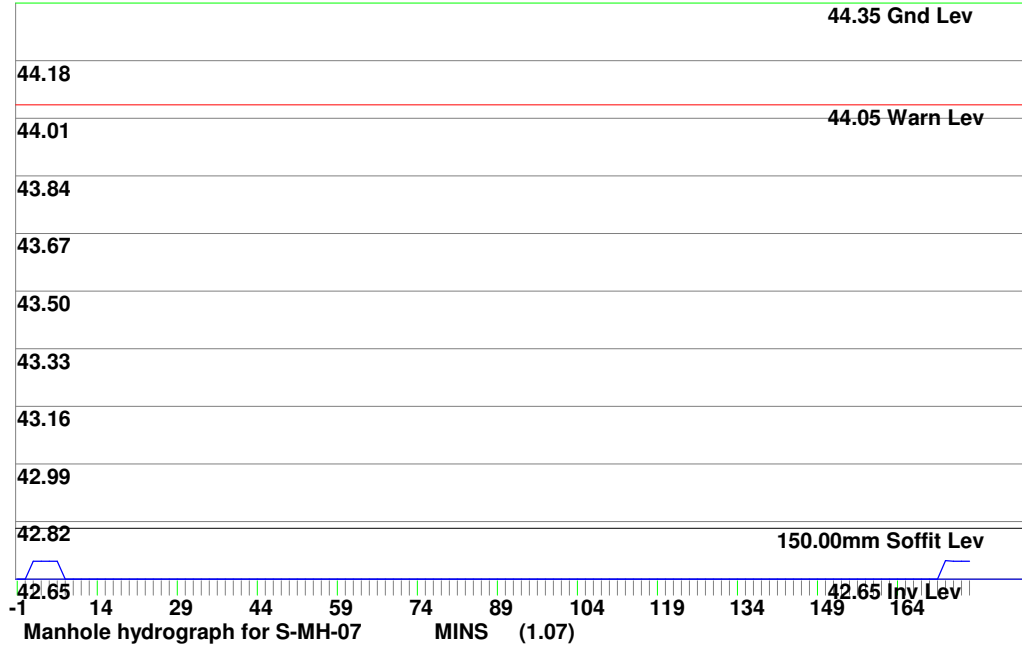
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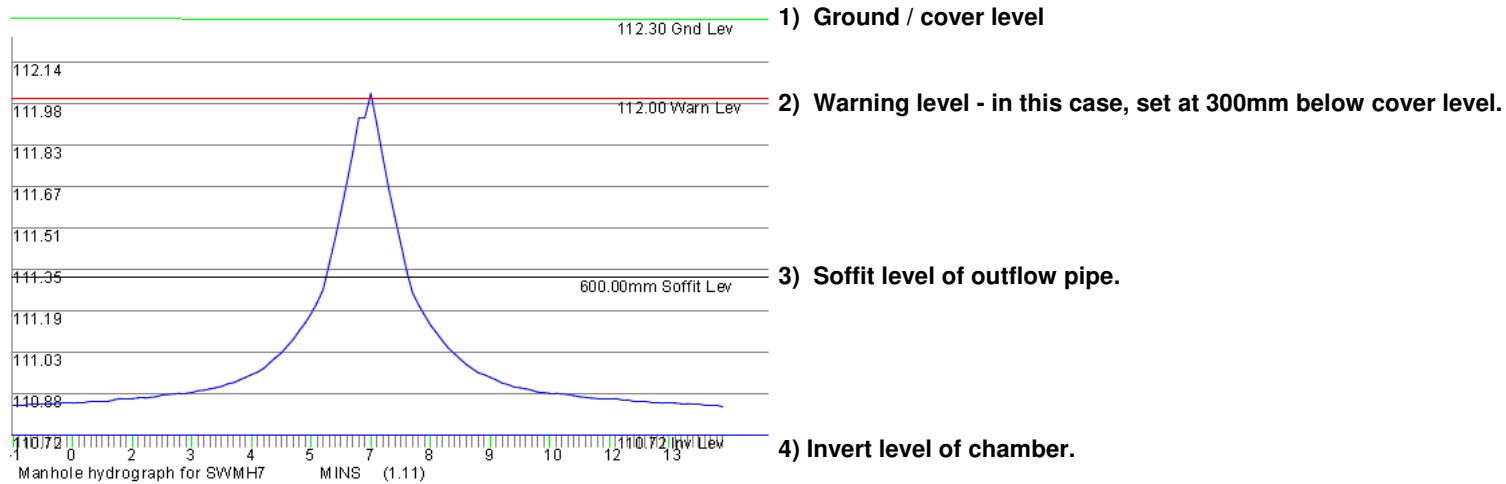
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## Notes

- 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.