



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**

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

**PEAK hydrograph values printed**  
Storm duration = 360 mins  
No offline storage

Mean rain intens. 8.00 mm/hr  
Storm profile = Winter  
Using FSR data

Peak rain intens. 20.00 mm/hr  
Sample period = 180.0 secs.

| Entry No. | SECT. No. | MANHOLE REF   | PIPE CAPACITY<br>l/s | RATE FLOW<br>l/s | PIPE SIZE<br>mm | CHAMBER<br>DIAM/LxW<br>mm | INVERT LEVEL<br>m | WATER LEVEL<br>m | GRND LEVEL<br>m | SURCHARGE<br>fract. | Depth | EXCESS FLOW<br>l/s | FLOODED VOL<br>m³ | DRAINED AREA (m²)<br>x FACTOR | STATUS |
|-----------|-----------|---------------|----------------------|------------------|-----------------|---------------------------|-------------------|------------------|-----------------|---------------------|-------|--------------------|-------------------|-------------------------------|--------|
| 1         | I         | 1.01 S-MH-01  | 42.1                 | 1.2              | 225             | 1200                      | 43.85             | 43.87            | 44.80           | 0.03                | 0.02  | 0.00               | 0.000             | 527                           | OK     |
| 2         | I         | 1.02 S-MH-02  | 77.8                 | 3.6              | 300             | 1200                      | 43.58             | 43.61            | 44.80           | 0.05                | 0.03  | 0.00               | 0.000             | 1579                          | OK     |
| 3         | I         | 1.03 S-MH-03  | 78.4                 | 4.9              | 300             | 1200                      | 43.43             | 43.46            | 44.80           | 0.06                | 0.03  | 0.00               | 0.000             | 2106                          | OK     |
| 4         | I         | 1.04 S-MH-04  | 78.0                 | 4.9              | 300             | 1500                      | 43.30             | 43.33            | 44.60           | 0.06                | 0.03  | 0.00               | 0.000             | 2106                          | OK     |
| 5         | B         | 2.01 S-MH-09  | 184.0                | 2.5              | 450             | 1500                      | 43.08             | 43.10            | 44.35           | 0.01                | 0.02  | 0.00               | 0.000             | 1065                          | OK     |
| 6         | B         | 2.02 S-MH-10  | 184.9                | 8.2              | 450             | 1500                      | 42.99             | 43.04            | 44.35           | 0.04                | 0.04  | 0.00               | 0.000             | 3560                          | OK     |
| 7         | B         | 2.03 S-MH-12  | 398.2                | 8.2              | 450             | 1500                      | 42.87             | 42.89            | 44.35           | 0.02                | 0.02  | 0.00               | 0.000             | 3560                          | OK     |
| 8         | I         | 1.05 S-MH-05  | 227.8                | 13.1             | 450             | 1500                      | 42.79             | 42.84            | 44.42           | 0.06                | 0.05  | 0.00               | 0.000             | 5666                          | OK     |
| 9         | B         | 3.01 S-MH-13  | 42.1                 | 1.2              | 225             | 1200                      | 43.90             | 43.92            | 44.80           | 0.03                | 0.02  | 0.00               | 0.000             | 527                           | OK     |
| 10        | B         | 3.02 S-MH-14  | 95.8                 | 3.6              | 300             | 1200                      | 43.70             | 43.72            | 44.80           | 0.04                | 0.02  | 0.00               | 0.000             | 1582                          | OK     |
| 11        | B         | 3.03 S-MH-15  | 298.4                | 4.9              | 300             | 1200                      | 43.47             | 43.49            | 44.92           | 0.02                | 0.01  | 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   | <b>Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW</b> |

## 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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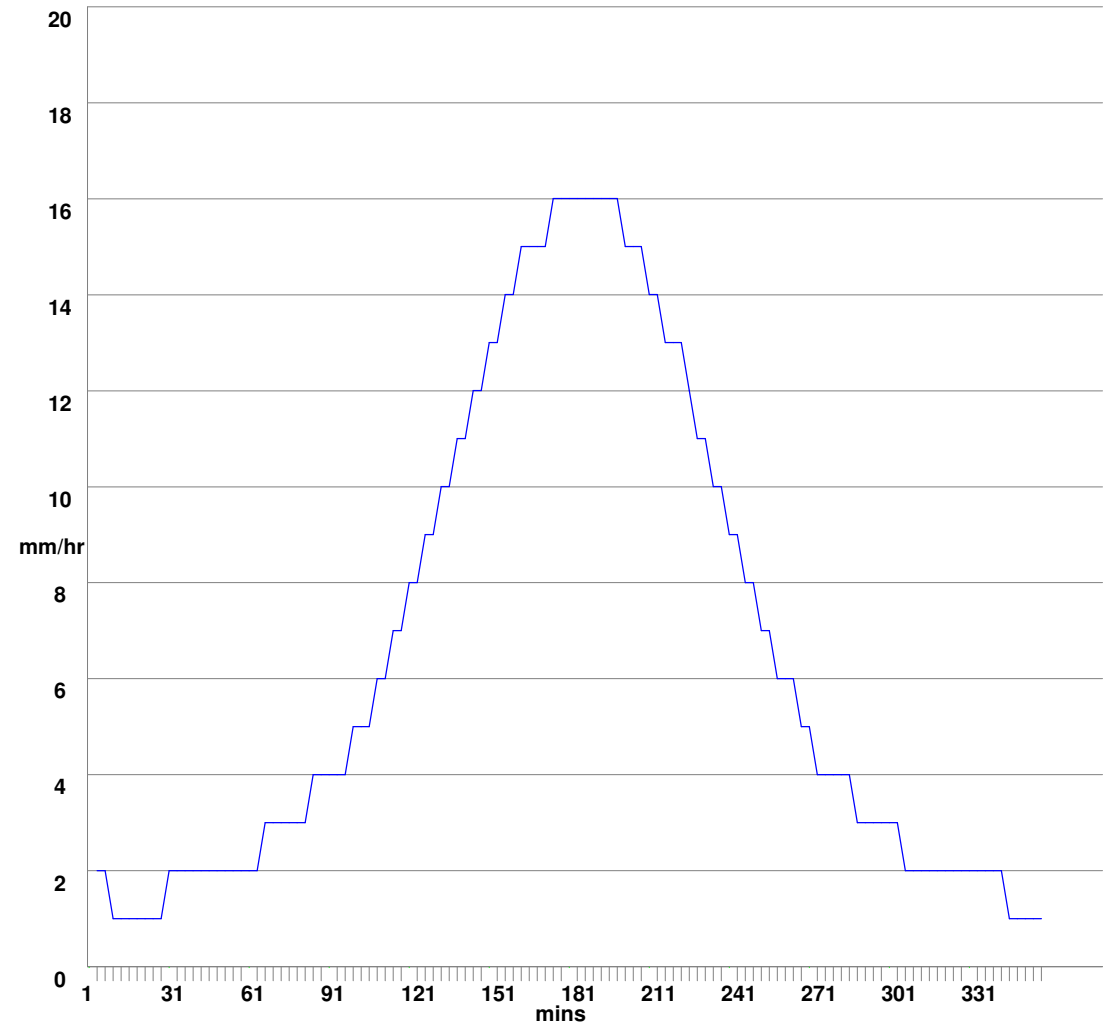
Project

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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 |
|--------------|---------------|--------------|---------------|--------------|---------------|
| 3:00         | 1.72          | 123:00       | 8.18          | 243:00       | 8.75          |
| 6:00         | 1.72          | 126:00       | 8.69          | 246:00       | 8.30          |
| 9:00         | 1.28          | 129:00       | 9.14          | 249:00       | 7.79          |
| 12:00        | 1.28          | 132:00       | 9.71          | 252:00       | 7.15          |
| 15:00        | 1.28          | 135:00       | 10.28         | 255:00       | 6.71          |
| 18:00        | 1.28          | 138:00       | 10.80         | 258:00       | 6.32          |
| 21:00        | 1.41          | 141:00       | 11.24         | 261:00       | 5.94          |
| 24:00        | 1.41          | 144:00       | 11.82         | 264:00       | 5.56          |
| 27:00        | 1.47          | 147:00       | 12.46         | 267:00       | 5.24          |
| 30:00        | 1.60          | 150:00       | 12.90         | 270:00       | 4.85          |
| 33:00        | 1.66          | 153:00       | 13.42         | 273:00       | 4.47          |
| 36:00        | 1.72          | 156:00       | 13.73         | 276:00       | 4.22          |
| 39:00        | 1.85          | 159:00       | 14.12         | 279:00       | 4.02          |
| 42:00        | 1.92          | 162:00       | 14.50         | 282:00       | 3.83          |
| 45:00        | 1.98          | 165:00       | 14.82         | 285:00       | 3.51          |
| 48:00        | 2.04          | 168:00       | 15.20         | 288:00       | 3.32          |
| 51:00        | 2.11          | 171:00       | 15.46         | 291:00       | 3.13          |
| 54:00        | 2.17          | 174:00       | 15.71         | 294:00       | 2.87          |
| 57:00        | 2.24          | 177:00       | 15.84         | 297:00       | 2.68          |
| 60:00        | 2.36          | 180:00       | 15.91         | 300:00       | 2.62          |
| 63:00        | 2.43          | 183:00       | 15.97         | 303:00       | 2.56          |
| 66:00        | 2.56          | 186:00       | 15.97         | 306:00       | 2.49          |
| 69:00        | 2.56          | 189:00       | 15.91         | 309:00       | 2.36          |
| 72:00        | 2.68          | 192:00       | 15.84         | 312:00       | 2.30          |
| 75:00        | 2.87          | 195:00       | 15.71         | 315:00       | 2.24          |
| 78:00        | 3.07          | 198:00       | 15.52         | 318:00       | 2.11          |
| 81:00        | 3.26          | 201:00       | 15.27         | 321:00       | 2.04          |
| 84:00        | 3.51          | 204:00       | 14.95         | 324:00       | 2.04          |
| 87:00        | 3.71          | 207:00       | 14.56         | 327:00       | 1.92          |
| 90:00        | 3.96          | 210:00       | 14.18         | 330:00       | 1.85          |
| 93:00        | 4.15          | 213:00       | 13.86         | 333:00       | 1.72          |
| 96:00        | 4.47          | 216:00       | 13.48         | 336:00       | 1.66          |
| 99:00        | 4.79          | 219:00       | 13.03         | 339:00       | 1.60          |
| 102:00       | 5.11          | 222:00       | 12.52         | 342:00       | 1.53          |
| 105:00       | 5.49          | 225:00       | 11.95         | 345:00       | 1.41          |
| 108:00       | 5.88          | 228:00       | 11.37         | 348:00       | 1.41          |
| 111:00       | 6.20          | 231:00       | 10.86         | 351:00       | 1.34          |
| 114:00       | 6.64          | 234:00       | 10.35         | 354:00       | 1.28          |
| 117:00       | 7.09          | 237:00       | 9.90          | 357:00       | 1.28          |
| 120:00       | 7.67          | 240:00       | 9.26          | 360:00       | 1.28          |

Hydrograph profile derived from data in the Flood Studies Report

Return period= 30 yrs      Duration= 360 mins      Profile - winter





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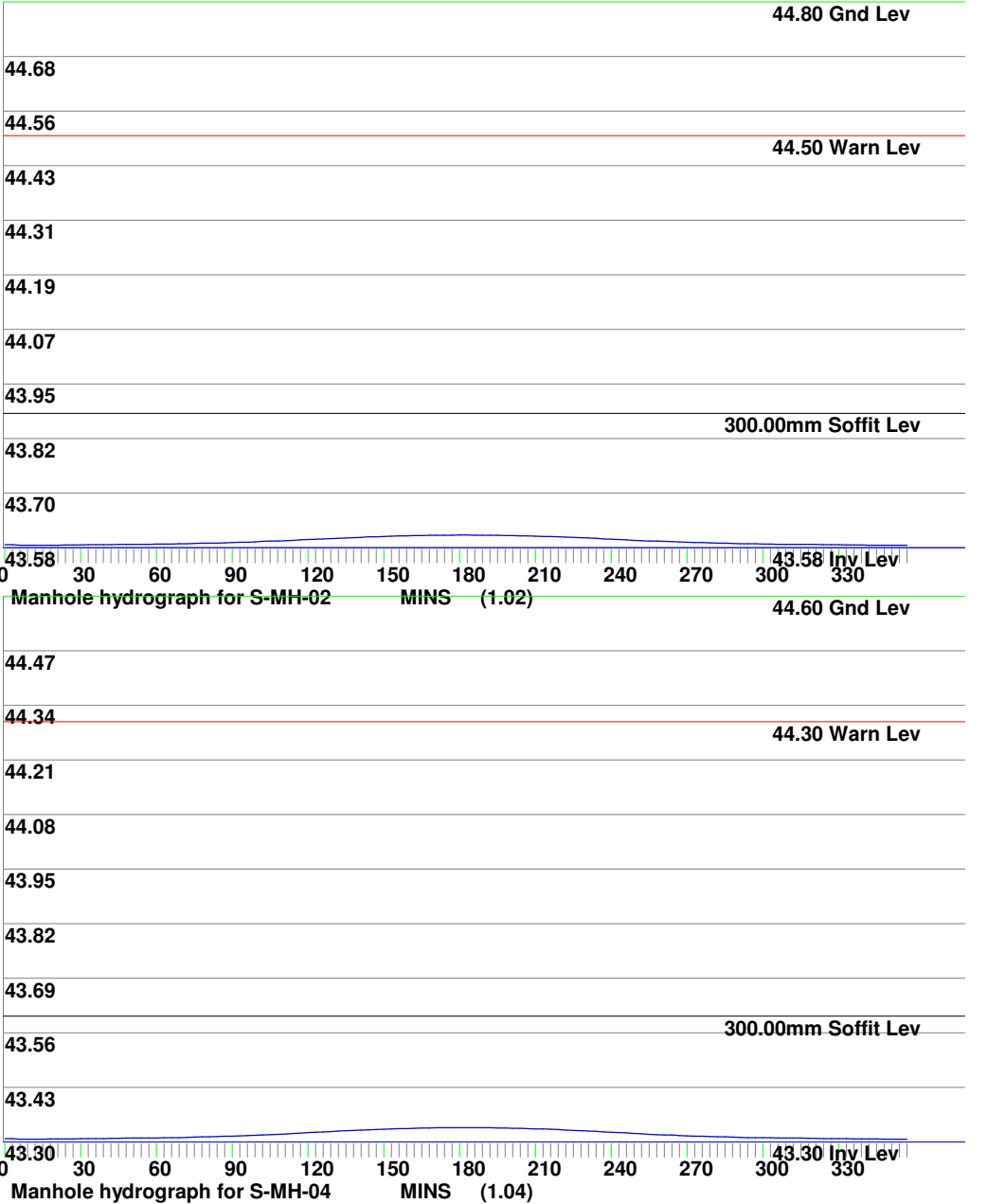
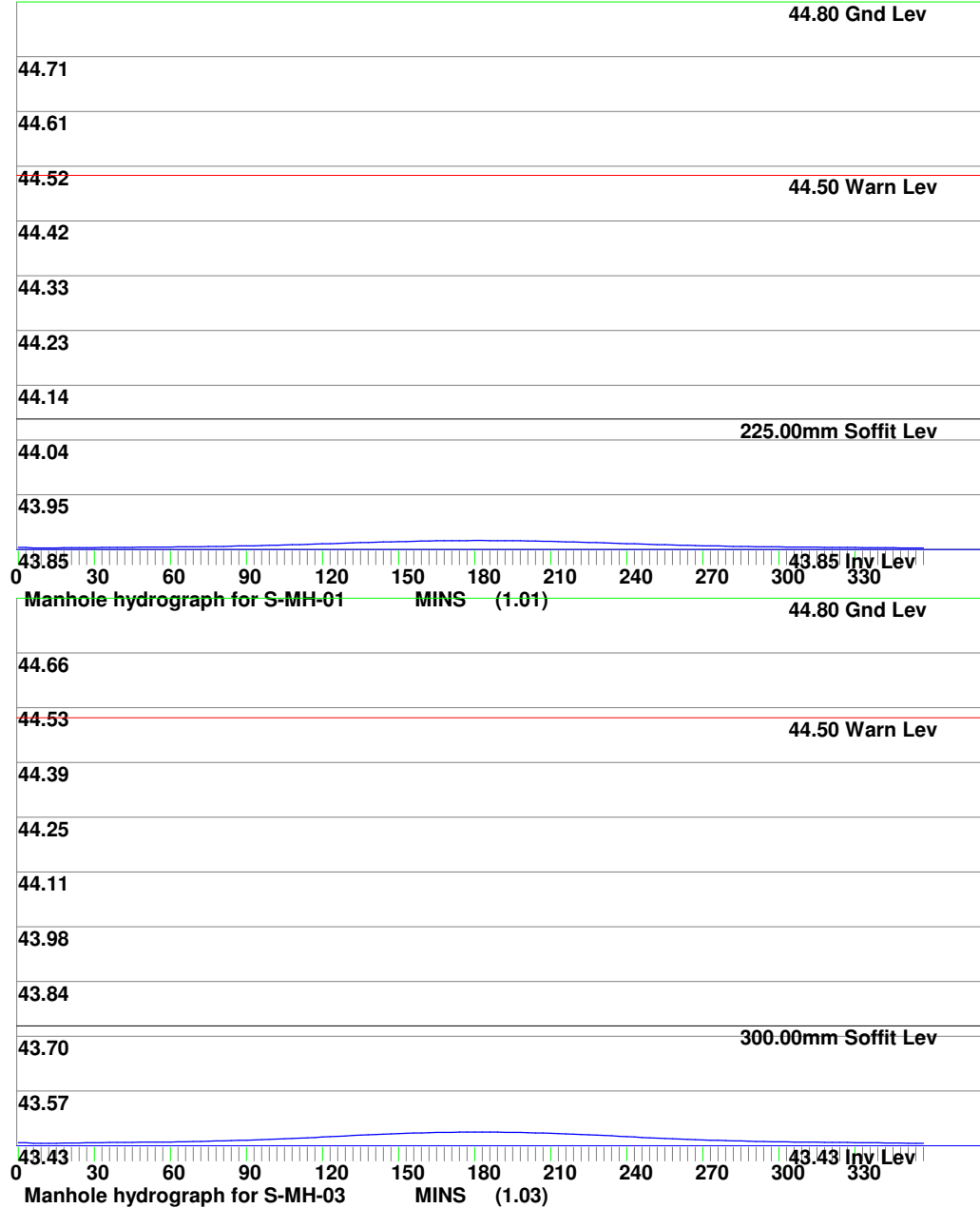
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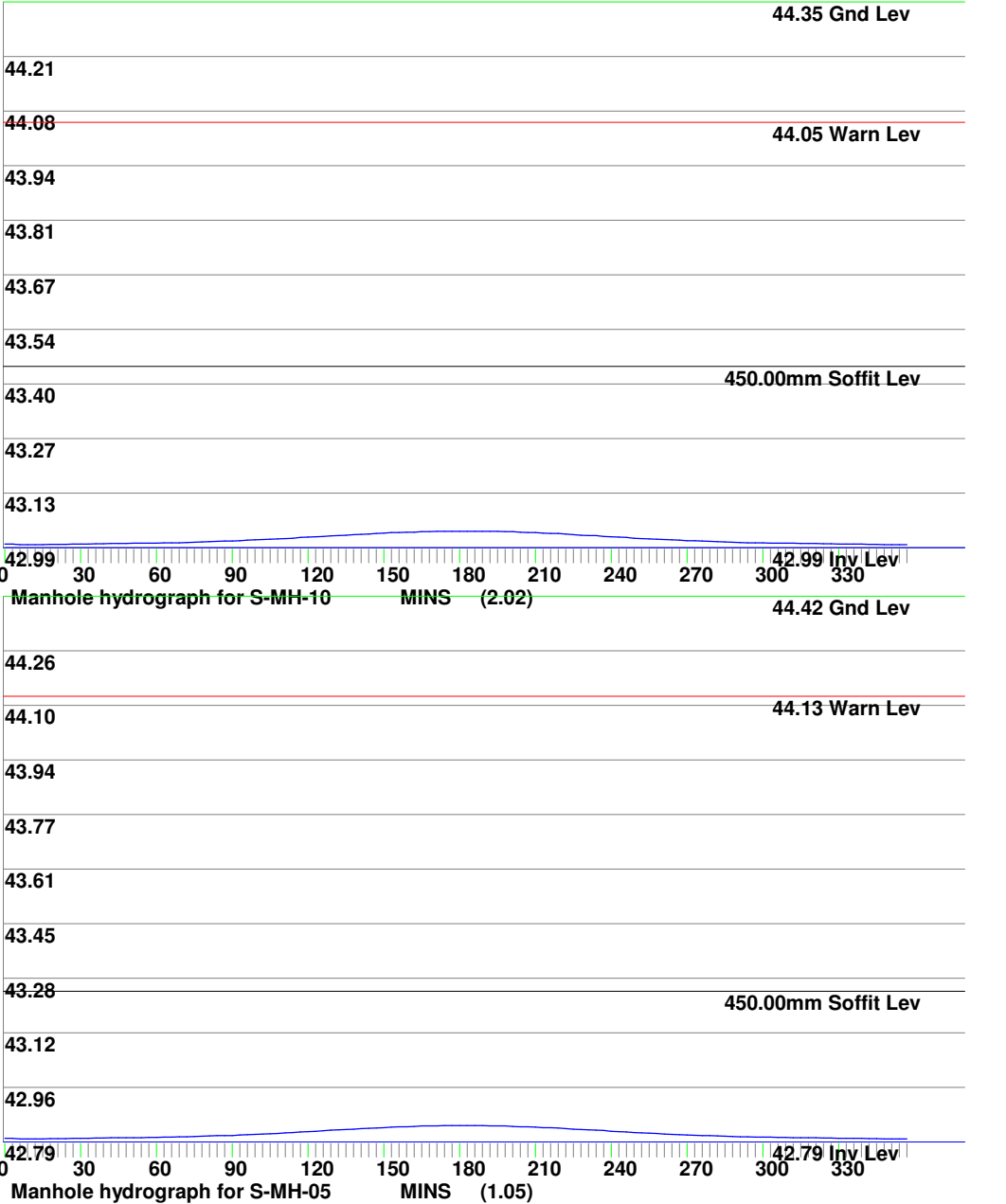
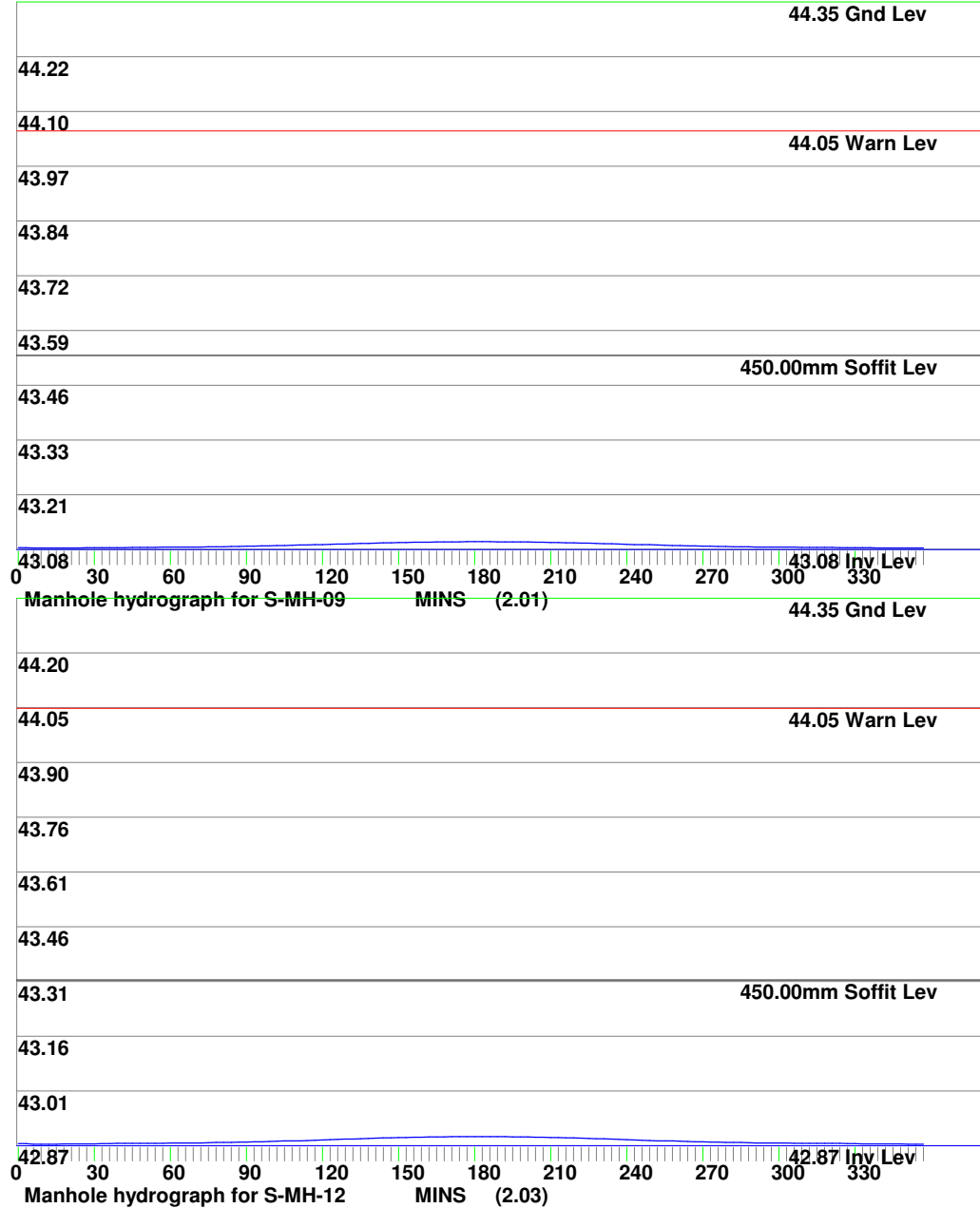
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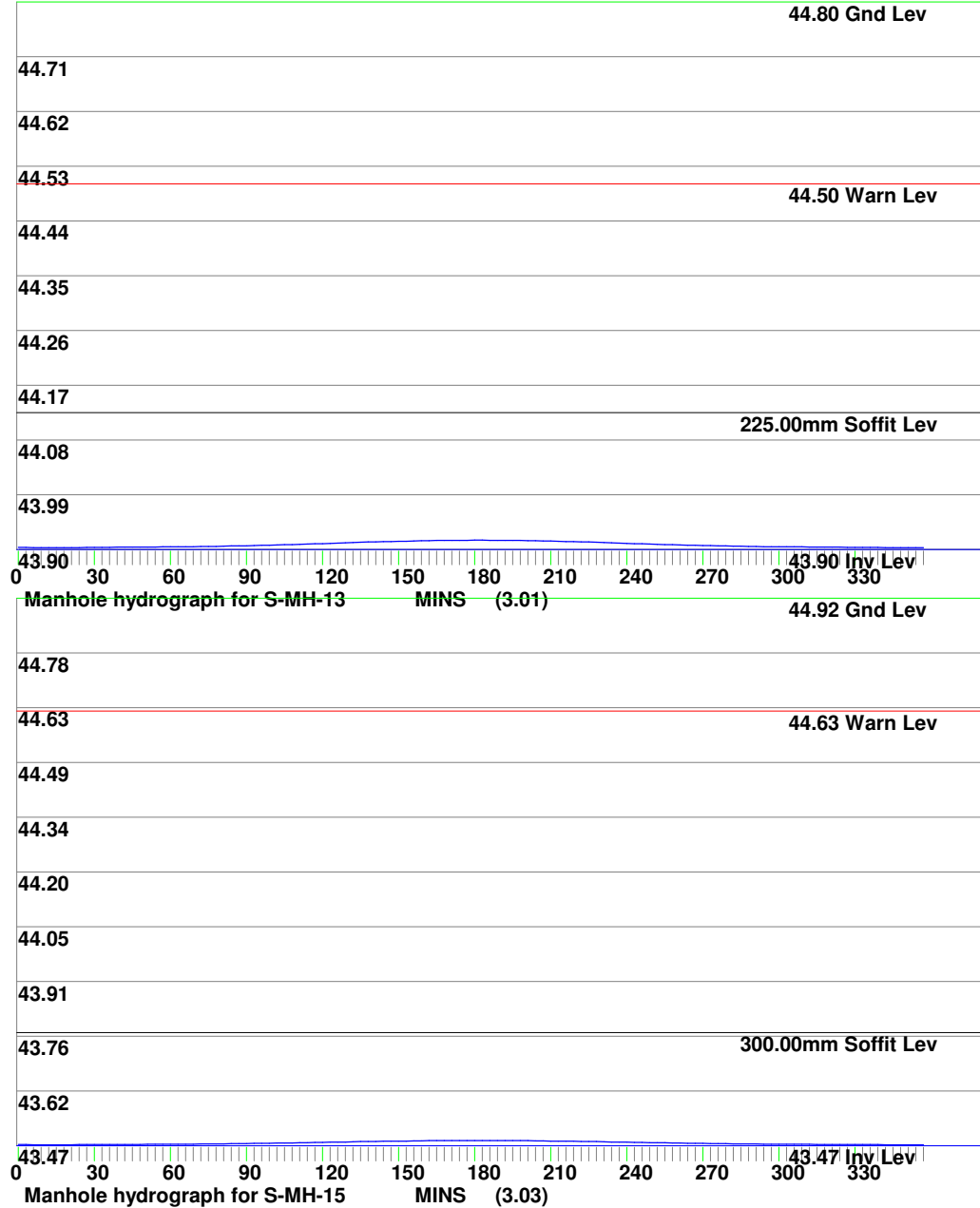
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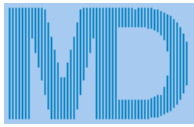
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Manhole hydrograph for S-MH-06

MINS (1.06)



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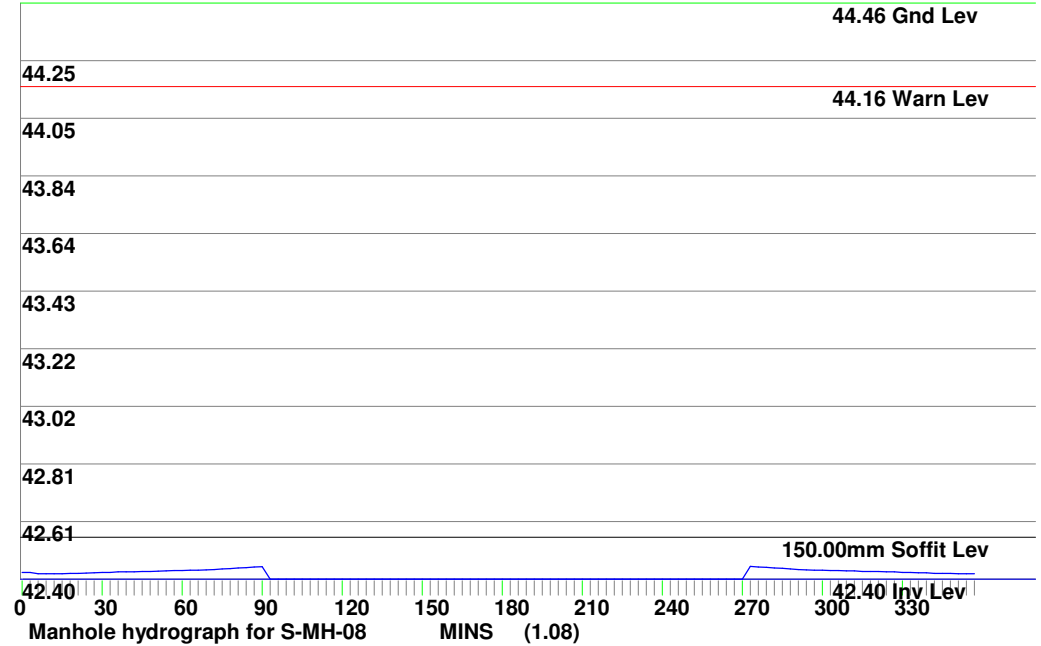
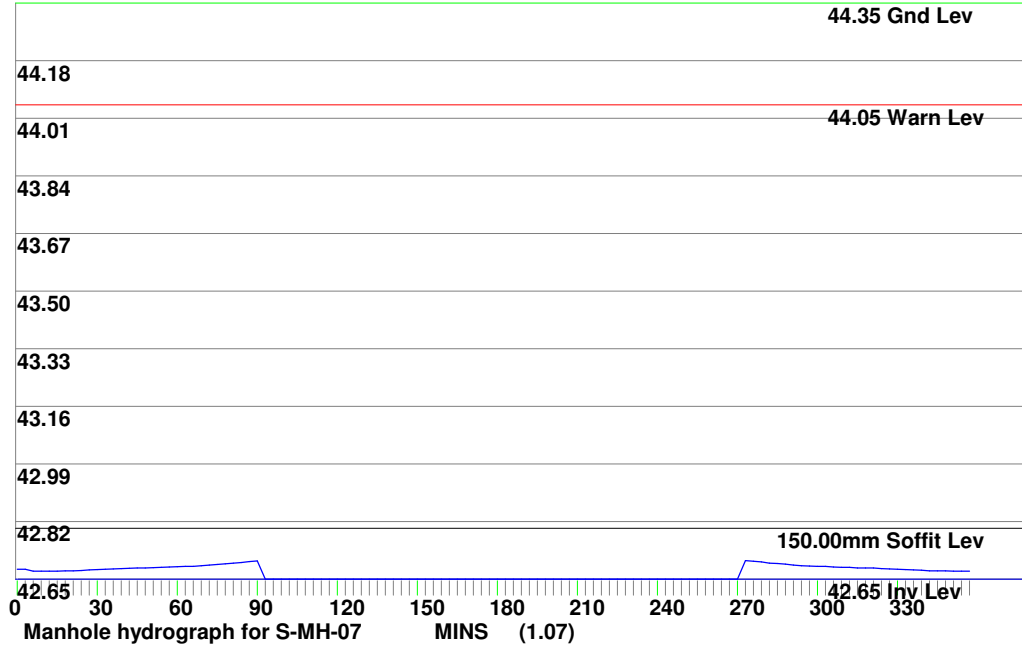
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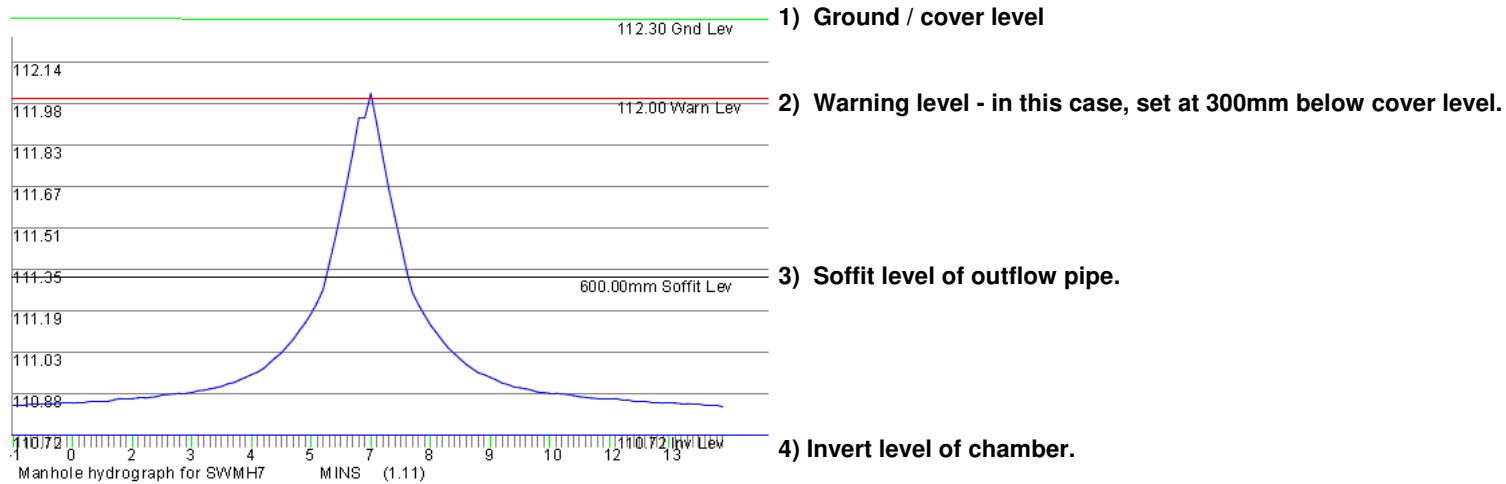
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Title **Surcharge calcs (Sized at 30 yrs storm) for SURFACE WATER DESIGN.SW**



## 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.