

|                                                        |                                             |                                                                                     |
|--------------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------|
| Atkins                                                 |                                             | Page 1                                                                              |
| Woodcote Grove<br>Ashley Road<br>Epsom Surrey KT18 5BW | Swansea Bay Tidal Lagoon<br>Entrance Area 1 |  |
| Date 26/05/2020 16:41                                  | Designed by Chris Woods                     |                                                                                     |
| File Area 1 Entrance 260520.MDX                        | Checked by D Hurley                         |                                                                                     |
| Innovyze                                               | Network 2019.1                              |                                                                                     |

### STORM SEWER DESIGN by the Modified Rational Method

#### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

|                                      |        |                                       |       |
|--------------------------------------|--------|---------------------------------------|-------|
| Return Period (years)                | 1      | PIMP (%)                              | 100   |
| M5-60 (mm)                           | 17.800 | Add Flow / Climate Change (%)         | 30    |
| Ratio R                              | 0.284  | Minimum Backdrop Height (m)           | 0.200 |
| Maximum Rainfall (mm/hr)             | 250    | Maximum Backdrop Height (m)           | 1.500 |
| Maximum Time of Concentration (mins) | 30     | Min Design Depth for Optimisation (m) | 1.200 |
| Foul Sewage (l/s/ha)                 | 0.000  | Min Vel for Auto Design only (m/s)    | 1.00  |
| Volumetric Runoff Coeff.             | 0.750  | Min Slope for Optimisation (1:X)      | 500   |

Designed with Level Soffits

#### Time Area Diagram for Storm

| Time<br>(mins) | Area<br>(ha) | Time<br>(mins) | Area<br>(ha) |
|----------------|--------------|----------------|--------------|
| 0-4            | 0.162        | 4-8            | 0.032        |

Total Area Contributing (ha) = 0.194

Total Pipe Volume (m³) = 3.320

#### Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|---------------------------------------------------------------------------------------|
| 1.000 | 32.600        | 0.192       | 170.0          | 0.019          | 5.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |  |
| 1.001 | 33.900        | 0.199       | 170.0          | 0.075          | 0.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |  |
| 1.002 | 17.000        | 0.100       | 170.0          | 0.100          | 0.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |  |

#### Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 39.44           | 5.54           | 5.441        | 0.019            | 0.0                  | 0.0           | 0.6               | 1.00         | 39.8         | 2.6           |
| 1.001 | 37.90           | 6.11           | 5.249        | 0.094            | 0.0                  | 0.0           | 2.9               | 1.00         | 39.8         | 12.5          |
| 1.002 | 37.18           | 6.39           | 5.050        | 0.194            | 0.0                  | 0.0           | 5.9               | 1.00         | 39.8         | 25.4          |

|                                                        |                                             |                                                                                     |
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| Innovyze                                               | Network 2019.1                              |                                                                                     |

### Summary of Critical Results by Maximum Level (Rank 1) for Storm

#### Simulation Criteria

Areal Reduction Factor 1.000    Additional Flow - % of Total Flow 30.000  
 Hot Start (mins) 0    MADD Factor \* 10m³/ha Storage 2.000  
 Hot Start Level (mm) 0    Inlet Coefficient 0.800  
 Manhole Headloss Coeff (Global) 0.500    Flow per Person per Day (l/per/day) 0.000  
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0    Number of Storage Structures 0  
 Number of Online Controls 0    Number of Time/Area Diagrams 0  
 Number of Offline Controls 0    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FSR    Ratio R 0.284  
 Region England and Wales Cv (Summer) 0.750  
 M5-60 (mm) 17.800 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0    DVD Status OFF  
 Analysis Timestep Fine Inertia Status OFF  
 DTS Status ON

Profile(s) Summer and Winter  
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,  
 720, 960, 1440, 2160, 2880, 4320, 5760,  
 7200, 8640, 10080  
 Return Period(s) (years) 1, 5, 100  
 Climate Change (%) 0, 0, 0

|       |       |           |        |                |               |           |           |          | Water |
|-------|-------|-----------|--------|----------------|---------------|-----------|-----------|----------|-------|
|       | US/MH |           |        | Return Climate | First (X)     | First (Y) | First (Z) | Overflow | Level |
| PN    | Name  | Storm     | Period | Change         | Surcharge     | Flood     | Overflow  | Act.     | (m)   |
| 1.000 | 1     | 15 Winter | 100    | +0%            | 100/15 Summer |           |           |          | 5.862 |
| 1.001 | 4     | 15 Winter | 100    | +0%            | 100/15 Summer |           |           |          | 5.841 |
| 1.002 | 5     | 15 Winter | 100    | +0%            | 5/15 Winter   |           |           |          | 5.650 |

| US/MH |      | Surcharged Flooded |             | Flow / Overflow |       | Pipe       | Level      |          |
|-------|------|--------------------|-------------|-----------------|-------|------------|------------|----------|
| PN    | Name | Depth (m)          | Volume (m³) | Cap.            | (l/s) | Flow (l/s) | Status     | Exceeded |
| 1.000 | 1    | 0.196              | 0.000       | 0.25            |       | 9.3        | SURCHARGED |          |
| 1.001 | 4    | 0.367              | 0.000       | 0.99            |       | 37.2       | SURCHARGED |          |
| 1.002 | 5    | 0.375              | 0.000       | 2.17            |       | 76.9       | SURCHARGED |          |