

230021 Uppingham School - Meadhurs Drainage Strategy

Design Settings

| Rainfall Methodology | FEH-22 | Minimum Velocity (m/s) | 1.00 |
|--------------------------------------|--------|------------------------------------|---------------|
| Return Period (years) | 2 | Connection Type | Level Soffits |
| Additional Flow (%) | 0 | Minimum Backdrop Height (m) | 0.200 |
| CV | 1.000 | Preferred Cover Depth (m) | 0.600 |
| Time of Entry (mins) | 4.00 | Include Intermediate Ground | \checkmark |
| Maximum Time of Concentration (mins) | 30.00 | Enforce best practice design rules | \checkmark |
| Maximum Rainfall (mm/hr) | 50.0 | | |

<u>Nodes</u>

| Name | Area (ha) | T of E (mins) | Cover Level (m) | Diameter (mm) | Easting (m) | Northing (m) | Depth (m) |
|------|--------------|------------------|-----------------------|------------------|----------------|-----------------|--------------|
| SW01 | 0.017 | 4.00 | 144.625 | 450 | 486564.004 | 299947.313 | 0.750 |
| SW02 | 0.017 | 4.00 | 144.700 | 450 | 486580.147 | 299945.960 | 1.062 |
| SW03 | | | 144.750 | 450 | 486583.660 | 299949.160 | 1.140 |
| SA01 | 0.003 | | 144.750 | | 486583.849 | 299951.403 | 1.153 |
| | | | | | | | |
| SW05 | 0.017 | 4.00 | 144.810 | 450 | 486571.082 | 299925.170 | 0.750 |
| SW06 | 0.017 | 4.00 | 144.810 | 450 | 486561.727 | 299925.945 | 0.844 |
| SA02 | | | 144.900 | | 486561.511 | 299923.362 | 0.960 |
| | | | | | | | |
| PP01 | 0.021 | 4.00 | 144.840 | | 486585.893 | 299920.309 | 0.350 |
| | | | | | | | |
| SW10 | 0.022 | 4.00 | 144.100 | 450 | 486608.388 | 299925.308 | 0.750 |
| SW11 | 0.003 | 4.00 | 143.300 | 450 | 486602.117 | 299958.681 | 0.750 |
| SW12 | 0.002 | 4.00 | 143.350 | 450 | 486606.428 | 299958.319 | 0.843 |
| SA03 | 0.000 | | 143.350 | | 486606.260 | 299956.326 | 0.863 |
| | | | | | | | |
| PP02 | 0.010 | | 144.500 | | 486593.284 | 299937.115 | 0.300 |
| | | | | | | | |

<u>Links</u>

| Name | US Node | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|-------|------------|------------|---------------|----------------|--------------|--------------|-------------|----------------|-------------|------------------|-----------------|
| 2.000 | SW01 | SW02 | 16.200 | 0.600 | 143.875 | 143.713 | 0.162 | 100.0 | 150 | 4.27 | 50.0 |
| 2.001 | SW02 | SW03 | 4.752 | 0.600 | 143.638 | 143.610 | 0.028 | 170.0 | 225 | 4.35 | 50.0 |
| 2.002 | SW03 | SA01 | 2.251 | 0.600 | 143.610 | 143.597 | 0.013 | 170.0 | 225 | 4.39 | 50.0 |
| 1.000 | SW10 | SW11 | 33.957 | 0.600 | 143.350 | 142.550 | 0.800 | 42.4 | 150 | 4.37 | 50.0 |
| 3.000 | SW05 | SW06 | 9.387 | 0.600 | 144.060 | 143.966 | 0.094 | 99.9 | 150 | 4.16 | 50.0 |
| 3.001 | SW06 | SA02 | 2.592 | 0.600 | 143.966 | 143.940 | 0.026 | 99.7 | 150 | 4.20 | 50.0 |
| 1.001 | SW11 | SW12 | 4.326 | 0.600 | 142.550 | 142.507 | 0.043 | 100.6 | 150 | 4.44 | 50.0 |
| 1.002 | SW12 | SA03 | 2.000 | 0.600 | 142.507 | 142.487 | 0.020 | 100.0 | 150 | 4.47 | 50.0 |

| Name | Vel (m/s) | Cap (l/s) | Flow (I/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (I/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|-------|--------------|--------------|---------------|--------------------|--------------------|----------------|--------------------------|----------------------|--------------------------|
| 2.000 | 1.005 | 17.8 | 3.1 | 0.600 | 0.837 | 0.017 | 0.0 | 42 | 0.751 |
| 2.001 | 1.000 | 39.7 | 6.1 | 0.837 | 0.915 | 0.034 | 0.0 | 59 | 0.727 |
| 2.002 | 1.000 | 39.7 | 6.1 | 0.915 | 0.928 | 0.034 | 0.0 | 59 | 0.727 |
| 1.000 | 1.549 | 27.4 | 4.0 | 0.600 | 0.600 | 0.022 | 0.0 | 38 | 1.104 |
| 3.000 | 1.005 | 17.8 | 3.1 | 0.600 | 0.694 | 0.017 | 0.0 | 42 | 0.752 |
| 3.001 | 1.006 | 17.8 | 6.1 | 0.694 | 0.810 | 0.034 | 0.0 | 61 | 0.914 |
| 1.001 | 1.002 | 17.7 | 4.5 | 0.600 | 0.693 | 0.025 | 0.0 | 52 | 0.841 |
| 1.002 | 1.005 | 17.8 | 4.9 | 0.693 | 0.713 | 0.027 | 0.0 | 54 | 0.858 |

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|------------------------------|--|--------------------------------------|-------------------------------------|--|--|--------------------|---|---------------------------------|---|---|--|---------|
| | | | | | <u>Pipeline</u> | <u>Schedule</u> | | | | | | |
| Link | Length | Slope | Dia | Link | US CL | US IL | US Depth | DS C | | | OS Depth | |
| 2 000 | (m) | (1:X) | (mm) | Туре | (m) | (m) | (m) | (m) | | (m) | (m) | |
| 2.000 | 16.200 | 100.0 | | | 144.625 | 143.875 | 0.600 | 144.70 | | 13.713 | 0.837 | |
| 2.001 | 4.752 | 170.0 | | | 144.700 | 143.638 | 0.837 | 144.7 | | 43.610 | 0.915 | |
| 2.002 | 2.251 | 170.0 | | | 144.750 | 143.610 | 0.915 | 144.75 | | 13.597 | 0.928 | |
| 1.000 | 33.957 | 42.4 | | | 144.100 | 143.350 | 0.600 | 143.30 | | 12.550 | 0.600 | |
| 3.000 3.001 | 9.387 2.592 | 99.9 99.7 | | | 144.810 144.810 | 144.060 143.966 | 0.600 0.694 | 144.8: 144.9(| | 13.966 13.940 | 0.694 0.810 | |
| 1.001 | 4.326 | 100.6 | | | 144.810 | 142.550 | 0.694 | 144.90 | | +3.940 12.507 | 0.810 | |
| 1.001 | 2.000 | 100.0 | | | 143.300 143.350 | 142.550 | 0.600 | 143.3 | | +2.307 12.487 | 0.893 | |
| 1.002 | | | | | | | | | | | 017 10 | |
| | Link | US Node | Dia (mm) | Node Type | МН Туре | DS Node | Dia e (mm) | Node Type | | МН Туре | | |
| | 2.000 | SW01 | 450 | Manhole | Adoptal | | • • | Manhol | | optable | | |
| | 2.000 | SW01 | | Manhole | Adoptal | | | Manhol | | optable | | |
| | 2.001 | SW02 | | Manhole | Adoptal | | | Junction | | optable | | |
| | 1.000 | SW05 SW10 | | Manhole | Adoptal | | | Manhol | | optable | | |
| | 3.000 | SW10 | 450 450 | Manhole | Adoptal | | | Manhol | | optable | | |
| | 3.000 | SW05 | | Manhole | Adoptal | | | Junction | | optable | | |
| | 1.001 | SW00 | 450 450 | Manhole | Adoptal | | | Manhol | | optable | | |
| | 1.001 | SW11 | | Manhole | Adoptal | | | Junction | | optuble | | |
| | | 0 | | | | | | | | | | |
| | | | | | <u>Manhole</u> | | | | | | | |
| Node | Eastin (m) | g ľ | Northing (m) | CL (m) | Depth (m) | Dia (mm) | Connecti | ions | Link | IL (m) | Dia (mm) | |
| SW01 | 486564. | 004 29 | 99947.31 | | | | | | | () | | |
| | | | | | | | \bigcirc | | | | | |
| | | | | | | | (\rightarrow) |) | | | | |
| | | | | | | | \bigcirc | | | | | |
| | | | | | | | | 0 | 2.000 | 143.875 | 150 | |
| SW02 | 486580. | 147 29 | 99945.960 | 0 144.700 |) 1.062 | 450 | | | 2.000 | 143.875 143.713 | | |
| SW02 | 486580. | 147 29 | 99945.960 | 0 144.700 |) 1.062 | 450 | 17 ⁰ | | | | | |
| SW02 | 486580. | 147 29 | 99945.960 | 0 144.700 |) 1.062 | 450 | 1 | 1 | 2.000 | 143.713 | 150 | |
| | | | | | | | 1 | 1 0 | 2.000 | 143.713 143.638 | 150 225 | |
| SW02 SW03 | 486580. 486583. | | 99945.960 99949.160 | | | | | 1 0 | 2.000 | 143.713 | 150 225 | |
| | | | | | | | 1 - 0 ⁴⁰ | 1 0 | 2.000 | 143.713 143.638 | 150 225 | |
| | | | | | | | 1 | 1 0 1 | 2.000 2.001 2.001 | 143.713 143.638 143.610 | 150 225 225 | |
| SW03 | 486583. | 660 29 | 99949.160 | 0 144.750 |) 1.140 | | | 1 0 1 0 | 2.000 2.001 2.001 2.002 | 143.713 143.638 143.610 143.610 | 225 225 225 225 | |
| | | 660 29 | | 0 144.750 |) 1.140 | | | 1 0 1 0 | 2.000 2.001 2.001 | 143.713 143.638 143.610 | 225 225 225 225 | |
| SW03 | 486583. | 660 29 | 99949.160 | 0 144.750 |) 1.140 | | 1 - O ^r | 1 0 1 0 | 2.000 2.001 2.001 2.002 | 143.713 143.638 143.610 143.610 | 225 225 225 225 | |
| SW03 | 486583. | 660 29 | 99949.160 | 0 144.750 |) 1.140 | | | 1 0 1 0 | 2.000 2.001 2.001 2.002 | 143.713 143.638 143.610 143.610 | 225 225 225 225 | |
| SW03 | 486583. 486583. | 660 29 849 29 | 99949.160 | 0 144.750 3 144.750 |) 1.140) 1.153 | 450 | | 1 0 1 0 | 2.000 2.001 2.001 2.002 | 143.713 143.638 143.610 143.610 | 225 225 225 225 | |
| SW03 SA01 | 486583. 486583. | 660 29 849 29 | 99949.160 99951.403 | 0 144.750 3 144.750 |) 1.140) 1.153 | 450 | | 1 0 1 0 | 2.000 2.001 2.001 2.002 | 143.713 143.638 143.610 143.610 | 225 225 225 225 | |
| SW03 SA01 | 486583. 486583. | 660 29 849 29 | 99949.160 99951.403 | 0 144.750 3 144.750 |) 1.140) 1.153 | 450 | | 1 0 1 0 | 2.000 2.001 2.001 2.002 | 143.713 143.638 143.610 143.610 | 225 225 225 225 | |
| SW03 SA01 | 486583. 486583. | 660 29 849 29 | 99949.160 99951.403 | 0 144.750 3 144.750 |) 1.140) 1.153 | 450 | | 1 0 1 0 1 | 2.000 2.001 2.001 2.002 | 143.713 143.638 143.610 143.610 | 225 225 225 225 225 225 | |
| SW03 SA01 | 486583. 486583. | 660 29 849 29 082 29 | 99949.160 99951.403 | D 144.750 B 144.750 D 144.810 |) 1.140) 1.153) 0.750 | 450 | | 1 0 1 0 1 | 2.000 2.001 2.001 2.002 2.002 | 143.713 143.638 143.610 143.610 143.597 | 225 225 225 225 225 225 225 | |
| SW03 SA01 SW05 | 486583. 486583. 486571. | 660 29 849 29 082 29 | 99949.160 99951.403 99925.170 | D 144.750 B 144.750 D 144.810 |) 1.140) 1.153) 0.750 | 450 | | 1 0 1 0 1 | 2.000 2.001 2.002 2.002 3.000 | 143.713 143.638 143.610 143.610 143.597 143.597 | 150 225 225 225 225 225 225 150 | |
| SW03 SA01 SW05 | 486583. 486583. 486571. | 660 29 849 29 082 29 | 99949.160 99951.403 99925.170 | D 144.750 B 144.750 D 144.810 |) 1.140) 1.153) 0.750 | 450 | | 1 0 1 0 1 0 1 | 2.000 2.001 2.001 2.002 2.002 3.000 3.000 | 143.713 143.638 143.610 143.610 143.597 144.060 143.966 | 150 225 225 225 225 225 225 225 225 225 2 | |
| SW03 SA01 SW05 SW06 | 486583. 486583. 486571. 486561. | 660 29 849 29 082 29 727 29 | 99949.160 99951.403 99925.170 | D 144.750 B 144.750 D 144.810 5 144.810 | 1.140 1.153 0.750 0.844 | 450 | 1 - 0 = 0 $1 - 0 = 0$ $1 - 0 = 0$ $0 = -0$ $0 = -0$ | | 2.000 2.001 2.002 2.002 3.000 3.000 3.001 | 143.713 143.638 143.610 143.610 143.597 143.597 143.966 | 150 225 225 225 225 225 225 150 150 150 | |
| SW03 SA01 SW05 | 486583. 486583. 486571. 486561. | 660 29 849 29 082 29 727 29 | 99949.160 99951.403 99925.170 | D 144.750 B 144.750 D 144.810 5 144.810 | 1.140 1.153 0.750 0.844 | 450 | | | 2.000 2.001 2.001 2.002 2.002 3.000 3.000 | 143.713 143.638 143.610 143.610 143.597 144.060 143.966 | 150 225 225 225 225 225 225 150 150 150 | |
| SW03 SA01 SW05 SW06 | 486583. 486583. 486571. 486561. | 660 29 849 29 082 29 727 29 | 99949.160 99951.403 99925.170 | D 144.750 B 144.750 D 144.810 5 144.810 | 1.140 1.153 0.750 0.844 | 450 | $1 \longrightarrow 1^{0}$ | | 2.000 2.001 2.002 2.002 3.000 3.000 3.001 | 143.713 143.638 143.610 143.610 143.597 143.597 143.966 | 150 225 225 225 225 225 225 150 150 150 | |
| SW03 SA01 SW05 SW06 | 486583. 486583. 486571. 486561. | 660 29 849 29 082 29 727 29 | 99949.160 99951.403 99925.170 | D 144.750 B 144.750 D 144.810 5 144.810 | 1.140 1.153 0.750 0.844 | 450 | $1 \longrightarrow 1^{0}$ | | 2.000 2.001 2.002 2.002 3.000 3.000 3.001 | 143.713 143.638 143.610 143.610 143.597 143.597 143.966 | 150 225 225 225 225 225 225 150 150 150 | |

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| PP01 | Easting | Northing | CL | Depth | Dia | Connections | Link | IL | Dia |
|--------------|--|---|--|--|---|--|---|---|------|
| PP01 | (m) | (m) | (m) | (m) | (mm) | | | (m) | (mm) |
| 1101 | 486585.893 | 299920.309 | 144.840 | 0.350 | | | | | |
| | | | | | | o | | | |
| | | | | | | | | | |
| SW10 | 486608.388 | 299925.308 | 144.100 | 0.750 | 450 | ° 1 | | | |
| | | | | | | (| | | |
| | | | | | | 0 | - | 143.350 | 150 |
| SW11 | 486602.117 | 299958.681 | 143.300 | 0.750 | 450 | 1 | 1.000 | 142.550 | 150 |
| | | | | | | | | | |
| | | | | | | 1 0 | | 142.550 | 150 |
| SW12 | 486606.428 | 299958.319 | 143.350 | 0.843 | 450 | 1 | 1.001 | 142.507 | 15(|
| | | | | | | 1-() | | | |
| | | | | | | 0 | | 142.507 | 150 |
| SA03 | 486606.260 | 299956.326 | 143.350 | 0.863 | | | 1.002 | 142.487 | 150 |
| | | | | | | 4 | | | |
| PP02 | 496502 294 | 200027 115 | 144 500 | 0 200 | | | | | |
| PPUZ | 486593.284 | 299937.115 | 144.500 | 0.300 | | | | | |
| | | | | | | 0 | | | |
| | Methodology Summer CV Winter CV | FEH-22 1.000 | Skip | nalysis Sp Steady S | | | ck Discha | age (m³/ha) vrgo Bato(c) | 20. |
| | | 1.000 | Drain Dow | n Time (n | nins) 2 | | | rge Volume | |
| 15 | 30 60 | | S | Storm Du | rations | 240 Chec | ck Dischai | rge Volume | |
| 15 | 1 1 | 0 120 eturn Period | 5 180 2 Climate Ch | Storm Du 40 3 | rations 60 dditiona | 240 Chec 480 600 - | ck Dischai 720 1 a l Flow | rge Volume | х |
| 15 | 1 1 | 0 120 | 5 180 2 | Storm Du 40 3 hange A | rations 60 | 240 Chec 480 600 - | ck Dischar 720 S al Flow %) | rge Volume | х |
| 15 | 1 1 | 0 120 eturn Period (years) | 5 180 2 Climate Ch | Storm Du 40 3 hange A) 0 35 | rations 60 dditiona | 240 Chec 480 600 - al Area Addition 6) (Q S | ck Dischai 720 1 a l Flow | rge Volume | х |
| 15 | 1 1 |) 120 eturn Period (years) 2 | 5 180 2 Climate Ch | Storm Du 40 3 hange A) 0 | rations 60 dditiona | 240 Chec 480 600 600 al Area Addition 6) (Q 9 | ck Dischar 720 S al Flow %) 0 | rge Volume | х |
| 15 | 1 1 | 0 120 eturn Period (years) 2 30 100 | S 180 2 Climate Ch (CC %) | Storm Du 40 3 iange A) 0 35 40 | rations 60 dditiona (A % | 240 Chec 480 600 5 al Area Addition 6) (Q 9 0 0 | ck Dischar 720 9 al Flow %) 0 0 | rge Volume | х |
| Base | Re Inf Coefficient | 0 120 eturn Period (years) 2 30 100 <u>No</u> 5 (m/hr) 0.07 | 5 180 2 Climate Ch (CC %) Ode SA01 D | Storm Dur 40 3 hange A) 0 35 40 epth/Are | rations 60 dditiona (A % <u>a Storag</u> or 2.0 | 240 Chec 480 600 6 al Area Addition 6) (Q 9 0 0 0 0 2 5 5 5 5 5 5 5 5 5 1 1 1 1 1 1 | tk Dischar 720 1 al Flow %) 0 0 0 0 0 vert Leve | rge Volume 960 14 | .450 |
| Base | Re | 0 120 eturn Period (years) 2 30 100 <u>No</u> 5 (m/hr) 0.07 | 5 180 2 Climate Ch (CC %) Ode SA01 D | Storm Du 40 3 hange A) 0 35 40 epth/Are | rations 60 dditiona (A % <u>a Storag</u> or 2.0 | 240 Chec 480 600 6 al Area Addition 6) (Q 9 0 0 0 0 2 5 5 5 5 5 5 5 5 5 1 1 1 1 1 1 | tk Dischar 720 1 al Flow %) 0 0 0 0 0 vert Leve | rge Volume 960 14 | .450 |
| Base | Re Inf Coefficient Inf Coefficient Depth | 2 120 eturn Period (years) 2 30 100 <u>No</u> (m/hr) 0.07 (m/hr) 0.07 (m/hr) 0.07 | S 180 2 Climate Ch (CC %) Dde SA01 D 700 Sa 700 Sa a Dept | Storm Du 40 3 iange A 0 35 40 epth/Are fety Facto Porosi th Area | rations 60 dditiona (A % <u>a Storag</u> or 2.0 ty 0.99 Inf Au | 240 Chec 480 600 4 al Area Addition 6) (Q 9 0 0 0 2 <u>ce Structure</u> 5 Time to half rea Depth A | k Dischar 720 al Flow %) 0 0 0 0 vert Leve empty (r wrea Inf | rge Volume 960 14 91 (m) 143 91 (m) 536 Area | .450 |
| Base | Re Inf Coefficient Inf Coefficient Depth (m) | 2 120 eturn Period (years) 2 30 100 <u>No</u> (m/hr) 0.07 (m/hr) 0.07 | S 180 2 Climate Ch (CC %) Dede SA01 D 700 Sa 700 Sa 700 (m) | Storm Du 40 3 hange A 0 35 40 epth/Are Porosi th Area) (m ²) | rations 60 .dditiona (A % <u>a Storag</u> or 2.0 ty 0.9! Inf Au (m ² | 240 Chec 480 600 4 al Area Addition 6) (Q 9 0 0 0 2 <u>ce Structure</u> 5 Time to half rea Depth A | k Dischar 720 al Flow %) 0 0 0 0 vert Leve empty (r wrea Inf | rge Volume 960 14 el (m) 143 mins) 536 | .450 |
| Base | Re Inf Coefficient Inf Coefficient Depth (m) | D 120 eturn Period (years) 2 30 100 <u>No</u> (m/hr) 0.07 (m/hr) 0.07 Area Inf Are (m ²) (m ²) 31.5 31. | 5 180 2 Climate Ch (CC %) 0 0 0 0 0 0 0 0 0 0 0 0 0 | Storm Dur 40 3 hange A) 0 35 40 epth/Are fety Factor Porosi th Area) (m ²) 00 31.5 | rations 60 dditiona (A % a Storag or 2.0 ty 0.99 Inf Au (m ² 5) | 240 Chec 480 600 6 al Area Addition 6) (Q 9 0 0 0 2 5 Time to half rea Depth A (m) (| k Dischar 720 al Flow %) 0 0 0 0 vert Leve empty (r wrea Inf m²) (| rge Volume 960 14 960 143 mins) 536 Area m²) | .450 |
| Base Side | Re Inf Coefficient Inf Coefficient Depth (m) | 0 120 eturn Period (years) 2 30 100 <u>No</u> (m/hr) 0.07 (m/hr) 0.07 (m/hr) 0.07 Area Inf Are (m ²) (m ²) 31.5 31. | S 180 2 Climate Ch (CC %) Dede SA01 De 700 Sa 700 Sa 700 Sa 700 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | Storm Dur 40 3 hange A) 0 35 40 epth/Are fety Factor Porosi th Area) (m ²) 00 31.5 | a Storag Inf Au (m ² (m ² (m ² (m ² 5) | 240 Chec 480 600 600 al Area Addition 6) (Q 9 0 0 0 0 0 0 0 0 0 0 0 0 0 | k Dischar 720 al Flow %) 0 0 0 0 vert Leve empty (r wrea Inf m²) (| rge Volume 960 14 961 143 mins) 536 Area m²) 51.5 | .450 |

| CAUSEWAY 🛟 | Alan Conisbee & A | Ne An | | STAGE 3a (FEH) - rm Network hall | | am School - Meadhurs Strategy |
|--|---|---|---------------------------|---|---------------------------|----------------------------------|
| Depth (m) 0.000 | Area Inf Area (m²) (m²) 24.0 24.0 | DepthArea(m)(m²)0.80024.0 | Inf Area (m²) 41.6 | Depth Area (m) (m²) 0.801 0.0 | Inf Area (m²) 41.6 | |
| | <u>Node P</u> | P01 Depth/Area S | Storage Stru | <u>ucture</u> | | |
| Base Inf Coefficien Side Inf Coefficien | | Safety Factor Porosity | 2.0 0.30 | Invert L Time to half empt | • • | 144.490 23 |
| (m) | Area Inf Area (m²) (m²) 100.8 100.8 | DepthArea(m)(m²)0.280100.8 | Inf Area (m²) 100.8 | Depth Area (m) (m²) 0.281 0.0 | Inf Area (m²) 100.8 | |
| | <u>Node S</u> | A03 Depth/Area S | Storage Stru | <u>ucture</u> | | |
| Base Inf Coefficien Side Inf Coefficien | | Safety Factor Porosity | | Invert L Time to half empt | • • | 142.050 465 |
| Depth (m) 0.000 | Area Inf Area (m²) (m²) 17.0 17.0 | Depth Area (m) (m²) 0.800 17.0 | Inf Area (m²) 33.8 | Depth Area (m) (m²) 0.801 0.0 | Inf Area (m²) 33.8 | |
| | Node SV | N11 Depth/Area | Storage Str | <u>ucture</u> | | |
| Base Inf Coefficien Side Inf Coefficien | | Safety Factor Porosity | 2.0 0.30 | Invert L Time to half empt | | 142.550 132 |
| Depth (m) 0.000 | Area Inf Area (m²) (m²) 7.2 7.2 | Depth Area (m) (m²) 0.600 7.2 | Inf Area (m²) 22.0 | Depth Area (m) (m²) 0.601 0.0 | Inf Area (m²) 22.0 | |
| | <u>Node P</u> | P02 Depth/Area S | Storage Stru | <u>ucture</u> | | |
| Base Inf Coefficien Side Inf Coefficien | | Safety Factor Porosity | 2.0 0.30 | Invert L Time to half empt | | 144.200 23 |
| (m) | Area Inf Area (m²) (m²) 100.0 100.0 | Depth Area (m) (m²) 0.225 100.0 | Inf Area (m²) 100.0 | Depth Area (m) (m²) 0.226 0.0 | Inf Area (m²) 100.0 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |



Page 5 230021 Uppingham School - Meadhurs Drainage Strategy

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.35%

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (I/s) | Node Vol (m³) | Flood (m³) | Status |
|-------------------|------------|----------------|--------------|--------------|-----------------|------------------|---------------|--------|
| 15 minute summer | SW01 | 10 | 143.921 | 0.046 | 3.4 | 0.0279 | 0.0000 | ОК |
| 15 minute summer | SW02 | 10 | 143.707 | 0.069 | 6.8 | 0.0332 | 0.0000 | ОК |
| 15 minute summer | SW03 | 10 | 143.677 | 0.066 | 6.8 | 0.0106 | 0.0000 | ОК |
| 360 minute summer | SA01 | 248 | 143.627 | 0.030 | 1.7 | 5.2915 | 0.0000 | ОК |
| | | | | | | | | |
| 15 minute summer | SW05 | 10 | 144.104 | 0.044 | 3.4 | 0.0272 | 0.0000 | ОК |
| 15 minute summer | SW06 | 10 | 144.035 | 0.069 | 6.8 | 0.0387 | 0.0000 | ОК |
| 360 minute summer | SA02 | 232 | 143.775 | -0.165 | 1.6 | 3.9957 | 0.0000 | ОК |
| | | | | | | | | |
| 120 minute summer | PP01 | 72 | 144.535 | 0.045 | 1.9 | 1.4014 | 0.0000 | ОК |
| | | | | | | | | |
| 15 minute summer | SW10 | 10 | 143.391 | 0.041 | 4.4 | 0.0303 | 0.0000 | OK |
| 15 minute summer | SW11 | 10 | 142.609 | 0.059 | 5.0 | 0.1408 | 0.0000 | ОК |
| | | | | | | | | |
| 15 minute summer | SW12 | 10 | 142.566 | 0.059 | 5.1 | 0.0121 | 0.0000 | ОК |
| 360 minute summer | SA03 | 240 | 142.277 | -0.210 | 1.1 | 3.6583 | 0.0000 | ОК |
| | | | | | | | | |
| 60 minute summer | PP02 | 39 | 144.222 | 0.022 | 1.2 | 0.6596 | 0.0000 | OK |

| US Node | Link | DS Node | Outflow (I/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|------------|--|--|--|--|--|---|
| SW01 | 2.000 | SW02 | 3.4 | 0.765 | 0.191 | 0.0718 |
| SW02 | 2.001 | SW03 | 6.8 | 0.674 | 0.171 | 0.0478 |
| SW03 | 2.002 | SA01 | 6.8 | 0.721 | 0.170 | 0.0212 |
| SA01 | Infiltration | | 0.4 | | | |
| | | | | | | |
| SW05 | 3.000 | SW06 | 3.4 | 0.559 | 0.191 | 0.0574 |
| SW06 | 3.001 | SA02 | 6.8 | 0.903 | 0.382 | 0.0195 |
| SA02 | Infiltration | | 0.5 | | | |
| PP01 | Infiltration | | 1.0 | | | |
| SW10 | 1.000 | SW11 | 4.4 | 0.902 | 0.161 | 0.1738 |
| SW11 | 1.001 | SW12 | 4.7 | 0.738 | 0.266 | 0.0276 |
| SW11 | Infiltration | | 0.1 | | | |
| SW12 | 1.002 | SA03 | 5.0 | 0.829 | 0.283 | 0.0122 |
| SA03 | Infiltration | | 0.2 | | | |
| ΡΡΩ2 | Infiltration | | 0.5 | | | |
| | Node SW01 SW02 SW03 SA01 SW05 SW06 SA02 PP01 SW10 SW11 SW11 SW11 SW12 | Node SW01 2.000 SW02 2.001 SW03 2.002 SA01 Infiltration SW05 3.000 SW06 3.001 SA02 Infiltration PP01 Infiltration SW10 1.000 SW11 1.001 SW12 1.002 SA03 Infiltration | NodeNodeSW012.000SW02SW022.001SW03SW032.002SA01SA01InfiltrationSW06SW053.000SW06SW063.001SA02SA02InfiltrationSW06SA02InfiltrationSW11PP01InfiltrationSW11SW101.000SW11SW111.001SW12SW121.002SA03SA03Infiltration | Node Node (I/s) SW01 2.000 SW02 3.4 SW02 2.001 SW03 6.8 SW03 2.002 SA01 6.8 SW03 2.002 SA01 6.8 SA01 Infiltration 0.4 SW05 3.000 SW06 3.4 SW06 3.001 SA02 6.8 SA02 Infiltration SA02 6.8 SA02 Infiltration 1.0 5 PP01 Infiltration 1.0 1.0 SW10 1.000 SW11 4.4 SW11 1.001 SW12 4.7 SW11 Infiltration 0.1 5.0 SA03 Infiltration 0.2 5.0 | Node Node (I/s) (m/s) SW01 2.000 SW02 3.4 0.765 SW02 2.001 SW03 6.8 0.674 SW03 2.002 SA01 6.8 0.721 SA01 Infiltration 0.4 0.759 SW05 3.000 SW06 3.4 0.559 SW06 3.001 SA02 6.8 0.903 SA02 Infiltration 0.5 0.55 PP01 Infiltration 1.0 1.0 SW10 1.000 SW11 4.4 0.902 SW11 1.001 SW12 4.7 0.738 SW11 Infiltration 0.1 SW12 1.02 SA03 Infiltration 0.2 0.829 0.829 | Node Node (l/s) (m/s) SW01 2.000 SW02 3.4 0.765 0.191 SW02 2.001 SW03 6.8 0.674 0.171 SW03 2.002 SA01 6.8 0.721 0.170 SA01 Infiltration 0.4 0.4 0.191 SW05 3.000 SW06 3.4 0.559 0.191 SW06 3.001 SA02 6.8 0.903 0.382 SA02 Infiltration 0.5 0.5 0.191 SW10 1.000 SW11 4.4 0.902 0.161 SW11 1.001 SW12 4.7 0.738 0.266 SW11 Infiltration 0.1 0.1 0.283 0.283 SA03 Infiltration 0.2 0.283 0.283 |



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 Uppingham School - Meadhurs
 Drainage Strategy

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.35%

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (I/s) | Node Vol (m³) | Flood (m³) | Status |
|--|--------------|----------------|--------------------|----------------|-----------------|-------------------|------------------|------------------|
| 240 minute summer | SW01 | 232 | 143.998 | 0.123 | 2.8 | 0.0753 | 0.0000 | ОК |
| 240 minute summer | SW02 | 232 | 143.998 | 0.360 | 5.6 | 0.1726 | 0.0000 | SURCHARGED |
| 240 minute summer | SW03 | 232 | 144.001 | 0.390 | 5.3 | 0.0621 | 0.0000 | SURCHARGED |
| 240 minute summer | SA01 | 228 | 143.997 | 0.400 | 5.5 | 16.3847 | 0.0000 | ОК |
| | | | | | | | | |
| 180 minute winter | SW05 | 172 | 144.213 | 0.153 | 2.3 | 0.0935 | 0.0000 | SURCHARGED |
| 180 minute winter | SW06 | 172 | 144.213 | 0.247 | 4.6 | 0.1387 | 0.0000 | SURCHARGED |
| 180 minute winter | SA02 | 172 | 144.213 | 0.273 | 4.6 | 13.9705 | 0.0000 | ОК |
| 60 minute summer | PP01 | 51 | 144.684 | 0.194 | 8.7 | 6.0855 | 0.0000 | ОК |
| 15 minute summer | SW10 | 10 | 143.429 | 0.079 | 14.8 | 0.0586 | 0.0000 | ОК |
| 240 minute winter | SW11 | 224 | 142.746 | 0.196 | 2.7 | 0.4711 | 0.0000 | SURCHARGED |
| 240 minute winter 240 minute winter | SW12 SA03 | 224 224 | 142.746 142.746 | 0.239 0.259 | 2.8 2.8 | 0.0493 11.2455 | 0.0000 0.0000 | SURCHARGED OK |
| 60 minute summer | PP02 | 42 | 144.278 | 0.078 | 4.2 | 2.3893 | 0.0000 | ОК |

| Link Event (Outflow) | US Node | Link | DS Node | Outflow (I/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|-------------------------|------------|--------------|------------|------------------|-------------------|----------|------------------|
| 15 minute summer | SW01 | 2.000 | SW02 | 11.5 | 1.040 | 0.648 | 0.1791 |
| 15 minute summer | SW02 | 2.001 | SW03 | 23.0 | 0.902 | 0.578 | 0.1211 |
| 15 minute summer | SW03 | 2.002 | SA01 | 23.0 | 0.997 | 0.578 | 0.0607 |
| 240 minute summer | SA01 | Infiltration | | 0.5 | | | |
| | | | | | | | |
| 15 minute summer | SW05 | 3.000 | SW06 | 11.3 | 0.687 | 0.637 | 0.1567 |
| 15 minute summer | SW06 | 3.001 | SA02 | 22.8 | 1.294 | 1.280 | 0.0445 |
| 180 minute winter | SA02 | Infiltration | | 0.7 | | | |
| | | | | | | | |
| 15 minute summer | PP01 | Infiltration | | 1.1 | | | |
| | | | | | | | |
| 15 minute summer | SW10 | 1.000 | SW11 | 14.8 | 1.157 | 0.541 | 0.4527 |
| 15 minute summer | SW11 | 1.001 | SW12 | 15.9 | 0.944 | 0.897 | 0.0725 |
| 240 minute winter | SW11 | Infiltration | | 0.1 | | | |
| 15 minute summer | SW12 | 1.002 | SA03 | 17.0 | 1.098 | 0.956 | 0.0309 |
| 240 minute winter | SA03 | Infiltration | | 0.3 | | | |
| | | | | | | | |
| 15 minute summer | PP02 | Infiltration | | 1.1 | | | |



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 Uppingham School - Meadhurs
 Drainage Strategy

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.35%

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (I/s) | Node Vol (m³) | Flood (m³) | Status |
|-------------------|------------|----------------|--------------|--------------|-----------------|------------------|---------------|------------|
| 360 minute winter | SW01 | 344 | 144.203 | 0.328 | 1.8 | 0.2010 | 0.0000 | SURCHARGED |
| 360 minute winter | SW02 | 336 | 144.204 | 0.566 | 3.6 | 0.2710 | 0.0000 | SURCHARGED |
| 360 minute winter | SW03 | 360 | 144.204 | 0.594 | 3.4 | 0.0945 | 0.0000 | SURCHARGED |
| 360 minute winter | SA01 | 344 | 144.203 | 0.606 | 3.6 | 22.5569 | 0.0000 | ОК |
| | | | | | | | | |
| 240 minute winter | SW05 | 228 | 144.548 | 0.488 | 2.4 | 0.2988 | 0.0000 | FLOOD RISK |
| 240 minute winter | SW06 | 228 | 144.548 | 0.582 | 4.8 | 0.3272 | 0.0000 | FLOOD RISK |
| 240 minute winter | SA02 | 228 | 144.548 | 0.608 | 4.5 | 18.2514 | 0.0000 | ОК |
| | | | | | | | | |
| 60 minute winter | PP01 | 59 | 144.770 | 0.280 | 8.1 | 8.8002 | 0.0000 | ОК |
| | | | | | | | | |
| 15 minute summer | SW10 | 10 | 143.443 | 0.093 | 19.3 | 0.0693 | 0.0000 | ОК |
| 180 minute winter | SW11 | 176 | 143.203 | 0.653 | 4.4 | 1.4531 | 0.0000 | FLOOD RISK |
| | | | | | | | | |
| 180 minute winter | SW12 | 176 | 143.203 | 0.696 | 4.7 | 0.1434 | 0.0000 | FLOOD RISK |
| 180 minute winter | SA03 | 176 | 143.202 | 0.715 | 4.4 | 12.9281 | 0.0000 | OK |
| | | | | | | | | |
| 60 minute summer | PP02 | 44 | 144.312 | 0.112 | 5.5 | 3.4279 | 0.0000 | ОК |

| Link Event (Outflow) | US Node | Link | DS Node | Outflow (I/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|-------------------------|------------|--------------|------------|------------------|-------------------|----------|------------------|
| 15 minute summer | SW01 | 2.000 | SW02 | 14.9 | 1.091 | 0.839 | 0.2211 |
| 15 minute summer | SW02 | 2.001 | SW03 | 29.8 | 0.951 | 0.749 | 0.1806 |
| 15 minute summer | SW03 | 2.002 | SA01 | 29.8 | 1.054 | 0.749 | 0.0894 |
| 360 minute winter | SA01 | Infiltration | | 0.5 | | | |
| | | | | | | | |
| 15 minute summer | SW05 | 3.000 | SW06 | 14.8 | 0.843 | 0.835 | 0.1653 |
| 15 minute summer | SW06 | 3.001 | SA02 | 29.7 | 1.688 | 1.671 | 0.0452 |
| 180 minute summer | SA02 | Infiltration | | 0.7 | | | |
| 15 minute summer | PP01 | Infiltration | | 1.1 | | | |
| 15 minute summer | SW10 | 1.000 | SW11 | 19.3 | 1.218 | 0.705 | 0.4932 |
| 15 minute summer | SW11 | 1.001 | SW12 | 20.2 | 1.145 | 1.139 | 0.0762 |
| 180 minute winter | SW11 | Infiltration | | 0.2 | | | |
| 15 minute summer | SW12 | 1.002 | SA03 | 21.8 | 1.243 | 1.231 | 0.0342 |
| 120 minute summer | SA03 | Infiltration | | 0.4 | | | |
| 15 minute summer | PP02 | Infiltration | | 1.1 | | | |

APPENDIX F - SUDS MAINTENANCE PLAN

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Uppingham School - Meadhurst Refurb

Sustainable Drainage Maintenance Plan

Ref: 230021/A Marshall Approved By: A. Marshall Date: 8 Dec 2023 Version: 1





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1.0 INTRODUCTION

The purpose of this document is to outline the proposed maintenance schedule for the drainage system and all SuDS features for the proposed new boarding house at Uppingham School.

The maintenance schedule set out here complies with the CIRIA SuDS Manual (C753), which is identified as providing current best practice in the industry. The report does not replace manufacturers' requirements and these should be followed for each product in addition to the information in this document.

For the proposed extents of SuDS features on a plan drawing, please refer to the separate drainage layout plans and drainage strategy report.

2.0 ORGANISATION RESPONSIBLE

The client, Uppingham School, will be responsible for undertaking maintenance of the proposed drainage for the whole life of the site.

3.0 CONVENTIONAL DRAINAGE SYSTEMS

3.1 Gullies, Silt Traps, Manholes, Catchpits & Pipework

On completion of construction, the internal surfaces of the sewers and manholes shall be thoroughly cleansed to remove all deleterious matter, without such matter being passed forward into the existing sewers.

All trapped gullies, silt traps, manholes and catchpits are to be regularly inspected every three months and cleared out on a regular frequency for the first nine months. After this period, the frequency can be reduced to every six months.

All drainage runs will be inspected once a year. The system is to be jetted clear if/when necessary.

4.0 SUDS FEATURES

4.1 Introduction

The following SuDS measures are proposed for the proposed new boarding house at Uppingham School.

- Permeable Paving
- Soakaway
- Filter drains

During the first year of the operation of all types of SuDS should be inspected at least monthly and after significant storm events to ensure that the system is functioning as designed and that no damage or faults are evident.

It is recommended that a report on the condition of the SuDS is undertaken further to an inspection at least once annually.

4.2 Permeable pavements

The pavement should be inspected regularly for clogging, litter, weeds and water ponding, preferably during and after heavy rainfall to check effective operation. Permeable pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. The SuDS Manual indicates that sweeping once per year is sufficient for most sites, however the sweeping frequency should be adjusted to suit site specific conditions and should also be informed by annual inspection reports.

Care should be taken in adjusting vacuuming equipment to avoid removal of joining material. Any lost material should be replaced.

Table 1 outlines the proposed operation and maintenance regime for permeable pavements. This is adapted from The SuDS Manual (C753).

| Maintenance Schedule | Required Action | Frequency | |
|---------------------------|---|--|--|
| Regular maintenance | Brushing and vacuuming (standard cosmetic sweep over whole surface) | Once a year, after autumn leaf fall or reduced frequency as required, based on site- specification observations of clogging - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediments | |
| | Stabilise and mow contributing and advancement areas | As required | |
| Occasional maintenance | Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying | As required –once per year on less frequently used pavements | |
| Remedial actions | Remediate any landscaping which through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving | As required | |
| | Remedial work to any depressions rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material | As required | |
| | Rehabilitation of surface and upper structure by remedial sweeping. | Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging) | |
| Monitoring | Initial inspection | Monthly for three months after installation | |
| | Inspect for evidence of poor operation and/or weed growth- if required, take remedial action | Three-monthly, 48h after large storms in first six months | |
| | Inspect silt accumulation rates and establish appropriate brushing frequencies | Annually | |
| | Monitor inspection chambers | Annually | |

Table 1: Operation and maintenance requirements for permeable pavements

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4.3 Soakaway

The useful life and effective operation of an infiltration component is related to the frequency of maintenance and the risk of sediment being introduced into the system.

Maintenance will usually be carried out manually, although a suction tanker can be used for sediment/ debris removal for large systems. If maintenance is not undertaken for long periods, deposits can become hard-packed and require considerable effort to remove.

Replacement of the geocellular units will be necessary if the system becomes blocked with silt. Effective monitoring will give information on changes in infiltration rate and provide a warning of potential failure in the long term.

Roads and/or parking areas draining to infiltration components should be regularly swept to prevent silt being washed off the surface. This will minimise the need for maintenance.

Table outlines the proposed operation and maintenance regime for soakaways. This is adapted from The SuDS Manual (C753).

| Maintenance Schedule | Required Action | Frequency |
|---------------------------|--|--|
| Regular maintenance | Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings | Annually |
| | Cleaning of gutters and any filters on downpipes | Annually (or as required based on inspections) |
| | Trimming any roots that may be causing blockages | Annually (or as required) |
| Occasional maintenance | Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings | As required, based on inspections |
| Remedial actions | Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs | As required |
| | Replacement of clogged geotextile (will require reconstruction of soakaway) | As required |
| Monitoring | Inspect silt traps and note rate of sediment accumulation | Monthly in the first year and then annually |
| | Check soakaway to ensure emptying is occurring | Annually |

Table 2: Operation and maintenance requirements for soakaway

4.4 Filter Drains

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and infiltration, of surface water runoff. Filter drains will require ongoing regular maintenance to ensure continuing operation to design performance standards.

Litter (including leaf litter) and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All litter should be removed from site.

The main risk to the performance of a filter drain is from sediment clogging the filter drain. This is dealt with by an upstream treatment train removing the sediment first. However if, due to unforeseen reasons, exception sediment loads affect the filter drain then this could necessitate digging out and replacing the gravel fill in a filter drain.

Table3 outlines the proposed operation and maintenance regime for swales. This is adapted from The SuDS Manual (C753). Specific maintenance needs of the bioretention area should be monitored, and maintenance schedules adjusted to suit requirements.

| Maintenance Schedule | Required Action | Typical Frequency |
|---------------------------|--|-----------------------------|
| Regular maintenance | Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices | Monthly (or as required) |
| | Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage | Monthly |
| | Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies | Six monthly |
| | Remove sediment from pre-treatment devices | Six monthly, or as required |
| Occasional maintenance | Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG,2007 or BS 3998:2010) | As required |
| | At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium | Five yearly, or as required |
| | Clear perforated pipework of blockages | As required |

Table 3: Operation and maintenance requirements for filter drains

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5.0 SUDS PROGRAMME

The proposed SuDS for the site will come on-line approximately Summer 2025.

The contractor should ensure that during the construction phase (or in any other phasing associated with the site coming on line) that SuDS are not damaged by construction works.

6.0 OPERATION AND MAINTENANCE MANUAL RECORDS

6.1 Documents to be handed over

Conisbee will provide this document to Uppingham School, who will provide the document to the construction contractor, and Uppingham School will also include it in the Operation and Maintenance Manual.

Uppingham School will have copies of the drainage design drawings which show locations of the proposed SuDS and any 'as-builts' provided by the contractor.

6.2 Maintenance Records

Uppingham School will be provided with the standard proforma in Appendix B of The SuDS Manual to enable them to record the outcomes of inspections.