

| Maintenance Schedule | Required Action                                                                                                                       | Frequency                                   |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
|                      | 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           |
| Monitoring           | Inspect silt traps and note rate of sediment accumulation                                                                             | Monthly in the first year and then annually |
|                      | Check filter trenches to ensure emptying is occurring                                                                                 | Annually                                    |

Note: This is basic and generic guidance that should be monitored and amended to suit site specific requirements and read in conjunction with manufacturer's installation guidance.

### 3.6 Swales & Basins

#### 3.6.1 All run-off will be conveyed through the basins & swales.

Table 4: Maintenance Schedules for Swales

| Maintenance Schedule   | Required Action                                                                                                                      | Frequency                                                                         |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Regular Maintenance    | Litter and debris removal.                                                                                                           | Monthly (or as                                                                    |
|                        | Grass cutting - to retain height within specified design range.                                                                      | Monthly (during growing season) or as required.                                   |
|                        | Manage other vegetation and remove nuisance plants.                                                                                  | Monthly (at start then as required)                                               |
| Occasional Maintenance | Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter and cut back adjacent vegetation where possible. | Annually                                                                          |
|                        | Reseed areas of poor vegetation growth. Alter plant types to better suit conditions, if required.                                    | Annually, or if bare soil is exposed over 10% or more of the swale treatment area |

| Maintenance Schedule | Required Action                                                                                                                        | Frequency                 |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Remedial Actions     | Repair erosion or other damage by re-turfing or reseeded                                                                               | As required               |
|                      | Re-level uneven surfaces and reinstate design levels.                                                                                  | As required               |
|                      | Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface | As required               |
|                      | Remove build up of sediment on upstream gravel trench, flow spreader or at top of filter strip.                                        | As required               |
|                      | Remove and dispose of oil or petrol residues using safe standard practices.                                                            | As required               |
| Monitoring           | Inspect inlets, outlets and overflows for blockages and clear if required.                                                             | Monthly.                  |
|                      | Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for >48 hours.           | Monthly, or when required |
|                      | Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.                                          | Half yearly.              |

---

**Note:** This is basic and generic guidance that should be monitored and amended to suit site specific requirements and read in conjunction with manufacturer's installation guidance.

---

### 3.7 Storage Tanks & Cellular Storage Units

- 3.7.1 Regular inspection of cellular storage tank systems is required to ensure effective long-term performance of the system. Maintenance needs of the system should be monitored and schedules adjusted to suit the specific requirements of the Development.

The following maintenance regime is recommended as a minimum, but actions and frequencies should be adjusted to suit the specific requirements of the site. Manufacturer's specific recommendations should also be followed.

Table 4: Maintenance Schedules for Swales

| Maintenance Schedule   | Required Action                                                                  | Frequency                                                               |
|------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Regular Maintenance    | Inspect and identify incorrect operation                                         | Monthly (or as required)                                                |
|                        | Debris removal from catchment area using sweeping and vacuuming.                 | 3 monthly                                                               |
|                        | Removal of silt and debris from rain water gutters, gullies & catchpit manholes. | 6 monthly                                                               |
| Occasional Maintenance | Jetting and clearing out of silt and sediment from the tank chambers.            | 1-2 years or as maybe required due to evidence of any poor performance. |
|                        |                                                                                  |                                                                         |

Note: All maintenance will be the responsibility of the developer, until such time that a suitable Management Company will be appointed for all future maintenance.



### Links

| 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) |
|-------|-----------------|---------|------------|-------------|-----------|-----------|----------|-------------|----------|---------------|--------------|
| 1.000 | PermeablePaving | Basin 1 | 20.000     | 0.015       | 43.571    | 42.370    | 1.201    | 16.7        | 225      | 7.00          | 50.0         |
| 1.001 | Basin 1         | 3       | 35.000     | 0.015       | 42.350    | 41.870    | 0.480    | 72.9        | 225      | 7.51          | 25.0         |
| 2.000 | 4               | 1       | 25.000     | 0.015       | 40.900    | 37.000    | 3.900    | 6.4         | 100      | 7.19          | 25.0         |

| Name  | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) | Pro Depth (mm) | Pro Velocity (m/s) |
|-------|-----------|-----------|------------|--------------|--------------|-------------|--------------------|----------------|--------------------|
| 1.000 | 2.398     | 95.4      | 28.9       | 0.355        | 0.905        | 0.160       | 0.0                | 85             | 2.100              |
| 1.001 | 1.146     | 45.6      | 14.5       | 0.925        | 0.105        | 0.160       | 0.0                | 87             | 1.019              |
| 2.000 | 2.251     | 17.7      | 0.0        | 1.200        | 0.900        | 0.000       | 0.0                | 0              | 0.000              |

### Simulation Settings

|                      |        |                        |        |                            |      |
|----------------------|--------|------------------------|--------|----------------------------|------|
| Rainfall Methodology | FEH-13 | Analysis Speed         | Normal | Additional Storage (m³/ha) | 20.0 |
| Summer CV            | 1.000  | Skip Steady State      | x      | Check Discharge Rate(s)    | x    |
| Winter CV            | 1.000  | Drain Down Time (mins) | 240    | Check Discharge Volume     | x    |

### Storm Durations

|    |    |    |     |     |     |     |     |     |     |     |      |
|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 |
|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|------|

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|-----------------------|-----------------------|-----------------------|-----------------------|
| 2                     | 40                    | 0                     | 0                     |
| 5                     | 40                    | 0                     | 0                     |
| 10                    | 40                    | 0                     | 0                     |
| 30                    | 40                    | 0                     | 0                     |
| 100                   | 40                    | 0                     | 0                     |

### Node PermeablePaving Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Downstream Link          | 1.000  | Sump Available          | ✓                              |
| Replaces Downstream Link | x      | Product Number          | CTL-SHE-0153-1000-0450-1000    |
| Invert Level (m)         | 43.571 | Min Outlet Diameter (m) | 0.225                          |
| Design Depth (m)         | 0.450  | Min Node Diameter (mm)  | 1200                           |
| Design Flow (l/s)        | 10.0   |                         |                                |

### Node Basin 1 Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Downstream Link          | 1.001  | Sump Available          | ✓                              |
| Replaces Downstream Link | ✓      | Product Number          | CTL-SHE-0075-2500-1000-2500    |
| Invert Level (m)         | 42.350 | Min Outlet Diameter (m) | 0.100                          |
| Design Depth (m)         | 1.000  | Min Node Diameter (mm)  | 1200                           |
| Design Flow (l/s)        | 2.5    |                         |                                |

### Node PermeablePaving Carpark Storage Structure

|                             |         |                           |        |               |        |
|-----------------------------|---------|---------------------------|--------|---------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 43.571 | Slope (1:X)   | 1000.0 |
| Side Inf Coefficient (m/hr) | 0.00000 | Time to half empty (mins) | 91     | Depth (m)     | 0.450  |
| Safety Factor               | 2.0     | Width (m)                 | 28.000 | Inf Depth (m) |        |
| Porosity                    | 0.30    | Length (m)                | 20.000 |               |        |

### Node Basin 1 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00360 | Safety Factor | 2.0  | Invert Level (m)          | 42.350 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 1.00 | Time to half empty (mins) |        |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 14.3                   | 14.3                       | 1.000     | 112.0                  | 14.3                       |

### Node 4 Flow through Pond Storage Structure

|                             |         |                           |        |                          |         |
|-----------------------------|---------|---------------------------|--------|--------------------------|---------|
| Base Inf Coefficient (m/hr) | 0.00360 | Porosity                  | 1.00   | Main Channel Length (m)  | 35.000  |
| Side Inf Coefficient (m/hr) | 0.00000 | Invert Level (m)          | 41.850 | Main Channel Slope (1:X) | 10000.0 |
| Safety Factor               | 2.0     | Time to half empty (mins) |        | Main Channel n           | 0.200   |

### Inlets

3

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 37.6                   | 0.0                        | 0.350     | 120.0                  | 0.0                        |

### Node 1 Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00360 | Safety Factor | 2.0  | Invert Level (m)          | 37.000 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 1.00 | Time to half empty (mins) | 12444  |

| Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf Area (m <sup>2</sup> ) |
|-----------|------------------------|----------------------------|-----------|------------------------|----------------------------|
| 0.000     | 84.0                   | 84.0                       | 1.000     | 100.0                  | 84.0                       |

**Results for 2 year +40% CC Critical Storm Duration. Lowest mass balance: 41.27%**

| Node Event         | US Node         | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) |
|--------------------|-----------------|-------------|-----------|-----------|--------------|---------------|------------|
| 180 minute summer  | PermeablePaving | 112         | 43.720    | 0.149     | 15.0         | 24.2544       | 0.0000     |
| 360 minute summer  | Basin 1         | 296         | 42.769    | 0.419     | 5.7          | 15.0309       | 0.0000     |
| 720 minute summer  | 3               | 600         | 42.027    | 0.174     | 2.5          | 0.1967        | 0.0000     |
| 120 minute summer  | 4               | 100         | 40.927    | 0.027     | 3.0          | 0.0301        | 0.0000     |
| 1440 minute winter | 1               | 1680        | 37.817    | 0.817     | 2.3          | 73.9610       | 0.0000     |

| Link Event (Outflow) | US Node         | Link              | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|----------------------|-----------------|-------------------|---------|---------------|----------------|----------|---------------|
| 180 minute summer    | PermeablePaving | 1.000             | Basin 1 | 6.3           | 0.734          | 0.067    | 0.4435        |
| 120 minute summer    | Basin 1         | Hydro-Brake®      | 3       | 2.5           |                |          |               |
| 15 minute summer     | Basin 1         | Infiltration      |         | 0.0           |                |          |               |
| 960 minute summer    | 3               | Flow through pond | 4       | -92.1         | -0.178         | -9.994   | 21.3955       |
| 480 minute winter    | 4               | 2.000             | 1       | 2.4           | 1.435          | 0.136    | 0.1175        |
| 15 minute summer     | 4               | Infiltration      |         | 0.0           |                |          |               |
| 15 minute summer     | 1               | Infiltration      |         | 0.0           |                |          |               |

**Results for 5 year +40% CC Critical Storm Duration. Lowest mass balance: 41.27%**

| Node Event         | US<br>Node      | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) |
|--------------------|-----------------|----------------|--------------|--------------|-----------------|------------------|---------------|
| 120 minute summer  | PermeablePaving | 80             | 43.768       | 0.197        | 27.1            | 32.5833          | 0.0000        |
| 240 minute summer  | Basin 1         | 264            | 42.986       | 0.636        | 8.7             | 29.5773          | 0.0000        |
| 960 minute winter  | 3               | 810            | 42.028       | 0.174        | 2.5             | 0.1969           | 0.0000        |
| 30 minute winter   | 4               | 60             | 40.927       | 0.027        | 0.4             | 0.0302           | 0.0000        |
| 1440 minute winter | 1               | 1680           | 37.980       | 0.980        | 2.1             | 89.9852          | 0.0000        |

| Link Event<br>(Outflow) | US<br>Node      | Link              | DS<br>Node | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) |
|-------------------------|-----------------|-------------------|------------|------------------|-------------------|----------|------------------|
| 120 minute summer       | PermeablePaving | 1.000             | Basin 1    | 9.4              | 0.829             | 0.098    | 0.4591           |
| 30 minute summer        | Basin 1         | Hydro-Brake®      | 3          | 2.5              |                   |          |                  |
| 15 minute summer        | Basin 1         | Infiltration      |            | 0.0              |                   |          |                  |
| 30 minute winter        | 3               | Flow through pond | 4          | -76.2            | -0.163            | -8.271   | 19.4356          |
| 1440 minute summer      | 4               | 2.000             | 1          | 2.4              | 0.827             | 0.138    | 0.1175           |
| 15 minute summer        | 4               | Infiltration      |            | 0.0              |                   |          |                  |
| 15 minute summer        | 1               | Infiltration      |            | 0.0              |                   |          |                  |

**Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 41.27%**

| Node Event         | US<br>Node      | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) |
|--------------------|-----------------|----------------|--------------|--------------|-----------------|------------------|---------------|
| 120 minute summer  | PermeablePaving | 80             | 43.808       | 0.237        | 32.6            | 39.4032          | 0.0000        |
| 240 minute summer  | Basin 1         | 268            | 43.107       | 0.757        | 9.8             | 39.6502          | 0.0000        |
| 1440 minute winter | 3               | 1050           | 42.028       | 0.174        | 2.5             | 0.1970           | 0.0000        |
| 15 minute summer   | 4               | 54             | 40.927       | 0.027        | 0.4             | 0.0303           | 0.0000        |
| 1440 minute winter | 1               | 1350           | 38.000       | 1.000        | 2.2             | 92.0000          | 9.5440        |

| Link Event<br>(Outflow) | US<br>Node      | Link              | DS<br>Node | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) |
|-------------------------|-----------------|-------------------|------------|------------------|-------------------|----------|------------------|
| 120 minute summer       | PermeablePaving | 1.000             | Basin 1    | 9.9              | 0.828             | 0.104    | 0.4617           |
| 15 minute summer        | Basin 1         | Hydro-Brake®      | 3          | 2.5              |                   |          |                  |
| 15 minute summer        | Basin 1         | Infiltration      |            | 0.0              |                   |          |                  |
| 30 minute winter        | 3               | Flow through pond | 4          | -76.4            | -0.163            | -8.288   | 19.4558          |
| 480 minute winter       | 4               | 2.000             | 1          | 2.6              | 1.496             | 0.145    | 0.1171           |
| 15 minute summer        | 4               | Infiltration      |            | 0.0              |                   |          |                  |
| 15 minute summer        | 1               | Infiltration      |            | 0.0              |                   |          |                  |

**Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 41.27%**

| Node Event         | US Node         | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) |
|--------------------|-----------------|-------------|-----------|-----------|--------------|---------------|------------|
| 60 minute summer   | PermeablePaving | 50          | 43.888    | 0.317     | 64.5         | 53.3318       | 0.0000     |
| 240 minute winter  | Basin 1         | 276         | 43.261    | 0.911     | 9.9          | 54.5734       | 0.0000     |
| 1440 minute winter | 3               | 1290        | 42.027    | 0.174     | 2.5          | 0.1965        | 0.0000     |
| 15 minute summer   | 4               | 53          | 40.927    | 0.027     | 0.4          | 0.0302        | 0.0000     |
| 1440 minute winter | 1               | 1230        | 38.000    | 1.000     | 2.2          | 92.0000       | 30.2519    |

  

| Link Event (Outflow) | US Node         | Link              | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|----------------------|-----------------|-------------------|---------|---------------|----------------|----------|---------------|
| 240 minute summer    | PermeablePaving | 1.000             | Basin 1 | 10.0          | 0.728          | 0.105    | 0.4620        |
| 15 minute summer     | Basin 1         | Hydro-Brake®      | 3       | 2.5           |                |          |               |
| 15 minute summer     | Basin 1         | Infiltration      |         | 0.0           |                |          |               |
| 15 minute winter     | 3               | Flow through pond | 4       | -13.5         | -0.061         | -1.467   | 18.1684       |
| 360 minute summer    | 4               | 2.000             | 1       | 2.5           | 1.692          | 0.141    | 0.1168        |
| 15 minute summer     | 4               | Infiltration      |         | 0.0           |                |          |               |
| 15 minute summer     | 1               | Infiltration      |         | 0.0           |                |          |               |

**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 41.27%**

| Node Event         | US Node         | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) |
|--------------------|-----------------|-------------|-----------|-----------|--------------|---------------|------------|
| 60 minute summer   | PermeablePaving | 59          | 43.993    | 0.422     | 82.1         | 71.5291       | 0.0000     |
| 360 minute winter  | Basin 1         | 376         | 43.431    | 1.081     | 10.0         | 73.4450       | 0.0000     |
| 360 minute winter  | 3               | 424         | 42.030    | 0.176     | 2.6          | 0.1995        | 0.0000     |
| 120 minute winter  | 4               | 80          | 40.927    | 0.027     | 0.4          | 0.0301        | 0.0000     |
| 1440 minute winter | 1               | 1200        | 38.000    | 1.000     | 2.1          | 92.0000       | 54.3416    |

  

| Link Event (Outflow) | US Node         | Link              | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) |
|----------------------|-----------------|-------------------|---------|---------------|----------------|----------|---------------|
| 240 minute winter    | PermeablePaving | 1.000             | Basin 1 | 10.0          | 0.748          | 0.105    | 0.4620        |
| 360 minute winter    | Basin 1         | Hydro-Brake®      | 3       | 2.6           |                |          |               |
| 15 minute summer     | Basin 1         | Infiltration      |         | 0.0           |                |          |               |
| 180 minute winter    | 3               | Flow through pond | 4       | -10.2         | -0.052         | -1.109   | 18.4550       |
| 480 minute winter    | 4               | 2.000             | 1       | 2.5           | 1.414          | 0.141    | 0.1179        |
| 15 minute summer     | 4               | Infiltration      |         | 0.0           |                |          |               |
| 15 minute summer     | 1               | Infiltration      |         | 0.0           |                |          |               |