# Enclosure 8

Bioretention Basins Maintenance Plan prepared by GeoLINK Environmental Management and Design, Revision 1, dated 25 May 2022;

# Bioretention Basins Maintenance Plan

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**Quality solutions. Sustainable future.** 



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## 1. Overview

The bioretention basins have been designed to provide the dual function of both treating and detaining stormwater. During smaller rainfall events, stormwater will temporarily pond on the surface of the basin and infiltrate down through the filter media (sandy loam) to be collected in the slotted underdrainage pipes. In larger rainfall events, stormwater will fill the basin to a greater depth and there will be outflow via the low flow culverts and the high flow weir.

The bioretention basins require ongoing inspection and maintenance to ensure they establish and operate in accordance with the design intent. Potential problems that may arise because of inadequate maintenance include:

- Decreased aesthetic amenity;
- Reduced functional performance;
- Public health and safety risks; and
- Decreased habitat diversity (e.g. dominance of exotic weeds).

Importantly, the most intensive period of maintenance is during the plant establishment period (initial one to two years) when weed removal and some replanting may be required.

It is recommended that the personnel who are to undertake the operation and maintenance of the bioretention basin be briefed and trained on procedures and protocols prior to commencement. Maintaining records on the condition of the systems and all maintenance works required will be important to inform and schedule future maintenance works.

This Maintenance Plan is based on information contained in the Water by Design (2012) publication called *Maintaining Vegetated Stormwater Assets* (Version 1). The Water by Design document should be consulted for additional information and details.



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#### 2. **Inspection and Maintenance Tasks**

Inflow pipes, headwalls, outlets and weirs require regular inspection, as these can be prone to scour, and litter build up. Debris can block inlets or outlets and can be unsightly, particularly in high visibility areas. Inspection and removal of debris should be done regularly, and debris should be removed whenever it is observed on a site.

Typical maintenance of a bioretention basin involves:

- Routine inspection of the bioretention basin to identify any areas of obvious increased sediment deposition, scouring from storm flows, rill erosion of the batters from lateral inflows, damage to the profile from vehicles and clogging of the bioretention basin filter media (evident by a 'boggy' surface).
- Routine inspection of inlets, outlets and weirs to identify, clean and repair any areas of scour, litter build up and blockage.
- Removal of sediment where it is smothering vegetation.
- Repairing damage to the basin profile resulting from scour, rill erosion or vehicle damage by replacement of appropriate fill (to match original soils) and revegetating.
- Tilling of the bioretention basin surface, or removal and reinstatement of the surface layer, if there is evidence of clogging.
- Regular watering/irrigation of vegetation until plants are established and self-sustaining.
- Removal and management of invasive weeds.
- Removal of plants that have died and replacement with plants of equivalent size and species as detailed in the plant schedule.
- Pruning to remove dead or diseased vegetation and to stimulate growth.
- Vegetation pest monitoring and control.

Rectification (i.e. resetting, reconstruction) of the bioretention basin will be required if the system fails to drain adequately after tilling of the surface and/or replacement of the surface layer. Regular inspections are required, as well as inspections following large storm events to check for scour and other damage. Major maintenance involving machinery should only occur after a reasonably rain free period when the soil in the bioretention system is relatively dry.



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# 3. Inspection and Maintenance Schedule

### 3.1 Vegetation Establishment Period (first three months)

During the vegetation establishment period, inspections should be undertaken on a weekly basis and after rainfall events with greater than 25 mm of rain in a 24-hour period. The inspection and maintenance checklist provided in **Appendix A** should be used as a guide and filled in as part of each inspection. Any necessary remedial maintenance activities should be undertaken as soon as possible. The weed control measures and watering schedules summarised below are recommended to ensure successful plant establishment.

Conventional surface mulching of bioretention basins with organic material (e.g. tanbark) should not be undertaken. Most organic mulch floats and runoff typically causes this material to be washed away with a risk of blocking outlets and drains. Adopting high planting densities and, if necessary, applying a suitable biodegradable erosion control matting to the basin batters only (i.e. not the surface of the bioretention basin) will help to combat weed invasion and reduce labour intensive maintenance requirements for weed removal.

Regular watering of bioretention basin vegetation is essential for successful establishment and healthy growth. The frequency of watering to achieve successful plant establishment is dependent upon rainfall, maturity of planting stock and the water holding capacity of the soil. The following watering program is generally adequate but should be adjusted to suit the site conditions:

- Week 1 2: three visits per week
- Week 3 6: two visits per week
- Week 7 12: one visit per week

### 3.2 Ongoing Maintenance

After the vegetation establishment period, maintenance inspections should be undertaken every three months. Once again, the maintenance checklist provided in **Appendix A** should be used as a guide and filled in as part of each inspection. Any necessary remedial maintenance activities should be undertaken as soon as possible. Watering may still be required, particularly during the first winter (dry period). Watering requirements to sustain healthy vegetation should be determined during ongoing maintenance site visits.





Water by Design, (2012). *Maintaining Vegetated Stormwater Assets* (Version 1). Healthy Waterways Ltd, Brisbane



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## Appendix A

# **Inspection and Maintenance Checklist**



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General Information	
Asset Type	
Asset ID	
Description / name of asset	
Location	
Date of inspection / maintenance	
Date & amount of last rainfall	
Current weather	
Personnel involved in inspection / maintenance	
General comments / sketches	



Issue (what to look for)	Performance Indicator (PI)	Condition Rating *	Maintenance undertaken **	Additional work needed		
* Condition Ratings: 1 = PI is met; 2 = PI is met after maintenance completed; 3 = Additional maintenance required; 4 = Rectification may be needed; NI = not inspected; NA = not applicable ** Quantify where possible. e.g. amount of sediment or litter removed						
SURROUNDS	SURROUNDS					
Damaged or removed structures e.g. traffic bollards	No damage that poses a risk to public safety or structural integrity					
INLET						
Erosion	Inlet is structurally sound and there is no evidence of erosion or subsidence/ settlement					
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity					
Sediment, litter or debris	No blockage					
COARSE SEDIMENT EORERAY (if present)						

#### COARSE SEDIMENT FOREBAY (if present)

Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended		
Sediment	Coarse sediment forebay <75% full and no litter		



Additional work needed

Maintenance undertaken \*\*

* Condition Ratings: 1 = PI is m ** Quantify where possible. e.g	net; 2 = PI is met after maintenance comp . amount of sediment or litter removed	leted; 3 = Additional mainte	enance required; 4 = Rectification may be neede	ed; NI = not inspected; NA = not applicable
BATTER SLOPES AND BA	ASE OF BASIN			
Erosion	Minor erosion only that does not pose a risk to public safety or structural integrity and would not worsen if left unattended			
Crust of fine sediment	No surface crusting			
Depressions or mounds	No surface depressions or mounds >100 mm			
Hydraulic conductivity or permeability	Filter media is draining freely, whereby water is not ponded on the surface for more than 12 hours after rainfall and there is no obvious impermeable or clay- like surface on the filter media			
Underdrains / clean out points	Clean out points not damaged and end caps securely in place			
Litter	Maximum 1 piece of litter per 4 m²			
Unusual odours, colours, or substances e.g. oil and grease	None detected			

Condition Rating \*



Issue (what to look for)

Performance Indicator (PI)

Issue (what to look for)	Performance Indicator (PI)	Condition Rating *	Maintenance undertaken **	Additional work needed		
* Condition Ratings: 1 = PI is met; 2 = PI is met after maintenance completed; 3 = Additional maintenance required; 4 = Rectification may be needed; NI = not inspected; NA = not applicable ** Quantify where possible. e.g. amount of sediment or litter removed						
Vegetation	Minimum 95% vegetation cover (minimal bare patches)					
	Plants healthy and free from disease					
	Average plant height > 500 mm					
Algal or moss growth	Maximum 10% of surface covered in algae; No moss growth					

#### OUTLET (overflow weir, pipe and/or outfall)

Erosion	Outlet is structurally sound and there is no evidence of erosion or subsidence/ settlement, including around edges of rock protection or toe of spillway for large systems		
Damaged or removed structures e.g. pit lids or grates	No damage that poses a risk to public safety or structural integrity		
Sediment, litter or debris	No blockage		



Issue (what to look for)	Performance Indicator (PI)	Condition Rating *	Maintenance undertaken **	Additional work needed		
* Condition Ratings: 1 = PI is met; 2 = PI is met after maintenance completed; 3 = Additional maintenance required; 4 = Rectification may be needed; NI = not inspected; NA = not applicable ** Quantify where possible. e.g. amount of sediment or litter removed						
Outlet freely draining to receiving drainage or waterway	No downstream impediments to the release of water, no erosion or damage to the outfall structure, and no evidence of malfunction (e.g. excessive sediment accumulated)					

