

<b>Hamilton City Development Manual</b>	
<b>Volume 2 : Design Guide</b>	<b>Part 9 —Landscaping Engineered Stormwater Devices</b>
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## **PART 9 : LANDSCAPING ENGINEERING STORMWATER DEVICES**

### **9.1 INTRODUCTION**

This section applies to the landscaping of engineered stormwater devices (LESD) or works in any way related to the use of landscaping as either an amenity or water mechanism in the development of new engineered stormwater devices and the remediation of existing engineered stormwater devices.

This Design Guide and Volume 3: Standard Technical Specifications, Section 4 are supplementary to the following sections of this Development Manual:

- Volume 2: Part 7 — Street Landscaping
- Volume 3: Standard Technical Specifications, Sections 1 and 2; and
- Are to be read in conjunction with this Development Manual's Volume 2: Design Guide Part 4 - Stormwater Drainage.

Where there is a variation, the LESD Design Guide and Section 4 Specifications take precedence in all LESD works.

These design guidelines apply to all LESDs that are located in any part of a road reserve, drainage reserve, subdivision or vested reserve, or where required as a condition of resource consent. These include, (but may also include other stormwater devices as required by resource consent conditions):

- Permanent Stormwater Ponds
- Raingardens
- Swales
- Vegetated Filters

Proposed landscape designs or works shall be approved or rejected at the sole discretion of Council or its delegated officer.

Landscape Plans will be submitted for approval with the Engineering Plans and shall comply with the Hamilton City Council Proposed District Plan Rule 5.3 (e) (ii).

#### **Applicable Engineered Stormwater Devices**

Refer to the Auckland Regional Council publication TP10 Stormwater Management Devices: Design Guidelines Manual for in-depth definitions of engineered stormwater devices. Examples of devices that require a landscaping component are as follows:

#### **Permanent Stormwater Ponds**

These are either wet ponds (where there is a permanent pool of water) or detention ponds (which have temporary pooling dependent on rain events). Both are used to capture and store stormwater in rain events and then release it at a slow rate. This rate is intended to be consistent with pre-urbanisation stormwater flow from the catchment. Landscape planting is used to:

- Prevent erosion and stabilize the pond slopes and flood zone
- Minimise long-term maintenance costs
- Increase run-off water quality

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- Increase local amenity values, and
- Increase the quality of ecological greenbelts throughout the city for regional flora and fauna

### **Raingardens**

These are temporary stormwater detention devices that retain water and release it into the stormwater catchment over a designed period of time, such as 24 hours, when peak stormwater flows have diminished. Water is absorbed by the plants and released through vegetative evapotranspiration. Plants also use trapped sediments for nutritional requirements. Depending on the design, stormwater flows and the trapped sediment loading, these last for 15-30 years, after which they will need to be excavated and replanted.

### **Swales**

These are mechanisms to control stormwater flow velocities from or through a site. Engineered ditches, they reduce the impermeable area of sites and assist with groundwater recharge. To be effective, they need to have low water velocities and are normally planted with a grass cover that is maintained at a calculated height so that velocities are slowed but not impeded. On slowing, suspended solids drop and aid in the soil nutritional value. Other plants may be used depending on the swale design.

### **Vegetated Filters**

Vegetated filters act as stormwater water quality filters that rely on a distributed waterflow to produce a thin layer of water passing through the vegetation to be effective. They are often used in conjunction with other stormwater treatment practices.

## **9.2 Minimum Requirements**

Minimum LESD design requirements are as follows:

- Stormwater Devices may be permanently grassed if the slope ratio is more than 1 (vertical) to 4 (horizontal). Should Council deem the slope too steep for safe maintenance, the slope shall be mulched and planted with permanent landscaping.
- LESDs need to enhance and strengthen the existing character and intended future character of neighbourhood areas.
- Any landscaping shall provide maximum long-term benefit with minimum ongoing maintenance. It shall not compromise the safety of adjacent property owners nor the local community.
- LESDs are to be landscaped so that they:
  - Comply with engineering requirements
  - Improve stormwater water quality discharge where possible
  - Become a community asset and positive visual amenity, and
  - Provide, where possible, forage and habitats for native flora and fauna.
- Safety of the site is paramount by incorporating CPTED (Crime Prevention Through Environmental Design) principles (refer to Part 7 — Street Landscaping)
- Plant species allocations are to be specific to soil type and conditions, site topography and exposure, post-development groundwater table levels and alignment with local indigenous native plant species.

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- Plant species are to be indigenous to the Waikato Region, although native New Zealand grasses are permitted. Likewise, plants are to be eco-sourced where possible from the Waikato Region.
- Planting plans are to be detailed, indicating different mixes and/or individual planting as applicable to the different Planting Zones, topographical, ecological and amenity zones within the LESD and surrounding environment.
- Pond planting may be staged to minimise slope erosion. The initial stage shall be grassing the site with the Council approved LESD grass mix, followed by landscape planting once grass has established.

Minimum planting provision requirements are:

- Quick establishment of plant cover is required for LESDs throughout the site, as engineering requirements permit.
- LESDs are to be landscaped with groundcovers, shrubs and trees where site conditions and engineering requirements permit, otherwise the LESDs are to be grassed or turfed as site design permits.
- Of the vegetation mix in Stormwater Ponds, at least 10 percent and no more than 25 percent must be staked 1.5m high grade trees.
- Avoid planting woody vegetation near the slope toe of Stormwater Ponds to prevent future bank stability issues when the plant reaches the end of its lifecycle and its root systems decompose.
- Swale surface treatments shall be preferably established with low maintenance treatments such as rolled turf (for short lengths) or planted up in approved Carex species or laid with loose river rocks. Swales sown with grass seed, though low cost to construct are often difficult to establish and maintain. Acceptance of grassed swales or other swale surface treatments shall be at the Engineers discretion.
- Where bark mulch is used, it is to be contained within the plant area that it is providing cover for. Other mulch applications are to be utilized on slopes greater than 1:3.

The minimum maintenance required post-landscaping is to comply with the LESD Defects Liability minimum standards and Maintenance Schedule in Volume 3: Part 9 — Landscape Works, Section 4.

### **9.3 MEANS OF COMPLIANCE**

#### **9.3.1 Location**

Planting shall be located so that the integrity and efficient operation of the engineering stormwater device or any other infrastructural service or structure both within and adjacent to the site are not compromised in any way.

#### **9.3.2 Site Preparation**

In regard to adjacent water bodies and/or courses, ensure that no debris or chemical spray enters or impedes the functionality of the water body, whether it is natural or manmade.

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### 9.3.3 Planting Zones

In addition to the aesthetic appeal and ecological benefits, plants in and around LESDs contribute to the stormwater device functional requirements such as trapping sediment and preventing scouring of the embankments.

The following planting zones define the planting regimes within LESDs. They are intended for stormwater ponds but can be applied to other LESDs and are based on vegetative tolerances to wet/damp roots and frequent/infrequent inundation. Refer to Table 2 for approved plant species.

Due to site conditions and LESD configuration it may not be feasible for all Planting Zones to be used within a LESD. Consult with the Engineer to confirm the applicable Planting Zones. The Planting Zones are:

#### **Wet Zone**

This area is where the pond ground surface is designed to be permanently submerged and where the plant roots are permanently water logged.

#### **Marginal Zone**

This area is likely to be submerged or partially submerged in a 2-year return storm event.

#### **Lower Bank Zone**

This is the planting zone between the Marginal Zone and Upper Bank Zone where plants may be occasionally submerged (storm events more severe than the 2-year return period storm). Plants are able to withstand inundation for short periods of time.

#### **Upper Bank Zone**

This planting zone is generally above the spillway level. Plants are able to sustain damp roots for periods but should not be fully inundated.

## 9.4 PLANTING

### 9.4.1 Site Screening

Site vegetative screening is to comply with Council Proposed District Plan requirements.

### 9.4.2 Planting Grades

Planting grades are to be of a suitable size to ensure that vegetation establishes rapidly with minimum mortality rates and/or replacement requirements. Refer to Table 2 for the minimum plant grades. Trees are to be a minimum grade of 1.5 metres high. Planting shall be according to volume 3, Part 7 — Landscape Works for Planting Specifications.

Trees are to be a minimum grade of 1.5m high and planted according to Council planting specifications.

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### 9.4.3 Plant Spacing and Selection

#### (a) Species Selection

Species are to be selected with regard to good conformation, healthy robust root systems, low maintenance and shall comply with Council's planting policies.

Planting species are to be selected according to the planting list indicated in Table 2 and corresponding site topography and ecology unless there are more suitable plants according to site conditions and/or local ecology. Other possible species may be referenced from the Hamilton City Council Gully Restoration Guidelines or the Waikato University Vegetation Types of Hamilton Ecological District. Where trees, shrubs and groundcovers are to be planted within a road reserve, Volume 2, Part 7 — Street landscaping design considerations and requirements shall also apply.

Species selection considerations include:

- Compliance with Section 3.6 and 3.14 of this Manual in regard to sight distances where the LESD is within or near the road reserve
- Engineering requirements, including improving post-treatment stormwater water quality
- Ensure that intended plants are not classified as regionally noxious weed or pest species.
- Longevity and corresponding maintenance requirements
- Minimal leaf fall in autumn (which can reduce LESD efficiency)
- Pest and disease resistance
- Services, including overhead powerlines
- Shading consistent with location and adjacent landowners
- Suitability to environmental conditions, for example, modified groundwater table, exposure to wind and frost, vehicular and cycle traffic.
- Ensure that no species that drop branches, debris, or may in any other way cause damming and/or unplanned flooding in and adjacent to watercourses (such as streams and spillways) are planted within 5.0m of watercourses.

#### (b) Plant Selection for Specific Landscaped Engineering Stormwater Devices

##### **Raingardens**

Plants selected shall be a mix of groundcovers, shrubs and/or small trees (up to 4m high) that are able to withstand periods of soil waterlogging according to the Marginal and Lower Bank Planting Zone plant species.

Where LESDs occur in the road reserve, suitable plants from the Road Reserve Planting Strategy (refer to Part 7-Street Landscaping) may be used in addition to species indicated in Table 2.

Ensure that no large trees are selected that may impede maintenance requirements and/or require a resource consent for removal should this be required in the future. Should Council approved biodegradable matting be used for mulch, this shall not be visible once plants are fully established.

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### **Stormwater Ponds**

Stormwater ponds are to be planted up as soon as possible after civil construction is completed according to the Planting Zones indicated in 9.3.3. All stormwater ponds with an inner batter slope ratio of 1 (vertical) to 4 (horizontal) or steeper must be landscaped as the slope is too great for safe maintenance.

Where site conditions such as unstable soil structures require a more rapid groundcover than shrubs and trees provide, exposed surfaces above the Upper Bank and Lower Bank Planting Zones shall be stabilised with grassing first prior to landscape planting.

Planting within the Marginal Zone shall be installed at the same time that the upper slopes receive grassing to minimise slope toe erosion. The Wet Zone shall be planted up once the normal standing water level has been achieved. Refer to Figure 1, Stormwater Pond Staged Landscape Planting.

Pond plant species shall be a mix of Council approved groundcovers, shrubs and trees from Table 2 as site conditions and engineering requirements permit.

### ***Vegetated Filters***

Species shall be a mix of Council approved groundcovers, shrubs and trees from Table 2 according to the Planting Zone criteria, as site conditions and engineering requirements permit.

### **Swales**

Swales are to be turfed to ensure rapid establishment and mitigate channel surface scouring. Generally, grass needs to be maintained at heights between 50 and 150mm, depending on design parameters.

Where engineering requirements permit, an appropriate Carex grass mix may be acceptable. Carex must be able to prostrate themselves when submerged by a stormwater flow. Carex secta in the lower channel is inappropriate as this eventually forms a trunk that may impede water flow.

### **(c) Plant Spacing**

Plants are to be planted according to the following spacing allocations:

- Trees, shrubs and groundcovers, as per Table 2 required spacings.
- Within the Marginal Zone, Carex shall be evenly staggered at 1.0m intervals.
- Where plantings are to include approved partially submerged species, these are to be irregularly clumped in groups of 3 to 7 plants along the circumference of the stormwater pond.
- For permanent stormwater ponds, plant 0.4m below the designed normal standing waterline, approved sedges and rushes.
- Amenity plantings of tussocks are to be clumped in groups of 3 to 10 plants.
- Trees shall be spaced at 2.5m intervals from other plants.
- In respect to the pond maintenance access track:
  - No shrub or groundcover centres are to be located within 1.0m of the track.
  - No trees centres are to be located within 2.5m of the track.

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- Plantings within 2.0m either side of the access track are to have species that are able to recover quickly should they become damaged during pond maintenance.
- In subdivision and shopping precincts, planting design either side of the access track should also ensure that the track may be used for pedestrian amenity purposes.

## **9.5 PLANT SOURCING**

Plants are to eco-sourced from the Waikato Region where possible, at grades that minimize potential mortality rates, from reputable nursery stock. It is strictly prohibited to transplant vegetation from existing wetlands and other such environments to be used in LESD landscaping.

## **9.6 MULCHING**

The types of mulching specified are to ensure rapid planting establishment while maintaining good ground infiltration without souring the soil or causing negative amenity values, and allowing some scope for landscape design variations. Mulching for the LESDs shall be as detailed in Table 1.

Council favours biodegradable weedmats over synthetic geotextile weedmatting. No synthetic geotextile weedmatting is to be utilised in the installation of the landscaping portion of landscaping engineered stormwater devices. However, synthetic geotextiles and other materials may be used, as applicable, to meet device engineering requirements; for example, at inlets, outlets and high velocity channels. Biodegradable matting must:

- Have a lifespan of at least 12 months,
- Prevent weed growth within the mulched area,
- Help stabilize the soil while plants are establishing,
- Not easily lift from the ground if submerged for periods of time, and
- Appear reasonably tidy from a visual amenity perspective.

Examples of approved biodegradable matting products include:

- Coir matting, 10mm thick minimum
- Jute-Hessian weed control mats, 800 gms/m<sup>2</sup> minimum
- Densely woven flax matting

Where bark mulch is used, it is to be contained within the plant area that it is providing cover for. Likewise bark mulch is not permitted in any LESD:

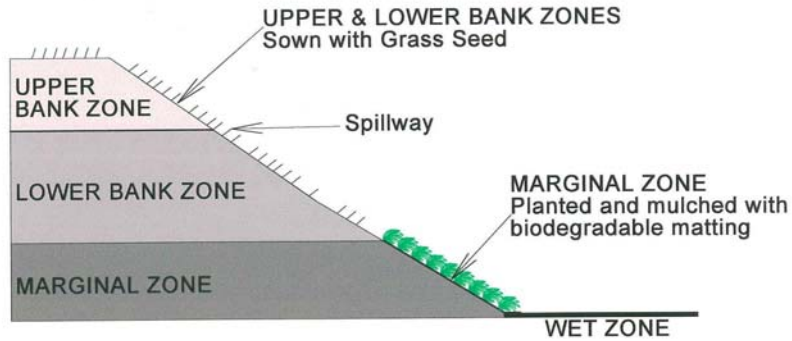
- Within 3.0m of any watercourse or water body,
- Where water ponding or flooding may occur, and
- On slope gradients of greater than a 1:3 ratio.

**Table 1. Council Approved Landscape Mulching for LESDs**

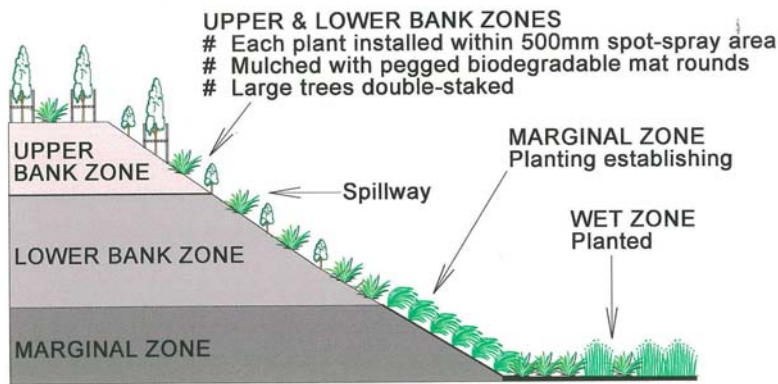
<b>ENGINEERING DEVICE</b>	<b>PLANTING ZONE</b>	<b>MULCH TYPE</b>
<b>Raingarden</b>	All	Council approved biodegradable weed matting  50-150mm diameter River Rocks in 100-300mm deep Council approved gabion matting
<b>Stormwater Pond</b>	Amenity Planting — Site Entrance and Drainage Reserve Boundary Line to Upper Bank Zone where no ponding, flooding, or mulch travel is possible  Amenity Planting — Site Entrance and Drainage Reserve Boundary Line to Upper Bank Zone where ponding or flooding is possible  Upper Bank and Lower Bank Zones  Marginal Zone  Wet Zone	Council approved Bark &/or aged Woodchip  Council approved biodegradable weed matting  Council approved 0.5m diameter biodegradable weed matting rounds  Council approved biodegradable weed matting  No mulch required
<b>Swale — River Rocks</b>	All	Loose River Rocks on Council approved biodegradable weed matting  50-150mm diameter River Rocks in 100-300mm deep Council approved gabion matting
<b>Swale — Roll on Turfing</b>	All	No mulch
<b>Swale — Vegetated (Carex grasses)</b>	All	Council approved biodegradable weed matting
<b>Vegetated Filters</b>	All	Council approved biodegradable weed matting

**Figure 1. Stormwater Pond Staged Landscape Planting**

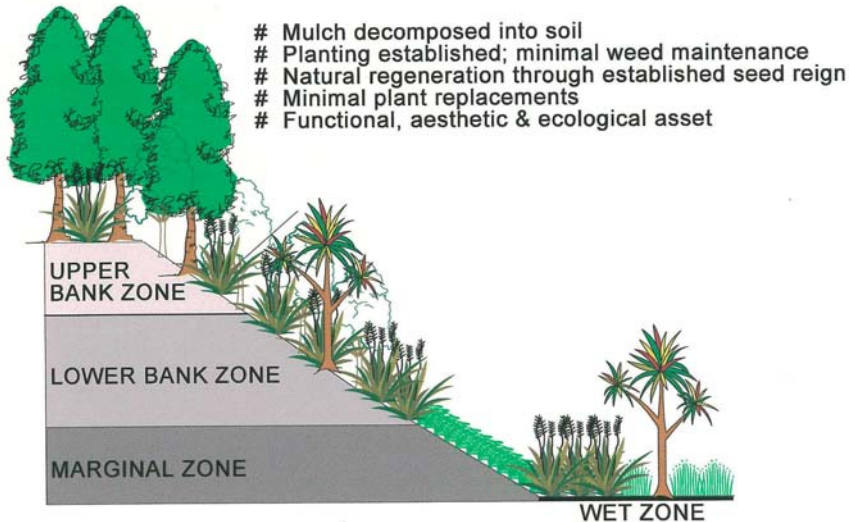
**STAGE 1 STORMWATER POND PLANTING**



**STAGE 2 STORMWATER POND PLANTING**



**STORMWATER POND 5 YEARS +**





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**REFERENCED DOCUMENTS AND STANDARDS**

Auckland Regional Council, (2003), TP10: Stormwater Management Devices — Design Guidelines Manual

Clarkson, B.D., Clarkson, B.R., Downs, T.M., (2001), Indigenous Vegetation Types of Hamilton Ecological District, The University of Waikato: Centre for Biodiversity and Ecology Research

Clarkson, B.D. and Wall, K., (2002), Gully Restoration Guide: A Guide to Assist in the Ecological Restoration of Hamilton’s Gully Systems, Hamilton City Council

Environment Waikato Regional Council, (1995), Design Guidelines for Earthworks, Tracking and Crossing

Environment Waikato Regional Council, Volumes 1 and 2, Erosion and Sediment Control: Guidelines for Soil Disturbing Activities