



with assistance from
New Zealand Water and Wastes Association
presents

**Managing Stormwater
and Road Run-off
Tools, Techniques and Devices**



Techniques, tool and devices: what works, where, and how?

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Non Vegetated Devices

Design Examples & Common Issues

What are Non-Vegetated Devices?

- Catchpits
- Filter Trenches
- Sand Filters
- Detention Basins
- Treatment Walls
- Modular Storage Systems
- Permeable Paving

What do they do?

- **TREAT**- provided via filtration, settlement, chemical reaction and microbial degradation
- **ATTENUATE** - provided via limited discharge outlets / infiltration
- As with vegetated devices, they are most efficient when constructed as part of a **SURFACE WATER MANAGEMENT TRAIN**
- As with any devices, they only work efficiently if they are **MAINTAINED**

URS

Why do we need them?



Do they work?

- YES! - Research around the world has proven their efficacy in a wide range of climatic conditions, catchment uses and sensitive receiving environments.
- BUT – performance can be highly variable (depending on sediment & runoff character, maintenance)
- Acknowledged that NZ research is still to develop substantive body of knowledge to prove worth
- Until this is realised careful detailing is required to ensure maximum efficiency can be taken from existing designs

Catchpits – Summary

- Extensive use in traditional systems
- Efficient at trapping gross solids
- Efficiency improved by use of screens & maintenance
- Can be used upstream of many other devices
- **Sumplex Catchpits**
 - Used at Northern Gateway, Auckland
 - Have potential to reduce maintenance

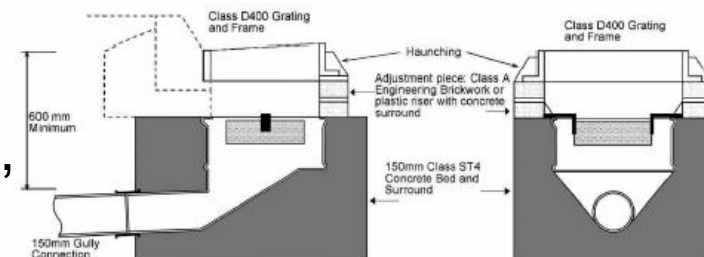
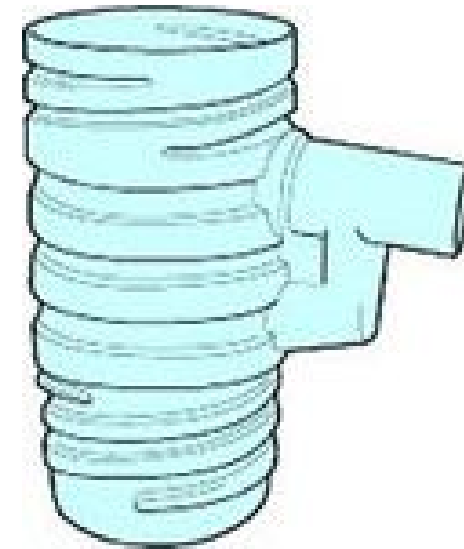


Figure 1 - Chute type sumplex gully

Filter Trenches – Summary

- Useful for linear features such as roads
- Good for use upstream of many other devices
- Use of geotextile in first ~100mm can allow for reduced maintenance
- Inlet details are important for piped inflow to limit blockages
- High sediment loadings can cause issues
- Again, operation is directly linked to **maintenance**



Detention Basins – Summary

- Simple & effective solution
- **Quality** and **quantity** issues can be addressed
- Potentially better than underground tanks in that any issues are visible and can be rectified
- Efficient at trapping gross solids such as litter and larger diameter sediment – requires frequent cleaning
- Use of underdrains can limit mosquito habitat
- Careful design can incorporate basins into landscape and even double space as recreational area – excellent for low rainfall areas
- **Maintenance** regime can be incorporated into general works

Detention Basins – Summary



Treatment Walls – Summary

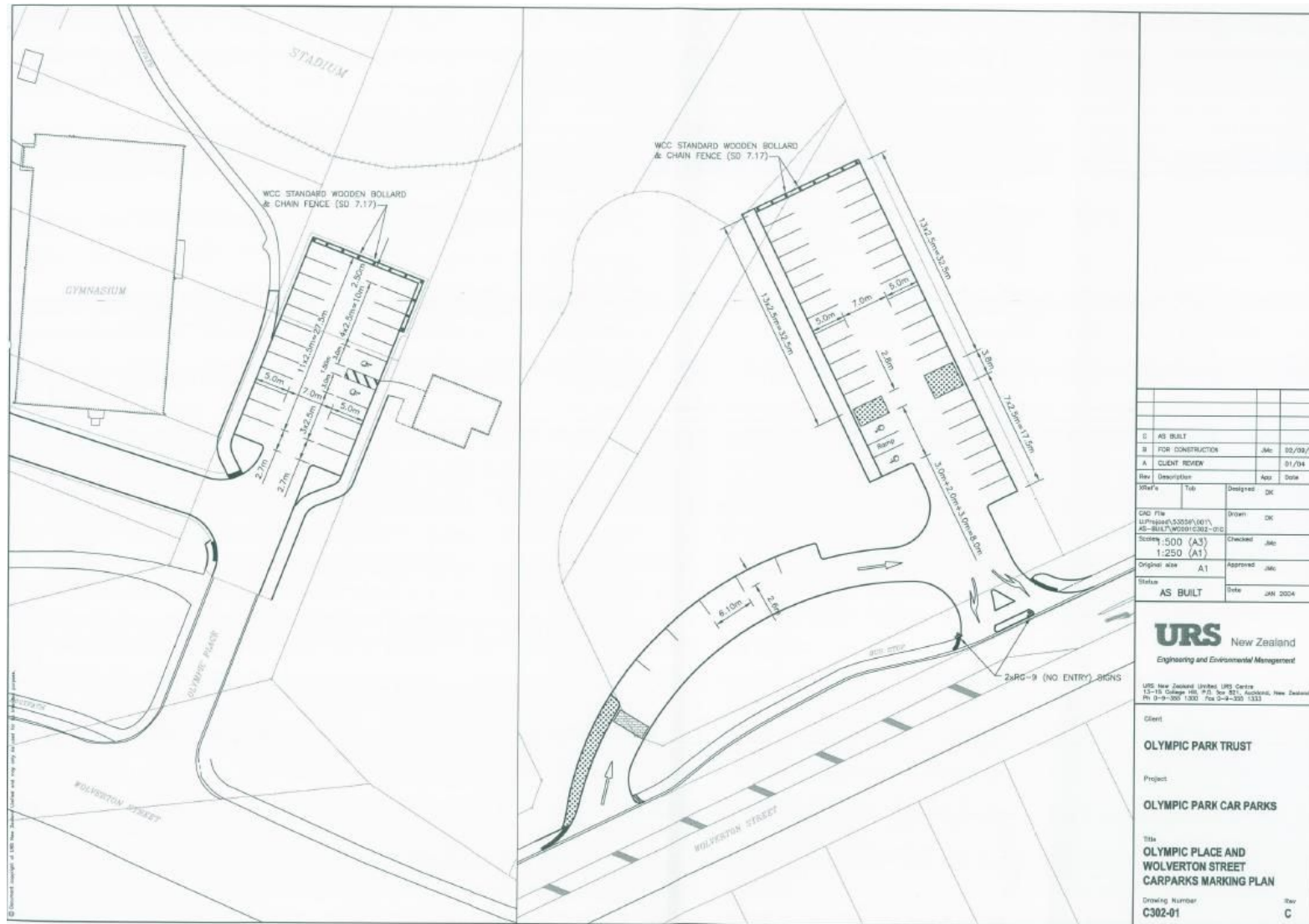
- Recent addition to potential options
- Developed by Landcare Research
- Utilises an extensively researched media mix to maximise treatment potential
- Again, operation is directly linked to **maintenance**



Permeable Paving – Case Study

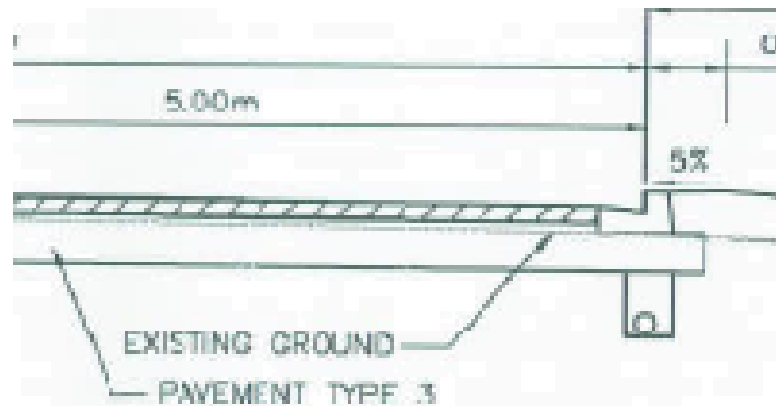
- Redevelopment of site at Olympic Park
- Requirement from Auckland Regional Council to provide treatment to surface runoff prior to discharge to Avondale Stream.
- No requirement to provide attenuation at that time
- Permeable paving drains to a rain garden prior to discharge to a watercourse

Permeable Paving – Case Study



Permeable Paving – Case Study

- 530m² of paving (Area 1) & 860m² of paving (Area 2)
- Initial difficulties associated with sub-base material overcome



PAVEMENT TYPE 3

80mm WCC PERVIOUS PAVERS

50mm SAND

GEOTEXTILE TERRAM 1000 OR SIMILAR APPROVED

50mm PERVIOUS BASECOURSE

200mm PERVIOUS SUB-BASE (MINIMUM)

OVER EXISTING CUL DE SAC HEAD TO MATCH EXISTING PAVEMENT DEPTH

GEOTEXTILE TERRAM 1000 OR SIMILAR APPROVED

DESIGN CBR=3

- As with many sites – Monitoring has not been undertaken to determine insitu efficacy of system

Permeable Paving – Case Study



Success is in the detail...

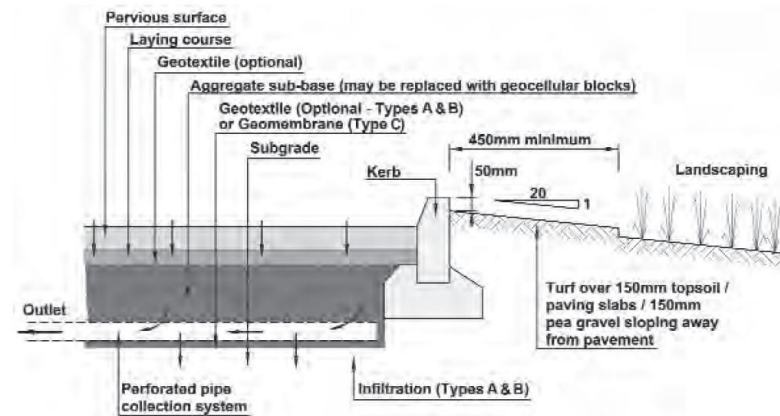


Figure 12.12 Landscaping detail for pervious pavement (adapted from Wilson et al, 2004)

Edging Details



Success is in the detail...



Landscaping and soil management



Success is in the detail...



Understanding the potential of devices



Success is in the detail...



Closer liaison between design team and construction team

Permeable Paving – Alternatives

- Potential alterations to include attenuation within the design – consider:
 - Increased depth of sub-base, with reduced diameter outlet pipe
 - Inclusion of underground attenuation / proprietary storage device below paving
- Alternatives to block paving
 - Grasscrete
 - Porous asphalt
 - Permapave

Permeable Paving – Alternatives





Putting Devices Together

Design Examples & Common Issues

Putting devices together

- **Why?**
 - Regardless of designed efficiency single device systems are vulnerable to failure
 - Placing a series of devices improves the robustness of the system
 - Proposed systems should be a balanced response to the threat posed

Putting devices together

- **Degree of protection needs to be assessed in terms of:**
 1. Scale of proposed road / development
 2. Potential for contamination
 3. Other pressures within catchment
 4. Sensitivity of receiving environment

Case Study – Greenfield Development



Case Study – Greenfield Development

1. Scale of proposed road / development

- Large supermarket with associated parking, attracting large volumes of traffic.

2. Potential for contamination

- Medium – Again, large volumes of traffic, including heavy goods vehicles
- Petrol Station present on site

Case Study – Greenfield Development

3. Other pressures within catchment

- Significant - Part of a 900 acre commercial and residential development.

4. Sensitivity of receiving environment

- Medium – Multiple local small watercourses
- Watercourses drain to recreational estuarine waters
- No groundwater issues

Storm Water Management Train

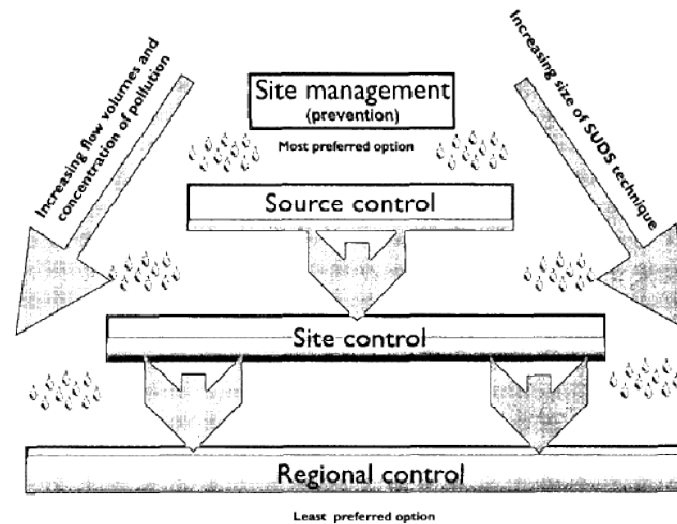


Figure 2.2 The management train

- Fundamental to provide robust treatment / attenuation system
- Linking a number of vegetated / non vegetated devices
- Number of devices dependant of scale/contamination potential of catchment area

Stormwater Management Train



Summary

- Wide variety of devices available
- These devices do work and offer real benefits above traditional reticulation systems – NZ body of evidence still needs to grow
- Understanding of nature of pollutants, capabilities of proposed devices and sensitivity of environment are key
- Careful attention to detail can maximise efficiencies
- Individual devices are often not enough, multiple techniques are more robust
- Surface Water Management Train provides practitioners with a holistic way to view surface water management.