

# On-Site Stormwater Management Guideline

October 2004



*Ministry for the*  
**Environment**  
*Manatū Mō Te Taiao*

**Sustainable Management Fund**



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Published in October 2004 by the  
New Zealand Water Environment Research Foundation,  
PO Box 1301, Wellington, New Zealand

This document is available on the New Zealand Water Environment Research Foundation's website:

[www.nzwerf.org.nz](http://www.nzwerf.org.nz)

NZWERF (2004). *On-site stormwater management guideline*. New Zealand Water Environment Research Foundation. Wellington, New Zealand.

## Foreword

The impact of stormwater on the environment is becoming an increasingly important issue. Impacts include both *quantity* effects such as flooding, erosion and effects on the water table and also *quality* effects such as sedimentation, litter, suspended solids and dissolved contaminants. Stormwater in our urban, semi-urban and rural environments needs to be managed differently and one part of the New Zealand Water Environment Research Foundation's research portfolio has been to identify how to manage stormwater across these three very different land environments.

We are all responsible for ensuring that we protect stormwater quality and managing our own stormwater. However, with the growing interest in sustainable urban design and improvements in water quality, the *On-Site Stormwater Management Guideline* will allow local government, private sector designers and homeowners to design stormwater systems which will reduce stormwater pollution and flooding incidents.

The purpose of the Ministry for the Environment's Sustainable Management Fund is to support the community, industry, iwi, and local government in practical environmental initiatives. I am pleased that the fund has been able to support the development of these guidelines to assist in the on-site management of stormwater in New Zealand.



Hon Marian L Hobbs  
**MINISTER FOR THE ENVIRONMENT**

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## Disclaimer

This Guideline aims to provide design professionals with the information they need to select the appropriate on-site stormwater management device for any given application. It gives step-by-step design procedures for the most common devices and as far as practical states key assumptions relevant to some of the devices and design methodologies. The aim is to help professionals tailor any measure to meet the needs of their general geographical area and the particular site.

The Guideline also provides a useful consolidated summary of information about on-site stormwater management in the New Zealand context, as well as highlighting areas where perhaps more work can usefully be done.

It should be noted, however, that the professional end user is responsible for applying the Guideline to particular sites and making the decisions about which on-site system to adopt. While this Guideline can help with this process, NZWERF and its consultants are not responsible for any consequences or effects of any system that may be installed solely on the Guideline's basis. NZWERF encourages users to obtain more specific advice where risks such as slope instability or flooding or other community concerns are present, in order to confirm that the proposed on-site system is efficient and adequate for the particular site and that it is installed correctly.

The Guideline does not supersede local and regional, manuals, standards or statutory plans.

Provision of information on suppliers and types of proprietary stormwater treatment devices does not imply any endorsement, approval or recommendation for their use. The lists of suppliers or types of proprietary treatment devices in this guideline may not be complete as at the time of writing, and will become out of date as the field progresses, so further information should be sought on these when using this guideline.

While every effort has been made to ensure the accuracy of the information included in this guideline, the Minister for the Environment and NZWERF accept no responsibility for any errors or omissions in the information supplied.

## Work in progress

This guideline is very much a work in progress, reflecting best practice in a fast-moving field as at 2004. Any comments and additional information that could help other stormwater practitioners in New Zealand are most welcome and can be directed to:

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# Acknowledgements

The Zealand Water Environment Research Foundation gratefully acknowledges the financial support received for this project from the Minister for the Environment's Sustainable Management Fund (SMF No. 2207), which is administered by the Ministry for the Environment.

NZWERF would also like to acknowledge the following financial contributors:

Ashburton District Council  
Central Otago District Council  
Dunedin City Council  
Environment Bay of Plenty  
Environment Waikato  
Franklin District Council  
Greater Wellington  
Landcare Research  
Manukau City Council  
Drainage Managers Group (NZWWA Subgroup)  
Timaru District Council  
Upper Hutt City Council  
Waimakariri District Council  
Wellington City Council

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Thanks are also due to the Project Control Group members for their overview and advice. They are:

**Mike Kerr**, Chairman and Senior Engineer Associate, Beca  
**Charles Willmot**, Senior Policy Advisor, Sustainable Business Group, Ministry for the Environment  
**Ian Gunn**, Land and River Operations Manager, Greater Wellington  
**Ian Hunter**, Stormwater Operations Manager, Regional Manager, Transfund  
**James Court**, Advisor, Working with Local Government, Ministry for the Environment  
**Keith Caldwell**, Senior Environmental Engineer, Opus International Consultants Ltd  
**Kirsten Forsyth**, Senior Policy Analyst, Greater Wellington  
**Mark Bishop**, Compliance Officer, Timaru District Council  
**Paul Sampson**, District Engineer, Rotorua District Council

This guideline has drawn heavily on the work of the Auckland Regional Council (TP 10 and TP 124) and the Auckland City Council (*On-site Stormwater Management Manual*). The project team gratefully acknowledges this work by Earl Shaver and Greg Paterson of those councils and their input to this guideline.

**Graham Levy**, Senior Associate (Water Resources) of Beca Infrastructure Ltd, reviewed sections 3, 4 and 5 and his feedback is also gratefully acknowledged.

The guideline has been prepared with extensive consultation, including launch of the proposal at the NZWWA Stormwater Conference in Rotorua in June 2004 and a three-phase input process inviting email comments from a growing number of New Zealand-wide practitioners on drafts made available on the NZWERF website ([www.nzwerf.org.nz](http://www.nzwerf.org.nz)).

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The work has involved the dedicated efforts of numerous people. In particular, the authors are pleased to acknowledge the contributions of:

Andrew James  
Bill Arnold  
Bronwyn Archibald  
Bronwyn Rhynd  
Bruce Gardner  
Chris Stumbles  
Chris Todd  
Darren Utting  
Janarie Jongkees  
Laura Watts  
Larry Shui  
Maria Archer  
Matthew Wallace  
Michael Hewison  
Norman Firth  
Peter Cochrane  
Peter Kovacevich  
Riaan Eliot  
Roger Hawthorne  
Sioban Hartwell  
Tony Miguel  
Treena Davidson

Staff of NZWERF were active and helpful project managers and the authors want to recognise the support given throughout the project by:

Barry Scott  
Andrew Clark  
Michael Hughes

# Contents at a glance

## Concepts

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2. On-site stormwater management devices	2.1 List of on-site devices covered in the guideline 2.2 The evolution of on-site technology 2.3 Rapid reference guide: how the devices work and issues with their use

## Device selection and design

Section and title	Content
3. Device selection and design approach	Guidance notes on selecting and designing on-site devices, covering: <ul style="list-style-type: none"> <li>• water quantity and quality control objectives</li> <li>• suitability of devices to local site conditions, including disposal to surface or underground water or infiltration</li> <li>• a flow chart approach to device selection, sizing and design/detailing</li> <li>• implementation aspects</li> </ul>
4. Device-by-device description and design procedures	Step-by-step procedures for common devices: <ul style="list-style-type: none"> <li>• device description</li> <li>• applicability</li> <li>• summary of design approach</li> <li>• preparatory steps</li> <li>• step-by-step design procedure</li> <li>• design detailing</li> <li>• implementation provisions</li> <li>• worked examples</li> <li>• references</li> </ul>
5. Device description and general guidance notes	Description of devices not included in section 4, their application and maintenance requirements and references for design procedures
6. Design and costing information	Available information on existing devices in the Auckland region and description of life cycle costing analysis

## Detailed resources and technical appendices

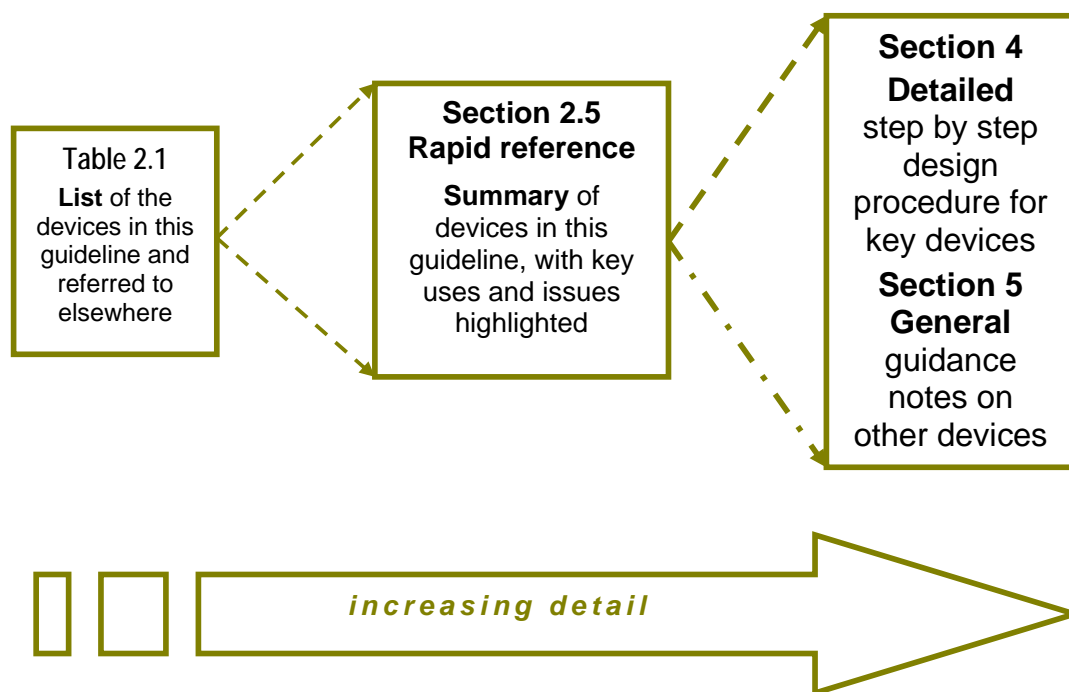
A. Other examples	A review of other examples examined as part of preparing the guideline
B. Compiled references	All references used in the document including available internet URLs
C. Hydrological hydraulic analysis	Guidance on undertaking the hydrological and hydraulic analyses required to size on-site devices
D. Operation and maintenance	Background on the general approach to operation and maintenance of on-site devices

# How to use this guideline

We recommend that all users, but especially entry-level device designers, review the entire document in order to become familiar with the concepts and resources available both within the guideline and referenced as useful companion documents.

As designers become more familiar with on-site devices, they may refer directly to Section 4 for the step-by-step procedures for the particular device they are about to design.

To gain an overview of the devices and how they can be used together in a treatment train, the guideline takes an expanding view:



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# Abbreviations

Note: asterisked terms are defined in the glossary overleaf.

AEP	Annual exceedance probability *
ARC	Auckland Regional Council
ARI	Average recurrence interval
BMP	Best management practice *
CMP	Catchment management plan (or planning) *
GIS	Geographic information system
HIRDS	High intensity rainfall design system (NIWA, 2002)
LGA	Local Government Act
LID	Low impact design or low impact development *
LIM	Land information memorandum
MfE	Ministry for the Environment
MPD	Maximum probable development
NZWERF	New Zealand Water Environment Research Foundation
NZWWA	New Zealand Water and Wastes Association
PAH	Polyaromatic hydrocarbon
O&M	Operation and maintenance
RMA	Resource Management Act, 1991
T <sub>c</sub>	Time of concentration *
TLA	Territorial local authority
TPH	Total petroleum hydrocarbons
WSUD	Water sensitive urban design (or development) *

# Glossary

## Notes:

- 1 Definitions apply to the context in which they are used in this Guideline
- 2 Definitions exclude those of the specific on-site devices described in s2.2

Aquifer	Underground water body
Annual exceedance probability	The probability, expressed as a percentage, that a flood of a given magnitude will be equalled or exceeded in any one year. For example, the 10% AEP is a flood expected to occur on average once in a 10 year period
ARI (average recurrence interval)	The average period between exceedances of a given rainfall or flow rate
Best management practice	For stormwater, a method of control that meets sustainable water quantity and quality objectives
Body corporate	Legal entity responsible for the operation and maintenance of a multi-unit dwelling complex
Brownfields site	Brownfields are generally defined as abandoned or underused industrial or commercial properties where redevelopment is complicated by actual or perceived environmental contamination. They vary in size, location, age and past use, and can range from a small, abandoned corner gas station to a large, multi-acre former manufacturing plant that has been closed for years. They generally have lower levels of contamination that can be successfully addressed using standard environmental cleanup practices, but may be stigmatised by their past use ( <a href="http://stlcin.missouri.org/cerp/brownfields/definition.cfm">http://stlcin.missouri.org/cerp/brownfields/definition.cfm</a> ) With certain legal exclusions and additions, the USEPA defines the term 'brownfield site' to mean real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. ( <a href="http://www.epa.gov/brownfields/glossary.htm">http://www.epa.gov/brownfields/glossary.htm</a> )
Catchment	Area contributing flow to a point on a drainage system
Catchment management plan	Plan for dealing with the runoff generated in a catchment (normally to meet specified water quantity and quality objectives)
Catchpit	Small chamber incorporating a sediment trap that runoff flows through before entering a reticulated stormwater system (also termed cesspit)
Cluster housing	Multi-unit development on one or more lots, normally with some communal facilities and amenities

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Combined sewer	Piped reticulated system that conveys both stormwater and sewage
Detention of stormwater	Temporarily detaining runoff on a site before discharging it to reticulated or natural system (refer also 'retention')
Erosion	In this guideline, means the process of detachment and transport of soil or sediment by water from the ground surface
Four waters	Comprises all forms of natural water, plus the stormwater, drinking water and wastewater systems that interact with these (see three waters)
Flood frequency	The probability that a flood discharge rate will be equalled or exceeded in any year (refer also 'annual exceedance probability' above)
Greenfield site	Land on which no urban development has previously taken place; usually understood to be on the periphery, of an existing built-up area Slough Borough Council, UK, ( <a href="http://www.slough.gov.uk">http://www.slough.gov.uk</a> )
Groundwater	Water under the ground surface that is stored and/or moving below the soil layer
Hydrologic neutrality	Neutralising the effect of increased impervious surfaces on the urban hydrograph to pre-development levels, typically by on-site and multi-site stormwater management measures, with respect to one or more of: reduction in the peak flows of selected design storms; enhancement of stream baseflows; or average annual discharge
Impervious/ impermeable surface	Surface through which water cannot pass, that sheds water, such as roofs, roads, paths
Infiltration	The passage of water through soil to reach groundwater
Low impact design	Design approach for site development that protects and incorporates natural site features into erosion and sediment control and stormwater management plans
Mana whenua	Customary authority exercised by an iwi or hapu in an identified area
On-line device	All the runoff from a contributing catchment area flows through a stormwater device
Off-line device	Only run-off up to a nominated maximum flow rate passes through a stormwater device. Flows in excess of the nominated maximum flow rate bypass the device
On-site stormwater management	The use, detention and/or retention of runoff on a site (refer also 'detention' and retention')

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Orifice	A hole of a specified size designed to discharge flow at a pre-determined rate (it is normally machine-drilled in a plate and attached at the entry to a pipe)
On-site device	An on-site stormwater management system that is designed to meet water quantity and/or quality goals, which utilises detention and/or retention of runoff
Overland flow path	Route taken by flood runoff not able to be contained in the reticulated or natural stormwater conveyance system
Pathogen	Disease-causing organism
Permeable (pervious) surface	Surface through which water passes by infiltration
Retention	A system that temporarily retains runoff and then disposes of it on site by infiltration
Rohe	Territory, area
Runoff	The flow of rainwater across the ground or an artificial surface generated by rain falling on it
Site	For the purposes of this guideline, a 'site' is defined as one lot, though it may include a number of separate buildings (refer section 1.2)
Source control	The control of runoff and/or contaminants at or near the point where it was or they were generated
Tangata whenua	Iwi or hapu that holds mana whenua over a particular area
Three waters	Comprises the three water systems; stormwater, drinking water and wastewater (see also four waters)
Time of concentration	Time taken for rain falling at the head of the catchment to reach a designated point as runoff
Watercourse	Natural or artificial channel which conveys runoff
Water sensitive urban design	Low impact development as defined above, with an added emphasis on sustainable vegetation practices and low-level of water usage

# 1. Background, scope and aims of this guideline

In this section:

- 1.1 Background
- 1.2 What is a 'site'?
- 1.3 The place of on-site stormwater management devices within the range of stormwater management tools
- 1.4 Scope:
  - what this guideline does and does not cover
  - limitations of this guideline and the need for further work
- 1.5 Aims of the guideline
- 1.6 Contribution of on-site stormwater management to sustainability
- 1.7 The statutory framework for onsite stormwater management
- 1.8 What does using this guideline mean for your council or consultancy?
- 1.9 References

## 1.1 Background

In 2001 the New Zealand Water and Wastes Association (NZWWA) carried out a stormwater scoping survey and needs analysis to which 41 people from city, district, regional councils and consultancies responded (the full report is on the NZWWA website, [www.nzwwa.org.nz](http://www.nzwwa.org.nz)). A key finding was that not enough people responsible for stormwater management in New Zealand were aware of the seriousness of stormwater impacts – a situation that has changed to a remarkable degree in the intervening period. A growing range of relevant professions – engineers, planners, ecologists, architects, developers and the like are now becoming interested in sustainable urban design, rather than just sustainable stormwater management. Stormwater cannot be managed in isolation from water supply, wastewater and natural water assets, nor from land and habitat values that in the words of one respondent are 'part of a larger natural system that has many values important to our living environment'.

Many respondents made unprompted suggestions that a guideline was needed for better stormwater management throughout New Zealand, while more than two-thirds of respondents agreed with the proposition that a New Zealand guideline on comprehensive stormwater management was necessary. Plans were laid for NZWERF to carry out the project in 2003, funding was sought from a range of organisations during the year, and work on the project began in January 2004. Through the Minister for the Environment's Sustainable Management Fund and the other funding contributors listed earlier, NZWERF has produced this guideline to meet the needs – and concerns – identified in that 2001 survey.

This guideline is part of a stormwater management resources programme being carried out by NZWERF. The programme is made up of two components, the other one being the Stormwater directory of New Zealand. The Stormwater directory of New Zealand comprises an internet based, searchable database of stormwater information resources, such as guidelines and design manuals. Resources are listed in four main categories; regulations and legislation, catchment analysis, stormwater design and construction and asset

management. A stormwater links page includes an education and research links section and an online form for adding and updating resources. The *Stormwater Directory of New Zealand* is available here: [www.stormwaterdirectory.org.nz](http://www.stormwaterdirectory.org.nz).

Interestingly, those who agreed a guideline was needed expressed the same reservations as the nay-sayers. Those who did not think a guideline was needed said:

- ‘guidelines become rules very easily [but] local conditions mean local solutions; that is, what is appropriate for a stormwater discharge from a steel plant into a mangrove estuary may not be appropriate for a stormwater discharge onto an open coastline’
- there is ‘too much variability between regions – the issues on which different stormwater strategies are based are quite different region to region’
- ‘if written they are likely to then become mandatory and they could not recognise all the differences that occur within New Zealand’

Those who said a guideline is needed or ‘highly desirable’ right now reasoned that:

- ‘urban stormwater discharges require consenting before October 2001’
- ‘a common approach may be useful. Case studies can also be useful’
- ‘we need firm guidelines to avoid confrontation based on individual personal opinions’

Again, their qualifying provisos were that any guidelines:

- ‘may need to be regional rather than national to reflect ecological differences’ and ‘must recognise different environments’
- would ‘need to carefully consider all current statutory and regulatory requirements and provisions, and the different agency roles and responsibilities [that] pertain to stormwater management and related initiatives’
- by themselves ‘will not deal with inconsistent implementation by Councils and consultants... clearer definition and application of outcomes to be achieved is needed’
- ‘must be practical with good balance between cost and effectiveness if [they are] to gain widespread acceptance’

The aims of this guideline as outlined in section 1.5 overleaf are intended to address all the needs and concerns expressed by:

- balancing consistency with flexibility for on-site stormwater management
- using information already available so practitioners can use their own judgement
- providing for geographic, policy and regulatory variability

## 1.2 What is a ‘site’?

For the purposes of this guideline, the term ‘site’ covers a range of land areas, including:

- individual residential household sites
- multi-unit residential developments on individual sites
- individual commercial or industrial sites, which may sometimes be large

It does not cover sites clustered together in neighbourhoods that would be served by sub-catchment or catchment scale stormwater devices.

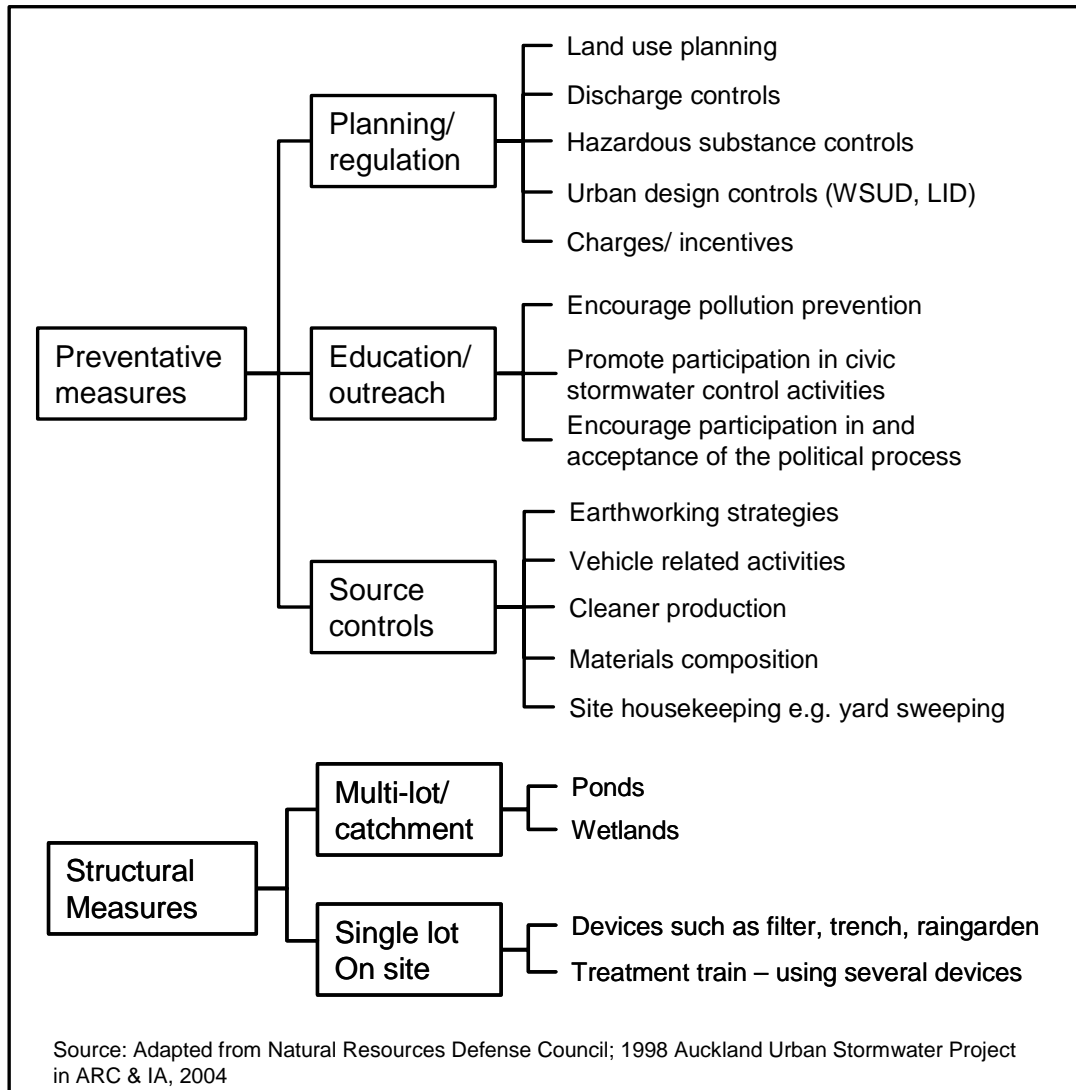
## 1.3 The place of on-site stormwater management devices within the full range of stormwater management tools

The range of potential stormwater management tools is shown in Figure 1.1. This guideline only addresses single lot on-site stormwater structural measures (devices).

Figure 1.1 somewhat artificially separates on-site devices from planning and regulatory measures. In practice, on-site stormwater management devices may be used to achieve or help achieve some planning and regulatory controls such as:

- discharge controls – for example, limiting peak flow discharges
- urban design controls – in conjunction with low impact design or water sensitive design, such as grass swales or using rain tanks for water re-use

**Figure 1.1 Potential stormwater management tools**



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## 1.4 Scope

### 1.4.1 What this guideline does and does not cover

This guideline covers on-site stormwater devices that are suitable for use on residential, commercial and industrial sites in urban, suburban (low density) and rural areas. It does not attempt to give a history of the evolution of stormwater management practices in the New Zealand statutory environment.

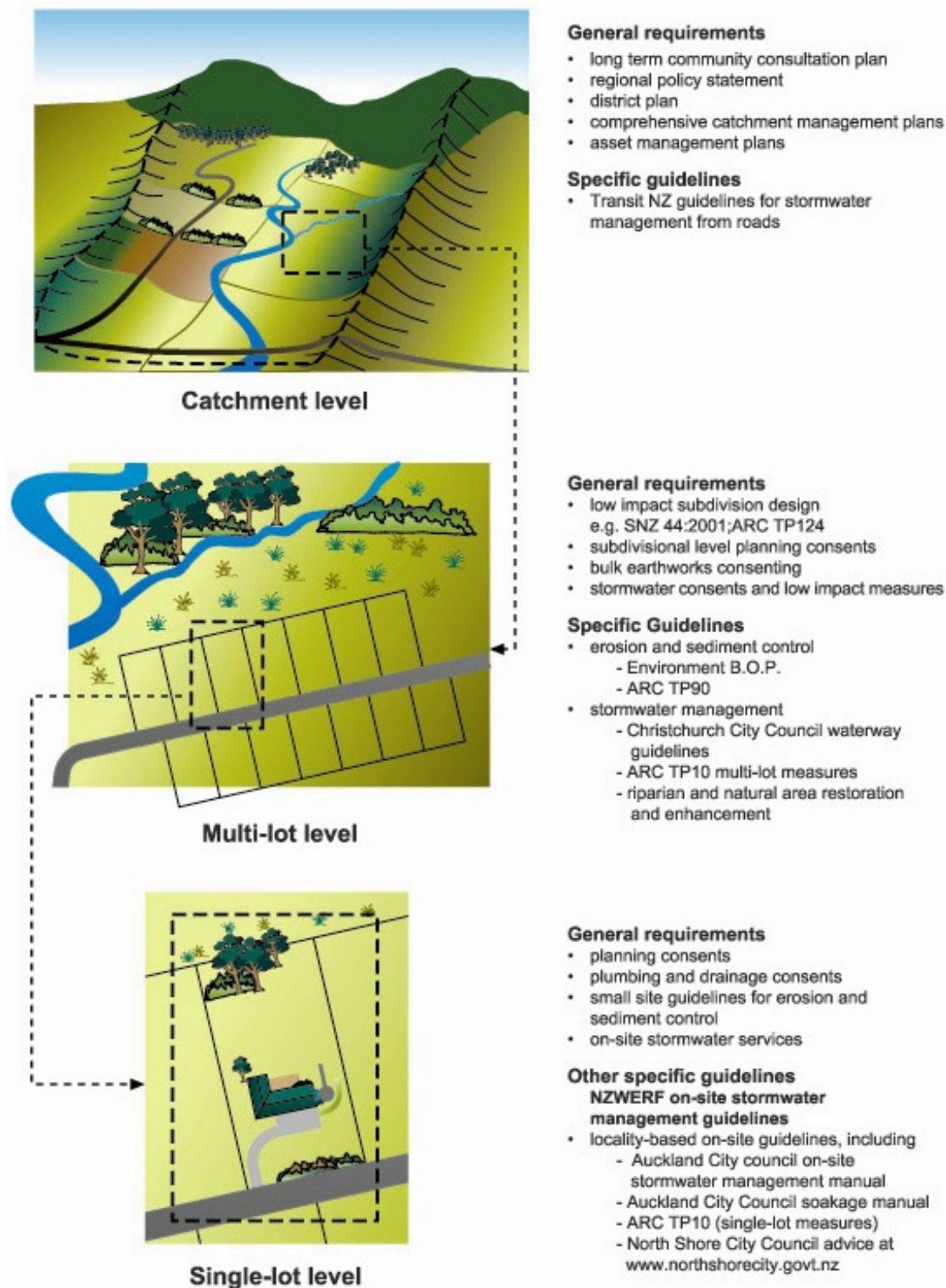
Neither does it cover matters well traversed in other New Zealand documentation, such as:

- non-structural and some structural at-source management and maintenance practices such as bunds and diversion valves or lawn maintenance and street and yard sweeping. Many documents cover this, including the ARC's EOP (Auckland Regional Council, 2000, *Environmental Operations Plan* (henceforth referred to as the 'ARC EOP'))
- detailed assessment and engineering design of stormwater disposal mechanisms, in particular to avoid local scour or erosion
- forestry, farming and related rural activities, as well as wider rural drainage and flooding
- specific stream management methods such as daylighting, erosion protection or channel design
- erosion and sediment control during earthworks - this is covered in guidelines by Environment Bay of Plenty and in the Auckland Regional Council's TP90 (Auckland Regional Council, 1999, *Erosion and Sediment Control: Guidelines for Land Disturbing Activities in the Auckland Region*, ARC Technical Publication No. 90 (henceforth referred to as ARC TP90))

The guideline does not cover runoff from roads in any detail, especially public roads with high traffic volumes. The devices described in the guideline and design methodologies will, however in some cases, be suitable for managing road runoff.

Figure 1.2 indicates how this guideline relates to other guiding documents for stormwater management.

Figure 1.2 How this guideline relates to other documents



## 1.4.2 Limitations of this guideline and the need for further work

The primary focus of these guidelines is on stormwater management devices that provide:

- water quality treatment with final disposal to surface water or to ground soakage
- peak flow and quantity reduction for sites where final disposal is to surface water

These devices will enable developments to go some way towards hydrologic neutrality, without necessarily achieving it in all respects. For example, many devices will achieve a measure of success in reducing the peak flows in certain storms, but few will achieve enough soil or groundwater recharge to maintain base flows in urban streams. This may be a constraint to sustainable urban development in many areas.

Moreover, the work done to produce this guideline indicates that the different capabilities of on-site measures with respect to hydrologic neutrality – an important resource management goal – are not always clearly specified. This guideline aims to clarify these capabilities, but a lot is yet to be learned about the actual effectiveness of many devices for managing the urban hydrograph.

This guideline is a first base for New Zealand stormwater practitioners. However, the rapid pace of theory and implementation means it will need regular review. The recommendations made below aim to focus the attention of practitioners on monitoring and information needs that can further refine future editions. Recommendations for ongoing work are:

- developing improved definitions of hydrologic neutrality and monitoring the performance of on-site stormwater devices with respect to achieving it
- arrangement by territorial local authorities, unitary councils and regional councils to analyse local rainfall records and other aspects of treatment devices in order to arrive at accurate local or regional quality design storms
- developing a management and monitoring framework for on-site stormwater devices, in order to encourage the gathering and sharing of monitoring data in a way that is sufficiently robust and detailed to be useful to stormwater practitioners for comparing costs and performance for different sites and devices
- developing design guidelines for stormwater management devices, where current guidelines do not exist or are deficient or need refining
- preparing RMA section 32 and 36 analyses, to determine whether on-site stormwater management devices are justified in terms of quadruple bottom lines (social, environmental, cultural and economic)
- developing sound procedures relating to ownership, operation and maintenance issues, including maintenance costs
- assessing the need for further capacity-building and training for building inspectors who may need to inspect and sign off on stormwater devices
- ongoing research work to foster the use of new or under-used technologies/devices

## 1.5 Aims of this guideline

This guideline aims to provide design professionals with the information they need or appropriate sources to select and design appropriate on-site stormwater management devices for any given application in New Zealand. It overviews on-site stormwater management concepts in order to provide a sound basis for selecting and designing specific devices, based on a review of New Zealand and overseas precedents and use or adaptation of these to reflect New Zealand wide needs. The guideline recommends step-by-step design procedures for a range of commonly used devices where it was thought most useful to consolidate and clarify the

design issues. Where this information is already well known and/or available elsewhere, such as for oil and water separators or proprietary devices, it refers to the relevant sources.

Regional variations in natural and institutional conditions mean that the individual designer needs to make an informed choice of device, based on the guidance given, in order to meet the needs of his or her general geographical area and the particular site. Wherever possible, the guideline spells out what background assumptions are known and not known about various devices and design methodologies in order to enable users to use different assumptions if desired. The guideline also provides a useful consolidated summary of information about on-site stormwater management in the New Zealand context, as well as highlighting areas where perhaps more work can usefully be done.

The format of this guideline was based on a review of the guidelines and manuals listed in Appendix A. This guideline aims to:

- focus on New Zealand applications for rural as well as small and large urban areas while drawing closely on relevant precedents from overseas
- compile information from many sources into one place where this is needed, but with an annotated bibliography, including websites, to point users to more detailed sources
- provide sound guidance on how to choose the most appropriate on-site device
- explain each of the technical issues involved in setting the design approach; design objectives, performance standards, matching site physical characteristics and so on
- as far as practicable, provide for the wide variety of site conditions and device applications that may be encountered throughout New Zealand
- put design guidelines for each on-site device in a consistent, easy-to-follow format which meets the needs of both the first-time user and the experienced professional
- give worked examples of a range of applications
- show working examples of on-site devices, with photos, narrative and performance data

The guideline also aims to promote sustainable stormwater management through wider adoption of appropriate onsite practices by:

- increasing the understanding, awareness and appropriate use of on-site practices
- encouraging the incorporation of on-site stormwater management into the development and implementation of policy, regulation, management, technical design and operations
- promoting best on-site stormwater management practice

Although reference material is cited for users to develop further skills, the guideline assumes users are broadly familiar with stormwater management technology and practice, especially:

- storm hydrology – hydrograph generation and routing: Gribbin, J.E. 1996. *Hydraulics and Hydrology for Stormwater Management*. Delmar Learning
- basic hydraulic analysis:
  - Brater, King, Lindell & Wei, 1996. *Handbook of Hydraulics*. McGraw Hill 7<sup>th</sup> Edition
  - Streeter, 1985. *Fluid Mechanics*. McGraw Hill 8<sup>th</sup> Edition
- stormwater quality: Auckland Regional Council. 2003. *Stormwater Treatment Devices Design Guidelines Manual*. ARC Technical Publication No.10 (henceforth referred to as ARC TP10)

## 1.6 The contribution of on-site stormwater management to sustainability

On-site devices are increasingly being used to help meet the objectives of ecologically sustainable development, or 'development that uses, conserves and enhances the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life now and in the future can be increased' (NSESD, 1992).

Sustainability objectives for stormwater management include:

- avoiding or minimising the discharge of contaminated stormwater to sensitive fresh or marine receiving waters
- reducing the frequency and duration of stormwater flows where necessary to reduce the potential to cause erosion or scour
- reducing flood peaks that exceed natural and built infrastructure capacity, cause hazards or cause property and other damage
- promoting cost-effective infrastructure asset management by utilising natural and privately owned assets, for example overland flow paths and depression storage, as key components of the built stormwater system ('greening' the 'grey' infrastructure) and integrating the management of all four waters (see glossary)
- promoting terrestrial and aquatic biodiversity with appropriate planting and reduction of adverse environmental effects on streams and saline receiving environments
- engaging greater general public awareness of stormwater and its interaction with the natural environment, encouraging them to take steps to protect their local environment and perhaps re-use stormwater where appropriate (in turn, this increased awareness can be tapped into to facilitate proper maintenance of on-site devices)
- meeting the concerns of tangata whenua about waters in their rohe

On-site stormwater measures promote sustainability by making some contribution towards hydrologic neutrality; that is, reducing the effect of increased impervious surfaces on the urban hydrograph towards pre-development levels. Different measures contribute to reducing peak flows from selected design storms, enhancing groundwater recharge and stream baseflows and maintaining average annual stream discharges. On-site stormwater management devices will not generally achieve pre-development runoff conditions with respect to all aspects of stormwater runoff, especially runoff volume. Sustainable development requires designers and regulators to consider a range of stormwater management measures, which may include on-site stormwater management devices.

Sustainable stormwater management is best implemented through integrated stormwater catchment management plans or other planning mechanisms that incorporate the principles of low impact development, low impact urban design and development and water sensitive urban design. On-site, multi-site and catchment-wide devices need to be planned together to form an integrated treatment train to aid progress towards the goal of sustainability.

Developers and their consultants often have limited resources to investigate the sensitivity and limiting factors for the receiving environment of an individual site and need guidance from the relevant regional and territorial councils on the most appropriate measures to help address catchment level stormwater issues: on-site stormwater management may not always be the best option at catchment level. For example, proliferation of treatment devices throughout a catchment may increase the overall lifecycle cost of stormwater management, while detention devices at the bottom third of the catchment may potentially increase the peak discharge by increasing the recession limb of the hydrograph for the lower catchment.

Again, if stormwater runoff from an individual site does not discharge into an open water body, and centralised stormwater quality and quantity management devices can be accommodated at the bottom of the catchment before discharging to the receiving water, then at-source control may not be advantageous: some sort of cost/benefit analysis should then be undertaken within the framework of a catchment wide study, in order to assess the potential for such impacts and to identify the best practical (and most affordable) management options to achieve the desired environmental outcomes.

## 1.7 Statutory and policy framework for on-site stormwater management

The core legislation relevant to stormwater discharges from sites is the Resource Management Act 1991 (RMA), the Local Government Act 2002 (LGA) and the Building Act 1991. Several current government initiatives also affect stormwater and are summarised below.

### 1.7.1 Resource Management Act 1991

The framework of the RMA relevant to site stormwater diversions and discharges is shown in Figure 1.3. Regional, district and city councils, and unitary authorities, all have functions under the RMA to control stormwater:

- under district plans, by specific rules; for example rules on maximum impermeable surfaces as a percentage of the net site area, related to site zoning
- under regional plans, by specific rules limiting:
  - the total impermeable area for a site or total contributing catchment area
  - concentrations of contaminants in site stormwater discharges or rules relating to particular land uses. Rules are increasingly being set to achieve water quality standards specified for particular receiving environments

If site parameters or stormwater diversion or discharge parameters do not comply with the permitted activities or performance standards of the relevant rules in the District Plan or Regional Plan, then a resource consent or consents could be required. Specific restrictions in the RMA controlled by regional councils and unitary authorities that may apply to stormwater infrastructure, diversions and discharges are:

- s9 for uses of land that may affect water or soil conservation such as earthworks (some existing uses are allowed)
- s12 for activities, for example structures, in the coastal marine area. All structures, such as stormwater outlets, in the coastal marine area require a resource consent unless allowed by a rule in a regional plan or regulations (some existing uses are allowed)
- s13 for activities in the beds of rivers and lakes. All structures in lakes and rivers, such as stormwater outlets, culverts or pipes, require a resource consent unless allowed by a rule in a regional plan or regulations (some existing uses are allowed)
- s14 for taking, using, damming or diverting (storm)water. Any damming of water, such as by blocking a drain, requires a resource consent unless allowed by a rule in a regional plan or regulations
- s15 for discharging water to water, or discharging contaminants to land, air or water. All stormwater discharges to land and water, including coastal water, require a resource consent unless allowed by a rule in a regional plan or regulations

Specific restrictions in the RMA that are controlled by district and city councils and unitary authorities, and may apply to stormwater infrastructure, diversions and discharges, are:

- s9 for restrictions relating to earthworks, or other uses of land that may have effects on the environment including water, for example, site coverage, impermeable surface areas, set

back distances from streams and whether the land is used for residential, rural or industrial purposes (some existing uses are allowed)

- s220 for activities associated with subdivision. Subdivision consents are authorised by district councils. Subdivision conditions can cover matters such as the intensity of developments and stormwater infrastructure requirements

Regional planning documents can recommend that comprehensive catchment management plans or integrated catchment management plans be completed by territorial local authorities (TLAs) for urban or urbanising catchments. These allow stormwater discharges to a council controlled drainage system provided they comply with conditions of the comprehensive consent.

### 1.7.2 Local Government Act 2002

This statute provides a new purpose for all local authorities based on sustainability principles. The purpose of local government includes democratically promoting the social, economic, environmental and cultural well being of communities now and in the future.

Documents prepared by TLAs that should always be consulted when considering on-site stormwater management issues include:

- stormwater bylaws, for example to manage overland flow paths (the Local Government Act, 2002 requires local authorities to review all their bylaws by 1 July 2007)
- asset management plans
- engineering codes of practice
- water and sanitary assessments: levels of service for community stormwater systems may change as a result of community consultation and risk analysis

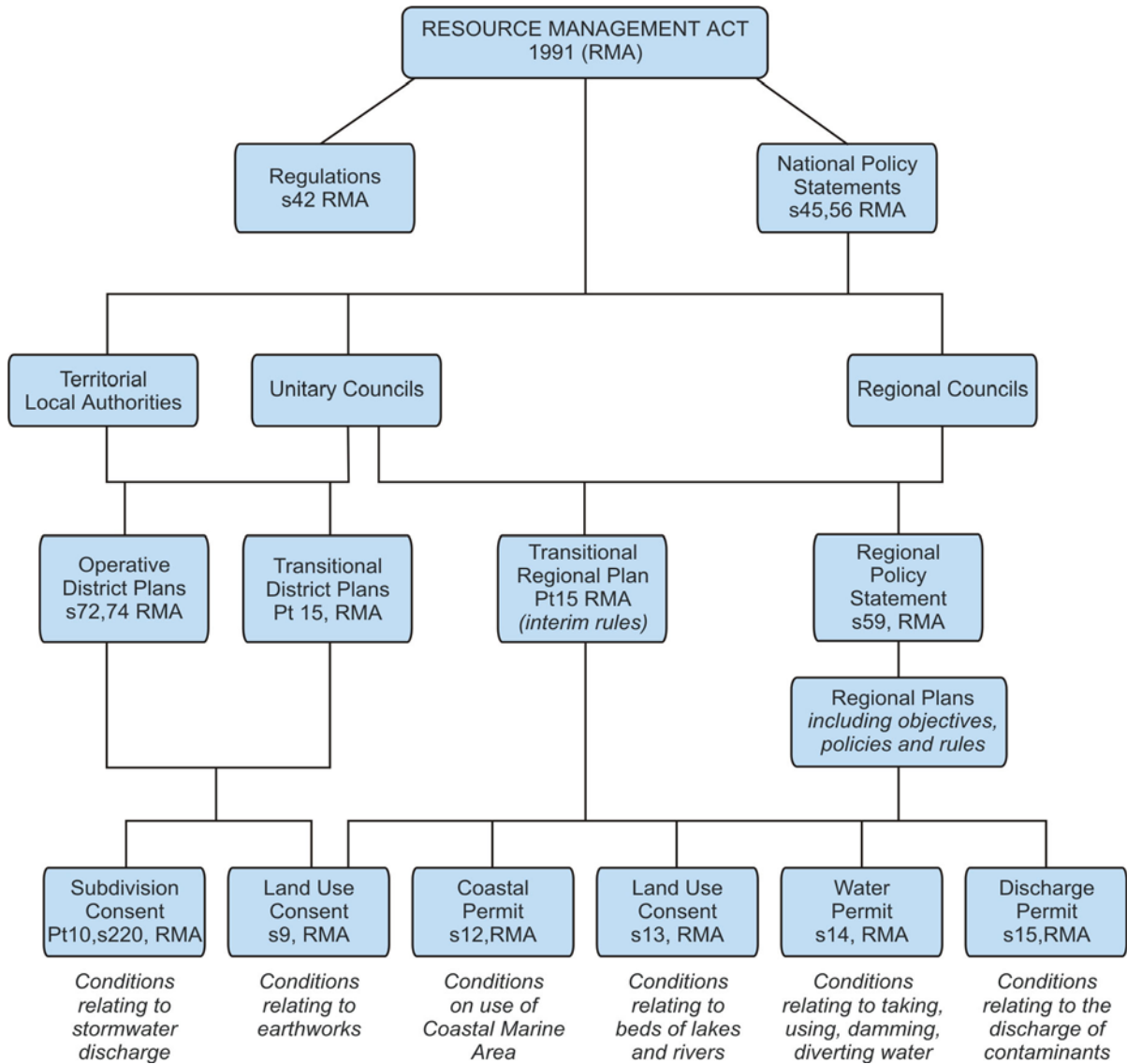
### 1.7.3 Building Act 1991 and Building Code

S 36 of the current Building Act ([www.legislation.govt.nz](http://www.legislation.govt.nz)) requires that all building work is adequately protected from flooding and that the results of the development do not make flooding worse. Clause E1 (surface water) of the approved New Zealand Building Code ([http://www.bia.govt.nz/e/publish/legislation/building\\_code.shtml](http://www.bia.govt.nz/e/publish/legislation/building_code.shtml)) addresses:

- estimation of runoff
- sizing surface water systems
- secondary flow
- disposal to soak pit
- minimum acceptable floor level

Proposed amendments to the Building Act and Code aim to promote sustainable development by the development of building standards in relation to among other things, water efficiency, and water conservation and the need to facilitate the efficient use of water and water conservation in buildings. On-site stormwater management measures may assist these goals to be met as well as meeting stormwater management goals.

Figure 1.3 Regulation of on-site stormwater management



### 1.7.4 Government initiatives

There are several government initiatives relevant to stormwater management, including:

- the Department of Prime Minister and Cabinet's January 2003 Sustainable development programme of action, supported by the Ministry for the Environment's sustainable cities group
- the Ministry for the Environment's Water programme of action, which initially consists of a number of projects covering water allocation and use and water quality
- the Oceans policy, which aims to ensure integrated and consistent management of the oceans within New Zealand's jurisdiction by way of a cross-government exercise, covering all aspects of oceans management including effects from land
- the proposed National environmental standards for Raw drinking water sources. In development at time of writing, this may require risk gradings to be placed on drinking water catchments, some of which may be affected by stormwater discharges
- the Government's infrastructure stocktake ([www.med.govt.nz](http://www.med.govt.nz)), which also raises issues about the capacity and condition of water-related infrastructure

The Sustainable development programme of action addresses (among other things) the quality and allocation of fresh water to ensure that freshwater quality is maintained to meet all appropriate needs. Relevant to stormwater discharges are the goals of:

- preserving/improving current water quality and identifying and mitigating sources of freshwater contamination
- establishing industry and other sector partnerships to improve freshwater quality

Provisions relating to sustainable cities that are relevant to on site stormwater management include:

- working collaboratively with local authorities to improve the legislative arrangements and statutory controls on planning, development and service delivery for urban areas, especially Auckland, focusing in particular on removing legislative impediments to sustainable medium and high density housing and infrastructure investment planning
- working collaboratively with local government, design professionals, and cultural, heritage and environmental interests to develop an urban design charter which aims to:
  - incorporate collaborative urban design in project planning and delivery
  - consider natural systems
- developing environmental standards, for air quality, water quality, noise and waste, and a timetable for their implementation, in consultation with urban authorities
- with urban authorities, developing a methodology and committing to collecting data and indicators to record the state of social and environmental well-being of urban areas

The Ministry for the Environment (MfE) has formed a pilot group of government agencies that are seeking to take practical steps towards sustainability. The MfE website advises that Government will facilitate initiatives by government agencies to:

- assess the main impacts of their operations on the environment
- get started with eco-efficient procurement
- report on their operational environmental performance

In the international context, Agenda 21 is a comprehensive plan for management of all forms of human impact on the environment, developed principally by the United Nations and Governmental groups. This plan of action was adopted by 178 countries (including New Zealand) in 1992. The full implementation of Agenda 21 was strongly reaffirmed at the World Summit on Sustainable Development in Johannesburg, South Africa, in 2002.

## 1.8 What does using this guideline mean for your council or consultancy?

This guideline outlines a decision-making and design process that enables practitioners to use onsite stormwater management devices that are appropriate to different land uses, receiving environments, soils and climates around New Zealand. It is not a standard.

Councils that want to promote or require the use of this guideline in their area will need to work out how this is best done, depending on their own approach to policy, regulation, education and other stormwater management tools. Time and other resources will be needed to go through processes such as:

- detailed critique of the design assumptions, in order to ensure that the most appropriate rainfall and other relevant criteria are used for the locality
- consultation with local stormwater practitioners
- analyses under sections 32, 35 and 36 of the Resource Management Act, to justify the expense of recommended measures by considering alternatives (for example, neighbourhood or catchment-based measures), benefits and costs; the requirement to gather information, monitor and keep records; and the possible need to fix charges to recover the reasonable costs incurred to manage the systems they wish to put in place
- recording on-site devices on the LIM (land information memorandum), GIS (geographic information system) and other relevant databases
- linking with asset management plans and rating procedures (refer to the need for further work identified in section 1.4.2 of this guideline and the operation and maintenance issues raised in Appendix D2)
- internal change management processes such as those described in Paterson and Menzies (2003), especially capacity-building for consenting and compliance monitoring of devices, as well as appropriate legal and funding arrangements and administrative systems

Consultants wanting to use the guideline to design onsite measures for use in any council's area are advised to approach the council to work out whether or not devices designed according to this guideline are acceptable.

## 1.9 References

Notes:

1. Internet references are accurate at the time of publication
2. Short references are given in brackets at the end of key documents that are used throughout the text for ease of use, for example (ARC TP10, or CCC, 2003)

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