5.1 General Principles

A number of principles apply to both stormwater design approaches including:

- Stormwater disposal should mimic, to the extent possible, the natural drainage processes of an area;
- Modifications to existing natural drainage patterns should be kept to a minimum;
- Stormwater should not be discharged directly into streams from a piped system;
- Impervious areas should be kept to a minimum; and
- Appropriate methods to hold stormwater back (detention) before dispersal into waterways should be employed.

Incorporation of stormwater treatment into the design of conveyance and storage systems provides opportunity to achieve the third objective of mitigating against increased contaminant discharge.

5.2 Preliminary Design

5.2.1 Stormwater

An important first step is to understand where stormwater currently flows on the site.

1. **Obtain the relevant drainage plans from Council for the site.**
2. **Before progressing with any new development talk to Council about overland flow paths to check if any run through the property and try and observe directly where water flows on the site when it rains.**
3. **The ultimate discharge point for stormwater from the site should be determined based on site topography. On rural lots the most likely discharge point will be a stream, small tributary or road drain.**
4. **If a stream runs through the property check if the Council can provide an estimate of the 100 year flood level. Floor levels should be a minimum of 500 mm above the 100 year flood level.**

It is very important to consider the location of any development in relation to existing overland flow paths. Blockage of overland flow paths by construction of new buildings or landscaping can cause stormwater to be diverted into neighbouring lots. This is one of the most common causes of localised flooding.

5.2.2 Wastewater considerations

The implications of an on-site wastewater treatment and disposal system can be quite significant, particularly on small lots, and must be considered in conjunction with the design of on-site stormwater management systems.

The type of treatment system and the size and location of the disposal field will be determined by such factors as the soil conditions, the dwelling occupancy and the environmental constraints of the site. The land requirement of a wastewater disposal field is normally around 1000 m^2 for an average, three-bedroom house on clay soils. This includes a reserve area, which may be equal in size to the primary disposal area.

A summary of relevant design information from the ARC TP58 design manual is provided in Part C of the Code.

At the preliminary design stage comprehensive site surface and subsurface investigations will be needed to determine if on-site wastewater treatment and disposal is appropriate for the site. This requires the identification of the following:

- Potential disposal areas;
- Site characteristics (rainfall, vegetation cover, surface water drainage);
- Site constraints (slope shape, slope angle, aspect);
- Environmental constraints (ground water, surface water);
- Type of soil under disposal area; and
- Separation between disposal fields and dwellings and/or watercourses

The site may then be assessed for suitability for an on-site disposal system. Design of various aspects of the treatment and disposal systems should then be carried out.

5.2.3 Water supply considerations

The source at potable water should be determined first. Identify whether there is a network or groundwater supply for potable water. If rain water tanks are to be relied on as a potable water source this will affect how big they need to be and also whether some form of treatment is needed for the water.

Reference should be made to Part C at the Code for water supply public health guidelines applicable to rain water tanks.

5.2.4 Riparian margins

Both RDC and WCC apply riparian margins to all of their streams. No development is allowed within these margins. The margins serve a number of purposes. Primarily they are required as a means of protecting and enhancing the natural habitat and vegetation surrounding streams.

As a general rule a minimum margin of 15-20 m either side of a stream will apply. It is important to check the requirements for riparian margins with the relevant Council.

Riparian margins also provide a buffer between properties and the stream during flood events and if planted can act as a filter removing any contaminants entrained in stormwater.

5.3 Device Location

Different devices suit different locations. How devices fit site topography needs to be thought about in the preliminary design stage, in particular:

- To plant bush it is ideal to have the bush located so that the runoff generated from the site can be dispersed into the bush, hence the bush should be located downgradient of the impervious areas. If bush planting is to be used in combination with other stormwater management devices the bush should be the final step in the stormwater management process, hence downgradient of all stormwater devices.

- When assessing the placement of stormwater detention devices, consideration of the proximity to residential dwellings needs to be made. A wetland area or a rain garden the detention device should be located downgradient of the house and sufficient freeboard needs to be provided between the floor of the house and the stormwater detention area.

- For rain water tanks, rain gardens or wetland areas the release of flow from the stormwater detention device requires a dispersal device to distribute the flow to avoid concentration and possible erosion downstream. The dispersal device would be located downgradient of the detention device. If there was an area of bush on-site it is preferable to disperse the flow from the dispersal device to the bush area. The dispersal area should be sited such that flows will not concentrate for a distance of at least 30 metres downgradient of the outlet.

- Rain gardens do not suit steep sites and/or sites with slope stability issues.

Figures 5-1 to 5-3 illustrate conceptual layouts of typical sites showing possible stormwater management systems that could be implemented to mitigate the effects of development on the environment.

Figure 5-1 illustrates the layout of a site where the impervious areas are located at the highest point (Layout 1), and there is hence plenty of space to use for the layout of the stormwater management devices. Figure 5-1 shows a rain water tank located adjacent to the house to collect the roof runoff. The flow from the rain water tank is then piped to a dispersal trench upgradient of an area of bush. The runoff from the driveway is collected in a sump, and piped to a rain garden or a wetland area. The flow from the

rain garden or wetland area is piped to the dispersal trench. A 30 metre length clearance is provided downstream of the dispersal trench. The area of bush is located downgradient of the site and all stormwater management devices.

Figure 5-2 shows a site layout where access is at the downgradient boundary, and a long driveway is used (Layout 2). The on-site stormwater management needs to incorporate this layout to provide adequate stormwater management within the confined space that is downgradient of the impervious areas. Figure 5-2 illustrates how the rain water tank has been provided to offset the flows from the roof, and a rain garden or detention devices has been provided to offset most of the runoff from the driveway and hardstand areas. A swale has also been provided to convey most of the remainder of runoff from the driveway to an area of bush.

Figure 5-3 shows a residential development (Layout 3). Rain water tanks have been used to offset the roof runoff in this subdivision. The remainder of the runoff from the impervious areas has been offset using bush planting located around the existing watercourse to act as riparian zone.

5.4 Combined Methods

This section outlines some possible combinations of stormwater management techniques to provide on-site stormwater management. They are listed in order of preference from higher to lower.

Flood Protection Approach

1. Full bush planting

   The increased flow due to development is fully offset by planting bush on pasture to accommodate an increase in runoff for the 1 % AEP event. The area of bush required would be assessed based on Section 4. If sufficient bush planting is implemented, stormwater discharge from the house roof and driveway/hardstand areas could be diverted into dispersal devices with no detention. The dispersal device would be sized in accordance with the recommendations in Part B.

2. Rain water tank temporary storage and some bush planting

   The rainwater tank temporary storage would offset the increase in runoff from the roof area and bush planting would offset any increase in runoff from the driveway/hardstand area. The bush planting would allow for the total site impervious area less the roof area of the house and garage. The house rain water tank outlet would require a dispersion device sized in accordance with the recommendations in part B

Stream Channel Protection Approach

3. Full Bush Planting (as per 1.0)

4. Rain water tank temporary Storage and some Bush Planting (as per 2.0 with rainwater tank designed for Stream Protection Approach).

5. Rain water tank storage and rain garden or wetland area for driveway/hardstand Area

The rain water tank temporary storage would offset the increase in runoff from the roof area, and a rain garden or wetland area would offset the increase in runoff from the driveway/hardstand area. The rain water tank would be sized based on Part B. The rain garden would be sized based on Part B while a wetland area would be sized based on ARC TP10. The flow from the house rainwater tank and from the rain garden/wetland area would require a dispersion device.

6. Rain garden or Wetland Area for Total Impervious Area

A rain garden or wetland area would offset any increase in runoff from the entire site. The rain garden would be sized based on Section 6 while a wetland area would be sized based on ARC TP10. The flow from the wetland area would require a dispersion device sized in accordance with the recommendations in Part B.

5.5 Application of Methods Not Listed in the Code

This Code is intended to be a guide to appropriate stormwater management on sites no smaller than 4,000 m^2. The stormwater management measures listed in this code are simple to use and aimed at providing methods that are considered most applicable for the conditions encountered. However other variations of the methods proposed in the code may be used if designed in accordance with the ARC technical publications: 'Stormwater Treatment Devices – Design Guideline Manual' (TP10) and the 'Low Impact Design Manual for the Auckland Region' (TP124). Details of all methods used and the design details should be included with any application for building consent.

6.1 Introduction

The design information provided in the Code has been developed to provide the flexibility to select various stormwater management options and combination of options that are most appropriate for the site. The Code provides flexibility for landowners to implement combinations of methods to be used to achieve the key objectives listed in Section 2.0.

So how do you use the Code of Practice?

6.2 What to do

Step 1 – Identify what amount of impervious area is being added to the site.

Step 2 – Identify which Design Approach applies based on review of the relevant ICMP and discussion with WCC or RDC (as applicable)

Step 3 – Confirm wastewater and water supply constraints to stormwater management. Reference Part C of the Code for detail.

Step 4 – Identify what stormwater management methods are appropriate taking into account site constraints and landowner/developer preferences.

Step 5 – Design the stormwater management devices using Part B of the Code.

6.3 What to do Next?

To enable WCC or RDC to assess your application in terms of effects on stormwater you must clearly and accurately provide the information set out in the three checklists provided in Part B of the Code. Your application must clearly present the existing site conditions and the proposed development and its potential effects on stormwater.

All relevant information should be provided along with the three checklists and provided with the application. It is important that you present this information clearly, as this will assist with the assessment of your application. You are advised to use the services of a consulting engineer to assist in the preparation of your application.