



**Works on
Waterways Notes No. 5**

Drainage Outlets

Drainage outlets can provide outfall for run off generated from rainfall from isolated catchments, irrigation and drainage schemes and can include:

- Natural depression or waterway;
- Excavated earthen drain inlet;
- Pipe structure;
- Rock chute;
- Flume or drop structure.

The assessment criteria for applications of these works are described in **Section 5.2**.

5.1 Potential Waterway Impacts

Potential impacts of drainage outfalls are summarised below.

- Increased flows in the stream;
- Erosion of bed and banks at the outlet;
- Sediment, nutrient and salt inputs;
- Entry of untreated farm effluent;
- Litter and pollutants entering waterways;
- Potential headward erosion in the bed of the outfall.
- Native vegetation disturbance;

Use of stormwater drains to convey runoff from rural and urban areas may adversely increase sediments, nutrients and various contaminants entering waterways if not properly designed. This will contribute to degradation of water quality for downstream users and the instream environment.

The proposed works need to be consistent with the relevant CMA Water Quality and Drainage Strategy. The assessment of applications for outlet works should also examine the broader issues of where the water is coming from and what measures are in place to address water quality.

5.2 Assessment Criteria

Minimum Standards

Catchment management solutions should be explored prior to consideration of any drainage program. If drainage works are proposed it is preferable that they be carried out as part of an “approved scheme” process consistent with Community Service Drains Guidelines, and must be designed by a suitably qualified engineer. Where drainage works are proposed the following standards apply:

- Whole farm plans within irrigation districts; and
- Natural resource plans and dryland drainage Practice and Policy – Draft (March 2001).

Design Flow

The scale and type of drainage works will determine whether the rate of runoff from the catchment is significantly affected. The receiving waterway must have the capacity to cater for runoff from the drainage works.

Where the proposed drainage works consist of minor depression regrading (depth of cut less than 300mm), the increase in flow rate can be expected to be minor and acceptable.

In cases where substantial drainage earthworks are involved, the catchment is modified as for urban or intensive agricultural development, or the waterway capacity is limited, the applicant should demonstrate the effect of the works on the receiving waterway. If the proposed works cause increased flow levels in the receiving waterway it is necessary to ensure the proposed works limit the peak drain flow to a more acceptable level, preferably the pre-development flow level from the catchment.

Drainage scheme designs would normally include a hydrological and hydraulic design to address water quantity and quality issues and this should be submitted with the application for assessment by the CMA.

Scour Protection

Site characteristics will determine the most suitable type of outlet structure. Provision must be made for flows to enter the stream under a range of flow conditions without causing erosion to the bed or banks of the stream, or the outfall drain itself.

It is suggested that the outlet structure should have a minimum capacity based on a 2 year ARI rainfall event with provision for greater flows to be conveyed into the receiving waterway, possibly utilising a rock chute spillway.

The applicant should provide adequate hydraulic design details to enable the outlet structure to be fully assessed. These include design flow, exit velocities, likely tailwater levels in the receiving stream and also the impact of above design flows.

Outlet Type

There is often a considerable drop between a drainage or stormwater outlet and the normal low flow level in the stream. It is therefore necessary that the entry to the stream be designed to dissipate the excess energy without causing erosion.

Suitable arrangements for dissipation include:

- Piped outlet which is fully submerged at normal low flow level.
- Pipe outlet with concrete headwall partly submerged.
- Pipe outlet with a concrete baffled energy dissipater.
- Pipe outlet above water level with rock riprap – maximum drop 1 metre.

Rock riprap will be placed around the outlet structure.

There will be special cases where more complex impact type energy dissipaters may be proposed. These would be assessed using the *Guidelines for Stabilising Waterways* (SCRC, 1991), Chapter 3.

Cut-offs

A common outfall problem is when flows bypass the outfall pipe, either under or around the pipe or upstream headwall, leading to failure of the structure and extensive bank erosion. The design should be checked for adequate concrete cut-offs at the upstream end, mid-way along the pipe structure, and at the outlet end. The concrete cut-off should extend at least 450 mm into solid ground.

For rock chutes, a rock cut-off can be incorporated into the structure. All bed and bank rock must be properly keyed into the foundations to a minimum depth of 600mm.

Water Quality

The drainage works must include measures to protect the beneficial uses of waterways. The principles developed in the *Urban Stormwater Guidelines* (CSIRO, 1999) should form the basis for the assessment and can be applied in both rural and urban areas. The principles are as follows:

- Preservation: Preserve existing valuable elements of the drainage system, such as natural channels, wetlands and stream-side vegetation.
- Source Control: Limit changes to the quantity and quality of stormwater at or near the source. This can include land use planning, regulation and operational practices to limit changes to the quality or quantity of runoff before it enters the drainage system.
- Structural Control: Use structural measures, such as treatment techniques or detention basins, to improve water quality and control discharges.

Application of these principles to particular types of drainage or stormwater outlets is described below:

Rural Drains

- Grass lined drain bed and batters, ie. grassed floodways.
- In-line and off-line dams to act as sediment traps.
- Runoff from irrigated properties to only enter the stream as overflow from a drainage reuse system.
- Dairy wastes isolated from drainage system and re-used on the property.

Urban Drains

- Signage on drainage pits (eg. drain flows to river).
- Sedimentation traps on earthworks sites.
- Kerbside filter traps.
- Gross pollutant traps.
- Sedimentation ponds or shallow wetland systems with macrophytes.
- Diversion of high flows around sediment ponds and wetlands.

The type of measures that are included will depend on the characteristics of the catchment, ie. rural, residential, commercial or industrial, catchment area and topography.

Best practice also includes regular maintenance of the system elements, particularly the removal and off-site disposal of entrapped material from litter traps, or the harvesting and off-site disposal of macrophytes in wetland systems. The applicant shall provide details of the operation and maintenance program.

Public Safety

There is potential for outlet structures to be a hazard to the public. The proposed works should be checked for potential problems such as open pits. The responsibility for operational safety rests with the owner of the structure and regular inspection and maintenance is required.