



North East Catchment Management Authority

Regional Rural Drainage Management Strategy

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Prepared in association with ID&A Pty Ltd

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- A Regional Design Standards - Surface Drains***
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EXECUTIVE SUMMARY

Introduction

This report presents a draft regional strategy for rural drainage management within the North East Catchment Management Authority (NECMA) region.

Rural drainage in the context of this strategy has been defined as the removal of excess water within the North East region by man-made or significantly man altered systems in rural areas.

The NECMA are responsible for the co-ordination and management of rural drainage activities within the North East region. A regional strategy for managing rural drainage activities is necessary to provide for:

- the protection of catchment and waterway health from the potential adverse impacts of rural drainage;
- the definition of roles and responsibilities to allow for the co-ordination of management of rural drainage schemes and in some cases the direct management of schemes;
- the identification of any future rural drainage studies required within the region; and
- the implementation schedule for drainage management functions to allow for the preparation of rolling 3 year business plans by the CMA.

The preparation of the draft strategy has included public consultation in the form of public meetings held at the commencement of the project in November 1998, two key stakeholder workshops held in March and May of 1999 and Steering Committee meetings held at regular intervals during the project.

Impacts of rural drainage

Rural drainage can provide a number of benefits including reducing waterlogging and improving farm access which leads to increased agricultural productivity. Rural drainage can however result in adverse impacts which include:

- an increase in the severity and duration of downstream flooding;
- an increase in the export of nutrients, sediment and saline water into downstream receiving waters; and
- damage or destruction of wetlands.

Much of the regional strategy is concerned with ensuring that the above adverse impacts are avoided.

Objectives

The objectives of the rural drainage strategy are listed as follows:

- Objective 1: To co-ordinate the management of rural drainage throughout the region.
- Objective 2: To maintain and enhance the functions of natural drainage lines to convey and store water.
- Objective 3: To limit the rate of discharge from rural drains to minimise changes in downstream flooding and drainage behaviour.
- Objective 4: To minimise any adverse impacts on the environment and water quality in the catchment.
- Objective 5: To implement measures which reduce the impact of waterlogging within the region and lead to improved agricultural productivity.
- Objective 6: To control modifications / extensions to existing drainage schemes in the region to ensure the stability of existing drains.
- Objective 7: To minimise the construction of inappropriate drainage works within the region.
- Objective 8: To support stakeholder and the broader community education and involvement in rural drainage management.

Strategy Framework

The regional strategy will involve the implementation of identified actions which have been split into six programs. These six programs and a summary of key actions within each program are listed as follows:

- **statutory land use planning**
 - rural drainage activities (with exception of some exemption categories) to require a Local Government planning approval permit;
 - appropriate rural drainage planning controls to be incorporated into Local Government planning schemes at the schemes next review; and
 - CMA and others to act as referral authorities within the proposed formal approval process.
- **information management**
 - ground survey / audit to be carried out to establish location and condition of existing rural drains (ie. establishment of baseline data); and
 - existing data and future data collected on rural drains to be added to the CMA's information database.

- **education and training**
 - key stakeholders to be supplied with appropriate education and training to allow them to carry out their respective roles within the proposed formal approval process; and
 - ongoing contact to be maintained with relevant groups (eg. Implementation Committees, Landcare Groups) to promote the strategies objectives.
- **management plans / drainage dispute investigations**
 - no need for specific area rural drainage management plans within the North East region at present; and
 - ongoing need for the investigation and resolution of disputes over rural drainage issues as they arise.
- **maintenance improvement works**
 - future maintenance and improvement works to be undertaken based on identified priorities and in a coordinated programmed manner.
 - public funding for maintenance and/or improvement works to be provided only for works on strategic drains (ie. those drains which provide some degree of public benefit).
- **performance monitoring**
 - regional strategy to be reviewed at completion of each three year business cycle; and
 - periodic survey / audit of condition of rural drains required to assess the success or otherwise of the regional design standards and maintenance / improvement works.

Roles and Responsibilities

The roles and responsibilities have been defined within the report in both general terms (refer Section 3.5) and also in relation to the implementation of the specific actions making up the six programs (refer Section 4).

The CMA has generally been allocated the lead agency role in the majority of rural drainage management functions. A key support role will be provided by Local Government given the adopted approach of requiring formal approval for carrying out proposed rural drainage activities through the Local Government planning schemes.

Support roles will also be required of the Department of Natural Resources, the local rural water authorities, VicRoads, V/Line and importantly the landowners and their representative groups.

Regional Design Principles and Standards

Underlying the management actions required under the regional strategy are the adopted regional design principles and standards. The following principles to rural drainage management are to apply:

- **catchment wide approach** - assessment of rural drainage applications to consider catchment wide impacts in addition to local impacts and also cumulative impacts of multiple similar proposals
- **catchment management options** - construction of new or enlarged rural drains to be viewed as a secondary form of drainage management and should only be implemented if catchment management techniques cannot fully overcome drainage problems;
- **design standards** - the design and associated applications for proposed rural drainage activities to be prepared in accordance with the design standards presented in Appendix A; and
- **community support** - applicants should seek approval from adjoining and all affected landowners as part of the application requirements.

Cost Sharing Arrangements

The cost sharing arrangements which are to apply to rural drainage management and associated actions are to be based on the State Government's natural resource management guidelines. These guidelines are in general based on the principle of beneficiary pays.

Public funding for maintenance and improvement works for rural drainage activities will therefore only be appropriate on strategic rural drains (ie. those drains which provide public benefits). The initial ground survey / audit to be undertaken of existing rural drains within the North East region should identify those rural drains which qualify as strategic drains.

1. Introduction

1.1 Background

This report presents a draft regional strategy for rural drainage management for the North East Catchment Management Authority (NECMA).

The strategy has been prepared in consultation with a project Steering Committee made up of representatives of the CMA and local government. Consultation in the form of key stakeholder workshops and public meetings has also been undertaken.

The draft strategy has been developed in the following stages:

- Stage 1: Inception - public meetings, data collection and initial stakeholder consultation;
- Stage 2: Investigation - review of available information, identification of impacts of rural drainage, identification of existing rural drainage within the region and review of potential for future rural drainage activity;
- Stage 3: Vision, Objectives and Targets - identified a vision for rural drainage management, management objectives and targets for specific actions required to implement the strategy;
- Stage 4: Draft Strategy - draft strategy prepared which identifies the framework proposed for rural drainage management including the roles and responsibilities of the CMA and other stakeholders, cost sharing arrangements for rural drainage management and performance monitoring guidelines for the implementation of the strategy;

The CMA is developing a regional floodplain management strategy in parallel with the rural drainage strategy. Separate rural drainage and floodplain management reports were prepared for Stages 2 and 3 of the project. A common report covering both rural drainage and floodplain issues was prepared for Stage 1 of the project.

This report presents the draft strategy. Stage 5 will involve the CMA refining the draft strategy to address comments received on the draft report. All key stakeholders will receive a copy of the draft strategy for their review.

1.2 Need for strategy

The North East CMA was formed on the 1 July 1997. The CMA is the responsible authority for the service delivery of waterway management which is expanded to include the related areas of floodplain management, the

management of Heritage Rivers outside of the National Parks and the coordination / management of rural drainage.

A regional strategy for the management of rural drainage is required in order for the CMA to be able to carry out its rural drainage management role effectively and to identify the roles and responsibilities of the numerous interests involved in rural drainage.

One of the nominated objectives of the North East Regional Catchment Strategy (RCS - Reference 1) is to maintain the region as a major source of high quality water in the Murray Darling Basin by ensuring optimal water quality and quantity. Rural drainage can impact adversely on both the water quality and the flooding and drainage characteristics in downstream waterways, storages and wetlands. An effective regional rural drainage strategy is therefore necessary to ensure the RCS objectives are achieved.

Further concerns in relation to rural drainage were identified by the North East Salinity Strategy report (Ref. 2) which recommended that the NECMA coordinate the development of a drainage strategy to address concerns relating to the discharge of saline groundwater via drainage systems into waterways.

The strategy will provide the necessary planning framework to provide for:

- the protection of catchment and waterway health from the potential adverse impacts of rural drainage;
- the definition of roles and responsibilities to allow for the coordination of management of rural drainage schemes (and in some cases direct management of schemes);
- the identification of any future rural drainage studies required within the region; and
- the implementation schedule for drainage management functions to allow for the preparation of rolling 3 year business plans by the CMA.

1.3 Structure Of Report

The report is set out as follows:

- Section 2 provides a summary of the potential impacts of rural drainage, the extent of existing rural drainage in the region and the potential for future rural drainage activities;
- Section 3 outlines the vision and objectives of the strategy, the proposed management framework, details the roles and responsibilities of stakeholders in rural drainage management, the basis for cost sharing arrangements and the regional design principles; and
- Section 4 details the programmed actions identified for the implementation of the rural drainage management strategy.

2. Rural Drainage In North East Region

2.1 Rural Drainage - Definitions

Rural drainage in the context of this strategy is defined as the removal of excess water within the North East region by man-made or significantly man altered systems in rural areas (ie. includes both surface and sub surface rural drains).

Strategic rural drains are defined as those drains servicing rural areas which provide some degree of public benefit.

2.2 Impacts Of Rural Drainage

The potential adverse impacts which can arise from rural drainage activities, if not implemented in accordance with appropriate design principles and standards, were described in the Stage 2 investigations report (Ref. 3). These adverse impacts can include:

- increased downstream flooding;
- increased sediment, nutrient and saline water export into downstream waterways, storages and wetlands;
- acidification of soils;
- damage / loss of wetlands; and
- landowner disputes.

Rural drainage can also provide the following benefits:

- reduction in waterlogging leading to increased agricultural productivity;
- reductions in water table levels;
- enhanced evacuation of floodwaters;
- reduced road maintenance and construction costs; and
- improved farm access.

2.3 Existing Rural Drainage

The North East region encompasses an area of 19,750 km² bounded by New South Wales, the Goulburn Broken CMA region and the East Gippsland CMA

region. The majority of the North East region is within the Upper Murray River Basin, the Kiewa River Basin and the Ovens River Basin.

Most of the North East region is relatively free draining due to the favourable topography conditions. Past levels of rural drainage activity has therefore been relatively low in comparison to other flatter regions within Victoria.

The focus for past rural drainage activities in the North East region has been in the following areas:

- area bounded by Ovens River, Murray River the Hume Freeway and the eastern boundary of the Indigo Creek catchment (area includes the Black Dog Creek, Murdering Hut Creek and Bob and Dicky Creek catchments); and
- lower portion of the Fifteen Mile Creek catchment south of Wangaratta.

The above areas are highlighted in Figure 2.1. Drainage problems and issues within the North East region have included the following:

- the general issue of waterlogging impacting on the productivity of agricultural activities;
- the diversion / outfall of drainage water onto and off road reserves away from their natural flow paths;
- the construction of on-farm levees which alter the natural passage of runoff;
- the impact that roads have on altering drainage characteristics in terms of both diverting drainage water, impeding the drainage of water and concentrating flows;
- the need for funding and management of increased maintenance of drains / waterways (ie. to manage siltation and erosion); and
- the drainage / loss of wetlands in the area and their associated environmental benefits (ie. habitat for vegetation and wildlife and their water quality treatment functions).

There are only two major rural drainage schemes in the North East region. They are listed as follows:

- Gooramadda Drainage Scheme located at the downstream end of Bob and Dicky Creek which was constructed in the 1960's with recent minor extensions to the scheme carried out by North East Waterways in 1997; and
- Carlyle Drainage Scheme located north of Rutherglen and constructed in the late 1950's / early 1960's.

Scale 1:1 100 000

Figure 2.1 - Rural Drainage Priority Areas in North East CMA Region

The majority of rural drainage activities in the past thirty years has involved the deepening / widening of natural drainage lines particularly during the period 1970 to 1985. These types of works were carried out on sections of Black Dog Creek, Whim Creek, Sleeping Dog Creek, Diddah Diddah Creek, Fogarty Creek, Elliot Creek, College Creek, Barmundah Creek, Bob and Dicky Creek, Murdering Hut Creek and Cookinburra Creek. More recently the focus has been on stabilisation works to address erosion and siltation problems as they arise.

Most of the above works occurred on what were originally broad shallow depressions which have been transformed into drainage channels to improve the drainage characteristics of the area. The majority of these drains were declared as designated waterways by the BDCIT in 1990 and as such the CMA includes them in its waterway management program which involves undertaking stream stabilisation works based on assessed priorities across the whole of the region.

The Gooramadda Drainage Scheme was also declared by the BDCIT in 1990 as designated works and as such its management and control was the responsibility of the BDCIT.

2.4 Potential For Future Rural Drainage Development

The focus for rural drainage activities has in the past 10 to 15 years been on the stabilisation of existing drains rather than the construction of new rural drains or rural drainage systems. This is partly due to the majority of the region being relatively free draining with limited waterlogging problems therefore arising.

Those flatter areas within the region which in the past have experienced waterlogging would in general appear to be relatively well serviced by the rural drainage works which occurred in the 1950's through to the 1980's. These works have however required ongoing maintenance to stabilise sections of drain which experience erosion or siltation.

It is not therefore apparent that there is currently a need for establishing major new rural drainage schemes such as the Gooramadda Drainage Scheme. Future rural drainage activities are more likely to involve smaller collector drains servicing single or a small number of properties which discharge into an existing waterway / drainage system. Future rural drainage management needs to ensure that potential adverse impacts arising from the cumulative effects of these minor works are avoided and maintaining the existing rural drains in a stable condition.

The strategy for future rural drainage management includes encouraging the use of catchment management techniques ahead of constructing rural drains as a means of addressing waterlogging problems. The retention of existing significant wetlands is also an integral part of the strategy. Both these objectives should further limit the need / potential for future rural drainage works.

3. Development of the strategy

3.1 Vision For Rural Drainage Management

The North East Regional Catchment Strategy (June 1997) states the vision for the North East region as:

"Ensuring sustainable natural resource management whilst increasing productivity and community viability for the benefit of the North East Region and the downstream community".

This vision is based around managing the environment in an ecologically sustainable manner, with also a clear recognition of the economic sustainability of the region.

The vision for rural drainage management needs to also support the ecological and economic sustainability of the region. The proposed vision for rural drainage management within the North East region is therefore :

"With the involvement of the local community, to manage rural drainage activities in order to maintain and enhance agricultural productivity whilst protecting and enhancing the biodiversity both within the region and downstream of the region."

3.2 Strategy Objectives

Objectives for rural drainage management have been developed in consultation with key stakeholders. Objectives for the management of rural drainage in the North East region are listed as follows:

- Objective 1: To co-ordinate the management of rural drainage throughout the region.
- Objective 2: To maintain and enhance the functions of natural drainage lines to convey and store water.
- Objective 3: To limit the rate of discharge from rural drains to minimise changes in downstream flooding and drainage behaviour.
- Objective 4: To minimise any adverse impacts on the environment and water quality in the catchment.
- Objective 5: To implement measures which reduce the impact of waterlogging within the region and lead to improved agricultural productivity.
- Objective 6: To control modifications / extensions to existing drainage schemes in the region to ensure the stability of existing drains.

Objective 7: To minimise the construction of inappropriate drainage works within the region.

Objective 8: To support stakeholder and the broader community education and involvement in rural drainage management.

3.2.1 Water Quantity Control Objectives

Specific objectives for limiting the impact of proposed rural drainage activities on downstream flooding and drainage behaviour are listed as follows:

- to control the rate of discharge so that peak flows are not increased leading to significant increased downstream flooding in drains and/or waterways;
- to ensure that points of entry and exit (to and from properties) are not unduly altered;
- to consider the impacts of potential increased flooding on downstream properties; and
- to ensure that drainage works consider the potential for future drainage development.

3.2.2 Water Quality Control Objectives

Specific objectives for limiting the impact of proposed rural drainage activities on the health of downstream waterways, storages and wetlands are listed as follows:

- to limit the export of nutrient loads into downstream waterways, storages and wetlands;
- to limit the drainage of saline groundwater into downstream waterways, storages and wetlands;
- to limit the export of sediment loads resulting from erosion associated with drainage works into downstream waterways, storages and wetlands; and
- to ensure the health of significant existing wetlands.

3.3 Formal Approval Process

The Regional Strategy for Rural Drainage Management will provide a framework for the protection of regional bio-diversity, soil and water related values. The purpose of this framework will be to improve the management of rural drainage activities within the North East region by developing a formal process for assessing proposed rural drainage works based on regional strategies, principles and standards.

The framework provides the following:

- sets out a formal process for the assessment of proposed new drainage works within the region;

- identifies roles and responsibilities of relevant authorities in the above approval process; and
- identifies roles and responsibilities of relevant authorities in other rural drainage management functions.

Regional drainage within the North East region requires co-ordination and control to limit the potential associated adverse impacts which can arise from rural drainage activities. An "ad-hoc" approach to drainage management will lead to reduced benefits, increased disputes and increase the rate and extent of adverse impacts which can result from rural drainage works.

A By-law was established by North East Waterways in 1996 requiring that all proposed rural drainage activities obtain formal approval prior to being carried out. This formal approval process has not been actively used by landowners since the establishment of the By-law for the following possible reasons:

- the detailed information which needs to be submitted with an application which requires all potential adverse impacts arising from rural drainage works to be addressed (ie. landowner will generally require professional assistance in preparing application in accordance with the Application Guidelines);
- the possible need for an applicant to gain separately both Local Government and North East Waterways/CMA approval for proposed works;
- recent low levels of drainage work activities due to relatively dry years in 1997-1998; and
- a reduced level of cropping activities in the Black Dog Creek area for economic reasons with an associated reduced need to avoid extended periods of waterlogging.

It is proposed that the formal approval process for assessing proposed rural drainage activities within the regional strategy be based on all rural drainage proposals requiring Local Government planning consent. The CMA would act as a referral authority within this formal approval process which would form one of the key elements of the framework for future rural drainage management.

Under the Victorian Planning Provisions (the VPP's), which represent a consistent state-wide format for planning ordinances, a schedule to the Rural Zones is provided to express, at the discretion of the Council / Shire, the circumstances under which specified land forming works, including drainage, require a permit. To assist in co-ordination under the VPP's, the CMA can be specified as a Referral Authority where works have the potential to alter the drainage characteristics of an area. The CMAs comments must be considered by the Council / Shire in its determination whether to issue or not issue a permit and the conditions attached in relation to permits which are issued.

This process provides an opportunity for the CMA to be an active partner involved in the land use approval process, in conjunction with local

government, to ensure works are consistent with broader catchment and rural drainage strategies.

The approach of using the local government planning process for assessment of proposed drainage works is consistent with that proposed for the management of works on floodplains. It will also eliminate the potential need for an applicant to gain separate approval from both local government and the CMA for certain works.

The formal approval process will involve four stages discussed as follows.

- **Stage 1 - Initiation**

- Landowner develops concept of rural drainage improvement. Needs to consider catchment management alternatives ahead of drainage works.
- Landholder to obtain a Planning Permit Application Form for rural drainage from Local Government and make an initial assessment against the check list within the application form to gain an understanding of the application requirements and the likely chance of the applications success.
- Local Government may decide to undertake an initial inspection following the initial approach from the landowner although it is likely this would not be needed until a formal application is lodged.

- **Stage 2 - Formal Application**

- Landowner prepares formal application to obtain a permit to carry out rural drainage activities using application form. Details to be provided similar to that required to currently gain approval for carrying out rural drainage works in Black Dog Creek catchment under the existing By-law (ie. meets relevant design principles and standards, considers impacts on downstream drains and waterways).
- Landowners are likely to require professional assistance to prepare the application. General advice can be provided by the CMA. Specific advice in relation to any designs would need to be provided by qualified practitioners.

- **Stage 3 - Local Government Assessment**

- Local Government to make an initial assessment of application and check that it provides all of the requested information.
- Local Government to refer the application to the CMA if the proposed works do not clearly meet the relevant regional rural drainage principles and standards.
- Local Government to refer the application to any other relevant authorities (eg. NRE, VicRoads, V/Line, RWA's) for their assessment.
- Referral authorities to assess application and respond to Local Government.

- **Stage 4 - Decision and Planning Output**

- Local Government to make decision on application based on its own assessment and those of the referral authorities.
- Local Government to advise applicant of outcome (ie. application approved possibly with conditions attached or application refused with reasons for refusal outlined).
- Local Government to ensure any approval conditions complied with by inspections during or after completion of works as appropriate.

3.4 Exemptions From Formal Approval Process

It is recommended that exemptions from requiring a permit to carry out rural drainage works activities be limited to the following:

- routine maintenance of non strategic rural drains (eg de-silting of drains) which does not affect the original grade, shape or size of the drain;
- where rural drainage works are to be carried out according to the details specified in an approved scheme (eg. a scheme which forms part of an approved rural drainage management plan); and
- construction of minor on-farm rural drainage works which do not involve any of the following:
 - construction of a drain greater than 0.3 metre deep and/or draining a catchment greater than 5 hectares in area; and
 - the diversion of runoff across away from its natural drainage path.

3.5 Roles And Responsibilities

3.5.1 Key Stakeholders

The roles and responsibilities of key stakeholders involved in the management of rural drainage activities needs to be clarified to allow an effective strategy to be implemented. As part of this process the CMA needs to develop ongoing relationships with the other stakeholders.

Key stakeholders are listed as follows:

- North East CMA;
- Local Government (Alpine Shire, Rural City of Wangaratta, Indigo Shire, City of Wodonga, Towong Shire and Moira Shire);
- Department of Natural Resources and Environment (NRE);
- rural water authorities (North East Water, Goulburn-Murray Water); and
- landowners and their representative groups (Victorian Farmers Federation, Landcare Groups)

Roles and responsibilities in general of the key stakeholders are discussed in general terms in the following sections. Roles and responsibilities in relation to the implementation of identified management actions are given in Section 4.

3.5.2 North East CMA

Consultation with stakeholders in the earlier stages of this project reveal an expectation that the CMA is to generally adopt the lead agency role in relation to the management of rural drainage. Given that the CMA adopts this lead role, the following management functions need to be carried out by the CMA in that role:

- programming and implementation and/or supervision of maintenance and approved improvements to strategic rural drains within the region (strategic drains are those drains which provide some degree of public benefit);
- investigation of serious rural drainage problems and/or disputes between private landowners as they arise;
- assessment of proposed new rural drainage works where such works do not clearly meet the relevant application requirements (ie. as a referral authority to local government as outlined in Section 3.3);
- preparation of rural drainage management plans as the need arises (eg. as for 1994 Drainage Management Plan for Black Dog Creek area);
- ongoing stakeholder and broader community education and training in relation to rural drainage management;
- preparation of applications for special funding (eg NHT) for rural drainage maintenance and improvement works for eligible works; and
- provide assistance / advice to landcare groups where rural drainage improvement projects are being undertaken (eg. fencing and revegetation of drain buffers).

3.5.3 Local Government

The role of Local Government is as follows:

- to incorporate rural drainage management planning controls into their local planning schemes;
- to carry out its role in the formal approval process for the assessment of proposed rural drainage activities as outlined in Section 3.3;
- provision of compatible road structure drainage capacities on local government roads where such structures form part of strategic rural drainage schemes.

The CMA will need to provide advice / training to local government staff in relation to their assessment of applications to undertake rural drainage works. It is not the intention that local government staff undertake detailed checking of applications. This will be carried out by the CMA in its role as a referral authority.

3.5.4 Other Authorities

- **NRE**

The local offices of the NRE will need to provide specialist advice to Local Government in relation to the significance status of wetlands which may be effected by proposed rural drainage works. This advice would be provided by the NRE as a referral authority within the formal approval process. Advice may also be sought from the NRE in relation to flora and fauna issues and soil management issues.

- **VicRoads and V/Line**

VicRoads and V/Line should provide compatible drainage structure capacities where such structures form part of strategic rural drainage schemes. Structures should also be provided in accordance with the strategy objectives (ie. to maintain and enhance the functions of natural drainage lines and ensure that points of entry and exit are not unduly altered).

The diversion of flows away from their natural drainage lines to reduce the number of road and railway line drainage structures should in general be avoided. This practice leads to a concentration of flows which has in the past been blamed for increased downstream flooding and erosion.

VicRoads and V/Line will need to be consulted as referral authorities where proposed rural drainage activities may impact on their assets.

- **Rural Water Authorities (RWAs)**

RWAs (eg. Goulburn Murray Water, North East Region Water Authority) will need to be consulted as a referral authority where proposed rural drainage activities may impact on their assets.

3.5.5 Landowners / Landowner Groups

The role of landowners is as follows:

- to seek approval for all proposed new rural drainage works with the exception of those category of works eligible for exemption;
- to implement catchment management techniques as a primary means of addressing waterlogging problems (ie. the construction of new drains should be viewed as a secondary measure needed only if waterlogging problems cannot be overcome by catchment management techniques); and
- to provide input into identifying priorities for maintenance / improvement works on strategic drains (eg. through the Implementation Committees and Landcare Group submissions).

3.6 Cost Sharing

3.6.1 Principles

Cost sharing arrangements for rural drainage management should be based on the State Government's natural resource management guidelines. These guidelines are listed as follows:

- at the broadest level cost sharing arrangements are based on a combination of polluter pays and beneficiary pays principles;
- all natural resource users and managers have a duty of care to ensure that they do not damage the natural resource base. The users should be responsible for making good any damage incurred as a result of their actions;
- when it is not possible to identify causes of damage then primary beneficiaries should pay;
- Government contribute primarily for activities which produce public benefits. Users, both existing and future, are expected to pay for activities which provide private benefits;
- Government may agree to contribute to land and water management activities that produce private benefits where the cumulative uptake of these activities provides significant public benefit;
- before Government will contribute to any land and water management activity, the activity must be technically sound and the benefits must justify the cost; and
- Government will meet the cost of statewide planning, statewide resource monitoring and assessment, and research and investigation, where they are crucial to sustainable resource management.

Rural drainage activities commonly only provide benefits to the private landowner proposing the works. On the basis of the above resource management guidelines, the capital costs and associated ongoing maintenance costs of drainage works which generate only private benefits should be met wholly by the beneficiary.

Public benefits can however be derived by the implementation of drainage works. This can be in the form of:

- reducing road maintenance costs;
- reduction in erosion induced by sheet runoff; and
- maintaining lower water table levels.

Where the above and other public benefits are demonstrated to be derived from rural drainage works, then a portion of the cost reflecting the distribution of the benefits should be contributed by the public (ie. through Commonwealth, State and Local Government funding).

Catchment management techniques in general provide increased levels of public benefit in comparison to rural drainage works without the potential adverse impacts associated with rural drainage works. These public benefits can include:

- reduced runoff (ie. leads to a decrease in downstream flooding);
- reduced sediment, nutrient export; and
- reduced water table levels.

The implementation of catchment management techniques to address waterlogging should therefore be encouraged and supported through the provision of public funding for such activities.

3.6.2 General Guidelines

General guidelines to apply to cost sharing arrangements are outlined as follows. Program specific cost sharing proposals are provided in Section 4.

- **New Works - Catchment Management Activities**

Catchment management techniques need to be encouraged as a primary means of reducing waterlogging as they offer increased public benefits without the adverse impacts which can arise from rural drainage works.

The cost sharing arrangements for these types of works should reflect the distribution of benefits. The appropriate level of funding assistance will vary from project to project.

- **New Works - Rural Drainage Activities**

Government funding assistance for rural drainage works should not be provided unless public benefits are derived from the works.

Landholder contribution costs for proposed rural drainage schemes servicing multiple properties should be based on a pro rata basis which uses the area on each property within the drains catchment which actually derives some significant benefit from the new drainage scheme (ie. does not include the areas within the catchment which are not subject to waterlogging).

Municipalities should contribute to the cost of compatible road structures which form part of strategic rural drainage schemes where they stand to benefit from reduced road maintenance costs due to a reduction in roadside waterlogging and possible road overflows.

3.7 Funding Sources

Funding contributions can be sought from:

- Commonwealth Government (eg. Department of Primary Industries and Energy)
- State Government (eg. DNRE)
- Local contributions (eg. council, CMA, landowners)

3.7.1 Commonwealth Funding

The primary source of Commonwealth Government funding contributions is the Natural Heritage Trust (NHT). The main program operating within the NHT which could provide funding for the implementation of the rural drainage strategy is the National Landcare Program. Other NHT programs which may provide funding sources include the National Wetlands Program, the National Vegetation Program and the Murray-Darling 2001 Initiative.

3.7.2 State Funding

State Government funding sources include the following:

- State Government contributions to the NHT program to complement Commonwealth Government contributions;
- Core annual funding for CMAs towards their corporate costs; and
- Waterway Business funding for CMAs to implement floodplain management, waterway management and rural drainage activities outlined in their business plans.

3.7.3 Local Funding

The major source of local funding include the following:

- CMA base rate through the collection of tariffs within its region;
- negotiated cost sharing agreements for specific projects and management plans (eg. between the CMA, municipal councils and water authorities);
- municipal council base rate for contributions to the NHT program and other initiatives; and
- landowners.

The major local source of funding is likely to be through the CMA rate base which involves the collection of tariffs within the region for the purpose of implementing floodplain management, waterway management and rural drainage management regional strategies.

3.8 Rural Drainage Design Principles

The preparation and assessment of applications to undertake rural drainage activities will largely relate to complying with identified design principles and standards which are intended to minimise the potential adverse impacts associated with rural drainage works. Proposed design standards for surface drains associated with the design principles are presented in Appendix A.

The following principles to rural drainage management in the North East region are to apply.

3.8.1 *Catchment Wide Approach*

A catchment wide approach (ie. an approach which considers impacts on the whole catchment) is required as opposed to an ad-hoc approach. This is critical to avoid the potential adverse impacts on downstream properties and waterways which can arise from rural drainage works. It is the only approach that allows an assessment of all potential impacts and incorporation of appropriate mitigating measures.

All rural drainage proposals must form part of an approved scheme or be compatible (ie. be able to integrate) with existing drainage schemes.

Planning of rural drainage for the region should not therefore consider municipal boundaries given the adoption of a regional catchment wide approach.

3.8.2 *Catchment Management Options*

The approach of managing water at the source, through catchment based strategies is often the most sustainable option. Drainage can overcome the existing problem, however in doing so has often in the past resulted in a transfer of the problem onto a downstream landholder.

Catchment management options are to be encouraged as a primary means of rural drainage management. The construction of new or enlarged drains should be viewed as a secondary form of drainage management and should only be implemented if catchment management techniques do not fully overcome drainage problems.

Catchment management options available include:

- management of water at the source;
- improvement of soil management;
- increase the vegetation/plant uptake of water;
- storage/reuse of runoff;
- management of wetland and vegetation communities; and
- management of riverine environments.

3.8.3 Cumulative Effects

Both the impacts arising from the individual proposal and the possible cumulative impacts which may arise from multiple similar proposals are to be taken into account when assessing impacts arising from proposed rural drainage works.

3.8.4 Design Standards

Appropriate design standards must be adopted to avoid the adverse impacts which can be associated with rural drainage. The design standards need to address the following:

- longitudinal drain slope;
- drain cross section;
- drain capacity;
- drain outfall;
- water quality control;
- existing wetlands;
- fencing and revegetation; and
- heritage and cultural values.

Regional design standards for the above are presented in Appendix A.

3.8.5 Water Quantity Considerations

The design standards need to be met such that significant increases in downstream flooding do not result from rural drainage works. This may necessitate the inclusion of retarding basins as part of proposed rural drainage works.

The degree to which control is provided over outflows and provision, if any, is made for extraction, will vary according to particular circumstances.

3.8.6 Water Quality Considerations

Design standards need to be met so that adverse impacts on downstream water quality do not result from rural drainage works. This needs to involve the following:

- determination of acceptable water quality limits for critical aspects of the catchment (ie. wetlands, receiving waters); and
- consideration and incorporation of treatment options.

Nutrient levels generally decrease significantly from source to drain outfall. It may be that a suitable drain design that incorporates selected vegetation species may in the future provide an effective treatment system. There has however yet to be any definitive study done on this issue.

3.8.7 *Enlist Community Support*

Approval for works should be sought from adjoining and all affected landowners. As a general rule the more successful schemes are those that have the stakeholders as active participants (ie. they have a vested interest in getting it done).

4. Regional Strategy Programs

4.1 General

The success of the regional strategy will be achieved through the implementation of identified actions. The strategy actions have been split into categories of actions or programs. There are six programs listed as follows:

- statutory land use planning;
- information management;
- education and training;
- local drainage studies and drainage management plans;
- maintenance / improvement works; and
- performance monitoring.

Details of the actions required to be undertaken and the authorities responsible for implementing the various actions in either a primary or supporting role are presented in the following sections. Roles are defined as follows:

- **Lead Agency** - directly initiates, coordinates and manages the process by which the task is achieved. Actively seeks the necessary input from the supporting authorities and stakeholders to ensure the task is implemented.
- **Support Agencies** - provides assistance on request (eg. advice, inspection, assessment, funding etc) to the authority nominated as the lead agency.

The priority / target timeframe for the implementation of the various tasks within each programme have been assigned as follows:

- **high** - to be implemented within the initial 3 year business plan period;
- **medium** - to be implemented within 5 years;
- **long** - to be implemented within 10 years; and
- **ongoing** - recurring task.

4.2 Statutory Land Use Planning

The use of the local planning process for the assessment of proposed rural drainage activities was discussed in Section 3.3. Draft rural drainage policy and planning controls for incorporation into local government planning schemes is presented in Appendix B.

Consideration should be given to incorporating additional planning controls relating to earthworks in general into local planning schemes which would

encompass works which have the potential to impact on rural drainage and also flooding behaviour (eg. construction of farm access tracks which act as levees).

It is proposed that responsibility for enforcement of the formal approval process for rural drainage works be jointly adopted by local government and the CMA.

Actions and associated implementation responsibilities for tasks associated with statutory land use planning are presented in Table 4.1.

Table 4.1

Programme for Statutory Land Use Planning

Task No.	Strategy Action	Implementation	Lead Agency	Support Agencies	Priority	Total Cost (\$)
1	Appropriate rural drainage planning controls be provided for inclusion in local government planning schemes (draft policy / controls provided in Appendix B of this report).		CMA	All key stakeholders will have opportunity to review draft strategy.	High	5,000
2	Rural drainage planning controls adopted by local government and incorporated into local planning schemes at next review of schemes.		Local Government	CMA	High	5,000
3	Applications for rural drainage activities to be assessed by Local Government using CMA and others as referral authorities.		Local Government	CMA, NRE, RWA's, VicRoads, & V/Line.	Ongoing	10,000 / annum
4	Approved works to be inspected to ensure compliance with conditions.		Local Government	CMA, NRE, RWA's, VicRoads, & V/Line.	Ongoing	2,000
5	Periodic review of rural drainage policy and planning controls.		CMA	Local Government & NRE.	Ongoing	3,000 / annum

Proposed cost sharing arrangements for the implementation of tasks associated with the statutory land use planning program are as follows:

- Local contributions (CMA and Local Government) to wholly fund the development and incorporation of rural drainage planning controls into the local government planning schemes and any future reviews; and

- Local contributions (CMA, Local Government and landowners through application charges) to fund the assessment of applications for rural drainage activities.

4.3 Information Management

Limited documentation is available for existing rural drains in the North East region as discussed in the Investigations report (Ref. 3). Little or no documentation of the Carlyle Drainage Scheme exists. There is therefore a need to undertake an audit of rural drains in the North East region to establish sufficient baseline data to allow sufficiently informed assessment of future rural drainage proposals.

The objective of the initial rural drainage audit / survey would be as follows:

- to identify using GPS survey techniques the location and extent of existing rural drains (both individual rural drains and larger drainage schemes);
- to identify and locate structures along the existing drain routes (ie. culvert / bridge crossings); and
- to catalogue the condition of existing drains (ie. the need or otherwise to undertake maintenance and/or improvements based on a visual inspection).

Costs associated with updating rural drainage information on the CMA's database as future works are approved and carried out should be relatively minor based on the low levels of new rural drainage activity which has occurred in recent years.

Actions and associated implementation responsibilities for tasks associated with information management are presented in Table 4.2.

Proposed cost sharing arrangements for the implementation of tasks associated with the land information program are as follows:

- initial audit of strategic rural drains to establish baseline data to be funded by the Commonwealth and State Government (ie. in the same way that baseline data is being funded for floodplain management baseline data);
- Local contributions to fund any future audits/surveys of strategic rural drains; and
- Local contributions to fund the cost of updating the information database.

Table 4.2

Programme for Information Management

Task No.	Strategy Action	Implementation	Lead Agency	Support Agencies	Priority	Total Cost (\$)
1	Initial audit / survey of rural drains within North East region carried out to establish baseline data.		CMA	Landowners	High	30,000
2	Output of rural drainage audit to be added to the CMA's information database (eg. GIS system).		CMA	-	High	5,000
3	New rural drainage works to be added to CMA's information database.		CMA	Local Government	Ongoing	3,000 / annum

4.4 Education And Training

It will be necessary for Local Government staff to have a good understanding of the rural drainage application requirements. It is therefore likely that the CMA may need to carry out limited training (ie. conduct workshops) for Local Government staff in relation to carrying out preliminary assessments of applications (ie. deciding whether the application needs referral to the CMA).

As previously indicated, landowners are in general likely to require professional assistance to prepare applications for carrying out rural drainage works. It may therefore be necessary for the CMA to again carry out limited training in the form of workshops for preparing rural drainage designs and applications in accordance with the regional design principles / standards.

Actions and associated implementation responsibilities for tasks associated with education and training are presented in Table 4.3. The CMA has been allocated the lead agency role for implementing the identified actions associated with the education and training programme.

Proposed cost sharing arrangements for the implementation of tasks associated with the education and training program are as follows:

- Commonwealth and State Governments to fund the education and training of stakeholders and the broader community in relation to the implementation of the regional rural drainage strategy in line with other strategies which are crucial to sustainable resource management.

Table 4.3

Programme for Education and Training

Task No.	Strategy Implementation Action	Lead Agency	Support Agencies	Priority	Total Cost (\$)
1	Advertisement / promotion of strategy.	CMA	Local Government, NRE	High	10,000
2	Conduct training workshops for Local Government staff, other authorities, practitioners and landowners.	CMA	Local Government, NRE	Medium	10,000
3	Ongoing contact with Implementation Committees, Landcare Groups to encourage catchment management techniques as primary means of addressing rural drainage problems.	CMA	NRE	Ongoing	-

4.5 Management Plans / Drainage Dispute Investigations

The need for preparing specific area rural drainage management plans similar to that prepared for the BDCIT would at this time not appear warranted. More effort is however likely to be required for investigating serious private landowner disputes over rural drainage behaviour.

Actions and associated implementation responsibilities for tasks associated with rural drainage investigations and the preparation of rural drainage management plans are presented in Table 4.4.

Proposed cost sharing arrangements for the implementation of tasks associated with the investigation of private landowner drainage disputes and the preparation of drainage management plans are as follows:

- Funding for the preparation of Drainage Management Plans similar to that prepared for the BDCIT to be done on a 1:1:1 basis (Commonwealth: State: Local). The Local funding contribution would be provided by the CMA and Local Government; and

- Funding to cover investigation of private landowner rural drainage disputes should be funded through landowner drainage tariffs.

Table 4.4

Programme for Rural Drainage investigations and Management Plans

Task No.	Strategy Implementation Action	Lead Agency	Support Agencies	Priority	Total Cost (\$)
1	Investigation / resolution of rural drainage disputes.	CMA	Landowners, Local Government, NRE, VicRoads, Vline, RWA.	Ongoing	10,000 /annum
2	Preparation of rural drainage management plans as the need arises (ie. as for BCIT).	CMA	Local Government, NRE, VicRoads, V Line, RWA, Landcare Groups, Landowners.	Ongoing	-

Proposed cost sharing arrangements for the implementation of tasks associated with the investigation of private landowner drainage disputes and the preparation of drainage management plans are as follows:

- Funding for the preparation of Drainage Management Plans similar to that prepared for the BDCIT to be done on a 1:1:1 basis (Commonwealth: State: Local). The Local funding contribution would be provided by the CMA and Local Government.
- Funding to cover investigation of private landowner rural drainage disputes should be funded through landowner drainage tariffs.

4.6 Maintenance / Improvement Works

The CMA currently carries out a stabilisation works program on waterways throughout the North East region including a number of waterways which are actually man made drains which have been constructed along natural depressions to improve drainage efficiency. This program includes the Gooramadda Drainage Scheme which was declared as designated works in 1990 by the BDCIT. The existing waterway management program therefore encompasses a large proportion of the rural drains within the North East region.

The majority of future new rural drainage works are likely to be non strategic (ie. have no public benefit) and therefore the capital and future maintenance costs associated with these works should be wholly funded by the private landowners putting forward the works.

Rural drains within the CMA which fall within the category of strategic rural drains (ie. provide some degree of public benefit) should be identified as part of the initial rural drainage audit study.

Actions and associated implementation responsibilities for tasks associated with maintenance and improvements to strategic rural drains are presented in Table 4.5.

Table 4.5
Programme for Maintenance / Improvement Works for Strategic Drains

Task No.	Strategy Implementation Action	Lead Agency	Support Agencies	Priority	Total Cost (\$)
1	Priorities for maintenance / improvement works to be identified on an ongoing annual basis.	CMA	Landowner Groups (ICs)	Ongoing	3,000 /annu m
2	Maintenance and improvement works on strategic drains.	CMA	Landowner Groups, Local Government, RWA, VicRoads, V Line.	Ongoing	25,000

Proposed cost sharing arrangements for the implementation of tasks associated with the implementation of maintenance and improvement works are as follows:

- The cost of maintenance / improvement works on non strategic drains (ie. no public benefits derived) to be met wholly by the landowner or group of landowners.
- The cost of maintenance / improvement works on strategic rural drains to be based on the distribution of benefits provided by the drain or drainage system.

4.7 Performance Monitoring

Actions and associated implementation responsibilities for tasks associated with monitoring the performance of the regional strategy are presented in Table 4.6. The CMA has been allocated the lead agency role for implementing the identified actions associated with the performance monitoring programme.

Proposed cost sharing arrangements for the implementation of tasks associated with performance monitoring are as follows:

- The cost of ongoing monitoring of the implementation of the strategy and future updates of the strategy to be met by the CMA; and
- The cost of ongoing monitoring of the implementation of the strategy and future updates of the strategy to be met by the CMA; and
- The cost of future audits / surveys of the condition of strategic rural drains to be met by local contributions (CMA, local government and landowners).

Table 4.6
Programme for Performance Monitoring of Strategy Implementation

Task No.	Strategy Implementation Action	Lead Agency	Support Agencies	Priority	Total Cost (\$)
1	Rural drainage strategy reviewed at completion of each business cycle (to involve consultation with key stakeholders).	CMA	Local Government, NRE, V/Line, VicRoads, Landowner Groups.	Ongoing	5,000 /review
2	Periodic update audit / survey of condition of strategic rural drains.	CMA	Local Government, NRE, Landowner Groups.	Ongoing	10,000 /audit

4.8 Strategy Implementation Costs

Cost sharing will be based on the cost sharing principles identified in Section 3.6. A preliminary indication of the total cost of implementing the regional strategy is provided in Table 4.7.

Table 4.7
Strategy Implementation Costs

Program	Estimated Annual Expenditure (\$)					
	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Statutory Land Use Planning	5,000	5,000	12,000	12,000	15,000	49,000
Information Management	0	35,000	3,000	3,000	3,000	44,000
Education and Training	10,000	10,000	-	-	-	20,000
Management Plans - Drainage Dispute Investigations	10,000	10,000	10,000	10,000	10,000	50,000
Maintenance / Improvement Works	28,000	28,000	28,000	28,000	28,000	140,000
Performance Monitoring	-	-	5,000	-	10,000	15,000
Totals	53,000	88,000	58,000	58,000	63,000	318,000

5. References

1. North East Catchment and Land Protection Board (1997), North East Regional Catchment Strategy.
2. North East Salinity Working Group (1997), Draft North East Salinity Strategy, prepared for the North East Catchment Management Authority.
3. ID&A Pty Ltd (1999), Regional Strategy for Rural Drainage Management - Stage 2 Investigations Report, prepared for the North East Catchment Management Authority.
4. Ian Drummond and Associates Pty. Ltd. (1994), Development of a Drainage Management Plan, prepared for the Black Dog Creek Improvement Trust.
5. Sinclair Knight Merz (1997), Community Surface Drainage Schemes - Guidelines for Design, prepared for the Department of Natural Resources and Goulburn-Murray Water.

Appendix A

Regional Design Standards - Surface Drains

Appendix B

Draft Policy and Planning Controls

REGIONAL DESIGN STANDARDS - SURFACE DRAINS

A1 GENERAL

The design standards presented in this report are largely based on those given in the 1994 Drainage Management Plan for the BDCIT (Ref. 4) and the 1997 Guidelines for Design of Community Surface Drains (Ref. 5) prepared for the NRE and Goulburn-Murray Water.

Regional standards are to apply for the following:

- longitudinal drain slope;
- drain cross section;
- drain capacity ;
- drain outfall;
- water quality control;
- existing wetlands;
- fencing and revegetation; and
- heritage and cultural values.

A2 REGIONAL STANDARD 1 - LONGITUDINAL DRAIN SLOPE

The slope of a drain and its surface roughness, will determine the rate at which water will flow. This parameter therefore is related to other regional standards including flow rate and quantity. A design standard for the longitudinal drain slope is required to limit the potential erosion within the drain and to limit the deposition of silt within the drain.

The longitudinal grade of a drain will be governed by the natural slope of the ground. Where possible, the design bed grade should be within the limits shown in Table A1. It may however not be possible to achieve the minimum grade in particularly flat areas. In these areas the additional maintenance cost associated with increased siltation and subsequent weed growth will be unavoidable.

The optimum grade for excavated drains is between 1/1600 and 1/1200. At these grades the velocities limit both weed growth and erosion.

Particular care must be taken to avoid the construction of drains within erosive soils. Erosion will lead to a reduction in downstream water quality, impact adversely on infrastructure, cause sedimentation in downstream drains and waterways and create a highly efficient channel possibly leading to increases in downstream flood peaks. Often regardless of slope, unless drains are well vegetated, within some soil profiles erosion will result.

Table A1 - Longitudinal Bed Grades

Capacity	Flow of 0-50ML/d	Flow over 50ML/d
Maximum : clay loam soils	1/500 (0.2%)	1/600 (0.17%)
Minimum : sandy or dispersive soils	1/700 (0.14%)	1/1000 (0.1%)
Optimum	1/1200 (0.08%)	1/1600 (0.06%)
Minimum	1/2500 (0.04%)	1/4000 (0.025%)

A3 REGIONAL STANDARD 2 - DRAIN CROSS SECTION

Shape

A trapezoidal section has been universally adopted as the cross section which offers the best compromise between hydraulic efficiency and construction and maintenance requirements.

Drains which have a bed/depth ratio of between 1.0 and 3.0* have been recommended by Ref. 5 for the following reasons:

- the area of weed growth and its effect on the hydraulic capacity of the drain is reduced;
- the drain is more efficient over a wide range of flows. Low flow velocities are higher and siltation is reduced;
- drain maintenance, desilting and spraying are easier to perform; and
- less land is required for the drain.

Drain Depth

The bed depth of a drain is dependant on the design flow, velocity design constraints, command requirements for drainage of land and surface elevations along the drain route.

The following principles are to apply to the selection of drain depth:

- avoid protrusion into groundwater table;
- allow for 0.1 metre below lowest point to be drained and a minimum grade of 1/2500 from the low point to the drain being designed; and
- avoid drain depths exceeding 1.5 metres for stability reasons.

Bed Width

The following drain bed width standards are recommended:

- minimum bed width of 1.0 metres to apply
- maximum bed width of 2.5 metres to apply

The above limits are based on a review of maintenance and capacity considerations. A bed width in excess of 2.5 metres should not be necessary given that the capacity of a drain with a bed width of 2.5m, depth of 1.5m, longitudinal grade of 1/2500 is 5.1 m³/s (440 ML/d). This should more than meet the capacity requirements of almost all rural drains.

Batter Slopes

The selection of the batter slopes is made on the basis of depth of cut and soil type. Table A2 shows the maximum batter slopes which should be adopted to prevent batter slippage.

Table A2 - Drain Batter Slope Selection

Depth of Cut (m)	Minimum Batter Slope	
	Clay Loam/Clay Soils	Dispersive or Sandy Soils
Less than 1.0 m	1 : 1.5	1 : 2.0
Greater than 1.0m	1 : 2.0	1 : 2.5
<u>Note:</u> Batter slope is written as vertical : horizontal		

Banks

Banks along drains are primarily provided to prevent runoff directly entering the drain and eroding the batters. Banks along drains are however in general not encouraged as they can impede flows. Where banks are present, it is recommended that the drain bed depth be reduced to limit the drain capacity to the relevant design discharge. It is also recommended that a buffer be provided between the top of drain and the toe of the bank batter.

Dimensions of the banks can vary according to the amount of excavated material available, however it is suggested that banks, where provided, should have the following dimensions:

Height above natural surface	0.3m maximum
Design crest width	1.0m
Batter slope	As for cut selection
Buffer from top drain to bank toe	0.3 times drain top width

The above guidelines are an optional feature of any proposed rural drainage design. Banks should not impede the discharge of runoff down natural drainage lines or the conveyance of floodwaters in floodplains.

A4 REGIONAL STANDARD 3 - DRAIN CAPACITY

The construction of rural drains has the potential to increase peak flows within downstream drains and waterways leading to increased flooding on adjoining properties. It is essential that rural drainage works are designed such that increases in peak downstream flows do not occur which result in significant adverse impacts on downstream landowners.

The primary capacity design standard which is to apply to rural drainage design is that drains are to have a maximum capacity equivalent to the 2 year average recurrence interval (ARI) design flood flow. The 2 year ARI standard is viewed as providing a reasonable level of protection for crop and pasture and will also satisfactorily limit the period of inundation for larger events due to the shortening of the tailwater flooding period.

The 2 year ARI design flow can be determined using the Rational formula method based on the procedures specified in Australian Rainfall & Runoff (AR&R -1987) as follows:

$$Q_2 = 0.278 C I A$$

where

Q_2 is the 2 year ARI design flow (m^3/s)

C = the coefficient of runoff

I = average rainfall intensity (mm/h) for a design storm ARI of 2 years and the calculated time of concentration of the catchment serviced

A = catchment area (km^2)

The drain flow is calculated using the Manning formula which can be written as:

$$Q = \frac{A R^{2/3} S^{1/2}}{n}$$

where

Q is the drain flow (m^3/s)

A is the drain cross sectional area (m^2)

R is the hydraulic radius - ie. area/wetted perimeter (m)

S is the bed grade (m/m)

n is Manning's roughness coefficient

The recommended Manning's roughness coefficient values for use are given in Table A3.

Table A3 - Manning's "n" Values for Rural Drains

Flow (ML/d)	Roughness Coefficient "n"
Less than 20	0.045
20 - 75	0.040
Over 75	0.035

The Manning formula estimates the depth of flow which occurs under uniform flow conditions in a drain. This depth is known as the normal depth and is constant for and unique to any given set of uniform flow condition, cross section and grade.

In practice, uniform flow is rarely achieved due to the presence of culverts or changes in the cross section, bed grade and channel roughness. Where flow conditions are altered the water surface will transition upstream to the new normal depth. The distance over which this transition occurs can be long and other changes to flow conditions will often occur before uniform flow is again achieved. Backwater curve computations allow the actual water surface profile along the drain to be calculated for any given flow conditions. These computations should be carried out by a consultant.

A5 REGIONAL STANDARD 4 - DRAIN OUTFALL

The primary standards in relation to outfalls for rural drainage are as follows:

- the point of outfall must form part of an approved drainage scheme or be at a natural watercourse
- the point of outfall must be located at the point (low point) where the natural flow path exists

The outfall of proposed rural drainage schemes onto road reserves and onto private land will not be permitted.

The outfall must have capacity to receive the drainage water from the proposed works and, in the case of approved drainage schemes, must have been originally designed to include the drainage of the proposed catchment.

It may be necessary to provide retardation to reduce peak flows discharged by the proposed drainage works to meet downstream capacity constraints and/or if increases in peak flows resulting from the increased drainage efficiency result in a significant increase in flooding on downstream properties. Retarding basins involve the temporary storage of runoff for release at a controlled rate to reduce outflows to a targeted level. Storage basins can also be used for permanent water storage (ie. incorporate artificial wetlands) as long as the required active storage component is provided.

Retardation of flows to be discharged by proposed rural drainage works must be provided where:

- the outfall drain or waterway does not have sufficient capacity to accept the proposed rural drain's design discharge; and
- the proposed rural drainage works cause an increase in downstream peak flows which leads to a significant increase in flooding of downstream properties.

The retarding basin design is to consider the total upstream catchment inflow, not just the catchment collected by the proposed drainage works.

A6 REGIONAL STANDARD 5 - WATER QUALITY

Proposals for rural drainage works need to address the impact of rural drainage on water quality within downstream wetlands and receiving waters which results from the possible increased export of sediment, nutrients and saline groundwater.

The following management practices which reduce the potential for rural drainage to impact adversely on water quality are to form part of rural drainage designs:

- provide revegetated minimum width buffer strips and stock proof fencing either side of proposed rural drains (refer to Regional Standard 7);
- provide selected vegetation species within the proposed drain itself which promote the filtration of nutrients (little information currently available at present to assist in selecting optimum vegetation species);
- maintain maximum longitudinal grade controls on drains to limit erosion and the subsequent export of sediment to downstream receiving waters (refer to Regional Standard 1);
- incorporate constructed wetlands where possible into proposed drainage schemes to reduce the export of nutrients and sediment to downstream wetlands and receiving waterways; and
- maintain the natural wetting/drying cycle of existing wetlands effected by the proposed rural drainage works (refer to Regional Standard 6)

Opportunities for the inclusion of constructed wetlands would be particularly present where retarding basins are required for rural drainage works. Generally it would be relatively low cost to modify the retarding basin arrangement to incorporate dead storage for a wetland in addition to the active storage required for peak flow retardation purposes.

A7 REGIONAL STANDARD 6 - EXISTING WETLANDS

Rural drainage schemes should be designed as far as possible such that the natural wetting/drying cycle of existing wetlands are maintained. Methods for achieving this are discussed in detail in Ref. 5. The following standards are recommended to be applied where rural drainage impacts on existing wetlands:

- Wetlands of Significance - A permit for rural drainage works should not be issued where the proposal is deemed to impact adversely on wetlands listed under the Convention on Wetlands of International Importance (Ramsar Convention); and
- Other Wetlands - No drainage activity is to occur within 30 metres of public or private wetlands delineated by a municipal Planning Scheme Environmental Overlay.

A8 REGIONAL STANDARD 7 - FENCING AND REVEGETATION

As part of the development of a rural drainage system, the incorporation of fencing and revegetation to create a buffer strip must be provided on both side sides of proposed rural drains.

The construction of fencing, and associated revegetation, will provide a number of water quality control functions. The concentration of nutrient levels and suspended solids entering rural drains will be reduced. Eliminating stock access to drains will protect revegetation areas and reduce batter and bed erosion within the drain. Habitat values will also be improved.

Fencing

Rural drains are to be protected by the provision of stock proof fencing. Fences are required to be permanent.

Fences will be under considerable pressure from stock when feed in the adjacent paddocks is scarce. Security against stock ingress is particularly difficult where fences must cross drainage lines. These pose real problems in practical revegetation programs and landowner co-operation is essential.

The recommended buffer width for rural drains is 1.0 times the top width of the constructed channel. It is therefore recommended that fences be located this required buffer width from the edge of the drain.

Revegetation

Revegetation of buffer strips between drains and adjoining fencing is to be provided.

For maximum environmental benefit, emphasis is put on planting of indigenous species, preferably grown from locally collected seed. Effort is typically concentrated on shrubs and tree species but the importance of native grasses, sedges and reed is gaining increasing recognition.

A9 REGIONAL STANDARD 8 - HERITAGE AND CULTURAL SITES

Heritage and cultural sites of significance require protection from drainage / earthworks activity. Construction methods, drain alignments, etc. may cause damage or destroy significant sites. Areas of significant heritage or cultural significance should be delineated by Aboriginal Affairs Victoria (AAV) and the Australian Heritage Commission (AHC).

The recommended standard applicable is that rural drainage works should not proceed within 30 metres of sites identified as having cultural or heritage significance.

B1 POLICY APPLICATION

The policy applies to all dryland areas within the municipality which are in the North East Catchment Management Authority region.

B2 POLICY BASIS

The management of rural drainage activities is necessary to ensure the protection of catchment and waterway health from the adverse impacts which can arise if works impacting on drainage behaviour are not implemented in accordance with appropriate design principles and standards. Adverse impacts of rural drainage can include, but are not limited to:

- Accelerated flows leading to increased flooding and drainage problems on downstream properties;
- Increased levels of sediment and nutrient export which impact adversely on downstream waterways, storages and wetlands;
- Discharge of saline groundwater into downstream waterways, storages and wetlands;
- Redirection of drainage waters from their natural courses;
- Damage to rural property due to drain erosion;
- Social trauma and disruption due to landowner disputes over drainage;
- Inequitable distribution of drainage problems;
- Risk to flora and fauna habitats
- Damage / loss of wetlands; and
- Increasing river erosion and/or siltation.

A consistent and catchment wide approach to the management of rural drainage activities is essential to avoid the adverse impacts on downstream properties and waterways which can arise from rural drainage works. A catchment wide approach to the management of rural drainage is embraced by Local Government within the North East region.

B3 POLICY OBJECTIVES

- To co-ordinate the management of rural drainage throughout the region.
- To maintain and enhance the functions of natural drainage lines to convey and store water.
- To limit the rate of discharge from rural drains to minimise changes in downstream flooding and drainage behaviour.
- To minimise any adverse impacts on the environment and water quality in the catchment.
- To implement measures which reduce the impact of waterlogging within the region and lead to improved agricultural productivity.
- To control modifications / extensions to existing drainage schemes in the region.
- To minimise the construction of inappropriate drainage works within the region.
- To support stakeholder and the broader community education and involvement in rural drainage management.

B4 POLICY STATEMENTS

It is Policy to:

- Implement a consistent and catchment wide approach to rural drainage management throughout the North East region through the implementation of the Regional Rural Drainage Management Strategy.
- Encourage the implementation of catchment management options as a primary means for addressing rural drainage problems prior to considering new or enlarged drainage works.
- Discourage inappropriate use and development on land which is identified as being on natural drainage lines.
- Promote the effective management of natural drainage lines by controlling levee bank construction, farm infrastructure acting as levee banks and drainage diversion works to ensure that the capacity of natural drainage lines to carry and store water is not diminished.

- Assess applications for rural drainage activities with regard to individual and cumulative effects as follows:
 - the likelihood of them causing an increase in the flood and drainage risk on downstream properties; and
 - the likelihood of them causing a decrease in the water quality of downstream receiving waters.
- Ensure that rural drainage activities be designed and constructed in accordance with the relevant design principles and standards identified by the regional strategy.
- Existing rural drainage works that have been shown to cause excessive adverse impacts on downstream flooding and drainage behaviour and the water quality in downstream receiving waters should be modified as necessary to minimise impacts to acceptable levels.