

CATCHMENT MANAGEMENT: MAKING IT SIMPLE

Yvette Rodrigo and Claire Perkins, MWH New Zealand Ltd

ABSTRACT

Ensuring consistency in the development of Catchment Management Plans (CMPs) for stormwater can be a challenge due to the dynamic and unique environment of each catchment. A framework and template for preparation of CMPs has been developed by leveraging experience in stormwater catchment planning and consenting, which has been refined through work for three local councils. This framework includes ten defined stages to ensure a streamlined and efficient process, while allowing a consistent approach across various catchments. It asks questions of the user so that all ecological, social, cultural, amenity and economic objectives for managing water quality, water quantity and land use can be achieved. The CMP template incorporates the frameworks stages in varying degrees of detail for all catchments to standardise the process for CMP preparation and ensure consistency and robustness. This paper will examine and provide examples for what should be included in each stage of the process and show how this framework and template can be used for those who need to manage water resources and land use within a catchment.

KEYWORDS

Catchment management, Stormwater management, CMP, objectives

PRESENTER PROFILE

Yvette Rodrigo is a Senior Environmental Scientist at MWH specialising in water resource management and integrated stormwater catchment management. She also has extensive experience in auditing and assessing environmental impacts associated with stormwater discharges into land and water. Yvette has been involved with assisting territorial local authorities in New Zealand obtain and implement catchment consents for discharges from their stormwater management networks

1 INTRODUCTION

Several regional plans developed recently for managing land and water resources in New Zealand promote the use of Integrated Catchment Management Plans (CMPs) for managing the environmental effects of discharges from reticulated stormwater networks¹. Rules in these plans require stormwater network operators to obtain global or catchment consents for discharges from their networks, which are supported by CMPs for each catchment.

The direction provided by these regional plans to manage stormwater in an integrated manner through the development of CMPs recognises the connectivity between different parts of the environment and the cumulative impacts of stormwater discharges within these catchments. It also provides a mechanism for catchments to be managed for different purposes and enables community involvement in setting environmental, social,

¹ Reticulated stormwater networks can include pipes, open drains, channels or any other type of stormwater management device that forms part of the network.

economic and cultural outcomes through consultation via the consenting and CMP development process.

For many District Councils, the development of CMPs and the process of obtaining global consents for network stormwater discharges have proven to be time-consuming, resource hungry and costly due to the multitude of variables that need to be considered. Catchments are inherently complex systems consisting of various land uses, natural and anthropogenic pressures and receiving environments that may be affected to varying degrees by these pressures. This leads to challenges associated with ensuring that the collection of information is focused on the outcomes sought and the sheer management of such a large amount of data. In addition, there is very little guidance in the form of best practice guidelines or national standards in New Zealand on how to prepare effective CMPs.

This paper presents a framework used for preparing CMPs to manage stormwater discharges from catchments. The framework is essentially a tool that guides the development of a CMP, from setting the purpose and limits of the CMP, information gathering and analysis, developing methods for mitigating effects and finally implementation and monitoring of the CMP. Details of each stage in the process and a discussion of how the framework can be used to ensure that the process for developing a CMP is streamlined, efficient and cost-effective, especially when multiple CMPs are required, are presented.

1.1 THE NEED FOR A CATCHMENT BASED APPROACH

Stormwater management has historically been about draining land in order to enhance its productivity and potential for development. Whether discharged to land via rapid soakage systems such as soakpits or to surface water via pipes, the main objective was to dispose of stormwater quickly. Treatment of stormwater prior to discharge was rarely considered necessary especially for land-uses such as residential development, which was not considered to be a highly contaminative land-use.

Over the last decade however, with an increasing understanding of the impacts that stormwater discharges from urban catchments are having on the environment, the focus has changed from providing stormwater infrastructure based on rapid disposal to management systems that are designed to protect a number of social and environmental values. Within a catchment therefore, there may be a diverse range of stormwater management systems that provide varying degrees of stormwater treatment and attenuation.

Without an integrated and holistic view of stormwater management within a catchment, understanding the cumulative impacts of stormwater discharges on various receiving environments can be difficult. This lack of integration can consequently result in adverse environmental effects being greater than the effects from discharges which occur under an integrated approach. The proliferation of individual stormwater management systems in a catchment can also place significant pressure on funding and resources available to stormwater network managers for maintenance and monitoring of these systems.

1.2 CATCHMENT MANAGEMENT PLANS

A CMP is effectively a planning tool that can be used to manage natural and physical resources on a catchment-wide basis. Resources may be subject to stress or pressure as a result of natural or anthropogenic factors. CMPs provide a mechanism for actively managing the impacts of these influences on the resources within a catchment.

Urban development can result in a range of impacts on social, cultural, economic and environmental values within a catchment. As a result, many District Councils and stormwater network managers around New Zealand are being encouraged by Regional Authorities to prepare CMPs. In some cases, for example, in Canterbury, the preparation

and implementation of stormwater catchment management plans are a statutory requirement under the rules of the Natural Resources Regional Plan (NRRP).

Territorial local authorities and stormwater network managers may also support the development of these plans, seeing benefit in providing management plans that ensure development is consistent with key environmental, social, economic and cultural objectives and that appropriate infrastructure is provided to manage development.

CMPs can focus on one particular stressor (e.g. stormwater) or can adopt a more integrated approach and include other factors (e.g. wastewater and water supply). The scope of the CMP will depend on the key drivers for the development of these plans.

1.2.1 WHAT IS AN EFFECTIVE CATCHMENT MANAGEMENT PLAN

An effective CMP needs to be easy to use and understand. The CMP is likely to be used or referred to by many different people within a District Council, stakeholder groups, developers and the wider community. In order to be easy to use, the structure must flow logically and the user should be able to understand how the objectives, methods and outcomes of the CMP are linked together and were derived.

A CMP must also be adaptable. A rigid plan is not an effective way to manage catchments which in New Zealand are inherently dynamic, be it as a result of natural processes or development progress. As we have seen in Christchurch recently, planned development can be rapidly fast-tracked or significantly altered as a result of matters out of control of regional and local authorities or developers. In addition, information gathered by monitoring may result in changes to the objectives, methods and expected outcomes of the CMP.

1.3 THE CHALLENGES

In responding to the requirement to provide effective CMPs either to satisfy legal planning requirements or to provide guidance to developers seeking advice on appropriate stormwater management measures, many District Councils or stormwater network operators are currently grappling with a number of challenges, including:

- *Lack of national and regional standards* - There are a number of uncertainties associated with the development of CMPs. There is no guidance at either a national or regional level on how to prepare an effective CMP. Some regional plans contain guidance on what is expected in a CMP (e.g. NRRP). Others do not provide any specific guidelines or requirements in the regional plan that sets out clearly what should be included in the CMP documents (e.g. Waikato Regional Plan) but may rely on conditions of global consents to provide direction.
- *Prioritisation of CMPs to keep up with development* - District Councils, especially those responsible for large urban centres consisting of multiple catchments need to prepare several CMPs. These CMPs will need to be prioritised to ensure that the plans are in place in a timely manner particularly in catchments subject to development pressure.
- *Expectations on level of detail and content* - There are also uncertainties around the level of detail required to develop robust CMPs and often, differing expectations between regional and district councils on what these plans should include.
- *Cost, time and resources* - In the absence of recognised standards and guidance on developing CMPs many District Councils and stormwater network managers in New Zealand have based their CMPs on their own expectations of what these documents should include. This has resulted in CMPs that range not only in content but the costs, time and resources associated with the preparation of these documents.

- *Understanding of and changes to Structure Plans* – Often in greenfield areas, District Councils will prepare Structure Plans which set out the future development and land use patterns, areas of open space, the layout and nature of infrastructure, and other key features for managing the effects of development. The link between CMPs and Structure Plans may not clearly be defined or understood. In addition, depending on the status of Structure Plans, they may be subject to change. This could impact on the amount of development and therefore the location, number and type of stormwater measures within the catchments.
- *Who pays* – Not all the stormwater mitigation identified in each CMP may be implemented by a District Council or stormwater network manager. Councils may seek to require developers to implement specific measures, however, until the mitigation measures have been defined through the CMP development there is no certainty over the costs and associated responsibilities for design, installation and maintenance.

1.4 THE PURPOSE & OBJECTIVES OF THE FRAMEWORK

The CMP framework was developed to assist District Councils and stormwater network operators to develop “fit-for-purpose” CMPs for new and existing development. The CMPs would need to provide stormwater objectives, standards and guidelines for stormwater management on a catchment basis. It also had to enable the development of CMPs using an appropriate level of detail that was representative of the scale and significance of the issues within each specific catchment.

To achieve these objectives the framework needed to clearly set out what was required to prepare robust CMPs that could apply to any catchment, the stages of the process that needed to occur and who would be responsible for each phase of work. The framework also needed to include guidance on when and how consultation with key stakeholders should occur to ensure that all relevant information and views from these parties were considered in the CMP preparation at the appropriate time.

To prepare the CMP framework, conditions on global consents requiring supporting CMPs and a number of CMPs developed nationally were reviewed to ensure that good practice used elsewhere and guidelines endorsed by regional authorities were incorporated into the development of the framework. A spreadsheet setting out each stage of the CMP development process was prepared along with guidance on who would be involved at each stage and when consultation with key stakeholders should be carried out.

To streamline the process further, a template or table of contents that would apply (in varying degrees of detail) to all CMPs was prepared. Providing a template that could be generally applied to each catchment was considered to provide a means of standardising the process for the preparation of the CMPs, which would subsequently lead to cost savings, especially when multiple CMPs were required. Using a CMP template report for all catchments would also allow comparison of CMPs between catchments to ensure consistency in the quality of the documents prepared and prioritisation of work.

2 CMP FRAMEWORK

The CMP framework focuses on setting robust objectives for each catchment, collecting and analysing relevant and necessary information and the development of stormwater management options that will achieve the objectives and outcomes sought.

CMPs need to incorporate a large amount of information from planning, environmental and engineering inputs in order to provide methods and guidelines to ensure that sought environmental, social, economic and cultural objectives are met. The CMP framework sets out a ten stage process for the development and implementation of stormwater CMPs, and

the preparation of CMP reports to satisfy Regional Authority requirements. Additional stages have also been included in the framework and relate to the implementation phase of the CMP and a monitoring phase to test the effectiveness of these plans.

The CMP Framework utilises a spreadsheet which provides details of the various stages of CMP development, the anticipated outputs for each stage, the actions associated with each stage and who should be responsible for carrying out the tasks. The 10 stages of the CMP framework are diagrammatically shown in Figure 1 below.

Simplistically, the first four stages of the framework relate to setting the context and limits of the CMP. The next four stages work within these limits to prepare the detail of the CMP, including using the information gathered in previous stages to develop appropriate mitigation measures for the catchment and mechanisms for implementing these measures. The last two stages relate to implementation of the CMP and finally, monitoring the effectiveness of the plan.

Figure 1: CMP Framework - 10 stages to an efficient and effective catchment management plan



2.1.1 STAGE ONE: DEFINING THE PURPOSE OF THE CMP

This stage relates to defining the purpose and scope of the CMP. In determining the purpose of the CMP, the key drivers for the preparation of the plan should be considered and the general intent of the plan (e.g. as a guidance document for developers or to comply with conditions of a global consent) should be set. Decisions will also need to be made on the following limits and boundaries of the plan:

- *Duration* – The CMP should have a timeframe associated with it and this should be based on the purpose of the plan. For example, if the CMP is to provide for development in certain areas in accordance with a Structure Plan developed for the catchment, then the duration should align with the duration of the Structure Plan. It should be noted that the CMP can be updated after it is developed as new information is obtained, so the duration of the plan can be longer provided there is

an agreed process with Regional Authorities and interested parties on how updates to the plan can occur.

- *Scope* – The scope of the CMP may be focused only on stormwater or may be extended to include wastewater and water management within a catchment. Developers of CMPs will need to decide at the start of the process on the general scope of the CMPs for each catchment. If CMPs are required for multiple catchments, this decision could be made once for all catchments to ensure consistency or to streamline the process for subsequent catchments. This decision however can be re-visited when beginning work on each of the CMPs, if the need arises.
- Some Regional Authorities have specific information requirements, either in the regional plan and/or specifically defined in a global consent, and assessments that they expect to be included in a CMP and this therefore will set the scope of the CMP.
- *Outcomes* – The outcomes in this context relate to the anticipated results of the CMP. Outcomes sought should be considered in relation to providing for the economic, social, cultural and environmental well-being of the catchment.

These limits set the context for determining the content and level of detail required for the CMP. As there will be many parties including Council staff, planners, engineers and technical experts involved in the development of CMPs, it will be important to ensure that these limits are well understood by these parties.

At this point of CMP preparation, holding a workshop with those who will contribute to the development of the CMP is considered to be an efficient and inclusive mechanism for setting the limits of the CMP and will ensure that these requirements are well understood and agreed to. The outputs of this workshop form the basis of Section 1 of the CMP and the CMP Template Report.

A large amount of data and information is collected and analysed as part of the CMP development process. Managing this information and documenting key decisions throughout the process are essential in ensuring that it can be demonstrated that conclusions reached in the CMP document are well-founded and robust. To ensure that this information is managed properly, a database should be set up at this stage that will track all information that is collected and reviewed in relation to the CMP. This database can also be used to track key decisions and outcomes of consultation.

2.1.2 STAGE 2: STRATEGIC OBJECTIVES

“Strategic objectives” are high level objectives that are set out in either statutory or non-statutory documents. These documents provide information and guidance on the economic, social, environmental and cultural issues within a catchment and provide direction on how these issues should be managed. This direction may be in the form of objectives, policies and rules of plans or strategies developed to manage particular resources.

All relevant documents are reviewed during this stage and strategic objectives in relation to stormwater management within the catchment are identified. These objectives are documented in Section 2 of the CMP template report and should also be recorded in the CMP database, with each objective referenced to its source document.

2.1.3 STAGE 3: BASELINE INFORMATION REVIEW

This stage of the process relates to obtaining all relevant information relating to stormwater management within the catchment. This should include information about the existing stormwater network and the physical, social and environmental values within the

catchment. The information will assist in further clarifying the issues associated with stormwater management within the catchment, which will lead to the development of appropriate mitigation and stormwater management methods for the CMP.

The first part of this stage involves ensuring that all relevant information is obtained. Sources of information may include investigations associated with previous consent applications, data and reports held by both local and regional authorities, and information used to support any Structure Plan and global consent process. All information collected should be referenced and recorded in the CMP database.

The next part of this stage involves the review of this information by technical experts in various fields of expertise (e.g. hydrology, ecology) to identify the key issues associated with stormwater management, including the values that need to be protected and any key constraints within the catchment. The purpose of this review will also be to identify any critical gaps in the information and further work or investigations that may be required, either to assess the environmental effects of development or to determine appropriate mitigation measures to address the issues.

Based on the advice provided from technical experts, decisions need to be made on whether further investigations and assessments are warranted for the development of the CMP. The requirement for further work will need to be considered based on the objectives of the CMP, the outcomes that the CMP needs to achieve, and the consequences of not undertaking this work. For example, are the information gaps significant or can they be addressed by either applying assumptions or by requiring additional mitigation or is it more appropriate for developers within a catchment to supply this information later in the process?

A consultation strategy and communications plan is developed during this stage. This plan should identify key stakeholders and set out a strategy for consultation with them. It should also specify when and how the wider community will be advised of the CMP and steps for obtaining feedback at various stages of the CMP development process to ensure that the values and expectations of the community are taken into account. An initial and targeted round of consultation should be undertaken at this point as part of the information gathering process.

2.1.4 STAGE 4: FURTHER INVESTIGATIONS

During this stage any further assessments and investigations deemed necessary in Stage 3 of the CMP process are undertaken. The results of these investigations are usually provided in a report, and each report should be recorded in the CMP database. This information will supplement any existing information obtained previously and form the basis of Section 3 of the CMP document.

2.1.5 STAGE 5: OPERATIONAL OBJECTIVES

The "Strategic Objectives" identified in Stage 2 are high level and general objectives relating to how resources within a catchment should be managed (e.g. a strategic objective for water quality may require that it is maintained or enhanced to meet a particular standard). "Operational Objectives" are more specifically related to the outcomes that need to be met to effectively meet the Strategic Objectives when considering the impacts of stormwater on these resources (e.g. to achieve a particular water quality standard, first flush stormwater from all future development will need to be treated).

These Operational Objectives sit under the Strategic Objectives. They need to take into account the information obtained in Stages 3 and 4 relating to the issues and constraints associated with stormwater management within the catchment and the values that could be affected by discharges of stormwater.

A list of Operational Objectives should be prepared with input from the technical experts involved in development of the CMP and Council staff. These objectives are written up in Section 5 of the CMP document.

2.1.6 STAGE 6: METHODS

This stage involves the development of methods to achieve the Operational Objectives set for the catchment. These methods may include mitigation measures provided by the Council, or by individual developers, floodplain strategies, stormwater bylaws or a public education programme.

The technical team working on various aspects of the CMP development will be able to provide recommendations on the range of options available to meet the operational objectives for the catchment. These methods will then be analysed and evaluated to determine the best practicable option(s) to address each objective.

Further targeted consultation with key stakeholders and the community should be undertaken at this point, presenting the strategic and operational objectives for the catchment and proposed mitigation measures. Feedback from consultation could assist the Council to confirm the options or identify any potential blockers that have not been previously identified.

2.1.7 STAGE 7: METHOD IMPLEMENTATION

In this stage, the Council and the technical team will need to develop a programme of works that will set out how the methods identified in Stage 6 will be implemented. The programme will also clearly set out mitigation methods that the Council will be responsible for delivering and those that each developer applying to subdivide land within the catchment will need to provide. The programme and timeframe for delivery of the measures the Council will be responsible for will depend on development pressure within the catchment, funding and resources available through the LTP process.

2.1.8 STAGE 8: PREPARATION OF THE CMP DOCUMENT

The draft CMP document will be completed in this stage. This would involve compiling the sections of the CMP that have previously been written and completing the remaining sections. A final round of consultation with the draft CMP document would be used to obtain feedback from the regional authority, key stakeholders and the community.

Once feedback from consultation has been obtained, the CMP document can be finalised and submitted to the regional authority.

2.1.9 STAGE 9: IMPLEMENTATION OF THE CMP

During this phase, the programme of works set out in the CMP will be carried out in accordance with the timeframe in the CMP. The programme may need to be amended, as new information is obtained as development proceeds and further investigations are undertaken by developers. A process that allows this to occur will need to be confirmed with the regional authority.

2.1.10 STAGE 10: REVIEW AND MONITORING THE EFFECTIVENESS OF THE CMP

Upon implementation of the CMP, a monitoring programme should be carried out to test the effectiveness of the CMP and the methods being implemented. The results of this programme can be used to review the CMP and ensure that the plan and programme of works is achieving both the strategic and operational objectives for the catchment. Where possible, the monitoring programme should be linked to other programmes, such as any monitoring required for an associated global consent, to ensure that information and data collected is shared.

3 THE TEMPLATE REPORT

In order to streamline the process of CMP development, a CMP Template Report was developed. The actual development of a CMP can take months or even years depending on the size of the catchment and the issues that need to be resolved. The template report is another means of providing focus on the final deliverable from the CMP process. The CMP document essentially provides the details and results of each stage of CMP development. Writing each stage as you go will ensure that the information is accurate and may reduce the time to re-visit and compile information at the end of the process, when preparing the final CMP document.

The CMP template report was prepared by reviewing:

- other CMPs developed nationally,
- guidelines for urban stormwater discharge consent applications provided by regional authorities, and
- draft conditions of global consents that provide guidance on regional authority expectations of the scope and content of the CMP document.

The purpose of preparing a template report is to identify the content of a CMP document. Issues related to stormwater management will vary from catchment to catchment and the template report will ensure that these issues will be dealt with in a consistent manner.

The template report that was prepared is closely aligned with the CMP Framework. Alignment with the framework should reduce time and costs, as various sections of the CMP template report can be written once the various stages of the CMP process are complete rather than having to collate and write the CMP document at the end of the process.

The template report provides consistency and ensures that various catchments can be compared, however as it provides for a general structure of the document, the content of the CMP can be tailored to reflect the size or the issues of a specific catchment.

3.1 TEMPLATE REPORT CONTENT

The CMP Template Report that was prepared consists of sections. The introduction, Section 1, introduces the specific catchment that the CMP relates to and outlines the purpose and scope of the CMP document for that catchment.

Section 2 of the report provides the planning framework behind the CMP and sets out the requirements of national, regional and local statutory and non-statutory documents. From these documents, the "Strategic Objectives" for the catchment are derived.

Section 3 of the report describes the catchment in more detail than the description contained in the introduction. This section briefly describes the sources of information used to describe the catchment (i.e. existing reports and data, field investigations). This is important to provide an understanding of the robustness of the information used to develop the CMP. This section will also describe the values that have been identified within the catchment that need to be protected along with any constraints that may affect the type of measures that may be used to mitigate the effects associated with stormwater management for the catchment.

Section 4 describes any consultation that has been undertaken during the CMP development process and the feedback from this consultation.

Section 5 details the “Operational Objectives” that have been developed for the catchment. These objectives would include any environmental, economic, cultural and social objectives associated with the management of stormwater from the catchment. This section of the report should clearly show how these “Operational Objectives” were derived and how they align with the “Strategic Objectives” developed and set out in Section 2 of the document. As an example, for a strategic objective that states that surface water quality should be maintained or enhanced the operational objective could be that stormwater discharges from that particular catchment is treated to a high level or that discharges to water are not appropriate and where possible discharges to land should be encouraged.

Section 6 of the CMP will provide details on the nature of the stormwater discharges from the catchment. This will include information on the quality and quantity of stormwater prior to and after development. It will also include the evaluation of options, associated with mitigating the effects of these discharges, against the operational objectives for the catchment, and present the best practicable solutions.

This section of the CMP will outline the implementation programme for mitigation measures and set out guidance for developers on what they will need to provide for individual developments within the catchment.

Section 7 of the CMP relates to assessing the impacts of stormwater discharges from the developing catchment on the receiving environment, assuming all mitigation measures are implemented as intended. The impacts assessed should include those that may arise from the discharge of contaminants as well as impacts associated with changes to the hydrological regime of the catchment resulting from development.

Section 8 outlines the monitoring programme that will be carried out to test the effectiveness of the CMP against its objectives. There may be opportunities to align monitoring required for testing the effectiveness of the CMP with other monitoring programmes, for example, those associated with conditions of a global consent for the catchment, which would ensure greater efficiency and cost-effectiveness.

This section should also set out how the monitoring programme will be undertaken, including a timeframe, and the types of criteria and indicators that will be used to test the effectiveness of the CMP. Based on the data collected, the CMP may need to be updated using the process agreed to between the party preparing the CMP and the regional authority.

The last section of the CMP is a Glossary that provides definitions for terms used in the document.

4 OVERCOMING THE CHALLENGES

Section 1.3 of this paper outlines some of the challenges that District Councils and stormwater network operators face when required to prepare CMPs. The framework and the template report address these issues in the following manner:

- *Lack of guidelines and national standards* – The CMP framework and template report was developed by reviewing regional plans, global consent conditions, examples of CMPs and relevant technical papers on the preparation of CMPs. The CMP framework and template report that has been developed provides a tool for managing the CMP development process. The framework essentially provides a checklist that enables those involved in preparing CMPs to stay focused on delivering a document with:
 - well-defined objectives and anticipated outcomes;

- use of relevant and necessary information; and
 - methods to achieve the outcomes set for the catchment that have been derived through a robust analysis of the data collected.
- *Prioritisation of catchments and cost, time and resources* - For a stormwater network operator such as a District Council that may need to prepare multiple CMPs, the framework can result in a more stream-lined, efficient and cost-effective process. For example, some of the stages of a CMP, particularly the first few stages relating to setting the limits, purpose and scope of the CMPs may only need to be undertaken once or the information used to develop strategic objectives for a catchment may be transferable to other catchments within a district.
 - *Expectation on the level of detail and content* – The framework provides an indication of when consultation with key stakeholders, technical advisors and Council staff should occur throughout the process. Asking the right questions of the right people at the right time should ensure that there is a general acceptance of the level of detail and content of the CMP. The timing of consultation can also be crucial in ensuring all relevant information is used to inform the development of the CMP and reduces the risk of having to re-do work if key information is missed.
 - *Understanding of and changes to the Structure Plans* – Again consultation with appropriate parties involved in the Structure Plan process and effective communication during the first few stages of the CMP process should ensure that appropriate linkages between the CMP and Structure Plan are established.
 - *Who pays* – The framework allows Councils to make informed decisions on the level of stormwater management within a catchment that they wish to provide, primarily through allowing for consultation with key stakeholders during crucial stages of CMP development. In some situations it may be appropriate for developers within a catchment to provide more detailed investigations of environmental conditions or propose mitigation measures. Consultation should assist in determining the appropriateness and acceptability of this approach for a specific catchment.

5 WIDER USES

While the framework described here has focused on stormwater management by stormwater network operators, in particular District Councils, there is potential for wider uses of this framework. Examples include:

- Developers who may wish to use this framework to identify the most appropriate stormwater management measures to implement within their developments. Use of this approach would enable more streamlined discussions and agreements between developers and Councils to be reached as the reasons for the proposed measures would be clearly set out and supported.
- Mining catchments where integrated management of stormwater, land use, and wastewater is essential for safe and environmentally sustainable mining operations.
- This framework could also be applicable at the farm scale where Farm Environmental CMPs are becoming a more common and best practice method of managing farming activities and minimising the environmental effects of those activities.

By no means is this list exhaustive. The framework is adaptable to management of land use and water resources at any catchment scale, as the level of detail is able to reflect the

size of the catchment, significance of the receiving environment and risk posed by the catchment activities.

6 CONCLUSION

There are a number of challenges associated with the development of CMPs in New Zealand. These challenges are generally associated with the need to prepare CMPs in a timely manner to keep up with development, the lack of standards to determine the content or level of detail required for CMPs and the amount of time, costs and resources that result.

The CMP Framework and Template Report has been prepared to assist stormwater managers prepare CMPs using a streamlined 10 stage process. The framework provides a means of keeping the CMP development process focussed on the objectives that are set for a particular catchment by either statutory plans or by stakeholders within the catchment. The framework and template report also provide consistency and comparability when stormwater managers are required to prepare multiple CMPs.

Measures are included throughout the 10 stage process, that enable informed decisions to be made on the level of detail in the CMP and the extent of the investigations and assessments undertaken to develop the CMP for each catchment. The process includes consultation at key stages of development with the community and key stakeholders such as the regional authority to ensure that the end product is based on sound information and incorporates the expectations of other groups who are likely to influence the success of the CMP.

The CMP template report provides another mechanism for ensuring that a consistent approach is taken for the development of multiple CMPs. The template report is aligned closely to the CMP Framework, and therefore results in saving time, costs and resources by allowing sections of the CMP document to be written as various stages of the framework are completed.

In the absence of best practice guidelines for the preparation of CMPs, the framework and template report structure may be used as a tool to ensure a more streamlined, cost effective and efficient process in the development of CMPs.

ACKNOWLEDGEMENTS

The authors wish to thank the management and staff at the Hamilton City Council, in particular Tim Harty and Raewyn Simpson, for their input and funding of the work that went into the development of this framework. Input from Graham Harrington at Christchurch City Council and Malcolm Loan at Invercargill City Council was also invaluable.

REFERENCES

Environment Canterbury (2011) *Natural Resources Regional Plan*, R11/2, Canterbury Regional Council.

Environment Waikato (2007) *Waikato Regional Plan*, Environment Waikato Policy Series 2007/21, Waikato Regional Council.

Golder Associates (NZ) Lts (2008) *Integrated Catchment Management Plan for South-West Christchurch*, prepared for Christchurch City Council.

Feeney, C., Trowsdale, S., Allen, W., Greenaway, A., Hellberg, C. and Davis, M. (2006) 'Integrated Catchment Management Planning: Benefits of Logic Models', *NZWWA (now Water NZ) Stormwater Conference Proceedings 2008*, 17p.

Feeney, C., Kouwenhoven, P., Crawford, J., Le Gros, P. and Shui L. (2009) 'Writing Catchment Management Plans: Threading Planning Inputs Through to Action Outputs and Monitoring of Outcomes – A Practical Approach', *Water NZ 6th South Pacific Stormwater Conference Proceedings 2009*, 21p.

ABBREVIATIONS

CMP	Catchment Management Plan
LTP	Long Term Plan
NRRP	Natural Resources Regional Plan