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Corangamite Catchment  
Management Authority and the  
City of Greater Geelong

**EMO Implementation for The  
City of Greater Geelong**

**Summary Report Phase 3**

Project Report - 30 June 2006

Report No: 229/01/06

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# 1. Introduction

The Corangamite Catchment Management Authority (CCMA) is currently finalising the Soil Health Strategy (CSHS) as a sub strategy of the Corangamite Regional Catchment Strategy (CRCS). The development of the City of Greater Geelong (CoGG) Erosion Management Overlay (EMO) is a priority action under the CSHS and is viewed as a critical process to allow CoGG to address both strategic and developmental issues of land degradation and soil health.

The overall development and implementation of EMOs within the CCMA region also facilitates a key CCMA function by providing water quality and biodiversity benefits through the reduction in erosion. Key municipal objectives are also likely to be achieved through reductions in liability, risk to infrastructure and the general public and the protection of the environment. In particular, the implementation of the EMO for CoGG is seen as an important mechanism in achieving goals set out within CoGG's Municipal Strategic Statement (MSS) and the newly developed CoGG Environment Management Strategy (EMS)

As a result of ongoing discussion between the CCMA and the CoGG, a project was commenced in the City of Greater Geelong (CoGG) in 2004 and represents a co-investment between the CCMA and CoGG. The key aims of the project include the development of critical elements to enable the implementation of an Erosion Management Overlay (EMO) including schedules, maps and supporting documentation.

The process for implementation has evolved during the course of the project and now includes two separate schedules under the EMO. EMO1 will address the risk of landslides while EMO2 will address the risk of soil erosion.

This report details the development of the project over a three year period and provides information and data on the final products and elements delivered by the CCMA to CoGG under the terms of the original co-investment agreement.

## 2. Key Objectives of the Overall Project

Key objectives and aims of the overall project as related to the CRCS and the CSHS included:

- To develop an erosion management overlay (EMO) and associated documents for the CoGG to address the risk and subsequent impact of landslides and soil erosion through the planning scheme.
- To use the CoGG EMO as a pilot study, in which other municipalities within the Corangamite Catchment will be encouraged to adopt a similar approach.
- To formalise an agreement between the CoGG and the CCMA that outlines each organisation's commitment to complete and implement the CoGG EMO.

The use of erosion management overlays to address issues of soil health and land degradation is seen as a critical element in achieving the goals of both the CRCS and the CSHS. The implementation and use of an EMO will provide each municipality with a number of benefits relating to a diverse range of issues including:

- Responsibility and duty of care.
- Liability.
- Economic considerations.
- Environmental diligence and commitments.
- Social responsibilities.

Further detailed discussion on each of these aspects is contained in Appendix A.

### 3. Background

This project evolved from an original business case for a Landslide Risk Assessment program developed in January 2003 by Alex Shackleton (Wetlands Officer with CoGG) in association with Tony Miner (A.S. Miner Geotechnical Pty Ltd). An initial project brief for the development of a landslide risk assessment process for EMO1 was completed in February 2003.

An additional project brief on the implementation of an EMO for CoGG was developed in November 2003. Discussions with the CCMA in relation to opportunities to continue the project development under the RCS and the CSHS were initiated at the same time. An agreement was made between the CCMA and the CoGG that the CCMA would co-invest into the project with the understanding that both EMOs (i.e. EMO1 (landslides) and EMO2 (soil erosion)) would be developed for implementation by CoGG. It was also agreed that the development of the CoGG EMO would act as a pilot study and guide other municipalities within the Corangamite Catchment to develop their own EMOs.

The environment and Natural Resource Department of CoGG received internal funding to complete Phase 1 of an EMO implementation project in 2004; however, delays in funding allocations prevented the CCMA obtaining matching funding in this period. However, in 2004/05, CCMA received funding to develop Phase 2 of the CoGG EMO that matched the CoGG contribution from the year before. Final funding commitments by both the CCMA and CoGG were allocated to complete Phase 3 of the project by June 2006. Table 1 outlines the overall investment breakdown.

<i>Output</i>	<i>CoGG investment</i>	<i>CCMA investment</i>
Phase 1 – August 2004	\$45,000	\$0
Phase 2 – June 2005	\$4,000	\$49,000
Phase 3 June 2006	\$10,000	\$31,500
<i>Total</i>	<i>\$59,000</i>	<i>\$80,500</i>

**Table 1: Investment breakdown from CoGG and CCMA of outputs contributing towards CoGG EMO.**

## 4. Phase 1 - 2003/04

The initial Phase 1 stage of the implementation of an EMO for the CoGG was completed in August 2004. The main aim of the project was to provide the CoGG with a consistent framework for the management of risk associated with land degradation processes under the provisions of the Victorian Planning Scheme. Details of the initial phase of work are contained in the following report:

“Erosion Management Overlay for the City of Greater Geelong. Phase 1 Report”.  
GHD Pty Ltd Report No 31/14896/42 dated August 2004.

Outcomes of the Phase 1 project included:

- The establishment of a personal geodatabase to assist with data management and manipulation.
- Production of a series of preliminary susceptibility maps relating to various forms of land degradation including landslides, sheet, gully, rill, tunnel and wind erosion.
- Development of preliminary guidelines and policy notes.
- Recognition of the limitations in Phase 1 especially the need for refinement of susceptibility maps for a planning overlay and the development of an accompanying planning schedule.

Initial data used to populate the geodatabase was obtained from a diverse range of sources including newspaper articles, geotechnical reports, maps, journals, interpretation of aerial photographs and previous regional studies.

Initially 71 instances of mapped occurrences of land degradation were reviewed, collated and entered into the personal geodatabase which operates using Microsoft Access and Arc GIS software.

Preliminary susceptibility maps were also produced for the CoGG local government area boundary from previous regional maps produced by the Department of Primary Industries (DPI). Due to issues of scale, accuracy and the initial methodology employed by DPI, the newly developed CoGG susceptibility maps were not recommended for immediate use at a planning scale. As a result further refinement and calibration of these maps was recommended for the next stage of the project.

Preliminary guidelines and notes on a proposed approach to the administration and implementation of an EMO for the COGG were also provided as part of the Phase 1 project. It was recognised that these guidelines and notes should ultimately contribute input into the content of the accompanying planning schedules needed for the final implementation of an EMO under the planning scheme.

## 5. Phase 2 - 2004/05

Phase 2 of the project commenced in 2004 and aimed to address issues identified in the initial phase of the project. The following sections describe various tasks undertaken as part of the Phase 2 works.

### 5.1 Development of an Erosion Risk Methodology

Whilst risk management techniques have been successfully applied to landslides in Australia (AGS 2000), the initial Phase 1 study identified a lack of a consistent framework for the application of risk management techniques to erosion. Whilst some forms of erosion hazard identification and assessment had been developed by the forestry industry and transport authorities, the approaches tend to be specific to the activity undertaken (i.e. road construction projects) and were difficult to transfer to other circumstances.

As a result, a risk based methodology for erosion risk management was developed by A.S. Miner Geotechnical to address the limitations identified in the Phase 1 work.

The proposed methodology was based on the overall approach developed in the Australian Standard on Risk Management (AS/NZS 4360:2004). In addition the proposed method and format was aligned with the risk management concepts and guidelines developed for landslides by the Australian Geomechanics Society (AGS 2000).

The method used the relationship for risk as follows:

$$\text{Risk} = \text{Function} (\text{Likelihood and Consequence})$$

Likelihood is a function of both susceptibility and triggering events while consequence relates to life, infrastructure and the environment.

A detailed description of the proposed methodology including informative appendices is contained in the following report:

*“Erosion Risk Assessment Methodology. EMO Implementation Project for the City of Greater Geelong.” Prepared for Corangamite Catchment Management Authority. Report No 263/01. A.S. Miner Geotechnical, July 2005.*

This document was submitted and reviewed by the CCMA in July 2005. It now forms part of the integrated framework for the implementation of EMOs within municipalities throughout the Corangamite region.

### 5.2 Additional Data Mapping

In order to address ongoing data issues relating to the distribution of soil degradation occurrences through the CCMA region, a spatial erosion and landslide database was created for the entire CCMA region under project funding supplied through the DPI to the University of Ballarat (UoB). The database was compiled by Warren Feltham (Geology Honours student) under the supervision of Peter Dahlhaus (Senior Geology Lecturer at UoB).



Mapping of erosion and landslide features was undertaken using non-stereo photographic interpretation techniques applied to the latest ortho-corrected photographs for each of the municipalities within the CCMA region. The study resulted in 4673 land degradation features being mapped within the CCMA with over 465 erosion and landslide occurrences mapped within the CoGG Local Government boundary.

The final report was submitted to the CCMA at the end of July 2005 and details of the report are as follows:

*“CCMA Landslide and Erosion Database Version 2”. Prepared by Warren Feltham. Bachelor of Applied Science (Honours) - Geology. Ballarat University, July 2005.*

The additional data obtained during the UoB study significantly added to the number of recorded occurrences in the initial preliminary database established in Phase 1 of the project. This expanded data set allowed more detailed calibration of the preliminary susceptibility maps and was further added to by the results from the field verification program with Landcare groups (see next section).

The erosion and landslide data base established by UoB has since been used to develop Resource Condition Targets as part of the Corangamite SHS. Breakdown of land degradation type and occurrence within each municipality within the CCMA is proving to be valuable data in understanding the economic and social impact of such processes throughout the region.

### **5.3 Field Verification Program with Landcare Groups**

A program of community engagement utilising the services of local Landcare and community networks throughout the CCMA region was commenced in March 2005 by Troy Clarkson (DPI). The aim of the process was to verify the occurrence and details of the features mapped remotely from the ortho-corrected photographs by UoB.

Initial approaches were made to the Bellarine Landcare group and the Swan Bay Catchment Landcare network coordinated by Steve Smithyman. The process involved the provision of 1:20,000 scale field maps for each Landcare area. Known areas and occurrences of erosion and soil degradation were then marked on the field maps by members of the Landcare groups and the maps returned to DPI. The marked up maps were then delivered back to UoB for inclusion within the erosion and landslide database.

Field maps were produced for the entire CCMA region and delivered to the appropriate community groups. A number of completed maps were returned, verified and information transferred to the database at the end of 2005. A total of 151 land degradation features were added to the overall database from Landcare areas covering approximately 49% of the total CCMA area.

### **5.4 Refinement of Phase 1 Susceptibility Maps**

Further refinement of the preliminary Phase 1 susceptibility maps was undertaken by Dahlhaus Environmental Geology Pty Ltd (DEG) as part of the overall Phase 2 works. The refinement process was initially focused on producing the required line-work and boundaries to allow the development of planning overlays for both erosion and landslide within the CoGG.

The initial intention was to produce separate overlays as follows:

- EMO1 Landslide.
- EMO2 Erosion (including sheet, rill, tunnel, gully, wind, stream bank and coastal dune, foreshore and beach).

The refinement process was aimed at refining the preliminary Phase 1 maps produced from regional data (1:100,000) to larger scale maps (possibly 1:5,000 to 1:10,000) which are more suited to planning decision-making. The initial process of refinement involved the overlaying of appropriate mapped occurrences on individual susceptibility maps and gauging the accuracy or otherwise of the proposed susceptibility ratings.

The initial review generally indicated broad scale agreement at a small scale (1:100,000). However, significant variations in the accuracy of the line work and the postulated susceptibility when viewed at larger scales (1:10,000 and 1:5,000), were noted in the initial calibration stages of the Phase 2 refinement work. The addition of field verification data from the Landcare groups into the erosion and landslide database further highlighted accuracy and interpretation issues with the initial susceptibility maps.

As a result of the work undertaken during Phase 2, it was concluded that it was not possible to directly produce defensible, planning scale maps from the initial preliminary susceptibility maps. The revised outcome of the Phase 2 work was then aimed at producing the next generation of susceptibility maps at an intermediate scale of 1:25,000. This process involved the inclusion of areas of mapped erosion and landslides, and the provision of buffer zones around potentially susceptible areas such as, streams and rivers not already contained within high susceptibility areas. No alteration to other susceptibility area boundaries was attempted.

Whilst the Phase 2 (1:25,000) susceptibility maps represented a significant refinement of the initial maps, it was duly noted that they were probably not suitable for the final formulation of the EMO boundaries. As a result, further refinement of these 1:25,000 scale maps was undertaken in Phase 3 (see next section).

## **5.5 Development of Preliminary Planning Schedules**

As indicated previously it was intended to produce two planning overlays: EMO1 (landslide) and EMO2 (erosion). As such, the development of accompanying planning schedules to the proposed overlays was commenced as part of the Phase 2 program.

Initial drafts of the two schedules were developed and reviewed by CoGG's planning department and the environment and natural resource department. Details of the preliminary draft schedules are as follows:

- "Schedule 1 to the Erosion Management Overlay. Shown on the planning scheme map as EMO1. Land susceptible to Landslide".
- "Schedule 2 to the Erosion Management Overlay. Shown on the planning scheme map as EMO2. Land susceptible to Erosion (Land degradation excluding Landslide)".

However, due to the dependency of the schedules on the model adopted by CoGG for the administration and implementation of the new EMOs within the CoGG planning scheme, finalisation of these schedules was not possible under Phase 2 of the project.

In particular, the schedules made reference to a series of referred documents governing such issues as:

- Public information.
- Inventory of information on landslides and erosion and relevant sources of data.
- Internal CoGG procedures manual and guidelines.
- External referral authority procedures manual and guidelines.

As a result, issues regarding the adoption of an administrative and implementation model remained unresolved and ongoing discussions with key stakeholders in the development of a regional framework such as the Department of Sustainability and Environment (DSE), DPI and CCMA have continued into Phase 3 of the project.

## **5.6 Pilot Acid Sulphate Soil Study for CoGG**

A scoping study on the potential occurrence of acid sulphate soils (ASS) in CoGG undertaken by CSIRO was commissioned by DPI in March 2005. The study identified areas within COGG of high ASS susceptibility developed in previous regional studies within the CCMA region. A limited number of sites were tested with initial results indicating somewhat lower potential for ASS than suggested in earlier reports.

The study report was finalised and submitted to CCMA in July 2005. Details of the report are as follows:

- *“Investigation into the potential risk of acid sulphate soils on proposed development in the City of Greater Geelong”. Report to the City of Greater Geelong, The Corangamite Catchment Authority and the Victorian Department of Primary Industries. CSIRO Land and Water Client Report, July 2005.*

Whilst the study noted a number of potential areas within the CoGG Local Government area, no significant acid sulphate soils were identified as part of the limited laboratory testing program.

## 6. EMO Phase 3 2005/06

The combined work under Phase 1 and 2 of the EMO implementation project for CoGG yielded significant progress in the development of key elements aimed at assisting the implementation of an EMO in the CoGG planning scheme. However it was again recognised that further works were required.

The final phase of the planned 3 year program was commenced in 2005 with an anticipated delivery date of 30<sup>th</sup> June 2006 for a diverse range of project outcomes including maps, schedules and associated documents. As such deliverables completed as part of the final phase of the EMO implementation project can be divided into three main classes of information:

- General Information.
- Information relating to EMO1.
- Information relating to EMO2.

### 6.1 General Information

General tasks and information aimed at assisting the implementation of an EMO within the Geelong planning scheme were developed as part of the final phase of the project. These included:

#### 6.1.1 Collation of Final Landcare Erosion Occurrences.

As previously discussed, a program of field data acquisition utilising Landcare groups throughout the CCMA region was commenced in Phase 2 of the project. The remaining data collected by Landcare groups was received in February 2006 and entered into the database established as part of the earlier University of Ballarat research study.

Whilst numbers of new features identified were limited, the information proved to be extremely valuable in verifying and validating previous data captured from the ortho photo mosaic. The process also proved to be a particularly useful way on engaging and involving local interest groups whilst raising the profile of land degradation throughout the CCMA region and in particular the Geelong and Bellarine regions.

#### 6.1.2 Report on Inventory of Information and Databases for Soil Degradation Processes in the CCMA region

A general report on an inventory of information and databases relating to soil degradation in the CCMA region including a bibliography of relevant reports and articles was prepared as part of the general information delivered to assist the implementation process. The report includes resource materials for the City of Greater Geelong and the wider CCMA regions and consolidates various data sources into a single document.

Whilst the document should not be seen as a complete record of all available information or the only source of information, it does serve as a critical starting point for consultants, municipalities and referral authorities in identifying previous information relating to soil degradation processes in both the City of Greater Geelong and the CCMA region.

The use of previous data and information is critical in developing an understanding of spatial distribution, the estimation of likelihood and the understanding of consequence for soil degradation processes. These aspects form the basis of effective hazard risk assessment which in turn is the underlying principle of the proposed standard EMOs to be applied throughout the CCMA region.

### **6.1.3 Refinement of Susceptibility Mapping for CoGG**

Further refinement of the preliminary susceptibility maps was undertaken by the University of Ballarat taking into account original data sets, GIS techniques, the latest inventory data, process boundaries and scale issues. The refinement process was adapted from an earlier methodology developed as part of a UoB honours project in 2005. (Feltham 2005a).

Refinement of susceptibility maps for landslides, sheet/rill erosion and gully erosion was undertaken for the entire CCMA region using a GIS statistics based composite index method. A complete description of the modelling process is contained in the following document:

- *“Landslide and Erosion Susceptibility Mapping in the CCMA Region”. June 2006. Consultants report No 306/01/06. Prepared for University of Ballarat by A.S. Miner Geotechnical.*

As part of the mapping project outcomes, new susceptibility maps for landslide, sheet /rill and gully erosion were produced specifically for the City of Greater Geelong at a scale of 1:25,000. Detailed field checking of the maps was carried out in the CoGG Local Government area as part of the project.

The maps represent a significant advancement on the previously available preliminary susceptibility maps produced in earlier phases of the project and are considered to be a good representation of susceptibility for the three modelled degradation process at the intended use of scale of 1:25,000.

### **6.1.4 Potential EMO Boundaries**

A further outcome from the refinement of the susceptibility maps involved the production of the boundaries for the two separate EMO overlays. As such potential EMO boundaries were developed from a consideration of the modelled susceptibility.

The boundary for EMO1 was developed utilising all areas of moderate, high and very high landslide susceptibility. These areas were merged with the areas of all mapped landslide occurrences and then further buffered by 20 m to take account of mapping tolerances and some degree of limited landslide run-out potential.

The boundary for EMO2 was based on all areas of high and very high susceptibility. These areas were again merged with areas of mapped erosion occurrences and buffered by 20 m.

The formulation of EMO2 was undertaken in this manner to take account of a proposed strategic decision to deal with areas of low-moderate and moderate erosion susceptibility through a combination of the use of other overlays and through new provisions within an amended MSS.

### **6.1.5 Suggested Changes to MSS**

Whilst it was recognised that various maps, plans, schedules and associated documents would be required to facilitate the implementation of an EMO amendment for the City of Greater Geelong, it was also noted that other important strategic changes would also be required.

As such a proposed amendment to CoGG's Municipal Strategic Statement (MSS) was prepared by John Keaney (a consultant planner) under direction from DPI. The amendment is currently presented as a working draft and includes alterations to section 21.11 Protection of Catchments, Waterways and Groundwater to now include reference to both landslides and erosion.

## **6.2 Specific Information Relating to EMO1 (lands subject to landslides)**

As previously indicated the proposed implementation of the EMO is planned to include two separate schedules:

- EMO1 (lands subject to landslides).
- EMO2 (lands subject to erosion).

Documents and processes for each were developed throughout the course of the project. It should be noted that the development of EMO1 proved to be more straightforward as models for its administration and implementation already existed at a number of other Victorian municipalities including Colac Otway Shire in south west Victoria and Yarra Ranges Shire in the east of Melbourne.

As such the documents relating to EMO1 are considered to be more advanced than their counterparts for EMO2. In particular there has been detailed discussion with various stakeholders on aspects of the EMO1 schedule.

However it is important to note that all documents still require a thorough review and appraisal by the CoGG planning staff due to the overall limited interaction with CoGG during Phase 3 of the project.

### **6.2.1 Schedule to EMO1**

A detailed schedule to EMO1 (lands subject to landslides) was developed over a series of workshops and communications with planning staff from the CoGG, the COS and the DSE. The proposed schedule incorporates aspects from a number of existing planning scheme schedules around the state as well drawing on the earlier Phase 2 draft versions.

The final working draft for the EMO1 schedule was prepared by Mr John Keaney under direction from DPI. As with all documents delivered under Phase 3 of this project it still requires detailed assessment and appraisal by CoGG prior to implementation.

### **6.2.2 Policy on the Use and Application of EMO1**

A document designed to provide information on the policy for the use and application of the EMO1 was prepared as part of the supporting information aimed at assisting the implementation of the EMO1. The document was based on a similar structure to standard Development Control Plans used in NSW and can be used as both a public information document and an internal reference.

### **6.2.3 Internal Procedures and Guidelines Manual for EMO1**

Based on an existing procedures manual previously prepared for Colac Otway Shire, a working draft of a the CoGG Internal Procedures Manual was prepared as a detailed quality control process to assist the administration of the EMO1 within the CoGG planning department. The manual aims to provide a step by step approach to issues relating to the EMO process and includes checklists and additional public information.

The manual is provided as a guide and framework for an internal process and must be reviewed and assessed by the CoGG for its suitability and application. It must be noted that no detailed discussions have been held with the CoGG on this manual to date.

### **6.3 Specific Information Relating to EMO2 (lands subject to erosion)**

Much of the discussion during Phase 3 centred on details for the implementation of EMO1. Issues relating to EMO2 have proven to be more challenging as few workable examples of a planning scheme system relating specifically to erosion exist within the state.

Much of the development work to date has focused on implementing a risk based approach for erosion issues similar to that already well established for landslides. Whilst a new risk methodology was developed for erosion in Phase 2 many issues remain to be resolved including that of development versus land use and how to best implement strategic change within the planning scheme.

As a result, limited discussion of the EMO2 issue was completed in Phase 3 and the following documents have been provided in preliminary working draft format. These documents will require detailed discussion and development with the CoGG before a process of administration and implementation of the proposed EMO2 can be finalised.

#### **6.3.1 Discussion Paper on Implementation Options for EMO2**

After a series of workshop discussions on various aspects of the EMO2 implementation process, a discussion paper was commissioned by DPI to explore possible options for the introduction of erosion management tools within the CoGG planning scheme. The paper was prepared by John Keaney and concluded that a variety of planning strategies should be considered to address issues relating directly to erosion. These included:

- The use of a limited EMO to deal specifically with high and very high susceptibility areas and for specific types of development only.
- The use of existing overlays to deal with other areas of susceptibility.
- The use of the MSS and the newly created Environmental Management Strategy (EMS) to deal with erosion.

#### **6.3.2 Development of a Preliminary Schedule to EMO2**

A preliminary working draft of a schedule for EMO2 was developed after a limited number of discussions between DPI, A.S. Miner Geotechnical and John Keaney. No detailed input into the schedule was provided by either the CoGG or the COS. The preliminary schedule mirrors the structure and process proposed for EMO1 but requires significant review, assessment and confirmation by all stakeholders.

### **6.3.3 Preliminary Policy for Use and Application of EMO2**

A preliminary policy on the use and application of an EMO2 was developed as a working draft document to assist with the implementation of one option for erosion control under the planning scheme. Many issues remain unresolved including the process for referral to a state authority such as DSE to reduce the burden of technical responsibility on the CoGG.

This document requires significant development and review by the CoGG and can only be refined once detailed discussions on EMO2 have been held.



## 7. Comments and Recommendations

In summary the main deliverables and outcomes under Phase 3 of the EMO implementation project for CoGG include:

- Refined susceptibility maps at 1:25,000.
- Locations of potential EMO boundaries based on the susceptibility mapping.
- A number of general reports relating to susceptibility mapping and data sources.
- A series of well developed schedules and associated documents for EMO1.
- A series of preliminary schedules and associated documents for EMO2.

Outcomes from extensive discussions and development works since the start of the project, confirm that the implementation of EMO1 is an appropriate way to deal with issues relating to landslide within the planning scheme. As such maps, a schedule, reports and associated documents allowing for the implementation of the EMO1 have been completed and now only require detailed assessment and appraisal by CoGG.

An assessment of options for the control of erosion issues under the planning scheme indicates that a series of initiatives may be best suited to this purpose. The development of preliminary maps, a schedule and associated documents have been developed in a working draft format to assist with the further development of an overall strategy for addressing erosion issues.

### 7.1 Issues Requiring Further Consideration

One of the major issues to date has been the limited opportunity for “hands-on” involvement in the development process for key deliverables by key CoGG staff at all levels.

Given the project was commenced under a CoGG initiative in 2003 it is extremely important that the CoGG retained a sense of ownership in the project. However overall involvement by CoGG staff has diminished through successive phases of the project, which is probably reflective of high time commitments on other internal CoGG projects.

The current deliverables now require significant input, review and assessment by the CoGG in order to ensure they comply with current internal policy and resource commitment. This assessment should ideally reconfirm the commitment established at the start of the project in order to achieve the expectations of both parties under the initial co-investment agreement.

The refinement of the preliminary susceptibility maps has advanced significantly however, the current maps are still only considered appropriate for use at a scale of 1:25,000. Detailed discussion of this aspect of the maps is contained in the susceptibility mapping report (see section 6.1.3). The potential EMO boundaries which are based on the susceptibility maps have limits in their accuracy. Their application at larger scales commonly used in the planning scheme must be assessed.

It is strongly recommended that such technical issues be clearly defined and discussed with the CoGG planning staff given the possible requirements for integration of the susceptibility maps and the associated EMO boundaries into the CoGG GIS system and planning scheme.

Any details of future works and possible further refinement of the maps will ultimately depend on the requirements of the end users.

Finally, broader policy and strategic issues still need to be resolved to facilitate and allow the final development of the EMO2. Such issues may include:

- The role of DSE/DPI or another authority as a referral authority for issues such as erosion under the planning scheme.
- Resource and funding arrangements which allow the proposed scheme to function effectively for all municipalities within the CCMA region.
- Application of the model and scheme at a State level.
- Implications of any changes to landslide and erosion risk management guidelines and policy currently being undertaken at a National level.

It should be emphasised that the ongoing cooperation and commitment of both the CoGG and the CCMA is critical to the successful completion of this project. Further development is required to achieve the final implementation of both the EMO1 and EMO2 for the CoGG.

## **7.2 Recommendations**

Based on the progress to date and the works completed under the latest phase of the project the following recommendations are made:

- A memorandum of understanding should be immediately developed between the CCMA and the CoGG regarding the process for implementation of both the EMO1 and EMO2.
- Timeframes commensurate with any final additional development work required for each of the overlays should be established and agreed upon by both the CCMA and CoGG.
- Specific EMO implementation meetings including key stakeholders such as CCMA, DPI, DSE and CoGG, should be convened as soon as possible to discuss detailed technical issues with all deliverables for the EMO1 and possibly EMO2.
- In particular, issues relating to the required scale of mapping and the required accuracy of all the EMO boundaries should be clearly defined with all stakeholders.
- Meetings with key stakeholders including the CCMA, DPI, DSE and CoGG should be convened to discuss outstanding issues with EMO2. These meetings should include discussion on all options for control under the planning scheme and a consensus reached on the final strategy to deal with erosion including the status of implementation of the EMO2.

- In order to address the limited opportunity for interactive involvement to date, sessions with all levels of CoGG planning staff should be organised to explain the proposed process and supplied documentation and to assist with internal arrangements for the administration and implementation of EMO1 in the short term and possibly the EMO2 at a later date.

Appendix A

# Potential Benefits of an EMO

## Responsibility and Duty of Care

The obligation for action on issues relating to natural resource management, land degradation and soil health is currently shared between Local Government and the CMA's and regulated under a hierarchy of State, Regional and local policy. CMA's have the responsibility to set out land owner duties with respect to managing land and to prepare broad land manage planning and support land protection with detailed projects and programs, particularly where that land is susceptible to degradation process. Local Government on the other hand controls and directs new land use change and development in the landscape having regard to other authority's plans and duties. This is an important process to enable landowner and developers with the best planning and direction to ensure improvements to landscapes whilst generating homes, farms, villages, towns and wealth from the natural landscape.

Municipalities are bound and must have regard to State Planning Policy Framework (SPPF), Regional Catchment Strategies (RCS) and Geographic Strategies provisions of the Victorian Planning Provisions. The CMA and Municipality share the broad planning role in some instances but the Municipality has the detailed development system in the Local Planning Scheme. When the Council decides on planning permits as the Responsible Authority this role can be sometimes shared because of parallel other state or region authorities policies or activities. This is often formalised through referral to these agencies at the time of a planning permit and enables that authority's concerns or directions to be taken on board. This also reduces the need for separate and further permits or consents to be gained.

Both the CMA and the Municipality have a duty of care to coordinate their activities and policies and this is doubly important where erosion and landslide risk exists. The landholder also has a duty of care but public agencies have a high duty of care because of their technical and scientific expertise and statutory duties.

The implementation of an EMO within a municipal planning scheme is one specific tool that can be used to address environmental issues arising out of or impacting upon new development. Interrelated issues of land stability, degradation, soil health, water quality and biodiversity can all be brought to bear in assessing the design, siting and overall proposal to appropriateness of proposals. Whilst an EMO is primarily a tool to regulate development, it can also be used to address issues of infrastructure location, public safety, cultural and heritage issues and offer mapping for strategic planning purposes. Existing development, and development for which a planning permit is not required, will also benefit from the flow effect on knowledge to adjoining land holders and land industries. This leads onto the improved land management practices message that under pin the advice and directions where permits are issued under the overlay. In some cases an EMO can also be used to address current or proposed land use such as agricultural activity. However, this matter has not been canvassed although it is recognised that erosion and as of right land use change are closely related and will eventually need to be examined in each catchment.

## Liability

Public and private liability issues can arise out of situations where poor development design and decision making exists and it is important the responsible authorities are continuously improving their knowledge and improving public decision making procedures. Unless continual improvements are made, responsibility will not be diminished or shared equally. Much of the information now relating to land degradation and in particular landslide and erosion now lies within the public arena and needs to be shared and transferred to the professions responsible for land use and development. Significant information sources now include a database being constructed by the CCMA, studies conducted by the University of Ballarat and reports from other State and Federal government bodies such as the former Soil Conservation Authority (SCA). In addition information is also held by the responsible authorities themselves which may not be widely distributed within the organisation itself and this project has sought to align and integrate the best data into clear decision support procedures.

The implementation of an EMO will formalise the data standards, assessment methodology and access arrangements of information through a series of proposed incorporated planning scheme documents such as data inventories. It is also proposed that a centralised publicly accessible web-based system providing ready access to relevant information be established.

The process of dissemination of information is intended to avoid current issues of uneven access to information for geo-technical experts advising on these issues and to improve the up keep of the data sets as we learn more about the changing landscape. Often data systems such as this can be susceptible to being discarded, ignored or forgotten either by the authorities or those conducting the supporting studies and research.

## Economic

One of the initial economic benefits of a municipality participating in the EMO implementation program lies in the sharing of the initial development costs of the program. It is anticipated that significant elements of the scheme developed comprise a low cost and these in the initial studies can be readily transferred to other municipalities in the region ensuring a consistent planning and development approach across the catchment. For example, the methodology for erosion risk management developed in Phase 2 of the CoGG pilot study can be adopted for other shires. Similarly current developmental work planned by Colac Otway Shire and the CCMA on a web based information delivery system will benefit CoGG and other shires in the region.

However the major economic benefit of the implementation of an EMO for any municipality will lie in avoiding inappropriate developments in areas of high susceptibility to land degradation. Economic benefit will derive from reduced occurrence of existing or new erosion and its associated impacts both on-site and to receiving environments off-site.

In addition costs benefits will be gained from an anticipated reduction in the number of external peer reviews and associated Victorian Civil Administrative Tribunal (VCAT) arbitration hearings. This particularly applies to developments currently not governed by an EMO or the inadequate addressing of erosion issues under other associated overlays.

The targeted risk areas through the EMO will also ensure that the developer addresses land degradation issues at the earliest possible time in the development process and

avoid and minimise impacts by following guidelines before planning applications are made.

A Study conducted by the University of Ballarat (Feltham 2005) highlights a significant number of assets within 50 and 100 m of known occurrences of land degradation. Because these mapped occurrences form part of the basis for the final susceptibility maps and associated EMO, it is anticipated that a reduction in inappropriate developments adjacent to such infrastructure will occur as a result of the more stringent requirements for development under an EMO.

## Environmental

Significant environmental benefit is expected to be derived from the implementation of EMOs throughout the CCMA region by providing water quality benefits through the reduction in landslide and erosion. The newly developed erosion risk management methodology clearly identifies the five asset classes commonly adopted by the CCMA (including the environment, flora fauna and biodiversity) as key elements at risk. This ensures such issues are included in any assessment where a report is required under the EMO.

Another significant benefit of the current investment in the healthy landscape program is that the overall CCMA Soil Health Strategy (and the associated program of EMO implementation) provides a consistent approach throughout the region. This can have significant benefit for the environment where natural processes are not governed by local government boundaries and impacts may be experienced far from the source.

## Social

The implementation of an EMO is also expected to have significant social benefit. This is likely to occur through a reduction in the risk to life from landslide and inappropriate development in such high susceptibility areas. Much of the coastal public spaces in the CCMA region are susceptible to landslide including parts of the Bellarine Peninsula, and these are particularly under increasing pressure from adjoining residential subdivision and development such as surface and sub-surface drainage changes.

Consistent and forward looking planning and regulation can reduce and or avoid the potential for loss of life and damage to what are becoming increasingly more expensive coastal dwellings and infrastructure.