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Corangamite Catchment
Management Authority and the
City of Greater Geelong

EMO Implementation for The City of Greater Geelong

Progress Report

Project Report - 30 July 2005

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1. Introduction

The Corangamite Catchment Management Authority (CCMA) is developing a Soil Health Strategy (SHS) as a sub strategy of the Corangamite Regional Catchment Strategy. As such the current SHS is an evolving document that provides a framework to assist stakeholders in addressing a diverse range of soil health issues in the Corangamite region.

A pilot study was commenced in the City of Greater Geelong (CoGG) in 2004 as part of the overall process of development and implementation of the SHS within the CCMA region. The main aim of this study was to facilitate the implementation of an Erosion Management Overlay (EMO) within CoGG planning scheme under the Victorian Planning Provisions. The use of EMO's within the region is viewed by the CCMA as a critical element in allowing municipalities to address both strategic and developmental issues of land degradation and soil health.

The development and implementation of EMOs within the CCMA region facilitates one of the key CCMA functions by providing water quality 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).

In addition, the EMO pilot study for CoGG also provides an opportunity to develop a consistent approach to planning scheme amendments within the region and will result in a number of process elements (including methodologies and documents) which can be readily transferred and adopted within other municipalities.

This report briefly summarises the works in Phase 1 of the program which was completed in August 2004. The report then describes the progress to date under Phase 2 of the project which is to be completed by the end of July 2005. Comments and recommendations are made in relation to the next stage of work required to complete the developmental phase of the project. Following confirmation of strategic issues relating to resources and funding arrangements, the implementation of the EMO for CoGG is planned for completion by June 2006.

2. Summary of Phase 1 Aims and Outcomes

The initial Phase 1 stage of the implementation of an Erosion Management Overlay (EMO) for the City of Greater Geelong (CoGG) was completed in August 2004. The work was undertaken to provide 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 to 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 ortho-corrected 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 Industry (DPI). Due to scale and accuracy issues as well as 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 administration and implementation of an EMO for COGG were also provided as part of the Phase 1 project. It was recognised that these guidelines and notes would ultimately provide input into the content of accompanying planning schedules needed for the final implementation of an EMO under the planning scheme.

As a result of the works undertaken in the Phase 1 project a number of comments and limitations were discussed and can be summarised as follows:

Project Implementation

- The level of involvement of key stakeholders in the project was identified as a critical element to success including more involvement from internal departments at CoGG.
- A broad review of the overall project aims and goals was recommended as part of the ongoing program.
- The use of local groups such as Landcare was recommended as a potential beneficial addition to the next phase of the program.

Data and Assessment Methodology

- The current susceptibility maps that have been derived from regional data sets (1:100,000) need to be refined to produce maps that are accurate at a planning scale (1:5,000).
- Reference back to the original data sets was needed to extend the regional maps in areas blanked out within the urban confines of the city.
- More detailed and complicated methodology used in susceptibility mapping may need to be utilised to produce the required larger scale maps.
- Further data on occurrences was needed due to the limited resources available to mapping processes in the Phase 1 program.
- Mapped data also needed to be field checked to confirm the accuracy of the mapping process.
- No consistent method of risk assessment was available for the assessment of erosion risk and was needed to be developed to allow a consistent risk management approach for both landslides and erosion.
- A standard approach to risk terminology was also needed in describing the process of assessment for both landslide and erosion.
- Difficulties in data sharing arrangements had a detrimental effect on the progress in Phase 1 of the project and need to be addressed in future stages of the program.

Policy and Strategy

- Implications of the proposed scheme and the potential increase in resources required to administer the overlays needed to be discussed with all relevant stakeholders.
- The pilot study should be seen as a vehicle for providing a standard and consistent framework for the implementation of EMO's across the Corangamite region.
- The Phase 1 works highlighted the issue of management of new development under the planning scheme as opposed to an ability to change current use as a matter of strategic policy. It was recognised that the implementation of an EMO was only partially able to achieve both goals.

3. Proposed Scope of Works for Phase 2

A.S. Miner Geotechnical was commissioned in March 2005 to undertake the next phase of work in the CoGG EMO implementation project. Under the original brief developed by Troy Clarkson at DPI the following assignment scope was provided:

“To develop a methodology and guidelines for land and soil erosion by wind, water and coastal processes in the City of Greater Geelong, which are prescriptive, universal, transferable and based on risk management”.

An initial project meeting was held with Peter Dahlhaus (representing the CCMA) and Troy Clarkson (DPI) on the 4th March to discuss the scope of work under the initial project brief. The following project elements were discussed and agreed upon as forming the basis for the Phase 2 works:

- Developing a methodology for erosion risk management.
- Supplementing mapped occurrences of landslide and erosion in COGG through the aerial photographic mapping project being conducted by Peter Dahlhaus and Warren Feltham at the University of Ballarat.
- Undertaking field verification of data through the use of Landcare groups.
- Refinement of the existing Phase 1 susceptibility maps for CoGG in order to allow boundaries to be formulated for use as the EMO overlays.
- Development of preliminary planning schedules associated with the proposed overlays.
- Commissioning of a pilot study to assess the potential occurrence of Acid Sulphate Soils (ASS) within the CoGG local government area boundary.

A meeting was then subsequently held with Troy Clarkson (DPI) and Leigh Dennis (CCMA) at the State Government Offices in Geelong on the 20th of April 2005 to further refine the scope of the Phase 2 program for the CoGG. It was decided at this meeting to:

- Exclude coastal processes from the Phase 2 works but include terrestrial land degradation processes associated with dunes, beach and foreshore areas.

In addition, the next Soil Health Forum was planned to be undertaken during June 2005 at which time an update on the progress of the pilot study for the EMO was intended to be disseminated to forum attendees including local government and state government representatives.

4. Update on Phase 2 Progress

4.1 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 have 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 are difficult to transfer to other circumstances.

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

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

The method uses the relationship for risk as follows:

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

Likelihood is a function both susceptibility and triggering events and 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 in July 2005 and is currently being reviewed by CCMA and will form part of the integrated framework for the implementation of EMO's within municipalities throughout the Corangamite region.

4.2 Additional Data Mapping

A spatial erosion and landslide database was created for the entire CCMA region under project funding supplied by the DPI to the University of Ballarat (UoB). The database has been compiled by Warren Feltham (Geology Honours student) under the supervision of Peter Dahlhaus (senior geology lecturer at UoB).

Mapping of erosion and landslide features has been undertaken using photographic interpretation techniques applied to the latest ortho-corrected photographs for each of the municipalities within the CCMA region. The study has resulted in 4175 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 is due to be submitted to the CCMA at the end of July 2005 and details of the report are as follows:

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

The additional data obtained during the UoB study has significantly added to the number of occurrences in the initial preliminary dataset established in Phase 1 of the project. This expanded data set has allowed more detailed calibration of the preliminary susceptibility maps and will be further added to after the results from the field verification program are received.

The erosion and landslide data base established by UoB is also currently being 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.

4.3 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.

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 onto which the known erosion and soil degradation areas were mapped by members of the Landcare groups and returned to DPI. The marked up maps were then delivered back to UoB for inclusion within the erosion and landslide database.

Currently field maps have been produced for the entire CCMA region and are being delivered to the appropriate community groups. The completed maps are expected to be returned, verified and information transferred to the database by the end of the year.

Further information on the program progress can be obtained from Troy Clarkson (DPI) and Peter Dahlhaus (UoB).

4.4 Refinement of Phase 1 Susceptibility Maps

Refinement of the existing Phase 1 susceptibility maps is being undertaken by AS Miner Geotechnical in conjunction with Dahlhaus Environmental Geology Pty Ltd (DEG). Completion of the refinement process is 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 current intention is 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 process is aimed at refining the preliminary Phase 1 maps produced from regional data (1:100,000) to larger scale maps (1:5,000) more suited to planning decision-making. The initial process of refinement has involved the overlaying of appropriate mapped occurrences on individual susceptibility maps and gauging the accuracy or otherwise of the proposed susceptibility ratings.

This initial work has 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), have been noted in the initial calibration stages of the Phase 2 refinement work. The recent addition of field verification data from the Landcare groups into the erosion and landslide database has further highlighted accuracy and interpretation issues with the initial susceptibility maps.

As a result of the work undertaken during Phase 2, it has been concluded that it is not possible to directly produce defensible, planning scale maps from the initial preliminary susceptibility maps. The revised outcome of the Phase 2 work is now aimed at producing the next generation of susceptibility maps at an intermediate scale of 1:25,000. This current process involves 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 susceptibility area boundaries has been attempted thus far.

Whilst the Phase 2 1:25,000 susceptibility maps represent a significant refinement of the initial maps, it must be noted that they should not be used for the final formulation of the EMO boundaries. As a result, further refinement of these 1:25,000 scale maps is still required to produce planning scale maps at 1:5,000.

Further refinement work now required under Phase 3 of the project needs to include a review of the original datasets including geology, geomorphological units and terrain categories. Boundaries need to be reviewed, assessed and altered as appropriate utilising the mapped data and the ortho-corrected aerial photographs. In addition the use of GIS techniques to allow an assessment of the importance of other factors such as geology, rainfall, slope length, slope angle, vegetation and land use and landform may also now be required to further refine both the susceptibility ratings and the boundaries between different susceptibility areas. Buffer zones including provision for landslide travel distance and zones of potential impact around susceptible features such as stream are also intended to be reviewed and added to the current maps.

Initially intended for completion by the end of June 2005, the refinement process has proven to be more challenging than initially anticipated and the development work is currently continuing. Completion of the 1:25,000 scale next generation susceptibility maps is scheduled for mid August 2005 and will represent the end of the Phase 2 refinement process. The new date for completion of the Phase 3 refinement to allow planning scale maps and the EMO boundaries to be produced has yet to be confirmed.

4.5 Development of Preliminary Planning Schedules

As indicated previously it is intended to produce two planning overlays: EMO1 (landslide) and EMO2 (erosion). As such, accompanying planning schedules to the proposed overlays are currently being developed for incorporation into the CoGG planning scheme.

Initial drafts of the two schedules have been developed and are currently under review by CoGG's planning department and the environment and natural resource department.

Details of the 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)".

As yet the schedules are still in a developmental stage and the final format and content is dependent on the model adopted by CoGG for the administration and implementation of the new EMO's within the CoGG planning scheme.

The schedules reflect a proposed approach aimed at minimising the need for additional resources within CoGG either employed directly or through the services of an external consultant. The current versions of the schedules are relatively prescriptive with respect to the process and requirements needed to be satisfied by an applicant where the overlays apply. The schedules make 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.

The adoption of an administrative and implementation model is yet to be resolved and discussions are currently being undertaken with key stakeholders in the development of a regional framework such as the Department of Sustainable Environment (DSE), DPI and CCMA.

4.6 Pilot Acid Sulphate Soil Study for CoGG

A scoping study on the potential occurrence of Acid Sulphate soils 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 the 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.

5. Works Required under Phase 3

The combined work under Phase 1 and 2 of the EMO implementation project for CoGG has yielded significant progress in achieving the overall aims of the initial pilot project established by the CCMA and CoGG. The current intention is to finalise the implementation of an EMO for CoGG by June 2006. In order for the EMO to be implemented for CoGG as planned, a number of outstanding issues still remain to be finalised under Phase 3 of the project. As such recommendations for further work under Phase 3 of the project are made as follows:

Overlays and Schedules

Outstanding issues and tasks relating to overlays and schedules include

- Completion of the final refinement process of the susceptibility maps taking into account original data sets, GIS techniques, the latest inventory data, process boundaries and scale issues (see section 4.4 for detail).
- Production of the boundaries and line-work for the EMO overlay.
- Preparation of EMO 1 and EMO 2 overlays in format compatible with the requirements of DSE.
- Discussion (via a workshop) of issues relating to the preliminary planning schedules and the proposed administration process with all appropriate stakeholders.
- Finalising the content of the planning schedules.
- Preparation of planning schedules 1 and 2 in a format compatible with the requirements of DSE.

Referred and Incorporated Documents

A series of referred or incorporated documents need to be developed to support the schedules and overlays and these may include:

- Report on data inventory and bibliography of relevant information relating to the occurrence of erosion and landslides in CoGG and the wider CCMA region.
- Erosion and landslide risk assessment guidelines and procedures manual for CoGG and potentially other municipalities within the wider CCMA region.
- Erosion and landslide risk assessment guidelines and procedures manual for DPI or another authority acting as a referral authority to the proposed scheme.

Data Collection

Ongoing collation of erosion and landslide information remains an important element of the proposed system and as such the following issues require continuing attention:

- Completion of the data gathering and field verification process with Landcare and community groups commenced in Phase 2.
- Review, ratification and incorporation of this new data into the existing erosion and landslide database.

Data Management

In addition to data collection, other data management and information issues also need to be resolved such as:

- Establishing a data repository model and data delivery system probably as a web based system.
- Finalising details for an appropriate authority or organisation to act as data managers.
- Finalising details for ongoing data updating and management.
- Producing a series of public information pamphlets and documents discussing the EMO implementation and the needs for the new scheme within CoGG and throughout the region.

Policy and Strategic Issues

Finally, broader policy and strategic issues need to be resolved to allow the final development of the preferred model for implementation and administration of EMO's within the CCNMA region. Such issues may include:

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

Many of the outstanding issues discussed in the sections above are inter-related and will have significant implications on final aspects of any scheme adopted throughout the CCMA region. However it is hoped that the pilot study for the implementation of an EMO for CoGG can be completed by scheduled completion date of June 2006. It should be emphasised that the cooperation and commitment of both the CoGG and the CCMA is critical to the successful completion of this project.