

a.s.miner
Geotechnical
Consulting Engineers

50 Calder Street, Manifold Heights, VICTORIA 3218
Tel : 03.52294568 Mobile : 0438.294568
ABN 72 856 478 451
Email: aminers@pipeline.com.au

The Department of Primary
Industries

**The Determination of On-Ground
Actions for CSHS Target areas
and Sites**

Supporting Document to the
Corangamite Soil Health Strategy

Report No: 352.1/01/06

Date 29th September 2006

Prepared for Troy Clarkson
Department of Primary Industries
PO Box 103
Geelong
VIC 3220

Contents

Executive Summary	i
1. Introduction and Background	1
2. Scope of Commission	3
3. Concept of Target Areas and Sites	4
4. Key Asset Classes and Sub Classes	7
5. Rankings of Target Areas and Sites for Erosion and Landslides within Landscape Zones	8
6. Stakeholders and Potential Actions	11
6.1 Stakeholders and the choice of actions	11
6.2 Potential actions to be taken to stakeholders for discussion	11
6.3 Proposed actions for target areas and sites.	12
7. Comments and Discussion	14

Appendices

A Example of the Field Verification Sheet	
---	--

Executive Summary

Soils are seen as a significant asset within the Corangamite region as they control water quality to a significant degree and provide the medium for plant and crop production whilst supporting infrastructure and development. In accordance with the overall aims of the Corangamite Regional Catchment Strategy, the Corangamite Soil Health Strategy (CSHS) was developed to promote soil health by reducing the consequences and effects of soil threatening processes which can impact both public and private assets.

In order to facilitate the assessment of soil related risks in the region, the CSHS adopted the Corangamite Landscape Zones as the basis for delineating the various soil threats throughout the region. 15 landscape zones exist throughout the CMA and these were each individually assessed for 12 different soil threatening processes.

An initial process of allocation of relative risk to asset method was adopted and various combinations of threats and landscape zones were ranked from 1 to 150. The top twenty threat-landscape combinations were chosen as priority areas for assessment and investment for the CSHS. A field verification and validation program was undertaken to confirm the validity of the initial assessment through the selection of a number of target areas and sites for on site assessments. This overall assessment and evaluation process has been described previously in the CSHS and an earlier companion report prepared by A.S. Miner Geotechnical.

The earlier report detailed the methodology used and recorded both the field observations and the field based assessment of risk. It then described the process for revision and readjustment of the initial top twenty rankings.

This current report serves as a companion to the earlier field verification report and details the process by which the target areas and sites were assessed for proposed discussion with stakeholders and describes the formulation of potential actions relating to on ground works and studies as part of the overall CSHS investment strategy.

1. Introduction and Background

Soils are seen as a significant asset within the Corangamite region as they control water quality to a significant degree and provide the medium for plant and crop production whilst supporting infrastructure and development.

The Corangamite Regional Catchment Strategy (RCS) developed by the Corangamite Catchment Management Authority (CCMA) helps to set guidelines and policy for investment to ensure overall catchment health (including soil health) throughout the region. The Corangamite Soil Health Strategy (CSHS) is one of a number of sub strategies under the RCS aimed at achieving this overall objective of healthy and sustainable catchments.

As such, the CSHS has been developed to minimise the detrimental effects of soil threatening processes throughout this region. The CSHS aims to promote soil health by reducing the consequences and effects of soil threatening processes which can impact both public and private assets.

The CSHS was developed by the Department of Primary Industries (DPI) for the CCMA over a four year period with a final draft produced in August 2006. A critical part of the development included the completion of a background paper by MacEwan in 2003 which identified threatening process related to soil health. Such soil threatening processes included soil structure decline, soil erosion, landslides, waterlogging, nutrient management, soil salinity, soil acidification, acid sulphate soils, soil contamination and management of soil organic matter and biota (Dahlhaus 2006.)

In order to assist the assessment process the CSHS adopted the Corangamite Landscape Zones (based on sub catchment areas) as the basis for delineating the various soil threats throughout the region (see Figure1). 15 landscape zones exist throughout the CMA and these were each individually assessed for 12 different soil threatening processes.

A workshop including technical experts on soil degradation processes and regional asset managers was held in 2003 to identify and assess the threats in each landscape zone. The threats were rated on both private and public assets according to their impact and importance to the asset manager. This process was later expanded and the CSHS describes the “relative risk to asset” approach used to rank 150 combinations of soil threatening process and landscape zones throughout the CMA region.

The ranking process used a GIS based method to identify soil threatening risks and assets as they are known and mapped in existing CCMA databases. As part of an overall quality control program aimed at confirming the validity and accuracy of this desktop type process, a number of field based studies and assessments were undertaken. These studies form the basis of a verification process which is intended to ratify areas designated as having high relative risk to assets from soil threats and to ensure any future investment is based on a sound and defensible understanding of the ranking processes.

An earlier report (ASMG consultants report 252/01/06) detailing the selection of a number of specific target areas and sites and the process undertaken for the field verification of the initial relative risk to assets rankings for *erosion and landslides* at these target locations was prepared by A.S. Miner Geotechnical in September 2006.

The earlier report details the methodology used and records both the field observations and the field based assessment of risk. It then describes the process for revision and readjustment of the initial top twenty rankings.

This report serves as a companion to the earlier field verification report and details the process by which the target areas and sites were assessed for proposed discussion with stakeholders and describes the formulation of potential actions relating to on ground works and studies as part of the overall CSHS investment strategy.

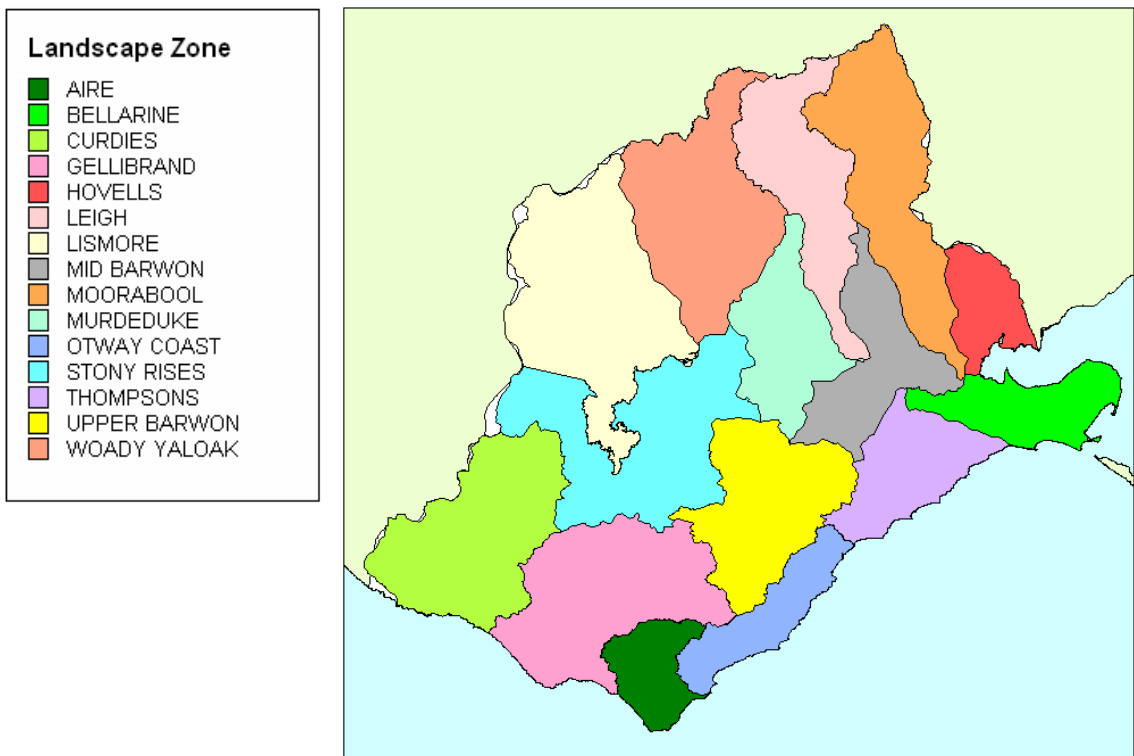


Figure 1 Location of CCMA landscape zones (after Dahlhaus 2006)

2. Scope of Commission

A.S. Miner Geotechnical was commissioned by Troy Clarkson (DPI project manager for the Corangamite Soil Health Strategy) to assist with the determination of actions for on ground works and investigations in selected target areas and sites as identified in the CSHS. The various target areas and sites were identified as part of the field verification and validation process of the Corangamite Soil Health Strategy (CSHS).

As a result, the following processes were undertaken in order to achieve the overall project task aim:

- Discuss the concept of target areas and specific target sites.
- List the major asset classes and sub classes under threat on the basis of field observations, expert knowledge and experience.
- Individually rank target areas within landscape zones for erosion and landslide issues based on the previous assessment of risk adjusted for relative asset value.
- Identify the key stakeholders potentially affected by the threats.
- Establish a list of proposed actions to be discussed with the stakeholders to allow appropriate investment under the CSHS.
- Establish recommendations to implement the proposed actions.

This report documents the processes involved in undertaking the above tasks.

3. Concept of Target Areas and Sites

The establishment of landscape zones within the CCMA region initially allowed the disaggregation of the regional landscapes into components well suited to the management of waterways throughout the region. However they tend to be very broad when related to soil health issues and the use of a more specific system is needed to address soil related threats within each landscape zone.

The use of soil landform units are better suited to the development of management action plans as they group like geologies, soil types and landscape forms and as such they can be expected to produce more consistent management areas at local scale. However some of these soil landform units are spatially extensive and an even larger scale delineation of specific areas and sites is sometimes needed to accurately define a particular threat or hazard.

The process of choosing target locations for field validation is described in detail in the earlier report and will only be briefly discussed here.

Through a process of visual inspection of the 6 different asset class maps for a particular threat-landscape zone combination (e.g. landslides in Gellibrand) it was possible to identify hot spots or geographical clusters of intersection points within the landscape zone. These hot spots or potential target areas for more detailed field verification were then transferred by hand onto a series of road atlas maps and later digitised onto a GIS layer.

Other target areas and sites were also added to each landscape zone after later discussions amongst the workshop team members and /or as a result of observations in the field during the initial field inspections.

It is important to note that the target locations were based on the intersection of threats and assets and not on the spatial density of the threat alone. Some locations contained numerous intersections of assets and threats (e.g. numerous landslides along a 15 km stretch of Turton's Track in the Gellibrand landscape zone) while others were limited to specific sites where an individual hazard might not be extensive but its impact was considered to be very significant (e.g. Bouwmans landslide on the Princetown Simpson Rd also in the Gellibrand landscape Zone).

Hence the choice of target locations was not based on any one particular spatial scale or extent.

As a result, the choice of target locations to validate the previous desk top assessment of asset based risk (see earlier report) involved a diverse range of spatial extents. These target locations ranged from individual sites, where there was a known significant intersection of asset and threat, to spatially large tracts of land with consistent characteristics and an equally consistent distribution of threats intersecting with assets. Hence target locations were delineated as either *sites* or *areas*.

Based on the process described in the earlier report, 16 target areas and 5 target sites for erosion were identified in 5 different landscape zones. In addition, 23 target areas and 14 target sites for landslides were also identified in 5 different landscape zones. The final lists of target areas for landslides and erosion respectively in each landscape zone are detailed in Tables 1 and 2.

General locations of these target areas and sites for both erosion and landslides are detailed in Appendix A while further site observations and information on selected target areas and sites are also contained on site inspection sheets in Appendix A of the earlier report.

Landscape Zone	Landslide Target Location ID	Description
Gellibrand	G1	Johanna Heights
	G2	Gellibrand River Estuary
	G3	Wiridjil / Valley View Rds
	G4	Great Ocean Rd Old Princetown PO
	G5	Tomahawk Cr / Coradjil Rds
	G6	Turton's Track
	G7	Kawarren East / Fry's Rds
	G8	West Gellibrand Reservoir / Arkins Ck
	G9	Moonlight Head / Gables Rds
	G10	Princetown-Simpson Rd (Bouwman's Landslide))
Otway Coast	OC1	Fairhaven (Clarke's Landslide)
	OC2	Big Hill / Lorne
	OC3	Windy Point
	OC4	Mt Defiance to Jamieson River
	OC5	Wye River
	OC6	Kennett River to Grey River
	OC7	Skenes Creek / Beacon Point
	OC8	Wongarra Gt Ocean Rd
	OC9	Wild Dog / Sunnyside Rd
	OC10	Apollo Bay / Barham Valley
Curdies	C1	Pt Campbell-Cobden Road
	C2	Cooriemungle / Williams Rds
	C3	Scotts Creek Area
	C4	12 Apostles and Coast
Upper Barwon	UB1	Winchelsea-Lorne Rd
	UB2	Bambra / Coal Mine Creek Rds
	UB3	Pennyroyal Area
	UB4	Forest including Lake Elizabeth
	UB5	Deans Marsh-Lorne Rd (Sincocks Rd)
	UB6	Birregurra-Yeodene Rd (Phillips Landslide)
Aire	A1	Gt Ocean Road
	A2	Forestry at Bins Rd Aire Valley
	A3	Ford River
	A4	Hordern Vale Rd
	A5	Gt Ocean Rd near Glenaire / Castle Cove
	A6	Upper Ridge (Beech Forest to Lavers Hill)
	A7	Aire River Forestry

Table 1 Target areas and sites for landslides based on GIS analysis, expert judgement and field observations.

Landscape Zone	Erosion Target Location ID	Description
Woody Yallock	WY1 WY2 WY3 WY4	Misery Moonlight Creek Area Paddy Gully Road Cars / Boyles Road Rokewood-Corindhap Road
Moorabool	M1 M2 M3 M4 M5 M6	Eclipse Creek West Branch of the Moorabool River Lynches Road Dermott's Road (Fire affected area) Robs Road Yendon / Lal Lal
Thompson	T1 T2 T3	Willowite Rd Blackgate Rd Thompson's Creek (off McCann Rd)
Upper Barwon	UB1 UB2 UB3	Deans Marsh Rd / Coal Mine Creek / Wurdale Rds Yan Yan Gurt Ck and Retreat Ck West Barwon River Valley-Colac-Muroon / Birregurra
Leigh	L1 L2 L3 L4 L5	Magpie Sand Road Coopers Road Shelford-Mt Mercer Road (inc Meekes in Robbies Rd) Shelford-Meredith Road

Table 2 Target areas and sites for erosion based on GIS analysis, expert judgement and field observations.

4. Key Asset Classes and Sub Classes

In keeping with the list of asset classes used in the initial assessment undertaken in the CSHS, the following asset classes and subclasses were adopted for consideration in the assessment of risk in the various target areas and sites.;

- Infrastructure (including major roads, minor roads, dwellings, channels, dams and other structures).
- Water Quality (including major waterways, minor waterways/streams/creeks, and proclaimed catchment areas).
- Biodiversity (wetlands, conservation sites, natural vegetation, environment).
- Land use (dairying, pasture/ grazing, forestry/plantations, public recreation/tourism).

A key asset class was generally identified for each target area or site and this formed the basis for the both the ranking and the proposed choice of action for on ground works and studies described in later sections. In general, it was found that infrastructure and land use were the key issues for landslides whilst water quality and land use were the key issues for erosion.

Specific information on the key asset class and sub class identified for each target area and site is contained in Table 5 in Section 6.3.

5. Rankings of Target Areas and Sites for Erosion and Landslides within Landscape Zones

The process for ranking of target areas and sites is based on a relative risk to asset method adjusted for relative asset value. The process allowed for confirmation of the existence and nature of the threat in the field and assessed the impact to the asset in the context of a risk based approach. The process is fully described in the earlier companion report and only a brief description is provided below.

The initial process of assessment was commenced in 2002 and involved a number of workshops with technical experts and asset managers. A relative risk to asset method was adopted for the assessment of risks to assets posed by the various soil threatening processes. This method was based on a desktop type analysis whereby the intersection of mapped occurrences of soil threatening process with known assets was calculated using GIS techniques. The severity of the impact of the threat on the asset was estimated using a relative asset value and an overall risk ranking value was calculated for 150 different combinations of soil threats and landscape zone combinations.

The relative risk value then allowed the various combination to be ranked from 1 to 150 and the top twenty threat-landscape combinations were chosen as priority areas for the CSHS.

The validity of the initial assessment was then verified through a series of site inspections and field based evaluations of risks for a number of key target areas and sites. The selection of these sites was based on an additional GIS based method and the expert knowledge and judgment of the research team. A secondary assessment of risk was then conducted using the understanding and insight gained from the field validation program and the top twenty threat–landscape combinations were reviewed and re-ranked in order to reflect the field observations and refined assessments

The results of the review including the detailed assessment of individual target areas and sites were collated and re-ranked so as to produce a priority list for each particular combination of threat and landscape zone (e.g. landslides in the Gellibrand landscape zone). Final results are detailed in Tables 3 and 4.

Landscape Zone	Landslide Location ID	Target Location	Target Area or Site	Total Risk Value (adjusted)
Gellibrand	G6	Turton's Track	Area	221
	G8	West Gellibrand Res/ Arkins Ck	Site	194
	G4	Great Ocean Rd Old Princetown PO	Site	170
	G2	Gellibrand River Estuary	Area	157
	G1	Johanna	Area	140
	G7	Kawarren East / Fry's Rds	Area	124
	G10	Princetown Simpson Rd Bouwmans	Site	110
	G9	Moonlight Head/ Gables Rds	Area	99
	G5	Tomahawk Cr/ Coradjil Rds	Area	70
	G3	Wiridjil/ Valley View Rds	Area	56
Otway Coast	OC5	Wye River	Area	182
	OC7	Skenes Creek/ Beacon Point	Area	163
	OC10	Apollo Bay/ Barham Valley	Site	160
	OC9	Wild Dog/ Sunnyside Rd	Area	153
	OC4	Mt Defiance to Jamieson River	Area	149
	OC2	Big Hill/ Lorne	Site	147
	OC3	Windy Point	Site	132
	OC6	Kennett River to Grey River	Area	130
	OC8	Wongarra Gt Ocean Rd	Area	121
	OC1	Fairhaven Clarke's Slide	Sites	108
Curdies	C4	12 Apostles and Coast	Area	166
	C1	Pt Campbell Cobden Rd	Area	129
	C2	Cooriemungle/ Williams Rd	Area	120
	C3	Scotts Creek	Area(site)	120
Upper Barwon	UB4	Forest including Lake Elizabeth	Area	256
	UB6	Birregurra Yeodene Rd / Phillips	Site	129
	UB2	Bambra/ Coal Mine Creek Rd	Area	91
	UB3	Pennyroyal	Area	71
	UB1	Winchlesea Lorne Rd	Site	64
	UB5	Deans Marsh Lorne Rd Sincocks rd	Site	56
Aire	A3	Ford River	Site	205
	A1	Gt Ocean Rd	Site	119
	A7	Aire River Forestry	Area	116
	A5	Gt Ocean Rd near Glenaire/ Castle	Site	105
	A6	Upper ridge Beech Forest to Lavers Hill	Area	96
	A2	Forestry at Bins Rd Aire Valley	Area	64
	A4	Hordern Vale Rd	Area	63

Table 3 Final rankings of target areas and sites for landslides within landscape zones.

Landscape Zone	Erosion Location ID	Description	Target Area or Site	Total Risk Value (adjusted)
Woody Yalloak	WY1	Misery Moonlight Creek Area	Area	134
	WY4	Rokewood-Corindhap Rd		91
	WY2	Paddy Gully Rd		84
	WY3	Cars / Boyles Rd		84
Moorabool	M1	Eclipse Creek	Area	141
	M4	Demott's Rd (Fire affected area)		110
	M6	Yendon / Lal Lal		101
	M2	West Branch of the Moorabool River		94
	M3	Lynches Road		68
	M5	Robs Road		52
Thompson	T2	Blackgate Rd	Site	60
	T3	Thompson's Creek (off McCann Rd)	Site	58
	T1	Willowite Rd	Site	30
Upper Barwon	UB3	West Barwon River Valley-Colac/Muroon / Birregurra	Area	72
	UB1	Deans Marsh Rd / Coal Mine Ck / Wurdale Rds	Site	64
	UB2	Yan Yan Gurt Ck and Retreat Ck	Area	42
Leigh	L1	Magpie	Area(site)	99
	L2	Sand Rd		77
	L5	Shelford-Meredith Rd		53
	L4	Shelford-Mt Mercer Rd (inc Meekes in Robbies Rd)		45
	L3	Coopers Rd		44

Table 4 Final rankings for target areas and sites for erosion within landscape zones.

6. Stakeholders and Potential Actions

6.1 Stakeholders and the choice of actions

Based on the nominated key asset class and sub class, a key stakeholder was identified for each target area and site. In the case of infrastructure, the stakeholder was generally the responsible authority whereas for issues of land use, the stakeholders were divided into public and private stakeholder classes. For water quality and biodiversity, stakeholders were either identified as the public or the responsible authority for water management such as Barwon Water.

The identification of the key stakeholder was an important consideration in the choice of actions. Whilst all stakeholders are equally important under the overall guiding principles of the CSHS, responsibility for the affected asset ultimately lies with the asset manager or stakeholder. For example, whilst infrastructure sub class of roads and the potential threats from landslides and erosion is seen as an important process within the CSHS, the primary source of remedial funding for repairs and remediation generally lies with VicRoads or the Shires. However the communication of the spatial distribution of hazards and the associated risks as identified through mapping and inventory programs sponsored under the CSHS is an important function as it ultimately promotes overall strategic outcomes.

In contrast, threats to waterways and wetlands have a direct link to the key CCMA function of protection of water quality and it is therefore likely such target sites and areas with such issues would be appropriate for more direct action such as field trials and remedial works.

In some cases the attitude of the stakeholder towards remediation will also be important in the allocation of actions. For example, a land owner who is concentrating on dairying or grazing may have little personal incentive in preventing sediment load to a small water way which could ultimately deposit in a larger river system running into state or national park. In this instance it would be appropriate to assist the land owner to address an issue that has little personal financial impact but a greater public benefit.

6.2 Potential actions to be taken to stakeholders for discussion

Having identified the target area or site, the nature of the threat, the key asset under impact, the severity of the interaction between the threat and the asset, and the stakeholder most affected, it was then possible to produce a list of potential actions aimed at on ground works and studies which could form part of an overall investment strategy under the provisions of the CSHS.

Based on a series of discussion between Troy Clarkson, Shari Wallis and the author focusing on existing and potential remedial solutions, techniques and investigation techniques, a list of potential on ground actions were developed as follows:

- On ground works and field trial using an existing or old method of remediation.
- On ground works and field trial using a new or innovative method of remediation.
- On ground trial using multiple or alternative methods of remediation.
- Assessment and monitoring of an existing treatment.

- Assessment and monitoring of a new or innovative treatment.
- Monitoring of the threat or hazard only as a precursor to possible treatments.
- Use of area or site as an example of community engagement at work.
- Communication of the threat and public education programs.
- Case study aimed at collating information on the threat and area or site for use in future public information programs or to assist future understanding of processes and remedial techniques.
- No immediate action warranted.

The implementation of the actions is intended to initially include significant stakeholder discussion and input and is expected to strengthen partnerships between stakeholders. The actions cover a wide range of responses and allow an individual action to be assigned to each and every target area or site with the possibility of review in the future.

As discussed, the major consideration in the allocation of actions is the key asset class involved, the stakeholder involved, the responsibility and attitude of the stakeholder in preventing risks and the stated outcomes of the CSHS.

6.3 Final list of proposed actions for target areas and sites.

Based on the previously described selection of sites and the ranking of relative risks posed by threats to assets it was possible to individually rank each target area and site within landscape zones for both erosion and landslide. Combining this level of risk with considerations of asset class, stakeholder responsibility and attitude it was possible to determine a series of actions to be discussed with the stakeholders to allow appropriate investment under the CSHS. The final list of proposed actions is detailed in Table 5.

Determination of On Ground Actions for CSHS Target Areas and sites

A.S. Miner Geotechnical CSHS Areas and Sites for Investment										
Landslide										
Landscape Zone	Site I.D.	Description	Relative Ranking Adjusted for RAV	Target Type	Key Asset Class	Asset Sub Class(es)	Stakeholder(s) identified for action	Proposed Action for Stakeholder Discussion	Comments and Discussion	
Gellibrand	08	Turtles Track	221	area	Infrastructure	Road	ViRoads	Communication and education		
	08	West Gellibrand Res/ Arkins Ck	194	site	Water Quality	Reservoir/Pipeline	Barwon Water	Communication and education		
	04	Great Ocean Rd Old Prisoners PO	170	site	Infrastructure	Road	ViRoads	Example of community engagement		
	02	Gellibrand River Estuary	167	area	Biodiversity	Wetlands/rivers	Public	Case study - information	This area represents potential impact on waterways and wetlands	
	01	Johanna	140	area	Land Use	Pasture and grazing	Private	No immediate action warranted		
	07	Kawarren East / Frise Rds	124	area	Land Use	Pasture and grazing	Private	No immediate action warranted		
	0210	Preveston Simpson Rd Boumans	110	site	Infrastructure	Dwelling and road	Private + Shire	Case study - information	This site represents the most significant loss to housing	
	09	Moonlight Head/ Gables Rds	99	area	Land Use	Pasture and grazing	Private	No immediate action warranted		
	05	Tomahawk Cr/ Coradi Rds	70	area	Land Use	Dairying	Private	No immediate action warranted		
	03	Winekit Valley View Rds	56	area	Land Use	Dairying	Private	No immediate action warranted		
	Otway Coast	OC5	Wye River	182	area	Infrastructure	Dwellings and road	Shire + Private	Communication and education	
		OC7	Stanes Creek/ Beacon Point	163	area	Infrastructure	Dwellings and road	Shire + ViRoads	Communication and education	
		OC10	Aoslo Bay/ Barham Valley	160	site	Land Use	Pasture and grazing	Private	Case study - information	This site is an excellent example of revegetation and sensible land use after failure
OC9		Wild Doop/ Sunnyside Rd	153	area	Infrastructure	Dwellings and road	Shire + Private	Case study - information	This area is the best studied site in the Otways to determine trends and rates	
OC4		Mt Defence to Jamieson River	149	area	Infrastructure	Road	ViRoads	Communication and education		
OC2		Big Hill/ Lorne	147	site	Infrastructure	Road	ViRoads	Communication and education		
OC3		Windy Point	132	site	Infrastructure	Road	ViRoads	Communication and education		
OC8		Kennett River to Grey River	130	area	Infrastructure	Road	ViRoads	Communication and education		
OC6		Wonacarra Gt Ocean Rd	121	area	Infrastructure	Road	ViRoads	Communication and education		
OC1		Fairhaven Clarkes Slide	108	site	Infrastructure	Dwellings	Private + Shire	Communication and education		
Curdies		C4	12 Apostles and Coast	166	area	Biodiversity	Environment	State Govt	No immediate action warranted	Ongoing degradation is inevitable due to coastal erosion but intervention is unacceptable
	C1	Pl Campbell Cobden Rd	129	area	Infrastructure	Road	Shire	Communication and education		
	CC	Cootemundung/ Williams Rd	120	area	Land Use	Dairying	Private	Assessment and monitoring of existing treatment	Select sites to assess drainage techniques used in the area	
	C2	Scotts Creek	120	area/site	Land Use	Dairying	Private	Monitoring of threat or hazard only	Select Pennyfather site for monitoring of sediment load to waterways	
Upper Barwon	UB4	Forest including Lake Elizabeth	256	area	Water Quality	Channels and waterways	Barwon water	Communication and education		
	UB8	Birraura Yeeden Rd / Philips landslide	129	site	Water Quality	River	Private	Multiple actions required	Significant site posing a potential major risk to major waterway	
	UB2	Bambra/ Coal Mine Creek Rd	91	area	Water quality	Streams	Public	No immediate action warranted		
	UB3	Pannivoyal	71	area	Land Use	Pasture and grazing	Private	No immediate action warranted		
	UB1	Winchelsea Lorne Rd	54	site	Water Quality	Streams	Private	No immediate action warranted		
Aire	UB5	Deans Marsh Lorne Rd + Sincocks Rd	56	site	Land Use	Pasture/ Rural houses	Private	No immediate action warranted		
	A3	Ford River	205	site	Water Quality	River	Public	Multiple actions required	Discussions needed with logging company + shire including assessment of remediation works	
	A1	Gt Ocean Road	119	site	Infrastructure	Road	ViRoads	Communication and education		
	A7	Aire River Forestry	116	area	Land Use	Forestry	Private	Communication and education		
	A5	Gt Ocean Rd near Glenaire/ Castle Cove	105	site	Land Use	Pasture and grazing	Private	No immediate action warranted	Discussions needed with logging company + shire including assessment of remediation works	
	A6	Upper ridge Beech Forest to Lavers Hill	96	area	Land Use	Pasture and grazing	Private	No immediate action warranted		
	A2	Forestry at Dine Rd Aire Valley	64	area	Land Use	Forestry	Private	Communication and education		
	A4	Harden Vale Rd	63	area	Infrastructure	Roads	Shire	No immediate action warranted		
Erosion										
Landscape Zone	Site I.D.	Description	Relative Ranking Adjusted for RAV	Target Type	Key Asset Class	Asset Sub Class(es)	Stakeholder(s) identified for action	Proposed Action for Stakeholder Discussion	Comments and Discussion	
Woody Yallock	WY1	Misery Moonlight Creek area	134	area	Water quality / lands	Creek / grazing	Private	Case Study Information / Field trial using a number of alternative treatments, assessment of existing and new treatments	This target area has the greatest active soil erosion in the Corangamite Region.	
	WY4	Rokewood Cornthorpe Rd	91	site	Water quality	Creek	Shire	Monitoring of threat or hazard only	Sheet and hill erosion on the road side	
	WY2	Paddy Gully Rd	84	site	Water quality	Creek	Private	On ground works field trial using a number of alternative treatments		
	WY3	Gams / Bayles Rd	84	site	Water quality / lands	Creek / grazing	Private	Case study information / Monitoring of threat or hazard only	Mostly older erosion sites	
Moorabool	M1	Eldose Creek	141	area	Water quality	Creek / WSPA	Private	Case Study Information / Assessment/monitoring of existing treatment, new treatment, onground works and education	2nd worst erosion target area, eventually sediment potentially flows into the WSPA.	
	M4	Demotts Rd (Fire affected area)	110	site	Landuse / Water or Grazing / dams	Creek / WSPA	Private	Communication and education	Dams full of sediment, some sedimentation of creek, loss of extensive pasture land. DPI state government works currently being deployed to control erosion and clean out dams	
	M6	Tension / Le La	101	site	Water quality	Creek / WSPA	Private	Case study information / Communication and education, monitoring of threat or hazard only	Sheet erosion on red granite used by potato farms.	
	M2	West Branch	94	site	Water quality	Creek	Private	Case Study Information / On ground works field trial using a number of alternative treatments	Some active erosion	
	M3	Lynches Rd	88	site	Landuse	Grazing / creek	Private	No immediate action warranted		
Thompson	M5	Robe Rd	52	site	Water quality	Creek	Private	No immediate action warranted		
	T2	Blackgate rd	80	site	Water Quality/Bio	Creek/ Conservation	Public	Case study - information	Investigate the link between salinyschdising and sediment transport to rivers	
	T3	Thompsons Creek off McCann Rd	38	site	Water Quality	Creek	Public	No immediate action warranted		
	T1	Willow Rd	30	site	Water Quality	Creek	Public	No immediate action warranted		
Upper Barwon	UB3	West Barwon River Valley-Colac Muroo/ Birraura	72	area	Water Quality	River /stream	Public	No immediate action warranted		
	UB1	Deans Marsh Rd, Coal Mine Creek, Wurdale Rd	64	site	Water Quality	River /stream	Public	Case study - information	This site is a good example of remediation techniques and would help community engagement profile	
	UB2	Yan Yan Gurt Ck and Retreat Ck	42	area	Water Quality	Creek	Private	No immediate action warranted		
Leigh	L1	Maple	99	site	Water quality	Creek	Shire	Assessment and monitoring of existing treatment	Road side sites showing active erosion after recent Shire works.	
	L2	Sand Rd	77	site	Water quality	Creek	Private	Case study information / Monitoring of threat or hazard only	Large old erosion sites present and active	
	L5	Sheffield Meredith Rd	53	site	Water quality	Creek	Private	Case study information / On ground works field trial using a number of alternative treatments	Older erosion sites, many still highly active	
	L4	Sheffield - Mt Mercer Rd no Robbins Rd	45	area/site	Water quality	Creek	Private	Case Study Information / Assessment and monitoring of existing treatment	Select Meekes site as example of rock stubs and assess effectiveness	
L3	Coopers Rd	44	site	Water quality	River	Private	No immediate action warranted /			

Table 5 Proposed Actions for Investment under the CSHS for Target Areas and Sites

Table 5 Proposed Actions for Investment under the CSHS for Target Areas and Sites

7. Comments and Discussion

This report serves as a companion to the earlier report prepared by A.S. Miner Geotechnical and together they describe the process of verification, validation, review and revisions of the risks of the top twenty threat-landscape combinations. In addition the reports then proceed to identify target areas and sites within landscape zones for erosion and landslides and to allocate proposed actions with stakeholders to allow investment under the provisions of the CSHS.

The selection of target areas and sites has been based on the current information in the erosion and landslide database in combination with the expert knowledge and understanding of the research team. It is recognised that other significant target locations probably exist within the various landscape zones however there is insufficient data and awareness to allow their inclusion in the assessment process at this point in time.

As a result, the target areas and sites listed in this report and the associated actions formulated for discussion with key stakeholders are presented as the basis for investment under the provisions of the CSHS during the initial phase of the program. The basis for these actions is founded on an objective and transparent approach described in the two companion reports and uses the currently best information available. Undoubtedly other sites can and should be added to the process as further information and understanding is obtained.

Appendix A
Location of Target Areas

