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Corangamite Catchment Management Authority

Case Study for Erosion and Landslides.

Barham Valley Rd, Apollo Bay

Report No: 356.3/01/06

Prepared for Troy Clarkson

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1. Site Description

1.1 Site I.D.

356.3/01

1.2 Site address

Barham Valley Road, Apollo Bay

1.3 Brief site description

The landslide occurs to the north west of an existing dwelling and shed on the eastern flanks of the Barham River. The slopes generally show extensive modification through mass movement with the dwelling being sited on a large rotated block which has formed an essentially flat bench. The slopes on which the landslide is situated are undulating and later stereo aerial photo interpretation by Roberts (2004) indicated these slopes were the site of previous older features which have since become degraded and less defined in the landscape.

1.4 Map datum/ Map projection/ Zone

MGA Zone 54 (GDA 94)

1.5 Easting

728392E

1.6 Northing

5706733N

1.7 Municipality

Shire of Colac Otway

1.8 CCMA landscape zone

Otway Coast

1.9 Previous ID

WF4589

1.10 Previous Data Source

Warren Feltham (2005) CCMA landslide and Erosion Database. Version 2. The University of Ballarat. Geology Department July 2005. Contained in a MapInfo Table entitled “SW_erosion_landslides”

2. Hazard Description

2.1 Soil degradation type

Landslide

2.2 Soil degradation sub-class

Complex rotational slide with earth flow component at the toe

2.3 Description of hazard present on site or threatening site from above or below

The slide has all the classic features of the idealized slide shown in Turner and Schuster (1996). The main scarp is well defined in early photos as is the main body of the slide which is located in the upper half of the visibly displaced mass of material. A zone of accumulation exists where the landslide material has flowed out beyond the toe of the surface of rupture and has continued downslope to form the toe of the slide.

2.4 Dimensions of Hazard (width, length and depth if appropriate)

50 mm (W) x 125 m (L) x ?? m (D)

2.5 Extent of Hazard (spatial area and volume if appropriate)

0.62 ha and volume unknown

2.6 Magnitude of hazard (travel distance or rate of occurrence)

Of the order of 40 m

2.7 List previous reports or studies relevant to this site

1- Dahlhaus Environmental Geology (2001). Landslide Risk Management. Final Report. 30th June 2001. Consultants report to Colac Otway Shire. (Photos and brief reference)

2- R.Bucholtz 2005. Landslide development in the Apollo Bay Region. Final year project. B.App.Sci (Geology). University of Ballarat. (Section 5.1.2)

2.8 Custodian of previous reports and studies

1- Copies of report held by A.S. Miner Geotechnical and Dahlhaus Environmental Geology.

2- Copies of report held by A.S. Miner Geotechnical, Dahlhaus Environmental Geology and the Geology Department at University of Ballarat.

3. The Event Has Already Occurred

3.1 Date of first occurrence

Circa 1986 but reported in Bucholtz (2005) as originating in 1987.

3.2 Date of most recent re-activation or acceleration

Bucholtz (2005) reported that changes to the foot, tip and toe of the slide occurred between 1987 and 1998. He states these lower sections of the slide appear to have moved slowly downslope and have flattened out from the initial displaced bulge of landslide debris in the accumulation zone. The headscarp has also retrogressive slightly upslope in some isolated section. Little activity in the slide mass or headscarp was evident from photos taken in 1998 and 2005 although extensive replanting/ revegetation program was undertaken prior to 2005 which resulted in a moderately dense cover of young trees and shrubs over much of the slide.

3.3 Actual or postulated trigger event including magnitude and duration

Unknown but possible events include 60.0 mm on 17/04/1986 and 61.2 mm on the 28/04/1986.

3.4 Frequency of Trigger Event if known

Unknown however 60.0 mm is ranked 29th of 36,764 daily rainfall records and 61.2 mm is ranked 27th out of 36,764 daily rainfall records. Both have an Antecedent Rainfall Probability Exceedance Threshold (or ARPET) values = 0.1%

3.5 What damage or impact occurred?

The only obvious impact is to agricultural grazing as the material does not have appeared to have travelled far enough to impact the river below.

3.6 Was there a risk of injury or loss of life?

Although the dwelling is located approximately 50 metres to the south east it is unlikely this slide posed any significant threat to either the dwelling or the inhabitants. Some photos suggest a track along the fence to the north but it would be extremely unlikely that anyone would have be impacted given the very low density of use.

3.7 How important was it?

Minor consequence to agricultural grazing land with limited damage and loss of pasture. No impact on the river below or the dwelling to the south.

3.8 What asset classes were impacted?

Land Use

3.9 What asset sub classes were impacted?

Grazing land

3.10 What are the asset values?

Low relative asset value= 5

3.11 How severely were assets impacted?

Disruption to the agricultural land was significant enough to mean the area has not been able to be returned to production

3.12 Estimated cost of impact (including qualitative and quantitative costs for loss of asset, investigations, remedial works, cultural, business and environment)

3.12.1 $ Cost of loss of asset

Estimated cost of grazing land=$7000/ ha, Estimated cost of lost land=$4300

3.12.2 $ Cost of any investigation prior to failure of occurrence

None known

3.12.3 $ Cost of prior remediation works

Tree planting=$1000 or 0.62 ha of high density planting. Fencing 330 m at $5/m = $1650

3.12.4 $ Cost of any prior monitoring or maintenance

None known

3.12.5 Disruption to business (qual)

None except possible disruption to grazing operations but expected to be minimal

3.12.6 Social and cultural impact (qual)

Unknown but it is expected that the close proximity to an inhabited dwelling would have caused some degree of concern and stress

3.12.7 Impact on environment (qual)

Minimal with a low potential for sediment transport to river below

4. Remediation Has Already Been Undertaken

4.1 What remediation option was used?

Re-vegetation and re planting has been undertaken without any obvious earthworks or drainage works.

4.2 How was the site initially assessed?

Unknown

4.3 How was the remediation designed and by Who?

Unknown

4.4 Did it require specialist equipment or subcontractors?

Unknown

4.5 How effective has the remediation been?

Difficult to judge but anecdotal evidence suggest little activity in the period between 1998 and 2005 when trees must have been planted.

4.6 How was the effectiveness judged?

Visual observations using limited time series photos

4.7 Would other treatments worked here?

Yes. Earthworks and re-contouring would have been very beneficial in removing any low lying or reverse slopes causing water to pond. Given the slide appears to have occurred on a previously failed slope any reduction in groundwater pressures would also have been very useful in reducing the potential for further failures. This could have been achieved through surface drainage works and the installation of sub horizontal drains via drainage trenches or bored drains.

However the sue of extensive planting is probably the most cost effective approach given the level of risk involved.

4.8 Was it early intervention or reactive?

Reactive

4.9 What was the cost of remediation (including design, construction and implementation)?

4.9.1 Investigation costs

Unknown

4.9.2 Design costs

Unknown

4.9.3 Construction and implementation costs

Unknown but based on area= 0.62ha and cost of trees = $1500/ha an estimate of the order of $1000 plus labour and ongoing maintenance

4.10 How was the remediation funded?

Unknown but possibly through land care groups.

5. Ongoing Review and Monitoring Requirements

5.1 What is the likely ongoing monitoring and review strategy?

Unknown

5.2 What is the nature of future monitoring and maintenance?

Unknown

5.3 What are the likely costs of monitoring and maintenance?

Unknown

Photos

Photo 1 1987

Photo 2 1998

Photos

Photo 3 1998

Photo 4 2001

Photos

Photo 5 2001

Photo 6 2005

Sketches and Drawings