


Session 6

Stabilisation and Rehabilitation

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
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Introduction

- Effective rehabilitation protects the soil surface against erosion in the long term
- Can readily reduce soil loss to much less than 1% of the unprotected condition
- Rehabilitation should occur promptly and progressively as works are completed in individual areas


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Stabilisation Targets

- General Site Areas
 - Low rainfall period (Mar-Nov)
 - $C = 0.15$ (50% effective groundcover) after 20 days inactivity
 - High rainfall period (Dec-Feb)
 - $C = 0.1$ (60% effective cover) after 20 days inactivity
 - $C = 0.05$ (70% effective cover) after a further 60 days
- Stockpiles
 - If stockpile is to be left for more than 10 days, stabilise to $C = 0.1$ (60% effective cover)


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Stabilisation Targets

- Diversion drains
 - Stabilise within 10 days, $C = 0.05$ (70% effective cover), and ensure stable discharge area
- Waterways
 - When rain not forecast in next 3 days $C > 0.1$ (i.e. less than 60% effective cover), and emergency measures on hand in case of rain to reduce $C < 0.1$
 - Within 10 days $C = 0.05$ (70% effective cover)

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
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Options

Cover the soil surface:

- Re-Vegetation
- Physical cover: mulch, woodchip
- Spray products: soil binders, bitumen emulsion, hydromulch
- Roller products: RECPs, geosynthetics
- Hard armouring: paving, rock lining, shotcrete, concrete etc.

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Soil Slopes

Flat <1 in 10

Mulch and veg., reveg planting or seeds, soil binding, bonded fibre matrix, compost blankets, jute mesh and mats, mulch and veg, turf

Mild 1 in 10 to 1 in 3

Mulch and veg., reveg planting or seeds, soil binding (hydroseed), bonded fibre matrix, compost blankets, jute mesh and mats, anchored mulch and veg, turf

Step >1 in 3

Bonded fibre matrix, compost blankets, anchored jute mesh and mats, reinforced turf, cellular confinement system, rock armouring

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C-Factors

Class	Type	Stability for Vegetation Types	Design Life (months)	Use in Conventional Farming	Availability (years)	Relative Cost Breakdown	Residual Impact in	C-Factor 100% (40%)	C-Factor 20% (40%)	C-Factor 30% (40%)	C-Factor 40% (40%)
BIODEGRADABLE MULCHES¹¹											
Straw (anchored)	4.5 tonnes per hectare	Grass	1 to 6	No	< 5 days	Low	Moderate	0.17	0.17	0.20	0.20
Wood Chip	10 tonnes per hectare	Grass/Straw	1 to 6	No	< 5 days	Low	Moderate	0.08	0.08	0.08	no data
Wood Chip	22 tonnes per hectare	Straw	1 to 6	No	< 5 days	Low	Moderate	0.05	0.05	0.05	no data
Wood Chip	46 tonnes per hectare	Straw	1 to 6	No	< 5 days	Low	Moderate	0.02	0.02	0.02	0.02
Hydro mulching	1.5 tonnes mulch + 300 litres binder per hectare	Grass	1 to 3	No	< 5 days	Low	Low	0.00	0.00	0.07	0.06
Bonded Fibre	15 tonnes fibre per hectare	Grass	1 to 6	No	< 5 days	Low	Moderate	0.00	0.00	0.07	0.06
SOIL EROSION CONTROL PRODUCTS (SECP)¹¹											
Biodegradable	Jute mesh	Grass	6 to 12	Yes	< 5 days	Low	Moderate	0.10	0.20	0.40	0.40
	Coconut fibre mesh (1-400 gsm)	Grass	24	Yes	< 5 days	Low	Moderate	0.10	0.20	0.40	0.40
	Coconut fibre mesh (1-700 gsm or more)	Grass	48	Yes	< 5 days	Medium	Moderate	0.10	0.10	0.20	0.10
	Coconut strand fibre	Grass	6 to 12	Yes	< 5 days	Medium	Moderate	0.01	0.05	0.10	0.10
	Jute matting (300 gsm)	Grass	6 to 18	Yes	< 5 days	Medium	Moderate	0.00	0.00	0.07	0.06
	Jute matting (400 gsm)	Straw	12 to 24	Yes	< 5 days	Medium	Moderate	0.00	0.00	0.07	0.06
	Coconut fibre matting (1-400 gsm)	Grass	12 to 18	Yes	< 5 days	Medium	Moderate	0.00	0.00	0.07	0.06
	Coconut fibre matting (1-600 gsm)	Straw	18 to 24	Yes	< 5 days	Medium	Moderate	0.00	0.00	0.07	0.06
Photobiodegradable	Wheat (1-5 mm coverage)	Grass	1 to 6	Yes	< 5 days	Low	Moderate	0.01	0.05	0.10	0.10

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Appendix A

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Site Preparation and Topsoil

- Successful rehabilitation starts with good soil management and site preparation
- Deep rip, scarify, track walk or otherwise stabilise embankments along the contour
- Replace stored topsoil evenly over rehab surface (~75mm flat/gentle, 40-60mm steeper)
- Stabilise constructed surface using a range of appropriate measures

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Surface Roughening

- Topsoil far more likely to 'adhere' to roughened surface
- Track walking, contour ripping, scarification, terracing etc
- Up to 50% reduction in soil loss from properly prepared slopes
- Creates micro-contours to trap sediment and water
- Maximising vegetation 'strike'

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Example



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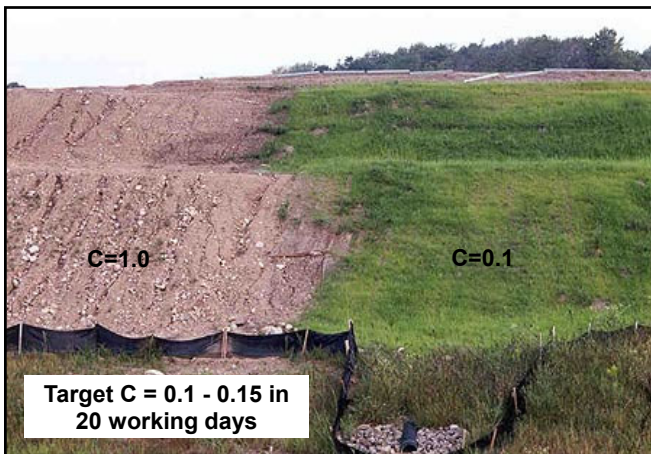




Re-vegetation

- Ideal, inexpensive method in most situations, but use with caution in concentrated flow and on steep slopes
- Annuals for temporary cover and fast establishment, often combined with perennials for longer term protection
- Require topsoil, water, fertiliser, soil ameliorants
- Seek specialist advice – Vegetation Management Plan

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Grasses

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Cover Crop and Turf Strips

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Jute and Native Grasses

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Hydroseeding



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Hydroseeding Issues

- Different to hydromulching
- Typically just seed, fertiliser and seed carrier (typically paper confetti), maybe wetting agent?
- Can be dislodged by raindrop impact or surface flows
- Can result in slumping of product down slope
- May include other soil ameliorants (lime, gypsum etc)

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Native Mulch



Woodchip 16t/Ha C=0.08

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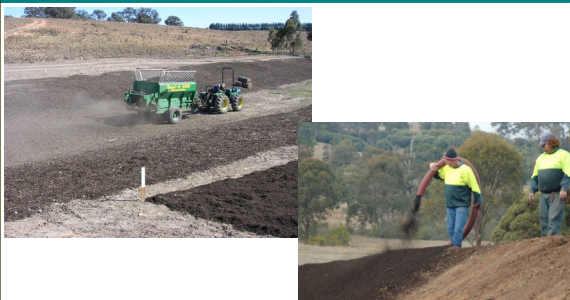
Mulch and Vegetation



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Compost Blanket



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Straw or Cane Mulch



Pneumatic or Mechanical application

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Problems



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Hydromulch



C=0.05 - 0.1

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Bonded Fibre Matrix (BFM)

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Bitumen Emulsion

- Water based emulsion, e.g. “Dustdown”
- \$1-\$2 per litre
- Diluted at rates 10:1 to 40:1
- Application at 1 diluted litre per m²

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Bitumen Emulsion

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Rolled Erosion Control Products

- Products that help stabilise the soil while vegetation establishes
- Particularly useful on steeper batters and in waterways where water velocity can be high
- Must be securely anchored to the ground
- Always follow manufacturer’s advice on product selection and installation

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RECP Types

- Erosion Blankets
 - Jute mesh
 - Jute matting
 - Coconut fibre matting
- Plastic fibre meshes
 - Non-biodegradable nylons
 - Biodegradable polymers
- Reinforced turf

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Range of Products/Manufacturers



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Jute Mat



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Jute Mesh and Grass



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Jute Mesh



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Bonded Fibre Blanket



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Reinforced Turf



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Woven Plastic Mesh



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Cellular Confinement Systems

- Can be used to stabilise drains, chutes, banks or channels with low to medium velocity flows or steeper slopes
- Permanently fixed to stable soil base
- Topsoil used to fill “cells” prior to re-vegetation
- May also be filled with small gravel or other engineered drainage materials
- Can be used to construct temporary stream crossings

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CCS - Geoweb



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Permanent Armouring

- In high erosion hazard situations vegetation is often not suitable (e.g. waterways, steep embankments)
- Consider use of rock rip-rap, concrete, gabions, retaining walls etc.

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Gabion Baskets



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Rock Rip-Rap



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Poor Stabilisation?

- Poor stabilisation leads to ongoing erosion and pollution problems
- Often brought about by lack of proper design and failure to properly assess the site constraints and product capabilities

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Insufficient Cover



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Concentrated Flow Inappropriate Product



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