

2011 MINE CLOSURE CONFERENCE

6th INTERNATIONAL CONFERENCE ON MINE CLOSURE
Connecting Mine Closure Practitioners Around the World

SEPTEMBER 18 - 21 | CHATEAU LAKE LOUISE | LAKE LOUISE, ALBERTA, CANADA




Three “R’s” for mine Closure – Responsibilities, Regulations and Results

Hugh Jones

Goldier Associates, SUNCOR, Cranfield University, ACG

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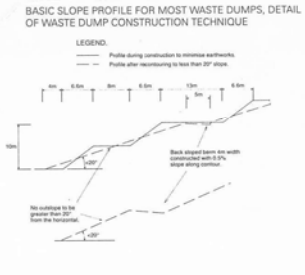
Regulatory resources



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Prescriptive Legislation



BASIC SLOPE PROFILE FOR MOST WASTE DUMPS, DETAIL OF WASTE DUMP CONSTRUCTION TECHNIQUE

LEGEND:
 - Profile during construction to minimize settlements
 - Profile after recontouring to less than 20° slope

Bank covered with 100mm soil with geotextile and 0.2% water saving mulch

No contour to be greater than 20° from the horizontal

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Water Harvesting Pilbara Iron Ore Mine




Very hard, dense banded iron formation and minor shale, strongly resistant to weathering

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Water Harvesting Another Iron Ore Mine



Less dense material, shales and volcanics, weathers rapidly on exposure

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Water Harvesting Gold Mine



Top soil-capped, greenstone, soft friable material that weathers rapidly

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MINE CLOSURE CONFERENCE **Slopes by degrees-or how 20° happened**

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MINE CLOSURE CONFERENCE **Award Winner 2011**

Photo: Department of Mines and Petroleum

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MINE CLOSURE CONFERENCE **Comparison of Waste Dump and a Natural Hill**

ELEMENT	TYPICAL WASTE DUMP	NATURAL ANALOGUE
Material	Loose, unconsolidated run-of-mine waste	Rock core with thin regolith
Void space	Often 20% or greater	Rarely over 1%
Top surface	Large, near-flat	Very small, domed
Slope angle	Uniform (typically 20°)	Concavo-convex
Slope configuration	Regular, horizontal steps	Smooth, no steps
Drainage	Poorly-defined or poorly constructed	Well-developed, clearly defined
Vegetation	Initially a uniform monoculture	Mature, varied ages

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MINE CLOSURE CONFERENCE **Natural Analogue for Waste Dump?**

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MINE CLOSURE CONFERENCE **Normal flow down a slope, incident rainfall only**

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MINE CLOSURE CONFERENCE **Erosion simulations over 100 years**

Slope Geometry	Final Percentage (at 100 years)
1. Steep single slope (Bank side)	100%
2. Steep slope	79%
3. Flattened	97%
4. Low banks	104%
5. High banks	135%
6. Concave slope	77%
7. Over slope	79%

35 m high structure

AFTER: McPhail, G. and Rye C. (2008) Comparison of the Erosional Performance of Alternative Slope Geometries. Proceedings of the First International Seminar on the Management of Rock Dumps, Stockpiles and Heap Leach Pads, 2008, ACS pp. 277-289.

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Erosion of 20° slope, one major rain event

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Erosion of terraced dump 12 years old

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Dyffryn Rohndda coal mine, Wales

1965 Operating 1969/70 Deconstruction

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Almost 40 years after closure

1975 2007

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- “The straight line belongs to man, the curve to God.”

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