Daily and Final Capping Options

Sam Bateman
Principal Consultant Bateman Brothers Consulting
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Daily Cover – What's it for?

- They don't seem to need it in Germany!
- This photo was taken at the Kaiserslautern landfill in 1993

Purpose of Daily Cover BPEM 2016

- Control Odours
- Control Litter
- Prevent spread of fires (non combustible)
- Minimise Vectors (birds, vermin)
- Provide a trafficable surface

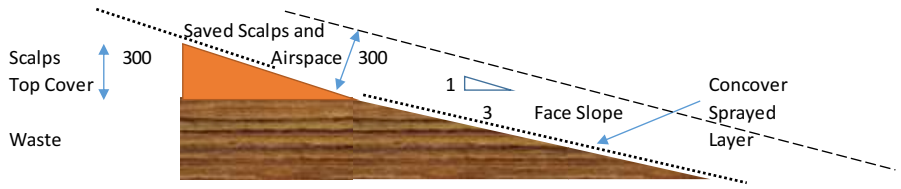
Need for Alternative Cover at Wollert

- Hanson traditionally used waste quarry scalps for daily cover
- By 2013 all stockpiles had been used up
- To allow new stockpiles to build up an alternative was needed.
- Concover was selected for a trial

Concover

- Concover is a mixture of fibre, a filler and a binder.
- It is sprayed onto the waste face from a trailer mounted spray machine oved by a bulldozer
- The face can be quickly covered with the sprayer
- Following a two month trial and an Auditors assessment, the EPA approved the use of Concover

Profile of Alternative Concover



Wollert Approved Alternative Daily Cover	$1,500/day	Extra Plant and Material Cost
	$4,000/day	Saved Scalps Costs

Concover being sprayed onto the face

Concover on the waste materials

Cost/Benefit of Concover

- Approx $1,500/day for 900m2 face
- Its simple to mix and apply
- It doesn't deter the birds
- It eliminates rubbish smell at the face
- It will last for more than 5 days
- It is easy to breakup with the compactor
- It saves paying Landfill Levy on imported cover
- It saves airspace.

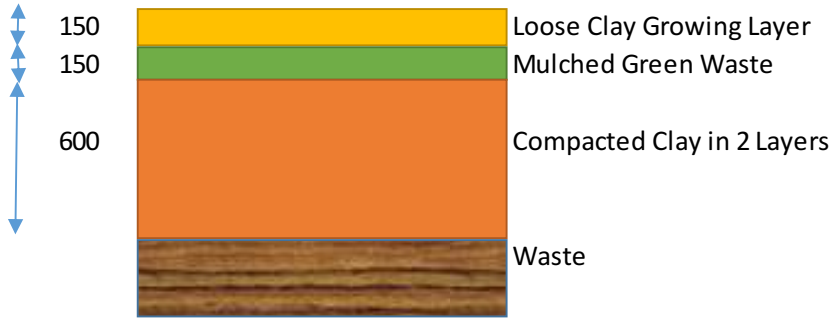
Purpose of Final Cover BPEM 2016

- Minimising infiltration of water into the waste, ensuring that the infiltration rate does not exceed the seepage rate through base of the landfill
- Providing a long-term stable barrier between waste and the environment in order to protect human health and the environment
- Preventing the uncontrolled escape of landfill gas
- Providing land suitable for its intended afteruse

Cooper Street, Epping 2005

- Hanson operated a non-putrescible landfill
- It closed in 2005 and needed a final cover
- Agreed with EPA that mulched greenwaste could be used as a moisture layer on a clay cap
- Clay cap was process specified not tested.
- Mulch came from kerbside greenwaste

Profile of Cooper Street Cap

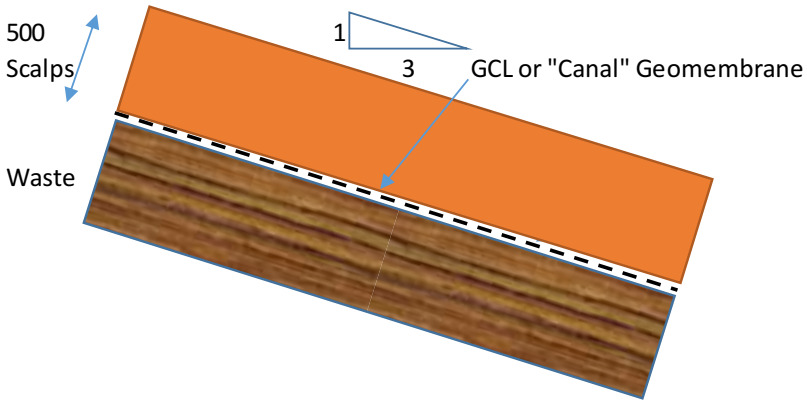


Final Cap Cooper Street Landfill $20/m2

Wollert Interim Capping on Long Term Batters

- Wollert is filled progressively in Cells
- The southern side of the cells has a batter which remains exposed for 10 years or more as other cells are filled
- The 120m long 3:1 batter needs to shed clean stormwater
- An interim cap of a GCL or Geosynthetic Layer covers by 500mm of scalps is used
- A drainage bench is provided halfway down the batter.

Profile of Interim Cap



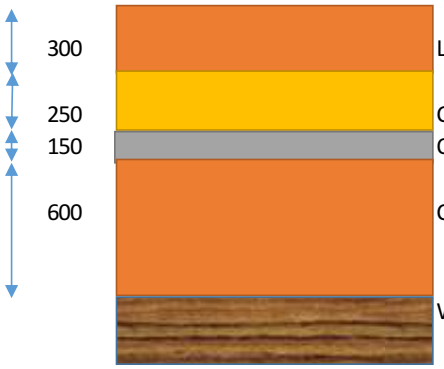
Wollert Long Term Interim Capping $40/m2

Long Term Interim Cap on Southern Batter

Wollert Landfill, Clay Cap Cells 1&2

- Cells 1 and 2 were clay lined in 2000/02
- When it came time to cap them BMEP regulations were for a clay cap.
- Modelling was carried out to understand desiccation of the clay.
- A layer of quarry dust was placed to protect the clay
- Revegetation was annual rye grass on loose clay

Profile of Clay Cap



Final Cap Wollert Cells 1&2 $45/m2

Spreading Scalps on Clay Cap

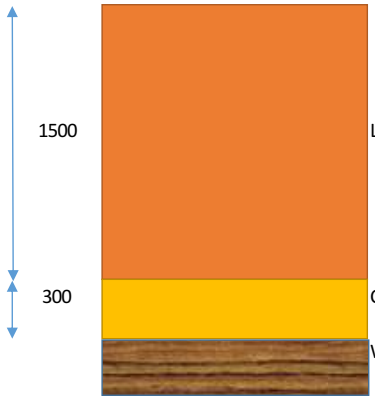
Wollert PhytoCap on Cell 3

- Hanson were looking for a cheaper alternative to a membrane cap in 2003.
- PhytoCaps were introduced into Australia and Hanson started a 5 years PhD research project with R Michael
- From the results of the research EPA approved a large scale trial on Cell 3 in 2010
- The data was collected over 5 years and modelled to show very low median infiltration on one of the trial plots
- The EPA has approved the use of a PhytoCap at Wollert

Lessons Learned on PhytoCaps

- Selection of the soil is important to give consistency
- Selection of drought tolerant plants is important
- Control of weed invasion is difficult
- The plants you want to grow aren't always the ones that do.
- PhytoCaps take a long time to establish

Profile of PhytoCap



Trial PhytoCap Wollert Cell 3 $55/m2

PhytoCap after 5 Years

PhytoCap Regeneration after Disturbance

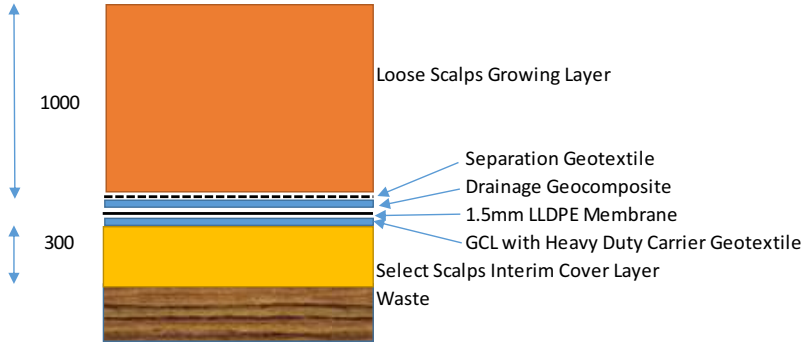
PhytoCap Field Station

PhytoCap Logging Station

Wollert Membrane Cap Cells 4-6

- A BPEM compliant cap was chosen for cells 4-6
- This used a GCL as the clay barrier but it was difficult to protect it from stones in the scalps
- GCL materials proof testing was difficult to achieve
- Flooding after heavy rain damaged the GCL during construction
- The LLDPE prove difficult to weld due to temperature variations
- Scalps growing layer had the same plants as the PyhtoCap

Profile of Membrane Cap



Final Cap Wollert Cells 4, 5 and 6 $87/m2

Membrane Cap Before Revegetation

Membrane Cap After Revegetation

Comparison

Capping Type	Cost$/m2	Comment
Cooper St Clay Cap	20	Minimal testing, low spec but highly effective. Mulch was free
Long Term Interim Cap	40	Scalps can be recovered for daily cover
Wollert Clay Cap	45	No geotextiles and very effective desication prevention. Grass re-seeds every year
Wollert Phytocap	55	Site and soil specific. Needs a lot of research. Cost of quarry scalps 45% of total. Easy to construct. Self maintaining but plants need to be cared for
Wollert Membrane Cap	87	High cost of geosynthetics and testing. High consultant input. Difficult to construct and weather dependant.