

C.3 Equity Silver Mine – Ten Years Experience with Dry Covers

Keith Ferguson and Mike Aziz

Placer Dome Inc.

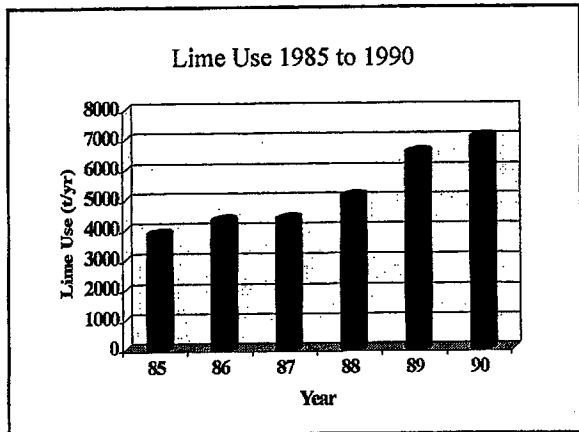
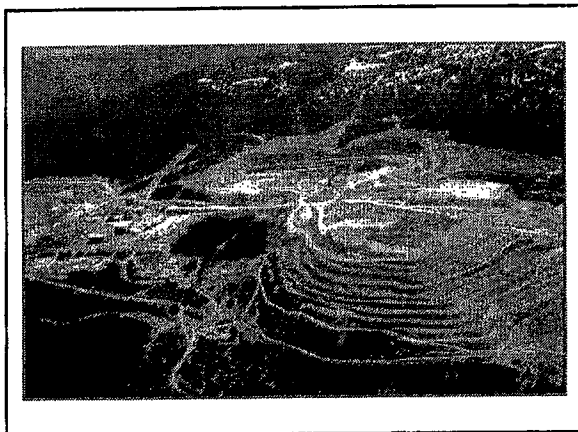
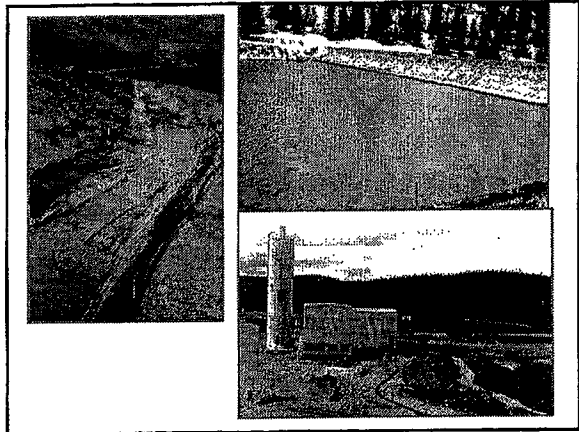
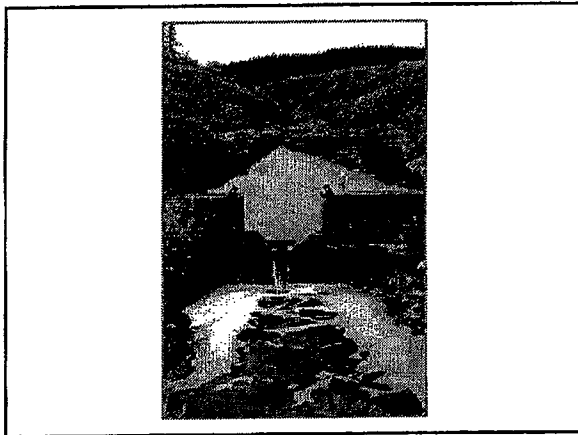
|
|
|
|
L
L
L
L
L
C
C
C
C
C
C
C
C
C
C
C
C
C

Equity Silver Mine

10 Years Experience with Dry Covers

By: Keith Ferguson & Mike Aziz

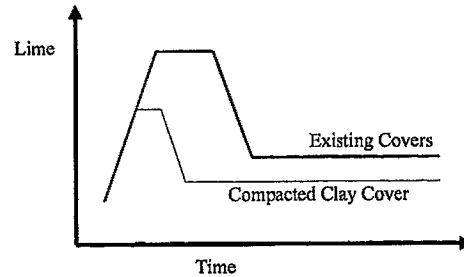
PLACER DOME INC.



1991 Evaluation of Cover Alternatives

- Closure approaching - ARD getting worse!
 - ARD increasing at 10% per year
 - lime use correlated with waste rock addition?
 - ARD at No. 1 dam seepage decreasing
 - other sites suggest a reduction after mining
- 1991 bond review
 - expect rather sharp reduction after w. rock dumping stopped then less rapid decline then levelling off
 - maximum values based on assumed acid conc.
 - significant reduction of ARD expected after installing a compacted till cover

1991 Technical Committee Lime Scenarios



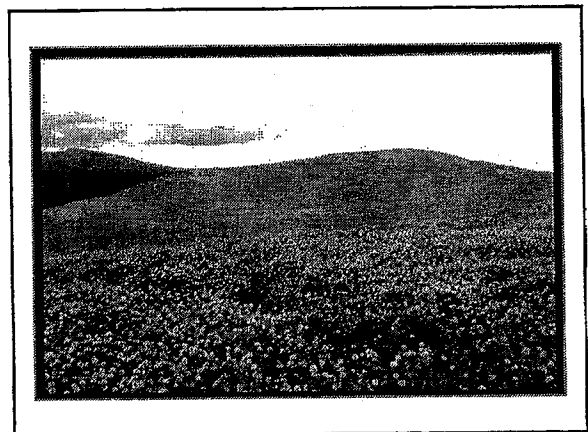
1991 Comparison of Covers

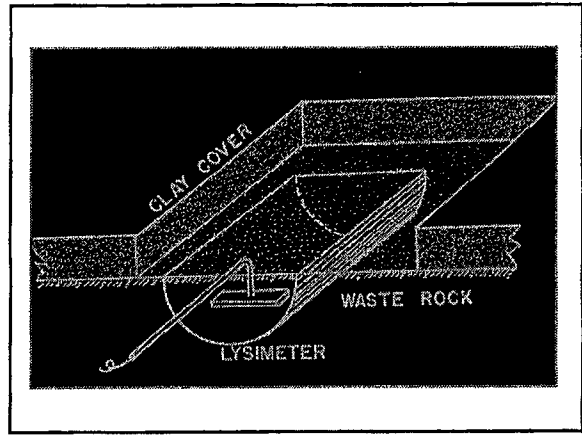
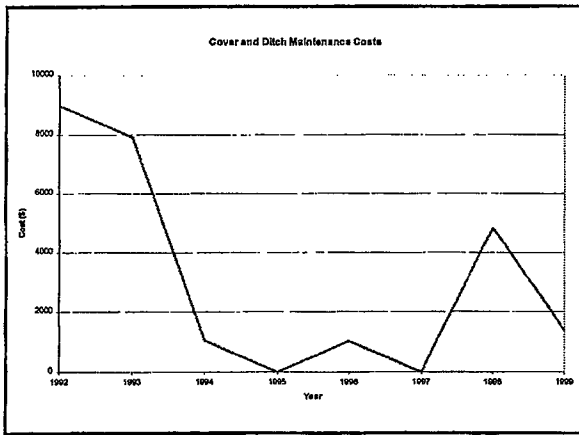
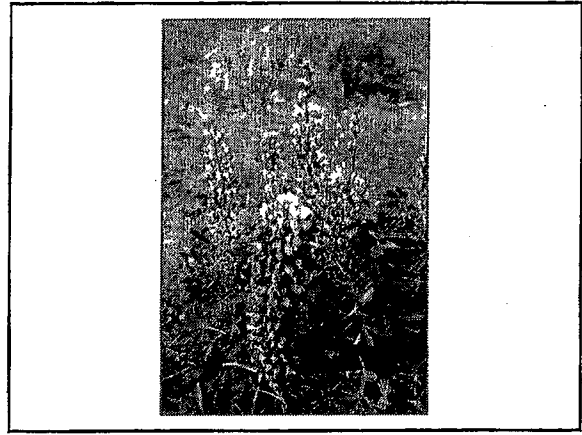
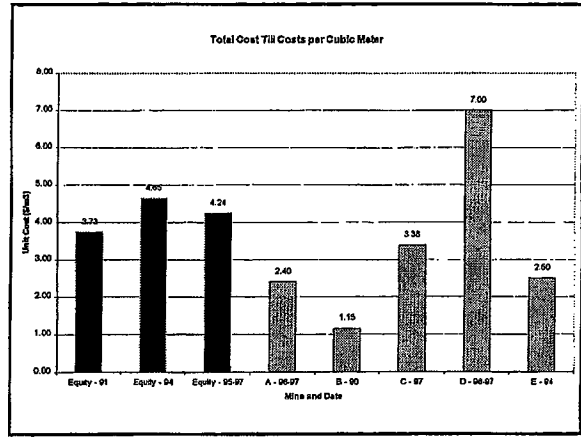
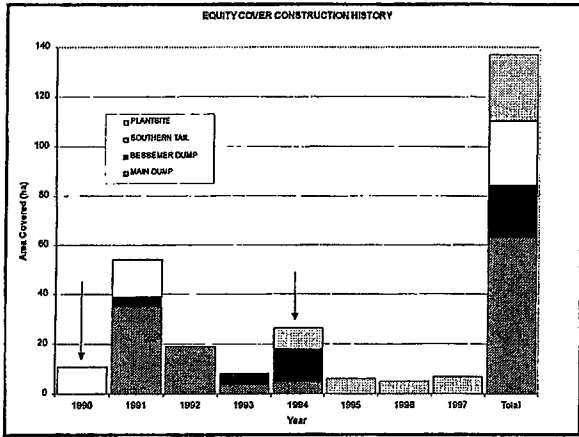
Parameter	Existing Cover	Compacted Cover
% Increase/yr	10	10
Peak lime (t)	10,000 - 15,000	7,500 - 10,000
Peak period (yrs)	2	1 - 5
% Decline/yr	4 - 6	10
Low-level lime (t)	2,000 - 3,500	600 - 1,200
Avg. Lime (t)*	2,650 - 5,980	1,080 - 2,270
Potential Bond (\$)	\$34.2 - \$56.6 M	\$22.8 - \$32.1 M

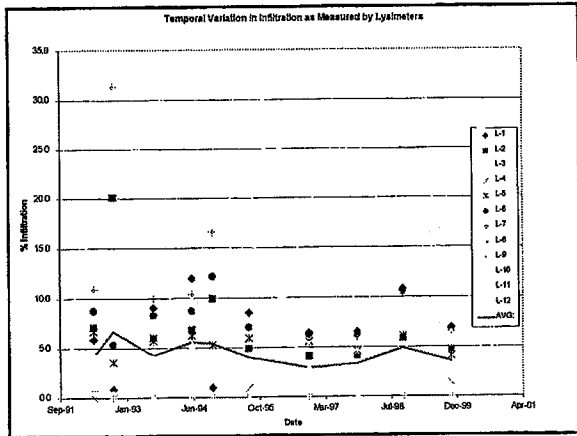
*over 100 years

History of the Equity Cover

- Late 1980's placed 1.0 m uncompacted till cover over part of waste rock dump
- 1990 - 1997 - replace uncompacted till cover with a 0.5 compacted plus 0.3 m compacted till cover
- 1998 - revegetation of cover complete
- average cost of cover \$35,000/ha

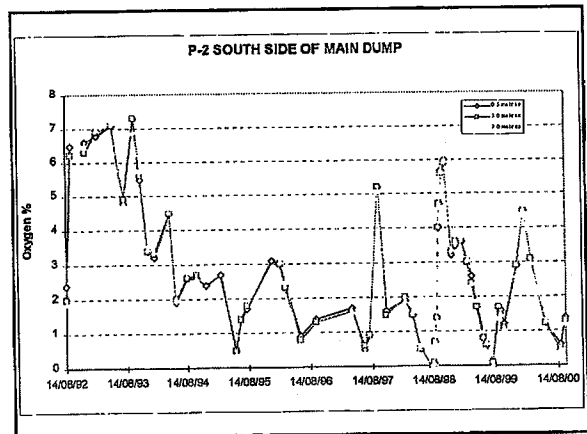
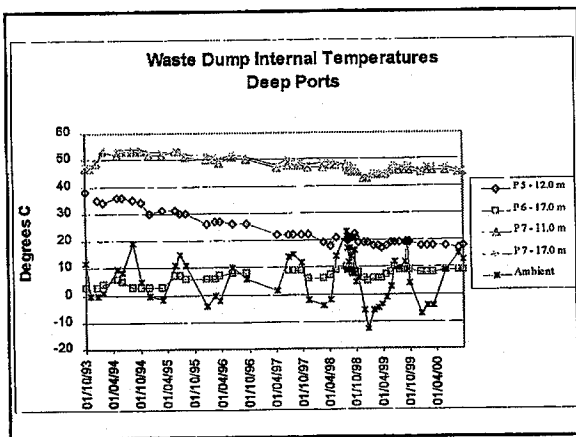
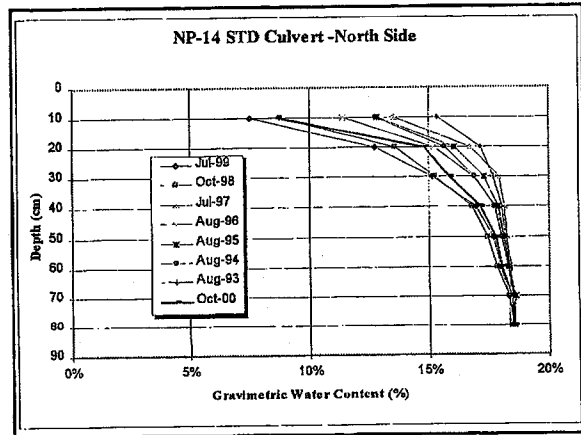
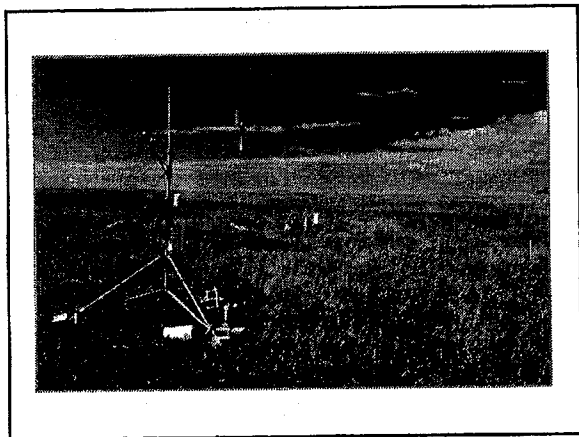


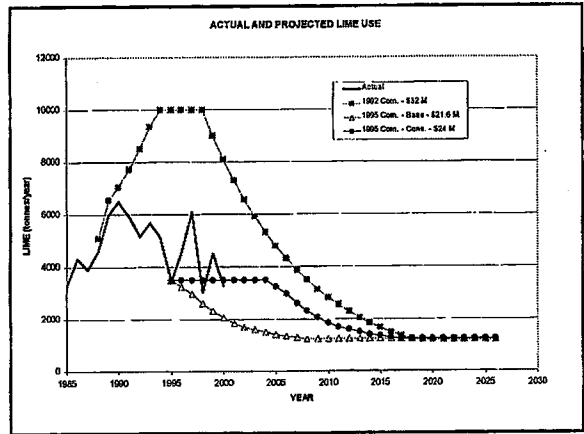
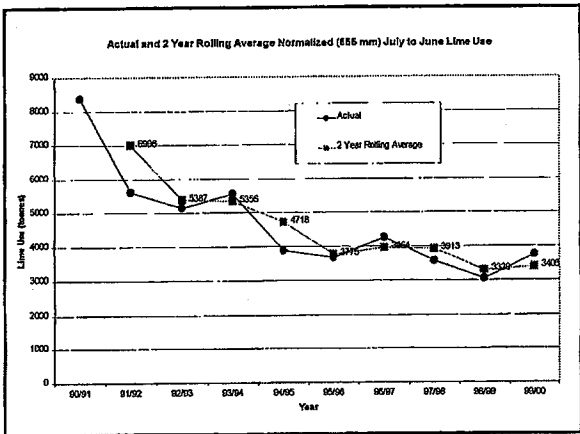
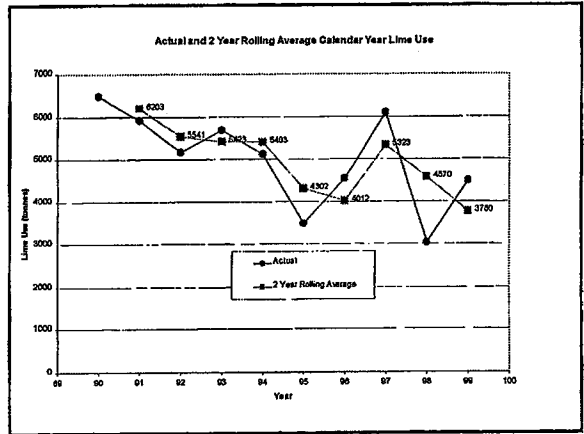
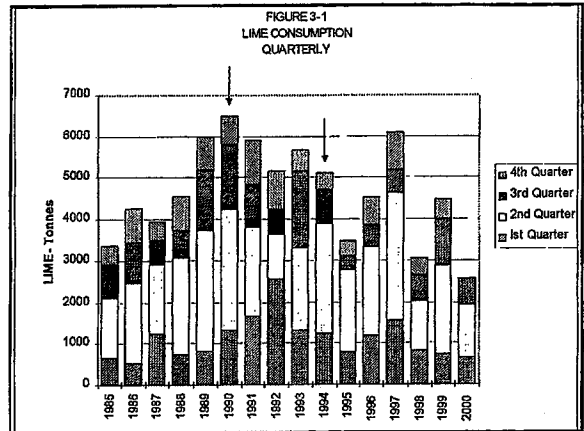
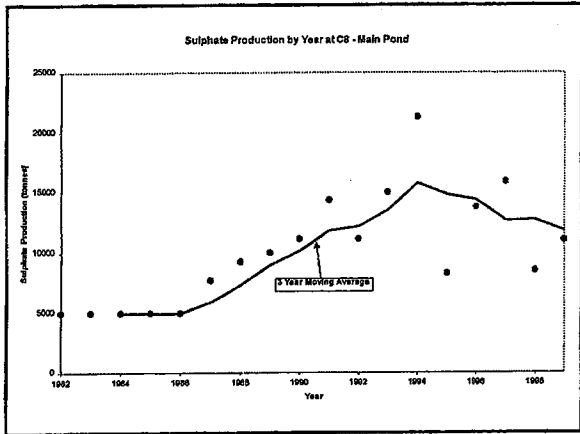




U of Saskatchewan Studies

- 5 year study to investigate performance of the cover
 - measurements of water content and suction in the cover
 - modelling of cover performance
- saturated layer that prevents oxygen ingress
- measured 4% infiltration
- modelled 3% infiltration



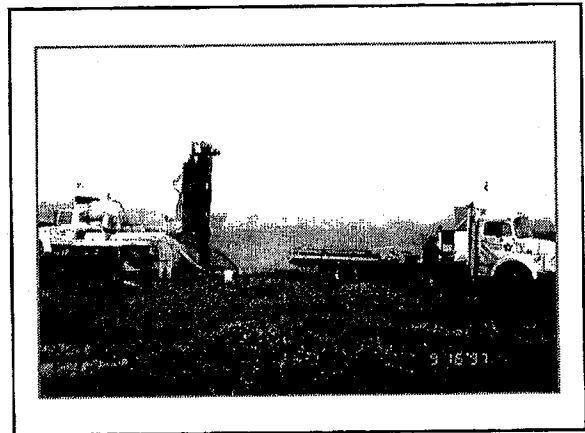
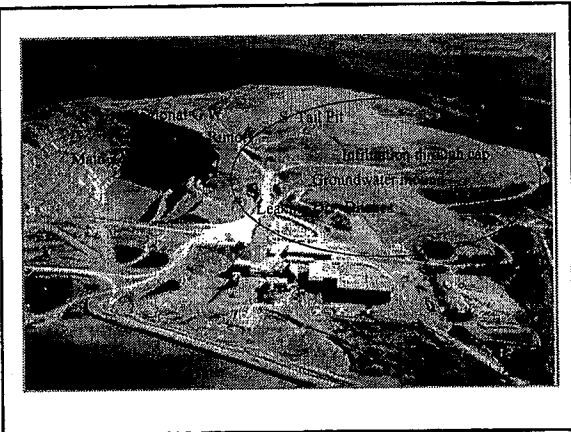


What do we know?

- Lime use has dropped from peak but...
- It is significantly higher than some early projections based on expected cover performance
- Acidity loading corresponds to precipitation/runoff events - no significant change in concentration
- About 3 day delay from maximum precipitation/runoff to seep flow increase
- Main dump water balance OK at 4% infiltration
- Bessemer dump water balance need 15% infiltration

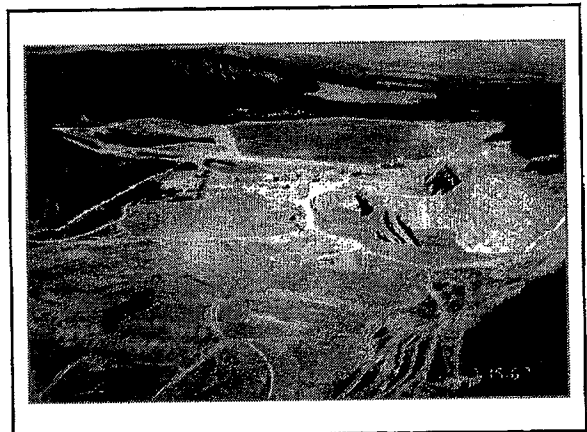
Where Does all the ARD Come From?

- Main Zone pit groundwater
- Tailing pond groundwater
- Southern Tail pit groundwater
- Groundwater mound in dump
- Regional groundwater (inc. leaking upslope diversion ditches)
- Infiltrating runoff under cover
- Leaking dump diversion ditches
- Infiltration through cover



Where Does all the ARD Come From?

- Main Zone pit groundwater
- Tailing pond groundwater
- Southern Tail pit groundwater
- Groundwater mound in dump
- Regional groundwater (inc. leaking upslope diversion ditches)
- Infiltrating runoff under cap
- Leaking dump diversion ditches
- Infiltration through cap





Identifying Source of Additional ARD

- Three phase groundwater investigation
- Pump MZ pitwater
- Measure surface diversion ditch flows
- Construct regional groundwater cutoff trench
- Tracer studies of infiltration?

Uncertainties and Challenges

- Source of additional ARD & cover performance
- Maintenance requirements
 - erosion
 - woody species
- Long-term evolution of cover
- New technologies
 - cover improvements
 - treatment
 - metal recovery

Conclusions

- Cover construction was straight forward and maintenance has been simpler and less costly than expected
- The cover has reduced ARD production
- ARD production is not as low as was hoped
- Other sources of water may be increasing ARD
- Further studies of water sources, ARD generation and long-term performance of the cover are required.

The final chapter of the Equity story has yet to be written!

