

AREA A HIGHWALL FINAL RECLAMATION PROJECT DESIGN IMPLEMENTATION¹

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Extended Abstract: Western Energy, a subsidiary of Westmoreland Mining LLC owns and operates the Rosebud Mine in Colstrip, Montana. In thirty-eight years of production more than 375 million tons have been produced.

Westmoreland Mining purchased Western Energy in 2001, in addition to other mining operations owned by The Montana Power Company and the Knife River Corporation. Westmoreland Mining and its affiliate Westmoreland Resources, Inc together own five surface and coal or lignite mines in the United States. These mines make their parent company Westmoreland Coal Company one of the top ten coal producers in the U.S.

Colstrip was founded in 1923, mining started in 1924. The coal was used to fuel steam locomotive boilers on the Northern Pacific Railway. Forty four million tons of coal was mined during the 34 years of operation. Mining by the Northern Pacific ceased in 1958 when diesel replaced the coal-fired steam locomotives.

This abstract updates the progress of this project since 2003 when the Area A highwall final reclamation was presented at the 2003 National Meeting of the American Society of Mining and Reclamation and the 9th Billings Land Reclamation Symposium, Billings MT, June 3-6, 2003.

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Area A Permitting, Mining and Reclamation History

- State Program Permit issued September 2, 1986
- Coal shipped to out of state utilities through 1995
- Postmining topography revisions for final reclamation approved in 1999
- Spoil side regrading conducted from 1999-2002
- Final highwall regrading completed in 2005

Final Reclamation Opportunity

During reclamation activities on the spoil side during 2001 an opportunity to preserve various topographic features such as steep slopes, sandstone cliffs, rock outcrops and unique habitat features was identified. In addition, by reducing the area needed for final highwall reduction, approximately 5000 ponderosa pines would be saved.

Final Reclamation Design

To take advantage of this unique reclamation opportunity the design had three significant problems to address:

- Provide stable drainages from the reclaimed area to tie with the undisturbed areas both upstream and downstream.
- Balance the cut and fill volume required with a smaller highwall reduction area.
- Provide for topographic diversity and vegetation diversity on the spoil side recognizing that more cut material would be required from the spoil side.

Final Reclamation Implementation

Construction of Stable Drainages. The drainages were constructed to drain from the undisturbed highwall zone to the undisturbed, downstream zone in a concave, longitudinal manner. The drainage slopes vary with the elevation difference between both tie points, and are designed to ensure stable hydrologic performance (i.e. through slope design and side-channel design). 2005 was an above average precipitation year at 23.5 inches. Although vegetation had not established at the time, the constructed drainages proved to be stable.

Filling the Final Pit. In order to reduce the final highwall reduction zone to preserve the native features the following methods were used to achieve a material balance:

- Cut more on the spoil side
- Create slopes on the highwall side

During the design process the cuts and fills were balanced to ensure that the material be moved the shortest distance to obtain the most diverse and hydrologically functional topography. The area was then divided into logical blocks that signify which type of equipment will be moving the material, and signifying where that material must be moved. The logical blocks were input into a GPS dozer guidance system for material to be moved by a dozer or staked in the field for material that was to be moved by truck/loader or scraper to let the operators know the optimum directional push, and let the operators know when an area is complete. A project review at the end of the year revealed that designed post mining topography was achieved at

production rates that met or exceeded budget. In addition, a Phase 1 bond release application has been submitted to the state Department of Environmental Quality and is being reviewed.

Providing for Topographic Diversity. To enhance the topographic diversity, several minor tributaries to the main drainages were developed. Variable topsoil replacement depths were also used to increase vegetative diversity. Topsoil depths were varied according to the appropriate slope aspect. This process will ensure that a mix of Ponderosa pine and native grasses succeed and enhance the area.