Little Boyd Coal Co., Inc. - Remining No. 1 Mine
A General Overview For Presentation At The
AMD Symposium, April 2003

A. Introduction

In 1999, Little Boyd Coal Co., Inc. (Little Boyd) acquired rights to mine a certain block of reserves along Thacker and Grapevine Creeks in Magnolia District of Mingo County, West Virginia. The perception of these reserve areas had been tainted by the low pH of the waters in Thacker and Grapevine Creek caused by previous mining performed before the implementation of the current mining regulations in 1977. This report presents the challenges of permitting and successfully executing a remining[1] plan for this reserve block. This report will address the geology of the area, the water quality of Thacker and Grapevine Creek, the past mining that occurred on the property, identification of existing AMD[2] sources, the development of a remining plan, the permitting process, and the results of the implementation of the mine plan.

B. Geology

The reserves evaluated included coals from the Kanawha Group of the Pottsville series of the Pennsylvania Formation that is overlain and underlain by various types of shales, siltstones and sandstone. The coal seams targeted by the initial evaluation are identified as the Williamson, Upper Cedar Grove, Lower Cedar Grove, and Alma Seams[3]. Other coal seams present on the property include the Coalburg Seam in the horizons above the target seams and the Pond Creek and Cedar Seams in the horizons below the target seams.

Numerous geologic test holes have been drilled on the property in the past to gather information regarding the number and thickness of coal seams that may be present. For evaluation purposes, as well for use in future permit applications, a test hole was drilled for specific use by Little Boyd. The cores retrieved from this drill hole were tested using Acid Base Accounting (ABA)[4] to determine qualities of the overburden materials in different catagories. The test hole was designated DDH 99-1. The log of the DDH 99-1 and the results of the ABA testing are included as Appendix A in this report.

---

[1] The term remining, as used in this report, will mean a mining operation that will mine again an area where mining had previously occurred before the implementation of the current mining regulations in 1977 and where a variance from applicable water quality standards is sought from the State of West Virginia Environmental Quality Board.

[2] AMD is the acronym for Acid Mine Drainage. AMD, as used in this report, is water that has low pH and in most cases elevated Manganese readings, which resulted from to past mining activities.

[3] These seam identifications are those used locally and by the landowner. The WVDEP references for these seams include the No. 2 Gas Seam instead of the Alma Seam. Local residents refer to the Lower Cedar Grove Seam. Reserve reports prepared on behalf of the landowner also include the Middle Cedar Grove Seam.

[4] ABA is an evaluation of overburden strata samples that indicates its potential to produce acidity. This testing compares the potential to produce acidity to the neutralization potential of the sample. The result is expressed in a ratio of tons of Calcium Carbonate Equivalent material to each one thousand tons of sample material. A positive result reveals an excess in neutralization potential, while a negative result indicates a potential to produce acidity.

Of particular interest to this project is the presence of a layer of dark gray shale directly above the Lower Cedar Grove Seam[5]. This shale was identified in the geologic log as "*dark gray shale, fissile, massive, moderately hard, plant fossils, grading to carbonaceous.*" This dark gray shale is identified as samples S-43, S-44 and S-45 in the ABA. These samples all have deficiencies in the ABA of –8.25 to –28.56. This dark gray shale will be discussed in more detail in the Past Mining Practices portion of this report.

C. Water Quality

A comprehensive sampling plan was developed to determine the quality of water originating from seeps or discharges created by previous mining and the waters in Thacker and Grapevine Creeks. This sampling plan has, at times, included one hundred and twenty-two (122) ground water sites and fifty-eight (58) surface water sites. The sampling protocol required by guidelines set forth by WVDEP and EPA include a twice monthly sampling for a period of one year with a desired minimum of twenty-four (24) samples. Not all the referenced sites were monitored for the full protocol due to the cost of the sampling and testing, however, sites necessary for the permitting process were sampled for the full protocol.

The ground water seeps and discharges vary in quantity from<1 gpm to >100 gpm. Most of these seeps and discharges are highly dependent upon surface rainfall. Others, though flow may lessen, flow year round. This tended to indicate that abandoned deep mine workings is concentrating the ground waters and providing passage to surface openings. These surface openings are not always visible due to natural reclamation of the old highwalls. The quality of the groundwater seeps and discharges was poor in nature with pH values of two (2) to four (4) and elevated manganese and aluminum values. A typical analysis compilation of the ground water is contained herein as Appendix B.

The surface waters were also found to have poor water quality with pH values of three (3) to four (4) common. The manganese and aluminum values were also elevated in the surface water samples. A typical analysis compilation of the surface water is contained herein as Appendix C.

No major elevations in iron were discovered during the sampling. Thus, the streams in the area are generally clear with no adverse aesthetic problems immediately apparent. Only upon closer examination does the existing degradation of the water come to light.

Little Boyd also determined that it would be prudent to conduct a study of the benthic populations present in the streams in the areas where the first remining was proposed to occur. This benthic sampling found no minnows and the macroinvertebrate populations include only the very hardiest of species that are acid tolerant. This benthic sampling will also serve as a basis for comparison of populations after mining to those before mining. This benthic sampling is contained herein as Appendix D.

D. Past Mining Practices

Surface mining and underground mining have both occurred in the areas subject to this proposed remining operation. No specific dates of this mining can be determined from

[5] Much assistance in the exploratory process was provided to Little Boyd Coal Company by Mr. Nick Schaer, a geologist with the WVDEP. Mr. Schaer helped identify the strata involved in the formation of the AMD as well as provided keen insight into measures to prevent the creation of AMD. Mr. Schaer is to be commended for his efforts.

the information available at this time. Searches of the archive records in the Office of Miner's Health Safety and Training in Charleston failed to locate any mapping of the underground workings. USGS topographic maps dated 1927 and in the possession of the State Historic Preservation Office indicate the presence of "*tunnels*" on the property, which were most likely entries through long points to shorten the haul distance for animal powered loads. Horizontal borings performed by Little Boyd revealed the existence of voids at distances of twenty (20) to eighty (80) feet from the outside surface of the coal as exposed in the existing highwalls.

Highwalls exist along the entire length of the Lower Cedar Grove Seam present on the property. The surface mining that created these highwalls is generally known as the "shoot and shove" method. This method involved the blasting of overburden[6] with disposal of the overburden accomplished by shoving or casting the material over the hillside by the use of dozers or shovels. This surface mining that created these highwalls targeted only the Lower Cedar Grove Seam. One would be lead to believe that the underground mining occurred after the surface mining because entries are not encountered along the length of the highwall. The total height of the existing highwalls range from thirty-five (35) to (70) feet. The Lower Cedar Grove Seam, in places, contains approximately nine (9) feet of coal with one major parting of approximately three (3) to four (4) feet. The Upper Cedar Grove Seam lies approximately twenty (20) feet above the Lower Cedar Grove Seam and is also exposed along the entire length of the highwalls.

Further exploration of the previously mined areas revealed areas were coal was left in place, possibly due to quality or equipment limitations. This coal is present mainly in the berm areas along the outside of the existing bench or on points.

A typical cross-section, depicting the highwalls and coal seams remaining after the historic mining, is contained in this report as Appendix E.

E. Identification of AMD sources

As stated above in Section B, a layer of dark gray shale is present directly above the Lower Cedar Grove Seam that has a deficiency in calcium carbonate equivalent material. Since the past mining methods saw the overburden shoved over the hillside, it is only logical that this mining, that targeted the Lower Cedar Grove Seam, shoved this potentially acid producing material over the hillside. Moreover, since it was the overburden directly upon the Lower Cedar Grove Seam, this material was the last material shoved over the hillside, thereby placing it on or near the surface. This is the most undesirable location for this material because it is then exposed to the elements and to rainfall, allowing for the leaching of AMD from this material.

Due to the presence of sulfur in the Upper and Lower Cedar Grove Seams and the above mentioned dark shale between the seams, the seeps and discharges from the Lower Cedar Grove Seam underground workings also cause AMD.

Coal that was left in place on the existing bench was also identified as potential sources of AMD.

[6] Overburden is the rock strata overlaying the coal seam. Surface mining performed prior to the implementation of the current mining laws in 1977 saw this material shoved over the hillside for disposal. Modern surface mining utilizes this overburden material for the reclamation of all highwalls with any left over material placed in spoil disposal facilities such as valley fills.

G. Remining Plan

The EPA has developed a set of guidelines establishing Best Management Practices (BMPs)[7] for utilization in remining operations. These BMPs were reviewed to determine if any of the methods could be utilized at this proposed remining operation. The BMPs state that one of the best methods is the removal of the target coal seam through the entire strata of the mountain, thereby, eliminating all voids that could collect and transport water. The BMPs also allow for the isolation of AMD producing material by encapsulation in the backfill areas. And BMPs also recognize that neutralization of AMD is assisted if the acid producing material comes in contact with alkaline material that has an excess of calcium carbonate equivalent material. These three (3) BMPs were determined to be achievable, in part or in whole, with this proposed remining operation.

This remining plan would then be required to accomplish the following while economically extracting the coal reserves:

1). Remove any coal present on the existing benches
2). Eliminate as much underground workings as possible
3). Encapsulate any potential acid producing material encountered during the mineral removal process including the new overburden, the overburden previously placed over the hillside and pit cleanings[8].
4). Direct drainage on the operation to bring as much water as possible into contact with alkaline material

The advance work for the surface mining operation is planned to include a reconnaissance of the existing bench to determine if coal has been left in place. This coal, when present will be removed before further site prep work is accomplished.

The second cut planned for the Lower Cedar Grove Seam cannot fully eliminate all voids that may collect and transport water. However, the planned second cut eliminates portions of the existing underground mine working. Full elimination of the existing workings cannot be accomplished due to excessive mining ratios (overburden:coal).

The second cut planned for the Lower Cedar Grove Seam cannot fully eliminate all voids that may collect and transport water. However, the planned second cut eliminates portions of the existing underground mine working. Full elimination of the existing workings cannot be accomplished due to excessive mining ratios.

The remining plan involves the extraction of the Williamson, Upper Cedar Grove, Lower Cedar Grove and Alma Seams (See Appendix E). This operation is fortunate to have the presence of the Alma Coal Seam approximately eighty (80) to ninety (90) feet below the Lower Cedar Grove Seam. As the mining cut to the Alma Seam is developed, a large portion of the spoil placed over the hillside by the previous mining is encountered. This encountered material will be segregated and encapsulated in the remining plan.

The material, identified in the ABA as acid producing and present over the hillside, will not be placed in any valley fill. This material when encountered will be encapsulated in the backfill by placing the material on a pad of the cleanest available sandstone available at the time of placement. This allows for the drainage of water from the material. This material is then covered with the most claylike material available at the

---

[7] “Coal Remining – Best Management Practices Guidance Manual,” draft of June 1999. This document was reported to be finalized at the time of this report.
[8] Pit cleanings are those materials left in the pit after the coal product is removed. This material includes shales and low quality or weathered coals.

time of placement. This helps prevent surface water from coming in contact with the material. This material will not be placed within ten (10) feet of any highwall.

Other than the coals and the dark gray shale material discussed above, the remainder of the overburdens to be encountered in the remining process, are alkaline in nature, having excesses in calcium carbonate equivalent material. The overburden materials not necessary for the full elimination of highwalls will be placed in valley fills. By directing water flows through the valley fills, the fills become buffers for the water. Water also comes in contact with alkaline material as it passes through the backfills. The seeps and discharges that originate from the remaining Lower Cedar Grove workings will filtrate through the backfill thus bringing it into contact with alkaline material.

H. Permitting Process

The application process for this remining operation involved review by and/or approval from the WVDEP, EPA, NPDES, OSM, Army Corp of Engineers and the WV Environmental Quality Board (EQB). Most notable among these is the EQB. The EQB has rule making authority allowing it to approve variances from applicable water standards for remining operations if the operator demonstrates the potential for improved water quality. During the EQB approval process, the operator provides a set of numerical limits that they expect to achieve in the streams below the operation. These limitations, if approved by the EQB, then become the measurement by which EQB gauges the success of the remining operation. Approval for this remining operation was granted by the EQB.

Water quality for remining operations are monitored by both an NPDES Permit using Remining Standards and by the final water quality standards required by the EQB. NPDES water quality monitoring for remining is not based upon instantaneous numeric readings of a grab sample. Water quality is measured by loading calculated in pounds per day of a given pollutant. Limits are established based upon the results of the baseline water monitoring using the remining protocol. Since pH values are inherently an instantaneous reading in standard units, they are not utilized. Acidity levels are used to calculate loadings.

The EQB requires that the operator provide that board with water quality limits that the operator then must meet at the end of the operation. Little Boyd sought variance from applicable water quality only for the pH and manganese parameters. The EQB, with considerable input from WVDEP, NPDES and EPA, approved a two-tier standard for gauging the ultimate success of this remining operation. The first hurdle is the maximum allowable reading. This limitation was set by applying a percentage of improvement to the worst reading obtained in the baseline monitoring program. The second hurdle is applying that same percentage of improvement to the average water qualities obtained in the baseline monitoring program. This two-tiered approach is used because an improvement could be made to the worst values but the overall water quality, as realized in an average, could be degraded. The reverse could also occur. This two tiered approach assures that improvements are made to the worst values and to the overall qualities[9].

The remining regulations state that all available spoil be used for highwall elimination during remining operations. To eliminate the question of what "all available spoil" really

[9] Please note that pH Standard Units are logarithmic in nature and not progressive. Any percentage improvement to pH must be made converting the first pH to a numeric acidity value, applying the percentage improvement, then converting the numeric acidity value back to pH Standard Units.

means, especially if material is placed in valley fills, Little Boyd will reclaim all highwalls created during the remining process. This was a major concern of the OSM.

I. Implementation of Mining Plan Results

No remining plan could be expected to be successful if that plan cannot be effectively implemented by the field personnel and equipment operators. Several training sessions were held with the superintendents, foremen and equipment operators. Fortunately, the colors of the dark shale and the materials over the hillside allow for easy identification in the mining process. Due to this, the encapsulation of the AMD creating material is being successfully accomplished.

The NPDES limitations concerning acidity and manganese loading have been met during the operation of this remining operation. No non-compliance discharges have occurred through the last quarter of 2002.

The EQB limitations have been met. Little Boyd must maintain pH values of 3.8 standard units or greater in the streams associated with this remining operation. The last quarter of 2002 included pH readings of 5.84, 7.40, 6.50, 6.54, 5.90 and 6.30 standard units. Little Boyd must also maintain manganese values of 7.07 ppm or less in the streams associated with this remining operation. The last quarter of 2002 included manganese readings of 2.19, 4.61, 4.92, 3.94, 3.16, and 5.04 ppm.

J. Conclusion

Based upon the results of the water quality analyses, Little Boyd is successfully implemented a remining plan that is maintaining compliance with the requirement of all applicable permits and variances with particular emphasis placed upon those approved by NPDES and EQB.

This report is prepared by:
Heritage Technical Associates
P. O. Box 4510
Chapmanville, West Virginia 25508
Telephone: (304) 855-2300
Facsimile: (304) 855-5300
Email: heritage@app-net.com