DLM COAL CORPORATION'S APPROACH TO MINING FOR WATER QUALITY

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I would like to share with you the approach that DLM Coal Corporation has taken in order to deal with mining coal in an area which has potentially toxic overburden. Our mine is located in the southeastern portion of Upshur Countv, West Virginia along the Buckhannon River. The coal we mine is the upper, middle and lower Kittanning Seams. Our operation is an area mine utilizing a modified haulback method of mining. The equipment used in our operation is primarily loaders and dozers.

We have just completed mining approximately fifteen acres utilizing a method of operation which is similar to the one out-lined in the task force report. We are currently beginning a new 100 acre permit utilizing the same general operational considerations.

Because I was a member of the task force which drafted the booklet that you received today and I have also had some experience with the implementation of those recommendations, I have been delegated to share with you some of my practical experiences.

The basic task force philosophy is to properly handle acid forming material, while at the same time, try to eliminate the production of acid by preventing ground water and air from coming in contact with the toxic material. We have intentionally not developed. a cookbook approach to solving our problems because they are so diverse and site specific. In order for the basic ideas of this booklet to be successful, operators must require good prior planning, knowledgeable supervision, and a mining operation dedicated to water quality.

The most important factor in our operation is the development of a workable mining plan. We are not interested in a plan that just meets basic regulatory specifications, rather one that every-one from the general manager through the foreman can live with. Engineers, supervisors, and business managers should be held responsible for the implimentation of a permit and therefore their involvement in the planning of the permit is critical.

I do not intend to cover every aspect of our operation. I would, however, like to share with you what I consider the most important basic lessons I have learned in trying to cope with this problem.

For example, by todays standards, the sucess or failure of our jobs is determined by water quality. Therefore we must have a very good idea what the water quality is before we start mining. Place the same emphasis on good baseline data that you would a good mining plan. The reason for this is that we are not dealing with just a permit requirement but a tool that will be used by the regulatory agencies for granting or denying our bond releases. Make sure that you get consistent baseline data before submitting it in the permit application. In other words, compare what is being submitted to what you know the quality of the water to be. Water samples should be taken at the proper place by a responsible individual.

My first transparency is an example of a water sample supposedly taken off an abandoned strip mine bench. It is hard for me to believe that 6.7 pH and the additional water quality data will exist in drainage of this sort in southeastern Upshur County. The second transparency is an example of a fairly consistent baseline that we have gathered over a period of several months.

Another important planning point is to coordinate your exploratory drilling, your overburden analysis and ground water monitoring, if possible. Our operation uses an air drill to spin to the coal and then the coal is cored. Spin chips are collected at one foot intervals and. stored in styrofoam. cups. As you can imagine, proper logging and collection of samples is extremely important. Usually these samples are taken to a lab where they are examined and consolidated by color or rock type. This is where operational problems can begin. Sometimes small bands of toxic material can become mingled with the overburden sample and the result is that a large quantity of non-toxic material suddenly falls into the "Bad Column" (maximum needed pH 7). If this should occur, have the lab rerun the tests on individual samples within the bad area or re-evaluate that portion of the core that is remaining.

Transparency #3(Overburden analysis showing large band of potentially toxic material.) This example shows a large band of potentially toxic mudstone above the coal seam. If we had not re-evaluated this strata a mining plan would have been developed to special handle material that was riot necessarily toxic. The actual toxic material was approximately six inches of material above the coal.

Another consideration of the planning phase of the operation is to ensure that enough room is provided in your permit for spoil placement. As we know, adequate spoil room for the initial cut is a necessity. The last thing we want to do is constantly move this toxic material or be forced to place it in unsuitable locations. It would be a tremendous waste of time and money to go to the trouble to get good water quality inside the pit only to have it work it's way through some toxic, material near the surface and have the water quality change from a 6.0 DNR spring to a 4.5 Operators seep.

The mining plan that we have developed utilizing the overburden analysis on transparency #4 was very simple and we found that it has not required us to drastically change our method of operations. The topsoil storage, drilling and overburden removal take place much the same way they always have. The only difference exists as we come near the first coal seam. As the color of the strata changes from above the coal is hauled back to so that future ground water will and it will be exposed to surface of time as possible. These coal most toxic material that come out grey to black the material a designated point and dumped never come in contact with it water for as short a period cleanings have proven to be the of our pits. This material should be stacked and not spread to reduce the amount of toxic material that could come in contact with the elements. Both seams of coal are cleaned in this manner.

Transparency #5 (Cut and Spoil Sequence) We have developed certain basic rules that everyone in our operation tries to follow. On our initial and subsequent cuts, only non-toxic material will come into direct contact with the original ground or pit floor. Toxic material is placed on top of the non-toxic mudstone at least one lift above the pit floor. It is important before the job starts that everyone knows at least where this potentially toxic material is located and what it will look like so that it can be handled properly.

As the initial cut is made and the highwall is exposed I take highwall samples to reconfirm the overburden analysis. Four to six miscellaneous samples are taken based on color and type of exposed rock. By doing this at the outset of the operation I can show our foreman and other personnel where the problem areas are as we come in contact with them. This way key people in our operation can actually see the material that needs to be handled in a special manner. Using this process we have discovered that our separation is much hotter than we anticipated. Knowing thds before we got too far into the operation has no doubt helped prevent future water quality problems.

During the coal removal and cleaning process, lime is spread where equipment enters and leaves the pit. This allows wheeled vehicles to help spread some alkalinity and also eliminates the possibility of inadvert&ntly spreading toxic material throughout the job.

Once the coal has been removed, it is very important to clean the pit floor in the same Tranner as you would the coal. When this task is completed, we spread lime on the pit floor to form a hard lime coating in order to render the pit floor virtually inert. We do not try, as you might think, to neutralize all of the potential acidity. It is important to watch the pitch and roll of the pit floor. Low places where water will naturally flow or stand should be given large quantities of lime. Once these tasks are completed, material from the adjacent cuts is pushed into the pit.

The recontouring of the overburden and topsoil, is in my opinion, one of the most important parts of mining for water quality. Large flat areas where surface water can percolate through the overburden to the pit floor must be eliminated. Allowing these large recharge areas to exist on your job will only increase the probability of seeps. It is much easier and cheaper to treat surface water because of its low acidity and alkalinity ratios and low metal content than it is to cope with ground water that could contain very high amounts of acidity and therefore high concentrations of iron and manganese.

The results we have been able to achieve at this point have been encouraging. In the last transparency I would like to show you the difference in water quality from the beginning of our baseline data in 1977 until February 26th of this year. This is an untreated sample from the same stream taken during current mining operations.

We have not completed this permit. I don't claim to have solved the acid production problem, but I do believe we are on the right track. More research is desperately needed in the area of extraction technology. A method for the dissemination of this information to the people who mine the coal is essential. The task force, I believe, is step in the right direction for our industry. I hope we can continue to generate practical new ideas to help solve the problems of our industry so that our coal can play a large part in our country's search for energy independence.

TRANSPARENCY #1

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pH	6.7 Standard Units
Total Hot Acidity	8 mg/l
Total Mineral Acidity	0 mg/l
Total Alkalinity	15 mg/l
Total Iron	0.70 mg/l
Total Aluminum	1.5 mg/l
Total Manganese	.05 mg/l
Total Sulfate	4 mg/l
Total Suspended Solids	4.1 mg/l
Total Dissolved Solids	109 mg/l
Turbidity	120 NTU

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TRANSPARENCY #2

	12/23/78	1/23/79	2/14/79	3/28/79	4/30/79	5/30/79
pH	6.14	6.28	5.98	7.38	6.50	7.38
Hot Acid.	12.0	12.0	10.0	30.0	15.0	30.0
Min. Acid.	-11.0	-12.0	-	-	-	-
Alkalinity	15.0	15.0	30.0	30.0	25.0	50.0
Iron	.26	.30	.84	.20	.42	.75
Manganese	.10	.08	.08	.07	.12	.07
Susp. Solids	15.0	14.5	19.0	5.0	16.0	25.0
Diss. Solids	100.0	30.0	-	-	-	-
Sulfate	5.0	5.0	-	-	-	-
Aluminum	.30	.39	-	-	-	-

	6/19/79	7/28/79	8/28/79	12/29/79	2/1/80	
pH	6.56	5.8	6.1	5.6	5.3	6.2
Hot Acid.	30.0	5.0	4.0	3.0	8.0	2.0
Min. Acid.	-	-	-	-	-	0
Alkalinity	45.0	6.0	8.0	4.0	3.0	4.0
Iron	3.22	1.20	2.17	.70	.64	.77
Manganese	.05	.10	.11	.11	.09	.09
Susp. Solids	5.0	23.0	58.0	18.0	5.0	9.0
Diss. Solids	-	-	-	-	-	-
Sulfate	-	-	-	-	-	-
Aluminum	-	-	-	-	-	-
Specific Conductivity		35	38	58	32	40

TRANSPARENCY # 3

$CaCO_3$ EQUIVALENT - Tons/1000 Tons of Material

(Feet) Depth	Rock Type	Fiz	Color	Max. Needed (pH-7)	Excess
0-12	Sample not included				
12-15	Sandstone	0	7.5yr 8/0		13.51
15-18	Sandstone	0	7.5yr 8/0		24.50
18-21	Sandstone	0	10yr 8/1		3.77
21-24	Sandstone	0	10yr 8/2		3.55
24-27	Sandstone	0	10yr 8/2		22.14
27-30	Sandstone	0	2.5y 8/0	1.39	
30-33	Sandstone/Mudstone	0	2.5y 8/0	1.52	
33-36	Mudstone	0	7.5yr 8/0	4.62	
36-39	Mudrock W/ Coal Bands	0	10yr 6/1	39.37	
39-42	Coal	0	10yr 2/1	23.70	
42-44	Coal/Shale	0	10yr 2/1	61.76	
44-45	Shale	0	10 yr 6/2	17.49	
45-47	Shale/Mudrock	0	10 yr 6/1	4.37	
47-50	Mudrock	0	10 yr 5/2		10.16
50-53	Mudrock/ Sandstone	0	10 yr 6/2		5.14
53-56	Coal	0	10 yr 2/1	59.39	
56-59	Coal/Shale	0	10 yr 3/2	106.24	
59-62	Shale/Mudrock	0	10 yr 6/2	10.41	
62-65	Mudrock	0	5 y 8/1	5.09	
65-68	Mudrock	0	10 yr 8/1	3.08	

TRANSPARENCY #4

$CaCO_3$ Equivalent - Tons/1000 Tons of material

Depth (Feet)	Rock Type	Fiz	Color	Max. Needed (pH-7)	Excess
0- 1	Soil	0	2.5 y 6/4	3.47	
1- 5	Soil/MS	0	2.5 y 8/4	2.83	
5- 8	MS	0	2.5 y 8/3		
8-15	MS	0	5 y 7/2		15.6
15-25	MS	4/5	2.5 y 7/2		64.2
25-28	MS	3	5 y 7/1		53.4
28-40	MS	1	10 yr 7/1		16.8
40-54	MS	1	10 yr 7/1		22.8
54-65	MS	4	2.5 y 6/2		47.7
65-72	Carb/Coal	2	10 yr 2/1	63.1	
72-73	MS not seen		10 yr 4/2	5.0	
73-81	Carb/Coal	1	10 yr 3/1	81.3	
81-91	MS	1	2.5 y 5/2	12.3	

	8/1/77	2/26/80
pH	3.2	6.0
Hot Acidity	720	5
Mineral Acidity	60	0
Alkalinity	0	5
Iron	6.82	1.56
Manganese	1.0	1.27
Suspended Solids	3	8
Dissolved Solids	145	98
Aluminum	2.5	1.31
Sulfates	89	64