Region V Governor's School for Science and Technology Educational Investigation Activities at the Powell River Education Center

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The students of the Region V Governor's School for Science and Technology participated in an annual educational investigation project at the Powell River Education Center located in Wise County, Virginia, during the summer of 2002. The Powell River Project is a cooperative research and educational effort dedicated to the development of the economic resource potentials of southwestern Virginia. The Powell River Project was a learning enhancement experience for the Governor's School students, who studied at an abandoned strip-mine site.

Sixty gifted students in the tenth and eleventh grades from the four-county service area of Southwest Virginia Community College participated in the Region V Governor's School for Science and Technology. Students desiring to participate in the Governor's school must meet academic requirements in order to be considered for acceptance into the program. Students must have taken upper division math and science courses, rank in the upper twenty-five percent of their class, have high achievement test scores, and be recommended by a member of the faculty or school official.

A division of efforts was created with four groups of fifteen students each assigned different responsibilities. The four groups were identified as Engineering Science, Life Science, Environmental Science, and Cutting-Edge Technology. Each group was assigned different tasks, namely, the Cutting-Edge Technology students investigated the physical characteristics of the Christmas trees, the Environmental Science group investigated the soil chemistry of the plats, the Life Science group investigated the surrounding insect populations and the Engineering Science group investigated the economic feasibility of remining a strip mine high-wall.

A technical document detailing the processes and procedures of each of the four groups is produced by the students and disseminated to all related agencies. A synopsis of the Engineering Science activity is included as a sample of the students work.

As an educational investigation the students were assigned the problem to determine whether or not it is economically feasible to remine an old strip mine based on a 20:1 overburden to recoverable coal. Calculations performed on five sectional slices of the strip mine result in a 19:1 calculation of overburden to recoverable coal. From the student calculations the data show that the high-wall can be remined 125 feet deeper into the mountain.

Engineering Science Class procedures to determine whether or not it is economically feasible to remine an old strip mine. For review of the data supporting this educational investigation refer to the technical document entitled, Region V Governor's School for Science and Technology Powell River Project Research 2002.

Team C was provided with a topographic map that was enlarged with the scale adjusted, a line on the map was to be our cross section line, another line was drawn so that the slope could be determined along with a cross section of both lines. Our goal was to find out how far back an

existing wall, with coal underneath, could be mined at the highest profit. We were told that the ratio was 20:1, meaning 20 cubic yards of coal could be removed per acre-ton of coal. We were provided with a device that could measure area on a topographic map.

First, we looked at our topographic map and cross-section. Next, we drew the coal seam on the cross-section. After that, we decided to attempt to move the wall back 100 feet on both sided of the line. On our topographic map, that was one half of an inch. We measured one half of an inch on both sides of the 1st and 2nd lines we had been provided. Now, we had a total of eight points, four on the left of the lines and four on the right. Two of the points on the left side were the original endpoints of the line. The other two were the one half inch marks. These four points were connected to form a shape. Using a planimeter, we measured the area of the shape we had made. Then, we repeated the process on the right side, making sure to write down and label both of the areas for future use.

Next, we indicated the marks made on our cross-section, taking care to see that we allowed for the difference in scale between the two. The indications were made by a vertical line one hundred feet from the high wall. Once the four vertical lines were made (two on each cross-section), we measured in inches the length of these lines. Also, the two heights of the high wall on both cross-sections were measured. Then, we looked only at the bottom cross-section. The high-wall height and the height of the line one hundred feet back were averaged on both sides of the cross-section. Next, we performed the same action to the top one. Once both had been completed we averaged the left two averages and the right two averages.

Then we multiplied the left area found earlier by this left average. This was converted to cubic yards. We now knew exactly how much land had to be removed for one half of an inch on the topographic map.

Next, we had to find out how much coal could be removed as a result of that dig. We divided the area of the first shape by 43,560 to find out how many acres of coal were present. We multiplied this number by 90% because not all the coal would be recoverable during the mining process. We knew there were 1742 tons of coal in one acre of land by one foot deep. Since the coal was four feet deep, we multiplied 1742 by 4 resulting in the number of tons of coal per acre potentially to be recovered. We then multiplied the acres of coal by the tons of coal recoverable per acre to arrive at the total number of tons of potentially recoverable coal at the site. This figure was divided into the cubic yards of overburden in order to arrive at a ratio of overburden to potentially recoverable coal.

Our first attempts gave us the ratio of about 15:1, we moved back another 25 feet, and repeated the process until we arrived at a point at which it would no longer be economically feasible to mine any deeper into the mountain. Our last calculation produced a ratio of 20.5:1.

The data from our investigation suggest that it is economically feasible to remine the strip as much as 125 feet into the mountain.

The students of the Region V Governor's School for Science and Technology would like to express our appreciation to Mr. Jon Rocket and Mr. Billy Campbell for their assistance with this very worthwhile educational experience.