

OSM Investigative Report  
Flood Event of July 19, 2002  
Winding Shoals Branch at Lyburn, Logan County, West Virginia  
September 13, 2002

I. Summary

On July 19, 2002, the West Virginia Department of Environmental Protection (WVDEP) received a report of a flood event at Winding Shoals Branch in Lyburn, Logan County, West Virginia. Storm water runoff, rock, mud, and debris from a Bandmill Mining Company surface mine, permit S-5023-93, flooded the narrow stream valley destroying residences, vehicles, and property downstream. There were no injuries reported. WVDEP personnel, local emergency personnel, and representatives of the mining company were soon on the scene. The mining company assisted the impacted residents through temporary housing, food, and other support. The WVDEP issued an imminent harm cessation order (IHCO) with remedial measures requiring reclamation of the fill, cleaning out the sediment control structure, emergency monitoring, and providing for the residents' needs after the flood.

The Office of Surface Mining (OSM) finds the primary cause of the significant damage at Lyburn was the condition of Valley Fill 6 and its close proximity to structures at the time of a heavy rain. At the time of the storm, the company was reclaiming this end-dumped fill. It was in its most vulnerable condition to erode and contribute to peak water discharges. Material was being pushed down the fill to create the required slope, preventing the installation of any drainage control on the face. During this time, fine soil and small rock at the surface of the face were exposed and highly susceptible to erosion. This condition is typical of an end-dumped durable rock fill during reclamation.

OSM also identified concerns with the administration of regulatory requirements on certain aspects of this permit. The probable hydrologic consequences determination (PHC) did not quantify the flooding potential in the original permit nor in subsequent revisions. One revision moved the toe of the fill closer to structures in the valley. It also approved a concave-like face for Valley Fill 6 that increased the disturbed area beyond that needed for a fill with a straight face. Further, OSM questions whether the reclamation plan required sufficient resources for timely reclamation since the fill had not been reclaimed two years after coal removal ceased.

Concerns with engineering certifications and rock durability were also identified at the Lyburn fill. WVDEP previously found (and OSM concurs) that the latest quarterly engineering certification for the fill above Lyburn did not contain adequate information about the construction of the fill. This certification was not accepted by WVDEP and the preparing engineer was required to submit additional information. OSM suspects that the material placed in the fill may not meet the required 80 percent durable rock standard. Current testing methods

used by WVDEP and OSM to determine rock durability and the methods of calculating volumes of durable rock may need further consideration.

Many of OSM's concerns with the WVDEP program and its administration relate to decisions made in prior years. Actions the WVDEP has taken since 2000 would decrease the chance of this situation occurring on newly issued permits. In addition, OSM is currently processing a program amendment containing rules with more specific contemporaneous reclamation standards. WVDEP will implement the revised rules once they are approved. WVDEP has also proposed emergency regulations that require active and future operations to conduct a storm water runoff analysis. New operations will be required to also construct durable rock fills in lifts no greater than 100 feet. The Governor is currently reviewing the emergency regulations. Further, OSM will work with WVDEP on an action plan to provide oversight and technical assistance on the implementation of any new rules and other corrective measures associated with the findings of this report.

## II. Actions Taken By WVDEP

Discussed below are actions the WVDEP has taken or is taking to address the issues identified in this report. It should be noted that WVDEP started most of these actions before the July 19 flooding.

- In April 2002, WVDEP submitted revised contemporaneous reclamation regulations to OSM for approval. They submitted additional revisions in June and both sets of revisions are currently undergoing public review. OSM should issue a final decision shortly after the comment period closes. Among the changes in this amendment are provisions prohibiting fills from being inactive for more than 180 days and requiring operators to complete backfilling and rough grading of end-dumped durable rock fills on specified types of mining operations within 180 days of final mineral removal.
- WVDEP recently finished its own flood study of the effects of mining and timbering on storms that occurred in July 2001. The recommendations of that report included reviewing watersheds proposed for excess spoil placement for proximity of residents, structures, etc. before approval, prohibiting any increase in surface water discharge over pre-mining conditions, prohibiting wing-dumping of excess spoil, and limiting durable rock fills to "bottom up or incremental lift construction." WVDEP submitted proposed regulations addressing these recommendations to the Governor for consideration as emergency rules. If the Governor approves them, WVDEP will submit them to the Secretary of State for implementation.

- Recent WVDEP guidelines for Surface Water Runoff Analysis (SWROA) require mining companies to show that the operational plan will not increase peak flow beyond the permit boundary at any time. OSM and the U.S. Army Corps of Engineers assisted in developing these guidelines in 2001. If these rules had been in effect when the permit was approved, they would have provided greater protection to the residents. In addition, the proposed emergency regulations submitted to the Governor contain additional requirements dealing with storm water runoff.
- Immediately after the July 19, 2002, flood event at Lyburn, WVDEP initiated a field review of all durable rock fills that are full (complete and/or contain the spoil volume proposed), inactive, located within one-half mile upstream of residents, and/or at the angle of repose. From this study WVDEP identified three more fills with reclamation concerns. Two of the three were being reclaimed and one was issued a notice of violation (NOV) requiring reclamation to begin. WVDEP is also planning further fill evaluations in an effort to identify other fills where reclamation is not being completed as required.
- In 2000, in cooperation with OSM and other agencies, WVDEP completed a guidance document for determining approximate original contour (AOC) on large surface mines. This document results in more spoil being returned to the mined areas.

### III. Introduction

On July 19, 2002, the WVDEP received the report of a flood event at Winding Shoals Branch in Lyburn, Logan County, West Virginia. Runoff from unreclaimed excess spoil fill (Valley Fill 6) on a surface mining operation of Bandmill Mining Company, permit S-5023-93, had flooded the narrow valley and community. The mining operation and excess spoil fill are located upstream of approximately ten homes in Winding Shoals Branch. The WVDEP issued an IHCO with remedial measures requiring temporary housing for all affected residents of Winding Shoals, repair of all damage, and an emergency monitoring and evacuation plan. The IHCO also required the company to immediately reclaim Valley Fill 6, design and construct temporary sediment control, clean out Pond 6, and clean out and reconstruct the stream channel.

On July 23, 2002, OSM began a special oversight evaluation by a reclamation specialist, an engineer, and a hydrologist. The purpose of the evaluation was to examine the cause and effect of the flooding, evaluate the effectiveness of WVDEP's program administration, and make recommendations to reduce the risk of similar events in the future. Although this report touches on several operational areas within the permit, its focus is Valley Fill 6 and the flooding of Winding Shoals Branch.

## IV. Background

### 1. Site Location and Description

The permit is located seven miles south of Logan, West Virginia, near the communities of Lyburn, Dabney, and Neibert in Logan County. Access to the mine site is from State Route 10, up the Right Hand Fork of Rum Creek. The site is on the USGS Logan quadrangle at 37°47'17" and 81°54'50".

Valley Fill 6 is located about 1,500 feet upstream of the community of Lyburn in Winding Shoals Branch. It is an end-dump durable rock fill approved to contain 21 MCY of excess spoil. The steeply sloped fill face is more than 1,900 feet long, rising 830 feet in elevation. The distance around the upper unreclaimed perimeter of the concave-like fill face is approximately one mile. The unreclaimed fill face totals approximately 80 acres.

### 2. Rainfall

For July 19, 2002, data from the West Virginia Automated Flood Warning System documents a 24-hour precipitation of 2.71 inches at the Lomi station and 2.00 inches at the Lorado station (located 12 miles to the northwest and 10 miles to the east of Lyburn respectively). Unofficial reports from areas nearer Lyburn indicated considerably more rainfall than the amounts reported at the automated locations. In any event, OSM believes the amount of rainfall was significant but cannot establish the exact amount at Valley Fill 6 since localized rainfall amounts often vary.

### 3. Results and Responses

The flood damaged or destroyed approximately ten homes, several vehicles, and resulted in other miscellaneous property damage. WVDEP personnel, local emergency personnel, and representatives of Bandmill Coal Corporation were soon on the scene of the flood. They assisted impacted residents through temporary housing, food, and other support. The WVDEP issued an IHCO requiring all activities other than the abatement of the enforcement action to be ceased immediately. The following remedial measures were required:

- (A-1) Immediately provide temporary housing for all residents of Winding Shoals who were affected;
- (A-2) Repair all damages to residents' real and personal property through a process that allows residents to file damage-related claims and assures timely response to all claims;
- (A-3) Provide an emergency evacuation plan and provide 24-hour monitoring of Winding Shoals by a person qualified and approved by

DEP to recognize developing hazards related to fill and pond construction at Lyburn - Monitoring must be maintained until all potential danger is abated as determined by the DEP; (B-1) Immediately initiate and complete construction and reclamation of Winding Shoals Valley Fill in accordance with the approved design, provide construction and reclamation certifications; (B-2) Design and obtain approval of designs, construct temporary sediment control system for Valley Fill 6 and all off-site areas in the affected area; (B-3) Clean Winding Shoals Valley Fill Pond to 100% of design; (B-4) Remove all cobble and debris from stream and reconstruct to original configuration.

## V. Site History

Permit S-5023-93 was issued on November 17, 1993, to Elkay Mining Company for surface mining 1,585 acres. An AOC variance was not requested but the permit application estimated that 162 million cubic yards (MCY) of the total 325 MCY (50%) of mine spoil would be placed in excess spoil fills. The first modification of the mining plan occurred in December 1993 and the first Incidental Boundary Revision (IBR) occurred on February 22, 1994. By the time the permit was transferred to Bandmill Coal Company in August 1998, eight permit modifications and ten IBRs had been issued. Since that time, two additional modifications and five IBRs have been approved. Some of these changes greatly altered the mining methods, fill placement, and coal removal activities approved in the original permit. Two 1995 modifications increased the maximum disturbed area allowed at any point in time from 300 acres in the original permit to 335, then 400 acres.

Valley Fill 6 was begun in the summer of 1996. The original location of the fill was in the upper reaches of Winding Shoals Branch, in the hollow immediately east and upstream of a gas well. The original design volume of the fill was 5.7 MCY. IBR 7, approved on October 30, 1996, significantly increased the design volume of Valley Fill 6 to 21.1 MCY. The revision moved the toe of the end-dumped fill more than 1,000 feet downstream, closer to Pond 6 and the community of Lyburn. This revision quadrupled the fill volume and tripled the size of the fill face by allowing for a concave-like design.

Elkay ceased coal mining at the site in 1997 and transferred the permit to Bandmill Coal Company in August 1998. Bandmill ceased all coal removal activities by August 2000. Excess spoil fills in Magazine Hollow, Winding Shoals Branch, and Burgess Branch remained unreclaimed at the time coal production ceased. A revision approved on May 19, 2000, (Mod 9) detailed the reclamation plans for the fills.

In the winter of 1999 and continuing throughout the summer of 2000, serious erosion and stability problems were occurring at Valley Fill 5 located in Magazine Hollow. WVDEP issued several notices of violations (NOV) and two IHCOS on this fill and the associated pond. In

response to these enforcement actions, Bandmill concentrated reclamation activities in Magazine Hollow. There was minimal reclamation activity in other areas of the permit, including Valley Fill 6 and Valley Fills 1L and 1R.

On March 30, 2002, WVDEP required the company to submit a revised reclamation plan for the unreclaimed fills on this permit. On May 31, 2002, Bandmill submitted IBR 15 requesting approval to revise the plans for reconfiguring and reclaiming the fills in Burgess Branch and Winding Shoals. The IBR was approved on July 29, 2002.

A heavy rainfall occurred on May 13, 2002, causing significant erosion of Valley Fill 6, significant sediment deposition in Pond 6, and flooding of the streets and yards in Lyburn. WVDEP issued an IHCO requiring the company to submit a plan to stabilize the fill and establish drainage control. The IHCO remained in effect until May 29, 2002, when WVDEP modified the IHCO to a NOV following abatement actions that eliminated the imminent harm situation. The company had constructed rock check dams, cleared the underdrain, and started cleaning the pond. The NOV was terminated on June 13, 2002, after the pond was cleaned.

After the flooding on July 19, 2002, WVDEP issued another IHCO. Because of WVDEP's enforcement action, there are nine dozers, one excavator and one all wheel drive truck currently working at Valley Fill 6. The company has rerouted the emergency spillway and Pond 6 is being cleaned. Flood repair work in the community of Lyburn is ongoing.

## VI. Factors Contributing to the Flood

When the rainfall of July 19, 2002, occurred, the company had just regraded Valley Fill 6 and cleaned out Pond 6. There were approximately nine acre-feet of material removed. The company was pushing material down the fill to create the required slope. This prevented the installation of any drainage control on the face until the final slope was established. The grading also made the fine soil and small rock at the surface of the face subject to erosion. Because the company was actively reclaiming the end-dumped fill, it was in its most vulnerable condition to erode and contribute to peak discharges. The steepness of slopes, lack of drainage control on the fill face, and lack of ground cover resulted in direct runoff with little water retention. This condition is typical of any end-dumped durable rock fill during the reclamation phase of construction.

The loose material on the lower portion of the face contributed significantly to the flood damage in Lyburn. Sloughing and minor landslides in the material on the fill face exacerbated this flooding condition. The filling of the pond with sediment and the clogging of pipes downstream most likely created more damage. The filling of Pond 6 also caused the impounded water to be displaced, adding to the total flood damage.

A likely scenario for flooding would be:

The fill face began to slough and break-off after becoming saturated by the heavy rain. High velocity flow over the steep face of the fill caused additional erosion and transported the eroded material (which varies in size from clay size particles to large boulders) downslope toward Pond 6. The water decreased in velocity as it neared the base of the fill. Rocks and soil material were deposited in Pond 6, with the larger material settling out nearer to the toe of the fill. This forced the water in the pond over the embankment, increasing the total flood peak and volume.

Several other factors also played a role in the flooding. These factors include:

- The distance from the toe of the fill to other structures downstream.
- The concave fill face increased runoff because of the larger disturbed area.
- The temporary access roads being utilized in the reclamation of the fill directed flow toward the fill, rather than being diverted to the outside of the fill.
- The erosion and weathering of the fill material.

## VII. Areas of Concern and Corrective Actions

In this evaluation, OSM identified certain concerns related to the events of July 19, 2002. WVDEP and OSM have discussed these concerns and agreed to develop an action plan to address them. The action plan will determine the need for additional corrective actions. WVDEP is currently addressing many of the flooding concerns in new permits by the use of guidelines developed in 2000. A pending program amendment containing revised contemporaneous reclamation requirements and proposed emergency regulations related to fill construction and flooding predictions will address other concerns. All of the pending regulatory changes were developed prior to the flooding at Lyburn. OSM anticipates the action plan will address implementation of the regulatory changes along with other actions to address the following findings:

### 1. Drainage Control

Both State and Federal regulations require the diversion of surface water runoff from areas above and adjacent to durable rock fills into stabilized diversion channels. Valley Fill 6 did not have these diversions, however, the disturbed area above the fill was small because the face of the fill extended to within 50 feet of the reclaimed ridge top. This area did not provide a great contribution of surface water from above the fill face.

The company was regrading Valley Fill 6 at the time of the rainfall on July 19. Material being pushed down the face to create the required slope prevented the installation of any drainage control. This exposed fine soil and small rocks at the surface, causing the fill face to be in its most vulnerable condition to erode. This condition is typical of any end-dumped durable rock fill during reclamation.

WVDEP's proposed emergency regulations require the design and construction of durable rock fills in lifts. Under these regulations, operators could install benches and drainage control progressively from the toe upwards during fill construction. Had these regulations been in effect, they could have greatly reduced the erosion and sloughing at Valley Fill 6 by diverting water from the face of the fill.

## 2. Probable Hydrologic Consequences and Flooding Prediction

The original PHC predicted that there would be an initial increase in surface runoff due to surface disturbance from mining. This increase was predicted to occur only as the site was developed and during the mining phase. Neither the original permit nor any of the modifications or IBRs contained flood prediction or storm water runoff calculations showing the effects of increased runoff volumes or peak flows on structures downstream of the operation.

The PHC stated that construction of sediment basins would reduce suspended solids and regulate the "flashy discharge nature" of small watersheds. It also stated that the construction of durable rock fills would serve as "buffers" to the surface water quantity, and that minimizing the size of the disturbed area would minimize the impacts to the hydrologic balance. The PHC proposed rapid revegetation and timely reclamation to protect the hydrologic balance by reducing runoff volume.

By contrast, the actual mining practice was much different from that detailed in the PHC. The PHC indicated that the sediment basins would slow down storm flow runoff. However, OSM finds that the sediment basins were designed strictly as "flow through" structures. The designs did not include "dewatering" after a rainfall event. Although the ponds were correctly sized for sediment storage, they did not provide for flood retention.

The PHC predicted that rainfall infiltration into the durable rock fills would increase the flow to the streams in a "low flow condition". However, the PHC did not predict that the steep, ungraded fill would increase the potential for flooding.

There were no calculations for the permit reviewer to analyze. Historical precipitation data and runoff infiltration rates were not provided. There were no scientific or technical



references provided to justify the prediction that the fills would attenuate surface water runoff through increased infiltration.

Finally, despite the significant change in the disturbance in the watershed with the approval of the increased fill size for Valley Fill 6, WVDEP never required the PHC to be revised. Similarly the WVDEP did not revise their findings related to the cumulative hydrologic impact.

WVDEP guidelines for Surface Water Runoff Analysis (SWROA) would now require an applicant to demonstrate that there would be no increase in peak flow downstream during any phase of the mining operation (including the construction and breakdown of durable rock fills). These guidelines apply to all applications for new permits. The Governor is considering proposed WVDEP emergency regulations that will require a storm water runoff analysis for existing operations within 180 days of enactment.

### 3. Fill Certifications

The company submitted the required excess spoil fill certifications for the Bandmill permit but they were very vague and general. The last engineering certification (quarterly) for Valley Fill 6 was dated July 1, 2002.

WVDEP began a review of the Winding Shoals fill certifications in March of 2002. They found (and OSM concurs) that the latest certification did not contain adequate information about the construction of the fill. WVDEP denied this certification and is requiring the preparing engineer to submit additional information with a new certification. A revision/clarification was submitted but WVDEP has not accepted it because it is still incomplete.

OSM observed the following problems with the certification:

- The certification provided general information, such as the date the fill was permitted, but gave no specific dates for critical construction elements, including when fill construction actually began.
- The certification stated that construction complies with the approved plan when it is obvious that the design volume of 21.1 MCY was not placed in the fill. In other words, since mining was complete and the fill does not contain the predicted volume of material, it cannot comply with the approved plan.
- The certification stated: “The overburden material consisted primarily of sandstone. This material is at least 80% durable based on the geologic

information for the permit area”. The fill certifications should describe the specific material placed in the fill, not the composition of the overburden identified in the permit application.

- The certification stated: “All areas of the fill appear to be stable at this time”. WVDEP regulations require that certifications note any instances of apparent instability, structural weaknesses, and other hazards. WVDEP had issued an IHCO during the quarterly period covered by the certification and large scarps and erosion were visible on the fill. Stability problems were obvious but not addressed in the certification.

WVDEP and OSM concur that many certifications have not been as accurate and complete as required and that review and acceptance of the certifications by both agencies needs improvement. Because of the findings at the Bandmill site, WVDEP and OSM have agreed to review the procedures and requirements for certifications.

#### 4. Contemporaneous Reclamation

OSM found that a conflict exists between the mining and reclamation plan for the Bandmill permit and the approved WVDEP regulations regarding contemporaneous reclamation. Section 14.15.a of the WV Surface Mining Reclamation Regulations provides that:

*“The mining and reclamation plan for each operation shall reflect these standards in describing how the mining operations and reclamation operations are to be coordinated to minimize total land disturbance and to keep reclamation operations as contemporaneous as possible with the advance of mining operations. Particular emphasis must be given to (1) limiting the size and number of excess spoil disposal fills; (2) locating and configuring excess spoil disposal fills in such a way so as to minimize land disturbance; (3) controlled handling and placement of all spoil material; and (4) the timing and sequence of backfilling and regrading operations which will minimize the ratio of disturbed and unreclaimed area versus undisturbed and reclaimed area. All surface mining operations shall be conducted in such a manner so as to comply with the approved reclamation plan and the standards set forth in this subsection.”*

Coal removal operations have not occurred at the Bandmill site for two years and several unreclaimed fills still exist. The WVDEP believes the company met the specific acreage limitations and was performing reclamation activities according to the approved reclamation plan. OSM believes that this operation should have been regraded and revegetated sooner, based on the existing regulation “to keep reclamation operations as

contemporaneous as possible with the advance of mining operations”.

While OSM strongly believes that two years is not contemporaneous, we understand that enforcement efforts were hindered by the lack of specific regulatory standards involving time requirements to implement and complete reclamation activities on fills. OSM acknowledges that the reclamation activities complied with the approved plan. However, WVDEP should have required changes in the approved plan to achieve more timely reclamation.

To illustrate the problem with the reclamation effort approved in the permit, OSM compared the amount of equipment used during mining to that proposed for reclamation in the reclamation plan. Modification 4 states that the operation was moving 200,000 tons of coal and 4,000,000 loose cubic yards of overburden each month. The company utilized five spreads of equipment; including a 24-yard shovel, a 24-yard loader, two 12-yard loaders, five 200-ton rock trucks, two 75-ton rock trucks, and six 45-yard dozers. By contrast, Modification 9 detailed the reclamation plan for the excess spoil fills. It based all assumptions and timing for the reclamation on using two dozers to reclaim 288,000 loose cubic yards each month. The disparity between the efforts for mining compared with the efforts for reclamation resulted in delays in reclamation

Obviously, the longer an unreclaimed end-dumped fill face is exposed to the weather, the greater the probability of a major rainfall occurring at the site and the greater the probability of flooding and sediment deposition downstream. In the case of Valley Fill 6, coal removal ceased in August 2000 and reclamation is still not complete.

The WVDEP regulations also emphasize limiting the size and number of excess spoil fills, and locating and configuring fills in such a way to minimize land disturbance. However, OSM believes that the approval of IBR 7 authorized a greatly expanded fill face that disturbed many additional acres.

OSM conducted oversight inspections on this permit in 1994, 1996, and 1999. The two earlier inspections were partial inspections and did not evaluate contemporaneous reclamation on the excess spoil fills. In 1999, OSM conducted an oversight evaluation on contemporaneous reclamation, specifically looking at the disturbed and unreclaimed acreage requirements. The Bandmill permit was included in the evaluation and had 378 disturbed acres. This met the 400-acre variance approved in IBR 5 and OSM determined that the site met the contemporaneous reclamation standards. All of the OSM inspections at this mine occurred during active mining and did not anticipate that fill reclamation would be continuing two years after mining ceased.

OSM and WVDEP have historically used the amount of unreclaimed disturbed acreage to

evaluate compliance with contemporaneous reclamation standards on most mine sites. The situation on the Bandmill site points out that both State and Federal regulators need to think beyond disturbed acreage when reviewing contemporaneous requirements at inactive excess spoil fills. This was recognized by WVDEP when they developed the proposed regulations currently being considered by OSM as a program amendment. Even though these proposed regulations were developed long before the Lyburn flood, they contain specific reclamation requirements for all disturbed areas at many multiple seam contour and mountaintop mining operations, including excess spoil disposal areas. For these types of operations, the proposed regulations require reclamation of end-dumped excess spoil fills and other disturbed areas within 180 days of final mineral removal. Certain mountaintop mining operations with specific post-mining land use requirements and those required to comply with the WVDEP's AOC Guidance Document must be rough graded within 270 days of final mineral removal.

## 5. Fill Design

As referenced above, Section 14.15.a of WVDEP's regulations requires, in part, that the mining and reclamation plan give emphasis to "... (2) locating and configuring excess spoil disposal fills in such a way as to minimize land disturbance" and "... (3) controlled handling and placement of all spoil material". OSM questions whether the approved fill design and the actual site construction techniques comply with these requirements.

IBR 7 provided for the placement of 21 MCY of excess spoil with a final configuration that formed a concave-like angular face of three planar surfaces containing terraces at required intervals. This type of a design does not minimize land disturbance as required by the WVDEP regulation. Based on standard engineering practice and plane/solid geometry, a single straight fill face will provide more available volume for excess spoil disposal than the concave-like angular face designed for Valley Fill 6. A straight or plane fill face will create increased available fill volume and result in less disturbed surface area than a curved or angular face. In addition, a single straight face is much easier to construct while the angular face would be very difficult, if not impossible, to create. Creating a straight face would also eliminate a potential instability problem that could result when the 2h:1v curved face is blended into an existing steeper undisturbed natural slope.

A straight face also makes it easier to comply with Section 14.14.f.8 of the regulations. This section states requires that terraces be a minimum of 20 feet wide and slope 3 to 5 percent toward the face with a lateral slope of 1 percent to a discharge channel capable of passing a 100-year 24-hour precipitation event. It is standard engineering practice and common sense to design and construct ditches as straight as possible to prevent scour and erosion. With a horizontally curved ditch on a terrace there is constant radial force acting

to erode and undercut the edge of the ditch or terrace. This undercutting will lead to instability of the bank above it and create a continuing maintenance problem.

Approval of this fill design allowed the company to dump material along the entire upper edge of the mile-wide fill without violating State policies against dumping from the sides in front of the face of the fill (wing-dumping). When the operation created less excess spoil than was planned for the fill, dumping along the entire perimeter of the fill face had already created the concave amphitheater-shaped face of the fill. The amount of excess spoil generated was less than designed for this fill. Therefore, the fill face could have been smaller if the fill had been constructed only for the actual volume to be generated.

On future permits the concern with fill shape should be addressed by the procedures adopted by WVDEP for determining AOC. These procedures are designed to optimize the placement of spoil to reduce watershed impacts. Each proposed excess spoil disposal area is evaluated to ensure that the proposed fill will contain the maximum amount of spoil per unit length of stream. The applicant is required to segment the proposed fill and show the volume of material that will be placed in each segment. A final segment with a concave fill face would not contain the maximum amount of spoil and would not optimize the placement of spoil.

In addition, WVDEP's proposed emergency rules, that require the construction of durable rock fills in lifts will significantly alter current design techniques for new permits.

## 6. Durable Rock

Section 14.14.g.1 of WVDEP's approved regulations allows for an end-dump, single lift, fill consisting of at least 80% durable rock (i.e., rock which will not slake in water and will not degrade to soil material). While it is difficult to determine if the durability requirement is met by observing a fill face during reclamation activities, OSM is concerned that Valley Fill 6 may have contained more than 20% non-durable rock. Rock durability is generally tested by sampling and testing the entire overburden before mining. The WVDEP requires a durability testing criteria currently considered appropriate by OSM.

More stringent durability testing requirements and/or more operational control over the type of material placed in the fill could have improved the surface stability and drainage characteristics of the fill face and may have lessened the impact of the storm. Greater volumes of durable rock would allow the surface area of the fill to transmit rainfall to the underdrain. This would reduce the amount of erosion on the fill face. Construction of fills in lifts as required in the WVDEP's proposed emergency regulations will minimize the impact of the durability issue, but the issue remains.

## 7. Spoil Balance and AOC

The approved Bandmill permit allowed the placement of more than 50% of the projected spoil from the mined areas to be placed in excess spoil fills. Subsequent revisions to the mining plan greatly altered the location and quantities of spoil placed in fills, particularly at Valley Fill 6. Specifically, IBR 7 resulted in major changes to the permit, deleting 245 acres and adding 132 acres. The added acres allowed a large increase in the size of Valley Fill 6, (nearly four times its original size). This increased volume moved the toe of the fill downstream approximately 1000 feet. The IBR also provided for a large concave-like fill face around the perimeter of the ridge. The design of the fill greatly increased the surface area of the fill face (approximately 80 acres).

While this permit was approved as an AOC operation under the standards and procedures in place in 1993, it likely would not be approved as an AOC permit today. The “AOC Guidance Document” currently used by WVDEP requires detailed analysis of the spoil balance (i.e. backfill versus excess spoil) and calculations of the volume of excess spoil generated by the operation. Today, more spoil would be returned to the mined area and less would be allowed in fills.

## VIII. Other Concern

The original permit design for the emergency spillway of Pond 6 predicted a 444 cfs peak flow for a 25-year 24-hour storm event. This was based on a watershed with 31 acres disturbed (Valley Fill 6) and 190 acres forested. Currently there are approximately 80 acres of very steep disturbance upstream of the pond.

The company has installed a new six-foot diameter corrugated metal pipe in Lyburn to replace a four-foot culvert damaged by the flood. Although this pipe is larger than the one it replaced, it will safely pass only 200 cfs with the water at the top of the pipe’s inlet. The pipe will not carry a 25-year 24-hour storm event. Any blockage due to sediment or debris would further reduce the pipe’s capacity.

Because the capacity of the sediment pond spillway exceeds the capacity of the culvert, there will be flooding and an additional backwater condition (rise of flood water due to ponding) if rainfall causes more than a 200 cfs peak at the pipe’s inlet. Most likely, the floodwaters would “jump” over the pipe and erode anything above.

WVDEP has no jurisdiction over the size of the pipe, but has agreed to require the company to complete a storm water runoff analysis to document the peak flow that will leave the permit area in Winding Shoals and, if necessary, to initiate additional actions to reduce the flow.