

U.S. Department of Labor

Mine Safety and Health Administration
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Arlington, Virginia 22203-1984



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PROGRAM INFORMATION BULLETIN NO. P00-16

A handwritten signature in cursive script, appearing to read "Ernest C. Easter Jr.", is written above the typed name of the administrator.

FROM: MARVIN W. NICHOLS, JR.
Administrator
for Coal Mine Safety and Health

A handwritten signature in cursive script, appearing to read "Mark E. Skiles", is written above the typed name of the Director of Technical Support.

MARK E. SKILES
Director of Technical Support

SUBJECT: Addressing the Potential for and Prevention of the Unintentional Release of Water or Slurry From
Impoundments Into Active or Abandoned Mines

Who needs this information?

Coal Mine Safety and Health (CMS&H) enforcement personnel, Technical Support personnel who review impoundment plans, independent contractors, and coal mine operators should be aware of this information.

Why is MSHA issuing this bulletin?

MSHA is issuing this bulletin to add to information provided in a previous Program Information Bulletin (PIB P97-4), "Unintentional Release of Water or Slurry From Impoundments Into Active or Abandoned Mines." This bulletin provides additional information regarding precautionary measures to alleviate this potential problem.

Why is this bulletin necessary?

In 1994, an unintentional breakthrough occurred at a coal waste impoundment. In late 1996, within a two-month period, two incidents of water and slurry flowing uncontrolled into abandoned underground mines resulted in release of the material into downstream waters. In response to these unintentional releases, MSHA issued PIB P97-4. This bulletin outlined the potential dangers associated with constructing an impounding structure in the vicinity of underground mines, provided precautionary measures that should be taken by operators to alleviate the hazards, and described the measures that MSHA would take to evaluate all impoundment plans.

In the past three years, additional evaluations have been performed by mine operators, and all impoundments with breakthrough potential have been identified. Design plans for these sites have been, and continue to be, under review. However, on October 11, 2000, another unintentional release of water and slurry into an underground mine resulted in significant environmental damage in adjacent streams. Accurately identifying and mitigating the potential for future similar incidents remains MSHA's concern. This bulletin is intended to further clarify the problems and describe issues that should be addressed during the mine or impounding structure planning phase.

Background Information Since 1994, four unintentional releases of water and slurry have occurred when water and slurry from an impoundment broke through into adjacent and underlying underground mine workings. The initial events resulted in inundation of abandoned underground mines and minor environmental damage. In 1997, MSHA issued Procedure Instruction Letter I97-V-11, "Evaluating Breakthrough Potential and Impact of an Unintentional Release of Water or Slurry From an Impoundment; District Response Procedures" to instruct enforcement personnel regarding this issue. The latest event, in October 2000, resulted in material flowing through an active portion of a mine and major environmental damage. In each case, water and slurry flowed through the mines and discharged at old portal locations on the other side of the mine into adjacent hollows.

In general, potential problems can exist with impoundments located close to underground mine workings whenever:

1. mining has taken place in a coal seam that is completely below the level of the impoundment and water or slurry can enter the mine through subsidence features, shafts, slopes, or other openings;
2. mining has taken place in a coal seam that outcrops within the impoundment and water or slurry can enter the mine through subsidence

features, inadequately sealed openings, or inadequate outcrop barriers;

3. auger mining has taken place in a coal seam that has been deep mined and that outcrops within the impoundment and water or slurry can enter the mine through inadequate barriers left between the ends of the auger holes and the underground workings; or

4. surface contour strip mining has taken place in a coal seam that has been deep mined and that outcrops within the impoundment and water or slurry can enter the mine through barriers that have been reduced in size due to the strip mining.

An additional problem is the pooling of water or slurry within an underground mine in an area with an inadequate outcrop barrier or seal. This impounded material could constitute a hazard due to the force and the damage that could result if a blow-out were to occur. The elimination or minimization of the inundation hazard to workers in active mines or to persons immediately downstream of potential discharge locations remains MSHA's primary concern. However, as noted in the previous bulletin, significant hazards may also extend to structures or utilities or the environment located downstream of the potential discharge locations.

What should be done to prevent future unintentional releases? To mitigate the potential dangers associated with this problem, the following issues should be thoroughly addressed during the mine or impounding structure planning stages:

1. New mining, both underground and auger, proposed in the vicinity of water or slurry impoundments must be carefully surveyed, mapped, and certified. Old maps of existing workings have been found to be highly inaccurate in several cases. The importance of having accurate mine maps in situations such as this cannot be overstated. Mine maps of questionable accuracy should be treated as unknowns and any analyses performed should assume that the worst possible conditions exist. When necessary, the accuracy of mine maps should be verified through the use of collaborating information or through additional field exploration.

2. Mine operators should carefully and thoroughly evaluate the adequacy of all barriers left between the impoundment and the underground mine workings. Where the underground mine is located totally below the elevation of the site or is located in an adjacent hillside that outcrops within the impoundment, the adequacy of the mine strata and overburden should be evaluated. This includes addressing the stability of remaining pillars and immediate floor and roof, the potential for roof falls to propagate to the surface, and the effect of subsidence features that intercept the surface within the impoundment. In the case of the underground mine being located in a seam that outcrops within the impoundment area, the natural or man-made barrier at the outcrop should be evaluated for the maximum anticipated design hydraulic head that will exist on that barrier. The adequacy of these barriers should be certified by a professional engineer.

3. When subsidence analyses are performed, the potential surface tension zones should be identified. It is in these areas where surface cracks may open which could allow water or slurry to flow into the mine. Several reviewed designs have assumed that the fine refuse will have a sealing effect on any cracks. This may be true for narrow cracks or for wide cracks in low head conditions. However, slurry should not be considered capable of long-term plugging of wide surface cracks.

4. Old impounding sites may contain slurry that is several hundred feet thick. Slurry that has been deeply buried should still be considered capable of fluid movement unless data and analyses are submitted showing the opposite. Although the slurry itself may appear stable, water seeping through the slurry into cracks in the natural hillside could eventually create a piping situation where a direct and substantial flow path is created from the pool into the underground mine. Consolidation of the slurry may not be adequate to prevent a breakthrough of the material into a mine.

5. Mine operators may opt to conservatively assume that water or slurry will enter the underground mine, and they will therefore control the material through the use of underground bulkheads. Similar to the outcrop barrier situation, all areas where the impounded material may collect should be evaluated. All bulkheads should be designed and maintained for the maximum anticipated hydraulic head that may be present as a result of the pool level in the impoundment. The adequacy of all hydraulic bulkheads should be certified by a professional engineer.

6. Underground slurry injection worsened the outflow condition in several of the previous breakthrough incidents. In these cases, water or slurry flowed from the impoundment into the area of underground storage. This increased the slurry available for outflow. If located in an area susceptible to inundation from an impoundment, the bulkheads designed to contain the underground slurry should be capable of withstanding the maximum hydraulic head attributable to the impoundment.

7. When contour strip mining operations will remove a portion of the natural outcrop barrier, the remaining barrier should be evaluated for breakthrough potential. When these natural outcrop barriers are reduced, man-made barriers should be considered. Any man-made barrier should be designed to be capable of withstanding the maximum hydraulic head created by the impounded water and slurry.

What is the authority for this bulletin?

Federal Mine Safety and Health Act of 1977; 30 CFR 77.216.

Who are the contact persons for this bulletin?

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