

# Underground Mine Hydrology Evaluation Guidance Memo 40-20



# **UNDERGROUND MINE POOLS PROBLEMS AND CONCERNS**

- **Mine blowouts**
- **Floods**
- **Citizen concerns**
- **Water quality**



**problems from mine discharges**

# Underground Mine Pool Sources



- Precipitation
- Ground water stored in aquifers
  - Stream losses
- Seepage or interaction with adjacent, overlying or underlying mines

# RECENT PROBLEMS

- WVDEP investigated blowout at former T and T Mine in Preston County

ALBRIGHT, W.Va. (March 5, 2021) – The West Virginia Department of Environmental Protection (WVDEP) is currently investigating a blowout from the former T&T Mine Complex that is discharging into the confluence of Muddy Creek and the Cheat River in Preston County.

“The flow has to decrease to where we can shut off the valves that regulate the water out of the T&T mine,” said the WVDEP’s Acting Communications Director Terry Fletcher. “This would cause water to build up in the mine and allow our staff time to make repairs at the manhole and better assess the situation.”

- [NEWS STORY](#)



Courtesy: Paul Kinder

# Violations issued in Buchanan County mine blowout

Feb 5, 2019 Updated Apr 18, 2019  0

HURLEY, Va. — A mining company received a cessation order and two notices of violation for a mine blowout that occurred last week.

The Virginia Department of Mines, Minerals and Energy investigated the blowout that occurred in the Upper Elk Creek area of Buchanan County at about 1:30 p.m. on Jan. 30. The DMME said its investigators determined the incident occurred in an underground mine owned by CM Mining, LLC. The company has been ordered to stabilize the site.

CM Mining was issued one cessation order for causing imminent danger to the public health and safety, according to Tarah Kesterson, public relations manager for the DMME. They were also issued two notices of violation.

The mine stopped producing coal in 1994 and was reclaimed. But it still has a permit with DMME because the agency still monitors water at the site to ensure it is clean, Kesterson said.

Along with the violations, CM Mining must submit a plan that addresses water conditions of the underground works and have it approved by DMME. In the plan, the company must also list steps to prevent further material damage to offsite areas and any sudden release of built up water from the mine workings.

"This DMME enforcement action also requires the removal and proper disposal of sediment and debris that resulted from the mine blowout and repair of any eroded and other impacted areas located below the site of the blowout," Kesterson said.

Companies are required to keep a certificate of liability insurance when they apply to the commonwealth to mine coal. The insurance should cover costs for any of the damage that occurred during the blowout, Kesterson said.

CM Mining reports that one home had water damage and another property's driveway will have to be replaced as a result of the blowout. The company is also working with the Virginia Department of Transportation to make any road repairs and to clean up debris.

Engineers are working on answering why the blowout happened.

**From Bristol Herald Courier**

[RESIDENT VIDEO HERE](#)

# Photo 2



1/30/2019 14:30

# OSMRE OVERSIGHT STUDY

- **OSMRE determined post mine closure underground mine hydrology should be a priority for review.**
  - OSMRE found that assistance from OSMRE Hydrologists was often needed to assess potential impact on water after underground mining was completed.
  - OSMRE evaluated 20 underground Phase III bond releases in Virginia from August 2015 to June 2019 to determine potential for mine pool formation, outcrop barrier design, barrier pillar design and hydrologic prediction and monitoring.
  - OSMRE issued a final report AUGUST 2020 with these Findings and Recommendations:
    - Virginia DMLR should review its procedures to ensure the operator has demonstrated the required hydrologic assessment after completion of mining and prior to bond release.
    - There was often little to no information on post-mining water levels, hydraulic head or water quality within the underground mine, making it difficult for OSMRE to properly assess the potential post mining hydrologic impact.

# DMLR Response

- **Guidance Memo 40-20 drafted, gained OSMRE review and approval, and was issued to industry on November 30, 2020.**
  - **Ensure a proper evaluation of potential mine pool formations and barrier designs for prevention of blowouts and flooding.**
  - **Provide a water quality evaluation of existing or potential mine pools to minimize the potential for pollution discharges.**





# Who and When??

- **Who – Applies to permits having underground mine workings**
- **When – Hydrologic evaluation must be submitted and approved prior to the first bond release request after completion of underground mining, not just at final bond release.**

# **Applicable Virginia Regulations**

- **4VAC25-130-784.14(g) Hydrologic reclamation plan**
- **4VAC25-130-800.40 Requirements to release performance bonds**
- **4VAC25-130-817.41 Hydrologic balance protection**
- **4VAC25-130-817.42 Hydrologic balance, water quality standards and effluent limitations**

# Specifics of 40-20

**To all permittees holding a Virginia DMLR permit containing underground mine workings:**

After completion of all underground mining, but prior to the first bond release request, a Closure Evaluation must be submitted and approved that addresses the underground mine hydrology. This will evaluate the potential of pollution discharges and outcrop failures.

If minimal potential is determined, the bond release process can continue without further action.

If potential problems exist, the bond release process will not be granted until the issues have been properly resolved.

This evaluation shall be submitted to the Virginia DMLR in the form of an Electronic Permit Application in E-forms.

**This evaluation shall consist of the following three parts:**

**1. Blowout and Flooding  
Potential**

**2. Mine Pool Water Quality  
Evaluation**

**3. Mapping**

# Blowout and Flooding Potential

- An evaluation shall be conducted of blowout and flooding potential based upon completed mining, outcrop barrier stability, and the potential to discharge through constructed wet seals.
- This evaluation shall include not just the permitted mine workings but also any impact from adjacent, overlying, and underlying underground or surface mine workings.
- This evaluation shall be submitted in the Outcrop Barrier Section 18.5 of the Electronic Permit Application.

# Blowout and Flooding Potential (continued)

- Evaluation based on the maximum potential pool level and hydraulic head.
- Based upon such information as mine floor and roof elevations, direction and dip of mining, elevations of wet seals or other discharge locations, mining heights, and depths of cover.
- Evaluate outcrop barriers, underground barrier pillars and bulkhead seals for adequate sizing to prevent failures and minimize seepage.
- Evaluation shall include review of potential hydraulic connectivity created by uncased and/or unplugged drill holes, gas wells, or monitoring wells.





## **Blowout and Flooding Potential (continued)**

- **Adjacent mine workings, including those above and below, should be identified and considered in the calculation of hydraulic head and water influx.**
- **Accounting of all water contributing to the underground mine pool should be addressed, including all known wells, water monitoring points and discharges of both the permitted mine and all adjacent mine workings.**

# Failure Mechanisms of Barrier Blowouts

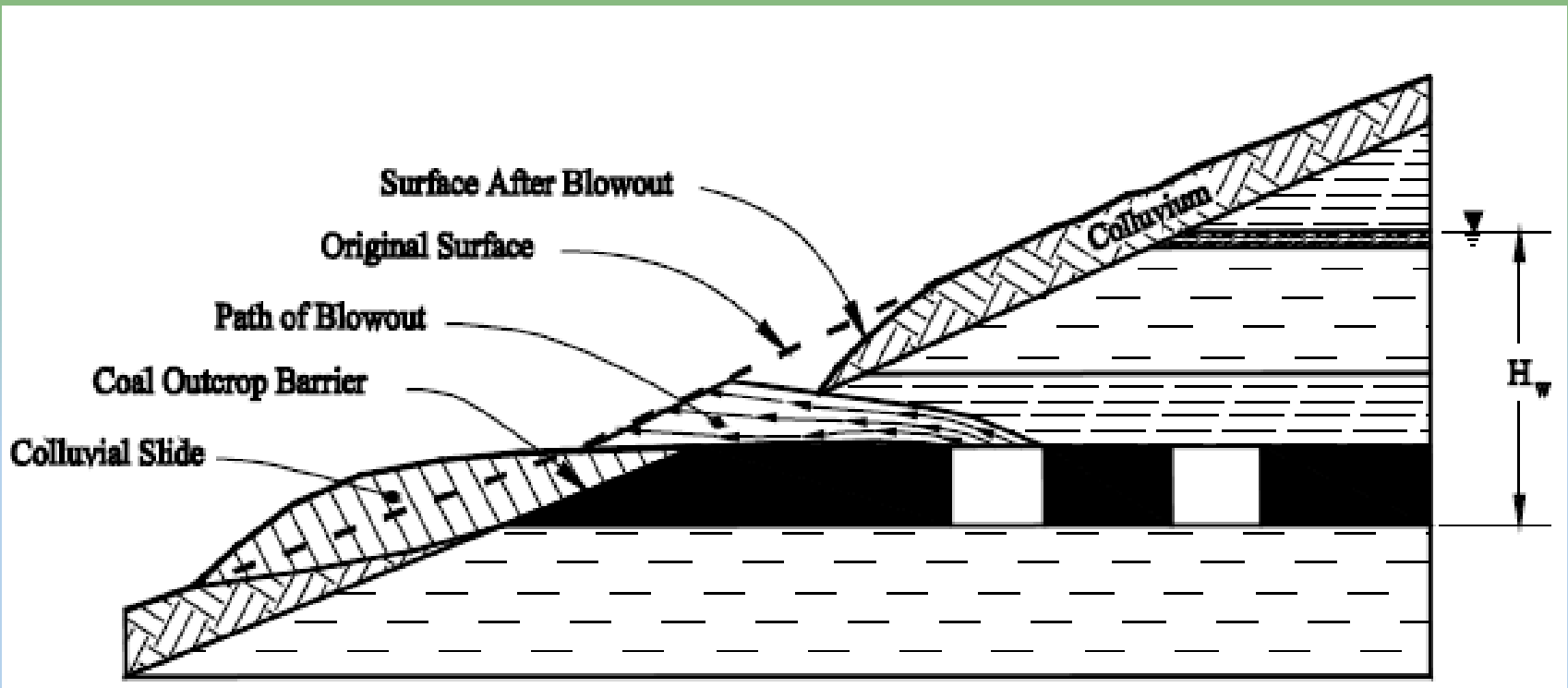
- Hydrostatic Lift Failure (Vertical)
- Overtopping Roof Fall Failure (Vertical)
- Piping Induced Failure (Vertical)
- Sliding Wedge Failure (Horizontal)

Most blowouts occur in a vertical direction along zones of weakness in vertically inclined fracture and joint systems of the overlying overburden.

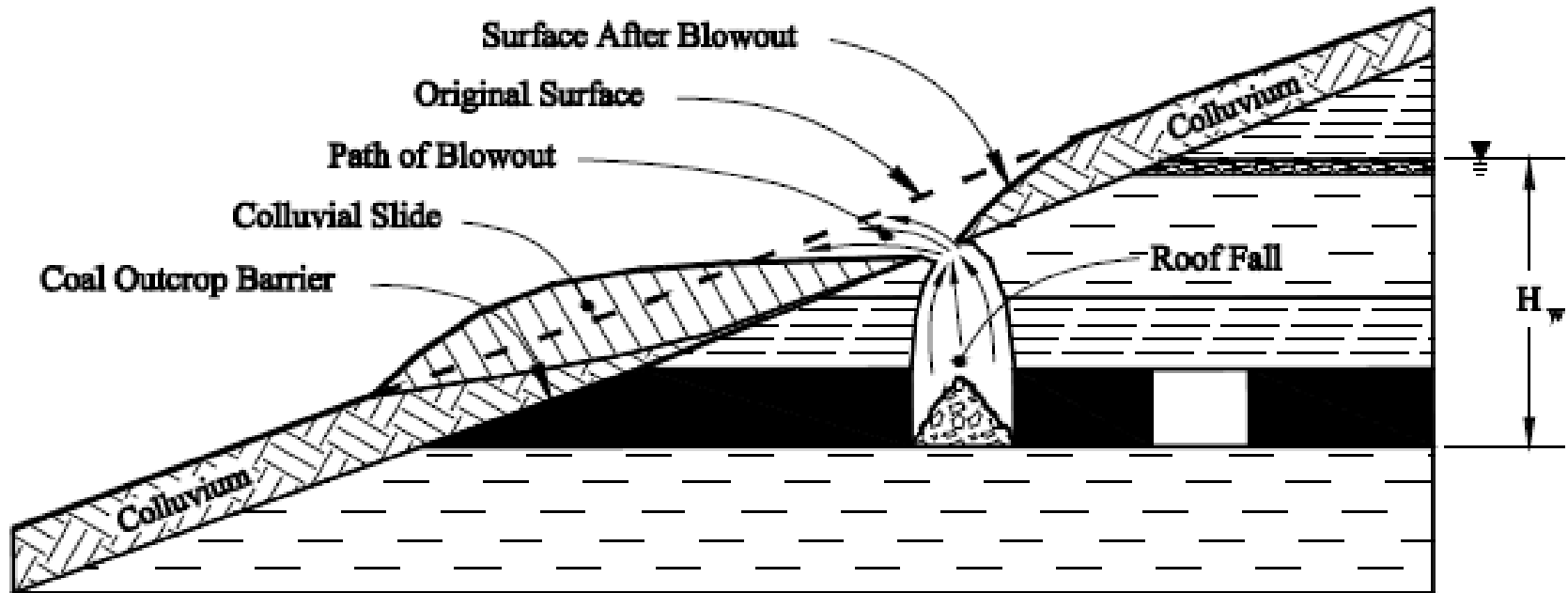




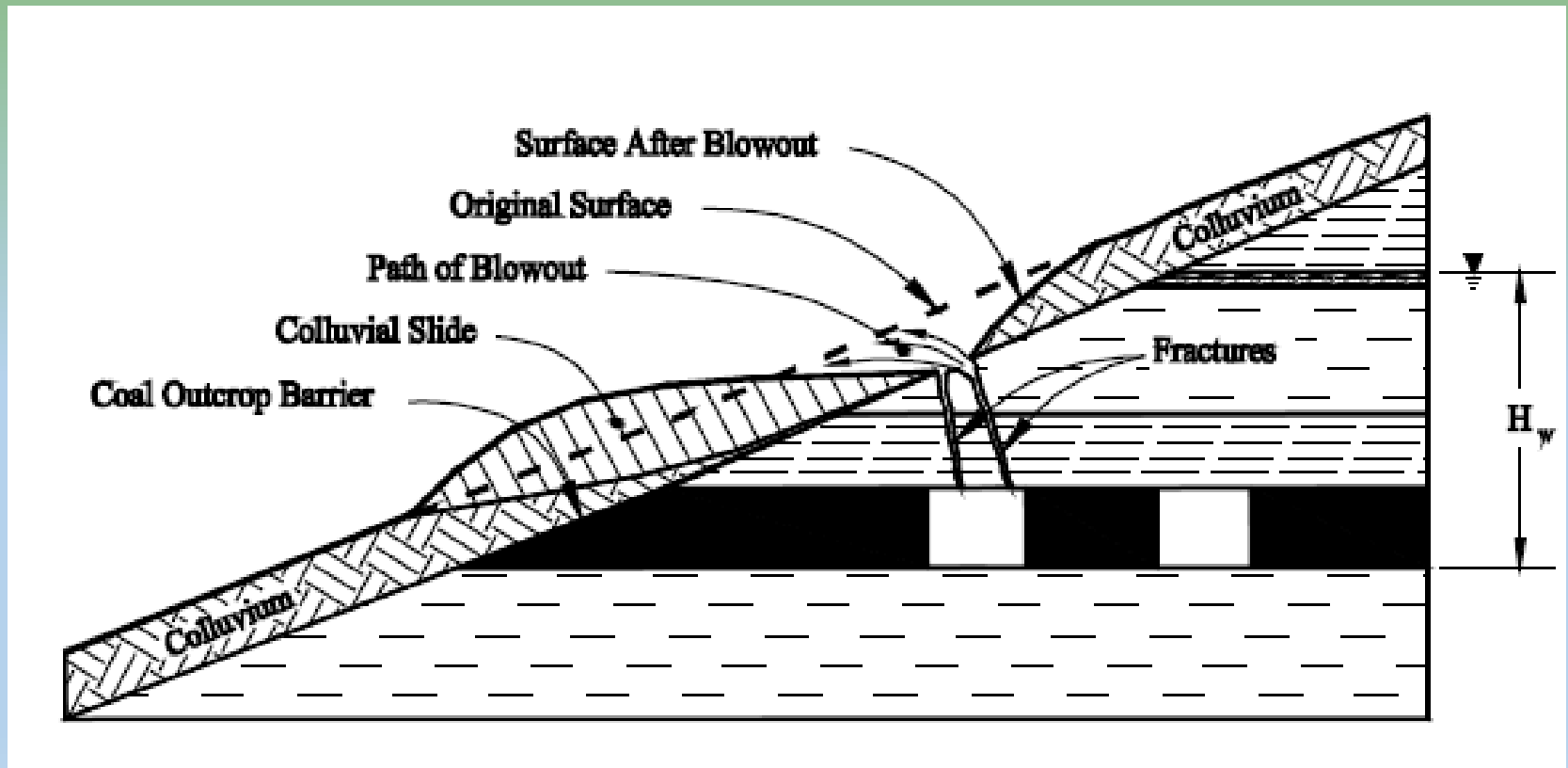
# Blowout Caused by Hydrostatic Lift



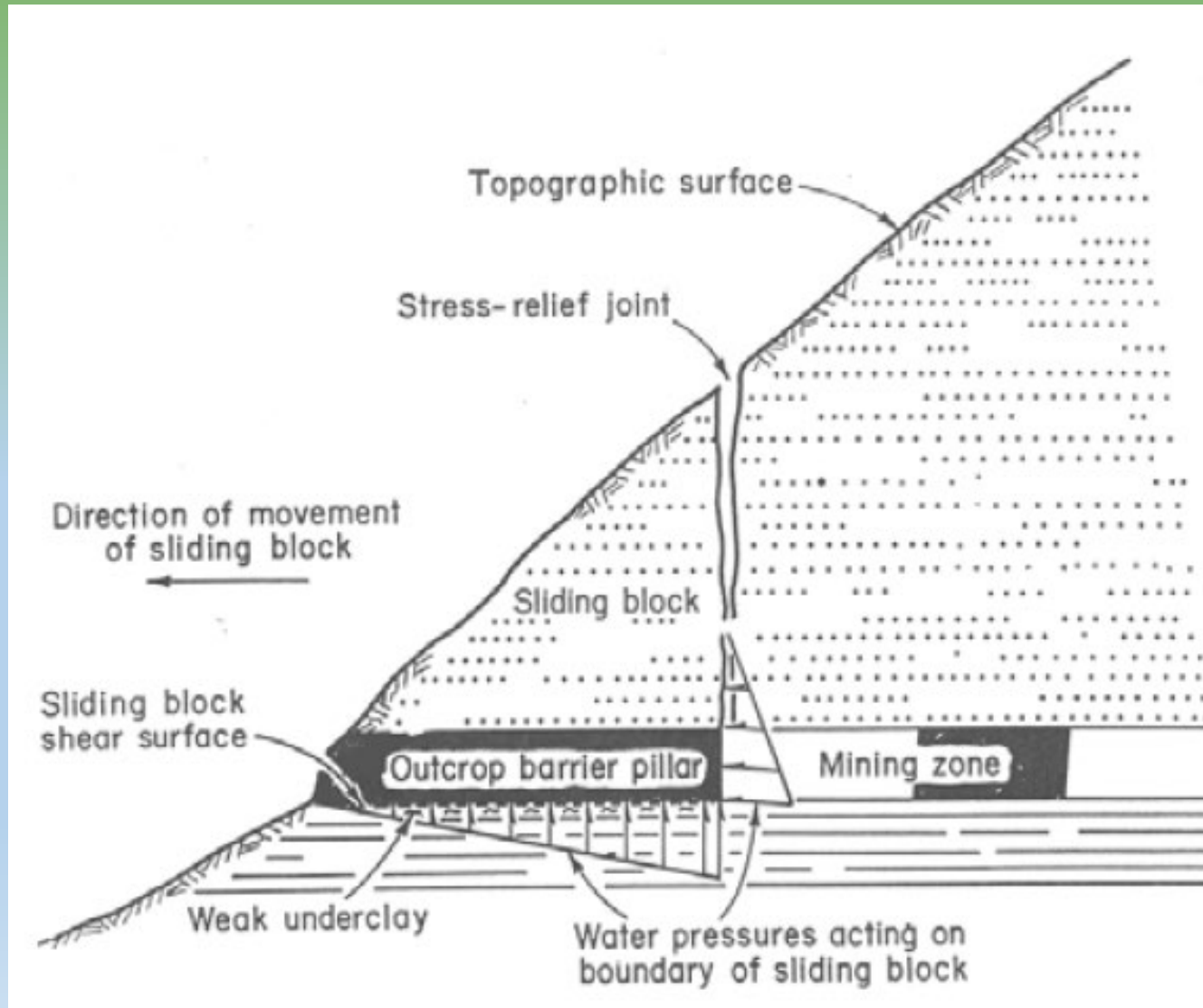
# Blowout Caused by Roof Fall



# Blowout Caused by Piping



# Blowout Caused by Sliding Wedge Failure



# Horizontal Barriers

- Outcrop Barriers and Internal Barriers
- Proper design of down-dip barriers to prevent blowouts, minimize post-mine seepage and prevent flooding from mine pools.
- Applicable design formulas
  - Coal Outcrop Barrier Width (Empirical Formula)  
 $W = 50 + H$   
W = barrier width, H = feet of hydraulic head
  - Internal Barrier Width (Ashley or Pennsylvania Mine Inspector formula)  
 $W = 20 + 4T + (0.1D)$   
W = barrier width, T = thickness of coal seam, D = thickness of overburden
  - Site specific certified designs may also be acceptable as an optional design.
- Must prevent the buildup of hydraulic head at, or below, an elevation that will not exceed the design limitation of down-dip barriers. Gravity dewatering through wet seals is generally used to prevent this buildup. Pumping of the mine pool could also be required if gravity dewatering is not possible.

# Vertical Barriers

- To prevent blowouts of vertical barriers, regulation prohibits underground mining where less than 100 feet of overburden exists without specific approval from DMLR.
- To prevent stream losses and infiltration into a mine pool, subsidence buffer zones are required underneath streams. These generally allow first mining only in areas with greater than 100 feet of overburden.



# Mine Pool Water Quality Evaluation

- Evaluation required of the mine pool water quality. Commonly made by sampling of wet seal discharge.
- If no current discharge is available, but potential exists for a mine pool to discharge, monitoring and sampling of the mine pool may be required to ensure accurate post-mining assessments and PHC verification.
- Should specific mine water quality data not be available, the evaluation shall provide adequate surrogate data demonstrating that drainage from the underground mine should not result in damage to the hydrologic balance outside the permit area or result in violations of any State or Federal water quality laws or regulations.
- Evaluation shall include whether pollution of surface or subsurface water is occurring, its known impacts and the cost for abatement.
- This evaluation of the underground mine hydrology for water quality and potential to discharge shall be submitted in Section 6.1.





# Recommendations

1. DMLR highly recommends adding water monitoring wells to provide direct measurement of the mine pool level and sampling of water quality, particularly when the pool does not discharge through constructed wet seals or when potential exists for hydraulic connectivity with adjacent, overlying and underlying mines.
2. Water monitoring points that are pertinent to the analysis of the underground mine hydrology shall continue to be monitored and will not be eligible for discontinuation until such time that the final PHC is approved and final bond release is pending. In the event that the Closure Evaluation is conducted prior to either a Phase I or Phase II bond release, the findings of the Closure Evaluation will be revisited during the final PHC assessment to ensure that all determinations remain valid.
3. In locations where wet seals are required after completion of mining, all seals in a set of portals will be equipped with wet seals, not just the one having the lowest elevation. This requirement will not apply to seals constructed before issuance of this Guidance Memorandum.

# Permit Applications

- The evaluation required by Guidance Memo 40-20 shall be incorporated into Sections 6.1, 18.5, and 21 of E-forms.
- Drawings and maps shall be in the form of .pdf in Section 21.2 and .dwg in Section 21.5.
- Approval is required before bond reductions/releases.

The screenshot shows the login page for the Virginia Dept. of Mines, Minerals, and Energy Division of Mined Land Reclamation E-Forms Center. The page has a blue header with the date 8/16/2021 and a 'Login' link. Below the header, the text reads: 'To access the E-Forms Center, you will need to login using your username and password:'. There are two input fields: 'Username:' and 'Password:'. Each field has a small blue link next to it: 'Forgot Username' and 'Forgot Password'. Below the input fields is a 'Login' button. Further down, there is a section for users who don't have a username or forgot their password, with links to 'DMLR E-Forms Center', 'User Registration Form', and 'FAQ'. At the bottom, there is a section titled 'Authorized Use' with a disclaimer about system access and a link to the 'Web Policy'.

8/16/2021 Login

Virginia Dept. of Mines, Minerals, and Energy

Division of Mined Land Reclamation E-Forms Center

To access the E-Forms Center, you will need to login using your username and password:

Username:  [Forgot Username](#)

Password:  [Forgot Password](#)

Login

Don't have a Username? Forgot your password? Please contact the [DMLR E-Forms Center](#).  
Not a Registered User Yet? Then complete the [User Registration Form](#) to get Access to DMLR's E-Forms Center!

[FAQ](#)

**Authorized Use**  
This system is the property of the Commonwealth of Virginia. Only persons authorized shall be allowed access to this system. Those permitted access shall use this system ONLY for purposes for which they have been authorized.

Access and usage on this system is logged. Monitoring of this system and data may include, but is not limited to, network traffic; application and data access; keystrokes (only when required for security investigations and approved in writing by the Agency Head); and user commands; email and Internet usage; and message and data content.

Any unauthorized access, use, or abuse of this system or the information contained therein shall be reported to appropriate authorities for investigation and prosecution to the fullest extent of the law.

For additional information, please read our [Web Policy](#).

**DMME**  
Virginia Department of  
Mines Minerals and Energy

# ***QUESTIONS?***

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