

Interoffice Memorandum

To: Jim Stark and Zach Trujillo
From: Rob Zuber
Subject: Review of Colowyo's assessment of the 25 July 2017 storm and impact on East Pit surface water structures and adjacent land (Ott property)
Date: 21 August 2017

Zach and Jim –

I have reviewed the following related to the July 25th storm that caused erosion and sediment issues on the east side of Colowyo and adjacent off-site area (Ott property):

- Zach's photographs of the East Pit area and adjacent off-site area after the storm.
- PAP output files for SEDCAD models of the East Pit and NTEP ditches.
- A technical memorandum by Dr. Richard Warner, who is an expert with SEDCAD and coal mine hydrology, and related SEDCAD runs.
- References such as the SEDCAD4 User's Manual and Applied Hydrology and Sedimentology for Disturbed Areas (Barfield, Warner, and Haan, 1987).

As you know, I also joined you guys for a meeting with Tri-State employees (Tony Tennyson and Chris Gilbreath) and Dr. Warner (via telephone) on 17 August 2017.

Based on my review, I have the following comments:

1. Dr. Warner assessed the July 25th storm with a SEDCAD run. The input parameters look to be identical to the 10-year, 24-hour SEDCAD model for the East Pit (see Exhibit 7-14 in PAP) except for the rainfall input. Thus, the comparison of the two models is appropriate (an "apples to apples" comparison was made). The peak flows above the ponds (EP1, EP2, NTEP1) were greater for the 10-year, 24-hour storm, but the peak flows below the ponds were greater for the simulation of the July 25th storm. This indicates to me that the July 25th storm did not necessarily have a return period greater than 10 years, and, in fact, suggests that the opposite is true: the return event for the July 25th storm was likely less than 10 years. This is supported by the fact that the total precipitation for the 10-year storm in the PAP is 1.8 inches, which is greater than the total precipitation of 1.67 inches for the July 25th storm.
2. It appears that the greater flows below the ponds for the July 25th storm are a result of two factors: the shape of the hyetograph for this storm and the hydraulics of the ponds. The July 25th storm had a large amount of precipitation prior to the peak of the precipitation (see Figure 1). Therefore, the ponds were relatively full when the peak precipitation and runoff hit. Due to the trapezoidal shape of emergency spillways, the discharge from pond spillways is greater when the elevation is higher. This is supported by the "Detailed Discharge Table" for Pond EP1 in the SEDCAD runs: at an elevation of 7,378.5 the discharge is 24.7 cfs and at 7,379.5 the discharge is 125.0 cfs.
3. Even if the July 25th storm had a greater than 10-year return interval (say 25-year, 6-hour storm), it would still be difficult to claim that the storm was "bigger" than the 10-year, 24-hour storm. I discussed this with Mike Boulay (who has extensive experience with DRMS hydrology issues,

including surface water issues at the Seneca mines), and Mike indicated that DRMS does not “go down that path.” We do not let operator’s avoid responsibility for failed structures because a storm was shorter but more intense (e.g., 25-year, 6-hour event) than the design storm.

4. I will let the two of you assess the issue based on off-site impacts independent of the hydrologic modeling.
5. I did get a call from a CDOT employee in Craig (Todd Weber) in response to my call to him. He said that the riprap in Ott’s field was definitely not from armoring at the CDOT culvert (Highway 13) inlet and/or outlet. He was positive that the material came from the Colowyo Mine.
6. Let me know if you want me to elaborate on my comments or if you want me to perform additional analyses related to this issue.

