



## **Appalachian Region Technology Team Teleconference July 6, 2015**

### **PARTICIPANTS:**

Michele Hamlin, Pennsylvania Department of Environmental Protection (PA DEP)  
Daniel Kestner, Virginia Department of Mine, Minerals, and Energy (VA DMME)  
Brent Means, Office of Surface Mining, Appalachian Regional Office (OSM ARO)  
Tiara Neal, Office of Surface Mining Appalachian Regional Office (OSM ARO)  
Michael Richmond, Office of Surface Mining Appalachian Regional Office (OSM ARO)  
Paul Rothman, Kentucky Department of Natural Resources (KY DNR)  
Jeff Snyder, Maryland Bureau of Mines (MD BOM)  
Charles Sturey, West Virginia Department of Environmental Protection (WV DEP)  
Jeff Trump, Office of Surface Mining Appalachian Regional Office (OSM ARO)  
Bill Winters, Office of Surface Mining Appalachian Regional Office (OSM ARO)

### **DISCUSSION:**

#### **Passive Treatment Tour at Flight 93**

##### **BRENT MEANS (OSM)**

Brent gave an update on the upcoming enhanced solids removal/passive removal of manganese tour/Flight 93 tour scheduled for August 27, 2015. The tour will begin at 10:00 AM. After the passive treatment tour, there will be a guided tour provided by the United States Parks Service. OSM is asking that you provide names of persons from your organization log into the URL NLT August 7, 2015 and provide the information requested.

#### **OSMRE Technology Transfer Event at the Flight 93 Memorial: Enhanced Solids Removal and Passive Removal of Manganese at Circumneutral pH**

You are invited to attend an OSMRE technology transfer event on August 27 on the Flight 93 Memorial grounds to discuss a passive technology capable of reducing total suspended metals to less than 2.0 mg/L and a passive technology capable of removing manganese to less than 1.0 mg/L at pH 7. Come tour both treatment technologies and hear discussions on the treatment theory and methods used to size and construct the systems.

### **Enhanced Solids Removal to Achieve Low Concentrations of Suspended Metals**

Achieving total metal concentrations of less than 2.0 mg/L can be very challenging at mine drainage treatment sites. Recent implementation of total maximum daily load and other water quality standards have lowered effluent criteria for total metal concentrations to less than 2.0 mg/L in many watersheds. Historically, low total metal concentrations in the effluent have been achieved by using a high treatment pH or the use of flocculants. Both treatment strategies result in increased treatment costs and additional labor to ensure proper dose. An extremely effective alternative to these strategies is to use a pond followed by a wetland to enhance solids removal. This treatment strategy can achieve total suspended metal concentrations of less than 2 mg/L.

The use of wetlands for mine drainage treatment has existed for several decades. The specific application of using wetlands to enhance solids removal to achieve less than 2 mg/L of solids concentrations is relatively new. Ponds and clarifiers use gravity as the primary settling mechanism. This mechanism is only effective if particles flocculate (growth of particles) to form non-buoyant suspended solids that can be pulled to the bottom of a pond by gravity. At times, small amounts of suspended particles fail to flocculate to form dense particles and remain in the water as "pin floc." Pin Floc is often responsible for effluent violations when effluent criteria for total metals are less than 2 mg/L. Pin Floc contain charged surfaces (see diagram) that promotes electrical repulsion between particles and prevents particles from flocculating to form a non-buoyant floc. The overall surface charge on iron hydroxide floc is typically net positive at pHs below 8 (see graph). Humic organic matter (HOM) in wetlands is instrumental in helping to reduce electrical repulsion and allowing particles to settle by releasing humic carboxyl and phenolic groups into the water column. Like a commercial anionic organic polymer, these groups contain a negative charge that will neutralize the positive surface charge of the iron hydroxide particle, promoting flocculation and settling. Furthermore, a dense growth of wetland plants improves settling through the physical impaction of particles into plant material. The impaction causes flocculated particles to lose momentum and initiate settling, much like a baffle in a pond. Combined, the mechanisms can routinely achieve suspended metal concentrations of less than 2.0 mg/L.

Please join OSMRE and others at the Flight 93 Memorial on August 27 for a technology transfer event. Experienced professionals will be onsite to provide demonstrations and explanations on how a pond - wetland treatment system on memorial grounds treats a 1,200 gallon-per-minute discharge to a total iron concentration of less than 1.0 mg/L. Treatment system design and sizing information will be discussed that can be used to improve existing treatment systems or used to design new systems.

### **Passive Removal of Manganese in a Limestone Bed at Circumneutral pH**

The most common method used to achieve manganese effluent standards is to use an alkali chemical to increase pH to 9.5 and precipitate Manganese Hydroxide. While effective, this method results in elevated chemical consumption and increased sludge production due to various nuisance reactions that occur at high pH. During the past 15 years, the use of limestone beds to passively remove manganese at

a pH between 6 and 8 has been refined. The technology uses biotic reactions to precipitate manganese onto the surface of limestone. These beds have been proven to be easy to construct, highly effective, and low maintenance. Several sites have produced NPDES compliant water for over 15 years. Please join us and tour a manganese removal bed installed on the Flight 93 memorial grounds and experience firsthand how the bed treats a 80 gallon-per-minute discharge to a total manganese concentration of less than 0.5 mg/L. Treatment sizing and construction practices will be discussed.

**MICHELE HAMLIN (PA):**

PADEP recently implemented an Environmental Policy Comment System, available at <http://www.ahs.dep.pa.gov/eComment/>, which allows users to view policy, guidance and other documents for which DEP is soliciting comments and submit/view comments during the comment period.

A miner was killed last week in a Pennsylvania mine when a ventilation/airlock door and frame fell on him at Dana Coal Company's 4 West Mine which is owned by Mepco. <http://www.dailyjournal.net/view/story/0c7eac7fba8c4381a9008bb0c9272520/PA--Fatal-Mining-Accident>

**TIARA NEAL (OSM):**

Tiara is working on the web page portal for the upcoming Flight 93 AML technical transfer event. Registration will be made on this URL and names are due back NLT August 7, 2015. Tiara and Jeff Trump gave an update on forthcoming changes for the Applied Science Projects. One of the changes is that these will have to be Section 508 compliant. Further guidance will be forthcoming on these changes.

**JEFF TRUMP (OSM)**

We are asking for your assistance on providing names for this TT event. The next scheduled teleconference will be on August 3, 2015 at 1:30PM.