**Coal Industry application of discharge management to control Sulfate and TDS in the Monongahela River**

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**Abstract**

In December 2010, the Pennsylvania Department of Environmental Protection (PADEP) declared the Monongahela River impaired due to sulfates that made the water hard and taste bad. Thanks to a novel problem-solving approach spearheaded by the West Virginia Water Research Institute (WVWRI) at West Virginia University with funding from the Colcom Foundation and the U.S. Geological Survey, a voluntary, science-based, non-regulatory, watershed-wide program has solved the Mon River’s sulfate problem. As a result, the U.S. Environmental Protection Agency recently approved PADEP’s decision to remove the Monongahela River from the “impaired for potable water use” listing.

**Salts and Drinking Water**

In the summer of 2008, reports were coming in from water suppliers and users along the Monongahela River and Rose Reilly of the U.S. Army Corps of Engineers in Pittsburgh that salt levels in the River were spiking to very high levels. Specific conductivity and TDS levels in the lower Mon River were nearly twice as high as those documented during the Corps’ entire 1969-2008 monitoring period, including the period prior to the mid-1970s when untreated mine drainage and municipal and industrial pollution were so severe that the Monongahela River was devoid of fish.

To get a handle on the problem, Dr. Paul Ziemkiewicz, Director of the West Virginia Water Research Institute at West Virginia University, began a study in July 2009 of the Mon and its major tributaries. “We started out by calling a meeting of the major Federal and state agencies who were monitoring the river but we learned that their programs, while useful, could not answer the three key questions: Which salts were causing the problem? Where were they coming from? And how could we control them?”

Initial monitoring efforts were funded by the U.S. Geological Survey’s Water Institutes Program and subsequent funding was obtained by the Colcom Foundation to establish the Three Rivers Quest (3RQ) Program. WVWRI staff have been monitoring water quality of the Mon and its major tributaries every two weeks since July 2009. The program expanded beyond the Mon River and now includes partnerships with Duquesne University, Wheeling Jesuit University, Trout Unlimited, various Conservation Agencies, and numerous watershed groups throughout the upper Ohio River basin (Allegheny, Mon, and Ohio). The 3RQ program disseminates data collected to the public on their website (<http://www.3riversquest.org>).

By December 2009, it became clear that calcium/sodium sulfates were the dominant salts and that it was coming from underground coal mines where water was being pumped out and treated on the surface to remove metals, but not sulfates, prior to being discharged into nearby streams. While these sulfates are not toxic at the concentrations detected in the river, they can affect hardness and taste. Sulfates are also extremely expensive to remove from water. Calcium/sodium sulfates are common in mine water, so controlling the sulfate salts would also control TDS.

High TDS was strictly seasonal. From December through July, the river flow runs high, diluting salts well below levels of concern. However, from August through November, the water flows are lower and when flow dropped below 1,500 cubic feet per second sulfate and TDS spikes were observed. The historical record indicated that those conditions occurred about 58 days per year. WVWRI prepared a mass balancing model predicated on discharge management by the coal industry. This was adopted by the industry on a purely voluntary basis.

**Discharge Management**

Since beginning discharge management in January 2010, the levels of both sulfate and TDS have met EPA standards in the Mon River. Discharge management only works because industry buys into the process and bi-weekly river monitoring validates the outcome.

Convincing the regulatory agencies and the public that the strategy works required accountability and transparency which is provided by a grant from the Colcom Foundation. Their funding allows the WVWRI to sample the river and its major tributaries every two weeks and put the results on WVWRI’s website. This effort is part of Colcom Foundation’s continued support for the Three Rivers QUEST, or 3RQ, program which addresses a wide array of water quality issues on the Monongahela, Allegheny, and Ohio rivers. Solving the sulfate problem is a prime example of 3RQ’s success.

**A Novel Approach to Fixing Watersheds**

While not the answer to every water quality problem, managing water quality on a watershed basis rather than the managing of individual discharges has advantages. Improvement is almost immediate, modest financial investment results in major improvements and the results meet the intent of the Federal Clean Water Act, which is to prevent pollution while restoring polluted waterways. Water users along the Mon realized an almost immediate elimination of the sulfate threat to their drinking water. They did not have to wait for multi-year studies and ineffective remedies.