CASE STUDY

Wellington-Oro Water Treatment Plant
Summit County, Colorado

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Prepared by
The Interstate Technology & Regulatory Council
Mining Waste Team

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SUMMIT COUNTY, COLORADO

1. SITE INFORMATION

1.1 Contacts

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1.2 Name, Location, and Description

The Wellington-Oro is located in Breckenridge, Summit County, Colorado. The mining complex contains over 12 miles of flooded workings along the French Creek tributary of the Blue River. Gold, lead, and zinc mining occurred from 1860s to the 1970s. Dredge operations also occurred along the Blue River and upstream through French Gulch. Impacts seen in the Blue River were traced back to a seep of the Wellington-Oro mine complex, identified as seep FG-6c. The seep location is at latitude of 39°28'54" N and longitude of 106°1'1" W. The contaminated media affected are surface water and groundwater.

2. REMEDIAL ACTION AND TECHNOLOGIES

The Town of Breckenridge and Summit County decided to purchase 1,800 acres of land from B&B Mines. The property included the Wellington-Oro mining complex. As part of the property transaction, the Town of Breckenridge and Summit County entered into a Consent Decree with the U.S. Environmental Protection Agency. In the Consent Decree, the Town of Breckenridge and Summit County agreed to construct and operate a treatment system to treat the discharge from seep FG-6c and remove the zinc and cadmium.

Discharge flows from the seep range from a winter low of 50 gpm up to a maximum treatment rate of 150 gpm during spring runoff. The contaminated water is characterized by a pH of 6.4 and elevated concentrations of cadmium (0.059 ppm) and zinc (123 ppm). Site cleanup goals are based on the mitigation of human health risk and mitigation of ecological risk.

The Wellington-Oro Water Treatment Plant (WTP) uses a sulfide precipitation process to cause the precipitation of zinc and cadmium sulfides. A small amount of soda ash is added into the process to control the pH to the optimal range for sulfide precipitation. Sulfides, in the form of sodium hydrosulfide, are added in a controlled dose. Dosing is carefully controlled so that zinc and cadmium are removed to discharge limits, but so that an excess hydrogen sulfide gas is not created (nor is too much iron precipitated).

The precipitated solids settle to the bottom of a clarification tank while the treated water flows off the top. The underflow solids from the clarifier are contained in a liquid sludge and are pumped to a plate and frame filter press for dewatering.

3. PERFORMANCE

The Wellington-Oro WTP began around-the-clock operations in November 2008. The process removes 99.8% of the zinc and cadmium and has been able to achieve the discharge limits—225 ppb for zinc and 4 ppb for cadmium. Other metals not required to be treated, such as iron, remain in solution. The treated discharge also passes Whole Effluent Toxicity testing for ceriodaphnia and fathead minnows and is nontoxic.

The solid filtercake contains approximately 65%–70% solids and passes testing of the Toxicity Characterization Leaching Procedure (TCLP). It is therefore characterized as a nonhazardous waste and may be disposed of in a municipal landfill. Given the high purity of the cake, the Town of Breckenridge and Summit County are attempting to sell the material to a smelter.

4. COSTS

The Wellington-Oro WTP had a cost of construction of approximately $4.3 million. Since the plant has not been in operation very long, ongoing operation and maintenance costs are not known and will largely depend on treatment flow rates and the final disposition of the filter cake.

5. REGULATORY CHALLENGES

None encountered.

6. STAKEHOLDER CHALLENGES

No information available.

7. OTHER CHALLENGES AND LESSONS LEARNED

The main challenge was finding a reliable method to quantify zinc concentrations in the effluent. The original strategy was to use a colorimetric method on a spectrophotometer. This method was subject to interference from ferrous and ferric iron concentrations in the effluent. It was not effective at providing real-time feedback to control process parameters. An atomic absorption spectrometer was purchased because it was not subject to iron interference.

8. REFERENCES

None reported.