

PLANTPROFILE

By Rebecca Wilhelm

Mitigating the Effects of Mining

Sulphide precipitation provides a unique treatment alternative for metal-contaminated water in Colorado

The Wellington Oro Mine in Summit County, Colo., actively produced silver, gold, lead and zinc from the late 1880s to the 1970s, eventually ceasing operations in 1972.

The mine site was producing acid mine drainage, a process that occurs at approximately 70% of all mine sites. Mining exposes rock containing sulphide-based minerals. Residual metals are dissolved from the rock when it is exposed to water and oxygen along with common bacteria, creating acidic water.

“The challenge at this particular site was identifying the best approach for treating water contaminated with high levels of zinc and cadmium, which was draining from more than 12 miles of abandoned tunnels, adits and associated mine infrastructure,” said Brad Marchant, chief executive officer of BioteQ Environmental Technologies. This contaminated water was potentially harmful to fish populations in French Creek and the Blue River.

Seeking Solutions

The U.S. Environmental Protection Agency (EPA) identified the mine site for potential Superfund listing in 1989. A team involving the EPA, Colorado Department of Public Health and Environment, Summit County and the town of Breckenridge established a unique arrangement as an alternative to Superfund, making the land available for purchase as public open space.

In 2005, Breckenridge and Summit County purchased the land. Subsequently, “the county, town and EPA worked cooperatively to release an request for proposals (RFP) that allowed proponents to assist in the identification of the best practical alternatives through their proposals,” said Brian Lorch, director of open space for the Summit County government.

The goal of the RFP was to find the best technology for treating the contaminated water at the Wellington Oro mine site and to lower the concentration of dissolved metals in the Blue River downstream of French Creek in order to protect a brown trout fishery and meet Colorado water quality standards.

Selecting Treatment

The chosen technology, ChemSulphide, a water treatment and metal recovery process from BioteQ, was selected because it was able to meet strict water criteria for metal content and would not generate solid waste sludge.

Marchant explained the treatment process: “The metal-contaminated water is pumped to a large contactor tank where chemical sulphide is added under controlled conditions to selectively precipitate metals as a metal sulphide. The precipitated metals and water are pumped to a clarifier tank where the clean water is separated from the metal solids and discharged or recycled. The metal solids are filtered to remove excess water, producing a high-grade metal sulphide product suitable for refining. To recover separate metal sulphide products, separate contactor and clarifier tanks are set up in series.”

The high-grade metal products formed during the process can be recycled into useful products,

and clean water can be discharged safely into the Blue River. Lime treatment, the common alternative to ChemSulphide technology, results in metal-laden sludge that requires ongoing maintenance and storage.

Construction

Summit County and the town of Breckenridge began construction of the 3,200-sq-ft water treatment plant in July 2007, according to Dale Stein, assistant town engineer/project manager for the town of Breckenridge, which operates the plant. The ribbon cutting and grand opening was held Nov. 18, 2008.

Not to mention the project’s 9,900-ft altitude, one major challenge faced during construction was adverse weather—a record amount of snow fell during construction, coupled with lower-than-average temperatures, Stein said.

Groundwater also proved to be a challenge. “We had to pump contaminated water away from the collection site, and also take measures (i.e., diversion) to prevent the water from freezing and return to its historical conveyance,” Stein said.

In addition, Stein added that digging on the abandoned mine site “required extra safety measures and procedures, including personal protective equipment for workers to mitigate the potential discovery of heavy metal-laden soils.”

“This project is unique because it addresses water quality concerns under an open-space protection effort. The two governmental entities undertook this water treatment effort in perpetuity so that a large portion of land could be protected for public recreation, natural resource protection and a scenic backdrop,” said Scott Reid, town of Breckenridge open space and trails planner.

Performance

BioteQ piloted the system at the site over a four-week period, “which verified that the process could meet strict water quality criteria and produce a residual metal product that could be recycled into useful products,” Marchant said.

“It has performed as designed,” Stein said. “This treatment process is designed to remove zinc and cadmium, while minimizing the amount of iron removed from the water. Currently, the plant is meeting the effluent levels put forth in the decree; however, we are fine-tuning the extraction level of the iron in the water we are treating. The plant was designed to not extract iron due to the treatment expense and the potential of degrading the sludge product, which can be used in other industries.”

“The water is returned to the French Gulch basin with less than 225 ppb of zinc and 4 ppb of cadmium,” Marchant said. **WWD**

Rebecca Wilhelm is associate editor for *Water & Wastes Digest*. Wilhelm can be reached at 847.954.7958 or by e-mail at rwilhelm@sgcmail.com.

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NAME:

Wellington Oro Water Treatment Plant

LOCATION:

Breckenridge, Colo.

PLANT SIZE:

3,200-sq-ft plant treats 150 gal per minute

INFRASTRUCTURE:

Water is collected in an underground tank and pumped into the treatment plant, where chemistry conditions are adjusted in a contactor tank. Metal particles are recovered using a clarifier and filter.



Water draining from the Wellington Oro zinc-silver mine, which operated from the 1880s to the 1970s, contains dissolved metals including zinc and cadmium.



Sulphide precipitation removes cadmium and zinc from acid mine drainage at the former Wellington Oro Mine, three miles east of downtown Breckenridge, Colo.

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