

Wellington Oro, Breckenridge, Colorado



An environmental legacy from past times...

The Wellington Oro Mine was the largest mine in Summit County, Colorado, with active underground mining from the late 1880s to the 1970s. The mine produced silver, gold, lead and zinc from an extensive network of tunnels and adits.

Although the Wellington Oro Mine ceased operation in 1972, it has left an unintended environmental legacy – water draining from the mine site is contaminated with dissolved metals including zinc and cadmium.

This “acid mine drainage” water can be harmful to the natural river environment, impacting fish populations in French Creek and the Blue River.

The area’s water quality concerns were addressed by a team involving the US Environmental Protection Agency (US EPA), the Colorado Department of Public Health and Environment, Summit County, and the Town of Breckenridge. In 2005, they issued an international call for proposals to find the best available technology to treat the metal-laden water. The team selected BioteQ’s unique metal recovery process for application at the site, paving the way for the Town of Breckenridge and Summit County to purchase the 1,800 acre site as a recreation area. BioteQ provided process design and engineering, procurement support, plant commissioning, and operator training. The plant was commissioned in November 2008, and is operated by the Town of Breckenridge Water Division.

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Taking Action to Preserve the Environment

1972

The Wellington Oro Mine closes, leaving an **environmental legacy** of metal-contaminated water.

1989

The Wellington Oro Mine site is identified for potential **Superfund listing** by the US Environmental Protection Agency. A team is formed to address the area's water quality issues while protecting alpine habitat and open space. This collaboration, involving the US EPA, the Colorado Department of Public Health and Environment, Summit County, and the Town of Breckenridge, creates an alternative approach to Superfund, resulting in a unique settlement arrangement that enables the land to be purchased for public open space.

2005

The Town of Breckenridge and Summit County **purchase the Wellington Oro site** as part of an 1,800 acre open space plan to enhance the region's recreational amenities.

2005

The US Environmental Protection Agency issues an international **call for proposals** to find the best technology to treat the water at the Wellington Oro Mine. The goal of the mine cleanup is to lower the concentration of dissolved metals in the Blue River downstream of French Creek, to meet Colorado Water Quality Standards and protect the brown trout fishery.

2005

An innovative process for water treatment and metal recovery developed by BioteQ Environmental Technologies is selected as the **best available technology** to remove dissolved cadmium and zinc from mine drainage produced at the Wellington Oro site. The process is selected because of its ability to produce treated water that meets very strict water quality criteria for metal content while generating no solid waste sludge that requires special disposal.

2006

The final construction drawings are prepared by the Town of Breckenridge, BioteQ Environmental Technologies, and Stantec Engineering.

2007

The Town of Breckenridge and Summit County begin construction of the 3,200 sq.ft. water treatment plant, along with the associated mine water collection and infiltration systems. The construction is carried out by Base Building Solutions, Design Electric, Bosco Constructors, and BJE excavating.

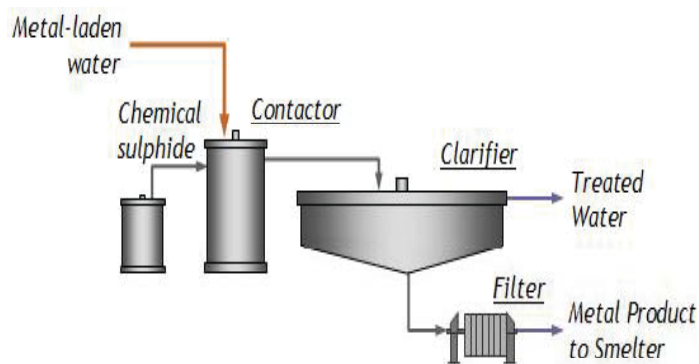
2008

The Wellington Oro water treatment plant is built and commissioned. It is operated by the Town of Breckenridge Water Division.

Applying the Best Available Technology

The water from the Wellington Oro Mine is treated using a process called “sulphide precipitation”. The contaminated water is collected in an underground tank, and is pumped into the plant, where the water chemistry conditions are adjusted in a contactor tank, using ChemSulphide® technology developed by BioteQ Environmental Technologies.

By changing the water chemistry, the dissolved metals “precipitate” to form solid metal particles. These particles are then recovered using a clarifier and filter, producing a high-grade metal product that can be recycled into useful products, and clean water that can be safely discharged to the Blue River.



The alternative to BioteQ’s technology is called “lime treatment”. Instead of using sulphide precipitation to recover solid metal particles, lime treatment would use lime ($\text{Ca}(\text{OH})_2$) to precipitate the metals as a sludge.

The disadvantage of the lime process is that it would create a metal-laden sludge that would require ongoing monitoring and storage, which could be detrimental to the environment and add to long-term operating costs.

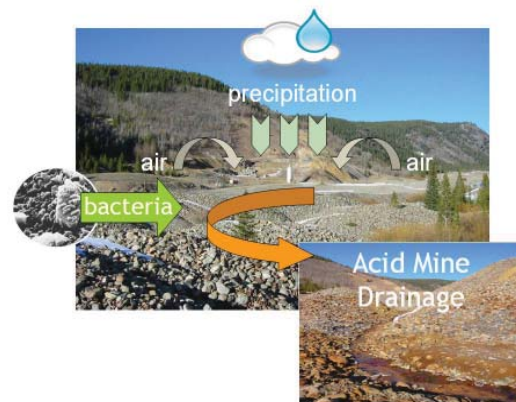
BioteQ’s technology was selected instead of lime treatment because it produces treated water that meets very strict water quality criteria for metal content while generating no solid waste sludge that requires special disposal.

The BioteQ process was selected for application at this site because the technology:

- Removes the dissolved metal contaminants from the water to meet Colorado Water Quality Standards for zinc and cadmium content. The metals are recovered in a form that can be recycled into useable products.
- Produces clean water that meets strict water quality criteria.
- Generates no waste that requires special disposal.

What is Acid Mine Drainage?

Acid mine drainage (also known as “acid rock drainage”) is a naturally occurring process that happens at an estimated 70% of the world’s mine sites. Mining activity can expose rock containing sulphide-based minerals in open pits or underground workings. When this rock is exposed to water and oxygen along with a common bacteria, acidic water is created that dissolves residual metals from the rock.



At the Wellington Oro site, acid mine drainage is created when rainfall and snow melt enter the mine’s 12 miles of tunnels and crosscuts. The water becomes acidic, dissolving zinc and cadmium as it moves through the natural watershed to French Creek. Elevated levels of these metals in the water can impact the brown trout fishery in the Blue River.



Fast Facts

- The Wellington Oro Mine, located near Breckenridge, Colorado, is a closed zinc-silver mine that ran from the late 1880s to the early 1970s. Water draining from the mine site is contaminated with dissolved metals.
- BioteQ's technology was selected from an international call for proposals as the **best technology** to address metal contaminated water at the Wellington Oro site.
- BioteQ's technology has been **reviewed by the US Environmental Protection Agency** (US EPA), the Colorado Department of Public Health and Environment, Summit County, and the Town of Breckenridge.
- The plant is designed to process 150 US gallons per minute, or up to **80 million US gallons** of water per year (equivalent to 120 Olympic-sized swimming pools).
- The plant **removes cadmium, zinc, and other minor contaminants** from metal-contaminated mine drainage. Approximately 4,000 pounds of metals are removed from the water each month (equivalent to the weight of an average automobile).
- Treated water from the plant **meets Colorado Water Quality Standards** for zinc and cadmium, and is discharged to the French Creek tributary of the Blue River. The water is returned to the French Gulch basin with less than 225 parts per billion of zinc and 4 parts per billion of cadmium.
- The plant operations are designed to meet international **ISO 14001 standards** for environmental compliance.
- The plant is **operated by the Town of Breckenridge** Water Division.
- The plant uses **proven technology** that has been successfully applied at mine sites in the US, Canada, Mexico, China, and Australia.