

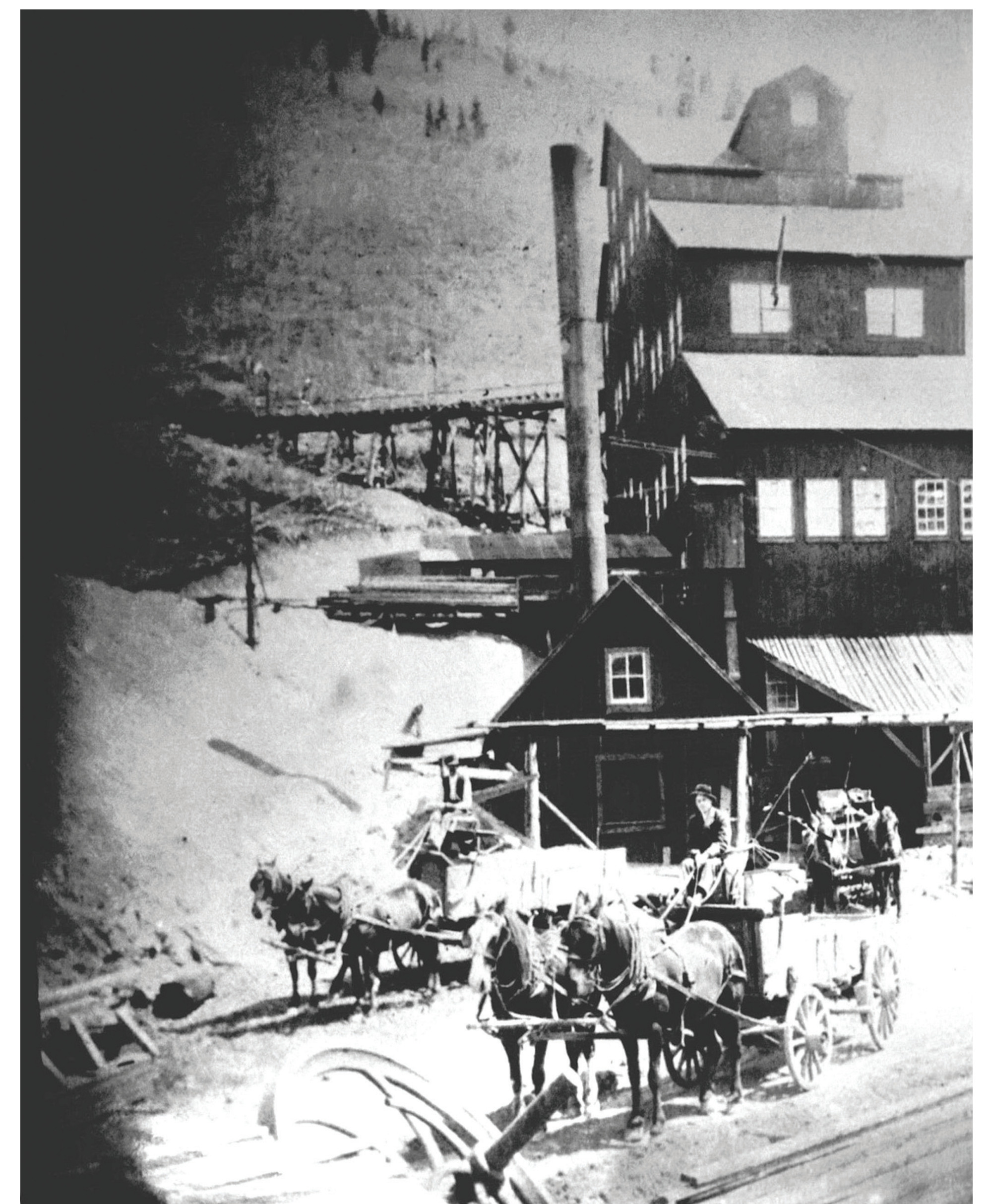


An environmental legacy from past times...

The Wellington Oro Mine was the largest mine in Summit County, with active underground mining from the late 1880's to the 1970's. 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.

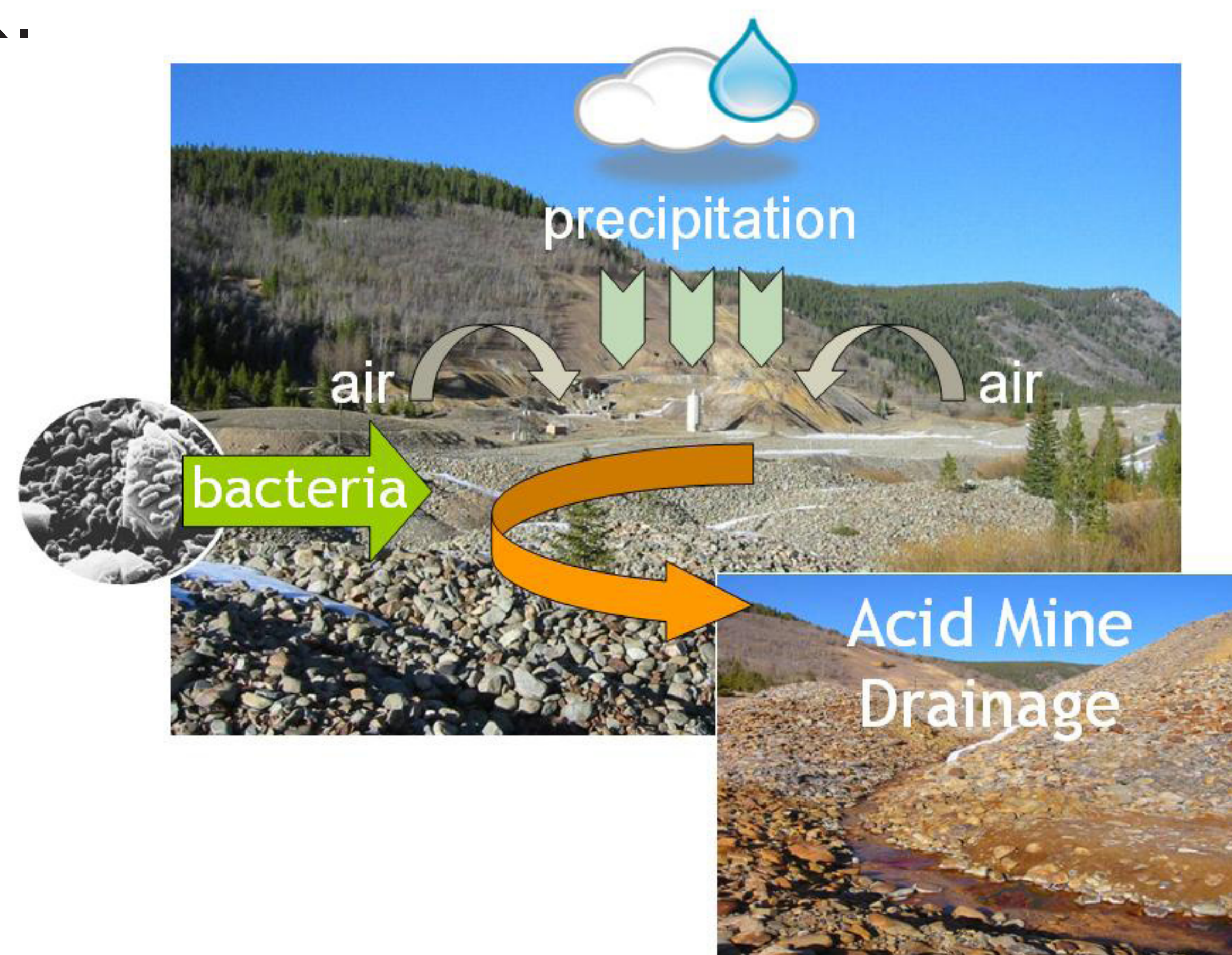
This “acid mine drainage” water can be harmful to the natural river environment, impacting fish populations in the French Creek and Blue River.





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.

Examples of Acid Mine Drainage





Taking action to preserve our 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.



Taking action to preserve our environment...



2005

An innovative process for water treatment and metal recovery developed by BioteQ Environmental Technologies is selected by Summit County, the Town of Breckenridge, the Colorado Department of Public Health and Environment, and the US Environmental Protection Agency (US EPA) 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 Town of Breckenridge and Summit County work on the **final design and construction drawings** needed to construct the water treatment facility. 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

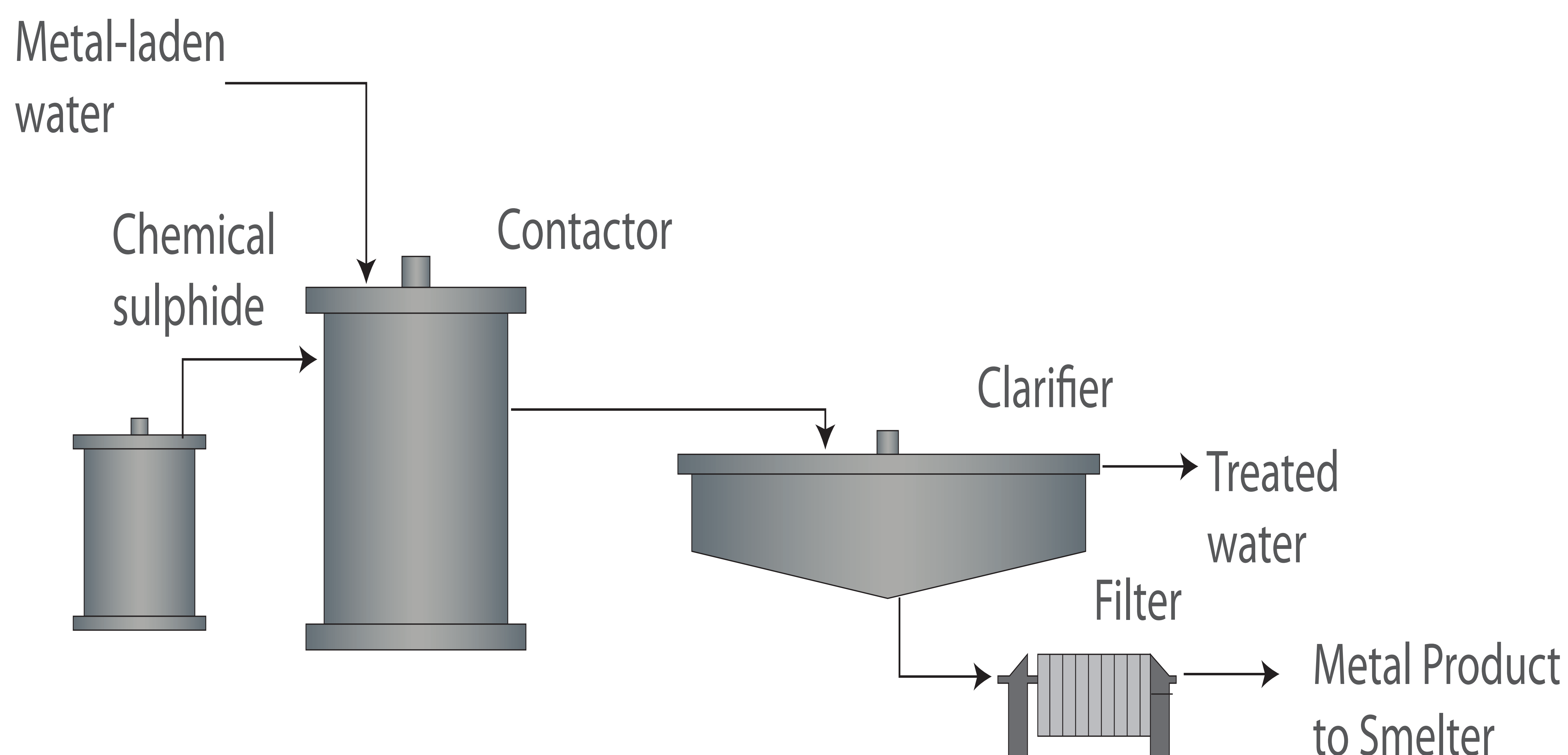
The Wellington Oro water treatment plant is **built and commissioned**. It is operated by the Town of Breckenridge Water Division.



Applying the best available technology...

The water from the Wellington Oro Mine is treated using a process called “sulphide precipitation”. The contaminated water is pumped into a large tank, where the water chemistry conditions are adjusted, 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.





Choosing a better alternative...

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.



Example of a sludge pond

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.



A proven process to improve water quality...

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 discharge to local receiving waters. 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.





A sustainable water treatment solution...

Fast Facts:

- ◆ 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 up to **80 million US gallons** of water per year (equivalent to 1,200 Olympic-sized swimming pools).
- ◆ The plant **removes cadmium, zinc, and other minor contaminants** from metal-contaminated mine drainage. Approximately 4,000 pounds of metals will be removed from the water each month (equivalent to the weight of an average automobile).
- ◆ Treated water from the plant **meets Colorado Water Quality Standards**, and is discharged to the French Creek tributary of the Blue River. The water will be returned to the French Gluch basin with less than 225 parts per billion of zinc and 4 parts per billion of cadmium. The treatment plant does not remove dissolved iron from the water.
- ◆ The plant operations are designed to meet international **ISO 14001 standards** for environmental compliance.
- ◆ The cost of the water treatment facility was approximately **\$4 million**, shared equally by the Town of Breckenridge and Summit County.
- ◆ The plant is **operated by the Town of Breckenridge** Water Division, at an expected annual cost of \$100,000 to \$150,000. Operating costs are shared equally by the Town of Breckenridge and Summit County.
- ◆ The plant uses **proven technology** that has been successfully applied at 7 other mine sites at locations in the US, Canada, Mexico, China, and Australia.





About BioteQ

Environmental Technologies

BioteQ is an industrial water treatment company that applies innovative technologies to remove dissolved metals and sulfate from contaminated water, producing saleable by-products and clean water that can be discharged to the environment.

BioteQ has built 8 commercial plants at locations in the US, Canada, Australia, Mexico and China, and currently has 7 new plants in development and construction in Canada, the US, China, and Chile.

BioteQ's customers include leading international mining firms, utility operators, and environmental regulatory agencies. For more information, go to www.bioteq.ca.

Breckenridge, CO



Sonora, Mexico



Mt. Gordon, Australia



Dexing, China



Arizona



Raglan, Quebec



Project Partners for the Wellington Oro Treatment Plant

