

A large-scale open-pit mine with a winding dirt road and terraced rock walls. The road is light-colored and shows tire tracks, curving through the mine. The rock walls are layered and show signs of excavation. Several utility poles are visible along the road.

# RioTinto

Kennecott  
Utah Copper's  
Bingham  
Canyon Mine

Teacher Guide

## Welcome to the Bingham Canyon Mine

Kennecott Utah Copper's (KUC) Bingham Canyon Mine Visitors Center, at an elevation of about 6,440 feet, provides educational, hands-on and up-close experiences to help visitors better understand how Kennecott produces metals and minerals that are essential to creating the products used in everyday life.

Inside the Visitors Center, you will see exhibits featuring everything from mining artifacts and model trucks to our modern-day operations and approach to environmental engineering. You'll also see three-dimensional models that offer an educational and entertaining experience for visitors of all ages.

Through your visit to the Visitors Center, you will also learn about Kennecott's plans to extend the life of the Bingham Canyon Mine

to 2028 and beyond through Kennecott's Cornerstone Project.

The Visitors Center opened in 1992 and has hosted more than 2.8 million visitors. Each year, the fees collected from the Visitors Center and donations from the Copperton Lions Club are donated to local charities through the KUC Visitors Center Charitable Foundation. Since its inception, more than \$2.4 million has been donated to local community charities and non-profit organizations. The funding benefits the truly needy with a special focus on the disabled, children and the elderly.

Please enjoy your visit, and thank you for your donation to the KUC Visitors Center Charitable Foundation.

## The history of the Bingham Canyon Mine

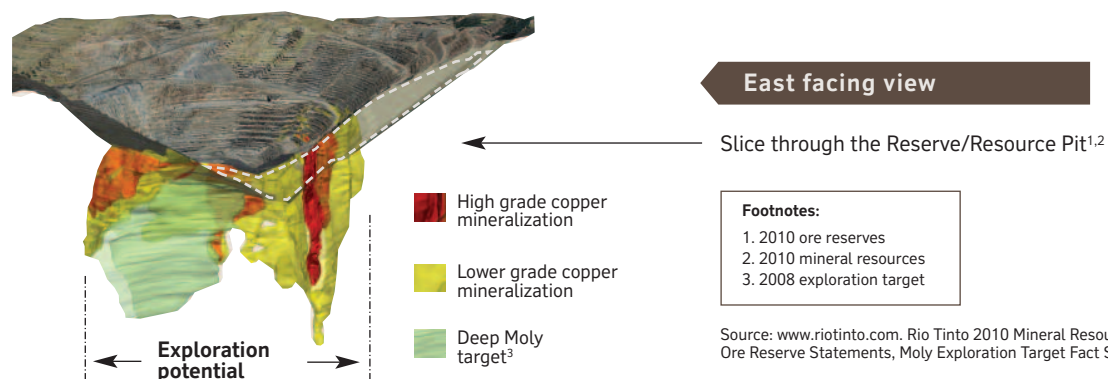
- Bingham Canyon was settled in 1848 by the Bingham brothers, Thomas and Sanford, who were ranchers with no mining experience.
- In 1863, soldiers stationed at Fort Douglas in Salt Lake City explored the canyon and discovered lead ore. Utah's first mining district was created in the Bingham Canyon area that same year.
- In 1893, Daniel Jackling, a metallurgical engineer, and Robert Gemmell, a mining engineer, studied the deposit and recommended developing the ore body through a revolutionary open-pit mining method and processing the ore through a large-scale industrial process.
- The miners and their families lived near Bingham Canyon in places called Highland Boy, Copper Heights, Copperfield, Carr Fork, Heaston Heights, Telegraph, Dinkeyville, Terrace Heights, Greek Camp and Frog Town. At one point, the population in the area approached 20,000 people.
- In 1903, the Utah Copper Company was formed to develop the mine, based on the recommendations of Mr. Jackling and Mr. Gemmell.
- In 1906, the first steam shovels began mining away the waste rock that covered the ore body. The ore was found in a part of the mountain that divided the main canyon.

## The geology of the Bingham Canyon Mine

- Every deposit of ore in the world is unique. There are no two ore bodies that are alike.
- Geologic depositional forces were at work in the Oquirrh Mountains between 260 and 320 million years ago (Late Paleozoic Period).
- About 30 to 40 million years ago, molten, metal-bearing rock deep within the earth's crust began to push toward the surface and formed Bingham's ore deposit. Volcanoes erupted above the evolving ore body. The Bingham Canyon Mine ore-body contains primarily copper, gold, silver and molybdenum.
- Tiny grains of ore minerals, mostly copper and iron sulfides, are scattered within what is called "host rock." Because there is far more host rock than there are minerals, it is known as a low-grade ore deposit.
- On average, a ton of ore contains about 10.6 pounds of copper.
- The Bingham Canyon Mine has significant mineralization below the current pit.

## How big is the Bingham Canyon Mine?

- Kennecott Utah Copper's (KUC) Bingham Canyon Mine has produced more copper than any mine in history – about 19 million tons.
- The mine is 2¾ miles across at the top and ¾ of a mile deep.
- You could stack two Sears Towers (now known as the Willis building), on top of each other and still not reach the top of the mine.
- If you stretched out all the roads in the open-pit mine – some 500 miles of roadway – you'd have enough distance to reach from Salt Lake City to Denver.
- KUC mines about 55,000,000 tons of copper ore and 120,000,000 tons of overburden per year.
- You could lay the soccer field at Rio Tinto Stadium in Sandy, Utah, end to end more than 38 times across the top of the Bingham Canyon Mine before it would reach both sides.
- The elevation of the Bingham Canyon Mine drops from 8,040 feet above sea level to 4,390 feet above sea level.



## Mining equipment and operations

- There are nine electric shovels and two hydraulic shovels operating in the mine.
- The largest electric shovel has a 56-cubic-yard dipper that scoops up approximately 98 tons of material in a single bite, a weight equivalent to about 50 automobiles.
- The newest electric shovel costs more than \$20 million and weighs 3.2 million pounds.
- There are about 80 gigantic haul trucks operating in the mine. These trucks carry as much as 320 tons of material in a single trip.
- A new haul truck costs about \$3.5 million.
- The fleet of haul trucks travel more than 10,000 miles a day at an average speed of 13 miles per hour.
- The mine has eight large drills that stand between 75 and 100 feet tall and drill blast holes 55 feet deep. On average, 200 holes are drilled in a typical day. Each hole is packed with 1,200 pounds of special blasting agents.
- The in-pit crusher reduces ore to less than 10 inches in diameter or about the size of a basketball. Very fine dust particles are captured in an air pollution control device called a bag house – similar to a very large vacuum cleaner.

## The mining process

**Bingham Canyon Mine** This is where the mining process begins. Every day, Kennecott Utah Copper mines about 150,000 tons of copper ore and 330,000 tons of overburden. The ore containing copper, gold, silver and molybdenum is hauled and deposited in the in-pit crusher and sent to the Copperton Concentrator.

**Copperton Concentrator** From the mine, ore is transported on a five-mile conveyor and stockpiled at the Copperton Concentrator. There the ore is ground into fine particles. The smaller pieces are then combined with air, water and chemical reagents to separate the valuable minerals from the waste rock. The mineral bearing concentrate is then transported to the smelter through a pipeline.

**Tailings** Tailings are the leftover rock material that have had most of the valuable metals removed. Tailings are sent through a pipeline from the Copperton Concentrator to the tailings impoundment area north of the town of Magna where they are stored.

**Smelter** At the smelter, the copper concentrate is transformed into liquid copper through a flash smelting process. The copper matte is processed in the furnace to produce 99.5 percent blister copper. From there, the 750 pound copper plates, called anodes, are sent to the refinery.

**Refinery** At the refinery, anodes are lowered into electrolytic cells containing a stainless steel blank and acidic solution. For 10 days, an electric current is sent between the anode and the cathode, causing the copper ions to migrate to the steel sheet. The other impurities, including gold and silver, fall into the bottom of the cell and are recovered in the Precious Metals plant. This process forms a plate of 99.99% pure copper. The copper is separated from the steel sheet and sent to market.

## Fun facts about copper

- The first known use of copper was around 10,000 years ago.
- The Salt Lake City 2002 Winter Olympic Medals were made from gold, silver and copper (bronze is made primarily from copper) from the Bingham Canyon Mine.
- The Statue of Liberty contains 179,000 pounds of copper. Since 1885, the statue has endured biting sea winds, driving rains and the beating sun. Over this time, the copper skin of the Statue of Liberty has not only grown more beautiful, it has also remained virtually intact.
- The word “copper” comes from kyprios, the Greek word for the island of Cyprus, where ancient people mined copper.
- Copper is essential to modern life. It is necessary for building construction, transportation, industry, computers and electronics, as well as advanced green technology, such as solar panels, wind turbines and hybrid cars.
- It requires about 15 different minerals to make a car, 30 different minerals to make a computer, and as many as 42 different minerals to make a telephone. Copper can be found in each of these products.
- On average, each person in America uses about 30 pounds of copper every year.
- The typical new home contains about 500 pounds of copper – found mostly in wiring, plumbing and brass fixtures.

## Our commitment to sustainable development

- Rio Tinto is an industry leader in finding, mining and processing the earth’s mineral resources in a way that’s economically, socially and environmentally responsible.
- KUC’s strategic focus includes following the sustainable development model. This model includes assuring Economic Prosperity, Social Well-Being, Environmental Stewardship and Governance surrounding our operation. When intertwined, these practices help promote an economically strong, productive and responsible company.
- KUC constantly strives to be a good steward of its resources. For example, KUC works to conserve and generate energy and reduce the environmental impacts of our operation.
- KUC strives to work with communities, government and nongovernmental organizations to achieve mutually beneficial goals.
- KUC recognizes that people are its most important resource and safety is the highest value. Helping to ensure a safe working environment for our employees is always a top priority.
- KUC’s Daybreak community is an example of Rio Tinto’s commitment to sustainable development. Daybreak sits on 4,126 acres in the City of South Jordan. Daybreak is a mixed-use, walkable community that incorporates quality education, a healthy and renewable environment, and a vibrant local economy.
- KUC has implemented vehicle idling reduction software on more than 400 vehicles to monitor speed, location, idling time and fuel usage.

## About Kennecott Utah Copper

As the second largest copper producer in the United States, Kennecott Utah Copper comprises nearly 25 percent of U.S. copper production. Kennecott's Bingham Canyon Mine is one of the top producing copper mines in the world with total production at more than 19 million tons. Every year, Kennecott produces approximately 275,000 tons of copper, 400,000 ounces of gold, 4 million ounces of silver, 25 million pounds of molybdenum, and 1 million tons of sulfuric acid, a by-product of the smelting

process. Rio Tinto purchased the Bingham Canyon Mine and related facilities in 1989 and has invested more than \$2 billion in the modernization since then. KUC has also spent more than \$350 million on the cleanup of historic mining waste and \$100 million on groundwater cleanup. Rio Tinto employs 2,400 people and influences 14,800 indirect Utah jobs and each year spends nearly \$1 billion in the state of Utah in wages, benefits, taxes and purchases from nearly 1,000 Utah area businesses.

## About Rio Tinto

Rio Tinto has been a world leader in mining and exploration for more than 130 years. The company mines and processes the earth's mineral resources and metals essential for making thousands of everyday products. Rio Tinto has operations on every continent and the company's products include aluminum, copper, diamonds, energy products, gold, industrial minerals and iron ore.

It is headquartered in the United Kingdom (UK), combining Rio Tinto plc, a London and NYSE listed company, and Rio Tinto Limited, which is listed on the Australian Securities Exchange.

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