

## What is mining?

Mining is the extraction of valuable materials from the earth. Today in the United States, technology, innovation and modern mining and environmental protection practices are used to extract the necessary minerals including copper, nickel, cobalt and platinum group metals (PGMs) to support our quality of life now and into the future.

Mining can be done in two main ways:

**Surface mining:** Where shallow bedrock is removed to extract contained minerals.

**Underground mining:** Where shafts or tunnels are dug into the earth to extract deeper mineral resources.

## Underground mining

Underground mining refers to a technique used to excavate material found deep underground. Many metals are mined this way including gold, silver, iron, copper, zinc or nickel.

Underground mining today is very different from what we envision of workers with shovels from the 19th century. Modern underground mines are high-

tech. They are well lit, use machinery, have ample fresh air, manage water, and use communication networks.

No two underground mines are identical. Much depends on the type of ore that is being mined, how far beneath the surface it is located and the makeup and the strength of the surrounding rock.

## Underground mine design

Underground mines are designed to limit environmental impacts and assure the long-term stability of the mine site and the ground above.

Designs are rigorously scrutinized by state and federal agencies to study impacts and potential alternatives prior to approval.

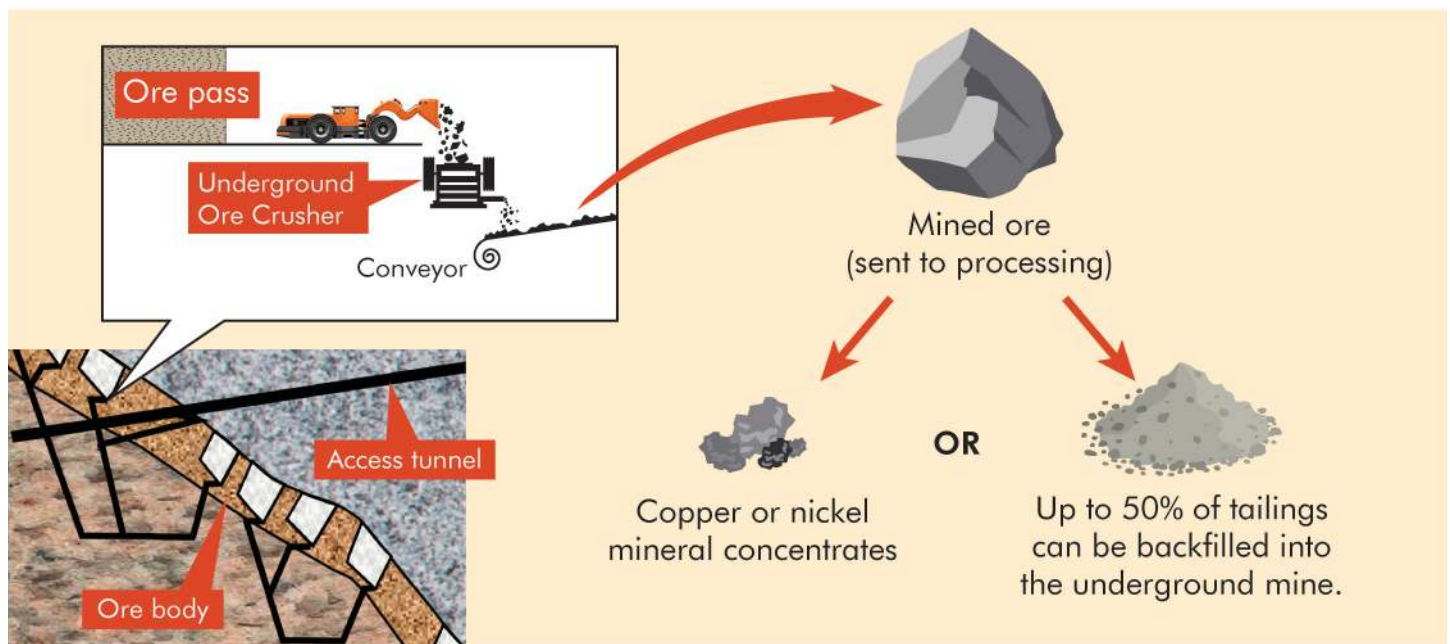
## Key Terms

**Ore:** Rock from which minerals can be economically extracted.

**Processing:** The procedure with which valuable minerals are separated from ore.

**Tailings:** The sandy sediment left over from the processing of ore.

**Waste rock:** Rock that is mined but not processed because the percentage of valuable minerals is too low.



The mining process

The underground mining method that is chosen for a particular mine is determined by:

- Size, depth and shape of the deposit that will be mined
- Strength of the rock in and surrounding the mine

Ore is brought to the plant and processed to separate out the valuable minerals. The tailings that are produced during processing must be stored according to permits.

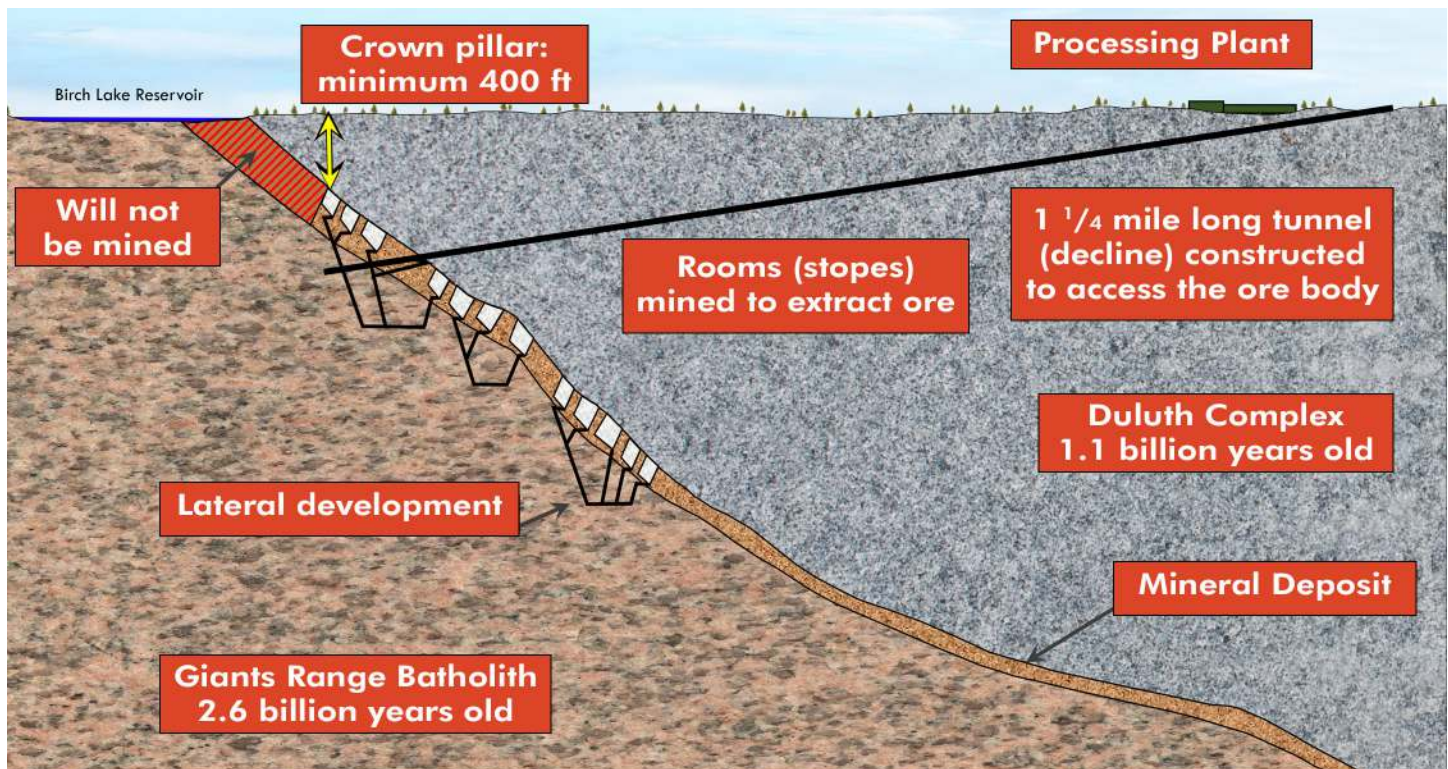
## Twin Metals Minnesota Project Site

The Twin Metals Minnesota (TMM) Project design would

utilize an underground mining technique to reach the minerals that would be mined below 400 feet and potentially down to 5,000 feet underground.

The underground mine would have two side by side decline ramps whereby ore would be delivered to the plant by a conveyor belt for processing.

The TMM Project design eliminates the need for surface waste rock piles. The underground mining method allows for up to half of the tailings to be returned to the mine as cemented backfill with the remainder being stored at the dry stack facility.



### Links to Underground Mine Design Resources:

TMM website  
[www.twin-metals.com](http://www.twin-metals.com)

International Council on Mining and Metals  
[www.icmm.com/](http://www.icmm.com/)

Mining Association of Canada Towards Sustainable Mining  
[www.mining.ca/towards-sustainable-mining/](http://www.mining.ca/towards-sustainable-mining/)