

# Dry Stack Tailings Management

Best Available Technology  
Best for the Environment

**Twin Metals Minnesota is committed to operating a safe 21st century underground mine—safe for workers and the environment.** As such, Twin Metals will use the dry stack tailings management for its mine. Dry stack and filtered tailings technology was endorsed in a 2020 study by MiningWatch, Earthworks, and by more than 140 NGOs. The dry stack method is also lauded globally by the International Council on Mining & Metals, which sets the standards for the safest possible tailings management practices for facilities around the world.

## What are tailings?

Tailings are the crushed rock—a silty, sandy material—that is left over after minerals are extracted. Storing this material is an important aspect of a mining operation.

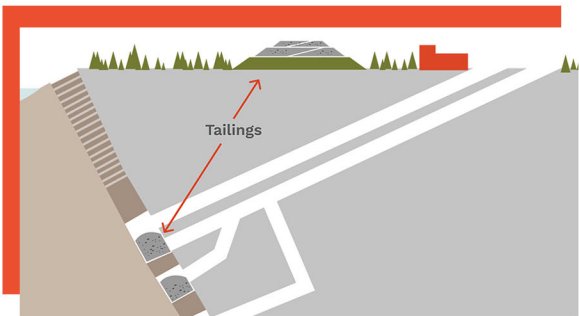
## DRY STACK EXPLAINED

Dry stacking is the most sustainable method used to store tailings after the copper, nickel, cobalt and platinum group metals are extracted. Tailings stored on a dry stack facility look similar in size and shape to a hill. Native plantings can be placed on top of the tailings structure over time so that it resembles the area's natural surroundings.

Some mines use a more traditional tailings storage method, which requires placing tailings in holding ponds with dams. With dry stacking, there is no need for tailings ponds or dams. Therefore, there is no risk of a dam failure. Twin Metals determined dry stacking is best for its project and location.



Shown here is an example of a partially reclaimed dry stack tailings storage at Greens Creek Mine in Alaska, which has been operational since the 1980s.



The dry stack process begins with large rocks crushed underground, which are then sent via conveyor belt to the processing plant on the surface. The metals, which are bound to the sulfides, are separated using a flotation process and placed in shipping containers to be sent out to customers. The leftover rock, or tailings, are then sent through a filtering process.

At the Twin Metals mine, the filtered tailings, by now the consistency of sandcastle sand, will be transported to the dry stack facility, located just south of the processing plant. The filtered tailings are placed and compacted into a highly engineered, dense mound. The dry stack facility is designed at optimum grades to allow water to run off into a collection system on the perimeter. The mound will average around 130 feet, consistent with the topography of the area. About half of the tailings will be placed on the dry stack facility, and the other half will be pumped into the underground mine as cemented backfill.



Shown here is a sample of Twin Metals tailings being tested in a lab for consistency, optimum moisture content and stability.

# OTHER KEY ENVIRONMENTAL POINTS

## Regulatory Review

Prior to permitting, proposed mine projects must pass strict regulatory approvals covering a host of protections through mine construction, ongoing operation and closure. This includes water and air quality, noise, views, drinking water supply, wetlands, generation and storage of hazardous and non-hazardous waste, endangered species, plant life, and cultural resources.

## No Acid Rock Drainage

The unique geology of the mineral deposit that Twin Metals will mine, in addition to its proposed mining methods, allows for the production of non-acid generating tailings. Twin Metals has tested its tailings for more than a decade to confirm this using the International Network for Acid Prevention's Global Acid Rock Drainage Guide. The tailings can be safely exposed to air and water because all but trace amounts of sulfur will be removed during processing.

## DRY STACK BENEFITS

- No dam means no possible dam failure
- Small footprint
- No long-term water storage issues
- Reclamation allows dry stack to blend in with natural surroundings

In June 2020, Earthworks, a non-profit organization dedicated to protecting communities and the environment from adverse impacts of mineral and energy development, and MiningWatch, a NGO dedicated to upholding humanitarian rights of communities impacted by mining operations, called on regulatory agencies to "mandate the best available technology for tailings, in particular, filtered tailings." In 2015, the Minnesota-based advocacy group Water Legacy explicitly requested that the Minnesota Department of Natural Resources require a proposed copper-nickel mine to consider the use of dry stack tailings because it is the "best available technology to protect water quality, wetlands and avoid the risk of failure." Additionally, in 2019, the Minnesota Center for Environmental Advocacy called "dry stack or filtered tailings" the best available technology.

## North American examples of dry stack facilities:

- Greens Creek, Alaska
- Raglan, Quebec (Canada)
- Eleonore, Quebec (Canada)
- Pogo, Alaska
- Meliadine, Nunavut (Canada)
- Pumpkin Hollow, Nevada

