TAMARACK WATER ALLIANCE

Tamarack Water Alliance Community Zoom Meeting
Wed. December 7, 2022, 10am CT

Everyone is invited to attend our open community virtual Zoom meeting on Wednesday, December 7, 2022 at 10am CT. This is an opportunity for you to learn about risks to the community of the proposed Talon Metals mine in Aitkin County. December's topic will be *Creating a Better World with Clean Water* presented by Waabishki Giiwedin Ikwe (White North Wind Woman) Tracey L. Wilkie.

Wilke is a citizen of Turtle Mountain Band of Chippewa in North Dakota where she was raised. Tracey is a human rights activist and Water Protector. She spent her career working with youth and their families from across the world in national model site for criminal justice reform in Portland Oregon. Since returning to back to North Dakota nearly 4 years ago Tracey has ran for office, stood against Line 3, worked for ND Federation of Families for Children's Mental Health. She is currently the chair of PAIMI Protection and Advocacy for Individual's with Mental Illness, serves on board of directors for Jeremiah Program and North Dakota Women's Network.

Some of Tracey's fondest childhood memories are learning how to swim in the beautiful lakes and rivers in Minnesota.

If you believe nickel-sulfide mining is too risky in Aitkin County, Tamarack Water Alliance has yard signs with this messaging available. Your $6 donation helps defray costs. Email **waters@tamarackwateralliance.org** to arrange pickup of your sign.

We hope you will share this information with others and keep in touch as we build a community that can protect water and health from the dangers of sulfide mining.

Encourage your friends, family and neighbors to sign up for the monthly Tamarack Water Alliance **email newsletter** (http://eepurl.com/hOboEb).

Hydrology and the Potential Impacts of Mining

by John L. Nieber, P.H., P.E., PhD
Department of Bioproducts and Biosystems Engineering
University of Minnesota St. Paul

The transition of the Earth from a more natural condition to something more serving to human needs has always had some consequences. It is nearly impossible that by making a change to the landscape the outcome will be an environment that replicates what was there naturally. Examples of the impacts of these types of transformations abound around the world and right here in Minnesota as well. One example near to home for us is the long-term impact of clearcutting the pine forests on the Nemadji River watershed. This clearcutting occurred in the late 19th century into the early 20th century, but the impact is still clearly visible today. The clearcutting led to changes in the water balance of the watershed brought about by a change in the amount of evapotranspiration of water by the native vegetation complexes. This transition in the hydrologic balance led to increased instability of the riverbanks and thereby increased annual loads of sediment transported to Lake Superior.Even a century later the river still has not adjusted back to the conditions that existed prior to the clearcutting.Many other examples of change exist here in Minnesota, with the historical mining in the northeast being a *poster child* of land disturbance.

It would be impossible to deny that historical open-pit mining has not changed the landscape of the land. The changes to the landscape are clearly visible to the casual observer, but underlying those changes is the impact the changes have had on the landscape water balance and water quality. We must admit that the mining of iron from the mining areas in northeastern Minnesota have been a major contributor to the economic well-being of the state, and to the nation in fact, however, we still need to live with the changes that the mining operations have had on the natural landscape.

Mining for metals deep underground is not conducive to an open-pit mining approach, and it might be thought from an ‘out of sight, out of mind’ viewpoint, that this should then shield the landscape from any negative impacts of the mining operation. However, as with any other change that humans make on the Earth, there will be some consequences. The question is as to whether the consequences are acceptable. Such mining operations will impact the hydrologic balance in the area, and will change the quality of the water in the area. Will the changes be too extreme? This article is not intended to answer this query, but instead the intention is to present some background information about hydrology to the reader to provide context for questioning proposed mining operation plans.

The hydrologic cycle is composed of components involving fluxes of water between various storage elements. A schematic of this is shown in the illustration presented in Figure 1. Here we see the fluxes of precipitation (rain, snow, dew), evaporation and transpiration, infiltration, surface runoff, groundwater recharge, groundwater flow, and river discharge. These fluxes are connected through various storages of water, including the storage in lakes, ponds, wetlands and streams/rivers, soil moisture, and shallow and deep groundwater.

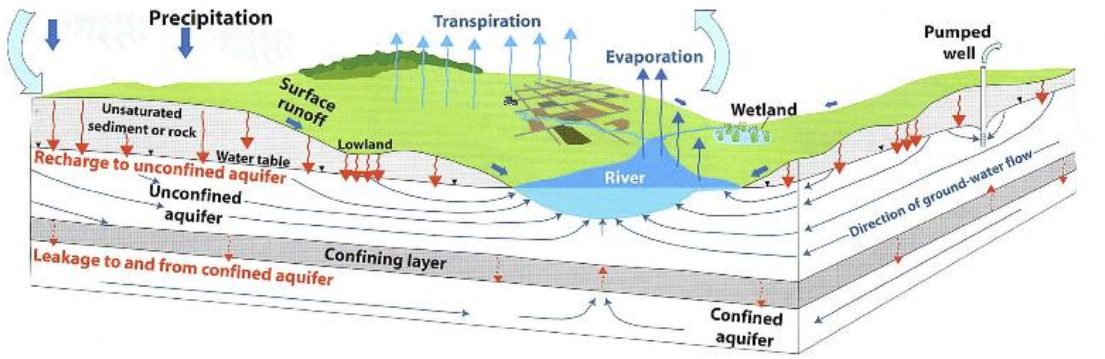

FIGURE 1: Illustration of the hydrologic cycle showing the fluxes of water within the system. Taken from USGS, Ground-water recharge in Minnesota, Fact Sheet 2007-3002, 2007

The precipitation component of the hydrologic cycle is the most significant since without the precipitation there would be no water at all. It comes mainly in the form of rainfall and snowfall/sleet. For the northeast region of Minnesota the annual average precipitation amounts to about 30 inches. This precipitation, when it reaches the earth is partitioned into canopy interception by trees, shrubs and grasses (2-5 inches), and the remainder is partitioned at the ground surface into surface runoff/detention storage (2 inches) and infiltrated water (26 inches). The recharge of groundwater from the infiltrated water is about 10 inches, while the evapotranspiration back into the atmosphere is about 16 inches (includes the canopy interception water, water from surface water bodies, and water from soil moisture). The recharge water supplies new water to the shallow aquifer, and of course some of that water may percolate downward from the surficial aquifer into the underlying confined/bedrock aquifer(s). The situation here is for the mostly natural conditions found in the northeast region. In areas of the region where there might be some human disturbances the water balance changes. And of course, across the state of Minnesota the balance changes significantly due to natural conditions (total precipitation varies across the state from about 33 inches annually in the southeast to about 20 inches annually in the northwest) and to land use change (agricultural production, timber harvesting, and development for industry, transportation, residential housing, and urban housing).

This discussion about the hydrologic balance brings us back a current proposal to conduct deep mining of copper/nickel/cobalt in the area near Tamarack, Minnesota, located in Aitkin County. The geology of the region is composed of glacial materials overlying bedrock. The glacial materials are composed of sand and gravel layers with glacial till layers in between. The underlying bedrock is the material in which the copper/nickel/cobalt ore materials are located, and might be an aquifer as well, though generally will not be so. As mentioned above, the layers of sand/gravel near the

surface form the surficial aquifer and the water table is fairly close to the surface (3-4 feet) in some areas. The layers of till which separate layers of sand/gravel provide some amount of confining of the sand/gravel layers and these sand/gravel layers can be thought of as being confined. An illustration of a somewhat idealized view of a cross-section of the aquifer system is presented in Figure 2. It is important to note that the layers of till, and those of the sand/gravel are not as continuous as idealized in this illustration.

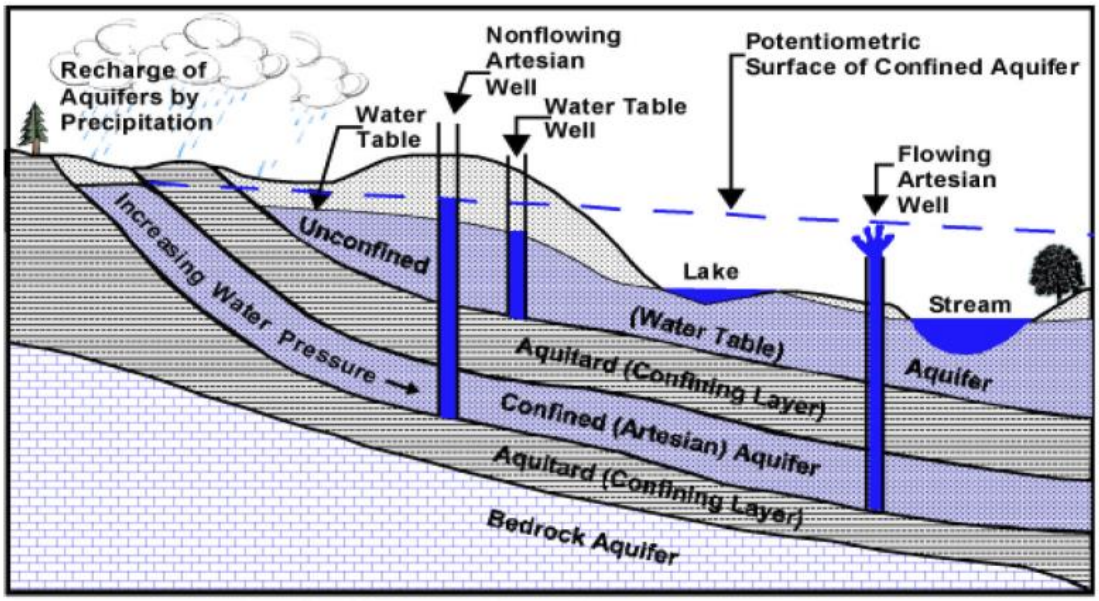

FIGURE 2: Here we see an idealized representation of layered aquifers in a system including the bedrock aquifer. Taken from Indiana DNR. 2015. Potentiometric Surface Mapping (1: 48,000) Overview. IN.gov. [Online] 2015. http://www.in.gov/dnr/water/7258.htm.

The underground mining of the copper/nickel/cobalt from the bedrock material will require drainage of groundwater by pumping water from the mined bedrock because without that the bedrock will be submerged with groundwater making it impossible to mine. The pumping will lead to gradients of mechanical energy towards the mine. Since the bedrock is connected to the overlying aquifers and aquitards (confining layers) there could be groundwater flow from the overlying aquifers toward the mine. If this flow is significant, it could have a detrimental impact on the surficial aquifer and the surface waters (streams, rivers, wetlands, and lakes) connected at the surface. Because the geology of the subsurface is so complex, the only way to test for such possible impact on the overlying aquifers and surface waters would be to conduct a pumping test for a sufficiently long period.

Even in the event that the pumping of the mine does not lead to negative impacts on

the surface waters, still there is the issue of the disposal of the pumped water. The quality of the pumped water needs to be determined to assess whether there are any undesirable constituents dissolved in the water, and if so the water will need to be treated. It should be expected that there will be toxic constituents coming from the bedrock once the mining operation is initiated and the bedrock is exposed to the atmosphere. Toxic constituents will include acids, metals, and sulfide.

On top of the issue about dewatering the mine and disposing of the drainage water, there is also the disposal of the mined rock extracted from the mine. Much of the disposed materials would be stored on the land surface, exposed to the atmosphere, large fluctuations in temperature, solar radiation, and precipitation. These mine waste piles will be sources of toxic constituents, the control of which will prove to be very challenging to the mine operation.

In summary, we can conclude without a doubt that the development of the underground mine will have an impact on the hydrologic balance of the area. With regard to the impact on groundwater quality and surface quality in the area, previous assessments of such mines around the world have concluded that the mining industry has a very poor track record with regard to preventing water quality degradation when mining sulfide ores. Citizens are therefore right to question such mining proposals.

SUMMARY
Mining areas in northeastern Minnesota have been a major contributor to the economic well-being of the state, and to the nation. However, we still need to live with the changes that the mining operations have had on the natural landscape. Because the geology of the subsurface is so complex, the only way to test for possible mine dewatering impacts would be to conduct a pumping test for a sufficiently long period to better understand water flow dynamics. Even in the event that the pumping of the mine does not lead to negative impacts on the surface waters, there is the issue of the disposal of the pumped water and how this water will affect the environment. The quality of the pumped water needs to be determined to assess whether there are any undesirable constituents dissolved in the water, and if so the water will need to be treated. In addition, the disposed materials would be stored on the land surface, exposed to the atmosphere, large fluctuations in temperature, solar radiation, and precipitation. Control/treatment of constituents in the drainage water coming out of these materials will also pose a serious challenge to the mine operators.

Tamarack Talon Metals Mine Risks

We are NOT making this up. All of this information is published in the Talon Metals PEA, a lengthy 350 page document posted on their website. You can read it here: **https://talonmetals.com/wp-content/uploads/2021/02/Talon-Tamarack-PEA3_2021.pdf**

Talon plans to pump up to 2.6 million gallons of water a day out of our local aquifers.

(SOURCE: PEA p. 276). Even if filtered, this level of pumping will surely lower water levels substantially in our lakes and wetlands. And where to they put all this water?

During mining operations, development rock and high sulfide ore storage areas would exist. Although these storage areas will hopefully be lined, we know from the Eagle Mine that such liners leak over time resulting in future contamination of the area.

Wind will blow the dust from the contaminated rock/ore storage areas and mine ventilation shafts into the surrounding area. This dust will contaminate the environment and pose human health risks.

Learn more at **tamarackwateralliance.org** and **tamarackmine.org**. We hope you will share this information with others and keep in touch as we build a community that can protect water and health from the dangers of sulfide mining.

"The severe and virtually permanent harm sulfide mining could cause to clean water calls into serious question whether it has a place in the transition to renewable energy. A serious commitment to reusing and recycling the mineral

reserves above ground could go along way toward meeting demand. "

Local View: No Need To Sacrifice Clean Water for Clean Energy
Abby Rogerson, Northeastern Program Associate for MCEA
Duluth News Tribune,October 15, 2022,.
https://www.duluthnewstribune.com/opinion/columns/local-view-no-need-to-sacrifice-clean-water-for-clean-energy?auth0Authentication=true

---

Who We Are

Tamarack Water Alliance (tamarackwateralliance.org) is a group of local residents and landowners working together with others from across Minnesota to protect water and community health from the dangers of sulfide mining near our beloved lakes and wild rice beds, at the headwaters of the Kettle River and in the Mississippi River watershed.

A proposal by a foreign owned mining company to mine nickel and other metals near Tamarack in Aitkin County threatens the health of our communities. This kind of sulfide mining, especially in water-rich environments, has never been done without severe impacts to water and the health of those downstream. Mining here is also a threat to environmental justice and the long-term economic security of nearby native and rural communities.

Review our community slide presentation,
(**tamarackwateralliance.org/docs/TamarackMineConcerns-Consolidated.pdf**)

Download seven informative flyers:
(**https://tamarackwateralliance.org/resources.html**)

- Talon Mine Risks,
- High Sulfide Mines Create Acid Mine Drainage,
- Nickel Not Needed for Future EV Batteries,
- Minnesota's Prime Wild Rice Lakes Under Threat,
- Minnesota Regulators Poor Record In Protecting The Environment,
- Responsible Mining
- Eagle Mine Environmental Report & Saving Our Meager Nickel Reserves

We will be sending this monthly newsletter to keep you informed about this project, to share information and opportunities to act, and to invite you to gatherings where you can connect with others who share a passion for clean water and community health.

Copyright © 2022 Tamarack Water Alliance, All rights reserved.