



Tamarack Water Alliance

Talon Tamarack High Sulfide Nickel Mine Project

- **About the Proposed Tamarack High Sulfide Mine**
- **Impact of High Sulfide Mining**
- **Key Mining Concerns**

<https://tamarackwateralliance.org/>

Who is Talon Metals?

- ❖ Talon Metals is a mineral exploration and marketing company registered in the British Virgin Islands with offices in Toronto Canada and Tamarack MN.
 - The Tamarack Project is currently 51% owned by Talon Metals Corp. (Talon), and the remaining owned by Kennecott Exploration Company (Kennecott / Rio Tinto) and is operated by Talon.
 - Talon has NO revenue and is classified as a VERY risky stock has been in decline since 4/22
- ❖ In August 2023, Talon announced it only had about \$11M (US) in working capital
 - Their working capital has been from the issuance of new stock – 860M shares outstanding
 - Their stated focus is on a Feasibility Study to raise more funds.

0.17 USD

+0.11 (184.00%) ↑ past 5 years

Oct 16, 12:19 PM EDT • Disclaimer

1D | 5D | 1M | 6M | YTD | 1Y | 5Y | Max



The Proposed Tamarack Mine

- ❖ Talon plans to build an underground high sulfide nickel-copper mine near Tamarack, MN in Aitkin County.
 - Located in a wetland area, in the 1855 treaty territory / Anishinaabe lands, near Minnewawa and Big Sandy Lake... Mississippi and Kettle Rivers (St. Croix).
 - Talon has submitted an Environmental Assessment Worksheet (EAW) in June 2023.
 - DNR, in September, replied with 772 comments on the EAW for Talon to address
 - <https://files.dnr.state.mn.us/input/environmentalreview/tamarack-nickel/2023-09-21-1-dnr-comments-june21-eaw-submittal.pdf>. And <https://www.dnr.state.mn.us/input/environmentalreview/tamarack-nickel-project.html>.

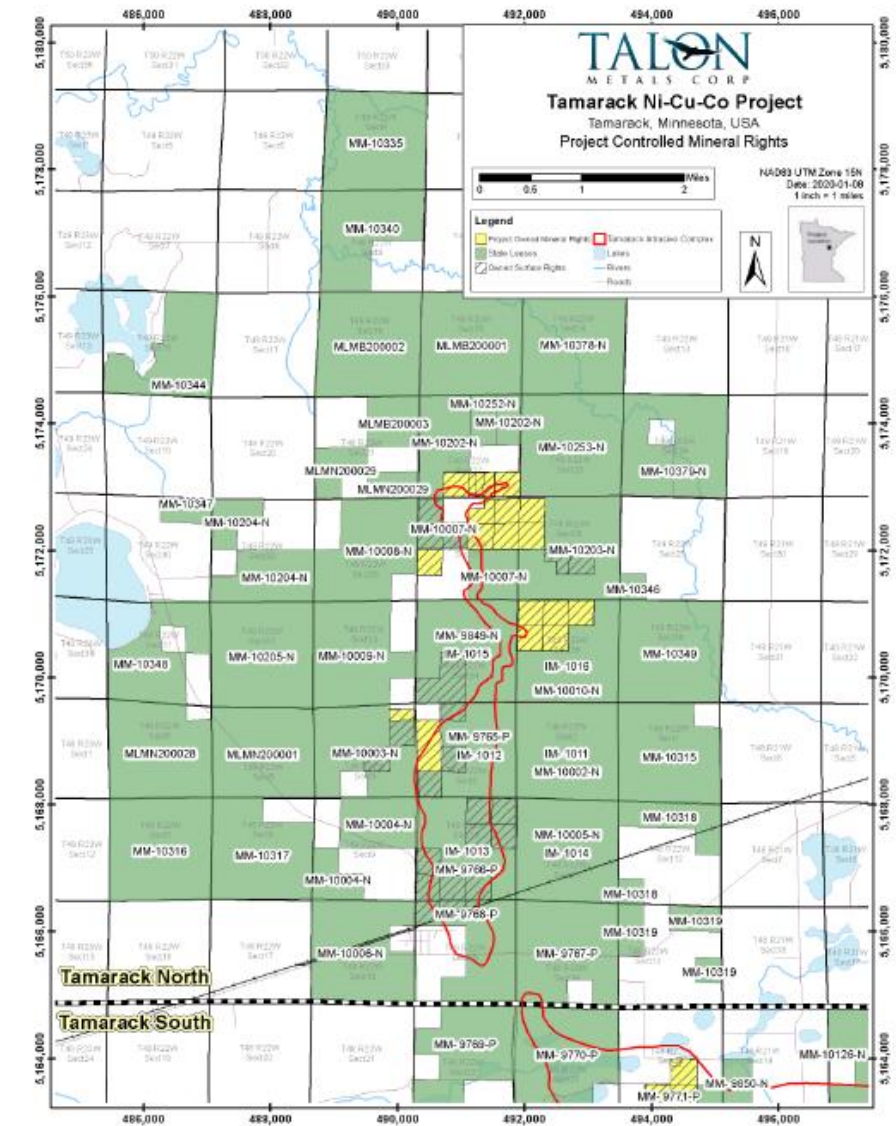
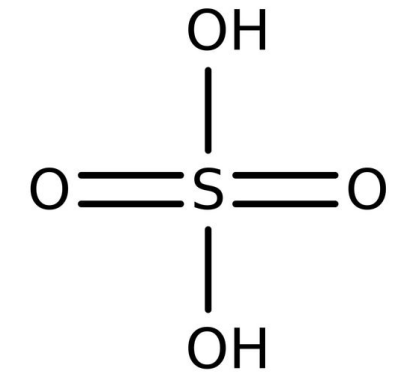


Figure 4-2: Tamarack North Project Mineral and Surface Rights

High Sulfide Nickel-Copper Acid Mine Drainage/Waste

- ❖ This NOT an iron mine! Nickel-Copper-Cobalt minerals are bonded to sulfur mined as sulfide ores
 - When these ores are exposed to air and moisture, a chemical reaction occurs that generates **sulfuric acid** that migrates into the surrounding environment and, through leaching, releases heavy metals present in the waste rock, pit walls, and tailings basins of mining operations.
 - Tamarack sulfide deposits (and tailings) also contain cobalt – a highly toxic mineral
 - The sulfuric acid along with dissolved heavy metals released onto the land will seep into the rich aquifers below and then into streams and lakes at levels that are toxic to fish and other aquatic life
 - Sulfates interact with sulfate-reducing bacteria to produce the more bio-toxic form of mercury, methylmercury, a known neurodevelopmental toxin
 - This type of pollution is commonly referred to as Acid Mine Drainage (AMD).
 - The close proximity of sulfide mines to valued water bodies such as lakes and rivers of the Mississippi watershed intensifies the magnitude of this issue.
 - All of the water bodies in the Tamarack area are linked by multiple aquifers.



Sulfuric Acid

A very strong acid

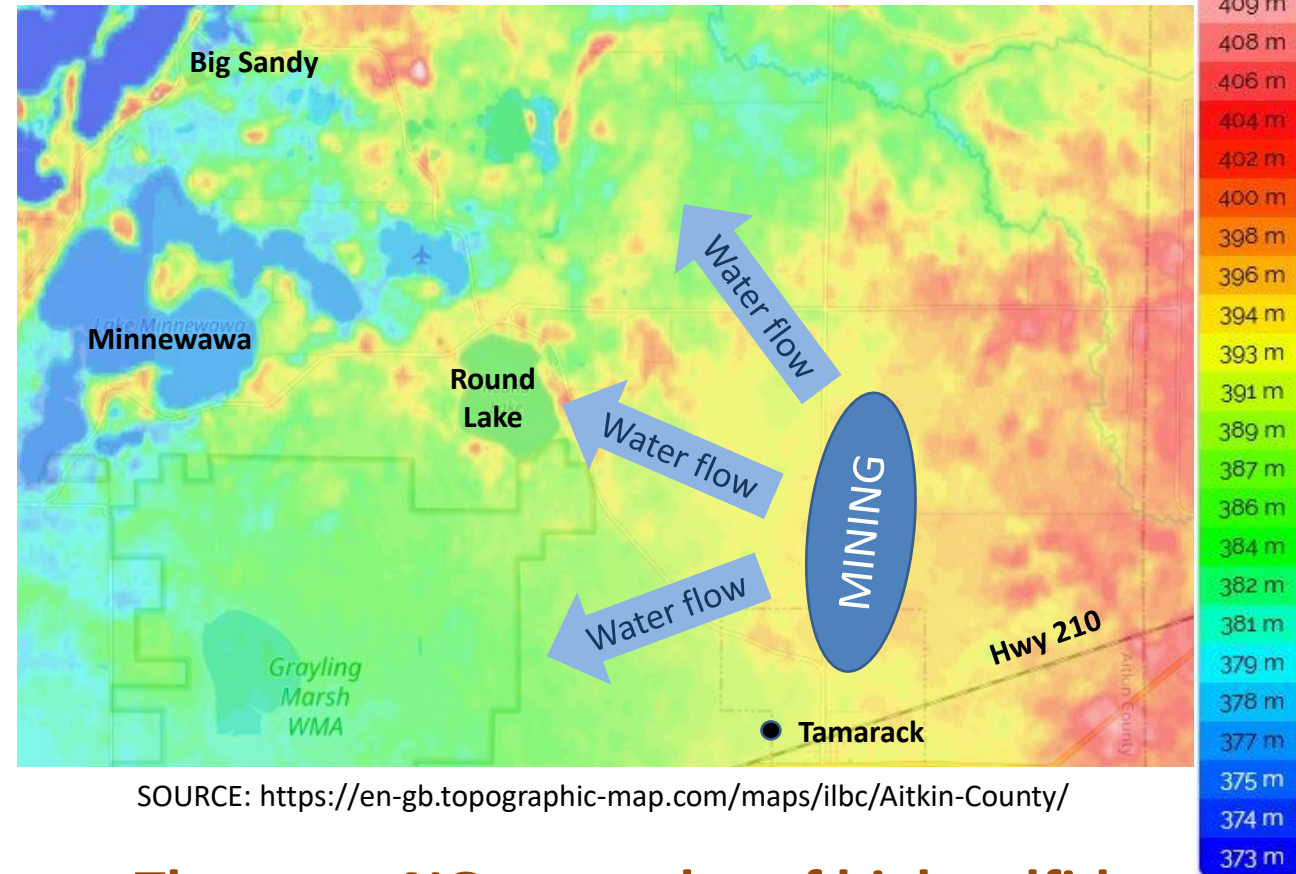
The chemical reaction of sulfide ore / tailings to sulfuric acid can happen over long periods of time – many 100's of years

Acid Mine Drainage

- ❖ A literature review on acid mine drainage concluded that “no hard rock surface mines exist today that can demonstrate that acid mine drainage can be stopped once it occurs on a large scale.”
- ❖ Acid runoff from the Summitville Mine in Colorado killed all biological life in a 17-mile stretch of the Alamosa River. The site was designated a federal Superfund site, and the EPA has spent over \$210 million on clean-up.
- ❖ Zortman Landusky mine in north central Montana filed for bankruptcy in 1998 leaving the state of Montana with the liability for \$33 million in long-term water treatment and reclamation costs

SOURCES:

- https://earthworks.org/issues/acid_mine_drainage/
- <https://www.usgs.gov/mission-areas/water-resources/science/mine-drainage>
- <https://www.epa.gov/nps/abandoned-mine-drainage-additional-resources>



There are NO examples of high sulfide mines in water rich areas that do not pollute the environment

Documented Health Risks of Sulfide Mining in Minnesota

- ❖ Sulfide Mining and Human Health in Minnesota

https://pubs.royle.com/publication/?i=352462&article_id=2624726&view=articleBrowser

- ❖ Risks and costs to human health of sulfide-ore mining near the Boundary Waters Canoe Area Wilderness

<https://www.tandfonline.com/doi/abs/10.1080/10807039.2019.1576026>

- ❖ Sulfide-ore mining AND human health in Minnesota - WHERE ARE WE NOW?

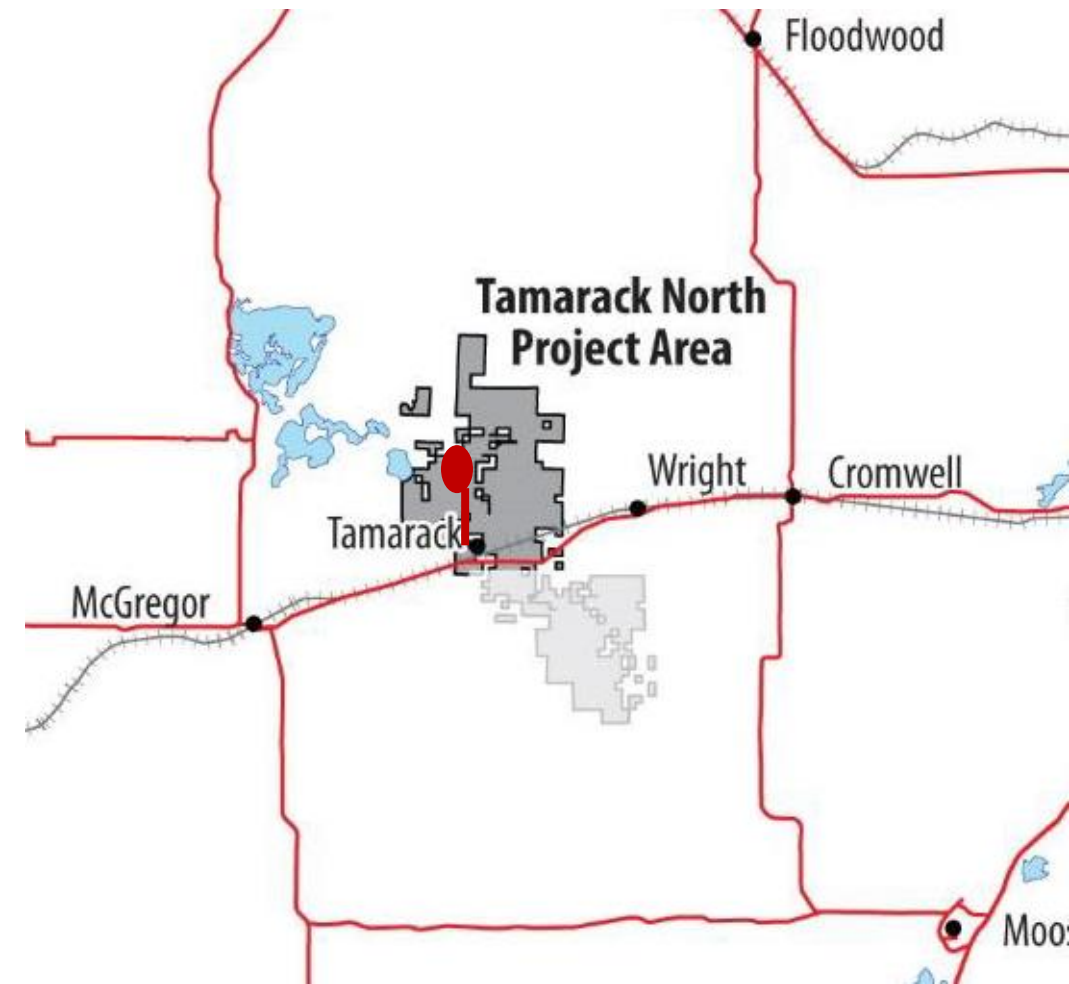
<https://www.savetheboundarywaters.org/sites/default/files/resource-file/MNMedicine2022.pdf>

- ❖ Human Health and Sulfide Mining

<https://www.tamarackwateralliance.org/docs/HumanHealthAndSulfideMining.pdf>

Proposed Tamarack High Sulfide Nickel-Copper Mine

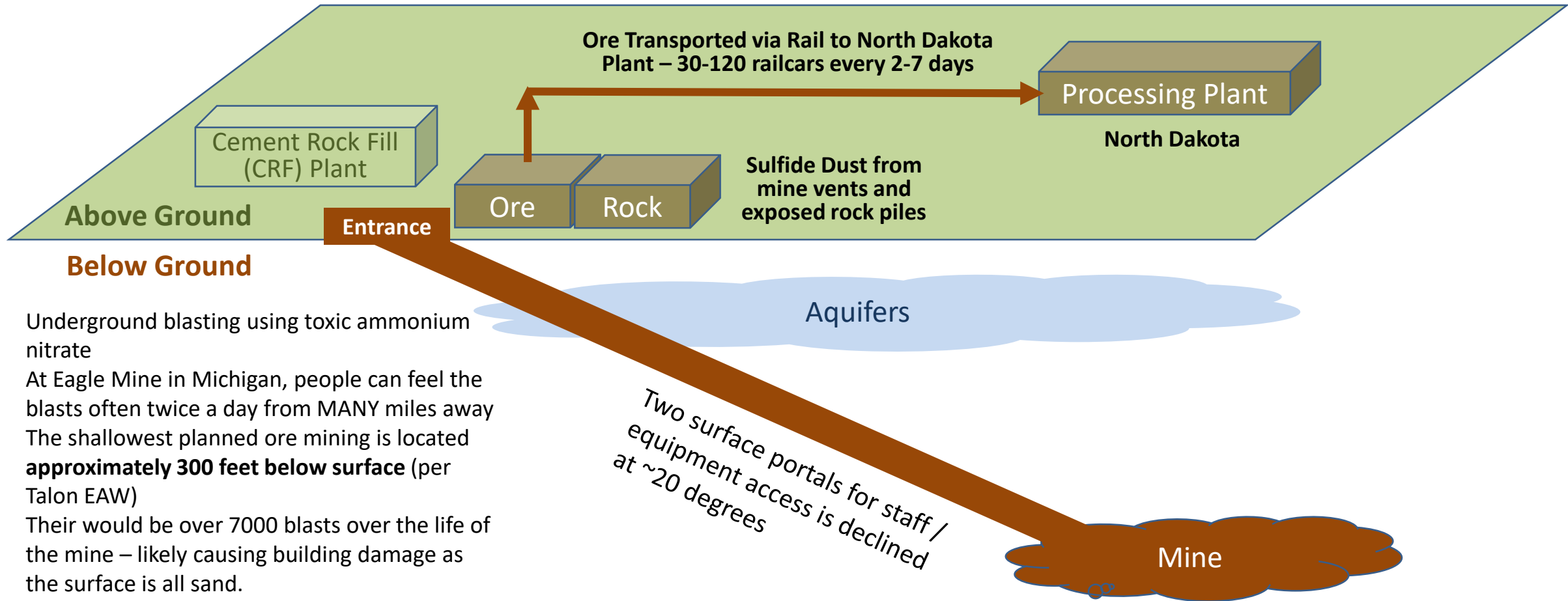
- ❖ The Tamarack North Project covers approximately 20,348 acres - Nearly **32 square miles** – but current EAW is looking at 447 acres (sq mile is 640 acres)
 - With plans to mine between ~8 million tons of ore over an 7-10 year period
 - Concerns based on Talon's EAW Submission to the State of Minnesota (June 2023)
 - Vented airborne dust from blasting and ore handling is contaminated with sulfide particles and not completely addressed by Talon's mine plan
 - Talon must pump 2.3 million or more gallons a day from the mine due to water entering from the aquifers and service water used in operations – Discharge of water as well as lowering of aquifer, lake and well levels are of concern
 - Mine site includes temporary holding piles which are not lined and will be subject to weather related spread of sulfides and other contaminants
 - Talon will be blasting daily which may cause local building foundation damage and can be felt for many miles
 - Rail transport will leak sulfides all along the route to the ND plant



How the Mine Works

BASIC OPERATION

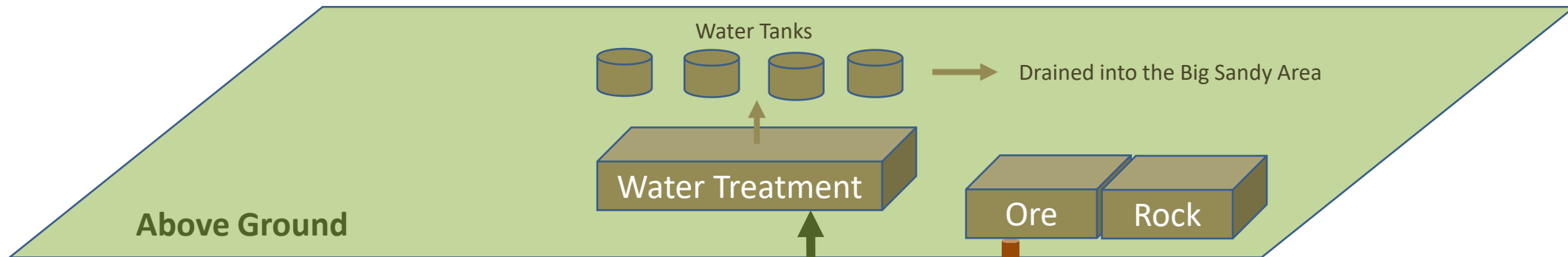
- Blast out stopes to collect ore
- Bring ore to the surface and store
- Ship ore over rail (**30-120 railcars every 2-7 days**) to North Dakota



- Underground blasting using toxic ammonium nitrate
- At Eagle Mine in Michigan, people can feel the blasts often twice a day from MANY miles away
- The shallowest planned ore mining is located **approximately 300 feet below surface** (per Talon EAW)
- There would be over 7000 blasts over the life of the mine – likely causing building damage as the surface is all sand.
- Blasts can open new cracks in the bedrock increasing water quantities that must be pumped

Water Balance Details

1. From page 228 of the 2021 PEA
2. Numbers vary from year to year



Above Ground

Below Ground

Approximately 2.3 million gallons of water must be pumped from the mine as a result of water leaking in from the aquifers above and mine service water based on the Talon model – but model may not apply in this area as there are no underground mines in Minnesota.

The amount of dewatering necessary may be much higher if blasting increases the number of water bearing features.

This water is sulfide contaminated water that must be filtered – Talon plans a membrane based filter, storage tanks, then discharge into a ditch that flows into the Big Sandy area. No studies provided to assess the environmental damage.

Aquifers

Mine

Blasting can open new fissures increasing pumping requirements

Talon notes groundwater inflows are based on an average inflow of 9.9 gpm per water bearing feature with one water bearing feature per 216m of drill data as measured through past logging.

Net water that must be pumped from the mine may be much greater than the 2.3 million gals/day and will likely affect aquifer, lake and well levels. At Eagle Mine monitor point QAL023B, the mean water level readings are often 1.7 feet (ft) below the calculated minimum background baseline level - pumping only 5% of Talon Mine levels

But Don't We Need Nickel?

❖ Talon argues that nickel is needed for EV batteries

NO – EV battery industry quickly moving away from nickel based batteries

❖ If you don't support Talon's nickel mine – you must be in favor of child labor practices in Africa

NO – Africa does not actually produce nickel (its not listed in the USGS survey on nickel). Africa does produce cobalt but Talon is not mining cobalt (per the EAW).

❖ But we need nickel for solar panels, cell phones and all our electronic toys.

NO – Solar panels and electronic devices use silicon ... from chips to solar cells ... made from sand



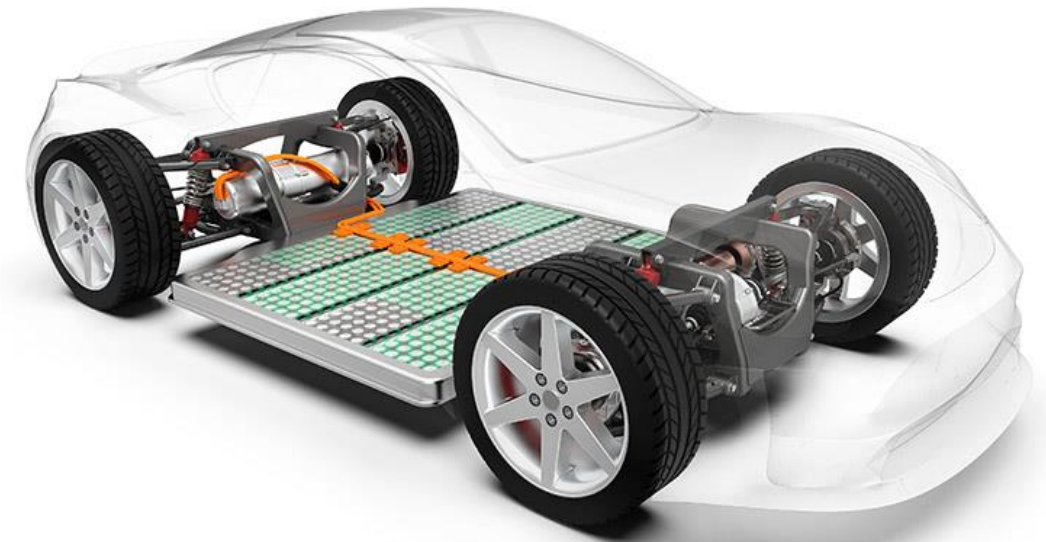
Price of nickel falling to pre-EV craze days ... making Tamarack nickel too pricey for stainless steel

But Don't We Need Nickel?

- ❖ Tamarack North Mine Will Make NO difference in the Global Supply of Nickel
 - Only 0.5% of the world's supply of Nickel comes from the US (Michigan Eagle Mine)
 - US only possesses 0.375% of the worldwide reserves of Nickel (Michigan and Tamarack)
 - Instead of shipping this nickel onto global markets / China, should we not save our meager reserves for the future?

Tamarack Nickel will make no difference in the global supply of nickel ... but will serve to increase profits for Rio Tinto

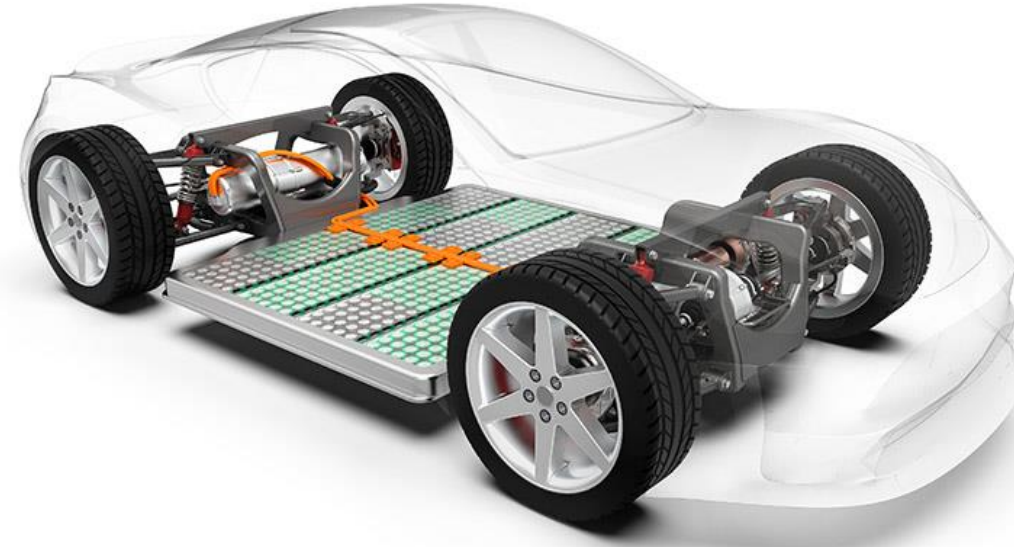
From the USGS <https://pubs.usgs.gov/periodicals/mcs2023/mcs2023-nickel.pdf>



Tesla publishes their list of mineral suppliers on an ongoing basis and guess what TALON IS NOT ON THE LIST
(<https://electrek.co/2022/05/06/tesla-list-battery-material-suppliers-long-term-nickel-deal-vale/>).

But Don't We Need Nickel?

- ❖ EV Batteries - Nickel costs \$18,000 per tonne (10/2023) and its use makes EVs unaffordable for most people
 - EV batteries using Li-Ion technology can cost \$20,000 when nickel was \$10,000 per tonne ... now battery costs have sky rocked!
 - Nickel batteries can never be a solution to affordable EVs
- ❖ Tesla has announced a long term shift to (LFP) Lithium Ferrous Phosphate EV batteries – safer and longer life
 - Tesla 1Q22 quarterly report – nearly 50% of their vehicles in that quarter were already shipping with LFP (no nickel) batteries and
 - Tesla is transitioning their fixed battery product line to LFP
- ❖ Gotion unveiled a lithium manganese ferrous phosphate (LMFP) battery, with an energy density comparable Li-Ion (nickel)
- ❖ CATL is trialing a Sodium Ion EV battery – no nickel but made with locally sourceable inexpensive materials
- ❖ Lyten Corp and others are trialing a Lithium-Sulphur battery (no nickel) that has 2-3 times the energy density of the old Nickel based Lithium-Ion batteries – for much longer range vehicles.



Industry is quickly moving away from Nickel & Cobalt based EV batteries due to the high cost of these materials

Concerns - Air

- ❖ Vented airborne dust from blasting and ore/rock handling and storage is contaminated with sulfide particles and other toxic minerals – Eagle Mine monitors for at least 33 toxic substances
- ❖ Talon EAW simply tries to “reduce particulate matter” not filter toxins.
- ❖ Eagle Mine does a very poor job at managing dust – a possible cause of the water contamination demonstrated in the Eagle Mine Exception report
 - After including an air filtration system in its original permit, Eagle sought to have it removed in 2013, which the MDEQ approved, blowing a plume of unfiltered mine emissions out over the Salmon Trout River and the Yellow Dog Plains. No stack monitoring is taking place, and the emissions have not been measured since September 2014, before the mine was in full operation.
Source: Mining Action Group <http://savethewildup.org/about/eagle-mine-facts/>
 - <http://savethewildup.org/2013/03/air-filtration-necessary-on-eagle-mine-air-stack-to-keep-air-clean/>



Mining dust has saturated and stained the Flags on the Eagle Mine bulletin board.

2021 Annual Mining and Reclamation Report, Eagle Mine, LLC
(https://www.eaglemine.com/_files/ugd/145c36_8ba8f315c6d04aec933216a522621511.pdf)

Concerns - Water

- ❖ Talon must pump 2.3 million (or more) gallons a day from the mine due to water entering from the aquifers and service water used in operations
 - Is the Talon water model valid? No underground mines in Minnesota to vet the model means this estimate may be way low
 - Pumping requirements may actually be **substantially higher** due to blasting which may open new crevices
 - No studies to show the environmental impact of dumping this much water on the surface
 - Aquifer levels and surface water impacts are of concern (no studies provided to address this concern)
 - Lower aquifer levels may cause subsidence (sink holes) on the surface
- ❖ At Eagle Mine monitor point QAL023B, the mean water level readings from 10/2019 – 9/2020 were a maximum of **1.7 feet (ft) below the calculated minimum background baseline level**
 - Mine attributed this drop in water levels to pumping of the mine services well and groundwater infiltration into the mine
 - This drop in water levels is then due to an average pumping requirement of 80,000 to 150,000 gallons a day – what happens at the Talon Tamarack site where it's estimated that 2,300,000 gallons might be pumped per day ... **approximately 20 times more than Eagle Mine**
- ❖ Water levels at many Eagle Mine wetland monitoring locations fell up to six inches below pre-mining baseline levels when overall water levels have been increasing since the fall of 2013
- ❖ Eagle mine listed at least 17 monitoring events that show levels of pollution and water chemistry changes outside the planned benchmark range – some with sulfate levels that exceed MN wild rice standards by x1500

Concerns – Ore/Rock Storage

- ❖ Tamarack Talon Mine site will include “temporary” storage areas for development rock and ore to be shipped to North Dakota
 - These areas must be lined but we know linings leak over time (Talon EAW does not address use of liners)
 - These areas also become a source of wind blown dust into the environment
 - “Temporary” may be as long as 10 years.
- ❖ At Eagle Mine TDRSA (Temporary Development Rock Storage Area) is lined with both a primary and secondary lining
 - A leak detection system is installed between the liners to monitor primary lining integrity
 - A total of approximately 55 gallons of water was purged from the leak detection sump in 2020, a larger volume than 2019.
 - Thus we see that the lining system does leak after only a few years of operation
 - **The leak levels are currently very small at this point but as noted in the document, increasing slightly over time.**

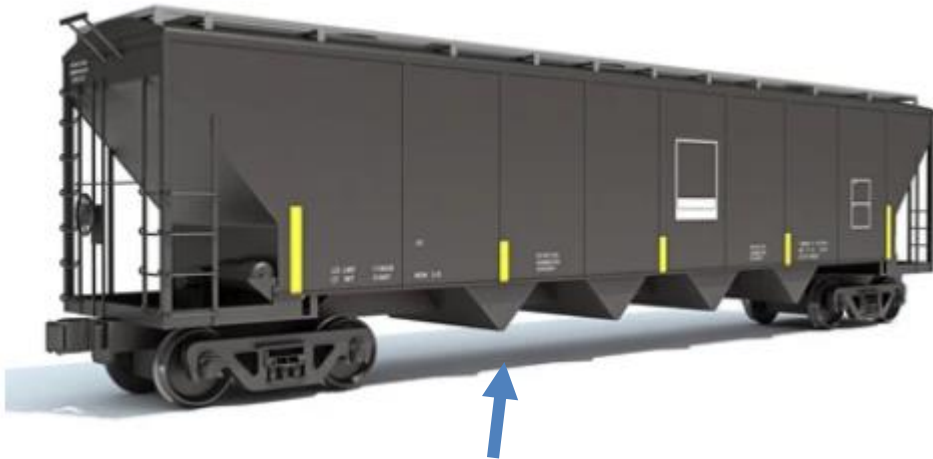
Concerns – Blasting

- ❖ **Page 13 of EAW:** “Blasting – The explosives are initiated to break the rock.” ... “The blast holes are loaded with explosives, consisting of either ANFO (**ammonium nitrate** and fuel oil) in prill (pellet) form, or a water-resistant ANFO emulsion (explosive mixture). “
 - Blasting would normally occur at shift boundaries when the mine is evacuated of personnel – 2-3 times a day ... potentially **over 10,000 blasts** in a 10 year life of mine period
 - No shake table tests were presented – over time, constant shaking of the ground will cause foundations to fail / sink causing significant damage to nearby structures.
- ❖ Parts of Oklahoma now have the same earthquake risk as California — and a new study found a scarily direct link to fracking (<https://www.businessinsider.com/earthquakes-fracking-oklahoma-research-2018-2>)
 - A large increase in small tremors (similar to the blasting) due to fracking have resulted in significant road and building damage.
- ❖ Talon has produced NO studies to support their claim that blasting is “no problem”

Blasting may occur anytime of day or night, 2-3 times a day, disrupting life and likely causing building damage over time

Concerns – Rail Transport

- ❖ **Page 20 of EAW:** “An outgoing shipment of approximately 30-120 railcars would be collected by the BNSF approximately every 2-7 days. The Ore and Class 3 development (high sulfide) rock would be transported by railway from the Project Area to a stand-alone processing facility with a concentrator located off-site.”



Normal “hopper” style rail cars SHOULD NOT be used as sulfide particles (“fines”) will fall through the hopper doors on the bottom



Gondola cars may work BUT many gondola cars still have openings in the bottom that can leak materials. These have to be flipped upside down to empty since there is no bottom hatch. This will require a 'rotary car dumper' in North Dakota.

Concerns – Rail Transport (2)

- ❖ **Page 20:** “An outgoing shipment of approximately 30-120 railcars would be collected by the BNSF approximately every 2-7 days. The Ore and Class 3 development rock would be transported by railway from the Project Area to a stand-alone processing facility with a concentrator located off-site. ”
- ❖ In addition, since mine conditions are “very wet” (water is sprayed after a blast as part of dust mitigation and to clear loos rock), the ore will be wet.
- ❖ Thus when transported in freezing temperatures over long distance the ore freezes making it impossible to unload from the rail car.

What other chemicals or mitigations will Talon need to deal with rail transport freezing? And what are the environment impacts?

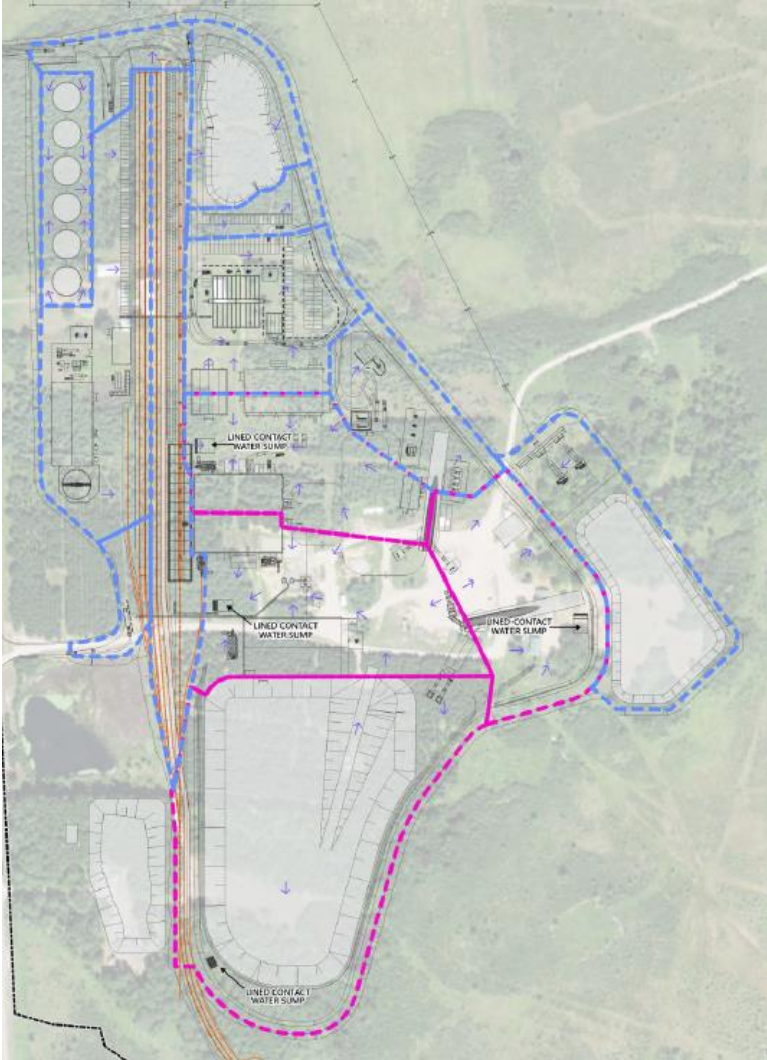
Concerns – Wetland / Peat Damage

- ❖ **Page 5 of EAW: “...some degree of construction in the wetlands is unavoidable in order to connect the existing railway to the main mine site. Areas of shallower peat would be excavated and replaced with fill material, while limited areas of deeper peat would require installation of pilings.”**

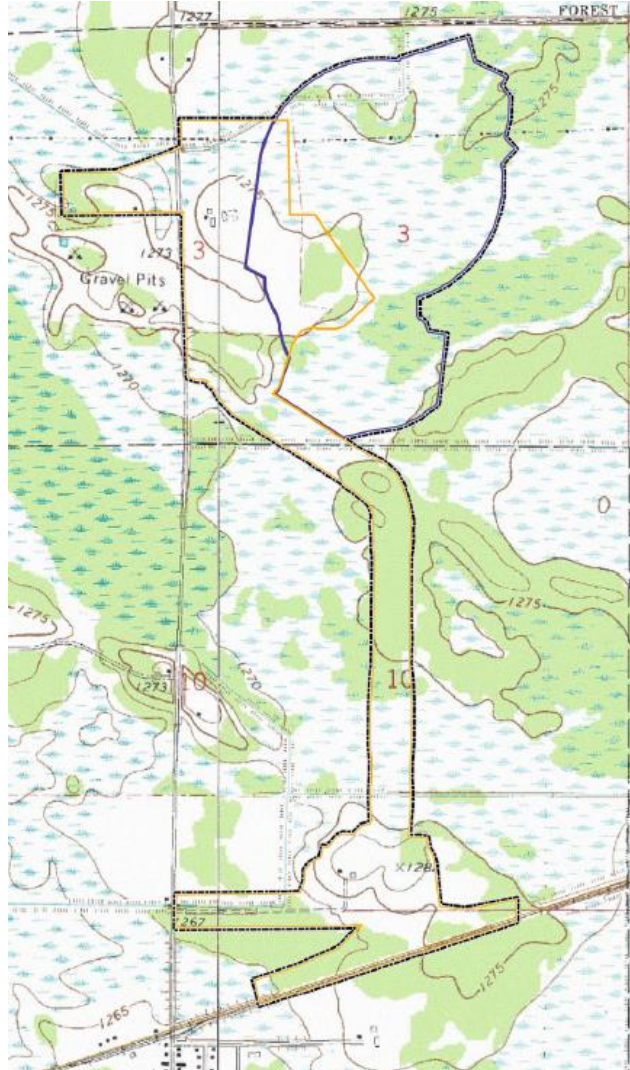
Talon Mine References

- ❖ All mine related information is taken from the publically available Talon documents
 - TALON 2021 Preliminary Economic Analysis - PEA (https://talonmetals.com/wp-content/uploads/2021/02/Talon-Tamarack-PEA3_2021.pdf)
 - Talon 2022 PEA ([https://talonmetals.com/wp-content/uploads/2022/11/Final NI43101 Report Talon TamarackN 20221102.pdf](https://talonmetals.com/wp-content/uploads/2022/11/Final_NI43101_Report_Talon_TamarackN_20221102.pdf))
 - Talon Environmental Assessment Worksheet submitted in June 2023 - <https://files.dnr.state.mn.us/input/environmentalreview/tamarack-nickel/06212023-talon-nickel-tamarack-mining-project-eaw-form.pdf>

Mine Maps



Mining Facility



Tamarack Mine Concerns

