Tamarack Water Alliance

Talon Tamarack High Sulfide Nickel Mine Project

https://tamarackwateralliance.org/

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

Who is Talon Metals?

- Talon Metals is proposing a high sulfide underground nickel mine near Tamarack, MN
- 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 funds much of its operations by launching marketing campaigns then “selling more stock”
  - Talon has incurred losses from operations and has an accumulated deficit of $76 million US (11/2024)

The Proposed Tamarack Mine

- Talon proposes to build an underground high sulfide nickel-copper mine near Tamarack, MN in Aitkin County.
- 7-10 years of production with a total yield of about 8.2 M tons of ore (EAW line 1102)
  - Talon has submitted their a recent Environmental Assessment Worksheet (EAW) in December 2025.
  - Located in a wetland area, in the 1855 treaty territory / Anishinaabe lands, near Minnewawa and Big Sandy Lake... Mississippi and Kettle Rivers (St. Croix).
  - They claim project construction may start in 2027 (earliest), and the construction duration is anticipated to be 24 months, with production starting in 2029 (EAW line 418)
  - Target mine area is 447.0 acres (Line 351) out of the 20,348 acre Tamarack North Project area (green on the right) (2%)

- https://files.dnr.state.mn.us/input/environmentalreview/tamarack-nickel/2024-12-12-tal-amended-eaw-data-submittal.pdf
- https://files.dnr.state.mn.us/input/environmentalreview/tamarack-nickel/2024-12-12-tal-amended-eaw-data-submittal-figures.pdf
- TALON 2021 Preliminary Economic Analysis - PEA (https://talonmetals.com/wp-content/uploads/2021/02/Talon-Tamarack-PEA3_2021.pdf

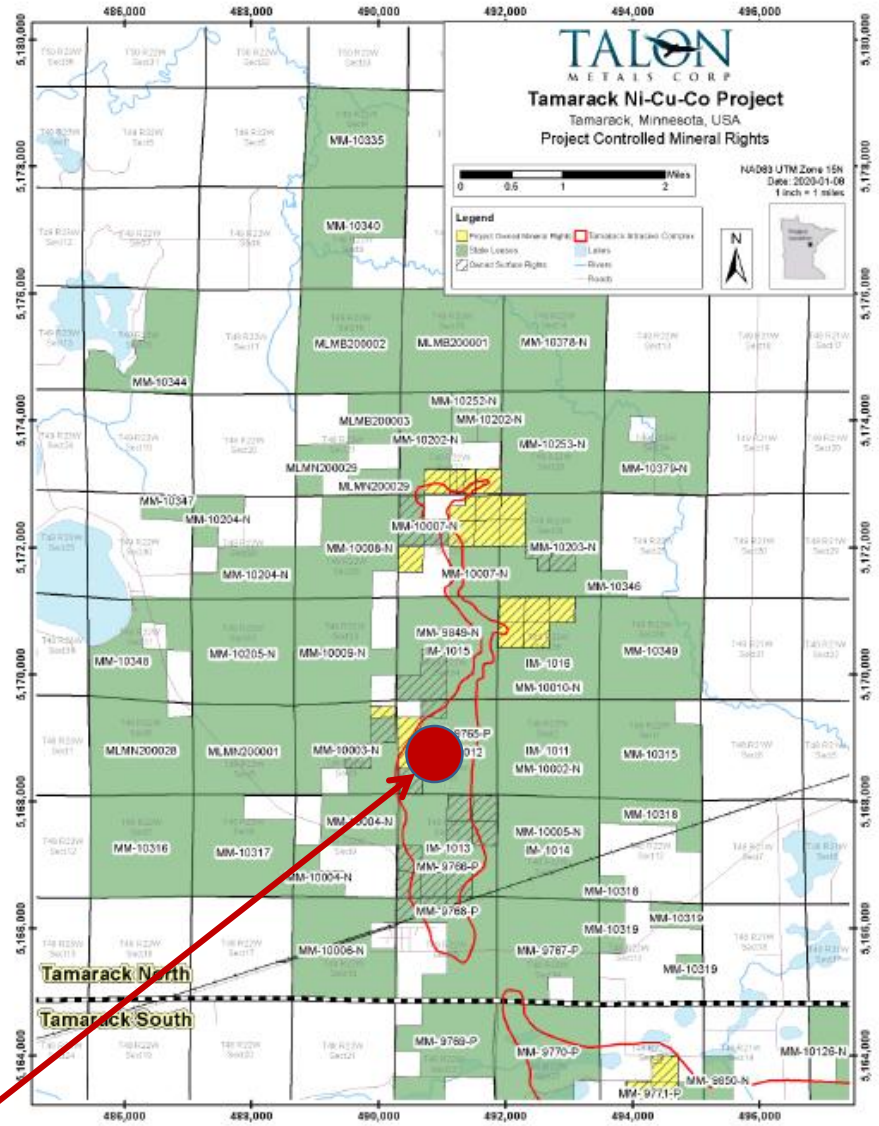


Figure 4-2: Tamarack North Project Mineral and Surface Rights

Taconite is **NOT** a High Sulfide Mining Operation

Taconite (Iron)

- **Grade**
  - Taconite is low grade ore (20-30% iron)
- **Found With**
  - Iron is bound in silica minerals (SiO_2 like quartz, … asbestos, …) and iron oxides
- **Price -> $120 per tonne (metric)**
- **Ownership -> Often US owned** (US Steel now owned by Nippon Steel)

Unlike iron mining, copper and nickel mining in Minnesota is characterized by:

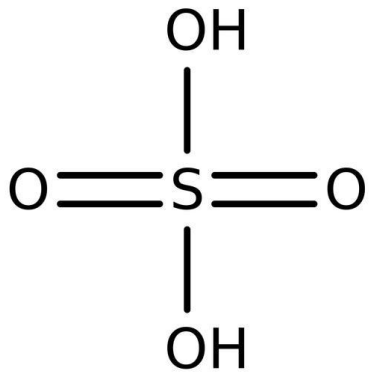
- Very high sulfur content (toxic impacts)
- Very low grades but high value
- Very large amounts of waste due to the low grade (sulfide contaminated)
- Foreign Owned

High Sulfide Mining (Copper and Nickel)

- **Grade**
  - Nickel from underground mines is generally in the range of 1.5-3% nickel (to be feasible) … some underground mines report much lower (0.19% numbers)
  - Nickel from open pit mines can be very low from 0.08% upward toward 0.5%
  - Copper from open pit mines can be 0.3% - 0.79% (Polymet)
- **Found With (in the Midwest)**
  - **Sulfides** -> Highly variable, e.g. the Arkansas Geological Survey, indicated ore with sulfur ranging from 6.5 to 32.4%
  - Deposits of up to 70% sulfur have been reported in MN
  - A high sulfide mine might have 10 times as much sulfur than the mineral being mined
- **Price -> Nickel $15,000, Copper $9,600 per tonne (sulfur is about $100 per tonne)**
- **Ownership -> Foreign companies (Rio Tinto, Glencore, Talon from Canada, …)**

High Sulfide Nickel-Copper Acid Mine Drainage/Waste

- Nickel-Copper-Cobalt minerals are bonded to sulfur mined as sulfide ores
  - A high sulfide mine might have 5-10 times as much sulfur than the mineral being mined
  - 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 toxic heavy metals present in the waste rock, pit walls, and tailings basins of mining operations – highly toxic to fish and aquatic life
  - Tamarack sulfide deposits (and tailings) also contain cobalt – a highly toxic mineral
  - Sulfur reducing bacteria convert free mercury in the environment to methyl- mercury which is highly toxic and accumulates in fish
  - 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.

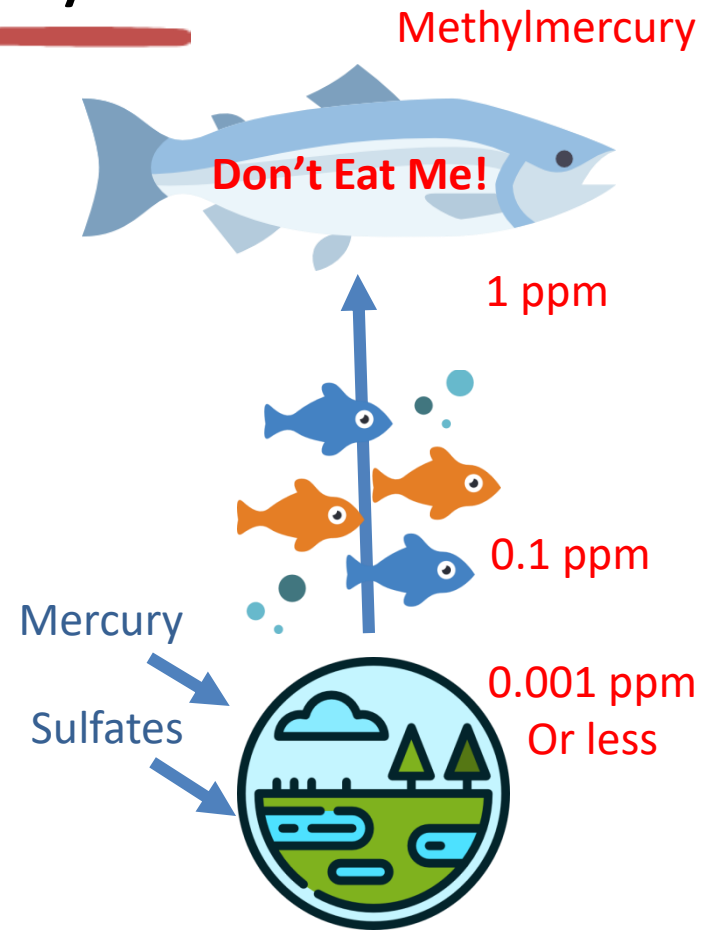


Sulfuric Acid
A very strong acid

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

Sulfate Reducing Bacteria Produces Methylmercury

- Atmospheric mercury (Hg) is the dominant source of Hg in northern Minnesota.
  - Taconite plants, are the largest industrial source of mercury pollution in Minnesota, have vented the toxic metal for years into the air without enforced limits.
  - https://www.startribune.com/epa-rule-targets-taconite-industry-mercury-polluter-minnesota-coal-regulation-earthjustice-tribe/600274349
  - Coal-fired power plants are another significant source of mercury
- Atmospherically derived Hg must be methylated prior to accumulating in fish
- Sulfate-reducing bacteria are the primary methylators of Hg in the environment
  - Sulfur + Mercury creates methylmercury
  - Sulfur historically comes from coal plants (e.g. Acid Rain), and to a lesser extent fertilizers and some soaps
- Methylmercury is a highly toxic substance that is fat soluble and thus can "bio-magnify" in the food chain (in fatty tissues), primarily in fish and shellfish.

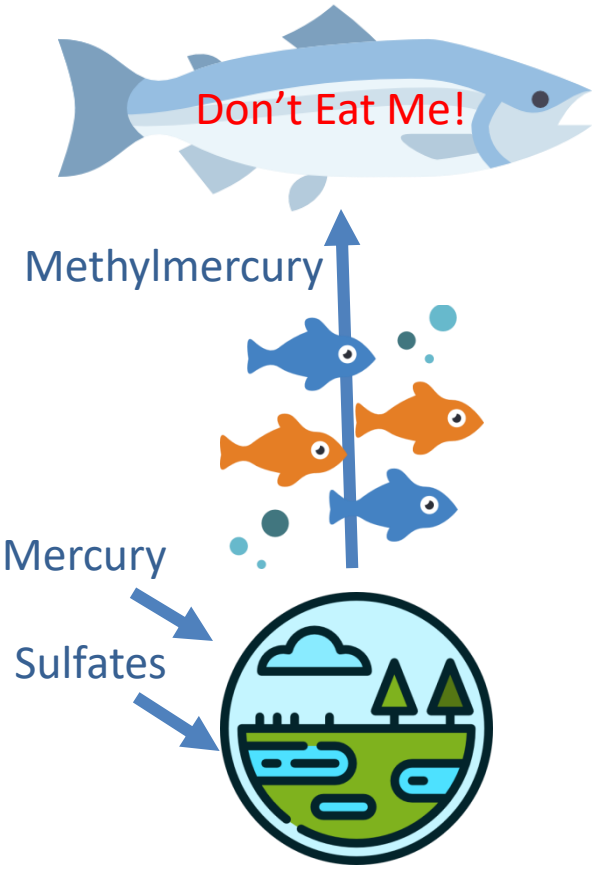


Methylmercury Presents a Serious Health Threat And is Created by Sulfate Reducing Bacteria

https://www.fs.usda.gov/nrs/pubs/jrnl/2006/nc_2006_jeremiason_001.pdf
https://www.pca.state.mn.us/pollutants-and-contaminants/mercury
https://pmc.ncbi.nlm.nih.gov/articles/PMC3514465/
https://www.ucsfhealth.org/medical-tests/methylmercury-poisoning
Fish icons created by Freepik, Smashicon and monkik - Flaticon

Methylmercury is VERY Toxic

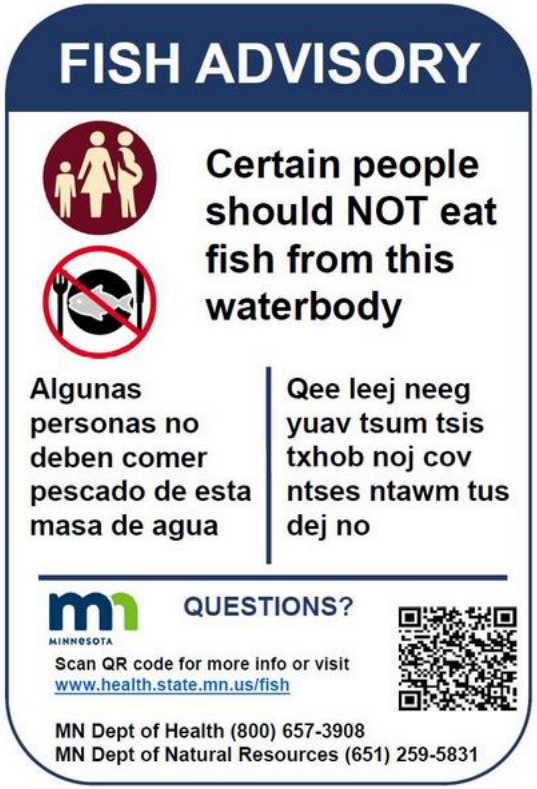
- Methylmercury can cause a wide range of health effects, including:
  - Neurological damage (e.g., tremors, seizures, memory loss)
  - Kidney damage
  - Cardiovascular problems
  - Developmental problems in children (e.g., brain damage, motor coordination difficulties)
- "Mercury in Newborns in the Lake Superior Basin" study showed that ten percent of tested newborns had concentrations of Mercury above the reference dose
  - Babies born during the summer months were more likely to have an elevated mercury level. suggesting that increased consumption of locally caught fish during the warm months is an important source of pregnant women's mercury exposure in this region
  - https://www.health.state.mn.us/communities/environment/fish/techinfo/newbornhglsp.html
- Karen Wetterhahn, a chemistry professor at Dartmouth College, died from mercury poisoning in 1997 due to accidental exposure to methylmercury
  - A few drops of the highly toxic compound seeped through her gloves
  - This led to her death about a year later
  - https://en.wikipedia.org/wiki/Karen_Wetterhahn



Local Lakes Are Already Impaired (mercury levels in fish)

- Impaired Lakes as listed in EAW (line 2150):
  - Round Lake (mercury)
  - Tamarack Lake (mercury)
  - Big Sandy Lake (nutrients and mercury)
- However – there are many more lakes in the area that are impaired including
  - Minnewawa (mercury)
  - Horseshoe (nutrients)
  - Savanna (mercury)
  - Glacier (mercury)
- Most of these lakes have generic fish consumption advisories due to mercury levels
- BUT only Round Lake which shares the same watershed as Talon has elevated mercury levels with specific limits

Mining Operations Will Only Make Lake Conditions Worse, Further Compromising Water Quality and Fish Consumptions Limits

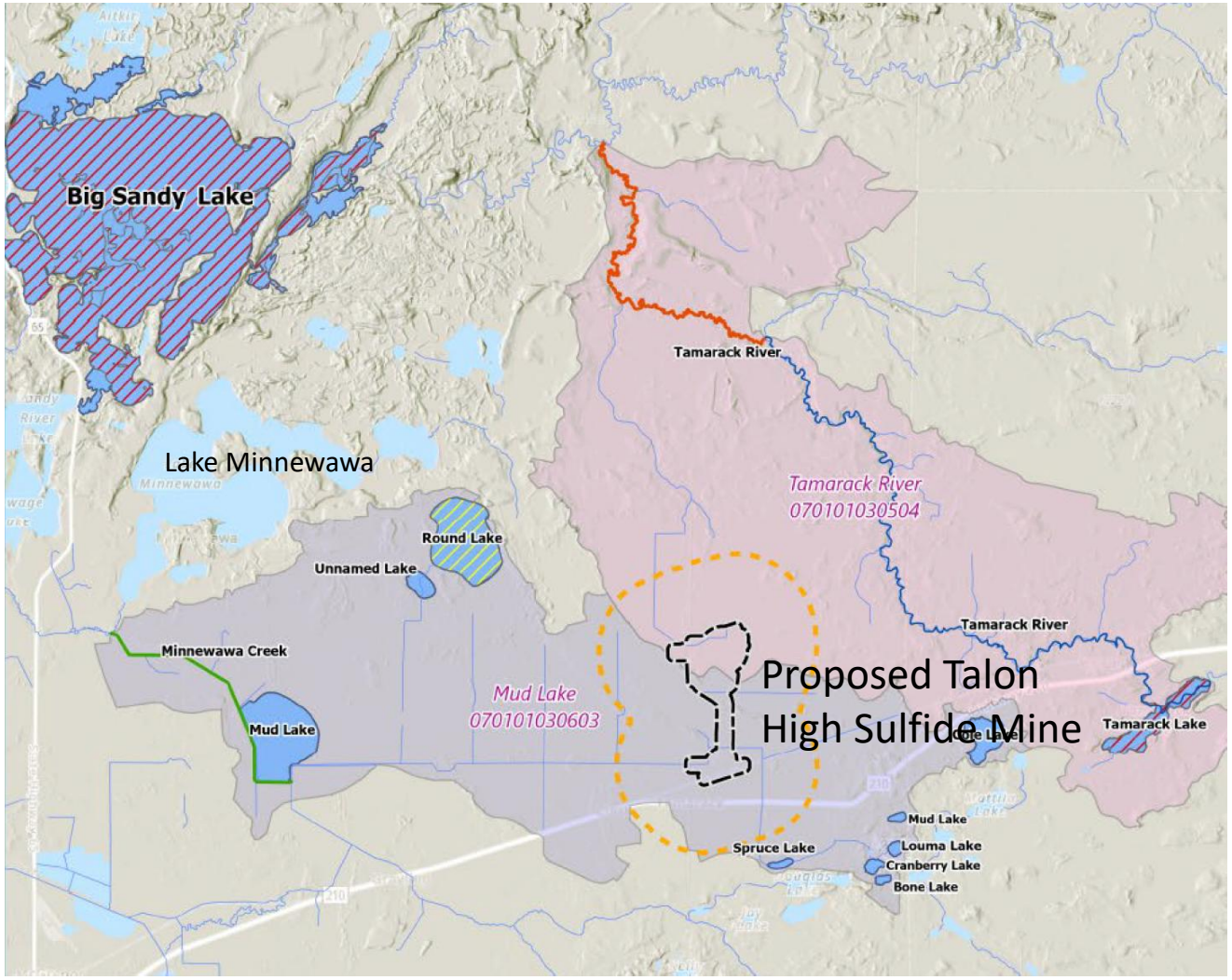


See list of *Minnesota Impaired Waters*: https://www.pca.state.mn.us/air-water-land-climate/minnesotas-impaired-waters-list
Minnesota Lake Finder for more detail:
https://www.dnr.state.mn.us/lakefind/lake.html?id=01002300
Fish consumption guidance can be found here:
https://www.dnr.state.mn.us/lakefind/fca/report.html?downum=01002300

An example – Round Lake Shares a Watershed with Talon

ROUND LAKE

- Round Lake is already impaired due high levels of mercury in the fish
  - DNR recommendation for Men, Boys Age 15 and Over, and People Not Planning to be Pregnant – Walleye -> 1 meal per month
- Round Lake shares the same watershed (Mud Lake Watershed) as the proposed mine
  - Tamarack drilling started in 2002 and sulfide drill "cuttings" have been dumped into pits without liners within a few feet of the water table
  - Sulfates interact with sulfate-reducing bacteria to produce the more bio-toxic form of mercury, methylmercury, a known neurodevelopmental toxin
  - Other area lakes are often designated as impaired but at a lower level with no specific fish consumption limits (as Round Lake has).



Talon Metals Has Been Dumping Toxic Drilling Waste On-site For Years

- Dumping has been going on since 2002 from more than 500 drill holes
- Materials “dumped” include high sulfide materials:
  - High sulfide cuttings from the drilling operations
  - These are known to create AMD
  - High sulfide materials react with environmental mercury to create highly toxic methyl-mercury
  - Sulfur above 10ppm will kill wild rice beds
  - Sulfuric acid created from this dumping can kill vegetation and leach heavy metals (toxic)
- And drilling fluids are used in cutting through rock
  - Even if these drilling fluids are food grade lubricants as Talon claims ..
  - Restaurants are not permitted to dump used cooking oil in their yards or anywhere else it might contact wildlife or the environment – EPA and MPCA rules require proper disposal by a waste management company.
  - Talon is not properly disposing these drilling fluids

RIO TINTO - TALON METALS HEADQUARTERS | DRILLING FLUID SUMPS

These pits are in the same watershed as Round Lake and only a few miles away

Acid Mine Drainage (AMD)

- AMD is primarily the result of sulfur from mine waste interacting with air/water to create sulfuric acid
- 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

- Torch Lake in Houghton County, MI is a superfund site
  - Copper mining activities in the area from the 1890s until 1969 produced mill tailings that contaminated lake sediments and the shoreline
  - Years later, fish were found with cancerous tumors and high levels of copper, arsenic, mercury and PCBs
  - Remediation efforts started in 1998 and continued through 2006 – EPA updated cleanup plan Nov 2024

Environmental Damage Not Recognized until nearly 20-30 years after mine closed!

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

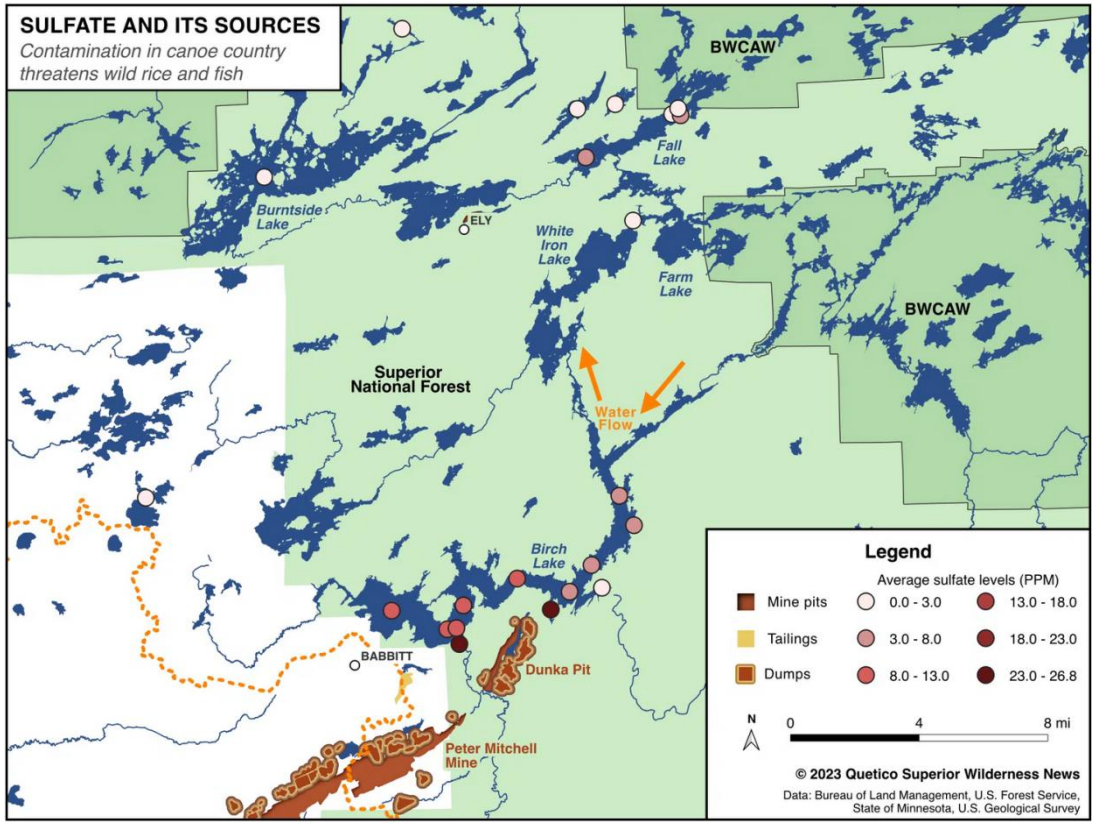
SOURCES:

- 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

Acid Mine Drainage (AMD)

- MPCA recently announced that Birch Lake has excessive sulfate in its water (impaired)
- The Dunka taconite mine (closed in 1991) waste rock piles, which are 80–100 feet high and extend for almost a mile, have been leaching metals into the streams and wetlands that flow into Birch Lake.
- Several lakes and rivers upstream of the Boundary Waters Canoe Area Wilderness are contaminated with sulfate, which causes more mercury in fish and kills manoomin (wild rice), according to the MPCA and several citizen-led sampling efforts.
- Waters downstream of past and present iron mines exceed standards for sulfate levels designed to protect the environment.

Environmental Damage Not Recognized until nearly 20-30 years after mine closed!

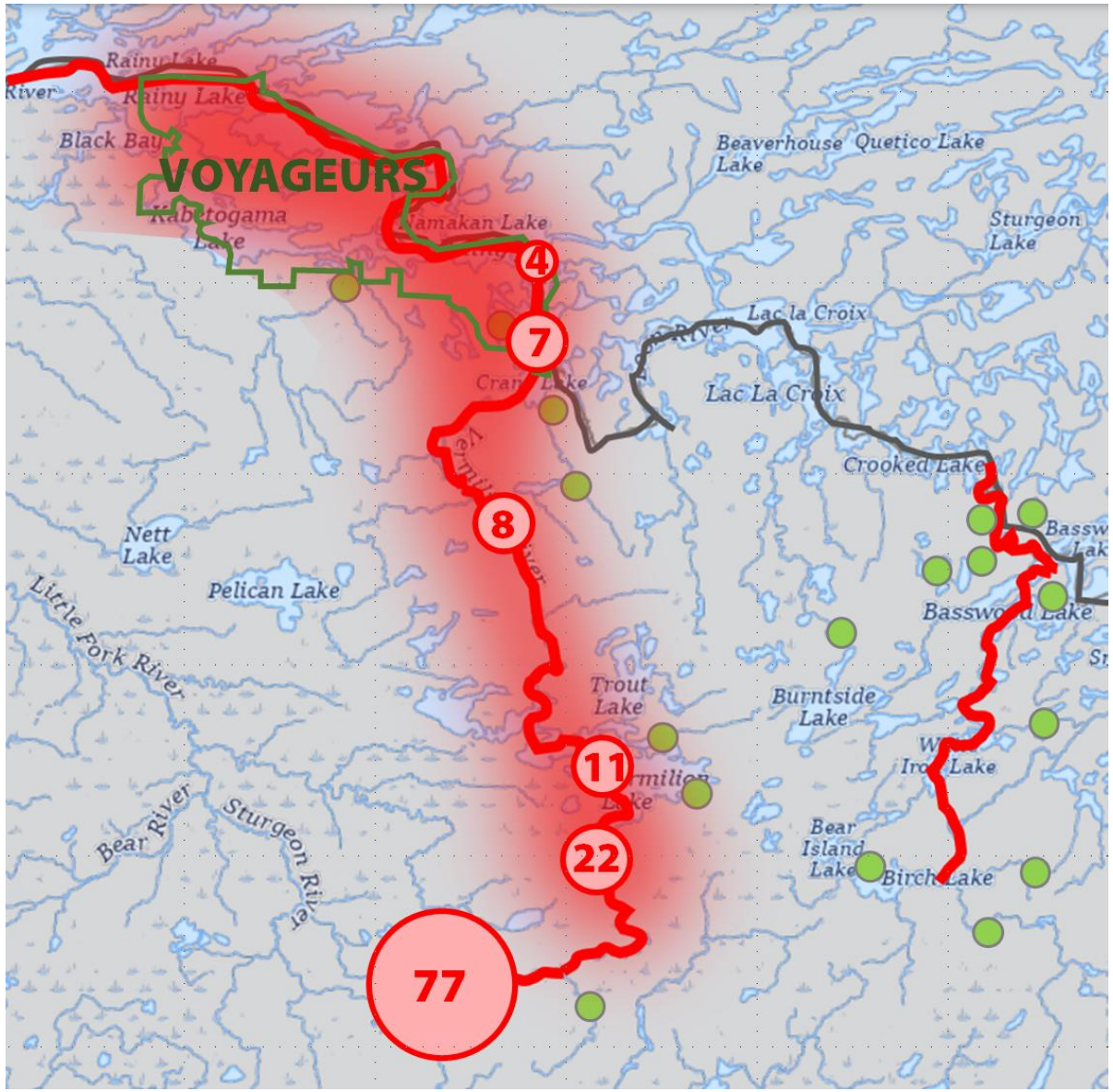


https://www.youtube.com/watch?v=ZW8p640wNno

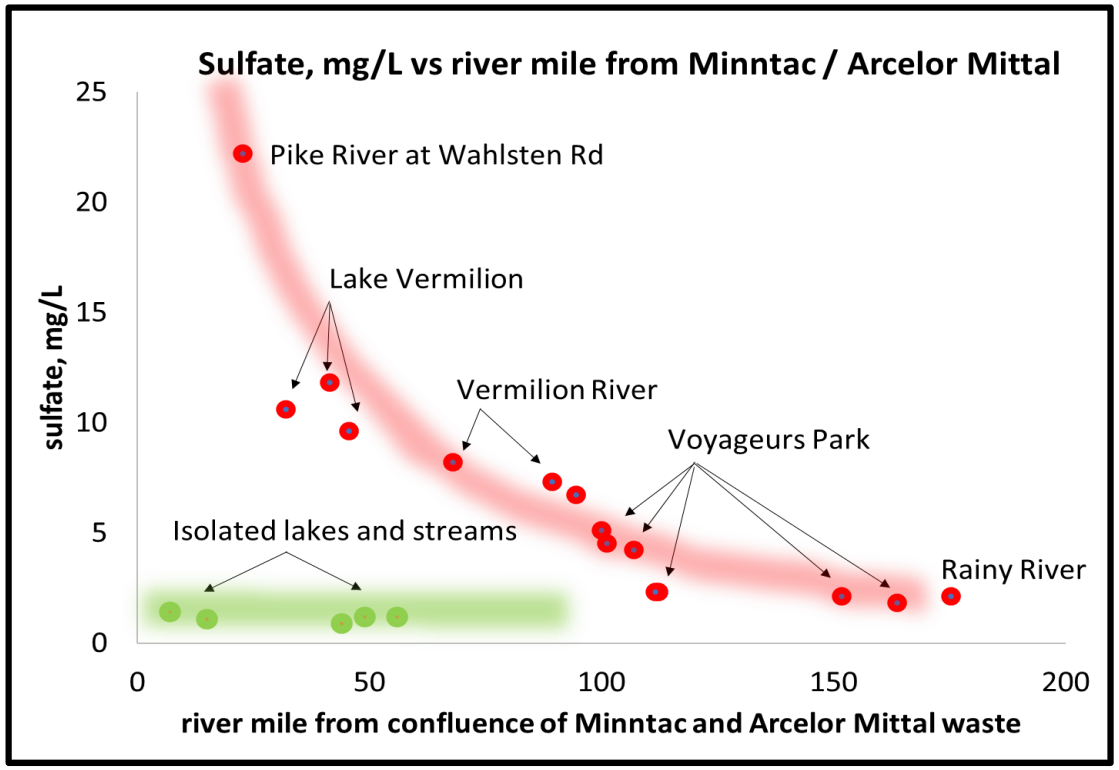
The Northern Lakes Scientific Advisory Panel, or NLSAP, monitors (sulfate based) water pollution in Voyageurs Park and the BWCA in cooperation with the Minnesota Pollution Control Agency and have measured high levels of sulfate

https://queticosuperior.org/birch-lake-near-bwcaw-polluted-by-sulfate-advocates-blame-taconite-mines/

BWCA/Voyageurs Pollution



More Info at: tamarackwateralliance.org/docs/2025_04June_NLSAP-TWA_meeting.pdf



- **LEFT**: Sulfate pollution from Minntac and Arcelor Mittal mines in Virginia, through Voyageurs Park
- **RIGHT**: Sulfates from Northshore Mine in Babbit though BWCA
- Red bubbles show the sulfate concentrations dropping steadily from 77 parts per million (PPM) in Virginia to 2.5 PPM in International Falls
- Background sulfate concentrations in unpolluted lakes and streams is less than 2 ppm as indicated by small green bubbles.
- Six PPM is enough to quadruple concentration of mercury in fish.
- Voyageurs Park walleyes are severely contaminated with mercury because of sulfates - WORSE than 64 of 65 commercial seafood species monitored by the US FDA

Courtesy of Northern Lakes Scientific Advisory Panel (NLSAP)

Acid Mine Drainage (AMD)

- For the 20 years that Wisconsin had a “Prove It First” law in place, the mining industry **could not find a non-polluting sulfide mine**. The law was repealed in 2017.
  - https://www.sierraclub.org/wisconsin/prove-it-first-law
- Kuipers et al studied 25 operating hard rock mines and their EISs:
  - All predicted compliance with water quality standard within their EISs
  - However pollution from 85% of mines near surface water and 93% of mines near ground water exceeded water quality standards
  - 89% had inaccurately predicted that they would not create AMD.

According to the EPA, sulfide ore mining is the most toxic industry in the US - metal mining industry releases the most toxic chemicals by weight compared to any other industry

https://earthworks.org/releases/epa_metal_mining_most_toxic_industry_in_america/

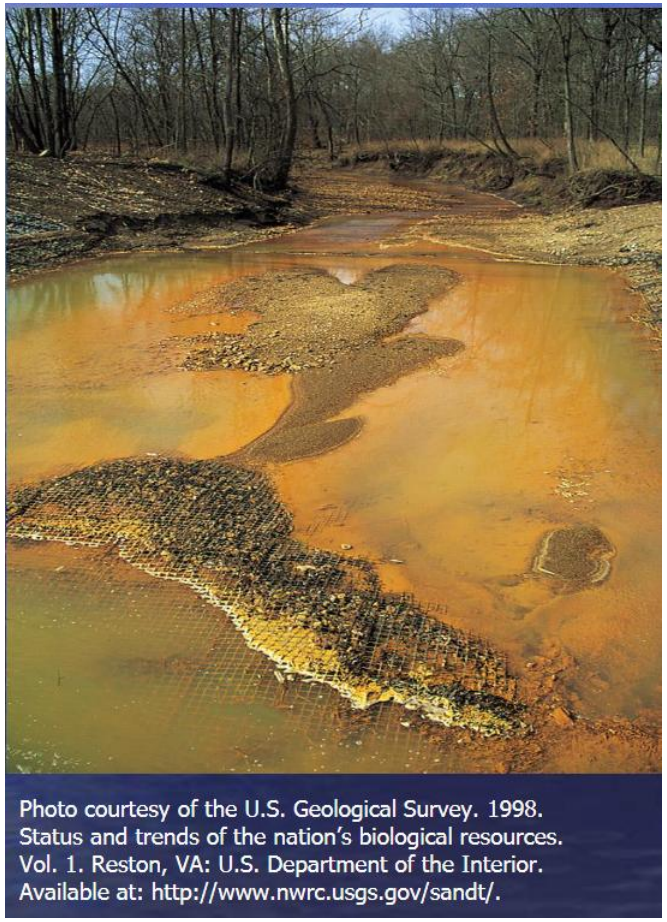


Photo courtesy of the U.S. Geological Survey. 1998. Status and trends of the nation’s biological resources. Vol. 1. Reston, VA: U.S. Department of the Interior. Available at: http://www.nwrc.usgs.gov/sandt/.

Sulfide Mining Threatens Tribal Wild Rice Resources

- Wild rice is very sensitive to sulfide contamination
- Anishinaabe seasonally harvest tens of thousands of acres of wild rice in Northeastern Minnesota's undisturbed watersheds
- Manoomin is sacred to their way of life.
- Pristine water quality must be maintained for wild rice to germinate, grow, and survive.
- Sulfates bound in glacial/bedrock geology are released when the water is disturbed due to mining, endangering wild rice fields.
- Many lakes and streams around the Great Lakes have already lost their wild rice.
- Wild rice is hard to restore once it is gone.

Minnesota's wild rice sulfate standard limits sulfate to 10 parts per million (ppm or mgL) in wild rice waters.

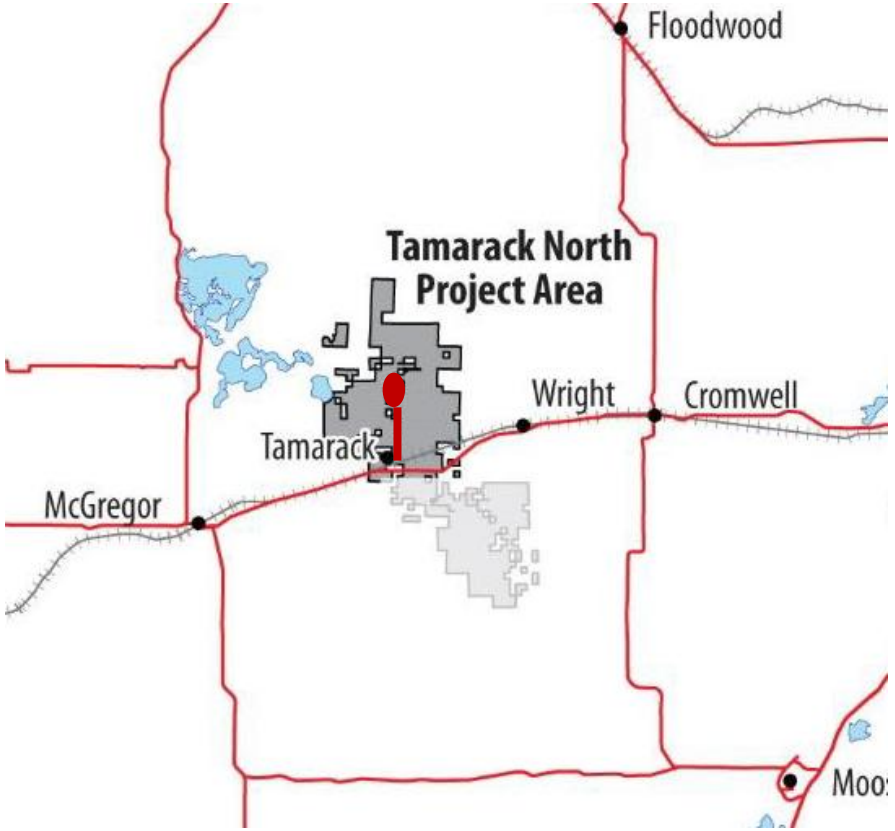
Documented Health Risks of Sulfide Mining in Minnesota

- 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

Talon "says" there will be no problem but offers no evidence for that statement – FACT IS … there has never been a high sulfide mine in a water rich area that has not polluted the environment

Proposed Tamarack High Sulfide Nickel-Copper Mine

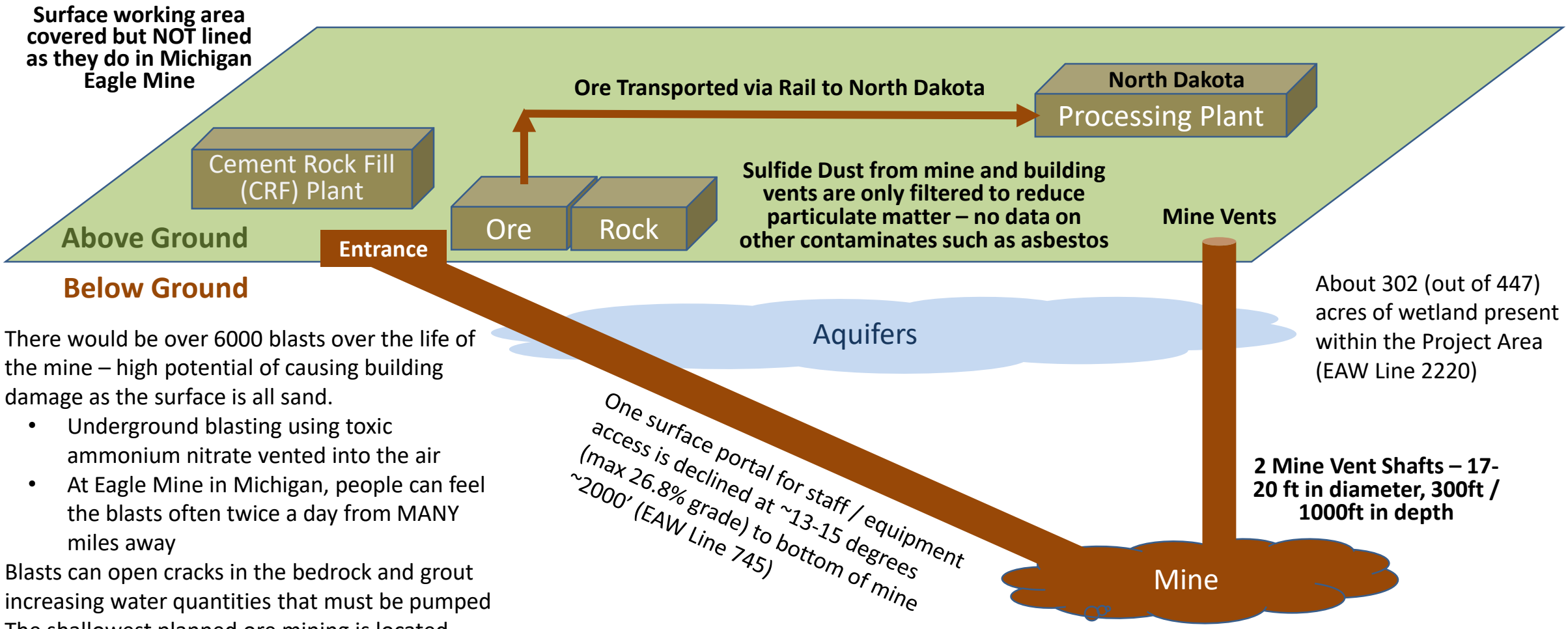
- The Tamarack North Project covers approximately 20,348 acres - Nearly **32 square miles** – but current EAW is looking at a small portion - 447 acres (EAW line 1905)
  - 302 acres of wetlands within the Project Area (EAW Line 2220)
  - With plans to extract ~8.2 million tons of ore over a 7-10 year period
- Primary Concerns based on Talon's EAW Submission to the State of Minnesota (December 2025)
  - Vented airborne dust from blasting and ore handling is contaminated with sulfide particles – Talon only plans to "reduce the amount of particulate matter" with filters (EAW line 905)
  - 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 – water model is highly suspect
  - Mine site includes temporary holding piles which, while covered, are not lined and will be subject to spread of sulfates and toxic materials
  - 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

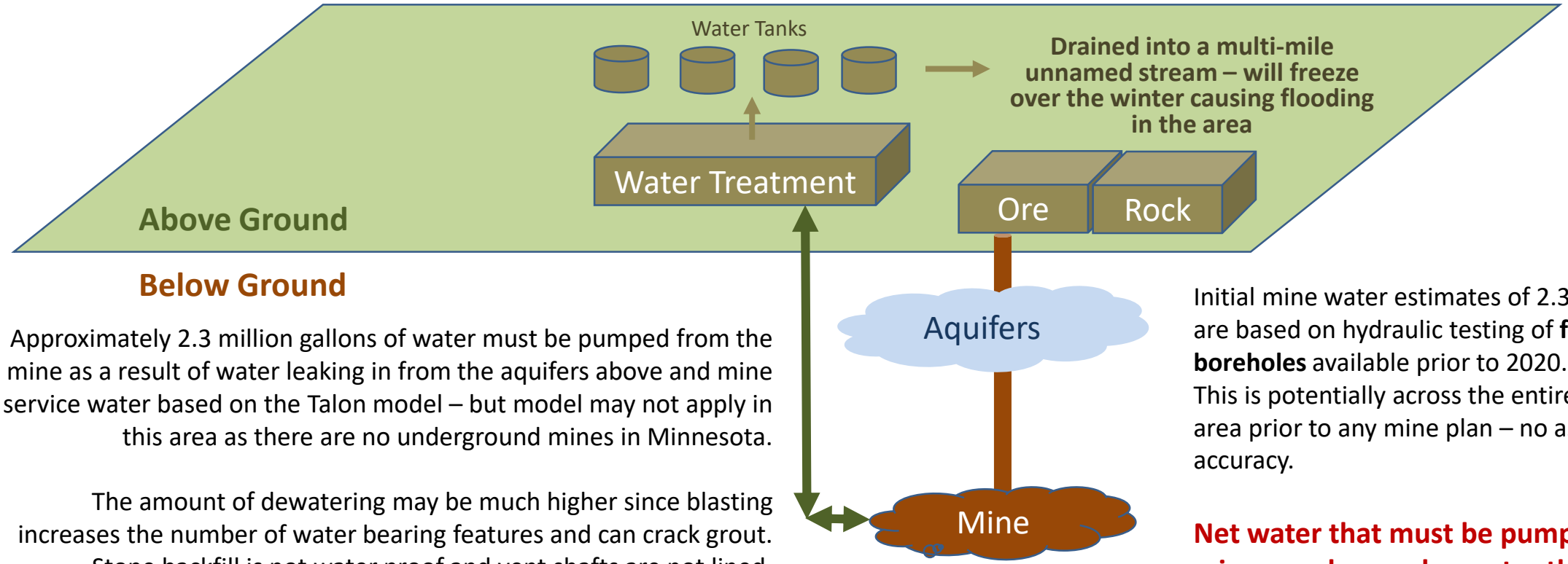
BASIC OPERATION

- Blast out stopes (large caverns / spaces) to collect ore
- Bring ore to the surface and temporarily store
- Ship ore over rail (**120 railcars about every 4 days)** to North Dakota



- There would be over 6000 blasts over the life of the mine – high potential of causing building damage as the surface is all sand.
  - Underground blasting using toxic ammonium nitrate vented into the air
  - At Eagle Mine in Michigan, people can feel the blasts often twice a day from MANY miles away
- Blasts can open cracks in the bedrock and grout increasing water quantities that must be pumped
- The shallowest planned ore mining is located **about 300 feet below surface** (EAW line 994)

Water Balance Details



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 may be much higher since blasting increases the number of water bearing features and can crack grout. Stope backfill is not water proof and vent shafts are not lined.

This is sulfide contaminated water that must be filtered – Talon plans a membrane based filter, then combined with polluted stormwater for discharge into a unnamed stream that flows into the Tamarack River. No plan when stream freezes over the winter.

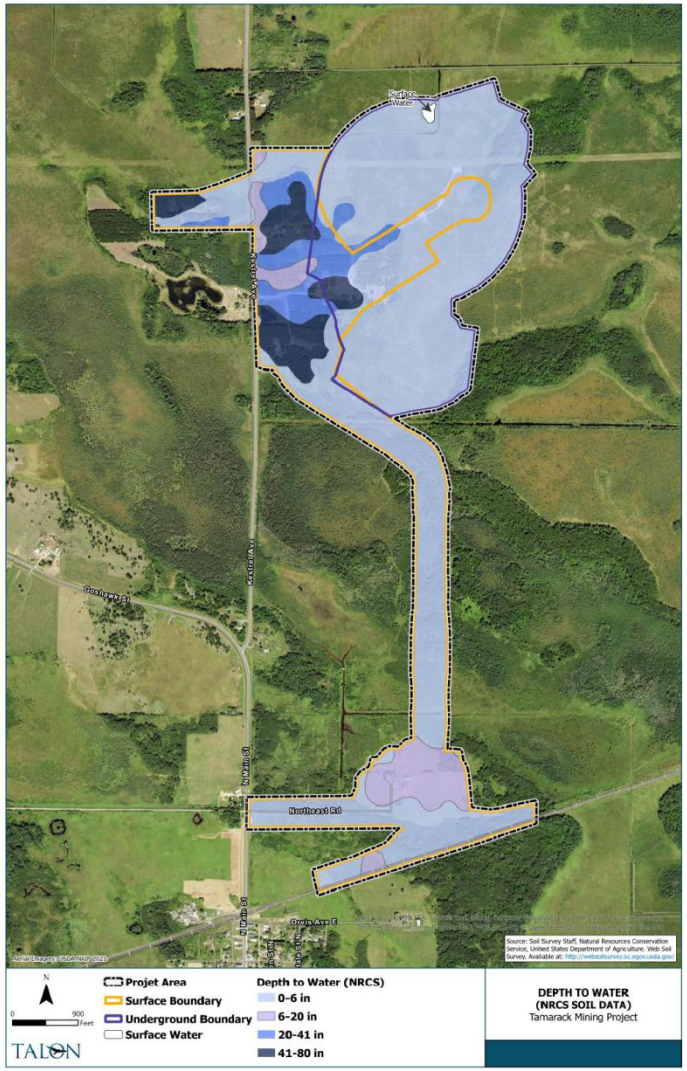
Blasting can open new fissures and crack existing grout increasing pumping requirements

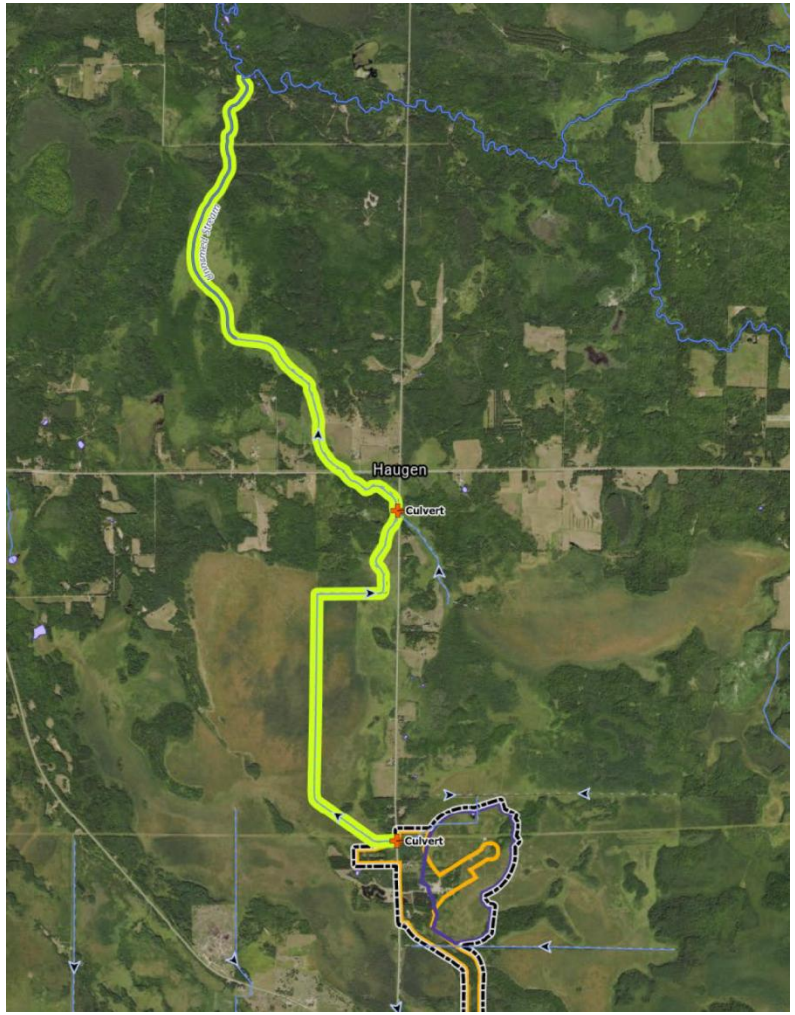
Initial mine water estimates of 2.3M gallons per day are based on hydraulic testing of **four bedrock boreholes** available prior to 2020. (EAW line 2348) This is potentially across the entire multi-square mile area prior to any mine plan – no assurance of accuracy.

Net water that must be pumped from the mine may be much greater than the 2.3 million gals/day and may affect aquifer, lake and well levels. At Eagle Mine monitor point QAL023B (2022), the mean water level readings were 2.8 feet (ft) below the calculated minimum background baseline level - pumping only 5% of Talon Mine levels

Mine Figures

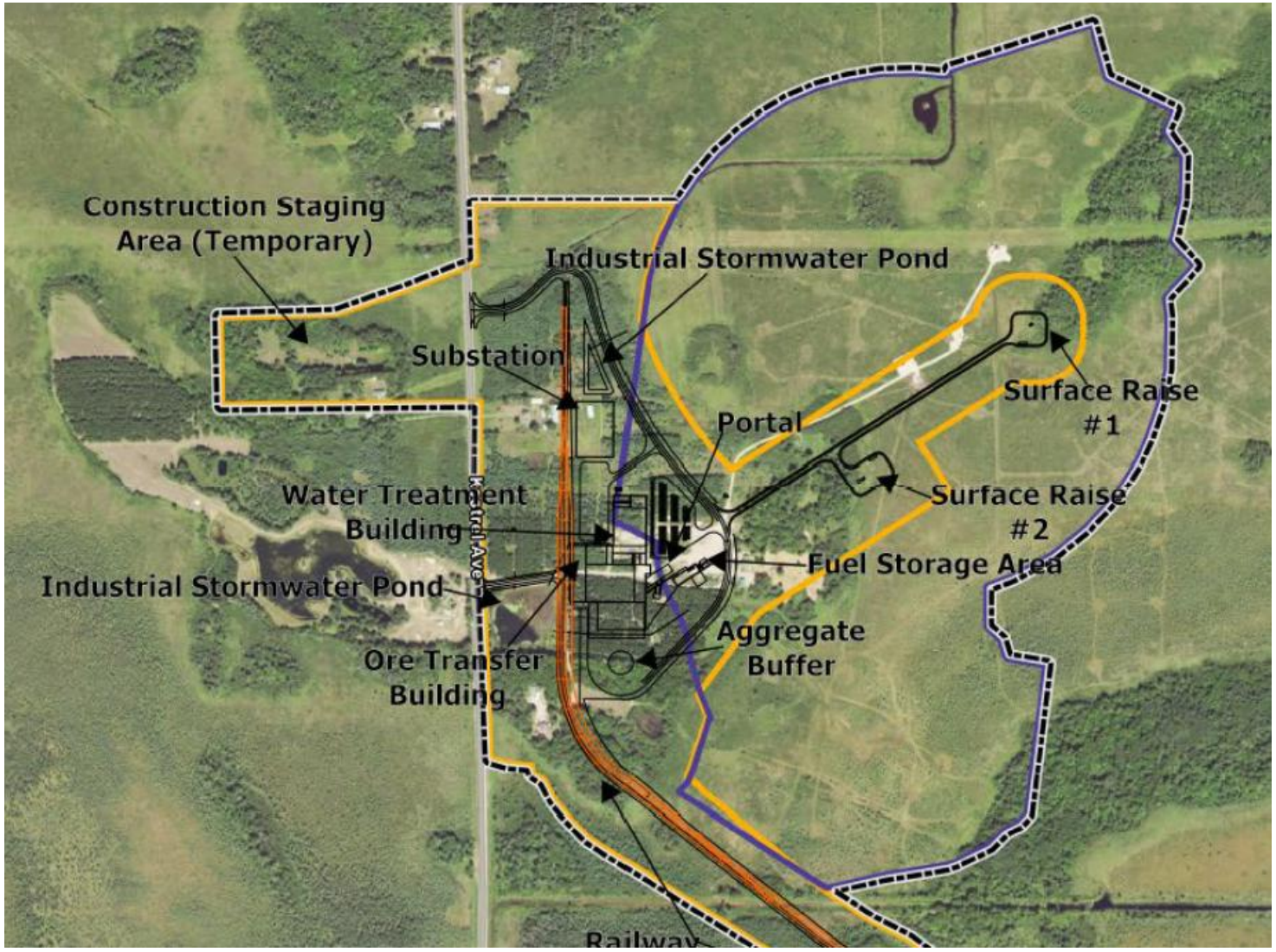
Figure 8 Depth to Water





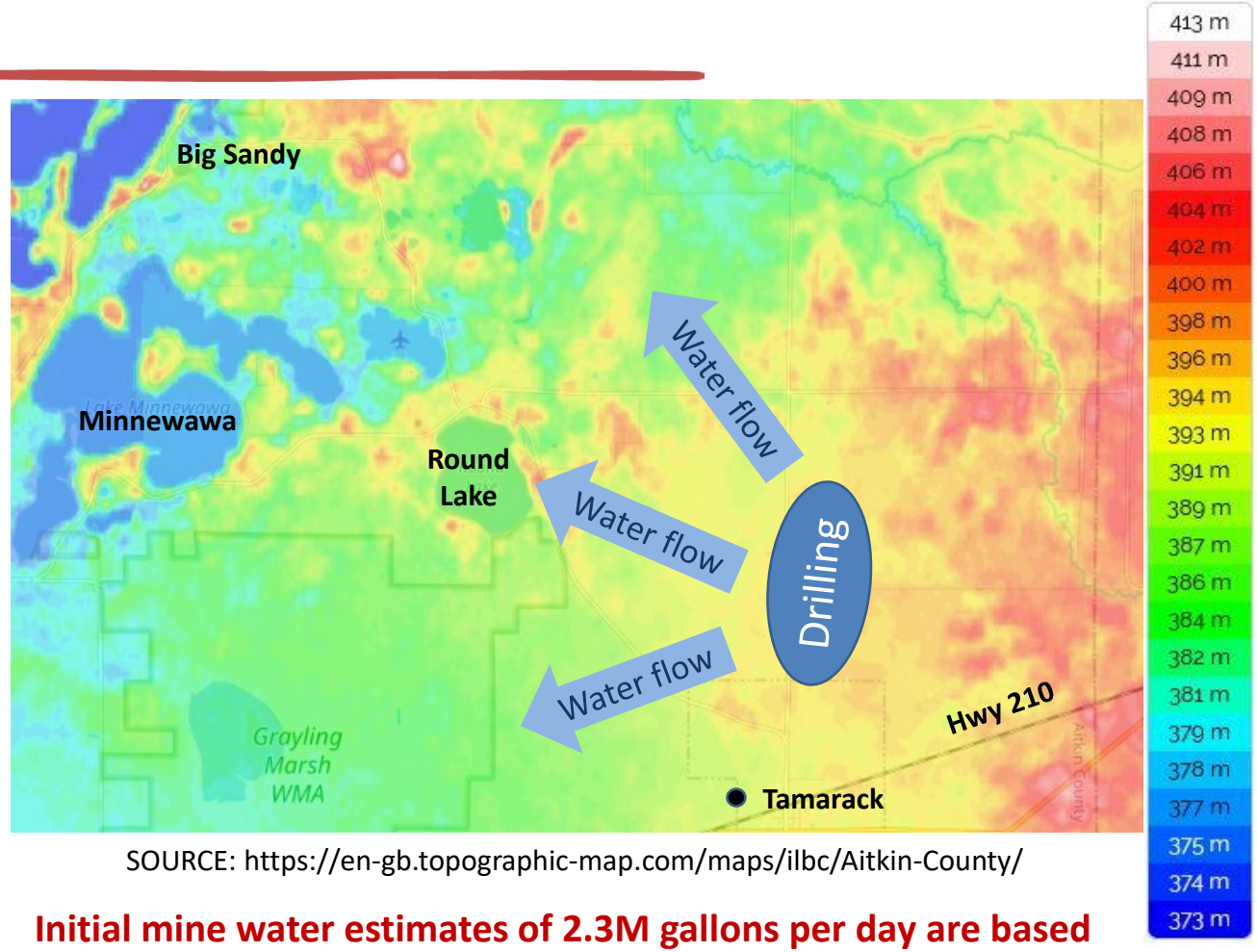
Water Depth At Surface

Aerial Views



Water Management

- Surface Water Conditions (it's a wetland)
  - Based on soil data from the Natural Resources Conservation Service, depth to water in surficial soils is less than 1 foot in approximately 77% of the Project Area (EAW line 2284)
  - Approximately 302 (out of 447) acres of wetland are present within the Project Area (EAW Line 2220)
- Talon still using pre-2020 data for mine inflow estimate of 2.3M gallons per day
  - Talon suggests they will address this through grouting but the 2.3M gallon estimate already includes grouting (page 228 of the Talon 2021 PEA)
  - Talon does not include impacts of daily blasting that may crack grout and widen water features
  - Talon does not account for the fact that their stope backfill is not waterproof, nor can they grout the bedrock after a stope is backfilled
  - Talon does not make any provisions for mine inflow from the nearly 1300 ft (20' in diameter) vent shafts



SOURCE: https://en-gb.topographic-map.com/maps/ilbc/Aitkin-County/

Initial mine water estimates of 2.3M gallons per day are based on hydraulic testing of four bedrock boreholes available prior to 2020. (EAW line 2348). This was done prior to any mine plan and reflects an area of many square miles – no assurance of accuracy.

Water Management

- Talon provides no information of potential impacts of pumping 2.3 M gallons or more from the mine
  - Talon would discharge this water and polluted runoff into an unnamed stream that flows into the Tamarack River.
  - However, the degree and efficacy of water treatment are unknown and depends both on regulatory rigor and the levels of the pollutants in the water, both of which are also unknown.
  - Aquifer levels and surface water impacts are of concern (no studies provided to address how much lower aquifers may be or impacts on wells)
  - Lower aquifer levels may cause subsidence on the surface
- At Eagle Mine monitor point QAL023B, the mean water level readings in 2024 were a maximum of **5.6 feet (ft) below the calculated minimum background baseline level**
  - Many other water level monitoring points observed water levels up to 1.4’ below minimum baseline.
  - 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**
- Eagle mine listed at least 20 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

Gravel Needed to Backfill Stopes (mined out caverns)

- “3.9 million tons (3.5 million tonnes) of backfill would be required. Of this, approximately 1.3 million tons (1.2 million tonnes) would be supplied by waste rock, which would account for approximately 1/3 of the requirements. Externally sourced aggregate would be required starting in the third year of production as the mine development begins to taper off once the decline ramp is completed. (EAW Line 1008)
- Daily need for gravel would then be **1,430 tons per day** at 365 days a year for 5 more years of mining
- Size of haul trucks not specified but Talon does use 20 ton haul trucks for initial excavation of the decline ramp (EAW line 561).
- Can you find this much aggregate near Tamarack?
- Rail design has no contingency for rail delivery of this much aggregate (13+ rail cars per day)

Surface Areas Used for Operations Not Lined

- Talon has “enclosed” in buildings most operations related areas and ore storage
- But floors may be just gravel or concrete (said to be “impervious”) (EAW line 2425)
  - However, concrete is NOT impervious to water flow and will crack at expansion joints over the life of the mine
  - Even residential building codes require cement / tile shower floors be lined!
  - Flooding, ceiling leaks and water usage for dust management will still contaminate the soil
  - Buildings must still be ventilated but Talon has only committed to “reduce particulate matter”
  - AND NOT to filter out airborne toxins
- 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.**

Venting / Air Quality

- Talon only plans air filtering “to reduce the amount of particulate matter” (EAW line 905)
- 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
- Asbestos can be present in taconite mines, which can increase the risk of asbestos exposure for workers – Talon makes no statement that they are even looking for asbestos in the mine dust.
  - https://cancer.umn.edu/news/connection-between-iron-range-miners-and-asbestos-related-disease
- Since sulfates are not well filtered, accumulation will occur in the local area causing storm water to be contact water and polluting the local environment potentially creating greater mercury concentrations
- Eagle Mine does a very poor job at managing dust – a possible cause of the water contamination demonstrated in the Eagle Mine Exception report

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

Talon has not provided any information on what toxic substances exist in the mine air or contact water

Blasting

- Talon notes that “Vibration modeling would be conducted to simulate the propagation of blast induced vibrations to predict the impact at nearby sensitive receptors, such as residences. This information would be provided in the EIS. (EAW line 3298)
  - Given the potential impact on the environment that could result in mine plan changes, modeling should be done prior to EIS
  - Blasting would normally occur at shift boundaries when the mine is evacuated of personnel – 2-3 times a day … potentially **over 6,000 blasts** in a 7 year life of mine period
- Parts of Oklahoma now have the same earthquake risk as California due to “blasts” from fracking
- Blasting operations produce toxic gaseous products including carbon monoxide (CO) and the oxides of nitrogen (NOx)
  stacks.cdc.gov/view/cdc/161251/cdc_161251_DS1.pdf

- **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.
- **In Oklahoma, Fracking May Have Damaged Hundreds Of Traditional Vertical Wells**
  - https://www.hppr.org/hppr-environment/2017-09-24/in-oklahoma-fracking-may-have-damaged-hundreds-of-traditional-vertical-wells
- **Oklahoma Tightens Regulations to Curb Fracking Earthquakes**
  - https://www.eli.org/vibrant-environment-blog/scoop-stack-causing-cracks-oklahoma-tightens-regulations-curb-fracking

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

- For rail transport to North Dakota, “each 120-car unit train would haul approximately 13,900 tons (12,600 tonnes) every 4.1 days on average - 90 trains per year” (EAW line 1520-1522)
- Talon is currently expecting to use conventional gondola railcars with covers made of solid and impervious material (EAW line 1540)
- The BNSF Railway would exchange the loaded **unit train** with a unit train of empty enclosed railcars returning from the processing facility in the on-site rail yard on a regular basis. About 30 of the empty unit train cars would be loaded each day and consolidated on the release track until the next 120-car unit train is filled and released for shipment. (EAW line 1525)

Covered gondola cars still have openings in the bottom for drainage 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.

BUT how does this work when the wet ore has frozen in the rail car?

Concerns – Wetland / Peat Damage

- Approximately 302 acres of wetland are present within the Project Area (EAW line 2220)
- Wetlands will be destroyed around project structures and the rail line from Tamarack.
- Talon specifically says “Construction and operation of the Project would result in the direct impact of approximately 71 acres of upland and wetland wildlife habitat and could further habitat fragmentation in the Project Area. (EAW line 2857)
- In addition, Talon says “the wetland complex in the Project Area may have been used as burial sites, raising the possibility of inadvertent discoveries. (EAW line 2936)

Other Issues

- Talon defers any analysis of hazardous waste to the EIS
  - Hazardous wastes generated and/or stored during construction and/or operation of the Project, including the methods of disposal, would be described in the EIS. (EAW Line 2755)
  - Thus Talon apparently does not know what hazardous waste products will be produced nor how to mitigate effects
  - Talon has no hazardous waste plan nor do they discuss issues related to cross contamination of hazardous waste
  - But they should have a hazardous waste list prior to EIS … how can you identify the environmental impact without this information? And mitigation may change the mine plan affecting other parts of the EIS work
- The Michigan Eagle Mine monitors for over 30 substances in water … no word on what Talon will do.

- Talon defers any analysis of wildlife in the project are to the EIS
  - Natural resources field surveys are currently being conducted within and across the Project Area. Information gathered during these surveys would be included in the EIS. (EAW Line 2781)
  - Thus Talon does not know very much about the wildlife in the project area
  - But they need to know this prior to EIS since – how can you evaluate the impact of operations before such information?

Talon proposes to defer all work needed for an environmental impact until the environmental impact stage – but this is too late as mitigations can change the mine plan affecting the environmental impact of the project

But Don’t We Need Nickel?

- Talon argues that nickel is needed for EV batteries

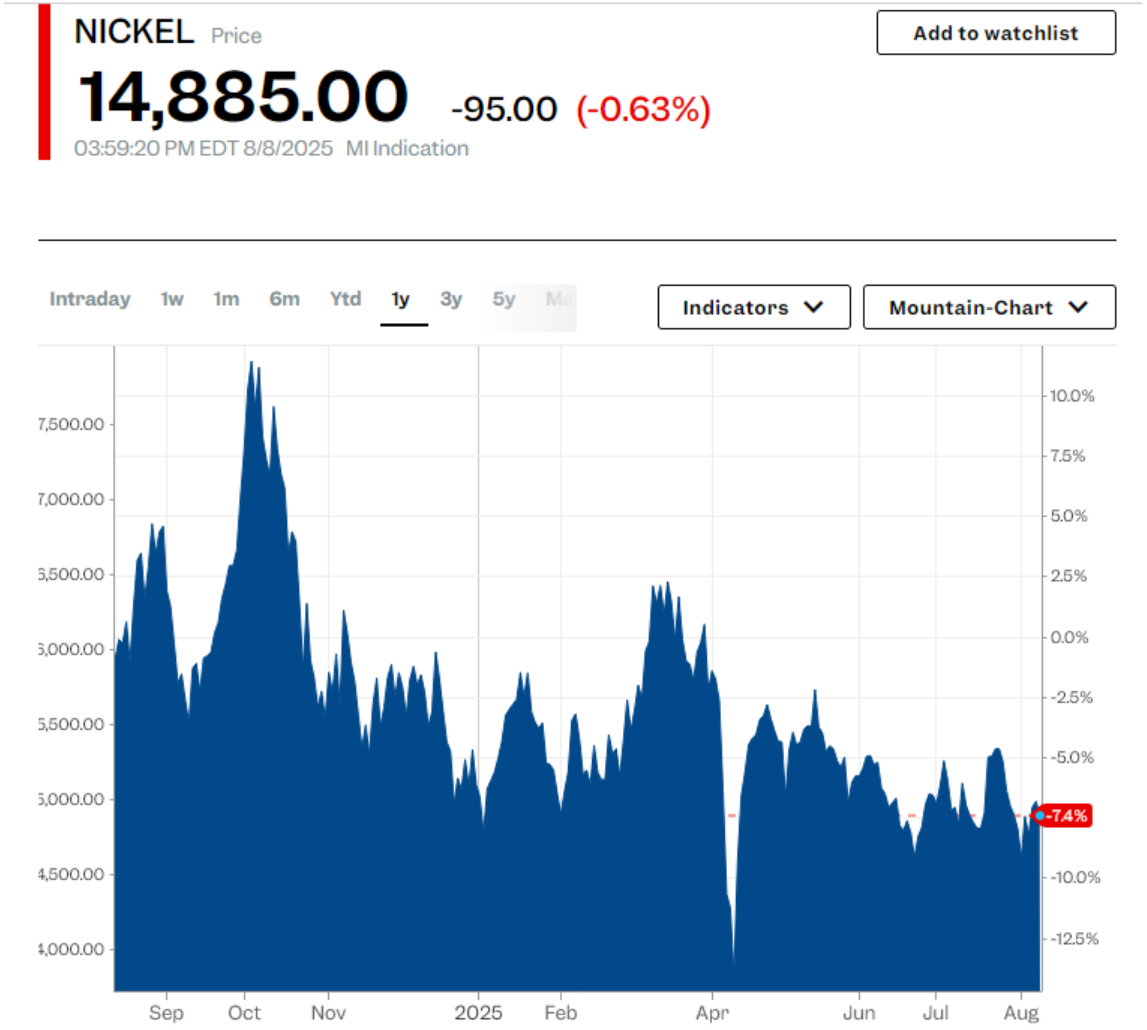
NO – EV battery industry quickly moving away from nickel based batteries in favor of LFP, Sodium Ion and Lithium Sulfur batteries (with no nickel)

- 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).

In addition, if you really wanted to boycott African based mining “slave labor”, you would stop using cobalt in batteries and convert completely to Lithium Ferrous Phosphate (LFP) batteries (with no nickel)

NOTE: Standard Lithium Ion batteries use Nickel, Manganese and Cobalt.



But Don't We Need Nickel Mining for a Green/Sustainable Future?

- **But don't 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 … and aluminum / plastic cases

- NOTE that mining by its very nature is NOT sustainable – minerals do not grow back like trees
- What we NEED is more recycling to create a sustainable economy
- Global nickel resources are estimated to be 54% laterite (iron) deposits and only 35% in magmatic sulfide (high sulfide) deposits (https://pubs.usgs.gov/periodicals/mcs2025/mcs2025-nickel.pdf)
  - Why mine highly toxic sulfide minerals in Minnesota when the majority of nickel reserves are found in iron deposits?

Nickel Institute notes
(https://nickelinstitute.org/en/blog/2025/march/nickel-industry-part-3-processing-nickel-laterites-high-pressure-acid-leaching/)

- High Pressure Acid Leaching (HPAL) is ramping up in capacity to supply battery markets from laterite nickel
- HPAL has relatively low greenhouse gas emissions, especially if sulphuric acid is made on site.

Price of nickel falling to pre-EV craze days … as non nickel EV batteries ramp ut

But Don't We Need Nickel?

- Tamarack North Mine Will Make NO difference in the Global Supply of Nickel
  - Only 0.22% of the world's supply of Nickel comes from the US (Michigan Eagle Mine)
  - US only possesses 0.24% 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 foreign owned mining companies

From the USGS https://pubs.usgs.gov/periodicals/mcs2025/mcs2025-nickel.pdf

IS THERE A TALON TESLA AGREEMENT?

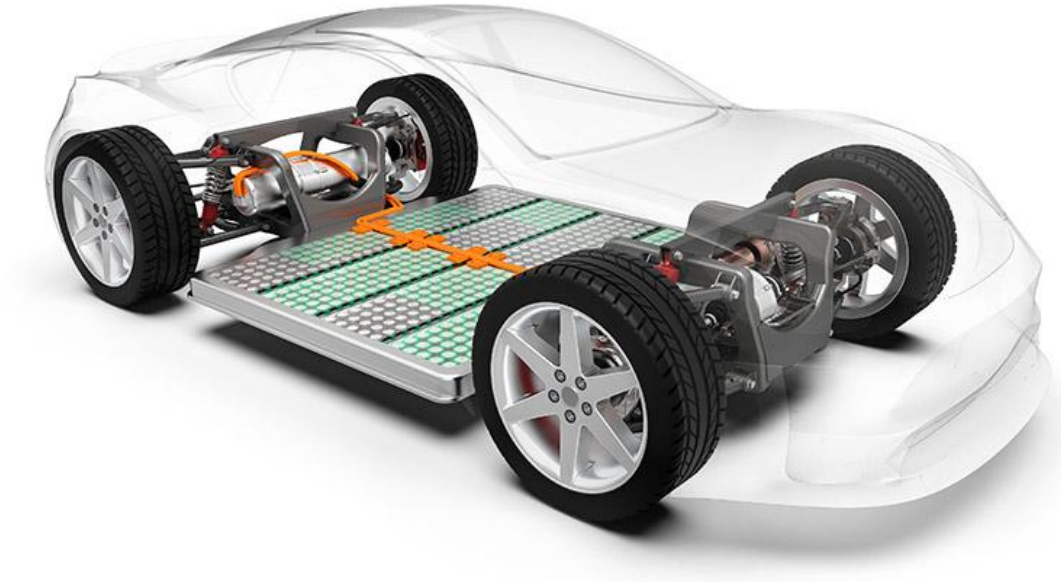
- Talon Metals provides additional detail on their so called "Tesla Supply Agreement" in their document, *MANAGEMENT'S DISCUSSION AND ANALYSIS*, Dated: November 14, 2024.
- On page 35 of this document from Talon, the "Conditions Relating to the Tesla Supply Agreement" are provided.
- Essentially - Clearly, Talon DOES NOT have the supply agreement they claim.

They simply have an agreement to enter into negotiations for a supply agreement if they are producing nickel this year (2025 - which is clearly impossible.)

https://www.sedarplus.ca/csa-party/records/document.html?id=e474af18cde2046e058b9ddef7e93f498fd780c00db38ddbc0dd7f664cbe92f4

But Don’t We Need Nickel?

- EV Batteries - Nickel costs $15,000 per tonne (2/2025) 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 and CATL unveiled a lithium manganese ferrous phosphate (LMFP) battery, with an energy density comparable Li-Ion (nickel based) batteries
- CATL is trialing a Sodium Ion EV battery – no nickel AND 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 moving away from Nickel & Cobalt based EV batteries due to the high cost of these materials

Other Details

- Do sodium ion batteries use nickel?
  - While some researchers have used nickel in sodium ion batteries, the main sodium ion battery producers have claimed not to need nickel
  - Natron Energy … a US leader in sodium ion batteries state they do not use nickel (https://natron.energy/our-technology/sustainability)
  - CATL Sodium Ion batteries are said to contain NO lithium, cobalt or nickel
  - https://www.reuters.com/technology/chinas-top-ev-battery-maker-catl-touts-new-sodium-ion-batteries-2021-07-29/