The need for a moratorium on Uranium and Rare Earth Mining in Quebec

A Brief presented to:

The '*Bureau d'audiences publiques sur l'environment*'

As part of the investigation and public hearing on the issues associated with the uranium industry in Quebec.

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About the Kipawa Lake Preservation Society

The mission of the Kipawa Lake Preservation Society is to preserve the Kipawa watershed as it is, environmentally healthy and unpolluted. As a group of concerned citizens, our goal is to bring the attention of the local, provincial and federal governments to the issues that endanger the environmental health and future of the Kipawa watershed. Currently a major issue is the mining exploration and proposed rare earth mine. In addition to the threats posed by all open pit mining operations, rare earth mining poses unique risks due to the presence of radioactive ores such as Uranium and Thorium and has never been carried out in a safe manner.

The Kipawa Lake Preservation Society is a group of local and seasonal residents of Kipawa Lake and neighboring communities. Our goals are to lobby for the long term protection of Kipawa Lake and surrounding areas. We are concerned about the many threats to this watershed and the impacts they will have on the environment and nearby human health.

We are led by a volunteer executive committee:

Chair – Christina Moreau

Co-Chair – Robert Fortin

Secretary – Mary Mckenzie

Treasurer – Joshua Trudeau

Graphic Design and Media – Donna Pariseau

Committee Member – Roxane McKenzie

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ABSTRACT

The goal of the Kipawa Lake Preservation Society is to see the long term health of the Kipawa watershed. Our organization has many concerns about the possibility of Uranium mining and mining of ores closely association with Uranium in Quebec. Currently the largest threat to the environmental health of the Kipawa Watershed is the possibility of mining in the region. There is a fairly advanced proposal for a rare earth mine along the shores of the Kipawa River and upstream of Kipawa Lake. Rare earth ores are often associated with radioactive elements such as Uranium and Thorium. Mining of rare earth elements poses many of the same risks as the mining of Uranium. Exploration for Uranium is also being carried out throughout the Kipawa watershed. Uranium mining has been carried out extensively throughout Canada in the past with devastating results. The radioactivity associated with these ores leads to chronic health problems and the development of cancers in both humans and wildlife. In the past Uranium mining has caused severe environmental damage and elevated cancer rates in neighboring communities. Our association is very concerned about the possibility of rare earth mining and uranium mining in the Province of Quebec and especially allowing it to take place near pristine watersheds such as Kipawa. Kipawa Lake is an important tourist destination and allowing mining in the watershed would negatively impact the tourism industry, air, soil and water quality and human health. It is our belief that the moratorium on Uranium mining should remain in effect and that a moratorium on rare earth mining should be instituted within the province of Quebec as well as all of Canada. The current risk to the environment and human health from uranium and rare earth mining are too great and not worth the risk for the limited economic benefits. The environment and human health should be given priority over such mining projects. Therefore, we do not support the mining of rare earths or uranium within the Kipawa watershed or within the province of Quebec.

WASTE MANAGEMENT AND MONITORING ISSUES

NUCLEAR WASTES AND ACCIDENTS

Uranium-235 and Uranium-238 are used in the nuclear fission reactions to produce nuclear power. This process generates nuclear wastes that must be managed. Currently, there are no long term disposal sites for nuclear waste (World Nuclear Association, 2014). Many proposals for long term storage of nuclear wastes are not socially acceptable. Ontario Power Generation currently has a proposal to bury radioactive nuclear waste near Lake Huron. This proposal has been met with strong public opposition over concerns over waste leakage and contamination of soil and water resources. Industry scientists cannot guarantee that the waste will not leak if the proposal proceeds (The Great Lakes Nuclear Dump Inc., 2014).

TAILINGS

Tailings are a by-product of metallic ore processing that may contain large amounts of arsenic, lead, cadmium, chromium, nickel and other toxic substances. Rare earth tailings also contain radioactive substances, usually Uranium and/or Thorium. Tailings are often stored on-site in tailings ponds for eternity (Environmental Law Alliance Worldwide, 2010).

There are several options for tailings disposal. The most commonly used disposal method is a wet tailings impoundment or a tailings pond. This involves the placement of tailings in a pond that may or may not be lined with a geomembrane and held back by a dyke or tailings dam (Environmental Law Alliance Worldwide, 2010).

While measures can be taken to prevent their release into the environment, such as the use of a geomembrane and tailings dams, these structures often have lifespans that are a great deal shorter than that of the toxic and radioactive substances that they are meant to contain.

The performance of a geomembrane is dependent upon many factors including temperature, exposure to UV-light, exposure to radioactive substances, as well as the materials used to fabricate the membrane and its thickness. HDPE and LLDPE geomembranes with 1.5mm to 2.0 mm thicknesses are commonly used for tailings ponds. These geomembranes can have average lifespans as low as 36 years while the radioactivity of the materials they contain will persist for thousands of years. They may be sufficient to protect the current generation but not future generations. Geomembranes can also be damaged or

punctured due to high loads, seismic activity, deformation of pipes connected to the drainage system (Breitenbach and Smith, 2006).

Water often accumulates and forms ponds on top of the tailings putting wildlife at risk. Tailings may release contaminated water. During storms or heavy rain events water may fill the tailings impoundment above its capacity releasing an overflow of toxic substances. This can contaminate nearby soil, groundwater and local waterways (Environmental Law Alliance Worldwide, 2010).

Tailings dam failures at wet tailings facilities have caused extreme environmental damage as a result of the release of large amounts of toxic substances that enter waterways, kill aquatic organisms and pollute drinking water (Environmental Law Alliance Worldwide, 2010). *Figure 1* below shows tailings dam failures over time while *Figure 2* displays tailings dam failures by continent. Current state of the art technologies and stringent environmental laws in North America have not been successful in preventing tailings dam failures. Many failures have occurred in the past decade (2000s) and many of the failures over time occurred within North America (Azam and Li, 2010).

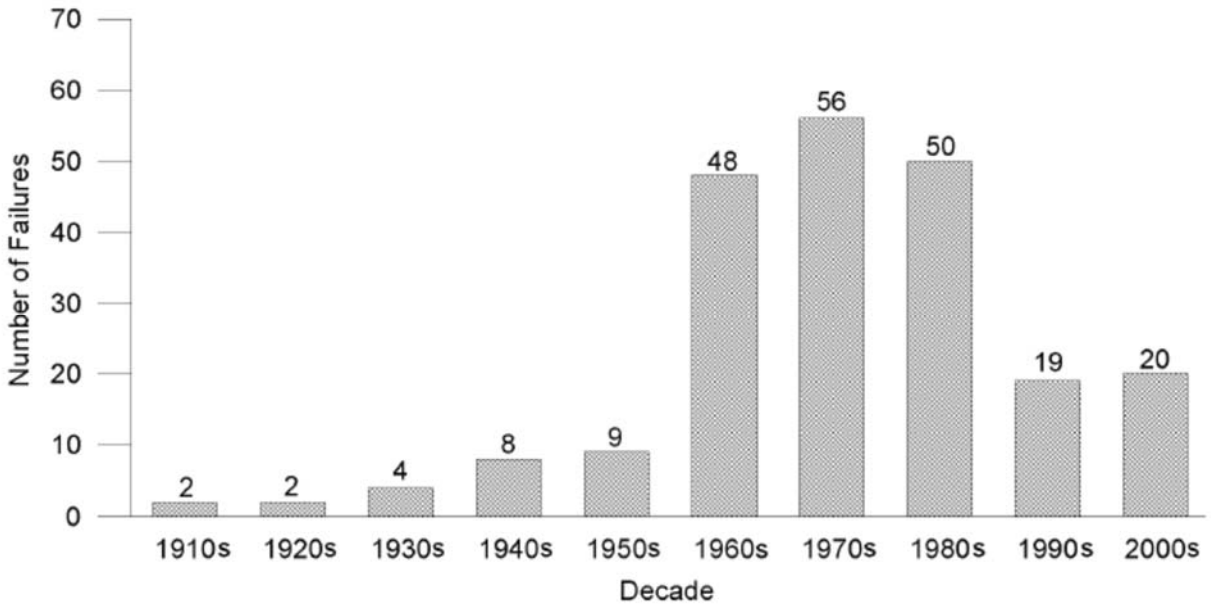

Figure 1. Tailings dam failures over time (modified from Azam and Li, 2010)

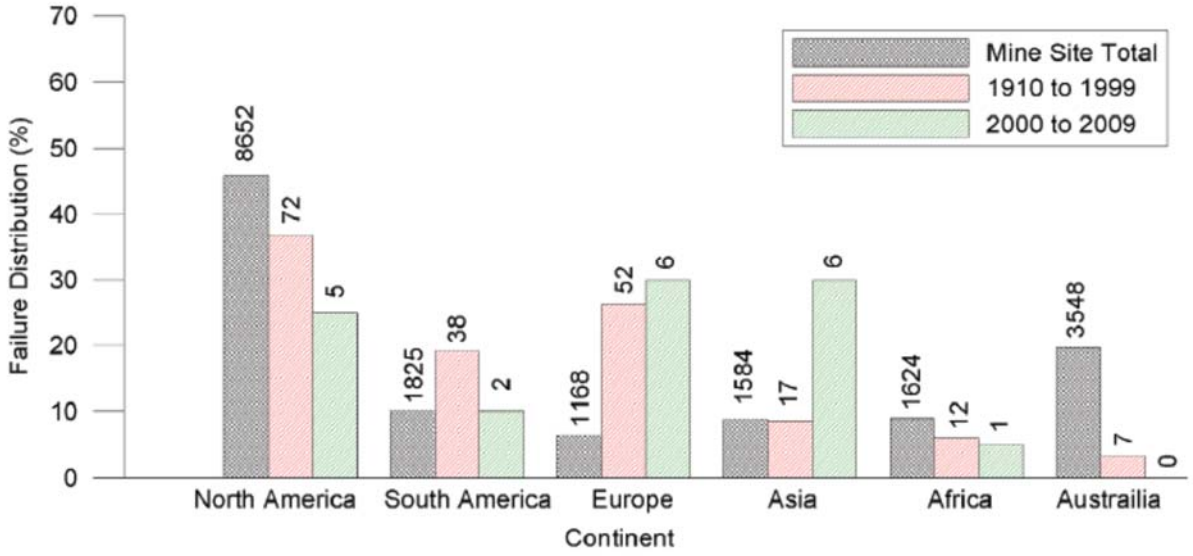

Figure 2. Tailings dam failures by region (modified from Azam and Li, 2010)

Recently, there have been several environmental disasters that have been the result of tailings dam failures. On August 4th 2014 a tailings dam at the Mount Polley Mine in British Columbia failed releasing 17 million cubic meters of contaminated water and 8 million cubic meters of tailings into Quesnel and Polley Lake (Ministry of Environment, 2014). The Mount Polley Mine disaster is a prime example of how even Canadian environmental laws and regulations are insufficient in preventing tailings dam failures. There have also been several recent tailings dam failures in the province of Quebec. The Coalition Pour que le Quebec ait Meilleure Mine has warned that a similar disaster could happen in Quebec as the province has had 12 tailings dam failures since 2008 that have released 300 million liters of mine tailings into Quebec's waterways (Quebec ait Meilleure Mine, 2014). Quebec currently has 1.2 billion dollars in abandoned mine sites (Hart and Lapointe, 2014). It would be a benefit to society and the environment to invest in clean up and rehabilitation of these abandoned mine sites rather than continue to open more. While there are funds dedicated to clean up and reclamation after a mine project these funds often are not sufficient if the damage is too great or if a large environmental disaster occurs. In such instances if companies don't have the funds for clean up or to pay fines they can simply declare bankruptcy and the burden of the waste management falls upon the tax payers. For example, in Kootenay B.C. the dam on a decommissioned tailings pond containing heavy metals began to give way, repairs cost the local government over $500,000 (Keating, 2012). In addition, the consequences of damaging the environment or of releasing a toxic chemical are not severe enough for companies to

devote money and resources to develop better management practices. Consider the Mountain Pass Rare Earth Mine in California which in 2012 had a chemical release into the environment of a substance that contained lead. The company, Molycorp, was given a fine of approximately $27,000 (Gee, 2014). For a large corporation this is a miniscule amount. In such cases it is far cheaper for companies to pollute the environment and pay the fines than to make use of best management practices and install safe guards to prevent contamination.

Wildlife often interact with tailings impoundments or consume contaminated water or plants in the vicinity of tailings ponds these contaminants bioconcentrate and bioaccummulate up the food chain to larger organisms including humans. Radioactive elements such as Uranium 238, Radon 226, Thorium 228 and Polonium 210 have been found in many animals inhabiting areas near tailings impoundments. Clulow *et al.* (1991) and Clulow *et al.* (1996) found elevated levels of the radionuclides mentioned above in bone and other tissues of Beaver, Snowshoe Hare, Muskrat and Grouse in the Serpent River water shed (Elliot Lake, Ontario) an area impacted by Uranium mining. Elevated radionuclides have also been found in White Tailed Deer and Moose in the same region (McLaren 1978, 1987).

The environmentally preferred option for tailings disposal is considered to a dry tailings disposal (Environmental Law Alliance Worldwide, 2010). However, dry tailings have many issues as well. Tailings must be dewatered prior to placement in dry tailings ponds. There have also been issues with air quality near dry tailings impoundments as the wind causes fine tailings residues to become airborne. In the Kawartha Lakes region large dry tailings stacks have led to air quality issues in areas downwind of the dry tailings facilities. The Peterborough County Public Health Unit issued advisories recommending that the public stay indoors and use HEPA air filters (MiningWatch Canada, 2013).

The only way to protect the environment and human health from the threat of mine tailings, especially those containing radioactive elements is to not allow mining in the first place.

MORAL AND ETHICAL ISSUES

There are also concerns regarding the intended use of Uranium that is mined. Two of the primary uses of Uranium are power generation and nuclear weapons (World Nuclear Association, 2014). Both uses are met with strong public opposition and concerns. Nuclear power is often marketed as a ‘clean’ energy source however it does have severe environmental impacts when incidents occur. There have only been a few nuclear meltdowns but there effects on the environment and human health have been significant. Nuclear meltdowns have occurred at Three Mile Island, Chernobyl and more recently Fukushima. There

is also the concern that Uranium ores would be used to create nuclear weapons. While the current inquiry is on the Uranium industry, specifically mining the ore, it is important to consider the intended use of the ore and the consequences. It would be unethical to promote an industry in Quebec simply for the economic benefits without consideration of the intended use of the ore, particularly if the use is to create nuclear weapons.

ENVIRONMENT, WILDLIFE AND HUMAN HEALTH CONCERNS

Wildlife refers to all plants, non-domesticated animals and other 'wild' organisms. Wildlife is affected by mining in many ways, including:

- Vegetation and topsoil removal
- Displacement (habitat loss or fragmentation)
- Soil, air and water contamination
- Noise and vibration
- Release of pollutants (including radioactive substances, heavy metals)

Fish and aquatic organisms are particularly sensitive and effects can range from chronic toxicity to acute toxicity and death. There are many impacts on human health. The most common are chronic toxicity and associated illnesses as well as elevated cancer rates from exposure to heavy metals and radioactive substances (Uranium and Thorium decay chain products) (Environmental Law Alliance Worldwide, 2010).

"Mining not only exposes uranium to the atmosphere, where it becomes reactive, but releases other radioactive elements such as thorium and radium and toxic heavy metals including arsenic, selenium, mercury and cadmium. Exposure to these radioactive elements can cause lung cancer, skin cancer, bone cancer, leukemia, kidney damage and birth defects." – Boulanger and Gorman (2004)

Elevated cancer rates have been reported in many communities near Uranium mines (Boulanger and Gorman, 2004). Finkelstein (1996) found that the incidence of lung cancer was three times higher among Ontario Uranium miners. The lung cancers were as a result of exposure to radon, daughter elements of radon had accumulated in the lungs for 4 to 14 years prior to cancer diagnoses. Samet *et al* (1984) performed a study on a non-smoking population of Navajo men. It was found that the majority of the cases of lung cancer were related to uranium mining. Another study evaluated the incidence of cancer near Australia's largest Uranium mine. The study found that the cancer rates were double in Aboriginal communities near the mine in comparison to Aboriginal communities in other regions of Australia's Northern Territory (Minchin and Murdoch, 2006).

Radionuclides

Thorium-232 and Uranium-238 are radioactive substances that persist in the environment for thousands of years. They produce over 30 other radioactive substances as they undergo decay and have the ability to alter biologic molecules and cause mutations and cancer. Many of the wastes and by-products of rare earth mining and processing are radioactive. The two isotopes of concern are Uranium-238 and Thorium-232. They have the ability to contaminate air, soil and water. They are often taken up by plants and are then able to bioaccumulate and bioconcentrate up the food chain. Uranium, thorium and their decay products persist for thousands of years and pose serious risks. Radioactive decay releases energy particles which can dislodge electrons in biologic molecules such as water, protein and DNA. This can cause mutations and cancer. The Uranium (*Figure 3*) and Thorium (*Figure 4*) decay chains include isotopes that are far more hazardous than the Uranium or Thorium themselves. These include Radon-222, Bismuth-214, Radium-226, Polonium-218, Polonium-214 and Polonium-210 all of which are dangerous radioactive substances. Radon-222 is carcinogenic to all organisms. Radon-222 is a gas, it is inhaled and then its decay products are solids which lodge themselves in the lungs and increase risk of developing lung cancer. Polonium-210 is an extremely dangerous isotope, on a per weight basis it is considered to be 250 billion times as toxic as cyanide. Mine tailings interact with the environment and emit gamma radiation, Radon, Radium and Arsenic can become air borne due to dust that is blown from the tailings ponds and Uranium and arsenic can seep into groundwater from tailings impoundments (Edwards, 2014).

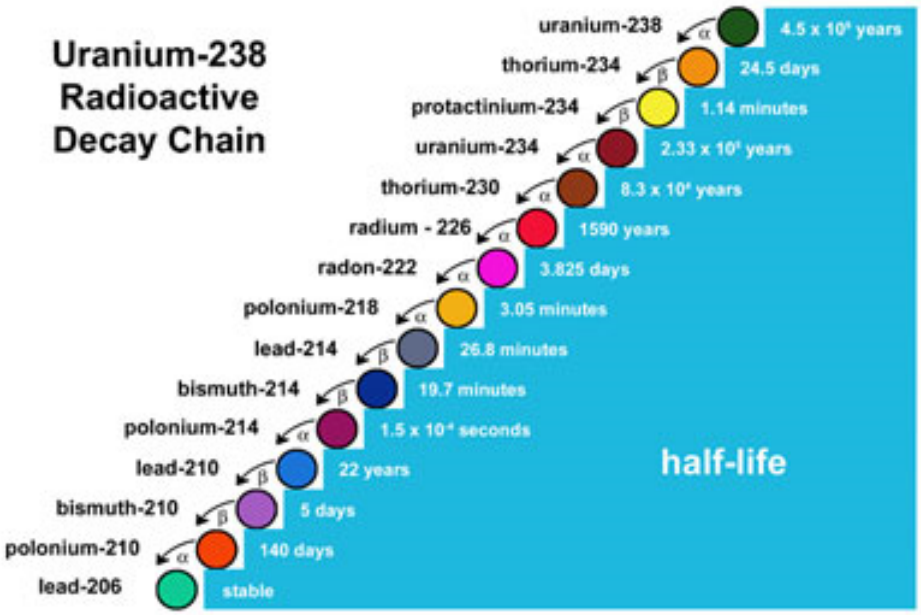

Figure 3. Uranium- 238 decay chain (modified from Ulmer-Scholle, 2014).

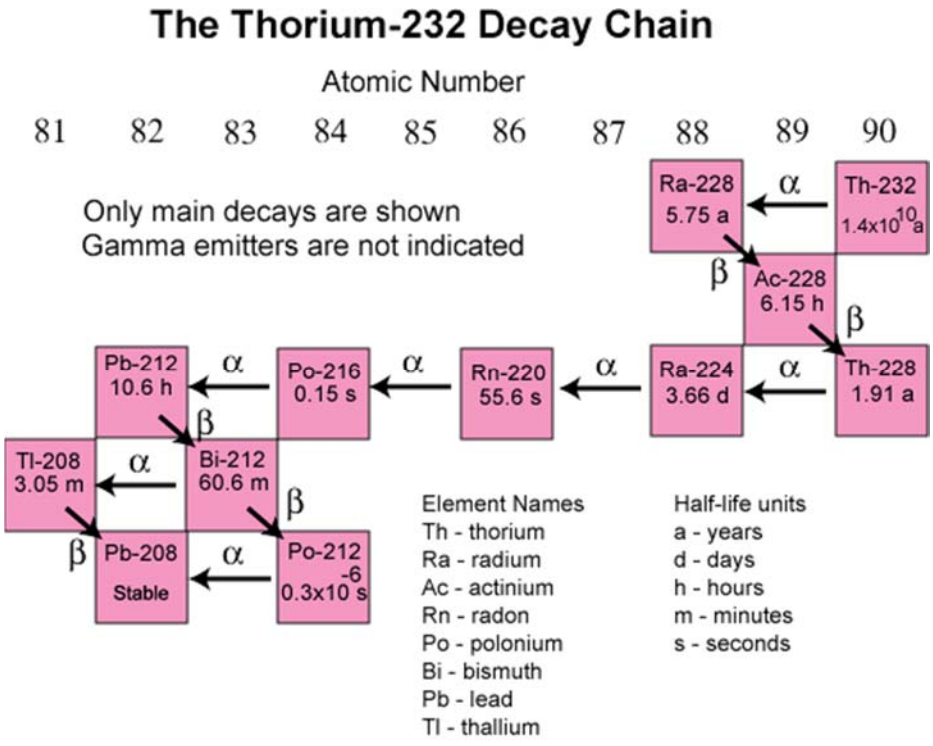

Figure 4. Thorium-232 decay chain (modified from USGS, 2014).

"Modern mining's legacy is more than 10,000 miles of polluted streams, hundreds of contaminated lakes, mountains reduced to craters and landscapes devoid of life where thriving forests and fragile deserts once existed. The effects of mining's impact on the earth are magnified in their effects on human health. Most of the people living in impacted communities don't know their health is at risk until their families, relatives or neighbors begin showing signs of illness. Dozens of communities across the Western U.S. have been affected, but few people outside these areas understand the extent of the damage" – Boulanger and Gorman (2004)

RARE EARTH MINING

Many other harmful substances in addition to radionuclides are released when mining rare earth ores. These substances are harmful to the environment, wildlife and human health. The toxicity and impacts of the rare earth ores themselves are still poorly understood. In addition to the release of Uranium, Thorium and Rare Earth elements rare earth open pit mines often release the following contaminants:

- Sulfide Minerals
- Aluminum
- Arsenic
- Lead
- Manganese
- Zinc
- Barium
- Beryllium
- Copper

(US EPA, 2011)

For more detailed information on these contaminants and their environmental/human health impacts please see Appendix 1.

Rare earth elements are 16 elements on the periodic table, they are not actually rare but are found worldwide. They are used in magnets, batteries, electronics, magnets, lasers, hybrid cars, motors, LCD screens, oil refining, weapons of defence, etc. Many companies market rare earth mining operations as 'green' as the intended use of some of the ores are in products designed to lower carbon emissions. However these 'green' products are no better at lowering greenhouse case emissions or at protecting the environment than conventional products when the methods used to extract the ore are taken into consideration. Procedures used to obtain rare earths are very damaging to the environment and far from being 'green'. The mining of rare earths releases many air pollutants including: nitrogen dioxide,

sulphur dioxide, carbon monoxide, particulate matter and dust fall. Greenhouse gases such as carbon dioxide, methane and nitrous oxide are also released.

Historically rare earth supply worldwide was largely from China although in the past few years they have cut exports due to extreme damage to the environment and human health.

"According to the Chinese Society of Rare Earths every ton of rare earth elements produced generates 8.5 kg fluorine, 13 kg flue dust...9,600-12,000 cubic meters of gas (laden with flue dust concentrate, hydrofluoric acid, sulfur dioxide and sulfuric acid)...75 cubic meters of acidic waste water and one ton of radioactive waste residue" US EPA 2011

While environmental legislation in China is not as stringent as in developed nations, rare earth mining has not yet been carried out anywhere in the world safely. Proper handling and disposal of uranium and thorium continue to be a major challenge for the rare earth industry. While Canada does have strict environmental laws in comparison to many other nations, Canada's laws were not written with rare earth mining in mind.

The Metal Mining and Effluent Regulations (MMER) were not designed to manage or regulate all of the contaminants of concern in rare earth mining. The MMER does not consider thorium and uranium harmful substances and does not impose controls upon their release into the environment. Since their release during mining activities is not associated with the nuclear fuel cycle they are not regulated by the Canadian Nuclear Safety Commission (CNSC).

The MMER imposes maximum daily discharge limits on arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids and radium-226. Other contaminants of concern are not regulated.

The processing of rare earth ores is frequently done on site and requires strong acids and bases (most often sulfuric acid, hydrochloric acid and lime). These chemicals must be transported to the mine site putting other areas at risk should spillage occur.

Rare earth mining has never been carried out in Canada, but there have been environmental disasters associated with rare earth mines in other developed nations. Mountain Pass rare earth mine in California was shut down in 2002 in part due to environmental concerns. During its operation the mine released over 600,000 gallons of waste water containing thorium into the nearby desert ecosystem. Local groundwater has been contaminated with radium, thorium and strontium. The Kerr-McGee

company had 4 rare earth sites in the state of Illinois. These sites are now among the most contaminated sites in all of the United States.

KIPAWA RARE EARTHS PROJECT

Located 50 km East of Temiscaming, Quebec. The proposed mine site is located 50 km East of Temiscaming, Quebec along the shores of the Kipawa River (between Brennan (Sairs) Lake and Sheffield Lake/Garden (Desjardins) River).

Figure 5. Location of proposed Kipawa Rare Earth Mine within the Kipawa Watershed (modified from Golder Associates, 2013).

Roche *et al.* (2013) and Golder Associates (2013) prepared a feasibility study and a description of the project. Much of the information presented below is from these two reports.

The mine site would consist of:

- Open pit (1,500 m x 320 m x 110 m) within 600 meters of the Kipawa River
- Waste dump (2 waste rock piles + in-pit waste rock storage)
- Low grade ore stockpile
- High grade ore loading facility
- Mine equipment maintenance facility

- 10.9 km haul road including a 60 meter bridge over the Kipawa River to bring ore to processing plant site
- 2 tailings storage facilities (located 4 km south of processing plant)
- Administrative offices, assay lab and warehouses at processing site

The ores of primary interest include:

- Dysprosium oxide
- Neodymium oxide
- Yttrium oxide
- Terbium oxide
- Total ore tonnage estimated at 19.8 million tonnes

A preproduction year would involve clear-cutting of the vegetation and removal of 1,328,480 tonnes of overburden as well as 130,760 tonnes of top soil. The mine would operate 361 days per year. The mill feed would operate 365 days per year. The mine will feed the mill with 3650 tonnes of ore per day. Drilling would occur day and night and it is estimated that there would be one production blast per week (this does not include pre-splitting). 18.65 Mt of waste rock would be produced and stored in 2 piles plus a 3rd 'in-pit' waste storage will be used during the last 3 years of the mining operations (year 12-15). Processing would be done on site using harsh chemicals including: Sulphuric Acid, Lime or Limestone and Sodium carbonate. Sulphuric acid would be used for leaching, limestone or lime for neutralizing and sodium carbonate for precipitation. The processing of the rare earth ore would involve grinding and crushing followed by magnetic separation and leaching.

The company has identified two tailings streams: MagSep reject – waste rock generated from magnetic separation and Hydromet tailing - produced from the hydrometallurgical processing which involves acid leaching, neutralization, removal of impurities and a final precipitation to produce the rare earth concentrate. At end of operations it is anticipated to have 2 piles of dewatered tailings and one waste rock dump.

Ore and rock samples were tested and some classified as high risk, some leachable for lead, zinc and selenium and some of the waste rock and several of ore samples exceeded NORM (Canadian guidelines for Management of Naturally Occurring Radioactive Materials) criteria. Most of the ore and some of the waste rock classified as radioactive. Tailings from magnetic separation were found to be leachable for lead, selenium and zinc. They exceed NORM criteria.

Total Wastes Generated:

- 18.6 Metric Tonnes (9.3 Mm3) waste rock
- 10.9 Metric Tonnes (7.5 Mm3) tailings from magnetic separation
- 9.25 Metric Tonnes (6.1 Mm3) tailings from chemical processing

Hydrology

Water use requirements estimated at **190-210 m^3** per hour. Two pumping stations would be located at Sheffield Lake and Desjardins River to provide freshwater.

Flow of groundwater from the open pit is west towards Sheffield Lake. The open pit will intersect the water table, water flow into the pit is estimated at 200-600 m3 per day. Maximum daily pumping from pit has been estimated at 900 m3 per day.

Two waste water treatment plants have been proposed. One at the mine site which would process 3,600 m3/day (781,000 m3 annually) and the other at the Hydromet site - 3,300 m3/day (688,400 m3 annually). Effluent will be released into the environment at these sites and additional release may occur at emergency overflow spillways.

Seismic Activity

Seismic activity of the project site is higher than the average for the Province of Quebec. Historic seismic activity for the area includes 16 recorded earthquakes (between 1980 and 2000) of magnitudes of 4 or greater on the Richter scale. An earthquake of 6.2 impacted the region in 1932.

Ecological Value

Protected areas are located within kilometers of the proposed site:

- An ecological reserve
- An exceptional forest system
- 2 biological refuges (located 300 meters North of open pit and 3 km South of tailings)
- Old growth forests of Lac-Richelieu
- Lac-Malakisis ecological reserve

Field surveys in 2012 identified many protected, vulnerable and threatened species.

Water sampling determined nearby lakes to be sensitive to acidification. The proposed project is located near several important recreational fishing lakes: the upper Kipawa River (Sheffield and Sairs Lakes)

which resides within Zec Restigo a controlled harvest zone and upstream of Kipawa Lake, Lower Kipawa River, Gordon Creek, Lake Temiscaming and the Ottawa River.

There are 28 species of fish in the region of the proposed mine, including spawning grounds for:

- Walleye (*Sander vitreus*)
- Northern Pike (*Esox lucius*)
- Brook Trout (*Salvelinus frontalis*)
- Yellow Perch (*Perca flavescens*)
- Lake Trout (*Salvelinus namaycush*)

The proposed mine site is covered by 2 Red Oak/Sugar Maple stands and 1 Red Oak/Red Maple stand (25 hectares of valuable tree stands).

Wetland communities include:

- Swamps
- Marshes
- Ponds
- Fens and bogs

5% of the mine site, 13% of the plant site and 34% of the tailings site are wetland communities.

Wildlife

The area is rich in biodiversity there are many mammal, bird, reptile and amphibian species. These include: white-tailed deer, moose, black bear, coyote, Canada lynx, gray wolf, red fox, North American beaver, river otter and mink. There are 81 bird species, 18 water fowl and aquatic bird species, 4 species of nocturnal raptors, 6 species of diurnal raptors, 11 species of amphibians and 6 reptile species.

Land Use

Land is used by Aboriginal and non-Aboriginal people for hunting, fishing, trapping, canoeing (vast system of canoe routes) and recreational uses (a large number of public land leases for camps and cottages near the mine infrastructure).

Environmental Impacts

Environmental impact assessments are currently underway. Some preliminary potential impacts include:

- Effects on surface water quality and hydrology
- Higher suspended soils

- Contamination by effluents and leachate from waste rock, ore piles, magnetic separation and tailings
- Spills of petroleum products or other chemicals
- Issues with surface water quality - has a direct impact on the ecosystem (fish and waterfowl)
- Potential for local water contamination by accidental spillage of petroleum products, contaminants or dust
- Clear-cutting, infrastructure, water intake and effluents can modify hydrology
- Drawdown of groundwater
- Groundwater inflow into mine pit estimated at a rate of 300 m3/day
- Groundwater quality impacted by accidental spillage, leaching or dissolution of metals
- Soil Quality - accidental spillage could contaminate local soil
- Air Quality - potential for air quality to be impacted by emissions from generators, vehicles, heavy equipment as well as release of contaminants and dust
- Vegetation clearing - Erosion due to creation of new roads, placement of installations, movement of vehicles, loading and unloading of material, mining, blasting crushing, processing, wind, removal of waste rock and tailings
- Noise and vibration created from machinery, vehicles, drilling, blasting and crushing of the ore
- Loss of vegetation and wetlands - vegetation (mixed forest stands) and wetlands lost by clear-cutting and construction of infrastructure, mine site, process plan site, tailings storage and access roads.
- Habitat Loss and Alteration:
    - Clear-cutting and infrastructure will reduce habitat available
    - Blasting has potential negative effects on fish health and habitat
    - Blasting can cause damage to internal organs, mortality of fish eggs and disturbance of spawning grounds
    - Loss and modification of fish habitat due to infrastructure and associated changes in hydrology, hydraulics and water quality. Alterations of spawning grounds for Walleye, Lake Trout, Brook Trout due to sedimentation. Fish habitat loss.
    - Potential risk of chemical products being split during transport (from Ontario to Quebec).

Socio-cultural impacts

- Relocation of seasonal camps and cottages
- Effects on recreational use of area (hunting, fishing, trapping, canoeing)
- Disturbance to archeological sites
- Two potential archeological sites have been identified near the tailings disposal facilities
- Visual modification to the landscape
- Traffic increases on the Maniwaki Road
- During construction – 15 trucks per day
- During operation – 10 trucks per day

- Additional vehicles for transportation of staff to and from the site
- Modifications to biophysical and social environment

Workforce and Taxes

Estimated taxes to MRC of Temiscaming 399,000 per year (based upon 2013 tax rates). Local population is 3,350, projected employment opportunities 109 non-unionized workforce. Many of these positions require specific skill sets, education or training. If 100% of the opportunities went to local residents this represents 3% of the local population.

Algonquin Socio-Economic Baseline Report

Kuyek (2014) identified additional socio-cultural impacts for the two First Nations closest to the mine site in Algonquin Socio-Economic Baseline Report For the Matamec Rare Earth Project. The First Nations communities near the proposed rare earth mine are Eagle Village (300 members, 600 off-reserve) and Wolf Lake (205 members). Hunting, fishing, trapping and gathering have a significant cultural importance. Many First Nation owned businesses rely on tourism (Migizy Gas Station, Algonquin Canoe Company, Camp La Lucarne, Wolf Lake Maganisipi tourism plan, tourist/outfitting/guiding operations). The 'camps' have an important cultural and social significance as this is where many of the fishing, hunting, trapping and gathering (berries and medicines) activities take place. The camps and these activities provide an opportunity for families to reconnect and for values to be transmitted.

The members of the First Nations were surveyed regarding their use of the territory:

- 81% use territory for camping
- 65% hunt
- 64% gather food and medicines
- 90% go fishing

Many also visit lakes in mine site:

- 28.2% visit Sheffield Lake
- 30% visit Booth Lake
- 54.2% visit Brennan Lake

Eagle Village is physically heathier than many other First Nations communities in Quebec. Berries, wild game and fish are essential dietary needs. Several families are located within the mine footprint. The camps have been in their families for generations and their traditional activities are already being

disrupted by mining exploration (road equipment, noise and dust). If the Kipawa Rare Earths project is allowed to proceed it will destroy trap lines, hunting grounds, the fishery and gathering places.

When asked about the proposed Kipawa Rare Earth mine 100% of First Nations members had fears and only 2 were in favor.

KIPAWA LAKE PRESERVATION SOCIETY CONCERS

The Kipawa Lake Preservation Society has many concerns about the Kipawa Rare Earths Project and Rare Earth Mining in general:

Impacts on the health of the environment and the Kipawa watershed

- Processing of ore on site with toxic acid and bases
- Storage of waste in tailings ponds and its potential to contaminate soil, air, water and living organisms (plants and wildlife)
- Destruction of fish spawning habitat
    - Kipawa lake Walleye and Lake Trout populations already at risk
    - Loss of Kipawa River spawning grounds would be devastating

Impacts on tourism industry

- Outfitting operations
- Canoe routes
- Kipawa lake is a beautiful wilderness area – not a mining district
- Mining and tourism don't mix
- Tourism important for local economy

Safety of drinking water

- Many communities downstream of proposed project
    - Kipawa, Temiscaming, Ottawa River, Ottawa, etc.

Human health

- Chronic illness, elevated cancer rates, etc. due to mining in region (radioactivity, heavy metals and other contaminants)
- Concerns over radioactivity being downplayed by company – levels of thorium and uranium in ore low but will be concentrated in the tailings ponds

Insufficient laws

- Rare earth mining never been done safely
- No rare earth mines in Canada
- Laws not written for these mines – Metal Mining and Effluent Regulations limit some but not all contaminants associated with rare earth mines

- Safety of rare earths themselves not known
- Lack of monitoring of mining operations

Social acceptability

- often mentioned but not assessed appropriately – Matamec mentions this is an important part of their project and discusses information sessions or meetings but has not addressed opposition – petitions, protests, concerns and questions from the public
- Project is not socially accepted among Kipawa Lake users and members of First Nations communities
- MRC Temiscaming voted in favor of the project in 2012 without accurate info on environmental risks or an assessment of social acceptability. Vote was based on information provided by Matamec info sessions rather than unbiased info.

Risks of this project outweigh the benefits

- Even with the best safety precautions accidents and environmental disasters happen
- Once polluted remediation can be done but will never be the same
- Matamec states they have no intention of polluting and will follow all government regulations
- Accidents happen, they can't guarantee their project won't impact the environment or human health
- Government too lax on polluting companies – easier to pay the fine than prevent pollution

Not mining is the only guaranteed way to protect the Kipawa Watershed, wildlife and local residents.

FIRST NATIONS AND SOCIAL ACCEPTABILITY

The vast majority of mine projects are located in remote areas, away from large city centers but often near First Nations Communities. Because these communities often rely on fish, wild game, wild plants and local drinking water sources introducing mining in First Nations Territories is an important concern. Should local wildlife, plants and water become contaminated these communities are directly impacted either by a loss of the resource or significant health problems should they continue to use the resource. When wildlife, fish, plants are no longer safe for human consumption this can impact health of these communities and their traditional way of life. The socially acceptability of mine projects in the local community where they are proposed should be of utmost concern. However, all too often we see projects approved despite local public opposition and very real threats to local human and environmental health. For example, in 2013 the Federal Minister of Aboriginal Affairs and Northern Development approved the Avalon Rare Metals Nechalocho proposal for a rare earth mine at Thor Lake, N.W.T. The project was approved by the Minister despite public opposition including opposition from the Dene First Nation (CBC News, 2013).

It is far too easy for someone who lives at a distance from one of these communities and who stands to benefit financially from a proposed project to state that the financial benefits outweigh the environmental and health concerns. It is something else to be a member of a community that will be impacted by a mine project that stands to benefit very little from the project but that will have to live with the consequences for generations.

In the pre-consultations for this BAPE it was mentioned how the economics and profits that are to be gained by allowing these types of mining projects are not a bad thing. We would argue that profits alone are no reason to allow projects such as these. When profits are gained at the expense of human health and the environment it is no longer socially acceptable and it is unethical.

In pre-consultations the phrase “les gens inquietes” or “worried people” was mentioned and it was suggested that people are often worried due to a lack of information. In the case of rare earth mining or uranium mining we would have to argue that the worry for these types of projects is not due to a lack of information. Often those that are the most concerned on these topics are those that have done the most research into the possible impacts. When it comes to a rare earth mine or a uranium mine proposal members of the community have a justified reason to be concerned.

Similarly, the phrase “pas dans ma cours” or “not in my backyard” was mentioned several times. Unfortunately far too often this phrase is used as a way to discredit the legitimate concerns of those who would have to deal with a proposal in their backyard and it is often used by those who live at a great distance and would not have to deal with the aftermath of the potential problems. When it comes to rare earth or uranium mining we’d have to argue that the majority of the public if fully informed on the risks would not want this in their backyard. Uranium mining and rare earth mining have never been carried out in a safe manner, they are industries that have taken their toll on the environment and human health.

For both Uranium Mining and Rare Earth Mining there is a lack of social acceptability and significant public opposition. Several organizations have formed in opposition to Uranium mining these include: Pour un Quebec sans Uranium (www.quebecsansuranium.org), West Quebec Coalition Against Uranium Mining (www.no-uranium.blogspot.ca), James Bay Cree #standagainsturanium (www.standagainsturanium.com) and many others.

For rare earth mining there has been signification public opposition to the Kipawa Rare Earths Project proposed by Matamec Explorations Inc. An online petition against the mine and development in the

Kipawa watershed has reached nearly 3,000 signatures (http://www.change.org/p/minister-of-natural-resources-quebec-protect-kipawa-lake). There have also been several paper petitions presented to the Provincial and Federal governments. There has been a great deal of local mobilization with lawn signs, t-shirts, community information sessions, etc. The Wolf Lake and Eagle Village Chiefs (Harry St-Denis and Madeleine Paul) in an October 2014 press release issued a statement that they are opposed to Quebec's $1,000,000 investment in the Kipawa Rare Earths Project and that their First Nations support a moratorium on the mining of both Uranium and Rare Earths in Quebec (MarketWired, 2014).

RECOMMENDATIONS AND CONCLUDING REMARKS

There is a great need for more emphasis on social acceptability and improved opportunities for the public to voice their concerns and for those concerns to be heard. Currently, for mining projects in Quebec there are two opportunities to do so. Canadian Environment Assessment Agency carries out an environmental impact assessment that includes a comment period for individuals and groups and Quebec has the BAPE (bureau d'audiences publiques) which gives the opportunity to submit a brief outlining concerns. Despite these opportunities projects are approved even with significant opposition and concerns from community and environmental groups. Citizens should have the right to say no to a project – currently citizens do not have that right even though they may be directly impacted by projects.

Due to the adverse impacts on human health, the environment and the tourism industry our suggestions are for the **moratorium on Uranium mining to remain in effect and for an immediate moratorium on rare earth mining** before any rare earth projects within the province proceed further than they have to date. Rare earth mining and Uranium mining present significant risks to environment, human health, tourism, etc. and provide few benefits to those living in the region where these activities take place. It is socially unacceptable to expose communities to these sorts of devastating impacts for the sake of producing nuclear power which is anything but clean or safe or in order to produce 'green' technologies that are anything but 'green'. Given the uncertainty and lack of scientific evidence that rare earth mining can be done safely rare earth projects should not be allowed to proceed at this time. We have to come up with new technologies and ideas that avoid the mining of radioactive elements and rare earths. Resources Quebec should be investing money into alternate solutions such as this rather than funding mining projects that are not deemed socially acceptable by local communities and the public at large.

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APPENDIX 1

Rare Earth Elements -Toxicity and effects on the environment and human health still not understood

Sulfide Minerals - Create sulfuric acid – acid mine drainage, decreasing the pH of water, which aids in the further release of sulfide minerals and metals and acid to be released into the environment.

Aluminum - Can enter air, soil, water. Aquatic organisms are sensitive to aluminum. Toxic to fish. In humans elevated levels cause developmental problems in children and pulmonary issues.

Arsenic - Can enter air, soil, water. Very mobile – travels long distances in the air before settling. Toxic to humans, human carcinogen. Increases risk of skin cancer. Low levels cause nausea, change in heart rhythms, low white blood cell count. Chronic exposure causes gastrointestinal issues, fatigue, blood disorders, and neuropathy. At high levels will cause death. All mammals experience same effects as humans. In aquatic organisms causes genetic mutations and cancer. In plants causes wilting, dehydration and death.

Lead - Once released will accumulate in soils. In plants, it decreases photosynthesis rates and water absorption. Major health concern for humans, especially children under 7 years of age. Causes negative effects on the cardiovascular, endocrine, muscular, nervous, reproductive and respiratory systems, may cause death. Likely a carcinogen. Same effects are seen in mammals, birds and fish.

Manganese - Can impair gastrointestinal, muscular and neurobehavioral function.

Zinc - Toxic in large amounts. In aquatic plants and animals causes decreased growth and reproduction and increased mortality. In mammals (including humans) impairs the nervous and cardiovascular systems. At elevated levels will cause liver and kidney issues.

Barium - Can enter groundwater. Harmful effects on the muscular system, disruption of heart rhythms and paralysis. Ingestion results in gastrointestinal irritation and kidney damage. Toxicity of barium to aquatic and terrestrial organisms is unknown.

Beryllium - Very mobile, can travel in the air and able to enter soil and water. Inhalation causes acute beryllium disease (reddening and swelling of the lungs). Human carcinogen (lung cancer).

Copper - Toxic to plants and animals at high levels. Aquatic organisms are extremely sensitive to copper exposure – causes death in aquatic organisms. Slowed growth and development in terrestrial organisms. Irritant to nose and throat when inhaled. Causes nausea, vomiting, diarrhea when ingested. Can lead to kidney and liver damage or death at high levels.

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