



**AVALON**  
RARE METALS INC.

*MATERIALS FOR CLEAN TECHNOLOGY*

# Public Hearing



TSX & NYSE AMEX: AVL



# Presentation Content

- Project Animation
- Water Quality
- Barging
- Air Quality
- Traditional Knowledge
- Wildlife
- Uranium & Thorium
- Closure
- Socio-Economics





# NECHALACHO PROJECT

## *Project Animation*





# WATER QUALITY



# Water Nechalacho Mine Site



## Design

- Tailings Management Facility (TMF) provides permanent, secure, and total confinement of all tailings solids within an engineered facility
- TMF located in a natural topographic feature containing non-fish-bearing ponds
- looped system allows for recycle monitoring and response.
- Water treatment systems developed that are protective of environment.



# Water Nechalacho Mine Site

Avalon commits to

- Water quality and biological (EEM) monitoring
- Meet CCME guidelines for water quality as reflected in proposed SSWQO's





# SSWQO – Metals Concentrations Nechalacho Mine Site

Parameter	Untreated Tailing Water (µg/L)	Treated Effluent and Mine Water (µg/L)	Drizzle Lake	Thor Lake	Proposed SSWQO [For Drizzle Lake] (µg/L)	CCME Guideline (µg/L)
			Background Mean (µg/L)	Background Mean (µg/L)		
Aluminum (Al)	1000	120	8.30	3.3	100	100
Arsenic (As)	<2	0.9	0.92	0.77	5	5.0
Cadmium (Cd)	0.04	0.003	0.01	0.02	Background	0.052
Chromium (Cr)	<5	<0.5	<0.5	<0.5	8.9	8.9
Copper (Cu)	<5	1.9	0.25	0.36	3	2-4
Iron (Fe)	2080	44	1091	69.5	Background (seasonal)	300
Lead (Pb)	1.3	0.92	0.028	0.05	4	1-7
Mercury (Hg)	<0.1	<0.1	<0.01	<0.01	0.026	0.026
Molybdenum (Mo)	13	6.2	1.27	2.1	73	73
Nickel (Ni)	5	2	<0.5	<0.5	110	25-150
Selenium (Se)	10	<1	<1.0	<0.1	1	1
Silver (Ag)	>0.1	<0.01	<0.01	<0.01	0.1	0.1
Thallium (Tl)	<2	0.017	<0.1	<0.1	0.8	0.8
Uranium (U)	2.8	0.01	0.08	0.36	15	15
Vanadium (V)	0.4	0.19	<1.0	<1.0	6	6
Zinc (Zn)	8	28	0.90	1.43	Background	30





# SSWQO – REE Concentrations Nechalacho Mine Site

Parameter	Untreated Tailing Water (µg/L)	Treated Effluent and Mine Water (µg/L)	Drizzle Lake	Thor Lake	Proposed SSWQO [For Drizzle Lake] (µg/L)
			Background Mean (µg/L)	Background Mean (µg/L)	
Cerium (Ce)	221	0.92	<0.05	<0.05	3.2
Dysprosium (Dy)	16.2	0.63	<0.05	<0.05	16.2
Erbium (Er)	6.8	0.022	<0.05	<0.05	19.1
Europium (Eu)	3.2	0.014	<0.05	<0.05	11.2
Gadolinium (Gd)	26.5	0.11	<0.05	<0.05	15
Hafnium (Hf)	0.8	0.005	<0.1	<0.1	4.4
Holmium (Ho)	2.9	0.010	<0.05	<0.05	0.7
Lanthanum (La)	94.2	0.41	<0.05	<0.05	1.8
Lutetium (Lu)	0.5	0.002	<0.05	<0.05	2.9
Niobium (Nb)	2.2	0.045	<0.1	<0.1	2.6
Neodymium (Nd)	114	0.49	<0.05	<0.05	14.3
Praseodymium (Pr)	29.7	0.11	<0.05	<0.05	3.5
Samarium (Sm)	26.1	0.11	<0.05	<0.05	7.4
Scandium (Sc)	1.2	0.82	0.9	0.5	2.9
Tantalum (Ta)	0.6	0.009	<0.1	<0.1	0.2
Terbium (Tb)	3.5	0.014	<0.05	<0.05	8.4
Thulium (Tm)	0.73	0.003	<0.05	<0.05	6.9
Ytterbium (Yb)	4.2	0.012	<0.05	<0.05	6.9
Zirconium (Zr)	9.7	0.07	<0.1	<0.1	11.2





# Water Hydrometallurgical Site

## Design

- Tailings waste product is inert gypsum
- Groundwater aquifer is extremely slow moving
- Groundwater modeling identifies water infiltrated in N-42 open pit will conservatively take over 40 years before reaching GSL
- Modeling shows that the most elevated parameters in the effluent (sulphate and magnesium) reporting to Great Slave Lake are within the natural variation levels





# Water Hydrometallurgical Site



Avalon commits to

- Groundwater quality monitoring
- Installation of monitoring wells along the projected migration path prior to the commencement of operations.
- Comparison of measured groundwater quality with modeling predictions.
- Reassessment of model predictions based on observed groundwater quality. Application of adaptive management measures if required.





# Water

## Significance

- Water quality in Thor Lake and further downstream is not anticipated to be adversely affected by mining activities
- At the Hydrometallurgical Facility, projected concentrations of all parameters of potential concern will be lower than or within the range of existing conditions in Great Slave Lake.





# BARGING





# Barging

## Design

- Barging has a reliable history
- Fuel barges
  - Isolated compartments,
  - Not loaded to full capacity
  - Annual barge inspections and certifications
- Barging schedule allows contingency days for bad weather

## Avalon commits to

- Follow Transport Canada and marine guidelines
- Adequate spill response



PWNHC N-1979-012-0005



# Barging



*Photo courtesy of CanDive*

- In the unlikely event of an accident, Avalon would require the barge company to recover barges, containers, or concentrate
- Test work has identified the concentrate to be inert, non-reactive and thus insoluble



# Barging

## Significance

- Rare earth metal concentrates are essentially inert and non-reactive.
- Barge traffic creates a small wake with no effects to fish and waterfowl
- Barge landings improve safety for recreational and traditional users







# AIR QUALITY





# Air Quality Nechalacho Mine Site

## Sources of Contaminants

- Ventilation raises
- Mine air heater
- Diesel generators
- Transfer and handling
- Vehicle emissions and road dust

## Mitigations

- Use of low NOx and SOx diesel power generators
- Underground crushing at Nechalacho eliminates dust
- Dust control using water during summer months
- All infrastructure located indoors





# Air Quality Nechalacho Mine Site



Avalon commits to

- Air quality monitoring and management plan
- Stack testing upon commissioning of the diesel generators
- Incineration management plan
- Conformance with GNWT and WSCC standards for mine and process plant air quality.
- Use of low sulphur diesel fuel and regular equipment and engine maintenance.



# Air Quality Hydrometallurgical Facility

## Sources of Contaminants:

- Hydrometallurgical Plant
- Vehicle Emissions & Road dust

## Mitigations

- The Hydromet plant will be equipped with a scrubber to reduce emissions released to the ambient air.
- The Hydromet plant will be powered by hydro-electricity rather than coal or diesel.
- The concentrate will be shipped in closed containers thereby minimizing fugitive dust emissions.
- Project access roads will be watered to control dust during summer months







# Air Quality Hydrometallurgical Facility



Avalon commits to

- Air quality monitoring and management plan
- Stack testing upon commissioning of the Hydromet plant
- Dust Suppression
- Use of existing highways for all Hydrometallurgical Plant-related vehicle traffic.
- Secure containment of concentrate product during transportation
- Use of low sulphur diesel fuel and regular equipment and engine maintenance.

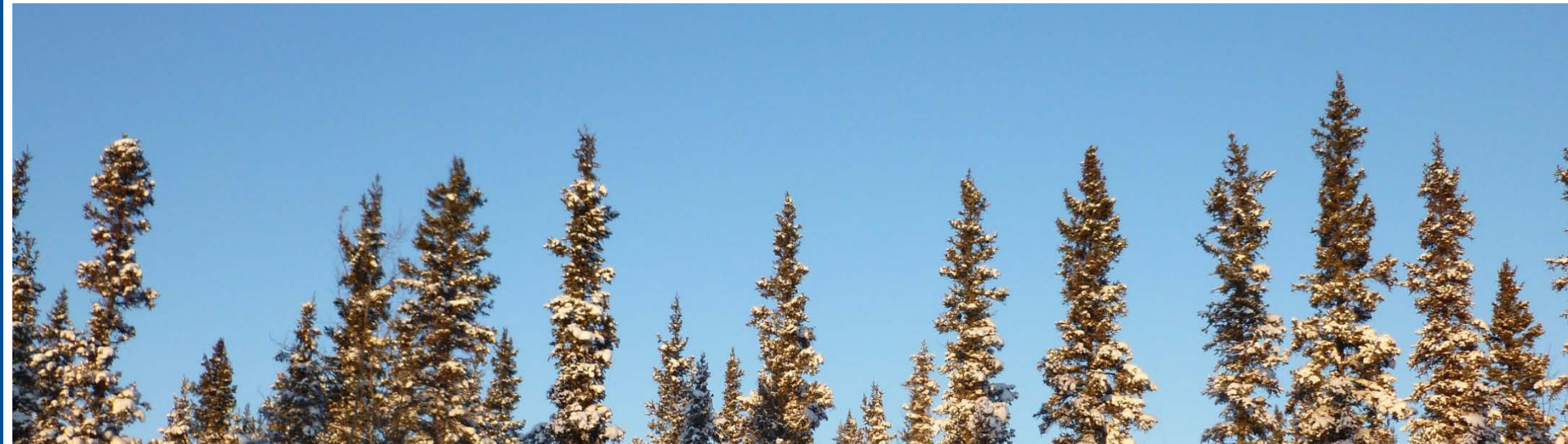




# Air Quality

## Significance

- Air emissions will be localized, short-term, periodic, of low magnitude, and rapidly reversible
- Maximum emission concentrations are predicted to be lower than the NWT Air Quality Standards for all contaminants





# TRADITIONAL KNOWLEDGE



# Traditional Knowledge Studies

Traditional Studies with DKFN, FRMC, LKDFN, and YKDFN

- Began by notifying elected leadership
- Obtained legal permission to conduct surveys and use for EA process

Aboriginal governments / organizations:

- Reviewed and approved the study proposal
- Organized and assisted with all interviews
- Identified a community representative
- All reports and support information were delivered to Aboriginal organization

Community representatives

- Directed the format
- Conducted interviews with Elders and land users
- Reviewed content for accuracy and finalization of the report







# Traditional Knowledge Study

The studies focused on:

- Terrain
- Climate
- Vegetation
- Wildlife
- Water
- Significant Sites
- Traditional Use
- Culturally significant sites were identified in the general areas near the project sites, but not within the proposed development sites.
- Knowledge from the study was incorporated into the DAR
- NSMA completed their study in 2013





# Traditional Knowledge

TK studies are only the first step.

- Traditional knowledge is an important part of the design and update of management plans (Closure, Aquatic Effects, Archeological Sites Protection, Wildlife)
- Aboriginal workers use their knowledge at site and participate in monitoring
- Negotiated Agreements enhance traditional knowledge use







# WILDLIFE





# Valued Species



## Valued Species

- Moose
- Caribou - Barren-ground & Woodland
- Black Bear
- Fur-bearers
- Breeding birds
- Raptors
- SARA listed Species



# Barren-Ground Caribou – Winter Range







# Wildlife Monitoring

## Wildlife and Wildlife Habitat Protection Plan

- Has been submitted at a conceptual level.
- Includes species-specific mitigations and procedures
- Requires Input from the parties prior to construction

## WEMP and Cumulative Effects

- Currently engaging with the GNWT to define expectations for these programs







# Wildlife Monitoring



## WEMP and Cumulative Effects

- The project does not have significant impacts
- Currently engaging with the GNWT to define expectations for these programs
- Will continue to engage with Aboriginal parties to discuss their expectations for wildlife monitoring



# URANIUM & THORIUM



# Uranium and Thorium

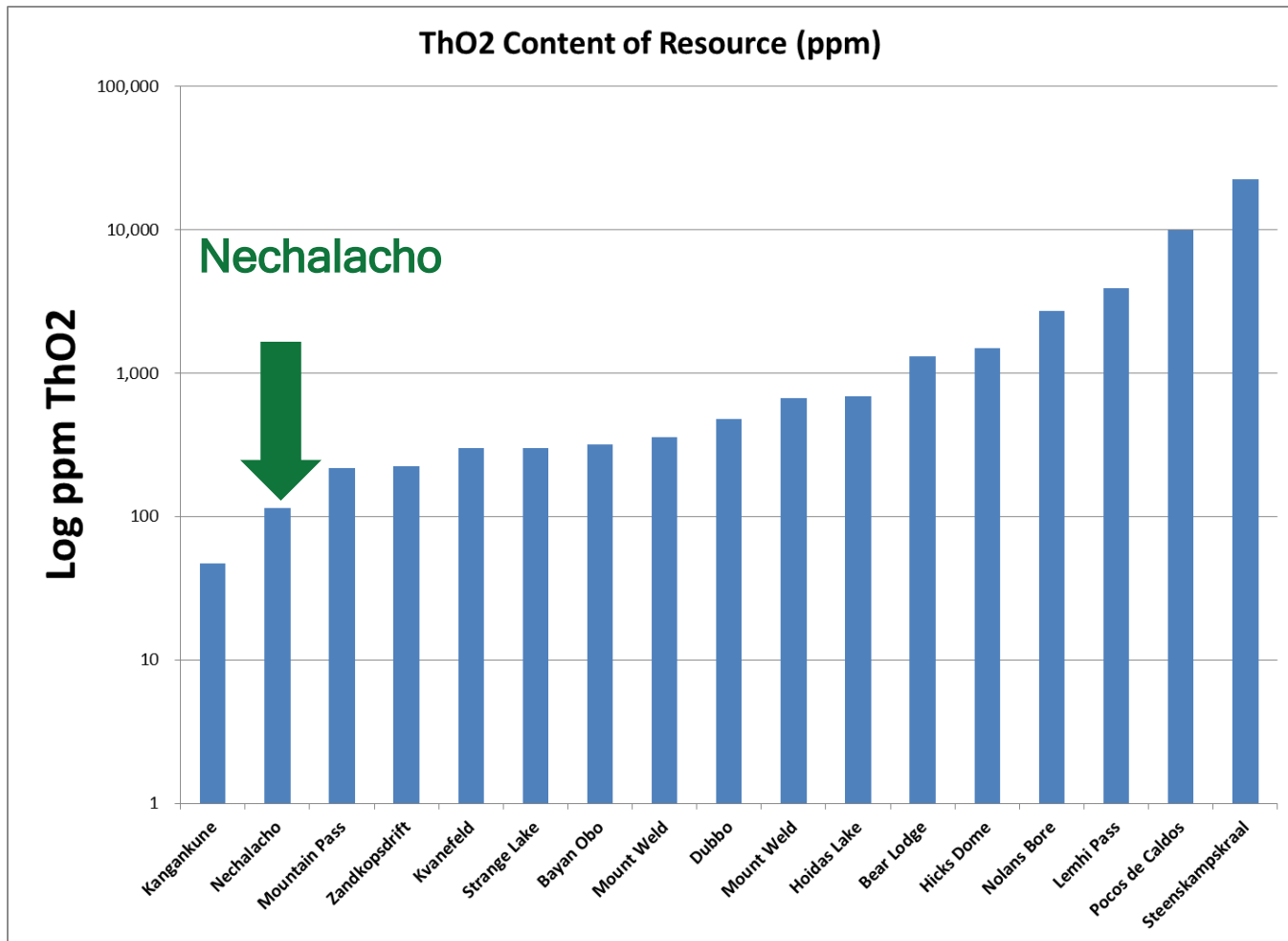
- Thorium, uranium and radiation are words that prompt strong emotion.
- We are all exposed to radiation in many forms and levels.
- All rare earth deposits contain Uranium (U) and Thorium (Th)
- Almost all U and Th are concentrated with the rare earths and does not go to mine tailings
- Avalon's rare earth ore body has one of the lowest average concentrations of U and Th amongst existing known rare earth deposits.







# ThO<sub>2</sub> Content Comparison in Various REE Deposits





# Independent Radiological Reports

SENES Consultants Limited (SENES) was retained to identify potential radiological issues. They are experts in radiation and exposures to the environment and people.

- Potential worker exposures were estimated including assumptions of direct exposures, and those associated with inhalation and ingestion of ore dust.
- The calculated dose was estimated at 1.4 mSv/year from all these sources.
- To put this in perspective
  - The average Canadian receives 1.8 mSv/year from natural background radiation.
  - The average person in Yellowknife receives 3.1 mSv/year from natural background radiation.
- The Health Canada dose limit is 20 mSv/year for workers who work in areas with NORM. The estimated dose is well below the limit





# Independent Radiological Reports

SENES evaluated that

- As the estimated exposure is above the 1 mSv/year incidentally exposed classification, it is good practice to implement a radiation protection program for workers.
- This is not required until doses exceed 5 mSv/year)
- Concentrations of uranium and thorium are sufficiently low as to not be regulated under the Canadian Nuclear Safety Commission or the Canadian or US transportation regulations







# Uranium and Thorium

- Independent study reports that these low concentration levels are below thresholds of concern in products and wastes (tailings).
- Levels do not invoke additional permitting requirements from Canadian Nuclear Safety Commission or special transport regulations.
- A radiation protection program will provide comfort and certainty
- No adverse impacts to water, air, wildlife, or people





# CLOSURE



# Design for Closure

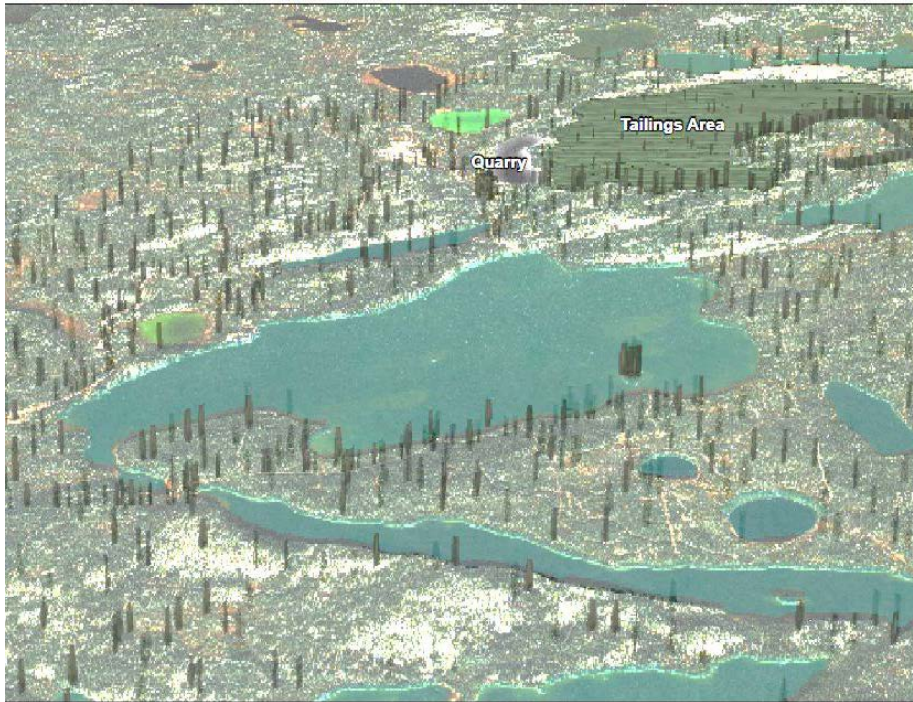
- Minimize the operating footprint
- Walk-away closure design (no perpetual treatment or maintenance will be required)
- No landfills on site.
- Progressive reclamation (during operations) will be completed where practical
- Maximize placement of tailings underground as pastefill **at Nechalacho**
- Salvage of soils during construction for use during closure **at Nechalacho**
- Docks are seasonal and will be removed when no longer required







# Reclamation Nechalacho Mine Site



- Exposed tailings will be capped and re-vegetated.
- Facility downstream embankments will be progressively reclaimed during operations
- Surface runoff control channels and permanent spillways will be constructed
- Infrastructure not required will be removed for re-use, salvaged and inert materials will potentially be disposed of underground or removed from site.



# Reclamation Hydrometallurgical Facility

- Process tailings will be placed in an abandoned open pit for progressive reclamation
- On closure, the tailings will be covered with overburden
- The plant site and tailings will be re-vegetated, rehabilitating a previously damaged site
- Re-vegetation trials will be conducted during operations
- Infrastructure not required will be removed for re-use





# Closure



## Closure planning

- Conceptual Closure Plan has been submitted
- Avalon will work with parties to refine the closure plan throughout the project life

## Avalon will monitor the sites until

- Water quality meets pre-development baseline conditions
- Ensure physical stability
- Revegetation is successful
- Currently anticipated to occur over a period of three to five years.





## SOCIO-ECONOMICS



# Neighbours

## Noise

- Varies with wind, and temperature
- Low noise because the mining activities will be underground and the process plant, camp and power generation plant will be enclosed inside solid, insulated structures.

## Light

- Low light because all mining activities will be underground and the process plant and camp will be enclosed inside structures.
- Outdoor lighting will be kept to a minimum. Focused and localized outdoor lights will be used when required for safe work.

Avalon continues to work with Blachford Lake Lodge towards “win-win” solutions





# Canada & NWT Benefits

	NWT	Canada
Wages and Benefits	\$380 million	\$770 million
Goods and Services	\$1.2 billion	\$3.4 billion
Government Revenues	\$774 million	\$1.5 billion
Direct Employment	3,590 person years	7,000 person years

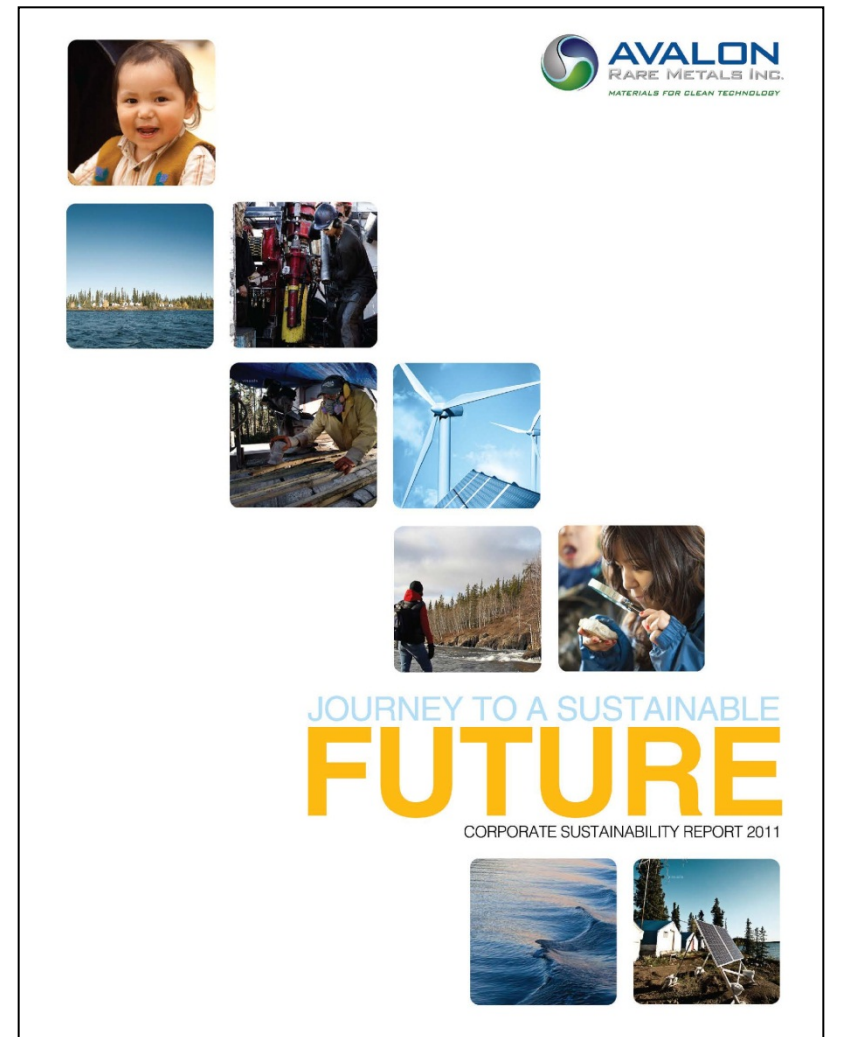






# Socio-Economic Reporting

- Committed to a Socio-Economic Agreement with the GNWT. Negotiations have started.
- Annual Sustainability report includes Global Reporting Initiative and Mining Association of Canada Towards Sustainable Mining and other socio-economic indicators





# ABORIGINAL ENGAGEMENT



# Aboriginal Engagement

- Engagement about the exploration program since the acquisition of the property in 2005
- Regular engagement with elected leaders as the project evolved
- Ongoing engagement with business arms about upcoming opportunities in exploration and the proposed construction and operations







# Negotiated Agreements

- Currently negotiating agreements with
  - Yellowknives Dene First Nation
  - Northwest Territory Métis Nation
  - North Slave Métis Alliance
- Lutsel K'e Dene First Nation agreement is in the ratification process.
- Completed Accommodation Agreement with Deninu K'ue First Nation.





**AVALON RARE METALS INC.**

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