4.0 DEVELOPMENT DESCRIPTION

4.1 PROJECT RATIONALE

The rare earth metals were first discovered in the 18th century. They are a group of 17 metallic elements with unique properties that make them critical for many technological applications (Sinton 2006). They were long considered chemical curiosities rather than vital building blocks for technology. Despite their name, rare earths are relatively abundant in the Earth's crust. However, the high cost of extracting rare earths means that only those deposits with high values, such as the Nechalacho deposit, can be feasibly exploited.

Avalon is focussed on mining, milling and extracting four (4) rare metal products from the TLP's Nechalacho deposit. These include: a combined rare earth oxide, zirconium, niobium and tantalum oxides. Currently, there is no available rare earth mineral concentrate that offers consumers the kind of REE distribution, particularly the heavy rare earths, as contained in the Nechalacho deposit. This unique distribution is ideally-suited to current market demand.

4.1.1 Rare Earth Elements

Rare earths currently play critical roles in industry including the electronics, automotive, petrotechnical and environmental sectors (green technologies). A list of uses for the rare earths is found in Table 4.1-1. It is anticipated that as these sector industries continue to grow, and their associated technologies develop, the demand for rare earth materials will continue to increase (Sinton 2006).

Avalon's REEs will sell into the world market at prevailing prices. The TLP will create significant training, employment and business opportunities for the people of the region and the NWT. It will also contribute to the NWT and Canadian Gross Domestic Product, as well as provide a return for investors considered acceptable in today's market.

TABLE 4.1-1: RARE EARTH ELEMENT USES		
Rare Earth Element	**Symbol**	**Industry Use**
Cerium	Ce	Catalytic converters for diesel engines
Praseodymium	Pr	Alloying agent for aircraft engines
Neodymium	Nd	Key component of high-efficiency magnets and hard disc drives
Lanthanum	La	Major ingredient for hybrid car batteries
Samarium	Sm	Lasers and nuclear reactor safety
Promethium	Pm	Portable X-rays and nuclear battery
Gadolinium	Gd	Compact Discs, Shielding for nuclear reactors
Dysprosium	Dy	Improves efficiency of hybrid vehicle motors
Terbium	Tb	Component in low-energy light bulbs
Erbium	Er	Fibre optics
Europium	Eu	Flat screen displays and lasers
Holmium	Ho	Ultra-powerful magnets and nuclear control rods
Thulium	Tm	Lasers and portable X-rays
Ytterbium	Yb	Earthquake monitoring equipment
Lutetium	Lu	Oil refining

Rare earth elements comprise 15 lanthanide series elements in the periodic table (atomic numbers 57 through 71), and yttrium (atomic number 39). The periodic table locations of the REEs and other products of the PFS are shown in Figure 4.1-1.

The REEs are divided into two groups:

- The Light Rare Earth Elements (LREE), or cerics, consisting of Ce, Pr, Nd, Pm, and Sm, and
- The Heavy Rare Earth Elements (HREE), or yttrics, consisting of Y, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu

The REEs with an even atomic number tend to be more plentiful than their odd-numbered neighbours and are preferred for commercial use. Despite their name, rare earths have a relatively high crustal abundance. However, economic concentrations of rare earth deposits are scarce. Chemical data for the REEs are shown in Table 4.1-2.

LREO and HREO refer to oxides of light and heavy REEs, respectively. In this document, TREO refers to LREOs and HREOs collectively.

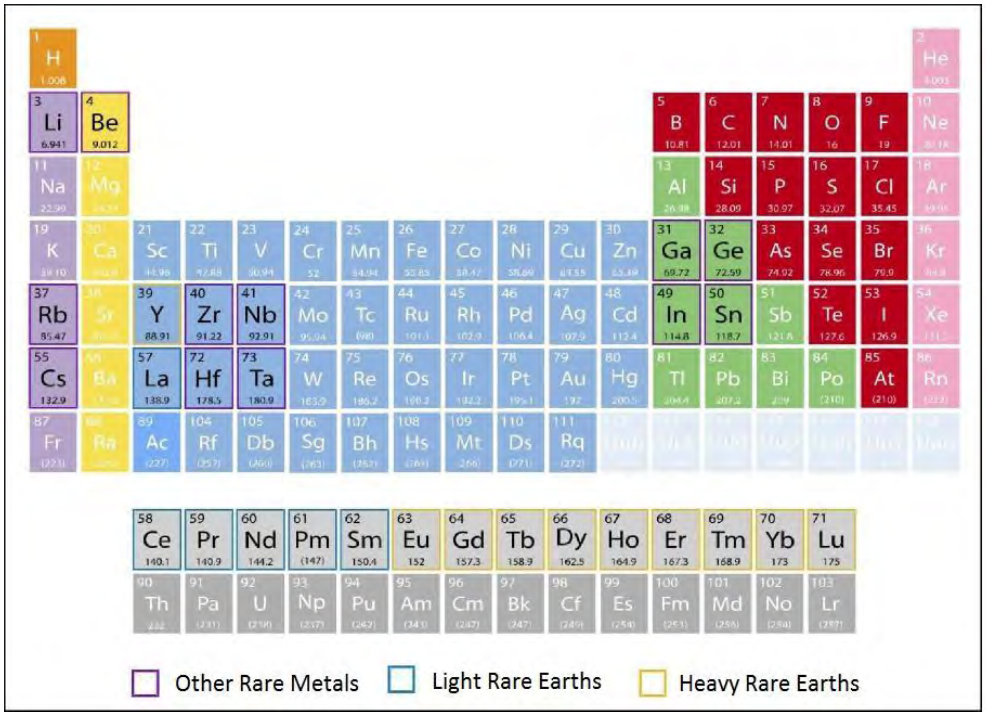


Figure 4.1-1
Rare Earth Elements in the Periodic Table

TABLE 4-1-2: RARE EARTH ELEMENT DATA – AVALON THOR LAKE PROJECT

Classification	Symbol	Atomic Number	Valence	Atomic Weight	Crustal Abundance (ppm	Oxides
Cerium Group (light rare earths)						
Lanthanum	La	57	3	138.92	29	La_2O_3
Cerium	Ce	58	3,4	140.13	70	Ce_2O_3 and CeO_2
Praseodymium	Pr	59	3,4	140.92	9	Pr_6O_{11}
Neodymium	Nd	60	3	144.92	37	Nd_2O_3
Promethium[1]	Pm	61	3	145	-	none
Samarium	Sm	62	2,3	150.43	8	Sm_2O_3
Yttrium Group (heavy rare earths)						
Yttrium	Y	39	3	88.92	29	Y_2O_3
Europium	Eu	63	3	151.96	-	Eu_2O_3
Gadolinium	Gd	64	3	157.25	-	Gd_2O_3
Terbium	Tb	65	3,4	159.2	2.5	Tb_4O_7
Dysprosium	Dy	66	3	162.46	5	Dy_2O_3
Holmium	Ho	67	3	164.92	1.7	Ho_2O_5
Erbium	Er	68	3	167.2	3.3	Er_2O_3
Thulium	Tm	69	3	169.4	0.27	Tm_2O_3
Ytterbium	Yb	70	2,3	173.04	0.33	Yb_2O_3

TABLE 4-1-2: RARE EARTH ELEMENT DATA – AVALON THOR LAKE PROJECT

Classification	Symbol	Atomic Number	Valence	Atomic Weight	Crustal Abundance (ppm	Oxides
Lutetium	Lu	71	3	174.99	0.8	Lu_2O_3

[1]Does not occur in nature.

Rare earth elements are used in numerous applications such as various electronics, lighting, magnets, catalysts, high performance batteries, and other advanced materials products. They are essential in these applications, with little to no potential for substitution by other materials. In some applications, selected rare earths may be substituted for each other, although with possible reductions in product performance. Table 4.1-3 illustrates some of the major applications for the rare earths to be produced at the Thor Lake Project.

TABLE 4-1-3: RARE EARTH ELEMENTS APPLICATIONS

Rare Earths	Applications	Description
Nd, Pr, Sm, Tb, Dy	Magnets	Computer hard drives, consumer electronics, voice coil motors, hybrid vehicle electric motors, wind turbines, cordless power tools, Magnetic Resonance Imaging, and maglev trains
La, Ce, Pr, Nd	LaNiMH Batteries	Hybrid vehicle batteries, hydrogen absorption alloys for re-chargeable batteries
Eu, Y, Tb, La, Ce	Phosphors	LCDs, PDPs, LEDs, energy efficient fluorescent lamps
La, Ce, Pr, Nd	Fluid Cracking Catalysts	Petroleum production – greater consumption by 'heavy' oils and tar sands
Ce, La, Nd	Polishing Powders	Mechano-chemical polishing powders for TVs, computer monitors, mirrors and (in nano-particulate form) silicon chips
Ce, La, Nd	Auto Catalysts	Tighter NOx and SO_2 standards –platinum is re-cycled, but for rare earths it is not economic
Ce, La, Nd,	Glass Additive	Cerium cuts down transmission of UV light, La increases glass refractive index for digital camera lens
Er, Y, Tb, Eu	Fibre Optics	Signal amplification

Source: Avalon Rare Metals Inc.

4.2 PROPERTY/PROJECT HISTORY

4.2.1 Odin and Mailbox Claims

The Thor Lake area was first mapped by J.F. Henderson and A.W. Joliffe of the Geological Survey of Canada (GSC) in 1937 and 1938. According to National Mineral Inventory records of the Mineral Policy Sector, Department of Energy, Mines and Resources, the first staking activity at Thor Lake dates from July 1970 when Odin 1-4 claims were staked by K.D. Hannigan for uranium. The Odin claims covered what was then called the Odin Dyke and is now known as the R Zone. Shortly after, the Odin claims were optioned to Giant Yellowknife Mines Ltd. and were subsequently acquired by Bluemount Minerals Ltd.

In 1971, the GSC commissioned an airborne radiometric survey over the Yellowknife region that outlined a radioactive anomaly over the Thor Lake area (GSC Open File Report 124). Simultaneously, A. Davidson of the GSC initiated mapping of the Blachford Lake Intrusive Complex. It has subsequently become clear that this radiometric anomaly is largely due to elevated thorium levels in the T Zone.

Four more claims (Mailbox 1-4) were staked in the area in 1973. No description of any work carried out on the claims is available and both the Odin and Mailbox claims were allowed to lapse. No assessment work was filed.

4.2.2 Highwood Resources Ltd.

In 1976, Highwood Resources Ltd., in the course of a regional uranium exploration program, discovered niobium and tantalum on the Thor Lake Property. The Property was staked as the Thor 1-45 claims and the NB claims were added in 1976 and 1977. From 1976 to 1979, exploration programs included geological mapping and sample trenching on the Lake, Fluorite, R, S and T Zones. Twenty-two drill holes were also completed, seven of these on the Lake Zone. This work resulted in the discovery of significant concentrations of niobium, tantalum, yttrium and REEs. Hole 79-1 intersected 0.67% Nb_2O_5, and 0.034% Ta_2O_5 over 24.99 m. Results also indicated an absence of uranium mineralization and that the anomalous radioactivity was due to thorium. Following this and inconclusive lake bottom radiometric and radon gas soil surveys, Calabras, a private holding company, acquired a 30% interest in the property through financing further exploration by Highwood. This was done through Lutoda Holdings; a company incorporated in Canada and owned by Calabras.

Recognizing a large potential resource at Thor Lake, Placer Development Ltd. (Placer) optioned the property from Highwood in March 1980 to further investigate the tantalum and related mineralization. Placer conducted magnetometer, very low frequency (VLF) electro-magnetic and scintillometer surveys on the Lake Zone. Thirteen holes were initially drilled in 1980. This was followed by five more in 1981 focused around drill hole 80-05 (43 m grading 0.52% Nb_2O_5 and 0.034% Ta_2O_5). Preliminary metallurgical scoping work was also conducted, but the mineralization did not prove amenable to conventional metallurgical extraction at the time. Placer relinquished its option in April of 1982.

From 1983 to 1985, the majority of the work on the property was concentrated on the T Zone and included geochemical surveys, berylometer surveys, surface mapping, significant drilling, surface and underground bulk sampling, metallurgical testing and a detailed evaluation of the property by Unocal Canada. During this period, a gravity survey was conducted to delineate the extent of the Lake Zone. Five holes were also drilled in the Lake Zone to test for high grade tantalum-niobium mineralization and to determine zoning and geological continuity. Two additional holes were completed at the southeast end of Long Lake to evaluate high yttrium and REE values obtained from nearby trenches.

In August of 1986, the property was joint-ventured with Hecla Mining Company of Canada Ltd. (Hecla). By completing a feasibility study and arranging financing to bring the property into production, Hecla could earn a 50% interest in the property. In 1988, earlier holes were re-assayed and 19 more holes were drilled into the Lake Zone, primarily in the southeast corner, to further test for yttrium and REEs. Hecla withdrew from the Project in 1990. The withdrawal came after the drilling was completed and a considerable amount of other work on the T Zone had been completed including some limited in-fill drilling, extensive metallurgical testing conducted at Lakefield and Hazen Research Ltd. (Hazen) in Denver and a marketing study on beryllium. In 1990, control of Highwood passed to Conwest Exploration Company Ltd. (Conwest) and the Project property remained dormant until 1996, at which time Conwest divested itself of its mineral holdings. Mountain Minerals Company Ltd. (Mountain), a private company controlled by Royal Oak Mines Ltd., acquired the 34% controlling interest of Highwood and Highwood and Mountain were subsequently merged under the name Highwood.

In 1997, Highwood conducted an extensive re-examination of Thor Lake that included a proposal to extract a 100,000 tonne (t) bulk sample. Applications were submitted for permits that would allow for small-scale development of the T Zone deposit, as well as, for processing over a four to five year period. In late 1999, the application was withdrawn.

Royal Oak's subsequent bankruptcy in 1999 resulted in the acquisition of the control block of Highwood shares by Dynatec Corporation (Dynatec). In 2000, Highwood initiated metallurgical, marketing and environmental reviews by Dynatec.

In 2001, Navigator Exploration Corp. (Navigator) entered into an option agreement with Highwood. Navigator's efforts were focused on conducting additional metallurgical research at Lakefield in order to define a process for producing a marketable tantalum concentrate from the Lake Zone. These efforts produced a metallurgical grade tantalum/zirconium/niobium/yttrium/REE bulk concentrate. The option was dropped in 2004 due to falling tantalum prices and low tantalum contents in the bulk concentrate.

Beta Minerals Inc. (Beta) acquired Highwood's interest in the Thor Lake Property in November, 2002 under a plan of arrangement with Dynatec. No work was conducted at Thor Lake by Beta.

4.2.3 Avalon Rare Metals Inc.

In May of 2005, Avalon purchased 100% interest and full title, subject to royalties, to the Thor Lake Property from Beta. Subsequently in 2005, Avalon conducted extensive re-sampling of archived Lake Zone drill core to further assess the yttrium and heavy rare earth element (HREE) resources on the property.

In 2006, Wardrop Engineering Inc. (Wardrop) was retained to conduct a Preliminary Assessment (PA) of the Thor Lake deposits (Wardrop 2006). In 2007 and 2008, Avalon commenced further drilling of the Lake Zone. This led to a further technical report on the property, which contained a Mineral Resource estimate for the Nechalacho deposit with the effective date of March 30, 2009 (Wardrop 2009).

The July 2007 to 2009 drilling was organized into three separate drill programs:

- July to October 2007: 13 holes totalling 2,550 m (BTW diameter);

- January to May 2008: 45 holes totalling 8,725 m, including 11 metallurgical holes totalling 2,278 m (NQ2 diameter);
- June to September 2008: 27 holes totalling 5,565 m (NQ2 diameter);
- February to May, 2009: 26 holes totalling 5474 m (NQ2 diameter); and
- July to October, 2009: 44 holes totalling 9098 m (HQ diameter).

Core from both historic drilling and recent drilling is stored at the Thor Lake site. Archived core has been re-boxed where necessary, with all old core racks having been replaced with new ones. Core pulps and rejects are stored in a secure warehouse in Yellowknife and at site.

The technical data used for the January 14, 2010 resource estimate were compiled, validated, and evaluated by Hudgtec. Bruce Hudgins, President of Hudgtec, was the Qualified Person for this resource estimate. Scott Wilson RPA reviewed Hudgtec's methodology for the January estimate and found no substantive issues. The January 2010 technical data was updated with new drill hole information and assay data for use in the June 14, 2010 resource estimate. Bruce Hudgins also validated this data set, updated the wireframe, and interpolated values for the REE elements (plus Zr, Nb, Ga and Ta) into the block model. Over-limit assays were re-run using a different geochemical method and the revised values were incorporated into the database. Again, the methodology was reviewed by Scott Wilson RPA and found to be acceptable.

The June 14, 2010 Mineral Resource update increased the tonnage by more than 100%, which required a new NI 43-101 Technical Report. This report was completed by Scott Wilson RPA in July 2010.

4.3 PROJECT ALTERNATIVES

The proposed TLP is comprised of two site locations, the Nechalacho Mine and Flotation Plant located on the Thor Lake Property, and the Hydrometallurgical Plant located at the brownfields site of the former Pine Point Mine near Hay River, NT.

The Nechalacho deposit will be mined underground and concentrated using conventional crushing, grinding and flotation techniques. The concentrate will be loaded into enclosed 40 tonne intermodal shipping containers and barged from a seasonal dock facility to be located 5 kilometres south of the Nechalacho Mine and Flotation site to a second seasonal dock facility to be located 8.5 kilometres north of the Hydrometallurgical Plant site. Upon arrival, the concentrate will be transported by truck from the south shore of Great Slave Lake to the Hydrometallurgical Plant site via an existing access road. The concentrate will be further processed at the Hydrometallurgical Plant. The resulting products will be transported to the railhead at Hay River by truck, and direct shipped to Avalon's separation plant for further refining.

Avalon investigated alternatives to major Project components to reduce potential effects to safety, Aboriginal culture, communities, environment and Project economics. Avalon's technical work conducted to date considered these aspects and utilized what it believes is the most environmentally responsible and operationally effective approach for the TLP. Future pilot studies, trade-off studies and field test work may result in one or more of the following alternatives to be reconsidered for updated technical studies and Project development. The following options were investigated:

- Alternative open pit mining method;
- Alternative Infrastructure Locations at Thor Lake;
- Alternative Tailings Management Facilities at Thor Lake;
- Alternative Hydrometallurgical Plant locations;
- Alternative Tailings Management Facilities at Pine Point;
- Alternative concentrate transportation via ice road over Great Slave Lake or connecting to Ingraham Trail and then onto Yellowknife; and
- Alternative concentrate containers.

4.3.1 Open Pit Mining

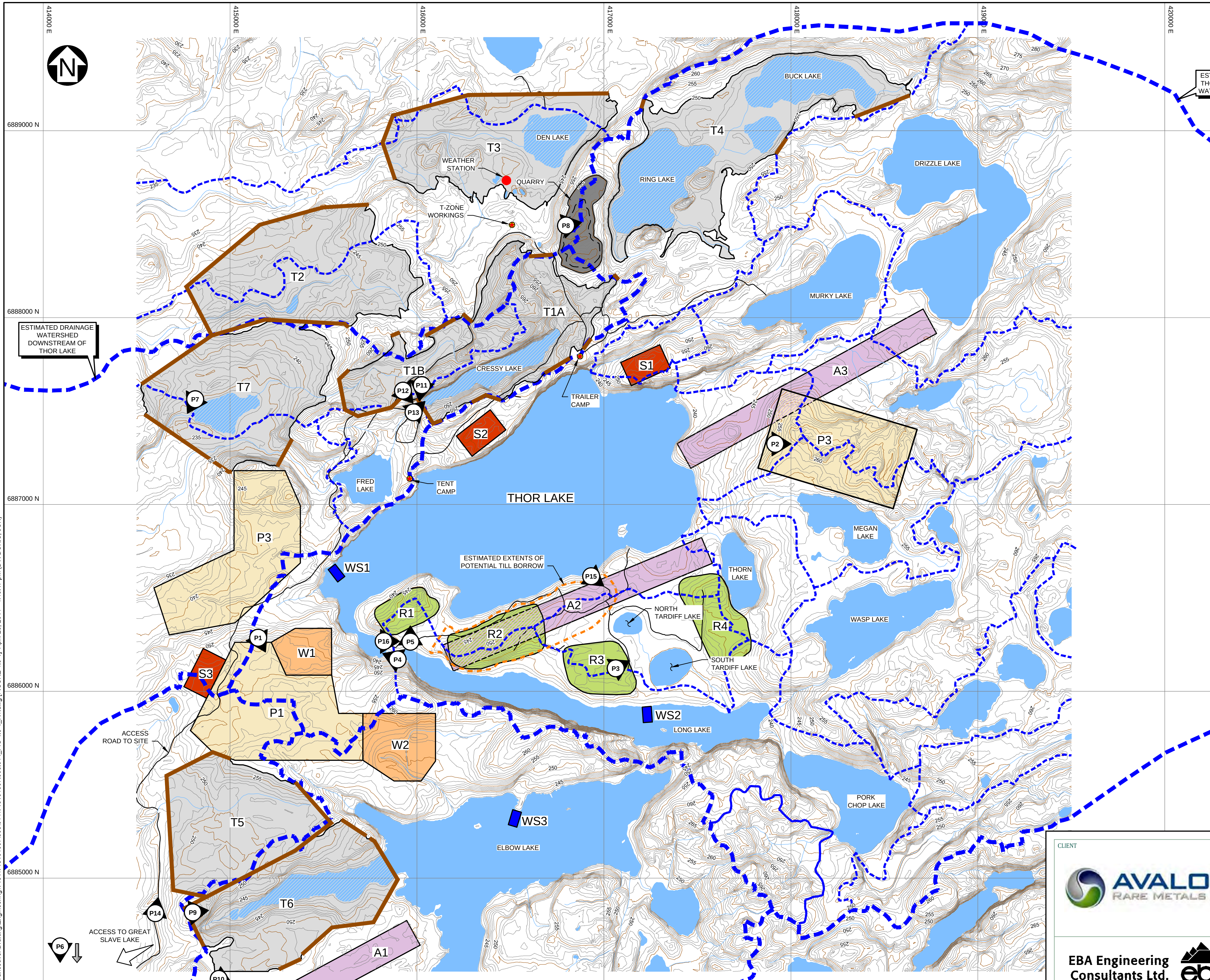
Wardrop Engineering Inc. completed a Preliminary Economic Assessment (PEA) in 2005 to examine the economics of utilizing an open pit to recover mineralized material near the surface. However, once Avalon completed its 2007 drill program, a distinct high grade zone with higher than average HREEs was identified. This high grade zone, referred to as the Basal Zone, was located approximately 180 m below the surface. The high grade Basal Zone was attractive and economic for selective underground mining techniques. Utilizing underground mining also minimized the potential surficial effects of concern to participating First Nations and surrounding communities. A resource update was completed by Wardrop Engineering in March, 2009 which emphasized the resource of the Basal Zone assuming underground mining (Wardrop 2009).

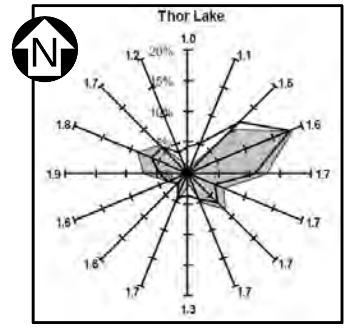
The REE markets also played a role in determining the amount of REEs Avalon would inject into the markets with emphasis on the heavy rare earth elements. Due to the basal zone containing a much higher grade of heavy rare earths, the economics of mining underground improved. Upon consideration of these factors, Avalon chose to pursue underground mining techniques focussed on the Basal Zone.

4.3.2 Alternative Infrastructure locations at Thor Lake

Knight Piésold (2009a) conducted a site visit of the Nechalacho deposit during the summer of 2009. The purpose of this site visit was to identify and recommend potential sites for the primary infrastructure needed to support underground mining activities. The primary infrastructure considered was an airstrip, process plant, staff accommodations and underground access portal. Potential site infrastructure locations were selected based on potential impacts to vegetation, wildlife, surface waters and Lakes, areas where bedrock was exposed, topographic highs, close proximity to the Nechalacho deposit and relatively flat topography with good ground conditions (i.e. bedrock or no permafrost). A total of 14 alternative sites were investigated and evaluated within Avalon's claims based on the above parameters (Figure 4.3-1). As a result, all but one location did not meet most or all of the requirements. The current infrastructure location is considered the best option for the following reasons:

- Area is quite flat and with abundant bedrock outcrop so site development should be relatively straight forward for grading and foundations with minimal impacts to vegetation;
- With minimal vegetation, wildlife is less likely to utilize this location as a source of food or consistent habitat;
- Location is located between the ore zone and existing access road, minimizing ore and concentrate transportation distances and new road construction;
- Location is setback at least 200 m or so from major water bodies, providing a buffer;
- Location topography is ideal for capturing run-off waters and temporary stockpiles of construction ore and waste rock;
- Location topography is ideal for ramp portal construction;
- Location is in reasonable proximity to Thor Lake for fresh water supply;
- Very little overburden present; and
- Location is in close proximity to existing airstrip for safe transport of employees and supplies to and from site.





WIND ROSETTE

NTS

NOTE:

WIND ROSETTE PROVIDED BY AVALON RARE METALS INC.

LEGEND:

- R — POTENTIAL RAMP PORTAL LOCATION
- P — POTENTIAL PROCESS PLANT AREA
- T — POTENTIAL TAILINGS MANAGEMENT AREA
- S — POTENTIAL STAFF ACCOMMODATIONS AREA
- A — POTENTIAL AIR STRIP LOCATION
- W — POTENTIAL WASTE ROCK STORAGE SITE
- WS — POTENTIAL WATER SUPPLY LOCATION
- WATER
- ROAD
- WATERSHED BOUNDARY
- SUB WATERSHED DIVIDE
- POTENTIAL TILL BORROW
- POTENTIAL DAM LOCATION
- WEATHER STATION
- P2 — PHOTO LOCATION

NOTES:

1. COORDINATE GRID IS UTM (NAD83) ZONE 12N AND IS IN METRES.
2. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1 METRE.
3. FIGURE SOURCE IS KNIGHT PIÉSOLD CONSULTING REF. NB09-00493 FIGURE 4 DATED JULY 28, 2009.

SCALE 1:20,000

200 0 200 400 800m

ISSUED FOR USE

CLIENT

AVALON RARE METALS INC.

THOR LAKE PROJECT

Nechalacho Mine Site
Project Layout Options

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
V15101007.006.014	JAB	RH	1
OFFICE	DATE		
VANC	April 28, 2011		

Figure 4.3-1

4.3.3 Alternative Tailings Management Facilities at Thor Lake

Knight Piésold (2009b) conducted an assessment of potential tailings deposition areas during the summer of 2009. Detailed topographical mapping was used to identify possible areas for development of a Tailings Management Facility (TMF). Seven potential areas were identified within Avalon's claims (Figure 4.3-1). The areas were selected on the basis of providing natural containment and/or minimizing impact to existing water courses and drainages. In order to minimize impacts to drainage patterns, a TMF is normally placed within the upper or top part of a watershed to minimize runoff management requirements within the contained area. Upon further examination, Avalon identified the Ring Lake System (RLS) (including Ring, Buck, Ball, and Drizzle lakes) as the most viable and preferred option for the tailings management facility as explained below:

- Ring, Buck, Ball, and Drizzle lakes are non-fish bearing (confirmed through historic and two year data on Ring, Buck, and Drizzle lakes, and one year data on Ball Lake);
- Natural topography of the RLS allows for a significant reduction in construction activities and materials required for dam building compared to alternative sites;
- RLS can accommodate the full period of operating life with additional capacity to expand for future years if necessary. The alternatives would have required expansion and most likely the addition of a second tailings facility;
- RLS provides effluent discharge to Drizzle Lake (also identified as non-fish bearing), with natural drainage back to Thor Lake. Other alternatives did not allow for a natural recharge back into Thor Lake; and
- RLS provides a semi-closed loop design system whereby natural drainage is minimally impacted and eventual discharge into Great Slave Lake occurs after 18 kilometres of natural drainage. Other alternatives did not provide a semi-closed looped system.

4.3.4 Hydrometallurgical Plant

Alberta and Saskatchewan were originally considered as possible locations for the Hydrometallurgical Plant. The southern provinces offer significant cost savings. They have the capacity to provide available low cost electric power, significantly shorter supply transport distances and lower cost labour. Avalon carefully weighed the advantages and disadvantages of placing the Hydrometallurgical Plant in the NWT and determined that this can be done economically by reducing the amount of reagents being shipped from the South and ensuring the plant design does not require electrical power or heating outside of the current supply available in the NWT.

As a result, Avalon has selected the old Pine Point Mine site as the location for the Hydrometallurgical Plant. The site is located 85 km east of Hay River and has all-season highway access. The site also has power from the Taltson Dam which Avalon can utilize. Justification for the former Pine Point site as the location for the Hydrometallurgical Plant follows:

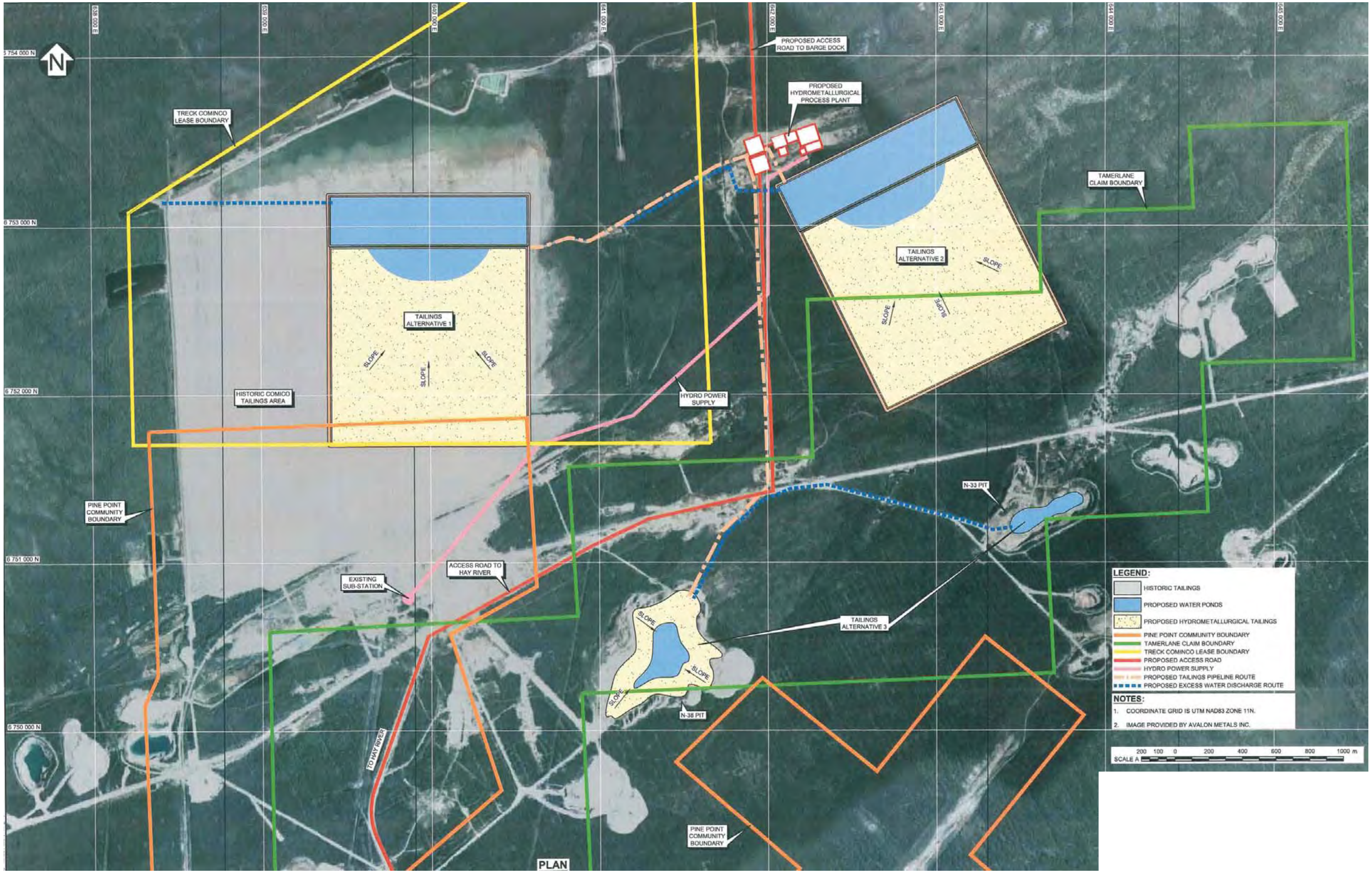
- Avalon's First Nations partners strongly recommended utilizing the Pine Point site during the Company's engagement process. Locating the Hydrometallurgical Plant at this site provides Avalon's Aboriginal partners with additional business and employment opportunities;
- Due to historic mining activities, there are costs savings associated with utilizing existing open pits in the area for progressive reclamation through discharge of the Hydrometallurgical Plant tailings;
- This location would not fall under MMER guidelines as there will be no direct water discharge to any downstream environment. This area provides a unique opportunity for fresh water supply from an existing nearby open pit and decanted waste water removal and insertion into another open pit for natural filtration into the massive area aquifer;
- This location provides the opportunity for pre-treatment of the Nechalacho Mine and Flotation Plant concentrates to remove impurities prior to downstream shipment to Avalon's separation facilities; and
- The federal and territorial governments are working with Avalon to develop incentives to keep the Hydrometallurgical Plant in the NWT. Early indications suggest that potential tax incentives, economic power, power alternatives and capital funding/support of one or more Aboriginal organizations may be possible. Ongoing collaboration with these groups will be essential to ensure that the Hydrometallurgical Plant will be located in the NWT.

Avalon also investigated Yellowknife as a potential location for the Hydrometallurgical Plant. Some hydro-power may be available at Yellowknife. However, any potential cost savings are diminished when compared to the additional cost of hauling tonnes of reagents annually to supply the Plant.

4.3.5 Alternative Tailings Management Facilities at Pine Point

Knight Piésold (2010b) conducted an assessment of potential tailings deposition areas during the summer of 2010. Three potential areas as shown in Figure 4.3-2 were identified for the construction and installation of the hydrometallurgical tailings management facility (HTMF) as follows:

1. Utilize existing impoundment area of the historic Cominco tailings;
2. Construct a new facility immediately adjacent to the proposed Hydrometallurgical Plant; and
3. Utilize historic open pits for the deposition and water management of the HTMF.



NOTES

1. Coordinate grid is UTM (NAD83) Zone 11N.
2. Image provided by Avalon Metals Inc.
3. Figure Source: Knight Piesold Consulting, November 2010 (Ref No. NB10-00488, Figure 3).

CLIENT

AVALON RARE METALS INC

EBA Engineering Consultants Ltd.

ISSUED FOR USE

THOR LAKE PROJECT

Pine Point Area Hydrometallurgical Tailings Management Facility Alternatives

PROJECT NO.	DWN	CKD	REV
V15101007.006	SL	RH	0
OFFICE	DATE		
EBA-VANC	March 17, 2011		

Figure 4.3-2

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Cursory review of the site conditions and subsequent review of background information for the site, and other projects implementing pit disposal of tailings, indicates that alternative #3 has merit from a technical and environmental point of view. Use of one or more of the historic open pits in the area for tailings disposal offers the following advantages:

- Construction of dams and associated impacts related to site disturbance for fill placement, borrow excavations and tailings placement in undisturbed areas can be minimized;
- Filling of one or more historic pits with tailings and use of previously stripped materials for capping and reclamation will help to restore these areas back to pre-development conditions;
- Risks associated with building dams to contain low strength tailings and process waters can be avoided; and
- Earthworks costs related to dam construction can be minimized.

4.3.6 Concentrate Transport

The proposed Nechalacho Mine and Flotation Plant site is located approximately 100 km east of Yellowknife, 50 km south of the Ingraham Trail (an all season highway) and 5 km north of Great Slave Lake. During the site selection process for the Hydrometallurgical Plant, Avalon investigated several concentrate transportation alternatives from the Nechalacho Mine and Flotation Plant site including:

- All season road connecting to the Ingraham trail which leads to Yellowknife;
- Winter road connecting to the Ingraham trail;
- Winter road along the north shore of Great Slave Lake to Yellowknife;
- Winter road across Great Slave Lake to Hay River;
- Winter road across Great Slave Lake to Pine Point; and
- Barging across Great Slave Lake.

Once the historic Pine Point site was selected as the location for the Hydrometallurgical Plant, the option to barge the concentrate from the proposed Nechalacho Mine and Flotation Plant site across Great Slave Lake to the Pine Point site became the preferred alternative. A local access road currently exists at the historic Pine Point site from the proposed dock facility to the proposed Hydrometallurgical Plant location.

The previously considered all-season or winter roads were deemed impractical for the following reasons:

- Excessive construction costs associated with developing an all-season road from the Ingraham trail;
- Potential interference with Blachford Lake Lodge operations should a winter or all-season road be connected to the Ingraham Trail;

- Excessive haulage costs associated with trucking to Yellowknife, then onto the railhead near Enterprise;
- Excessive maintenance and construction costs associated with an ice road to either Ingraham trail or along the north shore of Great Slave Lake;
- Excessive maintenance and construction costs associated with an ice road across Great Slave Lake, and variable annual ice conditions, which could significantly impact construction and haulage schedules; and
- Climate warming and associated implications for construction and use of ice roads.

An additional alternative exists for barging concentrate from the Nechalacho Mine and Flotation Plant site directly to the railhead located in Hay River. For this alternative, the 40 tonne product containers would be unloaded from barges directly to railcars for shipment to further processing. This option could have been more favourable but its attractiveness was offset by the benefits of locating the Hydrometallurgical Plant at Pine Point.

4.4 GEOLOGY

4.4.1 Property Geology

The following section is summarized from Trueman et al. (1988), LeCouteur (2002), Pedersen et al. (2007) and more recent observations by Avalon geologists obtained through personal communications during the 2007 to 2009 drill programs (Pedersen, Heiligmann and Trueman, personal communications).

The Thor Lake mineral deposits occur within the Aphebian Blachford Lake Complex, which intrudes Archean Yellowknife Supergroup metasedimentary rocks of the southern Slave geologic province. The complex is of variably alkaline character and intrusive phases vary successively from early pyroxenite and gabbro through leucoferrodiorite, quartz syenite and granite, to peralkaline granite and a late syenite (Davidson 1982). There appear to be successive intrusive centres; an early western centre that is truncated by a larger second centre consisting of the Grace Lake Granite and the Thor Lake Syenite. Nepheline syenite underlies Thor Lake Syenite and is only known from drilling on the Nechalacho deposit (Figure 4.4-1).

Davidson (1978) subdivided the Blachford Lake Complex into six texturally and compositionally distinct plutonic units including Caribou Lake Gabbro, Whiteman Lake Quartz Syenite, Hearne Channel Granite, Mad Lake Granite, Grace Lake Granite and Thor Lake Syenite.