

Miscellaneous REE-Y-Nb investigations in the Gardner Bay
and McLean Arm area.

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INTRODUCTION & CONCLUSIONS

This report describes several limited investigations that were conducted in 1985 and 1986. The scope of the work was to determine if brief reports pegmatites and copper-gold, deposits (McKevett) contained significant REE-Y-Nb mineral associations to warrant detailed investigations by U.S.B.M. as part of the Alaska strategic and critical minerals program. It was determined that these sites lie along a crudely definable trend of sodic-rich alkaline intrusions extending from Stonerock Bay north to Bokan Mountain on Kendrick Bay and thence on to Dora Bay (Barker and Mardock, 1988). Field reconnaissance failed to locate mineralization of interest, however, the copper prospects at WANO and Polson & Ickis (figure 1) proved to be somewhat larger and possibly contain copper of higher grade than previously reported by McKevett (1). Although these prospects do not appear to contain REO or Nb values of interest, it is recommended that private parties who are interested in exploring Cu and Au properties should further investigate the area of and to the south southeast of Polson and Ickis.

On McLean Arm the former Nelson and Tiff gold mine was found to be hosted by a carbonatite intrusion.

The investigations were based from on board boats belonging to R. Dotson (1985) and S. Cunningham (1986) both of Ketchikan. During both years these studies were in conjunction with the Bokan Mountain project that continued through 1987.

METHODS

Samples were collected as continuous chip samples across the various structures. Analyses were performed by Nuclear Activation Services, Inc., Ann Arbor, Michigan, using their standard techniques for a multi-element package (table 1).



Figure 1. - Location of prospects near McLean Arm and Gardner Bay.

Table 1. - Analytical methods and detection limits

ROCK SAMPLES

Element(s)	Analytical Method ¹	Detection limit, ppm	Element(s)	Analytical Method ¹	Detection limit, ppm
Ag	DCP	0.5	Pr	ICP-MS	0.1
As	NA	2.0	Rb	XRF	20
Au	NA	.010	Sb	NA	.2
B	DCP	100	Sc	NA	.1
Ba	XRF	10	Se	NA	3.0
Be	DCP	10.0	Sm	NA	.1
Bi	DCP	.5	Sr	XRF	20
Br	NA	1.0	Ta	NA	1.0
Cb	XRF	20	Th	NA	.5
Cd	DCP	.2	Tm	ICP-MS	0.1
Ce	NA	3.0	U	NA	.5
Co	NA	1.0	V	DCP	100
Cr	XRF	10	W	NA	3.0
Cs	NA	.5	Y	XRF	20
Cu	DCP	.5	Yb	NA	.02
Dy	ICP-MS	0.1	Zn	DCP	.5
Er	ICP-MS	0.1	Zr	XRF	20
Eu	NA	.2	Al ₂ O ₃	XRF	100
Ga	ICP-MS	0.1	CaO	XRF	100
Ge	DCP	100	Fe ₂ O ₃	XRF	100
Hf	NA	1.0	K ₂ O	XRF	100
Ho	ICP-MS	0.05	LOI	XRF	100
La	NA	.5	MgO	XRF	100
Lu	NA	.05	MnO	XRF	100
Mn	DCP	2.0	Na ₂ O	XRF	100
Mo	NA	5.0	P ₂ O ₅	XRF	100
Nd	NA	5.0	SiO ₂	XRF	100
Ni	DCP	1.0	TiO ₂	XRF	100
Pb	DCP	2.0			100

¹Analyses by Nuclear Activation Services, Inc., Ann Arbor Michigan.

DCP - Direct current plasma

NA - Nuclear activation

XRF - X-ray fluorescence

ICP-MS - Inductively coupled plasma followed by mass spectrometry

Samples prepared with fusion techniques

GARDNER BAY

Several small, weakly to non-radioactive, pegmatites are exposed in the tidal zone of a small lagoon along the south shore of Gardner Bay. The largest, best developed, pegmatite is about 2 ft thick and traceable for about 300 ft along a NE strike. The pegmatite dips about 20° south. Other randomly oriented smaller pegmatites occur in the area and all are hosted by quartz diorite. The highest radiometric reading was 120 cps over a background of 50 cps.

Texture is erratical with variable percentages of feldspar (perthite?), biotite, and quartz. There are isolated zones of massive white quartz forming the core of the pegmatites. The biotite is unique to these deposits in that it does not occur in the REE-Nb pegmatites at Bokan Mountain.

Sample SE24632 is a 2 ft chip sample of the most promising pegmatitic material. The analytical data indicated no significant concentrations of valuable metals. No further evaluation is recommended.

Prospect is described also by McKeveatt 1963,(p. 93-94) who reported "very sparsely distributed unidentified radioactive blacks".

GARDNER BAY-2 FT-THICK PEGMATITE

ELEMENT & UNITS	SE24632	ELEMENT & UNITS	SE24632
SiO ₂ %	74.1	Nb ppm	10
Al ₂ O ₃ %	13.4	Ni ppm	2
CaO %	1.21	Pb ppm	<2
MgO %	0.28	Rb ppm	100
Na ₂ O %	3.23	Sb ppm	<0.2
K ₂ O %	5.37	Sc ppm	0.54
Fe ₂ O ₃ %	0.63	Se ppm	<3
MnO %	0.02	Sn ppm	----
TiO ₂ %	0.09	Sr ppm	340
P ₂ O ₅ %	0.02	Ta ppm	<1
LOI %	0.70	Th ppm	3.7
Ag ppm	<0.5	U ppm	0.8
As ppm	<2	V ppm	30
Au ppb	<10	W ppm	<3
B ppm	40	Y ppm	<20
Ba ppm	1800	Zn ppm	14
Be ppm	<10	Zr ppm	<20
Bi ppm	<0.5	La ppm	5.3
Br ppm	1	Ce ppm	4
Cd ppm	<0.2	Nd ppm	<5
Co ppm	2	Sm ppm	0.1
Cr ppm	20	Eu ppm	0.4
Cs ppm	0.5	Yb ppm	<0.2
Cu ppm	19	Lu ppm	<0.05
Fe ppm	----	Pt ppb	----
Ge ppm	<10	Pd ppb	----
Hf ppm	1	SUM %	99.30
Li ppm	30		
Mn ppm	100		
Mo ppm	<5		

Elemental analyses in ppm

Wano

Steeply dipping argillic, quartz, hematitic veins with variable chalcopyrite and trace bornite and barite cut syenite and were traced along a ENE strike for about 500+ ft between elevations of 190-to 465-ft. Vein widths vary from 0.5-to 8-ft. Sulfides occur in massive pods and lenses; at the Wano they are slightly radioactive, especially along contacts. Trace levels of U and Th (SE24625) were detected and up to .12% LREE. The U, Th, and REE appear independent of the sulfide pods and veins as indicated by the lack of these elements in the copper-rich vein material found on the dump (SE24626).

Several adits have been driven and workings were mapped and described by McKeveatt (plate 5). Gold values up to .02 t oz/ton and a trace of Pt was detected (SE24625). No further investigations of this deposit as a Nb or REE resource is recommended.

Polson & Ickis

Similar to the Wano deposit, veins strike N 25 - 30° E and dip steeply SE. Sulfide mineralization, however, is more disseminated and extends out into syenite country rock. Locally, the syenite appears to grade locally into monzonite and quartz monzonite. Veins are wider than the Wano system, up to 20 ft or more. There is about 600 ft of underground workings at the Polson and Ickis. Weak radiation, about 2X background at best, was detected along the selvage. The vein in #1 adit was traced horizontally for about 600 ft and is open on both ends. Underground, the vein appears to widen into a much wider (\pm 150 ft)

silicified zone in monzonite with disseminated pyrite and chalcopyrite and trace bornite. The veins average 2 to 3 % sulfides by volume. A 20 ft chip sample (SE24631) gave .31 pct Cu and .01 t oz/ton gold, but no appreciable U, Th, or REE. McKeveit previously reported up to 0.58 t oz/ton Au in select samples. In outcrop and mine face the chalcopyrite appears more abundant than indicated by assay. In polish section, however, McKeveit noted "chalcopyrite to rim and cut pyrite grains" and this feature likely accounts for the lower than expected copper assays. Exposures, particularly, in the No. 1 Adit, would visually suggest a copper grade of about 1.0 pct. McKeveit also reported xenotime to occur as accessory in the monzonite, however the present samples did not contain yttrium and therefore xenotime is likely not present in the zones sampled. No further investigation of this deposit as a Nb or REE resource is recommended.

Table 2. - Sample results from Wano and Polson & Ickis prospects

ELEMENT & UNITS	WANO			POLSON/ICKSI			
	SE24625	SE24626	SE24627	SE24628	SE24629	SE24630	SE24631
	18" chip from adit	Wano hi-grade in dump					
SiO ₂ %	65.4	40.6				36.0	72.0
Al ₂ O ₃ %	11.7	0.81				2.45	12.9
CaO %	1.28	0.19				31.3	1.37
MgO %	4.47	0.37				0.21	0.19
Na ₂ O %	3.88	0.08				1.21	5.29
K ₂ O %	0.12	0.07				0.31	3.41
Fe ₂ O ₃ %	7.99	18.8				1.71	1.35
MnO %	0.05	0.01				0.19	0.05
TiO ₂ %	0.51	0.07				0.11	0.25
P ₂ O ₅ %	0.79	0.12				0.03	0.14
LOI %	2.93	8.70				21.0	2.08
Ag ppm	<0.5	7.5				0.5	0.5
As ppm	14	21				<2	<2
Au ppb	27	550				20	290
B ppm	40	20				<10	40
Ba ppm	160	1800				21000	4300
Be ppm	<10	<10				<10	<10
Bi ppm	2.0	6.5				<0.5	1.0
Br ppm	2	2				2	2
Cd ppm	<0.2	<0.2				<0.2	<0.2
Co ppm	6	6				4	9
Cr ppm	50	40				<10	30
Cs ppm	<0.8	<0.5				<0.5	<0.5
Cu ppm	1600	140000				7100	3100
Fe ppm	----	-----				----	----
Ge ppm	<10	<10				<10	<10
Hf ppm	7	1				<1	3
Li ppm	10	30				20	20
Mn ppm	310	26				1600	260
Mo ppm	<5	<5				5	<5

(Up to 2000 cps on tailings).

Table 2. - Sample results from Wano and Polson & Ickis prospects - cont.

ELEMENT & UNITS		WANO				POLSON/ICKSI		
		SE24625	SE24626	SE24627	SE24628	SE24629	SE24630	SE24631
		18" chip from adit	Wano hi-grade in dump					
Nb	ppm	30	10				10	20
Ni	ppm	7	1				3	3
Pb	ppm	<2	<2				<2	<2
Rb	ppm	<20	<20				<20	<20
Sb	ppm	0.2	0.5				<0.2	0.2
Sc	ppm	7.49	1.3				4.16	1.14
Se	ppm	<3	13				<3	<3
Sn	ppm	- - -	- - -				- - -	- - -
Sr	ppm	240	<20				1400	570
Ta	ppm	<1	<1				<1	<1
Th	ppm	59	12				1.6	11
U	ppm	9.3	1.4				0.5	2.2
V	ppm	690	100				40	50
W	ppm	9	<3				<3	<3
Y	ppm	<20	<20				30	<20
Zn	ppm	75	75				5.5	7.0
Zr	ppm	370	<20				<20	110
La	ppm	386	109				19.5	24.5
Ce	ppm	585	125				50	42
Nd	ppm	179	33				49	13
Sm	ppm	22.5	3.7				9.7	2.5
Eu	ppm	6.0	1.0				5.1	1.0
Yb	ppm	3.0	0.7				3.9	0.8
Lu	ppm	0.93	0.16				0.50	0.17
Pt	ppm	20	10				<10	<10
Pd	ppm	3	<2				<2	<2
SUM	%	99.20	70.00				97.00	99.60

CARBONITITES

McLean Arm

McLean Arm locally contains auriferous disseminated pyrite, and chalcopyrite. About 1300 tons were mined at the Nelson and Tiff property in the 1930's. An open cut was excavated at sea level and loaded onto a barge for shipment.

The deposit was hosted by a massive white carbonatite dike that intrudes meta-volcaniclastics. Up to 0.12 oz/t and .78 pct Cu was detected in selected mineralized samples (SE24623). Massive milky quartz with sulfides tend to concentrate near margins of the carbonate dike. Accessory minerals include arsenopyrite and scoridite, chloritized amphibole, and feldspar.

Weak radioactivity noted at a few sites along the wall rock contact at Nelson and Tiff mine, but no radioactive minerals were identified.

Elsewhere to the west along the north shore of McLean Arm white massive carbonatite intrudes quartz diorite plutonic rock, exposed in outcrops up to 50 by 200 ft. In at least one location, the carbonitite has been later intruded by basalt. Tremalite with clots of idocrase, calc-silicate, and epidote occur marginal to the carbonatite forming a sort of inverse skarn. No further investigation of this deposit as a Nb or REE resource is recommended.

Table 3. - Sample results from McLean Arm prospect

ELEMENT & UNITS	SE24613	SE24614	SE24617	SE24618	SE24622	SE24623	SE24633
	N. Wall	Py-Cpy zone		Carbonatite	Carb. alt diorite	Pyroxenite	Nelson & Tiff
SiO ₂ %	59.1	84.6		0.38	- - -	- - -	5.39
Al ₂ O ₃ %	9.88	0.59		0.04	- - -	- - -	0.73
CaO %	18.9	2.32		55.6	- - -	- - -	51.4
MgO %	0.84	0.34		0.44	- - -	- - -	1.37
Na ₂ O %	1.16	<0.01		<0.01	- - -	- - -	<0.01
K ₂ O %	0.60	0.06		0.01	- - -	- - -	0.02
Fe ₂ O ₃ %	2.20	5.15		0.05	- - -	- - -	1.46
MnO %	0.16	0.05		0.01	- - -	- - -	0.11
TiO ₂ %	0.28	0.08		0.01	- - -	- - -	0.03
P ₂ O ₅ %	0.09	0.04		0.02	- - -	- - -	0.04
LOI %	6.85	3.93		43.5	- - -	- - -	39.2
Ag ppm	<0.5	1.5		<0.5	- - -	- - -	<0.5
As ppm	13	6		<2	- - -	- - -	3
Au ppb	30	650		<10	5	<2	4000
B ppm	20	40		<10	- - -	- - -	<10
Ba ppm	390	310		<20	- - -	- - -	30
Be ppm	<10	<10		<10	- - -	- - -	<10
Bi ppm	<0.5	10		<0.5	- - -	- - -	5.5
Br ppm	1	3		1	- - -	- - -	2
Cd ppm	<0.2	<0.2		<0.2	- - -	- - -	<0.2
Co ppm	4	2		<1	- - -	- - -	2
Cr ppm	<10	30		<10	- - -	- - -	<10
Cs ppm	0.7	<0.5		<0.5	- - -	- - -	<0.5
Cu ppm	39	7800		8.0	- - -	- - -	330
Fe ppm	- - -	- - -		- - -	- - -	- - -	- - -
Ge ppm	<10	<10		<10	- - -	- - -	<10
Hf ppm	2	1		<1	- - -	- - -	<1
Li ppm	30	30		20	- - -	- - -	20
Mn ppm	1300	300		150	- - -	- - -	860
Mo ppm	<5	<5		<5	- - -	- - -	<5

Table 3 - Sample results from McLean Arm prospect - cont.

ELEMENT & UNITS		SE24613	SE24614	SE24617	SE24618	SE24622	SE24623	SE24633
		N. Wall	Py-Cpy zone		Carbonatite	Carb. alt diorite	Pyroxenite	Nelson & Tiff
Nb	ppm	20	<10		<10	8	20	10
Ni	ppm	1	<1		1	- - -	- - -	2
Pb	ppm	<2	<2		<2	- - -	- - -	<2
Rb	ppm	<20	<20		<20	- - -	- - -	<20
Sb	ppm	0.5	1.2		<0.2	- - -	- - -	0.2
Sc	ppm	1.50	0.66		0.16	- - -	- - -	0.56
Se	ppm	<3	<3		<3	- - -	- - -	<3
Sn	ppm	- - -	- - -		- - -	- - -	- - -	- - -
Sr	ppm	150	<20		100	- - -	- - -	130
Ta	ppm	<1	<1		<1	- - -	- - -	<1
Th	ppm	3.1	0.9		<0.5	- - -	- - -	0.7
U	ppm	1.7	0.6		<0.5	- - -	- - -	0.5
V	ppm	30	10		30	- - -	- - -	30
W	ppm	<3	3		<3	- - -	- - -	<3
Y	ppm	20	<20		<20	- - -	- - -	<20
Zn	ppm	44	35		1.5	- - -	- - -	15
Zr	ppm	50	<20		<20	- - -	- - -	<20
La	ppm	13.6	0.7		0.8	- - -	- - -	1.3
Ce	ppm	33	3		<3	- - -	- - -	3
Nd	ppm	15	<5		<5	- - -	- - -	<5
Sm	ppm	2.9	0.3		0.1	- - -	- - -	0.3
Eu	ppm	0.7	<0.2		<0.2	- - -	- - -	<0.2
Yb	ppm	1.9	0.4		<0.2	- - -	- - -	0.2
Lu	ppm	0.30	0.09		<0.05	- - -	- - -	<0.05
Pt	ppb	- - -	- - -		- - -	<10	<10	- - -
Pd	ppb	- - -	- - -		- - -	<2	2	- - -
SUM	%	100.1	97.20		100.1	- - -	- - -	99.80

REFERENCES

1. MacKevett, E. M., Jr. "Geology and Ore Deposits of the Bokan Mountain Uranium-Thorium Area, Southeastern Alaska, U.S. Geological Survey Bulletin 1154, (1963) 125.
2. Barker, J. C. and C. L. Mardock. "Rare-Earth Element and Columbium-Bearing Pegmatite Dikes Near Dora Bay, Southern Prince of Wales Island." U.S. Bureau of Mines Bulletin 675, (1985), 647-664.