Dave: your copy. 1 of 4P

820518

BRITISH COLUMBIA

Ministry of Employment and Investment

MEMORANDUM

To: William Pearce, Q.C.
Senior Counsel
Ministry of Attorney General
Legal Services Branch
Victoria.

9th December 1996

From: Gerry Ray
Senior Economic Geologist
B.C. Geological Survey
Ministry of Employment and Investment
Victoria

Re: Mockingbird Claim (Lot 284) - Tatshenshini/Alsek Park
Registered Owner: Eric Stanley Thompson.

Dear Mr. Pearce,

Thank you for your memorandum dated the 21st of November 1996 which was passed to me from Denis Lieutard, our Director of Mineral Titles. As I mentioned in our telephone conversation on the 6th of December, in my professional opinion the Rainy Hollow area (in which Mockingbird Claim lies) has a great potential for copper, gold and silver, and consequently the claim and other adjacent properties have a considerable economic value.

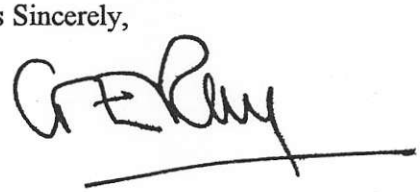
This view has been stated publicly by myself and other colleagues at talks and in writing (*see* attached copy of our report on the Rainy Hollow area, page 239). It is based partly on the fact that the area has extremely favorable geology and there are two former copper-silver mines, the Maid of Erin and the State of Montana mines (Lots 722 and 283 respectively) which lie a short distance west of the Mockingbird Claim. There are also numerous other copper-gold-lead and zinc mineral showing in the immediate area, including the Victoria (Lot 903), Adams (Lot 727) and Lawrence (Lot 955). Moreover, a regional stream sediment (RGS) sampling program completed by the Provincial Government in 1992 revealed that some of the drainage basins at Rainy Hollow contained among of the highest gold values in the entire region, which supports the presence of economic mineral deposits.

In our phone conversation, you asked me to estimate an economic value of the Mockingbird Claim to its owner. With the good current exploration market for copper and gold, and the favorable geology mentioned above, I believe that the owner should have been able to negotiate an initial deal with an exploration company for at least several tens of thousands dollars per annum, if the claim had not been included in the park. Of course, successful exploration would eventually lead to considerably higher option payments to the owner, and the discovery of a mineable ore deposit would enhance the value of the area immeasurably.

Given the past mining history at Rainy Hollow, its favorable economic mineral potential and the value of the mineral claims, it is unfortunate that the area was included in the park (particularly since the mineralized area is small, it lies on the park boundary and its removal would hardly diminish the size of the park). I should emphasize that prior to the decision to establish the park, I had consistently recommended the Rainy Hollow area to companies seeking to do exploration in British Columbia. Removing the Rainy Hollow area from the park would enable the provincial government to avoid expensive compensation payments with the many claim owners and allow the full mineral potential of this promising area to be exploited.

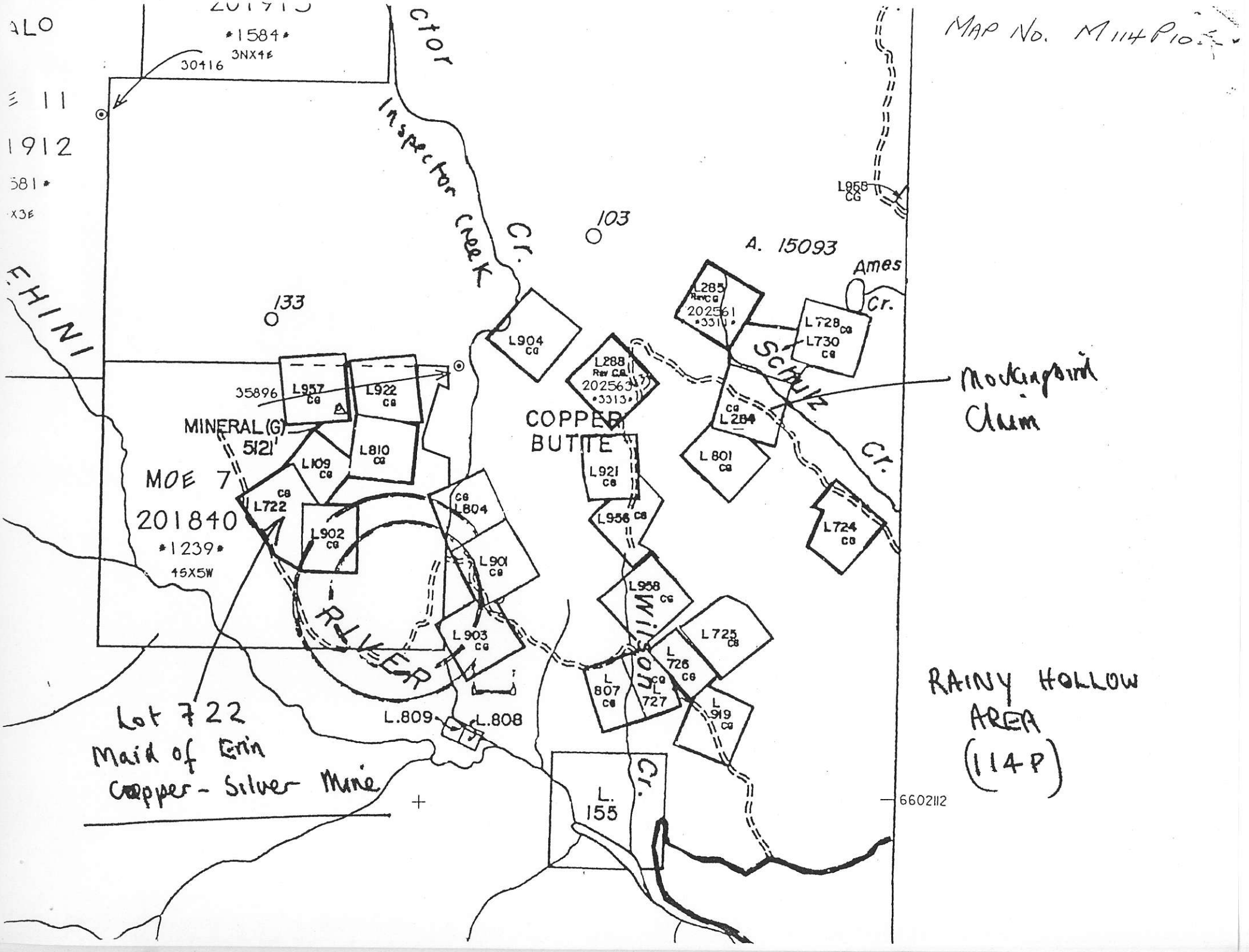
If you require any further details, please contact me.

Yours Sincerely,



Gerald E. Ray (Tel. 952 0408)

cc Denis Lieutard
Bill MacMillan
Dave Lefebure
Mitch Mihaynuk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1584
3NX4E
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Inspector Creek
Cr.
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A. 15093
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L285 Rev CG
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Schulz
Cr.
Mockingbird Claim
35896
L957 CG
L922 CG
MINERAL (G)
512'
L109 CG
L810 CG
COPPER BUTTE
L921 CG
L956 CG
L284 CG
L801 CG
L724 CG
MOE 7
201840
1239
15X5W
L722 CG
L902 CG
CG L804
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RIVER
WILSON
L958 CG
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Lot 722
Maid of Erin
Copper - Silver Mine
L. 155
Cr.
6602112
RAINY HOLLOW AREA (114P)

AN INVESTIGATION OF SELECTED MINERALIZED SKARNS IN BRITISH COLUMBIA

By I.C.L. Webster, G.E. Ray and A.R. Pettipas

KEYWORDS: Economic geology, skarn, metallogeny, geochemistry, mineralogy, wrigglite.

INTRODUCTION

A number of skarn deposits and occurrences throughout the province were examined and sampled during the 1991 field season (Figure 2-2-1). The season represented the final part of a 4-year field program to map, study and compile data on some of the 700 or more mineralized skarns recorded in MINFILE. It is hoped to determine relationships between these skarns and their metal content, geochemistry, mineralogy, age, associated intrusions and lithostructural setting. Preliminary geochemical results and descriptions of the mineralized skarn samples collected this season are presented in Tables 2-2-1a and b. Whole-rock and additional trace element analytical results, together with data on microprobe analyses, will be published at a later date.

Earlier work in this program focused on the province's gold and iron skarns, such as those in the Hedley, Texada Island and Merry Widow camps, and in the Iskut River area; publications include those by Ray *et al.* (1988, 1991), Ettlinger and Ray (1989), Ray and Webster (1991), Webster and Ray (1991), and Ray and Dawson (in preparation). The 1991 research concentrated on some of British Columbia's copper, zinc-lead, tungsten, molybdenum and tin skarns (Figure 2-2-1). The final results of the study will eventually be published in bulletin form (Ray and Webster, in preparation).

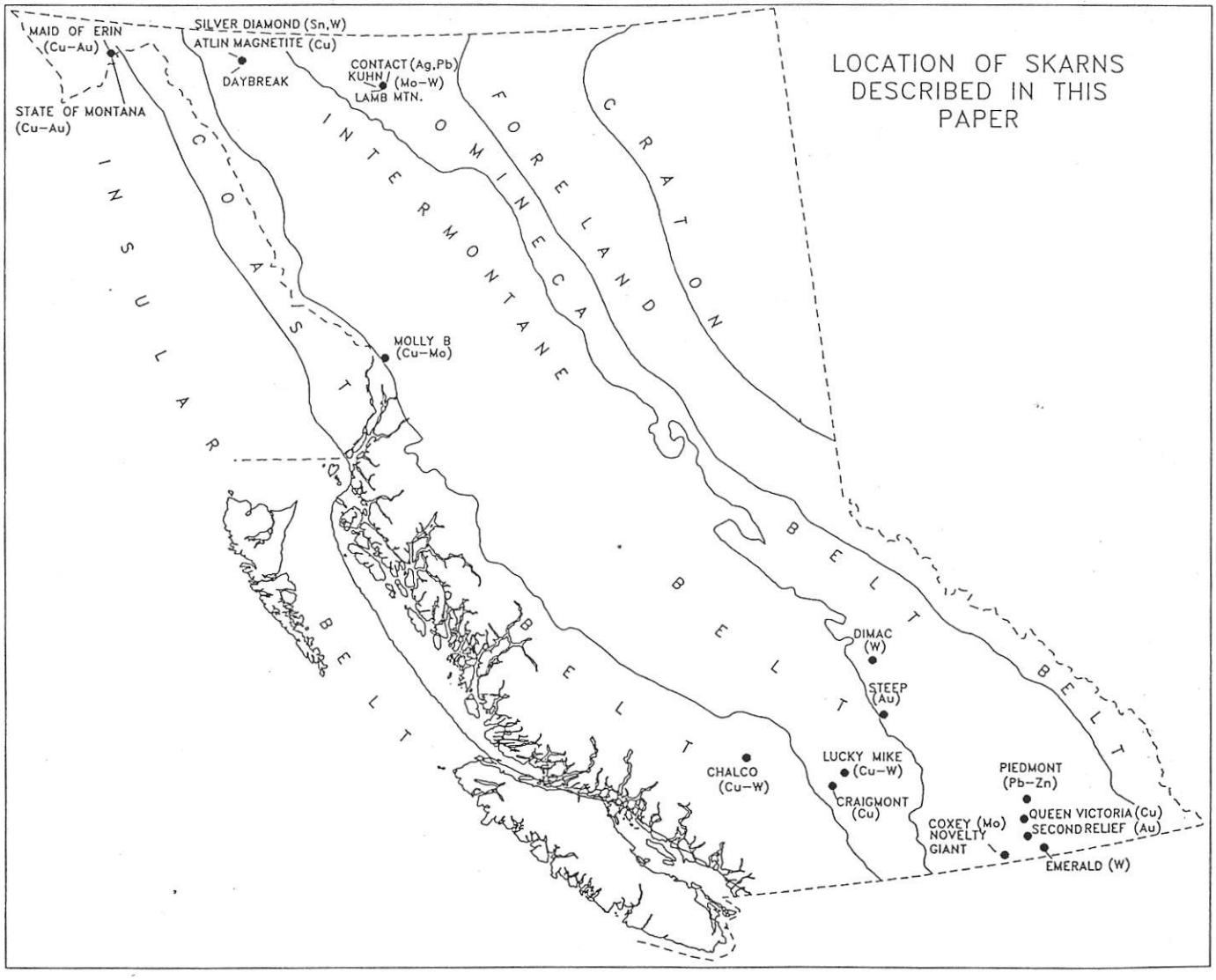

Figure 2-2-1. Location of mineralized skarns examined during the 1991 field season, showing their relationship to the tectonic belts.

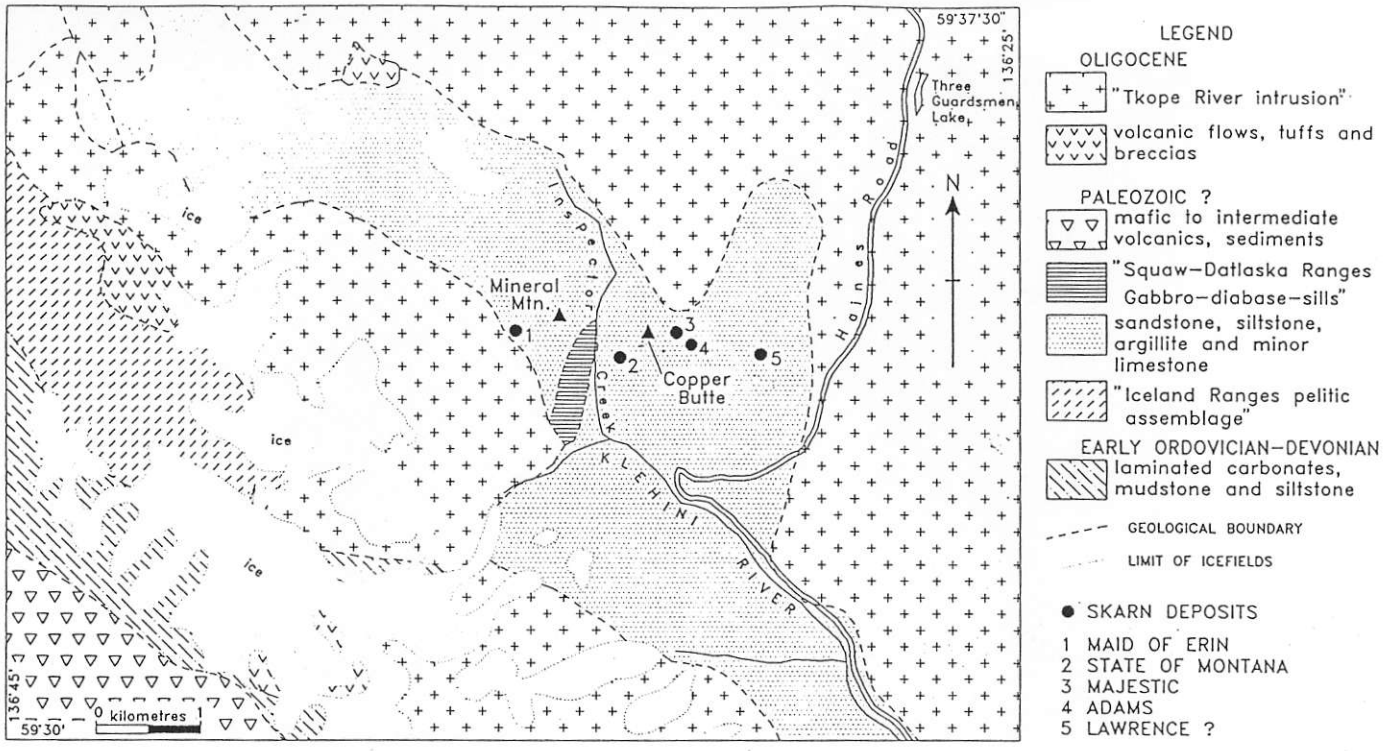

Figure 2-2-2. Geology and location of skarns in the Rainy Hollow area, northwest B.C. (geology after Campbell,1983).

TABLE 2-2-2
SKARNS VISITED DURING THE 1991 FIELD SEASON GIVING TECTONIC BELT, LITHOTECTONIC TERRANE AND PRODUCTION

Skarn name	Belt	Terrane	Ore (t)	Au (kg)	Ag (kg)	Cu (t)	Pb (t)	Zn (t)	Mo (t)	Fe (t)	W(t)
Maid of Erin	Ins	Alex	3 285	0.3	1 487	244	-	-	-	-	-
State of Montana	Ins	Alex	9	-	14	2	-	-	-	-	-
Victoria	Ins	Alex	none	-	-	-	-	-	-	-	-
Adams	Ins	Alex	none	-	-	-	-	-	-	-	-
Lawrence	Ins	Alex	none	-	-	-	-	-	-	-	-
Chalco	Cst	BrdgR	none	-	-	-	-	-	-	-	-
Craigmont	Int	Ques	29 325 342	78	242	402 704	-	-	-	141 634	-
Lucky Mike	Int	Ques	5	0.6	4.3	0.9	0.8	-	-	-	-
Molly B	Int	Stik	290	0.7	3.5	2	-	-	-	-	-
Oral M	Int	Stik	12	0.3	1.5	1	-	-	-	-	-
Silver Diamond	Int	Cache	none	-	-	-	-	-	-	-	-
Atlin Magnetite	Int	Cache	none	-	-	-	-	-	-	-	-
Day Break	Int	Cache	none	-	-	-	-	-	-	-	-
Coxey	Omn	SldMtn	1 035 509	-	-	-	-	-	1 749	-	-
Novelty	Omn	SldMtn	unknown production		-	-	-	-	-	-	-
Giant	Omn	SldMtn	*4 131	113	23	1.3	-	-	-	-	-
Second Relief	Omn	Ques	207 023	3 118	866	20	1	0.1	-	-	-
Emerald camp**	Omn	ANA	7 683 190	-	-	-	-	-	-	-	7 416
Queen Victoria	Omn	Ques	45 352	8	950	673	-	-	-	-	-
Piedmont	Omn	Ques	479	-	71	-	24	71	-	-	-
Steep	Omn	Koot	none	-	-	-	-	-	-	-	-
Dimac	Omn	Bark	105	-	-	-	-	-	-	-	105
Contact	Omn	Cass	25		10	0.02	2	-	-	-	-
Kuhn	Omn	Cass	none	-	-	-	-	-	-	-	-
Dead Goat	Omn	Cass	none	-	-	-	-	-	-	-	-
Lamb Mtn.	Omn	Cass	none	-	-	-	-	-	-	-	-

Abbreviations: Belts: Ins = Insular, Cst = Coast, Int = Intermontane, Omn = Omineca.
Terranes: Ques = Quesnellia, Stik = Stikinia, Cass = Cassiar, Bark = Barkerville, Alex = Alexander, Koot = Kootenay, SldMtn = Slide Montain, Cache = Cache Creek, ANA = Ancestral North America, BrdgR = Bridge River
* = Giant and California claims production.
** = Emerald Tungsten, Dodger, Feeney, Invincible: tungsten production figure from Jersey Mine records.

TABLE 2-2-1b
DESCRIPTIONS OF SAMPLES LISTED IN
TABLE 2-2-1a

LABNO	DEPOSIT	SAMPLE DESCRIPTION
043058	Maid of Erin	Bornite ore with yellowish green garnet.
043059	Maid of Erin	Massive bornite ore.
043060	Maid of Erin	Below deposit; rusty silicified float with disseminated po.
043062	Maid of Erin	Mineralization on road east of deposit.
043065	State of Montana	Massive bornite and garnet ore.
043066	State of Montana	Massive bornite and garnet ore.
043067	State of Montana	Disseminated po in banded garnet skarn.
043063	Adams	Minor py, po and aphl in siltstone and phyllite.
043068	Lawrence	Sphl with minor cpy and gal with green garnet in marble.
043064	Majestic	Massive po vein with minor cpy and quartz veinlets.
043069	Rainy Hollow	Disseminated po in rusty siliceous siltstone on road into deposit.
043070	Rainy Hollow	Disseminated po in rusty siliceous siltstone on road into deposit.
043072	Rainy Hollow	Disseminated po in schist; east side of Mineral Mountain.
043073	Rainy Hollow	Disseminated po in hornfelsed schist; Inspector Creek float.
043077	Chalco	Po, cpy and mgt in garnet pyroxene skarn.
043078	Chalco	Po, cpy and mgt in garnet pyroxene skarn.
043079	Chalco	Po and mo in skarn altered schist.
042818	Craigmont	Mgt, hem and cpy in epidote-chlorite skarn.
042548	Eric	Mgt, hem, malachite and potassium feldspar in garnet skarn.
042544	Lucky Mike	Cpy, scht and calcite in brown garnetite.
042823	Molly B	Po in garnet-pyroxene skarn.
042824	Molly B	Po, cpy and py in garnet-pyroxene skarn; mine dump.
042825	Molly B	Sphl, po and cpy in pyroxene-garnet skarn; upper cut.
042826	Oral M	Py and cpy in quartz vein.
042827	Oral M	Py and cpy in quartz vein.
043048	Atlin Magnetite	Mgt, cpy and po in garnet skarn.
043049	Atlin Magnetite	Mgt, cpy and azurite in garnet skarn.
043050	Silver Diamond	Coarse sphl,po and cpy mineralization.
043052	Silver Diamond	Po, cpy and fluorite with sericite.
043053	Silver Diamond	Black manganese in granular crystalline fluorite.
043054	Silver Diamond	Sphl and gal veinlets with minor coarse py in quartz vein
043055	Daybreak	Wrigglite skarn.
043056	Daybreak	Wrigglite skarn.
043057	Daybreak	Wrigglite skarn.
042557	Coxey	D pit; Po veinlets in pyroxene-amphibole skarn.
042573	Coxey	Mo in pyroxene hornfels; uA pit
042559	Coxey	Mo and po matrix in diorite breccia; A pit.
042560	Coxey	Mo and py veins in skarn; E pit.
042561	Coxey	Mo and py veins in skarn-altered siltstones; F pit.
042563	Novelty	Asp, mo, py ore with cobalt bloom.
042564	Novelty	Asp and mo in silicified sedimentary breccia.
042565	Novelty	Asp, cpy and cob ore.
042572	Novelty	Asp in siliceous sediment.
042568	Giant	Asp, mo with minor po, py and garnet ore; upper adit dump.
042566	Vein north of Coxey	Gal and py in thin, subhorizontal quartz vein.
042584	2nd Relief	Py, po, and cpy in quartz vein.
042585	2nd Relief	Sulphide-rich pyroxene hornfels with minor garnet in wallrock.
042586	2nd Relief	Sulphide-rich quartz vein with dark green mineral.
042588	2nd Relief	Sphl and asp-rich quartz vein.
042556	Emerald W	Scht, and mo in garnet skarn inside portal.
042553	Dodger	Po, py and asp at limestone-granite contact in portal.
042554	Dodger	Po and py and equigranular quartz in granite at portal.
042578	Queen Victoria	Cpy and py in garnetite.
042579	Queen Victoria	Cpy and py in garnetite.
042580	Queen Victoria	Sulphide-rich quartz vein.
042581	Piedmont	Massive gal, sphl and po ore.
042582	Piedmont	Massive po and sphl from inside adit.
042583	Piedmont	Gal, sphl and po ore.
042828	Steep	Po in garnet skarn
042829	Steep	Po and cpy in skarn.
042819	Dimac	Po and scht in quartz-garnet skarn.
042820	Dimac	Coarse scht with po in garnet-pyroxene-quartz skarn.
042822	Dimac	Scht and po in garnet-pyroxene-quartz skarn.
043080	Contact	Mgt, po and sphl ore.
043082	Contact	Mgt, po sphl ore.
043083	Kuhn	Mo and minor po in actinolite, garnet quartz skarn.
043084	Kuhn	Po and cpy in float.
043085	Dead Goat	Coarse po and py with minor sphl and mgt in coarse garnet skarn.
043086	Dead Goat	Sphl and po in pyroxene skarn.
043087	Lamb Mountain	Minor po and cpy in actinolite skarn.
043088	Lamb Mountain	Disseminated po in rusty, siliceous quartz monzonite.
043089	Lamb Mountain	Disseminated po in rusty, siliceous quartz monzonite
043074	Unnamed	Garnet-pyroxene skarn with py and po (#6 in Figure 6).
043075	Unnamed	Garnet-pyroxene skarn with py and po (#6 in Figure 6).
043076	Unnamed	Endo skarn with py, po and mo (#5 in Figure 6).

Abbreviations; mo = molybdenite, py = pyrite, cpy = chalcopyrite, po = pyrrhotite, asp = arsenopyrite, hem = hematite, scht = scheelite, cob = cobaltite, gal = galena, sphl = sphalerite

Analytical methods:

Au,Ba,Ce,Cr,Rb,Se,Sn,Th,W; neutron activation, Activation Laboratories Ltd.,Ancaster, Ont.

Ag,Bi,Cd,Co,Cu,Mn,Mo,Ni,Pb,Zn; atomic absorption spectroscopy. Anaytical Sciences Laboratory, B.C. Geological Survey Branch, M.E.M.P.R.

As,Sb; atomic absorption-hydride generation, Anaytical Sciences Laboratory, B.C. Geological Survey Branch, M.E.M.P.R.

INSULAR BELT

A number of skarns, including the Maid of Erin and State of Montana deposits, are located in the Rainy Hollow area in the northwest corner of the province (Figure 2-2-1) approximately 70 kilometres northwest of Haines, Alaska. They occur within the Alexander Terrane and are hosted by Upper Paleozoic sediments that are intruded on the west and east by Oligocene rocks of the Tkope River intrusions (Campbell, 1983). A suite of Squaw-Datlaska gabbroic sills and dikes also occurs in the area (Figure 2-2-2). Skarn alteration and silicification, with zones of massive and disseminated sulphides, are exposed over a wide area. Intermittent underground mining took place, mostly at the Maid of Erin between 1907 and 1956; approximately 244 tonnes of copper, 1.5 tonnes of silver and minor gold were produced (Table 2-2-2). Minor production is also reported from the State of Montana claim. In addition to these two producers, several small skarn occurrences are exposed in old pits and exploratory adits in the area; they include the Lawrence, Adams, Victoria, Hibernia, Wonderful and Majestic skarns (McConnell, 1913; Hudson, 1927; Watson, 1948).

MAID OF ERIN (MINFILE 114P 007)

The Maid of Erin skarn lies less than 200 metres from the northeast margin of a hornblende-biotite quartz diorite body belonging to the Tkope River intrusions. This large massive stock, which underlies the skarn, is cut by numerous narrow, white quartz veins. The skarn is hosted by an altered and silicified package of tuff, argillite and marble that dips moderately northeastwards; these rocks are locally cut by narrow, endoskarn-altered sills and dikes that are believed to originate from the nearby diorite.

The endoskarn intrusions and exoskarn lenses largely comprise banded, massive and crystalline garnet with lesser pyroxene; banding in the exoskarn probably represents remnant bedding. The garnet includes pale brown, red, lime-green and yellow varieties, some of which are optically zoned. Several phases are recognized in the marble; an early, brown garnet is overgrown, in turn, by dark green and yellow crystals. Also present are coarse, radiating crystals of vesuvianite and wollastonite as well as lesser epidote, sericite and biotite. The fine-grained biotite mainly occurs in remnant patches of dark, siliceous, hornfels-like rock that is cut by veinlets of pyroxene and later garnet. Watson (1948) reports the presence of zoisite, clinozoisite, monticellite, anorthite and blue gahnite spinel in the skarn.

Mineralization is found both in the exoskarn and endoskarn. It consists of veins and blebs of mainly bornite, chalcocite and lesser chalcopyrite with sporadic and minor azurite, black sphalerite, molybdenite and magnetite. Wittichenite (Cu_3BiS_3) has also been identified in some ore as well as trace covellite and native silver (Watson, 1948). Mineralized samples of sulphide-rich skarn contain high values of copper, silver and bismuth with some gold (Ettlinger and Ray, 1989; Table 2-2-1a). Extensive silicified and albitized zones containing disseminated pyrrhotite occur adjacent to the Maid of Erin skarn and on Mineral Mountain (Figure 2-2-2), however, samples of this material contained no gold (Table 2-2-1a).

State of Montana (Minfile 114P 008)

The alteration and mineralization at this property are similar to that at the Maid of Erin skarn, approximately 1 kilometre to the east (Figure 2-2-2). The skarn consists mainly of green and brown garnet with minor amounts of coarse, radiating actinolite crystals. It is hosted by layered, steeply dipping marbles and siliceous and albitized metasediments close to small bodies of mafic diorite.

Mineralization appears to be confined to the green garnet skarn. It consists of veins and layers of massive bornite and chalcocite up to 10 centimetres thick; Watson (1948) notes that wittichenite occurs in bornite as microscopic grains. Like the Maid of Erin skarn, some of the silicified and albitized metasediments contain fine disseminated pyrrhotite.

Other Skarn Occurrences in the Rainy Hollow Area

The **Victoria, Adams and Lawrence** (MINFILE 114P 009, 010 and 011) occurrences are characterized by variable amounts of brown and green garnet with some minor wollastonite. Mineralization is dominated by black sphalerite with lesser galena (Hudson, 1927; Watson, 1948); some pods of massive pyrrhotite were also documented at the Adams where the skarn follows a marble-argillite contact, close to thin diorite sills. The Victoria skarn was not visited during this season because its location is uncertain.

The **Majestic** lies on the east side of Copper Butte (Figure 2-2-2) where it is hosted by grey marbles. At least two adits were driven on an east-trending zone of massive pyrrhotite. A narrow lens of crystalline brown and green garnet skarn is developed on the north side of the zone, between it and the marble.

The pyrrhotite zone contains garnet as well as rare veinlets of quartz and chalcopyrite. A pyrrhotite-rich sample from the Majestic is weakly anomalous in bismuth and cobalt but contains no gold (Table 2-2-1a).

To summarize, our examination of the Rainy Hollow area suggests that the numerous mineralized skarn deposits and occurrences are part of a major skarn system. This system, which probably resulted in a discontinuous but extensive alteration envelope that exceeds 1 square kilometre in outcrop area, covers parts of the Mineral Mountain and Copper Butte areas. It is uncertain whether it is related to the large Oligocene Tkope River intrusions or to a gabbroic sill suite forming part of the Squaw-Datlaska Ranges complex (Figure 2-2-2). The envelope contains copper and silver-rich skarn close to the Tkope River intrusion at the Maid of Erin deposit. Farther from the intrusion it contains some zinc-lead skarns as well as extensive alteration zones that are silicified and albitized with massive and disseminated pyrrhotite.

Past mining and exploration drilling at Rainy Hollow were concentrated on the proximal copper-rich skarn, while the possible existence of distal gold-rich and copper-poor skarn mineralization, similar to that at the Fortitude deposit in Nevada (Wotruba *et al.*, 1988; Myers, 1990), has largely been ignored. Although our samples of this pyrrhotite alteration were barren of gold (Table 2-2-1a), other features suggest that gold skarn mineralization could exist at Rainy Hollow. These features include the localized enrichment of gold, cobalt and bismuth in the hydrothermal system as well as the low Cu/Ag ratio (250) of the Maid of Erin ore; such a low ratio is atypical of most copper and iron skarns but is a characteristic of many gold-skarn systems (Ettlinger and Ray, 1989).

COAST BELT

Chalco (Minfile 92JNE043)

The Chalco 5 skarn is located 11 kilometres southeast of Bralorne in the Bridge River Terrane of southwestern B.C. (Figure 2-2-1). The area is underlain by biotite schist, banded amphibolite and marble of the Bridge River Group and the skarn is hosted by a northwest-trending pod of coarsely crystalline marble and schist 200 metres in length. An adit and open cut expose a section of marble containing a skarn zone up to 3 metres wide. The hornblende diorite Bendor batholith outcrops 100 metres to the north and is probably responsible for the skarn; it has yielded a Tertiary age of 64 Ma (Church and Pettipas, 1989). Small dikes of altered hornblende diorite crosscut the schist adjacent to the skarn.

Skarn minerals include coarse brownish red to black garnet with lesser pyroxene, actinolite and epidote. Garnet generally forms an interlocking mass of subhedral crystals up to 3 centimetres in diameter and often shows noticeable growth zoning; minor sericite is interstitial to the garnet. Locally the garnet skarn is banded with, or contains clots of, pyroxene and actinolite. Some crosscutting veins of quartz and carbonate contain euhedral crystals of garnet and pyroxene.

The disseminated metallic mineralization is sparse; it includes pyrrhotite, chalcopyrite and some magnetite with rare molybdenite. Geochemical analyses indicate sporadic minor enrichment in gold, bismuth and tungsten (Table 2-2-1a).

INTERMONTANE BELT

Craigmont Mine (Minfile 92ISE035)

The Craigmont copper skarn is situated in the Quesnel Terrane of southern British Columbia (Figure 2-2-1), approximately 13 kilometres northwest of Merritt. It is the largest copper skarn deposit in the province having produced over 400 000 tonnes of copper and 140 000 tonnes of magnetite iron ore (Table 2-2-2) from open-pit and underground workings. Mining took place between 1961 and 1982; since 1983 magnetite has been recovered from the tailings for use by the coal industry.

The Craigmont orebody was located on a major fault and was hosted mainly by volcanics, bedded tuffs and limestones of the Late Triassic Nicola Group adjacent to the southern margin of the Guichon Creek batholith. This batholith, which represents a high-level intrusion, was coeval with the Nicola Group volcanism and is associated with porphyry copper mineralization in the Highland Valley (McMillan, 1976, 1978). Quartz dioritic rocks of the