TABLES 1–8

Table 1. Abbreviations used in tables

Term	Abbreviation	Term	Abbreviation	Term	Abbreviation
		Mineral name			
actinolite	act	forsterite	fo	prehnite	preh
amphibole	amph	galena	gal	pyrite	py
andradite	an	garnet	gar	pyrolusite	pyr
ankerite	ank	goethite	goe	pyroxene	px
apatite	ap	grossular	gros	pyrrhotite	po
argentite	arg	hedenbergite	hed	quartz	qtz
arsenopyrite	apy	hedleyite	hedl	realgar	real
azurite	azur	hematite	hem	scapolite	scap
biotite	biot	hessite	hes	scheelite	sch
bismuthinite	bism	hornblende	horn	scorodite	scor
bornite	bor	jasper	jas	sericite	ser
calcite	cal	K-feldspar	k-spar	serpentine	serp
carbonate minerals	carbs	leucopyrite	leucopy	siderite	sid
cerargyrite	crg	limonite	lim	spadaite	spa
cerussite	cer	loellingite	loel	specularite	spec
chalcocite	cc	ludwigite	lud	sphalerite	sph
chalcopyrite	cpy	magnesite	mags	spinel	spin
chlorite	chl	magnetite	mag	stibnite	stib
chrysocolla	chr	malachite	mal	stilpnomelane	stilp
clinopyroxene	clinopx	maldonite	mald	telluride(s)	tell
clinozoisite	clinoz	marcasite	marc	tenorite	ten
covellite	cov	molybdenite	moly	tetradymite	tetd
cubanite	cub	muscovite	musc	tetrahedrite	tet
cummingtonite	cum	native bismuth	Bi	tourmaline	tour
cuprite	cup	native copper	Cu	tremolite	trem
diopside	diop	native gold	Au	vermiculite	ver
dolomite	dol	native silver	Ag	vesuvianite	ves
electrum	elec	nontronite	non	white mica	wm
enargite	enar	orpiment	orp	wolframite	wolf
epidote	ep	oxide(s)	ox	wollastonite	wol
feldspar	feld	phlogopite	phlg	zoisite	zoi
fluorite	fl	plagioclase	plag		
		Rock type			
agglomerate	agglom	hornfels	hfs	sandstone	sst
andesite	and	limestone	ls	sedimentary	sed
argillite	argl	manganiferous	mang	sediments	seds
calcareous	calc	marble	mar	shale	sh
carbonaceous	carb	monzonite	monz	siltstone	sltst
conglomerate	congl	mudstone	mdst	skarn	skn
dolostone	dolos	porphyry	porph	slate	sl
greenstone	grnst	quartzite	qtzite	volcanic rocks	volcs

Table 1. Abbreviations used in tables—Continued

Term	Abbreviation	Term	Abbreviation	Term	Abbreviation
		Age			
Tertiary	Tert.	Carboniferous	Carb.	Proterozoic	Prot.
Miocene	Mio.	Pennsylvanian	Penn.	Early	E.
Eocene	Eoc.	Mississippian	Miss.	Middle	M.
Mesozoic	Mes.	Devonian	Dev.	Late	L.
Cretaceous	Cret.	Silurian	Sil.	early	e.
Jurassic	Jur.	Ordovician	Ord.	middle	m.
Triassic	Tri.	Cambrian	Camb.	late	l.
Paleozoic	Pal.	Precambrian	Prec.	Upper	U.
Permian	Perm.				
		Other			
average	avg	million	M	sequence	seq
Formation	Fm.	million years	Ma	short ton (2000 lb)	st
gram	g	tonne(s) (metric tons)	t	trace	tr
Group	Gp.				

Country	Country code	Country	Country code
Afghanistan	AFGH	Philippines	PLPN
Australia, New South Wales	AUNS	Papua New Guinea	PPNG
Australia, Queensland	AUQL	South-West Africa (Namibia)	SAFR
Australia, Tasmania	AUTS	Spain	SPAN
China	CHNA	Sweden	SWDN
Colombia	CLBA	Thailand	THLD
Canada, British Columbia	CNBC	United States, Alaska	USAK
Canada, Quebec	CNQU	United States, California	USCA
Canada, Yukon Territory	CNYT	United States, Colorado	USCO
Ecuador	ECDR	United States, Idaho	USID
Indonesia	INDS	United States, Montana	USMT
Japan	JPAN	United States, Nevada	USNV
Mexico	MXCO	Soviet Union	USSR
Malaysia	MYLA	United States, Utah	USUT
Nicaragua	NCRG	United States, Washington	USWA
North Korea	NKOR	Federal Republic of Germany	WGER
Peru	PERU		

Table 2. Gold-bearing skarns in which gold and silver are major commodities exploited

[p, metal present in unquantified amount; other abbreviations listed in table 1]

Name	Location (mining district)	Host lithology	Formation age/ name	Igneous rocks	Age	Ore minerals	Gangue minerals
Bau	MYLA	mar, sh	L. Jur./Bau Ls.	acid porph stocks & dikes	Mio.	Au, apy, py, sph, stib, real, orp, scor	chl, diop, ep, gar, wol, ves, qtz, cal, rare plag, ap, preh
Beano	CNBC (Zeballos)	ls, and tuff	Tri.-Jur./ Quatsino Fm. Bonanza volcs.	diorite-rhyolite porph sill	Jur.	po, cpy, apy, mag, hedl	act, qtz, cal, chl, clinopx, Cl-amph
Broadway (Victoria)	USMT (Silver Star)	ls	Miss./Mission Canyon Ls.	Boulder batholith, Rader Creek pluton, qtz monz	Cret.	auriferous jas, cup, mal, argentiferous lead ore, py, po, cpy	jas, lim, ep, gar, cal, py, serp hed, chl, non, diop
Brown's Creek	AUNS	ls & mdst in tuff	Ord./ Angullong Tuff	Carcoar Granite diorite	Dev.	Au, apy, cpy, py, po, ten, tet, bor	act, diop, ep, gar, wol, ves, trem, clinoz, phlg, sid, clay, chl
Buffalo Valley	USNV (Battle Mountain)	chert, argl, ls	Penn.-Perm./ Havallah seq.	granodiorite porph	Tert.	py (Au?), hem, Au, cpy, Ag, mal, chr	qtz, lim, px, cal, ep, gar, non
Canty	CNBC (Hedley)	ls, sltst, limy argl, tuff	L. Tri./ Nicola Gp.	Hedley intrusions, qtz diorite sills	E. Jur.	Au, apy, py, cpy, po	clinopx, cal, gar, ep, qtz, scap, k-spar, albite
Discovery	CNBC (Banks Island)	mar	Pal.(?)	Coast plutonic complex	Cret.(?)	py, po, cpy, mag, apy, sph	gar, px, chl, qtz, cal, amph
Dividend-Lakeview	CNBC	ls, grnst, qtzite, and flows & tuffs	Perm.-Tri./ Kobau Gp. or Perm/Anarchist Gp.	Nelson/Osoyoos batholith, qtz diorite-granodiorite	Cret.	mag, cpy, py, po, apy, Au, Bi, marc, hedl	qtz, cal, ep, gar, chl, Ch-amph, act, sphene, clay, minor diop
Esmeralda	USMT (Ophir)	ls, and, grano-diorite, mar	Pal., Cret.	granodiorite, and	Cret.	Au, cpy, mal, jas	gar, ep
Excelsior	USMT (Bannack)	ls	Miss./ Madison Ls.	Bannack stock granodiorite		auriferous py, Au in goe, Ag, bor, tetd, spec, hem	gar, cal, ep, qtz
Fortitude (Lower Fortitude)	USNV (Battle Mountain)	calc seds	Antler Sequence	granodiorite stock	Tert.	po, cpy, apy, elec, bism, Bi, tell, marc, gal, mag, sph	clinopx(hed), gar(an), act, chl, preh, ep, qt
French (Oregon)	CNBC (Hedley)	ls boulder congl, limy argl, tuff	L. Tri./ Nicola Gp.	Hedley intrusions, porph qtz diorite, sills	E. Jur.	po, cpy, py, bor, apy, Cu, sch	clinopx, gar, ep, qtz, cal, axinite, wol, clinoz, biot, trem-act, k-spar
Golden Curry	USMT (Elkhorn)	ls, qtz monz	Camb./ Wolsey Fm.	Boulder batholith, qtz monz	Cret.	po, bism, tetd, cpy, mag	gar, diop, cal, ep

Ore control	Tonnage (millions of tonnes)	Au (g/t)	Ag (g/t)	Base metals	Comments	References
contact zone, fractures, permeable lithology	2.4	7.2	0.1	---	Area includes skn, vein, and replacement mineralization in irregular pods and lenses along joints and fractures; contains 0.002% Sb	1, 2, 3, 4
---	0.000021	157	67	0.16% Cu	Contains Au, Ag, Cu,Bi, Te, Co; Au-poor iron skarns nearby; similar setting for nearby Hiller property (potential Au skn based on assays >1 g Au/t)	5, 6, 7
contact zone between qtz	0.0272	37.6	p	Cu p Pb p	Ore concentrated in jasper zone along granodiorite-ls contact; px-gar skn locally	8, 9
lst-tuff contact, fractures	0.39	8.7	10	0.44% Cu	Contains As, Sb	10
intense qtz-py silicification in fractured skn near porph	1.81 (0.0027	1.71 13.88	--- 17.6	--- Cu p)	Skn assemblages are rare in pit but more common at depth; produced approx 9,200 oz Au during fiscal 1988; geologic gold reserves, 110,900 oz in 1988 (1924–51 production: 1,380 oz Ag from 0.0024 Mt, 0.80% Cu from 542 t of ore, 1937–39); Horizon Gold Inc./Chevron Resources	11, 12, 13
Cahill Creek fault zone, lithology	0.0015	10.8	p	---	Size based on 1939 and 1941 production; mineralization probably hosted by upthrown, fault-bounded sediments within the fault zone; contains Au, W, As, Co, Ag; Mascot Gold Mines Ltd.	5, 7, 14, 15 16
fracture zone at granodiorite-mar contact	0.038	17.1	p	p	Probable reserves indicated by drilling; Au in skn and in qtz-py veins; additional reserves (0.0955 Mt of ore at 16.21 g/t) for a massive sulfide vein (Tel zone) that cuts mar and metapelite; Trader Resources Corp.	7
contact zone, structure	0.1113	4.5	0.79	0.06% Cu Pb p Zn p	Gar-ep skn replaces volcs and mar; contains As, Co, Bi, Te	5, 7, 17, 18, 19
contact zone between granodiorite and ls	0.00000907	20.5	6.8	---	Skn explored by 120-m-long adit; surface cuts contain ls, and, jas—all of which probably contain Au	20
contact zone between granodiorite and ls	0.000599	27	74.1	Cu p	Production reported for 1902, 1917–19; 385 t contained 3.2% Cu; estimate 0.0058 Mt produced 36.5 g Cu/t before 1914	21, 22
favorable lithology	5.1	10.45	27.8	0.2% Cu	Porph Cu skn, polymetallic veins; Battle Mountain Gold Co.	23, 24, 25, 26
hinge zone of anticline	0.068	19.9	2.6	0.03% Cu	8700 t of unmined ore reported to contain as much as 85 g/t Ag and 2% Cu; contains W, As, Mo, Bi, Co, Sb	5, 7, 14, 27
contact zone	0.089	8.3	4	0.33% Cu; Fe p	Production data for 1904–51. Four types of ore present: mag veins, jasperoid lodes, massive mag-po, and massive po-cpy in px gangue	28, 29

Table 2. Gold-bearing skarns in which gold and silver are major commodities exploited—Continued

Name	Location (mining district)	Host lithology	Formation age/ name	Igneous rocks	Age	Ore minerals	Gangue minerals
Golden Leaf	USMT (Bannack)	ls	Miss./ Madison Ls.	Bannack stock granodiorite	Tert.	Au, Ag, tet, crg, cpy, bor, mal, gal, cer, sph, mag	qtz, gar, py, cal, ep, chl, sid, ves
Good Hope 1	CNBC (Hedley)	tuff, argl, ls	L. Tri./ Nicola Gp.	Hedley intrusions, qtz diorite	E. Jur.	apy, py, cpy, po, Bi, moly, hedl	clinopx, gar, cal, wol, ep, biot, qtz
Hardcash (Dolcoath)	USMT (Elkhorn)	ls	Camb./Park Sh.	Boulder batholith	Cret.	bism, tetd, cpy	gar, ep, diop, cal
Labrador	USNV (Battle Mountain)	calc sh, calc sst, arkose, calc congl	U. Camb./ Harmony Fm. M. Penn./ Battle Fm.	granodiorite porph	Tert.	Au, py, po, lim	gar, ep, chl, cal, qtz
La Luz (Siunna)	NCRG	ls, limy sh, agglom, tuff	Mine Series	granodiorite	Tert.	Au, cpy, py, hem	ep
Lebedskoe (Kaurchak)	USSR	ls, calc sh, dolos	E. Pal.	diorite	Pal.	Au, apy, sph, tet, Pb tell, mag, cpy, hem, py, cc, po, gal, sph, ten, bor	gar (an, gros), diop, hed, trem, ep, clinoz, wol, act
Marshall	CNBC (Greenwood)	ls, siliceous sltst, argl, congl	L. Tri./ Brooklyn Gp.	microdiorite granodiorite	L. Tri.	cpy, py, po, sph, Au, minor mag, hem, gal, marc	chl, gar, diop, amph, ep
Mascot Fraction	CNBC (Hedley)	sltst, ls, congl, tuff	L. Tri./ Nicola Gp. (Hedley Fm.)	Hedley intrusions, porph qtz diorite, gabbro, sills & dikes	E. Jur.	apy, po, cpy, mag, bor, mald, hedl	px, gar, wol, biot, k-spar, cap, cal, qtz, preh, ap, axinite
McCoy	USNV (McCoy)	ls, dolos, qtzite	Tri./ Augusta Mountain Fm. Tri./Cane Spring Fm.	Brown stock granodiorite	Tert. (39.7 Ma)	Au, py, cpy, cc, cov, sph, gal, po, hem, mag	gar, px, ep, cal, qtz, chl, amph, ves, feld
Midas	USUT (Gold Hill)	ls	Manning Canyon Sh. & Oquirrh Fm.	qtz monz	Tert.	py, apy, Cu sulfides	wol, diop, gar, ves
Molly B	CNBC	tuff, argl, ls	Jur./ Haselton Gp.	Coast Range batholith	Cret.(?)	py, po, cpy, moly, sch	gar, ep, px, qtz
Mt. Hamilton	USNV (White Pine)	sh, ls, calc sh	Camb./ Secret Canyon Sh.	Seligman and Monte Cristo stocks, granodiorite	Cret.	Au, sch, moly, cpy, py, apy, sph, gal, bor, tetd, py, hem	gar, qtz, ep, cal
Navachab	SAFR	turbidites, clastics	L. Prec.	2 mica granite	Camb.	---	---
Nickel Plate	CNBC (Hedley)	ls, limy argl, qtzite, tuffs, sltst, congl	L. Tri./ Nicola Gp. (Hedley Fm.)	Hedley intrusions, qtz diorite, gabbro, sills & dikes	E. Jur. (180 Ma)	Au, elec, apy, cpy, py, po, tetd, sph, marc, gal, moly, mag, titanite, hedl, tell, cobaltite, erythrite, platinum, Bi, maldonite, gersdorffite, Cu, pyrargyrite	gar, clinopx, cal, axinite, scap, ap, clinoz, ep, biot, trem-act, qtz, preh, wol
Northeast Extension	USNV (Battle Mountain)	calc congl	M. Penn./ Battle Fm.	granodiorite stock	M. Tert.	po, cpy, py, Au	act, ep, sphene, k-spar, chl
Pagaran Siayu	INDS (Muara Sipongi area)	ls, and volcs	Perm./ Silungkang Fm.	Muara Sipongi intrusions, granodiorite, diorite	L. Jur.	Ag, Au, cpy, bor, tetd, tell, apy, sph, gersdorffite	gar, wol, diop, qtz, preh, chl, cal

Ore control	Tonnage (millions of tonnes)	Au (g/t)	Ag (g/t)	Base metals	Comments	References
contact zone between granodiorite and ls	0.0875	10.8	34.1	<0.01% Cu; Trace Zn 0.06% Pb	Production figures for 1909–41; Cu, Pb, Zn production for lower tonnages of ore; oxidized to 100-m depth	21, 22
fault cutting skn	0.0114	15.6	10.5	---	Same stratigraphic horizon as French mine	5, 7, 14, 15, 16
replaced bed	0.003	8.52	4.13	0.20% Cu 0.006% Pb	---	28, 29
northeast- & northwest-striking faults	0.907	1.3	3.7	---	Minable reserves. Ore associated with oxidized py along faults cutting gar skn; Battle Mountain Gold Co.	30
fault/hanging wall andesite	15	4.1	1.2	0.44% Cu	---	31, 32, 33
---	0.12	4	---	---	Estimated tonnage and grade (ref. 37). Au in py, 0.8 to 30 ppm; Au in cpy, 13.6 ppb; low quantity of sulfide in deposit (few percent)	1, 34, 35, 36, 37, 38
crest isoclinal fold at contact of ls with underlying siliceous sltst	0.00019	77.3	92.8	0.24% Cu; 0.29% Zn; 1.19% Pb	Described as Au-enriched Cu skn	5, 7, 17, 39
skn-mar contact	0.6186	11.2	2.76	0.14% Cu	Forms part of same deposit as Nickel Plate; As-Au skn; Mascot Gold Mines Ltd./Corona Corp.	7, 14, 15, 16, 40, 41
contact between ls and stock, endoskarn, shears, bedding planes, faults	13.2	1.5	30	0.08% Cu	Distal disseminated Cove Ag-Au deposit nearby with 16.4 Mt of 2.6 g Au/t and 111 g Ag/t; Echo Bay Minerals Co.	42, 43, 44, 45, 46, 47
bedding	0.0006	25	p	---	Production estimated for 1902 data; estimate 86 t higher grade ore pre-1897; lower grade production reported for 1904	48
---	0.00029	2.36	4.5	0.13% Cu	---	7, 49
contact zone between granodiorite and calc sh; retrograde alteration	7	1.7	17.1	Cu p W p Mo p	Au associated mostly with intense retrograde alteration of gar-py skn; sulfide-bearing qtz veins overprint skn; Westmont Mining Inc.	50
---	9.75	2.5	---	---	Purported to be a skn deposit; Erongo Mining and Exploration Co. Pty. Ltd.	51, 52
contact zone	2.986	13.96	1.39	0.03% Cu	Forms part of same deposit as Mascot Fraction; As-Au skn; Mascot Gold Mines Ltd./ Corona Corp.	1, 7, 14, 53, 54, 55, 56, 57, 58
favorable lithology	1.4	2.9	5.1	0.11% Cu	Porph Cu skns, polymetallic veins; Battle Mountain Gold Co.	59
contact zone regional faults	0.113	5.6	2.5	0.2% Cu	Production for 1936–39; numerous Au-Ag-Cu skarns in this area of West Sumatra; N.V. Mijnbouw Maatschappij Moeara Sipongi	3, 60, 61

Table 2. Gold-bearing skarns in which gold and silver are major commodities exploited—Continued

Name	Location (mining district)	Host lithology	Formation age/ name	Igneous rocks	Age	Ore minerals	Gangue minerals
Red Dome (Mungana)	AUQL (Chillagoe)	sst, chert, andesite, lithic congl, ls	Sil.-Dev./ Chillagoe Fm.	qtz feldspar porph dikes & sills	Carb.-Perm.	Au, bor, mag, sph, Pb & Ag tells, cc, wittichenite, cpy, moly	gar, wol, clinopx
Rokuromi	JPAN	biot schist, ls	Carb./ Utakai Fm.	qtz diorite, granodiorite	Mes.	po, apy	gar, ep, others
Second Relief	CNBC	basalts, tuffs	L. Jur./ Rossland Gp. (Elise Fm.)	Nelson batholith diorite porph dike		py, po, cpy, mag, moly	gar, ep, qtz, amph, clinopx, biot, carb
Sheahen-Grants	AUNS	sltst, sh, sl, mostly calc	Ord./ Malongulli Fm.	granodiorite	Dev.(?)	Au, po, mald, py, apy, cpy, sph, Au-Bi-sulfide	px, horn, bio, ep, trem, preh, cal, qtz, chl
Silverado	CNBC	metavolc, ls	---	granodiorite	Jur.-Tert.	sph, cpy, po, mag	px, gar, ep, qtz, cal
Suian	NKOR	schist, qtzite, sl, dolos, ls	---	Suian granite stock	Mes.(?)	Au, apy, cpy, gal, py, po, sph, bism, tetd, loel, moly, borate minerals	gar, diop, phlg, act, lud, chl, talc, trem, wol
Surprise	USNV (Battle Mountain)	calc sh, calc sst	U. Camb./ Harmony Fm.	---	Cret.(?)	elec, py, cpy, mal, lim, hem, sph	gar, diop, chl, cal, qtz, amph, ap, k-spar, non
Tillicum (Heino-Money, East Ridge)	CNBC (Tillcum Mountain)	tuffaceous seds, calc slst, argl	E. Jur./ Rossland Gp.	qtz monz	E. Jur.(?)	Ag, Au, gal, po, sph,	act, gar, feld, trem, clinoz, py, apy, cpy, marc, biot, qtz, cal, k-spar tetd, elec
Tomboy-Minnie	USNV (Battle Mountain)	calc congl	M. Penn./ Battle Fm.	granodiorite porph	Tert.	Au, cpy, gal, py, po, sph, apy	act, chl, ep, trem, clays, musc
Tul Mi Chung	NKOR	schist, qtzite, sl, dolos, ls	---	Suian granite stock	---	Au, apy, cpy, gal, py, po, sph, bism, tetd, loel	gar, diop, phlg, act, lud, talc, trem, wol, chl

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Ore control	Tonnage (millions of tonnes)	Au (g/t)	Ag (g/t)	Base metals	Comments	References
intrusive contact	13.8	2.3	5.25	0.46% Cu; 1% Zn	Deposit includes mineralization in breccia and qtz vein stockwork; associated with Cu and Zn-Pb skns; Murray reports a Zn grade of 1.8%; Elders Resources Ltd.	62, 63
---	0.081	8	2	---	Fe (mag) skarns; adjacent to Kamaishi	64
dike contact, fault contact	0.206	15.1	4.16	0.0098% Cu; 0.0005% Pb; 0.0002% Zn	Production data for 1900–48; anomalous As, Bi; skn overprints volcs and porph diorite; skn cut by later qtz veins, sulfides	7
multistage contact metasomatism of reactive bed	1.52	4.53	---	---	Tonnage and grade composited from recorded production and drill-proven geologic reserve	65, 66
faults	0.00013	42.8	79.2	0.07% Cu Zn p	Skn cut by faults	7, 67, 68, 69
contact zone	0.53	13	4.9	---	Cu skns; worked from ancient times; grade and (or) tonnage may be underestimated	11, 70, 71
favorable beds, faults	1.53	2.77	23.1	0.85% Cu	Mineable reserves; associated with Late Cret. porph Cu skns and polymetallic veins; Battle Mountain Gold Co.	30
contact zone, permeable lithology	0.05 2	35 6.9	p p	Zn p; Pb p Zn p; Pb p	Proven reserves (ref. 7) for the Heino-Money zone, and estimated reserves for the East Ridge deposit (0.34-Mt core of deposit grades 10.3 g/t Au); two phases of metal deposition—Au, apy, ±sph, qtz, calc silicates followed by Ag-gal, apy, sph; Esperanza Exploration Ltd.	7, 72, 73, 74, 75, 76, 77
---	3.54	3.1	9.6	0.03% Cu; Zn p; Pb p	Associated with Mid.-Tert. porph Cu skns and polymetallic veins; Battle Mountain Gold Co.	31, 78
contact zone	0.4	12	---	---	---	70, 71

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Table 3. Gold-bearing skarns in which gold and silver are byproduct commodities

[p, metal present in unquantified amount; other abbreviations listed in table 1]

Name	Location (mining district)	Host lithology	Formation age/ name	Associated igneous rocks	Age	Ore minerals	Gangue minerals
Fe skarns with byproduct gold							
Larap	PLPN	calc seds including ls, calc sh, arkose	Eoc.(?)/ Universal Fm.	diorite, granodiorite, syenite stocks, dikes	Mio.	mag, hem, py, po, moly, cpy, bor, gal, sph, cobaltite	gar, px, ep, amph, cal, chl, ap, k-spar, scap albite
Nabesna	USAK	ls, dolos, marl, mafic volcs	Tri./ Chitistone Ls.	monzodiorite stock	104–114 Ma	py, mag, cpy, Au, po, gal, sph, apy, stib	gar, wol, ves, ep, act, horn, chl, scap, ap, serp, qtz
Cu skarns with byproduct gold							
Apex	CNBC (Queen Charlotte)	ls, volcs	Tri./Kunga Fm. or Kamutsen Fm.	San Christoval batholith-qtz diorite	E. Jur.	py, cpy, mag	qtz, cal, gar, ep
Bailey Day	USNV (Battle Mountain)	calc sst	U. Camb./ Harmony Fm.	---	Tert. (?)	py(Au), cpy, mal, chr, azur, ten, hem, lim, Au, Ag	ep, k-spar, sphene, gar, chl, biot
Benson Lake	CNBC (Vancouver)	ls, volcs	U. Tri. & L. Jur./ Vancouver Series Quatsino Ls. & Karmutsen volcs.	Benson Lake stock qta diorite	Jur.	cpy, mag, bor, py, po, apy	gar, ep, cal, chl
Blue Bell	USMT (Elliston)	qtz monz	Cret.	qtz monz	Cret.	mal, azur, Au, moly, py	gar, ep, qtz, scap
Bluestone	USNV (Yerington)	ls	Tri.	granodiorite	Jur.	cpy, py	ep, gar, minor diop
Carissa	USNV (Battle Mountain)	sh, calc sh, ls	U. Camb./ Harmony Fm.	granodiorite-monzogranite	Tert. or Cret.	Cu carbs, Fe ox, py, cpy, po, sch	ep, diop, gar, qtz, cal, chl, clays
Coast Copper	CNBC (Vancouver)	ls, and volcs	U. Tri. & L. Jur./ Vancouver Series Quatsino Ls. & Karmutsen volcs.	diorite-gabbro	---	cpy, bor, mag	---
Concepcion del Oro	MXCO	ls, sltst	granodiorite stock	Mes.	Eoc.	cpy, py, mag, hem, enar, tet, gal, sph, po, ten, bism, cosalite, wittichenite	an, chl, diop, ep, px, plag, ves, zoi, scap, act, ilvaite
Copper Queen	CNBC (Texada Island)	ls, mar	Tri./ Marble Bay Ls..	diorite porph	Mes. (?)	bor, cpy, Ag, tet, moly, sch	gar, px, ep, cal
Cornell	CNBC (Texada Island)	ls, mar	Tri./ Marble Bay Ls.	gabbroic suite-diorite porph	Mes. (?)	cpy, bor, po, mag, marc, Ag, py, moly, tet, sch	cal, gar, diop, ep, serp
Crevice Creek (McNeil)	USAK	ls, argl, chert, metavolcs	U. Tri./ Kamishak Fm. Jur./Talkeetna Fm.	granodiorite stock of Pilot Knob	Jur. (?)	py, cpy, mag	ep, gar
Cyclone	USMT (Ophir)	ls	Pal.	porphyritic granite	Cret.	mal, Au	gar, qtz, ver
Empire	USID (Alder Creek)	dolomitic ls	Miss.	granite, porph dikes	---	cpy, py, po, secondary Cu minerals	gar, px

Ore control	Tonnage (millions of tonnes)	Au (g/t)	Ag (g/t)	Base metals and Fe	Comments	References
Fe skarns with byproduct gold						
fractures, sediment contact with unconformably overlying volcs	>18	1.37	6.2	0.12% Cu 43% Fe	Deposit grades into Cu-Mo porph at lower levels ; 0.08% Mo, 0.02% Ni, 0.03% Co; Pim Bessemaer	1, 2, 3, 4,
contact zone	0.08	25	p	Fe p	Main Au ores are py veins along fractures; minor Au in mag and po bodies; no Fe production; Nabesna Mining Corp.	6, 7
Cu skarns with byproduct gold						
---	0.000099	58.1	17	0.70% Cu	Based on 1945 production; note that Ettlinger and Ray (1989) report reserves of 163,000 t for Ag-Cu Alpine (Apex Star) skn of 34% Fe, 0.90% Cu, 24.6 g/t Ag, no Au reported	8, 9, 10
favorable bed, structure	0.0023	19.2	38.9	1.2% Cu	Additional Au-ore tonnages discovered in 1980's at this deposit; associated with Cu and Au skns, polymetallic veins	11
ls-and contact	1.26	1.98	4	1.6% Cu	Coast Copper Co., Ltd.	8, 9, 12, 13
---	0.0000045	6.9	186	1.62% Cu	Gar apparently veins qtz monz	14
---	0.378	2.86	3.34	2.08% Cu	Associated with a porph Cu deposit	15, 16, 17
favorable bed	0.0091	17.1	73.7	2.96% Cu	Associated porph Cu deposit; Battle Mountain Gold Co.	11, 18
lst-and contact	2.99	2.31	>2.1	1.56% Cu 33.3% Fe	Adjacent to Benson Lake mine; Quatisino Copper-Gold Mines Limited and Empire Development	19
contact zone	15	1.7	---	2% Cu Fe p Pb p Zn p	In Zactecas; endoskarn present	1, 2, 20, 21
contact zone	0.0041	11.5	87	4.4% Cu	Based on 1903–17 production; reported Mo, W	9, 22, 23,24
contact zone	0.0407	11.6	53.9	3.4% Cu	Based on 1897–19 production; Vanada Mining Co., Ltd. (1943)	9, 22, 23, 24
---	0.000011	4.5	514	17.5% Cu	Ep-gar skn bodies in ls adjacent to stock; mag zones; magnetic anomalies around stock	5, 25, 26
contact zone	0.000028	10.96	110	9.7	Based on 1942–61 production; Ag grade from 23 t; Cu grade from 22 t	14
contact zone	0.694	1.65	53.89	3.64% Cu	---	27

Table 3. Gold-bearing skarns in which gold and silver are byproduct commodities—Continued

Name	Location (mining district)	Host lithology	Formation age/ name	Associated igneous rocks	Age	Ore minerals	Gangue minerals
Cu skarns with byproduct gold—Continued							
Esashi (Akagane)	JPAN	ls	Carb./Shiba & Yonezato Fms.	qtz porph, granodiorite	Cret.	cpy, py, bism, Bi, sch, cub	diop, ep, gar, tour, amph, hed
Gold Bug	USMT (Bannack)	ls	Miss.	granodiorite	Tert.	auriferous py, Au, auriferous tetd	qtz, cal, gar, goe, ep, mal
Il'mensk (ul'ma)	USSR	---	---	diorite (?)	---	---	gar, px
Jumbo	USAK (Jumbo)	mar	L. Pal./ Wales Gp.	granodiorite stock	E. Cret.	Au, cpy, sph, moly, hem, py, po, spec	diop, gar, wol, ep, act, horn, chl, scap, plag, qtz
Katanga	PERU	ls, sh	Cret./equivalent of Ferrobamba & Tintaya Ls.	qtz dioritie, qtz monz	Tert.	cpy, py, bor, chal, chr, mal, brochantite, mag, Au, Ag	gar, trem
Klondyke	USMT (Elkhorn)	dol	Dev./Jefferson Fm.	Boulder batholith near Black Butte stock-gabbro diorite	Cret.	tetd, py, cpy, lim, mal	diop(?), gar, trem, cal, chl
Lily	CNBC	grnst, ls	L. Tri./ Karmutsen Fm. E. Jur./Kunga Fm.	Jedway stock	L. Cret.	mag, po, cpy, py, sph	gar, act, chl, cal
Little Billie (Vananda)	CNBC (Texada Island)	ls, mar	Tri./ Marble Bay Ls.	felsic granodiorite, qtz monz	Mes. (?)	cpy, bor, Ag, Au, py, po, sph, mag, moly, sch, marc, gal, tell	cal, diop, gar, ep, act, wol, amph, ves, qtz
Lucky Mike (Last Chance)	CNBC	grnst, ls, breccia, agglom	L. Tri./ Nicola Gp.	acidic dikes, granite-diorite	Jur. (?)	py, po, cpy, sch	gar, px, ep, cal
Marble Bay	CNBC (Texada Island)	ls, mar	Tri./Marble Bay Ls.	diorite	Mes. (?)	cpy, bor, po, mag, marc, Ag, Au, py, sph, moly, tet	ep, gar, cal, diop, wol?, trem, qtz
Morning (Ikeda)	CNBC	ls, basalt	L. Tri./ Karmutsen Fm. Kunga Fm.	Collision Bay diorite stock, Carpenter qtz monz stock	L. Cret.-E. Tert.	mag, py, cpy, po, apy, bor	gar, px, qtz
Mother Lode	CNBC (Greenwood)	sharpstone congl, ls	L. Tri./ Brooklyn Gp.	Wallace Creek granodiorite	L. Jur.	cpy, py, hem, mag, Au	ep, gar, cal, qtz, act, trem, chl
Natalevskoe	USSR	ls, calc sh, dolos	Pal.	diorite, syenite, aplite	Pal.	cpy, bor, apy, py, po, bism, sph, mag, moly, cc, Au, gal, elec, Bi, cub, Pb tell, Ni selenide, tet, ten, Ag	an-gros, diop, trem, wol, ep-clinoz, fo, phg, serp, ves, scap, spin, fl, chondrodite, clinohumite, preh, ap, chl, sphene

Ore control	Tonnage (millions of tonnes)	Au (g/t)	Ag (g/t)	Base metals and Fe	Comments	References
Cu skarns with byproduct gold—Continued						
---	3.796	1.1	10.1	0.8% Cu 23.7% Fe	Deposit has 5 ore bodies, largely skn but some disseminated veins; 5.9%pyrite, reported Bi	28
granodiorite-ls contact; ore generally exterior to gar skn	0.0021	31.7	70.3	0.76% Cu 0.31% Pb	Tonnage and grade figures represent 1922–41 production; originally staked as Dakota claim	29, 30
---	0.1	1	---	5% Cu	Estimated tonnage and grade (ref. 31); in northeastern Altai Mountains; Au-Cu mineralization in skn may predate associated diorite	31, 32, 33
contact zone	0.1115	1.97	24.5	4.1% Cu Fe p	Production data for 1907–44; estimated 0.28 Mt ore reserves of 45% Fe, 0.73% Cu	5, 6, 34, 35
contact, fissures	2	6.1	46.5	3.5% Cu Fe p	In Chillioroya region; Mitsui Mining and Smelting Co.(?)	36, 37
fractures, bedding planes	0.0006	30.3	17.4	1.04% Cu 1.58% Pb	Based on 1915–57 production. Cu grade for 375 t ore; Pb grade for 16.3 t ore; similar to nearby Hardcash deposit	38, 39
---	0.0134	3.82	64.3	4.28% Cu	Veinlike masses in altered and sheared grnst	9, 10, 40
granodiorite-mar contact	0.0637	5.7	18.8	1.3% Cu Fe p	Deposit size based on production; reported Mo; Texada Mines Ltd.	22, 23
---	0.000024	2.58	178	3.65% Cu 3.31% Pb	---	9, 44
---	0.199	7.75	63.4	3.4% Cu Fe p	Deposit size based on production; Ideal Basic Industries, Inc.	22, 23
faults, intrusive contacts	0.000029	30	25.8	2.49% Cu Zn p Fe p	Production from Cu claims; ore in dikelike sulfide bodies along faults and contacts	9, 10, 42
faults	4.24	1.27	5	0.82	Includes Sunset property; Gold Mines Resources, Ltd.	8, 9, 22, 43, 44, 45
steep fracture-skn intersection	0.48	5	11	1.6% Cu	Estimated tonnage and grade (ref. 31); 3 stage magnesian skn; numerous small podlike bodies of ore form at intersection of steeply dipping fractures; gold is relatively fine (avg about 930); only a few percent sulfide in deposit	31, 46, 47, 48, 49, 50

Table 3. Gold-bearing skarns in which gold and silver are byproduct commodities—Continued

Name	Location (mining district)	Host lithology	Formation age/ name	Associated igneous rocks	Age	Ore minerals	Gangue minerals
Cu skarns with byproduct gold—Continued							
Old Sport	CNBC	ls, and volcs	L. Tri./ Quatsino Ls.	Coast Copper Stock diorite/ gabbro	Jur.	cpy, po, bor, cpy, py, mag, apy	cal, ep, gar, amph, diop, chl, qtz
Pauline	USAZ (Helvetia-Rosemont)	ls	Cret.	qtz latite porph	Tert.-Cret.	gal, cer, cpy, py, sph, moly, Au, Ag, spec	gar, qtz, ep
Phoenix	CNBC (Greenwood)	sharpstone congl, ls, argl, tuff	L. Tri./ Brooklyn Gp.	granodiorite of Nelson batholith	Cret.	po, cpy, py, hem, spec, minor mag, Ag, Au	amph, ep, gar, qtz, cal, chl
Pioneer-Lilyama	USCA (El Dorado, CO)	hfs, mar	---	horn grano-diorite	Mes.	py, cpy, bor, **mag,** hem, minor sch	gar, ep, qtz, feld, ves, cal
Rosita	NCRC	ls, mar	Cret.	diorite, monz	Tert.	cpy, py, po, mag, bor, cc, mal, cup	gar, ep
Seven Devils district	USID	ls	Tri./Martin Bridge Ls. (?)	Deep Creek stock-qtz diorite	Cret.	cpy, bor, cc, mal, azurite, chr, cov, sch-powellite	gar, ep, diop, hed, trem, act
Sinyuzhinskoe	USSR	ls, calc sh, dolos	Pal.	diorite	Pal.	Au, apy, Ni & Pb tells, ten, tet, moly, mag, bor, cc, cpy, py, gal, sph, po	gar(an-gros), diop-hed, wol
Vieja	CLBA	---	---	lbaque batholith	130–150 Ma	cpy, gal, py, spec	cal, ep, marmetite, qtz
Yaguki	JPAN	sh, ls	Perm.	granodiorite	Cret.	cpy, po, cub, mag, W, Bi, hem, bism, cobaltite, sph, gal, moly	ep, gar(an), qtz, px, preh, babingtonite, chl, act, plag
Yreka	CNBC	limy tuffs, and ls	L. Jur./ Bonanza Gp.	qtz-feldspar porph dikes & sills	---	po, cpy, py, sph, mag, spec	---
Zackly	USAK	mar	Tri.	qtz monzodiorite	Cret.	cpy, born, py, Au, Cu, mal, lim, chalcedony	gar (an), wol, px, clinopx
Porphyry Cu skarn related byproduct gold							
Carr Fork Parnell ore body	USUT (Bingham)	ls	L. Penn./ Bingham Mine Fm., Parnell ls.	Bingham stock-qtz monz porph	Tert.	py, cpy, po, apy, hem, mag, tet-tennantite	gar, diop, qtz, sid, clay

Ore control	Tonnage (millions of tonnes)	Au (g/t)	Ag (g/t)	Base metals and Fe	Comments	References
Cu skarns with byproduct gold—Continued						
ls-volc contact	2.658	1.46	4.41	1.55% Cu 20.6% Fe	Ls beds in volcs; may be Cu-rich part of zoned system; nearby Merry Widow, Kingfisher, and Ravel deposits produced 3.4 Mt iron ore; grab samples from Merry Widow assay as high as 19 g Au/t; Coast Copper Co. Ltd. (1968)	8, 9, 22, 51
ls-dike contacts	0.000136	8.57	28.6	2% Cu 2% Pb	Although ls and qtz latite porph both silicated, bulk of sulfides is in skn; erratic py in porph	52, 53
congl-lst contact, faults	26.96	1.12	7.12	0.85% Cu Pb p	Includes Knob Hill and several other claims; mine was closed in 1978 and reclaimed; Granby Co.	8, 9, 22, 44, 45, 54, 55
faults	0.004296	1.57	16.5	2.3% Cu	Bulk of sulfides associated spatially with mag; some syenite porph as dike	56, 57
---	3.45	1.17	15.8	3% Cu	Gar-ep skn is deeply weathered; Rosita Mines, Ltd.	1, 46, 58, 59
ls, xenoliths in qtz diorite, fractures	0.00071	2.54	165	16.1% Cu 10.0% Pb	Composited production from 1943–51 for Arkansas-Decorah, South Peacock, and Helena mines; Pb grade for 131 t of ore; Pb-rich zones in some mines; W present.	60, 61
---	0.65	8	---	2.5% Cu	Au in stage II py, 0.1 to 1.6 ppm; Au in cpy; 0.93 ppb; deposit has only small amount of sulfide (a few percent)	46, 47, 48, 49
---	0.45	0.9	35	1.7% Cu	---	62
---	>1.08	3.4	171	0.8% Cu	Deposit is 1 km by 310 m and as much as 70 m thick	1
limy tuffs	0.495	1.1	33.5	2.6% Cu	Uke Resources, Ltd.	8
contact zone, faults	1.25	>6	p	2.6% Cu	Estimated reserves. Assays up to 6.6% Cu, 4.4 g/t Au. Zoned	5
Porphyry Cu skarn related byproduct gold						
faults, distance to stock, elevation	0.8	8.7	4.2	1.02%	Drill-indicated resource for Parnell gold shoot. Multistage mineralization: high-grade Au in py-qtz and py-clay overprint on Cu-Au-Ag skn. Avg 1.9 g Au/t in garnetized ls. Byproduct Au was produced 1979–81 at Carr Fork mine from estimated reserves of 61 Mt of ore of avg grade 1.89% Cu, 0.38% g Au/t, 10.6 g Ag/t, and 0.027% Mo	63, 64, 65

Table 3. Gold-bearing skarns in which gold and silver are byproduct commodities—Continued

Name	Location (mining district)	Host lithology	Formation age/ name	Associated igneous rocks	Age	Ore minerals	Gangue minerals
Porphyry Cu skarn related byproduct gold—Continued							
Ok Tedi	PPNG	---	---	---	---	cpy, gal, py, po, sph, mag, marc	act, cal, gar, px, trem, talc
Zn-Pb skarns with byproduct gold							
Chichibu	JPAN	sl, sst, chert, ls	Pal.	qtz diorite	Mio. 7.9, 8.2 Ma	cpy, sph, py, mag	gar, clinopx, ep, act, cal, qtz
El Sapo	CLBA	---	---	lbaque batholith	130–150 Ma	cpy, gal, py, mag, bor	gar, wol, marmetite, qtz
Falun	SWDN	ls, qtzite	Prot./Leptite Series	granite, qtz porph dikes, amphibolite	Prot.	py, cpy, po, sph, gal, mag, Au, gahnite, weibullite	trem, talc, act, diop, qtz, biot, anthophyllite, chl, almandine, cummingtonite, ophicalcite, cordierite, andalusite
Garpenberg Oda	SWDN	dolos, qtzite, mica, schist	Prot./Leptite Series	granite	Prot.	sph, gal, py, po, cpy, Au	trem, qtz, mica, talc, fl, tour, diop, gahnite
Maxfield	USUT (Big Cottonwood)	ls	Miss./ Gardison Ls.	diorite	Tert.	py, gal, tet, sph, Cu-stained oxide minerals	cal, qtz, sepiolite, diop, ep, mica, wol, gar
SE Afghanistan	AFGH	---	---	---	---	py, cpy, cc, rare Mo	---
Thanksgiving	PLPN (Baguio)	ls, minor congl, sst, sh, lithic tuff	Mio./Zig-Zag Series	diorite porph	---	py, sph, apy, cpy, gal, hem, mag, Au tell, Au	chl, gar, cal, qtz, clinoz, ep, act-trem, ves
Tsumo	JPAN	dolomitic mar	Pal./Koseiso Fm.	diorite, granodiorite, granite	Cret.	cpy, mag, malayaite	qtz, clay, phlg, gar, trem, chondrodite, wol, hed
Woodlawn-Kentucky-Utah	USUT (Big Cottonwood)	ls	Miss./ Deseret Ls.	Alta stock, granodiorite	Tert.	mag, cpy, py, gal, cer, arg, Au, sph	trem, calcsilicates

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Ore control	Tonnage (millions of tonnes)	Au (g/t)	Ag (g/t)	Base metals and Fe	Comments	References
Porphyry Cu skarn related byproduct gold—Continued						
---	40	1.6		1.5% Cu	---	1, 66
Zn-Pb skarns with byproduct gold						
---	0.5	3.6	52	0.45% Cu 6%Zn Pb p Fe P	Cu is restricted to gar-bearing skn; 12% pyrite; Nitchitsu Mining Co., Ltd.	67, 68
---	0.33	11.5	79.8	5.1% Cu 16.21% Pb	---	62, 69
lithology, contact zone	35	3	18	1.06% Cu 4.1% Zn 1.4% Pb	Associated with Fe skn; deposit is zoned	70
structure, contact zone	9.6	1	86	0.3% Cu 5.2% Zn 3.6% Pb	Deposit has well-developed zoning	70
fissures	0.00486	5.65	1774	19.7% Pb 1.4% Cu	Average grades reported for 1902–40 production	71, 72
---	0.227	<5	>100	3% Zn 9% Pb	Average composition reported from Pb-Zn exploration of Cu-skarn mineralization	73
contact, favorable beds & structures	1.7	6.41	40.55	0.36% Cu 4.47% Zn	Mined largely for Au-Ag; reported Cd; Banquet Explorations, Ltd.	2, 74
---	4.9	1.36	50.9	0.68% Cu 2.43% Zn	Two ore bodies: Tsumo, Maruyama	67, 75
contact	0.000368	1.48	933	11.9% Pb 2.64% Zn	Pb-Ag-Zn production from bedded replacement fissure	71, 72

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Table 4. Gold-bearing skarn deposits and deposits purported to be gold-bearing skarns for which grade and tonnage data are unavailable

[Abbreviations listed in table 1]

Mine name	Location (mining district)	Description	Reference(s)
Akshiyryak Range	USSR (Kirghiziya)	280-Ma granite (K/Ar, biot) intrudes carbonate-siliceous sequence. Au mineralization is associated with skarnoid & secondary silicified rocks in mar & silicate-carbonate rocks gradationally farther out than skarn. Au is mainly in highly silicified rock that contains wol, locally ves, px. Dark-gray highly silicified rock contains po, py, Au (as 0.1-mm-wide flakes).	Dolzhenko, 1974
Alae-Sayan	USSR	Skn includes px, gar, amph, serp, and late qtz with Cu, Pb, Zn, As, Sb, Cd. Fluids: high Cl; Na/K=1.1 to 1.5:1. Early skarns formed at 480–890 °C. Au deposited at 250–150 °C.	Indukaev, 1977
Alvarado	USUT (Gold Hill)	Cu-Au skn formed in Miss. Ochre Mountain Ls. near Tertiary Gold Hill qtz monz stock. Ore includes Au, py, cpy, gal, bor, cc, mag, mal, lim, chalcanthite, jarosite. Gangue consists of wol, diop, ap, gar, spa, zoi, ves, trem, serp, qtz. Nolan (1935) reports $120,000 in Au produced 1892–1895.Channel sample assays range from tr to 5.8 g Au/t, tr to 387 g Ag/t, tr to 1.9% Cu. Woodman Mining Co.	Nolan, 1935; Wilson, 1959; El-Shatoury and Whelan, 1970
Ban Na Lom	THLD	Au, py, cpy associated with qtz deposition during or after retrograde skn formation. Although 3 skn types are recognized, Au mineralization is associated with relatively coarse grained gar-ep skn. Calcic skn is thought to be a metasomatically transformed tuff sequence.	Pisutha-Armond and others, 1984
Blue Grass	USMT (Bannack)	Gar-ep-cal skn veined by qtz as much as 5 m wide; veins not continuous. Ore along contact between granodiorite & ls mined from 40- by 7-m open cut.	Geach, 1972
Bright Diamond	USCO	Ore in flat shoots about 3 m thick; Au localized in mag-py; porph dike as much as 10 m wide nearby.	Irving, 1905; Irving and Cross, 1907
Buckhorn Mountain	USWA	Described as a gold-bearing skn in Okanogon Co., Washington, that displays geological similarities to some major gold skn deposit in Nevada. Exploration in progress. Crown Resources Corp. and Gold Texas Resources Ltd.	Mining Journal, 1989
Bumblebee	USMT (Ophir)	Gar skn showing superimposed faults. Explored by 30-m-deep shaft. Mal in qtz stringers in skn.	McClernan, 1976; Mineral Resource Data System, 1989, record DC09691
Cable	USMT (Cable)	Mineralized ls pendant of Camb. Hasmark dol, calc sh of Silver Hill Fm. in Eoc. Cable granodiorite stock. Primary ore: py, cpy, mag, po, Au, gal, sph, apy, tetd, marc. Oxidized ore: lim, hem, cc, bor, mal, azurite, Cu, Mn ox. Gangue minerals: gar, px, amph, wol, qtz, cal, dol, sid, mica, scap. Mag skn (Pomeroy mine) nearby. Most production pre-1900; total production for district, which includes Cable placer, estimated at 165,127 oz Au, 134,583 oz Ag. Nearby structurally controlled vein mineralization and oxidized ores occur at Southern Cross, Gold Coin, and Pyrenees deposits; Magellan Resources-Chevron Resources Co.	Earll, 1972; Emmons and Calkins, 1913; Emmons, 1907; Holmes, 1982; Meinert, 1988a; Holser, 1950
Cadia	AUNS	Au-bearing skn in area of Fe skn.	McLeod, 1965
Cane Springs	USUT (Gold Hill)	Cu-Au skn formed in Miss. Ochre Mountain Ls. near Tert. Gold Hill qtz monz porph stock. Ore: Au, py, cpy, bor, cc, cov, moly, mal. Gangue: gar, wol, diop, ves, zoi, qtz, cal, spa. Produced $50,000 to $70,000 gold 1892–95; 42 t ore assayed at 36.6 g Au/t, 103 g Ag/t, and 5.5% Cu in 1914; 1,479 t ore produced 1931–35. Recent assays reported by El-Shatoury and Whelan (1970) range from tr to 21.2 g Au/t, tr to 6.8 g Ag/t, and 0.12 to 1.03% Cu.	Nolan, 1935; Wilson, 1959; El-Shatoury and Whelan, 1970

Table 4. Gold-bearing skarn deposits and deposits purported to be gold-bearing skarns for which grade and tonnage data are unavailable—Continued

Mine name	Location (mining district)	Description	Reference(s)
Carlés (Salas, Asturias)	SPAN	Apy-cpy-py-Au in qtz-veined skn; 5– to 100-μm-size Au associated with apy.	Rau-Figueroa and others, 1985
Carr Fork	USUT (Bingham)	Gar-diop-act-ep-wol skn associated with porph Cu mineralization.	Atkinson and Einaudi, 1978; Reid, 1978
Central Tadzhikistan	USSR	Au-Cu-As in px & gar-px skn associated with L. Miss.- E. Perm. granodiorite & qtz diorite rocks; overall trapping temperatures of fluid inclusions range from 450° to 750°C; Au ores deposited paragenetically late in two stages: early py-apy, late tet-cpy at 250°–350°C.	Morozov, 1976; Morozov and others, 1974; Morozov and others, 1973
Charmitan	USSR	Four ore-forming stages: Au-Bi-tell, py-apy, Au-sulfide polymetallic, qtz-cc.	Proskuryakov and others, 1979
Chihuahua district Chihuahua	MXCO	Au-Ag-Pb-Cu skn occurs at ls-diorite contact. Over 2,100 kg Au was produced 1928–49 from approx 60,000 t ore, with grade ranging from 0.1 to >100 g Au/t.	D.L. Mosier (oral commun., 1987)
Chillioroya area Chumbivilcas	PERU	Cu-Ag-Au ore occurs in small bodies of gar-mag skn at ls-qtz monz porph contact. Ore minerals include cpy, py, bor, cc, Au. Grades are reported as "few" g Au/t, about 5% Cu, <100 g Ag/t for 2–10 Mt ore. Katanga (table 2) is found in this area.	Mineral Resource Data System, 1981, record W002200; Frank Simon (written commun., 1960)
Culverwell	USNV (Pennsylvania)	Skn associated with mag replacement pods in Camb. ls. Ep replaces monz-diorite; some skn includes copper ox, py, cpy. Grab samples assay as much as 85 g Au/t.	Mineral Resource Data System, 1984, records M241646 and M032085
Dutro	USMT (Blue Cloud)	Free Au, cassiterite, Bi reported from hydrosilicate altered skn including qtz, jas, trem, opal.	Knopf, 1933
East Sayan Mtns. (Medrezhye and Konstantinovskoe deposits)	USSR (Siberia, middle Asia)	Au ores preferentially formed in calcic skn from Cl-SO4-Ca Na-bearing fluids (Na/K=2:1 to 6:1; Cl/F=31:1) at 220°–420°C; Cl>F in leachates from productive Au skn.	Korobeynikov, 1976a, b, c; Korobeynikov and Chernyaev, 1976; Korobeynikov and Matsyushevskiy, 1973
El Fenomeno	MXCO	Au, Cu are reported to occur in this W skn mined during WWI and 1937–44; possible additional ore exists. Sch, secondary Cu minerals, py, po, cpy, apy occur in gangue of gar, ves, axinite, dio, qtz, cal. Main ore body was fan-shaped tactite zone at contact of L. Pal. mar & Cret.-Tert. diorite. In northern Baja California.	Salas, 1975; Fries and Schmitter, 1945; Leonard, 1989
First Chance	USMT	Au reportedly produced, together with W, from xenoliths of Dev. Jefferson Ls. in granodiorite.	Pardee, 1918; Kaufmann, 1963
Ge Jiou Yun Nan	CHNA	Sn-Au skn formed during Mes. contact metasomatism.	Sang and Ho, 1987
Geunteut area Sumatra	INDS	Geunteut granodiorite (14.3 Ma) intrudes L. Jur. & E. Cret. ls of Woyla Gp. Mineralization includes cpy, py, bor, azur, mal.	Bowles, 1984
Gissaro-Alay	USSR (central Tadzhikistan)	W-apy-Au-Cu skn containing px, gar, qtz, feld, amph, dol, wm.	Khasanov, 1982
Glassford Creek	AUQL	Gar-mag-ep-wol-hem-act skn in ls at granite contact; ore minerals include cpy, bor, po, hes, Bi, Au, secondary Cu minerals; 735 t Cu, 80 kg Au 725 kg Ag were produced 1905–7.	Murray, 1986
Goldstrike	USNV (Carlin)	Au-bearing skn occurs at the No. 9 Pit & at Skarn Hill at the Goldstrike Mine (includes several types of ore bodies); skn formed in Dev. ls, informally named the Popovich Ls., beneath the Roberts Mountain thrust. At West No. 9 Pit, Au mineralization occurs in 160-Ma(?) granodiorite. Skn assemblages include gar, diop, act, chl, Au. American Barrick Resources, Inc.	R.J. Roberts (oral commun., 1989); Schafer and Buffa, 1988

Table 4. Gold-bearing skarn deposits and deposits purported to be gold-bearing skarns for which grade and tonnage data are unavailable—Continued

Mine name	Location (mining district)	Description	Reference(s)
Gould-Corry	USMT (Red Lion-Hidden Lake)	Au reportedly produced from Au-Ag-Cu-W skn in Camb. ls intruded by Cret. granodiorite; gar, ep, goe, qtz present.	Earll, 1972
Hua Tong An Hui	CHNA	Cenozoic Cu-Mo-Au skn.	Sang and Ho, 1987
Huarca	PERU (Cuzco)	Irregular patches of Cu-Ag-Au ore in garnetite at contact of qtz monz porph with ls. Minerals include cpy, mag, minor bor & cc. Average grades of < 1 to 2 g Au/t are reported for 1–10 Mt of ore.	Frank Simon (written commun., 1960)
Hudson Group	USMT (Silver Star)	Gar-ep skn developed in Camb. ls near contact with Cret. qtz monz of Boulder batholith; average grade reportedly 32–42 g Au/t, 42–52 g Ag/t; serp, sid, cal, asbestos present.	Sociedad Nacional de Mineria y Petroleo (Peru), 1969
Iron Clad	USCO	Ore in flat shoot; Au localized in mag-py as replacement with silicates of blue-gray ls.	Winchell, 1914; Sahinen, 1939
Kaliostrovskoe	USSR	Large blocks of ls engulfed totally by granitoid rock.	Irving, 1905; Irving and Cross, 1907
Kochulak Dalnagorsk region	USSR	Au-tell-tet stage formed at homogenization temperatures of 240°–270°C and 170°–190°C, together with Ag, Pb, Cu tell at lower temperatures (130°–150°C).	Ivankin and Rabinovich, 1972
Kommunar district	USSR (Altai-Sayan)	In 8 deposits, Au associated with py, po, cpy, mag primarily in qtz-act veined skn developed in Camb. sed-volcs sequence as result of emplacement of L. Camb. px diorite & monz.	Genkin and others, 1983
Kaznetskiy Alatau and Gornyi Altai	USSR	Au-bearing skn formed at 280°–700°C from homogenization temperatures in qtz & gar.	Lobanov, 1972
La Gloria	MXCO	Small Au-bearing W skn with Cu, Mo. Sch cpy, auriferous py, apy, moly occur in E. Cret. ls adjacent to granite. Gangue minerals include gar, ep, tour. Reserves of W-Mo ore are estimated at 25,000 t. In State of Sonora.	Pavlova, 1983
La Sonora	MXCO	A small Au-Cu skn in Pal. ls associated with L. Cret.-E. Tert. granite. Minerals include Cu-ox. In State of Sonora.	Perez Segura, 1985; Radelli, 1985; Leonard, 1989
Lucky Strike	AUNS	South of Bathurst, near Beuraga.	Perez Segura, 1985; Leonard, 1989
Many Peaks	AUQL	Gar-mag-cal skn in shear zone with py, cpy; 8,650 t Cu, 130 kg Au were produced from 1910–18.	Murray, 1986
Marn (Mini Grid)	CNYT	Assemblage elec (Au_{60-40})-Bi-bism-hes associated with cub exsolution in cpy or as blebs in apy, all hosted by px ($diop_{20-40}$)-act ($trem_{25-35}$)-po skn; avg grade 1.4 g Au/t, 2.8 g Ag/t.	Brown and Nesbitt, 1984, 1987
Midas	USUT (Gold Hill)	Ls beds in Manning Canyon Fm. altered to wol-gar-diop-ves skn near qtz monz; associated with oxidized and sulfidized Cu & Pb-Ag ore. Minor production (86 t, avg $56 Au per st produced before 1897).	Nolan, 1935; Thompson, 1973
Midas (Berg Creek)	USAK	Cu-Au skn in Tri. Nizina Ls adjacent to Jur. granodiorite-qtz monzodiorite pluton. Ore: mag, py, cpy, Au. Gangue: ep, gar,qtz. Grab samples assay as high as 8 g Au/t, 10 g Ag/t, 20% Cu.	Nokleberg and others, 1987
Mottini	USNV (IXL)	Au skn in U. Tri. sh, sst, sltst associated with 28-Ma granodiorite. Produced 272 t ore, avg $375 Au per st (est. 564 g Au/t, assuming a price of $20.67/troy oz); Ag, Cu, Pb, Ni present. Gangue of gar, cal, qtz, mag, spec, Fe and Mn ox. Ore consists of free Au, Ag & sulfides (py, gal, cpy).	Schrader, 1947; D.A. John (oral commun., 1989)
Mount Biggenden	AUQL	Gar-cal skn at granite contact; ore minerals include mag, bism, Bi, cpy, py, apy; 185 kg Au, about 235 t Bi produced 1890–1901; 378,725 t magnetite produced from adjacent skn from 1967 to present.	Murray, 1986

Table 4. Gold-bearing skarn deposits and deposits purported to be gold-bearing skarns for which grade and tonnage data are unavailable—Continued

Mine name	Location (mining district)	Description	Reference(s)
Nambija	ECDR	Gar skn, including k-spar altered to chl, ep, cal; includes Au, sch, auriferous py, apy; related to emplacement of Jur. batholithic rocks; grade reportedly may be as high as 30 g Au/t; notable concentrations of Au at qtz-qtz boundaries and qtz-gar-k-spar flooded portions of endoskarn.	E. Salazar (written commun., 1987); Minera Nambija (written commun., 1988)
Natal Sumatra	INDS	Skn has formed where L. Cret. Manunggal batholith (87 Ma) intrudes E. Cret. Soma Fm. & U. Jur., Lower Cret. Woyla Gp. sed rocks; both include meta-vols, ls, meta-ls members. Skn has formed at margins of batholith & in xenoliths of ls. Mineralization includes py, mag, Au, Ag, Cu-Pb-Zn minerals.	Bowles, 1984
New Calumet	CNQU	Pb-Zn-Ag ores; Grenville province. Ore shoots, masses occur in Grenville biot gneiss near its contact with an overlying amphibolite. Minerals include sph, py, marc, po, gal, cpy, apy, Ca & Mg silicates. Production (1943–68): 3.74 Mst at 6% Zn, 1.7% Pb. Reserves (1968): 0.282 Mst at 4.51% Zn, 1.08% Pb, 2.34 oz Ag/st, 0.014 oz Au/st. Consolidated Professor Co.	Boyle, 1982; Canada Department of Energy, Mines and Resources, 1980
New World district	USMT	Cu-Pb-Au skn in Camb. ls & shaly ls associated with Tert. rhyodacite porph & other intrusions. Ore: Au, gal, sph, py, cpy, spec. Gangue: gar, ep, trem, ves, qtz, ank. Daisy mine produced 13 carloads of gold ore in 1888 that averaged $50 per ton (est. 83 g Au/t). Skn gangue reported at other mines, prospects in district. Crown Butte Mines, Inc. developing New World Project for Au, Cu in 1987.	Lovering, 1929; Reed, 1950; Elliott, 1979; Elliott (oral commun., 1989); Lawson, 1988
Nixon Fork-Medfra	USAK	Group of Cu-Au skn deposits at contact (of ls) of Ord. Telsitna Fm. with L. Cret. monz pluton; in fractures, roof pendants. Ore: cpy, py, bor, Bi, lim, mal, Au. Gangue: diop, gar, ep, plag,qtz, ap, act. Produced 1.24 to 1.87 Mg Au, with Cu, Ag. Some deposits have grades as high as 113 g Au/t, 1.5 to 2.0% Cu.	Nokleberg and others, 1987; Newberry, 1986
Novo Brdo	YUGO	Skn & replacement mineralization in ls along schist-ls & dacite-ls contacts; ore minerals include sph, gal, po, cpy, marc; main skn mineral is gar. Ore contains 1–5% Pb, 1–8% Zn, about 100 g Ag/t, 3–4 g Au/t.	Jankovic, 1982
Oka	CNBC	Au in sulfide pods along skn-mar contacts & in faults; associated with diorite sills & reported to be similar to Mascot deposit 50 km to southwest. Fairfield Minerals Ltd. has identified several areas of mineralization along 5-km soil geochemical anomaly through mapping, chip sampling, trenching. Future drilling is planned on basis of chip sample analyses with 0.24–1.12 oz Au/st. Contains Au, Ag, Cu, As, Zn.	Skillings' Mining Review, 1987; Ettlinger and Ray, 1988, 1989
Olkhovskii West Siberia	USSR	Ord. diabase, diorite porph, qtz porph, aplite dikes intrude M. Camb. carbonate & tuffaceous rocks. Au-bearing mineralization occurs in gar-px skn & in qtz-sulfide veins. Ore minerals include cpy, sph, gal, bism; Au, Ag tells. Alteration includes chloritization, sericitization, slight serpentinization. Deposit is considered to have formed at medium depth, moderate temperature.	Smirnov and others, 1981
Primor'ye area	USSR (Far East)	Sch-Au-py skn formed under relatively reducing conditions; some associated Au-wolf deposits; mafic granite intruded into Sikhole Alin folded belt; some apy, mica, po; hed, gros, ves, cum, ep, act, tour, stilp, bustamite; mag, cc assemblages in skn.	Stepanov, 1977, 1981; Stepanov and others, 1976a, 1976b; Stepanov and Kuryakova, 1973; Makiyevskiy, 1978, 1979; Efimova and others, 1982; Piskunov and Makiyevskiy, 1978
Sara Alicia	MXCO	Small Au-Cu skn in Jur.-Cret. ls(?) associated with L. Cret.-E. Tert. granitic intrusives. In State of Sonora.	Perez Segura, 1985; Leonard, 1989

Table 4. Gold-bearing skarn deposits and deposits purported to be gold-bearing skarns for which grade and tonnage data are unavailable—Continued

Mine name	Location (mining district)	Description	Reference(s)
Sayakskiy region	USSR	High-temperature zones of skn contain three assemblages: (1) Au1: gersdorffite ($NiS_2 \times NiAs_2$)-apy-cobaltite (>250° C); (2) Au_2: Bi-cpy-po (250°C) with ep, act; (3) Au_3: wittichenite (Cu_3BiS_3)-moly-bor-cpy (225°C).	Fomichev and Kuznetsova, 1972
Shul Kou Shan	CHNA	Pal. contact metasomatic deposit. Skn mined for Pb, Zn, Au.	Sang and Ho, 1987
Spring Hill	USMT (Helena)	Gar-px skn developed in Miss. Madison Ls; skn altered to qtz-ank-cal-chl assemblage with Au-apy-po-py-cpy-gal inore; much of ore reported to be px-rich.	Pardee and Schrader, 1933
Stormont	AUTS	Au-Bi skn in Moina district, area known primarily for Sn-W skn, veins, greisens. Deposit is in Ord. Gordon Ls., associated with Dev. granite. Had minor production 1928–34. Reported Au values at Moina skn, 4.5 ppm.	Green, 1975; Collins and Williams, 1986; Kwak and Askins, 1981
Sylvester K	CNBC	Lenticular bodies of Au-bearing skn concordant with enclosing rocks of Tri. Brooklyn Fm., associated with micro-diorite stocks, dikes of L. Jur. to E. Cret. age. Mineralization consists of massive py, mar, po, minor cpy in calcic exoskn. Deposit has lim-goe cap several meters thick.	Church, 1984; Canada Department of Energy, Mines and Resources, 1986
Terrazas	MXCO	Au-bearing Cu skn along ls-diorite contact. Skn runs 2–3% Cu as cup, azur, mal, cpy, Cu. Associated Pb-Ag veins. In State of Chihuahua.	Salas, 1975; Gonzalez, 1956; Clark and Goodell, 1983; Leonard, 1989
TP (claims)	CNBC	As much as 15 g Au/t, 3.9% Co in chip samples from mag-calgar-amph skn in pre-Tri. gneiss, schist, mar of Yukon Gp. Skn zone is 15 by 200 m, controlled by two NW.-trending fracture zones. Four types of skn present.	Ettlinger and Ray, 1988
Union Amalgamated	USNV (Manhattan)	Sulfide-bearing skn veined by Au-bearing qtz; developed in Pal. marine sed & metamorphic rocks; possibly related to 16-Ma caldera or Cret. intrusion.	Shawe and others, 1986
West Park	USUT (Snake Creek)	Skn formed along contact of Miss. ls with Tert. granodiorite Peak Stock); ore includes cpy, bor, mag; average grade production 1946–50: 3% Cu, 17.2 g Ag/t, 1.57 g Au/t.	U.S. Bureau of Mines, Strategic Minerals Examination, 1950; Mineral Resource Data System, 1984, record D011978

Table 5. Mineral abundances for gold-bearing skarns

[Data are reported as a percentage of the number of deposits in the data set that report a given mineral present]

Data set	Au-skarn	Byproduct Au-skarn	Alaskan Fe-Au skarn
Reference	This study, table 2	This study, table 3	Newberry, 1986
Number of deposits	39	47	106
Ore minerals (in percent)			
Au/electrum	62	36	0
pyrite	72	91	72
pyrrhotite	67	51	42
chalcopyrite	85	96	90
arsenopyrite	51	17	6
magnetite	33	64	77
hematite/specularite	20	28	25
sphalerite	46	38	8
galena	28	34	1
Bi or bismuthinite	23	9	0
hedleyite	13	0	0
telluride minerals	26	9	0
molybdenite	18	23	11
scheelite	8	15	0
Gangue minerals (in percent)			
garnet	82	91	78
pyroxene	72	60	42
epidote	72	66	70
amphibole	46	45	41
chlorite	46	34	28
prehnite	13	2	0
vesuvianite	13	13	8
wollastonite	31	21	6
scapolite	8	13	9
boron minerals	13	0	0

Table 6. Analytical data for some igneous rocks associated with gold-bearing skarn deposits in north-central Nevada

[n.d., not detected;—, no data]

Analysis	1	2	3	4
SiO_2	64.0	70.5	66.2	63.6
Al_2O_3	15.1	14.5	15.1	16.5
Fe_2O_3	2.0	1.0	[1]3.34	[1]2.82
FeO	3.1	.16	—	—
MgO	3.5	1.5	2.5	2.5
CaO	3.5	.95	4.1	6.8
Na_2O	1.5	2.1	3.1	2.7
K_2O	4.3	6.1	2.9	2.3
TiO_2	.51	.47	.50	.56
P_2O_5	.16	0	.16	.21
MnO	.02	0	.03	.05
Other[2]	1.94	2.0	1.65	1.40
Au (ppb)	n.d.	100	42.4	<1
Cu (ppm)	990	1,500		
K_2O/Na_2O	2.87	2.90	.94	.84
Fe_2O_3	.65	6.25	—	—

1. Altered granodiorite sill at north edge of West ore body, a Cu-Au skarn deposit related to 38-Ma altered granodiorite of Copper Canyon. Fortitude Au-bearing skarn deposit lies just north of West ore body and is also probably genetically related to altered granodiorite of Copper Canyon. Analysis from Theodore and others (1973) (loc. 12, sample MB-40).
2. Altered granodiorite of Copper Canyon. Analysis from Theodore and others (1973)(loc. 9, sample MB-18).
3. McCoy granodiorite stock, 5,300-ft bench McCoy Mine sample 87JH013. XRF analysis by J. Taggart, A. Bartel, and D. Siems. Gold determined by INAA, G. Wandless, analyst.
4. Granodiorite dike at South shaft, Buffalo Valley Mine, sample 87TT228. Same methods as 3.

[1]Total iron as Fe_2O_3.

[2]Other = H_2O^+, H_2O^-, CO_2 for analyses 1, 2; = loss on ignition for analyses 3, 4.

Table 7. Representative data for minerals in gold skarns from north-central Nevada

[Total iron as FeO for pyroxene, idocrase, amphibole; total iron as Fe_2O_3 for garnet. Values are in weight percent. n.d., not detected]

Analysis	1	2	3	4	5	6	7	8	9	10
Mineral	Pyroxene		Garnet				Idocrase	Amphibole		
SiO_2	50.4	53.8	35.1	34.8	37.6	34.9	36.2	50.5	51.2	55.0
Al_2O_3	.36	.65	6.35	.01	13.0	0	14.4	1.25	4.49	2.49
FeO (Fe_2O_3)	18.2	3.40	23.4	32.5	13.8	31.7	3.40	27.1	12.4	8.12
MgO	6.99	16.49	.27	.29	.29	.29	2.71	6.34	15.4	18.7
CaO	23.2	25.6	34.4	33.0	35.8	33.5	34.6	11.4	12.6	13.0
Na_2O	.11	.02	0	0	0	0	.01	.11	.33	.12
K_2O	0	0	n.d.	n.d.	n.d.	n.d.	.01	.06	.29	.07
TiO_2	.01	.02	.49	0	.48	0	3.67	.04	.10	.05
MnO	.66	.20	.33	.23	.31	.30	.12	.92	.06	.28
F	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	.97	.01	.06	.09
Cl	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	.61	.01	.18	0
Total	99.8	100	100	101	101	101	95.3	97.7	96.9	97.9

1. Fortitude deposit sample 85TT243; average of 7 grains in massive pyrrhotite ore.
2. McCoy deposit, samples 86TT134 and 86TT137; average of 5 grains in massive oxidized garnet skarn.
3. Fortitude deposit, drill core sample of garnet-bearing sulfidized skarn; colorless, anisotropic zone.
4. Yellow isotropic andradite zone in same garnet grain as 3.
5. Surprise deposit, drill core sample of oxidized garnet skarn; colorless, anisotropic rim of large, euhedral zoned grain.
6. Yellow isotropic andradite core in same grain as 5.
7. McCoy deposit, sample 87TT137; average of 3 grains in idocrase-rich pod in garnet skarn.
8. Fortitude deposit, sample 85TT243; ferro-actinolite in pyroxene-bearing sulfidized skarn.
9. Northeast Extension deposit, sample 87TT2; actinolitic hornblende in epidote-amphibole-quartz-chlorite-sulfide skarn; no garnets or pyroxenes present.
10. Actinolite in sample 87TT2.

Table 8. Chemical signatures of nontronite clay layers associated with gold-bearing skarns

[—, not detected; N.D., not determined]

Sample[1]	85JH115		85JH142	86TT135	88TT63	87JH004
Method[2]	a	b	a	b	b	b
			Weight percent			
Al	—	0.33	—	1.5	0.12	2.94
Ca	1	.73	10	15	5.8	3.65
Fe	10	8.2	10	7.3	5.3	12.7
Mg	1	.89	.5	7.7	.13	.29
Na	—	.02	—	.19	.02	—
K	—	<.05	—	.37	<.05	<.05
P	—	.01	—	.1	.1	.12
Ti	.1	.08	.1	.1	.01	.51
			Parts per million			
Mn	100	660	1000	760	977	2150
Ag	2	30	7	8	<2	12
As	—	<10	—	20	40	30
B	10	—	10	—	—	—
Ba	200	160	500	82	13	17
Be	—	<1	—	2	<1	3
Bi	—	10	—	<10	<10	<10
Cd	—	<2	50	2	5	<2
Ce	—	<4	—	7	<4	993
Co	5	210	—	14	2	17
Cr	50	46	70	44	9	1350
Cu	200	320	20	3800	1	6050
Ga	—	<4	—	8	<4	23
La	—	<2	—	4	7	636
Li	—	7	—	7	9	23
Ni	15	12	—	12	5	553
Pb	20	100	—	11	6	326
Sc	7	4	—	6	<2	20
Sn	—	<10	—	100	<10	20
Sr	100	53	200	61	49	164
V	100	71	100	40	23	53
Y	—	3	20	3	9	16
Zn	500	550	200	400	240	564
Zr	50	—	200	—	—	—
Hg[3]	0.03		N.D.	0.08	N.D.	N.D.
Au[3]	.07		N.D.	5.1	0.04	0.42
Pd[3]	.001		N.D.	.001	N.D.	N.D.
Pt[3]	<.010		N.D.	<.010	N.D.	N.D.
Rh[3]	<.001		N.D.	<.001	N.D.	N.D.
W[3]	5.0		N.D.	5.0	N.D.	N.D.

1 Analyses were done on bulk samples of earthy, yellow-green clay layers in skarns. X-ray diffraction studies show that all samples are mixtures of clay and significant amounts of quartz and calcite or pyroxene. All samples have characteristic smectite peaks at 14 angstrom that expand to about 17 angstrom with glycolation. Microprobe work on 85JH115 confirms the Fe-rich nature of clay. Samples are from skarns in the Harmony Formation (85JH115) and in the Battle Formation (85JH142) in Battle Mountain Mining District, the McCoy Mine (86TT135) in McCoy Mining District, the Buffalo Valley Mine (88TT63), and the Surprise Mine (87JH004).

2 Elements sought for but not detected at limit of methods a and b include Au, Mo, and W. (a) Six-step direct current arc semi-quantitative spectrographic analyses; analyses performed in U.S. Geological Survey exploration research laboratories by Betty Adrian and Olga Ehrlich; X-ray studies by Steve Autley and Ted Botinelly. (b) Quantitative inductively coupled plasma direct reader emission spectroscopy by M. Malcolm in U.S. Geological Survey analytical laboratories; X-ray work by Karen Gray.

3 Trace analysis and chemical separation by C. Gent, R. O'Leary, B. Libby, N. Rait, and S. Wilson in U.S. Geological Survey analytical laboratories.