

DESCRIPTIVE MODEL OF LOW-SULFIDE Au-QUARTZ VEINS

By Byron R. Berger

APPROXIMATE SYNONYMS Mesothermal quartz veins, Mother Lode veins.DESCRIPTION Gold in massive persistent quartz veins mainly in regionally metamorphosed volcanic rocks and volcanic sediments.GEOLOGICAL ENVIRONMENTRock Types Greenstone belts; oceanic metasediments: regionally metamorphosed volcanic rocks, graywacke, chert, shale, and quartzite. Alpine gabbro and serpentine. Late granitic batholiths.Age Range Precambrian to Tertiary.Depositional Environment Continental margin mobile belts, accreted margins. Veins are generally post-metamorphic and locally cut granitic rocks.Tectonic Setting(s) Fault and joint systems produced by regional compression.Associated Deposit Types Placer Au-PGE, kuroko massive sulfide, Homestake gold.DEPOSIT DESCRIPTIONMineralogy Quartz + native gold + pyrite + galena + sphalerite + chalcopyrite + arsenopyrite ± pyrrhotite. Locally tellurides ± scheelite ± bismuth ± tetrahedrite ± stibnite ± molybdenite ± fluorite. Productive quartz is grayish or bluish in many instances because of fine-grained sulfides. Carbonates of Ca, Mg, and Fe abundant.Texture/Structure Saddle reefs, ribbon quartz, open-space filling textures commonly destroyed by vein deformation.Alteration Quartz + siderite and (or) ankerite + albite in veins with halo of carbonate alteration. Chromian mica + dolomite and talc + siderite in areas of ultramafic rocks. Sericite and disseminated arsenopyrite + rutile in granitic rocks.Ore Controls Veins are persistent along regional high-angle faults, joint sets. Best deposits overall in areas with greenstone. High-grade ore shoots locally at metasediment-serpentine contacts. Disseminated ore bodies where veins cut granitic rocks.Weathering Abundant quartz chips in soil. Gold may be recovered from soil by panning.Geochemical Signature Arsenic best pathfinder in general; Ag, Pb, Zn, CU.EXAMPLES

Grass Valley, USCA	(Lindgren, 1896)
Mother Lode, USCA	(Knopf, 1929)
Ballarat Goldfield, Victoria, AUVT	(Baragwanath, 1953)
Goldfields of Nova Scotia, CNNS	(Malcolm, 1929)

GRADE AND TONNAGE MODEL OF LOW-SULFIDE Au-QUARTZ VEINS

By James D. Bliss

COMMENTS All mines within 1.6 km were combined and only deposits containing more than 99 tonnes are included. Gold grade is correlated with tonnage ($r = -0.30$) and with silver grade ($r = 0.45$, $n = 39$). See figs. 182-183.

DEPOSITS

<u>Name</u>	<u>Country</u>	<u>Name</u>	<u>Country</u>
Al	AUVT	Colfax	USCA
Achilles	NZLD	Colombo	USCA
Alabama Shoot	AUVT	Comet	USAK
Alex Hill-Mad Kiss	GUYN	Confidence	USCA
Alice	USCA	Coulterville	USCA
Alleghany East	USCA	Coulterville South	USCA
Alleghany West	USCA	Country Harbour	CNNS
Alto	USCA	Cove District	USCA
Amador City	USCA	Cow Bay	CNNS
American Bar	USCA	Cox, Bolyan & Loberg	USAK
Ample	CNBC	Cranberry Hill	CNNS
Angels-Carson	USCA	Dalesford	AUVT
Argo	USCA	Damascus	USCA
Argus Hill	AUVT	Defender	USCA
Ashland	USOR	Delta	USCA
Atlas	USCA	Demarest	USCA
Bagby	USCA	Dinero	USCA
Bagby Valley	USCA	Dominion Consolidated	NZLD
Ballarat	AUVT	Dorothea	USOR
Barrandum	USCA	Eagle Bluff-River Bend	USCA
Bear Valley	USCA	Eagle Shawmut	USCA
Bear Valley South	USCA	Early-Sweetwater	USCA
Beaver Dam	CNNS	East Rawdon	CNNS
Belden	USCA	Eclipse No. 1	USCA
Bendigo	AUVT	Ecum Secure	CNNS
Bendigo	NZLD	El Dorado	USCA
Berry Creek	USCA	El Portal	USCA
Bethanga	AUVT	Eliza-Schroeder	USCA
Big Oak Flat	USCA	Empire-Lone Star	USCA
Birthday-William Fancy	AUVT	Enterprise	USCA
Black Bear	USCA	Esmeralda	USCA
Black Boy	USCA	Ester Dome SE	USAK
Blackstone	USCA	Experimental	USCA
Blockhouse	CNNS	Felicianna	USCA
Blue Lead	USAK	Fifteen-mile Brook	CNNS
Blue Mountain	USCA	Fifteen-mile Stream	CNNS
Bonanza	NZLD	Fifty-five	USCA
Bondurant	USCA	Fine Gold	USCA
Braden	USOR	Finney	USCA
Bralorne-Pioneer	CNBC	Five Pines	USCA
Broken Hills	USCA	Forbestown	USCA
Brookfield	CNNS	Ford	USCA
Buller-Mokihinui	NZLD	Forest Hill	CNNS
Caledonia	AUVT	Four Hells Mine	USCA
Canyon Creek-East Fork	USCA	Fourth Crossing	USCA
Caribou	CNNS	Francis Ormand	AUVT
Caribou-Aurum	CNBC	Franklin	USCA
Carleton	CNNS	French	USCA
Carolin	CNBC	French Gulch	USCA
Cassilis	AUVT	Fryer's Creek	AUVT
Central	USCA	Gabriels Gully	NZLD
Central Rawdon	CNNS	Galice North	USOR
Chewton	AUVT	Gabretta	USCA
Chichagof	USAK	Gabrinus	USCA
Cleary Hill	USAK	Gem	USCA
Clunes Goldfield	AUVT	Gem Olive	USCA
Coarsegold	USCA	German Bar	USCA
Cobol	USAK	Giant King	USCA
Cochrane Hill	CNNS	Gibraltar	USCA

Gladstone	USCA	Lone Mary	USCA
Glencoe-Woodhou.se	USCA	Long Tunnel	AUVT
Globe-Ralston	USCA	Lord Nelson	AUVT
Gold Bug	USCA	Lucky Bart	USOR
Gold Point	USCA	Lucky Shot-War Baby	USAK
Gold Reef	USCA	Lyell Goldfield	NZLD
Gold River	USCA	Mabel	USAK
Gold Chariot	USCA	Maiden North	AUVT
Golden Eagle	USCA	Mammoth	USCA
Golden Jubilee	USCA	Mariners	AUVT
Golden-El Dorado	USCA	Mariposa	USCA
Goldenville	CNNS	Maude & Yellow Girl	AUVT
Grand Victory	USCA	Midas	USCA
Granite Hill	USOR	Mikado	USAK
Granite King	USCA	Miller Lake	CNNS
Grant	USAK	Minto	CNBC
Grass Valley	USCA	Mizpah	USAK
Green Excelsior	USCA	Mohawk-Dome View	USAK
Greenback	USOR	Mokelumne	USCA
Gwynne	USCA	Molega	CNNS
Hall Creek	CNBC	Montague	CNNS
Ham & Elirney	USCA	Moore's Flat	USCA
Harriet	CNBC	Moose River	CNNS
Harrigan Cove	CNNS	Moosehead	CNNS
Hathaway	USCA	Mooseland	CNNS
Hazel	USCA	Mormon Bar	USCA
Hedley Camp	CNBC	Morning Star	AUVT
Henry Ford	USAK	Morris Ravine	USCA
Herman	USCA	Mount Bullion	USCA
Hi-Yu	USAK	Mount Gaines	USCA
Hillgrove	AUNS	Mount Pleasant	USCA
Hirst-Chichagof	USAK	Mount Shasta	USCA
Homestake-McCarty	USAK	Mount Uniacke	CNNS
Hornitos	USCA	Mount Vernon	USCA
Horseshoe I	USCA	Mountain King	USCA
Hunter Valley	USCA	Nalden South	AUVT
Iconoclast	USCA	Nashville	USCA
Indian Path Mine	CNNS	National	USCA
Invincible Lode	NZLD	new Bendigo	AUVT
Isaac's Harbour	CNNS	New Era-Rowe	AUVT
Jabal Guyan	SAAR	Nimrod	AUVT
Jamestown	USCA	North Murphy	USCA
Joe Walker	USCA	North Star	USAK
Jubilee	NZLD	Nuggetty	AUVT
Jubilee-New Jubilee	AUVT	O'Connors	AUVT
Julian-Banner	USCA	Old Diggings	USCA
K.C.	USCA	Oldham	CNNS
Kelsey	USCA	Ophir	USCA
Kelsey North	USCA	Oregon Bell	USOR
Kemptville	CNNS	Oriental	AUVT
Killag	CNNS	Oro Grande-Buena Vista	USCA
Kinsley	USCA	Oturehua Field	NZLD
Kinsley North	USCA	Ovens	CNNS
Kotchkar Mines	USSR	Oya	JAPN
Lake Catcha	CNNS	Paloma-Gwin	USCA
Lamphear	USCA	Paparoa Range	NZLD
Lawrencetown	CNNS	Patrick	USCA
Leipsigate	CNNS	Penryn	USCA
Leviathan	AUVT	Phoenix	USCA
Liberty	USCA	Pipestem	CNBC
Little Squaw	USAK	Placerville	USCA
Locarno	USCA	Pleasant River	CNNS
Loch Fyne	AUVT	Porto Rico	CNBC

Pyramid	USCA	Soulsbyville	USCA
R.R. Flat South	USCA	South Uniacke	CNNS
Rainbow	USOR	Spring Gully	AUVT
Rainbow	USCA	Stonewall	USCA
Ranch	USCA	Sultan	AUVT
Ravenswood	NZLD	Surf Inlet	CNBC
Reefton Goldfield	NZLD	Sutter Creek	USCA
Reicher Trost	PLND	Sylvanite	USOR
Renfrew	CNNS	Tangier	CNNS
Rich	USCA	Taylor	USCA
Rich Gulch	USCA	Tipperary Mine	NZLD
Rich Gulch (Virgilia)	USCA	Toombou	AUVT
Rindge No. 1	USCA	Treadwell Mines	USAK
Robert E	USOR	Truscott	USCA
Robertson	USOR	Uncle Sam	USCA
Rose of Denmark	AUVT	Upper Seal Harbour	CNNS
Rosethistle & Shamrock	AUVT	Valley View	USCA
Royal Mountain King	USCA	Vogler's Cove	CNNS
Ryan	USCA	Ward	CNBC
Ryan Group	USAK	Warrington	USCA
S. Branch Stwejacke	CNNS	Washington	USCA
Sailor's Gully	AUVT	Wattle Gully	AUVT
Salmon River	CNNS	Waverley	CNNS
Salsigne	FRNC	Wayside	CNBC
Sambas	AUVT	West Gore	CNNS
Sandford	USAK	West Jacksonville	USCA
Scott Bar	USCA	Westland	NZLD
Seal Harbour	CNNS	Whiteburn	CNNS
Second Relief	CNBC	Whitlock East	USCA
Sesson Mine	USCA	Whitlock West	USCA
Sheep Ranch	USCA	Wilshire-Bishop	USCA
Shenandoah Mine	USCA	Wine Harbour	CNNS
Sliger	USCA	Yankee Hill	USCA
Soo	USAK	Zeila	USCA

LOW-SULFIDE GOLD-QUARTZ VEIN

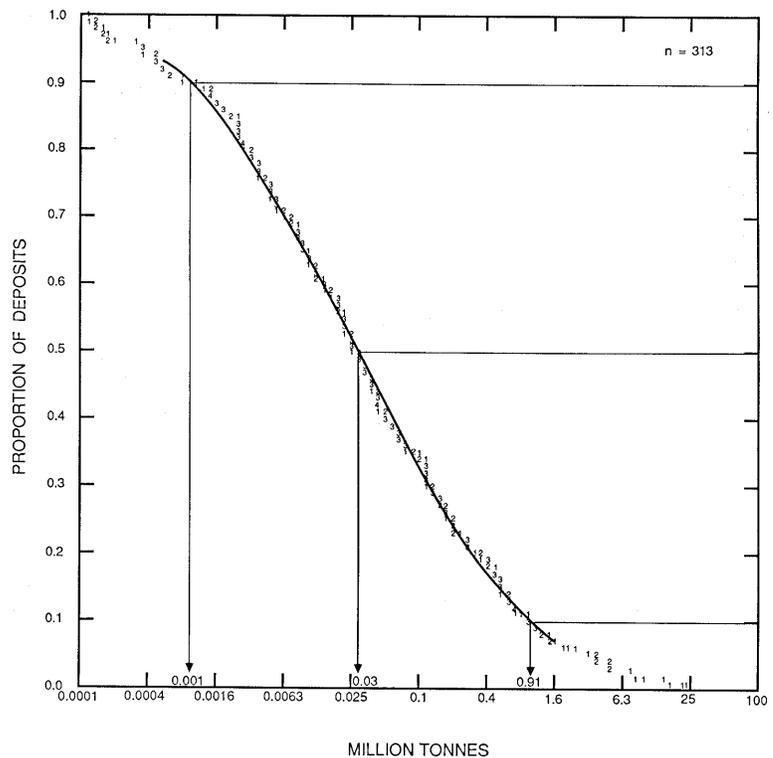


Figure 182. Tonnages of low-sulfide Au-quartz vein deposits.

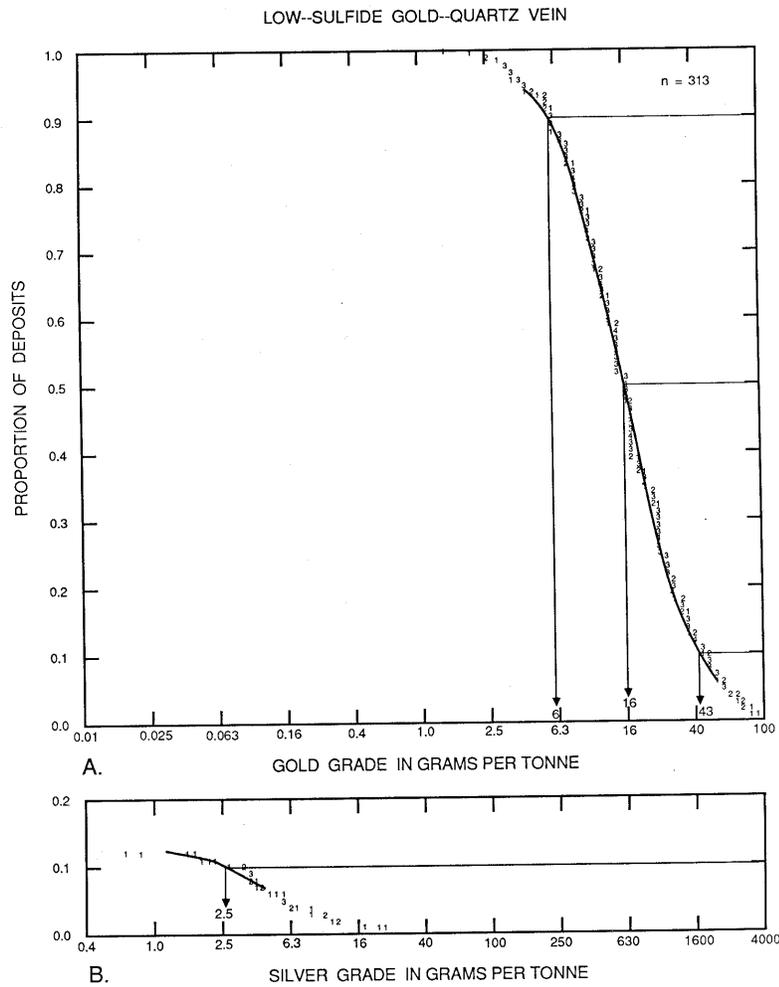


Figure 183. Precious-metal grades of low-sulfide Au-quartz vein deposits. **A**, Gold. **B**, Silver.