Ministry of Energy, Mines and Petroleum Resources

British Columbia Geological Survey Geoscience Map 2018-01

Surficial geology of the Highland Valley Copper mine area (Parts of NTS 092I/06, 7, 10 and 11), British Columbia

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0 1 2 4 6 8 10

Kilometres

Scale 1:50,000

Geomatics by L. Robertson. Cartography by D. Viner and H. Arnold

Note: Where map units are composed of multiple surficial materials, a compound map unit designator is used, separating more extensive materials from less extensive (e.g., for Tb.Th, Tb is more extensive than Th).

ANTHROPOGENIC DEPOSITS

H — ***Anthropogenic deposits:*** rubble, diamicton, sand, gravel, and mine tailings; massive; more than 3 m thick; occurring as flat to steep surfaces emplaced by human activity near active mine sites.

QUATERNARY SURFICIAL DEPOSITS

HOLOCENE

NONGLACIAL ENVIRONMENT

Organic deposits: peat and plant material in various stages of decomposition; 1 to 3 m thick on average; peat derived from decayed plant material in an eutrophic environment; generally occur as flat, wet terrain (swamps) over poorly drained substrates; form relatively open peatlands; may include minor fluvial and lacustrine sediments.

Owf — ***Fen peat:*** peat derived from sedges and partially decayed shrubs; forms relatively open peatlands with a mineral-rich water table that persists seasonally near the surface; can be covered with low shrubs and sparse trees; forms in a minerotrophic environment where water is supplied mainly from small surface streams.

Owb — ***Bog peat:*** sphagnum or forest peat; may be treed or treeless; forms in an ombrotrophic environment where water is supplied mainly by precipitation.

O — ***Organic deposits, undifferentiated:*** undifferentiated bog and fen peat.

Colluvial and mass wasting deposits: diamicton and rubble; poorly sorted, massive to stratified debris deposited by direct, gravity-induced movement; composition dependent on source material.

Ca — ***Colluvial apron deposits:*** diamicton and rubble of variable composition derived from bordering slopes; 1 to 10 m thick, but may exceed 10 m near the toe of large slopes; forms a sloping surface with a gradient of 25-35°.

Cz — ***Landslide deposits:*** diamicton, generally 1 to 10 m thick, but may exceed 10 m near the toe of large landslides; hummocky topography; includes inactive and potentially active landslides.

Cv — ***Colluvial veneer:*** thin and discontinuous cover of slumped material; generally 1 to 2 m thick; mainly overlies bedrock or till; occurs on moderate to steep slopes.

Alluvial deposits: sorted gravel, sand, minor silt and organic detritus deposited by modern streams; commonly stratified.

Ap — ***Alluvial floodplain sediments:*** sorted sand and silt with lesser amount of pebbly gravel and organic detritus; more than 1 m thick; forming active floodplains close to river level with meander channels and scroll bars; prone to flooding.

Af — ***Alluvial fan sediments:*** poorly sorted gravel, sand and diamicton; more than 2 m thick; occur where a stream issues from a narrow valley onto a plain or valley floor.

At — ***Alluvial terraced sediments:*** sorted gravel, sand and minor silt; more than 2 m thick; forming inactive terraces above modern floodplain; represents a potential aggregate source.

A — ***Alluvial sediments, undifferentiated:*** undivided floodplain, alluvial terrace, and alluvial fan sediments.

Lacustrine deposits: Sorted and stratified fine-grained sediments deposited in a modern, nonglacial lake; can be unvegetated or sparsely vegetated with grasses; exposed due to fluctuating lake levels.

L — ***Lacustrine sediments, undifferentiated:*** sand, silt, and minor clay intermixed with variable amounts of organic material, deposited in a lake; more than 1 m thick; exposed following lowering of lake levels; includes organic deposits too small to be mapped separately.

LATE WISCONSINAN

PROGLACIAL AND GLACIAL ENVIRONMENTS

Glaciolacustrine deposits: fine sand, silt, and clay, with minor mass flow diamicton and gravel; laminated to bedded and massive; deposited in glacier-dammed lakes in valleys and along the margin of retreating glaciers.

GLd — ***Deltaic glaciolacustrine sediments:*** gravel, sand and minor silt; massive to bedded; more than 2 m thick; occurs at the mouth of meltwater channels entering former glacial lakes.

GLh — ***Hummocky glaciolacustrine sediments:*** fine sand, silt and clay; massive, laminated and bedded; more than 2 m thick on average; can be folded and faulted post-depositionally; forms a hummocky to rolling surface.

GLv — ***Glaciolacustrine veneer:*** fine sand, silt, and clay; generally laminated and bedded; 1 to 2 m thick on average; thin and discontinuous.

GL — ***Glaciolacustrine sediments, undifferentiated:*** undivided glaciolacustrine sediments; more than 1 m thick.

Glaciofluvial deposits: sand and gravel with minor diamicton; well to poorly stratified; deposited behind, at, or in front of the ice margin by glacial meltwater; represent a potential aggregate source.

GFp — ***Outwash plain sediments:*** sand and gravel; bedded; 1 to more than 10 m thick; deposited by meltwater at various positions in front of the retreating glaciers; generally forms flat surfaces sloping away from direction of retreat.

GFt — ***Glaciofluvial terraced sediments:*** sand and gravel; 1 to 10 m thick; forming gently sloping flat surfaces perched above modern streams, meltwater channels or alluvial deposits.

GFf — ***Outwash fan sediments:*** sand and gravel; bedded; 1 to more than 10 m thick; deposited at the mouth of meltwater channels that entered the Nicola River valley; might have been deposited subaqueously in a glacial lake.

GFh — ***Hummocky glaciofluvial sediments:*** poorly-sorted sand and gravel with minor diamicton; bedded to massive; individual beds can be deformed; 1 to more than 20 m thick; deposited in contact with a retreating glacier; forms hummocky topography that is related to melting of buried ice.

GFk — ***Kame terrace sediments:*** poorly-sorted sand and gravel with minor diamicton; bedded to massive; individual beds can be deformed; 1 to more than 20 m thick; deposited in contact with a retreating glacier; forms terraces, generally unpaired, on valley walls; perched above modern valley floor.

GFr — ***Esker sediments:*** sand and gravel; massive to bedded; 3 to more than 5 m thick; forming ridges deposited by meltwater flow within tunnels or channels in glacier ice.

GFb — ***Glaciofluvial blanket:*** sand and gravel; more than 2 m thick; occurs near the margins and at the mouth of meltwater channels; forms gently undulating to flat surfaces.

Till deposits: matrix-supported diamicton consisting of clasts of all sizes in a sandy to silty-sand matrix; deposited directly by glaciers; clasts are of various lithologies and many are striated.

Th — ***Hummocky till:*** more than 2 m thick on average; hummocky to rolling surface including discontinuous lenses of glaciofluvial gravel; most likely deposited from stagnant ice.

Tr — ***Ridged till; moraine:*** more than 2 m thick; might include minor sand and gravel.

Ts — ***Streamlined and fluted till:*** variable till thickness from less than 1 m on high ground to more than 2 m in lower areas; till surface marked by streamlined landforms including flutings, drumlins, and crag-and-tails; bedrock outcrops are abundant in regions with crag-and-tails.

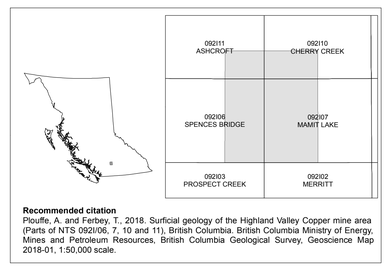
Tv — ***Till veneer:*** 1 to 2 m thick on average; discontinuous till cover; underlying bedrock morphology is discernible; bedrock outcrops are abundant.

Tb — ***Till blanket:*** more than 2 m thick on average; continuous till cover forming undulating topography that locally obscures underlying units; rare bedrock outcrops.

PRE-QUATERNARY

R — ***Bedrock, undifferentiated:*** Paleozoic to Cenozoic volcanic, intrusive, sedimentary, and lesser amount of metamorphic bedrock; can include local pockets of till or colluvium generally less than 1 m thickness.

- Open pit mine
- Mine tailing
- Gravel pit
- Kettle:
  - *Small*
  - *Large*
- Geological contact, defined
- Debris-flow
- Landslide:
  - *Small scar*
  - *Escarpment*
- Terrace scarp
- Paleodrainage direction
- Meltwater channel:
  - *Minor (paleocurrent known)*
  - *Minor (paleocurrent unknown)*
  - *Minor lateral (tick indicates uphill side)*
  - *Major*
- Moraine:
  - *Minor*
  - *Major*
- Esker:
  - *Paleocurrent direction known*
  - *Paleocurrent direction unknown*
- Drumlin:
- Drumlinoid ridge:
  - *Buried*
  - *Large*
- Crag-and-tail:
  - *Large*
  - *Small*
- Fluted bedrock or drift (paleo ice-flow direction unknown)
- Roche moutonnée
- Cirque headwall
- Arête
- Lineament in bedrock
- Kame, small
- Glacial striations:
  - *Paleo ice-flow direction known, poorly defined*
  - *Paleo ice-flow direction known*
  - *Paleo ice-flow direction unknown*
  - *Crosscutting (numbers indicate relative age; 1 = oldest)*
- Mineral occurrence (see Table 1; numbers indicate Map ID)
  - Producer ^{12}
  - Past Producer ^{12}
  - Developed Prospect ^{12}
  - Prospect ^{12}
  - Showing ^{12}
- *Small bedrock outcrop*
- *Station (Ground observation)*
- *Sample*



Recommended citation

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North American Datum 1983
Universal Transverse Mercator Zone 10 North
Shaded relief image derived from the digital elevation model supplied by Natural Resources Canada. Illumination: azimuth 315°, altitude 45°, vertical factor 1x
Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications.
Contour interval 20 metres. Elevations in metres above mean sea level.

Descriptive notes

The Highland Valley Copper mine (porphyry Cu-Mo) is a major copper producer in Canada. In the mine region, till deposited during the Late Wisconsinan Fraser glaciation is the most extensive glacial sediment. During the Fraser glaciation, ice flowed predominantly south to southeastward as indicated by the orientation of drumlins and flutings. During deglaciation, lateral meltwater channels cut into the flanks of valleys and mountain slopes, indicating that ice occupied low ground when higher elevations were ice free. Accumulations of glaciofluvial sand and gravel, too small to be mapped at this scale, can be found close to these meltwater channels. The glaciofluvial drainage was generally to the south during ice retreat, with aggradation of glaciofluvial sediments in the Guichon Creek valley. Glaciolacustrine sediments in the Witches Brook valley were deposited in a lake that formed when the eastward drainage was blocked by a mixture of ice and sediments. Mine tailings blank et areas near open pits and in the valley that extends northwest from the mine (previously occupied by Pukaist Creek).

This map supersedes Plouffe and Ferbey (2015).

Acknowledgements

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References cited

Lefebure, D.V. and Höy, T. (ed.), 1996. Selected British Columbia mineral deposit profiles, Volume 2 – More metallic deposits; British Columbia Ministry of Energy, Mines and Petroleum Resources, British Columbia Geological Survey Open File 1996-13, 172 p.

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Table 1. Mineral occurrences from MINFILE database (MINFILE, 2018). Letter and number designation under deposit type correspond to definitions provided by Lefebure and Ray (1995) and Lefebure and Höy (1996).

Map ID	MINFILE No.	Name	Status	Commodity	Deposit type
1	092INE034	DANSEY	Prospect	Cu, Mo	L04: Porphyry CuMoAu
2	092INE038	GETTY NORTH	Developed Prospect	Cu, Mo	L04: Porphyry CuMoAu
3	092INE040	DAB	Showing	Cu	L04: Porphyry CuMoAu
4	092INE041	LODGE	Showing	Cu, Mo	L04: Porphyry CuMoAu
5	092INE042	BX	Prospect	Cu	L04: Porphyry CuMoAu
6	092INE043	GETTY SOUTH	Developed Prospect	Cu	L04: Porphyry CuMoAu
7	092INE111	RM	Showing	Cu	L04: Porphyry CuMoAu
8	092INE135	WDR	Showing	Cu	L04: Porphyry CuMoAu
9	092INE144	DAVE	Showing	Cu	L04: Porphyry CuMoAu
10	092INE151	LUX	Showing	Cu, Ag	L04: Porphyry CuMoAu
11	092INE163	GUICHON CREEK	Showing	Diatomite	F06: Lacustrine diatomite
12	092INW006	NIM	Showing	Cu	L04: Porphyry CuMoAu
13	092INW011	GLOSSIE	Prospect	Cu, Ag, Au	I06:CuAg qua rtz veins, L04:Porphyry CuMoAu
14	092INW012	VERA	Showing	Cu	L04: Porphyry CuMoAu
15	092INW014	DEN 38	Showing	Cu	L04: Porphyry CuMoAu
16	092INW027	RAF 16	Showing	Cu	L04: Porphyry CuMoAu
17	092INW028	MER	Developed Prospect	Cu	L04: Porphyry CuMoAu
18	092INW029	JOY 1	Showing	Cu	I06:CuAg qua rtz veins, L04:Porphyry CuMoAu
19	092INW030	BLU 3,4	Showing	Cu	I06:CuAg qua rtz veins, L04:Porphyry CuMoAu
20	092INW032	DEN 13,15	Showing	Cu	L04: Porphyry CuMoAu
21	092INW033	DEN 76	Showing	Cu	L04: Porphyry CuMoAu
22	092INW040	GETTY WEST	Prospect	Cu, Mo	L04: Porphyry CuMoAu, I06:CuAg qua rtz veins
23	092INW041	HIGHLAND	Prospect	Cu	L04: Porphyry CuMoAu, I06:CuAg qua rtz veins
24	092INW053	MO	Showing	Cu	L04: Porphyry CuMoAu
25	092INW056	A	Showing	Cu	L04: Porphyry CuMoAu
26	092INW085	PUKAIST CREEK	Showing	Diatomite	F06: Lacustrine diatomite
27	092ISE001	BETHLEHEM	Past Producer	Cu, Ag, Au, Mo	L04: Porphyry CuMoAu
28	092ISE002	BETHLEHEM (EAST JERSEY)	Past Producer	Mo, Cu	L04: Porphyry CuMoAu
29	092ISE003	BETHLEHEM COPPER (SIMONS)	Showing	Cu	L04: Porphyry CuMoAu
30	092ISE004	BETHLEHEM (HUESTIS)	Past Producer	Cu	L04: Porphyry CuMoAu
31	092ISE005	BETHLEHEM (SNOWSTORM)	Past Producer	Cu, Mo, Ag, Au	L04: Porphyry CuMoAu
32	092ISE006	BETHLEHEM (IONA)	Past Producer	Cu, Mo	L04: Porphyry CuMoAu
33	092ISE007	BETHLEHEM COPPER-WHITE	Showing	Cu	L04: Porphyry CuMoAu
34	092ISE008	BETHLEHEM COPPER-SPUD LAKE	Showing	Cu	L04: Porphyry CuMoAu
35	092ISE010	SHEBA	Showing	Cu, Mo	L04: Porphyry CuMoAu
36	092ISE011	JERICHO	Developed Prospect	Cu, Mo, Ag	L04: Porphyry CuMoAu
37	092ISE013	HIGHMONT	Past Producer	Cu, Mo	L04: Porphyry CuMoAu
38	092ISE014	CU 16	Showing	Cu, Mo	L04: Porphyry CuMoAu
39	092ISE015	BORNITE RIDGE	Showing	Cu	L04: Porphyry CuMoAu
40	092ISE017	BOB	Showing	Cu, Mo	L04: Porphyry CuMoAu
41	092ISE018	JAY 1	Showing	Cu	L04: Porphyry CuMoAu
42	092ISE019	WIZ 3	Showing	Cu	L04: Porphyry CuMoAu
43	092ISE020	SHO	Showing	Cu	L04: Porphyry CuMoAu
44	092ISE023	DOT	Past Producer	Cu, Au, Ag, Mo	L04: Porphyry CuMoAu
45	092ISE024	ABERDEEN (L.960)	Past Producer	Cu, Ag, Au	L04: Porphyry CuMoAu
46	092ISE025	HAT-OUTRIDER	Showing	Cu	L04: Porphyry CuMoAu
47	092ISE056	MANCHESTER (L.1216)	Showing	Cu	
48	092ISE057	HC	Showing	Cu	L04: Porphyry CuMoAu
49	092ISE060	MOSS 4	Showing	Cu	L04: Porphyry CuMoAu
50	092ISE062	SKY	Showing	Cu	L04: Porphyry CuMoAu
51	092ISE063	WIZ	Past Producer	Cu, Mo, Ag, Au	L04: Porphyry CuMoAu
52	092ISE065	BUCK	Showing	Cu	L04: Porphyry CuMoAu
53	092ISE067	MAD ARAB	Showing	Cu, Pb, Zn, Ag, Au	I05: Polymetallic veins Ag-Pb-ZnsAu
54	092ISE069	SKU	Showing	Cu	L04: Porphyry CuMoAu
55	092ISE070	GAZA	Showing	Cu, Mo	L04: Porphyry CuMoAu
56	092ISE071	ROD	Showing	Cu	L04: Porphyry CuMoAu
57	092ISE072	FIDDLER	Showing	Cu, Mo	L04: Porphyry CuMoAu
58	092ISE073	PAT	Showing	Cu, Mo	L04: Porphyry CuMoAu
59	092ISE074	PRICE	Showing	Cu, Mo	L04: Porphyry CuMoAu
60	092ISE075	SAHARA	Showing	Cu	L04: Porphyry CuMoAu
61	092ISE076	LYNN	Showing	Cu	L04: Porphyry CuMoAu
62	092ISE077	CLARKE	Showing	Cu, Mo	L04: Porphyry CuMoAu
63	092ISE078	TYNER LAKE	Showing	Cu	
64	092ISE079	TAP	Showing	Cu	L04: Porphyry CuMoAu
65	092ISE080	VIKING	Showing	Cu	L04: Porphyry CuMoAu
66	092ISE085	LEM	Showing	Cu	L04: Porphyry CuMoAu
67	092ISE086	RWS	Showing	Cu	L04: Porphyry CuMoAu
68	092ISE088	IDE-AM	Developed Prospect	Cu, Mo	L04: Porphyry CuMoAu
69	092ISE089	JERICHO 18	Showing	Cu, Mo	L04: Porphyry CuMoAu
70	092ISE090	GNAT 2 FR.	Showing	Cu, Mo	L04: Porphyry CuMoAu
71	092ISE091	MALACHITE HILL	Showing	Cu	L04: Porphyry CuMoAu
72	092ISE092	JAY 11	Showing	Cu	L04: Porphyry CuMoAu
73	092ISE093	WIZ 47	Showing	Cu	L04: Porphyry CuMoAu
74	092ISE126	OLE-PAT	Showing	Cu, Mo	L04: Porphyry CuMoAu
75	092ISE127	ZONE 1	Showing	Zn, Pb	I05: Polymetallic veins Ag-Pb-ZnsAu
76	092ISE128	ZONE 2	Prospect	Zn, Pb, Cu, Ag	I05: Polymetallic veins Ag-Pb-ZnsAu
77	092ISE129	ZONE 3	Developed Prospect	Zn, Pb, Cu, Ag	I05: Polymetallic veins Ag-Pb-ZnsAu
78	092ISE146	MM	Showing	Cu	L04: Porphyry CuMoAu
79	092ISE149	JA	Developed Prospect	Cu, Mo	L04: Porphyry CuMoAu
80	092ISE150	YUBET	Developed Prospect	Cu	L04: Porphyry CuMoAu
81	092ISE152	ANN	Developed Prospect	Cu, Mo	L04: Porphyry CuMoAu
82	092ISE153	TDM	Showing	Cu	L04: Porphyry CuMoAu
83	092ISE154	WENDY	Showing	Cu	L04: Porphyry CuMoAu
84	092ISE157	CAPER	Showing	Cu	L04: Porphyry CuMoAu
85	092ISE167	SA	Showing	Cu	
86	092ISE172	IND	Showing	Cu	L04: Porphyry CuMoAu
87	092ISE186	JOE	Showing	Cu	L04: Porphyry CuMoAu
88	092ISE193	CHATAWAY	Showing	Cu	L04: Porphyry CuMoAu
89	092ISE199	RATERIA (ZONE 2)	Prospect	Cu, Mo, Ag, Re, Au	
90	092ISW001	TAR	Showing	Cu, Ag	L04: Porphyry CuMoAu
91	092ISW002	NANCY	Showing	Cu, Mo	L04: Porphyry CuMoAu
92	092ISW003	PIM	Showing	Cu	L04: Porphyry CuMoAu
93	092ISW004	LAKEN	Showing	Cu	L04: Porphyry CuMoAu
94	092ISW005	VICTOR	Past Producer	Cu	L04: Porphyry CuMoAu
95	092ISW006	FIR	Showing	Cu	L04: Porphyry CuMoAu
96	092ISW007	JAY 2	Showing	Cu	L04: Porphyry CuMoAu
97	092ISW008	RIO	Showing	Cu	L04: Porphyry CuMoAu
98	092ISW009	CANA	Showing	Cu	L04: Porphyry CuMoAu
99	092ISW010	ALWIN	Past Producer	Cu, Ag, Au, Mo, Pb	I06:CuAg qua rtz veins, L04:Porphyry CuMoAu
100	092ISW011	DAWN	Showing	Cu, Mo	L04: Porphyry CuMoAu
101	092ISW012	HIGHLAND VALLEY COPPER	Producer	Cu, Mo, Ag, Au, Pb, Zn	L04: Porphyry CuMoAu
102	092ISW013	NW 48	Showing	Cu	L04: Porphyry CuMoAu
103	092ISW014	EMPIRE	Showing	Cu	L04: Porphyry CuMoAu
104	092ISW015	LORNA	Showing	Cu	L04: Porphyry CuMoAu
105	092ISW016	BAR	Showing	Cu	L04: Porphyry CuMoAu
106	092ISW017	KEY	Showing	Cu, Mo	
107	092ISW018	BJ	Showing	Cu	
108	092ISW019	EYE	Showing	Cu	L04: Porphyry CuMoAu
109	092ISW020	SAN JOSE	Showing	Cu	
110	092ISW021	AL	Showing	Cu	L04: Porphyry CuMoAu
111	092ISW022	BIN	Showing	Cu	L04: Porphyry CuMoAu
112	092ISW023	BIN 1-28 (NORANDA)	Showing	Cu	L04: Porphyry CuMoAu
113	092ISW024	FRANK 63	Showing	Cu	L04: Porphyry CuMoAu
114	092ISW025	JAN	Showing	Cu	L04: Porphyry CuMoAu
115	092ISW026	AYE	Showing	Cu, Mo	L04: Porphyry CuMoAu
116	092ISW027	KATHLEEN (L.5632)	Showing	Cu, Mo, Au	
117	092ISW028	JON	Showing	Cu	L04: Porphyry CuMoAu
118	092ISW031	CALCO	Showing	Cu	
119	092ISW033	ALAMO	Showing	Cu	
120	092ISW034	TAM	Showing	Cu	L04: Porphyry CuMoAu
121	092ISW036	HIGHMONT (WEST)	Past Producer	Cu, Mo	L04: Porphyry CuMoAu
122	092ISW038	ROYAL	Showing	Cu	
123	092ISW041	JAC	Showing	Cu, Mo	L04: Porphyry CuMoAu
124	092ISW042	BETHSAIDA	Showing	Cu, Mo	L04: Porphyry CuMoAu
125	092ISW043	BIN 93	Showing	Cu	
126	092ISW044	NORD	Showing	Cu	L04: Porphyry CuMoAu
127	092ISW045	LORNEX	Producer	Cu, Mo, Ag, Au, Zn	L04: Porphyry CuMoAu
128	092ISW066	KEN	Showing	Cu, Mo	L04: Porphyry CuMoAu
129	092ISW069	LOREX	Showing	Cu	L04: Porphyry CuMoAu
130	092ISW070	LL	Showing	Cu	L04: Porphyry CuMoAu
131	092ISW073	BEAR FR.	Showing	Cu, Mo	L04: Porphyry CuMoAu
132	092ISW075	CHRIS	Showing	Cu	L04: Porphyry CuMoAu
133	092ISW108	DOT MORDENITE	Showing	Zeolite	D01: Open-system zeolites
134	092ISW113	COPPER SWAM	Showing	Cu	
135	092ISW114	ABBOTT	Showing	Cu, Ag	
136	092ISW115	POLE 346 EAST	Showing	Cu, Ag, Au	