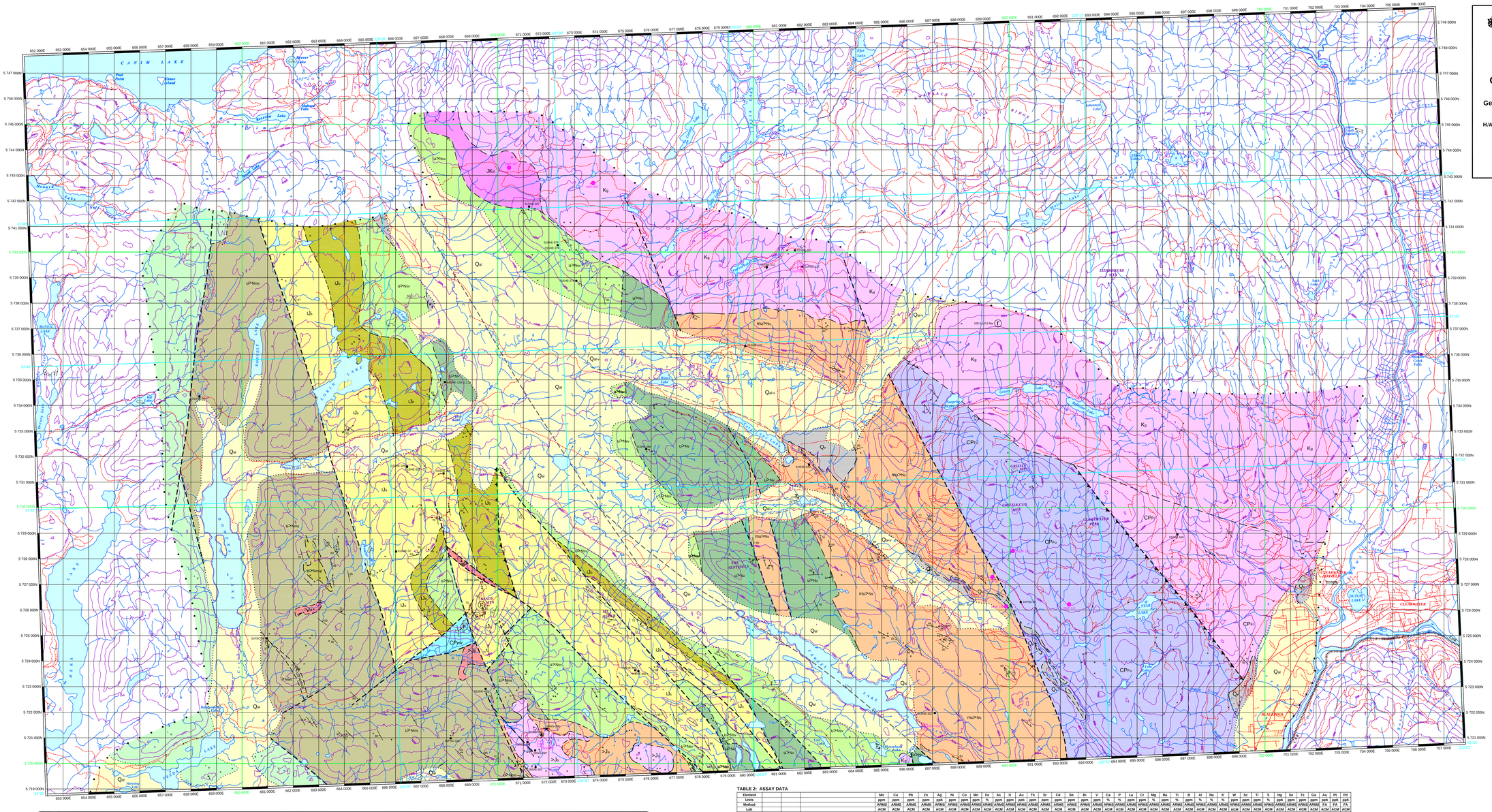


BRITISH COLUMBIA
Ministry of Energy and Mines
Hon. Richard Neufeld
Minister
Geological Survey Branch

Geological Survey Branch

OPEN FILE 2002 - 15

GEOLOGY OF THE CLEARWATER - BOWERS LAKE AREA

NTS 92P/9, 10, 15, 16

Geology by P. Schiarizza, S. Heffernan, S. Israel and J. Zuber

Macrofossil Identifications: T.P. Poulton, GSC Calgary;
H.W. Tipper, GSC Vancouver; P.L. Smith, The University of British Columbia
Isotopic Dating: R.M. Friedman, The University of British Columbia

Digital Cartography: V. Vilkos, J. Zuber

SCALE 1:50 000

0 1 2 3 4 5
Kilometres

QUATERNARY

- **Qal** — *Unconsolidated glacial, fluvial and alluvial deposits*
  Qal+, Qal? *inferred to underlie thin veneer of* Qal
- **Qv** — *Basalt*

?OCENE
Kamloops Group

- **?v** — *Skull Hill Formation: andesite, basalt, dacite, volcanic breccia; minor amounts of sandstone, siltstone, conglomerate*

?OCENE?

- **?s** — *Laminated mudstone, siltstone*

CRETACEOUS

- **Kg** — *Granite, granodiorite, quartz-feldspar porphyry*

JURASSIC or CRETACEOUS

- **JKd** — *Diorite, quartz diorite*

EARLY JURASSIC

- **Jh** — *Siltstone, sandstone, conglomerate*

LATE TRIASSIC(?) and EARLY JURASSIC

- **Jb** — *Volcanic conglomerate, breccia, sandstone; rare pillowed to massive pyroxene-phyric basalt flows*
- **>Js** — *Syenite, monzonite, quartz monzonite*
- **>Jd** — *Diorite, microdiorite, syenite, intrusion breccia; pyrite-silica-altered rock, skarn and chloritic schist derived from these intrusive rocks and/or associated country rocks*
- **>Jd** — *Diorite, microdiorite, gabbro; locally includes monzonite, syenite and intrusion breccia*

MIDDLE AND LATE TRIASSIC
Nicola Group

- **uPNsv** — *Volcanic sandstone, siltstone, conglomerate, volcanic breccia, tuff, basalt, chert, limestone*
- **uPNv** — *Mafic volcanic breccia, massive to pillowed pyroxene-phyric basalt; minor amounts of volcanic sandstone, siltstone and conglomerate*

Meridian Lake succession

- **uPNns** — *Siltstone, argillite, slate, sandstone, conglomerate, limestone;* **uPNsap** *- volcanic conglomerate, sandstone*
- **uPNsp** — *Hornblende-pyroxene porphyry*

Wavey Lake succession

- **?Nns** — *Chert; slate, siltstone, volcanic sandstone, conglomerate*

Lemieux Creek succession

- **muPNs** — *Siltstone, slate, phyllite, sandstone, quartzite, sillite, limestone*

CARBONIFEROUS - PERMIAN
Harper Ranch Group

- **CPHu** — *Siltstone, argillite, chert, limestone*

Fennell Formation

- **CPFu** — *Upper Structural Division: pillowed and massive basalt; minor amounts of chert, diabase, gabbro*
- **CPFl** — *Lower Structural Division: chert, slate, siltstone, basalt, gabbro, diabase*

SYMBOLS

- Geological contact (defined, approximate, inferred)
- Geological contact (inferred, projected under Qal)
- Fault (defined, approximate, inferred)
- Fault (inferred, projected under Qal)
- Thrust fault, teeth on upthrust block (inferred)
- Bedding, tops known (inclined, overturned)
- Bedding, tops unknown (inclined, vertical)
- Slaty cleavage or schistosity (inclined, vertical)
- Crenulation cleavage (inclined)
- Axis of mesoscopic fold
- Macrofossil locality — F
- Location of isotopically dated sample (U-Pb zircon) — 105.5±0.5 Ma — I
- Mineral occurrence with MINFILE number (Table 1)
  - Showing — 092P 018
  - Prospect — 092P 007
- Assay sample with sample number (Table 2) — 01SHE-280
- Field station (shown only where not indicated by another symbol)
- Limit of extensive Qal cover
- Limit of mapping
- Contours (100 metre intervals)
- Roads (paved, gravel, rough)

REFERENCES

1. Schiarizza, P., Heffernan, S. and Zuber, J. (2002): Geology of Quesnel and Slide Mountain terranes west of *Clearwater, south-central British Columbia (92P/9, 10, 15, 16); in Geological Fieldwork 2001, British Columbia Ministry of Energy and Mines, Paper 2002-1*, pages 83-106.
2. Schiarizza, P. and Israel, S. (2001): *Geology and mineral occurrences of the Nehalliston Plateau, south-central British Columbia (92P/7, 8, 9, 10); in Geological Fieldwork 2000, British Columbia Ministry of Energy and Mines, Paper 2001-1*, pages 1-30.

TABLE 1: MINERAL OCCURRENCES

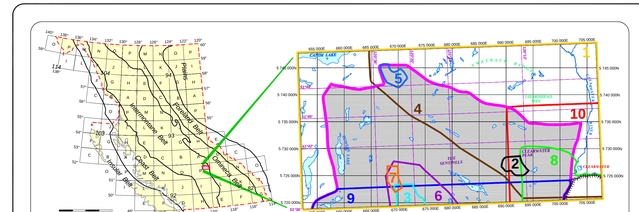
MINFILE No.	Name	Easting	Northing	Commodities	Type
092P 007	Bogg	671680	5720760	Cu, Pb, Pt, Pd, Ag	Pyrite, chalcopyrite and bornite along fractures, in quartz veins and as disseminations
092P 018	Ace	686680	5723420	Ag, Pb, Zn, Au, Cu	Massive sulphide lenses containing pyrrhotite, pyrite, arsenopyrite and minor chalcopyrite
092P 022	Double Lake	678100	5740630	Mo, Cu	Molybdenite, pyrite and chalcopyrite disseminated in granite and along fracture planes
092P 023	Aku	681844	5739424	Mo	Molybdenite, pyrite and traces of chalcopyrite along fractures and within quartz veinlets
092P 025	CL	673730	5742700	Mo	Molybdenite in quartz veins and along fractures
092P 107	Hood	670440	5743000	Cu, Mo	Pyrrhotite, pyrite, chalcopyrite and traces of molybdenite disseminated in diorite
092P 116	CP 53	690140	5729310	Cu	Quartz vein with chalcopyrite
092P 117	CP 17	692340	5728220	Cu	Quartz vein with chalcopyrite
092P 118	CP 34	689880	5728540	Cu	Quartz vein with chalcopyrite
	CP 41	689340	5727290	Pb	Quartz-carbonate vein with trace galena

TABLE 2: ASSAY DATA

Element				Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	S	Hg	Se	Te	Ga	Au	Pt	Pd
Units				ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%	ppm	ppm	ppb	ppb	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	ppm	ppm	%	ppm	ppb	ppm	ppm	ppb	ppb	ppb	ppb
Method				AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	AR/MS	FA	FA
Lab				ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME	ACME
Detection				0.01	0.01	0.01	0.1	2	0.1	0.1	1	0.01	0.1	0.1	1	0.1	0.5	0.01	0.02	0.02	2	0.01	0.001	0.5	0.5	0.01	0.5	0.001	1	0.01	0.001	0.01	0.2	0.1	0.02	0.2	5	1	0.5	2	2	2	2
Field Number	Easting	Northing	Type																																								
00SIS-268	671552	5721351	hornblende-quartz porphyry; py, po	6.72	158.88	2.52	23.1	139	21.7	38.4	322	3.66	4.2	0.5	4	1.5	38.1	0.1	0.18	0.21	100	1.92	0.131	8.1	31.3	1.18	123.1	0.188	4	1.88	0.049	0.57	2	3	0.2	0.99	7	1.1	0.13	7.7	4	8	3
00SIS-269	671711	5721133	intrusion breccia?; py, cpy, born, mal	6.84	3754.17	198.43	379.7	29434	7.7	10	1977	3.9	10.8	1	24.6	0.8	293.7	32.9	2.9	85.15	76	4.19	0.075	12.1	6.9	0.45	80.2	0.014	<1	0.2	0.029	0.18	1.4	0.7	0.3	2.27	263	23.1	1.41	2.4	37	208	149
00SIS-281	671475	5719699	qtz-carb-py-po vein	1.36	54.44	0.83	3.1	49	3.5	5.6	87	0.97	0.8	<.1	0.5	0.6	18.5	0.11	0.02	0.05	5	0.08	0.007	2	3.9	0.07	3.7	0.001	<1	0.06	0.004	0.08	0.2	<.02	0.01	0.1	5	<.1	<.02	0.2	5	3	2
00SIS-282	671158	5720025	altered intrusive rock; py, born, cpy	5.58	54.18	43.53	22.1	89	23.5	17.9	150	1.78	1.5	0.4	4.9	0.9	75.2	0.4	0.4	0.16	61	1.65	0.086	3.9	23.3	1.44	44.9	0.037	1	0.84	0.086	0.12	0.7	0.8	0.03	0.48	17	3.1	0.05	1.7	5	5	2
00SIS-288	671166	5720025	altered intrusive rock; py, born, cpy	3.03	54.45	7.52	20.1	49	23.1	19.1	1035	1.79	1.5	0.4	4.9	0.9	72.4	0.4	0.4	0.16	61	1.65	0.086	3.9	23.3	1.44	44.9	0.037	1	0.84	0.086	0.12	0.7	0.8	0.03	0.48	17	3.1	0.05	1.7	5	5	2
01PSC-34	660957	5724890	quartz-carbonate-sericite-altered diec; py	3	11.56	14.65	114.6	40	21.7	12.2	945	3.1	6.6	0.6	0.6	3.5	183.7	0.1	0.81	0.2	37	3.18	0.103	17.2	70.7	0.58	448.2	<.001	.4	0.79	0.053	0.24	<.2	3.9	0.08	0.34	30	2.5	0.02	1.9	2	3	3
01PSC-34rep	660957	5724890	quartz-carbonate-sericite-altered diec; py	3.26	12.68	15.78	118.6	65	23.4	13.7	996	3.24	6.5	0.6	0.3	3.9	191.1	0.49	0.75	0.23	37	3.3	0.107	17.7	66.9	0.6	454.6	<.001	.5	0.79	0.003	0.22	<.2	4	0.09	0.39	33	2.7	0.02	<.2	<.2	<.2	<.2
01PSC-97	669450	5726311	altered monzodiorite; py, born, cpy	0.14	76.73	1.49	32.8	96	54	21.5	490	2.74	3.2	<.1	<.1	0.4	0.06	0.05	1.53	0.05	166	1.66	0.055	0.7	109.1	1.3	733.2	0.473	.3	0.18	0.128	0.28	0.3	2.5	0.57	0.23	<.1	0.3	<.02	0.8	1	<.2	2
01PSC-122	680528	5738415	sheeted quartz veins; py, spec, mo?	327.51	114.7	163.36	35.7	42030	12.3	6.5	224	7.9	2.9	4	53.9	8.3	5.2	0.48	0.28	210.09	31	0.07	0.016	8.4	118.6	0.09	70	<.001	2	0.35	0.026	0.21	86.6	0.5	0.09	0.09	<.5	1.7	2.84	6.2	45	3	<2
01PSC-127	680528	5738415	quartz vein in leucogranitic sediment; py	115.22	1.9	1.82	1.4	<.2	4.1	0.6	45	0.34	0.1	1	0.7	0.5	0.04	0.1	0.04	0.2	5	0.004	0.1	137.4	0.01	13.4	<.001	<1	0.11	0.016	0.05	<.2	0.2	0.02	0.01	<.1	<.1	<.02	0.4	<.2	<.2	<.2
01PSC-319	666158	5720580	quartz-carbonate-altered rock; py	0.21	88.44	2.68	43.5	144	7.6	16.2	1100	3.45	0.9	<.1	21.6	0.6	531.0	0.09	0.07	0.06	23	3.29	0.1	4.6	12.1	1.3	263.6	<.001	.5	0.55	0.035	0.34	0.5	4.3	0.05	0.07	5	0.2	0.13	1.1	24	4	6
01PSC-326	668455	5722180	altered diorite; py, po	15.3	116.43	2.96	86	54	9.8	18.3	615	6.48	3.3	0.5	0.6	1.4	17.4	0.06	0.25	0.05	132	1.27	0.057	8.5	38	1	41.5	0.283	16	1.2	0.586	0.21	<.2	3.4	0.05	1.38	35	0.8	<.02	0.6	1	<.2	2
01SHE-72	666023	5728287	epidote-quartz-pyrite-altered sandstone	0.77	72.7	5.24	21.9	65	4.4	9.1	117	4.83	2.2	0.4	3.5	1	82.9	0.03	0.07	0.04	129	0.73	0.143	2.2	18.5	0.4	19.2	0.293	3	0.81	0.054	0.09	<.2	4.4	0.02	1.98	355	0.7	0.59	5.3	4	7	4
01SHE-76	668330	5728180	epidote-calcite-quartz-pyrite-sericite-altered sandstone; py	1.82	111.74	4.2	89.7	284	23.3	11.4	711	5.46	1.7	0.2	0.6	0.6	117.2	0.29	0.53	0.11	67	5.82	0.11	4.3	48.6	0.3	144.6	0.066	205	1.74	0.043	0.3	1.8	0.04	0.84	73	6.1	0.08	6.5	7	4	4
01SHE-128.1	667931	5734914	brittle fault zone; po, py	1.92	156.98	6.97	75.9	96	34.1	33.1	935	5.64	5.5	0.4	4.2	1.4	258.4	0.11	8.4	0.03	205	6.13	0.143	5.8	52.9	1.91	11.1	0.207	5	1.76	0.023	0.06	0.7	3.8	0.05	1.85	82	0.4	0.02	10.5	14	<2	12
01SHE-128.2	667931	5734914	altered monzodiorite; py, born, cpy	1.37	53.35	2.5	13.8	70	26	28.3	727	3.07	1.1	0.3	1.9	0.6	460.5	0.02	0.4	0.02	41	2.08	0.078	3.5	38.1	1.89	32.5	<.001	.6	0.55	0.026	0.16	<.2	4.5	0.04	0.52	20	0.5	0.03	1.1	14	5	3
01SHE-128.3	667931	5734914	pyritic basalt	0.94	30.82	2.19	21.3	27	4.4	7.8	848	2.63	40.4	<.1	3.5	0.2	704.6	0.09	5.47	<.02	28	10.71	0.035	5.5	27.8	0.25	23.8	<.001	3	0.33	0.002	0.05	<.2	2.5	0.02	0.29	34	0.4	0.14	1.6	18	2	2
01SHE-150	666577	5739973	altered basalt along fault zone; py, po	7.75	63.09	30.6	34.5	974	13.7	7	186	4.43	4.9	1.7	0.6	0.4	0.51	1.01	0.47	5	0.7	0.09	0.4	48.8	0.4	32.5	0.014	<1	0.19	0.004	0.4	<.2	0.5	0.16	0.85	7	13.5	0.1	1.2	3	2	3
01SHE-152	681620	5740070	quartz vein in granite	125.37	7.28	24.13	7.1	48	4.6	2.1	39	1.75	0.8	2.5	0.4	5.7	14.4	0.05	0.29	484.98	1	0.04	0.02	0.8	131.8	0.06	230	0.000	4	0.18	0.014	0.37	317.2	0.9	0.14	0.37	<.5	0.3	0.21	1.3	2	4	<2
01SHE-172	679875	5738320	quartz-epidote-altered fault zone; py, po, cpy	0.75	322.95	40.33	207	2168	178.5	47.8	276	4.36	69.5	0.1	5.4	0.4	324.3	8.31	7.14	1.25	337	2.34	0.114	0.5	237.9	2.54	114.7	0.189	4	3.52	0.154	0.95	33.3	2.6	0.65	2.14	9	34.1	0.07	8.7	8	14	14
01SHE-174	679375	5738876	fault breccia; py, po, cpy, ga, sph	7.6	354.99	9190.9	7304.8	2222	13.6	12.2	223	5.1	1.5	2.1	160.9	217.7	21.88	4.7	8.56	0.109	32	0.61	0.161	3.7	0.995	1	19.1	0.051	2.2	0.45	1.76	0.09	0.3	0.8	0.02	0.05	2	0.2	0.04	0.3	2	3	2
01SHE-243	680173	5731889	altered siltstone along quartz-porphyry sill; py	2.85	84.83	3.99	42.4	41	21.9	23.6	872	5.37	75.6	0.1	0.7	0.1	826.1	<.01	0.79	0.37	132	5.35	0.072	2.5	493.5	5.06	208.3	<.001	1	1	0.035	0.38	0.7	8.8	0.14	0.06	150	0.7	0.05	2.5	3	6	6
01SHE-301	675053	5729320	gossanous carbonate-altered volcanic breccia	2.3	135.45	24.12	68.3	21	29.5	59.8	2030	5.48	0.8	0.2	1.8	0.7	4.4	0.29	14.78	0.33	146	5.39	0.063	0.8	24.4	1.42	203.1	<.001	3	0.09	0.26	0.4	3	2	0.09	0.45	146	0.6	<.02	0.9	3	6	3
01SHE-302	667891	5729370	quartz-sulphide lens, ars, py, ga, sph, cpy	4.23	701.67	971.88	15987.5	50273	89.5	35	736	28.22	9999	0.3	448	<.1	4.6	449.04	108.09	259.29	<.2	0.25	0.001	0.8	17.8	0.03	13.8	<.001	<1	0.03	0.001	0.01	2.6	<.1	0.1	13.28	128	88.9	2.51	0.7	810	2	2
01SHE-306	667887	5731341	gossanous carbonate-altered conglomerate	5.19	82.75	18.51	58	234	20.4	14.2	742	5.45	18.3	0.4	4.8	1.8	39	0.52	0.95	0.26	176	2.5	0.127	8.6	49.1	1.13	66.6	0.095	2	1.41	0.105	0.94	0.4	1	0.08	1.47	42	0.4	0.03	2.7	3	6	5
01SHE-325	666437	5731598	hydrothermal breccia with calcite matrix	1.72	72.51	7.5	133	143	34.7	17.2	575	3.63	70.7	1.1	1.1	0.1	574.5	1.61	0.98	0.12	108	10.25	0.087	5.1	58.3	1.13	89.4	0.135	2	1.71	0.018	0.21	0.3	3	0.06	0.17	56	1.6	0.05	6.3	3	6	5
01SHE-375	672344	5746289	pyritic argillite	6.89	88.34	12.3	83.8	248	32.6	13.4	580	2.98	7.6	0.4	0.3	3.1	20.3	0.08	0.48	0.07	71	1.51	0.016	2.1	45.7	0.51	8.6	<.001	1	0.06	0.005	0.06	0.2	2.5	0.02	0.11	86	0.4	0.02	0.9	3	10	3
01SHE-376	672344	5746289	quartz-epidote veinlets in hornfels; py, ga	7.03	41.38	69.37	188.4	886	20.9	6.3	459	1.66	7	0.8	2.3	3.6	8.1	4.18	0.54	1.66	19	1.98	0.13	18.2	61.2	0.44	62	0.106	1	0.65	0.108	0.07	1.2	0.6	0.04	0.63	7	22.8	0.07	2.6	4	3	2
01SHE-379	672344	5746289	quartz-epidote veinlets in hornfels; py	13.27	110.5	6.49	311.3	141	59.9	11	107	2.37	8.1	1.2	2.1	4.1	7.3	10.58	0.95	0.56	105	1.14	0.1	8.9	48.3	0.38	83	0.144	<.1	1.32	0.207	0.36	0.7	1.5	0.22	1.8	47	0.4	0.14	2.4	4	3	2
01SHE-427	675077	5741779	chlorite-sulphide veinlets in diorite; mag, py, cpy	0.56	565.32	6.66	35.7	235	5.7	8.4	417	2.28	9.1	0.5	8.2	2.5	93	0.31	0.32	0.25	114	1.19	0.154	7.7	39.2	0.44	72	0.118	<.1	1.03	0.195	0.37	<.2	1.8	0.1	0.09	<.5	0.7	0.05	5	8	3	9
01SHE-427	675077	5741779	argillite	4.88	208.53	9.78	152.3	379	49.2	22.1	791	4.58	8.3	0.5	2.1	30.3	1.61	0.14	1.29	48.5	1.85	0.14	7.3	48.1	1.85	70.5	0.28	3	2.47	0.198	0.18	2.1	2.4	0.08	1.26	51	0.8	0.07	3.8	5	5	3
01SHE-405	675022	5729604	gossanous sandstone/siltstone/argillite; po	14.78	122.12	18.87	128.7	592	18.5	6.5	461	3.69	87.9	1	0.5	1.9	11.1	2.01	4.47	0.4	118	0.35	0.073	4.4	32.6	1.38	121.6	0.165	1	1.61	0.077	0.17	<.2	2.6	0.07	0.16	184	7	0.02	6.4	6	5	3
01SHE-422	669524	5729211	quartz-carbonate-altered sandstone; py	0.39	126.93	1.83	81.8	86	18.4	35	1064	5.92	7	0.3	0.4	0.8	424.3	0.13	0.05	0.05	246	3.59	0.129	3.9	15.8	3.19	350.1	0.364	1	2.68	0.044	0.61	<.2	13.2	0.21	0.29	5	0.6	0.03	8	2	<2	2

Abbreviations: ars-arsenopyrite; born-bornite; cpy-chalcopyrite; ga-galena; lim-limonite; mag-magnetite; mal-malachite; mo- molybdenite; py-pyrite; po-pyrrhotite; spec-specularite; sph-sphalerite

Notes: Analyses of steel milled samples prepared by GSB. AR/MS = Aqua regia digestion - ICP/MS; FA = Lead fire assay-ICP finish; ACM = ACME Analytical, Vancouver.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