## Location/Identification

**MINFILE Number:** 082ESW030
**National Mineral Inventory Number:** 082E6 Ag1
**Name(s):** **BEAVERDELL**
BEAVERDELL MINE, HIGHLAND-BELL, BELL (L.2343), HIGHLAND LASS (L.2341), TECH, LASS

**Status:** Past Producer
**Mining Method** Underground
**Regions:** British Columbia
**BCGS Map:** 082E045
**NTS Map:** 082E06E
**Latitude:** 49 25 56 N
**Longitude:** 119 03 40 W
**Elevation:** 1524 metres
**Location Accuracy:** Within 500M

**Mining Division:** Greenwood
**Electoral District:** West Kootenay-Boundary
**Resource District:** Arrow Boundary Forest District

**UTM Zone:** 11 (NAD 83)
**Northing:** 5477551
**Easting:** 350560

**Comments:** The Beaverdell is located 1.9 kilometres east of the town of Beaverdell. The location given is the centre of the Bell Crown Grant Lot 2343. The underground workings (2900 level) plot near the centre of Crown Grant Lot 3960s when they are projected to surface.

## Mineral Occurrence

**Commodities:** Silver, Lead, Zinc, Gold, Cadmium, Copper

**Minerals**
**Significant:** Galena, Sphalerite, Pyrite, Tetrahedrite, Pyrargyrite, Chalcopyrite, Polybasite, Acanthite, Silver, Arsenopyrite, Pyrrhotite
**Associated:** Quartz, Calcite, Fluorite
**Alteration:** Chlorite, Clay, Calcite
**Alteration Type:** Propylitic, Argillic
**Mineralization Age:** Eocene

**Isotopic Age:** 50 Ma **Dating Method:** Lead/Lead **Material Dated:** Galena

**Deposit**
**Character:** Vein, Shear
**Classification:** Hydrothermal, Epigenetic
**Type:** I05: Polymetallic veins Ag-Pb-Zn+/-Au
**Shape:** Bladed **Modifier:** Faulted
**Dimension:** 150x1x0 metres **Strike/Dip:** 045/50S
**Comments:** Ore shoots up to 150 metres long were intersected. The Bell vein averages 0.9 metre and the Lass vein averages 1.5 metres width. Age date: Canadian Journal of Earth Sciences, Vol. 19, No. 6, p. 1276.

## Host Rock

**Dominant Host Rock:** Plutonic

| Stratigraphic Age | Group | Formation | Igneous/Metamorphic/Other |
|---|---|---|---|
| Permian | Anarchist | Wallace | ------ |
| Jurassic | ------ | ------ | Westkettle Batholith |
| Eocene | ------ | ------ | Unnamed/Unknown Informal |

| Isotopic Age | Dating Method | Material Dated |
|---|---|---|
| ------ | ------ | ------ |
| ------ | ------ | - |
| 50.6 +/- 1.5 Ma | Potassium/Argon | Whole rock |

**Lithology:** Granodiorite, Quartz Latite Dike, Andesitic Tuff, Andesitic Lava, Hornblende Diorite Porphyry, Olivine Gabbro, Hornblendite

**Comments:** A quartz latite (Idaho-type) dike has been dated as Eocene age (Canadian Journal of Earth Sciences, Vol. 19, No. 6, page 1267).

## Geological Setting

| | | | |
|---|---|---|---|
| **Tectonic Belt:** | Omineca | **Physiographic Area:** | Okanagan Highland |
| **Terrane:** | Plutonic Rocks, Harper Ranch | | |
| **Metamorphic Type:** | Regional | **Relationship:** | Pre-mineralization |
| **Grade:** | Greenschist | | |

## Inventory

**No inventory data**

## Summary Production

| | | Metric | | Imperial | |
|---|---|---|---|---|---|
| | **Mined:** | 1,198,829 | tonnes | 1,321,482 | tons |
| | **Milled:** | 1,170,226 | tonnes | 1,289,953 | tons |
| **Recovery** | Silver | 1,076,005,759 | grams | 34,594,388 | ounces |
| | Gold | 520,197 | grams | 16,725 | ounces |
| | Zinc | 13,900,078 | kilograms | 30,644,426 | pounds |
| | Lead | 11,598,238 | kilograms | 25,569,738 | pounds |
| | Cadmium | 58,171 | kilograms | 128,245 | pounds |
| | Copper | 11,657 | kilograms | 25,699 | pounds |

## Capsule Geology

The former Beaverdell mine on the Bell (Lot 2343) Crown grant, is located 1.25 kilometres northwest of the summit of Mount Wallace and 3.00 kilometres east of Beaverdell, British Columbia (Assessment Report 15704).

Initial prospecting began in the Beaverdell area in the late 1880s. The first ore was shipped in 1896. The major producing mines in the Beaverdell silver-lead-zinc vein camp, from west to east, were the Wellington (082ESW072), Sally and Rob Roy (082ESW073), Beaver (082ESW040), and Beaverdell (082ESW030), with numerous other small workings throughout the area. Production commenced on the Highland Lass in 1922. In 1930, R.B. Staples and associates obtained control of the Bell and Highland Lass, however production was recorded separately until the purchase was complete in 1936. Production continued under the amalgamated Highland-Bell mine owned by Highland-Bell Ltd. Highland-Bell Ltd. was purchased by Leitch Gold Mines Ltd. in 1946 but operations continued as the Highland-Bell mine. In 1953, a down-faulted section of the Lass vein system was found 229 metres vertically lower and developed by a 1600-metre adit. Teck Corp. assumed control of the mine in 1970. In 1986 and 1987, property exploration by Teck Corp. located an eastward ore extension with increased gold content on the lower (2900) level. This included an ore block containing 5442 tonnes grading 1371 grams per tonne silver (Assessment Report 15790). Production ceased in 1991.

Granodiorite of the Westkettle batholith underlies most of the area. It has been intruded by small quartz monzonite porphyry stocks including the Beaverdell, Tuzo Creek, Eugene Creek and Carmi stocks. Other granitic porphyry stocks that intrude the Westkettle batholith are the Beaverdell porphyry. These have been dated by potassium- argon methods as Eocene (Watson, P.H. (1981): Genesis and zoning of silver-gold veins in the Beaverdell area, south-central British Columbia; Leary, G.M. (1970): Petrology and structure of the Tuzo Creek molybdenite prospect near Penticton, British Columbia and Exploration in British Columbia 1995, pages 124-126. The Westkettle batholith has been correlated with the Nelson intrusions that has been dated by potassium-argon and uranium-lead methods as Middle Jurassic. The Westkettle batholith contains remnants of pendants and/or screens of metamorphosed Wallace Formation. The Wallace Formation is believed to be correlative with the upper sections of the Carboniferous to Permian Anarchist Group. Lithologies include metamorphosed andesitic tuffs and lavas, hornblende diorite porphyries, olivine gabbro and hornblendite, hornfels and minor limestone. The contact between the Wallace Formation and the Westkettle batholith is sinuous, trending north with gentle east dips. These are unconformably overlain by Oligocene tuffs and conglomerates and Miocene plateau basalts. Westkettle granodiorite or Beaverdell quartz monzonite are the dominant hostrocks. Mineralization rarely extends into the Wallace Formation to the east.

A series of dikes, ranging in composition from quartz latite and quartz monzonite porphyries to hornblende andesite porphyries, are found throughout the area. In the Beaverdell camp, fine-grained, brown andesite dikes, referred to as Wellington-type dikes, are believed to be pre-mineralization. One of these was dated by potassium-argon methods at 61.6 +/- 2.2 Ma (Watson, P.H., 1981). Quartz latite dikes are referred to as Idaho-type dikes and thought to be syn or post-mineralization. One of these has given a potassium-argon age of 50.6 +/- 1.5 Ma (Watson, P.H., 1981).

Beaverdell silver-rich veins are found in a 3.0 by 0.8 kilometre belt, referred to as the Beaverdell silver-lead-zinc vein camp. Five distinctly separate quartz vein systems are arranged roughly en echelon in this structural zone. The west-half contains the Wellington (Lot 2621), Sally (082ESW075,

Lot 2092) and Rob Roy (Lot 2093, also part of Sally) systems which all strike east and dip from 70 degrees south to vertical. The Wellington and Sally each comprise two separate veins and the Rob Roy three. In the central part of the zone, the Bell (082ESW030, Lot 2343) comprises two veins which strike east to northeast and dip south to southeast. The eastern part of the zone contains the upper and lower sections of the Lass (082ESW133) and Highland Lass (Lot 2341, also part of the Bell) vein which strikes northeast and dips 50 degrees southeast.

In general, quartz breccia veins and stockworks are so complex that continuous mineralized sections are a maximum of a few metres before being faulted or disrupted. Nevertheless, some mineralized zones have been found that extend up to 150 metres horizontally. Faults have been classified into five types based on their orientation, with each type having common orientation, kind of movement and age relationship: (1) high angle, north striking normal faults, (2) low angle, north trending strike-slip faults, (3) northeast-striking, high angle normal faults (terminal faults), (4) northeast-trending 'slice' faults and (5) crossfaults. The northeast-striking, high angle normal faults pose the greatest obstacle to systematic exploration and mining, as these faults are commonly spaced a few metres apart dividing veins into short segments in a northwest-downward direction.

Vein-type mineralization of the Beaverdell camp is characterized by a high silver content. Mineralization is composed of galena, sphalerite and pyrite with lesser amounts of arsenopyrite, tetrahedrite, pyrargyrite, chalcopyrite, polybasite, acanthite, native silver and pyrrhotite. The gangue minerals in veins are mainly quartz with lesser amounts of calcite, fluorite and sericite with rare barite. 'Ore ground' has been described as propylitic altered granodiorite, quartz diorite and quartz monzonite of the Westkettle batholith, up to 15 metres wide. These zones are characterized by sericite, clay minerals, chlorite, calcite, epidote and hematite. The fault-bounded veins commonly have a banded texture defined by outer, crudely parallel sulphide stringers. The wallrocks are brecciated and sheared over 30 to 150 centimetres width adjacent to veins. Weak sericite alteration of feldspars is pervasive in the Westkettle batholith.

The interpretation of galena lead-lead isotope age data coupled with geometrical and age relationships between dikes and veins suggests mineralization was formed around 50 Ma, coeval with Eocene stocks (Canadian Journal of Earth Sciences, Vol. 19, No. 6, pages 1264-1274, 1982).

The Beaverdell mine is composed of the Highland Lass (Lot 2341) past producer (082ESW133) and Bell (Lot 2343) where the Upper and Lower Lass vein system were mined and which have accounted for the majority of production. Most of the veins are hosted in granodiorite of the Westkettle batholith. Some mineralization locally extends for short distances into Wallace Formation rocks which overlie the batholith at the eastern end of the mine area, although the mineralized structures tend to horsetail and disperse.

The mineralized quartz veins occupy fissures along east-trending faults in the western part of the mine area and along northeast- trending faults in the eastern portion of the system (part of Bell, Upper Lass, Lower Lass). Towards the east the veins generally exhibit progressive increases in width, and intensity and extent of wallrock alteration. Propylitic alteration is found in the wallrock up to 8 metres from the veins. Thin section studies show amphiboles almost entirely converted to chlorite and feldspars replaced by clay and calcite. The Bell and Lass veins average 0.9 and 1.5 metres wide respectively, but are rarely continuous for more than 5 to 10 metres without offset.

A series of widely spaced, north to northeast striking, southeast-dipping faults divide the mineralized system into large blocks, often with up to 100 metres of vertical displacement between them. The West Terminal fault separates the Bell and Upper Lass veins and the East Terminal fault separates the Upper and Lower Lass vein. The East Terminal fault has displaced downwards the eastern- half of the Lass vein (Lower Lass) by 213 metres. The veins are chopped into small segments by northeast striking, closely spaced normal faults which flatten the dip to the northwest and generally show less than a metre displacement.

Major metallic minerals in the quartz veins are galena, native silver and pyrrhotite. The gangue material is mainly quartz with some altered wallrock fragments included in the vein and small concentrations of calcite and occasional fluorite. Some supergene silver mineralization is present, chiefly as native silver wires and plates. Native silver is especially abundant close to fault intersections. However, most of the mineralization is of hypogene origin.

Two zones of distinctive mineralization are recognized in the Lass vein system. The boundary between these two zones trends north and lies within the Lower Lass, about 120 metres east of the East Terminal fault. In contrast to the lower eastern part (Lower Lass), the upper western portion (Upper Lass) of the vein system is characterized by high silver and moderate zinc and lead values, more gangue, and thinner veins within multiple vein and stringer zones. The lower east end of the Lower Lass however, contains high gold, moderate to high zinc and lead values and low silver values. Silver associates with galena, sphalerite and antimony sulphosalts and gold associates with pyrite and chalcopyrite.

Reserve figures are not computed at the Beaverdell mine due to the extensively faulted vein, but in 1989 approximately 3400 tonnes of ore was milled per month.

The Beaverdell mine was the longest producing mine in the area; almost continuously between 1913 and 1991. Over this period, 1,198,829 tonnes of ore were mined from which 1,076,005,759 grams of silver, 520,197 grams of gold, 11,598,238 kilograms of lead, 13,900,078 kilograms of zinc and 58,171 kilograms of cadmium were recovered.

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|---|---|---|---|---|---|
| **Date Coded:** | 1985/07/24 | **Coded By:** | BC Geological Survey (BCGS) | **Field Check:** | N |
| **Date Revised:** | 2008/02/21 | **Revised By:** | Karl A. Flower (KAF) | **Field Check:** | N |