Site Description

Comstock Mining District

(updated 2012)

Geologic setting: Adapted from LaPointe and Price (2009): The Comstock Mining District, with its extensive underground and surface operations, is located in the Virginia Range SE of Reno. The range consists of Oligocene to Miocene volcanics overlying Mesozoic metamorphic rocks and Cretaceous granodiorite. Andesitic to dacitic volcanics erupted from 18 to 8 Ma, while rhyolitic and basaltic (bimodal) volcanism continued to 1 Ma. Davidson Diorite was intruded during the andesitic eruptions, and now forms Mt. Davidson west of Virginia City. The volcanic system waned, but hot water continued through fractures, altering and mineralizing the broken rock much like the Steamboat Hot Springs hydrothermal system. Hydrothermal systems also deposited the gold and silver that led to development of the Comstock Mining District.

Geothermal features: Water circulation through the Comstock was erratic, with numerous clay seams sealing off flow. Cutting a clay seam could release dammed-up bodies of water and flood the mine workings. Seams greatly inhibited the upward convective flow of hot water. No hot springs are found along the Lode's surface croppings, and water encountered in the upper workings was cold, suggesting that upward flow of hot water was feeble compared to the downward percolation of meteoritic water. The "perched," imprisoned nature of the water is illustrated by the effect of Sutro Tunnel drainage: once the water level fell below Sutro Tunnel elevation, water never rose to that level again (as long as the workings remained open to observation), even after pumping had stopped.

The restricted flow strongly suggests that volcanic and intrusive wall rocks were the source of heat, rather than convective transport of distant hot water. Exothermic reactions involving vein materials have been proposed as a possible heat source, but the low acidity, relatively unmineralized water, and rarity of exothermic reaction products suggest that little heat has been generated by this mechanism.

The Comstock’s silver-gold mines were known for their extremely hot, difficult working conditions (Lord, 1883, p. 389-406); the miners commonly worked in temperatures of 38-51°C. Church (1879, p. 289) considered the Comstock mines "to be the hottest in the world." Smith (1943, p. 245) stated that "no other mines in the world have encountered such heat and such floods of scalding water." Because of variations in ventilation, air temperatures in the workings varied considerably over short distances and are difficult to interpret. Rock temperatures were also modified by ventilation and water removal; thus temperatures taken in drill holes or immediately after a rock face was exposed

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are more useful. As Locke (1912) put it, the "temperatures are deranged by the presence of the mine workings which make possible the presence of the observer."

Sutro Tunnel: Generally, rock temperatures in these mines increased 1.94°C for every 30.5 m of depth (Becker, 1882, p. 230; figure). This gradient persisted for some distance away from the Lode, but water temperatures within the Sutro Tunnel rose rapidly as the Lode was approached, even though the tunnel elevation remained relatively constant (figure). Present-day water flowing from the Sutro Tunnel portal is 28°C (Glancy and Katzer, 1975).

Yellow Jacket Mineshaft: The highest rock temperature recorded was 75°C from a dry drill hole at 900m in the Yellow Jacket Mine (diary, Superintendent Thomas G. Taylor). Mr. Cosgrove, foreman of the Yellow Jacket, measured rock temperatures of 60 and 58°C on the 670-m level.

New Yellow Jacket Mineshaft: The highest temperature of any large water flux was recorded during the flooding of the 900-m New Yellow Jacket shaft in November, 1880 (Becker, 1882, p. 230). A drill hole struck 77°C water under considerable pressure at 939 m depth and soon flooded the mine. On February 13, 1882, a flood of 69°C water from the 853 m level of the Exchequer Mine again drowned the pumps in the New Yellow Jacket shaft. All mines in the vicinity were flooded, the water rising to the level of the Sutro drainage tunnel (annual report, Superintendent Thomas G. Taylor, July 1, 1882). A small flow of water in the cast crosscut on the 600-m level of the Crown Mine had a temperature of 69°C (Church, 1879, p. 291).

Ophir Mineshaft: Temperatures of about 54°C were recorded at numerous locations between 580 to 610 m depth in the Ophir, Chollar, Potosi, Crown Point, and other mines. These temperatures were measured in drill holes immediately after a hole was finished. The rock surface temperatures of workings in the same area were 51°C or less.

Savage Mineshaft, Hale and Norcrosse Mineshaft: The body of water that flooded the Savage and Hale, and Norcross Mines in 1877(?) still had a temperature of 68°C two years later (Church, 1879, p. 291) even after a million metric tons of water had been removed.

C&C Mineshaft: From the Comstock Historical Marker No. 1 (Marshall, 2009): “The C&C was the largest and most modern of all Comstock era shafts and was located on the grounds of the California Mine. It was the joint property of the Consolidated Virginia and California Mining Companies. It was used to extract the “Big Bonanza” ores of both mines. The shaft was started in the mid-1870s and was part of a line of vertical shafts sunk in an attempt to tap the Comstock Lode at depths of 3,000 feet beneath the surface.”

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Goudt Curry Mineshaft: No additional information is available.

Sutro Springs: The Mariner dataset (unpubl., Mariner, 2001; see Penfield et al., 2012) records Sutro Springs at 33°C, with geothermometer values of 58°C (Ca-Na-K; Fournier and Potter, 1979) and 81°C (chalcedony; Fournier, 1977). The sample was taken from "above the pool adjacent the road" in Kate Peak andesite.

Leasing information:

N/A

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