
Amalgamated Mill Site Marion County, Oregon Feasibility Study

Prepared for
Persis Corporation

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CHM HILL

2 Site Characterization

2.1 Site Location

The Amalgamated Mill is located in Marion County at the headwaters of the Little North Santiam River near Elkhorn, Oregon, in the Lester Mining District (formerly the North Santiam District). The site location is shown in Figure 2-1. The mill site is approximately 10 miles from the nearest paved road and covers approximately 1-1/2 acres.

The Amalgamated Mill site is located on National Forest System land. The site is adjacent to the Starvation Mill property and the Jawbone Flats property, which are owned by the Friends of Opal Creek. These properties are currently used for educational and recreational purposes, such as day hiking and mountain biking.

The Amalgamated Mill site is adjacent to the southern boundary of the Bull of the Woods Wilderness Area. On March 29, 1996, Senator Mark O. Hatfield, senior senator from the state of Oregon, introduced legislation that would create the Opal Creek Scenic Recreation Area in the Opal Creek Wilderness and Opal Creek Scenic-Recreation Act of 1996 (S 1662). The Amalgamated Mill site is part of the proposed Opal Creek Scenic and Recreation Area.

Public vehicular access to the site via a Forest Service roadway is restricted by a locked gate approximately 3 miles from the site. The access road is rustic, has limited clearances, and is potentially unsafe for vehicular traffic in certain areas. It parallels the Little North Santiam River and crosses several tributaries. Several wooden bridges and half-bridges support a section of the roadway. These structures were built against steep hillsides where the width of the cut into native rock was insufficient to permit traffic.

2.2 Site History

The Amalgamated Mill was built in the 1930s and reportedly operated into the 1940s. The building was crushed by snow in 1949 and subsequently destroyed by fire.

The Amalgamated Mill site is situated within the historic North Santiam Mining District, where a number of mines were developed in the altered igneous and volcanic rocks. The primary minerals in the region were metal sulfides and some silver and gold. The metal sulfide minerals included sphalerite (zinc sulfide), galena (lead sulfide), chalcopyrite (copper-iron sulfide), and pyrite (iron sulfide). Mined ore from the Morning Star and the Ruth mines was the principal mineral processed at the Amalgamated Mill and the Starvation Mill sites.

Mineral processing at the Amalgamated Mill included crushing the mineral-enriched mined rock to an optimum size for separating out the minerals of interest. The rock was crushed by running it first through a jaw crusher (which reduced the mined ore to a size less than 1 inch), then through a roll crusher (which further reduced the material to a size less than 1/4 inch), and finally into a ball mill (which reduced the material to an optimum size of 65 mesh [65 openings per square inch]). A froth flotation/separation system was used to extract the desired minerals from the crushed rock.

Residue from the milling process, defined as mill tailings, was discarded downhill from the mill in an unlined, uncovered area partially separated from Battle Ax Creek by a log-and-wood-timber retaining wall. The mill tailings sit on a rock bench carved out of the underlying rock by blasting. According to historical site data, the downstream section of the wall collapsed, allowing tailings to slough towards the creek. In fall, 1991, as a temporary response, the Forest Service, through its contractor, Hart Crowser, Inc., covered the tailings, after first removing the tailings from the edge of Battle Ax Creek.

2.3 Physical Setting

The physical setting of both the Amalgamated Mill and the Starvation Mill areas are discussed in this section. The Starvation Mill area is included because it is evaluated later in this report as the location for an engineered fill for the Amalgamated Mill tailings and mined ore. The rationale for selection of this location is presented in Section 4.2.

Much of the information presented below is excerpted from the remediation report for the Starvation Mill site prepared by EMCON, Northwest Inc. (*Metal and Hydrocarbon-Contaminated Soil Remediation, Shiny Rock Mine, Marion County, EMCON, 1993*).

2.3.1 Topography

Site topography is characterized by dendritic drainages that form steep, narrow valleys. Elevations in the immediate vicinity of the site range from 1,600 to 4,400 feet above mean sea level. The Amalgamated Mill site is at approximately 2,300 feet, as is the Starvation Mill site. Hill slopes in the area commonly are as steep as 35 degrees. (EMCON, 1993)

As part of this FS, the Starvation Mill site was evaluated as the potential location for an engineered fill by CH2M HILL's geotechnical engineers. The results of this evaluation are presented in Appendix A.

2.3.2 Hydrology

Surface drainage from the Amalgamated Mill site drains to Battle Ax Creek. The Starvation Mill site is drained by Opal Creek and, to a lesser extent, by Battle Ax Creek. These creeks meet within 1/4 mile downstream of the Starvation Mill site and form the Little North Santiam River (Figure 2-2). Approximately 0.75 mile downstream of the confluence of these two creeks, Stony Creek flows into the Little North Santiam River from the south. Near the west end of the property, Gold Creek flows into the river from the north. (EMCON, 1993)

As part of this FS, the regional hydrology was evaluated to estimate the water level of Opal Creek that would result from a 100-year flood event. This analysis was conducted to determine whether the proposed engineered fill site at Starvation Mill would be above the 100-year flood elevation. The methodology used and the results of this analysis are presented in Appendix B. This analysis indicates that the 100-year flood event of Opal Creek would result in a water level elevation approximately 35 feet below the elevation of the Starvation Mill. Figure 2-3 shows a cross section through Starvation Mill to Opal Creek, the water level measured by CH2M HILL in April 1996, the February 1996 high water elevation based on visual observations by CH2M HILL in April 1996, and the estimated 100-year flood water elevation.

2.3.3 Geology

2.3.3.1 Region

The site is located within the Western Cascades Subprovince. Rocks in the area are volcanic and volcanoclastic of Eocene to late Miocene age, partially covered by Pliocene to Recent volcanics erupted from the High Cascades. Geologic units include (from youngest to oldest) the Sardine Formation, the Little Butte Volcanic Series, and the Colistin Formation. The volcanic stratigraphy is cut by many Tertiary-age intrusions. Northwest-trending faults are common throughout the Western Cascades Subprovince. (EMCON, 1993)

2.3.3.2 Site

The following text is excerpted from EMCON, 1993. Full references are included in Section 7.

The Amalgamated Mill site and the Starvation Mill site are located within the historic North Santiam Mining District. All rocks in the district are assigned to the Sardine Formation (Olson, 1978), which consists of andesitic flows and laharic breccias (Pollock, 1984). Intrusive rocks in the area are fine-grained and vary in composition from basalt to rhyodacite (Olson, 1978). Mineralization in the district comprises northwest trending sulfide veins plus disseminated porphyry copper. The most abundant metallic ores are copper, lead, and zinc. The most common sulfide minerals are chalcopyrite, specularite, pyrite, sphalerite, and galena (Olson, 1978).

According to visual observations by CH2M HILL geotechnical engineers, the sites generally consist of thin layers of alluvial/colluvial materials underlain by bedrock. At the Amalgamated Mill site, the alluvial/colluvial materials appear to be a few feet in thickness. At the Starvation Mill site, based on the work performed by EMCON in 1992, the alluvial/colluvial materials appear to be at least 20 feet thick.

2.3.4 Hydrogeology

There is little information available about the hydrogeology in the area of the Amalgamated Mill and the Starvation Mill. No well logs are on file with the Oregon Water Resources Department for wells within or near the site. Because surface water is abundant at the site, it is unlikely that any wells have been constructed. (EMCON, 1993)