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THE WINKELMAN ALUNITE DEPOSIT, MARYSVALE, UTAH

The Winkelman alunite deposit is about 4½ miles northwest of Marysvale, in sections 2 and 3, T. 27 S., R. 4 W., Piute County, Utah. The patented claims were first located for copper, but the alunite was discovered during the First World War and some 30 carloads was mined for potash. Several small quarries and a 100-foot tunnel were opened at this time, which, with the earlier copper tunnel, are the only workings. The Bureau of Mines, however, completed eight exploratory diamond-drill holes in 1943, the cores of which provided much helpful information on the subsurface geology. The area was mapped and the outcrops and workings studied at various times between 1938 and June 1943 by the Geological Survey.

The Winkelman is a replacement type deposit contained entirely within a thin-bedded tuff and breccia in the Bullion Canyon volcanics of early Tertiary age. The unaltered or slightly altered tuff is a red, well-bedded rock showing a tendency to split into thin plates. Except for a very thin latite flow, this tuff is the only type of rock exposed in the mapped area, and it generally strikes north to northeast, with an east or southeast average dip of 20°. Drill cores show that a porphyritic latite underlies the tuff, but nowhere does it crop out. The western part of the mapped area consists of spherulitic glass talus derived from the red phase of the Mount Belknap rhyolite, a younger Tertiary formation unaffected by the alunite mineralization.

Of the faults within the alunite, the most prominent strike about northeast and dip steeply either southeast or northwest. Some bedding-plane faults are also believed to be present, including one at the tuff-latite contact, where drilling indicated that the ore bottoms abruptly. Movement along this or along a high-angle normal fault to the west may also be responsible for the topographic juxtaposition of the Mount Belknap rhyolite and the Bullion Canyon volcanics. Various evidences, including apparent offsets, unexplained changes in dip, and severe local brecciation suggest the existence of other faults, details of which have not yet been determined.

The ore occurs in the tuff of the Bullion Canyon volcanics as several alunitized and silicified masses, between which the tuff is only slightly altered. The highest grade material is exceedingly fine-grained and waxy and breaks with a conchoidal fracture. In color it may vary from pure white through pink to a yellowish-green and is usually mottled with black. It is heavy and tough but easily scratched with a knife. Intermixed fine-grained quartz or chalcedony is always present and helps make these masses more resistant to weathering than the surrounding rock. For this reason the alunite masses are topographically prominent, whereas the tuff is usually covered by thick talus.

The shapes of the ore bodies have not been thoroughly ascertained but are believed to be similar to that of the one at the main quarry, which apparently is an almost vertical, flat-bottomed plug or finger. The localization and shape of the ore bodies are apparently controlled by the breccia areas and the bedding of the tuff. The former were probably channels through which the mineralizing solutions could circulate with ease. Eventually the solutions replaced the breccia fragments and filled the available open space with alunite. Part of the solutions also soaked into the surrounding tuff and replaced it, but only along the most susceptible layers was this replacement sufficient to make ore. Except for the latite contact at the bottom, the ore boundaries are gradational.

The reserve estimates are based primarily on drill core assays of available alumina, Al_2O_3, much of which may be in the form of clay rather than of alunite. The known thicknesses of the alunite, the areas of blocks A, B, and C (pl. 2), and a factor of 12 cubic feet to the ton were used to calculate the indicated reserves:

Block	Indicated tonnage
A	200,000
B	530,000
C	280,000
Total	1,010,000

Grade: 20-21 percent Al_2O_3

By extrapolation to unexplored areas underlying surface exposures similar to those mapped, an "inferred" reserve of about 1,000,000 tons can be added.