



CONTACT INFORMATION  
Mining Records Curator  
Arizona Geological Survey  
416 W. Congress St., Suite 100  
Tucson, Arizona 85701  
602-771-1601  
<http://www.azgs.az.gov>  
[inquiries@azgs.az.gov](mailto:inquiries@azgs.az.gov)

The following file is part of the Grover Heinrichs Mining Collection

#### **ACCESS STATEMENT**

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

#### **CONSTRAINTS STATEMENT**

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

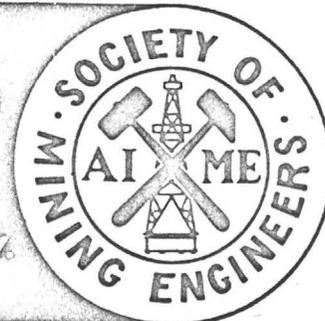
The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

#### **QUALITY STATEMENT**

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

**SOCIETY OF MINING ENGINEERS**  
*of AIME*

345 EAST 47TH STREET, NEW YORK 17, N. Y.



MINERALIZATION OF THE SILVER STAR STOCK

M. T. Heath BA, MA, *ph D candid*  
University of Washington  
Department of Geology  
Seattle, Washington

This paper is to be presented at the Annual Meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers, Los Angeles, California, February 19-23, 1967.

Permission is hereby given to publish with appropriate acknowledgments, excerpts or summaries not to exceed one-fourth of the entire text of the paper. Permission to print in more extended form subsequent to publication by the Institute must be obtained from the Secretary of the Society of Mining Engineers of A.I.M.E.

If and when this paper is published by the Institute, it may embody certain changes made by agreement between the Technical Publications Committee and the author, so that the form in which it appears here is not necessarily that in which it may be published later.

**Preprint distribution by coupon only — see other side for ordering information.**

## Mineralization of the Silver Star Stock

by M. T. Heath

### INTRODUCTION

Numerous mineral deposits of somewhat limited extent and grade are associated with most of the Tertiary granitic intrusions in the Cascade Mountains of Washington. The Silver Star area in southwestern Washington is typical of many of these small, and at the present time, economically marginal mineralized areas. Small but fairly high grade deposits of copper, lead, and zinc sulfides are found within the borders of a small granodiorite stock, and in surrounding Tertiary volcanics. This paper will discuss these deposits and their genetic relationships with the intrusion.

### GENERAL INFORMATION

The Silver Star area is located in the western foothills of the southern Cascades of Washington and is shown in Figure 1.

Mining interest in this area extends back over seventy-five years and several mines have had a small production history. Economic development is mostly limited to numerous small prospect adits and shafts, and at the time of this report no properties are in operation.

Felts (1939) described the petrology of the stock, and Magill and Appling (1957) investigated one property in the area as part of a U. S. Bureau of Mines study of copper resources of the Cascade Mountains. This report, part of the author's Masters thesis in Mining Engineering at the University of Washington, is the only known work covering the deposits in the area.

### GENERAL GEOLOGY

The Silver Star stock, about ten miles long by two miles wide, has intruded a flat-lying Eocene to Miocene series of andesites, tuffs, and flow breccias. These volcanic units along with later basalts are the most widespread lithologies in southwestern Washington. The stock is very similiar, both chemically and petrographically, to other mid-Tertiary granitic intrusions further north in the Cascades-- mostly medium grained leucocratic granodiorite that grades into more mafic quartz diorite near its borders. This is the only intrusion within a radius of thirty-five miles, and is also the only known location of mineral deposits within the same radius.

DEPOSIT GEOLOGY

Mineral deposits are found in both the exposed granodiorite and in the intruded volcanics. Structural control is by fracturing and mineralization occurs in two types: narrow, continuous fracture-filling veins, and stockworks or breccia zones. The principal mineralization of economic interest is sulfides of copper, lead, and zinc.

The fracture-filling veins predominate in the eastern and southern portions of the area. The major deposits are located at the eastern border of the stock and extend well out into the volcanics. Mineralization occurs in andesites and volcanic breccias as far as two and three-quarter miles from the exposed intrusive contact. These veins are very straight and continuous, and tend to be quite isolated. Of the eight significant veins investigated within a six square mile area, all displayed west-northwest strikes and near vertical dips. Widths vary from a few inches to several feet, and sometimes more in volcanic rocks, but are characteristically narrow and seldom show any branching or diverging systems. Faulting does not appear to have been of importance in any of the fractures, but they seem to have undergone dilation, with vuggy cavities common and considerable brecciation and shattering between the solid, well defined walls. Bornite, chalcopyrite, chalcocite, galena, and sphalerite are the



