Some exploration possibilities at the New Almaden quicksilver mine Santa Clara County, California /

Edgar H. Bailey, August 1950

INTRODUCTION

The New Almaden mine, which has yielded about a third of the quicksilver produced in the United States, is 10 miles south of San Jose, California. A study of the entire New Almaden district, begun in 1941 as a part of the Survey's program of strategic mineral investigations, was continued until 1948. In the future the complete results of this study will be embodied in a comprehensive report; however, to eliminate the inevitable time lapse between the completion of the study and publication of the report, some of the material of immediate economic value is being released through placement in open files. Geologic maps of the accessible workings of the New Almaden mine, including most of those above the 850 level, have already been released. This report presents a short description of some of the more easily tested exploration possibilities in the same mine. It is not exhaustive, and does not pretend to be an evaluation of the possibilities of the entire district.

The price of quicksilver, which normally is controlled by a European cartel, was low in mid-1950 when this report was prepared, and virtually all quicksilver mines in the United States had been forced to suspend operation because of the relatively high cost of labor and construction materials and the low grade of known reserves. The New Almaden mine has been shut down since 1945, and no new ore bodies minable at a time of low value of quicksilver have been found in the New Almaden mine since about 1900. The well authenticated production records of the mine prior to this

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time, however, indicate that if new ore bodies comparable in grade to those formerly mined can be found they will be minable even under the existing economic conditions.

The average grade of all ore furnaced at New Almaden by 1900 was about 4 percent quicksilver, and the relatively small amount of lower grade ore removed since that time, although not so completely recorded, would not reduce this average very much. In contrast, ores containing as little as 3 pounds of quicksilver to the ton were successfully mined by open cut methods during the period of high quicksilver value during World War II.

The New Almaden mine area has been explored by about 35 miles of underground workings distributed from the surface to a depth of about 2400 feet. In spite of this extensive exploration, much of which was well planned, the Survey's geologic study indicates the existence of a few unexplored, yet easily tested, areas that are believed to be geologically favorable for the discovery of ore bodies. They remained unexplored largely because of the lack of geologic study of the environment of the known ore bodies and the surrounding areas during the development of the mine between 1850 and 1900.

GEOLOGY

The oldest rocks of the New Almaden mine area are a part of the heterogeneous Franciscan group of Upper Jurassic (?) age. These rocks are folded and intruded by serpentine sills, the margins of which are altered to a quartz-magnesite rock known as silica-carbonate rock. Ore bodies are found in this silica-carbonate rock close to the original intrusive contacts of the sills. Most of the ore bodies that have been mined were along the upper side of the sills close beneath a "capping" of sheared shale; others not quite so large but equally as rich, were along the lower parts of the sills above similar sheared shale. Where the contacts are relatively flat the ore bodies are in the higher parts, as in the crests of domal or anticlinal structures. Where the contacts are steeper the bodies are in places where steep northeasterly trending quartz-carbonate veins are particularly abundant. In both situations the ore was formed by replacement of the silica-carbonate rock along the vein fractures, but generally the veins themselves are virtually barren.

As the ore occurs along the altered margins of the serpentine, the form of the serpentine intrusive is the dominant structure of the mine area insofar as a search for additional ore is concerned. The principal intrusive crops out at the surface in the central part of Mine Hill and in the past has been interpreted as having the form of a cedar tree that expanded irregularly downward, being steep but serrate along its south flank and relatively gently inclined on the north and east. The majority of the ore bodies were found as the result of exploration along the margin of this body and contouring of the surface of the intrusive indicates that at least two unexplored areas remain which might contain ore. These areas (areas A and B of this report) can be probed by drilling 250- to 600-foot vertical holes from the surface.

Other potential ore-bearing areas are suggested by a reinterpretation of the shape of the serpentine intrusive. This irregular mass is now believed to consist chiefly of two main sills that are joined in the upper central part of the mine area first explored and give the appearance of a single intrusive mass. This new interpretation introduces three additional extensive, but little explored, contact areas that can be expected to contain ore bodies in favorable parts. Two contact areas (areas C and D of this report) that appear especially promising can be reached by drilling a few hundreds of feet from the 800 level Day Tunnel.

AREAS SUGGESTED FOR EXPLORATION

Area A.

Area A lies along the upper margin of a serpentine sill at an altitude between 1,000 and 1,150 feet, under and east of the camp area (See figure 1). The upper part of the sill has been explored to the south by the Harry workings and to the west and northwest by the Velasco and North Randol workings. A projection of the contact as explored in these workings indicates that between them there is a northwesterly trending arch, with its apex a little east of the main camp area (see figure 1). Similar structures in other parts of the mine have contained ore bodies. That ore-bearing solutions have penetrated the area is indicated by: (1) A small amount of cinnabar occurs in a dolomite vein at the base of the Camp Shaft, although such veins in most of the mine area are barren. (2) The company surveyors reported finding "cinnabar" and "low grade ore" when the northern part of the Harry 800 level was driven. (3) A little cinnabar occurs in chert at the apex of Church Hill, several hundred feet east of the crest of the arch.

The area could be most easily explored by a series of vertical holes, from 250-600 feet deep, put down from the surface between the camp and the crest of Church Hill.

Area B.

Area B lies along the upper margin of a serpentine intrusive at altitudes between 1,100 and 1,350 feet beneath the saddle northwest of Cemetery Hill (see figure 1). The serpentine surface has been extensively explored to the north and east by the Harry-Cora Blanca workings and to the northwest by the San Francisco workings. Although the margin of the intrusive is not altered to silica-carbonate rock at the surface between these two groups of workings, underground all of the nearest workings are in silica-carbonate rocks which contain small, local ore bodies. The shape of the surface of the intrusive between these two areas cannot be accurately predicted from the available data, but, as is shown by the structural contours on figure 2 the intrusive surface is believed to contain a structural "nose" plunging to the southeast. As similar structures have served to localise ore bodies elsewhere in the mine, this area offers promise for further exploration. It can be most easily tested by drilling vertical holes from 200 to 400 feet long from the surface.

Area C.

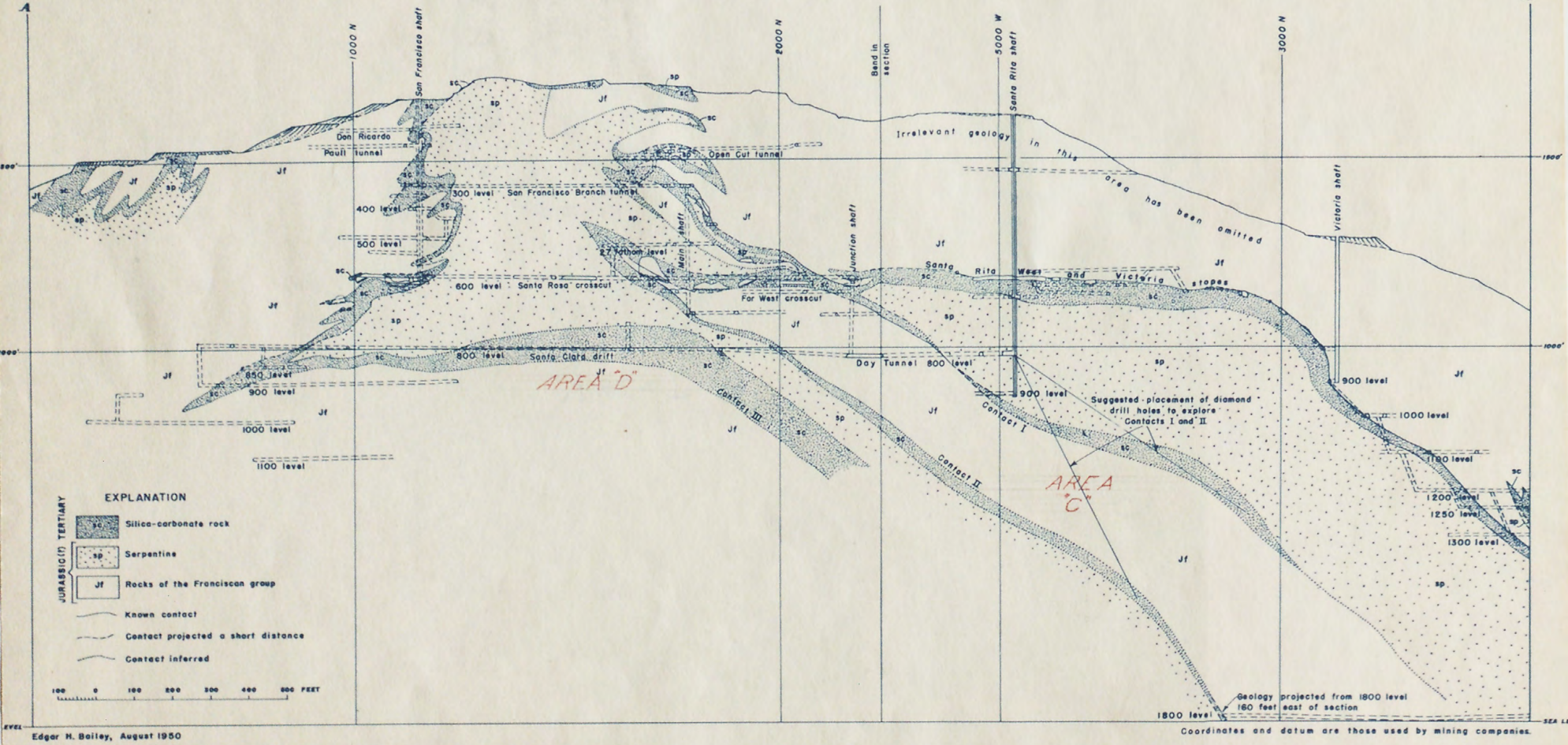
Area C, as shown on figure 2, is northwest of the Santa Rita shaft and between 200 and 600 feet below the 800 level Day Tunnel. Exploration of this area is suggested to test the silica-carbonate rock along the two contacts labelled I and II in the figure. Each of these contact areas contains some ore at and above the Day Tunnel level, but has been little explored below this level. A part of contact I exposed in a drift extending eastward from the base of the Santa Rita shaft on the 900 level contained silica-carbonate rock but no ore, although the drift was driven to search for the downward continuation of ore found on the level above. Below the 900 level this contact is cut 800 feet west of the section on the 1400 level and 450 feet east of the section near the 1800 level of the Santa Rita shaft. Although no silica-carbonate rock was found in either of these last two places, it is not improbable that silica-carbonate rock and ore bodies might be found in the unexplored area between the 900 and 1400 levels. If the lower surface of the sill conforms roughly to its upper surface, it is arched in the area between the 1000 and 1200 levels. Such a structure offers a good possibility for ore. Exploration of this area could be easily carried out by drill holes bearing N. 15°-35° W from the Day Tunnel near its intersection with the Santa Rita Shaft. As the position of the arch is inferred, the inclination of exploratory holes should be governed by what is found in the first hole, which should be inclined downward at no less than 35°.

Contact II forming the upper surface of the lower sill, is even less explored below the Day Tunnel level than contact I. Except for a winze which follows 61 feet down this contact from the Day Tunnel level, no workings penetrate the contact between the Day Tunnel level and a crosscut from the Randol shaft on the 1800 level. A short drift from the end of this crosscut extends westward to within about 160 feet of the line of section shown on figure 2. It explored a shell of silica-carbonate rock about 20 feet thick that was reported by the mine surveyors to contain cinnabar. The distance between these two points down the dip is about 1400 feet, and an equal lateral extent of the silica-carbonate rock is quite possible. Available data are too few to attempt an accurate delineation of this contact or any prediction of where are the most favorable parts along it. It can be most readily explored by drilling from the branch of the 800 level Day Tunnel leading toward the Santa Rita shaft.

Area D.

Area D is in the central part of the mine a short distance below the Day Tunnel and just above the lower contact of a serpentine sill ("contact III" in figure 2). This contact has not been penetrated anywhere near the section line, but its position and attitude is postulated from the arch of silica-carbonate that is penetrated for more than 600 feet by the Day Tunnel. Elsewhere in the mine area the silica-carbonate rock is found only along the margins of the serpentine sills; and as this mass of silica-carbonate is overlain by serpentine it presumably marks the lower side of the serpentine body, and is underlain by rocks of the Franciscan group. Exploration on the 900, 1000, and 1100 levels in the area a little farther south reveals such rocks beneath the contact (see figure 2).

The most favorable part of this contact area is the crestal portion of a dome, which is inferred to lie east of the old "mule barn" cutout in the Day Tunnel. Favorable indications for the existence of ore in this part of the mine are: (1) The Day Tunnel follows several northeasterly trending veins similar to those that generally accompany ore bodies; (2) The highly altered silica-carbonate rock is similar to the rock found along the margins of the stoped out ore bodies; and (3) When the Day Tunnel was driven, cinnabar fines were seen in a spring near the "mule barn". A raise put up here in search of ore penetrated into barren serpentine, but no winze was ever put down to the contact below. The area is favorably situated for exploration by drilling downward and eastward from near the "mule barn", and any ore that is found can be readily exploited through the Day Tunnel.



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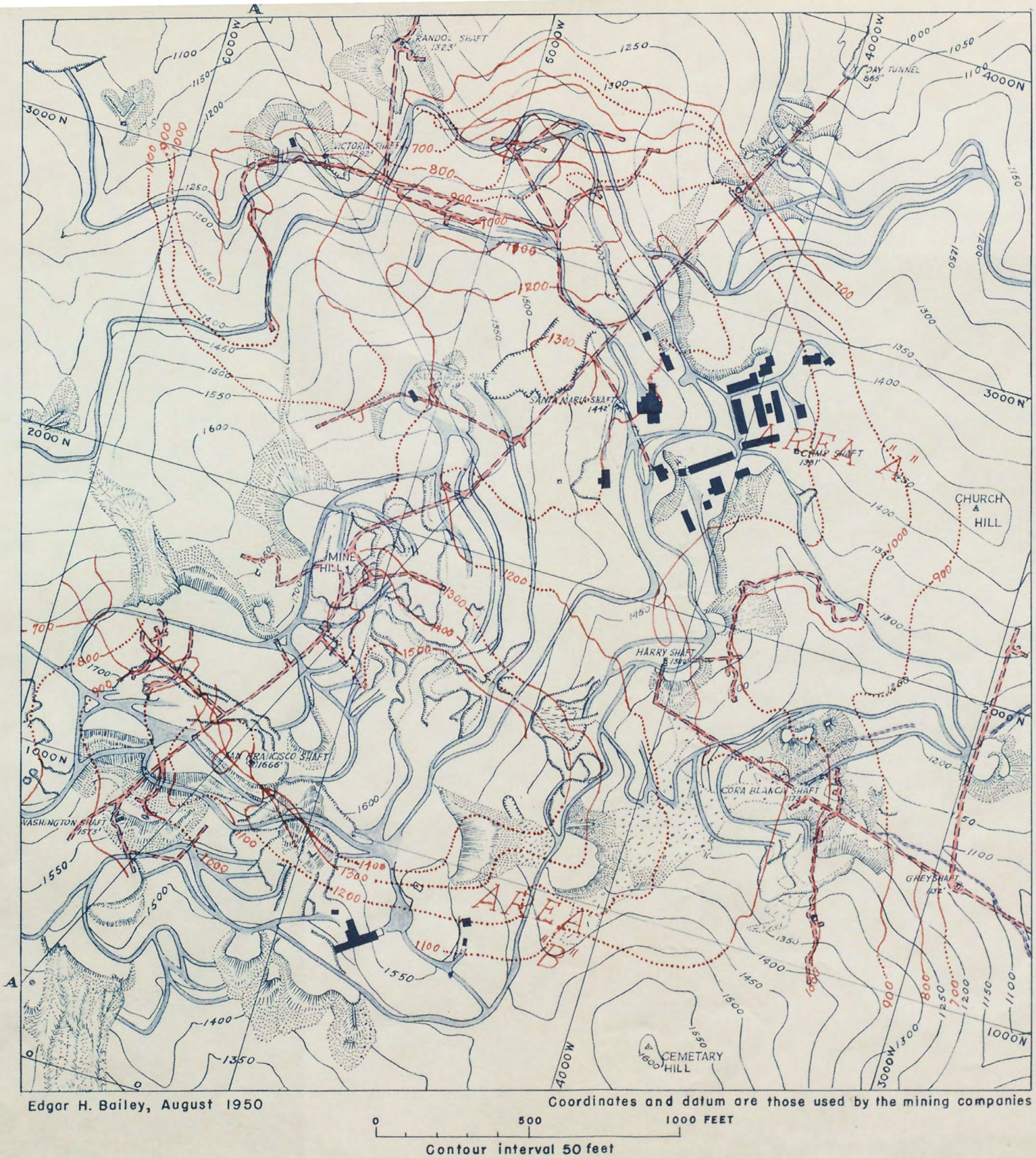
Coordinates and datum are those used by mining companies.

Figure 2. CROSS SECTION THROUGH NEW ALMADEN MINE AREA, SANTA CLARA COUNTY, CALIFORNIA



EXPLANATION

Roads

Underground workings on the 800 level.

Contours on the upper surface of the upper serpentine sill. Solid where known; dotted where projected.

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Coordinates and datum are those used by the mining companies

0 500 1000 FEET

Contour interval 50 feet

Figure 1. TOPOGRAPHIC MAP OF A PART OF THE NEW ALMADEN MINE AREA, SANTA CLARA COUNTY, CALIFORNIA