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J. A. KRUG, SECRETARY

BUREAU OF MINES
R. R. SAYERS, DIRECTOR

REPORT OF INVESTIGATIONS

PEERLESS LEAD-ZINC MINE, GRANT COUNTY, N. MEX.

BY

JOHN H. SOULE'

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PEERLESS LEAD-ZINC MINE, GRANT COUNTY, NEW MEXICO[1/]

By John H. Soulé[2/]

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INTRODUCTION

The Peerless mine was examined by W. R. Storms, an engineer of the Bureau of Mines, on June 2, 1944, in conjunction with a mineral survey of the adjoining Fort Bayard Military Reservation. Storms again studied the mine on January 13, 15, and 16, 1945, to determine the possibilities of finding new ore reserves to replace those depleted by mining. A project to explore the Peerless vein at depths below and to the south of the principal mine workings was proposed. Special attention was given to the possibility of exploring favorable beds in the Magdalena and Lake Valley limestones at points near the Peerless fault.

The proposed project was approved and exploratory work started on January 2, 1946, and was completed on June 5, 1946. The mine was not in operation during the project, and all equipment had been removed.

ACKNOWLEDGMENTS

In its program of exploration of mineral deposits, the Bureau of Mines has as its primary objective the more effective utilization of our mineral resources to the end that they make the greatest possible contribution to

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 4044."

2/ Mining engineer, Bureau of Mines.

national security and economy. It is the policy of the Bureau to publish the facts developed by each exploratory project as soon as practicable after its conclusion. The Mining Branch, Lowell B. Moon, chief, conducts preliminary examinations, performs the actual exploratory work, and prepares the final report. The Metallurgical Branch, R. G. Knickerbocker, chief, analyzes samples and performs beneficiation tests.

Acknowledgment also is made of the assistance rendered by J. H. Hedges, chief of the Tucson Division, Mining Branch, W. R. Storms, engineer-in-charge of the Silver City, N. Mex., field office, and Donald H. Mullen, mining engineer attached to that office.

LOCATION, ACCESSIBILITY, AND OWNERSHIP

The Peerless mine is one-fourth mile east of Central, N. Mex. It can be reached by taking the unpaved Hanover Road from Central for one-fourth mile; this road passes through the Peerless claims. Central is 10 miles east of Silver City on paved U. S. Highway 260 (fig. 1).

The principal part of the mine is in sec. 36, T. 17 S., R. 13 W., although a drift on the 300-foot level extends south into sec. 1, T. 18 S., R. 13 W. This area is the western edge of the Central Mining District.

The Peerless property consists of two patented mining claims - the Peerless and the Peerless No. 2 (mineral survey No. 1999). They are owned by C. B. Munroe of Silver City and E. L. Martin of Socorro, N. Mex., Munroe owning two-thirds and Martin one-third.

PHYSICAL FEATURES AND CLIMATE

Gently rolling hills characterize the topography of the area near the Peerless mine. Altitude at the main shaft collar is about 6,030 feet (fig. 2).

Scant grass and a few scattered junipers and yucca comprise the vegetation on these claims. The annual precipitation is about 17 inches in the form of heavy summer rains and some winter snow. Summers are warm and winters not too severe.

There are no permanent streams nearby. Water stood at about 120 feet below the collars of holes 1 and 2.

HISTORY AND PRODUCTION

Mining in the Central District began early in the 19th century. Copper was produced at the Santa Rita mines during the Spanish regime. A mine near Fierro, N. Mex., a few miles northwest of Santa Rita, produced some copper about 1858. Iron ore was mined and shipped from Fierro in 1891. This date also marks the beginning of lead-zinc mining in the district. Mining has slowly increased, and the district has become an important producer of lead-zinc ores, ranking fourth in the United States in the production of lead-zinc ores and fifth in the production of copper ores.

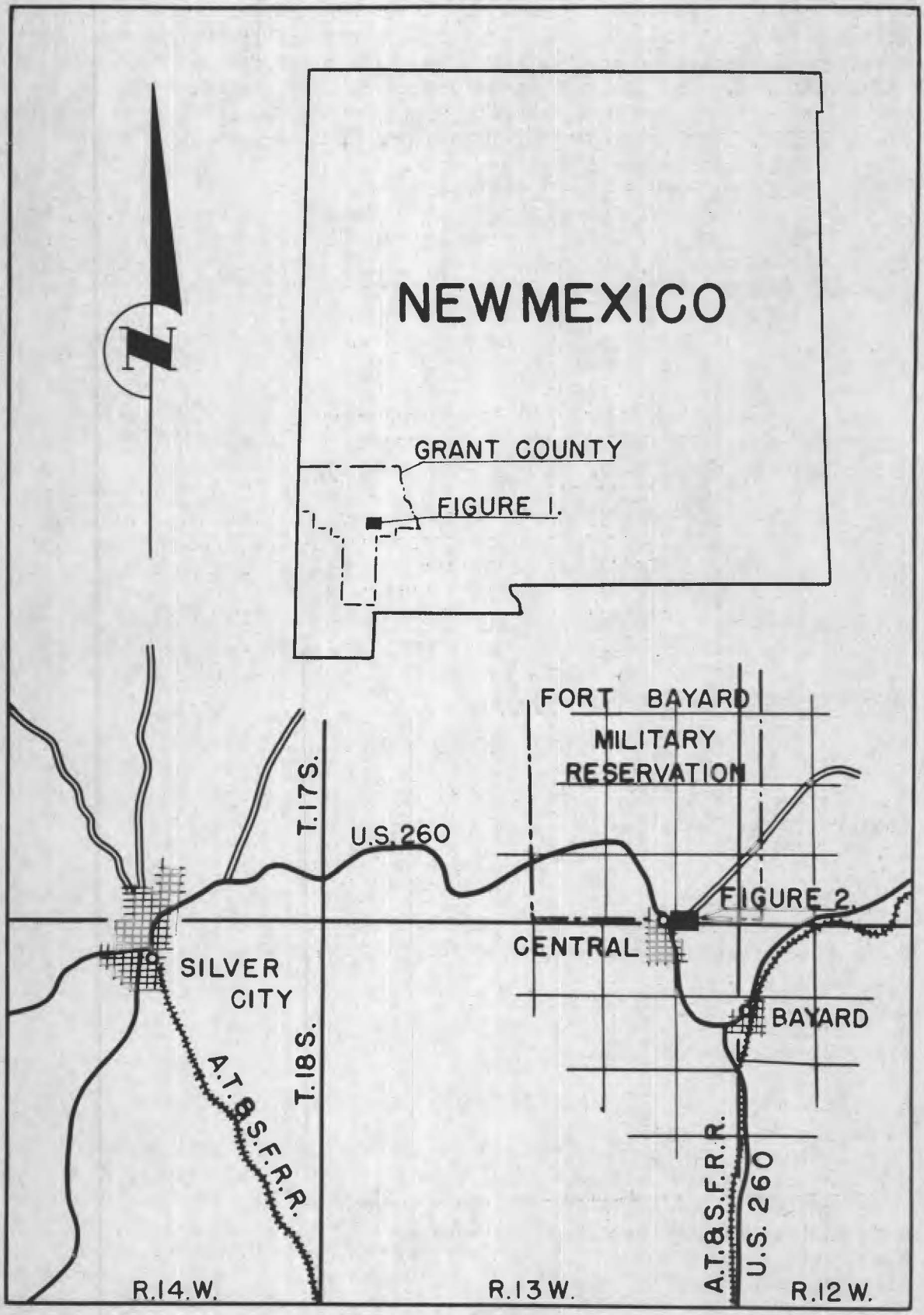

FIGURE 1.—INDEX MAP. PROJECT 15-185

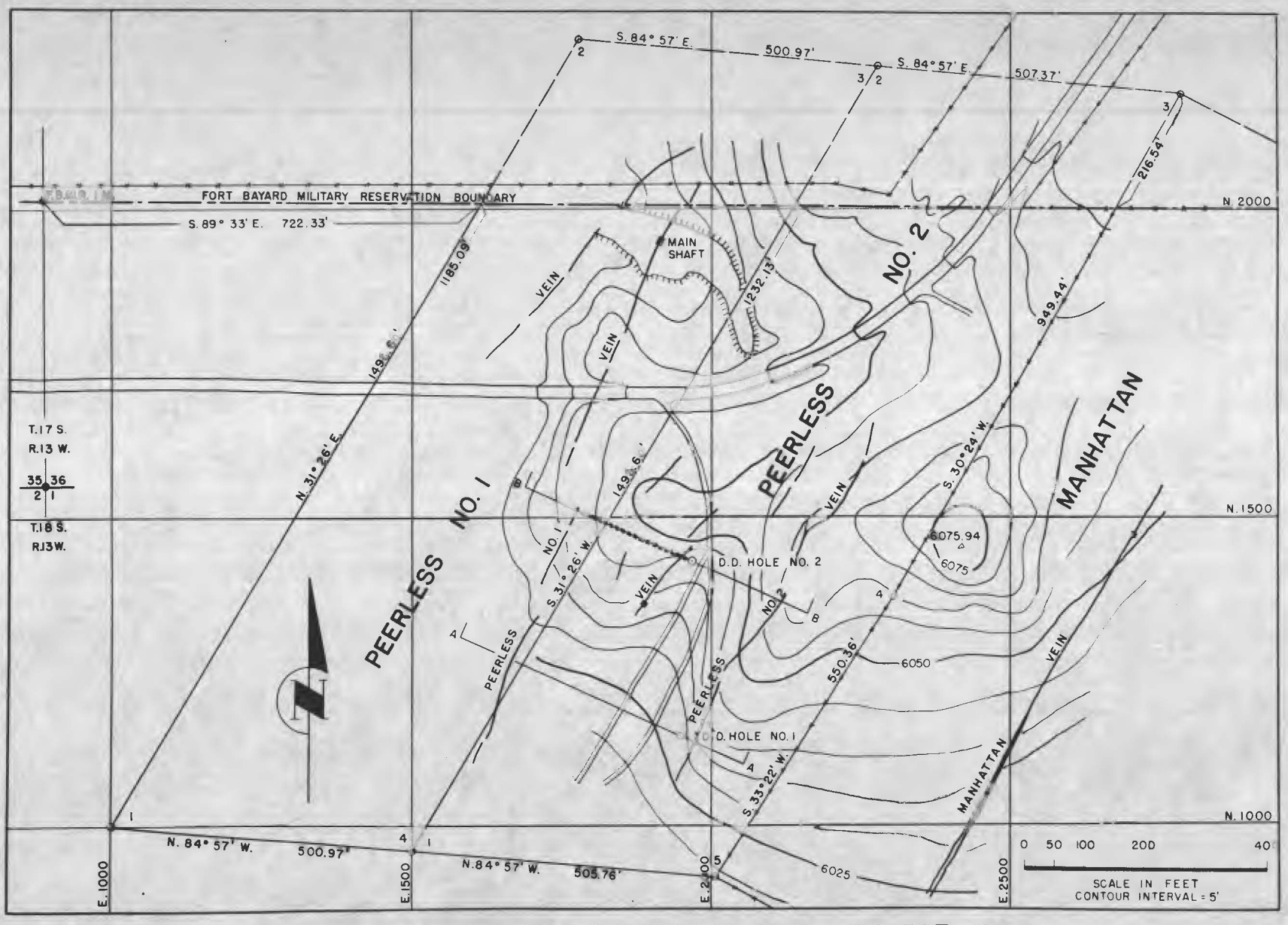

FIGURE 2. SURFACE AND TOPOGRAPHIC MAP - PROJECT 15-185

Early history of the Peerless mine is unrecorded. A few shallow stopes and shafts indicate a small amount of work, which was probably done in a search for gold ores.

The first notable operation was by the Peerless Mining & Milling Co., which mined and shipped ore in 1937-1938. The American Smelting & Refining Co. leased the Peerless property in 1938. They did considerable exploratory and development work but produced no ore. The results of this work seemed to indicate that the ore bodies extended onto the adjoining Fort Bayard Military Reservation. The option was allowed to lapse.

The New Mexico Ore Processing Co. leased the property in 1943 and operated it until October 1945, by which time all known ore bodies were exhausted. Additional exploratory work around the stoped area failed to indicate new ore bodies.

The Bureau of Mines explored deeper and unknown parts of the Peerless vein, starting their work on January 2, 1946, and completing it by June 5, 1946. No new ore bodies were found, but zinc mineralization was noted in a favorable horizon about 1,800 feet below the surface.

Prior to 1936, it is reported that 600 tons of ore was shipped from the Peerless mine to the Black Hawk mill at Hanover, N. Mex. About 1937 or 1938, the Peerless Mining & Milling Co. was reported to have shipped 3,404 tons of sulfide ore.

The New Mexico Ore Processing Co. began shipping ore to the Black Hawk mill early in 1943. They later purchased a mill in Silver City and began shipping to it in April 1944. This was continued until February 1945, when their mill was closed and the ore was again sent to the Black Hawk mill. Operations ceased with the last shipment in October.

The known production from the Peerless mine is shown in the following table:

TABLE 1. - Peerless mine production

Date	Tons	Metal content				
		Gold, ounces	Silver, ounces	Copper, tons	Lead, tons	Zinc, tons
Before 1936 1/	600	-	1,644	3	42	74
1937-1938 1/	3,404	.102	10,790	13	261	432
1943 1/:						
February	612	.12	2,448	2	49	73
March	425	8	1,318	1	24	46
April	788	16	2,522	2	38	56
May	823	-	-	-	33	58
June	623	6	1,769	2	41	81
July	360	7	1,260	1	22	47
August	625	25	2,500	2	56	94
September	569	156	2,245	2	53	97
October	539	27	2,156	2	49	92
November	508	25	2,032	2	51	91
December	695	-	-	-	70	125
Total	6,567	282	18,250	16	486	860
1944:						
January 1/	1,225	-	-	-	221	123
February 1/	628	-	-	-	100	57
March 1/	845	-	-	-	76	135
April 2/	897	-	-	-	81	144
May 2/	761	-	-	-	67	117
June 2/	1,126	-	-	2	102	170
July 2/	908	36	3,178	2	72	129
August 2/	758	-	-	-	73	121
September 2/	1,079	-	-	-	-	-
October 2/	1,131	-	-	-	79	142
November 2/	1,077	-	-	-	81	149
December 2/	935	-	-	-	28	53
Total	11,370				980	1,340
1945:						
January 2/	450	20	767	-	33	16
February 1/	206	14	587	-	15	27
March 1/	393	28	1,478	-	34	60
April 1/	401	23	1,570	1	38	65
May 1/	356	18	1,331	5	29	50
June 1/	368	39	1,536	1	36	65
July 1/	355	35	1,865	1	43	81
August 1/	317	16	1,566	1	34	60
September 1/	96	5	444	-	10	18
October 1/	39	2	126	-	19	50
Total	2,981	200	11,270	9	291	492

1/ Ore shipped to Black Hawk mill at Hanover, N. Mex.
2/ Ore shipped to Peerless mill at Silver City, N. Mex.

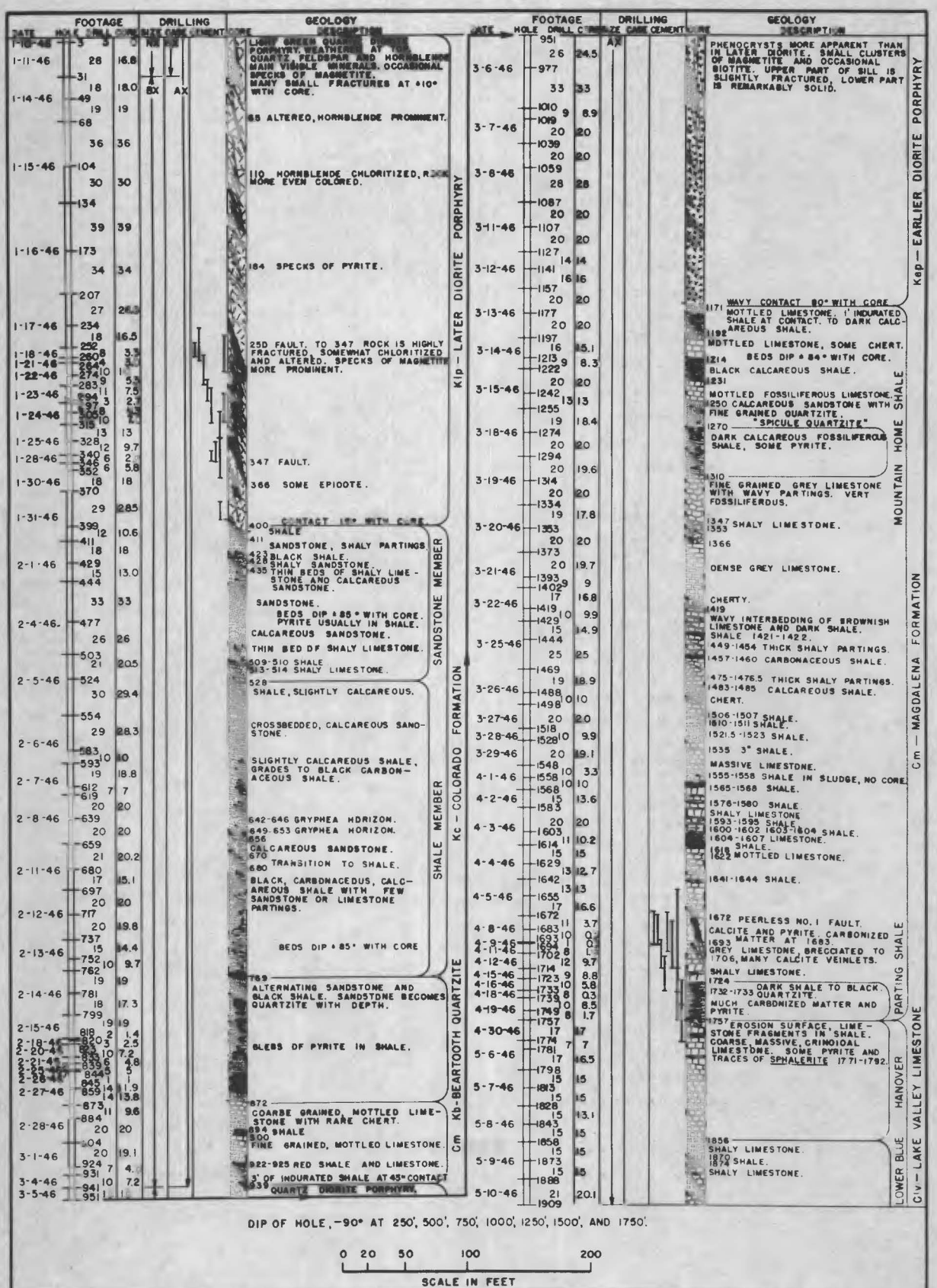

FIGURE 3. DETAILED LOG OF HOLE NO. 1 — PROJECT 15-185

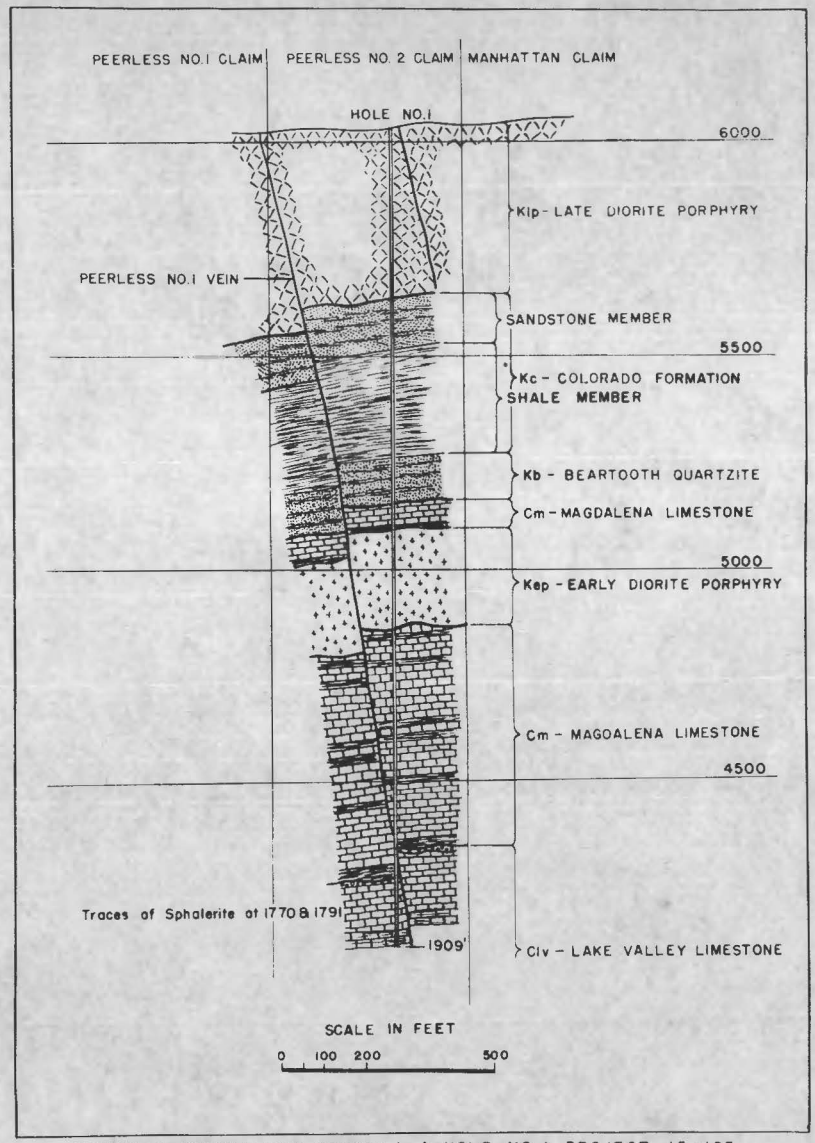

FIGURE. 4. GENERALIZED SECTION A-A. HOLE NO. 1. PROJECT 15-185

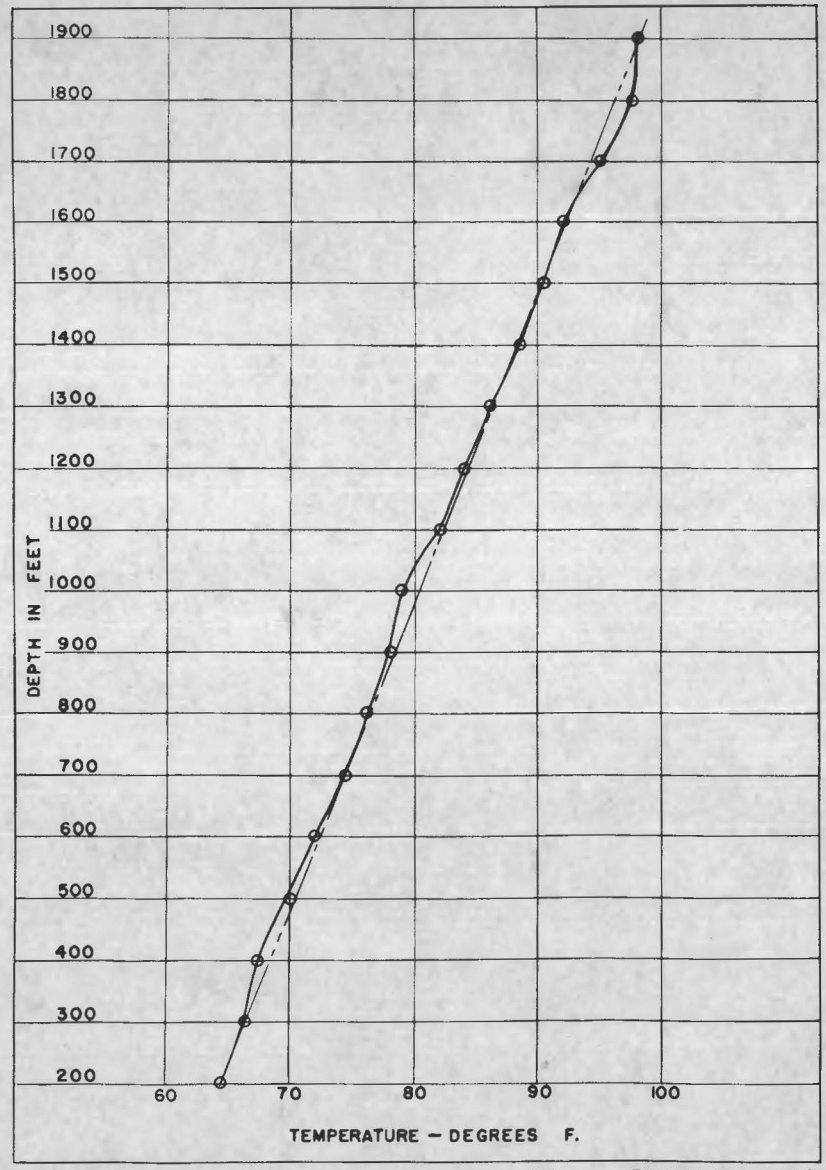

FIGURE 5. GEOTHERMAL CURVE, HOLE NO. 1 - PROJECT 15-185

Recapitulation

Date	Tons	Metal content				
		Gold, ounces	Silver, ounces	Copper, tons	Lead, tons	Zinc, tons
Before 1936...	600	-	1,644	3	42	74
1937-1938.....	3,404	102	10,790	13	261	432
1943.....	6,567	282	18,250	16	486	860
1944.....	11,370	-	-	-	980	1,340
1945.....	2,981	200	11,270	9	291	492
Total.....	24,922					

Based upon those months for which the information is complete, the approximate average grade of ore produced by the New Mexico Ore Processing Co. is as follows:

Gold, ounces per ton	Silver, ounces per ton	Lead, percent	Copper, percent	Zinc, percent
0.045	3.10	8.3	0.30	12.8

GENERAL GEOLOGY

A quartz diorite porphyry sill constitutes the surface rock in the area around the Peerless mine. This sill is 400 to 450 feet thick. Underlying the sill are about 360 feet of sandstone and shales of Colorado (Upper Cretaceous) age. These are underlain conformably by about 110 feet of Beartooth quartzite and shales, also of Upper Cretaceous age.

A hiatus separates the Beartooth quartzite disconformably from the underlying Magdalena formation. This Magdalena formation consists of about 580 feet of limestone and shale of upper Paleozoic (Permian) age. Dividing the Magdalena formation into two parts is another quartz diorite porphyry sill 230 feet thick, probably of earlier emplacement than the upper sill[3/].

Disconformably beneath the Magdalena formation, and separated by an old erosion surface, lie the Lake Valley series of limestones of Missippian age. The upper part of the Lake Valley formation is a massive, coarse-grained, light-gray, crinoidal limestone locally called the Hanover (fig. 3). This member contains most of the important replacement lead-zinc ore bodies in the district. Underlying the Lake Valley formation are probably the lower Paleozoic sedimentary rocks common to this section of the State.

A number of narrow veins traverse the Peerless claims (fig. 2). These veins strike about N. 30° E. and dip steeply to the southeast. Most of the ore was mined from the Peerless No. 1, which is the largest of the veins. This vein occupies a reverse fault that has a vertical displacement of 55 to 60 feet. (fig. 4). The horizontal displacement is unknown.

3/ Lasky, S. G., Geology and Ore Deposits of The Bayard Area, Central Mining District, New Mexico: U. S. Geol. Survey Bull. 870, 1936.

CHARACTER OF THE ORE

The Peerless was a typical complex lead-zinc ore with calcite and quartz as gangue minerals. The ore minerals were sphalerite and galena with a small amount of chalcopyrite. The ore contained a little gold and appreciable amounts of silver. Its average grade was 0.045 ounce gold, 3.11 ounces silver, 0.29 percent copper, 8.3 percent lead, and 12.8 percent zinc per ton. Only complete monthly production figures were used in calculating this average grade.

This ore was amenable to selective flotation treatment. However, the metallurgical characteristics were not as satisfactory as those of other ores of the district, owing to the present of finely disseminated chalcopyrite in the sphalerite.

Much finer grinding than was practicable would have been necessary to liberate these minerals in order to effect a clean separation.

DEVELOPMENT[4/]

All major developing has been done on the Peerless No. 1 vein and on the Peerless No. 1 claim. A few shallow shafts and stopes mark the only work on the other veins. The main Peerless shaft was sunk on an inclination of about 83° to the southeast and to a depth of 325 feet. Levels were opened at 60, 110, 170, 240, and 300 feet. The shaft has two compartments above the 60-foot level and three below it.

Drifts extend about 80 feet each way from the shaft on the 60-foot level. The northerly drift (N.33°E.) reaches almost to the boundary of the Fort Bayard Military Reservation. A little lead-zinc carbonate ore was extracted from above this drift. About 60 feet south of the main shaft, an old inclined shaft, now used for ventilation and as a waste-rock pass, connects the 60-foot and 110-foot levels with the surface. The shaft is now filled between those levels.

On the 170-foot level, a drift was driven about N. 27° E. for 100 feet to the property line. Another drift was driven about S. 30° W. for 300 feet.

On the 240-foot level, one drift was driven about 80 feet northward and 180 feet southward in the stoped area.

A drift was driven northward on the 300-foot level to the property line and southward along the vein for about 230 feet. A crosscut was driven about 40 feet to the west from this southern drift, and then another drift was driven southward to a point about 500 feet from the main shaft. Some stoping was done near the end of this latter drift. There is a crosscut on this level that extends about 170 feet westward and 130 feet eastward from the shaft. All known ore has been mined from above and below the level. A longitudinal projection on a vertical section of the mine workings is shown in figure 7.

4/ Taken from an unpublished report by W. R. Storms.

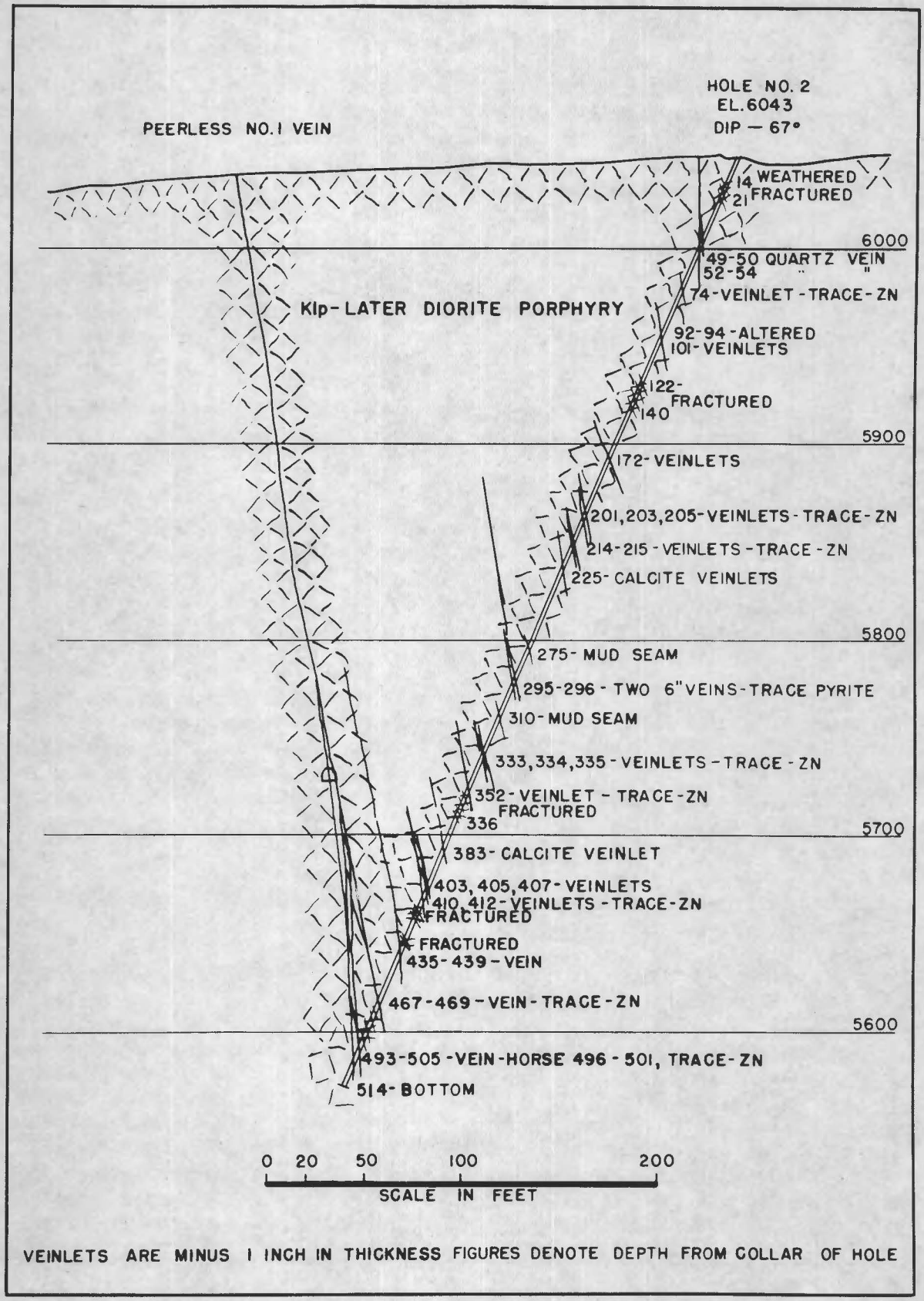

FIGURE 6. SECTION B-B AND LOG OF HOLE NO. 2. PROJECT 15-185

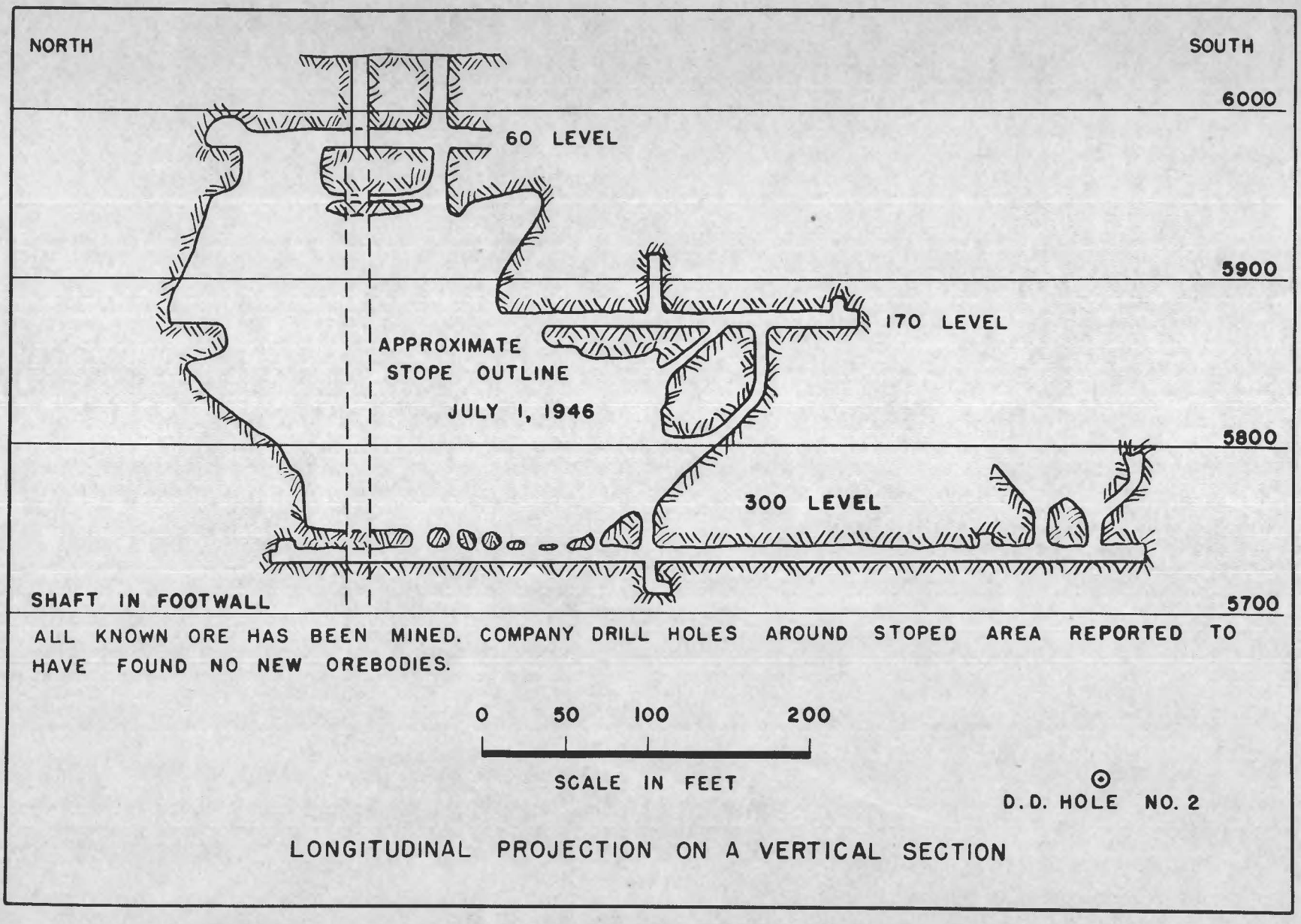

FIGURE 7. PEERLESS MINE WORKINGS — PROJECT 15-185

The ore was mined by horizontal cut-and-fill methods, stope fill having been obtained from development workings or caved material from the upper levels. Timbered chutes were carried up through the fill at approximately 15- to 25-foot centers, with one or two manways in each stope. Raises from the stopes to the level above served as passageways for waste fill. Ore was broken by column-mounted drifters and hand-held jackhammers. Mucking was done with scrapers.

There is no equipment at the mine other than a few rails underground and the pipelines for air and water. The few buildings used during the last operation are still standing in various states of disrepair.

EXPLORATION BY THE BUREAU OF MINES

The object of the Bureau's exploratory work was threefold: First, to add to the depleted ore reserves of the Peerless mine; second, to extend the area in which the replacement type of ore bodies occur, thus encouraging other operators to explore more actively in this part of the district; and third, to contribute geologic knowledge of the deeper and little-known parts of this area. The work was planned to test the Magdalena and upper Lake Valley limestones at depth for possible replacement ore bodies near the Peerless No. 1 fault. All work was done by diamond drilling.

Accordingly, hole 1 was drilled vertically in order to intersect any favorable ore-bearing formations that might lie close to the Peerless vein (fig. 4). This hole was drilled through the Hanover (upper Lake Valley) limestone (figs. 3 and 4), which is one of the most favorable host rocks for replacement-type deposits in the Central district. Although no actual ore was found, a small amount of sphalerite was noted in the Hanover formation. This was very encouraging and suggests more exploration at this depth when conditions warrant. The zinc minerals were found between 1,771 and 1,792 feet below the collar of the hole.

As time and appropriations would not permit more deep drilling, one hole, No. 2 (fig. 6) was drilled to test a hitherto untested part of the Peerless vein beneath an old stoped and now inaccessible area (fig. 7). Several small veins in addition to the Peerless No. 1 vein were intersected. Small amounts of sphalerite were noted in a number of them.

A total of 2,423 feet of hole was drilled, 1,909 feet for hole 1 and 514 feet for hole 2. Cementing was confined to two general areas in hole 1 (fig. 3) and throughout the lower part of hole 2. A total of 690 feet of hole was cemented.

Thirty-two hours were spent in surveying hole 1. A Maas compass in conjunction with an acid bottle was used to survey the hole at 250-foot intervals. There was no measurable deviation from the vertical at any of the survey points. Hole 2 was not surveyed.

Temperature readings were taken in hole 1 at 100-foot intervals. A maximum recording thermometer was used. The results are plotted in figure 5. The

geothermal curve was virtually a straight line. It is noteworthy that a geothermal high occurs in the area of sphalerite mineralization. Geothermal lows were noted near the lower contact of the upper sill and the upper contact of the lower sill.

Sampling

Sampling consisted of taking core and sludge samples where deemed necessary. All core samples were carefully logged, boxed, and stored. Sludge samples were taken in critical areas deep in hole 1. The sludges were split into 1/10 and 9/10 portions as they issued from the hole. This was done by means of a rotary sample splitter. The 9/10 portion was run through a series of settling tanks to remove the drill cuttings. A bucket was placed in the first tank just under the sampler to catch the bulk of the coarser and heavier cuttings from the hole. These were panned to note the presence of any sulfide mineral. The 1/10 portion was piped to a filter sack, where all of the cuttings were saved. If core recovery was very good, or if the pannings from the 9/10 sample were barren of sulfide minerals, the 1/10 portion was discarded. If core recovery was poor and panning of the 9/10 portion showed the presence of sulfide minerals, the 1/10 portion would have been dried and analyzed. No ore was found in the hole, so no samples were analyzed.