UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
WASHINGTON 25, D. C.

Denver Customhouse
Denver 2, Colorado

September 15, 1952

Memorandum

To: Secretary to the Operating Committee, Defense Minerals Exploration Administration

From: Field Team, Region IV

Subject: Final Report, DMEA Docket 1137, M. R. McCray's Greenleaf Fluorspar Mine, Luna County, New Mexico

Enclosed are the original and three copies of the report pertaining to the above application. The brochure is also enclosed.

The field examiners concur that there is no assurance that the ore reserves are adequate to repay a loan of the amount requested and they recommend that the loan be denied.

We concur in this recommendation.

W. H. King
W. H. King

A. N. Koechmann
A. N. Koechmann

Enclosures

HMC:oc

cc: WRStorms w/copy of final report
CAAnderson " " " "
AHKoechmann " " " "
Mining Div. " " " "
DMA Final Report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mining Division
Region IV

September 15, 1952

Memorandum

To: Field Team, Region IV

From: Acting Chief, Mining Division, Region IV

Subject: Final Report, DMPA Docket 1137, H. E. McCray's Greenleaf Fluorspar Mine, Luna County, New Mexico

Enclosed are nine copies of the final report on DMPA-1137 by L. L. Farnham of the Bureau of Mines.

The examining engineer concludes that no significant amount of measured ore exists in the accessible workings of the Greenleaf Mine and he recommends the loan be denied.

We concur in this recommendation.

W. H. King

W. H. King

Enclosures

Mining Division
Date Rec'd
SEP 10 1952
BUREAU OF MINES
TUCSON, ARIZONA
Denver, Colorado

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
MINING DIVISION
REGION IV

Arizona-New Mexico Branch
SOUTHWEST EXPERIMENT STATION
Box 4097
UNIVERSITY STATION

September 8, 1952

Memorandum

To : W. H. King, Denver, Colorado

From : Chief, Arizona-New Mexico Branch, Min. Div., Region IV

Subject : Final Report, Docket DMPA-1137, H. E. McCray's Greenleaf Fluorspar Mine, Luna County, N. Mex.

Enclosed are original and 8 copies of the section on Summary, Conclusions and Recommendations by L. L. Farnham of the Bureau of Mines and J. N. Faick of the Geological Survey, and the section on Engineering by Farnham. A separate section on Geology will be submitted by the Geological Survey.

As no measurable ore exists in the Greenleaf mine, only indicated and inferred ore, the examiners recommend that the loan be denied although they are of the opinion that the deposit has considerable merit. I concur with their recommendations.

Brochure is enclosed.

Walter R. Storms

Walter R. Storms

CC: W. H. King (8)
A. F. Shride
DMPA-1137
DF

FOR VICTORY
BUY
UNITED STATES SAVINGS BONDS AND STAMPS

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION
WASHINGTON 25, D. C.

200 New Customhouse
Denver 2, Colorado

September 12, 1952

Memorandum

To: DMEA Field Team, Region IV

From: A. H. Koschmann

Subject: DMPA Docket 1137, Greenleaf Fluorspar Mine, Deming, New Mexico.
H. E. McCray, Applicant.

Enclosed are the original and 8 copies of the geologic report by John N. Faick of the U. S. Geological Survey covering the above docket.

It has been recommended that the loan be denied.

A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (9)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P.O.Box 4126, University Station
Tucson, Arizona

September 8, 1952

Memorandum

To: A. H. Koschmann, Denver, Colorado

From: J. N. Faick, Tucson, Arizona

Subject: Report on Docket DMPA 1137, Greenleaf Fluorspar Mine, Deming, New Mexico; H. E. McCray, Applicant

Enclosed are the original and 8 copies of a geological report by John N. Faick of the U. S. Geological Survey on the above subject. An engineering report on the same subject is being submitted by Mr. L. L. Farnham.

The authors concur in recommending that the application be denied.

John N. Faick
Geologist

Enclosures 9

SEP 1952
RECEIVED
U.S. Geological Survey
Mineral Deposits Branch
Denver

UNITED STATES
DEPARTMENT OF THE INTERIOR
OSCAR L. CHAPMAN, SECRETARY

DEFENSE MATERIALS PROCUREMENT AGENCY

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMPA-1137, H. E. McCray's Greenleaf Fluorspar Mine

Fluorite Ridge Area, Luna County, N. Mex.

L. L. Farnham, Mining Engineer
U. S. Bureau of Mines

J. N. Faick, Geologist
U. S. Geological Survey

September 1952

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

By L. L. Farnham[1] and J. [illegible]. Feick[2]

In May 1951, H. E. McCray of Deming, N. Mex. applied to the Defense Minerals Administration, under the Defense Production Act of 1950, for a production loan amounting to $513,100. The application was docketed as DMA-1137. The funds requested were to be used for the equipment, development and exploitation of the Greenleaf mine and 4 other neighboring properties. Upon examination of these undeveloped properties, it was found that the fluorspar reserves were inadequate to guarantee the repayment of the requested loan and the application was denied.

Early in 1952, H. E. McCray submitted another, or revised application for a production loan amounting to $112,000. The funds requested in this case were to be used entirely for the development of the Greenleaf fluorspar property. This application was docketed as DMPA-1137. The mine was visited by the examiners during the week of August 11, 1952.

The Greenleaf property is located about 13 miles north of the town of Deming, in the Fluorite Ridge area of Luna County, N. Mex. For the past 20 years this district has been a rather important source of high-grade fluorspar ore.

The principal deposits of the area are found within a comparatively narrow belt extending for several miles in a northwesterly direction. Fluorite has been deposited in faults and fracture zones

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1/ Mining Engineer, U. S. Bureau of Mines
2/ Geologist, U. S. Geological Survey

in both sedimentary and intrusive rocks. The minable ore bodies vary greatly in size and shape, ranging from narrow veins to short thick pods and overlapping lenses, which pinch and swell abruptly.

The Greenleaf mine probably has been the principal producer and is the deepest in the district (440 feet). There the extremely irregular ore bodies are localized in a zone of complex shearing. Within this brecciated zone, which ranges from 20 to 40 feet in width, 5 or more intersecting and overlapping ore bodies have been mined over a length of 400 feet and to about the same depth. The mine's total production has been estimated to be of the order of 42,000 tons of fluorspar ore. No evidence was found to indicate that the deposit was approaching exhaustion at its present depth. The bottom level (400) was claimed to have been more productive than any of the upper levels. This could not be verified as the mine was flooded below the 367-foot level.

No significant amount of measured ore has been developed in the Greenleaf mine so its value is almost entirely speculative. In that respect the deposit has considerable merit. Based on the available production data, and assuming a similar continuation of downward extension of the ore bodies for a distance that the character of the deposit would seem to warrant, the indicated and inferred ore reserves are of the order of 30,000 tons containing about 70 percent CaF_2.

The difference between the average current value of the ore and the estimated production costs show a profit of about $4.00 a ton.

Federal and State taxes would probably reduce this operating profit to $3.00 a ton. Thus the prospective ore reserves are judged to have a net value on the order of $90,000.

Excluding the present indebtedness of the applicant and the requested working capital, an investment of at least $75,000 would be necessary to equip the mine and develop the prospective ore. Although the estimated value of the ore reserves exceeds the minimum loan requirements, this net value of $90,000 was based on indicated and inferred reserves. It is the writers' understanding that in the case of production or development loans, the security for the repayment of such loans must be based on the profit to be won from measured or well assured reserves. In this instance there are no appreciable measured ore and over one half of the total estimated profit is based on inferred ore. Thus the ore reserves are not considered adequate to guarantee the repayment of a loan, sufficient in amount to properly equip and develop the mine. Therefore, it is recommended that the request for a production loan on the Greenleaf property be denied.

GREENLEAF FLUORSPAR MINE
(H. E. McCRAY)
LUNA COUNTY, NEW MEXICO
DMPA 1137

FLUORSPAR

Geology

By
John N. Faick
Geologist, U. S. Geological Survey

GREENLEAF FLUORSPAR MINE
(H. E. McCRAY)
LUNA COUNTY, NEW MEXICO
DMPA 1137

FLUORSPAR

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Fig. 1 Location Map	See Engineering Report
Fig. 2 Claim Map	" " "
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Fig. 6 Cross Section Through Shaft	" " "
Fig. 7 Longitudinal Projection	" " "

INTRODUCTION

In May, 1951, Mr. H. E. McCray, Deming, New Mexico, applied to the Defense Minerals Administration for a production loan of $513,000 to develop and put into operation a group of 5 fluorite mines and prospects, including the Greenleaf mine, situated on Fluorite Ridge near Deming, New Mexico. The properties were examined by L. L. Farnham, Engineer, U. S. Bureau of Mines, and in October, 1951 it was recommended that the application be denied because of insufficient ore reserves to justify such a large loan. About May, 1952 a revised application requesting $112,000 to develop and equip the Greenleaf mine was submitted by Mr. McCray to the Reconstruction Finance Corporation. This application to the R. F. C. included surprisingly large ore reserve estimates and because of these the application was forwarded to the Tucson office of the Defense Minerals Exploration Administration with a request that the reserves and other pertinent data be verified. It was specifically requested to determine if the ore reserves justified a loan of $60,000, the amount remaining after revision of the applicant's proposals.

The Greenleaf mine was re-examined August 12 and 13, 1952 by L. L. Farnham, this time accompanied by J. N. Faick, Geologist, U. S. Geological Survey. The examiners' greatest efforts were devoted to obtaining an estimate of the ore reserves that could be substantiated by factual data and would, therefore, be acceptable to both the Reconstruction Finance Corporation and the Defense Materials Procurement Agency. Other data involving such factors as production, costs, power requirements, and mine water problems were investigated as fully as practicable in order to properly appraise the mine.

All maps submitted in connection with this examination are included with the engineering report prepared by L. L. Farnham.

GENERAL GEOLOGY

Important deposits of fluorspar are present in Fluorite Ridge, an elongate group of barren rugged hills situated about 10 miles north of Deming, New Mexico. Fluorite Ridge trends northwest-southeast and occupies an area about 4½ miles long and a half mile wide; its crest is about 900 feet above the adjacent valleys.

The area is underlain by a stock of monzonite porphyry of Tertiary age that has intruded a thick series of Paleozoic and Mesozoic strata, the remnants of which cap the hills and occur as disconnected masses on the sides of the ridge. The central part of the ridge consists chiefly of intrusive monzonite porphyry, but the southeastern part is overlain by a series of conglomerate beds about 300 feet thick. Overlying the conglomerate beds is a series of agglomerates and flows with minor water sorted members. Basalt dikes cut the conglomerate and older rocks. Bolson deposits, consisting of a thick series of unconsolidated and semi-consolidated gravel, sand, and silt occupy the valley floor surrounding Fluorite Ridge.

The older strata have been arched primarily by the intrusion of the monzonite porphyry; however, in the southeast part of the district tilted and folded beds are discordantly overlain by younger beds, a condition that probably reflects deformation during pre-Cretaceous time.[1/] Northwesterly trending basalt dikes cut the conglomerate and older rocks

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1/ Rothrock, H. E., Johnson, C. H., and Hahan, A. D., Fluorspar Resources of New Mexico: N. Mex. Bureau of Mines and Mineral Resources, Bull. 21, p. 130, 1946.

and indicate the presence of a set of faults older than the basalt. Another set of faults, post-basalt in age, strike from N. 17° W. to N. 28° E. This set of faults is mineralized, and fluorite veins of economic importance have formed along a few of them.

GEOLOGY OF THE GREENLEAF MINE

The Greenleaf mine is located on the flats at the southeast end of Fluorite Ridge, in desert terrain at an altitude of approximately 4800 feet. Tertiary clastic rocks crop out at the mine, but Quaternary bolson deposits overlap the extensions of the veins, and most of the mine workings are in Tertiary monzonite porphyry.

The mine is in a major zone consisting of closely spaced intersecting normal faults and fractures. This zone has a width of from about 20 to 40 feet and has been proved by mine workings for a strike length of about 400 feet; and is thought to extend several hundred feet beyond the mine. The zone trends about N. 20° E. The faults constituting the zone (Figs. 3, 4, and 6) may be grouped in three minor zones differentiated by their strikes. The strikes of the minor zones are about as follows: N. 30° E., N. 10° E., N. 10° W. The general dip of all the faults is 70° to 80° E., but irregularities cause the dip to deviate from these figures by several degrees; in some places the faults even dip steeply to the west. Although these faults intersect one another, it is probable that they were formed almost contemporaneously and were modified by later stresses. The resultant of the movements on the faults is a throw of 165 feet (Fig. 6) as shown by the position of the contact between the clastic rocks and the monzonite porphyry on opposite sides of the major fault zone.

Notable amounts of fluorspar have been localized along and near many of the minor faults (Fig. 3, 4, and 6) within the main fault zone. The fluorite has formed by replacement of breccia, gouge and country rock

and to a minor extent has filled openings and cemented breccia. The commercial ore bodies occur as irregular, vein-like ore shoots having drift lengths ranging from 25 to 100 feet, and pitch lengths ranging from about two to several times the strike length. One ore shoot was mined continuously from the outcrop near the shaft to the deepest workings, the 400-foot level. The rake of the ore shoots is vertical or steeply to the north. Ore has been mined from about 11 closely spaced subparallel or branching veins, and in many places the veins overlap in both horizontal and vertical dimensions.

The fluorite in the Greenleaf mine is exceptional in that it occurs in unusually pure, high-grade masses or ore bodies that are relatively free of quartz and barite or other deleterious elements. Although silica is present, it usually occurs along the faults as a jasper-like material or as drusy crystals in cavities and the ore can be selectively mined or hand sorted to prevent contamination. Most of the ore is deep green in color but minor amounts of the ore are purple or pale blue.

It has been reported[2/] that of the production made prior to 1944 about two thirds of the fluorspar and most of the high grade ore was taken from below the 200 foot level. Ore above this level tended to be siliceous and diluted with waste. This difference in the character of the ore is explained by the character of the wall rocks in the different parts of the mine. Below 200 feet the veins are entirely in monzonite porphyry (Fig. 6) but above this level one or both walls of the vein are composed of clastic sediments. It is thought that the monzonite forms a more favorable host rock than the incompetent, friable sediments.

2/ Rothrock, H. E., and Grunig, J. K., Fluorite Ridge Cooperative Project of the Geological Survey and Bureau of Mines: U. S. Geological Survey, Unpublished Report, p. 14, 1944.

The walls above the water level are strong enough to permit shrinkage stoping and this method of mining has been used to a considerable extent in the past. No serious dilution or sloughing of the walls occurs and the stopes stand open indefinitely after mining. It is reported that "heavy" ground exists below the water table and that below the 400 level the shaft required square-set timber support.

ORE RESERVES

For a detailed account of the ore reserves the reader is referred to the engineering report by Mr. L. L. Farnham, Engineer, U. S. Bureau of Mines.

The DMPA examiners' estimates of ore reserves are summarized in the following table, and the locations of the reserves are shown on Figure 7.

SUMMARY OF RESERVES

	Tons	Location	Estimated Percent CaF_2
Indicated	10,000	Block "F"	72
	1,600	" "B"	63
	1,000	" "D"	63
			70.1
Inferred	15,000	Block "G"	72
	1,000	" "E"	63
	700	" "A"	63
	700	" "C"	63
			70.7

Total indicated and inferred ore is 30,000 tons having a weighted average content of 70.5 percent CaF_2. There is no significant amount of measured ore.

The revised application submitted to the R. F. C. about May, 1952 included estimates of reserves of 47,000 tons of positive ore, 123,000 tons of probable ore, and 150,000 tons of possible ore. The

estimates are obviously greatly exaggerated and are not based on known conditions but on anticipated conditions far in advance of exploration or development. The estimates cannot be substantiated by factual data, therefore must not be accepted as a basis for mine evaluation.

In October, 1951 Mr. Farnham estimated the Greenleaf ore reserves to consist of about 5,000 tons of inferred ore in the undeveloped part of the upper half of the mine, and 10,000 tons of indicated ore between the 400 level and the bottom of the 440 foot inclined shafts, and 15,000 tons of inferred ore between depths of 440 and 500 feet. These estimates are based on the best data available and there is no basis for making significant changes in the estimate at this time. Since October, 1951, 2,126 tons of ore have been produced from a footwall or west vein, (Fig. 3) found by driving a drift northward from the shaft on the 113 level. By driving the 113 drift an additional 20 feet a new ore body recently has been discovered on the hanging wall side of the ore zone. This is estimated to contain about 2,000 tons of ore, or approximately the same amount as has been produced from the footwall vein since October, 1951. It is possible that additional drifting northward in this same area will be rewarded with other discoveries.

EXPLORATION POSSIBILITIES

The Greenleaf mine, in this writer's opinion, provides excellent opportunities for exploration with a reasonable chance of being substantially rewarded. The nature of the deposit, having many small high grade ore shoots in a prominent fault zone, suggests that concealed ore bodies may exist along the fault. Excellent possibilities for successful exploration exist north of the shaft for several hundred feet, and it

appears to this writer that the vein zone south of the shaft may also deserve additional exploration. Excellent ore in wide vein widths is reported to have been mined between the 367 (350) and 400 foot levels and it is probable that the ore extends to much greater depths. There is no suggestion of either impoverishment in grade or decrease in size of the ore zone at the 400 foot level, in fact available reports indicate that the largest and highest grade ore shoots were obtained between the 367 and 400 levels. A substantial ore reserve could probably be established by keeping exploration and development ahead of mining.

The applicant is unable to participate in an exploration program, therefore, exploration is not considered at this time.

COMMENTS ON PROJECT PROPOSALS

The applicant's proposals for rehabilitation of the Greenleaf mine and plant have been fully discussed by Mr. Farnham in the engineering report. Only one of the proposals needs to be discussed here, and that is the feasibility of pumping the mine water through a churn drill hole by means of a submersible pump. The mine workings are flooded below a depth of about 380 feet, and the water level appears to be static at this depth.

The mine is reported to yield about 250 gallons of water per minute at depths below the 400 level and this, in the past, has prevented deep development of the mine. The applicant is of the opinion that if it were not for the large quantities of water the mine could easily be developed at greater depths and the ore obtained from development would pay the cost of the work.

To handle the mine water the applicant proposes to drill a 600 foot churn drill hole about 200 or 300 feet north of the shaft and locate it in such a place that it will penetrate the ore zone about 100 feet below the 400 level. The hole would then be equipped with a

submersible pump, having a capacity of about 300 gallons per minute; and this would be operated as required to pump the mine waters.

Success of the venture would require sufficient porosity of the vein to permit water to flow freely to the drill hole and would naturally require that the bottom of the drill hole be placed in porous or open portions of the vein. Although this method of unwatering mines is occasionally successfully used, it does not appear to be practicable in the case of the Greenleaf mine. Here most of the ore is massive and impermeable and occurs in small shoots often separated from each other by tight seams of gouge or by large masses of altered monzonite. Conditions do not appear to favor free movement of circulating waters within the vein, consequently the submersible pump in the drill hole might not be able to drain the mine.

It does not appear advisable to use this method because the cost of the hole and pump is quite high, and because of the risk involved in drilling the hole into the vein, and because there is no assurance that the vein can be drained in this manner. More satisfactory results will undoubtedly be obtained by pumping the mine water through the shaft in the usual manner.

CONCLUSIONS

The following conclusions result from this examination:

1. Measured ore reserves of the Greenleaf mine are negligible, and there is only about 13,000 tons of indicated ore and only about 17,000 tons that may be reasonably inferred.

2. The ore could be mined at an estimated profit of about $3.00 per ton, or about $90,000 for the estimated 30,000 tons of all classes of reserves.

3. As indicated and inferred reserves are not acceptable collateral for a production loan, it is concluded that repayment of the loan is not assured.

4. There is no indication that the Greenleaf mine is exhausted, and it is believed that excellent exploration possibilities exist both along the strike of the vein and below the old workings.

5. The applicant is financially unable to participate in an exploration program, therefore none is considered at this time.

RECOMMENDATIONS

Because there is not enough reasonably assured ore reserves to guarantee repayment of a loan of about $60,000, it is recommended that the application be denied.

DMPA-1137, H. E. McCRAY'S CHERRYLEAF FLUORSPAR MINE
FLUORITE RIDGE AREA, LUNA COUNTY, N. MEX.

Engineering Report

By L. L. Farnham
Mining Engineer
U. S. Bureau of Mines

September 1952

DMPA-1137, H. E. McCRAY'S GREENLEAF FLUORSPAR MINE
FLUORITE RIDGE AREA, LUNA COUNTY, N. MEX.

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INTRODUCTION

In May 1951, H. E. McCray, doing business as the Burro Chief Mines, applied to the Defense Minerals Administration under the Defense Production Act of 1950, for a production loan amounting to $513,100. This application was docketed as DMA-1137. It was proposed in that application to use the funds for the rehabilitation, equipment, and development of 5 undeveloped fluorite properties, known as the Greenleaf No. 1, Lucky, Valley, Howard, and Huerfano, situated in the Fluorite Ridge area of Luna County, N. Mex. The properties were examined by this writer in September 1951. The fluorspar reserves were found to inadequate to justify the requested loan, so the application subsequently was denied.

Early in 1952, H. E. McCray submitted another application for a development loan amounting to $112,000. The funds requested in this case were to be used for additional equipment and development of the Greenleaf No. 1 mine. This revised application was docketed as DMPA-1137. The writer, accompanied by J. N. Faick of the Geological Survey, revisited the Greenleaf property during the week of August 11, 1952.

ACKNOWLEDGMENTS

Thanks are due H. E. McCray for the help he gave the examiners during the investigation of the property. Acknowledgments also are made to the engineers and geologists of the Bureau of Mines and Geological Survey whose former work supplied much of the data used in this report.

LOCATION AND PHYSICAL FEATURES

The Greenleaf property is in the Fluorite Ridge area of Sec. 13, T. 22 S., R. 8 W., Luna County, N. Mex. It is about 13 miles by road north of the town of Deming. The mine is accessible over good roads and can be reached by traveling 1.5 miles north from Deming on paved U. S. Highway 266, thence eastward on State Highway 26 for 5.2 miles to a branch dirt road running northwesterly. It is 5.9 miles over this branch road to the Greenleaf No. 1 shaft (figure 1).

The Greenleaf claims lie on a level valley floor near the southeastern end of Fluorite Ridge at an altitude of about 4,800 feet. The region is semi-arid and covered with a sparse growth of desert vegetation.

HISTORY AND PRODUCTION

Fluorspar ore was produced from the Fluorite Ridge area as early as 1907. Although the district has been a rather important source of fluorite, there is no authentic information as to the intermittent production of the district or of the individual properties. The Greenleaf mine began producing in 1939 and operated almost continuously until 1945. During that period the incomplete records indicate that some 30,000 tons of fluorspar ore was produced. Following a period of inactivity the property was acquired late in 1943 by the applicant.

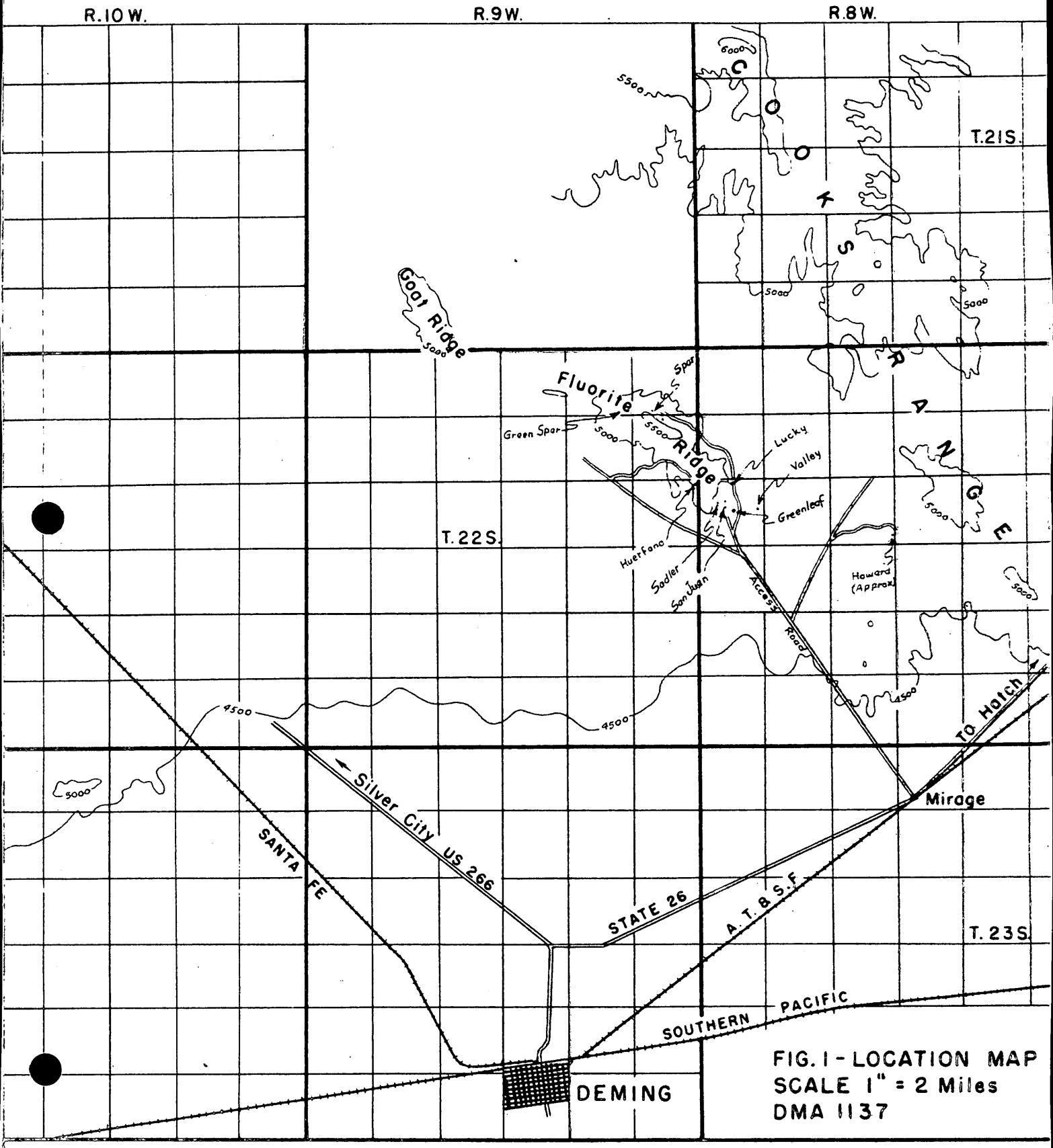


FIG. 1 - LOCATION MAP
SCALE 1" = 2 Miles
DMA 1137

The records submitted by the applicant show the late production to have been approximately as follows:

Greenleaf Mine Production

Year	Tons	Location	Approximate Percent CaF_2	Gross Value
1949	4,683	Bottom Level (400)	74	$84,800
1950	4,090	" " "	70	54,358
1951	2,188	Upper Levels	64	33,299
1952 (7 mos.)	1,227	" "	63.3	18,906 1/
Total	12,188			$196,363

OWNERSHIP AND EXTENT

The Greenleaf group, consisting of 5 contiguous unpatented mining claims, is owned at this time (September 1952) by the Greenleaf Corp. (figure 2). The applicant, doing business under the name of the Burro Chief Mines, has a lease and option to purchase the Greenleaf group for $150,000, payable at the rate of 10 percent royalty on the gross value of the ore produced.

In addition to the Greenleaf property the applicant holds various leases and options on several other groups of fluorspar.claims in the district.

DESCRIPTION OF THE DEPOSITS

General

The consolidated rocks of the Fluorite Ridge area range in age from pre-Cambrian to Tertiary. An intrusive mass of monzonite porphyry, thought to underlie most of the district, has tilted and arched the

1/ Does not include the sales of fluorspar or lead-zinc ores from other properties in which the applicant was interested.

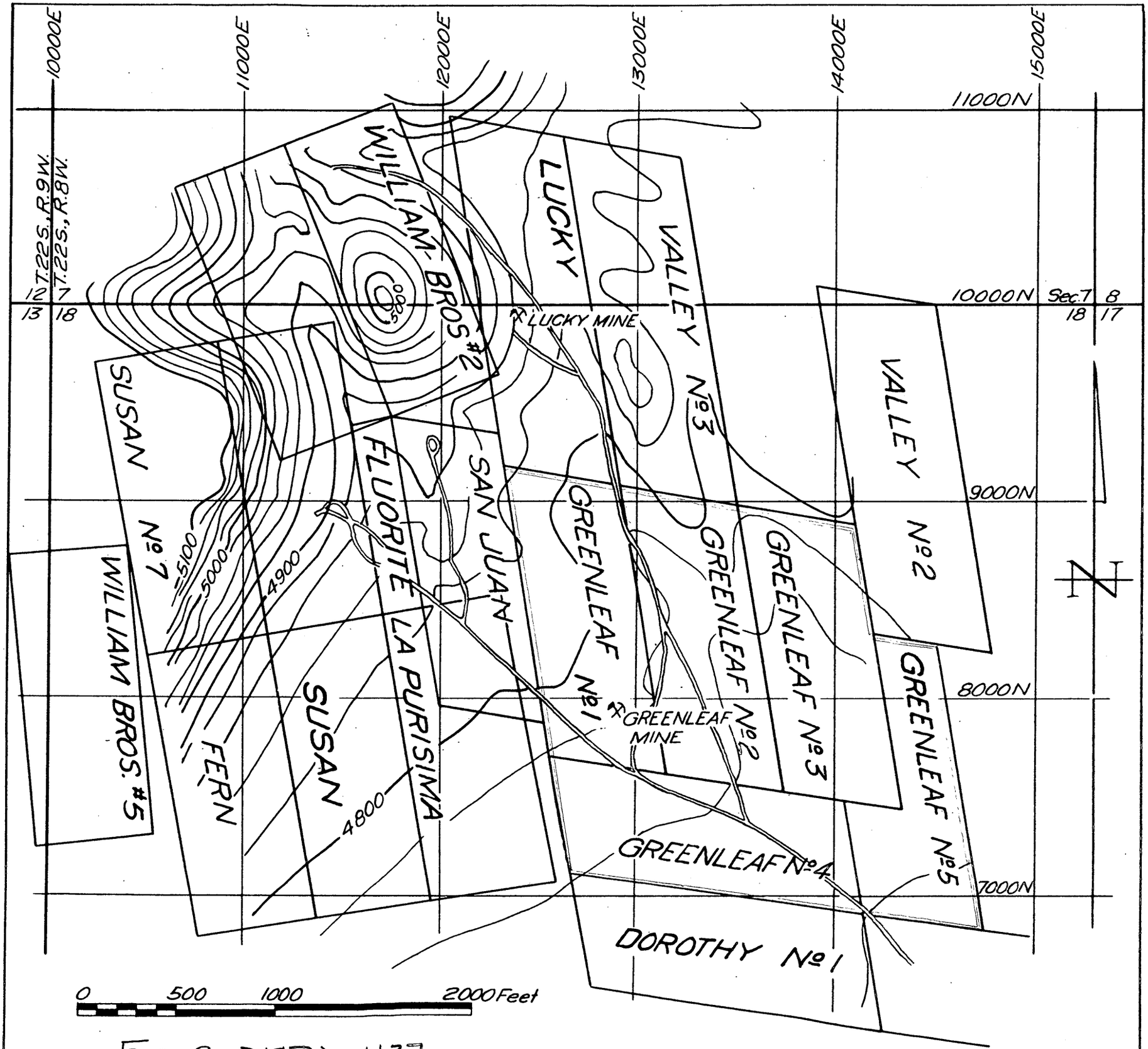


FIG. 2 DMPA-1137

older rocks. The principal fluorite deposits appear to occupy a comparatively narrow belt several miles long that trends in a northwesterly direction, roughly parallel to the crest line of Fluorite Ridge (figure 1).

The relatively short individual fissure zones with which the fluorspar ores are associated have northerly to northeasterly strikes, more or less transverse to the trend of the productive belt. Fluorite has been deposited in the faults and fracture zones in both the sedimentary and intrusive rocks. It has been reported that the deposits seemingly are more productive in the monzonite than in the sediments. Much of the fluorspar ore that has been produced in the area was especially high-grade and consisted largely of coarse massive crystals of green fluorite, which were readily hand-sorted.

Sorting resulted in two products, metallurgical flux and a mill-grade fluorspar. The former, or highest grade material was shipped directly to the steel industry, while the mill ore, if containing at least 50 percent CaF_2, was sold to local flotation mills. Thus mining has been restricted to the highest grade deposits with the result that material containing less than 50 percent CaF_2 remains unmined and unexplored.

The Greenleaf Deposit

The Greenleaf No. 1 mine is the deepest (440 feet) and probably the principal producer of the district. Fluorite occurs in a shear zone of closely spaced intersecting fractures. The width of this intensively brecciated zone ranges from 20 to 75 feet. Its most productive length, as exposed by the surface exploration performed by the Bureau of Mines in 1943, appears limited to about 500 feet. The average strike of the fluorite bearing zone is N. 20° E. with an easterly dip of about 80°.

The deposit outcropped in a coarse conglomerate. Underlying monzonite was encountered on the footwall of the zone at a depth of some 25 feet. The conglomerate continued down in the hanging wall section for about 200 feet, below which both walls of the deposit are in the monzonite (figure 6). Very irregularly-shaped ore bodies of various sizes have been mined in at least five of the nearly parallel overlapping fractures. The individual oreshoots consist of lenses, pods, and narrow sinuous veins. The width of the massive high-grade fluorspar bodies ranges from inches to as much as 12 feet. The central portion of one short lense was said to have swelled to a width of 25 feet. In many of the wider ore bodies, ribs and irregular horses of low-grade material often separate the better strands of fluorite. The ore shoots pinch and swell abruptly, both along the strike and the dip, so it is impossible to predict their individual continuity (figures 4 and 6). Some are not continuous for any considerable distance, but where they pinch, the ore on other overlapping fractures often widens. Thus, in a general way, the relative amount of ore contained in the zone as a whole may remain fairly constant for a considerable distance downward. For this deposit the records of past production appear to be the best means of estimating future ore reserves.

There was no evidence that would indicate that the Greenleaf deposit was approaching exhaustion at its present depth of 400 feet. Though the fluorite deposit is classed as epithermal, there is no way, short of exploration, of determining its ultimate depth extension.

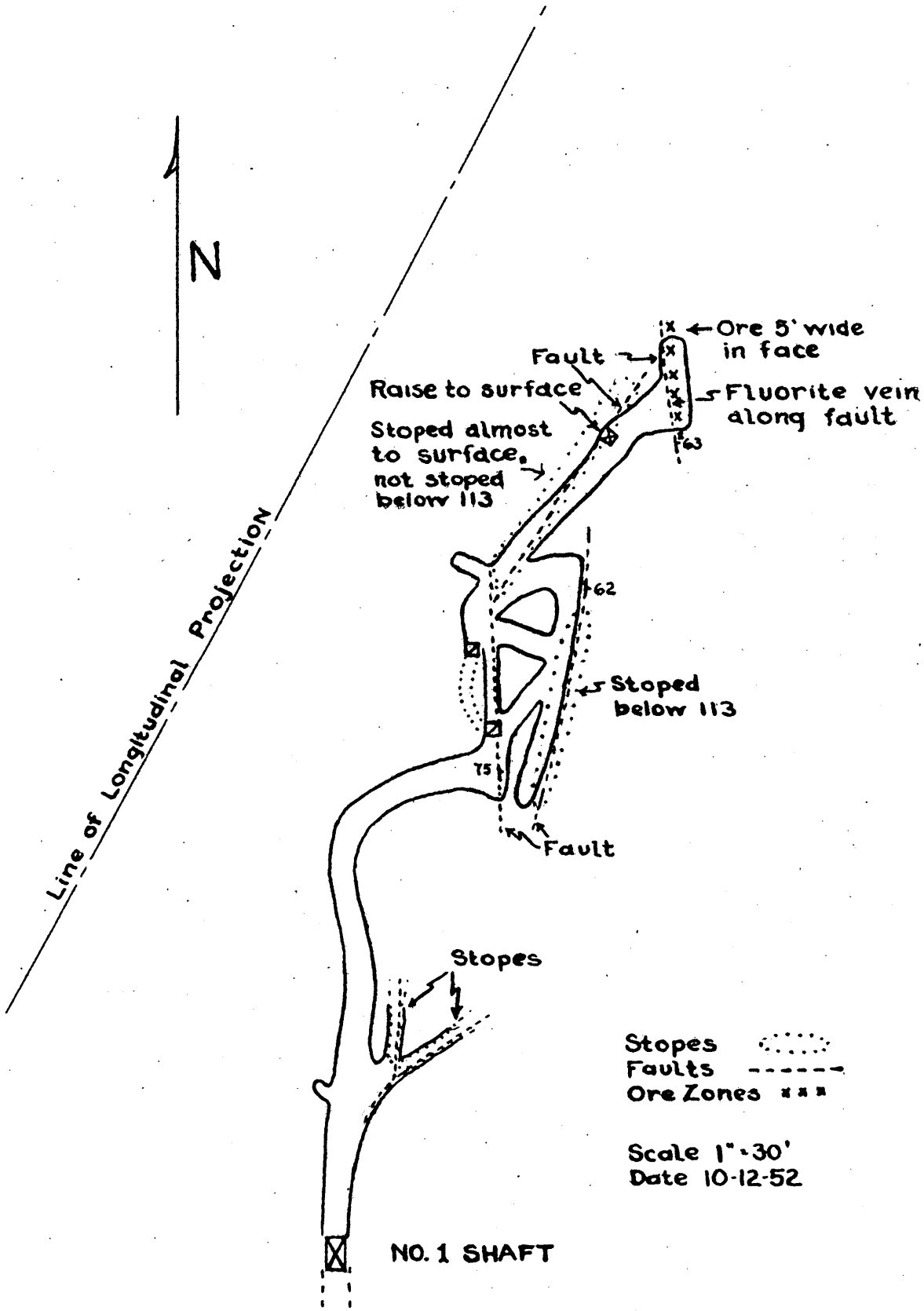


FIG. 3 113 LEVEL GREENLEAF MINE

DMA 1137

100 W
200 S
100 S
0
100 N
200 N
300 N
100 E
200 E
Line of Projection of Plate 4
Position of the shaft at the surface
True North
Magnetic North
10°30'
GREENLEAF MINE
367 Ft. Level
After U.S.G.S.
Scale 1" = 30'
FIG. 4 - DMA 1137
High Grade Fluorspar
Low Grade Fluorspar

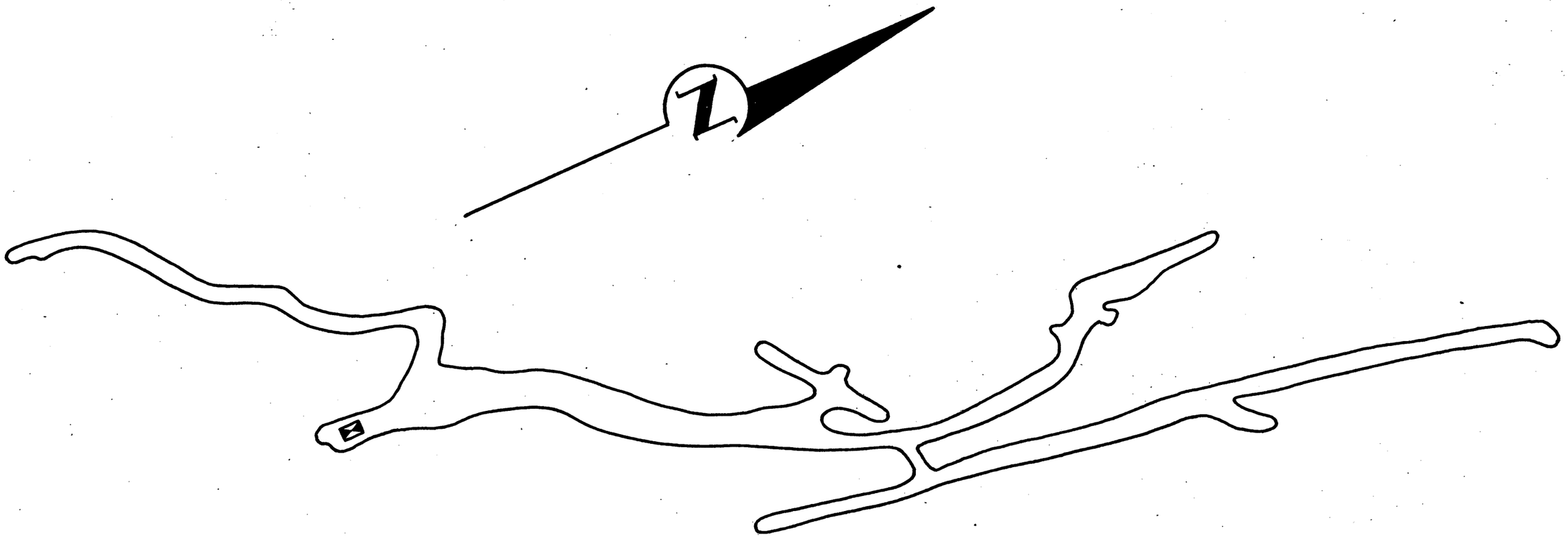
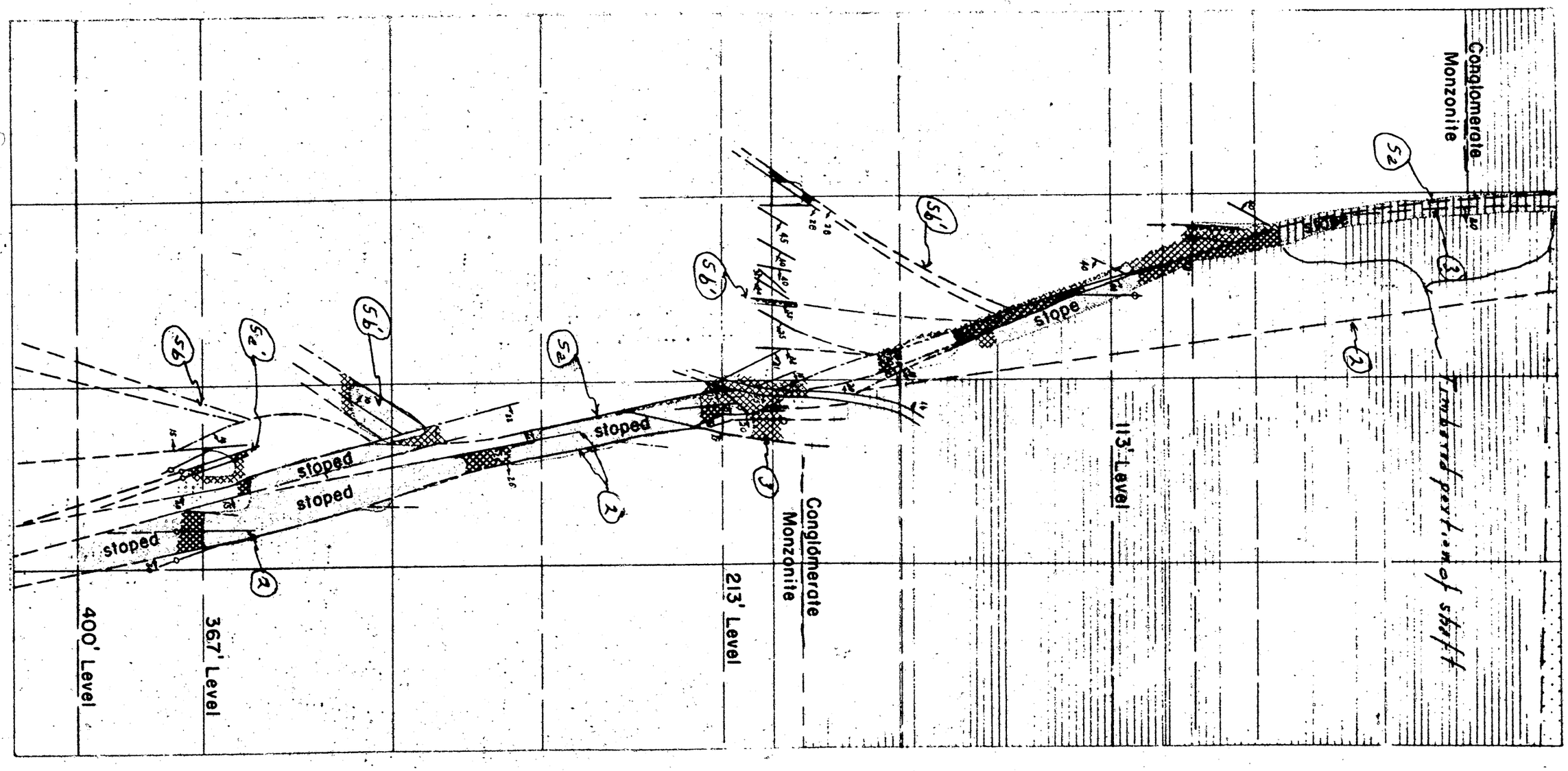


Figure 5 - 400 ft. level of Greenleaf Mine
Scale 1" = 30'
DMA 1137



GREENLEAF MINE
Cross Section Thru Shaft
Scale 1" = 30'
FIG. 6 - DMA 1137

ORE RESERVES

The Greenleaf deposit has been worked in the past on a "pay as you go" basis so that no appreciable amount of developed fluorspar ore exists in the accessible portions of the mine.

The Greenleaf No. 1 shaft has attained an inclined depth of about 440 feet, and according to all reports, a sizeable body of high-grade fluorite remains exposed in the bottom of the shaft. At the time of the examination the water stood about 20 feet below the 367-foot level,[2/] so that all the workings below that point were flooded.

According to the available records, during 1949 and 1950 the Greenleaf produced 8,773 tons of ore averaging about 72 percent CaF_2. Of this total tonnage 4,038 tons (46 percent) was sold to various buyers for metallurgical flux, and 4,735 tons (54 percent) was sold to local flotation mills. About 8,200 tons of this production was said to have been mined in the area lying between the 367-foot level and the bottom, or 400-foot level. Thus this level interval of 33 feet on the dip of the deposit produced about 250 tons per foot. The ore has been found to persist downward in the shaft for a distance of 40 feet below the 400 level, hence about 10,000 tons could be classed as indicated ore in this area between the 400-foot level and the bottom of the shaft. Assuming a like extension of the ore for an additional 60 feet below the bottom of the shaft, the inferred reserves would amount to 15,000 tons. Thus, based on the previous yield of the lowest block

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2/ The 367-foot level designated the 350-level on some of the maps.

is/

mined, the indicated and inferred reserves for the downward extension of the deposit would be of the order of 25,000 tons averaging about 72 percent CaF_2.

The upper half of the mine has not been as productive as the lower half. Some writers have attributed this to the fact that the lower half is in monzonite which may be a more favorable host rock. However, as shown on the longitudinal section, a considerable area in the upper half of the mine has not been developed to the same lateral extent as has the lowest portion. The applicant is now and for the past 18 months has been conducting development and mining operations in the upper portion of the mine.

In the 10 months between October 1, 1951 and August 1, 1952, about 2,126 tons of ore were mined from a stope opened above the north end of the 113-foot level (figure 7). The average grade of this ore as weighted by the examiners was 63.6 percent CaF_2. No minable ore remains in the back of the stope but the ore was intact along its floor. Assuming this body continues downward for 100 feet to the 213-foot level, it could be expected to yield an additional 2,000 tons, one half of which could be classed as indicated and the other half as inferred. These blocks are shown as "D" and "E" on figure 7.

Recent work had disclosed a new and partially overlapping strand of ore in the hanging wall at the northerly end of the 113 level stope (figure 3). At the time of the visit this new ore was exposed for a distance of 20 feet along the strike, averaged about 5 feet wide and appeared to be about the same grade as that mined in the adjoining

stope. Assuming this ore body would extend an additional 25 feet beyond both of the present drift faces, and a like distance above both the back and floor of the opening, then the indicated reserves of this area ("B") would be about 1,600 tons. If the ore should continue for an additional 25 feet above block "D" and a like distance below, then blocks "A" and "C" would contain about 1,400 tons, classed as inferred ore (figure 7). It is recognized that the unexplored areas of the mineralized zone lying above the 367-foot level may contain appreciable quantities of ore. However at this time, owing to the lack of exploration and the inaccessibility of the old workings, no reasonable basis exists for making greater ore reserve estimates than those set forth.

Summary of Ore Reserves 3/

Indicated:

Tons	Location	Estimated percent CaF_2	Tons times percent
10,000	Block "F"	72	720,000
1,600	Block "B"	63	100,800
1,000	Block "D"	63	63,000
12,600		70.1	883,800

Inferred:

15,000	Block "G"	72	1,080,000
1,000	Block "E"	63	63,000
700	Block "A"	63	44,100
700	Block "C"	63	44,100
17,400		70.7	1,231,200

Total: 30,000 tons, average content, 70.5 percent CaF_2

3/ Any ore that might be classed as measured was included with the indicated reserves.

PRESENT STATUS

Exploration and Development.

Nine levels have been driven from an inclined shaft that attempted to follow one of the ore bodies in the Greenleaf deposit. Former lessees of the mine robbed both the shaft and level pillars so the shaft for the most part is now a crooked skidway through the old stopes. Only 3 of the levels are accessible. These are the 113, the 213, and the 367-foot levels. The 367-foot level, also known as the 350, was largely accessible at the time of this examination, but the bottom level (400) was flooded. A minimum inflow of 250 gallons of water a minute is reported to have been encountered a short distance below the 367-foot level. Because of this water and the lack of dependable power, great difficulty and excessive costs were experienced in the sinking of the shaft below the water level.

During 1949 and 1950 the bottom, or 400-foot level was developed, and all the ore found was stoped between this level and the level above (367). During the past year a crew of from 5 to 7 men, under the supervision of the applicant, has been employed in development and mining operations in the upper half of the mine. This work has consisted of driving an inclined raise from the 213-foot level to the surface, and opening a stope above the north end of the 113-foot level (figure 7).

Mining Equipment

The major items of mining equipment at the Greenleaf consist of 3 portable Diesel-driven electric power units with a combined rating of 155 K.W. These were used principally for the operation of 3 two-stage motor pumps. Air for drilling was furnished by 2 portable

compressors, one of 115 cfm was driven by an electric motor and the other of 350 cfm was direct connected to a Diesel engine. A small single-drum hoist was geared to a truck engine using Butane as fuel. Ore was trammed to the shaft in small buckets mounted on dolly cars. Timber skids served as guides for the bucket in the shaft. A short timber headframe, with ore bins, completed the hoisting equipment. A power house, hoist house, 3 small frame dwellings and an office building constitued the housing facilities.

PROJECT PROPOSALS AND COSTS

The nature and amount of the expenditures as proposed in the loan application are as follows:

1.	Mine equipment	$ 6,650
2.	Churn drill hole - 600 feet	3,600
3.	Pump and motor for drill hole	7,500
4.	Power line and transformers	32,000
5.	Development on 165 level - 400 feet of drifts	1,120
6.	Development on 265-level - filling and drifts	2,500
7.	Notes payable	39,210
8.	Accounts payable	9,163.67
9.	Operating capital	10,256.33
	Total	$112,000.00

Comments on the above proposals:

1. The mine equipment to be purchased appeared to consist of the following:

1 - Electric hoist, complete	$3,500
1 - Motor-driven air compressor	3,150

Both of these items, as well as others, would be necessary if work was contemplated at greater depth.

2 & 3. The churn drill hole, equipped with a deep well pump and motor, was for the purpose of unwatering the mine to a depth of some 500 feet. This would appear an ideal way to handle the mine water if it should prove successful. A few years ago a 500-foot hole was churn-drilled in the Greenleaf deposit and it was found that of the total water inflow into the mine only about one tenth of that amount flowed into the drill hole. Thus, it is the opinion of the writer that the risk attending this proposal would not justify an expenditure of $11,100. It would appear more practical to increase the supply of electric power and handle the water in the conventional manner with the present pumps (which could be augmented if found necessary).

4. Additional and dependable electric power on the property is essential if the mine is to be worked below the water level. The two means of accomplishing this are either by the construction of 9 miles of transmission line or the installation of a suitable electric generating unit on the property. For a production of about 1,000 tons of ore a month the mine would need a Diesel-electric generator-set with a capacity of at least 200 K.W. The cost of such a unit, installed and purchased new, would be about $25,000. A used unit of this size probably could be purchased for about $16,000. The 75 KW and the 50 KW sets now on the property could be used as stand-by units. Although the transmission of power to the property from outside sources would have many advantages over a local power unit, the relative costs in this case are in favor of a generator-set on the property.

5. The 400 feet of development work on the 165-foot level as set forth in the application was estimated to cost $1,120. This was probably an error in the position of the decimal point and should have been $11,120. The applicant at the time of the examination changed this proposal to 250 feet of drifting estimated to cost $25 a foot, or a total of $6,250.

6. The work as originally proposed on the 265-foot level was to consist of filling an old open stope so that it could be crossed, and further drifting carried out beyond the end of the opening. At the time of the examination it was decided to drive a drift around the open stope rather than to fill it, so this proposal was changed to 250 feet of drifting estimated to cost $6,250.

Shaft sinking to the 500-foot level and the development of that level was contemplated by the applicant but the cost of this work was not included in the project proposals. As the prospective value of the property is largely dependent upon the ore reserves in that portion of the mine, it is essential that this work be done and its costs shown in the project proposals.

The shaft between the 265 and the 367-foot levels needs re-timbering and the present headframe should be rebuilt.

A rovision of the project proposals which seem more feasible than the foregoing are shown as follows:

Revised Project Proposals

Rehabilitation of shaft and headframe		$ 4,000
Mine equipment to be purchased:		
1 - 50 H.P. single-drum electric hoist..	$ 6,000	
1 - 500 cfm electric-driven compressor..	6,000	
4 - Rock drills - with accessories	3,500	
1 - 200 K.W. power unit	25,000	
Total equipment		$ 40,500
Development:		
500 feet of drifting, upper levels @ $25		12,500
70 feet of shaft @ $200		14,000
600 feet of drifting - 500 level @ $28		16,800
Total development		$ 43,300
Grand total		$ 87,800

It is probable that a suitable used hoist, compressor, and power unit could be purchased for about 60 percent of the above prices, thus reducing the total requirements to approximately $75,000. This does not include operating capital nor the applicant's indebtedness. It does not appear that working capital would be necessary during the equipment and development stages of the proposed projects.

MINING METHODS AND COSTS

The wider ore bodies of the Greenleaf mine were mined by shrinkage methods, while the narrower veins were extracted in open stopes, working from stull-supported platforms. The walls of the ore bodies in the upper portions of the mine were strong and stood well with little or no timber support. No serious dilution of the ore apparently resulted from the use of these methods, though the condition of the walls may be less favorable below the water level.

During the 6 months of this year the mine produced about 1,154 tons of ore from the stope above the north end of the 113-foot level.

According to the applicant's incomplete records, the cost of producing this ore was approximately as follows:

	Total	Per ton
Labor, including payroll taxes	$ 9,780.90 4/	$8.50
Power and supplies	1,500.61	1.30
Average cost of stoping - upper levels		$9.80

Using these costs as a basis, where applicable, the cost of developing and mining the prospective ore reserves is estimated as follows:

	Per ton
Development: $43,300 ÷ 30,000	$1.45
Mining:	
Supervision, $500 a month	0.20 5/
Labor, including payroll taxes	8.50
Power	0.75
Explosives	0.35
Other supplies and maintenance	1.00
Total estimated mining cost	$12.25

In September 1951, this writer estimated that the development and mining costs would amount to $9.50 a ton. In view of the actual labor costs since that time, this previous estimate was obviously too low, even though the present wage scale is about 20 percent greater than it was a year ago.

MILLING METHODS AND COSTS

Hand sorting of the mine-run ore has been the only method of grading the fluorspar ore produced from the subject property. The ore as it came from the mine was dumped from the hoisting bucket onto an inclined

4/ Does not include supervision
5/ Based on an average production of 1,000 tons a month.

grizzley, the oversize of which was raked onto a platform built over the top of a divided ore bin. The coarse waste was rejected from the grizzley oversize, while the larger pieces of fluorite were picked out and dropped into one of the bins. The ore remaining after removing the coarse high-grade was shoveled into another bin where it joined the grizzley undersize. The coarse hand-picked fluorite was sold usually as metallurgical flux. The other portion of the ore, including the material that passed through the grizzley, was sold to local flotation mills.

Two mills, which buy fluorspar ores, are available to producers of the area. The General Chemical Corp. has a flotation mill in Deming, and the Zuni Milling Co. buys ore at its plant located at Los Lunas, N. Mex.

Effective April 14, 1952, the General Chemical Corp. of Deming raised the prices paid for fluorspar, f.o.b. mill, as shown below:

Grade	Old price per ton	Present price per ton
50 percent CaF_2	$7.00	$9.75
60 percent CaF_2	9.50	13.35 plus bonus
70 percent CaF_2	13.10	17.55 plus bonus
80 percent CaF_2	15.70	21.55 plus bonus

In addition to this new price, a sliding scale bonus is paid for desirable ore, such as the Greenleaf, which contains 60 or more percent CaF_2. Under this new schedule and bonus, Greenleaf ore containing 70.5 percent CaF_2 would have a value of $19.05 a ton, f.o.b. the Deming mill.

The prevailing prices paid by the Zuni Milling Co. for fluorspar ores originating in the Deming area are as follows:

60 percent CaF_2 - $14.00 a ton plus freight to Los Lunas.

70 percent CaF_2 - $20.00 a ton plus freight to Los Lunas.

80 percent CaF_2 - $26.00 a ton plus freight to Los Lunas.

Under this schedule, Greenleaf ore containing 78.5 percent CaF_2 would have a value of $20.14 a ton, f.o.b. cars in Deming. Other things being equal, about $1.00 more a ton could be realized from the average grade by shipping to the Zuni Milling Co. rather than to the General Chemical Corp.

Trucking charges on ore from the Greenleaf mine to Deming range from $1.00 to $1.25 per wet ton, depending on whether the ore is unloaded in a stockpile or loaded into railroad cars.

Under the terms of the purchase contract on the property the royalty is 10 percent of the gross sales value of the ore.

SUMMARY: - COST OF PROJECT

To properly equip and develop the Greenleaf mine would require a capital investment of about $75,000. This does not include the present indebtedness of the applicant, nor working capital.

The estimated operating costs are as follows:

Mining and development	$ 12.25 a ton
Marketing (trucking to Deming)	1.25 a ton
Royalty	2.00 a ton
Overhead	0.50 a ton
Total	$ 16.00 a ton

The average estimated value of the ore at current prices, if sold to the Zuni Milling Co., would be $20.14 a ton. With an operating cost of $16, a profit of about $4.00 a ton would result. Thus the indicated and inferred reserves of 30,000 tons would have a value at this time of $120,000 before taxes and depreciation. It seems safe to estimate that the Federal and State taxes in this case would amount to at least $1.00 a ton, thus reducing the total prospective value of the ore reserves to $90,000.

As shown in the report of the examiner for the Reconstruction Finance Corporation, the applicant's estimate of the total operating costs were given as $13.65 a ton. As this estimate was not broken down there is no way to reconcile the difference between the estimates of the applicant and those of this writer. The applicant made no provision in the project proposals for the cost of the shaft or the development of the 500-foot level, so it appears probable that those costs at least were not included in the applicant's estimates.

CONCLUSIONS AND RECOMMENDATIONS

No significant amount of measured ore exists in the accessible workings of the Greenleaf mine. The net value of the ore reserves as estimated in this report was dependent upon indicated and inferred ore. The estimates of these reserves were based on the former production and the assumed continuity, or downward extension of the deposit, for which there was some geologic evidence.

The minimum capital requirements to properly equip and develop the potential reserves were estimated to amount to $75,000. The ore to be

developed by this expenditure was estimated to have a net value after taxes of about $90,000. Over $50,000 of this possible profit was based on inferred ore and about $40,000 on indicated ore. The degree of risk inherent in the estimation of these classes of ore, particularily inferred, is such that they do not constitue sound security for a production loan. Thus there is no assurance that the ore reserves are adequate to repay a loan of the amount required.

Therefore, it is recommended that the application for a production loan on the Greenleaf mine be denied.

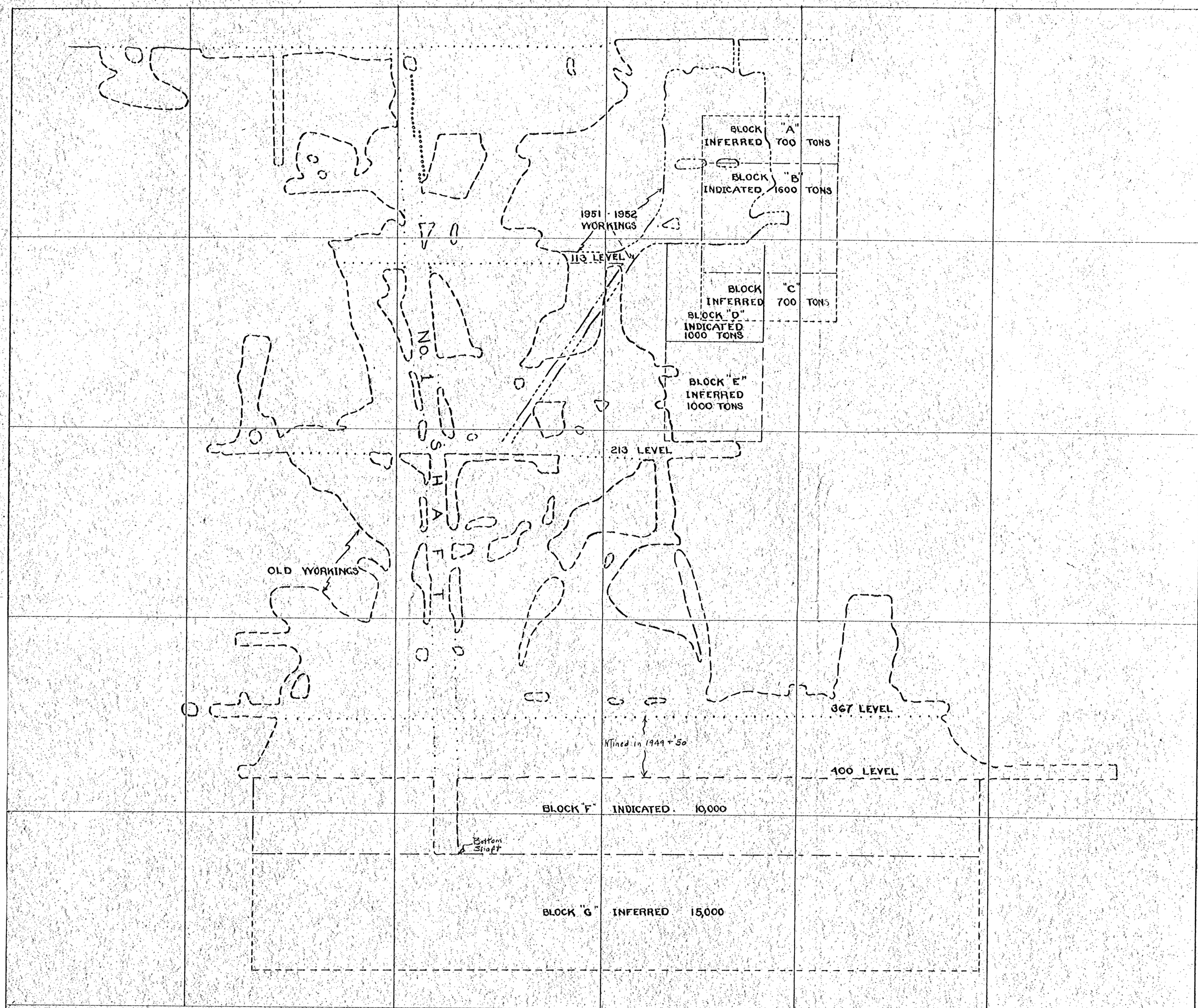

FIG. 7 LONGITUDINAL PROJECTION, GREENLEAF MINE, LUNA COUNTY, N.M.; D.M.A. 1137

Scale 1" = 30'