UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Region IV

Building 20, Room 137
Denver Federal Center
Denver 14, Colorado
February 19, 1953

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
FEB 24 1953

Memorandum

To: A. H. Koschmann, Geological Survey

From: Chief, Mineral Resources Branch, Mining Division, Region IV

Subject: DMEA 2752 (Uranium), Atomic Energy Uranium, Inc. (Pewabic-Iron mine), Gilpin County, Colorado

Please find enclosed the brochure on the subject docket originally submitted to you by the Region IV Field Team.

Thank you for making it available for our use.

W. M. Traver

W. M. Traver

enclosure

dd:cb

AHK 4/19/53

cc: WHKing (2)
AHKoschmann
DMEA 2752
Chron

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. 2752
Metal or Mineral
Date Received
Estimated Cost
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: ATOMIC ENERGY URANIUM, INC.,
405 INTERSTATE TRUST BUILDING,
DENVER 2, COLORADO.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.) See attached
(*d*) If a partnership, add to the above statement the names and addresses of all partners.) sheet

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract See attached sheet

(*b*) State any mine name by which the property is known. Pewabic Mine, Iron Mine

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Owner

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. Owner

(*e*) If you own the land, describe any liens or encumbrances on it Mortgage, copy attached as Exhibit "A"

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice.

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes. See attached sheet

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points. See attached sheet

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power. See attached sheet

5. *The exploration project.*—(*a*) [illegible]te the mineral or minerals for which you wi[illegible] explore Pitchblende (Uranium)

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc. See attached sheet

(*c*) The work will start within 60 days and be completed within 12 months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations. See attached sheet

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)? Yes

(*b*) How do you propose to furnish your share of the costs?

[X] Money [ ] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated OCT 9 1952, 1952

ATOMIC ENERGY URANIUM, INC.,
(Applicant)

By Mabel N. Scott
Secretary

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED.

1. Name of Applicant:

(a) Atomic Energy Uranium, Inc.,
405 Interstate Trust Building,
Denver 2, Colorado.

(b) A Delaware corporation

(c) George S. Groves, President and Director,
Box 126, Goodsprings, Nevada.

C. Hammond Burton, Vice President and Treasurer and Director,
225 Northway Road, Baltimore, Maryland.

Mable N. Scott, Secretary,
405 Interstate Trust Building,
Denver 2, Colorado.

H. D. Miller, Director,
423 East Baltimore Street,
Baltimore, Maryland.

3. Applicant's property rights: (Claim Map Attached)

(a) The following lode mining claims located in Russell Mining District, Gilpin County, Colorado, in Sec. 23, T. 3 S., R. 73 W:

Name of Claim	U. S. Survey No.
Pewabic and Millsite (Except that portion that conflicts with No. 857)	125
Pewabic and millsite	126
Pewabic	560
William Richardson	233
Bangor	571
Iron	572
Bobtail	573
Grasshopper	853
Eighty-Three	874
Eighty-Four	5141
Bloomfield	5720
Croesus	12988
Croesus Extension	12988
Congressional	17147
Senatorial	17147
Rose Bud	16963

Also Water Right specially reserved upon the incidental Placer Tract "B", U. S. Survey No. 858.

(b) Pewabic Mine
Iron Mine

(c) Owner

(d) Owner

(e) Mortgage, copy attached as Exhibit "A".

4. Physical description:

The applicant is successor to Gold Uranium Mining Company who originally obtained the contract to purchase the property. Gold Uranium Mining Company, as Lessee, rehabilitated one of the shafts, the Iron, to the 3rd level and gained access to the third level for examination purposes. A report of this examination, prepared by G. C. Ridland, is attached as Exhibit "B".

No mining or exploration operation is in progress at this time.

The only part of the mine workings of the property that is accessible is the Iron shaft and the 3rd level of the Iron mine.

(b) Past Production: From U.S.G.S. Prof. Paper 94, page 255:

"The Iron and Pewabic mines being under one management and carrying ore entirely similar in character, the tenor and production of the two may be considered together. Records of shipments show that the smelting ore shipped from February 19, 1910, to December 28, 1910, had an average value of $58.40 per ton. The poorest shipment showed 0.14 ounce in gold and negligible amounts of other metals; the richest showed gold, 10.47 ounces; silver 15.25 ounces; and copper, 11.65 per cent.

"One shipment which approaches the average in value showed gold, 2.62 ounces; silver, 5.75 ounces; and copper, 1.55 per cent. The average value of the concentrating ore is stated to be about $11 per ton, mainly in gold."

"The gross production of the Iron and Pewabic mines from 1904 to 1910, inclusive, was $526,000. The production before this period is estimated at $1,500,000 to $2,000,000."

Current production: None

Ore reserves: Only information that the applicant has on ore reserves is contained in G. C. Ridland's report, Exhibit "B", for the 3rd level of the Iron mine, page 6. Ore in place, 7,310 tons; broken, 2,620 tons; dump, 9,900 tons. Please see page 6, Exhibit "B" for grade.

Atomic Energy Uranium, Inc.,
405 Interstate Trust Building,
Denver 2, Colorado.

4. Physical description: Cont'd.

(c) Geological Features:

Pre-Cambrian granite-gneiss on the property is fractured and fissure veins in fractures carry values in gold, lead, zinc, silver and uranium. At a point 525 feet west of the Iron shaft, 3rd level, a crosscut extends south a distance of 25 feet. It intersects a vein 6 feet wide approximately paralleling the Iron vein and containing stringers and globs of a hard, solid variety of pitchblende.

A channel sample across the vein was broken in two parts. The first over 44 inches returned 0.38% U_3O_8 and the second, an extension of the first, over 28 inches returned 0.10%. A short drift along one wall of the vein exposes pitchblende almost continually along the drift. The vein is open at both ends of the drift. The applicant proposes:

1. To determine the size of the pitchblende ore body by extending the drift in both directions and by raising on the occurrence.

2. Unwater the lower levels of the Iron mine and examine the remaining accessible workings for other pitchblende occurrences.

Further geological features are given in U. S. G. S. Prof. Paper 94, pages 123, 124, 125, 254, 255 and 256, photostat copies attached as Exhibit "C". Maps are included with the Geological Report 41, Exhibit "A".

(d) Accessibility:

The property is on Colorado State Route 279, a gravel road connecting Central City two miles northeast of the property and Idaho Springs, 2½ miles south of the property. Denver, the main supply point, is 35 miles east of the property.

(e) Manpower, Materials, Supplies, Equipment, Water and Power:

Manpower - available locally. Supplies, equipment and material - available in Central City, Idaho Springs and Denver. Water is available from mine drainage. Power - electric power, connected at the Iron and Rewabic shafts, is available in any desired amounts from the Public Service Company of Colorado.

5. The Exploration Project:

(a) Pitchblende (Uranium)

5. The Exploration Project: Cont'd.

(b) Proposed Work:

1. Dewater and rehabilitate Iron shaft to bottom (700 ft.)

2. Clean up and lay track on 3rd level, west of Iron shaft

3. Drift east on pitchblende-bearing vein, 3rd level, 525 feet west of the Iron shaft, 150 ft.

4. Drift west, same location, 150 ft.

5. Raise 100 ft. on pitchblende vein, location to be chosen after 3 and 4, above, completed 100 ft.

6. Clean up and rehabilitate any caved drifts and crosscuts below the 3rd level in order to examine lower workings for pitchblende exposures.

7. Examine, sample and map levels below 3rd level, Iron Mine.

(c) The work will start within sixty (60) days and be completed within twelve (12) months from the date of an exploration project contract.

(d) The applicant, a Delaware corporation, has just been organized to take possession of the property. The work, however, will be under the direction and supervision of Dr. G. C. Ridland. A copy of his experience record is attached as Exhibit "D".

6. Estimate of costs:

(a) Independent contracts: None

(b) Labor, supervision and consultants:

4	miners or timbermen driving drifts and raises	$1.75/hr*
	sinking shafts or winzes	$2.00/hr*
4	muckers driving drifts and raises	$1.65/hr*
	sinking shafts or winzes	$1.85/hr"
1	hoistman	$1.75/hr*
1	carpenter	$2.10/hr*
1	superintendent	$500/month
1	geological engineer-consultant	$500/month

The crew engaged in drifting or cross-cutting may be paid at the rate of $10 per foot of advance.

Total estimated cost of labor $11,425.00

*Based on an 8-hour, 5-day week with time and one-half for overtime.

Atomic Energy Uranium, Inc.,
405 Interstate Trust Building,
Denver 2, Colorado.

6. Estimate of cost: Cont'd.

If work is conducted on more than a one shift per day basis, the above schedule of labor shall apply to other shifts except for the position of geological-engineer-consultant.

(c) Operating materials and supplies:

Powder, caps, fuse	$3,540
Drill Steel and bits	240
Timber	1,000
Track, ties	550
Pipe, pipe fittings	1,700
Powder	1,000
Small tools	500

Total Estimated Supplies. $8,530.00

(d) Operating equipment: (to be rented)

1	sinker pump	$130 per mo.
1	mine hoist	100 per mo.
1	mine pump	50 per mo.
1	compressor	250 per mo.
1	mucking machine	100 per mo.

Total estimated rent . . .(4.1 Months). $2,590.00

Operating equipment: (to be purchased)

1	½-ton pickup truck	$1,500
2	Copco drills	1,000

Total estimated cost $2,500.00

Operating equipment: (to be furnished by operator)

None.

(e) Rehabilitation and Repairs:

Repair of compressor house $250* $2

*This includes estimates of cost of supplies and labor.

(f) New buildings, improvements, installations:

None.

Atomic Energy Uranium, Inc.,
405 Interstate Trust Building,
Denver 2, Colorado.

6. Estimate of costs: Cont'd.

(g) Miscellaneous:

Maintenance of equipment	$475	
Analytical work - none		
Accounting, $100/month	1200	
Workmen's compensation and O.D.	275	
Social Security Tax	175	
Unemployment tax	350	
Total Miscellaneous		$2,475.00

(h) Contingencies:

No estimate

$27,770.00

Summary:

(a)	Contracts - none	
(b)	Labor and supervision	$11,425.00
(c)	Material and supplies	8,530.00
(d)	Equipment to be rented	2,590.00
	Equipment to be purchased	2,500.00
(e)	Rehabilitation and repairs	250.00
(f)	Buildings - none	
(g)	Miscellaneous	2,475.00
		$27,770.00

7. (a) Yes

(b) Money

The applicant has, cash on hand, $16,350.00 which will more than cover its share of the cost of the project and hopes that results of the above program will justify amending this application to carry on a much larger exploration program.

Atomic Energy Uranium, Inc.,
405 Interstate Trust Building,
Denver 2, Colorado.

LIST OF EXHIBITS

A. Mortgage

B. Geological Report 41 by G. C. Ridland,
"3rd Level, Iron Mine."
Claim map
Underground maps (2)

C. Photostat copies of pages 123, 124, 125, 254, 255 and 256 from U. S. G. S. Prof. Paper 94.

D. Experience record of G. C. Ridland

Atomic Energy Uranium, Inc
~~Powabic Uranium Corporation~~
405 Interstate Trust Building
Denver 2, Colorado

Exhibit D.
Form MF-100
Attachments

Dr. G. C. Ridland graduated from the University of British Columbia in mining engineering and received his Ph.D. degree from Princeton University in June, 1939, and was immediately employed by Bear Exploration and Radium, Ltd., at Yellowknife, N.W.T. as resident geologist. During the 15 months of employment he was in charge of the operation while the general manager was absent most of the time in Toronto. The company employed a crew of 15 to 20 men and sank a 150-foot prospect shaft, drove 500 feet of tunnelling, did considerable surface trenching and approximately 20,000 feet of diamond drilling.

From October, 1940 to August, 1943, Dr. Ridland was employed in the research laboratory of the Johns-Manville Corporation at Mansville, N.J., and from September, 1943 to December, 1945, was in charge of an extensive uranium exploration and development program for the Canadian Radium and Uranium Corporation. He supervised a 20,000-foot diamond drilling program conducted during the summers of 1944 and 1945 at Great Bear Lake, Canada, and in the rehabilitation and examination of an old mine in 1945 near Goodsprings, Nevada.

In 1947-8 he was in charge of the rehabilitation and examination of two mines and a transportation tunnel near Central City, Colorado for the American Mining Company.

From June, 1943 to November, 1949, he was the chief engineer and consultant for the Consolidated Caribou Silver Mines, Inc., Boulder, Colorado. He was in charge of mine mapping, sampling, examination and the planning of the diamond drilling and development work. During this period he prepared a Securities and Exchange registration statement pertaining to a public offering of the company's securities. Following this, and up to the present, he has been engaged in consulting work in Texas, Utah, Colorado, and Nevada.

Recorded at ..... o'clock ..... M. .....
Reception No. .... Recorder.

RECORDER'S STAMP

This Indenture, Made this 15th day of September in the year of our Lord one thousand nine hundred and fifty-two between

GOLD URANIUM MINING COMPANY (Assumed by Atomic Energy Uranium, Inc.)

a corporation duly organized and existing under and by virtue of the laws of the State of Colorado, whose address is 405 Interstate Trust Bldg. in the ~~County of~~ City and County of Denver and State of Colorado, party of the first part, and the Public Trustee of the County of Gilpin in the State of Colorado, party of the second part, Witnesseth:

THAT WHEREAS, The said corporation has executed its one certain promissory note, bearing even date herewith, for the principal sum of Fifty-five Thousand ($55,000) Dollars, payable to the order of C. P. GRIFFITH and L. D. BURT as surviving directors & trustees,* in installments, to-wit: $5,000.on or before March 15, 1953, $3,000.00 on or before September 15, ~~and the sum of~~ 1953, and in royalties on ore, which royalties ~~payable, payable to the order of~~ beginning September 15, 1953, shall amount to a guaranteed minimum of $1,000.00 per year, with interest thereon after default at 6% per annum, payable in full balance thereof in any event on or before May 15, 1957, all as more particularly set forth in said promissory note, to which reference is hereby ~~after the date thereof, with interest thereon from the date thereof at the rate of ..... per annum, payable~~ made for greater certainty.

*of Pewabic Mining and Milling Company, A Colorado corporation, dissolved, & the survivor and successors of them as such trustees,

AND WHEREAS, The said corporation is desirous of securing the payment of said promissory note, in whosoever hands said note ~~or any of them~~ may be.

NOW, THEREFORE, The said party of the first part, in consideration of the premises, and for the purpose aforesaid, has granted, bargained, sold and conveyed, and hereby does grant, bargain, sell and convey unto said party of the second part, in trust forever, the following described property, situate in the Russell Mining District in the County of Gilpin, State of Colorado, to-wit:

Pewabic Lode and Mill Site, U. S. Survey No. 125, (excepting so much as conflicts with U. S. Survey No. 857); Pewabic Lode and Mill Site, U. S. Survey No. 126; Pewabic Lode, U. S. Survey No. 560; the William Richardson Lode, U. S. Survey No. 233; the Bangor Lode, U. S. Survey No. 571; the Iron Lode, U. S. Survey No. 572; the Bobtail Lode, U. S. Survey No. 573; the Grasshopper Lode, U. S. Survey No. 853; The Eighty-Three Lode, U. S. Survey No. 874; the Eighty-Four Lode, U. S. Survey No. 5141; the Bloomfield Lode, U. S. Survey No. 5720; The Croesus Lode, U. S. Survey No. 12988; The Croesus Extension Lode, U. S. Survey No. 12988; The Congressional Lode, U. S. Survey No. 17147; The Senatorial Lode, U. S. Survey No. 17147; The Rose Bud Lode, U. S. Survey No. 10923; all grantor's right, title and interest in and to the Water Right specially reserved upon the Incidental Placer Tract "B", U. S. Survey No. 858.

Atomic Energy Uranium, Inc.,
405 Interstate Trust Bldg.,
Denver 2, Colorado.

Exhibit "A"
Form MF-103

TO HAVE AND TO HOLD the same, together with all and singular the privileges and appurtenances, thereunto belonging: **In Trust Nevertheless**, That in case of default in the payment of said note , or any of them, or any part thereof, or in the payment of the interest thereon, according to the tenor and effect of said note , or any of them, or in payment of any prior incumbrance, principal or interest, if any, or in case default shall be made in or in case of violation or breach of any of the terms, conditions, covenants or agreements herein contained, the beneficiary hereunder or the legal holder of the indebtedness secured hereby may declare a violation of any of the covenants herein contained and elect to advertise said property for sale and demand such sale, then upon filing notice of such election and demand for sale with the said party of the second part, who shall upon receipt of such Notice of Election and Demand for Sale, cause a copy of the same to be recorded in the Recorder's Office of the county in which said real estate is situate, it shall and may be lawful for said party of the second part to sell and dispose of the same (en masse or in separate parcels, as said Public Trustee may think best), and all the right, title and interest of the said party of the first part, its successors or assigns, therein at public auction at the front door of the Court House in the County of Gilpin and State of Colorado, or on said premises or any part thereof, as may be specified in the notice of such sale, for the highest and best price the same will bring in cash, four weeks' public notice having been previously given of the time and place of such sale by advertisement weekly in some newspaper of general circulation at that time published in said County of Gilpin , a copy of which notice shall be mailed within ten days from the date of the first publication thereof to said party of the first part at the address herein given and to such person or persons appearing to have acquired a subsequent record interest in said real estate at the address given in the recorded instrument; where only the county and state is given as the address, then such notice shall be mailed to the county seat, and to make and give to the purchaser or purchasers of such property at such sale a certificate or certificates in writing describing such property purchased, and the sum or sums paid therefor, and the time when the purchaser or purchasers (or other persons entitled thereto), shall be entitled to a deed or deeds therefor, unless the same shall be redeemed as is provided by law, and said Public Trustee shall, upon demand by the person or persons holding the said certificate or certificates of purchase, when said demand is made, or upon demand by the person entitled to a deed to and for the property purchased, at the time such demand is made, the time for redemption having expired, make and execute to such person or persons a deed or deeds to the property purchased, which said deed or deeds shall be in the ordinary form of a conveyance, and shall be signed, acknowledged and delivered by the said Public Trustee, as grantor, and shall convey and quit-claim to such person or persons entitled to such deed, as grantee, the said property purchased as aforesaid, and all the right, title, interest, benefit and equity of redemption of the party of the first part, its successors and assigns therein, and shall recite the sum or sums for which the said property was sold, and shall refer to the power of sale herein contained, and to the sale or sales made by virtue thereof; and in case of an assignment of such certificate or certificates of purchase or in case of the redemption of such property by a subsequent incumbrancer, such assignment or redemption shall also be referred to in such deed or deeds; but the notice of sale need not be set out in such deed or deeds; and the said Public Trustee shall, out of the proceeds or avails of such sale, after first paying and retaining all fees, charges and costs of making said sale, pay to the beneficiary hereunder or the legal holder of said note the principal and interest due on said note according to the tenor and effect thereof, and all moneys advanced by such beneficiary or legal holder of said note for insurance, taxes and assessments, with interest thereon at six per cent per annum, rendering the overplus, if any, unto the said party of the first part, its successors, legal representatives or assigns; which sale or sales and said deed or deeds so made shall be a perpetual bar, both in law and equity, against the said party of the first part, its successors and assigns, and all other persons claiming the property aforesaid, or any part thereof; by, from, through or under said party of the first part. The holder or holders of said note or notes may purchase said property or any part thereof; and it shall not be obligatory upon the purchaser or purchasers at any such sale to see to the application of the purchase money. If a release deed be required, the party of the first part, its successors or assigns, hereby agrees to pay all the expenses thereof.

And the said party of the first part, for itself, its successors and assigns, covenants and agrees to and with the said party of the second part, that at the time of the ensealing of and delivery of these presents it is well seized of the said lands and premises in fee simple, and has good right, full power and lawful authority to grant, bargain, sell and convey the same in manner and form as aforesaid; and that the said property is free and clear of all liens and incumbrances whatever

and the above bargained property in the quiet and peaceable possession of the said party of the second part, his successors and assigns, against all and every person or persons lawfully claiming or to claim the whole or any part thereof, the said party of the first part shall and will **Warrant and Forever Defend.**

And that the said party of the first part will in due season pay all taxes and assessments levied on said property and all amounts due, or to become due, on account of principal and interest on prior incumbrances, if any; and will keep all buildings that may at any time be on said lands, during the continuance of said indebtedness, insured against loss by fire in such company or companies as the holder of said note may, from time to time, direct, for such sum or sums as such company or companies will insure for, not to exceed the amount of said indebtedness, except at the option of said party of the first part, with loss, if any, payable to the beneficiary hereunder as interest may appear, and will deliver the policy or policies of insurance to the beneficiary hereunder, as

further security for the indebtedness aforesaid. And in case of the refusal or neglect of said party of the first part, to thus insure and deliver the policies of insurance, or to pay such taxes or assessments or amounts due, or to become due, on any prior incumbrance, if any, then the holder of said note , or any of them may procure such insurance, or pay such taxes or assessments or amounts due upon such prior incumbrances, if any, and all moneys thus paid, with interest thereon at six per cent per annum, shall become so much additional indebtedness, secured by this deed of trust, and shall be paid out of the proceeds of the sale of the property aforesaid, if not otherwise paid by said party of the first part, and such failure shall be a violation or breach of this covenant and agreement.

AND THAT IN CASE OF ANY DEFAULT, Whereby the right of foreclosure occurs hereunder, the said party of the second part or the holder of said note or certificate of sale shall at once become entitled to the possession, use and enjoyment of the property aforesaid, and to the rents, issues and profits thereof, from the accruing of such right and during the pendency of foreclosure proceedings and the period of redemption, if any there be; and such possession shall at once be delivered to the said party of the second part, or the holder of said note or certificate of purchase, on request, and on refusal, the delivery of such possession may be enforced by the said party of the second part or the holder or holders of said note or certificate of purchase, by any appropriate civil suit or proceeding, and the said party of the second part, or the holder or holders of said note or certificate of purchase, or any thereof, shall be entitled to a Receiver for said property, and of the rents, issues and profits thereof, after any such default, including the time covered by foreclosure proceedings and the period of redemption, if any there be, and shall be entitled thereto as a matter of right without regard to the solvency or insolvency of the party of the first part or of the then owner of said property, and without regard to the value of the property, and such Receiver may be appointed by any court of competent jurisdiction upon ex parte application, and without notice—notice being hereby expressly waived—and all rents, issues and profits, income and revenue of said property shall be applied to the payment of the indebtedness hereby secured, according to law and the orders and directions of the court.

AND, That in case of default in any of said payments of principal or interest, according to the tenor and effect of said promissory note aforesaid, or any of them, or any part thereof, or of a breach or violation of any of the covenants or agreements herein, by the party of the first part, its successors or assigns, then and in that case the whole of said principal sum hereby secured, and the interest thereon to the time of sale, may at once, at the option of the legal holder thereof, become due and payable, and the said property be sold in the manner and with the same effect as if the said indebtedness had matured, and that if foreclosure be made by the Public Trustee, an attorney's fee of the sum of 5% of unpaid indebtedness ~~dollars~~ for services in the supervision of said foreclosure proceedings, shall be allowed by the Public Trustee as a part of the cost of foreclosure, and if foreclosure be made through the courts a reasonable attorney's fee shall be allowed by the court as a part of the cost of foreclosure, and in either event shall be and become a part of the lien hereby secured.

IN WITNESS WHEREOF, The said party of the first part has caused its Corporate name to be hereunto subscribed by its President, and its Corporate Seal to be hereunto affixed, attested by its Secretary the day and year first above written.

(CORPORATE SEAL)

GOLD URANIUM MINING COMPANY

By .....
President.

ATTEST:

.....
Secretary.

STATE OF COLORADO,
City and County of Denver } ss.

The within and foregoing instrument was acknowledged before me this ..... day of September, 19 52, by George S. Groves, the President and Mabel N. Scott, the Secretary of Gold Uranium Mining Company, a Colorado corporation

Witness my hand and official seal.

My commission expires April 1, 1953.

.....
Notary Public.

No.....

Deed of Trust

FROM

GOLD URANIUM MINING COMPANY

....., a corporation

TO

The Public Trustee

FOR THE USE OF

C. P. Griffith et al, etc.

STATE OF COLORADO,
.....County of ..... } ss.

I hereby certify that this instrument was filed for record in my office at.....o'clock .....M., ..., 19..... and is duly recorded in book..... page.....

.....
Recorder.

By.....
Deputy.

Fees, $.....

6-52 BRADFORD-ROBINSON PTG. CO., DENVER

G. Carman Ridland
Geological Engineer

Denver, Colorado
Geological Report 41
May 15, 1950

GCR
11/5/53

THIRD LEVEL OF THE IRON MINE, GILPIN COUNTY, COLORADO

GOLD URANIUM CORPORATION

Summary

The Iron mine is located in the heart of the famous Central City-Idaho Springs mining district and is 2 miles southwest of Central City, 2½ miles north of Idaho Springs, and 40 miles west of Denver, Colorado. It consists of a 700-foot deep, crooked, inclined shaft and 7 levels, only one of which, the 3rd, is accessible at the present time. It is under lease and option to Gold Uranium Corporation.

The Iron vein is a mineralized zone cutting through schists and pegmatites of pre-Cambrian age. It varies in width from 1 to 12 feet and consists of quartz, talc and altered country rock heavily mineralized with pyrite and in places, some copper and zinc sulphides. Cross cuts on the 3rd level have opened other veins roughly parallelling the Iron. In one of these veins pitchblende occurs in commercial quantities.

The Iron has been stoped almost continuously over a horizontal distance of 1,318 feet. Some blocks in the form of pillars and low-grade ore have been left and these have been measured and sampled. The ore remaining in place is estimated to total 7,310 tons; broken ore, 2,620 tons, and dump ore, 9,900 tons.

The evidence at hand in the Iron mine appears to warrant an intensive development program for the whole Pewabic property.

G. C. Ridland

G. C. Ridland

cc: Mr. George S. Groves, Pres.
Mr. Harry H. Hahn, Vice-Pres.
Mr. Harry L. Hahn, Sec.-Treas.
Frank H. Knighton
M. O. Reynard
L. B. Riley

Atomic Energy Uranium Inc.
~~Pewabic Uranium Corp.~~
405 Interstate Trust Bldg
Denver 2, Colo

MF 10

Geological Report 41

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G. Carman Ridland
Geological Engineer

Denver, Colorado
Geological Report 41
May 15, 1950

THIRD LEVEL OF THE IRON MINE, GILPIN COUNTY, COLORADO

GOLD URANIUM CORPORATION

Introduction

Location - The Iron is one of several, former, gold-silver producers on the Pewabic group of claims near Russell Gulch, 2½ miles north of Idaho Springs and 2 miles southwest of Central City in Gilpin County, Colorado. Sixteen patented claims and one unpatented claim comprise the group. It lies east of the Old Town group of claims and contains the eastern extension of some of the Old Town veins. The Pewabic property is owned by the Pewabic Mining and Milling Company and is under lease and option to Gold Uranium Corporation.

Scope of Examination - The water-level in the mine was found to be between the 3rd and 4th levels, and, as the U. S. Geological Survey had access to all the levels of the mine and published in Professional Paper 94 (1917) a brief report on its geology, and as other, independent engineering reports are available, it was decided that the cost of dewatering the remaining levels of the mine could be dispensed with for the purpose of this examination.

Mine Workings

Iron shaft - The Iron Mine consists of a 2-compartment, inclined shaft approximately 5 x 8 feet in cross section and 700 feet deep. Levels are established at irregular intervals. The first level is at 97, the 2nd at 227 and the 3rd at 288 feet below the surface. Those below the 3rd level were flooded and not examined, but old reports place them at even hundreds to the 7th level which is 700 feet below the surface. The mine was made accessible to the 3rd level by replacing the ladders in the man-way compartment. The shaft follows down the dip of the east-west trending, Iron vein and varies in its inclination from vertical to 75°. The hanging-wall and footwall sides of the shafts are standing firmly. The adjacent sides are mostly cribbed to support stope fills. There are, therefore, few vein exposures in the shaft.

The 1st and 2nd levels are inaccessible for reason that stope fill has fallen into these levels near the shaft and has blocked entrance to the drifts. Attempts to reach the 2nd level from the 3rd level through old stopes also failed. Examination of the two upper levels, therefore, would be impossible without considerable

rehabilitation expense, and this was deemed unnecessary for this examination.

The 3rd level was accessible in its entirety. West of the shaft it follows the Iron vein for 870 feet. East of the shaft it follows the Iron vein for 180 feet, then branches to follow the Richardson and Grasshopper veins; the breast of the former is 739 feet and the breast of the latter is 438 feet from the Iron shaft.

Cross cuts - Cross cuts leave the main 3rd level drift and head south. The first is 524 feet west of the shaft and is 57 feet long. It intersects a vein at this point, and drifts run 15 feet and 30 feet west. At the west end is an inaccessible raise. The second cross cut leaves the main drift at 42 feet east of the shaft and is 340 feet long. It intersects a vein at 150 feet south of the Iron vein and drifts run 140 feet east and 45 feet west along the vein. The third cross cut takes off from the Richardson drift at a point 617 feet east of the Iron shaft. It follows a branch vein for 60 feet then turns southeast for 35 feet where it intersects a vein. Drifts run 55 feet east and 20 feet west on this vein.

General Geology

The rock enclosing the ore bodies of the Iron mine (the Pewabic property having been credited with a production of approximately $2,300,000 in gold and silver with much of the ore shipments averaging better than 2 ounces per ton gold and 5 ounces per ton silver) is the Idaho Springs formation. It is the oldest pre-Cambrian (Archean) rock formation in the district and is composed mainly of quartz-biotite schist and intrusive dikes and sills of granite pegmatite. Another rock type, a gray to brown-colored and very fine-grained intrusive, composed predominantly of feldspar, and called a Bostonite dike, cuts the Idaho Springs formation. The Iron and related veins cut both the Idaho Springs and Bostonite formations.

Ore Deposits

The 3rd level west of the Iron mine follows the Iron vein for its full 870 feet. The 3rd level east follows the Iron vein to a point 180 feet east of the shaft where the vein splits; one called the Richardson, strikes N.45°E. and dips 65° to 80° SE., and the other called the Grasshopper, continues with the same strike, approximately east-west, and dips vertical to steeply south. The Richardson has been opened for a length of 538 feet and the Grasshopper for a length of 258 feet. The Iron and Richardson veins, therefore, have been opened up on the 3rd level for a total length of 1,060 feet plus 258 feet on the Grasshopper, which is possibly the eastern continuation of the Iron. Almost this full length of 1,318 feet of vein matter has been stoped. Stopes vary in width from 1 to 12 feet. Pillars and remnants of vein material not mined were sampled with results varying from 0.03 to 1.60 oz./ ton gold. Not one sample returned nil for gold or silver. One channel sample taken across the back of a 12-foot stope gave 0.40 oz./ ton gold for a full 142 inches.

The veins exposed on the 3rd level have similar appearances. They are fissure fillings and replacements along fracture-planes. The fillings are of dark-gray or blue quartz containing heavy pyrite mineralization. Commonly associated with the quartz is talc, evidently a result of wall-rock alteration. Copper and zinc sulphide

mineralization was noted in places and zinc occurs in important amounts in places. A small occurrence of galena (lead sulphide) was observed in the far east side. Pyrite mineralization is intense and goes far back into the altered walls of the fissure.

Pitchblende was found at two widely separated areas. The first is in a vein to the south of the Iron vein which is opened by the most westerly cross cut and a short drift. Here a vein 6 feet wide is strongly radioactive across the whole 6 feet and along the length of the drift. Seams of high-quality pitchblende up to ½-inch in width lie in the vein closely parallelling the course of the vein. Channel samples across the 6 feet ran 0.38% for 44 inches and 0.10% for 28 inches for an average of 0.27% U_3O_8 for the 72 inches. A 20-pound sample of hand cobbed pitchblende specimens was knocked from the vein with only a geological hammer in a few minutes. Material representative of the 20 pounds ran 18.0% U_3O_8. This vein also carries important quantities of gold and silver. One channel over 25 inches ran 0.28 in gold and 19.56 in silver in addition to 0.10% U_3O_8. Another ran 0.52 in gold and 2.00 in silver and 0.10% U_3O_8. A third ran 0.16 in gold and 1.98 oz. in silver and 0.15% U_3O_8.

The second occurrence of pitchblende occurs at the east end of the Richardson drift. A thin seam of pitchblende covers a small patch of the footwall. Most, if not all, of this occurrence was removed readily with a geological hammer shortly after it was discovered.

Table of Assay Results

Sample No.	Width of Vein (Inches)	Gold (oz. / ton)	Silver (oz. / ton)	Copper (%)	Zinc (%)	Uranium Oxide (%)
119	44	1.24	4.96			
120	45	0.12	0.94			
121	36	0.10	0.92			
122	18	0.16	0.92			
123	34	0.03	1.63			
124	58	0.12	1.34			
125	36	0.76	0.30			
126	36	0.08	0.42			
127	24	0.84	3.80			
128	25	0.10	4.10			
129	28	0.98	1.02			
130	26	0.20	0.44			
131	24	0.22	0.10			
132	22	0.06	0.56			
133	38	0.14	0.18			
134	43	0.05	0.83			
135	28	0.08	1.04			
136	14	0.06	1.14			
137	26	0.10	1.26			
138	40	0.10	0.92			

Sample No.	Width of Vein (Inches)	Gold (oz. / ton)	Silver (oz. / ton)	Copper (%)	Zinc (%)	Uranium Oxide (%)
139	36	0.05	1.85			
140	39	0.07	0.07			
141	37	0.10	2.86			
142	32	0.07	1.25			
143	20	0.06	0.78			
144	22	0.12	4.58			
145	22	0.30	8.78			
146	21	0.11	6.60			
147	44	0.01	0.10			0.38
148	28	0.52	2.00			0.10
149	25	0.28	19.56			0.10
150	26	0.52	2.46			
151	20	1.60	2.04			
152	18	0.20	1.40			
153	18	0.14	1.06			
154	14	0.16	1.98			0.15
155	17	0.11	1.74			
156	142	0.40	2.18			
157	27	0.03	0.33			
158	30	0.08	0.60			
159	33	0.05	0.45			
160	24	0.13	1.82	0.81	1.83	
161	32	0.11	0.94			
162	18	0.02	0.46			
163	32	0.06	2.16	0.25	1.44	
1026	58	0.09	0.91			
1027	36	0.10	0.50			
1028	35	0.05	1.59			
1029	46	0.04	1.12			
1030	32	0.05	0.15			
1031	23	0.20	1.00			
1032	35	0.06	1.56			
1033	44	0.09	0.95			
1034	23	0.42	0.72			Tr.
1040	46	0.01	1.42			
1041	53	0.08	1.54			
1042	34	0.03	2.02			
1043	25	0.30	1.28		8.82	Tr.
1044	31	0.10	1.94			
1045	30	0.06	2.24			
1046	48	0.11	0.91			
1047	50	0.64	1.60		12.02	
1048	30	0.09	0.62		22.2	
1049	18	0.02	1.18			
1050	44	0.08	1.86			
1051	39	0.02	0.74			
1052	34	0.03	2.21			

Sample No.	Width of Vein (Inches)	Gold (oz. / ton)	Silver (oz. / ton)	Copper (%)	Zinc (%)	Uranium Oxide (%)
1053	22	0.05	1.85			
1054	26	0.07	1.43			
1055	20	1.60	2.62	0.76	19.78	
1056	29	0.07	1.07			
1057	24	0.03	2.31			
1058	26	0.01	1.58			
1059	78	0.26	1.40	0.25	5.47	
1068	31	0.02	0.82			
1069	46	0.03	0.78			
1070	50	0.02	0.90			
1071	34	0.01	0.76			
1073	38	0.03	1.17			
1074	20	0.06	1.10			
1075	26	0.10	0.38			
Stope-fill samples						
F-1		0.15	1.10			
F-2		0.20	1.18			
F-3		0.25	1.22			
F-4		0.09	0.73			
F-5		0.24	0.28	0.25	1.92	
F-6		0.44	2.76	0.38	6.62	
F-7		0.11	1.13			
F-10		0.36	2.28			
F-11		0.22	3.46			
F-12		0.30	1.04			
F-13		0.32	1.06			
F-14		0.48	0.40			
F-15		0.29	1.92			
F-16		0.18	1.48			
F-17		0.15	1.29			
F-18		0.32	1.56			
F-19		0.54	1.40		2.02	
F-20		0.11	0.93			
Dump samples						
D-1		0.06	1.74			
D-2		0.12	0.50			
D-3		0.66	1.12			
D-4		0.22	1.46			

Ore Reserves between the 2nd and 3rd Levels

Veins in place - A fairly thorough job of stoping was done along the Iron vein on the 3rd level. Nevertheless, 81 channel samples were taken across the Iron and other veins where they were not mined. Some of these samples were taken in the

drift under stopes where stoping did not take the full width of the ore zone. This part, not mined, was sampled. The sampling was done with the object of determining the grade of the remnants left by former operators. The parallel veins opened up on the 3rd level south of the Iron were also thoroughly sampled. Two sections on these veins gave commercial results (Blocks P and Q). The table below lists the blocks of vein material in place. All these blocks, however, may not be of commercial value at this time.

Vein Material in Place

Block	Width (ft.)	Amount (tons)	Gold (oz./t.)	Silver (oz./t.)	Copper (%)	Zinc (%)	U_3O_8 (%)
A	9.7	1,560	0.48	2.45			
B	3.1	180	0.10	0.92			
C	2.7	400	0.10	1.42			
D	4.0	20	0.52	1.22			
E	2.2	230	0.40	2.07			
F	1.7	150	0.58	1.83			
G	3.4	270	0.09	0.53			
H	2.6	790	0.08	1.33			
J	1.8	190	0.14	5.00			
K	8.0	2,190	0.20	1.08			
L	2.1	50	0.02	1.93			
M	2.2	410	0.29	1.41	Tr.	Tr.	
N	3.0	650	0.14	1.28		Tr.	Tr.
P	2.7	170	0.24	4.40			0.17
Q	2.4	50	0.24	1.66		13.3	
Total		7,310 tons					

The broken ore remaining in the old stopes cannot be measured or sampled with accuracy at this time. However, a crude attempt was made to arrive at some indication of their extent and worth. The following results were obtained by taking 100 lb. samples and quartering them down to 12-pound samples which were submitted to the assay laboratory.

Broken Ore

Block	Width (ft.)	Amount (tons)	Gold (oz./t.)	Silver (oz./t.)	Copper (%)	Zinc (%)
F-13	7.2	900	0.32	1.06		
F-14	3.4	200	0.38	1.16		
F-16	4.0	390	0.18	1.48		
F-18	3.1	30	0.32	1.56		
F-19	2.7	20	0.54	1.40		2.02
F-11	8.0	370	0.21	1.88		
F-10	4.0	140	0.36	2.28		
F-6	6.0	130	0.44	2.76	0.38	6.62
F-5	3.0	120	0.24	0.28	0.25	1.92
F-1	3.0	320	0.17	1.06		
Total		2,620 tons				

The dumps on the surface at the Iron shaft were sampled in the same manner as the underground broken ore and a similar statement regarding accuracy applies. One sample, D-3, ran 0.66 oz./t. gold and is apparently not representative. It has been reduced to 0.17, the average of the two adjoining samples, for estimating purposes. The result obtained is that the dumps measure 9,900 tons and average 0.12 oz./t. gold and 1.28 oz./t. silver.

Gamma-ray Intensities

Radioactivity was carefully measured, in detail, throughout the 3rd level and accessible stopes. Beginning at the Iron shaft a reading of 11 was obtained in contrast to a surface background count of 3. Going west from the shaft the count dropped slightly and varied from 6 to 9. At the first cross cut south on the Iron vein the reading was 10, and entering the cross cut the reading steadily increased to the point where the vein was reached. Across the 6 feet of vein matter the reading registered a count of 35 to 40. In the short drift running along the south side of the vein, the count varies from 20 to 35. Pitchblende is visible in this vein.

doesn't mean anything

The remainder of the Iron vein to the west gave readings varying from 4 to 8.

East of the Iron shaft the Iron vein and subsidiary structures to the south produced gamma-ray counts varying from 6 to 9 except for one spot near the east end of the Richardson shaft. Here a reading of 15 was obtained at a point on the footwall side. A small occurrence of pitchblende was observed. The occurrence does not appear to be extensive.

Some mild anomalies were noted on the east side along the south veins. These were not of sufficient intensity to indicate the presence of visible pitchblende.

A consistent reading above the normal surface background, along the 3rd level of the Iron mine is considered to be of significance. Readings varying from 4 to 11 do not indicate commercial quantities of radioactive minerals in the immediate vicinity of the reading, but do mean that there is positive radioactivity along the vein and wall rock of the mine, and, when this phenomenon exists, it is believed to mean that there is a possibility that the veins may, in places, contain commercial concentrations of radioactive minerals. The writer has yet to examine a mine where radioactive ores do occur and the general gamma-ray intensities away from the orebodies were not above the normal surface background count at least in places.

I guess rocks with monazite or zircon have some mass effect

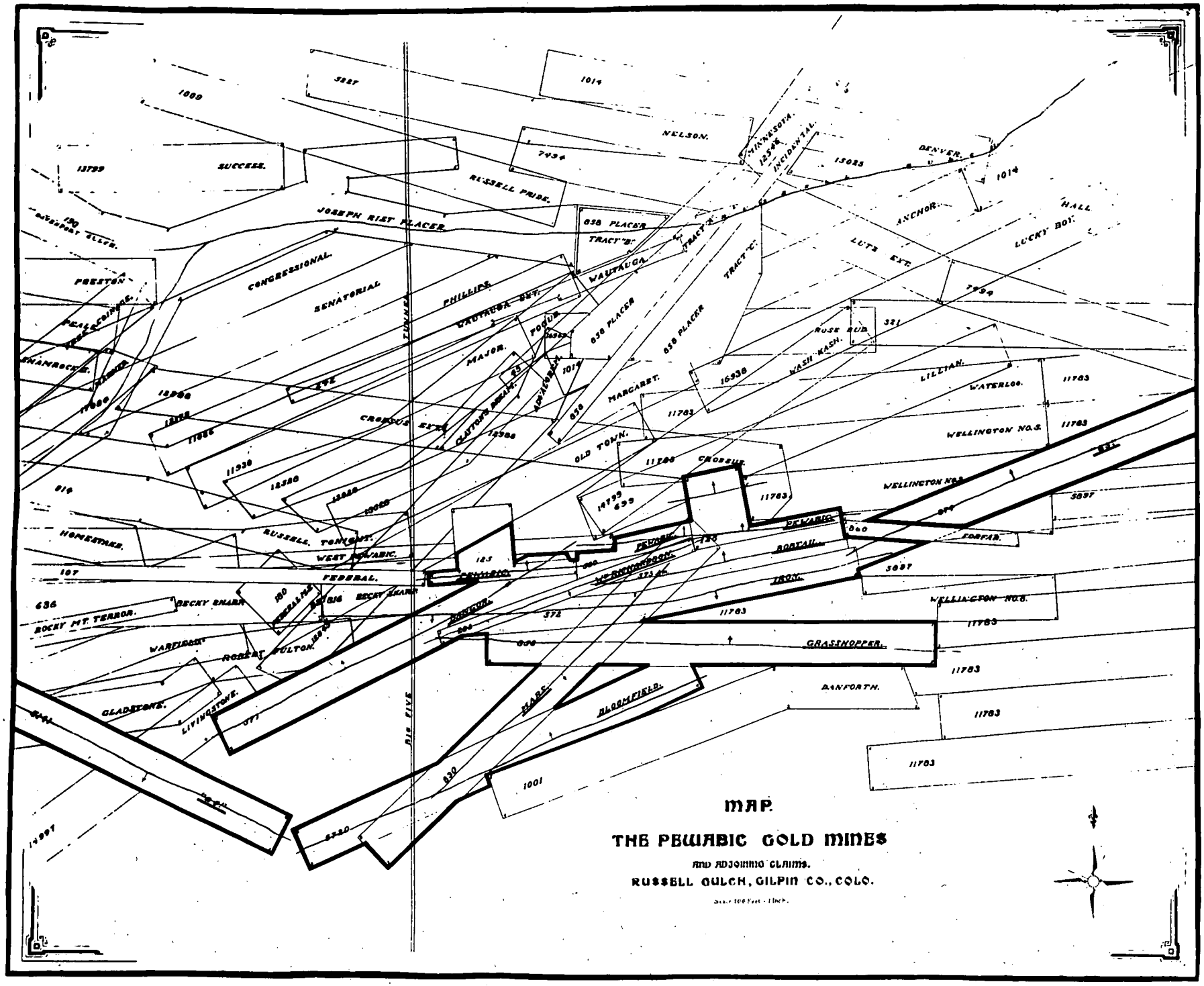
The pitchblende in the vein to the south on the west side of the mine is definitely of commercial grade at today's prices for uranium, and further development work on this showing is warranted.

Conclusions

It is evident, from the examination of the 3rd level, that the Iron mine was certainly an important producer in the past. An ore shoot with a horizontal length of over 1,000 feet and widths varying from 1 to 12 feet is impressive.

OK

There is a possibility, however, that one might conclude that this extensive ore shoot owes its existence to secondary enrichment, and, at depths below the present workings, ore of similar grade might not be found. In regard to this, little or no oxidation signs, other than those taking place at the present time due to exposure by the mine openings, were observed. Minerals diagnostic of secondary enrichment, such as chalcocite, covellite, native silver, or an abnormally high ratio of silver to gold content, were not observed. The U. S. Geological Survey, Professional Paper 94, Page 255, states that "the records of careful samplings (in the Iron mine) fail to show any regular decrease in ore values dependent upon depth." For these reasons, the writer is of the opinion that the ore-body on the 3rd level is a primary deposit and not secondary, and that ore shoots of similar width and grade will be found at deeper horizons. From the evidence at hand, an intensive development program is warranted for the Iron mine and Pewabic property.


MAP.
THE PEWABIC GOLD MINES
AND ADJOINING CLAIMS.
RUSSELL GULCH, GILPIN CO., COLO.
Scale 100 Feet - 1 Inch.
NELSON.
SUCCESS.
RUSSELL PRIDE.
JOSEPH RIET PLACER.
CONGRESSIONAL.
SENATORIAL
PHILLIPS.
WAUTAUGA.
WAUTAUGA EXT.
MAJOR.
POQUIN.
838 PLACER
TRACT "B"
TRACT "A"
TRACT "C"
MINNESOTA.
INCIDENTAL.
DENVER.
ANCHOR.
LUTZ EXT.
HALL
LUCKY BOY.
PRESTON
SHAMROCK.
CROCUS
CROCUS EXT.
CLAYTON BEAN.
APPLEBEE.
MARGARET.
OLD TOWN.
ROSE BUD.
WASH-KASH.
LILLIAN.
WATERLOO.
WELLINGTON NO. 5.
WELLINGTON NO. 8.
HOMESTAKE.
RUSSELL.
TONGUE.
WEST PEWABIC.
FEDERAL.
ROCKY MT. TERROR.
BECKY SHARP
WARFIELD.
ROBERT
FULTON.
GLADSTONE.
LIVINGSTONE.
PEWABIC.
ROBTAIL.
IRON.
FORFAR.
GRASSHOPPER.
DANFORTH.
BLOOMFIELD.
HARE.
McPHERSON.
TOWN 3 S.
RG. FIVE

not an abundant accompaniment of the cobalt-silver type of veins. Its kidney-shaped or rounded shell-like masses are ordinarily associated with chalcopyrite, galena, and brown carbonate. Müller regarded the pitchblende and its accompanying minerals as of slightly later formation than the primary cobalt and nickel minerals and earlier than the rich silver minerals.

CORNWALL DISTRICT, ENGLAND.

In and near the granite batholiths of Cornwall occur not only tin and copper lodes but also, usually at a greater distance from the granite, younger lodes of two types—(1) those containing uranium and nickel ores and (2) iron-manganese lodes.[1] In the vicinity of Bodmin, for example, there occur certain lodes containing arsenic and copper minerals and smaller quantities of uranium, cobalt, and nickel ores. These lodes cross the tin and copper lodes that are the main mineral resources of the district and are therefore somewhat younger, although it is believed that all the lodes are genetically connected with the granitic intrusives of the region.

In the St. Austle Consols mine, according to Williams,[2] uranium minerals have been found in certain small veins that cross the main tin-copper lode. The associates of the uranium minerals in the cross veins are locally copper ores but more commonly ores of nickel and cobalt. The uranium minerals also occur on the sides of the veins.

At Dolcoath, according to Pearce,[3] pitchblende occurred "associated with native bismuth and arsenical cobalt in a matrix of red compact quartz and purple fluorspar." At South Tresavean it occurs with "kupfernickel, native silver, and rich argentiferous galena." "I believe," says Pearce, "in all the localities I have named, it was found in little veins crossing the lodes" (that is, the tin lodes).

At the South Terras or Uranium mine, in Cornwall,[4] "The uranium lode * * * is said to vary in width from 3 to 5 feet, but the uranium ore is confined to a leader a few inches in width, consisting partly of pitchblende and calc and copper uranites with copper pyrites, mispickel, and galena, and small quantities of nickel, cobalt, and chromium ore in a veinstone of quartz and green garnet rock."

PITCHBLENDE IN THE CENTRAL CITY QUADRANGLE.

Within the area of the Central City quadrangle pitchblende has been reported from the Alps, Belcher, Calhoun, German, Kirk, Mitchell, and Wood mines, on Quartz Hill; from the 200-foot level west, in the Pewabic mine, in Russell Gulch; and from the Jo Reynolds mine, near Lawson. The pitchblende occurs as a minor component of gold-silver ores, and most of the mines mentioned above have been worked primarily for gold and silver rather than for pitchblende.

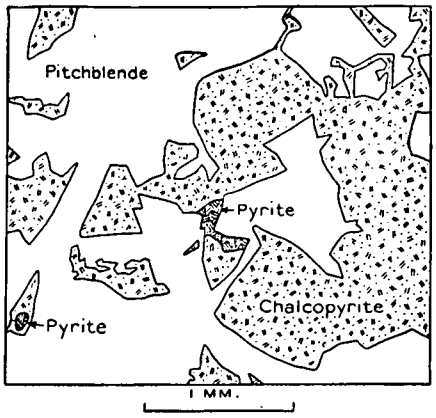


FIGURE 11.—Camera lucida drawing of polished section of ore from the Wood mine, Quartz Hill, showing contemporaneous intergrowth of pitchblende, chalcopyrite, and pyrite.

Although few opportunities were afforded for studying the richer pitchblende ores in place, because of suspension of mining at most of the mines, many excellent specimens from these mines were polished and studied under the reflecting microscope and found to show clearly the relations of the pitchblende to the sulphides which accompany it in the veins.

In a number of specimens it is evident that the pitchblende crystallized contemporaneously with chalcopyrite, pyrite, and probably gray quartz. A specimen from the Wood mine, obtained through the courtesy of Mr. W. C. Denison, presented, when polished, the appearance shown in figures 11 and 12. Some of the intergrown chalcopyrite and pitch-

[1] Ussher, W. A. E., Barrow, G., and MacAlister, D. A., The geology of the country around Bodmin and St. Austell: Geol. Survey England and Wales Mem., Expl. Sheet 347, p. 134, 1909.

[2] Williams, R. H., Notice of the occurrence of nickel and cobalt at St. Austle Consols mine, near St. Austle, Cornwall: Roy. Inst. Cornwall Thirty-ninth Ann. Rept., pp. 32-34, 1857.

[3] Pearce, Richard, Note on pitchblende in Cornwall: Roy. Geol. Soc. Cornwall Trans., vol. 9, pp. 103, 104, 1875.

[4] Ussher, W. A. E., Barrow, G., and MacAlister, D. A., op. cit., p. 157.

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blende of this specimen show angular outlines, as indicated in figure 11, but more commonly the pitchblende areas are ringlike in cross section, chalcopyrite occupying the center of the ring and inclosing it, as indicated in figure 12. Pyrite and gray quartz, apparently contemporaneous with the pitchblende and chalcopyrite, are present in small amounts. Specimens from the Wood and German mines in the mineral collections at the State Capitol in Denver show chalcopyrite and pitchblende so intimately intergrown as to leave little doubt of their contemporaneous crystallization. In other specimens from the Wood mine botryoidal

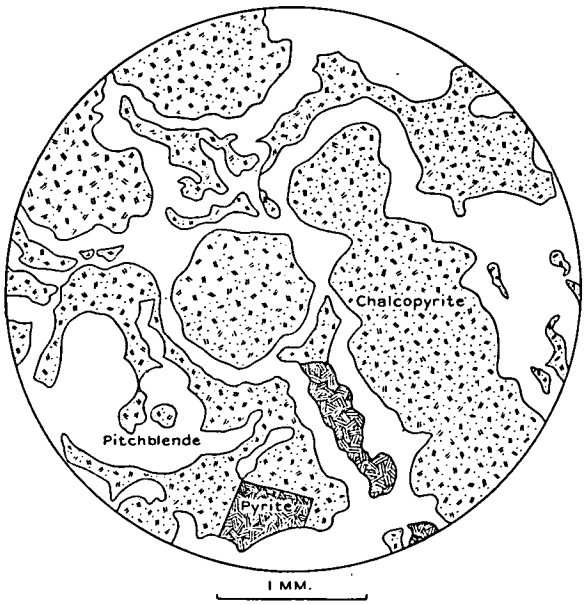


FIGURE 12.—Camera lucida drawing of polished surface of pitchblende ore from the Wood mine, Quartz Hill, showing contemporaneous intergrowth of pitchblende, chalcopyrite, and pyrite. In contrast with figure 11, which was drawn from another part of the same specimen, the pitchblende areas show rounded outlines.

pitchblende has cores of pyrite and is in places fringed with pyrite, as shown in Plate XV, *A*. To summarize, the manner in which the minerals are intergrown in several specimens shows conclusively that pitchblende crystallized contemporaneously with chalcopyrite and probably with minor amounts of pyrite and gray quartz.

Other specimens carry sulphides which are later than the pitchblende. A specimen of rich ore from the Calhoun mine, obtained through the courtesy of Mr. Hugh C. Brown, consists principally of pitchblende, but this mineral is sharply cut by veinlets one-eighth inch or less in width, composed of sphalerite, pyrite, and some galena. The form of some of these veinlets is shown in figure 13. Similar relations in a specimen from the German-Belcher mine, lent by Mr. Forbes Rickard, are shown in Plate XVI, *B*. Another specimen from the Calhoun mine shows pitchblende shattered to minute fragments which lie in a matrix of pyrite and chalcopyrite with some galena, sphalerite, and quartz. Similar brecciation of pitchblende in ore from the German-Belcher mine is shown in Plate XVI, *A*.

Specimens of pitchblende ore from the Jo Reynolds mine near Empire were kindly lent by Mr. R. B. Morton. They came from the tunnel level near the bottom of the old

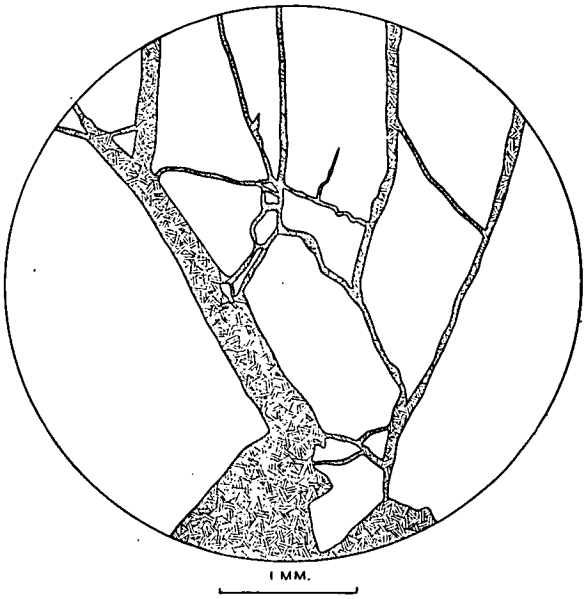


FIGURE 13.—Camera lucida drawing of polished face of ore from the Calhoun mine, showing pitchblende (white) traversed by later veinlets of pyrite, sphalerite, and galena (patterned).

shaft, from a point about 1,000 feet below the surface. Microscopic examination of polished surfaces of the ore showed fragments of pitchblende having characteristic botryoidal forms embedded in a matrix of quartz, siderite, sphalerite, galena, and chalcopyrite. In places minute veinlets of one or more of these minerals traverse the pitchblende. It is clear from the study of these specimens that after the period of pitchblende deposition the ores were fractured and the fractures filled with quartz, sphalerite, galena, chalcopyrite, pyrite, and, in the Jo Reynolds ore, siderite. In the Jo Reynolds ore no sulphides contemporaneous with the pitchblende were noted.

The significance of the contrasting and apparently contradictory modes of association of the pitchblende with the sulphide minerals becomes apparent when it is recalled that there have been in this region two periods of mineralization, an earlier pyritic mineralization and a later galena-sphalerite mineralization. The minerals intergrown contemporaneously with the pitchblende are those characteristic of the pyritic mineralization; those which are later than the pitchblende are characteristic of the galena-sphalerite mineralization. On this evidence it is believed that the pitchblende ores were deposited during the earlier or pyritic mineralization; that they were later fractured; and that ores of the later or galena-sphalerite type were deposited in the fractures. They are, according to this interpretation, merely a local and unusual variation in the main sulphide mineralization of this region—a variation of the same order as the occurrence of enargite in a neighboring group of veins near South Willis Gulch. No evidence was found to indicate that the pitchblende mineralization is genetically connected with the intrusion of the pre-Cambrian granitic rocks;[1] on the contrary, the writer believes that, together with the sulphides that accompany them, they are genetically related to the Tertiary (?) monzonite intrusives.

The general geologic relations and the absence of characteristic high-temperature minerals in the deposits of Quartz Hill, as well as in those of Cornwall and the Erzgebirge, indicate that the pitchblende was deposited under conditions of moderate temperature and pressure. Unlike the European pitchblende, however, the pitchblende of Quartz Hill is not associated with nickel and cobalt minerals, which so far as known have never been found in that region even in small quantities. The occurrence of pitchblende in pegmatite as well as in mineral veins of the type here described shows that the mineral may also form under conditions of high temperature and pressure.

[1] See Rickard, Forbes, Pitchblende from Quartz Hill, Gilpin County, Colo.: Min. and Sci. Press, vol. 106, pp. 851-856, 1913.

more than one-eighth of an inch wide but which locally swell to 1 inch. The narrower stringers are pyrite with a little chalcopyrite; the wider ones carry also some quartz. In the eastern part of the lateral the veinlets of solid pyrite that traverse the pyrite-impregnated gneiss are sharp walled and are plainly fissure fillings. In one place there is 1 foot of solid pyrite.

The so-called Columbus vein exposed on the Hot Time lateral is also pyritic but is only feebly mineralized. It is a fractured zone from a few inches to 2 feet in width carrying here and there a small stringer of pyrite and a little disseminated pyrite.

All ore is now mined through the shaft and is carried 3 miles to Blackhawk by the Gilpin Tramway. Smelting ore is sold to the sampling works at Blackhawk and concentrating ore shipped via the Colorado & Southern Railway to the Jackson mill at Idaho Springs. It has already been pointed out that the strength of the mineralization decreases in the deeper workings, a fact reflected in decreased value of the ore. An example of the richer portion of the lode is a shoot between the surface and the third level, in which the ore averaged about $59 per ton. A lens between the fifteenth and sixteenth levels averaged $40 per ton, mainly in gold. Chalcopyrite is, as a rule, much richer in gold than pyrite, and the better grades of ore commonly carry about 3 per cent of copper. Sampling of the fourteenth and fifteenth levels by Mr. W. H. Wiley gave an average ore value of $40.58 for one block and $32.01 for another, gold being reckoned at $20 and silver at $0.65 an ounce and copper at $0.18 a pound. The average width sampled was 3.8 feet. In these samples the gold ranged from 0.1 to 6.44 ounces, the silver from 0.3 to 22.1 ounces, and the copper from a trace to 8.8 per cent.

From shaft workings below the fifteenth level 124 samples of ore taken by Mr. Wiley showed gold contents from a trace to 4.22 (average 0.29) ounces and silver from a trace to 5.7 (average 0.78) ounces. The ore of the Old Town vein on the Hot Time lateral is said to average only $0.80 to $1 per ton.

The gross production of the mine is said to have been about $2,700,000.

BECKY SHARP MINE.

The Becky Sharp mine is a short distance southeast of Russell Gulch village, apparently on the westward extension of the Pewabic vein. The development consists of three shafts 120, 135, and 160 feet deep, with connecting drifts. All of the ore is of the pyritic type and of concentrating grade and is sent to the Jackson mill at Idaho Springs, where a concentration of about 3½ into 1 is effected. The value is said to be $8 to $10 per ton.

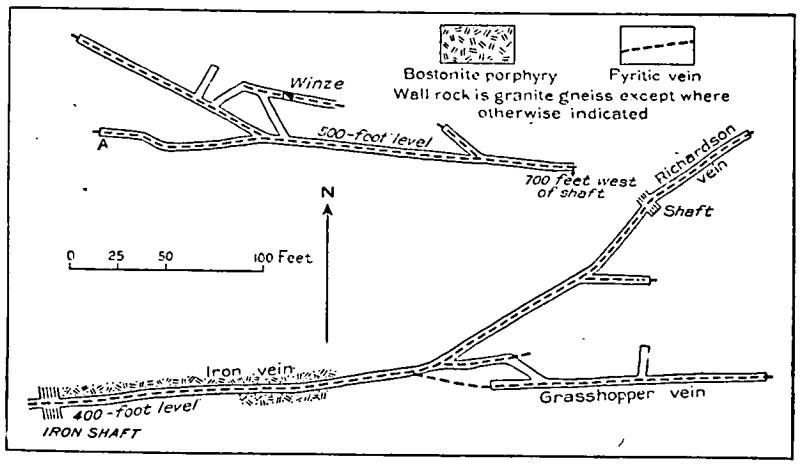


FIGURE 43.—Plans of portions of the 400-foot and 500-foot levels of the Iron mine, showing characteristic branching vein systems.

IRON MINE.

The Iron mine, on the south side of Russell Gulch near the town of that name, is mainly developed through an inclined shaft following the vein, with levels at 120, 250, 300, 400, 500, 600, and 700 feet. The wall rock is granite gneiss except for a small amount of bostonite porphyry. The workings, which are very extensive, are mainly on the Iron vein, whose average strike is nearly east and west and whose dip ranges from vertical to 75° S. On the 300 and 400 foot levels east the junction of the Iron vein with the Richardson and Grasshopper veins is exposed. (See fig. 43.) The 300, 400, and 500 foot levels were examined so far as they were accessible.

The commonest type of mineralization in the Iron vein is a dissemination of pyrite through the altered granite gneiss of a zone of fracturing. This zone may vary in width from a few inches to several feet, the stopes near the shaft on the

400-foot level being 12 feet in width. In a few places this disseminated ore is traversed by a net of minute pyrite stringers and more rarely by several inches of nearly solid pyrite. On the 400-foot level east the vein enters a dike of bostonite porphyry and divides into numerous small stringers, some of which are very vuggy. The mineralization is clearly later than this dike, but in the dike the ore is said to assay only $3 to $4 a ton.

At the time of this survey the mine was being worked by several sets of lessees. Little work was in progress on the Iron vein, the main activity being on branch or subsidiary veins exposed on the 500-foot level more than 800 feet west of the shaft. At the face on this level (A, fig. 43) 1 foot of nearly solid fine-grained pyrite is exposed in a narrow stope; and at a place 320 feet west of the shaft a breccia of gneiss fragments is cemented by pyrite in crystals a quarter of an inch in maximum size. Beautiful green crystals of hydrous iron sulphate are now forming in places on the walls on this level by deposition from surface waters descending along the vein. The waters of this mine are so corrosive that the overalls of miners working in wet places are sometimes eaten to shreds in a day or two, and iron rails, pipes, and nails must be frequently replaced.

The Richardson shaft, about 300 feet northeast of the Iron shaft, was inaccessible. The Richardson vein, however, was studied on the 400-foot level, which connects with the 400-foot level of the Iron mine (fig. 43). The average strike of the Richardson vein is about N. 40° E. and the dip is 65°–80° SE. A shaft with short levels at 160, 200, 300, and 400 feet descends on the vein. East of the shaft the vein was not traced far, but west of the shaft it forms a true junction with the Iron vein. One of the best exposures of the Richardson vein is in a stope 20 feet east of the shaft, where a width of 6 feet of altered granite gneiss is traversed by a network of irregular but sharp-walled sulphide veinlets 5 inches and less in width. These veinlets consist almost wholly of pyrite in crystals whose maximum size is 1½ inches. The vein here is said to sample about $7 per ton, the coarse pyrite being characteristically of low value.

The Grasshopper vein was accessible only on the 400-foot level (fig. 43), where it forms a true junction with the Iron vein about 180 feet east of the Iron shaft. As exposed it strikes nearly east and west and stands about vertical. Its mineralization is feeble. A vein between the Grasshopper and the Richardson (fig. 43) is 1½ feet wide and is similarly but more heavily mineralized.

The Mars vein, which strikes nearly east and west and dips 50°–80° N., is exposed on the 300-foot level of the Iron mine by a crosscut extending south-southeast. It lies about 115 feet south of the Iron vein and has been drifted upon for 85 feet and developed by a stope and winze. The vein shows from 1½ to 3 inches of solid pyrite bordered by granite gneiss carrying disseminated pyrite.

All of the veins described above are similar in mineral character and were formed at the same time. Although pyrite is the principal ore mineral, chalcopyrite and tennantite also occur in more or less pockety distribution and commonly indicate comparative richness. In most places where the ore carries over 2 ounces in gold it also carries copper in commercial amounts (over 1.5 per cent). The coarse pyrite is prevailingly of low grade, but much of the fine pyrite is fairly rich in gold.

The Iron and Pewabic mines being under one management and carrying ore entirely similar in character, the tenor and production of the two may be considered together. Records of shipments show that the smelting ore shipped from February 19, 1910, to December 28, 1910, had an average value of $58.40 per ton. The poorest shipment showed 0.14 ounce in gold and negligible amounts of other metals; the richest showed gold, 10.47 ounces; silver, 15.25 ounces; and copper, 11.65 per cent.

One shipment which approaches the average in value showed gold, 2.62 ounces; silver, 5.75 ounces; and copper, 1.55 per cent. The average value of the concentrating ore is stated to be about $11 per ton, mainly in gold.

The gross production of the Iron and Pewabic mines from 1904 to 1910, inclusive, was $526,000. The production before this period is estimated at $1,500,000 to $2,000,000.

The records of careful samplings fail to show any regular decrease in ore values dependent upon depth, and development has failed to reveal any regularity in the shape or attitude of the richer ore shoots.

PEWABIC VEIN.

The Pewabic vein outcrops about 100 feet north of the Iron vein and nearly parallels it in strike. It dips, however, in the opposite direction; that is, northward. The vein is developed by the Pewabic shaft, over 900 feet deep, and by the East Pewabic shaft, 700 feet deep, each shaft having levels at 100-foot intervals. The amount of drifting done on this vein is much less than that in the Iron mine.

Both shafts having been idle for some time the mine was not entered. The ore is entirely similar in character to that from the Iron vein, except that it is reported to carry uranium in the foot wall on the 200-foot level west. The value of the ore and the production have already been considered in conjunction with the Iron mine.

BANGOR MINE.

The Bangor shaft, which is about 800 feet west-southwest of the Iron shaft, appears to be on the westward continuation of the Iron vein or one of its branches. The shaft is equipped with a whim but could not be entered. The ore seen on the dump was mainly coarse pyrite and some chalcopyrite disseminated in altered schist. A few specimens show vuggy veinlets of galena and sphalerite cutting the pyritic ore sharply and evidently of later formation. Some narrow vugs are lined with crystals of quartz and sphalerite, the latter coated with a thin film of later quartz.

IRON DUKE MINE.

The Iron Duke mine, a short distance southeast of Russell Gulch village, is developed by a shaft 510 feet deep, but was idle at the time of survey. The underground workings are said to total 2,664 feet. The ore is of the pyritic type and appears to be entirely similar to that of the Iron mine.

HALL MINE.

The Hall mine, in the eastern part of Russell Gulch village, is developed by a shaft 260 feet deep, connecting with short levels at depths of 50, 100, and 200 feet. It was idle at the time of survey. The following are sampling-works assays of smelting ore shipped in 1910.

Sampling-works assays of smelting ore from the Hall mine, 1910.

Ore.	Gold.	Silver.	Copper.
Net pounds.	*Ounces.*	*Ounces.*	*Per cent.*
7,223	1.69	11.56	9.20
463	1.16	6.80	.....
6,441	1.66	8.60	3.55
3,674	.44	2.90	.....
591	1.14	2.60	2.00
462	.76	7.30	4.00

All the ore is of the pyritic type.

LOTUS MINE.

The Lotus mine, in the eastern part of the village of Russell Gulch, was not being worked

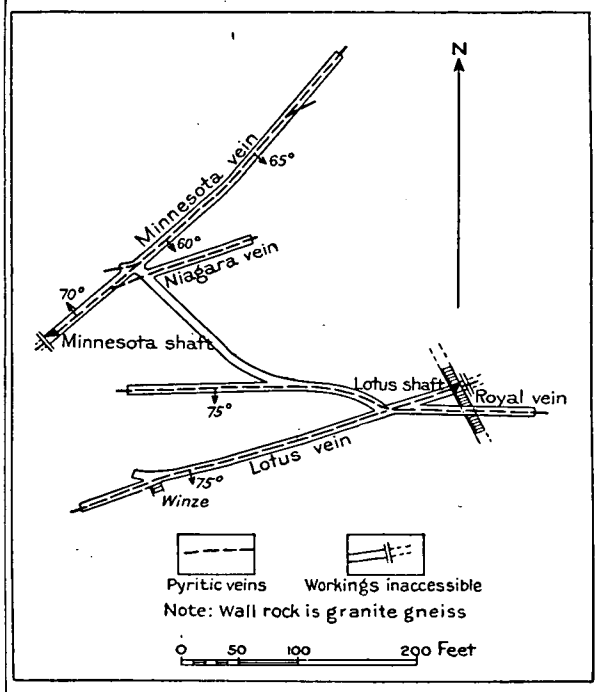
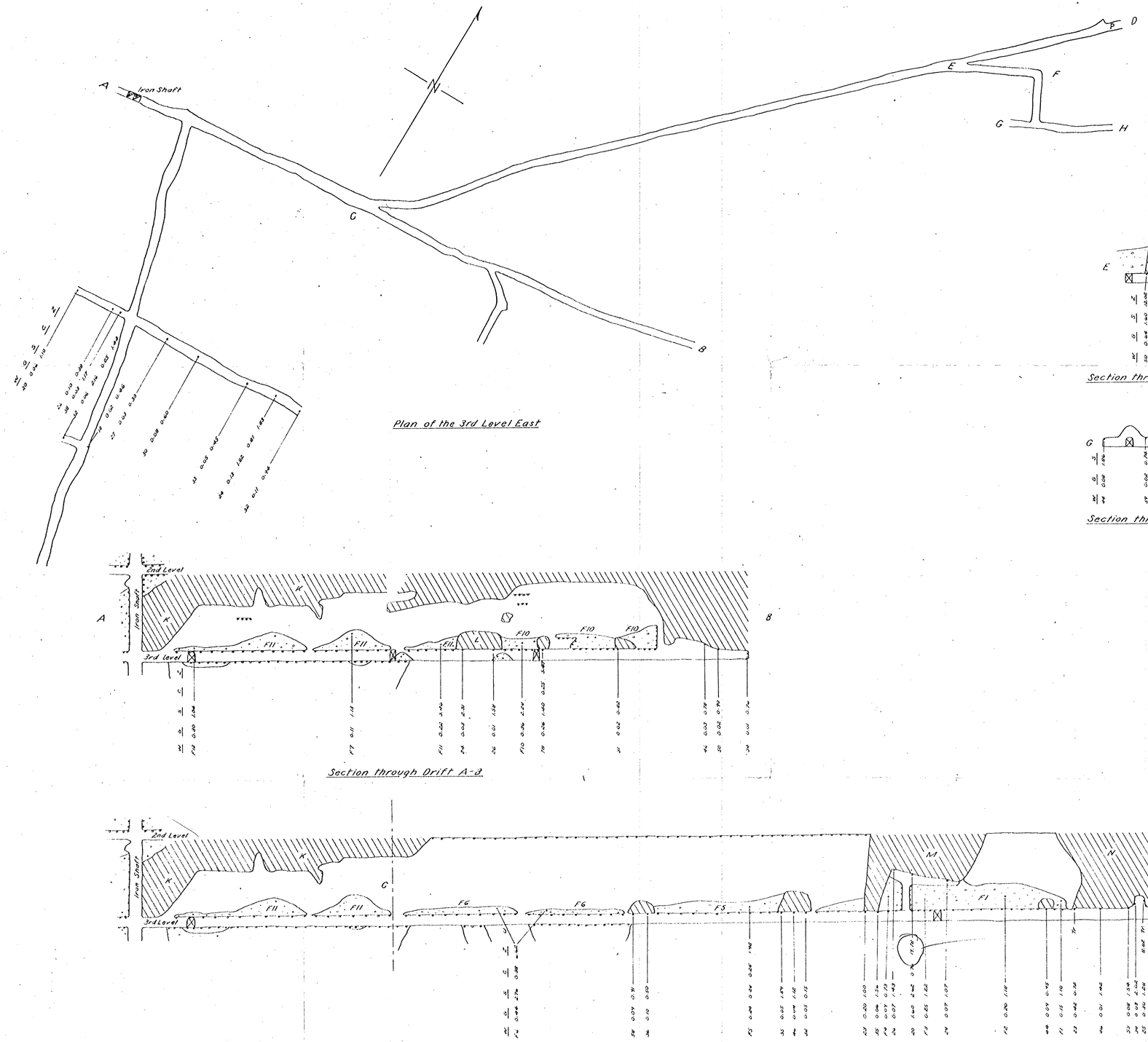


FIGURE 44.—Geologic plan of the 450-foot level on the Lotus vein and connecting workings on other veins. Surveyed by hand compass and pacing.

at the time of survey but was accessible through the first or tunnel level, at the side of the lower road between Russell Gulch and Central City.

The Lotus shaft, 810 feet deep, follows the Lotus vein, which strikes in general about N. 70° E. and dips 65°–75° SE. There are seven levels at intervals of approximately 100 feet. Most of these develop only the Lotus vein, but the 450-foot level (fig. 44) develops also the Royal, Minnesota, and Niagara veins.

The wall rock in the workings is almost exclusively granite gneiss but includes some



Explanation

Ore in place

Broken Ore

Assays Under:

- w When taken on vein in place, number gives width, in inches, of vein sampled. When taken on broken ore, number is sample number (F)
- a Gold in ounces per ton
- s Silver in ounces per ton
- c Copper in %
- z Zinc in %
- u Uranium in % U_3O_8

P Pitchblend occurrence

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To accompany Exhibit B

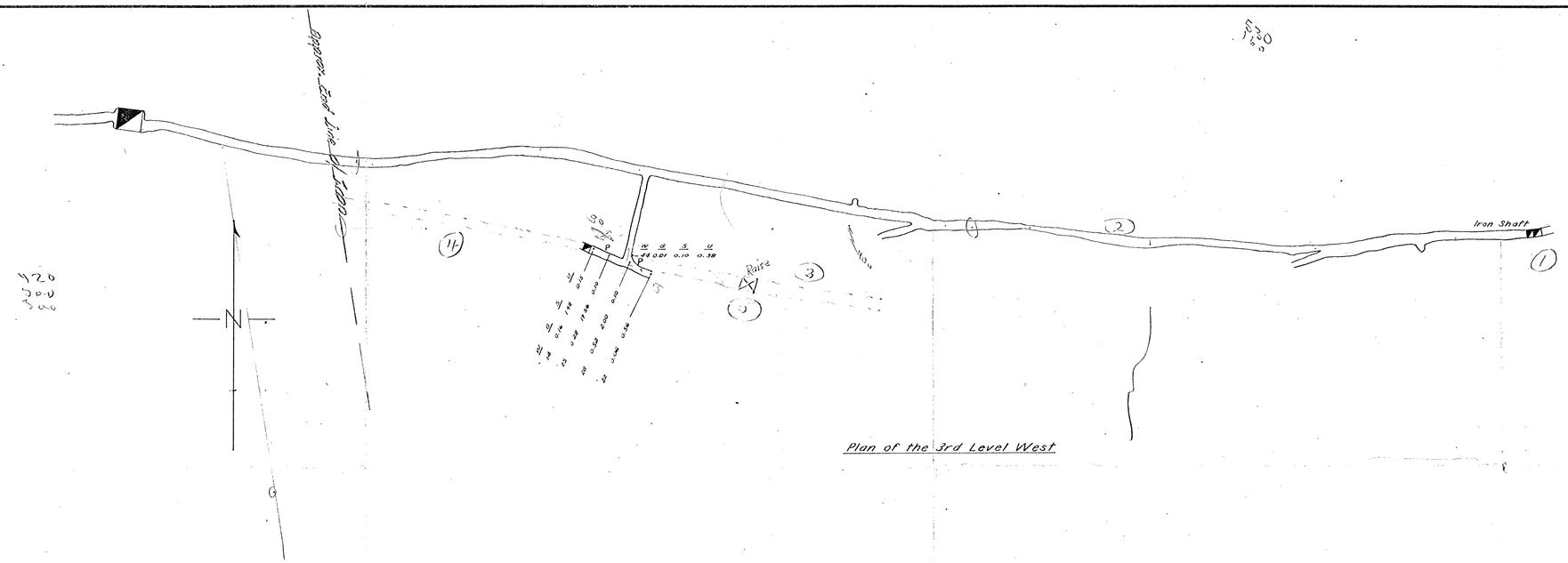
MF103

ASSAY MAP OF
3rd Level, East,
IRON MINE

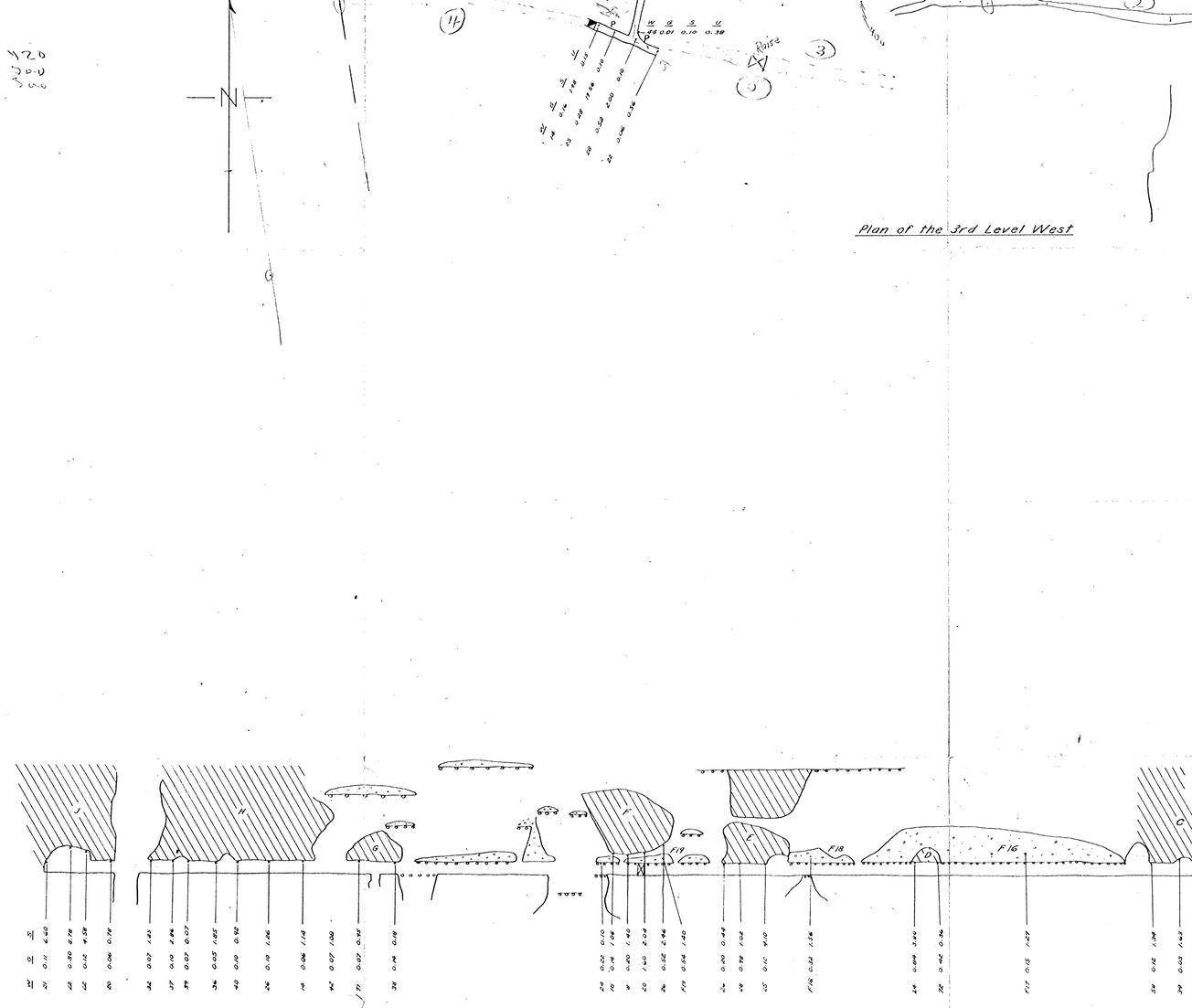
Scale 1" = 40'

March 10, 1950

To accompany Geological Report A1



Plan of the 3rd Level West



Section through Main Drift

Explanation

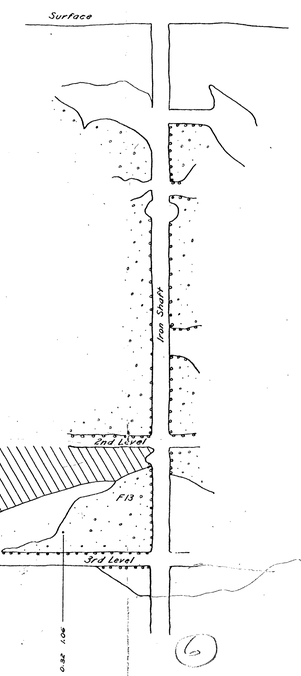
Ore in place

Broken Ore

Assays Under:

- w When taken on vein in place, number gives width, in inches, of vein sampled. When taken on broken ore, number is sample number (F)
- g Gold in ounces per ton
- s Silver in ounces per ton
- c Copper in %
- z Zinc in %
- u Uranium in % U_3O_8

P Pitchblend occurrence



ASSAY MAP OF
3rd Level, West,
IRON MINE

Scale 1" = 40'

March 10, 1950

Exhibit B

To accompany Geol. Rept 41

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Exhibit B MF 103