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December 27, 1968

OME 6558

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Dear Mr. Kirkemo:

Would you please send me a copy of the "Final Geologic and Engineering Report" on the Double Rainbow Mine.

Thank you in advance for your courtesy and cooperation.

Sincerely,

Anthony D. Terry/dl

Anthony D. Terry

dl

DOUBLE RAINBOW PROJECT

OME 6558 (SILVER) CONTRACT 2233

FINAL REPORT

Lead, South Dakota
December, 1968

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A. L. Slaughter
Olin Hart
December 27, 1968

DOUBLE RAINBOW PROJECT
OME 6558 (Silver) Contract 2233
FINAL REPORT

Introductory Summary

An application for exploration assistance was made by Double Rainbow Mines, Inc. to the Office of Minerals Exploration (OME) in March of 1966. A contract to explore for silver was awarded Double Rainbow on January 23, 1967. The contract was for a term of two years and specified a 75 per cent participation by OME in certain work to be performed on the property located at Galena, Lawrence County, South Dakota. The work consisted of drilling, shaft sinking, and drifting at two horizons in the Cambrian Deadwood formation. Total estimated, allowable cost to be shared by OME was $312,180.

Double Rainbow engaged the Homestake Mining Company of Lead, South Dakota as the contractor to do the work and at the same time made a lease with Homestake covering work beyond the OME contract. Site preparation and drilling was begun in early April of 1967. Work covered by the OME contract was completed in August of 1968. Lower Contact drifting and stoping was continued by Homestake until November 4, 1968 when all underground work was stopped. The last pump was removed from the Lower Contact workings on November 26. The headframe and building with hoist and compressor will be left on the property.

1400 feet of drifting from the old Upper Contact, Richmond-Sitting Bull workings was disappointing, although some ore was found. Any mining in this horizon would have to be in conjunction with a more extensive operation in the Lower Contact.

1500 feet of trackless drifts and 1300 feet of slusher drifts (plus additional drifting beyond the OME contract) found widespread, but erratic sulphide mineralization in the Lower Contact. Average thickness of ore is about 3.0 feet. From sampling results in drifting and experimental stoping it is reasoned that ore averaging 10.0 oz. Ag, and .086 oz. Au ($3.00 at 35.00/oz.) per ton, 2.0% Pb, and 1.5% Zn could be mined. Due to the irregularity of the deposits, no firm ore reserve figure can be calculated, but because of the pervasive nature of the mineralization and the area remaining to be explored, a figure of 200,000 tons does not seem to be out of reason.

Metallurgical test work has indicated that good recoveries of silver and lead can be attained by selective flotation followed by smelting. Gold recovery was only about 40% in the tests. Zinc is not considered to add any value.

The net return from the smelter from Lower Contact ore would not yield a profit on a basis of $2.00/oz. for silver. The silver price would need to be close to $3.00/oz. before a worthwhile profit could be realized.

Total cost of the project through November, 1968 is $591,392.

Location and Description of Property

The Double Rainbow property is located near the small community of Galena, South Dakota. The property is 6-1/2 airline miles and 10-1/2 road miles from

Lead, South Dakota, 9-1/2 road miles from the C.B. & Q. Railroad at Pluma. The northeast corner of the main block of property lies in the canyon of Bear Butte Creek at an elevation of 4,700 feet. The highest point encompassed in the property is the top of Custer Hill which is 5,514 feet above sea level. The area is heavily wooded with spruce, birch and aspen.

Total acreage is 290 with all but one claim being in a contiguous group. The Florence claim is separated from the main block by the canyon of Bear Butte Creek. A claim map is included as Figure 1. The Galena area is covered on two $7\frac{1}{2}'$ U.S.G.S. quadrangle sheets, Deadwood South and Deadman Mountain. An index map made up of these two sheets and showing the property outline is included as Figure 2.

The Galena district is about $1\frac{1}{2}$ miles square with a few of the smaller mines west and north of Bear Butte Creek. The Double Rainbow property is in the north part of the district.

General Geology of the Galena District

The canyons of Bear Butte Creek and its tributaries have entrenched sharply through Mississippian Pahasapa and Devonian Englewood limestones, the Upper Ordivician Whitewood limestone, the Lower Ordivician Winnepeg shales and sandstones, the Cambrian Deadwood formation which contains numerous intrusive sills of Tertiary porphyry, and into Precambrian schists, quartzites and phyllites. Strike of the sedimentary formations is approximately north-south with easterly dips ranging from 5° to 20° . The Precambrian foliation has a general strike of about N. 60° E. and dips southeasterly about 50°.

Deadwood Formation

The Deadwood formation is about 350 feet in thickness. It lies unconformably upon the Precambrian schists. The formation lends itself to a threefold division. The lower member consists of quartz-pebble conglomerate, overlain by hematitic sandstone, in turn overlain by quartzite. Dolomitic limestones, sandy shales, shaly limestones, and edgewise limestone conglomerate comprise the middle member. The upper member is represented by calcite-cemented, glauconitic sandstone. A section measured by N. Mukhergee near Bear Butte Creek about one mile from the Double Rainbow property gives a thickness of 55 feet for the lower member, 244 feet for the middle member and 51 for the upper member.

Tertiary Intrusive Rocks

The Galena-Gilt Edge area is one of the most uplifted parts of the Northern Black Hills. The center of uplift is in the vicinity of the old Gilt Edge Mine about two miles west of Galena.

Composition of the intrusive rocks ranges from diorite to rhyolite. They are predominantly porphyritic with aphanitic to phaneritic groundmass and phenocrysts of widely varying size and abundance. Emplacement of the intrusives was accompanied or closely followed by epigenetic mineralization. In the core of the uplift is a stock of latite porphyry intruded by dikes of trachyte and rhyolite porphyries and

mineralized with gold and silver. The east and southeast flank which is the Galena District, where the Deadwood formation was intruded by numerous sills, was mineralized with silver, lead and zinc.

Ore Deposits

Ore deposits in the district are principally confined to two horizons or contacts in the Deadwood formation called the Upper and Lower Contacts. These two horizons or "contacts" are the predominate ore horizons throughout all the mines in the Deadwood formation in the Northern Black Hills region. Upper contact ores occur as replacements in sandy dolomite near the top of the formation. The Lower Contact ore is a replacement in quartzite and dolomitic quartzite near the bottom of the formation. Vertical separation of the two contacts varies from 350 to 450 feet depending on the thickness and number of intrusive sills.

The ore on both contacts is controlled by, and develops outward from, systems of near vertical fractures (termed verticals). These verticals consist of overlapping, discontinuous fractures usually with dips within 10° of vertical. In areas above the water table they are heavily stained with iron and manganese. More than one system is usually present, one being predominant. The largest ore bodies are found at intersections. The longest dimension tends to be in the direction of the stronger verticals and the width can vary from a few feet to tens of feet. Thickness can be as great as 10 feet for a limited distance. In general the ore bodies are very irregular in outline and thickness due to the complexity of the fracture systems and the varying susceptibilities of the beds to replacement by the ore minerals.

Description of Past Mining, Exploration and Production

The principal underground mine on the property is known as the Richmond-Sitting Bull. This is opened by several adits on the north slope of Custer Hill and the workings are in the so-called "upper contact" ore horizon. The workings extend over a distance of 600 feet parallel to the hillside near the portals and into the hill about 1,300 feet. The shapes of the workings are controlled by the abundance and directions of the vertical fractures which control the ore deposition. Several other workings are east of the Richmond-Sitting Bull, all on the upper contact horizon; the McClellan Tunnel, two unnamed adits and the Barton Tunnel. West and southwest of the Richmond-Sitting Bull are several shallow workings also on the upper contact; the War Eagle, the Savage and the Custer. Upper contact workings on the Florence claim, which is north across Bear Butte Creek from the main block of property, penetrate the hill 700 feet. The upper contact workings were generally open and accessible.

The only lower contact workings are on the Merritt claims at the west edge of the property. On the Merritt No. 2 claim, the workings cover an area of about 400 feet by 300 feet. These are caved and inaccessible. On the Merritt No. 1 claim are several shallow workings.

All the old underground workings except the Florence are shown on the 1" = 200' scale map, Figure 3. They are also shown at a scale of 1" = 50' on the underground sample map, Figure 4. The latest attempt to operate the property prior to 1967, was in 1931 when a 150 ton flotation mill was built and the Barton Tunnel was driven. The mill operated only a few months, mostly on dump material from the

Richmond-Sitting Bull. Two reasons have been given for this failure, poor metallurgical recovery and poor management. The mill had been dismantled and all that remains is the foundation.

In 1964 an exploration program was conducted by Newmont Exploration and Hecla Mining Company as a joint venture. The program consisted chiefly of drilling 6 diamond drill holes from the surface through the Deadwood formation. Hole No. 1 intersected 5 feet of high grade silver ore at the Lower Contact (205.8 oz. per ton). Logs of these 6 holes are to be found in the appendix.

A lease was made with the Little Beaver Mining Company, a wholly owned subsidiary of the Homestake Mining Company, in 1965. Little Beaver conducted an underground sampling program and made a general geologic investigation (Figure 4). This lease was abrogated before the OME application was made.

Statements from various reports credit the Double Rainbow property, chiefly the Richmond-Sitting Bull Mine, with total production of from $450,000 to $1,750,000. The $450,000 figure was reported by Joseph Boreo in 1913 to have been substantiated from books of the First National Bank of Deadwood. Louis Noble in a report written in 1907 says that the mine was most actively productive from 1880 to 1883 and to some extent in 1891 and that records of production submitted to him showed a net value received of $451,383 from the sale of bullion and ores. He estimated that about 100,000 tons of material had been removed from the mine and that one-half of it was still on the ground. He also estimated that the gross value of all ore shipped and treated was $750,000.

Litigation involving a dispute over extra-lateral rights began in 1884 and continued for 16 years. During this period production was small and sporatic. Samples taken in 1920 indicate some production in that year, probably by leasers.

The records of how the ore was handled and treated are rather obscure. Noble says in his report that during the most productive time, 1880 to 1883, the ore was sorted by hand, the lead ores were smelted on the ground and shipped to Omaha, the silver and gold ores were treated in a pan amalgamation mill on the ground, and material too low grade for this treatment was put on the dump.

No record of production is available for the district as a whole, but it probably would not exceed $1,000,000.

Purpose and Objectives of the Program

The purpose of the new work was, of course, to find commercial deposits of silver-bearing ores.

In the Upper Contact, some of the exploration drifts were planned to follow known ore shoots to test size, continuity and grade. Other drifts were laid out as crosscuts to test extensions of known verticals beyond the limits of the old workings.

The objective of the Lower Contact work was to explore, at the Lower Contact horizon, the area beneath the Richmond-Sitting Bull mine. Except for the drive from the shaft to the Lower Contact horizon and to the Newmont No. 1 drill hole target, the exploration drifts could not be planned in advance. Their positions

depended upon the attitude of the beds, offsets in the beds caused by the porphyries, and the locations and patterns of the verticals.

Work Covered by OME Contract

To quote from the contract; "The purpose of this project is to explore for silver-bearing ore deposits occurring as replacement bodies associated with three dolomitic zones referred to as the Upper, Lower and Basal Contacts in the Deadwood formation of Cambrian age, and with sedimentary and metamorphic rocks at the base of the Deadwood formation overlying Precambrian rocks."

"The work shall be performed by diamond core drilling from the surface and from underground workings, and by shaft sinking, cross-cutting and drifting."

The work covered by the contract is categorized as follows:

1. Drill 4 holes from the surface, totalling about 2625'.
2. Drill 9 holes from underground in the Richmond-Sitting Bull workings, totalling 3475 feet.
3. Drive slusher drifts totalling 1400 feet in Upper Contact from the Richmond-Sitting Bull workings.
4. Sink shaft 280 feet for Lower Contact exploration.
5. Excavate shaft station, sump, and loading pocket, install skip loader, 9000 cubic feet.
6. Drive 700 feet of trackless drift from shaft to reach Lower Contact.
7. Drive 800 feet of strike drift along Lower Contact.
8. Drive slusher drifts totalling 1300 feet in Lower Contact.

A copy of the OME contract which gives specifications, unit costs, and other details is included as part of the appendix.

Work Performed

Preliminary Work

A certain amount of get-ready work had to be done before the OME-assisted work could begin, for the benefit of both the Upper Contact and the Lower Contact.

The Upper Contact Richmond-Sitting Bull workings had to be rehabilitated. Excavation at the portal caused a landslide which necessitated removal of much additional material and heavy re-timbering for 50 feet or more. Additional timbering was needed at places along the main drift. Enlargement of the main drift and some of the other drifts was necessary so that the underground trucks could get to the proposed slusher drift locations.

At the shaft site in the bottom of the canyon much preparatory work had to be done. Sites for the shaft and headframe, for the building, and for the waste dump and ore stockpile were prepared. Foundations were poured for the headframe and for the hoist and compressor building. The headframe was erected, the building put up and the hoist and compressor installed. The necessary electrical wiring and apparatus was installed.

Work Under OME Contract

Surface and underground drill hole locations are shown on maps, Figures 3 and 5. New underground work is shown and identified on maps, Figures 5 and 6.

Work accomplished under the OME contract is summarized below:

1.	Surface diamond drilling, 4 holes	2033 feet
2.	Underground diamond drilling, 9 holes	3990 feet
3.	Upper Contact slusher drifts	1400 feet
4.	Shaft sinking	253 feet
5.	Shaft station	9000 cu. feet
6.	Rock bolts	1450 bolts
7.	Water allowance, feet of drift	376 feet
8.	Lower Contact trackless drifts	1500 feet
9.	Lower Contact slusher drifts	1300 feet (1343)

Total allowable cost for the OME shared cost was $312,180. Actual total cost in which OME shared was $298,073.

Surface Diamond Drilling - Drilling was started in April of 1967 and finished in May. Circulation was lost in one of the 4 holes and cementing attempts were unsuccessful.

Underground Diamond Drilling - The first hole, No. 1U was drilled in June of 1967 and the last, No. 9U was finished in December, 1967. Sludge was recovered in only 4 of the 9 holes despite repeated attempts to restore circulation. Core recovery was good in all holes, averaging 95%.

Upper Contact Slusher Drifts - Rehabilitation of the Richmond-Sitting Bull workings had proceeded to the point where the slusher drifts could be started in September, 1967. This work was completed in February, 1968. A number of changes were made in the original plans due to unforseen circumstances. These will be discussed below.

No. 1 Slusher Drift was planned for 300 feet and 300 feet were driven. However, rather than enlarge the McClellan adit, a down-dip trackless drift was driven at Double Rainbow's expense in order to reach the position for starting the slusher drift.

No. 2 Slusher Drift was planned for 350 feet and 350 feet were driven. After about 150 feet had been driven in the proposed direction, a down-roll in the beds was encountered. A change in direction of the drift was then made in order to stay in the proper horizon and maintain a reasonable grade.

No. 3 Slusher Drift was stopped at 183 feet. The vertical being followed down dip became a very weak structure and the dip steepened to the point where progress became very difficult. The remaining 117 feet was used in Nos. 4 and 5 drifts.

No. 4 Slusher Drift was programmed for 450 but it was driven 499 feet, using 49 feet of 117 feet left over from No. 3.

No. 5 Slusher Drift was driven as an extension of the Bad Air Drift and was not in the original plans. Part of the balance of footage left over from No. 3 was used.

Shaft Sinking - Shaft sinking was begun in April, 1967, with the use of a clam shell shovel. Transition to conventional sinking equipment was made at a depth of 53½ feet. The shaft was completed to a depth of 253 feet in November, 1967. The choice of location for the shaft was based on information from drilling, but was influenced by property boundary and topographic limitations.

Shaft Station - The shaft station, slusher trenches and installation of the skip loaders were completed in November, 1967. The sump on the station level was finished in December.

Lower Contact Trackless Drifts - Drifting from the station was started in November, 1967. At a point 644 feet from the shaft the Lower Contact ore horizon was intersected on March 1, 1968. Up to this time the drift had intersected porphyry sills and higher beds in the Deadwood formation. (Section GCD Figure 7.) The Main Drift was continued another 70 feet to get in position to start No. 1 Slusher Drift.

Trackless drifts were started in two directions from the Main Drift at the ore horizon. These were designated the North and South Drifts. Both drifts were given slight uphill grades to facilitate drainage. The quartzite-dolomite contact was kept at 2 to 4 feet below the back. Trackless drifting was completed in May, 1968.

The South Drift was stopped at 330 feet from the Main Drift. A sharp roll in the beds put the contact below the floor of the drift. It was feared that this was an indication of proximity to a major roll or offset known from the drilling and that it would not be practical to continue the trackless drift.

The North Drift followed the horizon for a distance of 456 feet at which point the total of 1500 feet of trackless drift was achieved.

Lower Contact Slusher Drifts - Slusher drifts were driven both up and down dip from the North and South strike drifts. The drifts with footages driven under the OME contract are listed below.

Drift No.	Feet
1	411
2	26
3	37
4	199
4-1N	24
4-1S	47
4-2N	14
4-2S	55
5	19
6	125
6A	80
7	92
8	62
9	109
	1300

Work in Excess of Contract

Drifting - Drifting was continued in several places in the Lower Contact after the stipulated total amount under the contract had been accomplished. No extra footage was driven in the Upper Contact. Total additional footage is 633 for an overall total of 1933 feet of slusher drift in the Lower Contact. The 633 feet of additional footage is distributed as follows:

Drift No.	Feet
4	211
4-2S	18
4-2SA	91
6A	11
6B	169
7	51
7A	82
	633

Extra trackless drift footage in the Lower Contact (none in Upper Contact) totals 221. 121 feet of this was an extension of the North Drift. 100 feet was in a branch off of the North Drift called the Southwest Sublevel Drift. Original plans called for this to be driven to a point under 4-2SA Stope at which point it would be about 30 feet below the contact. A raise would then have been driven through the contact so that further exploration drifting could be done in the ore horizon. Discouraging results from experimental stoping caused a change in plans and the drift was stopped.

Drilling - One additional hole was drilled underground in the Main Drift to test the position and nature of the Lower Contact and to check the section beneath the drift. Depth of the hole, drilled into Precambrian, was 218 feet.

Stoping - Experimental stoping was done at 4 locations in the Lower Contact; No. 9 Stope in No. 9 Drift, No. 1 Stope and No. 1W Stope in No. 1 Drift, and No. 4 Stope in No. 4 Drift. Ore from these stopes was stockpiled separately for special sampling. 1373 tons of ore were stockpiled from these 4 stopes.

A stope was cut in 4-2SA drift in an attempt to find the No. 1 Newmont drill hole. The effort was abandoned without success.

Analytical Work - Assays for silver and gold were made at the Homestake assay office at Lead. Analyses for lead and zinc and the few for copper were made by the atomic absorbtion method in the Homestake laboratory. Three samples were analysed chemically for lead and zinc by the Colorado Assaying Co. at Denver. Results are compared below:

		Atomic Absorbtion	Chemical Analysis
H 209	% Lead	5.9	5.3
	% Zinc	3.6	4.6
H 222	% Lead	4.0	4.1
	% Zinc	7.0	7.4
H 224	% Lead	0.5	0.6
	% Zinc	0.9	1.1

Summary of Costs

The estimated allowable cost to be shared by OME was $312,180. The actual total shared by OME is $298,073. The difference is largely because the water allowance of $11,440 in shaft sinking was not used. OME share of $298,073 is 75% or $223,555. Total expense of the project through November, 1968 is $591,392. Cost to Double Rainbow then is $591,392 - $223,555 = $367,837. A list of detailed costs is included as part of the appendix.

Results of the Work

Drilling

The four surface and 10 underground holes gave discouraging results as far as finding ore is concerned. The best mineralized section found was 3.0 feet containing 4.6 oz. silver, 1.0% lead, and 1.5% zinc in hole No. 1S. This occurred in fractured quartzite separated from the overlying dolomite of the Lower Contact by a thick porphyry sill (see section CHJ, Figure 8).

Drilling was done on the Double Rainbow property by Newmont Explorations, Ltd. in 1964. Six holes were drilled to test the Lower Contact below the Upper Contact workings of the Richmond-Sitting Bull. One high-grade intersection was found. The information below is from the Newmont report.

Hole No.	Footage	Ft.	Au	Ag	Pb	Zn	Cu	Remarks
1	462.5-465	2.5	.16	10.41	0.2	1.7	.45	(Quartzitic dolomite
	465-467.5	2.5	.22	401.11	1.6	3.1	.15	(above sill "D"
2	599-602	3.0	.08	9.34				(Basal quartzite
3	466-469	3.0	.01	0.94				(Quartzitic dolomite (above sill "D"
4	475.4-480.8	5.4	.04	2.01	0.1	0.8	.20	(Quartzitic dolomite (above sill "D"
5	591-598	7.0	.01	1.26				(Basal quartzite
6	466.3-475	8.7	.07	2.48	Tr	1.2	Tr	(Quartzitic dolomite (above sill "D"

The drilling pointed out a significant difference between the position of mineralization in the Lower Contact in the Galena District and in the gold mines of the Bald Mountain District west and north of Lead. In the Bald Mountain District the best ore accompanies a silicious replacement of the dolomite beds just above the basal quartzite and some low-grade ore occurs in the quartzite. In the Galena District the best ore occurs in the top few feet of quartzite and the overlying dolomite is weakly mineralized. This difference in the two districts was confirmed in the underground work at Double Rainbow.

Some drill holes found mineralization near the base of the quartzite near the Precambrian contact. This has been designated the "Basal Contact" on some of the sections. The mineralization is a pyrite-galena-sphalerite dissemination in the quartzite. The best found is 3.0 feet of 9.34 oz. silver in Newmont hole No. 2. No. 5 Newmont hole found 7.0 feet of 1.26 oz. silver. All other holes either found none or less than one oz. of silver at this position.

The drill holes provided much useful information on stratigraphy and attitude of the beds and the porphyry sills. Of particular value was the information near the shaft site and the information on offsets of the Lower Contact caused by the sills. The drilling was of no value to work in the Upper Contact.

In general, the drilling shows the three-fold division of the Deadwood formation. Many porphyry sills were cored, varying in thickness from one foot to over 100 feet. For the most part these intrude the lower and middle members of the formation. From 4 to 8 sills are usually present in the Deadwood formation in each hole. Many are highly altered. The drilling shows that the sills thin toward the east and south and are thickest under the Richmond-Sitting Bull mine area. While they certainly have disturbed and elevated the Upper Contact horizon they have not caused the major offsets such as those found in the Lower Contact. The offsets are shown on some of the sections (8-2, Figure 9; 9-1, Figure 10). The sills transgress the bedding, moving from one horizon to another in the Deadwood formation. In places this results in a change in position of the Lower Contact horizon from above the sill to below the sill, or vice versa, with a resultant vertical displacement of as much as 100 feet. Approximate lines of offsets are shown on the 1" = 50' scale map of the Lower Contact, Figure 6.

Drill hole locations are shown on Figure 6 and on the 1" = 200' scale map Figure 3. Columnar sections of the drill holes are shown on the various sections. Logs of Newmont holes and logs and assays of Double Rainbow holes are included as part of the appendix.

Upper Contact

The drifting done from the old workings of the Richmond-Sitting Bull found some significant ore in one of the five drifts driven. The results of the work in each drift will be discussed separately.

Sampling - Grab samples were taken from each round of advance in the drifts. Face chip samples were taken where drifts were following verticals. Channel samples were taken in walls of drifts that were laid out to crosscut the vertical systems. All sampling in the new drifts is shown on the Upper Contact Sample Map, Figure 5. Sampling done by earlier workers in the old parts of the mine is shown on a copy of the same map as submitted with the application, Figure 4.

Geology - The new drifts followed the same horizon as was followed in the old workings, a contact between brown quartzitic sandstone and brown to gray sandy dolomite. The strike of the beds is about north-south and the dips are generally 7° - 10° to the east; they can be as much as 15°. The bottoms of the drifts were kept 1 to 2 feet into the quartzitic sandstone. The visual contact is that between a more massive rock and a banded rock above and is quite regular. The contact as based on the carbonate content, however, is irregular. In places, the upper several feet of the quartzitic sandstone is dolomitic. The ore horizon is the sandy dolomite which in much of the Richmond-Sitting Bull workings is 24 to 30 inches thick. Thicknesses of over 10 feet appear to have been mined in places, however. A calcareous shale overlies the ore horizon.

The primary minerals are pyrite, galena, arsenopyrite (or lollingite) and a little chalcopyrite. Some sphalerite is probably present also as a primary mineral as some zinc is found to be present by assay. The Upper Contact ores in the Richmond-Sitting Bull are now well oxidized, are red, brown and yellow, usually soft, but locally hard due to silicification. An occasional clot of coarse-grained galena is found. These are surrounded by bright red-brown oxidation products. Mapping has differentiated the following types of material constituting the ore horizon.

1. Unaffected dolomite, gray with bright sheen from crystal faces.

2. Oxidized dolomite, no mineral added.

3. Weakly mineralized dolomite, manganese stained, diffusion rings common.

4. Sanded dolomite, vuggy dolomitic cement between sand grains removed.

5. Mineralized dolomite, possible ore, commonly vuggy with silica, bright red-brown oxides, no visible sulphides.

6. Mineralized dolomite, ore, commonly vuggy with silica, bright red-brown oxides, visible galena.

Verticals were mapped in all of the new drifts and in accessible parts of the old workings deemed safe. They range from very weak fractures, which are barely discernable, to strong fracture zones with silicification. The fracture pattern is shown on the map, Figure 12. The systems of fractures are not well defined but most fall into two general directions. One, near east-west, varies from N. 80° E. to S. 80° E; the other, about northeast, varies from N. 40° E. to N. 60° E. Dips for the most part are within 10° of vertical with the majority dipping to the south or southwest.

No. 1 Drift - The best truck sample was 4.9 oz. silver but this could not be substantiated by the channel sampling. The best channel sample was 3.7 feet averaging 9.0 oz. silver, obtained where two mineralized verticals crossed the drift. Some fairly strong verticals were mapped but they were found to be only weakly mineralized. It was hoped that No. 1 Drift would intersect some of the ore bearing verticals observed in the east edge of the old workings.

No. 2 Drift - This drift was driven to check possible extensions of verticals seen in the old South Drift and stope. No ore was found. Some of the many verticals intersected are only very weakly mineralized with iron oxides. Little oxidation is present in this area, the rocks retain their blue-gray color.

No. 3 Drift - One of the best faces in the old mine was the face of the Haven's Drift which sampled 20.4 oz. of silver over a vertical distance of 5.5 feet. The drift had been driven on a strong, well mineralized vertical. Dips are steep, 12-15°. No. 3 Drift is an extension of Haven's Drift and was driven for the purpose of checking the continuity of the structure. No channel samples were taken but chip camples were taken of the faces after each round was blasted. These indicate a diminishing of values with advance of the drift. About half way to the end there is a pickup of values probably related to a cross vertical. The main vertical gradually weakened, values declined and the drift was stopped. Considerable pyrite and silicification is associated with this vertical.

No. 4 Drift - Several truck samples were obtained with silver in the 3 to 6 oz. range. Several ore-bearing structures were intersected, some of which are probably extensions of verticals from the South Drift and stoped area. Some of the sample information is summarized below:

	Feet	Oz. Ag	$ Au (35.00)	% Pb	% Zn
Thickest Ore	6.0	22.0	NF	5.0	0.7
	3.9	19.1	0.68	0.8	1.8
	3.6	10.0	1.35	3.7	1.4
	5.3	15.8	8.60	1.4	2.9
	6.0	6.5	3.05	7.0	1.4
Highest Silver	2.0	43.2	6.10	6.4	1.0
Highest Gold	1.7	24.9	37.42	9.5	1.6
Highest Lead	2.7	6.4	21.67	12.0	1.8
Highest Zinc	2.9	23.6	13.55	1.8	4.5

Five ore shoots can be delineated on the basis of the channel samples. From north to south they are as follows:

Width Ft.	Thick Ft.	Oz. Ag	$ Au (35.00)	% Pb	% Zn
15	3.2	12.4	0.39	1.1	1.7
20	2.7	9.5	1.28	1.9	1.1
5	5.3	15.8	8.60	1.4	2.9
25	2.9	10.6	4.20	5.2	1.5
30	2.0	14.6	12.84	5.5	1.2

No. 5 Drift - No. 5 is a 68 foot extension of the Bad Air Drift. It followed a strong vertical up-dip with the hope of finding an ore body at a possible intersection with the extension of the vertical from the old West Drift. A cross vertical was intersected but no important values were found.

Lower Contact

The relationship of work done in the Lower Contact to the Upper Contact Richmond-Sitting Bull workings is shown on Figure 5.

Structure and Stratigraphy - The dominant ore mineralization occurs in the top few feet of the basal quartzite of the Deadwood formation. The contact between the quartzite and the overlying gray dolomitic beds is the "Lower Contact". The dolomitic section as seen in the drill holes is 6 to 13 feet thick with shale partings in places. The trackless drifts were driven so as to keep from 3 to 5 feet of dolomitic beds exposed. The slusher drifts kept 1 to 2 feet of the dolomitic beds in the back. Shaly partings were usually present in the dolomitic beds. In places very soft clayey beds of 2 to 3 inches were found. The quartzite is a light gray, medium-grained, hard, massive rock. Just what makes the top few feet of the quartzite subject to cavitation, and replacement by the ore minerals is not as yet known, but it is presumed to contain some calcite or dolomite as a cementing material.

The strike of the beds is outlined by the north and south drifts which follow the Lower Contact. The strike swings from N. 20° W. in the north end of the north drift to about north in the south drift. The average dip is about 8° to the northeast and east, although dips of 12° have been measured.

The verticals are numerous as they are in the Upper Contact. The majority which includes the stronger ones fall into the quadrant between N. 45° E. and east. In places, two prominent sets can be seen which converge at an angle of 10 to 15°. Others are about north and a few have northwest alignments from N. 20° W. to N. 35° W. Most are within 10° of vertical and dip to the east and south, although many have dips in the opposite directions. A few are faults which displace the beds as much as 3 feet. Verticals are plotted on the map, Figure 13.

Tertiary Intrusive Rocks - No petrologic work has been done on the porphyries so they cannot be classified as to mineralogical composition. They vary in color from light gray to greenish gray and some have a purplish cast. Abundant light colored feldspar phenocrysts are in an aphanitic groundmass. These are as much as 1/2 inch in length. Dark minerals occur as small phenocrysts up to 1/8 inch in diameter. No quartz is visible with a hand lens. Most of the porphyries would probably fit a trachyte or latite classification.

Some porphyries are hard with very little alteration, but most show alteration of the feldspars to varying degrees. Some that are extremely altered are now largely clay.

The shaft station, sump and loading pocket were cut in hard fractured porphyry. The drift to the Lower Contact cut many sills in the Deadwood formation (Figures 7 and 13). Porphyries were encountered at several places in the strike drifts and in the slusher drifts as shown on the map, Figure 13. The North Drift crossed a nearly vertical contact into porphyry and was stopped.

Mineralization - The striking thing about the mineralization is the presence of numerous mineral-lined vugs. These occur in the top few feet of quartzite, some are as much as 5 feet below the top. They never occur in the dolomitic beds. The vugs are from 2 inches to 2 feet in diameter, usually irregular in cross-section. Some are quite elongate, one in the North Drift extends back into the wall for 8 feet. The vugs are lined with excellent crystals of most of the ore minerals, but principally with pyrite and galena. Pyrite is widely disseminated in the quarzite and in the lower 2 to 3 feet of the dolomitic beds. Massive ore as contrasted to the vuggy quartzite ore is almost complete replacement of the quartzite by pyrite accompanied by sphalerite and some galena as linings in small vugs, small clots and thin bands. Galena also occurs as thin bands and small clots in the less pyritized quartzite and rarely in the lower 2 feet of the dolomitic beds. Galena is found as thin seams in fractures both in quartzite and in porphyry, in some place well outside the usual ore horizon. A fracture in porphyry was encountered in the Main Drift which contained 4 to 6 inches of mineral-rich gouge (Figure 13).

Silver is the metal of chief value, but gold, lead, and zinc all contribute substantially to the total value. About equal amounts of silver are found in galena and in sphalerite concentrates. The galena is silver bearing. The silver that goes with the sphalerite is probably in silver rich tetrahedrite (fribergite) which is associated with the sphalerite. The gold is closely associated with the pyrite.

There is very little evidence of oxidation in the Lower Contact, only a slight red staining in some of the fractures.

Mineral and ore distribution are shown on 3 geologic-sample sections of drift walls, Figures 14, 15, and 16. Mapped contacts between mineralized and unmineralized areas are shown on the geology map of the Lower Contact, Figure 13. A more complete description of the minerals is given in a paper by Garske published in the 1968 Guidebook of the Wyoming Geological Association. A copy is included as part of the appendix.

Sampling - The same sampling procedures as used in the Upper Contact were used here except that many more channel samples were taken. A grab sample was taken from each round in drifts being driven in the ore horizon. Chip samples were taken from face of drifts following ore or likely ore structures. Finally, channel samples were cut along both walls of drifts where mineralization is present. These were spaced about 6 feet apart. The nature and uneven distribution of the minerals, the varying hardness, the vugs, made it difficult to do a good job of sampling. Extreme care was needed to obtain representative samples.

The truck samples and the channel samples are shown on the 3 sample maps (1" = 20'), Figures 17, 18 and 19. The face samples and the truck samples for each slusher drift are listed in tables and are to be found in the appendix.

Ore Bodies - Mineralogy of the ore and its stratigraphic position have been described. It is worth repeating that the ore is confined to the top few feet of

the basal quartzite of the Deadwood formation. Only rarely is material of ore grade found in the overlying dolomitic beds. It is suspected that the top few feet of quartzite is slightly calcareous or dolomitic, thus making it more susceptible to replacement. Proof of this must await further work.

The feature next in importance after the favored horizon is the system of near vertical fractures cutting the beds. The relationship of the ore to the verticals is not as clear as in the Upper Contact where oxidation has made the verticals easier to see. Where the back of a drift or stope is a shale bed the verticals in the Lower Contact are difficult to see, and in the ore horizon fairly complete replacement obliterates evidence of the vertical or verticals. However, some ore is clearly related to verticals. The vertical fractures are very numerous and most do not make ore. Criteria for distinguishing between the more favorable and the less favorable ones are lacking. Other structural features may have some influence on ore localization, such as changes in dip and folding of the beds, but such controls are not clearcut. There is some evidence that proximity to porphyry is a favorable relationship. Good ore of above average thickness was found adjacent to porphyry in the South Drift and in No. 1 Slusher Drift. In these instances the porphyry was highly altered.

The greatest continuous length of ore as determined by channel samples in the wall of a drift is 135 feet in No. 1 Slusher Drift. The ore bed cut by these 22 channels averaged 3.6 feet in thickness and contained 17.6 oz. silver, $6.71 gold at $35.00, 4.0% lead, and 2.4% zinc per ton. Another in Nos. 6 and 7 Slusher Drifts is 90 feet long, averages 2.6 feet in thickness and contains 13.1 oz. silver, $6.40 gold, 4.1% lead, and 5% zinc per ton. Wall samples may not represent the best part of the ore body. In No. 1 Drift, 100 feet of the 135 feet mentioned above was face sampled. The averages of 14 face samples are: average thickness 5.6 feet, 19.0 oz. silver, $6.05 gold, 3.2% lead, and 1.8% zinc per ton.

The average thickness of the ore is about 3.0 feet. Thicknesses of 6 to 8 feet have been sampled in several places.

Not enough mining in following ore has been done to know much about widths and outlines of ore bodies. In general they will be elongate but very irregular in outline. Boundaries between ore and waste are very sharp and masses of unreplaced quartzite occur within the ore.

Two truckloads of ore, one of 6 skips and one of 5 skips, were weighed and mositure sampled. It was determined that one skip of 29.5 cubic feet held 2.4 dry tons of broken ore and that it takes 12.3 cubic feet of broken ore to weigh one ton. The ore is judged to have an average specific gravity of 3.56, resulting in a factor of 9 cubic feet per ton for ore in place.

The ore mineralization is pervasive in the area explored. The only limits established are in the ends of the North and South Drifts, and further exploration here to locate the ore horizon may find more ore. Other offsets in the Lower Contact are known from the drilling, but the ore is expected to continue into the displaced areas.

Stockpiles - An ore stockpile was started when ore was first encountered in the drifts. All rock judged to contain 4.0 oz. silver or more was stockpiled. The grade of the stockpile is based on the average of the truck samples from the truckloads which were stockpiled.

Separate stockpiles were made of ore from each experimental stope as explained below. A summary of ore remaining in stockpiles is as follows:

	Tons	Oz. Ag	$35.00 Au	% Pb	% Zn
General stockpile	14,638	6.3	2.25	1.4	1.3
Stope stockpiles	1,373	7.5	3.67	1.7	1.5
	16,011	6.4	2.46	1.4	1.3

Experimental Stoping - Four areas were chosen for experimental stopes, 2 in No. 1 Drift, one in No. 4 Drift and one in No. 9 Drift (Figure 6). The objectives were, 1) to determine what grade of ore could be maintained by mining as cleanly as possible, and 2) to get some idea of the mining costs. To keep a working height it was necessary to take up the waste bottom in places where the ore was less than 5 feet thick. This waste had to be handled separately from the ore and a clean separation of ore and waste was difficult to achieve with the slushers. To minimize dilution of the ore each face was marked by the geologist and/or the mine foreman before drilling. After drilling,the foreman approved the holes for blasting. In spite of efforts made to hold the back, caving occurred in places, thus further diluting the ore.

The ore from each stope was stockpiled separately on the surfaces. The material was grab sampled in the mine by taking large samples from the piles after blasting. Each truckload taken from the collar of the shaft was kept separate from the main pile until it had been sampled. This sampling was done with a long post-hole spade. Grab sampling was difficult because of the mixture of coarse and fine material. Many pieces of quartzite and some pieces of massive pyrite as large as 8-10 inches in diameter were present. In 3 of the stopes the two sets of samples checked fairly well, but in No. 1 Stope with the largest tonnage there was a wide discrepancy. Because of this, trucksize samples were taken from each stockpile (2 from No. 1) in the following manner. The pile was leveled to about a 3 foot depth by bulldozer. A trench was then dug through the pile with a backhoe, every 4th bucket being loaded into the truck. 20 tons were taken from stockpile No. 1, 14 tons from No. 1W, 12 tons from No. 4, and 13 tons from No. 9. The ore was then hauled to the County rock crusher, crushed through a 3/4 inch screen and 7 to 9% taken off of the end of a conveyor belt for a sample. The rejects were returned to the respective stockpiles and the samples (1600 to 3600 pounds) were taken to the Homestake mill at Lead for final reduction to 2 pound size. Assay results are shown in the following table. The special bulk sampling is, of course, believed to be the most reliable of all of the sampling methods.

Stope	Tons		Special Stockpile Bulk Sampling	Stockpile Sampling By Geologist	Pile Sampling Underground
No. 1	547	Oz. Ag	8.8	9.9	20.0
		$ Au @ $35.00	4.91	4.65	6.56
		% Pb	1.4	1.8	
		% Zn	1.1	1.5	
No. 9	262	Oz. Ag	7.4	7.0	7.3
		$ Au	4.91	4.01	3.50
		% Pb	0.8	0.8	
		% Zn	0.8	1.0	
No. 4	216	Oz. Ag	4.0	6.6	8.0
		$ Au	3.50	3.72	4.19
		% Pb	1.4	3.1	
		% Zn	0.8	2.6	
No. 1W	348	Oz. Ag	7.8	6.9	7.8
		$ Au	4.91	4.70	4.38
		% Pb	1.3	1.3	
		% Zn	1.2	1.3	
Total	1373	Oz. Ag	7.5	8.1	12.6
		$ Au	4.67	4.39	5.05
		% Pb	1.3	1.7	
		% Zn	1.0	1.5	

A special study was made of the channel sampling in No. 1 Stope in order to compare the actual ore bed with the rock removed from the stope, both in tonnage and grade. The figures are not in agreement. The increase from 358 tons in the ore bed to 547 tons mined calls for a dilution of 53%. The decrease in the silver content from 20.4 oz. to 8.8 oz. calls for a dilution factor of 132%. Details of this sampling are shown on the map, Figure 20.

Ore Possibilities

Upper Contact

The new work from the old Richmond-Sitting Bull workings was disappointing. Some ore shoots were intersected in No. 4 Drift. Some drifting along some of these shoots would be worthwhile if the property became active again. Considerable dilution would be experienced in mining the thin ore bodies, perhaps reducing the grade below an economic limit. The hope would be to find ore of better grade and thickness.

The oxidized ores of the Upper Contact would require a completely different type of treatment for recovery of the metals than that required for unoxidized ores of the Lower Contact, greatly increasing the cost of a mill. It is somewhat doubtful if enough ore could be reasonably assured from the Upper Contact ahead of time to justify the added cost.

A mining operation in the Upper Contact could be successful only as an adjunct to a larger successful operation in the Lower Contact.

Lower Contact

The experimental stoping of the Lower Contact ores has demonstrated that it would be difficult to maintain a grade of 10 oz. of silver to the ton. However, with more experience and by using somewhat different methods, it is believed that this can be done. The grade of ore that can be mined from the Lower Contact is estimated as follows:

Ag	10.0 oz./ton	
Au	.086 oz./ton	($3.00 @ $35.00)
Pb	2.0%	
Zn	1.5%	

Enough of the ore mineralization has been seen and sampled to make it unlikely that further work would find ore of greater average grade or thickness than that already found, unlikely, but not impossible.

Ore shoots are irregular in outline, but can be fairly long in one dimension. Single ore shoots of continuous ore grade of more than 100 feet are present. Ore zones containing some spots of below ore grade have been found to be several hundred feet long in the limited amount of exploration work that has been done. Ore shoots cannot be safely projected into the unknown, nor can they be assumed to be continuous from one opening to another. However, ore mineralization is widespread over the area explored and there is good reason to expect that continued exploration would find more ore. Even if the ore is limited to the general area of the Upper Contact workings, and this is not necessarily so, considerable more area remains to be explored. A reasonable expectation would be that about 200,000 tons of ore could be mined from the Lower Contact on the Double Rainbow property. There is no basis for a firm ore reserve figure, only the inference that expansion in nearly all directions of the presently-known area appears favorable.

A daily production of about 75 tons could probably be maintained at the beginning. As more territory was opened up the daily production could probably be increased to 100 tons.

Metallurgical Test Work

Various metallurgical tests were conducted by the Department of Metallurgy at the South Dakota School of Mines and Technology and by the Galigher Company of Salt Lake City.

South Dakota School of Mines and Technology Tests

A sample was shipped in two lots on May 3, 1968 with a total dry weight of 5,530 pounds. After reduction and splitting by conventional methods, 61, $1\frac{1}{2}$ pound samples of -10 mesh material were prepared for test purposes. Partial analyses on 3 test samples are given below. More complete analytical data can be found in the appendix.

	Test Samples			
	1	2	3	Avg.
Oz./ton Ag	15.0	13.8	14.8	14.5
$ Au @ $35.00/oz.	2.45	2.80	2.80	2.68
% Pb	3.3	3.8	4.0	3.7
% Zn	3.4	2.7	2.9	3.0
% Cu	0.3	0.1	0.1	0.2

Three types of flotation tests were conducted. The first was bulk flotation which gave a concentration ratio of about 2 to 1. The second was selective flotation of the ore and the third was selective flotation of the bulk concentrate, giving concentration ratios of 5.6 to 1 and 4.5 to 1 respectively. Results of some of the tests with the better results are summarized on a following page.

Galigher Company

A copy of the S. D. S. M. & T. report was given to the Galigher people for study and they were asked to try and improve on the results. It was particularly desirable to increase the percentage of silver in the lead concentrate. Eight tests were conducted by Galigher, the first 6 being experimental. Test No. 7 was a final test and No. 8 a check on No. 7. Results of the two tests have been summarized in the table on the following page. A copy of the Galigher report is included as part of the appendix.

Economics

Net Smelter Return and Cost

An analysis of net smelter return and operating costs was made by Donald Delicate of the Homestake Mining in October, 1968. He used the estimated ore grade of 10.0 oz./ton silver, 0.086 oz./ton gold, and 2.0% lead. The zinc is considered to add no value. Using metal prices of $2.00/oz. for silver, $39.00/oz. for gold and 11¢/pound for lead, he calculated a net smelter return of $16.55/ton, less than the estimated operating cost of $17.65. He concluded that the silver price would have to increase to nearly $3.00/oz. before there would be justification for continuing the Double Rainbow project. The net smelter return analysis is included as part of the appendix.

As silver is the constituent of most value in the ore, increase in the silver price would be of the greatest benefit. Increases in the prices of gold and lead would benefit in lesser amounts, but could be important. An area with much room for improvement is in the gold recovery. If gold recovery could be increased to 80%, about double that indicated by the testing, more than one dollar would be added to net smelter return.

SUMMARY OF FLOTATION TESTS

Description	% Wt.	Assays % Pb	% Zn	Oz. Ag	Oz. Au	Distribution & % Recovery Pb	Zn	Ag	Au
S. D. S. M. & T. Tests									
Head Assay		3.3	3.4	14.3	.08				
Bulk Concentrates	47.8	6.5	5.8	27.3	.04	92.1	87.7	96.6	85.8
Selective Flot. of Ore									
Pb concentrate	6.8	51.0	2.5	89.4	.38	91.8	5.5	43.0	27.9
Zn concentrate	11.0	0.9	25.0	55.8	.12	2.6	89.2	43.5	14.3
	17.8					94.4	94.7	86.5	42.2
Selective Flot. of Bulk Concentrate									
Pb concentrate	9.1	65.0	2.8	100.9	.16	89.7	4.6	35.0	9.8
Zn concentrate	13.0	4.0	39.0	99.5	.32	7.9	92.5	49.3	27.8
	22.1					97.6	97.1	84.3	37.6
Galigher Tests									
Head Assay		3.9	3.2	14.9					
Average of Test 7 & 8									
Pb Cleaner concentrate	5.7	63.9	2.6	200.2	.52	91.3	4.8	73.7	28.2
Zn Cleaner concentrate	5.2	0.7	49.3	37.6	.15	0.6	81.7	12.3	5.5
	10.9					91.9	86.5	86.0	33.7
Pb Rougher concentrate	7.6	50.3	3.2	159.6	.44	95.3	7.8	78.0	31.5
Zn Rougher concentrate	6.5	0.6	40.1	31.3	.12	1.0	83.9	13.0	7.2
	14.1					96.3	91.7	91.0	38.7

Jan 24, 1969
completion date

EXPLORATION CONTRACT
DOUBLE RAINBOW MINES, INC.
OME-6558

EXHIBIT A

The purpose of this project is to explore for silver-bearing ore deposits occurring as replacement bodies associated with three dolomitic zones referred to as the Upper, Lower, and Basal contacts in the Deadwood formation of Cambrian age, and with sedimentary and metamorphic rocks at the base of the Deadwood formation overlying Precambrian rocks.

The work shall be performed by diamond core drilling from the surface and from underground workings, and by shaft sinking, cross-cutting, and drifting.

General Provisions

No drilling or underground work shall be done within 100 feet of the exterior boundaries of the land outlined on Figure 1.

The location, direction, and extent of each work item shall be subject to prior Government approval. The Government will not participate in the costs incurred for incomplete drill holes or for casing left in holes at the request of the Operator.

All surface diamond drill holes shall be cased through overburden and completed with standard BX (nominal diameter 1-5/8") core size or equivalent wire line size equipment.

All diamond drill holes drilled from underground locations shall be completed with standard AX(nominal diameter 1-1/8") core size or equivalent wire line size equipment.

Significantly mineralized core shall be split and one split assayed for silver and gold. Where indicated by the mineralization, the core may be assayed also for lead and zinc. No sample shall represent a core length greater than five feet. The remaining core shall be stored in proper sequence with the unmineralized core.

Facilities shall be provided for recovering drill sludges. Sludge samples shall be retained when drilling in significantly mineralized rock.

Diamond drill core shall be stored in boxes identified as to hole number with markers in the core sections indicating the depth represented. Sludge samples shall be stored in suitable containers properly identified as to source and location. The stored core and sludge samples shall be retained for Government inspection and possible use. With prior Government approval, the Operator may dispose of the core and sludge samples.

All significantly mineralized areas intersected by underground workings shall be sampled and assayed. A representative bulk sample shall be collected from each round broken in mineralized rock. Channel or chip samples shall be cut normal to the trends of the mineralized areas at intervals of not more than 5 feet. Each sample shall be split and one split assayed for silver and gold and, if warranted by inspection, for lead and zinc. The remainder of each sample shall be stored and identified in a suitable container for Government inspection and possible use. With prior Government approval, the Operator may dispose of the stored samples.

True copies of assay certificates of all samples shall be submitted with the Operator's monthly report which shall include also a map, sketch, or cross section showing the work completed during the reporting period and the locations of all samples taken from drill core and underground workings.

All drill holes and underground workings shall be logged or mapped geologically and copies of the logs of completed holes and maps of workings shall likewise be submitted with the Operator's monthly report.

The vertical shaft shall be not less than ~~8 by 10½~~ 7'4" x 15'4" feet in cross section in clear of timber, and shall be divided into manway and skip compartments. Ladders throughout and landings at vertical intervals of not more than 20 feet shall be installed in the manway compartment.

Drifts and cross cuts intended for passage of trackless loading and hauling equipment shall be not less than 8 by 10 feet in cross section. Drifts and crosscuts wherein slusher equipment is used shall be not less than 6 by 6 feet in cross section.

The underground workings shall be rock bolted or timbered to the extent necessary and proper. The Government's contribution shall be limited by the total estimated for the item, Rock bolting, listed under Estimated Costs of the Project.

A 2" dia. airline or 2 1" hoses, and a 1" water line, and 12" vent bag may be used in slusher drifts

Air lines shall be not less than 3-inch diameter, water lines not less than 1-inch diameter, and ventilation pipe not less than 14-inch diameter. In the event track haulage is used, mine rails shall be not less than 20-pound size.

The Operator shall provide such supervision, labor, and technical services as may be required to complete the work in a satisfactory manner.

The Operator at its own cost and expense shall rehabilitate and repair mine workings and installations on the Upper contact level which are necessary for access and operation of the exploration work on that level specified in the contract. The Operator also shall bear the total cost and expense of surface construction necessary for operation of the project.

Description of the Work

The work shall consist of diamond core drilling from surface and underground sites approximately 13 holes totalling about 6,110 feet, sinking a vertical shaft about 260 feet, excavating a station, sump, and loading pocket, and drifting a total of 4,200 feet on two levels, the Upper and Lower contacts.

The approximate locations of the work described are shown in plan view on Figure 2, entitled "Double Rainbow Mine Proposed Underground Exploration Work, Upper Contact," and on Figure 3, entitled "Double Rainbow Proposed Underground Exploration Work, Lower Contact," which are attached hereto and made part hereof.

Four holes, Nos. 1S-4S, inclusive, totalling about 2,635 feet shall be drilled from the surface at sites located approximately as indicated in red color on Figure 2.

Nine holes, Nos. 1U-9U, inclusive, totalling about 3,475 feet shall be drilled from the Richmond-Sitting Bull mine workings on the Upper contact at sites located approximately as indicated in blue color on Figure 3.

All holes presently planned are to be drilled vertically unless results of drilling dictate changes in the plan for subsequent holes. The geological targets and the possible depths of the holes are as follows:

Geological Targets

Hole No.	Upper Contact	Lower Contact	Basal Contact and Precambrian Rocks	Approximate Maximum Depth of Hole Feet
1S	X	X	X 671	750
2S	X	X 461'		650
3S	X	X	X 450'	535
4S	X	X	X 451'	700
			1572	
1U thru 8U		X		340-370
9U		X	X	640

2635
2033 add drill
602

1U 417'
2U 411'
7U ~~455'~~ 445'
4U 393'
3U 500'
5U 480'
6U 429'
3075 11-14-67

8U 405
3480 11-27-67

9U 510
~~4000'~~
3990

Holes intended to cut the Basal contact and basement rocks should penetrate about 25 feet into Precambrian rocks.

Unused footage remaining from the above described drilling program may be used as warranted within the limits of available drilling funds.

Based principally on information obtained from the surface diamond drilling, and from such information as is useful from the underground drill holes, a site for a vertical shaft shall be selected which will provide access for underground workings to be driven from the shaft on the Lower contact. The approximate location of the shaft is indicated on Figure 2 and 3. The approximate total depth of the shaft is 260 feet.

A shaft station, rock storage pocket, and sump shall be excavated for servicing the workings to be driven on the Lower contact.

Four slusher drifts totalling 1,400 feet shall be driven on the Upper contact from the Richmond-Sitting Bull mine workings and the McClellan tonnel as indicated on Figure 2.

Starting from the shaft station established for the Lower contact workings, a drift shall be driven southwesterly approximately

700 feet, thence southerly approximately 800 feet using trackless loading and hauling equipment to explore the Lower contact as indicated on Figure 3.

From positions selected in the trackless drift, about five slusher drifts totalling about 1,300 feet shall be driven to explore mineralized zones in the Lower contact as indicated on Figure 3.

Estimated Costs of the Project

Actual Costs

Category (1) Independent Contracts

Drilling, 6,110 feet b/	$ 28,548.00	$ 28,548.00
1,985 feet from surface sites into Precambrian rocks, BX @ $6.50/foot		
650 feet from surface site through Lower contact, BX @ $6.00/foot		
3,475 feet from underground sites, AX @ $3.38/foot	3475 -650 for #7 2825 652 3487	

Category (2) Personal Services

None except:

Subcategory (a) Supervision and Technical Services 1 - Outside geological consultant 30 days @ $75.00/day	$ 2,250.00	$ 2,250.00

Category (7) Miscellaneous

None except:

Consultant's per diem 30 days @ $16.00/day	$ 480.00	
Consultant's travel expenses, 1,825 miles @ $0.12/mile	219.00	699.00

Total Estimated Actual Costs (rounded)		$ 31,500.00
Fixed Unit Costs		
Shaft sinking, 260 feet @ $220.00/foot 1/	$ 57,200.00	
Allowance for excess water in shaft sinking	11,440.00*	
If water flow in excess of 50 gallons per minute is encountered during shaft sinking, an increase of $25.00 per foot of shaft sunk thereafter is allowed for each 50-gallon-per-minute increase in water flow.		
Excavate shaft station, sump, and loading pocket, including installation of skip loader, 9,000 cubic feet @ $2.16/cubic foot.	19,440.00*	
Rock bolting	4,348.00	
5-foot bolts @ $3.00 each, installed		
8-foot bolts @ $3.50 each, installed		
Drifting, 4,200 feet 1/ (rounded)	188,250.00	
Slusher drift, Upper contact, 1,400 feet @ $35.00/foot		
Slusher drift, Lower contact, 1,300 feet @ $41.73/foot		
Trackless drift, Lower contact, 1,500 feet @ $56.67/foot		
Total Estimated Fixed Unit Costs (rounded)		$280,680.00

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* Maximum

1/ Includes all costs whatsoever such as mobilization and demobilization, labor, equipment, materials and supplies, services, taxes, insurance, supervision, assays, etc.

SUMMARY

Total Estimated Actual Costs	$ 31,500.00
Total Estimated Fixed Unit Costs	$280,680.00
Total Estimated Cost of the Project	$312,180.00
Government Participation @ 75%	$234,135.00

HOLE #1

DRILL LOG

Double Rainbow Project, S.D.

Logged by: R. F. Sheldon

BX core

Started: 6/5/64
Compl. : 6/16/64

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	Collar to 83' drilled by Materi Exp. Co. with rotary bit. Remainder of hole drilled by MacPherson Drilling Co., coring with BX			
0-30	Overburden - clay and broken limestones.	)		
30-40	Broken lt. gy to buff partially sil. lms. (Whitewood Formation?)	)		
40-71	Prob. top of Deadwood Formation. Buff S.S. f. to m.g and sandy Dol. with a few beds of gn. Sh.	)	Cuttings only and largely for recovery of cuttings	
71-80	Buff sandy Dol. m.g. 71-72 very red with Fe stain.	)		
80-84	Gy to buff Fe & Mn stained silicified dolomitic S.S. (Top of ore horizon at 80'). Hole broke thru into stope at edge of pillar at 83'.	)		
84-85	Lt. gy Sh.	84-94	9.8	98
85-135	Dolomitic S.S. (transitional to dolomitic Quartzite), f-m.g. buff to reddish brn. Composed of white qtz. grains cemented with a matrix of buff dolomite and Lms, brown FeO, brownish-black MnO_2 and occasional grains of green glauconite. Matrix partially leached in some areas leaving reticulated network of silica grains.	94-104	9.8	98
		104-114	9.0	90
		114-124	6.2	62
		124-134	8.0	80
			42.8	
	Few 1/16" sh. beds @ 80° to core axis.			
	At 89' - 6" shaly & f.g.w. much MnO_2 and FeO			
	90-91' - Heavily stained with MnO_2 and FeO			
	97- 4" w. irreg. bands and blebs MnO_2			
	107-108' - @ 15% blebs and bands MnO_2			
	125-135' - 5-10% green glauconite disseminated and interstitial to silica grains			
	Sample: 88-92 Dolomitic S.S. well stained w. FeO and MnO_2			
*	No. 6116 B Au Tr. Ag. 0.92 oz/ton			
	96-100 as above			
*	No. 6117 B Au Tr. Ag. 0.92			
135-140	Porphyry "A" Monz. Porphyry sill bleached and altered to a pale grn-gy with a few white to buff feld. x ls - 1/4". Contains some assimilated dolomitic s.s. particularly near contacts. Speckled throughout with @ 2% MnO_2 mainly as blebs - 1/32" but some fine seams. Attitude of contact not regular but at 80° to core axis. Also some fine FeO stained cracks at 10° to core axis. Mottled darker grey in part due to irregularity of alteration.	134-144	10.0	100

HOLE #1

DRILL LOG

Double Rainbow Project, S. D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
140-174	Dolomitic S.S., f-m.g. buff to brown mottled due to oxidized Fe & Mn and containing at 10% glauconite interstitial to quartz grains. Few then shaley beds 80° - 90° to core axis.	144-154	10.0	100
		154-164	6.0	60
		164-174	8.0	80
	168-169 1/2' Dark brown, partially vuggy and porous due to leaching of Fe and Mn.			
*	Sample No. 6118 B Au 0.01 Ag 1.20			
174-194	Dolomitic S.S. buff to brown, conglomeritic in part with pebbles of gy. dolomitic S.S. in matrix of brown and green glauconitic S.S. Some shaley beds <2". Bedding attitude 80° to core axis. Beds becoming lighter buff to grey in color 184-194 and thinner bedded - generally <6" thick.	174-184	10.0	100
		184-194	9.5	95
194-221	Lt. gy dolomitic S.S. interbedded with greensh-gy shale. S.S. glauconitic in part with a few thin beds stained with FeO. Thin-bedded with the dolomitic S.S. beds up to 1 foot thick and the shale beds <3". Occasionally conglomeritic with grey pebbles of dolomite in shaley beds. Bedding attitude at 80° to core axis but somewhat wavy and irregular. Relative proportion of dolomitic S.S. to shale about 4:1	194-204	10.0	100
		204-214	9.6	96
		214-222	6.0	75
			70.1	
	Porphyry "B"			
221-231	Monz. Porphyry with white gen. lath-shaped x ls of feldspar < 1/4" long in a pale grey f.g. matrix. Few Fe stained cracks and small pitted vugs from leached pyrite with a very few pyrite grains remaining.	222-229	7.0	100
		229-236	6.5	93
	222.3 1" vuggy FeO			
	227-229 Brown Fe stained fracture 10° to core axis			
	231 Contact irreg. but 90° to core axis			
231-268	Alternating thin beds of <6" of: f.g. dolomit. S.S., white to greenish gy & glauconitic; dolomitic conglomerate containing white pebbles of dolomite and limestone in greenish-gy f.g. dolomitic S.S. matrix; and dark green shale bands. Bedding attitude 85°-90° to core axis.	236-246	10.0	100
		246-256	7.0	70
		256-265	9.0	100
268-339	Mainly beds of dark greenish-gy Sh. containing flattened conglomeritic pebbles of white (few pinkish) Dol. and Lms pebbles. Some beds <6" of dolomitic cong. with sandy to quartzitic matrix of gn-gy glauconitic S.S.	272-277.5	5.5	100
		277.5-293	15.5	100
		293-300	7.0	100
		300-310	10.0	100
		310-320	10.0	100

HOLE #1

DRILL LOG
Double Rainbow Project, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	325-329 - mainly dolomitic limestone cong. with flattened limestone pebbles in f.g. to m.g. matrix of gn-gy dolomitic limestone with some quartz grains and colored reddish in part with hematite.	320-325	9.5	100
		329.5-339	8.0	85
339-341	Silicified dolomitic limestones f-m.g., gn-conitic, purplish green and speckled with white limestone particles. Few thin beds gn-gy shale at 85°.	339-343	4.0	100
341-347	Sh. gn-gy w. a few calcite filled cracks. Bedding at 85°. 4" of shale at porphy. contact broken and bleached.	343-353	10.0	100
	Porphyry "C"			
347-414	Porphyry, pale grey to pinkish grey with many pinkish feldspar phenocrysts <3/4" and <3% hornblende phenocrysts <1/4". Few fractures at 10% to core axis coated with pyrite grains. Generally contains at 0.01% pyrite grains but more as noted.	353-363	9.0	90
		363-373	6.0	60
		373-383	4.3	43
		383-387	4.0	100
	357 - 1" green steatite alteration.			
	370-373 - Bleached and broken with @ 0.5% pyrite as disseminated grains - 1/100". Fractures at 10° to core axis	387-397	5.0	50
		397-401	4.0	100
		401-411	9.5	95
	390 - Pyrite coated fracture 10° to core axis.	411-416.3	4.5	85
	414 - Broken ground at contact			
414-421	Grey Sh. - broken in part with fractures at 5° core axis. Bedding at 80°.	416.3-421	4.3	92
421-449	Pebble Cong. - flattened pebbles of white dolomitic limestones <2" in matrix of gn-gy dolomitic S.S. f.g. and grey shale. Few sections with hematite stain. Bedding attitude 80° - 85° to core axis.	421-431	9.8	98
		431-441	10.0	100
		441-447	6.0	100
		447-457	10.0	100
	422 - Partial pyrite replacement of 1" limestone pebble.			
449-459	Pebble Cong. as above, but transitional to an arenaceous dolomite with limestone pebbles becoming fewer. Generally f.g. and mottled purplish and pale green to grey. Few streaky bands of shale at 80° to core axis.	457-466	8.5	94
	452-453 Several 1" to 1/2" irreg. drusy bands possibly from leaching of pyrite. Few visible grains of pyrite and chalcopyrite.			
459-460.5	Dolomite, siliceous in part, f.g., light grey with dark gy wavy shale bands. Few pyrite grains.			

Double Rainbow Project, S. D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
460.5 - 462.5	Quartzite, f.g., mottled and streaked lt. to dark grey and containing at 5% f.g. pyrite as streaky blebs. Very small amount chalcopyrite <0.2% Sample 460-462.5 * No. 6119 B Au .01 Ag 0.40 Cu 0.05%			
462.5 - 467.5	Sulphide, probably as a replacement of quartzite. Massive to f.g. with a few medium grained areas in drusy vugs. Visually, sulphide composed of: pyrite - 94.5% ZnS & PbS - 5% Chalcopyrite - 0.5% At 462.5' - 1/2" mainly chalcopyrite PbS, ZnS and chalcopyrite occur in the pyrite mainly as irregular streaks and blebs. Few octahedral x ls of PbS noted in small drusy vugs in pyrite. Sample 462.5' - 465.0' * No. 6120 B Au .16 Ag 10.42 Cu 0.45 Pb 0.2 Zn 1.7 Sample 465.0' - 467.5' * No. 6121 B Au .22 Ag 401.10 Cu 0.15 Pb 1.6 Zn 3.1	466-476	9.8	98
467.5 - 472.5	White to pale grey quartzite, f.g. containing at 4% pyrite as streaky blebs and vuggy bands. Pyrite as discrete grains in vugs. Bands irregular but generally 75°-90° to core axis. Sample 467.5' - 470.0' * No. 6122 B Au .02 Ag 1.12 Cu 0.07 Sample 470.0' - 472.0' * No. 6123 B Au .01 Ag 2.76 Cu 0.05			
472.5 - 476	White to pale grey quartzite, f.g. with a few pyrite grains <0.01% 474 - 476 Fracture at 5° to core axis			
476-485	No Core - slipped from tube	476-485	0	0
	Porphyry "D"			
485-572	Monzonite porphyry pale grey to gy-gn with phenocrysts of both feldspar and hornblende. Feldspar xls up to 1" and patches of hornblende to 1/2". Few grains of pyrite only except as noted. Occasional fracture at 30° to core axis. 493' - Fracture at 5° to core coated w. f.g. mammillary pyrite.	485-493 493-498 498-508 508-517 517-527 527-534 534-537	8.0 5.0 10.0 10.0 10.0 5.4 0	100 100 100 100 100 80 0

Double Rainbow Project, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	523-528 Bleached and softened with feld phenocrysts partially kaolinized, carbonatized and eroded. Few erratic stringers of white calcite.	537-541 541-551	4.0 10.0	100 100
	534-544 Bleached and slightly softened - calcite stringers	551-556	5.0	100
	534-537 No Core	556-566	10.0	100
	547-553 Bleached and altered - hornblende phenocrysts serpentinized and feldspars softened. Contains @ 1% pyrite as disseminated grains except as noted 547 1/2 - 549 1/2 - 1/4 in irregular veilet of purple quartz, white calcite and f.g. pyrite @ 10° to core axis. Few ZnS xls in drusy cavities.	566-576	10.0	100
	Sample 547.5 - 549.5 No. 6124 B Au Tr Ag 0.22			
	553-556 Slight alteration			
	567-572 Altered and bleached with kaolinization of feldspars and serpentization of hornblende. Few disseminated pyrite grains.			
	571-572 1/16" veinlet of f.g. pyrite @ 25° to core axis.			
	572 Irregular contact of porphyry with white quartzite. Quartzite inclusions at contact.			
572-579	Quartzite, white to lt. gy with thin black wavy (due to differential compaction) shale beds @ 80°-90°. Very few tiny grains and f.g. blebs of pyrite noted. 574- 1/8" drusy fracture @ 10° filled with m.g. white calcite. 579 - Contact with porphyry at 80° to core axis.	576-586	10.0	100
	Porphyry "E"			
579-586	Monzonite porphyry with 70% grey matrix and 30% distinctive white kaolinized feldspar phenocrysts <1/2" partially eroded by drill water. Contains @ 0.1% pyrite in disseminated f.g. xls and small blebs <1/16". 586 - Broken core at contact.			

HOLE #1

DRILL LOG

Double Rainbow Project, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
586-602	Mottled buff and greenish-grey arenaceous Conglomerate. Pebbles <1", flattened and compacted with only indistinct outlines in part. Matrix of greenish-grey, f.g. glauconitic S.S., limey quartzite and shale with butt to white pebbles of quartz and quartzite. Contains @ 0.2% introduced pyrite as f.g. streaky blebs <1/8", as hairline veinlets particle coatings and as discrete grains. Sulphide mineralization largely not visible to unaided eye - possibly some chalcopyrite.	586-596	10.0	100
		596-606	10.0	100
	Sample of representative portion 590-594			
*	No. 6125 B Au Tr Ag 0.32			
	602 - 1" clayey black shale at contact.			
602-607.5	White quartzite composed of clean white f-m.g. well water-rounded quartz grains with @ 0.1 % f.g. pyrite introduced interstitial to the quartz grains.	606-613	6.8	97
	Sample 602-605			
*	No. 6126 B Au Tr Ag 0.24			
	604 - Slickensided tight slip @ 75° to core axis. Drag sulphide.			
607.5-611	Interformational Cong. composed of sub-angular pebbles of white, buff and dark grey quartzite and a few pieces of white quartz, cemented with fine sand and @ 1% f.g. pyrite as a filling surrounding the pebbles as impregnations in the sandy matrix, and some replacement along cracks in the pebbles. 1" bleb chalcopyrite interstitial to sand grains at 607.5'.			
	Sample No. 6127 B			
*	607.5 - 611 Au Tr Ag 0.42			
Note	Base of Deadwood Formation at 607.5' and top of Algonkian Schist.			
607.5-632	Maroon colored sericite-biotite schist with a few white quartz veinlets <3" wide @ 75° to core axis. One quartz stringer showed bleb of pyrite, but otherwise barren. Schistosity 40°-70° to core axis.	613-617	3.0	75
		617-623	0	0
		623-641	18.0	100
632-644	Sheared and slightly brecciated white and grey banded quartzite laced with @ 3% f.g.pyrite mainly seamed along shear planes but also as blebby veinlets in numerous crosscutting fractures. Schistosity 35° to core axis.	641-647	6.0	100
	Sample of representative section 634-638			
*	No. 6128 B Au Tr Ag 0.10			
	640-644 Few seams of green chlorite.			

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
644-650	Mainly maroon to pale green sericite-chlorite schist with some gy quartzite bands and a few stringers of white quartz. Schistosity 40°-70° 650 - 1/2" of gouge at porphyry contact 80° to core axis Porphyry "F"	647-657	10.0	100
650-694	Monzonite Porphyry with a pale green matrix containing numerous, somewhat rounded phenocrysts of white feldspar <1/2" mainly slightly altered and softened to a pale greenish white. Generally < 0.1% pyrite as fine impregnated x ls or veinlets except as noted. 650 - 651 1%-2% f.g. pyrite in blebs and veinlets. 656 Pyrite filled fracture 15° to core axis. 673 - 678 1/16" pyrite and calcite filled branching fracture parallel to core axis. F.g. pyrite & pink calcite. Sample No. 6129B * 673 - 675 Au Tr Ag 0.06 694 - Sharp contact with schist @ 65° to core axis.	657-666 666-676 676-686 686-696	9.0 10.0 10.0 10.0	100 100 100 100
694-720	Schist - mixed assemblage of phyllite, amphibolite, quartzite, hematite and micaceous Schist with a few barren stringers of white quartz. Schistosity 60° to 85° to core axis. Few sections with f.g. pyrite banded along planes of schistosity.	696-706	10.0	100

TOTAL DEPTH OF HOLE = 720'
CORE RECEOVERY = 88.5%

Note: Water circulation in this hole finally lost at 108' and not recovered for remainder of hole.

? HOLE #2

DRILL LOG

Double Rainbow Project, S.D.

Logged by: R. F. Sheldon

Started: 7/17/64
Completed: 7/29/64

Dip: - 90°
BX Core

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
0-51	Casing - through overburden and broken rock.			
51-84	Interbedded f.g. impure limey S.S. and Sh., buff to reddish mottled and stained with FeO and MnO_2. A few erratic white calcite stringers <1/4". Bedding 80°-85° to core axis. Some sections up to 1 foot contain 30% pyrolusite.	51-57	6.0	100
		57-67	9.7	97
		67-77	10.0	100
		77-84	6.0	85
	66-68 Irregular fractures roughly parallel core partially filled with calcite or MnO_2. Siliceous with about 30% MnO_2 as irregular masses and bands plus FeO stain.			
*	Sample No. 6130 B 66-68 Au Tr Ag 0.90			
	71-75 At 30% MnO_2 and red ocherous hematite and limonite as irregular pods and bands			
*	Sample No. 6131 B 71-75 Au Tr Ag 0.50			
84-127	Dolomitic S.S. (transitional to dolomitic quartzite) f-m.g. buff to reddish brown. Composed of white qtz. grains, cemented with buff dolomite and lms, brown FeO, brownish-black MnO_2 and greenish glauconite when not altered and limonitic. Matrix partially leached in places leaving reticulated network of silica grains.	84-86	1.8	90
		86-88	In stope	
		88-91.5	In muck pile	
		91.5-96	4.5	100
		96-106	10.0	100
		106-114	8.0	100
		114-117	2.5	83
	Note: Stope on U/Contact horizon from 86-91.5. Hole entered stope 6 inches from pillar along a fracture and D.H. inclined from vertical to dip.	117-120	2.5	83
		120-124	2.0	50
		124-127	3.0	100
	Hole drilled through muckpile in stope to floor at 91.5'.	127-137	10.0	100
	91.5-123 Many parallel to sub-parallel branching fractures <1/4" partially filled with MnO_2 and FeO but showing pyrite boxwork.			
*	Sample No. 6132 B 91.5-96 Au 0.015 Ag 4.30			
*	Sample No. 6133 B 100-104 Au Tr Ag 1.34			
127-131	Porphyry "A"- Contact @ 80° to core axis.			
131-174	Dolomitic S.S., f-m.g. buff to brown mottled due to oxidation of Fe and Mn containing@ 10% glauconite interstitial to silica grains. Few thin shaly beds @ 85°.	137-147	10.0	100
		147-157	10.0	100
		157-167	10.0	100
	147-151 Tight FeO coated fracture parallel to core axis.			
	167-169 Dark brown, partially vuggy and porous due to leaching of Fe and Mn.	167-171	4.0	100
		171-176	5.0	100
*	Sample No. 6134B 167-169' Au Tr Ag 0.54			

HOLE #2

DRILL LOG
Double Rainbow Project, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
174-198	Dolomitic S.S., f.g., buff to brown and conglomerntic in part with flattened pebbles of gy. dolomitic S.S. in matrix of brown to green glauconitic S.S. Few beds of red hematite < 1/2" and many sections heavily stained with FeO and MnO_2. Few pale gn-gy shaly beds < 1" thick @ 85° to core axis. 195-196 Broken core, some gouge - possible fault. 197 1/4" fracture 30° to core axis filled with FeO and MnO_2.	176-186 186-196	10.0 9.0	100 90
198-213	Interbedded buff f.g. dolomitic S.S., pebble cong. and pale gn. Sh. Few patches FeO and MnO_2 stain. Bedding @ 85° to axis. 210 FeO stained fracture 10° to core axis. 211 Broken gougy core - poss. fault. 213 Contact with porphyry @ 80°.	196-206 206-217	10.0 11.0	100 100
213-225	Porphyry "B" 213-215 FeO and MnO_2 stained fracture parallel core axis. 225 Contact at 80° to core axis.	217-225	8.0	100
225-255+	Alternating thin beds of<6" of: Dolomitic S.S. white to pale gn-gy and glauconitic; dolomitic conglomerate with flattened white pebbles of dol. and limestones in a greenish-grey f.g. dolomitic sandstone matrix; and shale in dark green beds @ 85° to core axis.	225-235 235-245 245-255	10.0 10.0 7.2	100 100 72
255-350	DRILLED WITH PLUG BIT - NO CORE	255-350	Plug Bit	
350-352	Shale, green-grey with beds @ 85° to core axis. Contact with Porphyry @ 85°.	350-355	5.0	100
352-412	Porphyry "C" but generally completely unfractured and fresher and harder than in D.H.#1. Many 10' core runs pulled in one continuous piece of core. 381-382' Two tight fractures @ 15° to core axis. 396-405' Few tight fractures 10°-45° to core with thin coatings of calcite. 412 Irregular contact with shale @ 75° to core axis.	355-365 365-375 375-380 380-386 386-396 396-400 400-402 402-412	10.0 10.0 5.0 6.0 10.0 4.0 2.0 10.0	100 100 100 100 100 100 100 100
412-423	Grey shale with bedding @ 85°. Few fractures @ 45°	412-422	10.0	100
423-441	Pebble Cong. - flattened pebbles of white dolomitic limestones < 2" in matrix of green-grey dolomitic sandstone or grey shale. 434' 6" bed red hematite	422-426 426-436 436-446	4.0 10.0 10.0	100 100 100

HOLE #2

Drill Log
Double Rainbow Project, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
441-443	Grey shale. Bedding @ 85° to core			
443-459	Arenaceous limey dolomite, fine grained and with a few thin gritty beds of green-grey shale or flat conglomeritic pebble. Mainly mottled purplish to pale green to grey with an occasional very small grain of impregnated pyrite. Several vuggy sections <6" leached out containing thin coatings of white calcite and f.g. pyrite.	446-456	9.0	90
		456-466	10.0	100
		466-476	10.0	100
	455-460 Few pyrite coated fractures @ 25° to core axis.			
459-462	Arenaceous dolomite grading to quartzite, f.g. mottled and streaked lt. to dark grey with dark shaly bands. Contains @ 0.5% pyrite as fine interstitial grains and fine veinlets.			
	Note: This bed same as cut in D.H. #1 from 459-462.5 that immediately overlay the ore horizon.			
462-472	Lt. grey quartzite, f.g. containing @ 4% f.g. pyrite as finely disseminated xls interstitial to and corroding the quartz grains, irregular f.g. blebs, veinlets replacing along minute cracks, and as irregular vuggy bands partially replacing favorable thin beds. A few fractures @ 20° to core axis.			
*	Sample No. 6135B			
	462-467' Au Tr Ag 0.26			
*	Sample No. 6136B			
	467-472' Au Tr Ag 0.12			
	Contact with porphyry @ 75°.			
472-564	Porphyry "D"	476-486	10.0	100
	494-552 Moderate to intense bleaching and alteration with feldspars kaolinized and mafics serpentinized. Core completely crumbled in some sections.	486-496	9.7	97
		496-506	9.8	98
		506-512	5.0	83
		512-517	4.5	90
	500-506 Fracture parallel core 1/2" to 1/8" wide and filled with f.g. pyrite, calcite and a few blebs of ZnS. Fracture widest and best mineralized from 500-503'.	517-527	10.0	100
		527-534	5.5	80
		534-537	2.3	77
		537-547	10.0	100
		547-557	10.0	100
		557-566	9.0	100
*	Sample No. 6137 B			
	500-503 Au Tr Ag 0.34			
	510-517 Few calcite filled fractures 20°-45° to core.			
	523-527 1/8" fracture parallel core filled with f.g. pyrite, calcite and a few blebs of ZnS.			

HOLE #2

DRILL LOG

Double Rainbow Project, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	527-528 Several streaky blebs of f.g. pyrite 529-531 Fine fractures parallel core filled with f.g. pyrite. 533-534 Fine fractures 10° to core filled with f.g. pyrite. 540-545 Fine fractures 10° to core filled with f.g. pyrite 564.5 Gougey contact with quartzite at @ 80° to core axis. 2" of porphyry at contact contain @ 10% f.g. disseminated pyrite.			
564.5-572.5	Quartzite, white to pale grey, f.g. containing @ 2% pyrite in streaky blebs. From 567 to 571 a 1/16" fracture paralleling the core is filled with calcite, f.g. pyrite, ZnS and a barely visible amount of PbS.	566-575	9.0	100
*	Sample No. 6138 B 564.5-568.5 Au Tr Ag 0.10 Sample No. 6139 B 568.5-572.5 Au Tr Ag 0.32			
572.5-577	Quartzite, f.g., white to lt. grey with black wavy shale beds mainly < 1/16" @ 80° to core axis. Few flat cong. pebbles in shaly matrix. Contains @ 0.5% pyrite as very finely disseminated grains and occasional small streaky blebs. 577' - 6" broken core - probable fracture.	575-581	5.8	97
577-590	Arenaceous conglomerate, mottled with pinkish buff to lt. grey flat quartzite pebbles of mainly indistinct outline and small white quartz pebbles in a matrix of glauconitic greenish-grey f.g. sandstone, dark green to black shale and limey quartzite. Broken core shows many black small mollusk shells about 1/4" diameter lying normal to core axis with many replaced by f.g. pyrite or with pyritic coatings. Sulphide mineralization as follows: 577-581 @0.2% very finely disseminated pyrite 581-582 1/16" fracture healed with f.g. pyrite @ 30° to core axis; and blebby patches f.g. pyrite. Total pyrite content @ 3%. 582-585 @ 2% pyrite mainly as very f.g. disseminations but partly as streaky blebs and fine bands. 585-590 As above but contains 2%-3% f.g. pyrite with 1" streaky blebs 589-590.	581-591	10.0	100

Double Rainbow Project, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
*	Sample No. 6140 B 585-590 Au Tr Ag 0.32 590 - Ragged contact w. porphyry @ 80°.			
590-599	Porphyry "E". Several black shaly inclusions <1/2". @ 45° 591-591.5 Fractures <1/4" to core axis filled with f.g. pyrite. 599 Contact @ 75° to core axis of 3" of black pyritic gouge.	591-596	5.0	100
599-609	Quartzite, f-m.g.; white to lt. grey, wholly to partially replaced by f.g. pyrite as noted below. 1" wide flattened pebbles of white quartz or quartzite cut 606 and 607. A 1/4" wide pyrite filled fracture cuts the conglomeritic pebble at 606 and shows 1/2" displacement. 605-607 Branching pyrite filled fractures <1/4" parallel to core axis. 4" pink hematitic banding at 605.5. Sulphide mineralization content as follows: 599-600.5 95% replacement by f.g. pyrite, 5% white quartz grains and black sh. 600.5-602 30% pyrite as irregular bands up to 2" wide and as disseminated grains and blebs interstitial to quartz grains. 602-605 1%-2% f.g. pyrite as disseminated discrete grains or small blebs. 605-609 10% f.g. pyrite as interstitial fillings, fracture filling, weakly banded normal to core axis, and as irregular blebs <3/4".	596-605 605-615	9.0 10.0	100 100
*	Sample No. 6141 B 599-602 Au 0.08 Ag 9.34			
*	Sample No. 6142 B 602-605 Au Tr Ag 0.12			
*	Sample No. 6143 B 605-609 Au Tr Ag 0.24			
	609' - 2" pyritized quartzite breccia at contact with Algonkian Schist @ 80° to core axis.			
609-616	Algonkian Schist, maroon and grey banded phyllite-sericite schist. Schistosity 50°-70° to core axis. 609-610 Bleached pale grey partially serpentinized schist.	615-616	1.0	100
END	-----	(Average core recovery = 97%) Hole last circulation passing through stope from 86-91.5'		

HOLE #3

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S. D.

Dip: - 90° 40
BX core

Started: July 30, 1964
Completed: Aug 12,1964 Logged: R. F. Sheldon

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
0-45	Casing through overburden			
45-55	No core, soft, broken rock and much MnO_2.			
55-65	Broken rock consisting of arenaceous black shale, buff shale and light grey shale	55-65	4.0	
65-69	Shale, limey to arenaceous, thin-bedded, lt. to dark grey. Bedding @ 85° to core axis	65-75	10.0	100
69-92	Interbedded shale, limey sandstone and arenaceous shale, buff to brown and reddish mottled and stained with FeO and MnO_2. A few erratic calcite stringers. Bedding at 85° to core.	75-85	10.0	100
		85-95	10.0	100
	90-92 Increasingly arenaceous, with a 1/4" calcite filled fracture 5° to core axis.			
92-150	Dolomitic sandstone (transitional to dolomitic quartzite) f-m.g. lt grey to buff and reddish brown where stained with FeO and MnO_2. Mottled and irregularly banded with pyrolusite and heavily iron stained in part. Glauconitic where not oxidized to limonite.	95-98	3.0	100
		98-107	8.0	89
		107-117	10.0	100
		117-127	10.0	100
		127-136	8.2	91
		136-146	10.0	100
		146-156	10.0	100
	Note: Hole drilled through pillar in U/C stopes. Upper Contact ore horizon as mined is from @ 93'-100', but there is nothing to distinguish this section of core from the dolomitic sandstone underlying it.			
*	Sample No. 6144 B 93'98' Au .005 Ag 0.30			
*	Sample 6145 B 98'-103' Au.005 Ag 0.26			
*	Sample No. 6146 B 103'-108' Au .02 Ag 0.10			
	110-112 Irreg. MnO_2 filled fractures parallel to core.			
	150 Gougey contact with porphyry at 85° to core axis.			
150-154	Porphyry "A"			
154-186	Dolomitic s.s. f-m.g. buff to brown mottled with oxidation of FeO and MnO_2, glauconitic. Few shale beds < 1/4" @ 85° to core.	156-166	9.7	97
		166-176	10.0	100
		176-182	3.6	60
	165 - MnO_2 coated fracture @ 10° to core	182-186	2.4	60
	176-182 Partially dark reddish brown, vuggy and porous to decomposed broken core	186-188	2.0	100
		188-196	8.0	100
186-203	Dolomitic and limey s.s., f.g. buff to brown and conglomeritic in part with flat pebbles of grey s.s. Some thin shaly beds.	196-206	9.8	98
		206-208	2.0	100
203-237	Alternating thin beds < 6" of: dolomitic to limey s.s. white to pale gn-gy and glauconitic; dolomitic cong. with flat pebbles of white dolc. and limestones in gn-gy f.g. dolomitic s.s. matrix; and dark gn sh in beds 85° to core axis. Contact with porphyry at @ 45° to core axis.	208-216	8.0	100
		216-226	10.0	100
		226-236	10.0	100

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
237-248	Porphyry "B". Contact at 248' at @ 80° to core axis	236-246	10.0	100
248-280	Similar to core from 203-237.	246-256	10.0	100
280-339	Sh., gn-gy, mainly conglomeritic with white flattened limestone pebbles. Few arenaceous beds. Bedding @ 85°.	256-266	10.0	100
		266-276	10.0	100
339-356	Gn-gy. sh. with some arenaceous beds < 18"	276-286	10.0	100
356-415	Porphyry "C". Occasional fractures 5°-45° to core.	286-296	10.0	100
415-429	Sh. gn-gy with beds @ 85° to core axis.	296-306	10.0	100
429-447	Pebble Cong. - white limestone pebbles in matrix of gn-gy limey to dolomitic s.s. or gn-gy sh.	306-316	9.7	97
		316-326	10.0	100
447-449	Gy Sh. - bedding @ 85° to core axis	326-332	6.0	100
449-461	Arenaceous, limey, conglomeritic dolomite, f.g. Flattened pebbles of white lms. in a matrix of mottled purplish to pale gn-gy gritty to limey dolomite with thin irregular beds of gn. sh.	332-336	4.0	100
		336-346	10.0	100
		346-356	10.0	100
		356-364	8.0	100
461-469	Arenaceous dolomite gradational to quartzite, f.g., mottled and streaked lt. and dark grey with dark shaly bands. Contains f.g. pyrite as ragged bands with the bedding, as interstitial impregnations and as drusy fillings (few Zns xls druses) as follows:	364-371	6.1	87
		371-378	6.7	96
		378-386	8.0	100
		386-393	7.0	100
		393-403	10.0	100
	461-466 @ 2% pyrite	403-406	3.0	100
	* Sample No. 6147 B Au .015 Ag 0.25	406-415	9.0	100
	466-469 @ 30% pyrite, few Zns xls	415-418	3.0	100
	* Sample No. 6148 B Au .015 Ag 0.94	418-426	8.0	100
	469 - 1" gougey sulphidic mud and 2" sulphide (90% pyrite, 10% ZnS)	426-436	10.0	100
469-481	Lt. gy quartzite, f.g. containing f.g. pyrite in amounts as noted below occuring as: finely disseminated xls interstitial to and corroding the quartzite grains; as irregular vuggy bands <1/4" partially replacing favorable thin beds; and as a filling for fine fractures in the quartzite roughly parallel to the core.	436-446	10.0	100
		446-456	10.0	100
		456-463	7.0	100
		463-464	0	0
		464-466	1.5	75
		466-471	5.0	100
		471-476	4.9	100
	469-473 @ 4% pyrite	476-482.5	6.0	92
	* Sample No. 6149 B Au .005 Ag 0.35	482.5-489	3.5	100
	473-477 @ 3% pyrite	489-496	5.8	83
	* Sample No. 6150 B Au Tr Ag 0.16			
	477-481 @ 2% pyrite			
	* Sample No. 9001 D Au Tr Ag 0.06			
	471 - two pieces < 1" broken from a vug showing pyrite pseudomorphic after quartz xls forming shells that are coated inside with ZnS xls and a few xls of PbS.			
	481 - 3" gouge at contact with prophyry.			

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
481-574	Porphyry "D" moderately to intensely altered and bleached with the feldspars kaolinized and mafics serpentinized. Core crumbled in some sections. Disseminated to blebby f.g. pyrite in some sections and with pyrite and ZnS filled fractures as noted.	496-505	8.0	89
		505-513	7.7	96
		513-516	2.4	80
		516-517	0.3	30
		517-523	5.2	87
	481-485 @ 4% disseminated to blebby f.g.pyrite	523-526.5	3.3	94
*	Sample No. 9002 D Au Tr Ag 0.16	526.5-529	2.5	100
	508-512 @ 3% pyrite with a trace of ZnS as disseminated grains and blebs and as veinlets	529-533	3.8	95
		533-540.5	6.8	90
	512-517 1/8" fracture parallel to core filled with pyrite and ZnS. Broken core	540.5-546.5	6.0	100
		546.5-549	2.5	100
	521-525 1/8" fracture parallel to core filled with pyrite and ZnS. Broken core	549-554	5.0	100
	531-535 Fractures @ 15° to core coated with pyrite and ZnS. Broken core	554-556	2.0	100
		556-566	10.0	100
	558-560 Pyrite coated fractures @ 10° to core	566-576	10.0	100
	569-572 Pyrite and ZnS coated fractures @ 10° to core.			
	574 - Contact with quartzite @ 80° core axis			
574-577	Quartzite, f.g. white to lt. grey lined with fine wavy bands and shreds of black shale. Contains @ 0.5% pyrite as disseminated grains and streaky blebs.	576-586	10.0	100
	577 - Contact with porphyry @ 85°			
577-592	Porphyry "E" with occasional calcite coated fractures @ 5° to core axis	586-591	5.0	100
	592 - Contact @ 80° to core axis			
592-596	Quartzite similar to interval 574-577			
	596 - 1" gouge			
596-610	Arenaceous cong., mottled with pinkish-buff to lt. grey flat quartzite pebbles in a matrix of glauconitic greenish-grey f.g. s.s. and dark green to black shale and limey quartzite. Sulphide as small blebs or grain coatings < 0.2%. Many small mollust shells @ 1/4".	591-601	10.0	100
		601-610	9.3	93
610-616	Quartzite, lt. grey to white, f-m.g. with @4% f.g. pyrite mainly finely disseminated and as blebby patches but some filling two 1/16" fractures @ 30° to core axis.	610-612	2.0	100
		612-620	8.0	100
*	Sample No. 9003 D 610-616 Au Tr Ag 0.12			
	616 - A few grey and white quartz pebbles < 1/2"			
616-620	White to grey f.g. quartzite (possibly quartz as no rounded grains visible macroscopically) lined with irreg. pink hematite streaks < 1/4"			

HOLE #3

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	@ 60° to core axis. Contains @ 3% f.g. pyrite as fracture filling. Fractures < 1/4" and mainly @ 45°-60° to core axis with many fine erratic connecting fractures. Glassy lustre to quartz in contrast to semi-vitreous lustre of usual quartzites.			
	620' - Contact with prophyry @ 40° to core.			
620-639	Porphyry "E" but matrix a darker grey-green than in previous holes though feldspars still kaolinized.	620-626 626-636	6.0 10.0	100 100
639-641	Maroon Algonkian Schist.	636-641	5.0	100
END				

cc: R. F. Sheldon
cc: Hecla Mining Co.

HOLE #4

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Dip: -90°
BX core

Started: Aug. 13, 1964
Completed: Aug.27,1964 Logged by: R. F. Sheldon

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
0-66	Casing through overburden.			
66-71	Broken, black to grey muddy shale.	66-73	3.5	
71-103	Interbedded grey to limonitic buff colored shale, arenaceous shale and limey sandstone. Mottled and stained with FeO and MnO_2 in part.	73-74	0.8	80
		74-76	2.0	100
		76-86	9.0	90
103-160	Dolomitic sandstone (transitional to dolomitic quartzite) f-m.g., light grey but mottled buff to reddish brown where stained with FeO and MnO_2. Greenish tinged in part with glauconite where glauconite not oxidized to limonite. Many irregular bands and patches of MnO_2. Occasional fractures 5°-30° to core axis coated with MnO_2. Few shaly beds 1/4" @ 85° to core axis.	86-96	9.8	98
		96-106	7.8	78
		106-110.5	4.5	100
		110.5-116	5.3	96
		116-125	9.0	100
		125-130	5.0	100
		130-136	4.2	70
		136-146	10.0	100
		146-156	9.7	97
		156-166	9.3	93
	Note: The hole drilled through a pillar in the stopes on the Upper Contact Ore Horizon from 103'-110'.			
	103' - Broken and vuggy with much MnO_2 similar to rock observed near back of stope. Poss. some oxide Pb.			
*	Sample No. 9005D 103-107 Au .01 Ag 0.74 Pb 0.05			
*	Sample No. 9006D 107-111 Au .015 Ag 0.60			
	160 - contact @ 85° to core axis.			
160-164	Porphyry "A"			
164-198	Dolomitic to limey sandstone, f-m.g. Green-grey and glauconitic in part, otherwise buff to brown mottled with oxidized Fe and Mn. Bedding @ 80° to core. Few calcite coated fractures.	166-175	9.0	100
		175-185	10.0	100
		185-196	9.0	82
	184-191 Vuggy, reddish-brown, limonitic, broken core.			
198-212	As above but conglomeritic in part with pebbles of grey sandstone and with thin silty and shaly beds @ 85° to core axis. Calcite coated fractures @ 5° to core.	196-206	10.0	100
		206-216	10.0	100
212-238	Alternating thin beds < 6" of: dolomitic to limey sandstone green-grey+glauconitic; dolomitic cong. w. flat pebbles of white limestones and green shale in beds 80-85° to core axis. Contact w. porphyry @ 45°.	216-226	10.0	100
		226-236	10.0	100
		236-246	10.0	100
238-248	Porphyry "B". Contact ragged but 90° to core.	246-256	10.0	100
248-289	Similar to core from 212'-238'.	256-264	8.0	100
	268'-272' Calcite and MnO_2 coated fracture parallel core.	264-274	10.0	100

DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
289-352	Shale, green-grey, mainly conglomeritic with white flattened limestone pebbles. Some arenaceous beds. Bedding 85°-90°.	274-284	10.0	100
		284-285	0.8	80
352-372	Shale, green-grey with some reddish hematitic arenaceous beds <18". Contact with porphyry @ 90°.	285-295	10.0	100
		295-305	10.0	100
372-427	Porphyry "C". Occasional serpentinized fractures 5°- 45° to core axis.	305-315	10.0	100
		315-322	7.0	100
	403-409 Matrix of porphyry dark grey and feldspar phenocrysts up to 1".	322-326	4.0	100
		326-336	10.0	100
	408' Fracture @ 20° to core with 1/8" of ZnS and pyrite.	336-340	3.4	85
	421' 4" sharply defined band of biotite-hornblende schist @ 45° to core (probable inclusion of Algonkian schist.)	340-346	5.0	83
		346-356	10.0	100
		356-365	8.7	97
	427' Contact @ 90° to core axis.	365-374	9.0	100
427-439	Shale, green-grey. Bedding @ 85°.	374-386	11.6	97
439-456	Pebble Cong. - wh. limestone pebbles in matrix of green-grey limey sandstone or gn-gy shale.	386-392	5.8	97
		392-402	10.0	100
456-458	Grey shale.	402-408	4.0	67
458-470	Arenaceous, limey, conglomeritic dolomite, f.g. Flattened pebbles of white limestones in a matrix of mottled grey to purplish gritty dolomite and thin irregular beds of shale.	408-415	7.0	100
		415-425	10.0	100
		425-435	10.0	100
		435-445	10.0	100
	468-470 @ 0.3% finely diss. pyrite.	445-456	11.0	100
470-480.8	Arenaceous dolomite transitional to quartzite, f.g. mottled and banded lt. and dark grey with some thin silty and shaly beds. Mineralized to almost totally replaced as follows:	456-465	9.0	100
		465-476	11.0	100
		476-486	9.5	95
	470-475.4 @ 2% f.g. pyrite largely very finely diss. but also as blebs, ragged bands with the bedding and drusy fillings.			
	* Sample No. 9007D Au .02 Ag 0.94			
	475.4-478.0 @ 40% pyrite, f.g. and intermixed v.f.g. lollingite with possibly a very small amount of ZnS, PbS and chalcopyrite. Sulphide occurs as finely diss. grains and as ragged bands and fine veinlets following the bedding (approx. normal to the core axis).			
	* Sample No. 9008D Au 0.03 Ag 1.53 Cu 0.23% Pb 0.06% Zn Tr.			

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	478.0-480.8 95% Sulphide, massive to f.g. visually consisting of 75% Pyrite, and poss. arsenopyrite, 15% lollingite? ($FeAs_2$). Best at 480.5'. And 5% unreplaced quartzite Core crushed and broken in part and indicates some vugs. Some m.g. ZnS xls. in druses. Possibly some f.g. chalcopyrite or tetrahedrite. PbS and ZnS occurs as irregular bands and blebs and as interstitial grains later than the pyrite and lollingite.	5% ZnS and PbS		(mainly ZnS).
*	Sample No. 9009D Au 0.05 Ag 2.45 Cu 0.27% Pb 0.18% Zn 1.55%.			
480.8-482	Lt. grey quartzite, f.g. with @ 2% f.g.pyrite as diss. grains and streaky blebs.			
*	Sample No. 9010D Au Tr, Ag 0.18.			
	Broken contact with porphyry.			
482-575	Porphyry "D". Few fractures 5°- 45° to core axis.	486-496	4.0	40
	482'-485' Altered pale green - probably sericitized - and contains @ 2% disseminated pyrite.	496-506	10.0	100
		506-516	6.8	68
	491'-496' Dropped core - no recovery	516-523	1.2	17
	515-525' Slight to moderate alteration and bleaching. Broken core - probably steep fractures.	523-525	0.5	25
		525-535	10.0	100
	575' Contact at @80°.	535-540	2.7	54
575-581	Lt. grey quartzite, f.g. containing @ 1% pyrite (with a few xls of associated ZnS and PbS) as blebs < 1/4" and fine erratic veinlets.	540-546	6.0	100
		546-552	6.0	100
		552-556	4.0	100
*	Sample No. 9011D 575-581 Au .005 Ag Tr	556-566	10.0	100
		566-573	7.0	100
581-587	Quartzite, f.g. lined with fine wavy lines and thin beds -1/32" of black shale. Contains @ 0.5% pyrite as streaky blebs and diss. grains. Core broken in part with fractures parallel to core axis.	573-576	2.7	90
		576-580	4.0	100
		580-586	6.0	100
		586-596	10.0	100
	582-583 Porphyry "E". Contact @ 75°.			
587-599	Arenaceous Cong. mottled with pinkish-buff to lt. grey quartzite pebbles in a matrix of glauconitic green-grey f.g. sandstone, dark shale, and limey quartzite. Sulphide as small blebs < 0.3% Many black mollusk shells @ 1/4". 598' 1" gougey fracture 30° to core.			

HOLE #4

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
599-643	Porphyry "E" - 2" moderately to intensely altered with feldspar phenocrysts up to 1 1/4" in a pale, greenish-grey matrix. Phenocrysts generally white but buff colored in part and showing rimming alteration. Contains @ 0.1% f.g. pyrite as diss. xls and blebs. Few fractures < 1/4" filled with carbonate, some ZnS and pyrite @ 15° to core. 599'-600' f. grained chilled contact. 624' 1" inclusion of grey quartzite. 640'-641' series of seams 1/32" of f.-grained pyrite and minor ZnS @ 20° to core axis but branching and erratic in part. 641'-643' Porphyry f.g. showing chilling. Contact gradational with included pieces of pyritized quartzite and black shale.	596-606 606-616 616-626 626-636 636-646	10.0 10.0 10.0 10.0 9.7	100 100 100 100 97
643-684	Quartzite, f.g., white to light grey with generally indistinct bedding planes indicated @ 80° to core axis. Contains from 0.1% to 5% f.g. sulphide, mainly pyrite, as shown below: 643' 8" breccia of grey qtzite and black shale with @ 4% f.g. pyrite and trace of ZnS as blebs and disseminations. 644-647.5 @ 2% pyrite and ZnS mainly as blebby patches < 2" but some as ragged bands following the bedding or following fractures @ 20° to core. * Sample No. 9012D 644-647.5 Au .025 Ag 1.88 647.5-652 @ 0.1% diss. pyrite. 652' Gouge and broken core. Poss. fault 652'-656' @ 5% pyrite interstitial to and corroding the quartz grains. * Sample No. 9013D 652-656 Au .005 Ag .34 652-662 @ 2% diss. f.g. pyrite. From 660-663 a 1/4" fracture 5° to core filled with carbonate and minor pyrite and ZnS. 662-671 @ 5% f.g. diss. pyrite. Carbonate filled fractures with minor pyrite and ZnS from 665-668 at 5° to core axis. 663' Conglomeritic with a few pieces of white quartz. * Sample No. 9014D 662-667 Au Tr Ag .32	646-656 656-666 666-676 676-686	9.2 10.0 10.0 10.0	92 100 100 100

HOLE #4

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	671-676' @ 0.5% - 1.0% diss. pyrite. Quartzite pale pink color in part.			
	676-679' @ 5% diss. f.g. pyrite. Carbonate filled fractures parallel core.			
	679-684 Mottled pink and grey becoming porous and transitional to a s.s. with sugary f-m.g. texture. Few irregular blebs of f.g. pyrite.			
684-690	Calcareous f.g. s.s., mottled and banded grey and reddish=buff due to FeO. Few thin green shaley beds 80° to core. Contains @ 1% f.g. pyrite as disseminations, as ragged interstitial bands following bedding, and as a fine fracture filling irregularly parallel to core.	686-696	10.0	100
690-691	Bleached schist rubble cemented with s.s. Few pyrite grains noted. Top of pre-Cambrian Schist.			
*	Sample No. 9015 D 686-691 Au Tr Ag Tr			
691-696	Algonkian Schist - maroon and green-grey banded sericite schist with schistosity @ 60° to core.			
END				

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copy to R. F. Sheldon
H. E. Harper, Hecla Mining Co.

HOLE #5

DRILL HOLE LOG

DOUBLE RAINBOW PROJECT, S. D.

Dip: -90°
BX Core

Started: Aug. 28, 1964
Completed: Sept. 5, 1964

Logged by: R. F. Sheldon

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
0-68	Casing through overburden	68-76	8.0	100
68-71	Calcareous to dolomitic sandstone, f.g. mottled and FeO stained with some shaly members	76-86	9.0	90
		86-96	5.0	50
71-122	Dolomitic sandstone (transitional to dol.qtzite) f-m.g. lt. grey to buff and reddish brown where stained with FeO and MnO_2. Glauconitic where not entirely oxidized to limonite. Porous and vuggy where leached. Occasional bands and patches of pyrolusite. Some sections calcareous as a matrix to silica grains.	96-106	3.8	38
		106-116	3.9	39
		116-126	10.0	100
	71'-77' Silificfied and with much MnO_2. This is probably the Upper Contact Ore Horizon.			
	* Sample No. 9016 D 71'77' Au .005 Ag 0.82			
	86'-93' Core broken and vuggy with FeO and MnO_2. Poor recovery.			
	* Sample No. 9017D 86-93 Au .005 Ag .40			
	97'-116' Core vuggy and broken - poor recovery.			
	122' Contact with porphyry at 85°.			
122-128	Porphyry "A"	126-136	10.0	100
128-161	Dolomitic to calcareous s.s., f-m.g., grey and buff-brown mottled due to oxidized Fe and Mn with @ 10% green glauconite where not altered to limonite. Few thin shaly beds < 1/4" @ 80° to core axis.	136-146	10.0	100
		146-156	10.0	100
		156-166	10.0	100
		166-176	10.0	100
161-178	As above, but conglomeritic in part with flat pebbles of grey sandstone.	176-182	4.4	74
178-210	Alternating thin beds < 6" of: dol. to calc.s.s. and buff to green and glauconitic; dol. Cong; and green sh. with bedding @ 85° contact with porphyry @ 85°.	182-186	3.4	85
		186-191	4.5	90
		191-196	4.7	94
210-222	Porphyry "B". Fe stained fracture at 218 @ 20° to core.	196-206	10.0	100
222-255	Similar to core from 178-210	206-216	10.0	100
255-326	Shale, green-grey, mainly conglomeritic with white flat limestone pebbles. Few arenaceous beds. Bedding 85°-90° to core.	216-246	30.0	100
		246-253	7.0	100
	318-326 No core recovered - core barrel not latched.	253-256	2.4	80
326-338	Shale, green-grey with some arenaceous beds. Bedding @ 90°.	256-276	20.0	100
338-401	Porphyry "C". Some fractures with local bleaching mainly 5° to 35° to core axis. Contact at 401 at 90° to core.	276-286	2.0	20
		286-296	10.0	100
		296-300	3.0	75
401-408	Shale, green-grey with arenaceous beds	300-306	5.2	87
		306-316	9.2	92

HOLE #5

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
408-426	Pebble Cong. - white limestone pebbles in matrix of pale green-grey calcareous to dol. sandstone or dark green-grey shale. Some arenaceous beds are hematitic and pink in color.	316-318	1.0	50
		318-326	0	0
		326-329	2.0	67
426-428	Grey shale, bedding @ 35°. Few lms pebbles.	329-331	1.9	95
428-439	Calcareous to arenaceous conglomeritic dolomite, f.g. Flat pebbles of white limestone in matrix of purplish to pale green-grey gritty to calc. dol. or grey shale beds.	331-336	5.0	100
		336-382	46.0	100
		382-386	2.4	60
		386-396	10.0	100
	428' - Fracture 20° to core coated with f.g. pyrite.			
439-448	Transitional from a Dol. as above to f.g.qtzite mottled and streaked lt. and dk gy w. dark shaly beds. Few grains of pyrite from 446-448.	396-406	9.3	93
		406-426	19.8	99
		426-446	20.0	100
	448' - 2" gougey sh. w.f.g. pyrite.	446-455	9.0	100
448-465	Lt. gy. f.g. quartzite containing from 2% to 5% f.g. pyrite and very minor ZnS. Sulphides occur mainly as disseminated grains, but some as drusy blebs, ragged bands or as fine fracture fillings.	455-465	9.6	96
	448' - 6" of @ 10% sulphide - f.g. pyrite and minor ZnS.			
	* Sample No. 9018D 448'-454' Au .015 Ag .245			
	* Sample No. 9019D 454'-460' Au .005 Ag .24			
	* Sample No. 9020D 460'-465' Au Tr Ag .23			
	465' - Contact at 90° to core.			
465-568	Porphyry "D". Normally fresh to slightly altered except as noted.	465-469	3.6	90
	465' - Broken core and bleaching with slip @ 20° to core.	469-476	7.0	100
	467-469 Broken, bleached, crumbly core.	476-486	10.0	100
	540-542 Bleached and softened along slip @ 15° to core axis.	486-496	9.8	98
	551-553 Bleached, carbonate filled fracture 15° to core.	496-536	40.0	100
	556-559 Bleached, broken core. 1/2" carbonate gouge at 556' @ 40° to core.	536-566	30.0	100
		566-574	8.0	100
	568 Contact gradational with some assimilation of quartzite.			
568-578	Quartzite, lt. gy f.g. lined with shreds and wavy lines of black sh. Contains 0.5%-1% pyrite as f.g. diss. grains & Blebs.	574-584	10.0	100
		584-594	10.0	100
578-591	Arenaceous Cong. - mottled with pinkish-buff to grey quartzite pebbles in a matrix of glauconitic green grey s.s. and dark shale. F.g. sulphide <0.2% as small blebs. Many black mollusk shells 1/4" diam.			

HOLE #5

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	591' - 2" gougey shale.			
591-598	Quartzite, f.g. lt. grey to white containing @ 3% sulphides consisting of @ 2.8% pyrite, f.g. and 0.2% ZnS, PbS and chalcopyrite f-mg. Sulphide occurs mainly as blebby bands parallel to bedding at 85° to core and interstitial to the quartz grains - otherwise as follows:	594-604	10.0	100
	593' - 1" drusy vug with f-m.g. ZnS, PbS and Pyrite.	604-614	10.0	100
	597-598 Brecciated with inclusions of mineralized quartzite in porphyry with @ 5% f.g. pyrite and minor ZnS and PbS.			
*	Sample No. 9021D 591-598 Au .01 Ag 1.26			
598-658	Porphyry "E" with occasional carbonate coated fractures 5°-30° to core.	614-624	10.0	100
	658' - Contact with schist @ 50° to core axis	624-634	9.0	90
		634-646	11.8	97
658-661	Schist, sericitic, green to maroon. Schistosity @ 60° to core.	646-656	10.0	100
		656-661	5.0	100

END

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cc: R. F. Sheldon
Hecla Mining Co.

DRILL HOLE LOG

HOLE #6 — DOUBLE RAINBOW PROJECT, S.D. — Dip: -90°

BX Core

Started: Sept. 5, 1964 Logged by: R. F. Sheldon

Completed: Sept. 29, 1964

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
0-73	Casing through overburden	73-76	3.0	100
73-99	Interbedded grey to buff limonitic, f.g.: shale	76-86	10.0	100
	arenaceous shale; and calcareous s.s. Mottled	86-96	9.1	91
	and stained brown to black and vuggy with FeO	96-100	3.8	95
	and MnO_2 in part.	96-100	3.8	95
99-191	Dolomitic and calcareous s.s., f-m.g., greenish	100-104	Thru	Stope
	grey and glauconitic but glauconite mainly	104-116	3.0	25
	altered to limonite imparting a buff-brown	116-124	4.0	50
	coloration. Few patches and bands of dark brn	124-136	10.0	83
	MnO_2 stain. Few calcite and MnO_2 coated veinlets	136-146	10.0	100
	Bedding @ 80° to core.			
	99-105 F.g. and silicified. MnO_2 stain.	146-156	10.0	100
*	Note: Hole drilled thru partially caved stope	156-176	20.0	100
	from 100-105 on Upper Contact Ore Horizon.	176-186	9.8	98
	Ground fractured and broken above and below	186-206	20.02	100
	stope.			
	165-191 Finer ground, calcareous and with	206-226	20.0	100
	occasional beds of gn sh. < 1/4" @ 80°			
	to core axis.			
	177-185 Reddish-brown, limonitic.			
191-206	As above, but conglomeritic with gy s.s. pebbles			
	and with silty and shaly beds.			
206-224	Alternating thin beds < 6" of: dol. to calc.	226-234	7.8	97
	s.s. gn-grey and glauconitic; dolomitic cong.	234-240	0	0
	w. flat pebbles of white lms; and gn. sh. in	240-246	5.5	92
	beds 85° to core axis. Irreg. contact w. por-	246-256	8.5	85
	phyry 45° to core.			
224-231	Porphyry "A" Contact at 231' @ 30° to core.	256-266	10.0	100
	230-231 MnO_2 coated fracture 5° to core.			
231-278	Similar to core 206-224.			
	270-273 FeO stained fracture 5° to core axis.			
278-288	Conglomeritic sh. gn-gy w. white to pinkish flat	266-336	70.0	100
	lms. pebbles. Some arenaceous beds @ 85°.			
288-290	Porphyry "B". Contacts @ 80°.			
290-341	Similar to 278-288	336-346	9.8	98
341-359	Alternating beds < 4 ft. of grey to purplish	346-356	6.8	68
	arenaceous and calcareous Dolomite, conglomer-	356-362	6.0	100
	itic in part, and gn-gy sh. Core broken in			
	many sections w. calcite coated fractures			
	parallel to core. Few pyrite grains.			
359-418	Porphyry "C". Broken contact at 359.	362-366	3.6	90
	359-380 Moderate to intense alternaton to pale	366-379	13.0	100
	gn-gy and kaolinization of feldspar.	379-386	7.0	100

HOLE #6

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	389-394 Mod. alteration w. fracture parallel core.	386-396	10.0	100
	399-406 Mod. altn. Few fractures 30° to core.	396-406	9.6	96
	414-418 Fractures 20° to 45° to core axis.	406-416	10.0	100
	418 Contact with sh. at 80° to core.	416-426	6.8	68
418-434	Gy. sh. broken in part w. many fractures	426-434	6.3	79
434-455	Pebble Cong. - wh. lms. pebbles in gn-gy calc. s.s. or gn-gy sh. The s.s. beds have a few small grains of pyrite.	434-446	1.0	8
		446-448	2.0	100
	434-446 Core barrel not latched. Lost most of core.	448-456	6.2	77
455-462	Arenaceous, conglomeritic Dol. Flat pebbles of white dol. in f.g. lt. gy sandy dol. matrix with @ 2% f.g. pyrite mainly finely diss. but some in carbonate filled fractures parallel to core from 459-462.	456-462	4.9	82
		462-466	3.9	97
		466-476	10.0	100
		476-478	2.0	100
	Core broken 456-462	478-480	2.0	100
462-472.3	Arenaceous, f.g. gy Dol. banded with darker gy silty and shaly beds < 1/8" @ 85° to core. Sulphide content as shown below:			
	462-466.3 1% - 2% f.g. pyrite (v. minor ZnS) as blebs and ragged bands with the bedding.			
	* Sample No. 9022 D Au .005 Ag 0.84			
	466.3-466.8 @ 90% f.g. sulphide. Pyrite w. @ 1% PbS and ZnS in minute blebs.			
	466.8-471.3 @ 60% f.g. sulphide. Pyrite with @ 2% ZnS and PbS as ragged bands following bedding @ 80° to core.			
	* Sample No. 9023 D from 466.3-471.3 Au .02 Ag 1.28 Cu Tr Pb Tr Zn 1.70			
	471.3-472.3 @ 95% f.g. sulphide (92% pyrite, 3% PbS and ZnS). Few PbS and ZnS xls. m-c.g. Few lollingite? xls ($FeAs_2$) in vug at 472.3.			
	* Sample No. 9024 D Au 0.20 Ag 5.50 Cu Tr Pb Tr Zn 1.55			
472.3-477.7	Lt. gy. Quartzite f.g. containing 3%-5% pyrite disseminated and as streaky blebs except as noted. Few small vugs with ZnS and PbS xls.			
	474.7-475.0 Solid sulphide. F-m.g. pyrite with @ 5% m.g. PbS and ZnS as blebby patches.			
	* Sample No. 9025 D 472.3-475.0 Au .11 Ag 3.57			

HOLE #6

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
*	Sample No. 9026 D 475.0-477.7 Au Tr; Ag 0.24			
	476-478 Core fractures @ 30° to core. Broken contact with porphyry at 477.7			
477.7-479	Altered "D" type porphyry with @ 5% diss. f.g. pyrite.			
479-489	Lt. gy Quartzite, f.g. with @ 2% f.g. pyrite as streaky blebs, filling irregular fractures, or diss. Minor ZnS as fracture coating. Core largely crushed and broken with fractures parallel to core. Broken contact with porphyry	480-481	0.9	90
		481-486	2.5	50
		486-489	2.8	93
		489-494	4.4	88
		494-499	4.0	80
489-564	Porphyry "D", altered and broken as noted.	499-506	5.6	80
	489-523 Moderate to intense alteration - bleaching and kaolinization, much broken to crumbly core with fractures paralleling core.	506-515	8.4	93
		515-520	5.0	100
		520-526	6.0	100
	527-533 Moderate altn.	526-530	4.0	100
	541-553 Moderate Altn. Gougey slips parallel core.	530-536	6.0	100
	560-564 Fractures 20° to core.	536-543	6.0	86
	564 Chilled contact @ 80° to core.	543-556	13.0	100
564-566	Gy. Quartzite f.g. with fine, wavy beds of black shale. Contains @ 0.2% f.g. pyrite as diss. blebs.	556-561	5.0	100
		561-566	4.7	94
566-578	Arenaceous Cong. mottled w. pinkish-buff to gy. quartzite pebbles in a matrix of: gy, glauconitic f.g. s.s.; dark sh; and limey quartzite. Sulphide as small blebs < 0.2%. Many black mollusks < 1/4".	566-576	10.0	100
		576-596	20.0	100
	578 - Contact with porphyry at 90° to core.			
578-619	Porphyry Sill "E" but generally with only slight to moderate bleaching alteration.	596-606	10.0	100
		606-616	10.0	100
	609-614 Pyrite coated fracture parallel core.			
	616-619 Feldspars kaolinized and eroded with drill water.			
	619 Chilled contact 85° to core.			
619-653	Quartzite, f.g. white to lt. gy - but actually a well cemented s.s. in many beds. Bedding generally not distinct, but at 85° -90° to core. Contains from 0.1% to 5% f.g. pyrite with very minor ZnS < 0.1% as a filling interstitial to the silica grains, mainly disseminated but in places as banded disseminations with the bedding. Occasional tight fractures parallel to core. Some sections show pink hematite stain. Selected sections of core split and sampled as shown:	616-626	10.0	100
		626-636	10.0	100
		636-646	6.8	68
		646-656	10.0	100
		656-666	9.6	96

HOLE #6

DRILL HOLE LOG
DOUBLE RAINBOW PROJECT, S.D.

Footage	Description	Recovery From To	Ft. Rec.	% Rec.
	619-623 @ 2% sulphide			
*	Sample No. 9031 D Au .005 Ag Tr			
	623-628 @ 1% sulphide			
	628-630 @ 4% sulphide			
*	Sample No. 9032 D 628-630 Au Tr Ag Tr			
	630-647.5 0.5% - 1% sulphide			
	647.5-653 5%-8% sulphide, f.g. Mainly pyrite, but possibly minor arsenopyrite, lollingite or ZnS. Some beds pinkish with hematite stain.			
*	Sample No. 9033 D 647.5-653.0 Au Tr Ag Tr			
653-667.5	F-m.g. S.S., conglomeritic in part, mottled grey and pinkish-buff and with a few beds of green sh. < 1/2" @ 85° to core. Conglomerate pebbles are gy. quartzite. Generally contains 0.5%-1% f.g. pyrite as disseminations or as blebby bands, but more as noted: 662.5-667.5 Mainly f.g. grey quartzitic s.s. with @ 2% f.g. diss. pyrite.	666-676	10.0	100
*	Sample No. 9034 D Au .005 Ag Tr			
667.5-670	Interformational Conglomerate - white to lt. gy quartzite and quartz pebbles in matrix of green sericitic schist and grey s.s. Contains < 1% f.g. pyrite as diss. blebs.			
*	Sample No. 9035 D Au Tr Ag 0.04			
670-676	Algonkian Schist - green sericite and chlorite schist. Schistosity @ 60° to core axis.			

END

CC: R. F. Sheldon
10/22/64

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 1S (8342B). Completed May 31, 1967. Log by G.C.M.

Location: S. 551.92, W. 1281.02. Between Custer workings and Richmond Shaft.

Collar elevation: 5222.88. Vertical Angle -90°.

Cored 56'-671' Recovery 585/615 or 95.1%

Depth	Lithology
0- 56	Cased. Rock bit cuttings sampled at 2½ ft. intervals
56- 60	Dark gray shale with limonite stained fractures.
60- 67	No core
67- 76	Dark gray shale
76- 82	Brown, limonite stained, sandy dolomite.
82- 92	Gray to buff calcareous dolomite.
92- 95	Interbedded gray shale and buff calcareous dolomite.
95-103	Buff to light gray calcareous dolomite.
103-107	Dark brown calcareous dolomite.
107-113	Buff calcareous dolomite.
113-131	Gray to brown sandstone. Calcareous cement. Few glauconite grains.
131-139	Brown to grayish sandstone with calcareous cement.
139-140	Dark brown sandstone.
140-169	Gray to buff sandstone(quartzite), Calcareous cement.
169-178	Feldspar porphyry. Gray, vuggy, kaolinized feldspar phenocrysts.
178-198	Buff calcareous sandstone. Narrow calcite stringers.
198-207	Dark brown to buff(iron strained) sandstone. Calcareous bands and cement.
207-229	Gray to buff calcareous sandstone. Few limestone pebbles and calcite-filled fractures.
229-237	Light gray to buff sandy dolomite with limestone bands and pebbles.
237-245	Feldspar porphyry. Less than 10% altered feldspar phenocrysts ranging to 0.1" size.
245-267	Light gray to buff sandy dolomite. Few limestone beds and pebbles. Part shale 260-262.
267-277	Feldspar porphyry. Light gray to creamy. Up to 50% highly kaolinized white to brown feldspar phenocrysts ranging to 0.5" size. Some have pink centers.
277-293	Light gray to buff sandy dolomite with limestone pebbles and bands. Interbedded with thin olive shale bands.
293-304	Feldspar porphyry. Light gray with less than 10% altered feldspar phenocrysts ranging to 0.1" size. Many narrow iron stained fractures.
304-313	Light gray to buff calcareous dolomite.
313-320	Interbedded gray to buff calcareous dolomite and olive-gray shale.
320-347	Dark gray shale with 10% white to pink limestone pebbles. Limestone pebble conglomerate 337-338.
347-355	Dark gray shale with a few white limestone pebbles.
355-383	Dark gray shale with 30% limestone pebbles. Glauconitic dolomite at 379'-380'

(OME-6558 (Silver))
(Contract No. 2233)

Hole No. 1S (8342B)(continued)

Depth	Lithology
383-387	Gray to pink calcareous dolomite.
387-395	Gray shale with a little light gray dolomite.
395-399	Gray-green glauconite dolomite and gray shale
399-420	Gray shale.
420-438	Interbedded gray dolomite and dark gray shale both containing white to pink limestone pebbles.
438-440	Gray shale with white limestone pebbles.
440-447	Light gray dolomite with white limestone pebbles.
447-458	Gray fine grained dolomite. 5% fine grained disseminated pyrite throughout. 50% fn. gr. pyrite at 457-458'.
458-501.5	Feldspar porphyry. Light gray with 50% white kaolinized phenocrysts up to 0.5" size. Highly altered 486-492. 1% very fine grain pyrite disseminated throughout. Narrow (.05") fractures filled with galena and sphalerite at 492' and at 494'. 5% fine grain pyrite and galena at 501-502'.
501.5-504.5	Light gray fine grain quartzite with 5 in. pyrite, galena, sphalerite(?) at 502', 7 inches same at 503', 1 inch same at 504.5'.
504.5-511	Light gray quartzite with 0.1" galena, sphalerite at 505', 506', and at 508'. 5% pyrite disseminated and in veinlets and blebs throughout. 0.5" galena, sphalerite, chalcopyrite at 511'.
511-516	Feldspar porphyry. Highly fractured and kaolinized. 5% pyrite. Few galena crystals noted.
516-522	Feldspar porphyry. Partly fractured and kaolinized. Little pyrite. 6 in. highly altered with 0.1" galena veinlets at 518'.
522-525	Feldspar porphyry. Medium gray, relatively unaltered. 10% feldspar and ferromagnesium phenocrysts.
525-540	Feldspar porphyry. Partly kaolinized. 1% pyrite. 0.1" galena, sphalerite veinlet at 533' and at 536'.
540-612	Feldspar porphyry. Partly kaolinized. Little galena and sphalerite noted at 543', 553-554',556', 559', 569', 570-576', 578'. Less than 1% disseminated pyrite only at 578-612'.
612-618	Light gray quartzite. Little fine grain disseminated pyrite noted.
618-635	Medium gray mottled quartzite. Pyrite noted. Black molluscs noted at 631'.
635-642	Light gray quartzite. Less than 1% fine grain disseminated pyrite.
642-669	Precambrian. Brown mica schist. 5 in. white sericite schist at 642'. Vein quartz with soft pale green mineral at 654-655, and at 668-669'. Schistosity angle 35° from axis of core.
669-671	Precambrian. Soft reddish brown mica schist.

End.

Assay Form No. 9

Double Rainbow Project

Date May 31, 1967 Diamond Drill ~~Sludge~~ Core ASSAY REPORT

15	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Db. Rb 8342 B	440 - 444 ALS	.21	NF
Core	444 - 448	NF	NF
	448 - 452	NF	NF
	452 - 455	NF	NF
	455 - 458	.03	NF
	458 - 460	NF	NF
	486 - 489	NF	NF
	489 - 492	NF	NF
	492 - 495	NF	NF
	495 - 498	NF	NF
	498 - 500	NF	NF
	500 - 501½	NF Pb	Zn NF
	501½ - 504½	4.56 1.0	1.5 NF
	504½ - 508	.26 0.5	0.5 NF
	508 - 511	.52 0.5	0.7 NF
	511 - 514	.12	NF
	514 - 517	NF	NF

Assay Form No. 9

Double Rainbow Project

May 24, 1967 ASSAY REPORT

15	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rnb. 8342 Sludge	67 - 70	NF	Tr
	70 - 75	NF	Tr
	75 - 80	NF	NF
	80 - 85	NF	NF
	85 - 90	NF	NF
	80 - 95	NF	NF
	95 - 100	NF	NF
	100 - 105	NF	NF
	105 - 110	Tr	NF
	110 - 115	Tr	NF
	115 - 120	Tr	NF
	120 - 125	NF	NF
	125 - 130	NF	NF
	130 - 135	NF	NF
	135 - 140	NF	NF
	140 - 145 Sandstone	.4	NF
	145 - 150	Tr	NF
	150 - 155	.1	NF
	155 - 160	NF	NF
	160 - 165	NF	NF
	165 - 170	NF	NF
	170 - 175	NF	NF
	175 - 180	NF	NF

Assay Form No. 9

Double Rainbow Project

Date June 1, 1967 Diamond Drill Cores ASSAY REPORT

15	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rb Core 8342 B	517 - 520 GCM	.2 0.2 Pb	0.7% NF
	520 - 523	NF	NF
	523 - 526	.16 0.1	0.6 NF
	526 - 529	NF	NF
	529 - 532	NF	NF
	532 - 535	.13	NF
	535 - 538	NF	NF

NF = None Found

Assay Form No. 9

Double Rainbow Cores

Date June 5, 1967 XX ASSAY REPORT

15	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rnbw Cores 8342 B	542 - 544	NF	NF
GCM XX	553 - 555	NF	NF
	555 - 557	.15	NF
	558 - 560	.43	NF
	568 - 570	.8	NF
	570 - 573	1.24	NF
	573 - 577	.63	NF
	577 - 579	.79	NF

ASSAY FORM 8 G089

REPORT OF ANALYSIS

SAMPLE OF

DOUBLE RAINBOW ORE
XX Core 8342 B 15

A. A. Spectro Analysis

RECEIVED FROM _____ ON _____

	% Zn	% Pb
517 - 520	0.742	0.193
520 - 523	0.052	0.021
523 - 526	0.646	0.136
526 - 529	0.184	0.044
529 - 532	0.092	0.036
532 - 535	0.256	0.046
535 - 538	0.243	0.040
542 - 544	0.211	0.023
553 - 555	1.120	0.092
555 - 557	0.518	0.148
558 - 560	1.882	0.318
568 - 570	1.478	0.505
570 - 573	3.562	0.679
573 - 577	2.330	0.186
577 - 579	1.178	0.182

DATE 6/9/67 ANALYST W.H. Taylor

REPORT OF ANALYSIS

SAMPLE OF

DOUBLE RAINBOW ORE
8342 B

DDH 18.
SPLIT CORE

RECEIVED FROM _____ ON _____

	% Zn	% Cu	% Pb
511 - 514	0.648	0.008	0.116
514 - 517	0.512	0.003	0.044

	% Zn	% Cu	% Pb
440 - 444	0.078	0.004	0.044
444 - 448	0.058	0.004	0.037
448 - 452	0.126	0.003	0.047
452 - 455	0.077	0.002	0.043
455 - 458	0.264	0.002	0.062
458 - 460	0.092	0.003	0.033
486 - 489	0.094	0.005	0.022
489 - 492	0.060	0.0045	0.016
492 - 495	0.187	0.008	0.137
495 - 498	0.145	0.002	0.029
498 - 500	0.082	0.001	0.023
500 - 501½	0.168	0.001	0.065
501½ - 504½	1.488	0.014	1.037
504½ - 508	0.496	0.007	0.528
508 - 511	0.673	0.008	0.554

DATE 6/7/67 ANALYST W.H. Taylor

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 2S (8325B). Completed April 28, 1967. Log by G.C.M.

Location: S. 136.97', W. 956.06'. West of Richmond Shaft.

Collar elevation: 5083.73' Vertical angle -90°.

Cored 20'-461' Recovery 436/441

Depth	Lithology
0- 20	Cased. Half overburden and half soft bedrock.
20- 45	Tan to brown slightly sandy calcareous dolomite, olive tan shale 33-34. 0.1" calcite veinlets 24-26 and 40-44.
45- 47	Dark brown limy dolomite.
47- 50	Tan sandy calcareous dolomite. Few thin gray shale beds. Lost circulation at 50 feet.
50- 63	Tan to gray sandstone cemented with calcite.
63- 73	Dark brown vuggy sandstone with calcareous cement. 5 feet recovered.
73-108	Gray, tan, and brown sandstone with calcareous cement. 2" green glauconitic sandstone at 87' and 105'.
108-115	Feldspar porphyry. Gray to brown with 25° to altered white clayey feldspars. Size ranges to 0.1".
115-140	Brown to tan sandstone with calcareous cement. 8" gray shale between 121' & 122'. Gray and red oxide stained shale 123-124.
140-145	Dark brown sandstone with light gray limy spots.
145-150	Buff sandstone with limy cement.
150-154	Tan to brown sandy dolomite with limestone pebbles.
154-160	Gray to tan dolomite with limestone pebbles.
160-163	Buff sandy dolomite.
163-180	Light gray dolomite with white limestone pebbles, and irregular limestone beds.
180-195	Gray-green dolomite with white limestone beds and pebbles.
195-197	Gray dolomite with dark gray shale bands.
197-199	Light gray dolomitic limestone.
199-209	Feldspar porphyry. Gray, with 10% white altered feldspar phenocrysts about 0.1" size. A little green ferromagnesium content noted.
209-221	Gray-green dolomite with white limestone pebbles and thin limestone bands.
221-245	Gray-green calcareous dolomite with few narrow gray shale bands. Thickest shale 3" at 239'.
245-261	Dark gray shale with 20% light gray to pink limestone pebbles.
261-263	Gray to pink limestone conglomerate.
263-269	Dark gray shale with 10% limestone pebbles.
269-271	Gray limestone conglomerate, part dolomitic.
271-281	Dark gray shale with less than 10% light gray to white limestone pebbles.
281-305	Dark gray shale with 25% light gray, pink, and white limestone pebbles.
305-308	Gray to pink limestone.

Hole No. 2S (continued)

Depth	Lithology
308-332	Medium gray to dark gray shale. Hard calcareous shale at 319-321. Hard light gray pyritic shale at 331-332.
332-378	Feldspar porphyry. Gray, with 40% gray to pink 0.3" feldspar phenocrysts. Part altered and rounded. Less than 1% ferromagnesium content.
378-386	Gray shale.
386-407	Gray shale with 40% light gray to white limestone pebbles and gray dolomitic beds.
407-418	Gray dolomite with abundant white limestone pebbles and bands.
418-428	Gray dolomite. Vuggy at 424'.
428-446	Light gray quartzite. About 1% fine grained disseminated pyrite.
446-461	Feldspar porphyry. Gray-green with 25% gray stubby feldspar phenocrysts to 0.5". 10% green ferromagnesium(augite ?).

End

Assay Form No. 9

Double Rainbow Project

Date April 24, 1967

ASSAY REPORT

2 S SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dble Rbo Proj Casing Hole 8325 B	0 - 5	NF	NF
	5 - 10	NF	NF
	10 - 15	NF	NF
	15 - 20	NF	NF

NF = None Found

Date April 21, 1967 Double Rainbow Project ASSAY REPORT

Diamond Drill Sludge

2 S SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbow	20 - 25	.22	NF
DDH 2S (8325B)	25 - 30	Trace	NF
	30 - 35	Trace	NF
	35 - 40	Trace	NF
	40 - 45	Trace	NF
	45 - 50	Trace	NF

Assay Form No. 9

Double Rainbow Project

Date May 24, 1967

ASSAY REPORT

2 S SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rnb. 8342 Sludge	67 - 70	NF	Tr
	70 - 75	NF	Tr
	75 - 80	NF	NF
	80 - 85	NF	NF
	85 - 90	NF	NF
	80 - 95	NF	NF
	95 - 100	NF	NF
	100 - 105	NF	NF
	105 - 110	Tr	NF
	110 - 115	Tr	NF
	115 - 120	Tr	NF
	120 - 125	NF	NF
	125 - 130	NF	NF
	130 - 135	NF	NF
	135 - 140	NF	NF
	140 - 145	.4	NF
	145 - 150	Tr	NF
	150 - 155	.1	NF
	155 - 160	NF	NF
	160 - 165	NF	NF
	165 - 170	NF	NF
	170 - 175	NF	NF
	175 - 180	NF	NF

Assay Form No. 9

Date May 5, 1967

Double Rainbow Project

XX

ASSAY REPORT

2 S SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbo Proj. D D 8325 B	50 - 55 GCM	Tr	N F
	55 - 59	.08	N F
Cores	59 - 63	Tr	N F
	63 - 66	.06	N F
	71 - 73	.15	N F
	73 - 76	Tr	N F
	76 - 79	.06	N F

Assay Form No. 9

Date May 1, 1967

Double Rainbow Project

XX

ASSAY REPORT

2 S SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rbo Proj - D D Cores 8325 B	20 - 25	NF	NF
GCM	40 - 45	NF	NF
	45 - 50	NF	NF
	418 - 423	NF	NF
	423 - 428	NF	NF
	428 - 432	NF	NF
	432 - 436	NF	NF
	436 - 441	NF	NF
	441 - 446	NF	NF

NF = None Found

GO 94

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 3S (8302B). Completed April 7, 1967. Log by G.C.M. & A.L.S.

Location: N. 84.18',E528.54'. South side of Bear Butte Creek

Collar elevation: 4723.91' Vertical Angle 90°

Cored 17-450' Recovery 428/433

Depth	Lithology
0- 17	Cased. Hard bed 9-10. Water and mud 15-17.
17- 19	Brown sandy calcareous dolomite.
19- 29	Yellow and green-gray sandy dolomite with few thin gray shale beds and a few hard limestone lenses.
29- 33	Interbedded brown sandy dolomite and dark gray shale.
33- 38	Interbedded gray dolomitic limestone and thin shale partings. Hard fine grained limestone flat lenses and pebbles.
38- 51	Gray to green-gray dolomitic limestone with minor shaly beds and hard, white limestone lenses.
51- 59	Light gray shale, several gray limey beds.
59- 71	Hard, light gray limestone beds separated by thin gray shale partings.
71- 85	Gray shale with several thin beds of limestone pebble conglomerate. Red and gray pebbles.
85- 86	Light gray limestone flat-pebble conglomerate.
86- 88	Gray shale.
88- 90	White hard limestone. Flat pebbles in part.
90- 95	Feldspar porphyry. Light gray with about 10% partly altered feldspar phenocrysts about 0.1" long. About 1% disseminated fine-grained pyrite.
95-112	Dark gray shale with less than 10% flat limestone pebbles. Most of pebbles are light gray.
112-131	Medium gray shale containing about 30% light gray to pink flat limestone pebbles.
131-206	Feldspar porphyry. Gray to reddish brown. Abundant (about 50%) red brown stubby feldspars between 0.1" -0.5" long in gray matrix. About 2% green ferromagnesium(augite?) 0.1" long. Feldspars are partly altered 183-206.
206-215	Gray to brown limestone conglomerate beds separated by about 10% gray shale partings.
215-217	Dark gray shale.
217-219	Feldspar porphyry. Light gray altered stubby feldspar phenocrysts up to 0.7" long.
219-224	Gray shale.
224-226	Gray-green sandy dolomite and dark gray shale
226-229	Gray green (glauconitic?) sandy dolomite. Gray shale, 0.5' thick at 229'.
229-233	Feldspar porphyry, gray, with about 10% augite(?).
233-234	Gray shale parting 0.5' thick.
234-238	Feldspar porphyry, gray, with about 10% augite(?).

(OME-6558 (Silver))
(Contract No. 2233)

Hole No. 3S (continued)

Depth	Lithology
238-240	Dark gray shale.
240-244	Feldspar augite(?) porphyry. Partly altered feldspars.
244-247	Dark gray shale.
247-252	Feldspar augite(?) porphyry, gray, altered feldspars.
252-254	Dark gray shale.
254-258	Feldspar augite(?) porphyry, gray-green.
258-260	Dark gray shale.
260-271	Feldspar augite(?) porphyry, gray-green stubby feldspars to 0.7". Narrow calcite veinlets, few dark gray inclusions to 1" size.
271-276	Dark gray shale.
276-278	Feldspar augite(?) porphyry, gray-green.
278-290	Dark gray shale with white limestone pebbles. Several narrow dolomite beds with few limestone pebbles.
290-306	Gray-green dolomite enclosing white, elongate, irregular-shaped limestone pebbles.
306-315	Gray-green dolomite with fewer limestone pebbles.
315-319	Gray dolomite with very few limestone pebbles. Some fine-grained disseminated pyrite becoming abundant (over 50%) at 318-319.
319-335	Quartzite, well cemented grains, medium gray. Scarce (less than 1%) fine grained pyrite. Disseminated and in small blebs and thin veinlets.
335-356	Mottled dark gray porous quartzite (sandstone). Not as well cemented as above. Fine grained pyrite, disseminated and in blebs, up to 5% at 345' and 353'-356'. Green glauconite(?) grains (10%) at 346'-355'. Abundant 1/4" black mollusc fossils at 348'-350'.
356-392	Feldspar porphyry, white, with rounded phenocrysts. Very little ferromagnesium minerals.
392-395	Quartzite, white, finegrained pyrite(about 5%) in veinlets and disseminated.
395-396	Reddish conglomerate. White milky quartz and quartzite pebbles.
396-450	Precambrian. Reddish brown mica schist with white mica flakes up to 0.2". Schistosity 45° to 60° from core axis. Several narrow quartz stringers. Quartz breccia and mica schist at 449½-450'.

End.

Date April 5, 1967 Double Rainbow Project ASSAY REPORT
Diamond Drill Sludge

35	SAMPLE	Silver oz. per ton	GOLD Dollars per Ton at $20.67
8302 B	236 - 240	.04	None Found
	240 - 245	None Found	None Found
	245 - 250	.04	None Found

Date April 6, 1967 Double Rainbow Projec ASSAY REPORT
Diamond Drill Sludge

	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rnbw 8302 E (?)	250 - 255	None Found	None Found
~~8303~~	265 - 270	NF	NF
	255 - 260	NF	NF
	260 - 265	NF	NF
	270 - 275	NF	NF
~~8203~~	275 - 280	NF	NF
	280 - 285	NF	NF
	285 - 290	NF	NF
	290 - 295	NF	NF
	295 - 300	NF	NF
	300 - 305	NF	NF
	305 - 310	NF	NF

Date April 7, 1967 Double Rainbow Projec ASSAY REPORT
Diamond Drill Sludge

	SAMPLE	Silver Oz. Per Ton	Dollars per Ton
Dbl RnBw ~~8203~~	310 - 315	.06	None Found
8302	315 - 320	None Found	NF
	320 - 325	NF	NF
	325 - 330	.08	NF
	330 - 335	NF	NF
	335 - 340	.14	NF
	340 - 345	.16	NF
	345 - 350	.10	NF
	350 - 355	.08	NF
	355 - 360	.08	NF
	360 - 365	.08	NF
	365 - 370	.08	NF
	370 - 375	NF	NF

Date April 8, 1967 Double Rainbow Project ASSAY REPORT
Diamond Drill Sludge

	SAMPLE	Silver oz/ per ton	GOLD Dollars per Ton at $20.67
Dbl Rnbw ~~8203~~	375 - 380	None Found	None Found
8302	380 - 385	NF	NF
	385 - 390	NF	NF
	390 - 395	Tr	NF
	395 - 400	NF	NF
	400 - 405	NF	NF
	405 - 410	NF	NF
	410 - 415	NF	NF
	415 - 420	NF	NF
	420 - 425	.10	NF
	425 - 430	NF	NF
	430 - 435	NF	NF
	435 - 440	NF	NF
	440 - 445	NF	NF
	445 - 450	NF	NF

Date April 10, 1967 Diamond Drill Cores ASSAY REPORT
XX Double Rainbow Project

SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbo. D D Core 8302 B	306 - 310	NF	NF
(S 3)	310 - 315	NF	NF
Split Core Samples	315 - 319	NF	NF
	319 - 324	NF	NF
	324 - 329	NF	NF
	329 - 334	Trace	NF
	334 - 339	Trace	NF
	339 - 344	Trace	NF
	344 - 348	NF	NF
	348 - 352	NF	NF
	352 - 356	NF	NF
	392 - 396	NF	NF

ASSAY FORM 8 G089

REPORT OF ANALYSIS (LEAD)

SAMPLE OF

DOUBLE RAINBOW ORE

RECEIVED FROM Mathisrud ON SPLIT D. DRILL CORE

Perkin-Elmer Atomic Absorption method.		% Pb
3 S.- 8302 B	306' - 310'	0.0049
"	310' - 315	0.0055
"	315' - 319'	0.077
"	319' - 324'	0.047
"	324' - 329'	0.010
"	329' - 334'	0.024
"	334' - 339'	0.020
"	339' - 344'	0.026
"	344' - 348'	0.004
"	348' - 352'	0.0032
"	352 - 356'	0.004
"	392' - 396'	0.003

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 4S (8316B). Completed April 15, 1967. Log by G.C.M.

Location: S. 72.0', E. 1109.8'. Near Barton Tunnel

Collar elevation: 4705.54'. Vertical Angle -90°.

Cored 5'-451' Recovery 446/446

Depth	Lithology
0- 5	Cased. Buff sandy overburden with water.
5- 7	Gray dolomite, vuggy, part calcareous.
7- 21	Sandy calcareous dolomite. Buff with light gray limey spots.
21- 42	Sandstone with calcareous cement. Buff to brown sand grading to white where cemented best. Few 0.1" calcite stringers. MnO_2 stain 30-33.
42- 65	Sandstone with calcareous cement. Brown to reddish brown(limonite stain). Few MnO_2 stained spots. Light gray to buff 45-49. Narrow (3") silicified band at 58'.
65- 89	Gray to buff sandstone with calcite cement. Narrow calcite stringers at 76'.
89-103	Hard fine grained sandstone(quartzite) with silica? cement. Mottled gray with white calcareous spots.
103-119	Medium grained dark brown sandstone(quartzite) with a few limestone pebbles. Brown fine grained sandstone with a few pebbles at 116'-118'.
119-123	Conglomerate. White limestone pebbles in brown sandy dolomite matrix.
123-134	Medium grained gray-green dolomite with a few limy spots.
134-145	Fine grained gray dolomite with abundant flat limestone pebbles. Few narrow shale beds.
145-167	Interbedded gray-green dolomite and gray shale. Part contains few limy pebbles.
167-169	Gray shale alternating with calcareous dolomite.
169-204	Interbedded gray-green dolomite and thin gray shale beds. Few limy pebbles. Bedding deformed to 60° at 189-191.
204-219	Gray shale with about 10% white to pink limestone pebbles.
219-224	Feldspar porphyry. Gray, with about 20% altered white, 0.1" feldspar phenocrysts. About 10% green 0.1" ferromagnesium phenocrysts.
224-240	Gray shale with light gray limestone pebbles and a few 0.5' limestone conglomerate beds.
240-247	Dark gray shale with only 10% white, light gray flat limestone pebbles.
247-259	Dark gray shale with abundant(40%) light gray and white flat limestone pebbles.
259-266	Dark gray shale with only 10% light gray and white limestone pebbles.
266-268	Gray-green(glauconitic ?) sandy dolomite and shale.
268-271	Gray shale with light gray limestone pebbles.
271-276	Gray-green sandy dolomite with limestone pebbles alternating with shale.
276-283	Dark gray shale.
283-287	Gray-green(glauconitic)sandy dolomite with several thin gray shale beds.
287-308	Gray shale. 0.2' light gray dolomite bed at 303'.

(OME-6558 (Silver))
(Contract No. 2233)

Hole No. 4S (continued)

Depth	Lithology
308-316	Light gray calcareous dolomite interbedded with medium gray shale.
316-328	Dark gray shale with white limestone pebbles. Few narrow dolomite beds with limy pebbles.
328-336	Gray-green dolomite with 30% limestone.
336-349	Gray-green dolomite with water under 10% limestone. 2" brown oxidized band at 346'.
349-370	Gray quartzite. 0.1" calcite, galena, sphalerite veinlet at 356', 0.1" calcite, galena veinlet at 367'. 25% pyrite disseminated at 349-350, 10% at 350-353, 2% at 360-367.
370-375	Dark gray porous quartzite(sandstone). Mottled 370-372.
375-395	Feldspar porphyry. Light gray to white, 25% altered feldspar phenocrysts. No visible quartz or ferromagnesium minerals.
395-411	Medium to dark gray quartzite. Black 1/4" mollusc zone 401-404. Pyrite noted at 408-411. Several narrow shale partings.
411-424	Light gray partly cemented sandstone(quartzite). Light green altered clay(?) with abundant pyrite at 422'-423'. Pyrite blebs and disseminated throughout. Visible scattered galena at 411'-418'. Brecciated quartzite at 423-424.
424-437	Precambrian. Soft dark gray-brown phyllite and schist. Schistosity 70° - 80° from core axis.
437-439	Precambrian quartz mica schist. Hard gray-green to tan.
439-451	Precambrian. Soft chloritic phyllite and schist. Dark gray to greenish.

End.

Date April 12, 1967 Double Rainbow Project ASSAY REPORT
XX Diamond Drill Sludge

45	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. R'Bow 8316 B Sludge	GCM 0 - 5	Trace	NF
	5 - 10	.14	NF
	10 - 15	.3	NF
	15 - 20	.1	NF
	20 - 25	.12	NF
	25 - 30	Trace	NF
	30 - 35	Trace	NF
	35 - 40	Trace	NF
	40 - 45	Trace	NF

Date April 17, 1967 Double Rainbow Project ASSAY REPORT
Diamond Drill Sludge

45	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnb. D D 8316 B	235 - 240	Trace	None Found
	240 - 245	Tr	NF
	245 - 250	Tr	NF
	250 - 255	Tr	NF
	255 - 260	Tr	NF
	360 - 365	None Found	NF
	365 - 370	Tr	NF
	370 - 375	NF	NF
	375 - 380	Tr	NF
	380 - 385	Tr	NF
	390 - 395	NF	NF
	395 - 400	NF	NF
	400 - 405	Tr	NF
	405 - 410	NF	NF
	410 - 415	NF	NF
	415 - 420	Tr	NF
	420 - 424	Tr	NF
	424 - 429	Tr	NF

GO 94

Date April 18, 1967. Double Rainbow Project ASSAY REPORT
Diamond Drill Cores

45	SAMPLE	SILVER Oz. per Ton	GOLD Dollars per Ton at $20.67
D D 8316 B - GCM	336-340	NF	NF
	340-345	NF	NF
	345-349	NF	NF
	349-352	NF	NF
	352-355	NF	NF
	355-360	.46	NF
	360-365	Trace	NF
	365-370	Trace	NF
	370-375	.21	NF
	395-400	Trace	NF
	[illegible]	NF	NF
	[illegible]	NF	NF
	[illegible]	.12	NF
	412-415	NF	NF
	415-418	.44	NF
	418-421	Trace	NF
	421-424	Trace	NF

Date April 14, 1967 Double Rainbow Project ASSAY REPORT
Diamond Drill [illegible] Core

45	SAMPLE	[illegible]	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dlb. Rnbow D D Cores 8316 B		.5 - 10	Trace	None Foun
GCM		10 - 15	.15	NF
		15 - 20	Trace	NF
		20 - 25	Trace	NF

ASSAY FORM 8 G089

REPORT OF ANALYSIS LEAD [illegible]

SAMPLE OF

DOUBLE RAINBOW CORES
A.A. Spectro Analysis

RECEIVED FROM G. Mathisrud ON SPLIT CORE

DDH 45. (8316B)	% Pb
355 - 360	0.076
370 - 375	0.060
409 - 412	0.202
412 - 415	0.095
415 - 418	0.201

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. IU (8378B). Completed June 8, 1967. Log by G. C. M.

Location: S. 105.58, W. 282.29. Drilled from surface at west side of stope.

Collar elevation: 4990.85. Vertical angle -90°.

Cored 11'-454' Recovery 437/443 or 98.6%

Depth	Lithology
0- 11	Cased.
11- 19	Brown calcareous dolomite with thin shale beds.
19- 37	Buff to yellow calcareous dolomite. Few manganese stained fractures. Some limonite.
37- 66	Gray to brown sandstone with white calcite cement. Glauconite at 54'.
66- 69	Dark red-brown sandstone.
69- 86	Brown sandstone with calcite cement. Little manganese at 69-76.
86- 93	Gray to buff sandstone with calcite cement.
93- 97	Feldspar porphyry. Few small, altered, feldspar and ferromagnesian phenocrysts.
97-103	Gray to buff sandstone with calcite cement.
103-118	Gray sandy dolomite. Part buff. Some limestone bands and spots. Thin calcite-filled fractures. Clay at 118'.
118-128	Coarse grained gray to brown sandy calcareous dolomite.
128-151	Fine grained light gray to buff sandy calareous dolomite. Few olive shale beds.
151-171	Gray to buff calcareous dolomite with limestone pebbles. Few thin gray shale beds. Manganese at 171'.
171-177	Feldspar porphyry. Gray with 30% altered Kaolin feldspar phenocrysts to 0.2". Limonite stained fractures.
177-184	Interbedded light gray dolomite and dark gray shale.
184-186	Dark gray shale.
186-190	Brown limonite-stained sandstone with clay gouge filled fractures.
190-207	Gray dolomite with thin dark shale beds. Thin limonite stained fracture zones at 197 and 201.
207-214	Feldspar porphyry. Light gray to brown. Highly fractured. Some limonite stain. 25% kaolinized feldspar phenocrysts.
214-219	Interbedded gray-green dolomite and dark gray shale.
219-232	Dark gray shale with few gray-green dolomite beds. Thin limonite stained fractures.
232-248	Dark gray shale with 20% white limestone pebbles. Gray to pink pebble conglomerate at 234-235 and at 246-247.
248-258	Dark gray shale with 10% white limestone pebbles.
258-281	Dark gray shale with 30% white limestone pebbles.
281-285	White to gray and pink calcareous dolomite.
285-294	Dark gray shale.

(OME-6558 (Silver))
(Contract No. 2233)

Hole No. IU (8378B) (continued)

Depth	Lithology
294-297	Glauconitic dolomite.
297-308	Dark gray shale.
308-374	Feldspar porphyry. 50% gray to pink fresh feldspar phenocrysts to 0.5" size. Few narrow fractures with a little kaolin at 334-336. Pyrite noted in fracture at 354.
374-384	Dark gray shale with gray dolomite at 378-379.
384-404	Interbedded gray shale and dolomite with some limestone pebbles. Reddish dolomite at 394.
404-412	Dark gray altered vuggy dolomite. 1% fine grain disseminated pyrite. Galena noted at 405'.
412-420	Gray to pink dolomite. Thin shale partings. Pyrite noted.
420-439	Gray quartzite. Less than 1% fine grain disseminated pyrite. Few narrow pyrite coated fractures.
439-454	Feldspar porphyry. 30% kaolinized feldspar phenocrysts to 0.1" size. Abundant vertical fractures with kaolin. Less than 1% fine grain disseminated pyrite.

END

Assay Form No. 9

Double Rainbow

Date June 10, 1967 XX Cores

ASSAY REPORT

55 75

1U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
DB1 Rnbw D D 8378 B	404 - 408	Trace	NF
XX ALS	408 - 412	Tr	NF
	412 - 416	Tr	NF
	416 - 420	None Found	NF
	420 - 424	NF	NF
	424 - 428	NF	NF
	428 - 432	Trace	NF

ASSAY FORM 8 G089

REPORT OF ANALYSIS

SAMPLE OF

DOUBLE RAINBOW ORE
8378 B XX 1U

RECEIVED FROM _____ ON _____

	% Pb	% Zn
404 - 408	0.060	0.310
408 - 412	0.027	0.108
412 - 416	0.007	0.015
428 - 432	0.021	0.097

DATE 6/14/67 ANALYST W.H. Taylor

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 2U (8501A). Completed September 19, 1967. Log by J. M. W.

Location: S. 158.70, W. 5.08. Drilled from Richmond Level.

Collar elevation 4914.06. Vertical angle -90°.

Cored 0'-411' Recovery 366/411 ~~or 89.1%~~

Depth	Lithology
0- 22	Cased. Brown to light brown sandstone with calcareous cement, abundant iron oxide and green glauconite scattered throughout. Manganese at 17-18.
22- 25	Dirty brown calcareous shaley sandstone with scattered glauconite and abundant iron oxide.
25- 31	Brown sandstone with abundant manganese and moderate iron oxide.
31- 53	Brown to light brown sandstone with alternating dolomite and calcite cementation. Scattered glauconite, shale partings and beds of argillaceous sandstone. Abundant iron oxide with minor manganese.
53- 56	Dirty brown sandy argillaceous limestone with scattered glauconite.
56- 58	Gray green sandy dolomite with abundant glauconite.
58- 62	Gray to gray brown sandy argillaceous dolomite with abundant glauconite and minor gray green shale partings. 62' calcite fractures.
62- 65	Gray sandy dolomite with abundant glauconite and minor gray shale partings.
65- 72	Gray to gray brown argillaceous limestone with abundant glauconite.
72- 79	Reddish brown limestone with beds of sandy limestone locally. Abundant iron oxide and minor glauconite.
79- 91	Light brown sandy limestone with moderate iron oxide, minor manganese, and scattered tan shale partings.
91-100	Light gray brown sandy limestone with minor iron oxide. Abundant light gray limestone pebbles at 93'.
100-116	Gray to light gray bedded dolomite with thin gray shale partings. Scattered glauconite with gray white limestone pebbles at 113'.
116-120	Gray brown sandy limestone with scattered shale partings, flat limestone pebbles and minor glauconite.
120-130	Gray bedded dolomite with scattered white flat limestone pebbles and moderate shale partings.
130-150	Gray to light gray dolomitic limestone with moderate gray shale partings. Scattered gray white flat limestone pebbles and glauconite. Locally sandy limestone.

Hole No. 2U (8501A) (continued)

Depth	Lithology
150-158	Gray to gray brown sandy glauconitic limestone with thin gray shale partings.
158-164	Gray to light gray dolomitic limestone with moderate gray shale partings and minor glauconite.
164-185	Very thin bedded gray shale, scattered with flat limestone pebbles. 176-179 gray white flat limestone pebble conglomerate divided by a 1' shale parting. Some limestone pebbles stained pink to red. 183-184 thin limestone beds with pink flat limestone pebbles.
185-194	Gray feldspar porphyry with 20% white feldspar phenocrysts which average 0.1" and scattered ferromagnesian phenocrysts. Gray fine grained matrix and very scattered fine grained pyrite.
194-234	Dark gray very thin bedded shale with scattered white flat limestone pebbles. Locally a flat limestone pebble conglomerate with a limestone matrix at 212', 213', 224', 231', and 232'. Some of the pebbles are stained reddish to pink on the edges.
234-238	Gray to reddish gray limestone with abundant white to red stained flat limestone pebbles. Small red to gray line fossils. (?) Limestone is coarse grained.
238-249	Dark gray thin bedded shale with slight effervescence with strong acid. Gray limestone beds at 240' and 245'.
249-314	Light gray to light pinkish gray porphyry. 40% gray white to pinkish gray phenocrysts 0.2" to 0.3", up to 0.5" and stubby. Matrix is fine grained gray white to pink. Pyrite mineralization in small scattered fractures. Ferromagnesian mineralization is gray green and less-than 1%. At 274' a small dike 2" wide with gray green feldspar matrix and phenocrysts of biotite. Fracture at 303' filled with pyrite and sphalerite, and at 307' fracture filled with pyrite, sphalerite, and galena.
314-319	Light gray to buff thin bedded shale. Weak effervescence with strong acid. Shale appears to be leached. Pyrite in very thin fractures.
319-329	Dark gray bedded shale.
329-352	Alternating beds of dark gray shale and coarse grained limestone. Abundant white flat limestone pebbles. Scattered glauconite found in limestone beds.
352-364	Gray dolomitic limestone with scattered gray white , white limestone pebbles. Scattered beds of glauconitic dolomitic limestone. 362 manganese.
364-377	Gray coarse grained dolomite with very fine grained pyrite mineralization and minor amounts of manganese.
377-389	Gray massive quartzite with abundant pyrite mineralization. Vuggy zones filled with pyrite and minor amounts of manganese mineralization.

Hole No. 2U (8501A) (continued)

Depth	Lithology
389-390	Feldspar porphyry. Gray matrix with white feldspar phenocryst 0.1" long. Abundant pyrite mineralization.
390-397?	Gray massive quartzite with abundant pyrite mineralization. Vuggy zones filled with pyrite.
397-408	White chalky feldspar porphyry. Strong kaolin alteration and abundant pyrite mineralization.
408-411	Gray green feldspar porphyry. Stubby feldspar phenocrysts 15%. Ferromagnesian phenocrysts 1-2%. Gray green matrix.

Date September 15, 1967 Double Rainbow Project XX ASSAY REPORT

9 2U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
D D Hole 8501 A	JMW 0 - 5	.4	NF
Split Core	5 - 10	Trace	NF
	10 - 15	.1	NF
	25 - 30	.5	NF

Date September 23, 1967 Double Rainbow ASSAY REPORT

	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
2U			
Dbl. RnBow D D 8501 A	302 - 307	NF	NF
JMW	364 - 369	NF	NF
	369 - 373	NF	NF
split core samples	373 - 377	NF	NF
	377 - 382	NF	NF
	382 - 387	NF	NF
	387 - 392	NF	NF
	392 - 397	NF	NF
	397 - 408	NF	NF

*None Found

GO 94

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 3U (8530B). Completed October 20, 1967. Log by J. M. W.

Location: S. 393.79, W. 291.27. Drilled from Richmond Level.

Collar elevation 4949.14. Vertical angle -90°.

Cored 2'-500' Recovery 457/498 or 91.8%

Depth	Lithology
0- 2	Cased.
2- 22	Brown to rusty brown limonitic sandstone. Manganese mineralization from 8-9 and 21-22.
22- 25	Clean buff sandstone.
25- 32	Brown limonitic sandstone. Scattered glauconite and manganese at 29-32. Thin bands of sandstone with calcareous cementation.
32- 46	Brown to gray brown calcareous sandstone. Manganese from 43-44 and abundant iron oxide.
46- 49	Light gray with altered feldspar porphyry abundant kaolin and manganese in fractures at 48'.
49- 60	Brown to light brown argillaceous calcareous sandstone. Abundant iron oxide, minor glauconite and minor manganese at 53'.
60- 68	Alternating 2' beds of argillaceous calcareous sandstone and gray glauconitic sandstone. Very fine grained pyrite from 66-67.
68- 80	Brown argillaceous limonitic sandstone. Manganese from 168-173.
80- 99	Brown to light brown argillaceous limonitic calcareous sandstone. Manganese at 81 and 89-90.
99-111	Light brown argillaceous sandy limestone. Manganese and iron oxide at 106.
111-113	Dark brown argillaceous sandstone.
113-124	Alternating bands of gray green shale and gray brown limestone. Abundant iron oxide.
124-134.5	Light gray buff feldspar porphyry with many large weathered phenocrysts. Abundant fractures with iron oxide staining and dendrites. 20% gray white phenocrysts altered to kaolin.
134.5-162	Gray to gray brown limestone with thin gray green to gray shale partings with minor amounts of glauconite and scattered gray limestone pebbles.
162-177	Gray limestone with thin gray shale partings. Scattered gray flat limestone pebbles at base.

Hole No. 3U (8530B) (continued)

Depth	Lithology
177-228	Dark gray shale with scattered white to gray white limestone pebbles. Scattered thin gray limestone beds with gray white to white flat limestone pebbles. Some stained pink to red on edges. Massive limestone beds at 181-183', 185-187', and 192-194' with flat limestone pebbles, some stained pink to red on edges.
228-232	Coarse grained gray to reddish gray limestone with thin red lined fossils. (?)
232-248	Dark gray shale with thin beds of limestone from 241-243.
248-297.5	Gray to pinkish gray feldspar porphyry. Phenocrysts pinkish gray, 30%, stubby, 0.2"-0.3". Ferromagnesian phenocrysts less than 1%. Scattered phenocrysts 1.0". Fine grained matrix and slight kaolin alteration.
297.5-308	Dark gray thin bedded shale.
308-310	Light gray to gray green feldspar porphyry. Gray white phenocrysts 0.2"-0.4", 30%. Matrix is fine grained gray green.
310-315	Dark gray thin bedded shale.
315-335	Gray limestone with abundant dark gray shale partings. Abundant gray white to white flat limestone pebbles. Limestone stained red at 325.
335-346	Gray limestone with abundant gray white limestone pebbles. Scattered shale partings. Some beds of dolomitic limestone.
346-374	Gray green phonolite with 20% ferromagnesian phenocrysts 0.1"-0.2". Feldspar phenocrysts 15%, 0.5". Fine grained gray green matrix.
374-379	Transition zone. Light gray feldspar porphyry. Ferromagnesian phenocrysts 10% and pyrite mineralization.
379-408	Light gray feldspar porphyry. 40% phenocrysts 0.3-0.4 with gray matrix. Pyrite mineralization and kaolin alteration from 389-391.
408-410	Transition zone. Light gray feldspar porphyry with 5% ferromagnesian phenocrysts and pyrite mineralization.
410-456	Gray green phonolite. Abundant ferromagnesian phenocrysts, 20%, 0.1-0.2". Feldspar phenocrysts 15%, 0.5". Gray green fine grained matrix.
456-460	Dark gray dolomitic limestone with scattered gray shale partings.
460-466	Light gray coarse grained dolomite with scattered pyrite mineralization.
466-482	Massive gray quartzite. Pyrite mineralization throughout. Fracture at 469-470 has pyrite and galena mineralization.
482-494	Gray calcareous quartzite. Small shell fossils with scattered pyrite mineralization.
494-500	Dark gray glauconitic sandstone. Scattered fossils with some limestone fossil hash.

Date October 13, 1967 Double Rainbow ASSAY REPORT

10- 3U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rnbw 8530 B	2-5' JMW	.1	NF
sludge	5-10	.14	NF
	10-15	.2	NF
	15-20	.1	NF
	NF = None Found		

Date October 26, 1967 Double Rainbow ASSAY REPORT

10-24 3U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
D D 8530 B Double Rnbo	2 - 5 JMW	.2	NF
core samples	5 - 10	.2	NF
Split core	10 - 15	.15	NF
	15 - 20	.2	NF
	460 - 466	.1	NF
	466 - 471	.06	NF
	471 - 476	.1	NF
	476 - 482	.07	NF
	NF = None Found		

GO 94

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 4U (8518B). Completed October 4, 1967. Log by J. M. W.

Location: S. 421.04, W. 71.90. Drilled from Richmond Level.

Collar elevation 4926.93. Vertical angle -90°.

Cored 2'-393' Recovery 373/391 or 92.8%

Depth	Lithology
0- 2	Cased.
2- 4	Rusty brown sandstone with abundant iron oxide staining.
4- 5	Dirty brown argillaceous sandstone with abundant manganese and iron oxide.
5- 9	Light brown to gray green dolomitic sandstone. Abundant glauconite, iron oxide, and abundant scattered fine grained pyrite.
9- 23	Gray to gray green dolomitic glauconitic sandstone with abundant fine grained pyrite mineralization. 10-12 scattered gray flat dolomite pebbles and calcite filled fractures with iron oxide staining at 16' and 20'.
23- 27	Gray to brown sandstone with moderate iron oxide staining and glauconite.
27- 42	Brown to dark brown sandstone with abundant iron oxide alteration and manganese at 28-32 and 39-40. 34-37 has a strong iron oxide alteration with manganese. Scattered glauconite and dolomitic sandstone beds.
42- 50	Light brown calcareous sandstone with beds of calcareous argillaceous sandstone from 43-44 and 48-50.
50- 53	Gray green glauconitic dolomitic sandstone.
53- 64	Light brown argillaceous calcareous sandstone. 58-59 gray green dolomitic sandstone. Moderate iron oxide and thin green shale partings.
64- 76	Brown to dark brown argillaceous calcareous sandstone with abundant iron oxide. Manganese at 65'.
76- 89	Light brown to brown argillaceous sandy limestone. Scattered flat gray limestone pebbles and glauconite with manganese at 81'.
89- 98	Gray to brownish gray argillaceous calcareous sandstone with moderate glauconite.
98-123	Gray sandy glauconitic dolomitic limestone. Scattered flat limestone pebbles with abundance at 112'. Also scattered gray to gray green shale partings.
123-132	Gray white feldspar porphyry. 15% white feldspar phenocrysts. Ferromagnesium phenocrysts are less than 1%. Gray green fine grained matrix with abundant kaolin alteration.

Hole No. 4U (8518B) (continued)

Depth	Lithology
132-135	Gray dolomitic limestone with scattered flat limestone pebbles. Porphyry breccia at 138.6' -139.
137-143	Dark gray thin bedded calcareous shale with thin beds of limestone.
143-176	Gray dolomitic limestone with thin gray shale partings. Very scattered flat limestone pebbles and glauconite. Calcite fracture at 168'.
176-232	Dark gray thin bedded shale with 4"-12" limestone and flat limestone pebble conglomerate beds. Limestone pebbles are gray white with pink to red staining on edges. Very fine grained disseminated pyrite. Calcite fracture at 227'.
232-235	Gray shaly limestone with flat gray white limestone pebbles. Fine grained pyrite mineralization.
235-245	Gray white feldspar porphyry. Feldspar phenocrysts are stubby 0.1-0.3", 35% . Matrix is gray buff with strong kaolin alteration. Galena and sphalerite filled fracture at 236-240 and pyrite throughout.
245-249	Gray to dark gray coarse grained bands of limestone with thin red line fossils. (?) Scattered pyrite.
249-253	Gray thin bedded shale appears to be leached. Abundant vertical fractures with pyrite mineralization. Small fracture filled with manganese at 253.
253-301	Light gray feldspar porphyry. 30% feldspar phenocrysts from 0.2" to 0.4" and up to 0.8". Phenocrysts are stubby. Gray white matrix. Pyrite mineralization in fractures near upper contact. Scattered pyrite throughout. Ferromagnesium phenocrysts less than 1%. Some feldspar phenocrysts have light pink color.
301-303	Gray thin bedded shale. Fine grained pyrite in scattered limestone beds.
303-323	Thin bedded gray to dark gray shale. Very fine grained pyrite.
323-329	Thin bedded dark gray shale with thin limestone beds and flat white limestone pebbles.
329-347	Gray limestone with abundant flat white limestone pebbles, some very irregular in shape. Abundant shale partings and red limestone at 237'.
347-358	Gray coarse grained limestone with scattered limestone pebbles. Pyrite mineralization in thin fractures.
358-365	Gray coarse grained dolomite with abundant small fractures with pyrite. Pyrite scattered throughout.
365-372	Gray to gray white feldspar porphyry. 15% white feldspar phenocrysts 0.1"-0.2". 368-372 pyrite mineralization and moderate kaolin alteration.
372-385.5	Gray massive quartzite. Massive fine grained pyrite mineralization at 372-375 and 377-379. Pyrite filled vugs and fine grained pyrite throughout.
385.5-393	Light gray to light gray green feldspar porphyry. Light green ferromagnesium phenocrysts and gray matrix. Abundant kaolin at upper contact.

Date September 27, 1967 SLUDGE ASSAY REPORT

9-26 4U SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
8518 B Sludge 2'-5' - 90°	.5	NF
5'-10'	.24	NF
10'-15'	.2	NF
15'-20'	.1	NF

Date October 7, 1967 Double Rainbow ASSAY REPORT

4U SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbow 8518 B 236 - 241	.8	*NF
JMW 2 - 5	.2	NF
5 - 10	.2	NF
Split Core samples 10 - 15	.3	.20
15 - 20	.1	.20

Date October 6, 1967 Double Rainbow ASSAY REPORT

4U SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
~~Dbl. Rnbow, CEE C-32~~	~~1.9~~	~~NF~~
4U		
D D 8518 B JMW 353 - 358	Trace	NF
Dbl. Rnbow Project 358 - 361	Trace	NF
Split Core samples 361 - 365	Trace	NF
365 - 372	.4	NF
372 - 376	1.6	1.00
376 - 380	1.2	1.20
380 - 385	.1	NF

None Found - NF

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 5U (8552B). Completed November 2, 1967. Log by J. M. W.

Location: S. 552.21, W. 250.87. Drilled from Richmond Level.

Collar elevation 4946.22. Vertical angle -90°.

Cored 0'-480' Recovery 468/480' or 97.5%

Depth	Lithology
0- 19	Dirty brown sandstone with local calcareous sandstone. Badly weathered zones of abundant iron oxide and manganese at 9' and 12'.
19- 49	Light brown sandstone with local calcareous sandstone. Scattered 1' beds of argillaceous calcareous sandstone. Manganese at 36', 38', and 39'.
49- 51	Fine grained gray green porphyry with vugs of manganese and limonite filled fractures.
51- 59	Light brown calcareous argillaceous sandstone with scattered very thin shale partings.
59- 61	Blue gray glauconitic sandstone.
61- 68	Light brown calcareous argillaceous sandstone with scattered very thin shale partings.
68- 90	Light brown to brown sandy argillaceous limestone. Thin shale partings. Scattered glauconite, manganese staining from 77-81, and abundant iron oxide from 71-77.
90-109	Light brown to brownish gray sandy argillaceous limestone with scattered shale stringers. Flat limestone pebbles at 90' and from 92-93. Manganese from 95-99.
109-113	Gray glauconitic sandstone with abundant shale partings.
113-126	Brown to gray brown argillaceous limestone. Minor shale partings and scattered glauconite and iron oxide.
126-131	Gray limestone with abundant shale partings and scattered limestone pebbles.
131-141	Light yellow gray fine grained porphyry with kaolin alteration. Thin limonite and manganese filled fractures.
141-176	Gray glauconitic limestone with gray shale partings. Shale partings abundant locally and some beds of gray glauconitic dolomitic limestone.
176-228	Dark gray thin bedded shale with scattered beds of limestone and limestone conglomerate. Scattered limestone pebbles with pink to red staining on edges from 188-190.
228-255	Gray white porphyry. Stubby white phenocrysts 0.2-0.5 and a gray matrix. Fine grained pyrite near upper and lower contact. Moderate kaolin alteration. Fracture filled with manganese (?) at 254.

Hole No. 5U (8552B) (continued)

Depth	Lithology
255-264	Gray to red limestone with thin red line fossils. Scattered shale partings.
264-273	Gray very thin bedded shale and thin gray limestone beds.
273-310	White to pinkish white feldspar porphyry. 25% pinkish phenocrysts 0.2-0.3". Gray white matrix.
310-312	Gray shale with small white fine grained particles (origin unknown).
312-334	Gray thin bedded shale.
334-351	Gray limestone with abundant flat limestone pebbles and abundant dark gray shale partings.
351-371	Gray white feldspar porphyry with 30% white phenocrysts 0.2"-0.3". Gray white matrix with scattered pyrite throughout.
371-386	Gray limestone with scattered to moderate flat white limestone pebbles and scattered gray shale partings. Scattered pyrite mineralization.
386-450	Gray green phonolite with 10% ferromagnesian phenocrysts and scattered feldspar phenocrysts. Gray green matrix. Very scattered pyrite mineralization. 3" bed of limestone at 390'.
450-452	Gray coarse grained limestone with scattered pyrite.
452-460	Gray dolomite with scattered pyrite. Pyrite filled fractures at 452 and 455.
460-476	Gray massive quartzite with scattered pyrite mineralization. (galena (?) small crystals with metalic luster.
476-480	Gray quartzite with very thin beds of fossil hash.

Date November 2, 1967 Double Rainbow **ASSAY REPORT**

5U 5U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbow Sludge	2-5	.2	*NF
JMW	5-10	.14	NF
8552B	10-15	.1	NF
sludge	15-20	.1	NF

*None Found

Date November 2, 1967 Double Rainbow **ASSAY REPORT**

5U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbow. D D H 8552B	350-355	NF	*NF
Sludge	355-360	NF	NF
	360-365	NF	NF
	365-370	NF	NF
	370-375	NF	NF
	375-380	NF	NF

*None Found

Date November 4, 1967 Double Rainbow **ASSAY REPORT**

5U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbow D D 8552B	0 - 5	*NF	NF
JMW	5 - 10	NF	NF
(Paper Tags)	10 - 15	NF	NF
Split Core samples	15 - 20	NF	NF
	452 - 456	NF	NF
	456 - 460	NF	NF
	460 - 465	Tr	NF
	465 - 470	Tr	NF
	470 - 475	NF	NF
	475 - 480	NF	NF
Dbl. Rnbow D D 8552B	400 - 405	TR	NF
Sludge	405 - 410	Tr	NF
	460 - 465	Tr	NF
(Wood Tags)	465 - 470	Tr	NF
	470 - 475	Tr	NF
	475 - 480	Tr	NF
	Illegible	Tr	NF
	#14	Tr	NF

*None Found

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 6U (8566B). Completed November 13, 1967. Log by J. M. W.

Location: S. 561.97, W. 69.35. Drilled from Richmond Level.

Collar elevation: 4916.99'. Vertical angle -90°.

Cored 1.5'-429' Recovery 417.5/427.5 or 97.6%

Depth	Lithology
0-1.5	Cased.
1.5- 28	Gray brown to gray green glauconitic sandstone with local beds of glauconitic dolomitic sandstone. Moderate iron oxide, abundant pyrite and manganese at 16'.
28- 40	Dark brown sandstone with abundant iron oxide and manganese.
40- 65	Light brown to blue gray sandstone with scattered beds of calcareous sandstone and thin beds of dolomite. Scattered iron oxide and fine grained pyrite.
65- 91	Brown to gray brown sandy argillaceous limestone. Scattered beds of glauconite, moderate iron oxide, and manganese at 73'.
91-126	Gray to blue gray glauconitic limestone with moderate shale partings. Scattered beds of glauconitic dolomitic limestone.
126-135	Gray white feldspar porphyry with 15% feldspar phenocrysts 0.1 to 0.2". Scattered ferromagnesian phenocrysts.
135-176	Gray to blue gray glauconitic limestone with moderate shale partings and scattered beds of glauconitic dolomitic limestone.
176-203	Gray thin bedded shale with moderate 1' beds of light gray limestone. Scattered limestone pebbles and flat limestone pebble conglomerate. Some pebbles stained pink to red on edges.
203-213	Gray thin bedded shale.
213-224	Gray thin bedded shale with scattered flat white limestone pebbles.
224-235	White to gray white feldspar porphyry. 30% feldspar phenocrysts 0.2-0.3" with some up to 1.0". Kaolin alteration.
235-245	Gray thin bedded shale with scattered flat white limestone pebbles and gray thin beds of limestone.
245-250	Coarse grained gray to reddish gray limestone with red line fossils. (?)
250-253	Thin bedded shale.
253-291	Gray to pinkish gray feldspar porphyry. 25% pinkish gray feldspar phenocrysts 0.2 to 0.3". Gray matrix.
291-318	Dark gray very thin bedded shale with gray spotty limestone from 295-297.
318-328	Gray white to white limestone with abundant white flat limestone pebbles and abundant gray shale partings.
328-330	Gray to gray green phonolite. 20% phenocrysts with gray matrix.

(OME-6558 (Silver))
(Contract No. 2233)

Hole No. 6U (8566B) (continued)

Depth	Lithology
330-336	Gray white to white limestone with abundant white flat limestone pebbles and gray shale partings.
336-338	Gray thin bed shale with pyrite filled fractures.
338-354	Light gray coarse grained limestone with scattered pyrite mineralization and pyrite filled fractures. Last 2' reacts as dolomite but may be due to porphyry.
354-360	Gray white feldspar porphyry. Abundant kaolin alteration and scattered pyrite mineralization.
360-361.5	Gray limestone.
361.5-362.5	Blue gray phonolite. 15% phenocrysts with a gray matrix.
362.5-364	Gray coarse grained dolomite.
364-366	Gray quartzite with some calcareous cement.
366-370	Gray white feldspar porphyry with very scattered pyrite. Minor kaolin alteration.
370-371	Gray massive quartzite.
371-381	Gray green phonolite. 15% phenocrysts and gray matrix. Pyrite mineralization from 376-377.
381-397	Gray to gray white feldspar porphyry. Scattered phenocrysts with fine grained matrix.
397-416	Gray green phonolite with abundant ferromagnesian phenocrysts and scattered feldspar phenocrysts. Gray groundmass. Last 3' kaolin alteration and pyrite mineralization.
416-429	Gray massive quartzite with thin badly fractured zones. Scattered pyrite.

end

Date November 16, 1967 Double Rainbow

D.D.Hole8566B - Sludge

6U SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
D D Hole 8566 B Sludge 1 - 5	.74	*NF
5 - 10	.1	NF
10 - 15	.12	NF
15 - 20	.2	NF

Date November 16, 1967 Double Rainbow

ASSAY REPORT

6U SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbow D D HOle 8566B	1.5-5	tr	*NF
JMW	5-10	tr	NF
Split Core	10-15	tr	NF
	15-20	.16	NF
	20-25	.1	NF
	25-30	.12	NF

Date November 16, 1967 Double Rainbow

ASSAY REPORT

D.D.Hole 8566B

6U SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl.Rnbow D D Hole 8566B	339 - 344	*NF	NF
JMW	344 - 349	NF	NF
Split Core	349 - 354	NF	NF
	359 - 362	NF	NF
	362 - 366	NF	NF
	366 - 371	NF	NF
	416 - 419	NF	NF
	419 - 429	NF	NF

*None Found

(OME-6558 (Silver)
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 7U (8486A). Completed Sept. 5, 1967. Log by J. M. W.

Location: S. 772.60, W. 195.81. Drilled from Richmond level.

Collar elevation: 4924.85. Vertical angle - 90°.

Cored 0' -445' Recovery 100%

Depth	Lithology
0- 4	Light brown medium grained quartzite.
4- 7	Greenish gray glauconitic sandstone with fine grained pyrite. 5-6 calcite lenses.
7- 17	Rusty brown sandy dolomite, with abundant brown iron oxide.
17- 19	Gray Green glauconitic sandy dolomite. 17-17.5 is poorly cemented with abundant iron oxide.
19- 21	Brown sandy dolomite with abundant brown iron oxide.
21- 24	Brown sandy dolomite with abundant gray shale partings.
24- 32	Brown medium grained quartzite.
32- 41	Alternating quartzite and brown calcareous shale.
41- 42	Gray green glauconitic sandstone.
42- 44	Altered light gray green feldspar porphyry. Moderate kaolin alteration and fine grained pyrite.
44- 46	Gray green glauconitic sandstone.
46- 48	Dirty brown argillaceous limestone.
48- 52	Brown sandy dolomite.
52- 62	Dirty brown shaley limestone with some sandy dolomite lenses.
62- 66	Gray green glauconitic sandstone with thin dolomite beds.
66- 73	Dirty brown shaley limestone with some sandy dolomite lenses and scattered glauconite.
73- 78	Brown quartzite with scattered glauconite and well mineralized with vuggy manganese.
78- 87	Dirty brown sandy limestone.
87- 95	Gray flat pebble conglomerate in brown sandy limestone; bands of dirty brown sandy limestone and thin gray green shale lenses.
95- 97	Gray green glauconitic dolomitic sandstone.
97-105	Gray green glauconitic sandy dolomite.
105-107	Light gray feldspar porphyry with moderate kaolin alteration and well brecciated at base.
107-113	Light gray to gray green sandy glauconitic dolomitic limestone with thin gray shale partings.
113-133	Light gray to gray green sandy glauconitic dolomite with scattered white to light gray flat limestone pebbles. Thin beds of limestone and gray shale partings.
133-141	Gray feldspar porphyry ~~with~~ 20% white feldspar phenocrysts 0.1 to 0.2" long, less-than 0.1" wide.

Hole No. 7U (8486A) (continued)

Depth	Lithology
141-170	Gray glauconitic sandy calcareous dolomite with scattered gray shale partings, increasing between 142-144, 149-150, and 159-160. Also thin bands of light gray dolomitic limestone and scattered flat pebble limestone conglomerates with abundance from 144-145.
170-204	Feldspar porphyry. Fine grained gray matrix with 50% large gray white to white feldspar phenocrysts, strongly altered to kaolin and very fine grained pyrite mineralization throughout. Fluorite mineralization near upper and lower contact. Feldspar phenocrysts are blocky averaging 0.2" and up to 1.0". 203-204 is brecciated with a fine grained feldspar porphyry at the base with a 2.0" width.
204-237	Gray thin bedded shale which efferveses weakly with strong acid. Scattered flat limestone pebbles throughout, with local flat pebble conglomerates between 212-213; pebbles stained pink to red on edges to all the way through: 217-223 1' beds of flat pebble conglomerates, separated by 1' beds of shale; pebbles white to gray white, with occasional pink to red staining.
237-247	Gray white beds of limestone with abundant flat limestone pebble conglomerates. Some pink stained pebbles. 2-3" gray shale partings.
247-260	Gray shale which efferveses weakly with strong acid. Scattered flat limestone pebbles. 257-258 has abundant green glauconite.
260-264	Light gray calcareous dolomite with abundant flat limestone pebble conglomerates. Abundant red iron oxide and red lined fossils. (?)
264-266	Gray thin bedded shale with 4" bed of gray limestone at base.
266-294	Alternating zones of gray white to light pink feldspar porphyry. 20-40% feldspar phenocrysts and less-than 1% light gray green ferromagnesium phenocrysts. Slight kaolin alteration and very fine grained pyrite mineralization.
294-297	Dark gray thin bedded shale. Scattered thin beds of glauconitic limestone.
299-320	Thin bedded dark gray shale.
320-332	Gray shaley dolomite with abundant gray white to white flat limestone pebbles and scattered shale partings. 329' glauconite altered to iron oxide.
332-371	Gray ferromagnesium rich feldspar porphyry. Gray white feldspar phenocrysts 10-25%, 0.1-0.3" long and stubby. 20% gray green ferromagnesium phenocrysts, which average 0.1-0.2" and up to 0.6" long. Fine grained gray matrix with scattered fine grained pyrite.
371-395	Gray white feldspar porphyry with 30-35% stubby white feldspar phenocrysts, 0.1-0.5" long. Gray white matrix with ferromagnesium phenocrysts less-than 1%. Abundant fine grained pyrite mineralization and kaolin alteration on edges of feldspar phenocrysts.

(OME-6558 (Silver)
(Contract No. 2233)

Hole No. 7U (8486A) (continued)

Depth	Lithology
395-412	Gray to reddish gray calcareous dolomite with thin white limestone beds. Red iron oxide alteration.
412-420	Gray to gray green ferromagnesium rich feldspar porphyry. Feldspar phenocrysts 0.1-0.5", 20%; ferromagnesium phenocrysts 0.1-0.3, 20%. Fine grained gray matrix with kaolin alteration at base.
420-429	Gray glauconitic sandy coarse grained dolomite with very thin shale partings.
429-445	Gray quartzite with abundant pyrite mineralization.

end

Date September 7, 1967 Double Rainbow **ASSAY REPORT**

7U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl Rnbow Sludge	425 - 430	* NF	NF
JMW 8486 A	430 - 435	1.2	.80
	435 - 440	.3	NF
	440 - 445	.2	NF
Dbl Rnbow 8486A	170 - 175	NF	NF
XX JMW	420 - 425	NF	NF
	425 - 429	NF	NF
Split core samples	429 - 435	.9	NF
	435 - 440	NF	NF
	440 - 445	NF	NF

Date September 6, 1967 Double Rainbow **ASSAY REPORT**

7U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl. Rnbow #8486 A	300 - 305	*NF	NF
JMW	305 - 310	NF	NF
	310 - 315	NF	NF
Sludge	315 - 320	NF	NF
	320 - 325	NF	NF
	325 - 330	NF	NF
	330 - 335	NF	tr
	335 - 340	NF	tr
	340 - 345	NF	NF
	345 - 350	NF	NF
	350 - 355	NF	NF
	355 - 360	NF	NF
	360 - 365	NF	NF
	365 - 370	NF	NF
	370 - 375	NF	NF
	375 - 380	NF	tr
	380 - 385	NF	NF
	385 - 390	NF	NF
	390 - 395	NF	NF
	400 - 405	NF	NF
	405 - 410	NF	NF
	410 - 415	NF	NF
	415 - 420	NF	NF
	420 - 425	NF	NF

Date August 25, 1967 Double Rainbow XX **ASSAY REPORT**

7U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Double Rnbo 8486 A	0 - 4 JMW	.2	None Found
	4 - 7	.16	NF
Split Core	73 - 78	.24	NF

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 8U (8580B). Completed November 24, 1967. Log by J. M. W.

Location: S. 788.74, W. 58.92. Drilled from Richmond Level.

Collar elevation 4902.21'. Vertical angle -90°.

Cored 1.5-405' Recovery 394.5/403.5 or 97.7%

Depth	Lithology
0-1.5	Cased.
1.5- 5	Gray green glauconitic dolomitic sandstone with manganese mineralization.
5- 14	Brown limonitic sandstone. Very vuggy.
14- 20	Brown to gray glauconitic dolomitic sandstone with abundant pyrite from 14-15.
20- 30	Dark brown calcareous sandstone with abundant iron oxide. Some argillaceous calcareous sandstone beds.
30- 46	Gray green glauconitic dolomitic sandstone with scattered fine grained pyrite.
46- 85	Gray to brown to brownish green argillaceous sandy limestone. Scattered glauconite.
85- 92	Gray brown limestone with abundant flat gray limestone pebbles.
92-102	Gray calcareous dolomitic with moderate flat gray white limestone pebbles. Scattered glauconite.
102-103	White fine grained porphyry with abundant kaolin alteration.
102-130	Gray dolomitic limestone with moderate gray shale partings. Scattered to moderate flat gray white limestone pebbles. Scattered glauconite.
130-141	Gray white feldspar porphyry. 15% white feldspar phenocrysts altered to kaolin. Gray fine grained matrix.
141-180	Light gray limestone with moderate thin gray shale partings. Scattered flat gray white limestone pebbles.
180-223	Dark gray thin bedded shale with scattered flat gray white limestone pebbles. Thin beds of limestone with limestone pebble conglomerate. Some pebbles stained pink to red on edges.
223-231	Gray white feldspar porphyry. 30% white feldspar phenocrysts 0.1-0.2". Gray white matrix.
231-241	Dark gray thin bedded shale with scattered flat gray white limestone pebbles. Thin beds of limestone.
241-250	Gray to gray green limestone with red line fossils.
250-282	Dark gray thin bedded shale with scattered limestone pebbles near top. Abundant glauconite 273-275'.
282-288	Gray green phonolite. Ferromagnesian phenocryst 20%, feldspar 20%. Scattered large feldspar phenocrysts. Gray green fine grained matrix.
288-295	Gray thin bedded shale.

(OME-6558 (Silver))
(Contract No. 2233)

Hole No. 8U (8580B) (continued)

Depth	Lithology
295-299	Gray green phonolite. Ferromagnesian and feldspar phenocrysts each 20%.
299-305	Gray thin bedded shale.
305-309	Gray green phonolite.
309-310	Gray limestone with gray shale partings.
310-311	Gray green phonolite.
311-318	Gray limestone with scattered gray white limestone pebbles and gray shale partings.
318-328	Gray to gray green phonolite. Last 2' limestone breccia and phonolite.
328-336	Gray limestone with moderate flat gray white limestone pebbles and gray shale partings.
336-342	Gray green phonolite.
342-347	Gray limestone with moderate flat gray white limestone pebbles with scattered gray shale parts.
347-349	Gray thin bedded shale.
349-351	Gray to light gray green phonolite.
351-365	Gray to light gray limestone with scattered flat limestone pebbles. Calcite filled fracture from 361-363.
365-375	Light gray dolomite. Dark gray very thin beds at base. Very scattered pyrite.
375-404	Gray massive quartzite. Moderate pyrite mineralization and pyrite filled fractures at 376 and 402. Galena mineralization at 376 and sphalerite at 401.
404-405	Gray feldspar porphyry with abundant large feldspar phenocrysts. Kaolin alteration.

end

Date November 27, 1967 Double Rainbow DD Hole 8580B **ASSAY REPORT**

8U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
D D Hole 8580 B Sludge	2 - 5	.1	*NF
Sludge	5 - 10	Tr	NF
	10 - 15	Tr	NF
	15 - 20	.08	NF

Date November 27, 1967 Double Rainbow D D Hole 8580 **ASSAY REPORT**

8U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
D D Hole 8580	350 - 355	NF	*NF
Sludge	355 - 360	NF	NF
	360 - 365	NF	NF
	365 - 370	NF	NF
	370 - 375	.08	NF
	375 - 380	Tr	NF
	380 - 385	.24	NF
	385 - 390	.26	NF
	390 - 395	.08	NF
	395 - 400	.2	NF
	400 - 405	.44	NF

Date November 28, 1967 Double Rainbow D D Hole 8580B **ASSAY REPORT**

8U	SAMPLE	Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
Dbl.Rnbow D D Hole 8580B	1.5-5	*NF	NF
JNW Split Core	5-10	NF	NF
	10-15	NF	NF
	15-20	NF	NF

*None Found

(OME-6558 (Silver))
(Contract No. 2233)

DOUBLE RAINBOW PROJECT

Diamond Drill Log

Hole No. 9U (8593B). Completed December 13, 1967. Log by J. M. W.

Location: S. 992.34, W. 281.45. Drilled from Richmond Level.

Collar elevation 4925.67. Vertical angle -90°.

Cored 1.5'-510' Recovery 479.5/508.5 or 94.3%

Depth	Lithology
0-1.5	Cased
1.5- 10	Brown argillaceous sandstone with abundant iron oxide and manganese at 2'.
10- 23	Brown quartzite with beds of argillaceous calcareous sandstone. Minor manganese throughout.
23- 40	Gray brown quartzite with fine grained pyrite. Minor amounts of manganese.
40- 42	Gray green porphyry. Very badly altered with kaolin alteration.
42- 53	Gray to gray green glauconitic sandstone with strong vertical fractures from 48-50. Fractures filled with iron oxide and manganese.
53- 62	Gray brown calcareous sandstone with some argillaceous material. Moderate iron oxide.
62- 89	Brown argillaceous sandy limestone with moderate iron oxide. Calcite filled fractures from 66-67 and thin green shale partings near base.
89-106	Gray to reddish gray argillaceous limestone with flat limestone pebble conglomerate. Calcite and manganese filled fractures from 91-92 and manganese at 106.
106-110	Fine grained greenish buff feldspar porphyry. Abundant kaolin.
110-131	Gray to gray brown to brown limestone with abundant gray shale partings. Scattered glauconite.
131-139	Brown porphyry with 20% white feldspar phenocrysts 0.1"-0.2". Badly altered and manganese at 139.
139-187	Gray to gray brown limestone with abundant gray shale partings. Scattered glauconite.
187-203	Gray thin bedded shale with moderate thin limestone beds. Scattered flat limestone pebble conglomerate and scattered limestone pebbles. Some pebbles stained pink to red on edges.
203-207	Light gray to gray white feldspar porphyry. 30% feldspar phenocrysts. Fine grained pyrite mineralization. Abundant kaolin.
207-224	Gray thin bedded shale with scattered limestone pebbles and limestone beds.
224-256	Gray white feldspar porphyry. 40% feldspar phenocrysts 0.7"-0.3". Gray white matrix and moderate pyrite mineralization. Some phenocrysts up to 0.5".

(OME-6558 (Silver))
(Contract No. 2233)

Hole No. 9U (8593B) (continued)

Depth	Lithology
256-286	Gray thin bedded shale with moderate limestone beds, flat limestone pebble conglomerate and scattered limestone pebbles.
286-290	Gray to green limestone with abundant glauconite. Red lined fossils. (?)
290-316	Gray thin banded shale with local beds of abundant glauconite.
316-322	Gray fine grained phonolite with scattered phenocrysts.
322-327	Gray thin bedded shale.
327-340	Gray to gray white feldspar porphyry. 40% feldspar phenocrysts 0.2"-0.3". Gray matrix. Scattered fine grained pyrite.
340-342	Gray shale with beds of limestone.
342-345	Gray white feldspar porphyry.
345-346	Gray bedded limestone.
346-349	Gray white feldspar porphyry.
349-353	Gray limestone with thin gray shale partings.
353-367	Gray to gray green phonolite. 20% dark ferromagnesian phenocrysts. Gray matrix.
367-369	Gray limestone with flat limestone pebbles.
369-373	Gray to gray green phonolite.
373-377	Gray massive limestone with flat limestone pebbles.
377-380	Gray white feldspar porphyry.
380-395	Gray limestone with beds of gray shale and gray shale partings. Limestone at base.
395-402	Gray to light gray dolomite. Scattered beds of glauconite. Some pinkish gray color.
402-409	Gray green phonolite.
409-412	Gray massive dolomite with scattered pyrite mineralization.
412-434	Gray massive quartzite with scattered to moderate pyrite mineralization. 426 slickenside.
434-447	Dark gray dolomitic sandstone with scattered glauconite.
447-481	Gray white clean, coarse to fine grained pyrite mineralization. Quartz pebble conglomerates from 460-461, 466-467, 469-470, and 477-479. Pyrite mineralization from 469-470.
481-486	Red well oxidized sandstone with abundant mica from Precambrian.
486-510	Red to gray muscovite schist. Oxidized near top. Thin banded with scattered quartz stringers.

end

Date December 19, 1967 Diamond Drill Sludge ASSAY REPORT
Double Rainbow Project

9U	SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
D D Hole 8593	2 - 5	JMW	.2	NF
Sludge	5 - 10		.2	NF
	10 - 15		.24	NF
	15 - 20		.2	NF
B	370 - 375		trace	NF
	375 - 380		trace	NF
	380 - 385		trace	NF
	385 - 390		trace	NF
	390 - 395		.08	NF
	395 - 400		.08	NF
	408 - 410		.06	NF
	410 - 415		trace	NF
	415 - 420		.1	NF
	420 - 425		.1	NF

Date December 21, 1967 Diamond Drill Sludge ASSAY REPORT
Double Rainbow Project

9U	SAMPLE		Silver Oz. Per Ton	Dollars per Ton at $20.67
Dbl Rnbo D D 8593 B	1.5 - 5	JM	.12	NF
Split Core	5 - 10		.12	NF
	10 - 15		NF	NF
	15 - 20		.2	NF
	395 ~~295~~ - 400		NF	NF
	400 - 402		NF	NF
	409 - 415		.14	NF
	415 - 420		NF	NF
	434 - 439		NF	NF
	439 - 444		NF	NF
	444 - 447		NF	NF
	460 - 466		NF	NF
	466 - 472		NF	NF

NF = None Found

HOMESTAKE MINING COMPANY - GEOLOGY DEPARTMENT

DIAMOND DRILLING

HOLE NO. 8263A COMPLETED 7-17-68 LOG BY OMH

LOCATION Dorie Rawhide, Lower Contact / 10U COLLAR ELEVATION 4541 39

DIRECTION Vertical VERTICAL ANGLE -90°

DEPTH	FORM	LITHOLOGY	INTERVAL	MINERALIZATION	SURVEY	
0 - 3.5	Tph	Gry.grn. phonolite porp. w Pheno. to 10mm. most <5 mm. v. fresh, no alter.		Sec. Rock I.D		
3.5 - 5.0'	℄ Dw	Blk sh, non-calc. grading to blk sh, slightly calc w. flat lms pebbles. ‖ to bdg.				
5.0 - 6.0		Wht. lms. (70%) w. blk interbedded shale.				
6.0 - 12.0		Gy to tan lms (80%) w. little interbedded sh. Lms fine grained to granular, some reddish bands of lms. Zone grades - v. fine gr. to granular (1mm @ 12.0'				
12.0 - 18.0		Sandy text. gry to red gry lms. (90%) w thin (0.1 to 1 cm) interbedded calc. sh. Sh. tend to drk gry greenish color.				
18.0 - 19.3		Sandy Gy Green lms (70%) interbedded w. drk gry grn calc. sh.				
19.3 - 21.0	Tph	Gy grn phonolite porp w Pheno. to 10mm. most <5 mm. Altered felsic pheno 20.8' - to 21.0'		Sec. Rock I.D		
21.0 - 22.0 Lower Contact		Sandy text. gry grn. lms. (70%) interbedded w. drk grn calc sh.				
22.0 - 25.0		Gy to fleshy gry fine grained qtzite w. mod fine grained py. 67% RECOVERY OF CORE. V. poor recovery of Contact. Fine py in non-to mod in qtzite	22.0 22-25	Pb S. x/y 5mm w. much py in chips recov. py. py.		
25.0 45.5		Gy fine grained thin bedded qtzite w scattered tiny vugs filled w. py, py finely dessim. in qtz. <- 0.5%				

HOMESTAKE MINING COMPANY - GEOLOGY DEPARTMENT

DIAMOND DRILLING

HOLE NO. 8313A COMPLETED _____ LOG BY Zof

LOCATION _____ COLLAR ELEVATION _____

DIRECTION _____ VERTICAL ANGLE _____

DEPTH	FORM	LITHOLOGY	INTERVAL	MINERALIZATION	SURVEY	
45.5 - 50.0	Tp	Lgt gry tan porphyry without blk minerals, pheno 1-3mm w. occassional pheno to 10mm. 0.5mm hairline frac. ∥ & ⊥ bdng filled w. py, occassional py clot to 8mm.	45.5-55	num. py filled frac. (Sec. py in frac. Rock ID)		
50 - 66.0	Tp	Lgt gy tan porphyry without blk min, Pheno 1-5 mm, occassional pheno > 10mm. V few to no thin frac. filled w. py.		Rock ID alteration		
66.0 - 67.0	Tph?	Drk gy gry phonolite porp w. blk min. Pheno 1-5 mm. Occasional pheno > 10mm. Little to no py & only as frac. fill.		Sec. Rock ID w/ alteration?		
67.0 - 68.5	Tp	Lgt gy tan porphyry without blk min. Pheno 1-5 mm, few thin py fill frac.		Sec. Rock ID alteration?		
68.5 - 70.3	Tp	Drk gy gry phonolite porp w. blk min. Pheno 1-5 mm.		Have blk min been altered to Prod py?		
70.3 - 78.0	Tp	Lgt gy to tan porphyry without blk min. Pheno 1-5 mm, occassionally > 10mm.				
78.0 - 80.5	Tph?	Gy to gy gry phonolite porp. w. Drk gy to blk min. Pheno 1-5 mm.				
80.5 - 81.5	Tp	Lgt gy-tan porphyry without Blk min.		Sec. Alteration?		
81.5 - 86.0	Tph?	Gy gry phonolite porphyry Pheno 1-5 mm - occ. > 10mm				
86.0 - 86.3	CDv	Gy qtzite, homog-fine grained				
86.3 - 90.0	Tph?	Gy gry to Lgt gy tan porphyry phono?, Phonolite appears altered in spots		Sec. Alteration		
90.0 - 95.0	CDw	Gy sandy tan dol. v. lit. to no sh.				
95.0 - 101.0	Tph	Gy gry to Lgt tan phonolite porphyry locally altered? @ 96' Py clot (2") in topal porphyry	96'	Blk py clot 2" in porphyry. Sec. Alteration		

HOMESTAKE MINING COMPANY - GEOLOGY DEPARTMENT

DIAMOND DRILLING

HOLE NO. 9965A COMPLETED 7-17-68 LOG BY

LOCATION COLLAR ELEVATION

DIRECTION VERTICAL ANGLE

30°

DEPTH	FORM	LITHOLOGY	INTERVAL	MINERALIZATION	SURVEY	
101.0 - 102.0	ЄDw	Lgt gy dol. w v. lit fine py. black crecentric fossils?				
102.0 - 103.0	Tp	Lgt tan porphyry w pheno 1-5 mm, few > 15 mm. few blk inclusions of dol.				
103.0 - 106.0	ЄDw	Drk gy sandy text. dol. few red stained dol. grains. Little sh. grading into trace of glauconite.				
106.0 - 113.0	ЄDw	Drk gy sandy text glauconitic dol. trending to conglomeratic w pebbles. (< 10%) to 8 mm.				
113.0 - 116.0	ЄDw	Drk gy sandy dol, w. glauconite grading out and grading to shaly dol. w. py clots to 1/4" < 1"	113-1160	few scat py clots		
			113	1/2" Calcite filled frac. @ 20° to core axis		
116.0 - 117.8	ЄDw	Drk gy dolomitic sh, few thin beds sandy text. little fine py	1160-1180	fine py, scat		
X			125'	Strong water flow		
117.8 - 128.0	Tp	Lgt gy porphyry, matrix fine grained to glassy feld. phenos bleached altered (pitted) and range to 10 mm. fine py dess.				
128.0 - 131.0	Tp	Gy porphyry, matrix fine grained to glassy, feld. phenos fresh to slightly bleached, range to 8 mm.				
131.0 - 158.3	Tp.	Lgt gy to tan porphyry, matrix fine grained to glassy, feld phenos 1 to 5 mm, occasionally > 10 mm (pitted) [illegible] fine py. dess throughout				
158.3 - 187.0	ЄDw.	Gy med fine grained qtzite. relatively homo, slight x bedding locally traces of dolomite or carbonate - Quite pure qtzite.	165	1" bd fine dess. py		
			170-171	Dess py.		
187.0 - 187.2	ЄDw	Drk gy to near blk vuggy dolor. calcite xls 1 mm. grain size w. vugs to 3 mm, w. fine py. 1/2" Calcite veinlet, band ⊥ to frac walls [illegible]	1870-1872	py, v fine.		
			185'	Strong water flow		

G0301

HOMESTAKE MINING COMPANY - GEOLOGY DEPARTMENT

DIAMOND DRILLING

HOLE NO. 8863A COMPLETED 7-17-68 LOG BY

LOCATION COLLAR ELEVATION

DIRECTION VERTICAL ANGLE

DEPTH	FORM	LITHOLOGY	INTERVAL	MINERALIZATION	SURVEY	
187.2 - 187.6	ЄDw.	Lt gry qtzite, homo, med fine grained,				
187.6 - 188.0	ЄDw	Dk gy dolomite v/s w. fine py.				
188.0 - 196.5	ЄDw	Tan to lt red brn. sandy text. lms. slightly dolomitic - dol. fine grained to silty text.	192 - 193	pseudo conglomerate lms clasts to 1/2" in sandy text lms		
196.5 - 202.5	ЄDw.	Gy tan silty text dolomite to fine sand. text.	200.5	2" py clast v fine grained.		
202.5' - 203.0	ЄDw	Gy shaly dolomite @ 202.0 calcite veinlets ⊥ bedding 2mm wide.				
203.0' - 218.0	PЄ	Gy to med drk gy thin bd mic sch. no coloration at contact. Fol 45° to core axis. Clean sharp contact.				

Assay Form No. 9

Diamond Drill Cores

Date July 27, 1968

ASSAY REPORT

10U	SAMPLE		Silver Oz. Per Ton	GOLD Dollars per Ton at $20.67
D D Hole 8863 A	21 - 25	OMH	NF	NF
DOUBLE RAINBOW	25 - 30		NF	NF
10U	30 - 35		NF	NF
Core	35 - 40		NF	NF
	40 - 45		NF	NF
	45 - 50		NF	NF
	50 - 55		NF	NF

G0301

HOMESTAKE MINING COMPANY
Double Rainbow Project

Exploration & Development

	NOVEMBER 1968		4/1/67-11/30/68	
Engineering & Geology Supervision				
Engineering & geology	$ -		$ 2,192.50	
Supervision	1,058.65		23,746.94	
Outside consultant	182.00	$ 1,240.65	1,633.40	$ 27,572.84
Diamond Drilling & Assaying				
Surface diamond drilling	6.30		15,676.85	
Underground diamond drilling	-		16,844.85	
Assaying	394.00		11,487.00	
Sampling	84.76	485.06	1,984.58	45,993.28
Initial Construction-Surface				
Grading	-		941.06	
Hoist & accessories	-		4,111.62	
Compressor & lines	-		5,758.60	
Headframe & dump	-		8,080.14	
Buildings & accessories	-		11,341.31	
Electrical installation	-		6,138.43	
Vehicles	-		(633.14)	
Small tools & equipment	-		1,717.42	
Water & sewer system)				
Storage areas & fuel tanks)	-	-	7,778.26	45,233.70
Shaft & Stations				
Shaft sinking	-		62,887.03	
Shaft maintenance	311.34		3,090.11	
Skips and cages	94.19		2,374.92	
Station	-		20,825.18	
Skip loader	-	405.53	3,145.38	92,322.62
Drifting, Raising & Stoping				
Drifts - 8x10	56.52		53,222.21	
Drifts - 6x6 - upper contact	-		31,325.83	
Drifts - 6x6 - lower contact	4,836.97		50,501.93	
Drift rehabilitation	-		17,379.82	
Stopes	493.57	5,387.06	6,051.38	158,481.17
Underground Equipment				
Drills & accessories	402.85		19,937.45	
Trucks, loaders & accessories	494.42		11,667.31	
Slushers & accessories	94.00		8,669.40	
Fans & ventilation lines	-		4,088.89	
Pumps & drainage lines	553.60		30,001.24	
Miscellaneous small equipment	-		540.36	
Air and water lines	1,459.95		5,726.90	
Power system	901.57	3,906.39	7,663.77	88,295.32

Double Rainbow Project
Exploration & Development - Continued

	NOVEMBER 1968		4/1/67-11/30/68	
Power & Fuel				
Electric power	$1,535.45		$28,180.08	
Fuel & pols	-		3,423.86	
Power system-surface	-	$ 1,535.45	114.08	$ 31,718.02
Mine General Expense				
Shop expense & plant maintenance	12.64		4,500.68	
Deliver & transportation	895.72		10,390.29	
Yard & road expense	139.10		2,268.03	
Building expense	434.16		2,287.52	
Mine cap lamps	-		87.87	
Metallurgical testing	-		3,499.56	
Water testing	23.53	1,505.15	191.78	23,225.73
Hoisting & Rock Handling				
Hoist operation	807.31		18,612.65	
Ore disposal	67.35		6,344.43	
Waste disposal	149.54		7,693.35	
Skip loader operation	394.88		12,112.18	
Ore weighing	-	1,419.08	55.45	44,818.06
Taxes, Other than F.I.T.				
Property taxes		-		2,220.96
Administrative				
Legal fees & expenses	-		4,421.04	
Lease rentals	-		400.00	
Other	-	-	82.77	4,903.81
TOTAL		$15,884.37		$564,785.51

HOMESTAKE MINING COMPANY
Double Rainbow Project

Expenditure Summary

Item of Work	Estimated	Participation Gov.	Participation HMCO.	Expenditures Month Nov.	Expenditures Total To Date	Unexpended
Engineer & Geology						
Consulting	$ 2,950	$ 2,212	$ 738	$ 182	$ 1,633	$ 1,317
Homestake	10,500	-	10,500	1,059	25,940	(15,440)
Diamond Drilling						
Surface	16,805	12,604	4,201	6	15,677	1,128
Underground	11,745	8,809	2,936	479	30,316	(18,571)
Surface Grading	2,000	-	2,000	-	941	1,059
Surface Plant						
Hoist & accessories	4,500	-	4,500	-	4,112	388
Compressor & lines	1,100	-	1,100	-	5,759	(4,659)
Headframe & dump	7,500	-	7,500	-	8,080	(580)
Building & accessories	24,700	-	24,700	-	11,341	13,359
Electrical equipment	18,000	-	18,000	-	6,138	11,862
Fan & accessories	1,500	-	1,500	-	4,089	(2,589)
Vehicles & trucks	4,000	-	4,000	-	(633)	4,633
Small tools	4,500	-	4,500	-	1,717	2,783
Water & sewer	3,000	-	3,000	-	7,778	(4,778)
Shaft Sinking						
Shaft	57,200	42,900	14,300	-	62,887	(5,687)
Station & pocket	13,500	10,125	3,375	-	20,825	(7,325)
Skip loaders & misc.	5,940	4,455	1,485	406	8,610	(2,670)
Water allowance	11,440	8,580	2,860	-	-	11,440
Upper Contact						
Rehab. haulage	6,400	-	6,400	-	17,380	(10,980)
Drift 6x6	49,000	36,750	12,250	-	31,326	17,674
Lower Contact						
Drift 8x10	85,000	63,750	21,250	57	53,222	31,778
Drift 6x6	54,250	40,688	13,562	4,837	50,502	3,748
Underground Equipment						
Drills & accessories	5,000	-	5,000	403	19,937	(14,937)
U.G. trucks	20,000	-	20,000	-	* 26,606	(6,606)
Rock Bolts	4,350	3,262	1,088	-	-	4,350
Sub Total	424,880	234,135	190,745	7,429	414,183	10,697
All Other	-	-	-	8,455	177,209	(177,209)
Total	$424,880	$234,135	$190,745	$15,884	$591,392	$(166,512)

* Capitalized
Rock bolting charges included in shaft sinking and drifting
Water allowance charges included in shaft sinking and drifting

MINERALOGY OF THE LOWER CONTACT ZONE OF THE DOUBLE RAINBOW MINE, GALENA, SOUTH DAKOTA

By
David H. Garske[1]

The occurrence of silver with galena or its oxides in the Galena District has been known since at least 1877. The ore occurs in two horizons (Upper and Lower Contact Zones) near the top and bottom of the Deadwood formation. The ore usually is localized near vertical fractures in a dolomitic rock. In the Upper Contact Zone the rock is loosely cemented and fairly friable, and in the Lower Contact Zone in many areas it grades into a dolomitic quartzite.

Both contact zones have been mined near the surface, but little prospecting for subsurface deposits has been done. In the winter of 1966-1967 the Double Rainbow Mining Company began a drilling program near the entrance of the old Double Rainbow Mine, which is southeast of Galena above Bear Butte Creek. All holes penetrated the Deadwood formation and some mineralization was noted. On the basis of these holes an OME loan was secured to sink a shaft and do the exploratory drifting. A 290 foot vertical shaft was sunk, and exploration drifts were extended into the ore zone.

On April 8, 1968, a visit to the mine revealed that the ore is quite vuggy and unoxidized, in contrast to other deposits in the district. Pockets range up to two feet (60 cm) across, and are lined with excellent crystals of most of the ore minerals. Notes on the individual minerals follow:

ARSENOPYRITE

It was identified by color, crystallography, and x-ray powder diffraction. Arsenopyrite was erronously identified as loellingite in the district (Connolly and O'Harra, 1929). It usually occurs as crystals which are tarnished dull gray on the outside and are tin white when broken. It rarely is found in the massive ore. Larger crystals often are hollow twinned pseudomorphs after pyrrhotite crystals, and contain small crystals of arsenopyrite, sphalerite, and pyrite. Measurement of one crystal apparently a centimeter thick showed a wall only 50 microns thick, but uniform in thickness around the crystal. Often the crystals are coated with micro second generation galena crystals, or an extremely thin layer of secondary pyrite. The size of the crystals ranges from about 40 microns to over three centimeters in the complex twins.

CHALCOPYRITE

It was identified by color. Chalcopyrite probably is the least abundant sulfide, although in small amounts intermixed with pyrite it would be hard to detect without polished sections. In the only specimen noted the mineral occurred as a vein filling in pyrite which was about 1-2 mm thick.

GALENA

It is easily identified visually, except for the second generation which was identified by x-ray powder diffraction. Galena is quite abundant as cavity fillings, and is rarely found in the massive ore. The first generation of crystals occur as twinned cubes and octahedrons up to 3 cm across, and the second stage occurs as extremely small crystals coating the octahedral faces of the primary galena, and as thin coatings on arsenopyrite crystals. The galena is silver bearing, and possibly part of the second generation of galena could contain a silver sulfide or sulfosalt. About equal amounts of silver were found with the galena and sphalerite concentrates, depending on the type of flotation technique used.

KAOLINITE

It was tentatively identified visually as a rare occurrence in the quartzite.

PYRITE

It was identified by color and crystallography. The first generation of pyrite was the first mineral to replace the quartzite, and is the most abundant sulfide in the deposit. The mineral ranges from traces in quartzite to essentially pure pyrite bodies. It replaces quartz grains, fills fractures, and coats the inside of cavities in the quartzite. The second generation of crystals were almost the last mineral to form. First stage crystals are striated cubes, and the second generation crystals, when large enough to see, are octahedrons. Crystal size ranges downward from 1 mm with rare exceptions.

PYRRHOTITE

Although pyrrhotite has not yet been found in the mine, arsenopyrite crystals often occur as large pseudohexagonal crystals which have the crude form of pyrrhotite crystals. This phenomona is well known from other mining district, and could be expected here.

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SIDERITE

Siderite was identified visually, and by chemical, optical, and x-ray diffraction techniques. It was one of the last minerals to form and apparently crystallized in at least two stages. In some areas small siderite crystals are coated with a second stage of the same size crystals which do not show a crystallographic relation to the first crystals. There is often a gap between the two ages of crystals; with the gap having the outline of the primary crystals, as if part of the siderite has dissolved after the second generation had formed. Some of the crystals contain micro pyrite crystals, and also have cavities which may be equal to 50 percent of the volume of the crystal. These cavities appear to be growth phenomena. Crystal size ranges from 250 microns to over 3 cm.

SPHALERITE

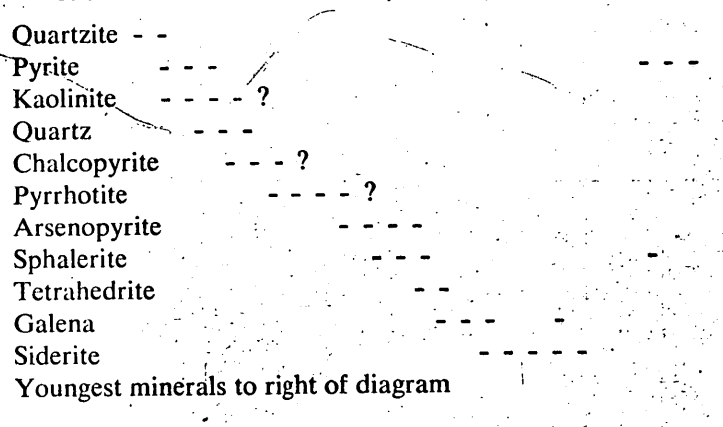
It was identified visually. Iron rich sphalerite is locally abundant mixed with the massive pyrite, and probably represents a significant ore of zinc. Sphalerite is the only sulfide noted other than pyrite which is abundant in the massive ore. When found in vugs it occurs as 1 mm black crystals with a rather poor cleavage.

TETRAHEDRITE

A silver rich tetrahedrite, fribergite, was identified by crystallography and x-ray powder diffraction. It was noted as 200 micron to 2 mm crystals associated with sphalerite and arsenopyrite. The crystals are usually tarnished, and may be mistaken for tarnished chalcopyrite crystals. If it does occur in the massive ore it would be hard to identify without polished sections. The majority of the silver noted in the sphalerite concentrates probably is due to associated tetrahedrite.

FIGURE 1

Paragenesis of Minerals in the Lower Contact Zone of the Double Rainbow Mine, Galena, South Dakota



REFERENCE

CONNOLLY, JOSEPH P., and O'HARRA, CLEOPHAS C., 1929, The Mineral Wealth of the Black Hills: South Dakota School of Mines and Technology Bulletin No. 16.

JOHNSTON

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over 40 years ago, when we invented drillstem testing and called ourselves **Johnston Testers.** Today, the name **Johnston** is synonymous with the finest formation evaluation, completion, production, workover, secondary recovery and fishing equipment. Finding better ways is our way of life.

DOUBLE RAINBOW No 1 Slusher Drift

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *			
	Ag	Au	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au	Pb	Zn
H 55 @ 0'	7.0	3.39	1.8	1.9								
H 56 6' Northwest	4.4	3.05										
H 57 12' Northwest	5.6	0.68	1.1	1.1								
H 140 23' Northwest	6.1	2.71	1.0	1.1								
H 141 26' Northwest	6.2	12.53	1.0	0.8								
H 142 28' Northwest	1.1	NF										
H 177 32' Northwest	2.1	0.34			No face samples due to coving ground							
H 178 33' Northwest	7.8	2.03	1.6	1.1								
H 179 38' Northwest	6.2	0.68	1.7	1.0								
H 180 41' Northwest	10.6	0.68	1.8	1.0								
H 195 45' Northwest	7.0	2.71	1.0	1.8								
H 196 Bar rock	19.7	4.91	4.8	3.3								
H 227, 49' from plug o	8.0	4.23	1.4	0.9								
F 44 7'x6' 49.5 plug o					12.8	5.59	2.2	1.5	12.8	5.59	2.2	1.5
H 228 plug bottom	14.1	4.23	2.1	0.9								
F 48A, 3.5'x6, 51.5' plug					21.4	8.47						
F 49B, 3'x6' " "					11.5	5.59	1.4	0.8	16.8	7.14	0.7	0.4
H 229, 51' from plug o	?	?	?	?								
H 230 56' from plug	20.8	11.18	3.4	1.5								
AVERAGES MAY, 1968	8.6	3.55	1.9	1.4								
H 251, 63' from plug	24.2	1.69	3.5	2.4								
F 55, 8'x6', 63' from plug					48.8	3.39	9.1	3.2	48.8	3.39	9.1	3.2
H 252, 70' from plug	30.5	4.91	2.0	1.2								
F 82, 6'x6', 69' from plug					27.2	14.05	2.3	4.3				
F 83, 4'x6', " " "					6.0	6.27	0.2	0.2	16.6	10.16	1.2	2.2
H 253, 77' from plug	27.2	5.59	2.2	1.2								
F 65 5'x6', 15' from plug 1					26.2	6.94	4.4	3.7				
F 66 5'x6' " " "					19.8	8.47	1.7	1.6				

DOUBLE RAINBOW № 1 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
H 254, 84' from o plug	13.2	1.69	1.7	1.6												
F 73A, see sketch, 26.5'					8.7	3.05	0.6	1.2								
F 73 B, " " " "					3.6	2.03			5.6	2.10	0.1	0.2				
H 267, 92' from o plug	12.6	2.71	2.3	1.8												
F 69A, 3'x6', 31' plug #1					17.4	8.47	1.8	2.8								
F 70 B 3.5'x6' " "									10.0	5.00	1.0	1.5				
H 268, 98' from o plug	11.2	4.06	1.9	1.2												
F 76A, 2.5'x5.5' 33' plug 1					3.4	0.68										
F 76 B, 4'x5.5' " "					33.5	8.30	9.1	1.7	18.0	3.30	4.5	0.8				
H 269, 104 from o plug	7.6	3.22	1.3	1.0												
F 78A, see sketch 39' plug #1					1.2	0.68										
F 78B, " " " "					10.7	5.08	0.6	1.0	5.5	2.70	0.2	0.3				
H 270, 110' from o plug	10.0	7.28	1.6	1.2												
F 80, 6'x1', 45' from plug 1					7.9	5.59	1.2	1.1	1.3	1.00	0.2	0.2				
H 289 0+128'	13.2	5.59	4.8	2.3												
H 290 0+134	24.0	3.39	11.4	1.5												
F 83A, 3'x6', 52' plug 1					1.0	NF										
F 83 B, 4'x6', " "					9.8	8.47	1.2	0.9	5.4	4.24	0.6	0.5				
H 307 0+140'	6.0	5.59	0.9	1.1												
F 87A, 1.5'x6', 59' plug 1					1.5	NF										
F 87 B, 2.5'x6', " "					15.3	6.94	1.4	2.0	6.7	3.35	0.6	0.8				
H 308 0+146'	8.0	6.27	1.3	1.0												
H 309 0+152	4.3	5.59	1.0	1.0												
F 89A see sketch, 64' plug 1					1.3	NF										
F 89B " " " "					24.1	6.27	6.8	2.8	14.1	3.50	3.8	1.6				
H 310, #0 plug + 158	6.6	2.71	1.80	1.2												
F 102 A (6.5 x 7) 1 1+70'					1.2	0.68										
F 102 B (4.8 x 7) 1 " "					13.5	5.76	2.4	0.8								
F 102C (1 x 4) 1 " "					10.0	4.23	0.6	0.5	9.4	3.00	1.5	0.8				
H 327, 164 from plug 0	8.6	6.94	1.2	3.1												
F 106 A (2x6) 2+13.5					NF	NF										
F 106 B (3x6) "					9.9	6.94	2.0	2.7								

DOUBLE RAINBOW No 1 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
F111A 3 2+19.5					4.0	2.03										
F111B " "					8.5	4.14			6.3	3.08	1.0	1.0				
H328 #D+170'	8.3	5.57	0.8	2.3												
F113A (2x6) 2+24'					2.7	2.71										
F113B (3x6) " "					11.8	6.55			5.8	3.60	1.0	1.0				
Averages June 1967	13.5	4.55							12.1	4.00	1.9	1.2				
H329 0+176	10.8	4.23	1.1	2.6												
F116A 2x5.5, 2+32					NF	NF										
F116B 2.7x5.5, "					16.1	4.80	3.9	2.9								
F116C 3.3x5.5, "					1.2	2.71										
H330 0+180	4.4	7.62														
F121A, see sketch 2+39					4.4	NF										
F121B " " "					26.9	12.19	5.8	6.0								
H339 0+188	3.6	1.35														
F124A 1.9x5.5 2+43.5					1.0	NF										
F124B 1x5.5 "					1.3	NF										
F124C 4.2x5.5 "					14.5	9.70	4.4	5.8								
H340 0+202	4.0	1.35														
F128A 2.9x5.5, 2+55					2.3	6.94										
F128B 2.6x5.5, "					4.0	4.23										
F128C 2.4x5.5, "					1.1	NF										
H341 0+208	3.7	2.03														
F131A no sketch 2+67					1.0	NF										
B "					10.2	5.59	5.4	4.4								
C "					1.7	3.56										
F136A 2x5.5 2+78					1.0	NF										
B 2.3x5.5 "					6.5	1.35	0.4	0.7								
C 2.6x5.5 "					0.2	NF										

DOUBLE RAINBOW № 1 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
F139 A 1.9x5.5 3+8					1.3	NF										
B 3.0x5.5 "					3.8	4.91										
C 2.8x5.5 "					1.1	NF										
F142 A 1.6x6 3+14.5					1.4	NF										
B 0.9x6 "					6.2	0.69	1.9	0.1								
C 4.5x6 "					3.6	0.69										
H342 0+210	3.5	NF														
F143 A 2.6x6 3+21					1.1	NF										
B 1x6 "					9.6	3.56	1.9	1.7								
C 4.3x6 "					1.0	NF										
H344 0+216	3.7	NF														
F148A 2.5x6 3+27					2.6	NF										
B 5x6 "					50.7	6.94	14.7	7.5								
H345 0+222	30.1	2.71	9.2	2.4												
H346 0+228	12.0	0.68	3.4	2.8												
F152A 2.2x5 79' from #2 of					1.0	NF										
B 1.2x5 dft #6					21.4	8.47	7.4	6.7								
F155A 1.5x6 84' from #2 of					0.4	NF										
B 1.0x6 #6 dft.					5.8	NF	2.4	0.5								
C 5.2x6					2.0	0.68										
H356 0+242	0.3	NF														
F157A 2x6 91' from #2 plug					0.6	NF										
B 1x6 of #6 dft.					0.6	NF										
C 1.5x6					36.8	4.23	20.7	4.8								
D 3x6					1.3	0.68										
H357 0+246	4.8	0.68														
F159A 2.1x6 3+58					1.7	0.68										
B 2.5x6 "					0.8	0.68										

DOUBLE RAINBOW No 1 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
F161A 2.6x6 3+67?					1.0	0.34										
B 1.8x6 3+67					9.2	6.27	1.5	1.6								
F162A 2x6 3+62.5?					1.7	NF										
B 1x6 "					1.9	NF										
C see sketch					42.4	6.94	14.1	0.9								
D " "					1.2	NF										
H358 0+248	6.2	1.35	2.0	0.8												
F164A 2.7x6 3+76					1.5	0.34										
B 2.6x6 "					17.6	7.28	4.1	4.0								
C 2.3x6 "					0.2	NF										
H359 0-260	9.2	1.69	3.1	1.1												
H367 0+268	30.1	2.71	10.3	1.4												
F169A 2x6 3+83					0.5	NF										
B 3.5x6 "					2.7	2.71										
H369 0+272	14.3	0.68	3.7	1.2												
F170A 2.9x6 3+89.5					1.0	0.68										
B 4.1x6 "					4.3	2.75										
H370 0+275																
H371 0+281	7.0	1.35	1.4	1.2												
F171A 2x6 4+65					NF	NF										
B (sketch) "					1.7	1.35										
H320 ?	15.1	3.56	4.0	1.7												
F173A 1x6 4+12					1.8	NF										
B 4.3x6 "					5.0	0.68	0.6	0.3								
H384 0+287	4.4	5.59														
H385 0+292	8.0	4.23	1.6	1.6												
H386 0+287	11.0	2.71	2.9	1.3												

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DOUBLE RAINBOW No 1 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples $35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples $35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * $35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values $35.00 Au	Estimated values Pb	Estimated values Zn
F176A 3.5x6 4+24.5					7.2	10.50										
B 4.0x6 "					0.2	NF										
H396 0+305	4.4	2.71														
F178A 3.5x5 4+30.5					3.0	4.23										
B 2.5x5 "					1.0	0.38										
H397 0+317	3.4	2.03														
H398 0+323	7.9	2.37	1.1	1.0												
H399 0+329	6.1	4.23	0.9	1.5												
H404 0+335	14.3	6.27	3.3	1.0												
F181A 1x6 4+37					1.0	1.69										
B 2.9x6 "					3.4	5.59										
Avg for July 1968	8.5	2.50														
H405 +327	9.2	7.62	2.0	1.5												
F183A 1.2x6 4+43.5					2.2	2.03										
B 6.3x6 "					12.2	5.59										
H406 +333	12.8	4.23	4.4	1.2												
F185A 1.6x6 4+52.5					0.6	NF										
B 6x6 "					10.5	5.25										
H407 +339	9.8	7.62	2.8	1.3												
F187A 1.1x6 4+57.5					1.1	NF										
B 6.4x6 "					21.9	6.60										
H412 +345	12.6	3.56	2.1	0.5												
F189A 1.3x6 4+61.5					3.1	1.35										
B 3.8x6					8.0	4.23										
C 2.1x6					4.6	1.35										
H413 +351	8.1	3.39	1.1	0.9												
F194A 2.6x6 4+68					14.4	10.50										
H414 +357	7.4	3.56	0.8	0.5												
F193A 2x6					18.9	5.59										
B 4x6					2.0	2.03										

DOUBLE RAINBOW № 1 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
H415 + 363	13.1	4.23	5.3	2.9												
F195A see sketch 4+81.5					0.6	NF										
B					23.6	11.85										
H420 + 369	5.4	3.56	2.9	1.0												
F199 A (sketch) 5+15					0.8	NF										
B					14.0	6.94										
H421 + 375	2.6	2.71	0.5	0.5												
F201 A (sketch) 5+21.5					0.4	NF										
B " "					2.4	4.23										
C " "					7.5	8.47										
D " "					0.2	NF										
H422 + 381	5.3	3.56	1.2	1.9												
F204A 1.7x7 5+28	8.6	4.40	2.3	1.2	0.2	NF										
B 0.6x7 "					6.0	2.71	0.3	0.1								
C 4.4x7 "					0.4	NF										
H423 + 3.95 (waste)	0.6	0.68														
F207A 2x5 5+?					0.2	NF										
B 4.2x5					0.2	NF										
H445 + 401 (waste)	0.1	NF														
F211A 2.8x5.5 5+41					0.4	NF										
B 3.9x5.5 "					0.8	NF										
H446 + 407 (waste)	NF	NF														
F213A 3.5x5 5+48					NF	NF										
H447 + 413 (waste)	0.6	NF														
№ 1 Stope																
F216A 2.0x5.5					36.2	10.50	4.8	4.4								
F217A 2.8x6					17.3	9.82	1.4	6.8								
F218A 2.1x4.5					49.9	20.32	12.6	2.6								
F219A 2.2x4.5					6.5	2.71	2.1	0.8								

DOUBLE RAINBOW No 1 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
No 1 Stope																
F220A 2×6					34.0	5.59	9.7	5.9								

*Adjusted to fill face or multiple samples combined.

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DOUBLE RAINBOW Nº 2 Slusher Drift

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted * Face Samples			
	Ag	Au	Pb	Zn	Ag	3500 Au	Pb	Zn	Ag	Au	Pb	Zn
H 187 6' West	4.6	0.68										
H 188 12' West	1.4	0.68										
H 189 19' West	5.5	1.02	1.7	1.0								
H 190 25' West	1.5	0.68										
F 3 2'x5' 10' west					1.9	0.34			0.6	0.12		
F 5 3x4' 17.5' west					2.8	0.68			0.6	0.14		
F25A 3'x8' 27' west					0.5	0.68						
F26B 3'x8' " "					2.8	NF			1.7	0.34		
AVERAGES, MAY, 1968	3.2	0.76							1.0	0.20		

DOUBLE RAINBOW — № 4 Slusher Drift

Sample Numbers & Description	Truck Samples Ag	Truck Samples Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples Ag	Adjusted Face Samples Au	Adjusted Face Samples Pb	Adjusted Face Samples Zn
H191, 4' west, 6' east	12.0	1.69	3.8	4.1								
H192, to 10' west of wall	13.0	5.59	3.4	4.6								
F1, 8'x6', 11' west to 11' east &					13.9	3.39	3.6	6.3	9.3	2.26	2.4	4.2
H193, 16' west	4.9	1.35										
F2, 7'x6', 16' west					11.6	4.91	4.5	2.9	9.3	3.93	3.4	2.3
H194, 22' west	10.2	2.03	4.3	3.1								
F4, 9'x6' 11.5' east					1.4	1.35						
H199, 29' west	11.1	5.59	3.6	3.9								
H200 " "	9.1	2.03										
F6, 6'x6', 29' west					4.3	2.88	1.4	1.9	3.4	2.30	1.1	1.5
H201, 36' west	18.3	2.03	7.2	5.4								
F16, 2'x6' (top) 35.5' west					3.4	5.59						
F17 4'x6' (bot) " "					28.1	6.27	11.1	4.1	19.9	6.04	7.4	2.7
H202, 42' west	7.8	3.39	3.9	2.5								
F19 6'x3'(?) 41.5' west					5.6	3.39	2.0	3.0				
F20 6x3'(?) " "					17.6	7.62	9.1	6.1	11.6	5.50	5.5	4.5
H219, 55' from plug 0	11.6	4.23	6.4	6.2								
H220, plug bottom	5.3	2.71	0.6	1.2								
F21A 3'x6', 55' plug					7.6	4.91	2.6	3.9				
F22B 3'x6', " "					15.1	5.59	7.9	10.0	11.3	5.25	5.1	7.0
H221, 60' from plug	9.9	5.25	4.9	5.1								
F ?												
F ?												
H222, 66' from plug	8.2	4.91	4.0	7.0								
F33A 1x6 66 " "					0.9	2.71						
B 3x6 " " "					6.9	3.39	2.4	6.8				
C 1x6 " " "					0.8	0.68			4.4	2.60	1.4	4.0
H239, 70' from plug	8.3	4.23	5.9	6.1								
F38A, 3'x7' 70.5' plug					9.8	4.23	6.8	5.0				
F39B, 3'x7' " "					5.6	2.71	3.6	8.9	7.7	3.47	5.2	7.0

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DOUBLE RAINBOW No 4 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
H240, 74' from plug	8.4	2.03	6.2	4.2												
F40B, see sketch 74'					7.4	4.91	2.9	4.8								
F40A " " "					1.0	NF			6.6	4.21	2.6	4.1				
H241, 79' from plug	8.0	4.23	4.7	3.0												
F45A see sketch 80'					0.8	NF										
F45B " " "					6.5	4.91	28	5.0	4.9	3.54	1.7	3.3				
AVERAGES MAY, 1968	9.7	3.42	4.5	4.3					8.8	3.91	3.6	4.1				
H242, 83' from plug	7.6	4.91	4.3	7.6												
H247, 85' from plug	9.4	4.23	6.10	6.97												
F54A, see 85' from plug					6.9	3.39	3.7	5.4								
F55B, sketch " "					0.4	NF			4.7	2.29	2.5	3.6				
? H248, 86(?) from plug	6.0	1.35	3.1	3.2												
F57A, 2'x6' 86' from plug					5.6	3.39	4.1	3.8								
F58B 4'x4' " " "					9.8	4.23	5.5	8.2	6.3	3.00	3.8	4.9				
H249, 15' from plug #1	5.3	1.69	3.0	4.1												
F60, 3.5', 15' plug #1					6.2	3.39	3.6	9.7								
F61 4.0', " " "					6.6	3.39	2.7	3.2	6.4	3.39	3.2	6.5				
H250, 21' from plug #1	2.5	0.34	1.0	1.0												
F67A, 4.0' 21' plug #1					10.8	5.59	5.0	4.0								
F67B, 4.0' " " "					2.4	0.68			6.6	3.13	2.5	2.0				
H259, 104, plug 0	4.6	2.03	1.5	1.6												
F72A, see sketch, 104'-0					4.5	7.62										
F72B, " " "					0.6	0.68			0.8	1.25	—	—				
H260, 110, plug 0	3.3	0.68	1.0	1.2												
F75, see sketch 34'-1					2.4	2.71			0.3	0.35	—	—				
H261, 116' plug 0	2.3	0.68	0.8	1.0												
F81A, 3'x6' 40.5-1					5.1	4.23	2.0	0.8								
F81B 3'x6' " "					0.9	0.34			3.0	2.28	1.0	0.4				

DOUBLE RAINBOW № 4 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
H262, 122 plug 0	4.0	1.35	1.5	[illegible]												
F82A, 4'x6', 46' 1					4.4	3.56										
F82B, 4'x6', " "					0.7	NF			2.5	1.78	1.0	1.0				
H283 0+128'	3.2	0.68	[illegible]	[illegible]												
F85A, 1.5'x6' 52' 1					0.9	NF										
F85B 3.5'x6' " "					4.9	4.23			2.1	1.70	1.0	1.0				
H284 0+134'	3.8	2.71	1.3	1.5												
F92 A, 1.5x6, 1+63.5					0.4	NF										
B 1.5x6 " "					4.3	0.68										
C 1.5x6 " "					4.9	2.71			2.4	1.00	1.0	1.0				
H285 0+140'	3.5	1.35	1.3	1.5												
H286 0+146'	5.2	3.39	1.7	2.9												
F95A, 1'x6' 1+27'					0.4	NF										
B, 2.5x6' "					8.4	3.39	5.5	7.5								
C, 3.6x6' "					1.2	0.34			3.9	1.50	2.1	3.0				
H299 10'N. 4W	4.2	2.03														
F101 A (1.2x6) 1+34'					NF	NF										
F101 B (1.2x6) " "					8.7	4.23	0.2	0.0	2.9	1.44	0.0	0.0				
F101 C (4x6) " "					NF	NF										
H300 12' N 4W	1.1	0.34														
F103 A (1x6) 0+125'					0.2	NF										
F103 B (0.5x6) " "					9.0	7.62			1.0	.80	—	—				
F103C (3.6x6) " "					0.2	NF										
H301 18' N. 4W	2.6	3.56														
F107 A (2.3x6) 0+22'					NF	NF			NF	NF	—	—				
F107 B (2.5x6) " "					NF	NF										
H295 0+152	3.2	2.71	[illegible]	[illegible]												
F98A (1x6.5) (see sketch) 1+70'					NF	NF										
F98B (2x6.5) ") " "					8.7	3.39	1.4	1.9	2.2	0.80	0.4	0.5				
H296 0+158'	4.0	2.71	1.3	[illegible]												

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DOUBLE RAINBOW No 4 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
F108A (1x6) 3 + 16.5					NF	NF										
F108 B (2.8x6) " "					68	4.91			1.1	0.80	—	—				
H 297 0+ 164'	3.2	0.68	1.1	1.2												
F 118, see sketch 3 + 29.5					8.7	1.35			1.5	2.2						
F 112 (1.7x6) 3 + 34'					1.8	0.68			0.6	0.33						
4W-15 H 319 (0-6) 4W-15	4.4	3.56	1.5	1.5												
F 115 A (1.3x5.5) 0+10.5					NF	0.2										
F 115 B (0.7x5.5) " "					45.3	0.68			5.0	—	0.3	0.3				
Averages June, 1968 for 4 #	4.4	1.97	1.9	2.4					3.1	1.70	1.4	1.6				
4W-1N drift	2.6	1.76	—	—					2.0	0.93	—	—				
4W-1S drift	4.4	3.56							5.0	—	—	—				
F119.A 1.9x6 0+16					0.2	2.71										
B 0.6x6 "					10.8	4.23	0.2	0.2								
H 320	3.6	0.68														
H335 (bottom)	2.0	NF														
H321 +20	2.9	NF														
F122A ? 0+22(?)					0.9	NF										
F125A 3.4x7 0+29					0.8	NF	drift too high									
B 2.2x7 "					0.7	NF	in beds because									
F127A 2x6.5 0+36					0.4	NF	of faulting									
B 3.7x6.5 "					0.7	NF										
H 322 +32'	1.4	NF														
H337 0+38	7.1	3.56	0.4	0.7												
4W-15 F133A 0.7x6.5 0+34.5					3.8	0.68										
B 0.6x6.5 "					226.4	NF										
C 3.6x6.5 "					0.8	NF										
H 336 0+42	1.7	NF														
F135A see sketch, 0+41					0.4	NF										
B " "					95.0	2.03										
C " "					1.7	NF										
H 332 0+46	4.0	0.68														
F137A 1.3x6 0+47					0.6	NF										
F140A 1.6x6 0+51.5					0.5	NF										

DOUBLE RAINBOW № 4 SLUSHER DRIFT

	Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
1W-15	H342 0+55	3.5	NF														
"	H323 0+176	7.0	0.68														
"	F145A 1.4x5 2+77					2.2	NF										
"	B 5.6x5					0.9	NF										
"	H324 0+182	1.7	NF														
"	F147A 1x5.5, 2+83					2.1	NF										
"	H325 0+194	0.7	NF														
"	F149A 1.5x6, 2+89					0.9	NF										
"	H326 0+200	2.8	NF														
"	F150A 2+95					0.7	NF										
#4	H473 42'	9.8	2.71	8.8	3.4												
	H474 46'	6.4	2.71	5.0	2.6												
	H475 50'	13.0	2.03	13.2	4.4												
	(?) H767 54'	2.6	0.68														
	F750A, 1.5x6 60'					2.0	1.02										
	B 4.5x6					0.4	NF										
	F752A 2x6 #3 +66					0.4	NF										
	B					0.1	NF										
	H789 +66	1.2	0.68														
	F754A 1.5x6 +72					0.2	NF										
	B 4.5x6					NF	NF										
	H790 +72	(w) 1.4	(w) NF														
	F756A 2x6 +78					NF	NF										
	B 4x6					0.4	NF										
	H791 +78	(w) 0.6	(w) 0.69														

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DOUBLE RAINBOW № 4 SLUSHER DRIFT

Sample Numbers & Description		Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
F758 A 1x6	+84					0.4	NF										
B 1x6						4.5	3.56										
C 4x6						0.3	NF										
H792	+84	4.9	2.71														
F760 A 4x6	+90					11.0	3.56	5.7	4.8								
H763	+90	2.6	1.35														
H794	+90?	4.5	423														
F765 1x6	+84?					9.3	7.62	2.4	4.7								
H795	+93	4.4	2.71														
H796	+96	3.5	0.69														
H801	+102	2.4	1.35														
F768 1.5x7	+104					4.8	3.56										
H802	+108	3.4	2.70														
F770 1x6	+119					3.4	2.03										
H803	+119	2.0	2.03														
F772 1x6	+126					5.0	3.56	1.0	2.0								
H804	+125	6.7	3.56	0.8	3.2												
F773 3x6	+132					5.7	2.03	1.5	3.9								
F775 5x6	+139					6.3	6.94	1.4	1.6								
H813	+139	4.6	4.23														
F776 A 1.5x6	+146					1.1	0.38										
B 3x6	"					6.3	5.59	2.9	7.2								
H814	+146	4.4	3.56														
F778 ?	+152					7.5	4.23	0.4	0.1								
H815	+153	8.9	2.03														
F779A 1.5x6	+157					1.0	0.69										
B 2x6	"					8.0	6.27	1.8	3.3								
H816	+159	3.3	3.56														
F781A 1x6	+163					2.2	0.69										
B 2x6						4.5	8.47										

DOUBLE RAINBOW № 4 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
F782A 1x6 +169					1.4	0.69										
B 2.5x6 "					9.8	6.94	3.5	5.2								
H821 +174	3.2	3.56														
F783A 1.5x6 +183					0.6	NF										
B 2x6 "					7.3	1.35	0.3	0.2								
H822 +180	5.2	5.59	1.6	1.8												
H823 +186	6.0	4.23	1.4	0.8												
H824 +192	4.7	0.69														
F784A 1.5x6 25' #4					1.8	4.91										
B 2.5x6 "					6.7	12.67	1.6	0.2								
H829 +25'	4.2	4.23														
F785A 3x6 +32'					0.8	0.69										
B 4x6					6.6	6.94	3.7	4.0								
H830 +31'	4.6	5.59														
H831 +37'	4.8	5.59														
H832 +43'	3.2	2.71														
H833 +50'	3.1	4.23														
4-2 SA																
H834 +10'	5.2	1.35	1.8	0.6												

*Adjusted to full face or multiple samples combined

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DOUBLE RAINBOW No 4-25 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
H 360 +6'	0.6	NF														
F154 A 1.7x5 +10.5					0.5	NF										
B 4x5 "					0.6	NF										
H 361 +12'	0.8	NF														
F156 A +15'					0.5	NF										
B "					0.2	NF										
H 362 +18	3.4	1.35														
F160 A +22'																
B "																
H 378 +24																
H 388 +30	2.8	0.34														
F168 A 3.2x6 +29.5					NF	NF										
B 1.5x6 "					1.6	4.91										
C 3.3x6 "					1.0	NF										
H 389 +35																
F174 A 2.4x6 +36					0.4	NF										
B 3.8x6 "					3.6	1.35										
H 390 +40	2.8	4.91														
F175 A ?					7.4	8.47	?	?								
B					5.8	3.56										
F179 A 2.3x6 5 +45.5					0.7	0.38										
B 4.8x6 "					3.1	2.03										
H 391 +45	2.6	3.56														
H 400 +49	2.8	2.71														
H 401 +53	4.6	2.71														
F182 A 1.7x6.5 52'					0.6	NF										
B 4.8x6.5 "					3.4	3.56										
H 402 +59	3.0	0.68														
F184 A 1.8x6 +59					0.4											
B 5x6 "					8.6	2.03	8.8	5.1								
H 403 +65	3.4	NF														

DOUBLE RAINBOW No 4-25 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
F188A 2x6 0+65					0.8	NF										
B 6x6 "					3.7	1.69										
H416 +69	3.4	2.71														
F190A 1.5x6 0+69					1.7	0.68										
B 1.4x6					4.3	1.35										
H417 +74	2.5	3.56														
F192A 2x6 0+74.5					0.5	NF										
B 5x6 "					0.4	NF										
4-25A																
H418 slabbing	4.1	1.35														
H424 +6	3.0	0.68														
H425 +12	5.7	3.56	1.0	2.9												
F198A 1.4x6 0+10					0.4	NF										
B 3.2x6 0+10					6.1	2.71	2.8	6.0								
H426 +18	3.8	3.56														
F200A 0.5x4.5 0+18					0.8											
B 2.7x4.5					15.7	7.62	8.6	3.5								
H427 +24																
F202A 0.6x6 0+23					0.9	NF										
B 3.9x6 "					6.1	2.03	0.9	2.8								
H432 (bottom)	5.5	2.03	1.0	1.2												
H433 0+30	6.8	5.59	1.8	3.3												
F205A 0.8x6 0+30					1.0	0.38										
B 5.4x6 "					9.0	3.89	1.6	2.0								
H434 0+38	4.5	3.56														
F208A 1.0x7 0+34					NF	NF										
B 7.5x7 "					10.3	4.91	1.4	1.8								
H444 0+47	2.0	2.71														

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DOUBLE RAINBOW No 4-2S SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
F210A 1.8x5 +47					0.4	NF										
B 2.0x5					4.0	3.56										
C 2.7x5					0.8	NF										
H449 +53	3.2	1.35														
F212A 1.1x6 +53					0.5	NF										
B					1.3	0.69										
C					0.6	NF										
H450 +59 (waste)	1.4	1.35														
F214A 1.1x6 +59					0.3	NF										
H451 +65	9.8	7.62	1.5	3.9												
H452 +71	4.8	3.56														
H453 +77 (waste)	3.0	1.35														
H454 +83 (waste)	1.0	2.37														
H455 +89	2.7	1.02														
	4.1	2.77	0.5	1.0												

*Adjusted to full face or multiple samples combined.

DOUBLE RAINBOW No 6 SLUSHER DRIFT

Sample Numbers & Description		Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
H 311	0+24'	6.9	3.39	1.4	1.9												
H 312	0+26'	4.1	2.37														
F 105 A (1.2×6')	0+27'					3.8	4.91										
F 105 B (2.5×6)	" "					9.6	6.35	2.3	4.6								
F 105 C (3.2'+6')	" "					1.2	0.34			4.7	3.30	1.0	2.0				
H 313	0+34'	1.8	0.68														
F 109 A (2×7')	0+32'					1.3	2.03										
F 109 B (4×7')	" "					7.4	5.59	1.8	3.9	5.4	4.41	1.0	2.0				
H 314	0+46	1.0	0.68														
F 110 A (2.6×6)	0+37'	[illegible]	[illegible]			5.9	1.35										
F 110 B (2.0×6)	" "					0.6	NF	2.8	5.3	2.2	.45	0.5	0.5				
F 114 A (2.3×8)						1.7	1.35										
F 114 B (2.5×8)						3.4	2.45	2.1	5.6	1.6	1.20	0.5	0.5				
Averages June, 1968		3.5	1.78							3.5	2.34	0.7	1.2				
F 117 A	0+50.5					0.8	NF										
" B	" "					4.2	3.10	2.2	6.9								
F 120 A	0+55.0					3.1	1.35										
" B	" "					3.6	5.59										
H 316	0+58	1.6	NF														
F 123 A	0+62					0.6	0.68										
F 123 B	0+62					0.8	NF										
H 317	0+63	5.8	4.91	0.9	1.1												
F 126 A	0+68.5					0.9	NF										
F 126 B	" "					0.6	NF										
H 318	0+70.0	0.4	0.68														
F 130 A	0+75.5					1.7	0.68										
F 130 B	" "					?	?										

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DOUBLE RAINBOW [redacted] N- [redacted] SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples* Ag	Adjusted Face Samples* 35.00 Au	Adjusted Face Samples* Pb	Adjusted Face Samples* Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
H332 0+80	0.6	NF														
H333 slab rd	3.4	0.68														
H334 0+39 slab	1.1	NF														
F132A see sketch 0+84.5					1.0	NF										
B " " "					6.6	0.68										
C " " "					1.8	NF										
H339 0+86	2.1	0.68														
H340 0+92	2.5	0.68														
H341 0+92(?)	4.0	NF														
H342 0+98	2.8	NF														
F138A 1.3 0+98					0.1	NF										
B 1.9					10.3	7.62	1.8	1.4								
C 3.6					4.4	0.68										
H348 0+104	4.[illegible]	0.68														
F141A 1.6x6, 2+12.5					0.8	0.68										
B 3.2x6 "					8.7	3.89	1.1	2.5								
C 2.8x6 "					1.1	0.68										
H349 0+110	3.0	3.56														
F144A 2.3x5.5, 2+18.5					1.8											
B 4.0x5.5 "					1.4											
F146					0.6	NF										
H350 0+116	1.6	NF														
H350 0+124	1.7	NF														
H351 0+129	1.6	NF														
F151A 2.9x6 2+48.5					1.6	0.68										
B 2.7x6					24.2	9.14	5.3	7.5								
start 6A H380 West of H1 +10'	21.0	2.71	5.6	2.2												
F134A (sketch) 0+92					0.9	NF										
B " "					17.0	4.23	5.9	3.3								
C " "					1.9	0.68										

out of Place Not 6A

DOUBLE RAINBOW № 6 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
F165A 2.3x6 3+15					3.8	0.68										
B 3.2x6 "					42.4	12.53	6.0	7.8								
H381 ?	16.7	3.56	3.5	3.0												
F166A 2.6x6 3+20.5					1.2	NF										
B 2.7x6 "					12.0	6.94	2.0	4.2								
H382 ?	8.6	3.56	1.9	1.3												
F167A 2.2x6 3+26					0.9	NF										
B 3.5x6 "					7.2	8.47	0.8	2.8								
H392 0+144	25.7	6.94	1.8	2.4												
H393 0+150	12.6	7.62	1.3	3.6												
H395 0+164	10.6	5.59	1.0	1.4												
F177A 5x6 3+33					2.6	3.56	0.6	1.8								
H408 0+170	8.3	3.56	0.6	0.7												
F180A sketch 3+36					6.0	5.56	0.9	6.5								
H394 0+141?	8.F	5.59	1.0	1.0												
6A Avgs July	14	4.90														
6A ↓ F186A 1.5x6 3+50					14.0	4.91	3.3	9.1	3.0	1.00	0.7	1.8				
B 5.5x6 "					0.6	NF										
H409 +175	33.6	2.03	3.8	7.0												
F191A 1.8x6 3+56.5					29.7	4.91	4.6	8.0								
B 4.5x6 "					0.6	NF			7.5	1.23	1.2	2.0				
H410 +181	12.1	2.71	3.0	5.6												
F196A 1.5x6 3+61.5					0.2	NF										
B 2.2x6 "					11.4	3.56	0.8	5.9	3.8	1.19	0.3	2.0				
H411 +186	4.0	2.03	0.5	0.5												
F197A 2.2x8 3+68					3.0	1.35										
B 2.7x8 "					30.0	3.10	8.6	2.7	9.0	.90	2.6	0.8				
C 3.8x8 "					1.2	NF										

DOUBLE RAINBOW № 6 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
6A H428 +192	38.9	5.59	18.6	1.8												
F203A 2.2×7 ?	..				0.3	NF										
B 1.0×7 ?					55.3	6.27	19.9	6.5	7.4	0.86	2.7	1.0				
H429 +201	24.5	2.03	8.8	3.2												
F206A 2.4×6 4+35					2.2	NF										
B 1.0×6 "					39.6	5.59	19.0	4.1	5.5	0.77	2.6	0.6				
Avg. for Aug. 1965	22.6	2.86	6.9	3.6					6.0	1.00	1.7	1.4				
6B H464 45'	5.9	3.56	1.7	1.3												
" H477 51'	5.0	1.35	0.9	1.8												
(6A) H481 81'	(5.2	3.39)	1.4	1.6												
6A H482 92'	(13.8	1.35	5.4	3.4												
6B H483 №1 plug +32	4.1	2.03														
6A? 462	9.0	4.23	2.0	1.9												
6B F753A #1 +38					0.6	0.38										
B –					0.4	NF										
F751A 6×6 +32					10.0	4.23										
F755A 6×6 +44					1.4	0.69										
F757A 0.5×6 +50					9.4	4.23	6.2	18.8								
B 5.5×6					0.6	3.56										
H478 #1 plug +38	5.3	4.23	1.6	1.4												
H779 +44	3.9	2.03														
H780 +50	3.7	0.69														
F761A above for 1×6 +56					29.2	2.03	33.5	9.0								
H797 +56	4.6	0.69														
F763A 2½×6 +62					10.0	6.27										
H798 +62	4.0	3.56														
F764A 2½×6 +68					18.4	5.59										
H799 +68	5.5	1.35														
H800 72	8.7	4.23														

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DOUBLE RAINBOW № 6 SLUSHER DRIFT

Sample Numbers & Description		Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
		Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
F767A ?	+79					3.0	NF										
B ?						9.6	2.03	2.9	3.1								
F769 1½	+85					21.4	4.23										
H805	+85	6.8	1.35	2.6	3.5												
F771 1.5	+91					15.6	5.59	7.6	15.2								
H806	+91	4.0	0.69														
F774 1.5	+97					18.3	5.59										
H807	+102	3.9	3.56														
F800 1.5	+101					12.6	4.23	6.8	5.0								
H825	+108	5.0	5.59	1.9	2.9												
F783 1.5	+107					10.4	4.23	6.2	7.3								
H826	+114	1.1	0.69														
H827	+120	1.7	2.03														

*Adjusted to full face or multiple samples combined.

DOUBLE RAINBOW — Nº 7 Slusher Drift

Sample Numbers & Description	Truck Samples Ag	Truck Samples Au (35.00)	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples Au (35.00)	Face Samples Pb	Face Samples Zn	Adjusted * Face Samples Ag	Adjusted * Face Samples Au (35.00)	Adjusted * Face Samples Pb	Adjusted * Face Samples Zn
H 155, 6' east of wall	7.8	2.71	1.5	2.3								
H 157, 12' east	11.0	4.91	2.0	3.4								
H 207, 18' east	13.9	4.23	2.9	2.2								
F 10, ? 18' east					24.9	4.30	2.1	3.1	12.5	2.15	1.1	1.6
H 208, 22' east	20.2	4.57	6.5	3.4								
H 209, 26' east	19.8	5.59	5.9	3.6								
F 12A, 6'x3', 25' east					18.6	2.71	4.5	3.2				
F 13B, 6'x3', " "					3.8	NF			11.2	1.35	2.3	1.6
H 210, 31' east	8.2	6.94	1.7	2.1								
F 15, 6'x4½', 31.5' east					12.4	7.62	3.6	6.7	8.0	4.90	2.3	4.3
F 18, 6'x4', 37' east					15.8	11.18	6.0	7.5	7.9	5.60	3.0	3.8
H 215 40' east	7.4	3.39	2.9	3.1								
H 216 40' east (bot)	6.2	2.71	1.9	3.2								
F 23A 2'x6', 45' east					2.3	0.68						
F 24B 4'x6', 45' east					11.4	10.50	3.9	8.8	8.4	7.23	2.6	5.9
H 217 45' east	16.1	6.27	5.8	7.0								
H 218 50' east	7.0	6.94	1.5	4.0								
F-31A 2'x8 50' east					1.2	NF						
F-31B 2x8± 50' east					11.7	7.70	2.7	3.0				
F-31C 2x8± 50' east					0.4	NF			4.4	2.85	0.9	1.0
H 231, 56' from plug o	5.6	2.71	1.3	2.0								
F 36 A, 1'x6' 56' plug					0.7	NF						
B 2'x6' " "					6.1	4.91	0.5	0.5				
C 3x6' " "					0.3	NF			2.3	1.64	0.2	0.2
H 232, 62' from plug	4.0	2.03										
Averages May, 1968	10.6	4.40	2.8	3.0					7.8	3.90	1.8	2.6
F 43, 3'x6', 62' plug					8.9	5.59	2.6	3.0	4.5	2.80	1.3	1.5

DOUBLE RAINBOW № 7 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples* Ag	Adjusted Face Samples* 35.00 Au	Adjusted Face Samples* Pb	Adjusted Face Samples* Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
F 47, 2.5'x6' 68' plug					1.0	0.68			0.4	0.30						
H 233, 68' from plug	?	?	?	?												
F 50A, 2.5'x7', 73.5' plug					0.7	NF										
F 51B, 3'x7 " "					5.9	1.02	0.8	1.4	3.0	0.50	0.4	0.7				
H 234, 75' from plug	1.2	0.68	0.3	0.3												
F 56, 3'x7', 78' plug					0.3	NF			0.2	—						
H 255, 82' from plug	1.4	1.02	0.3	0.3												
F 62, 4'x6', 9' plug #1					0.8	NF										
F 63, 3x6', " " "					0.5	NF			0.7	—						
H 256, 92.5' from plug #0	2.6	0.34	0.3	0.3												
F 64, 3'x6',					1.2	NF			0.6	—						
Averages June 1968	1.7	0.70	0.3	0.3					1.6	0.60	0.3	0.4				
Branch to So. #7A																
H 257 slabbing	2.3	0.69														
H 258 "	3.6	1.35	0.8	1.0												
F 77A, 2'x6', 45' plug #0					0.8	NF										
F 77 B 4'x6' " " "					10.0	5.59	2.0	3.6	7.0	3.76	1.3	2.4				
H 275 slabbing 6' @ 53'	4.7	2.03	1.2	1.8												
F 86A, 1.5'x6' 59.5 0 plug					15.1	4.23	1.6	3.5	4.0	1.05	0.4	0.9				
F 86 B, 1.5'x4' " "					0.4	NF										
H 276 0+53'	5.3	3.56	1.7	2.3												
H 277 0+59'	1.8	2.71	0.4	0.6												
F 91, A 1x6, 0+65.5					1.0	N.F.										
B 2x6 " "					12.0	11.18	4.8	4.0								
C 4x6 " "					2.2	1.35			4.8	4.00	1.4	1.1				
H 278 0+65'	4.3	2.71	1.2	1.2												
H 291 0+71'	3.7	2.71	1.0	1.0												
F 93A see sketch 0+71					0.8	NF										
B					15.0	4.06	1.8	1.5								
C																

DOUBLE RAINBOW № 7 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples Ag	Truck Samples 35.00 Au	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples 35.00 Au	Face Samples Pb	Face Samples Zn	Adjusted Face Samples * Ag	Adjusted Face Samples * 35.00 Au	Adjusted Face Samples * Pb	Adjusted Face Samples * Zn	Estimated values Ag	Estimated values 35.00 Au	Estimated values Pb	Estimated values Zn
7A face H 292 0+76'	1.2	2.03														
F 97 A (1x6) 0+76.5'					0.2	NF										
F 97 B (0.5x6) "					7.9	2.71	0.2	0.1	0.7	.25	—	—				
F 97 C (4.5x6) "					NF	NF										
Averages June 1968	3.4	2.20	0.8	1.0					4.6	2.25	0.7	1.0				
10-2-68																
#7 H471 107'	6.8	3.56	1.1	2.4												
H472 111'	5.9	3.56	1.1	0.2												
F757A 3x6 plug 2+37'					10.3	4.23	0.5	0.8								
B 3x6					0.8	NF										
H785 +37	10.5	4.23	0.8	1.4												
F762A 4x6 ?					12.0	3.56	0.3	0.3								
B 2x6					15.4	9.14										
H786 #1 + 43	14.0	4.91	2.1	2.4												
F 766A 4x6					23.9	19.65	14.6	10.0								
H 787 +48	11.7	4.23	4.6	2.4												
H 787 #1 +68	14.0	3.56	2.7	3.5												
H 788 +68	7.1	0.69	est 1.0	est 1.5												
F 765A 2x6 +62					1.7	NF										
B 3.5x6																
#7A H817 10-22-68	0.8	0.69														
F 777 ?					NF	NF										
H 818 +47	0.4	NF														
H 819 +53	0.4	NF														

*Adjusted to full face or multiple samples combined.

DOUBLE RAINBOW

№ 8 Slusher Drift

Sample Numbers & Description	Truck Samples Ag	Truck Samples Au (35.00)	Truck Samples Pb	Truck Samples Zn	Face Samples Ag	Face Samples Au (35.00)	Face Samples Pb	Face Samples Zn	Adjusted* Face Samp Ag	Adjusted* Face Samp Au (35.00)	Adjusted* Face Samp Pb	Adjusted* Face Samp Zn
H203, 6' west of wall	4.9	2.03										
F8, 2'x7', 6' " "					19.1	4.06	4.7	5.3	4.2	0.90	1.0	1.2
H 204, 12' west	8.0	1.35	1.6	1.2								
F 9, 4'x7'(?) 14.5 plug					16.7	3.05	6.9	1.3	8.4	1.53	3.5	0.7
H205, 19' west, 5' east	2.2	NF										
F 11, 3x7(?) 20½' west					3.0	1.02	0.8	1.9	1.5	0.51	0.4	1.0
F 14, 5x6(?) 26½ "					7.4	NF	0.5	1.7	5.3	NF	0.4	1.2
H 206, 26' west, 10' east	3.5	NF										
F 27A, 4'x8', 36' west					1.1	0.34						
F 28B, 2'x8' " "					17.2	4.23	2.8	3.8	6.5	1.64	0.9	1.3
H 211, 36' from plug	7.1	2.71	1.6	1.3								
H 212, plug bottom	10.9	4.23	1.1	2.4								
H 213, 40' from plug	5.6	3.39	0.9	1.8								
H 214, 45' " "	9.2	6.27	0.8	3.2								
F 32A, 1'x6', 45' "					4.1	2.03						
B, 2'x6', " "					1.7	0.68						
C, 3'x6', " "					24.2	10.50	1.7	6.8	13.4	5.81	0.9	3.4
H 235, 51' from plug	4.2	1.35										
F 37A, 1'x6', 51' plug					1.3	NF						
B, 2'x6' " "					2.7	1.69						
C, 3'x6' " "					16.2	9.14	2.1	2.5	9.2	5.13	1.0	1.3
H 236' plug bottom	8.2	2.71	1.1	1.9								
H 237, 53' from plug	6.0	4.23	1.0	1.3								
F 41A, 6'x6' 55' plug					1.4	0.68						
B, see sketch					0.7	0.37			1.0	0.50		
AVERAGES, MAY, 1968	6.3	2.57	0.6	1.1					6.2	2.00	1.0	1.2
H 238, 56' from plug	5.4	2.71	2.9	4.0								
H 263, 49', bottom	0.8	NF	—	—								
H 264, "	5.8	1.35	0.4	0.6								
H 265 "	2.7	2.71	0.5	0.7								
H 266 "	3.8	2.71	0.6	0.8								

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DOUBLE RAINBOW № 8 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
H 271 bottom	8.6	4.91	0.8	1.2												
H 272 "	4.8	7.62	0.5	1.0												
H 273 0+55'	6.4	4.91	0.8	0.4												
H 274 0+60'	4.0	3.56	0.5	1.1												
F 100 A See Sketch 0+48'					1.2	0.51										
F 100 B " " " "					1.2	0.34										
F 104 A (2.8x6) 0+54'					1.2	0.68										
F 104 B (2.7x6) " "					2.6	2.71										
F 104 C (1.7x6) " "					1.6	2.71										
Averages June, 1968	4.7	3.39	0.8	1.0												

* Adjusted to full face or multiple samples combined

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DOUBLE RAINBOW No. 9 Slusher Drift

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *			
	Ag	Au	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au	Pb	Zn
H 223, 11' from wall	10.1	1.35	0.6	1.1								
F 29A, 3'x8' 11' wall					2.0	0.34						
F 30 B, 2½'x8' " "					24.6	4.71	1.3	2.4	12.3	2.41	0.6	1.1
H 224, 15' from wall	7.6	4.91	0.5	0.7								
F 34A, 3'x7' 15' "					2.1	0.68						
F 35B, 2½'x7' " "					12.8	6.94	0.8	0.5	6.4	3.18	0.3	0.2
H 225, 22' from wall	6.9	1.35	0.6	1.2								
F 42A, 1'x6' 22' "					8.0	11.85	0.3	0.3				
B 1.5'x6' " "					11.1	0.68	0.8	0.9				
C 1'x6' " "					0.7	NF			5.3	2.37	0.5	0.5
H 226, 28' from wall	?	?	?	?								
AVERAGES [illegible]	8.2	2.53							8.0	2.72	0.5	0.6
F 46 A, 1'x6', 28' wall					1.3	0.37						
B 5'x6' " "					10.7	4.91	0.7	0.9	7.1	4.32	0.6	[illegible]
H 243 34' from E wall	5.0	3.39										
F 52 A, 4'x7.5', 2½' wall					1.2	0.34						
F 53 B, 2'x7.5' " "					10.6	[illegible]	1.2	1.3	[illegible]	.90	0.4	[illegible]
H 244 40' from E. wall	5.6	1.35	0.4	0.6								
F 79, 3.5', 43' from plug					1.2	0.34						
F 80, 2.5' " " "					12.0	4.23	0.8	1.8				
F 81, 2.0' " " "					3.4	1.35			[illegible]	2.54	0.4	[illegible]
H 245 46' from E. wall	3.6	1.35										
F 68, 5'x6', 48' wall					9.2	1.69	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
H 246 52' from wall	1.1	0.68										
F 71A 4'x6', 54' plugs					0.7	3.89						
F 71 B 2'x5' " "					6.5	0.68	0.2	0.1	2.1	3.15	[illegible]	[illegible]
H 271, (bottom)	7.9	2.03	0.4	0.6								
H 272, 57' from plugs	5.6	1.35	0.4	0.7								

DOUBLE RAINBOW № 9 SLUSHER DRIFT

Sample Numbers & Description	Truck Samples				Face Samples				Adjusted Face Samples *				Estimated values			
	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn	Ag	35.00 Au	Pb	Zn
F74A 2.5'x6', 60' plug o					1.3	NF										
F74B 3.5'x6' " "					16.3	3.39	0.8	1.4	10.1	2.00	0.5	0.8				
H 273, 64' from plug o	6.0	2.03	0.6	1.3												
F79A, 4'x6', 65' plug o					3.0	0.34										
F79B, 2'x6' " "					13.1	4.23	1.5	4.0	6.4	1.64	0.5	1.3				
H 274, 69' from plug o	7.0	3.39	0.5	1.1												
F84A, 3'x6', 72' plug o					0.3	NF										
F84B 3'x6' " "					11.9	5.59	0.8	1.2	6.1	2.80	0.4	0.6				
H 280 0+75'	6.1	5.59	0.4	1.0												
F88A 3'x6.5, 77' o plug					1.2	NF										
F88B, 2'x4.5, " "					11.0	5.59	1.4	4.0	4.3	1.87	0.5	1.3				
H 281 0+81	5.3	2.71	0.5	1.0												
F90A 2'x6', 82.5' plug o					0.7	NF										
F90B, 1'x6' " "					10.1	4.91	1.1	2.2								
F90C, 3'x6' " "					6.0	0.68	1.6	2.6	5.0	1.16	1.0	1.7	Face samples to 0+82.5' 6.2	2.17	0.5	0.9
H 282 0+87'	5.4	2.71	0.5	0.8									Truck samples 0+87' 5.4	2.42	0.4	0.7
F94A 2'x5.5' 0+88					0.6	NF										
F94B 4'x6' " "					0.9	0.34			0.8	0.20	—	—				
H 303 0+93'	1.8	0.68														
H 304 0+99'	2.8	1.69														
F 99A (1x6) 0+102'					NF	NF			—	—	—	—				
Averages June, 1966	4.9	2.23	0.4	0.6					5.3	1.83	0.4	0.7				
#9 stope																
F215A 3x6					14.1	4.91	0.8	2.0								
Stope sample No 1 3.24x3.5					15.9	4.23										
" " No 2 4.3x3.7					7.7	5.59										
No 3 3x5					11.0	3.05										
No 4 3x3.2					6.7	3.56										

*Adjusted to full face or multiple samples combined

Metallurgical Tests - Double Rainbow Ore
South Dakota School of Mines & Technology
Metallurgical Department

TABLE 1

ASSAY OF ORE SAMPLES

INGREDIENT	UNIT	LOT 1	LOT 2	TEST SAMPLES 1	2*	3*
L.O.I.	%	12.3	11.9	11.4		
Pb	%	2.4	16.7	3.3	3.84	3.96
Cu	%	0.2	0.4	0.3	0.10	0.10
Zn	%	2.6	9.6	3.4	2.72	2.91
Fe	%	18.0	24.0	18.3		
S	%	18.0	29.0	19.0		
CaO	%	0.9	0.7	0.8		
MgO	%	1.0	0.2	0.6		
Insol.	%	45.7	12.5	45.7		
Au	Oz/T	0.06	0.12	0.07	0.08	0.08
Ag	Oz/T	13.2	53.1	15.0	13.8	14.8

* Assayed in Homestake Laboratory

June 1968

THE GALIGHER COMPANY

ESTABLISHED 1901

CABLE ADDRESS
GALSAL
TELEX 038-536

545-585 WEST EIGHTH SOUTH STREET
P. O. BOX 209
SALT LAKE CITY, UTAH 84110
U.S.A.

TELEPHONE
359-8731
AREA CODE 801

August 22, 1968

Mr. F. M. Howell, Jr.
Homestake Mining Company
650 California Street
San Francisco, California 94108

Dear Mr. Howell:

Laboratory Report on the Testing of Your Sample of
Silver, Lead, Zinc Ore (Double Rainbow Mine)
Designated as Our Lot No. 1812

In accordance with the arrangements made with you, we are pleased to submit our report covering the test work which was conducted on your sample of silver, lead, and zinc ore from the Double Rainbow Mine. The ore sample was received at our laboratory on July 5, 1968, and was designated as our Lot No. 1812.

I. Sample Preparation and Analysis

Approximately 100 pounds of ore sample was received, the total sample being staged crushed through 20 mesh using laboratory jaw and roll crushers in closed circuit with a vibrating screen. The sample was then thoroughly mixed prior to splitting out a head sample, this being submitted to the Union Assay Office of this city for analysis. They reported the following:

	% Pb	% Zn	oz Ag/ton
Head Sample, Lot No. 1812	3.9	3.15	14.94

The above lead and zinc assays check very closely to those assays calculated from the various test products. Regarding the silver, it is indicated that the sample contains 15.6 ounces per ton rather than the above 14.94 ounces.

II. Investigation Objectives

Preliminary testing of ore samples, similar to the one we received, was conducted by the metallurgical department of the South Dakota School of Mines and Technology. We were provided with a copy of their report, dated June 21, 1968, and were asked if we thought it possible to improve on the results reported therein.

A review of their report showed that the main problem was that of obtaining a relatively high recovery of the silver in the lead concentrate. Therefore, it was on this problem that our efforts were mainly concentrated. Also, lead and zinc concentrate cleaning studies had not been performed, and we were asked to investigate this area.

III. Discussion of Test Results

The SDSM&T report pointed out that optimum mineral liberation occurred at about 100 mesh so, at your request, this was the grind utilized in all of our testing. The report also showed that high recoveries of the lead and zinc could be obtained into their respective concentrates. Silver recovery, on the other hand, into the lead concentrate was relatively low, it being in the range of 30-45%.

The reagents used in the lead circuit by the SDSM&T were soda ash, sodium cyanide, Z-11 and pine oil. It was suspected that the high levels of cyanide which were used (0.2 and 0.5 pounds per ton) might have a depressing effect on the silver or silver containing minerals, so our work involved studying the possibility of eliminating or reducing the amount of cyanide used. Also, the more conventional pH controlling reagent, lime, was used instead of soda ash.

Eight tests were conducted in this investigation, the complete details of which are contained on the data sheets appended to this report.

Our work was initiated checking the use of lime and zinc sulfate for pyrite and sphalerite depression (Test Nos. 1 and 2), but it was observed that these were ineffective regarding a selective recovery of the galena. Therefore, sodium sulfite was added to this reagent combination, and this resulted in the desired selectivity (Test No. 3). Later, in Test Nos. 5 and 6, a small amount of sodium cyanide was added (0.05 pound per ton) and it was found to be of possible advantage regarding selectivity, but it is doubtful if it is needed. With this reagent combination, silver recoveries in the range of 77-79% were obtained in lead rougher flotation.

The final two tests conducted in this investigation (Test Nos. 7 and 8) employed the above reagent combination for lead and silver flotation, the zinc also being subsequently floated and both concentrates being subjected to one stage of cleaning. Test No. 8 was a duplicate of Test No. 7 for checking purposes.

The procedures used and the results obtained in Test Nos. 7 and 8 are summarized as follows:

1. A representative sample of ore was ground in our laboratory ball mill at 50% solids with 6.5 pounds of lime, 2.0 pounds of zinc sulfate, 1.0 pound of sodium sulfite, 0.05 pound of sodium cyanide and 0.05 pound of Reagent 343 (Z-11). The screen analysis of the ball mill discharge was as follows:

Mesh	+65	+100	+150	+200	+325	-325
Wt.%	0.6	5.5	15.3	13.0	22.2	43.4

2. The ball mill discharge was diluted to 25% solids and the lead was floated for four minutes with 0.03 pound of frother (MIBC), stage adding an additional 0.02 pound of R-343 after the first minute of flotation. The pH during flotation was 9.0-9.1.

3. The lead rougher tailing was conditioned with 0.4 pound of lime for five minutes (pH 10.0), with 0.5 pound of copper sulfate for an additional five minutes (pH 9.5), and with 0.04 pound of Z-200 for an additional two minutes.

4. The zinc was floated for three minutes using 0.025 pound of Frother 65.

5. The lead rougher concentrate was subjected to a single stage of water cleaning for three minutes, the pH being 8.5-8.6.

6. The zinc rougher concentrate was conditioned for two minutes with 0.25 pound of lime (pH 10.0) and cleaned once for two minutes.

Lot No. 1812 - Test No. 7

Product	Wt. %	Assays					% Distributions				
		% Cu	% Pb	% Zn	oz Ag	oz Au	Cu	Pb	Zn	Ag	Au
Pb Cl Conc	5.7	0.907	64.2	2.46	201.36	0.588	40.0	89.7	4.5	72.9	24.7
Pb Cl Tail	1.9	0.327	10.2	4.63	38.20	0.192	4.8	4.8	2.8	4.6	2.7
Zn Cl Conc	5.2	0.510	0.7	48.99	38.30	0.127	20.4	0.9	81.2	12.6	4.9
Zn Cl Tail	1.4	0.151	1.2	4.22	6.90	0.135	1.6	0.4	1.9	0.6	1.4
Zn Ro Tail	85.8	0.050	0.2	0.35	1.70	0.105	33.2	4.2	9.6	9.3	66.3
Head (Calc)	100.0	0.129	4.08	3.13	15.74	0.136	100.0	100.0	100.0	100.0	100.0
Pb Ro Conc	7.6	0.762	50.7	3.00	159.2	0.489	44.8	94.5	7.3	77.5	27.4
Zn Ro Conc	6.6	0.433	0.8	39.5	31.6	0.129	22.0	1.3	83.1	13.2	6.3

Lot No. 1812 - Test No. 8

Pb Cl Conc	5.8	*	63.6	2.76	199.14	0.460		93.0	5.2	74.5	31.8
Pb Cl Tail	1.8		7.0	5.28	33.87	0.180		3.2	3.1	3.9	3.8
Zn Cl Conc	5.1		0.3	49.59	36.95	0.100		0.4	82.3	12.1	6.0
Zn Cl Tail	1.3		0.7	5.78	7.86	0.140		0.2	2.4	0.6	2.2
Zn Ro Tail	86.0		0.15	0.25	1.60	0.055		3.2	7.0	8.9	56.2
Head (Calc)	100.0		3.97	3.08	15.53	0.084		100.0	100.0	100.0	100.0
Pb Ro Conc	7.6		50.1	3.35	160.0	0.394		96.2	8.3	78.4	35.6
Zn Ro Conc	6.4		0.38	40.7	31.1	0.108		0.6	84.7	12.7	8.2

*Copper not assayed in this test.

THE GALIGHER COMPANY

Additional assays conducted on the lead and zinc concentrates obtained in Test No. 8 were as follows:

	% Fe	% As	% Sb
Test No. 8, Pb Cl Conc	7.65	0.95	0.43
Test No. 8, Zn Cl Conc	11.90		

An examination of the results of Test Nos. 7 and 8 shows that there is an excellent correlation of results. It is noticed that the silver recoveries in the final lead cleaner concentrates were in the range of 73-74% in these open circuit tests. These recoveries represent a considerable improvement over the earlier results.

A cursory microscopic examination of the zinc cleaner concentrate indicated that the high iron content is due to pyrite-sphalerite middlings. Regrinding of the rougher concentrate, prior to cleaning, would be expected to result in higher grade concentrates.

In accordance with your request, no testing was conducted in the direction of reducing the reagent quantities indicated in the lead rougher circuit. Those indicated are, perhaps, close to the optimum and further testing would probably show only minor adjustments. However, as stated earlier, it is believed that the cyanide can be deleted from the reagent schedule.

We've appreciated the opportunity to conduct these tests for you, and if you have any questions, please contact us.

Respectfully submitted,

THE GALIGHER COMPANY

R. O. Huch
Metallurgist

ROH/dh

cc: D. T. Delicate

AL S 148

HOMESTAKE MINING COMPANY

INTER-DEPARTMENT COMMUNICATIONS

TO Mr. J. O. Harder

FROM D. T. Delicate

REFERENCE

DATE 10/30/1968

SUBJECT DOUBLE RAINBOW PROJECT
Estimated Grade
Net Smelter Return Value &
Operating Costs

The following appraisal was prepared to assist in making decisions regarding future work at the Double Rainbow Mine near Galena, South Dakota.

The Geology Department has submitted the following estimate of stoping grade based on a study of known sample data and ore occurences. A daily production rate of 75 tons is estimated.

Metal	Mine Grade
Ag	10 oz./ton
Au	$3.00/ton (@ $35.00/oz.)
Pb	2%
Zn	1.5%

This head grade may be somewhat high for devlopment ore.

HOMESTAKE MINING COMPANY

INTER-DEPARTMENT COMMUNICATIONS

p. 2/3

TO Mr. J. O. Harder

DATE October 30, 1968

FROM D. T. Delicate

SUBJECT DOUBLE RAINBOW PROJECT
Estimated Grade
Net Smelter Return Value &
Operating Costs

REFERENCE

The net smelter return per ton of ore as calculated below is based on the following metal prices, the Galigher metallurgical test work, and the recent A S & R smelter schedule offered at Creede.

Metal	% Recovery	Price
Ag	90	$ 2.00/oz.
Au	43	$39.00/Oz.
Pb	96	.11/lb.

Estimated ratio of concentration is 7 to 1.

Concentrate Grade

Ag	10 oz. x 7 x .90 =	63 oz/ton
Au	.086 oz. x 7 x .43 =	.26 oz/ton
Pb	2% x 20 lb. x 7 x .96 =	268.8 #/ton

Payments

Ag Value
63 x 95% x $2.00 - $0.025 = $118.20/ton

Au Value
0.26 oz x 92.6% x $39.00 = 9.36/ton

Pb Value
(268.8 lbs. - 30 lbs.) x (90%) x (11¢-2.6¢/lb)
(238.8) x(.9) x (.084) $18.05/ton

Total Payment	=	$145.61
Less Treatment & Penalties	=	17.84
Less Freight ($ 10.71 @ 10% Moisture	=	11.90
Net Smelter Value per ton Concentrate	=	$115.87/ton

HOMESTAKE MINING COMPANY

INTER-DEPARTMENT COMMUNICATIONS

TO Mr. J. O. Harder

DATE October 30, 1968

FROM D. T. Delicate

SUBJECT DOUBLE RAINBOW PROJECT
Estimated Grade
Net Smelter Return & Value
Operating Costs

REFERENCE

Net Smelter Value per Ton Ore = $16.55

At $2.50/oz. Ag price the net smelter return per ton of ore would be: $20.83

At $3.00/oz. Ag. price the net smelter return per ton of ore would be: $25.10

Estimated costs of operation assuming that a mill circuit was built in Lead and crushing was done by Homestake Mining Company are as follows:

Item of Cost	@$ 2.00/oz. Ag	@$ 2.50/oz. Ag	@$ 3.00/oz. Ag
Mining	11.00	11.00	11.00
Milling	3.50	3.50	3.50
A & G (Incl. taxes)	1.60	1.60	1.60
Haulage	0.82	0.82	0.82
Royalty	0.73	1.40	2.07
Total Cost	$ 17.65	$ 18.32	$ 18.99

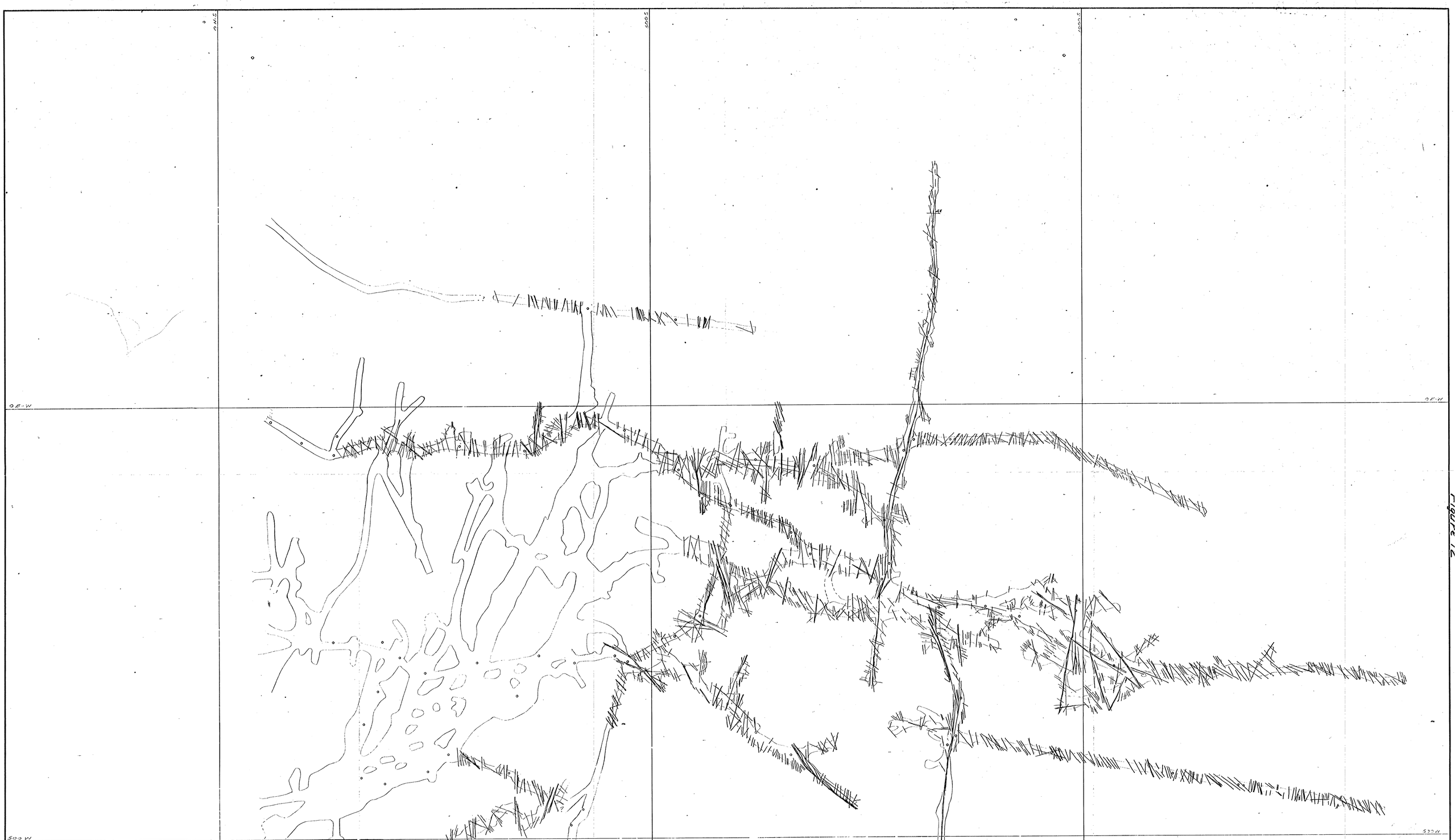
Estimated cash flow per ton to pay off the O M E loan and HM Co. investment would be as follows:

@$ 2.00/oz. Ag. price	$	(1.10) per ton
@ 2.50/oz. Ag. price	$	2.51 per ton
@ 3.00/Oz. Ag. price	$	6.11 per ton

It appears to me that the silver price would have to increase to nearly $3.00 per oz. before there would be justification to continue with this project. This is at the ore grades suggested by the Geology department.

Submitted by:
Donald T. Delicate
Donald T. Delicate

DTD:mb



Dark lines are verticals (fractures), usually within 10° of vertical. Multiple lines are fracture zones or strongly mineralized verticals.

DATE	BY	REVISIONS

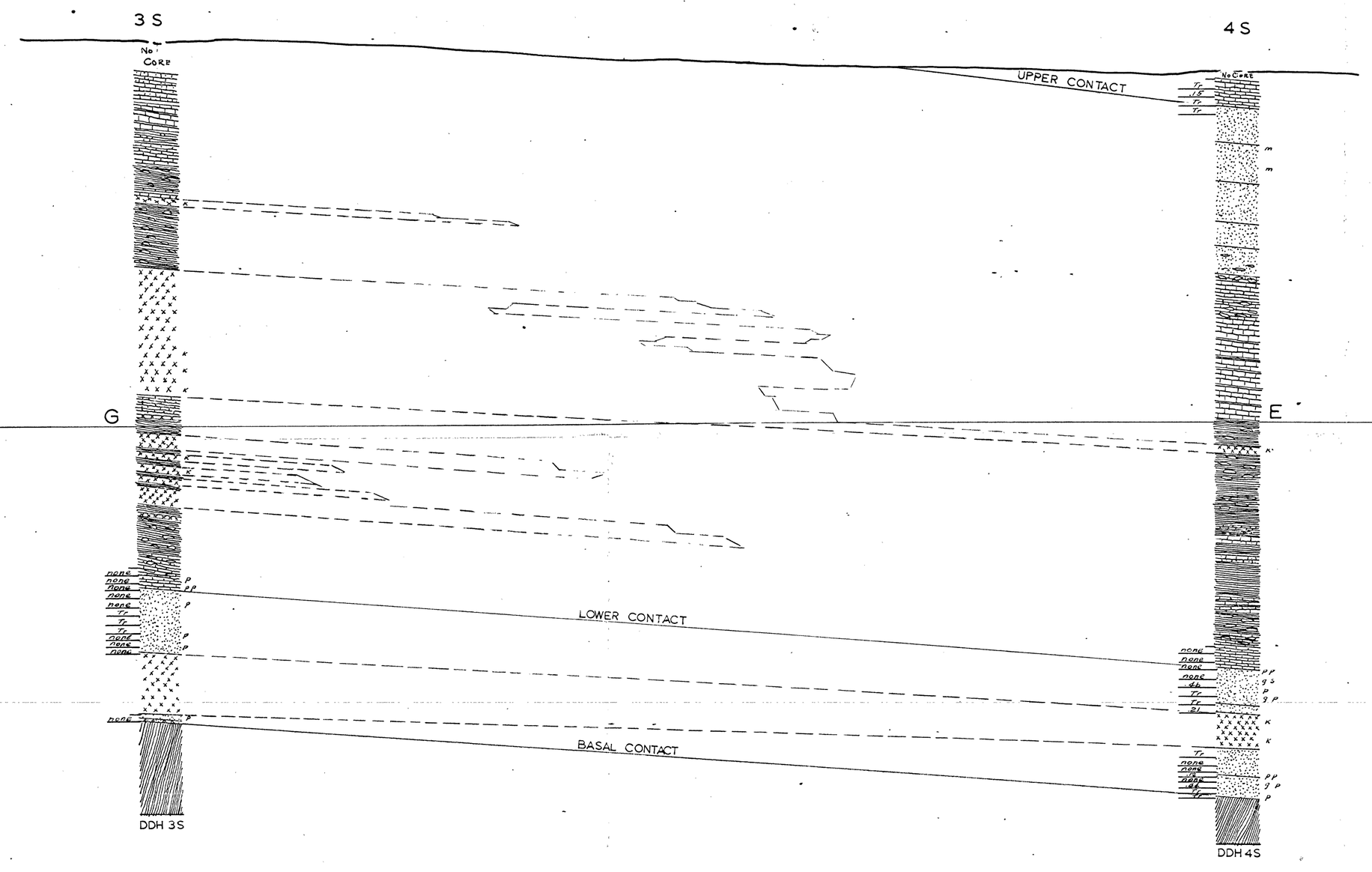
4-1-68

DRAWN BY _____ APPROVED _____
TRACED _____ SCALE 1" = 50'
CHECKED _____ DATE 12-5-67

DOUBLE RAINBOW MINES, INC.
RICHMOND – SITTING BULL MINE
GEOLOGIC MAP

OME- 6558 (Silver) CONTRACT NO. 2233

Figure 12



MINERALIZATION

- p PYRITE
- g GALENA
- s SPHALERITE
- m MANGANESE
- k KAOLINIZATION

NOTE; Single letters (as p) denote weak or disseminated mineralization or alteration. Double letters (as pp) denote moderate to strong mineralization or alteration.

Assays shown are ounces of silver.

LITHOLOGY

- FELDSPAR PORPHYRY
- SHALE & PEBBLES
- LIMESTONE & DOLOMITE
- SANDSTONE & QUARTZITE
- CONGLOMERATE
- PRECAMBRIAN

Figure 11

SECTION EG

DATE	BY	REVISIONS

DRAWN BY GCM APPROVED
TRACED SCALE 1" = 50'
CHECKED DATE

DOUBLE RAINBOW MINE
SECTION THROUGH DRILL HOLES
4 S & 3 S, FACING NORTH
OME- 6556(Silver) Contract 2233

DOUBLE RAINBOW MINE
LEGEND

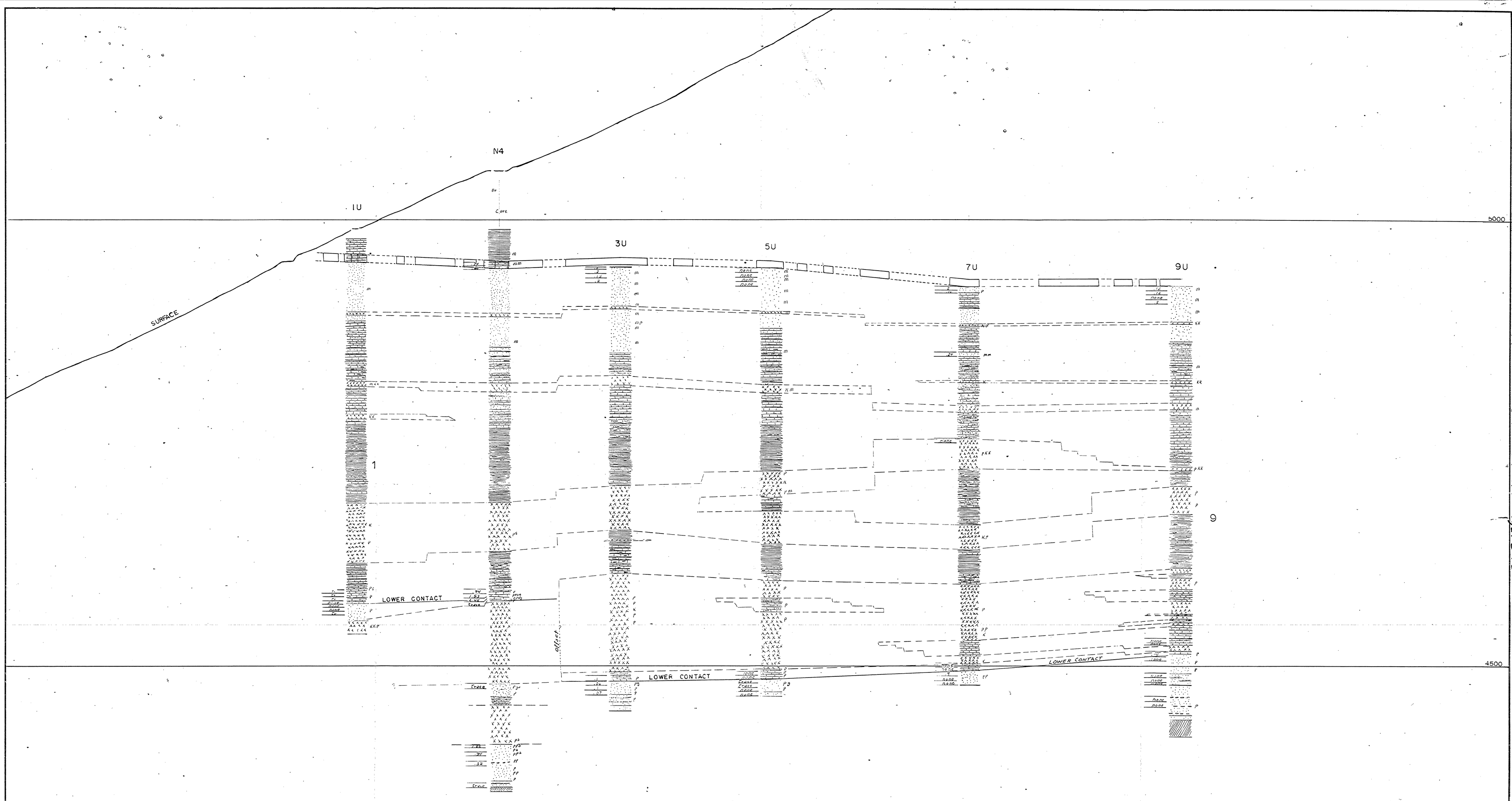


Figure 10

MINERALIZATION

p PYRITE

g GALENA

s SPHALERITE

m MANGANESE

k KAOLINIZATION

NOTE; Single letters (as p) denote weak or disseminated mineralization or alteration. Double letters (as pp) denote moderate to strong mineralization or alteration.

Assays shown are ounces of silver.

LITHOLOGY

FELDSPAR PORPHYRY

SHALE & PEBBLES

LIMESTONE & DOLOMITE

SANDSTONE & QUARTZITE

CONGLOMERATE

PRECAMBRIAN

SECTION 9-1

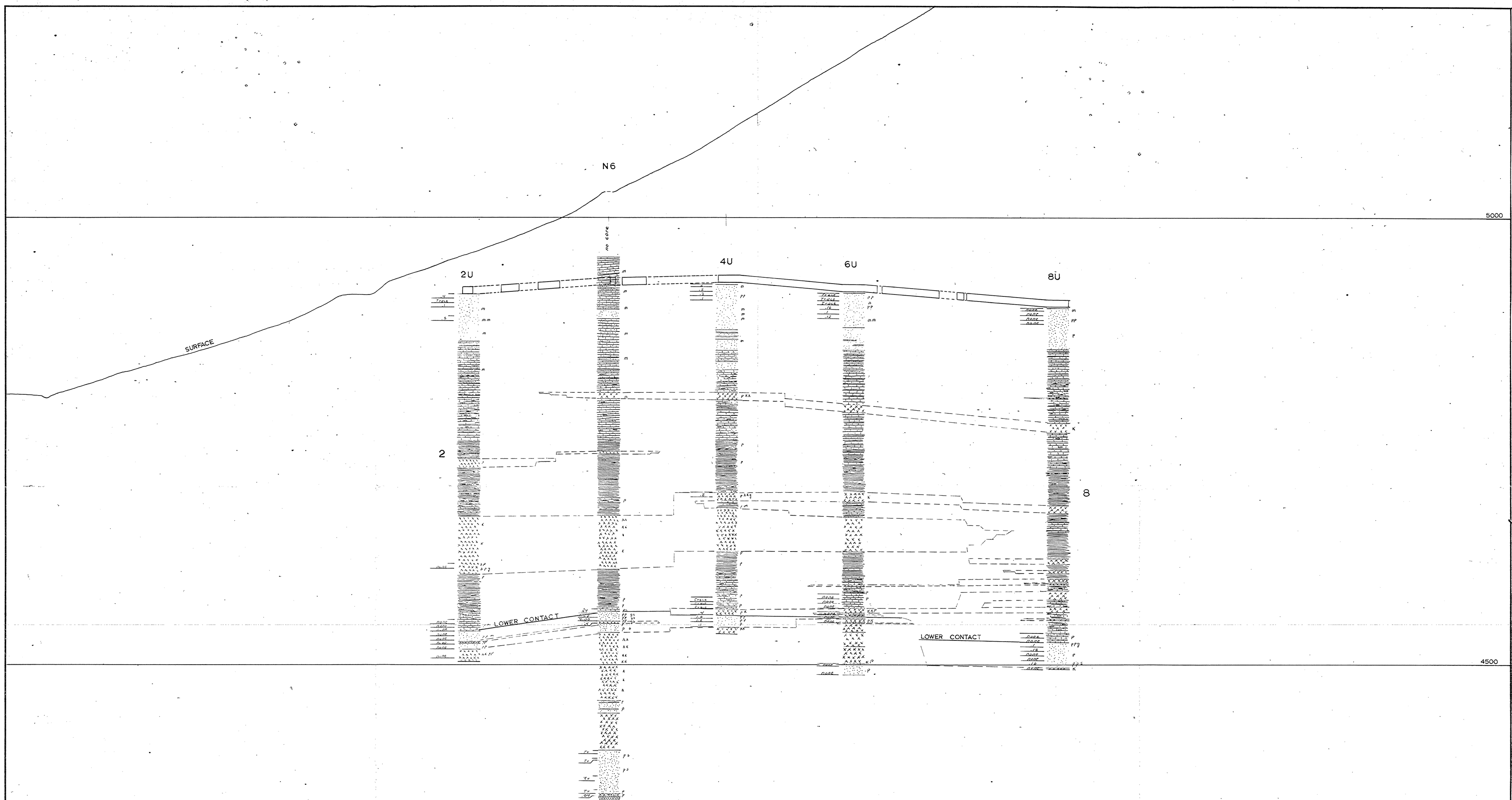
DATE	BY	REVISIONS

HOMESTAKE MINING CO.
LEAD, SO. DAK.
DEPARTMENT

DRAWN BY J.M.W. APPROVED
TRACED SCALE 1" = 50'
CHECKED DATE 9 - 22 - 1967

DOUBLE RAINBOW MINE
SECTION THROUGH DRILL HOLES
9U, 7U, 5U, 3U, N4, 1U FACING EAST
OME - 6558 (Silver) Contract 2233

DOUBLE RAINBOW MINE
LEGEND



MINERALIZATION

p PYRITE

g GALENA

s SPHALERITE

m MANGANESE

k KAOLINIZATION

NOTE: Single letters (as p) denote weak or disseminated mineralization or alteration. Double letters (as pp) denote moderate to strong mineralization or alteration.

Assays shown are ounces of silver.

LITHOLOGY

FELDSPAR PORPHYRY

SHALE & PEBBLES

LIMESTONE & DOLOMITE

SANDSTONE & QUARTZITE

CONGLOMERATE

PRECAMBRIAN

Figure 9

SECTION 8-2

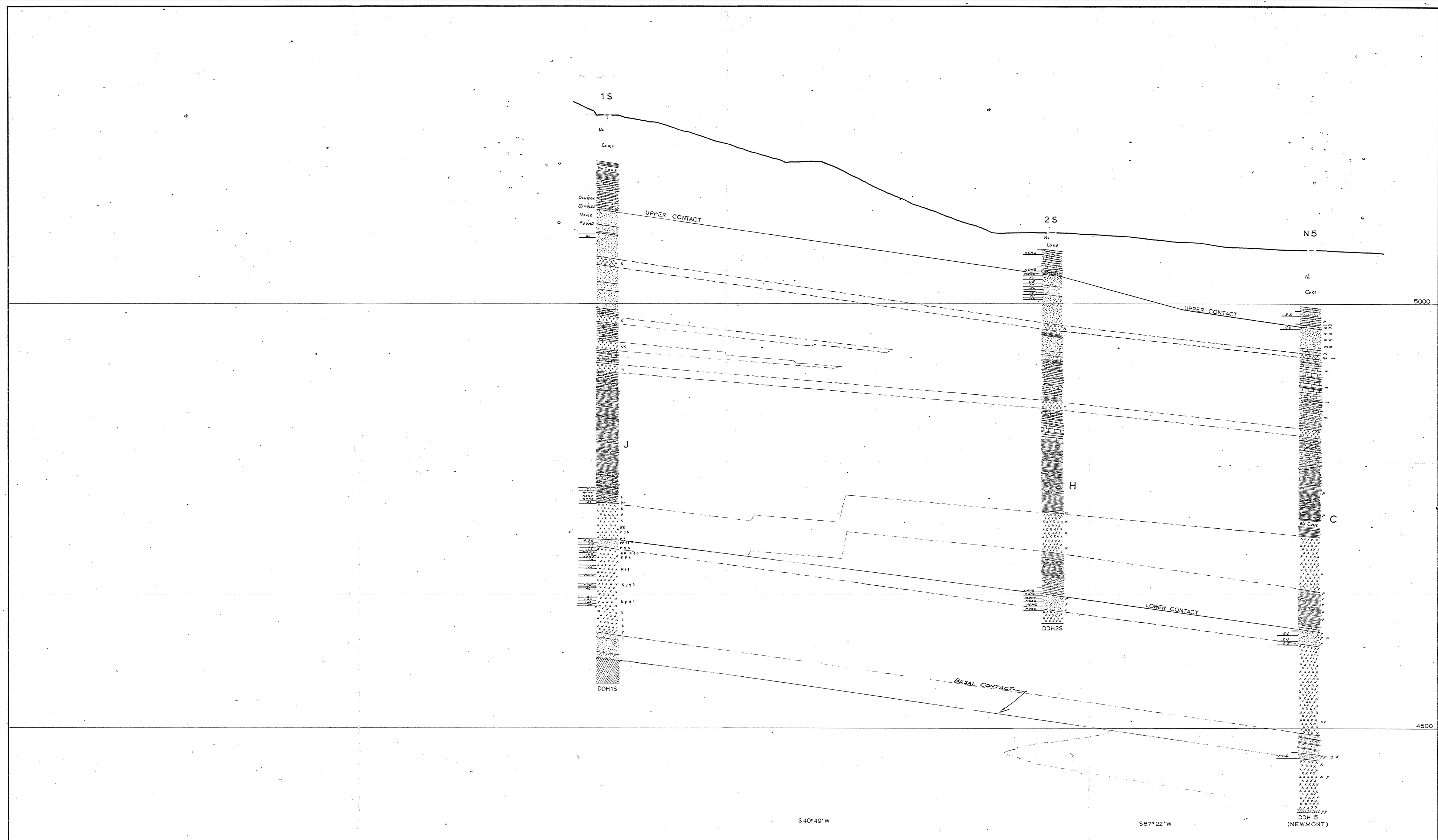
DATE	BY	REVISIONS

HOMESTAKE MINING CO.
LEAD, SO. DAK.
DEPARTMENT

DRAWN BY J.M.W. APPROVED
TRACED SCALE 1" = 50'
CHECKED DATE 9-26-1967

DOUBLE RAINBOW MINE
SECTION THROUGH DRILL HOLES
8U, 6U, 4U, N6, & 2U - FACING EAST
OME-6558(Silver) Contract 2233

DOUBLE RAINBOW MINE
LEGEND



SECTION CHJ

MINERALIZATION

- p PYRITE
- g GALENA
- s SPHALERITE
- m MANGANESE
- k KAOLINIZATION

NOTE: Single letters (as p) denote weak or disseminated mineralization or alteration. Double letters (as pp) denote moderate to strong mineralization or alteration.

Assays shown are ounces of silver.

LITHOLOGY

- FELDSPAR PORPHYRY
- SHALE & PEBBLES
- LIMESTONE & DOLOMITE
- SANDSTONE & QUARTZITE
- CONGLOMERATE
- PRECAMBRIAN

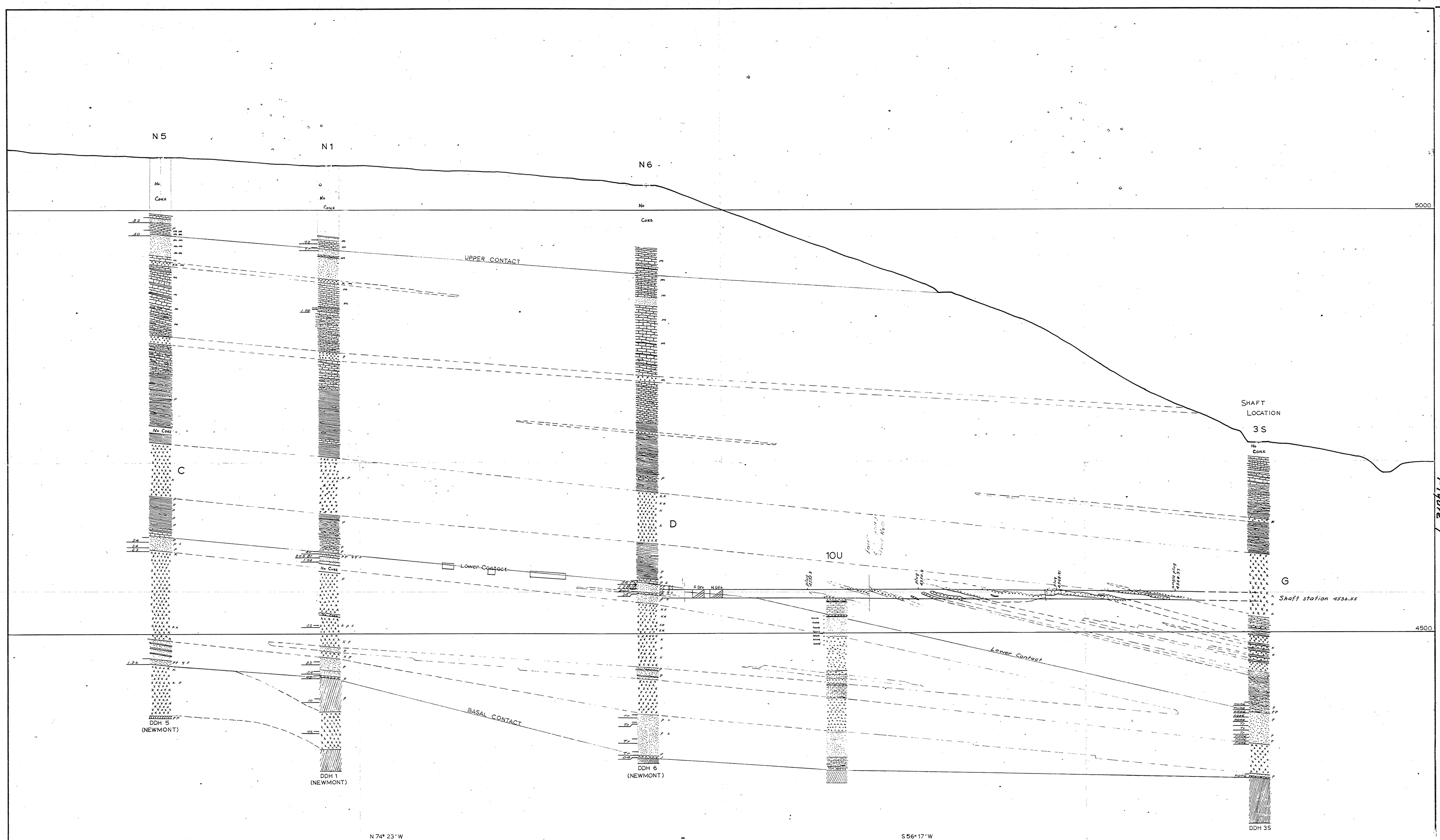
Figure 8

DATE	BY	REVISIONS

DRAWN BY: GCM APPROVED:
TRACED: SCALE: 1" = 50'
CHECKED: DATE:

DOUBLE RAINBOW MINE
SECTION THROUGH DRILL HOLES
N5, 2S, 1S, FACING NORTH
OME 6558(Silver) Contract 2233

DOUBLE RAINBOW MINE
LEGEND



SECTION GDC

MINERALIZATION

- p PYRITE
- g GALENA
- s SPHALERITE
- m MANGANESE
- k KAOLINIZATION

NOTE; Single letters (as p) denote weak or disseminated mineralization or alteration. Double letters (as pp) denote moderate to strong mineralization or alteration.

Assays shown are ounces of silver.

LITHOLOGY

- FELDSPAR PORPHYRY
- SHALE & PEBBLES
- LIMESTONE & DOLOMITE
- SANDSTONE & QUARTZITE
- CONGLOMERATE
- PRECAMBRIAN

Figure 7

DATE	BY	REVISIONS

DRAWN BY G.A. APPROVED
TRACED SCALE 1"=50'
CHECKED DATE

DOUBLE RAINBOW MINE
SECTION THROUGH DRILL HOLES
3S, N6, N1, N5, FACING NORTH
OME 6558(Silver) Contract 2233

DOUBLE RAINBOW MINE
LEGEND

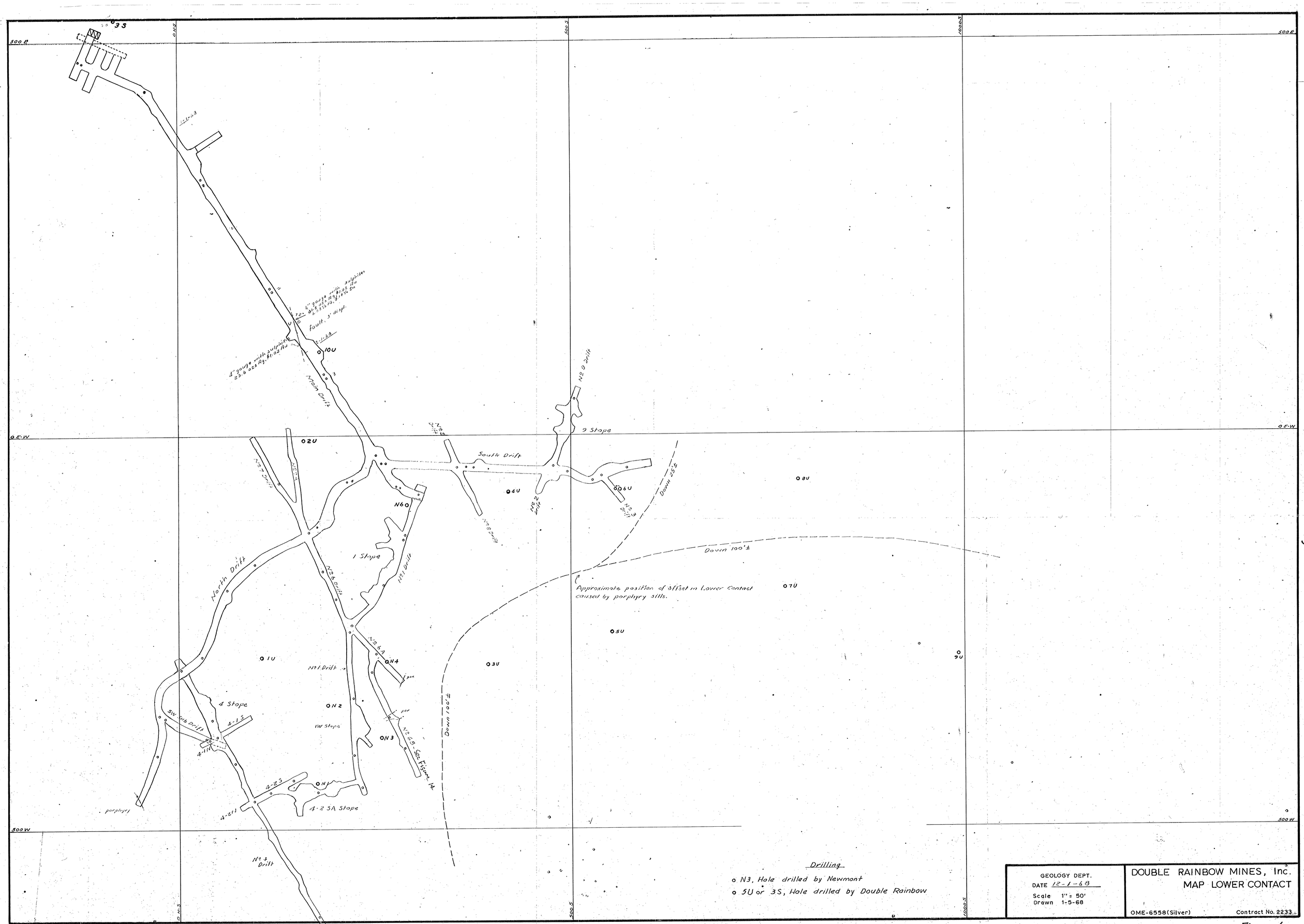
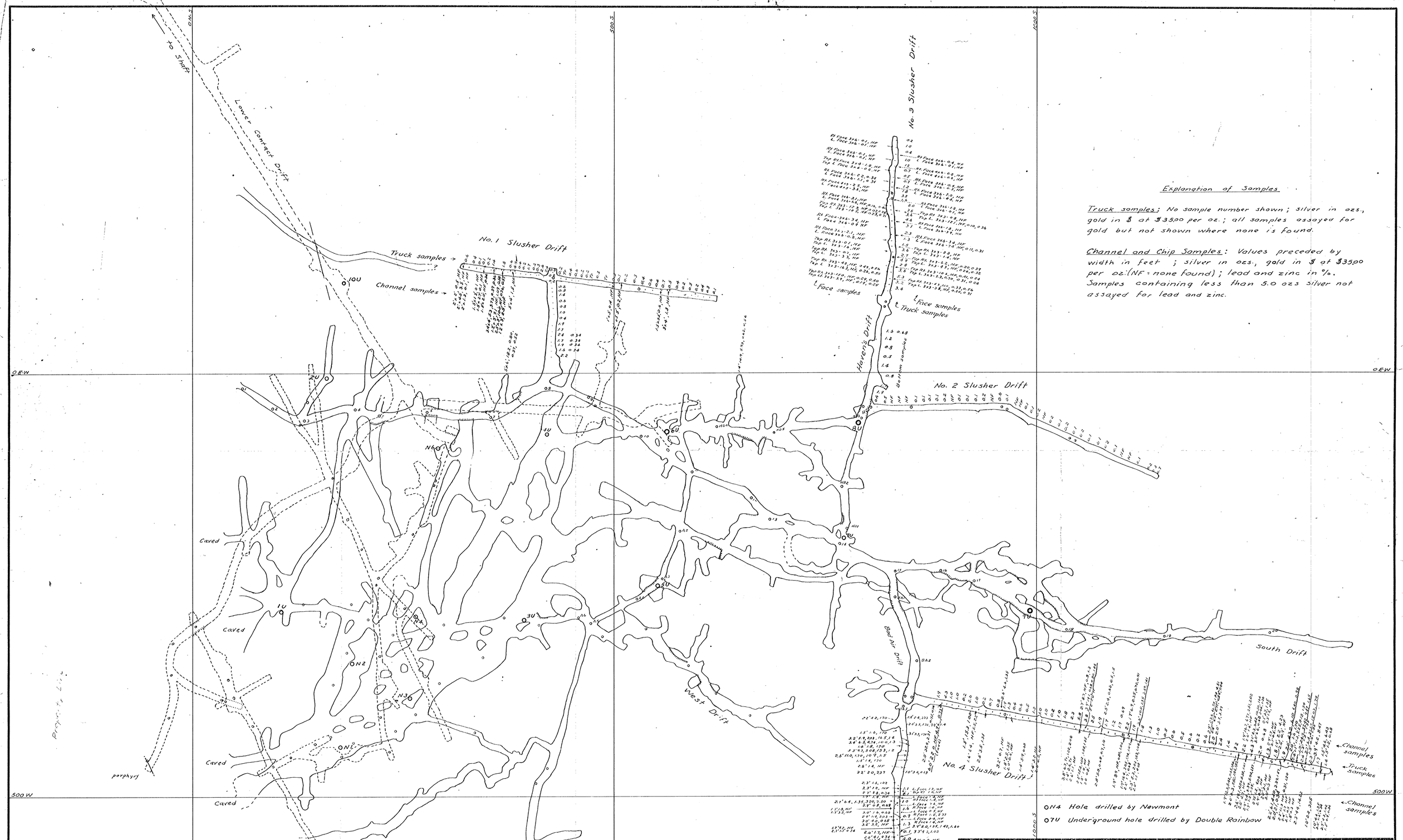


Figure 6

Figure 6



Explanation of Samples

Truck samples: No sample number shown; silver in ozs., gold in $ at $35.00 per oz.; all samples assayed for gold but not shown where none is found.

Channel and Chip Samples: Values preceded by width in feet ; silver in ozs., gold in $ at $35.00 per oz. (NF = none found); lead and zinc in %. Samples containing less than 5.0 ozs silver not assayed for lead and zinc.

REVISIONS		DOUBLE RAINBOW MINES, Inc.
		RICHMOND – SITTING BULL MINE
	DRAWN BY ____ APPROVED ____	OME – 6558 (Silver) Contract No. 2233
	TRACED ____ SCALE 1" = 50'	SAMPLE MAP
	CHECKED ____ DATE 10 – 5 – 67	UPPER CONTACT

Figure 5

Figure 5

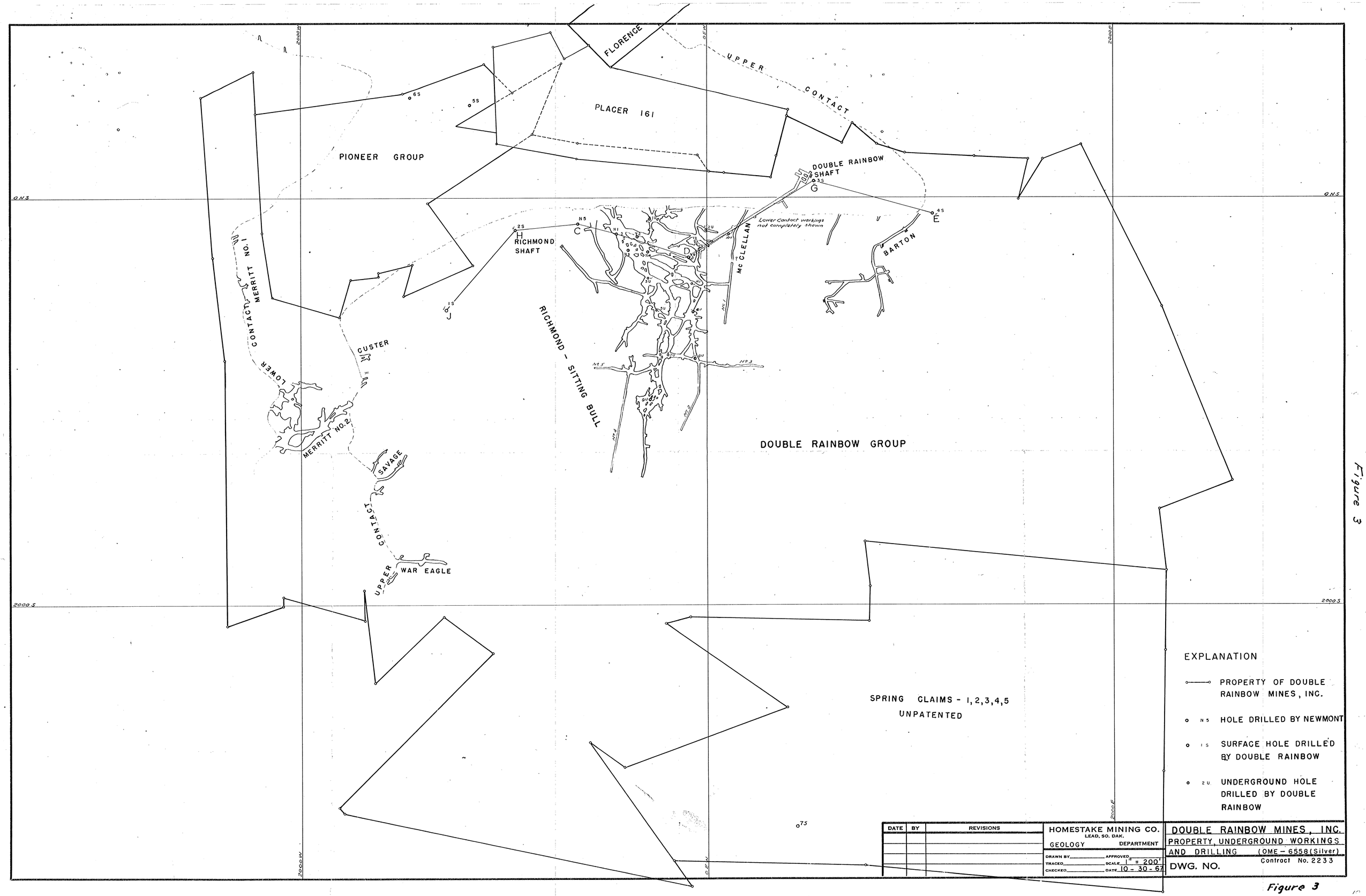


Figure 3

Figure 3

Figure 20

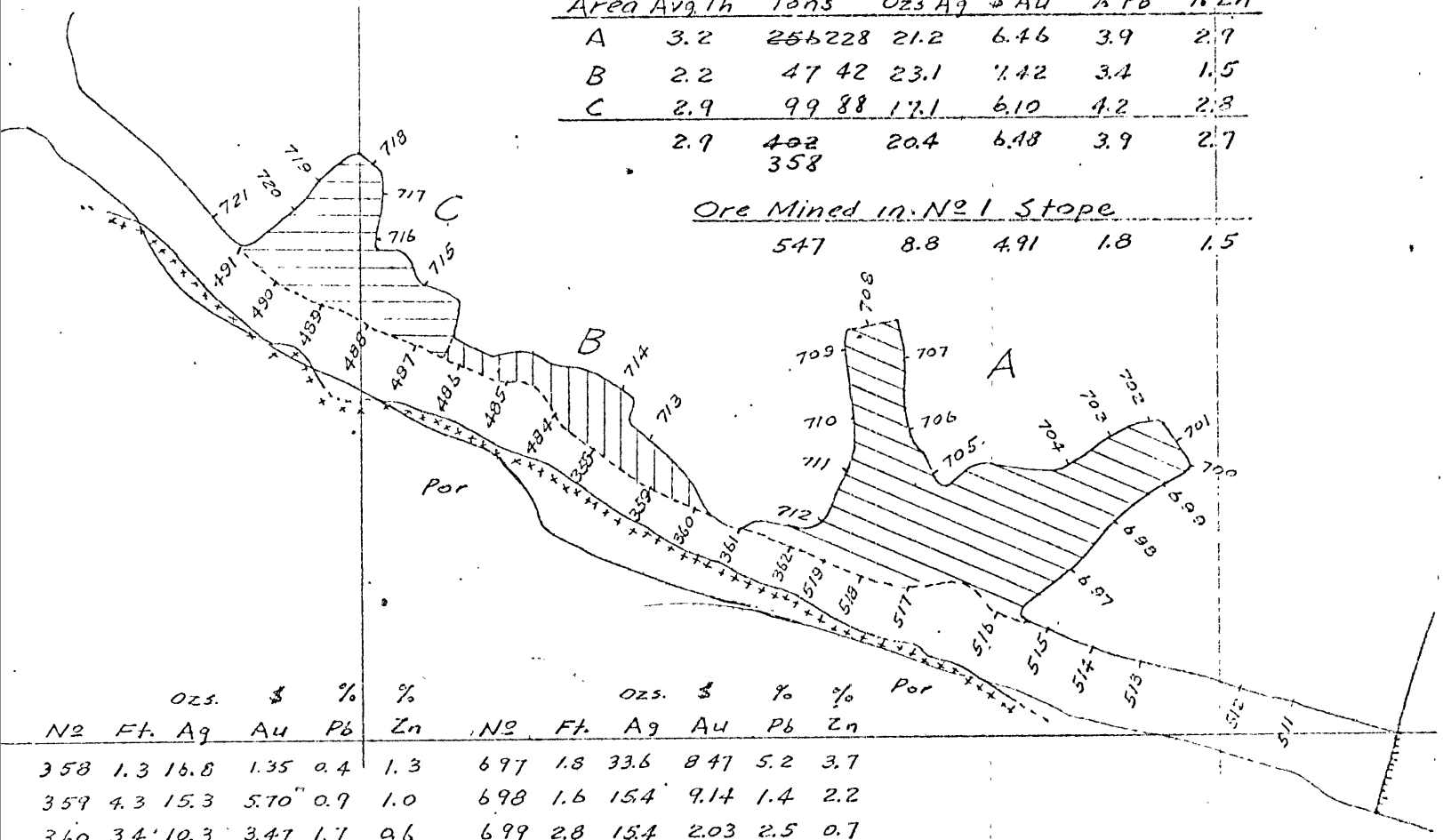
DOUBLE RAINBOW MINE
Nº 1 STOPE SAMPLING
1" = 20' Oct. 30, 1968

Tons & Grade in Ore Bed

Area	Avg. Th	Tons	Ozs Ag	$ Au	% Pb	% Zn
A	3.2	~~256~~ 228	21.2	6.46	3.9	2.9
B	2.2	47 42	23.1	7.42	3.4	1.5
C	2.9	99 88	17.1	6.10	4.2	2.8
	2.9	~~402~~ 358	20.4	6.48	3.9	2.7

Ore Mined in Nº 1 Stope

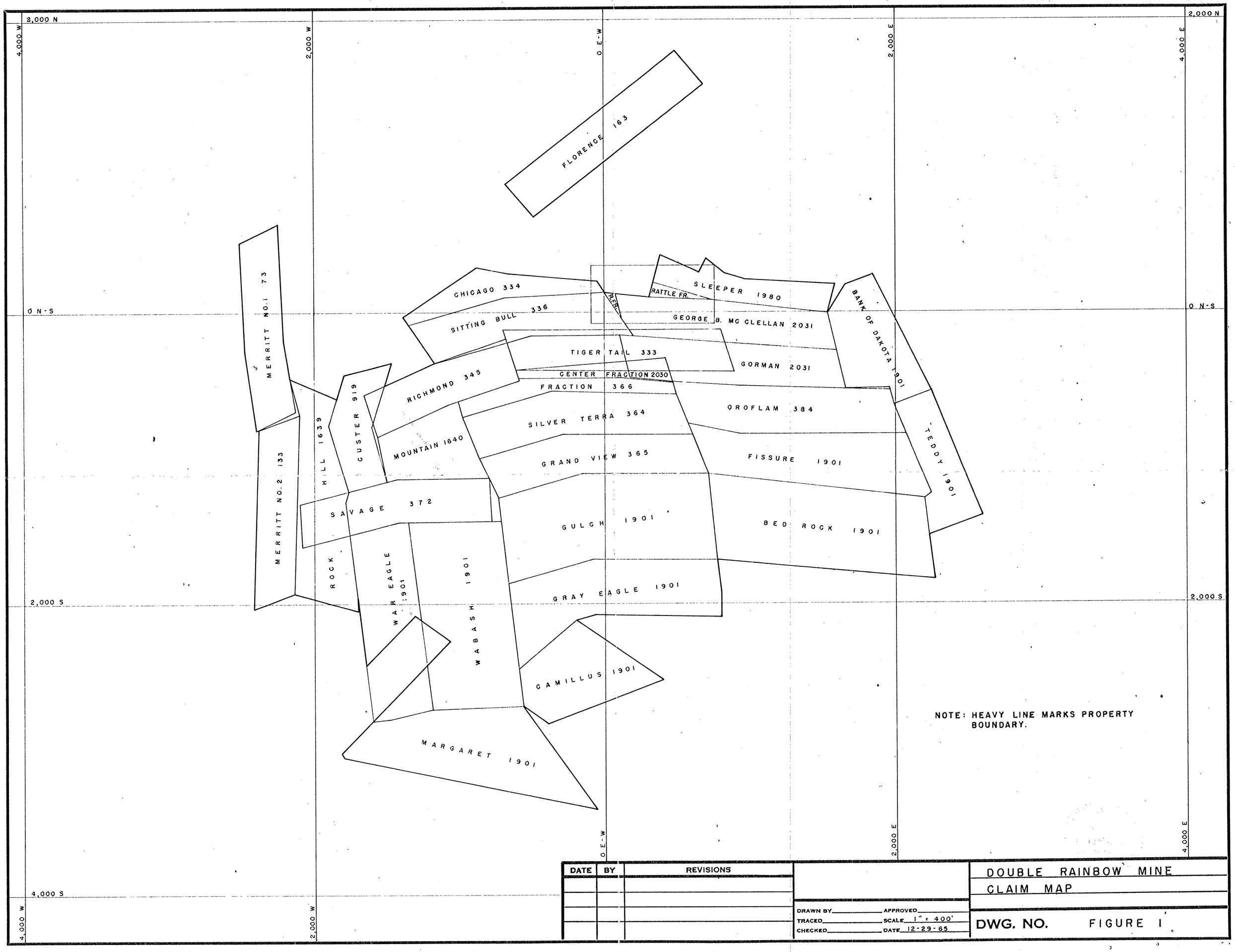
547	8.8	4.91	1.8	1.5



Nº	Ft.	Ozs. Ag	$ Au	% Pb	% Zn
358	1.3	16.8	1.35	0.4	1.3
359	4.3	15.3	5.70	0.9	1.0
360	3.4	10.3	3.47	1.7	0.6
361	1.5	6.6	4.23	1.7	0.6
362	3.6	11.4	6.27	0.9	1.4
484	2.6	18.4	6.27	0.7	2.0
485	2.7	36.6	14.05	8.2	1.7
486	2.7	28.0	13.21	5.0	1.7
487	1.8	45.7	6.94	16.1	2.1
488	4.6	9.2	5.03	1.4	1.0
489	1.5	19.4	6.94	9.4	2.2
490	5.6	22.2	5.55	5.9	2.8
491	2.3	7.6	3.56	0.9	1.9
511	3.1	22.6	5.42	2.2	3.6
512	1.6	14.0	6.94	3.2	4.6
513	1.8	4.0	4.23		
514	8.0	21.2	9.53	3.6	2.8
515	2.4	52.3	19.14	12.8	6.4
516	7.6	4.7	7.40	1.4	4.0
517	7.0	23.8	5.30	6.5	1.9
518	5.6	10.8	4.76	1.0	2.7
519	4.8	10.8	4.23	0.9	1.8

Nº	Ft.	Ozs. Ag	$ Au	% Pb	% Zn
697	1.8	33.6	8.47	5.2	3.7
698	1.6	15.4	9.14	1.4	2.2
699	2.8	15.4	2.03	2.5	0.7
700	1.8	11.2	7.62	4.5	3.0
701	1.3	73.8	9.82	6.3	5.4
702	2.1	24.2	11.85	3.2	1.7
703	3.4	16.2	6.94	3.3	2.3
704	3.1	30.7	6.94	14.8	3.8
705	1.8	23.8	16.09	2.9	3.6
706	1.1	11.8	4.91	1.8	1.6
707	3.1	17.0	4.23	1.3	3.2
708	1.7	39.3	4.23	11.7	4.2
709	3.0	30.2	9.82	3.0	4.9
710	3.0	28.2	6.94	3.4	1.3
711	3.9	52.0	12.53	8.2	6.0
712	2.9	22.0	11.85	3.2	3.2
713	1.8	23.1	7.62	5.2	1.3
714	1.9	73.4	7.62	7.0	3.4
715	2.6	12.8	10.50	1.4	5.5
716	2.4	19.8	6.94	6.2	3.2
717	2.3	5.2	6.94	0.8	4.2
718	1.7	12.8	10.50	1.4	5.5

Nº	Ft.	Ozs Ag	$ Au	% Pb	% Zn
719	3.0	23.4	4.91	5.0	3.0
720	4.4	16.1	4.23	4.4	1.5
721	2.3	16.3	7.62	5.0	6.3



DATE	BY	REVISIONS

DRAWN BY _____ APPROVED _____
TRACED _____ SCALE 1" = 400'
CHECKED _____ DATE 12-29-65

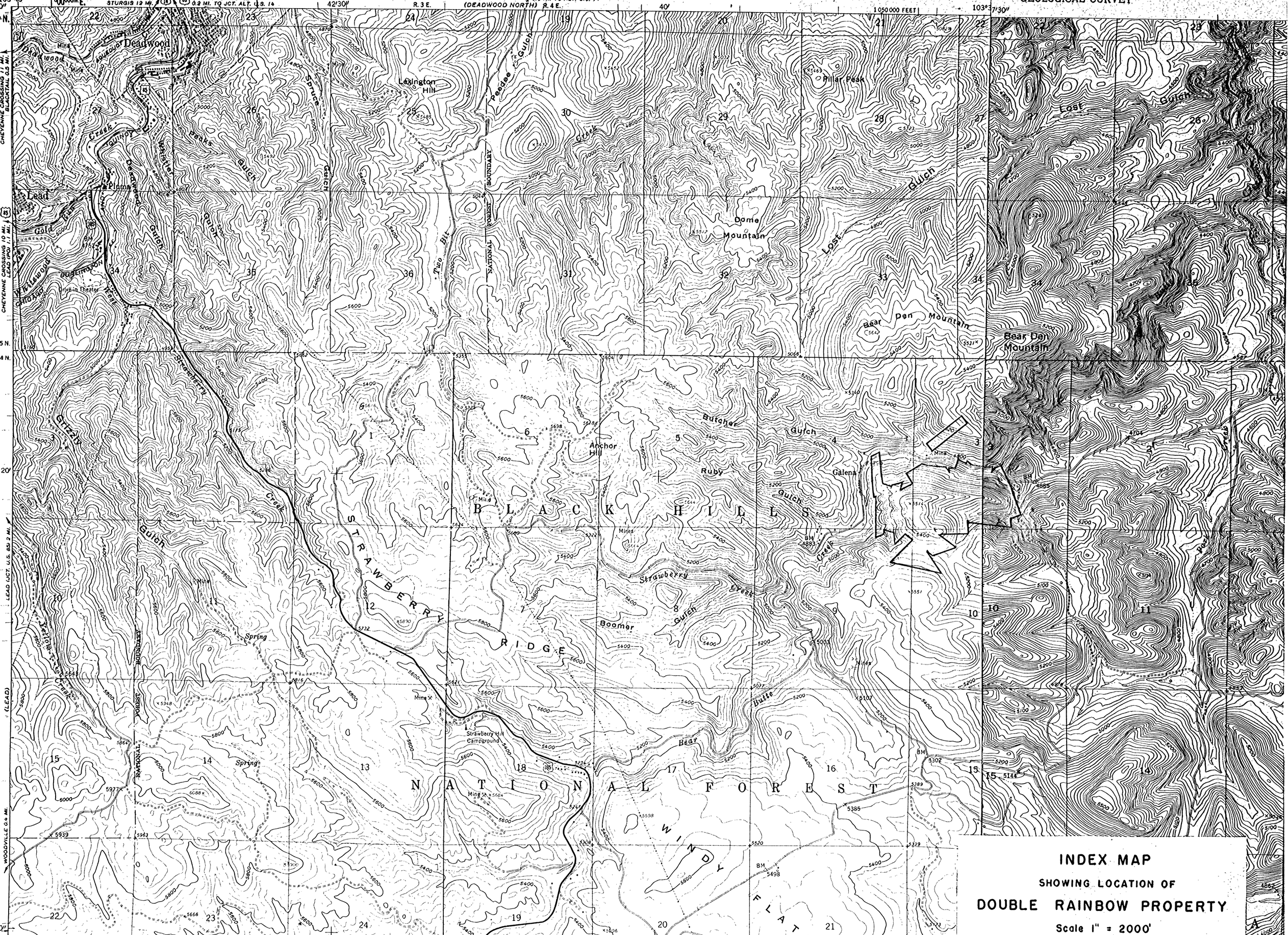
DOUBLE RAINBOW MINE
CLAIM MAP

DWG. NO. FIGURE 1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DEADWOOD SOUTH QUADRANGLE
SOUTH DAKOTA–LAWRENCE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 STURGIS 15' QUADRANGLE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



INDEX MAP
SHOWING LOCATION OF
DOUBLE RAINBOW PROPERTY
Scale 1" = 2000'

Figure 2

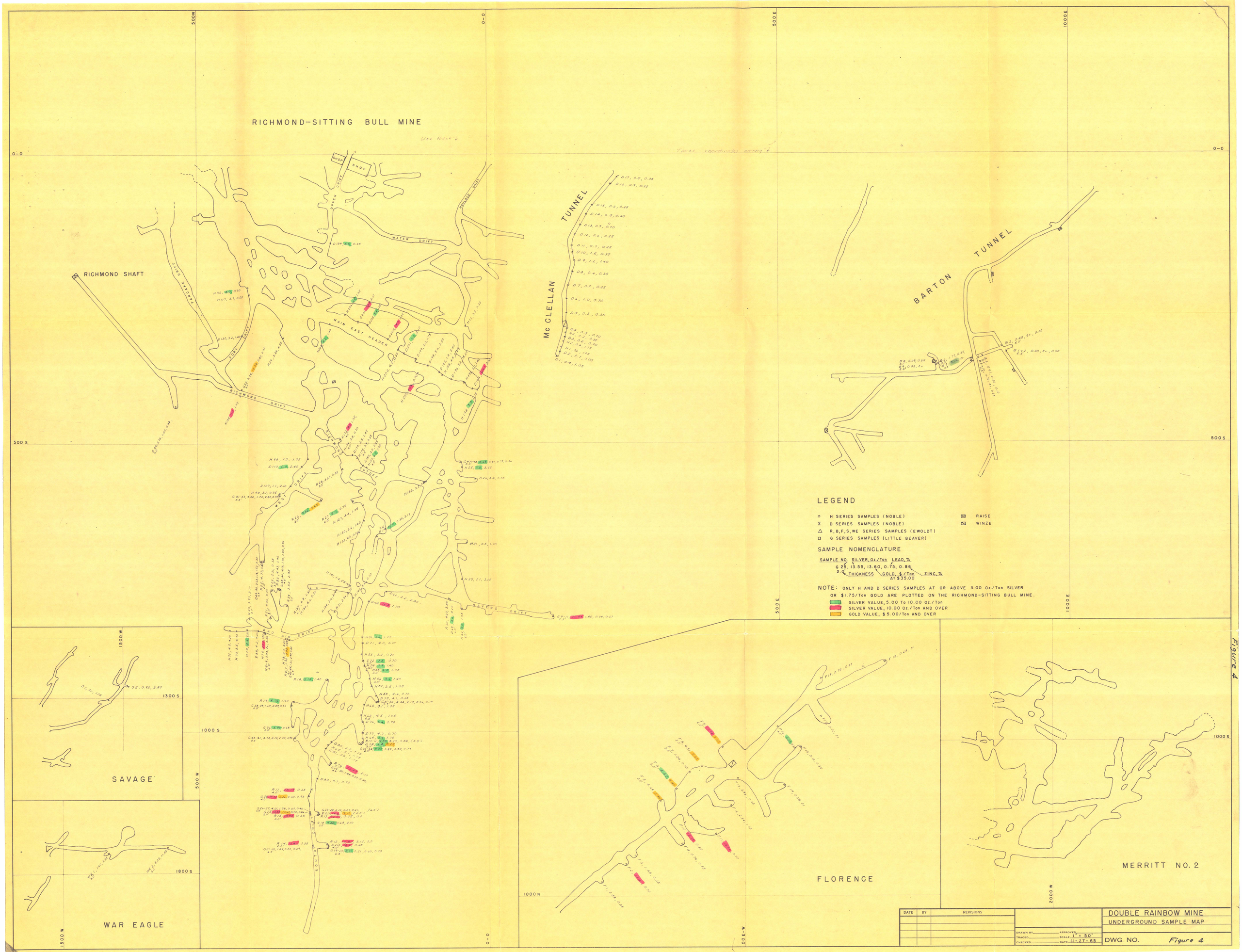
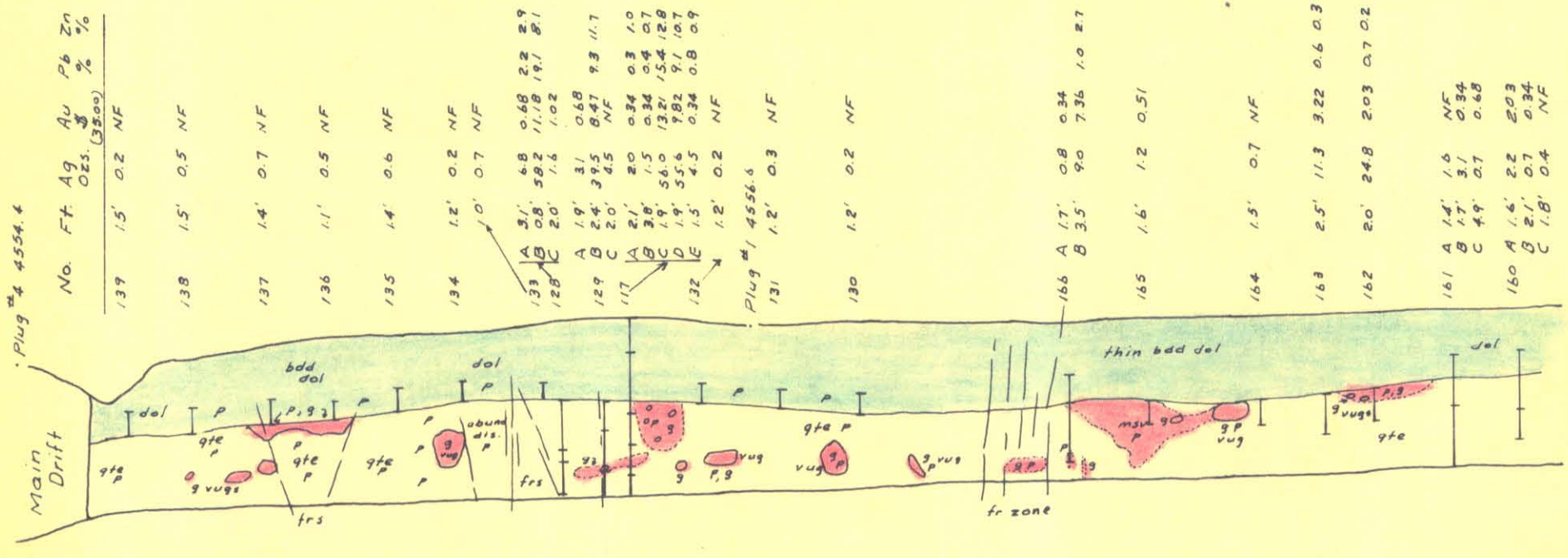

RICHMOND-SITTING BULL MINE
Use this
These coordinates wrong
RICHMOND SHAFT
SHOP
SHOP
UPPER DRIFT
TAILLAKE DRIFT
WATER DRIFT
PARKLAKE DRIFT
FORT DRIFT
MAIN EAST HEADER
RICHMOND DRIFT
WEST DRIFT
OUTCROP
HAVEN'S DRIFT
AIR DRIFT
SOUTH DRIFT
Mc CLELLAN TUNNEL
BARTON TUNNEL
SAVAGE
WAR EAGLE
FLORENCE
MERRITT NO. 2
LEGEND
H SERIES SAMPLES (NOBLE)
D SERIES SAMPLES (NOBLE)
R, B, F, S, WE SERIES SAMPLES (EWOLDT)
G SERIES SAMPLES (LITTLE BEAVER)
RAISE
WINZE
SAMPLE NOMENCLATURE
SAMPLE NO. SILVER, Oz./Ton LEAD, %
G 25, 13.55, 13.60, 0.75, 0.86
2.0 THICKNESS GOLD, $/Ton AT $35.00 ZINC, %
NOTE: ONLY H AND D SERIES SAMPLES AT OR ABOVE 3.00 Oz./Ton SILVER OR $1.75/Ton GOLD ARE PLOTTED ON THE RICHMOND-SITTING BULL MINE.
SILVER VALUE, 5.00 To 10.00 Oz./Ton
SILVER VALUE, 10.00 Oz./Ton AND OVER
GOLD VALUE, $5.00/Ton AND OVER
DATE BY REVISIONS
DRAWN BY
TRACED
CHECKED
APPROVED
SCALE 1" = 50'
DATE 11-27-65
DOUBLE RAINBOW MINE
UNDERGROUND SAMPLE MAP
DWG. NO. Figure 4

Figure 4



Shale & dolomite

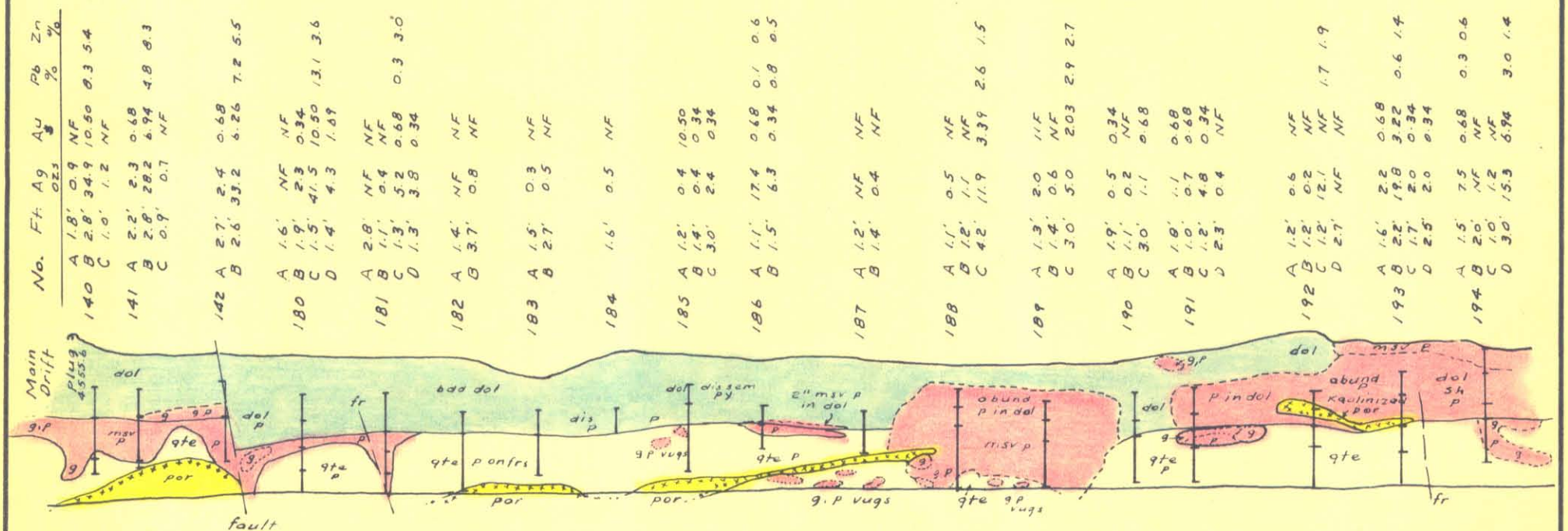
Sulphide mineralization

Quartzite

Tertiary porphyry

p pyrite
g galena
s sphalerite
gte quartzite
qz quartz
fr fracture
por porphyry

DRAWN BY ALS	DEPT. Geology	DOUBLE RAINBOW MINE	HOMESTAKE MINING CO. LEAD, SO. DAK.
TRACED	SCALE 1" = 10'	North Drift - West Wall	
CHECKED	DATE Nov. 27, 1968	Geologic and Sample Section	DWG. NO. Figure 16
APPROVED	ORDER NO.		



Shale & dolomite

Sulphide mineralization

Quartzite

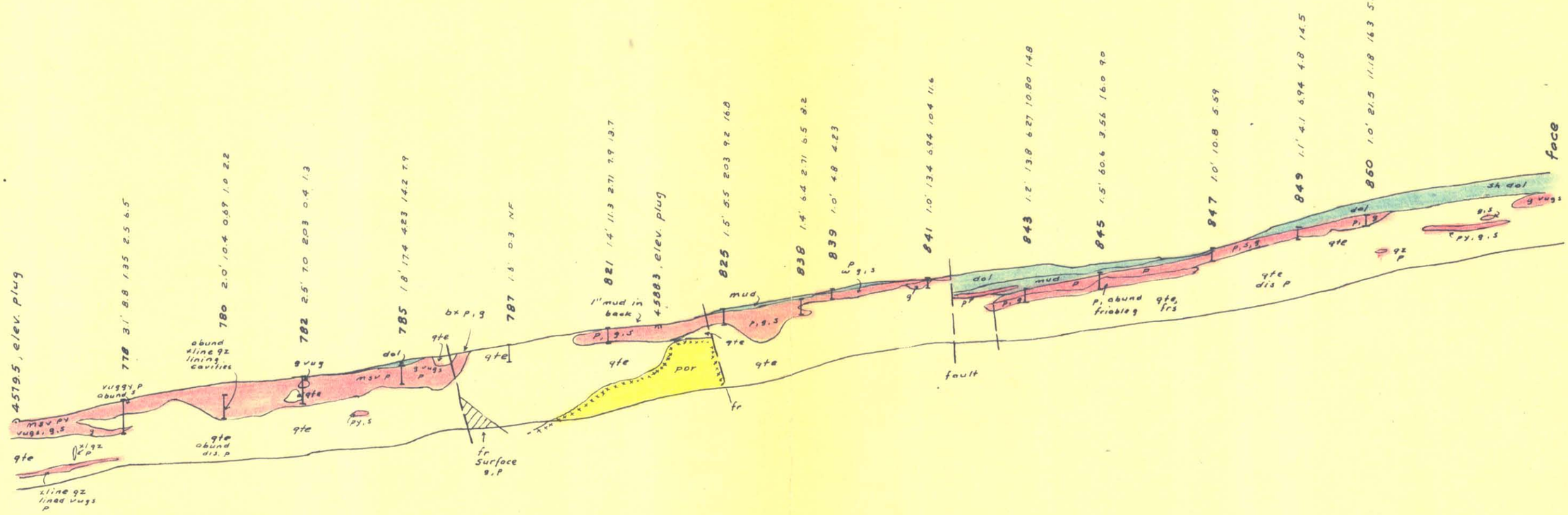
Tertiary porphyry

p pyrite
g galena
s sphalerite
qte quartzite
qz quartz
fr fracture
por porphyry

DRAWN BY ALS	DEPT. Geology	DOUBLE RAINBOW MINE	HOMESTAKE MINING CO. LEAD, SO. DAK.
TRACED	SCALE 1" = 10'	South Drift - South Wall	
CHECKED	DATE Nov 23, 1968		DWG. NO. Figure 15
APPROVED	ORDER NO.	Geologic and Sample Section	

See Figure 6 for drift location

Figure 14



Samples

No.	Ft	Ag ozs	Au($35.00)	Pb %	Zn %
778	3.1	8.8	1.35	2.5	6.5

p pyrite
g galena
s sphalerite
qte quartzite
qz quartz
fr fracture
por porphyry

Shale and dolomite

Sulphide mineralization

Quartzite

Tertiary porphyry

DATE	BY	REVISIONS

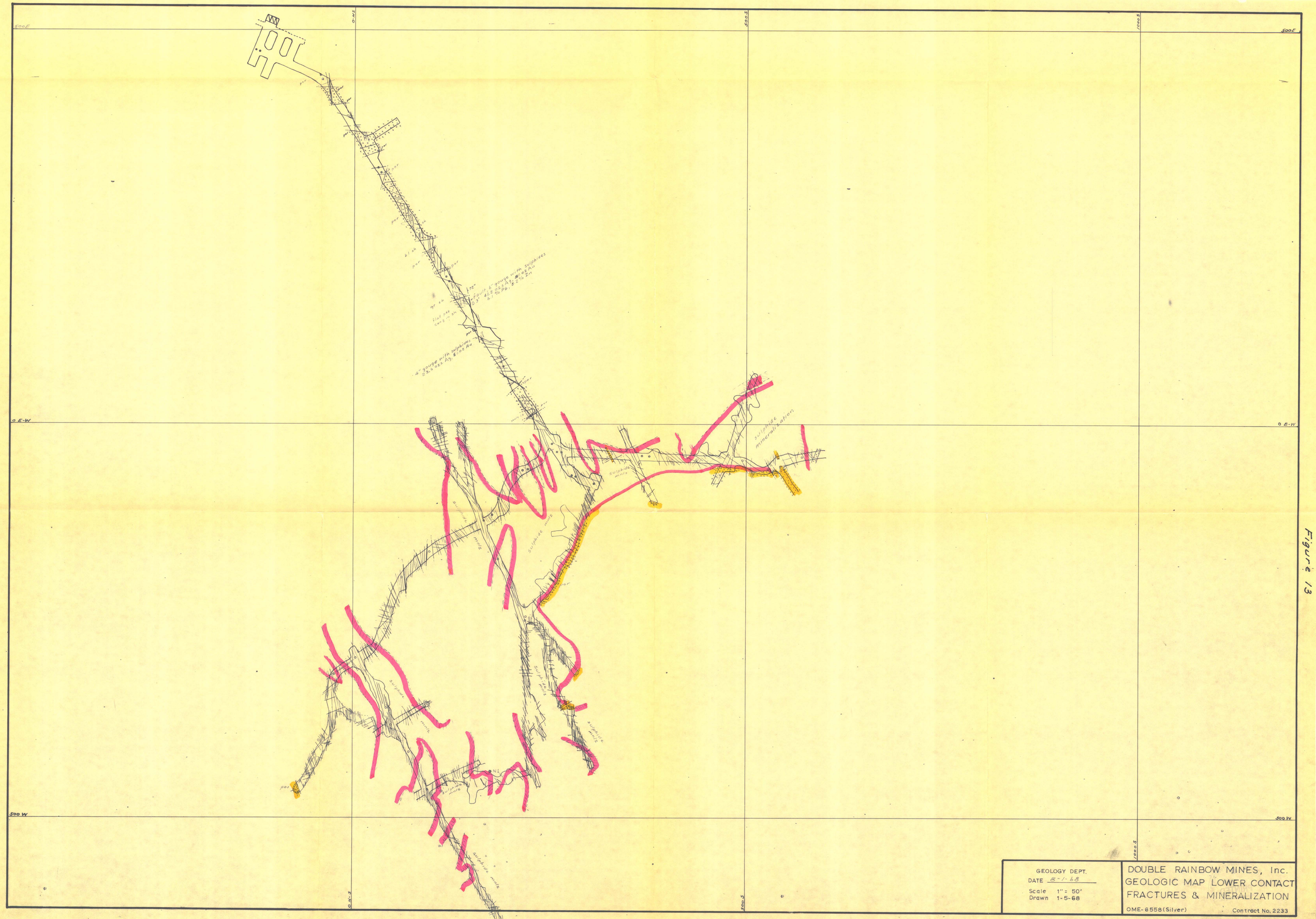
HOMESTAKE MINING CO.
LEAD, SO. DAK.
GEOLOGY DEPARTMENT

DRAWN BY ALS APPROVED
TRACED SCALE 1" = 10'
CHECKED DATE Nov 16, 1968

DOUBLE RAINBOW MINE
6B Drift - South Wall
Geologic Section

DWG. NO. Figure 14

See Figure 6 for drift location. SWH



GEOLOGY DEPT. DATE 8-1-68 Scale 1" = 50' Drawn 1-5-68	DOUBLE RAINBOW MINES, Inc. GEOLOGIC MAP LOWER CONTACT FRACTURES & MINERALIZATION OME-6558 (Silver) Contract No. 2233

Figure 13

Figure 13

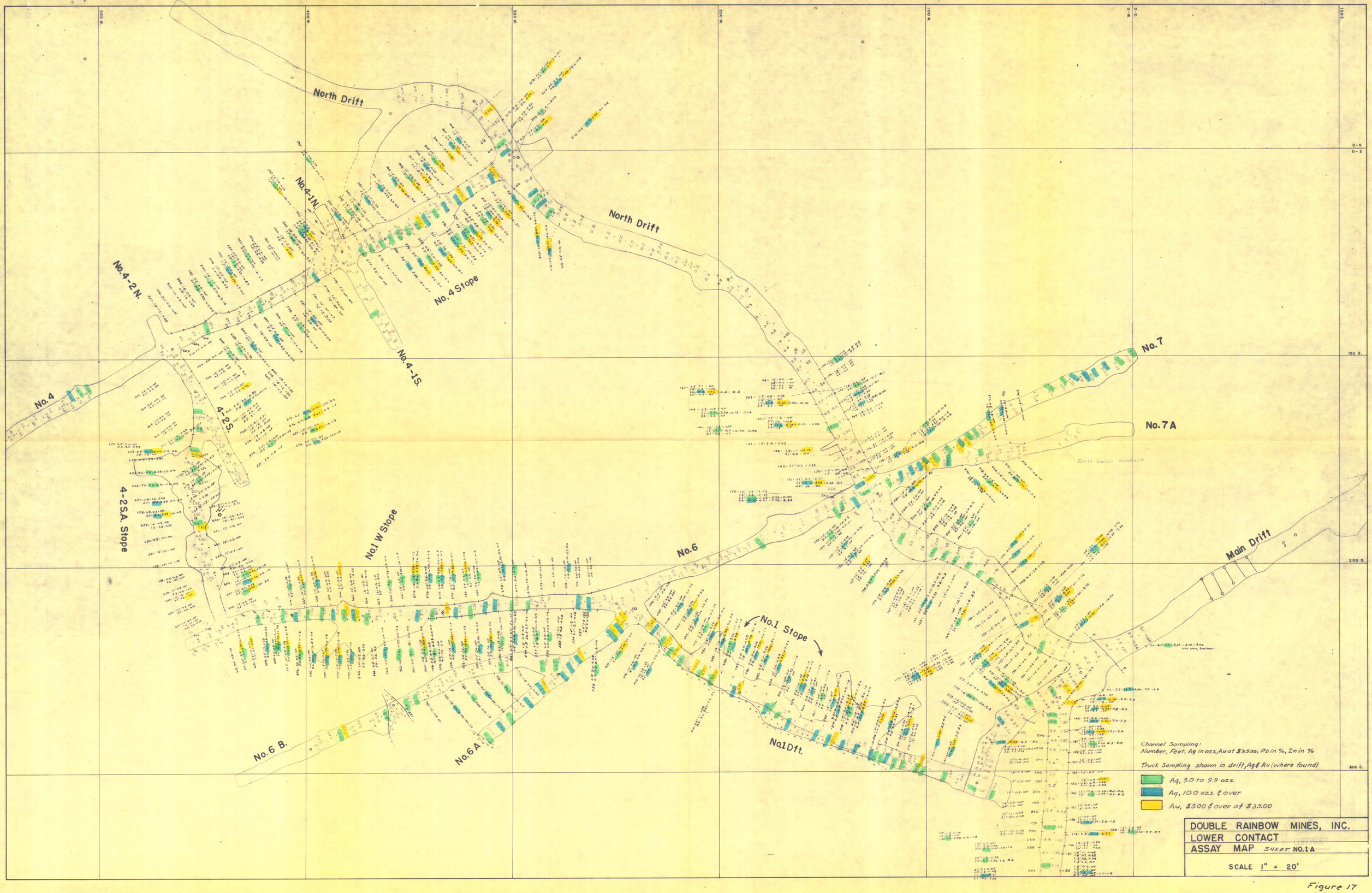
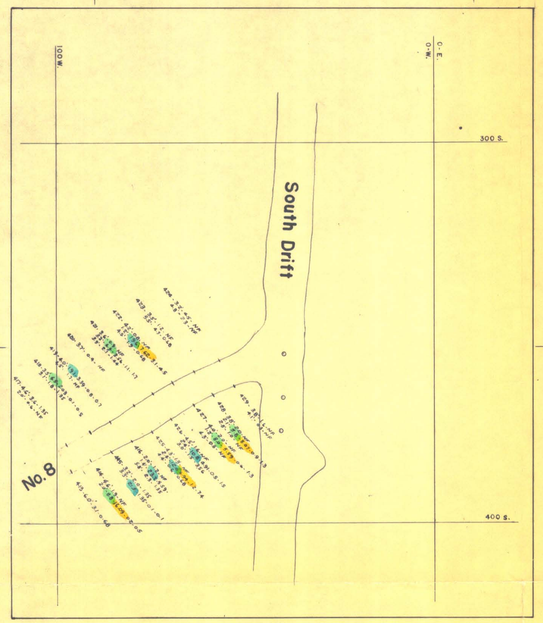


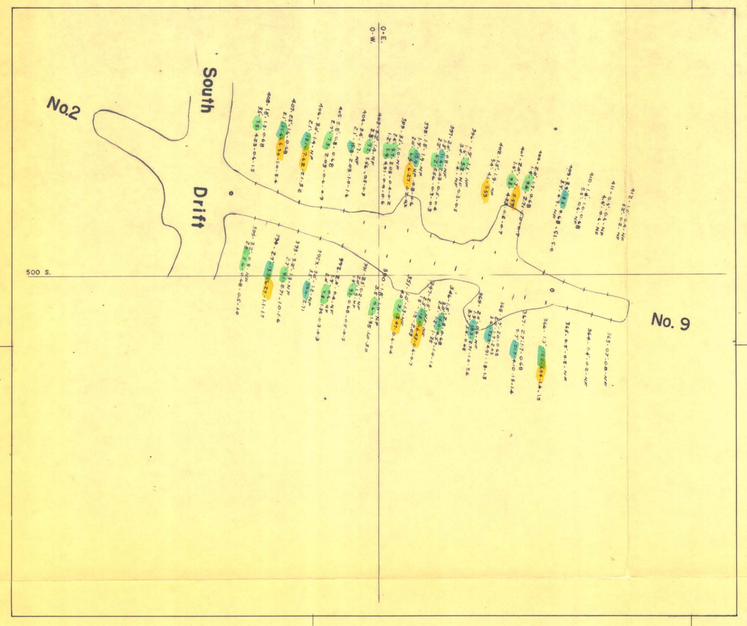
Figure 17

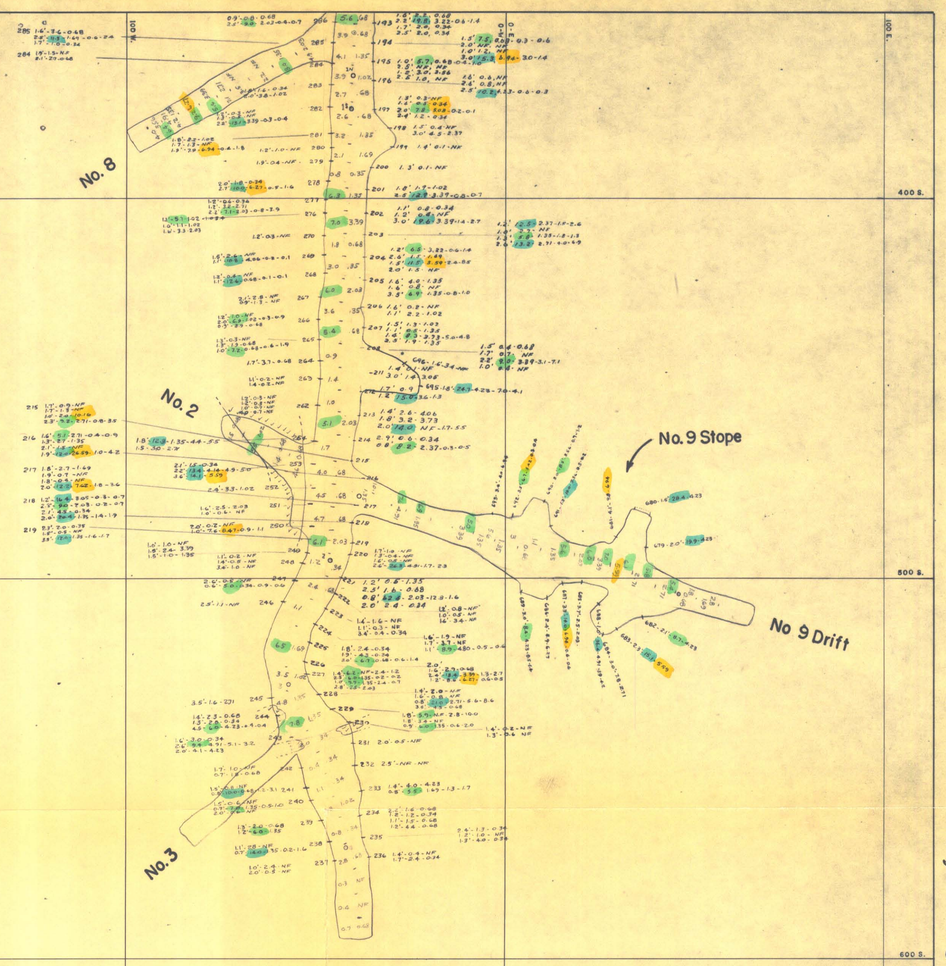
Figure 17

Figure 18

Figure 18







700 S.

Channel Sampling :
Number, Feet, Ag in ozs., Au at $35.00, Pb in %, Zn in %

Truck Sampling shown in drift, Ag & Au (where found)

- Ag, 5.0 to 9.9 ozs.
- Ag, 10.0 ozs. & over
- Au, $5.00 & over at $35.00

DOUBLE RAINBOW MINES, INC.
LOWER CONTACT
ASSAY MAP SHEET NO. 2
SCALE 1" = 20'

Figure 19

Figure 19