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TRANSWORLD

Resources CORPORATION

417 South Hill Street Room 1256
Los Angeles 13, California
MAdison 5-7514

2000 National Bank of Commerce Bldg.
San Antonio, Texas
CApitol 7-6091

Plant
Box 9, Hesperia, California

Los Angeles
December 9, 1960

Mr. Frank J. Frankovitch
3351 N. Sixth Avenue
Phoenix, Arizona

Dear Frank:

In order to avoid losing the leases on the Vizina and Mountain Maid claims on January 31, 1961 about $5,000 must be spent for drilling on the property. I have discussed this with Dave Shaw and it is our feeling we should not spend any more money on this property at the present time but that we should make an agreement with you that will permit you to continue your exploration program with new financing.

Since TRC does not want to conduct the drilling program necessary to extend the leases, it is my understanding that you will perform this work if we will give you an option for 90 days from this date to buy our 57% interest in the leases on the following terms:

1. A cash payment to TRC to equal our direct cost in the project of $19,257.11.

2. TRC to retain 5% net carried interest.

This is agreeable to us provided that if you do not perform the drilling program and the leases are allowed to lapse that we will maintain the same interest with you that we now have if a new lease is later obtained by you on the same property.

If you complete the drilling program and extend the leases but do not exercise the option at the end of 90 days, the $5,000 spent on the drilling program will increase your interest to 50%.

We hope that you proceed immediately on the further exploration of this property and that if you are successful in proving up sufficient ore for a mining operation that we will be able to work with you on the development of the mine.

Sincerely yours,

Robert B. Hicks

RBH:en
cc: Dave Shaw

TOMBSTONE MINING LEASE

This lease, made this _____ day of January, 1960, by and between Walter C. Foster, in his capacity as Mayor of the City of Tombstone, Cochise County, State of Arizona, and in no other capacity, and as ex-officio Trustee for the several use and benefit of the occupants of the Tombstone Townsite of Cochise County, Arizona, hereinafter referred to as Lessor, and Frank J. Frankovich, a married man whose wife is Marcene D. Frankovich of Maricopa County, Arizona, hereinafter referred to as Lessee:

WITNESSETH:

WHEREAS, it appears to the Lessee by virtue of certain title reports and investigations that Lessor in his ex-officio capacity as Trustee, may be the owner of all or part of the mineral rights of the area described in Exhibit A attached hereto, to which reference is hereby made for a more particular description, and which is located within township 19 south, range 22 west, Cochise County, Arizona; and

WHEREAS, the parties hereto are desirous of entering into an agreement to provide for the exploration, leasing and mining of minerals forty feet below the surface of said described area and to any depth below the said forty feet; and

WHEREAS, Lessor does not make any representation or warranty as to ownership of the minerals beneath the surface of any portion of the said described area and makes no warrantiea or representations relative to his authority to lease the same to lessee, but to the extent of his authority and his ownership, as such Trustee, Lessor, acting for and on behalf of the several use and benefit of the occupants of the Tombstone Townsite and pursuant to such authority as is vested in him by law, enters into this lease with the Lessee for the purpose of producing, for and on behalf of the occupants of the Tombstone Townsite, such income as may be available from the mining operations conducted by the Lessee under this lease.

NOW, THEREFORE, for and in consideration of the mutual covenants and agreements to be kept and performed by the parties hereto, it is agreed as follows, to-wit:

(1) Exploration and Mining Rights. Insofar as Lessor is legally capable of granting the same, Lessee shall have the exclusive right to enter within said described area, as stated in this lease. Lessor agrees, if Lessee requests permission of the City of Tombstone to enter upon the surface of any of said described area, (within the streets and alleys or any portions of the surface not claimed by an owner thereof) to use his good offices to procure such permission from the Mayor and Common Council of the City of Tombstone, it being understood that such permission may or may not be granted and then only upon such conditions as the Council shall specify. During the term of this lease Lessor agrees that he will make no agreement, contracts, or disposition affecting the mineral rights forty feet beneath the surface of any of said described area or the title thereto, except as he may be otherwise required by law to do so.

(2) No-Lien Notice. The Lessee shall file for record no-lien notice as required by law, in the office of the County Recorder of Cochise County, Arizona. Copies of said notice shall be posted, and kept posted, by Lessee, during the life of this lease, as required by Arizona Statutes.

(3) Taxes. Lessee shall pay all taxes assessed against the sub-surface minerals of said described area from date of this lease, together with all excise or sales taxes on all ores mined, milled or shipped under this lease. Lessee shall pay all taxes assessed against Lessor's interest in said described area. Should Lessee fail to pay said taxes, then Lessor shall have the right, at his election, to declare a forfeiture of this lease, the same as for failure to make the payments due hereunder.

(4) Materials Claims. Lessee shall pay all claims for labor, materials, supplies, services and equipment incurred by him. Lessee further agrees to save

Lessor harmless from any claims, debts, or liens against the property incurred by Lessee or his contractors or employees.

(5) Workmen's Compensation. Lessee shall obtain and keep in force, during the life of this agreement, adequate insurance under the Workmen's Compensation Act, or the Employer's Liability Act, of the State of Arizona, as the case may be, for injuries or deaths from accidents in operation of said mining property.

(6) Motor Vehicle Insurance. If the Lessee operates, or causes to be operated, any motor vehicle, such operation shall be adequately insured against public liability and property damage.

(7) Public Liability. Lessee at his sole expense shall provide public liability insurance in amounts not less than 100/300 thousand dollars to protect against injury and/or damage to persons or property occurring in or as the result of the operation of said mining operations in connection therewith, whether on the surface or beneath the surface and Lessee agrees to hold Lessor harmless thereby against any claims or demands for injury to the person or property of any person arising out of the mineral operations of Lessee contemplated under this lease.

(8) Workmanlike Manner. The Lessee shall conduct all work upon the property in a workmanlike minerlike manner, and in conformity with the applicable laws of the State of Arizona.

(9) Termination by Lessee. Lessee may, at any time after sixty (60) days' written notice to Lessor, declare this contract to be terminated and be released of any liability whatsoever from the termination date, provided that such termination shall not relieve Lessee of any obligation incurred by him before the termination date. In this event, all monies paid to Lessor by Lessee shall be retained by Lessor as rent and liquidated damages.

(10) Termination by Lessor. In the event Lessee shall fail or refuse to

make the payments provided for herein, or violate any other terms of this agreement, Lessor shall have the right to terminate and forfeit this lease within ninety days after written notice and, upon said forfeiture and termination, this lease shall become null and void and Lessee shall forfeit all right, title and interest therein and in said described area, and Lessee shall be entitled to retain all sums theretofore paid and also be entitled to recover any sums due him up to the date of said termination and forfeiture.

(11) Distribution and Removal of Property upon Termination. Upon termination of this lease by either party as herein provided, or upon the expiration of this lease, all improvements to the real property shall become the property of the lessor and lessee shall leave intact all pipe, rail and timber underground; all machinery, equipment and supplies shall remain the property of the lessee.

(12) Right to Assign. Lessee shall have the right to assign this lease providing, however, that any such assignee shall be bound by the terms of this agreement to the same extent as the Lessee herein.

(13) Waiver by Lessor. Waiver by the Lessor of any failure to comply with any of the work or obligations set forth herein shall not constitute waiver of other or succeeding compliance failures.

(14) Time is of the Essence. It is understood and agreed that time is of the essence of this agreement.

(15) Obligation of the Lessee. In addition to the agreement hereinabove contained, Lessee agrees: In exchange for the mining and mineral rights in the described area, Frank J. Frankovick, Lessee herein, will:

1. a) Pay to Lessor a royalty of 10% of the net smelter returns of ores extracted, smelted, milled, or removed from said property in accordance with the pro-rata plan hereinafter set forth. (referred to hereafter as "earned royalties")

b) The amount of the royalty due and payable to Lessor shall

be computed upon the royalty schedule above set forth and based upon the pro-rata amount of the surface ground of the described area which has not been conveyed to third parties by Lessor or his predecessors; it being understood that Lessee shall pay to Lessor and Lessor is entitled to receive from Lessee that pro-rata share of the net smelter return represented by that proportionate part of the surface area of said described area the title to which is held by Lessor, as such trustee, as the same bears to the entire surface of said described area.

c) To explain the meaning of this paragraph, the parties agree that if the Lessor, as such Trustee, holds title to one-fourth of the surface of said described area, Lessor shall be entitled to receive one-fourth of the 10% royalty called for herein; it being further understood that the area of all streets, alleys and/or parkways shall be included as surface ground held by the Lessor as such trustee; provided, further, that if it be judicially determined that the Lessor, as Trustee, owns all of the minerals under the surface of said described area, then Lessee is entitled to all of the royalties due and payable hereunder.

2. Net Smelter Returns. The term "the net smelter returns" as used herein shall mean the total amount paid on each shipment of crude ores or concentrates by the smelter or mill after the deduction of treatment charges and railway or truck freight charges from the mine to the mill and/or smelter; provided, however, if the concentrates from the mill are to be smelted, then there shall also be deducted from the total amount paid by the mill or smelter the treatment charges by the smelter for smelting the concentrates and the railway or the truck charges from the mill to the smelter.

3. Exploration Work and Drilling. Lessee will commence exploration work in the form of underground mining operations and diamond drillings within 60 days from the execution of this Lease and will spend on this program of exploration and diamond drilling at least $10,000.00 within approximately four (4) months after

beginning such operations.

4. Meeting the above and below conditions will keep this lease agreement valid for a period of eighteen months from date of signature. At the end of the eighteenth month after date hereof there shall be due to Lessor a payment of $550; annually thereafter a minimum payment of $500 will be due Lessor, or a royalty on production paid according to the schedule above, whichever is greater, continuously, so long as Lessee desires to keep this agreement valid and in effect, but for a maximum of 15 years; it being understood that if the royalties paid to Lessor in the annual period preceding the date on which any of said $500.00 payments is due, equals or exceeds $500.00, then no minimum payment of $500.00 shall be due and owing hereunder.

5. Have a copy of all smelter or mill returns sent to Lessor.

6. Make available to Lessor all records of drilling and assays of core and logs of holes, together with all geological data obtained in the prospecting operations, including the assays that may be made of samples taken in said operations.

7. Failure to meet any of the above conditions will cause all rights conveyed under this agreement to revert back to Lessor; and the Lessor may terminate this lease and take such action as is available to him to recover the premises if Lessee does not voluntarily surrender possession of same.

(16) Royalties May Be Escrowed. If anyone shall file suit against Lessee, Lessor, or both parties to this lease, claiming to be the owner of and entitled to all or any part of the minerals beneath the described area or the earned royalties due under this lease or any royalties from mining operations beneath the surface thereof, then Lessee shall have the right to deposit all earned royalties in an escrow fund with any bank in Cochise County, Arizona, until the ownership thereof be judicially determined in such litigation.

(17) Successors. This lease shall extend to, and be binding upon the

heirs, successors, administrators, assigns or personal representatives of the parties hereto.

IN WITNESS WHEREOF, the parties have hereunto set their hands this day of January, 1960.

Lessee	Mayor of the City of Tombstone, ex-officio Trustee for the several use and benefit of the occupants of the Townsite of Tombstone.

STATE OF ARIZONA)
County of Cochise)

On this, the _____ day of January, 1960, before me, _____, the undersigned officer, personally appeared Walter C. Foster of the State and County aforesaid, known to me to be the person described in the foregoing instrument, and acknowledged that he executed the same in the capacity therein stated and for the purpose therein contained.

In witness whereof, I hereunto set my hand and official seal.

_____
Notary Public

My Commission expires:

STATE OF ARIZONA)
County of Cochise)

This instrument was acknowledged before me this day of January, 1960, by Frank J. Frankovich.

_____
Notary Public

My Commission expires:

EXHIBIT A

Forty feet beneath the surface of all those lands lying westerly of the center line of 5th Street, Tombstone, Arizona, and within the original Townsite of said City of Tombstone and also within the subsequent addition thereto known as Bowman Addition, hereinafter referred to as "said described area", and located within the City of Tombstone, Township 20 South, Range 23 East, Cochise County, Arizona.

"DEFAULTED AREA" LEASE
FROM CITY OF TOMBSTONE
(Lease #2)
Dated Jan. 15 - 1960

① Restricted to a block whose top is "40 ft. below the surface"

② Note:

"Lessor does not make any representation or warranty as to ownership of the minerals beneath the surface of any portion of the said described area and makes no warranties or representations relative to his (the Mayor) authority to lease the same to lessee, ---"

③ To pay taxes on minerals.

④ Must provide public liability insurance 100/300,000

⑤ Lessee has right to assign.

⑥ Royalty is 15% of net smelter returns.

⑦ Work Requirement

① $16,000 by ~~May~~ July 15 - 1960 (Defaulted)
Had it been done, then lease would have been valid for 18 months - To July 15 - 1961

② After 18 months must pay $500; & then $500 annually thereafter as minimum royalty.

* MAX = 15 yrs life of lease

LAW OFFICES
MOORE, VLAHOVICH & GREENWOOD
FIRST NATIONAL BANK BUILDING, LOWELL BRANCH
BISBEE, ARIZONA

DANIEL E. MOORE
DUSHAN VLAHOVICH
JAMES B. GREENWOOD

TELEPHONE
HEMLOCK 2-2259

November 14, 1960

Mr. Frank J. Frankovich
3351 North Sixth Avenue
Phoenix, Arizona

Dear Mr. Frankovich:

Pursuant to your request for a legal opinion relative to the authority of the City of Tombstone to lease municipally owned realty to private citizens, please be advised as follows:

1. The City of Tombstone is a charter city and, as the name implies, has adopted a charter which governs the powers it may exercise.

2. The original charter of said City has been lost or destroyed and to the best of my knowledge the only exact copy of the original is probably in the State Archives in Phoenix. However, the City presently operates under and governs itself by a typewritten copy of the original charter which was compiled by a City Clerk, one Ray B. Krebs, some years ago. I am aware of no instance wherein the correctness of this copy has been challenged.

3. Article II, Section 3 of the above mentioned copy of the charter provides, in pertinent part, as follows:

> "The said officers and agents (of the municipal corporation) shall have the further power, and are hereby authorized <u>subject to the restrictions, provisions and conditions herein contained</u>, to manage and control, to sell, lease or otherwise except by mortgage or hypothecation, <u>or as herein provided</u>, dispose of any or all property of said corporation. . . ."

4. Insofar as I have been able to determine, the underlined clauses contained in the foregoing section refer to restrictions, etc. which are solely applicable to sales of property and not leases.

In view of the foregoing, it is my opinion that the City Council of Tombstone has express authority to lease real property to private individuals

and that said Council could enter into a valid lease, as lessor, of any mineral lands owned by the City. This opinion is, however, subject to the condition that it is based upon the section, hereinabove referred to, which is found in a copy of the Charter of the City and that no examination of the original charter has been possible.

Very truly yours,

MOORE, VLAHOVICH & GREENWOOD

By

JBG:bb

TOMBSTONE MINING LEASE

This lease, made and entered into this 9th day of November, 1959, by and between Walter C. Foster, in his capacity as Mayor of the City of Tombstone, Cochise County, State of Arizona, and in no other capacity, and as ex-officio Trustee for the several use and benefit of the occupants of the Tombstone Townsite of Cochise County, Arizona, hereinafter referred to as Lessor, and Frank J. Frankovich, a married man whose wife is Marcene D. Frankovich of Maricopa County, Arizona, hereinafter referred to as Lessee:

WITNESSETH:

WHEREAS, it appears to the Lessee by vistue of certain title reports and investigations that the Lessor in his ex-officio capacity as Trustee, may be the owner of all or part of the mineral rights under the area known as the Mountain Maid Patented Mining Claim, located within the townsite of Tombstone, Arizona, in township 20 south, range 22 east, Cochise County, Arizona; and

WHEREAS, the parties hereto are desirous of entering into an agreement to provide for the exploration, leasing and mining of minerals forty feet below the surface of the area known as the Mountain Maid Patented Mining Claim and to any depth below the said forty feet; and

WHEREAS, Lessor does not make any representation or warranty as to ownership of the minerals beneath the surface of any portion of the said Mountain Maid Patented Mining Claim and makes no warranties or representations relative to his authority to lease the same to the lessee, but to the extent of his authority and his ownership, as such Trustee, Lessor, acting for and on behalf of the several use and benefit of the occupants of the Tombstone Townsite and pursuant to such authority as is vested in him by law, enters into this lease with the Lessee for the purpose of producing for and on behalf of the occupants of the Tombstone Townsite such income as may be available from the mining operations conducted by the Lessee under this lease.

NOW, THEREFORE, for and in consideration of the mutual covenants and agreements to be kept and performed by the parties hereto, it is agreed as follows, to-wit:

(1) Exploration and Mining Rights. Insofar as Lessor is legally capable of granting the same, Lessee shall have the exclusive right to enter within the above described premises, as stated in this agreement. Lessor agrees, if Lessee requests permission of the City of Tombstone to enter upon the surface of any of said property, (within the streets and alleys or any portions of the surface not occupied by an owner thereof) to use his good offices to procure iauch permission from the Mayor and Common Council of the City of Tombstone, it being understood that such permission may or may not be granted and then only upon such conditions as the Council shall specify. During the term of this lease Lessor agrees that he will make no agreement, contracts, or disposition affecting the mineral rights forty feet beneath the surface of any of said area or the title thereto, except as he may be otherwise required by law to do so.

(2) No-Lien Notice. The Lessee shall file for record the original no-lien notice required by law, in the office of the County Recorder of Cochise County, Arizona. Copies of said notice shall be posted, and kept posted, by the Lessee, during the life of this agreement, as required by Arizona Statutes.

(3) Taxes. Lessee shall pay all taxes or assessments assessed against the said property from date of this agreement, together with all excise or sales taxes on all ores mined, milled or shipped under this agreement. Lessors shall pay all taxes assessed against Lessor's interest in said mining property. Should the Lessee fail to pay the taxes or assessments due under this lease, then the Lessor shall have the right, at his election, to declare a forfeiture of this agreement, the same as for failure to make the agreements hereunder.

(4) Materials Claims. Lessee shall pay all claims for labor,

materials, supplies, services and equipment incurred by him. Lessee further agrees to save the Lessor harmless from any claims, debts, or liens against the property incurred by the Lessee, or his contractors or employees.

(5) Workmen's Compensation. The Lessee shall obtain and keep in force, during the life of this agreement, adequate insurance under the Workmen's Compensation Act, or the Employer's Liability Act, of the State of Arizona, as the case may be, for injuries or deaths from accidents in operation of said mining property.

(6) Motor Vehicle Insurance. If the Lessee operates, or causes to be operated, any motor vehicle, such operation shall be adequately insured against public liability and property damage.

(7) Public Liability. The Lessee at his sole expense shall provide public liability insurance in amounts not less than 100/300 thousand dollars to protect against injury and/or damage to persons or property occurring on or as the result of the operation of lsaid mining claim or mining operations in connection therewith, whether on the surface or beneath the surface and Lessee agrees to hold Lessor harmless thereby against any claims or demands for injury to the person or property of any person arising out of the mineral operations of Lessee contemplated under this lease.

(8) Workmanlike Manner. The Lessee shall conduct all work upon the property in a workmanlike manner and minerlike manner, in conformity with the applicable laws of the State of Arizona.

(9) Termination by Lessee. Lessee may, at any time after sixty (60) days' written notice to Lessors, declare this contract to be terminated, and be released of any liability whatsoever from the termination date, provided that such termination shall not relieve Lessee of any obligation incurred by him before the termination date. In this event, all monies paid to the Lessor by the Lessee shall be re-

tained by the Lessor as rent and liquidated damages.

(10) Termination by Lessors. In the event Lessee shall fail or refuse to make the payments provided for herein, or violate any other terms of this agreement, Lessor shall have the right to terminate and forfeit this agreement in the manner provided by Arizona law and, upon said forfeiture and termination, this agreement shall become null and void and the Lessee shal lose and forfeit all of his right, title and interest therein and in the aforesaid mining claim, and Lessor shall be entitled to retain all sums theretofore paid and also be entitled to recover any sums due him up to the date of said termination and forfeiture.

(11) Distribution and Removal of Property upon Termination. Upon termination of this lease by either party as herein provided, or upon the expiration of this lease, all improvements to the real property shall become the property of the lessor and lessee shall leave all pipe, rail and timber underground intact; all machinery, equipment and supplies shall remain the property of the lessee.

(12) Right to Assign. Lessee shall have the right to assign this agreement providing, however, that any such assignee will be bound by the terms of this agreement to the same extent as the Lessee herein.

(13) Waiver by Lessor. Waiver by the Lessor of any failure to comply with any of the work or obligations set forth herein shall not constitute waiver of other or succeeding compliance failures.

(14) Time is of the Essence. It is understood and agreed that time is of the essence of this agreement.

(15) Obligation of the Lessee. In addition to the agreement hereinabove contained, Lessee agrees: In exchange for the mining and mineral rights heretofore described on the area known as the Mountain Maid patented mining claim, Frank J. Frankovich, Lessee herein, will:

1. a) Pay to Lessor a royalty of 10% of the net smelter returns

of ores extracted, smelted, milled, or removed from said property in accordance with the pro-rata plan hereinafter set forth. (referred to hereafter as "earned royalties")

b) The amount of the royalty due and payable to Lessor shall be computed upon the royalty schedule above set forth and based upon the pro-rata amount of the surface ground of the Mountain Maid Claim which has not been conveyed to third parties by lessor; it being understood that Lessee shall pay to Lessor and Lessor is entitled to receive from Lessee that pro-rata share of the net smelter return represented by that proportionate part of the surface area of the Mountain Maid Claim the title to which is held by the Lessor, as such trustee, as the same bears to the entire surface area of the said Mountain Maid Claim;

c) To explain the meaning of this paragraph, the parties agree that if the Lessor, as such Trustee, holds title to one-fourth of the surface area of the Mountain Maid Claim, Lessor shall be entitled to receive one-fourth of the 10% royalty called for herein; it being further understood that the area of all streets, alleys and/or parkways shall be included as surface ground held by the Lessor as such trustee; provided, further, that if it be judicially determined that the Lessor, as Trustee, owns all of the minerals under the surface of said Mountain Maid patented claim, then Lessor is entitled to all of the royalties due and payable hereunder.

2. Net Smelter Returns. The term "the net smelter returns" as used herein shall mean the total amount paid on each shipment of crude ores or concentrates by the smelter or mill after the deduction of treatment charges and railway or truck freight charges from the mine to the mill and/or smelter; provided, however, if the concentrates from the mill are to be smelted, then there shall also be deducted from the total amount paid by the mill or smelter the treatment charges by the smelter for smelting the concentrates and the railway or the truck charges from the mill to the smelter.

3. Drilling or Cross-cutting [illegible] diamond drilling on the Mountain Maid Claim or the Vizina Claim within one month from the execution of this lease or, in lieu thereof, within said time will commence cross-cutting under the surface of the Mountain Maid or the Vizina Claim and will complete, within one year, at least 125 feet of cross cutting under this or the Vizina Claim.

If diamond drilling is done Lessee will drill at least 200 feet of diamond core hole on said property within seven months after obtaining premission for the use of the surface.

4. Meeting the above and below conditions will keep this lease agreement valid for a period of eighteen months from date of signatures. At the end of the eighteenth month after date hereof there shall be due to Lessor a payment of $500; annually thereafter a payment of $500 will be due Lessor, or a royalty on production paid according to the schedule above, whichever is greater, continuously, as long as Lessee desires to keep this agreement valid and in effect, but for a maximum of 15 years.

5. Have a copy of all smelter or mill returns sent to Lessor.

6. Make available to Lessor all records of drilling and assays of core and logs of holes, together with all geological data obtained in the cross-cutting operations, including the assays that may be made of samples taken in said operations.

7. Failure to meet any of the above conditions will cause all rights conveyed under this agreement to revert back to Lessor; and the Lessor may terminate this lease and take such action as is available to him to recover the premises if Lessee does not voluntarily surrender possession of same.

(16) Royalties May be Escrowed. If anyone not a party to this lease, shall file suit against the Lessee or both parties to this lease, claiming to be the owner of and entitled to all or any part of the earned royalties due under this lease or from mining operations beneath the surface of said Mountain Maid Claim then Lessee shall have the right to deposit all earned royalties in an escrow fund with any bank

in Cochise County, Arizona, until the ownership thereof be judicially determined in such litigation.

(17) Nothing herein contained shall be construed to be an admission by either party to this lease that the United States Patent issued on the area described herein as the Mountain Maid Patented Mining Claim is a valid mining claim or deed.

(18) Successors. This lease shall extend to, and be binding upon the heirs, successors, administrators, assigns or personal representatives of the parties hereto.

IN WITNESS WHEREOF, the parties have hereunto set their hands this 10th day of November, 1959.

_____	_____
Lessee	Mayor of the City of Tombstone, ex-officio Trustee for the several use and benefit of the occupants of the Townsite of Tombstone.

STATE OF ARIZONA)
County of Cochise)

On this, the____day of November 1959, before me,_____ _____the undersigned officer, personally appeared Walter C. Foster of the State and County aforesaid, known to me to be the person described in the foregoing instrument, and acknowledged that he executed the same in the capacity therein stated and for the purpose therein contained.

In witness whereof, I hereunto set my hand and official seal.'

My Commission Expires: _____
Notary Public

STATE OF ARIZONA)
County of Cochise)

This instrument was acknowledged before me this _____day of November, 1959, by Frank O. Frankovich.

My Commission Expires: _____
Notary Public

THE PROPOSED FRANKOVICH-SMITH PROJECT
AT
TOMBSTONE, COCHISE COUNTY, ARIZONA

February, 1961

E. N. PENNEBAKER
CONSULTING GEOLOGIST
SCOTTSDALE, ARIZONA

THE PROPOSED FRANKOVICH-SMITH PROJECT

AT

TOMBSTONE, COCHISE COUNTY, ARIZONA

Submitted to Mr. Robert C. Smith

-- February 18, 1961

By E. N. Pennebaker

E. N. PENNEBAKER

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SUMMARY

The pattern of early mining development makes it appear that the shallow northern zone of rich silver deposits at Tombstone stops abruptly on the northwest against the Tribute dike. However, few mine workings have been driven into favorable areas beyond this apparent barrier, and the Frankovich-Smith project has been conceived for this purpose.

The property consists of two leased mining claims, one of which is obtained from the City of Tombstone. Mining rights down to a depth of 40 feet below surface are excluded from this leasehold, and the city does not warrant its title and right to lease. Inasmuch as the promising area is quite shallow, rights to this upper zone must be acquired, and it might be advisable to further investigate the validity of the lease, even though a favorable legal opinion has already been rendered.

There are also certain unspecified exclusions from the lease on the other claim, obtained from Tombstone Development Company. This matter also warrants investigation.

Transworld Resources Corporation was formerly associated in the exploration and development of these two claims. It is no longer active in this project but still retains a 50% interest in any profits that might be won. Mr. Frankovich has an option running until about March 9, 1961, to reduce this participation to 5%, at a cost of $19,257.11. This is believed to be too high a price in advance of exploration, and it is proposed that steps be taken to extend this option for not less than six months.

The proposed exploration is estimated to require about six months' time at a cost of around $40,000. If $70,000 were made available, then the exercising of the T.R.C. option would also be financed, and about $11,000 would remain for additional exploration or contingencies.

A number of geological conditions are judged to be favorable for ore deposition in the area of interest. The cost is reasonable and the possible reward is attractive. The project is recommended if the property rights be more tightly secured, but the speculative nature of the venture must be emphasized.

THE PROPOSED FRANKOVICH-SMITH PROJECT

AT

TOMBSTONE, COCHISE COUNTY, ARIZONA

INTRODUCTION

What we shall call the Frankovich-Smith project at Tombstone, Arizona, has been offered for consideration. This proposes to seek rich shallow ore bodies in the northwesterly part of this famous old silver camp.

The following report discusses the geological factors to be encountered and their influence on the degree of risk involved. The various property leases and their terms are analyzed, and additional ground that might be included in the project is indicated. Finally, the cost of the proposed work is estimated, and the speculative nature of the program is pointed out.

Silver deposits were discovered at Tombstone in 1877. The output of gold and silver up to the first of January, 1882, is said to have amounted to $7,359,200 with over $3,000,000 disbursed as dividends. Considering the remoteness of the district, an amazing amount of development was accomplished in these early years, and many mines were started and some were carried down to substantial depths. As a result of this early activity, water was encountered in mid-1881 at a depth of about 520 feet in the Sulphuret shaft. The most productive year of

the district's life was 1882, which saw an output valued at $5,202,876.

Unfortunately the early accounts of mining at Tombstone do not give the tonnage produced nor the value per ton of the ore. Information is also scarce concerning which mines contributed to this early production and the depths from whence it came. Nevertheless, it appears that a substantial amount was derived from shallow bodies of modest to large size that occurred on the northwest as bedded deposits along parts of geologic structures termed "anticlinal rolls". Some of this ore was exceedingly rich, apparently ranging in value up to $2,000 per ton, although most of the better material may have had a lesser, but substantial value of around $100 per ton. Very likely there were bodies of low-grade material that also occurred in parts of the northwesterly sector.

Information now available indicates that the rich northern zone stops abruptly on the northwest against the so-called Tribute fault and dike. Few mine workings have been driven into favorable areas beyond this apparent barrier, and the Frankovich-Smith project has been conceived for this purpose. Therefore the area of present interest is in and near the Vizina and Mountain Maid mining claims just south of and partly beneath the City of Tombstone. (See Maps Nos. 1 and 2.)

The present investigation was undertaken to consider the chances for success of the project. To accomplish this, three days were spent in Tombstone inspecting underground workings and going over exploration data with Mr. Frankovich. Published

accounts of the district were studied in the office, and the report and illustrations were then prepared.

The following references are the most helpful:

"The Geology and Veins of Tombstone, Arizona", by W. P. Blake. Published in The Transactions of the American Institute of Mining Engineers, Volume X, 1882, pages 334 to 345.

"The Tombstone, Arizona, Mining District", by John A. Church. Published in the Transactions of the American Institute of Mining Engineers, Volume XXXIII, 1903, pages 3 to 37.

"Geology and Ore Deposits of the Tombstone District, Arizona", by Butler, Wilson and Rasor. Published in Bulletin No. 143, Arizona Bureau of Mines, 1938, pages 7 to 108.

"Structural Control of the Ore Deposits at Tombstone, Arizona", by Butler and Wilson. Published in Bulletin No. 145, Arizona Bureau of Mines, 1938, pages 104 to 110.

"Ore Deposits at Tombstone, Arizona", by Butler and Wilson. Published in "Ore Deposits As Related to Structural Features" by Princeton University Press, 1942, pages 201 to 203.

DEFINITIONS OF CERTAIN GEOLOGIC TERMS

Before discussing the geology of the area, the following definitions are presented for the reader's guidance:

Sedimentary rocks are commonly deposited as horizontal beds or layers in water-filled basins. They are later uplifted to form land, and they may become tilted or folded.

Limestone is a fine-grained or dense sedimentary rock composed of calcium carbonate accompanied by various impurities.

Shale is a dense sedimentary rock composed of clay-like material. It may be fine-laminated with the bedding planes very close together.

Sandstone is a sedimentary rock composed principally of grains of quartz sand.

A novaculite, as the term is used in the Tombstone district, is a shale, sandstone, or limestone that has been invaded and replaced by silica (quartzy material). A very dense, thinly laminated brittle rock is the result.

Igneous rocks are derived from molten material that has cooled within the earth's crust to form aggregates of minerals, such as quartz, feldspar and mica. Granodiorite and diorite are varieties of igneous rocks rich in calcium, magnesium and iron. There is a significant association between igneous rocks and many ore deposits.

A fold is a bend in a layered or bedded rock, such as shale or limestone.

An anticline is an up-arched fold, which is convex upward. It is an upfold or arch in layered or bedded rocks.

An "anticlinal roll" is a small irregular fold superimposed on a larger structure.

A syncline is a down-arched fold or trough formed by rock beds. It is a structural basin.

A fault is a plane of breaking in the rocks of the earth's crust, along which one side has moved with respect to the other.

A fissure is a persistent crack or fracture in the rocks. Generally little or no movement has occurred along a fissure.

Sulfide ore contains valuable minerals made up of a chemical combination of various metals and sulfur. The original or "primary" deposition of most ores is in this form.

Oxidized ore is in the upper, shallow portion of an ore deposit where the primary minerals have been subjected to the action of surface (supergene) waters carrying oxygen. It occurs

in that zone in which sulfides have been altered to oxides and carbonates. In this process migration, re-precipitation, and enrichment of certain valuable metals may ormay not take place.

GEOLOGY

The most productive part of the Tombstone district, which includes the area in which this proposed project is located, occurs on the north in the so-called "Tombstone Basin", and only this subdivision of the district will be discussed here.

The Tombstone structural basin occurs beneath and just south of the City of Tombstone, where it is about a mile wide (east to west) and at least two miles long. The rock structure of the basin is that of an unsymmetrical synclinal fold that plunges southeasterly in its northern half.

From the standpoint of important ore occurrences, the rocks forming the upper part of the basin are:

Local Name	Kind of Rock	Thickness
Top		
Shale	Shale & subordinate limestone	3000 ft. plus
Blue limestone	Limestone	20 to 40 ft.
Novaculite	Silicified shale & limestone	55 to 70 ft.
Naco limestone	Limestone	3000 ft. plus

The most favorable beds that serve as hosts to ore deposits are near the base of the so-called "novaculite" and in the upper part of the Blue limestone. Other beds in the novaculite as well

as thin limestone beds in the shale series above the Blue limestone are also ore-bearing near strong fissures. Much of the production has come from a 200-foot thickness of beds that includes the horizons just mentioned.

The novaculite is thin-laminated and thin-bedded. It is apparently a group of shaly and siliceous limestone beds and conglomerate lenses that have been variably silicified and metamorphosed to give a brittle siliceous rock that contains lenses and beds of unreplaced limestone.

The Blue limestone is medium to thin-bedded and exhibits a characteristic gray-blue color both on the surface and underground. The upper portion of the Blue limestone contains an abundance of fossils.

Overlying the Blue limestone is 25 to 35 feet of shale, and above this is a 10-foot member of blue-gray fossil-bearing limestone known as the "10-foot limestone". This horizon contained some important ore bodies.

Overlying the "10-foot limestone" is another 25 to 35 feet of shale, and above this shale is the so-called "6-foot limestone". This horizon also contained some ore deposits.

The Tombstone basin is a major synclinal fold upon which a series of minor folds or "rolls" have been superimposed. Such corrugations run northwest-southeast, and much ore was deposited in and near them. Ore bodies are commonly in anticlinal crests, but they may extend down the flanks of such folds, even into the adjacent minor syncline.

The Tombstone basin is rifted by steep fissures that trend northeasterly. There is a series of these, with the stronger ones

somewhat regularly spaced at intervals of about 300 feet. These fissures cut the corrugations, or rolls, and are believed to form the channelways that introduced the primary mineralization. An individual fissure zone consists of a group of close-spaced, steep-dipping fractures. They are not always conspicuous, but there is little doubt regarding their importance.

The Tombstone basin contains a third element of geologic importance. This is a group of steep dike-filled faults that trends a little east of north and is a prominent feature of the ore-bearing ground on the north. In general the dikes range from 5 to 25 feet in thickness and appear to be remarkably persistent. They are composed of granodiorite to dioritic material that in places is heavily altered to kaolin (a variety of clay).

These faults and their contained dikes are crossed by the ore bodies on the north that follow the subordinate fold corrugations with northwesterly trend. Although the dike-filled faults have a small downthrow on the west, most of the ore deposits persist across them. On the other hand, the westernmost member, called the Tribute dike has more substantial movement, possibly around 100 feet, and to date only a little mineralization has been found beyond it on the extreme northwest. However, very few mine workings enter this area, and the Frankovich-Smith project has been designed to explore within and near it.

The relative age of the dikes and the ore bodies is a matter of concern. The fact that ore bodies across the dike-filled faults with little or no disturbance suggests that the dikes are older than the mineralization. Also, parts of the Tribute dike carry minute specks of a peculiar type of iron oxide that has

formed in place from a copper sulfide mineral. Moreover, ore bodies increase in size as they approach the Tribute dike from the southeast, another feature that suggests the pre-mineral age of the dike. On the other hand, the Tribute dike carries angular chunks of mineralized rock, and in this respect appears to be clearly later than mineralization.

Thus the evidence is contradictory and points to complicated relations. It is judged that the dike-filled faults were in existence prior to primary mineralization and that later movement occurred along them, tearing off chunks of ore and mashing them into the dikes. Oxidation, enrichment, and migrating supergene solutions further complicated the history of these famous deposits.

Later faulting occurred on other fault planes, but these are mostly in parts of the district away from the area of present interest.

It should be noted that where an ore body follows a particular bed and this ore body is faulted, two separated segments of ore are formed. Likewise, if a favorable bed be faulted before mineralization, and mineralization later seeks out and deposits ore in each part, then we also have two separated segments of ore. Consequently the practical mining problem is essentially the same, provided that ore is deposited in both segments, regardless of the relative ages of faulting and mineralization.

Furthermore, such faults do not necessarily divide the ore body in half, regardless of their relative age, and the segment to be sought may vary greatly from the size of the known segment.

There are few outcrops in the area of interest, and here the surface geology and mineral showings are poorly displayed because of a cover of soil, younger gravels, and vegetation. Farther north, inside the City of Tombstone, there is little to be seen of the geology.

ORE DEPOSITS AND PRODUCTION

There are a number of kinds of ore deposits in the Tombstone district, including those with substantial amounts of gold and other valuable metals; however, in the present area of interest we are concerned with oxidized bodies of silver ore that are found along fold corrugations that trend northwesterly, with possibly minor offshoots along fissures.

These ore bodies have the form of warped and crooked planks inserted irregularly along bedding planes of the favorable host rocks. They prefer the anticlinal crests of the minor folds, but they commonly extend down the flanks of these folds, in places even into the adjacent synclines. There appears to be a tendency for the northeast flank of a minor anticlinal fold, or "roll" to be the favored site for ore deposition.

The crests of these rolls are inclined upward toward the northwest and thus carry the favorable zones up toward the surface as they approach Tombstone. Near the south edge of the city ore is found under shallow cover, but bedrock is dropped down on the northwest side of the Tribute dike and favorable beds persist on to the northwest, to be eventually cut off by the erosion surface underneath the city.

Two stratigraphic horizons carry most of the ore, although other horizons also contain important bodies in certain places. The lower horizon is at or near the junction of the Waco limestone and the novaculite. The other is in the Blue limestone, whose base is some 60 feet higher, but the top of the Blue limestone appears to be preferred. Other places are in the "10-foot limestone" and the "6-foot limestone" horizons above the Blue limestone, and within the novaculite below the Blue limestone.

In some localities both the novaculite-Waco contact and the Blue limestone are mineralized, although it is more common for only one horizon to be ore-bearing in a particular place. It is the writer's opinion that the Blue limestone is the more productive horizon.

The ore bodies in and near the anticlinal rolls are associated with the steep fissures of northeasterly trend mentioned in a foregoing section. These cut across the fold corrugations, and offshoots of ore may follow out along them. In other parts of the district fissures of this type carry important vein-like bodies of ore that cut through the overlying shale.

In the stopes from which ore has been extracted in and near the Vizina claim it has been mined out so thoroughly that there is absolutely none left to examine and describe. Also, unfortunately, the published descriptions are scanty and leave much to be desired. Apparently most of the ore was thoroughly oxidized, although residual spots of galena (lead sulfide) may have remained here and there. A brief remark by Blake states that the ore was stratified. This implies oxidation and reworking by ground water with deposition in caves possibly formed

by the oxidation of bodies of sulfides. The writer would suspect that there was only a moderate amount of lateral migration by these enriching solutions because of the precipitating action of nearby carbonate-bearing rocks. It is also likely that this ore was porous and relatively light in weight, possibly measuring 15 or more cubic feet to the ton.

Information concerning early production (1877 through 1907) is rather unsatisfactory from a number of standpoints. On the other hand, Arizona Bureau of Mines Bulletin 143 gives a good statistical picture from 1908 through 1934. During the latter period some 600,000 tons of ore were produced with a total value of about $8 million, or an approximate value of $13 per ton. Mine extraction for this more recent period was at the average rate of about 22,500 tons per year. The largest production was in 1917 when 57,474 tons were extracted. This later period yielded low-grade ore from deeper zones and areas other than the area of present interest and will not be further discussed. The entire production (1877 to 1936) was about $37 million.

The Tombstone district yielded an early production of $28 million from 1879 through 1907, as listed in Bulletin 143, and Blake records a production of over $7 million up to January 1, 1882. It is this early period, up to 1890, in which we are particularly interested, because it appears that mining on the north was carried on then.

The true value of the early production is impossible to ascertain, because, as we are advised by Church, some mines reported only their net, whereas others reported a gross value. Church also states that 15% should be added to the value of early

production because of losses incurred by use of the pan-amalgamation method of silver and gold recovery.

The grade of the early, rich production is also impossible to ascertain, and we can only make certain guesses. From 1879 through 1886, Bulletin 143 reports a production of about 19 million dollars. If we assume a tonnage of 60,000 tons per year (somewhat above the maximum rates of 1908, 1916 and 1917) for 8 years (a total of 480,000 tons) then the average grade figure is about $39 per ton. On the other hand, if we take the listed production of $15.5 million total for 1879 to through 1883 we obtain an average grade figure of about $52, using the same tonnage rate. The writer believes that this rate is far too high for the very early years and that an average value of the rich ore probably was around $100 per ton or somewhat less, with the value almost entirely in silver in the area of interest. Silver sold for $0.99 to $1.20 per ounce between 1877 and 1886, whereas its present market price is $0.91375.

Blake gives a yield of $526,717 from the Vizina up to January 1, 1882, and Bulletin 143 reports production of unstated amount by lessees through 1890. The tonnage that yielded the $526,717 is unknown, but it was produced in three years and presumably was not less than 7,500. On this assumption the ore had a tenor of about $70 per ton.

Approaching the problem in another way, Tombstone Mill and Mining Company is reported by Blake to have produced $2.7 million in 2½ years (mid-1879 through 1881). This was treated in a ten-stamp mill (Bulletin 143, page 41). According to Richards ("Textbook of Ore Dressing", 1909, page 134) capacity ranges from

2.5 to 9.02 tons per stamp per 24 hours. Considering the long and expensive freight haul for construction material, it is likely that a light mill with lower capacity was constructed in 1879. Assuming a capacity of 3 tons per stamp, or 30 tons per 24 hours equals about 10,000 tons per year or 25,000 tons in 2½ years, then a value of about $110 per ton is indicated. At a capacity of 5 tons per stamp per 24 hours, a value of about $72 per ton is indicated. The Tombstone Mining and Milling Company probably treated ore from the Toughnut and Lucky Cuss mineralized zones. In 1880 this company had another mill of 20-stamp capacity available, so the tonnage milled may have been greater, and the value per ton less. (See Bulletin 143, page 41.) The Toughnut ore zone is nearby to the south of the Vizina.

The above gives only a crude estimate of the possible range in grade of the richer ore in this general area. It will be noted that it is based on certain assumptions rather than facts. Nevertheless, it appears that richer ores rather than low-grade were mined in the early days from within and near the area of present interest.

The size of some of the largest ore bodies in the "rolls" is known approximately. Judging by the few maps available, inspection of some of the old stopes, and information gained from Church's article, the following approximate dimensions are indicated:

In the West Side and Sulphuret claims, an "anticlinal ore body is about 1150 feet long and up to 100 feet wide". This possibly contained about 50,000 tons.

The Vizina-Goodenough anticlinal zone has been developed for about 700 feet southeast of the Tribute dike, and near the

dike the roll has been mined for a width of 150 feet. It possibly contained 100,000 tons. A part of this made up the three years' production from the Vizina claim mentioned in Bulletin 143.

The Quarry-Toughnut roll in and near the Toughnut claim was productive for a strike length of 1900 feet. It contained possibly 75,000 tons of ore.

The Girard roll in and near the Toughnut claim possibly contained 75,000 tons of ore.

The foregoing give some measure of the sizes of the larger bedded deposits, in addition to which there were many smaller ore bodies.

From the above it appears that targets of about 25,000 tons of ore with a gross assay value of about $75 per ton is what could be reasonably hoped for in the somewhat restricted area of interest near the Vizina shaft. Whether ore of this amount and value exists and can be found will depend upon the results of speculative exploration.

THE PROJECT'S PROPERTY AND LEASES

The property groups in the area of interest are shown by various colors on Map No. 1.

Only the Vizina and Mountain Maid claims (colored blue) are presently included in the proposed Frankovich-Smith project. These claims aggregate 37.44 acres and include a length along the Tribute dike of about 1100 feet. This ground is in a position to cover a possible extension of the Vizina-Goodenough ore-bearing zone beyond the dike and possibly other, as yet unknown, zones on the north. Southeast of the dike there is a promising section

northeast of the Vizina stopes. The two claims do not cover possible extensions of the Toughnut zone.

The Vizina patented mining claim is owned by Tombstone Development Company, which is controlled by Newmont Mining Corporation. It is presently leased to Frank J. Frankovich of Phoenix, Arizona, for a period of three years, expiring on August 31, 1962, with an option to extend it for 5 years. The work requirement for the first year is 1000 feet of diamond drilling. The period for accomplishing this was extended for five months to January 31, 1961. This work has been completed. For the last 18 months of the initial option period, an expenditure of $3,000 is required. If the lease be extended for five years, then a minimum of 100 shifts of work per year must be performed during this second period. Royalty is at the rate of 5% for ore giving "net returns" of $10 per ton or less; for ore giving net returns of over $30 per ton the royalty is 10%; and for values between $10 and $30 a sliding scale of ¼ of 1% for each dollar per ton increase in net returns is provided. Part of the City of Tombstone sits upon the Vizina claim, and ore in this area is known to be shallow. Therefore it is important to note that certain surface rights included in the original patent are excluded from the lease, and these exclusions are not set forth in the lease document. Also excluded are various rights earlier conveyed by Tombstone Development Company, apparently having to do with residential and business plots, and these also are not set forth in the lease document. A further point to observe is that the Vizina lease can be assigned to a third party (such as a Frankovich-Smith corporation) only

after receiving written consent from Tombstone Development Company.

The Mountain Maid patented mining claim is owned by the City of Tombstone. That portion of this claim lying beneath a depth of 40 feet below surface is leased to Mr. Frank J. Frankovich. (so-called Lease No. 1.) A copy of this lease has not yet been made available to the writer, but Mr. Frankovich has orally stated that the following are its terms:

If not forfeited, this lease runs for an unlimited number of years.

There is a minimum annual royalty payment of $500 per year after the first 18 months. This is due in May, 1961. Therefore the lease is dated about November, 1959.

We are advised that the work requirement has been completed and that this was satisfied by an expenditure of several thousand dollars on the nearby Vizina claim.

There is a royalty of 10% of net smelter returns.

The lease does not include the first 40 feet below surface. Presumably the owners of this upper block (except for streets, alleys, and unconveyed parcels) are owners of residential and business properties in the City of Tombstone.

The City of Tombstone does not warrant the title nor the mayor's authority to lease the claim. (See the resume of the City of Tombstone lease No. 2 on a following page.)

Very likely public liability insurance is also required, and the lease is probably assignable.

In the exploration and development of the Vizina and Mountain Maid claims Mr. Frankovich is associated with Transworld Resources Corporation under the terms of an undated letter agreement apparently confirmed and accepted by Frankovich in or about October, 1959. This corporation is no longer active in the exploration and development of these claims, but it presently retains a 50% interest in the leases and the proceeds from their mining, after deduction of operating expenses and payment of royalties and other obligations. Profits are not to be reinvested in other ventures.

This letter agreement also includes the Toughnut claim, but, inasmuch as Mr. Frankovich was unable to obtain a lease on the Toughnut, this provision is inapplicable. However, should such a lease be obtained in the future on this promising ground, Transworld Resources Corporation would no doubt claim a participation under the agreement as it now stands.

In a somewhat indefinite way, the letter agreement also provides for participation by a third party, as follows:

> In the event equity funds are contributed by third persons, upon such terms as shall be mutually agreed upon by the parties hereto but with or without additional contributions by the parties or either of them, the interest remaining in the parties after allowing for the interest acquired by such third persons shall be allocated proportionately between the parties hereto in accordance with their respective percentage interests.

In a letter dated December 9, 1960, Transworld Resources Corporation gave an option to Mr. Frankovich for 90 days which, if exercised, would get T.R.C. out of the picture except for a 5% retained interest, as follows:

1. A cash payment to T.R.C. equal to its direct cost in the project of $19,257.11.
2. T.R.C. to retain 5% net carried interest.

The validity of mining leases granted by the City of Tombstone on ground owned by the municipality has been investigated for Mr. Frankovich by a Bisbee law firm. Its opinion based on a copy of the City Charter is that the leases are valid. Corroboration of this opinion by another law firm might not be inappropriate.

OTHER PROPERTIES AND LEASES

1. So-called "City Lease No. 2" concerns a substantial block of ground lying to the north and west of the Vizina and Mountain Maid that is owned by the City of Tombstone. On Map No. 1 this ground is colored apple green and most of it lies to the north beyond the map. This is leased to Mr. Frankovich under date of January 15, 1960, and certain of its terms are noted, as follows:

a. "Lessor does not make any representation or warranty as to ownership of the minerals beneath the surface of any portion of the said described area and makes no warranty or representation relative to his (the mayor's) authority to lease the same to lessee.....".

b. The lease is restricted to ground whose top is 40 feet below the surface.

c. Mr. Frankovich must provide public liability insurance in the amount of not less than $100/300,000.

d. Mr. Frankovich has the right to assign the lease without obtaining permission.

e. The royalty is 10% of net smelter returns.

f. It is required that work costing $16,000 be completed within approximately four months after 60 days from January 15, 1960. Thus the completion date was about July 15, 1960, but this work was not done and the lease was defaulted. Apparently the requirement could have been performed on nearby claims (not necessarily those covered by the lease), and this work was performed later in 1960. Had the requirement been completed at the proper time, then the lease would have been valid for 18 months, to July 15, 1961. After this 18-month period, $500 was payable, with $500 required annually thereafter as minimum royalty.

g. Where the City of Tombstone has conveyed ground to third parties, a pro-rata allocation of royalty payments is set up.

City Lease No. 2 covers ground outside of the area of present interest. But, inasmuch as part of it borders the Mountain Maid claim on the northeast, it might have some future value to the Frankovich-Smith project.

2. The so-called Andrade-Frankovich group is on the east and is colored orange on Map No. 1. This is composed of various claims leased from third parties and of unpatented claims located by Mr. Frankovich. The terms of the association of Mr. Frankovich with Andrade, et al are not known to the writer. This ground is not included in the Frankovich-Smith project, but note should be taken of two promising areas in this claim group consisting of the southeast half of the Survey mining claim and the northeast half of the Defence mining claim.

3. The Toughnut and West Side patented mining claims are owned by Tombstone Development Company, which is controlled by Newmont Mining Corporation. These claims, particularly the Toughnut, contain promising ground along and near the Tribute dike. At present they are apparently not leased.

4. Mr. Frankovich states that he owns a one-quarter interest in the Intervener patented mining claim and can obtain a lease on the remaining three-quarters interest. This claim also has promising ground along the Tribute dike.

RECENT EXPLORATION AND RESULTS

Two campaigns have been conducted by Mr. Frankovich at Tombstone during recent years on the theory that rich ore deposits occur beyond the Tribute dike at shallow depth where the favorable beds rise on the northwest.

1. The Frankovich-Andrade project consisted of drilling some 17 diamond drill holes for a total of about 3,600 feet in and

near the Defence mining claim, continuing this drilling pattern to the southwest across the projected trend of the Lucky Cuss ore-bearing zone. No ore was found, and it was impossible to correlate small, important structures from the kind of information obtained. From this work it was concluded that exploration could best be carried out by underground driving supplemented by subordinate diamond drilling.

2. The Frankovich-T.R.C. project was next carried out by Mr. Frankovich in association with Transworld Resources Corporation. This work consisted of driving a drift about 240 feet along a promising fissure, with additional raises, sublevel drift, and diamond drilling. This driving followed a northeast fissure (called the Bonanza fissure) across an anticlinal fold, which was productive southeast of the fault, through and near the novaculite-Naco limestone contact. The work was conducted along the northwest side of the Tribute dike and about 75 feet distant from it in an area opposite the large Vizina mineralized area in the novaculite and near the Naco. The depth of the driving was shallow and varied from about 70 to 100 feet below surface. Four diamond drill holes were angled up to the northwest and somewhat away from the fissure, but they did not reach the Blue limestone. They did go within 15 or 20 feet of the erosion surface. (See Map No. 3).

The program was well-designed to test a promising area, but only small lenses of ore were found near the upper contact of the Naco limestone. Assays of 227 to 350 ounces of silver per ton are reported by Mr. Frankovich from these small showings. The drifting was mostly in the Vizina claim, but the last (northeasterly) 45 feet entered the Mountain Maid claim. Although this work did

not exhaust the ore-bearing possibilities of the immediate area, it did rule out a large ore body on the northwest side of the Tribute dike that would be a correlative of the big Vizina-Goodenough deposit below the Blue limestone. It did not reach and test the very promising Blue limestone.

EXPLORATION PRESENTLY PROPOSED

Mr. Frankovich now proposes that exploration be carried farther to the northeast to test the so-called Bonanza fissure near the top of the Blue limestone northwest of the Tribute dike, and possibly also to explore the same horizon southeast of the fault. This is the essence of the Frankovich-Smith project.

DISCUSSION

Recent work has demonstrated that the Tribute dike-and-fault offsets the favorable horizons a substantial amount, not yet precisely determined. This has the effect of displacing the Naco contact, the anticlinal fold, and the Blue limestone downward and to the northeast on the far (northwestern) side of the Tribute dike-and-fault in the Vizina area, thereby protecting the Blue limestone from being eroded away in the vicinity of the Vizina shaft. The complicated age relations of the dike-and-fault and their influence on the possible positions of ore body segments have already been discussed in a foregoing section.

The finding of small lenses of rich ore on the northwest side of the Tribute dike demonstrates that ore-bearing solutions were active on this side of the dike in the area of interest. The so-called Bonanza fissure was observed by the writer to be

comparable in appearance to other fissures associated with ore in this general part of the Tombstone district. Also, the anticlinal structure found northwest of the dike provides the usual environment for ore deposition near Tombstone.

Furthermore, study of available information on the occurrence of ore bodies at Tombstone reveals that the Blue limestone, particularly near its top, is the favored host for ore deposits. These most commonly occur on the northeast flank and near the crest of anticlinal rolls. It is important to note that the Blue limestone is probably eroded from the anticlinal crest northwest of the dike in the Vizina claim and that any mineralization eroded from here could have supplied a source for secondary enrichment of silver down the flanks of the arch.

Therefore the proposal to continue the 100-level drift some 300 feet farther to the northeast to follow the Bonanza fissure into and across the Blue limestone on the northwest side of the Tribute dike is warranted and is approved by the writer. This area is marked "X" on Map No. 3.

However, it must be particularly noted that if ore be present in this area it is inside the Mountain Maid claim at very shallow depth and may be partly within the 40-foot near-surface block excluded from the City of Tombstone leases. Therefore steps should be taken to lease this upper block in the area of interest.

As a preliminary step, Mr. Frankovich has proposed drilling a hole up from the 100-foot level to cut the Blue limestone on the southwest flank of the anticline near the Vizina shaft. This is promising because of reported mineralization encountered in a

cesspool immediately above. Nevertheless, the drilling of this hole should be deferred until near-surface property rights have also been checked for the Vizina claim, from which the lease states that exclusions have been granted.

The proposal to explore the Blue limestone southeast of the Tribute dike in the area marked "Y" on Map No. 3 is approved, but in the writer's opinion this is less promising than Area "X" because the occurrence of ore in the Blue limestone immediately above ore in the novaculite is much less common near Tombstone than the occurrence of ore in the Blue limestone alone. This section of ground is also rather shallow and it may be necessary to obtain leases here in the 40 feet below surface.

There are several problems related to the shallowness of possible ore in the area of interest. One is that it may be eroded off and not exist as we go farther northwesterly under the town. The other is the problem of possible damage to residential and business structures by mining at shallow depth.

It must again be pointed out that exploration of this kind is a speculative venture. To be undertaken, control of the promising area must be secure, and the reward, if the search be successful, must be substantial.

COST OF PROGRAM

Mr. Frankovich and the writer have made the following tentative cost estimates for exploration northwest of the Tribute dike to reach the target area in the Blue limestone.

Time Required	Kind of Work	Approx. Cost
8 weeks	Recondition Vizina shaft and drive 200 feet of exploration drift	$ 15,000
4 weeks	Drive an additional 100 feet of exploration drift	3,000
10 weeks	Drive 3 raises for a total of 200 feet	6,000
4 weeks	6 Diamond drill holes for a total of 1,000 feet	3,000
26 weeks	Manager's salary, 6 mos. @ $1250	7,500
	Payment on Mountain Maid lease due in May, 1961	500
	Industrial Insurance	1,000
	Miscellaneous & contingencies	4,000
	To buy out T.R.C. if ore is found	19,257
	TOTAL OF.....	$ 59,257

If $70,000 were contributed, then nearly $11,000 would be left over and available for exploring the Blue limestone southeast of the Tribute dike in area "Y".

The position still retained by Transworld Resources Corporation should be particularly noted. At present it is entitled to 50% of the proceeds from mining in the Vizina and Mountain Maid claims (and perhaps also in the Toughnut, if this claim be leased). The T.R.C. interest (except for a retained 5%) can be purchased for $19,257.11 on or before about March 9, 1961, but this would be <u>before</u> the Frankovich-Smith exploration project could determine the value of the ground, as pointed out in the foregoing section of this report. In the writer's opinion, an advance payment is not warranted for a project of this nature, and an extension of the T.R.C. option should be obtained.

POSSIBLE REWARD

The speculative nature of the venture must be emphasized, as it is apparent that success is by no means assured. With these points continually in mind, we might inquire as to the possible reward, should the exploration work be successful.

If our target be silver ore with a value of $75.00 per ton, then an approximate analysis is as follows:

	$ 75.00	gross value
Less -	12.00	shipping & treatment
	63.00	
Less -	6.30	royalty
	56.70	
Less -	10.00	mining cost
	46.70	
Less -	2.34	T.R.C. royalty
	$ 44.36	Net

For an ore body of 25,000 tons this possible reward would amount to about $1.1 million before taxes and other royalties to promoters. An ore body about 250 feet long, 100 feet wide, and 15 feet high would contain approximately 25,000 tons.

RECOMMENDATIONS

The writer recommends that the project be undertaken, but only provided that:

1. The option to buy out the T.R.C. interest be extended for at least six months.
2. Leases be acquired and possible damage liabilities be assessed for the parcels above 40 feet depth from surface in the area of interest in the Mountain Maid claim.

3. Further legal advice be obtained regarding the validity of leases granted by the City of Tombstone.
4. The exclusions from the Vizina lease be determined and additional leases be acquired where needed.

In addition, the default in City Lease No. 2 should be cured and this ground included in the project, or all of the City of Tombstone mining titles should be contained in one revised lease and made a part of the project.

In order to secure other exploration targets, and thereby increase the chances for finding ore, consideration might be given to obtaining additional ground, but this would, of course, require more financing. Such promising ground would be (1) the northwest half of the Toughnut claim, (2) the northeast half of the Defence claim, (3) the Intervener claim, and (4) the West Side claim.

E. N. Pennebaker

E. N. PENNEBAKER

Scottsdale, Arizona
February 18, 1961

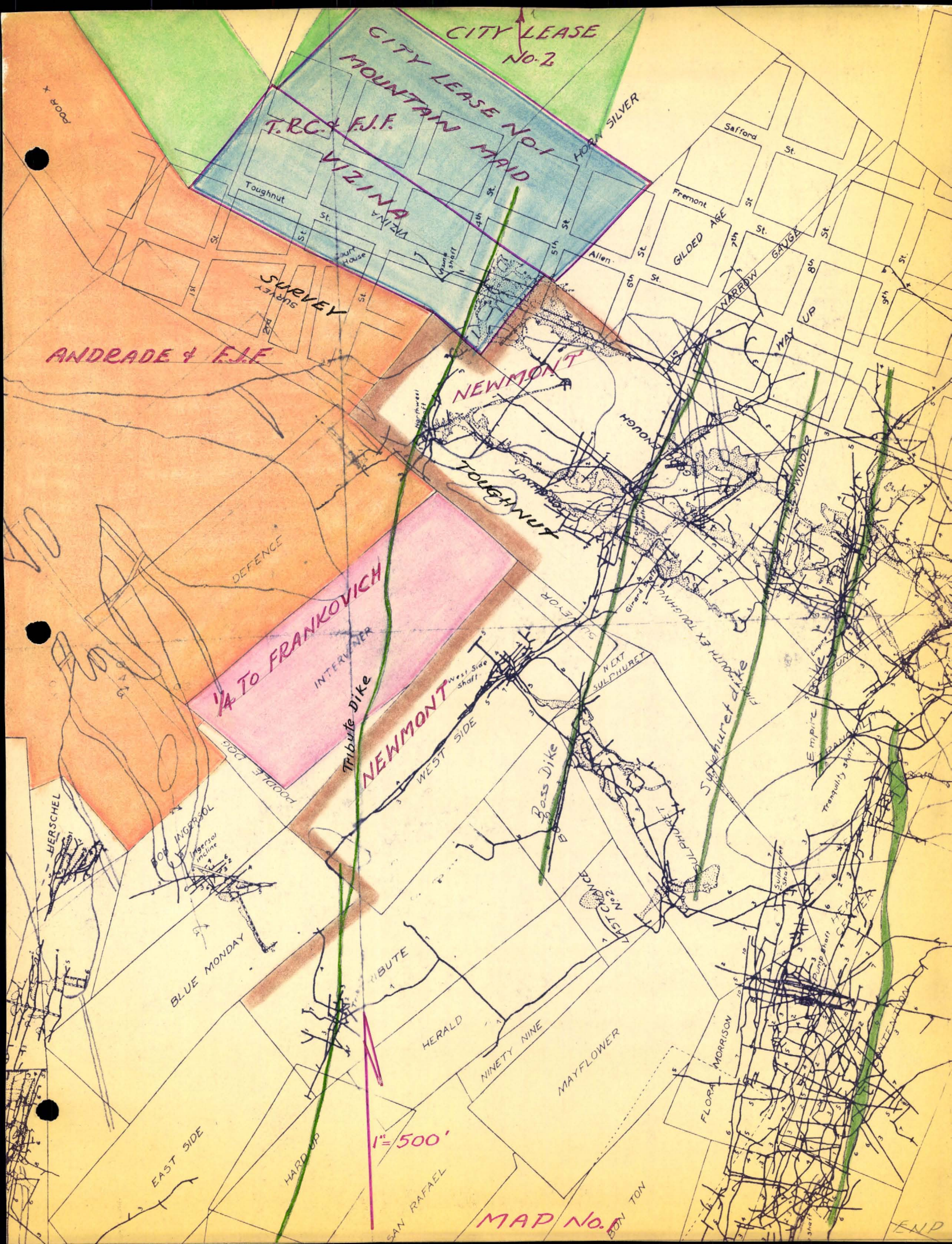
THE ACCOMPANYING MAPS FOLLOW THIS PAGE

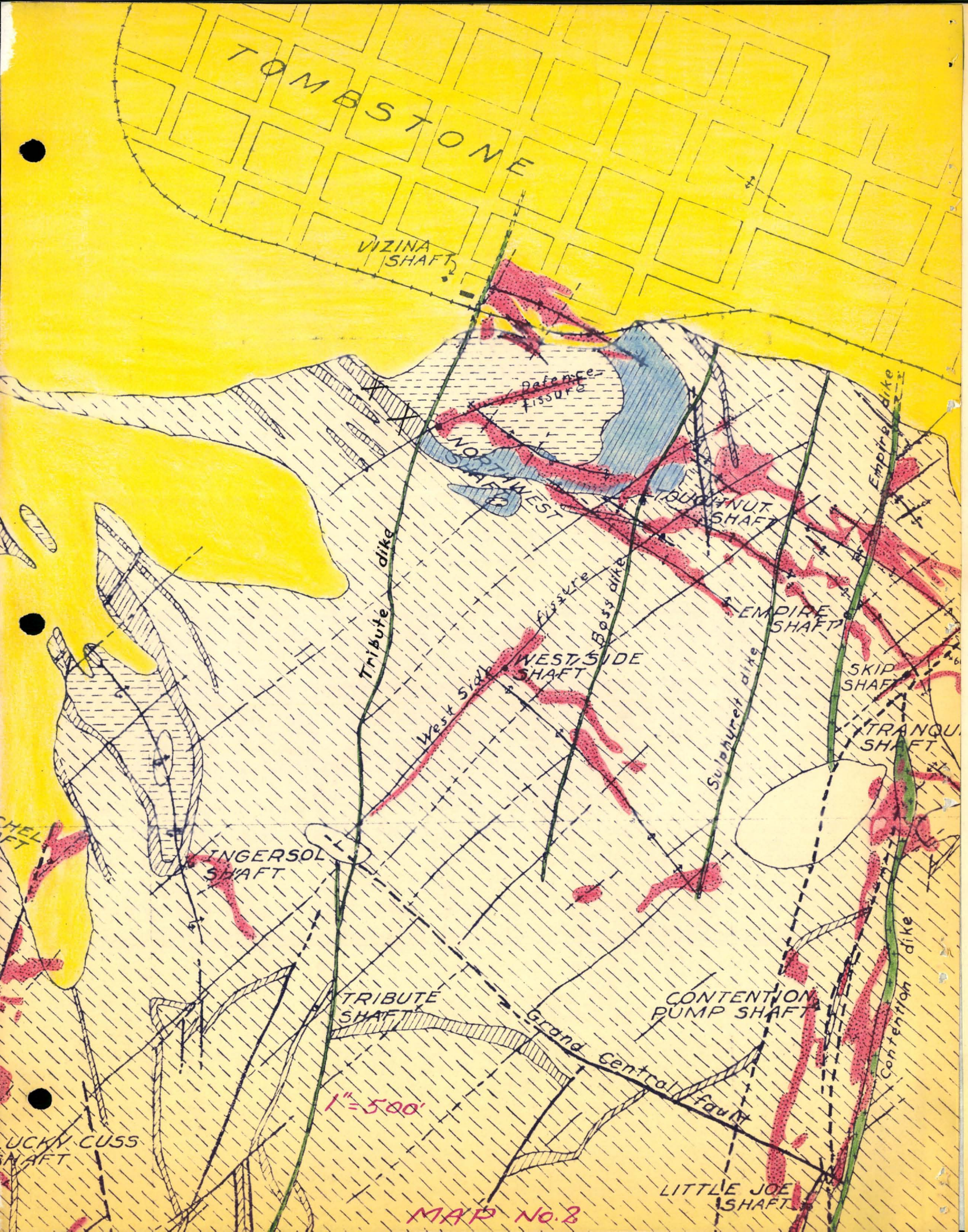
Maps Nos. 1 and 2 are based on plates contained in Arizona Bureau of Mines Bulletin No. 143.

On Map No. 2 the horizontal projections of ore bodies are shown in solid red.

Map No. 3 has been kindly provided by Mr. Frankovich and is based on his mapping. Ore body outlines are shown in solid red and are only approximate.

Figure 4 is a section along the Bonanza fissure to show the relation of the favorable Blue limestone to the shallow block excluded from the Mountain Maid lease. The data for this section were also furnished by Mr. Frankovich.


CITY LEASE No. 2
CITY LEASE No. 1
MOUNTAIN MAID
T.R.C. & F.J.F.
WZINA
HORN SILVER
Toughnut
Safford St.
Fremont St.
Allen St.
GILDED AGE
WARROW GAUGE
WAY UP
SURVEY
ANDRADE & F.J.F.
NEWMONT
TOUGHNUT
DEFENCE
1/4 TO FRANKOVICH
INTERVENER
Tribute Dike
NEWMONT
WEST SIDE
Boss Dike
Sulphuret dike
Empire Dike
HERSCHEL
BOB INGERSOL
BLUE MONDAY
TRIBUTE
HERALD
NINETY NINE
MAYFLOWER
FLORA MORRISON
EAST SIDE
HARD UP
SAN RAFAEL
BON TON
1" = 500'
MAP No. 1
END



EXPLANATION

QUATERNARY AND LATE TERTIARY

Gravel and sand

LATE CRETACEOUS OR TERTIARY

Schieffelin granodiorite

CRETACEOUS

Bisbee group

- Shale, sandstone and quartzite
- Blue Limestone
- "Novaculite" (silicified shale, conglomerate and quartzite)

UNCONFORMITY

CARBONIFEROUS

PENNSYLVANIAN AND PERMIAN

Naco limestone

MISSISSIPPIAN

Escabrosa limestone

DEVONIAN

Martin limestone

DISCONFORMITY

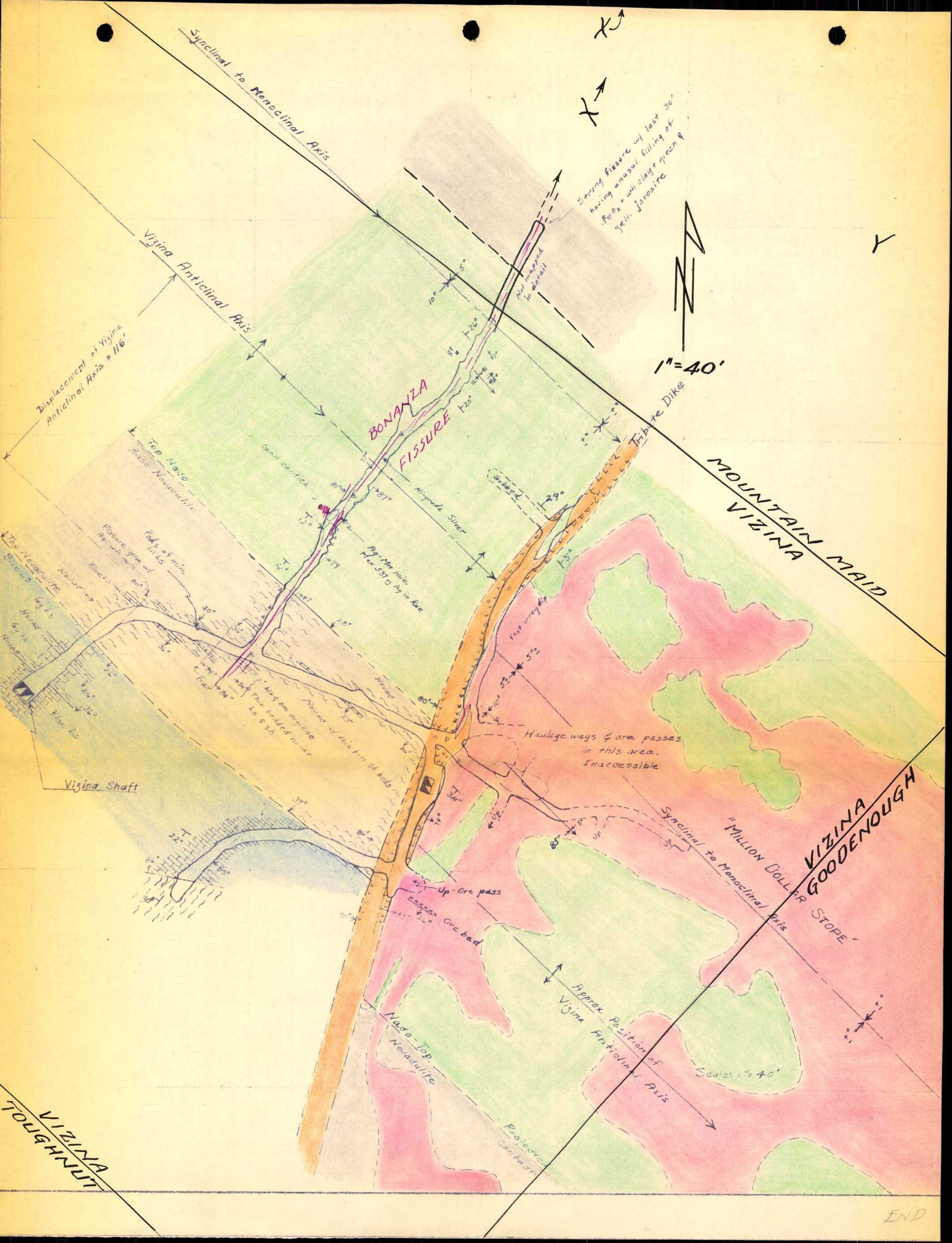
CAMBRIAN

Abrigo limestone

Bolsa quartzite

UNCONFORMITY

END

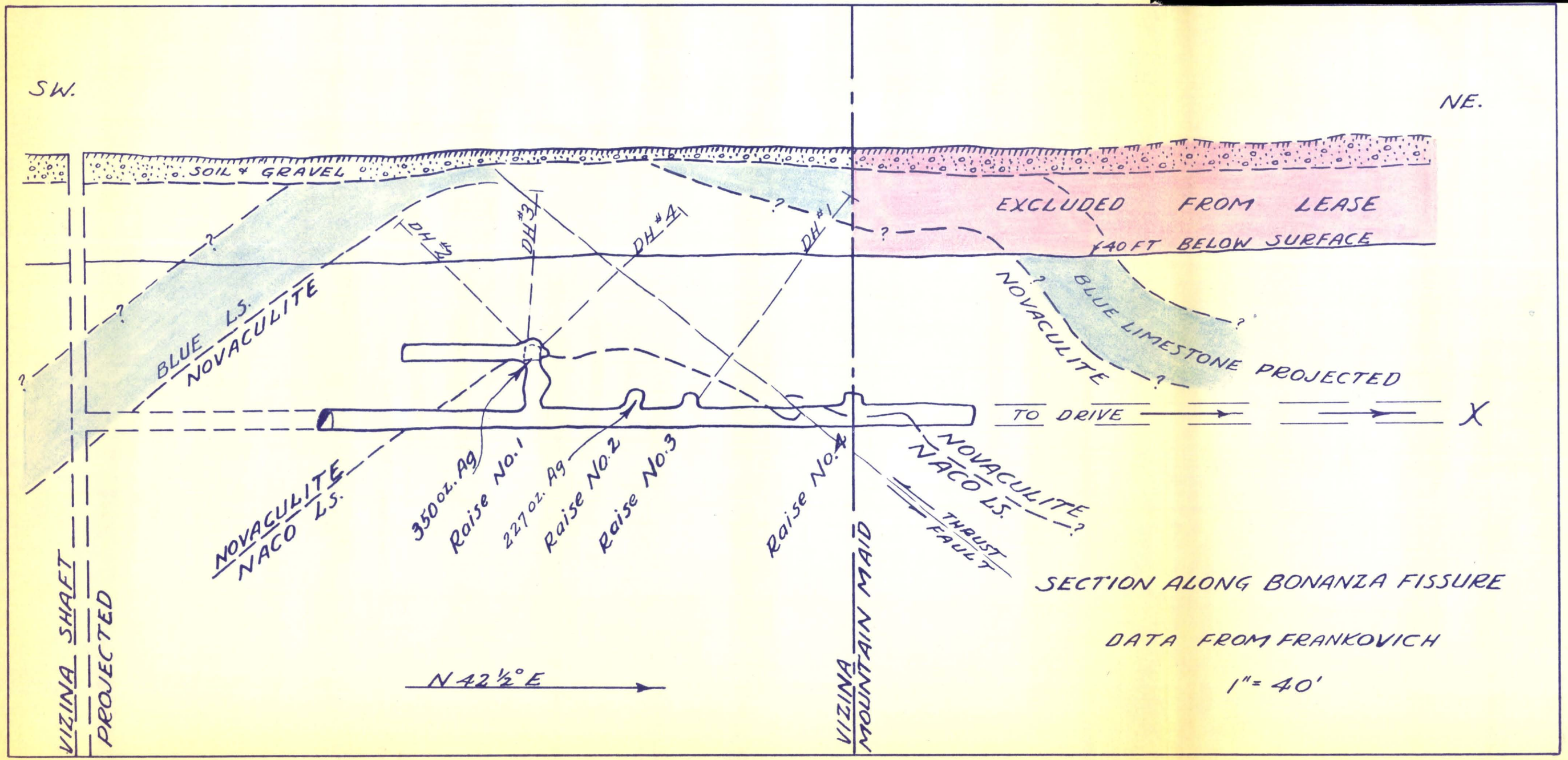


Synclinal to Monoclinal Axis
X
X
Strong fissure w/ last 30' having unusual filling of FeOx + wh clay + green & yell. jarosite
Not mapped in detail
N
Y
1"=40'
10°
5°
26°
81
51°
45°
20°
Vizina Anticlinal Axis
Displacement of Vizina Anticlinal Axis = 116'
BONANZA
FISSURE
Open cavities
77°
81°
87°
12°
Hi-grade Silver
Ag-Mn min. Max 537 oz Ag in Rse
79
87
28°
Gobbed
29°
Tibite Dike
MOUNTAIN MAID
VIZINA
Top Navo
Base Novaculite
Pods of min. in LS
Fissure zone w/ Ab wh. min
Top Novaculite
Blue LS
Novac
Gy LS
Novac
Gy LS
Novac
Blue LS
80°
30°
30°
26°
26°
36°
Frac
84°
84°
84°
2' blk & bm argillite
Thin bedded novac LS & sh
Novac w/ thin brn sh beds
Novac
23
Vizina Shaft
39°
22°
86°
30°
80°
80°
Flat irreg dip
5°
10°
5°
Haulage ways & ore passes in this area. Inaccessible
36°
18°
Up
Up
85°
5°
"MILLION DOLLAR STOPE"
Synclinal to Monoclinal Axis
VIZINA
GOODENOUGH
Up-Ore pass
Ore bed
70°
Approx. Position of Vizina Anticlinal Axis
Navo-Top Novaculite
Projected Contact
Scale: 1"= 40'
VIZINA
TOUGHNUT

END

MAP NO.3

END



SECTION ALONG BONANZA FISSURE

DATA FROM FRANKOVICH

1" = 40'

FIG. 4

wks

8	Reconditioning Shaft & Drifting 200'	$15,000
4	Extra 100 ft. @ $30.00	3,000
10	Misc raising - 3 raises total of 200'	6,000
4	Dia-Drilling - 6 holes from raises, total 1000'	3,000
26		7500
	6 months Frankovich salary	~~7,250~~
	Ind Ins @ $125 per mo	750
	Misc & Contingencies	5,000
		$40,000
	To Buy Out Slick (TRC) on or before Mar. 9-1961	20,000
		$60,000

If $70,000 is contributed, then would have $10,000 remaining for other expl, such as driving out to Blue LS + 101 LS hed on SE side of Tributo Dike or 250 ft @ $40.00 = $10,000

Add Payment due in May 1961 on Mtn Mais lease = $500.00

125
6
7500

Secure $70,000 but hold up spending until:

① Extn on TRC option ✓

② Default on City Lease #2 has been cured. ?

Also try to get

③ Lease on Toughnut (or NE 1/2 of claim)

Furthermore should have

④ NE 1/2 of Debence claim
⑤ NE 1/2 of Intervener

Dated

VIZINA LEASE FROM NEWMONT Sept. 1, 1959

① 3 years duration -- To August 31-1962
Option to extend 5 years

② ⓐ Exclusion of surface rights (as in the original patent). (These are not set forth)

ⓑ Exclusion of various rights earlier conveyed (residences) (These are not set forth.

③ Work requirements

1st Year — 1000' drilling

Last 18 mo — $3,000 expenditure

If Lease Is Extended:

Then 100 shifts per year.

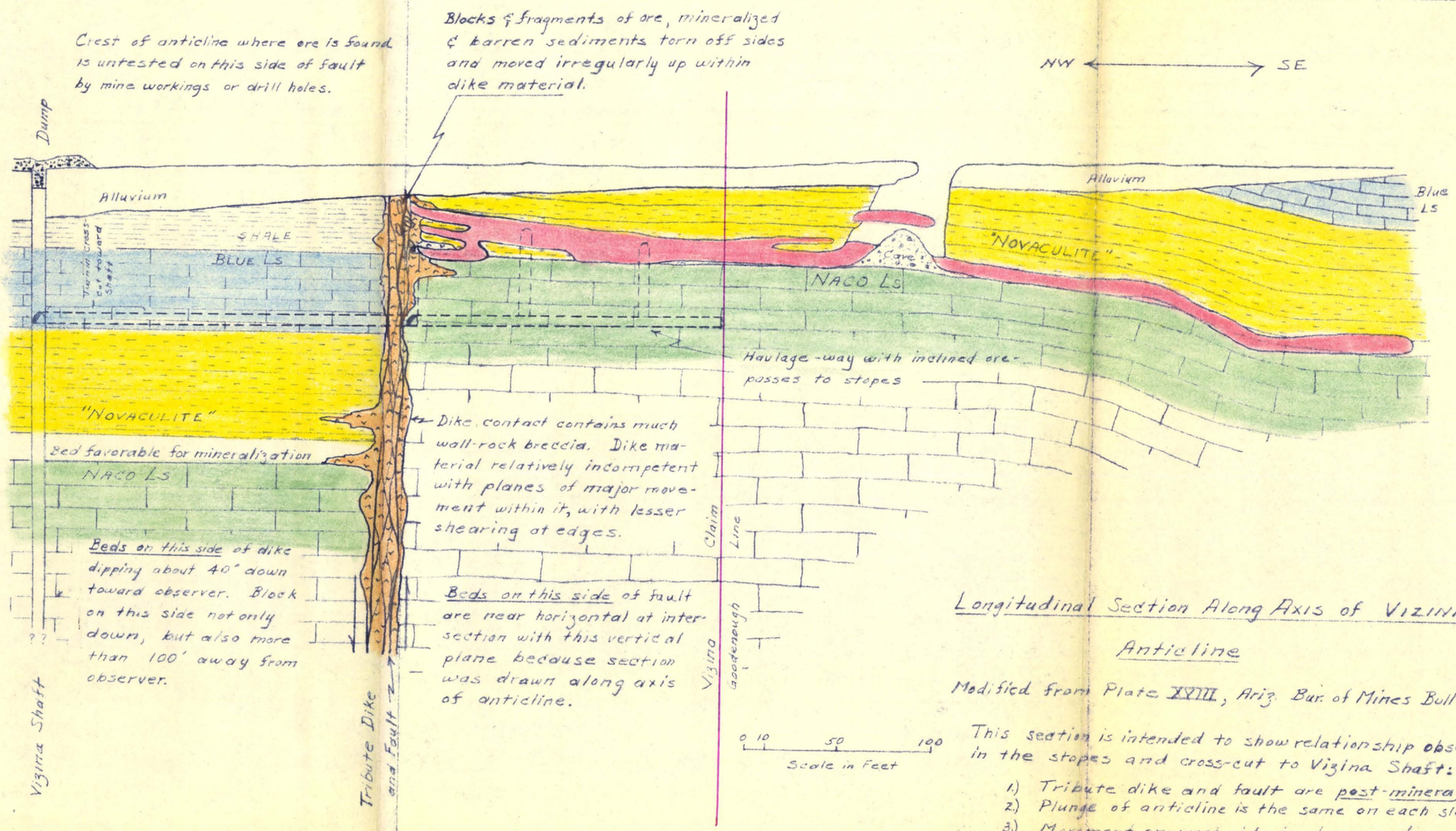
④ Royalties:

$10 per net return ton and less — 5%
$10 to $30 per ton — 1/4% increase for each dollar increase of value
Over $30 per ton — 10%

⑤ Frankovich To Pay All Taxes

⑥ Assignment only with Newmont's previous written consent. Otherwise, grounds for termination

W/H



Longitudinal Section Along Axis of VIZINA Anticline

Modified from Plate XVIII, Ariz. Bur. of Mines Bull #143

This section is intended to show relationship observable in the stopes and cross-cut to Vizina Shaft:

1.) Tribute dike and fault are post-mineral
2.) Plunge of anticline is the same on each side of fault.
3.) Movement on west side is down and north 100' plus
4.) Crest of anticline west of Tribute fault has not been tested for ore

Sept. 16, 1959 F. J. Frankovich

E. N. PENNEBAKER
CONSULTING GEOLOGIST
P. O. BOX 817
SCOTTSDALE, ARIZONA

May 17, 1961

Mr. Robert C. Smith
140 E. Lawrence Road
Phoenix, Arizona

Dear Mr. Smith:

Concerning the water situation at Tombstone with respect to the Frankovich-Smith project:

Bulletin No. 143, Arizona Bureau of Mines, published in 1938, states that "Water is encountered in the mines of the eastern part of the district at an elevation of 4,120 feet above sea level" (page 7). In the present area of interest water would be expected at approximately this same horizon.

Exploration proposed by the Frankovich-Smith project is near a sea level elevation of about 4,450 feet, some 330 feet above where water becomes a serious hazard. Deep exploration is not contemplated, and it is expected that any rich ores found would remain at relatively shallow horizons.

I have been underground in workings at about this same horizon (4,450 feet) and found them dry and dusty.

In my opinion, the encountering of underground water does not endanger the project as now planned.

Yours very truly

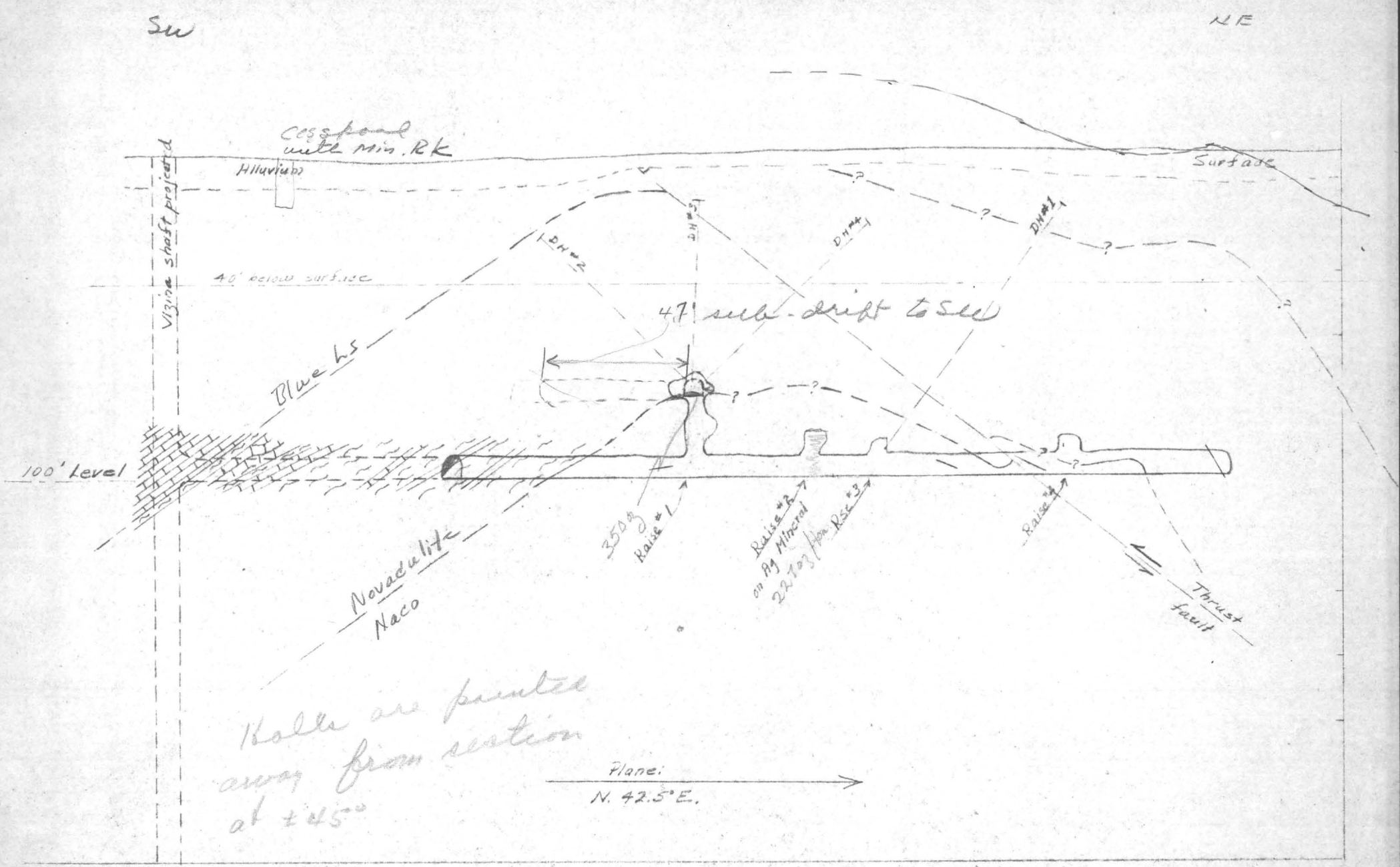
E. N. Pennebaker

E. N. Pennebaker

ENP:mc

6

COPY



Cross-section Along Bonanza Fissure

Horiz. & Vert. scales: 1" = 40'

F. J. Frankovich

2/17/60

E. N. PENNEBAKER

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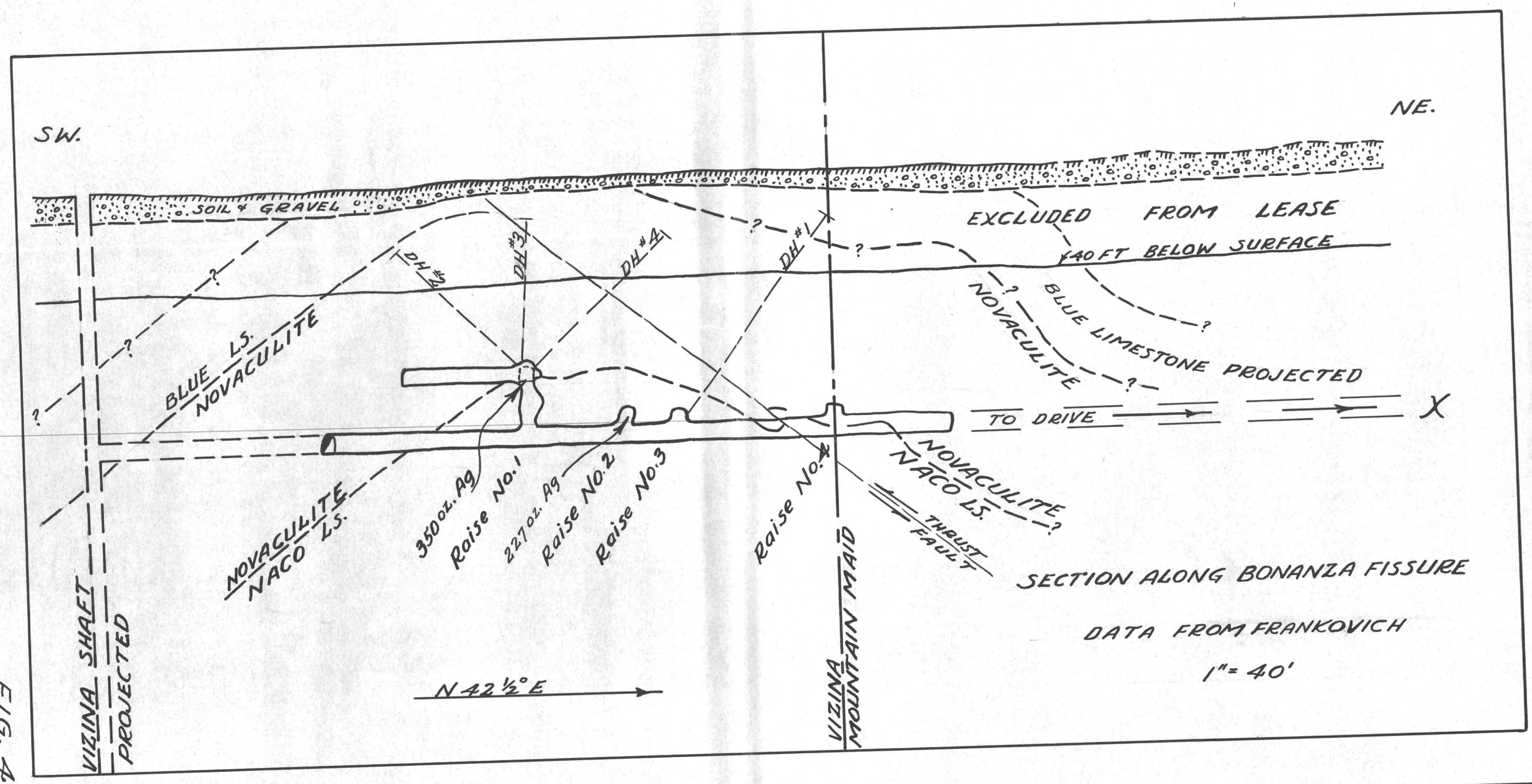

FIG. 4

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E. N. PENNEBAKER

work is expected of American chemists. The presence of arsenic is so rare in American irons that it is hardly necessary to mention the fact that where it is present the precipitation with molybdate must be made in a cold solution. My attention was lately drawn to this element by finding 0.05 per cent. in an iron sent out by chemist L. for the purpose of comparing results by different methods. My result on this iron was reduced from 0.180 per cent. to 0.152 per cent. of phosphorus by taking the above-mentioned precaution.

To sum up, I find of three chemists working the acetic and citric acid methods in list A, two are wrong. Of four who worked the direct molybdate method three are wrong, and the fourth has a variation of 0.010 per cent. in the method as regularly worked by him. Of three working the modification of the molybdate-magnesia method, in which there is a large quantity of chlorides present with the nitric solution when phosphorus is precipitated, all are wrong, and of ten working the method so that there is only nitric acid and ammonium nitrate present with the iron solution, nine are within the limits of error.

THE GEOLOGY AND VEINS OF TOMBSTONE, ARIZONA.

BY WILLIAM P. BLAKE, F.G.S., NEW HAVEN, CONN.

THE mining district and the town of Tombstone are situated in Cochise County, Arizona Territory, at the northwest end of the Mule Pass range of mountains, in longitude 110°, and latitude about 31° 40′ N., upon the right bank of the San Pedro River, from which the town is distant 9 miles east. It is also 24 miles south of Benson station on the Southern Pacific Railroad of Arizona, and about 40 miles north of the Mexican line. Its altitude above the sea is 4600 feet. The Dragoon Mountains rise across a valley to the northeast, and the Huachuca Range similarly upon the southwest. The country is open, without timber, and the surface, where the mines are opened, is in general gently rolling, and accessible to wagons by natural roads.

The first locations were made in the year 1878 by the Scheffelin brothers and Richard Gird, the latter being well known among the pioneers of Arizona as a surveyor and miner, who contributed largely to our knowledge of the geography of the Territory in early days,

when the dreaded Apache dominated the region. There are now, probably, over one thousand locations or claims in the district, and upwards of 2500 inhabitants.

The output of the precious metals, gold and silver, up to the first of January, 1882, aggregates $7,359,200, and over $3,000,000 have been disbursed in dividends. This product is distributed among the following-named mines and mills:

Production of Tombstone Mines and Mills.

Tombstone Mill and Mining Company,	$2,704,986 83
Contention Consolidated,	2,708,144 39
Grand Central,	1,050,875 30
Head Centre,	191,520 52
Vizina,	526,716 98
Ingersoll,	15,000 00
Sunset,	15,000 00
Corbin Mill,	40,000 00
Boston Mill,	112,007 83

Dividends.

Tombstone Mill and Mining Company,	$1,100,000
Contention Consolidated,	1,375,000
Grand Central,	600,000
Vizina,	80,000

This will suffice to show the importance of the locality for mining, and to indicate at the same time the principal claims.

GEOLOGY OF THE DISTRICT.

In going from the railway at Benson to the mines the traveller rises from the post-pliocene deposits along the San Pedro to a granitic plateau. The rock is gray and highly crystalline, and is apparently eruptive. It weathers in places into gigantic rounded blocks and masses, lying one upon another as if piled there by some Titanic force, rather than by the gentle and gradual effects of irresistible decay. This rock extends to within a mile or two of Tombstone, where stratified formations occur overlying the granite.

These stratified beds consist of quartzites, limestones, and shales, with frequent repetitions in an ascending series several thousand feet thick, but all conformable and dipping generally at a low angle from 20° to 45° to the eastward. The fossils which have been found in the middle and upper beds, consisting chiefly of *Productus* and cyathophylloid corals, show them to be *Paleozoic*, and probably

Lower Carboniferous. The lower strata are probably older. A small shell, like *Lingula*, occurs in the shales of the Contention mine.

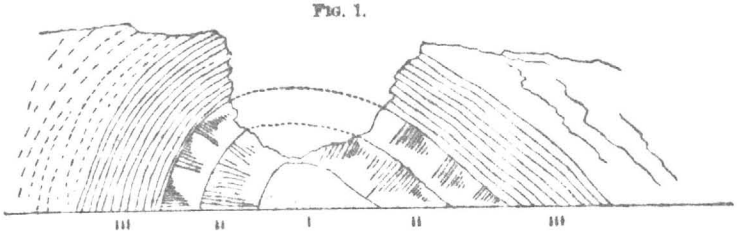
In addition to the stratified formations we find intrusive porphyritic dikes cutting through the strata indiscriminately, nearly at right angles, and trending approximately north and south, or a little east of north. This is the direction of the general rift or breaking of the country and of the mineral veins.

In the central portion of the district, covering the claims known as the Toughnut, Goodenough, Way-Up, Vizina, and others, erosion has exposed the outcropping edges of many strata of limestone, shales and "quartzites." Both the shale and so-called quartzite beds are of deep-sea origin, being very fine and compact in texture, with scarcely any signs of granular structure. The latter, particularly, is flint-like and very hard, and is more exactly described as a novaculite or bonestone. In places it passes insensibly into limestone, apparently forming beds of silicious limestone. It is, no doubt, largely organic in its origin, and is a very fine sediment, totally different from the typical quartzites, with granular structure, found in the higher parts of the series of strata. It evidently, in forming, accumulated slowly, beyond the influence of currents, at the sea-bottom. An abundance of iron pyrites in fine crystalline grains, disseminated through the layers of this rock, gives evidence of its organic origin in part, at least. This rock has special importance from the fact that the miners in the Toughnut and Goodenough claims find it *below* the chief ore-bearing limestone. It is regularly and evenly stratified for a thickness of about 140 feet, and rests upon a thickly-bedded dolomitic limestone below. The beds above it consist of dark, black or blue limestones, and of thick beds of dark argillaceous shale, alternating with black silicious shales for nearly half a mile to the eastward. The black limestones above the novaculite are the chief repositories of the bedded masses of rich silver ore, as will be presently shown.

The whole series of beds in this central part of the district is thrown into folds, being regularly plicated in a series of wave-like flexures, the steepest and sharpest folds being on the northwest of the Toughnut and Goodenough claims facing the granitic region in that direction. These folds may be traced, but with difficulty, upon the surface, but are best seen in the crosscuts of the mines and along the drifts. In the open cut upon the Toughnut there is a good exposure of some of the beds at the crest of an anticlinal fold present-

ing an appearance in section, along a northeast and southwest cut, nearly as shown in the annexed drawing:

FIG. 1.



Anticlinal fold. Toughnut.

I. Novaculite—under the limestone.
II. Limestone—bending over the novaculite.
III. Shales—bending over the limestone.

This little section is along the upper level known as the "adit." It is directly below the place on the surface where ore was found cropping out, mixed with soil and vein-stuff. At another place, upon the western end of the Goodenough, we find a series of plications, up and down, at about the angles shown, and with rich ore lying in the folds. These folds are not large, covering only a few hundred feet in extent, but are beautifully regular and well defined. As we pass up the hill, rising higher in the series of strata to the eastward, the dip becomes more regular, and coarse-grained quartzites, in thicker beds, take the place of the finer-grained deposits.

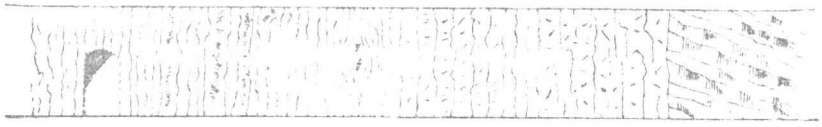
All of the formations named have not only been uplifted as described, but have been much broken and faulted either at the time of uplift or at long periods later. This is shown by the number of fissures and lines of fault, as well as by the outcrop of dikes of porphyry, and the dissimilarity of the stratified beds on either side of them, and the disjointed outcrops of the limestone beds.

THE CONTENTION MINE.

The chief fissure and ore-bearing vein of the district traverses the Grand Central and the Contention claims. These claims were located in a north and south direction upon the somewhat obscure croppings of a dike of dioritic porphyry carrying ore, in, through, and alongside of it. This location was made by Messrs. White and Parsons. The croppings were not remarkably well defined, consisting of the porphyry and a confused mixture of porphyry, chert, and quartz, with masses of porous quartzite alongside; none of these rocks rising high above the soil. There was, however, a considera-

ble discoloration of the soil by iron-rust along the line, and a little digging revealed good ore near the surface. The harder parts of the dike were the most prominent, and its direction governed the direction of location of the claim. This dike varies in width from a few feet to 50 feet or 70 feet, and dips to the westward at an angle of from 55° to 65°. It cuts indiscriminately through shales, quartzites, and limestones, and is evidently of igneous origin. The contact, however, with the abutting edges of the disrupted beds is not always marked by any great change in their appearance or composition, though in places there is obscure metamorphism, impregnations of silica, and some modifications of structure. The dike itself has a distinct vertical lamination or structure through most of its substance, and is more or less penetrated by veinlets of quartz. In some portions it is highly crystalline and nearly barren, and in others consists chiefly of a feldspathic base, in which the feldspar crystals are obscure. It passes into a felsite, which, in the decomposed portions of the dike, and when slaty in structure, might be mistaken for the partly decayed shales or quartzites. Large portions of the dike are so penetrated by quartz as to consist largely of it, and might be called quartz, although close examination will show the presence of feldspar.

Fig. 2.



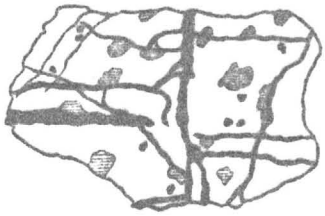
The accompanying cross section (Fig. 2) of the chief part of the dike taken on the first level of the Head Centre mine, upon the Contention lode, will convey a better idea than can be given in words. It shows the vertical structure, and the general distribution of quartz in vertical seams or layers, and in one place a vug or cavity, in which there are distinct quartz crystals. In general, however, combs of quartz crystals are wanting; the quartz being in an amorphous, subvitreous state, or in the form of chert. The lamellar arrangement of this quartz near the central part of the section is shown by the little cut of full size (Fig. 3) of a fragment ground down to a plane surface. The lines represent the layers of quartz; the intermediate spaces are filled with feldspar. This lamination is typical of the vertical structure of the dike. Another fragment, with less quartz, taken at a distance of about two feet from the first,

Fig. 3.

consists chiefly of a felsite base with obscure crystals of feldspar sparingly distributed. Examination shows it to be penetrated irregularly by veinlets of quartz, as shown by the accompanying sketches from ground and polished surfaces. (Figs. 4 and 5.)

FIG. 4.

FIG. 5.



There is also a considerable amount of mineralization of the dike by iron pyrites disseminated irregularly in its substance in cubical crystals, most of which have dissolved out and left the cavities only to indicate their former presence, making in some places a spongy mass of porphyry or of quartz. Although the mine has been worked to a depth of 600 feet, and there are some 12 to 15 miles of drifts, levels, and winzes in the Contention and adjoining mines, the undecomposed ores below the water-line have not yet been reached and mined, and all the ores above are in the decomposed and oxidized condition common to surface ores. A large part of the ore is highly charged with red oxide of iron, to such an extent that the clothing of the miners becomes saturated with the rouge-like powder, and the tailings at the mills are blood-red.

There has been an extensive decomposition of the porphyry, especially along the upper 300 feet of the dike, resulting in the formation of quantities of white clay, kaolin, sometimes perfectly snow-white and pure, but generally more or less mixed with red oxide of iron. This kaolinization extends in places to the adjoining shales, and there are some white, claylike, interstratified beds which may, on further examination, be found to be altered felsitic offshoots from the dike. It is not yet possible to say what the exact nature of the ore below the water-level will be found to be. The only metallic contents so far found, with the exception of the pyrites and some galenite and lead carbonate, are gold and silver in a comparatively free state; part of the gold, if not all, being free, and the silver occurring chiefly as chloride, or horn-silver (with probably some iodide), in crusts and films, also occurring in minute crystals upon

cleavage surfaces. The average value of silver and gold in the ore worked last year was about $70 per ton. The gold has of late increased from 20 to 25 per cent. of the value of the product, the rest being silver.

GOLD IN PORPHYRY.

One very interesting fact is the occurrence of free metallic gold, together with chloride of silver, in the midst of the porphyritic rocks, at a distance of many feet from the portions of the porphyry carrying quartz in veins, and disseminated. This gold is found chiefly in a portion of the rock apparently dioritic, containing finely-disseminated hornblende. In decomposing, this porphyry becomes steatitic, and in places appears to be changing to serpentine. The gold is found in thin sub-crystalline flakes and scales, chiefly in and along thin seams and cracks in the mass of the rock, as if it had been infiltrated and deposited from solution. This is probably the fact, and the magnesian nature of the rock has no doubt exerted an important influence in its deposition. Free gold is also found in quartz in the usual manner of association, but even in such specimens the crystalline feldspar of the dike is found.

METALLIZATION OF THE DIKE.

The time and manner of metallization of the dike may be considered as open questions, for a solution of which we must wait until the mining extends below the permanent water-level of the formation. It seems most probable that the rock, at the time of its intrusion, was pyritous, and the strata adjoining it no doubt were. It is not impossible that there may have been a concentration of the precious metals in the dike from the surrounding beds, the result of the decay and change of the pyrites diffused in the strata. On the other hand, we may suppose that the dike has been the source of the silver and gold we find in and about it.

In either case the vertical laminated or stratiform structure parallel with the walls has been an important factor in the distribution of the metals, and in the changes and modifications of the original condition of the dike. We may readily conceive of such vertical planes of structure affording planes or lines of least resistance to vertical movements, while the abutting ends of the strata, in contact with the walls of the dike, would offer great resistance by friction. The condition of the dike along a great part of its course seems to sustain and verify this hypothesis. There has evidently been considerable movement of parts of the dike upon itself, resulting in the

formation of heavy clay seams and brecciated layers of porphyry and quartz, sometimes occupying a medial position along the dike, sometimes at one side or the other, and again along the line of contact with the country rocks. Such seams and brecciated ground are sometimes wanting, and the structure and condition of the dike remain unchanged.

The whole of the dike with the adjoining strata have been subjected to extensive movements and displacements, shown not only by breaks of continuity, but by the brecciated cross-courses and seams traversing both the igneous and stratified formations. One of these faults resulting in a throw of the northern portion of the Contention lode 150 feet to the west, and partly outside of the west side-line of the claim, has recently led to expensive litigation. The faulting seam or break has been drifted upon between the two ends of the disjointed dike. It consists of a heavy breccia of fragments of the adjoining strata, together with a strong clay wall, marking the plane of greatest movement and slip. Its direction is southwest and northeast.

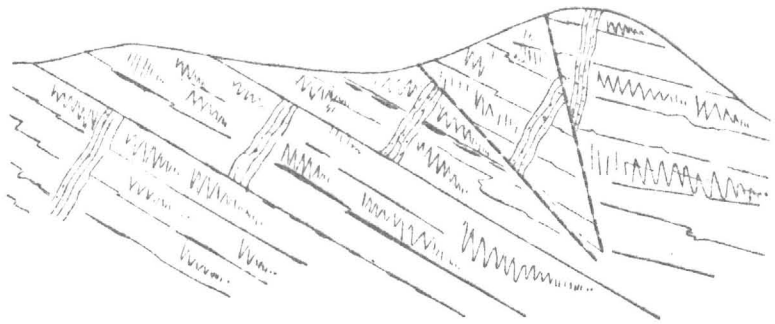
In addition to the lateral movement there have been extensive vertical displacements, and it is probable that the lateral shifting may be referred to them. It would be premature to attempt an exact description of the numerous faults and mechanical changes to which the dike has been subjected. They require further study and surveys. Mr. Isaac E. James, so long and well known upon the Comstock lode as an accomplished mine engineer, is now in charge, and has the subject under investigation. We owe the first determination of the nature and position of many of the vertical faults and throws to his careful observation and surveys. Without now entering into precise descriptions of particular displacements, it will suffice to give a sketch indicative of what has occurred, producing such a confused recurrence of ore upon certain levels of the mine, as to lead at one time to the supposition that there were several dikes of porphyry and ore over a breadth of five or six hundred feet.

The movement appears to have been from the west eastward and downwards, the top of the dike being carried off in successive blocks by the sliding of masses of the stratified formations partly upon the planes of deposition of the beds (these dipping eastward and affording surfaces of easy movement), and partly upon steeper planes of fracture generally dipping eastward, as shown in the outline sketch section, which may be taken as typical.

This disruption of the dike, with its attendant fracturing and

brecciation of the country rock, accompanied by the movement of the dike upon itself, and the formation of heavy clay seams, has provided favorable places for the accumulation of ore. It is generally found in the softer and most broken portions of the dike, coincident, no doubt, with the regions of greatest original metallization and subsequent movement, attended by clay seams. Such clay seams, with the accompanying ore, have by some been considered as marking

FIG. 6.



the limits of a second or subsequently-formed vein, following the dike and independent of it. This theory, formed under the inspiration of the necessity of narrowing down the vein and throwing it as far west as possible, in order to secure a greater length of it upon the Head Centre ground, would be more defensible, if in the stopes any vein structure referable to a later deposition could be found. Instead of the fragments of broken porphyry, shale, and quartz being cemented together by quartz, they are loosely aggregated, and show clearly that the formation is due to mechanical force and attrition. The clay seams are also not certain boundaries of the ore; it occurs on both sides of clay seams. The clay cannot, therefore, be taken as separating ore from waste. The seams, moreover, are not continuous, but give out, and in some parts of the dike are absent.

The only place upon the lode where water has been reached is upon the Sulphuret claim. At this point the lode intersects strata of limestone, and there is a bedded layer of ore following the stratification and connected with the dike. This ore is chiefly galena and iron pyrites. Very little has yet been taken out. So also in the Head Centre ground, at a higher level, where the dike intersects limestone, a bedded or interstratified layer of ore occurs. But the best examples of bedded deposits in the district are in the Toughnut and Goodenough claims before referred to.

BEDDED ORE DEPOSITS.

These also are associated with dikes and vertical fissures nearly parallel with the Contention lode. One of the longest and best defined is the West-Side lode, which may be traced for about two miles, until it passes into the underlying granite. Its northern prolongation appears to cut across the Toughnut claim, and to connect with the vertical fissure and quartz croppings at the Discovery shaft on the Goodenough.

A second line of fissure cuts across the anticlinal line of the formations at the open cut on the Toughnut, and crosses the whole breadth of the Goodenough into the Way-Up claim beyond. This has been followed on ore from the open cut to the Way-Up, and is connected with the chief lateral bedded deposits. A lode has also been followed in the same general direction from the claim called the "Defence," across the Toughnut into the Goodenough. This lode is marked by very heavy croppings of quartz and flinty boulders lying above the limestone on the surface.

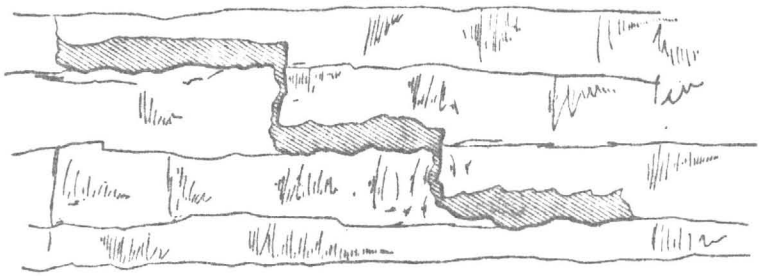
In the fissure extending into the Way-Up claim the ore was found in layers and bunches following the plane of the vein, extending upwards and downwards along its course in nearly vertical shoots or ore-bodies, but breaking off into the adjoining strata in flat bed-like layers, particularly where the vein intersects the lower limestone resting on the novaculite beds. These bedded offshoots from the vein are often of considerable lateral extent, following the planes of stratification on either side. We cannot yet state with confidence what the exact origin of these bedded deposits is. They may be due to the decomposition of nodular masses, but they are generally deposited in the limestone as if by replacement. They may be regarded as filling irregular cavernous spaces eroded from the strata by metalliferous solutions, and without any regular boundaries. These bedded masses do not have a symmetrical arrangement of the ore, except such as may be referred to stratification or deposition by gravity.

It is to be observed that these bedded masses of ore occupy the limestones rather than the silicious or argillaceous strata, as we might expect from the greater solubility of the limestone. Inasmuch as these limestone strata are folded and turned up in different directions, the intersection of the limestone with the vertical plane of the vein is an irregular line. At such intersections the walls of the fissure are corroded away and are obliterated, or are further apart than where the fissure cuts the silicious beds, the shales, or the quartzites.

In this respect the formations are similar to many abroad. Moissenet* represents bodies or shoots of ore corresponding in their pitch to the intersection of strata with the plane of a vein. Wallace describes a series of strata in the North of England consisting of limestones and shales traversed by lodes productive in the limestone, but poor when passing through shales. Other examples might be cited.

In extent, the bedded masses of the Goodenough and Toughnut claims have been much greater than the ore-bodies of the vertical fissures, and it may be said that the greater part of the production has been from the beds or flats. They extend irregularly between the two fissures a distance of about 400 feet, measured diagonally along the dip. It is noteworthy that they follow the stratification, and then suddenly break across it vertically, following a crack or break of the bedding, and then expand again horizontally for some distance to another, dropping down by a series of steps from one layer to another in and between the limestones.

FIG. 7.



The ores found in these bedded deposits in the limestones are much more plumbiferous than the ore of the feldspathic dikes. Galenite, blende, and iron pyrites are abundant in masses, which, within the reach of oxidizing agencies, are largely converted into oxides and carbonates.

Bedded ores of this nature are also found in the limestones of the Blue Monday claim contiguous to the vertical fissure in the westward prolongation of the West-Side lode, or vertical ore-bearing fissure. This contiguity of the bedded deposits of the camp to the vertical fissures and dikes, and the occurrence of bedded ores where the dikes intersect limestone strata, lead me to the opinion that the

* Annales des Mines (6) 9, p. 10.

metallization of the district is due to the igneous intrusions, and that these intrusions, with the accompanying impregnations and ramifying veinlets of quartz, are the true lodes, or "leads," that may be followed with confidence in the search for ores.

THE GOLD FIELDS OF THE SOUTHERN PORTION OF THE ISLAND OF SAN DOMINGO.

BY RICHARD P. ROTHWELL, NEW YORK.

In the year 1881, I visited San Domingo, in the interest of French capitalists, to examine and report upon certain "concessions" of gold-bearing gravel and quartz veins, on the Isabella and Jaina rivers and their tributaries.

This district is periodically reported to be extraordinarily rich, and there is cast around it the glamour of the mysterious shipments of gold, credited, in romance and in more or less romantic history, to Columbus and the Spaniards of the fifteenth and sixteenth centuries. Since considerable sums of money and several valuable lives have been lost in the unsuccessful search for its profitable mines, it seems desirable to place on record some of the information collected concerning the value of these famous gold fields, with the hope of facilitating the work of those who may hereafter be called on to investigate these claims, and of preventing the unnecessary waste of capital.

It is needless to add that the capitalists for whom my investigations were made abandoned the enterprise they had in view, although no doubt similar schemes will be brought forward many times in the future, as they have been in the past, under the fervent advocacy of too sanguine enthusiasts.

Since the time of the Spanish occupation of the Island of San Domingo, in 1497, when Columbus found the natives wearing ornaments of gold, more or less of the precious metal has been obtained annually by washing the gold-bearing sands of several of its streams. It is said that during the Spanish domination, when the native Indians were held in the most abject servitude, a certain amount of gold was *required* of each one as the result of his labor. Under this

Vizina - Newmont
Mountain Maid - Tombstone

Leases to Frankovich & TRC retains an interest

TRC interest is now 50% of net profits - They will reduce this interest to 5% on receipt of $19,257.11
Frankovich has option on this sales arrangement running to March 9, 1961

Say $200 are

Royalty	$20.00	?
Mining Cost	10.00	?
Shipping & Smelting	12.00	
	$42.00	

(TRC - Transworld Resources Corporation)

Newmont Lease

Vizina lease expires on Aug. 31, 1962
Option to extend for 5 yrs

Max. royalty is 10%

~~Tombstone Lease~~

Newmont extensions for work -

First was for 90 days
Second was for 60 days to
Jan. 31 - 1961. This was completed

Tombstone lease.

Right of City to lease ground appears okay but this opinion is based on interpretation of a copy of the charter, ~~no~~ the original is not available.

10% royalty
15 year lease

70
7) 5,000,000
70,000

150,000,00

150,000,70

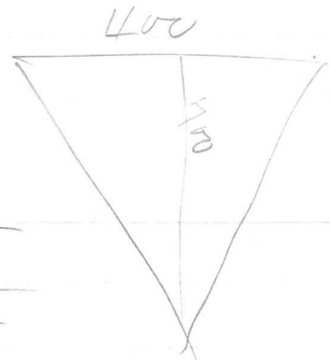
1050,000
35,000 profit

200 × 700

70,000 × 30²/15

140,000

150,000 tons Vizina



No. 1 City Lease

Min. annual royalty payment of $500 per year after first 18 months (due in May 1961.)

Work requirement has been completed. (or Mtn Maid or Vizina to spend ~~4,000~~ 6,000 on exploration. (or 10,000)

Perpetual lease.

10% royalty.

applies below 45' depth

TRANSWORLD
Resources CORPORATION
Madison 5-7514
Telephone
417 South Hill Street
Los Angeles, California

Mr. Frank J. Frankovich
3351 North 6th Avenue
Phoenix, Arizona

Re: Agreement for Development of Vizina-
Mountain Maid-Toughnut Claims.

Dear Frank:

The purpose of this letter is to clarify and confirm our previous oral understanding with respect to the exploration and development project on the Vizina, Mountain Maid and Toughnut claims in Tombstone, Arizona, as partially embodied in our recent Letter of Agreement.

The following summarizes our understanding of the terms of the agreement:

1. You now hold valid leases on the Vizina and Mountain Maid patented lode mining claims and will attempt to obtain a lease on the Toughnut patented lode mining claim, all located in Cochise County, Arizona. You warrant the validity of the leases. Any expenses reasonably necessary to establish title to any of the leased claims (having particularly in mind the questionable status of the title to the Mountain Maid claim) shall be chargeable to operating expenses. We ("Transworld" herein) have examined and are generally familiar with the claims, the legal descriptions thereof, and the terms, or proposed terms, of the leases. At our request, you will execute appropriate assignments to Transworld of each of the leases now held and of the Toughnut lease when obtained, and, if necessary, you will use your best efforts to procure the consent of the respective lessors to each assignment. After assignment of the leases, Transworld agrees to assume all obligations as lessee thereunder and to hold the leases subject to the terms of this agreement. Until the assignments are executed and delivered, or in the event no assignment is made or is impossible, you agree to hold the leases subject to the terms of this agreement.

2. From time to time as such funds are needed, Transworld agrees to provide up to $12,000 to defray the cost of driving 200 feet of cross-cut and other exploratory work to test the Vizina anticline and for other expenses incurred under this agreement. It is understood that this exploration program will be conducted diligently and will be completed by January 31, 1960.

3. In return for financing the exploration program, Transworld will receive a 50% interest in the leases and the proceeds from mining operations on the claims, after deduction of direct operating expenses for this project and payment of royalties and other obligations under the terms of the respective leases. The property is to be mined for maximum profits and profits are not to be reinvested in other ventures but paid to Transworld and Frankovich according to their respective interests.

4. If, upon completion of the exploration program or as the result of any other explorations or investigations, Transworld determines in its sole judgment that there is enough valuable ore to reasonably insure profitable mining operations on the claims or any of them, then within thirty (30) days after such determination, Transworld shall loan $12,000 as operating capital to finance further mining operations. In return for making this loan, Transworld will receive a further 16 2/3% interest in addition to and on the same basis as the 50% interest acquired under paragraph 3 above.

If the contribution of Transworld, together with any income realized from operations hereunder, is insufficient to carry out this project, additional funds may be contributed by either party with the consent of the other party, and the respective interests of the parties shall thereupon be adjusted accordingly. In the event equity funds are contributed by third persons, upon such terms as shall be mutually agreed upon by the parties hereto but with or without additional contributions by the parties or either of them, the interest remaining in the parties after allowing for the interest acquired by such third persons shall be allocated proportionately between the parties hereto in accordance with their respective percentage interests.

5. The costs of complying with the terms of the leases and keeping them in effect, including the payment of rent, shall be chargeable to the funds to be advanced by Transworld and to proceeds realized from mining operations, as such costs are incurred, accrue or become due. You shall use your best efforts to obtain, or shall cooperate with Transworld to obtain, the consents of the lessors of the claims to have all or part of the expenditures for exploration described in paragraph 2 regarded as satisfying minimum exploration requirements under the respective leases. The obligor under the leases at any given time, whether you or Transworld as assignee, hereby agrees to comply with the terms of the respective leases, subject to reimbursement of any expenditures from funds available under the program contemplated by this agreement. If the then obligor fails to comply with the terms of any lease, the other party may take action to effect compliance and shall thereupon be reimbursed for all necessary expenditures, including any penalties or additional costs

resulting from failure to effect timely compliance with the leases.

6. You will serve, at your option, as full-time manager of exploration and mining operations, for which services you will receive a salary of $250.00 per week in addition to your share of any profits resulting from mining operations. If you voluntarily terminate your employment, Transworld shall be under no obligation to reinstate you in such position, but may do so upon mutual consent. As manager, you will follow a program to be mutually agreed upon by you and Transworld, and you will undertake no changes in such program or make any expenditures or incur obligations in excess of $500.00 without Transworld's prior approval.

7. Profits realized from this project shall be allocated and distributed from time to time according to the respective interests of the parties hereunder. However, sufficient funds shall be retained at all times to meet reasonably anticipated operational expenses and lease obligations. Salaries and operating expenditures will conform to good mining practise. Complete and current accounts will be maintained at all times and may be inspected by either party at all reasonable times.

8. You shall be under no personal obligation to reimburse Transworld for any funds advanced pursuant to paragraphs 2 and 4 above.

9. Transworld shall be entitled to receive 2½% of first net smelter returns until all funds advanced by it on this project have been repaid without interest. Transworld shall retain ownership of all equipment purchased for the exploration program.

10. Each party hereby indemnifies and holds harmless the other from any cost, loss or damage suffered by the other or from liability to third persons, arising from the acts of each party or his or its agents or representatives in furtherance of or in connection with the program contemplated by this agreement. For purposes of this indemnification, but without relieving either party of its total obligation hereunder, and to comply with similar indemnity provisions in any of the leases, adequate insurance coverage, in appropriate form, shall be procured forthwith.

11. This agreement may be terminated as follows:

a. By the mutual consent of the parties.

b. By Transworld at any time prior to the completion of the exploration program or any extension thereof. Upon such termination, Transworld will retain as its interest in the leases one-half the pro-rata interest computed on the basis of

4/4 to 50 = 12½ ea

$12,000 earning a 50% interest in the leases; e.g., if Transworld elects to terminate this agreement after $6,000 has been expended for exploration, then it will receive one-half of 6,000/12,000 of 50%, or 12½%, interest in the leases.

c. By Transworld, after completion of the exploration program, upon its determination that there is not enough valuable ore to reasonably insure profitable mining operations. Upon such termination, Transworld shall retain its 50% interest in the leases but all powers of management shall be exercised by you.

d. By either party upon his or its determination in good faith, made as the result of examinations and reports based upon generally accepted mining and geological methods, that further mining operations would be unprofitable. The respective interests of the parties in the leases shall be fixed as they exist at the time of termination under this provision, and the complete powers of management shall thereafter be vested in the non-terminating party.

e. As to each affected claim, by the expiration under its terms of the lease on such claim, unless such lease be renewed upon terms mutually acceptable to both parties under this agreement.

f. By either party, upon a material breach of this agreement committed by the other party, which breach remains uncorrected for thirty (30) days after written notice thereof to the party charged with the breach. For purposes of this provision, failure of Transworld to promptly comply with its obligation under paragraph 2 hereof shall constitute a material breach of this agreement and the interest of Transworld shall, if such breach is not corrected as aforesaid, be thereupon reduced as provided in paragraph 11b above. For purposes of a termination pursuant to this paragraph 11f only, the party charged with the breach of this agreement shall nevertheless be regarded as the "terminating party" and the party not in default as the "non-terminating" party, with respect to the effects of termination as hereinafter provided.

From and after termination of this agreement, the costs of meeting obligations under the leases shall be shared and paid proportionately to the respective interests of the parties as fixed at the date of such termination. If either party refuses or fails to pay his or its proper share of such costs, then the other party may pay both shares. If the non-paying party fails or refuses to reimburse the paying party within thirty (30) days after a demand for the proper contribution, then the defaulting party shall have no further interest whatever in the leases. Such defaulting party, if named as then current lessee or assignee under the leases, shall forthwith

assign or re-assign the leases to the non-defaulting party, or shall hold any such lease for the benefit of the non-defaulting party if no assignment or re-assignment can be made, and shall pay any costs, including reasonable attorneys' fees, incurred in enforcing this provision. Notwithstanding the foregoing, a non-terminating party shall be under no obligation to keep the leases in effect; subject, however, to the right of the terminating party to continue the leases in effect by meeting the terms and obligations thereof as they mature, in which event the non-terminating party shall continue to retain his or its interest in the leases as fixed at the date of termination, but without being obligated to contribute toward maintenance of the leases. The termination of this agreement shall in no event discharge any rights or obligations fixed or accrued but not paid prior to the date of termination.

Arbitration

12. Any dispute arising out of this agreement which can not be settled by negotiation shall, upon the request of either party, be submitted for settlement to three qualified arbitrators, one each to be appointed by each party and the third to be appointed jointly by the first two. A determination by any two of the arbitrators shall be conclusive and binding upon the parties hereto.

Non-assignable w/o consent

13. No interest under this agreement shall be transferred or assigned, by operation of law or otherwise, in whole or in part, without the prior written consent of the other party, which consent shall not, however, be unreasonably withheld. Subject to the foregoing restriction, this agreement shall inure to the benefit of and be binding upon the successors and assigns of Transworld and your heirs, successors, personal representatives, and assigns.

Notices

14. Notices required or permitted to be given hereunder shall be in writing and either delivered personally to you or to Robert B. Hicks of Transworld, or delivered by prepaid mail or telegraph (confirmed by letter), addressed to you at your address as given to Transworld for the purpose, or to Transworld at 417 South Hill Street, Los Angeles 13, California, Attention: Robert B. Hicks, as may be appropriate.

* * * * * *

If the foregoing is in accordance with your understanding of our agreement and is acceptable to you, please indicate your confirmation and acceptance by dating and signing as indicated below, and return a copy of this letter so dated and signed to us, after which it will constitute a binding agreement between us.

Very truly yours,

TRANSWORLD RESOURCES CORPORATION

By _____

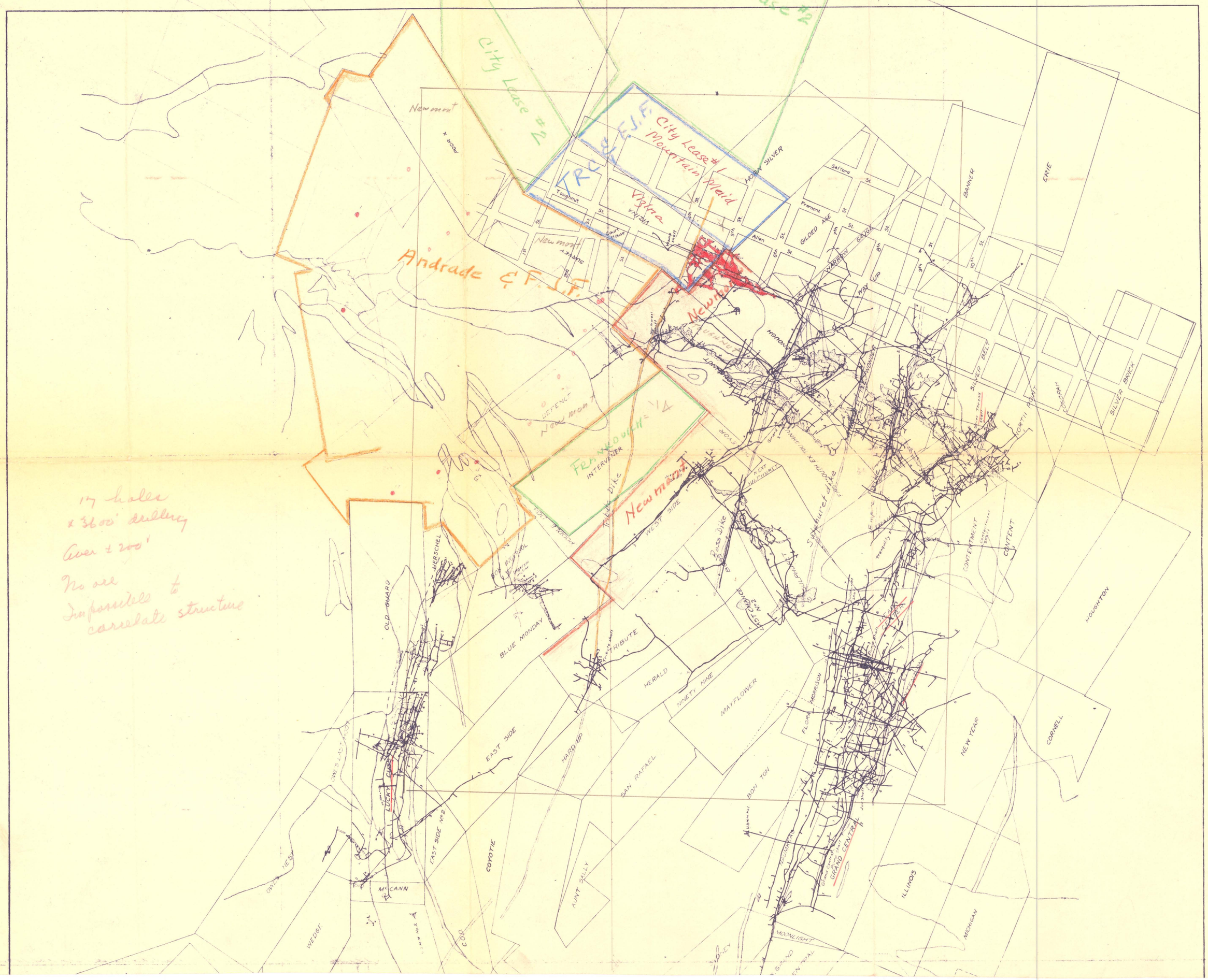
Its _____ (Title)

I hereby confirm and accept the agreement set forth in the foregoing letter this _____day of _____, 1959, at _____.

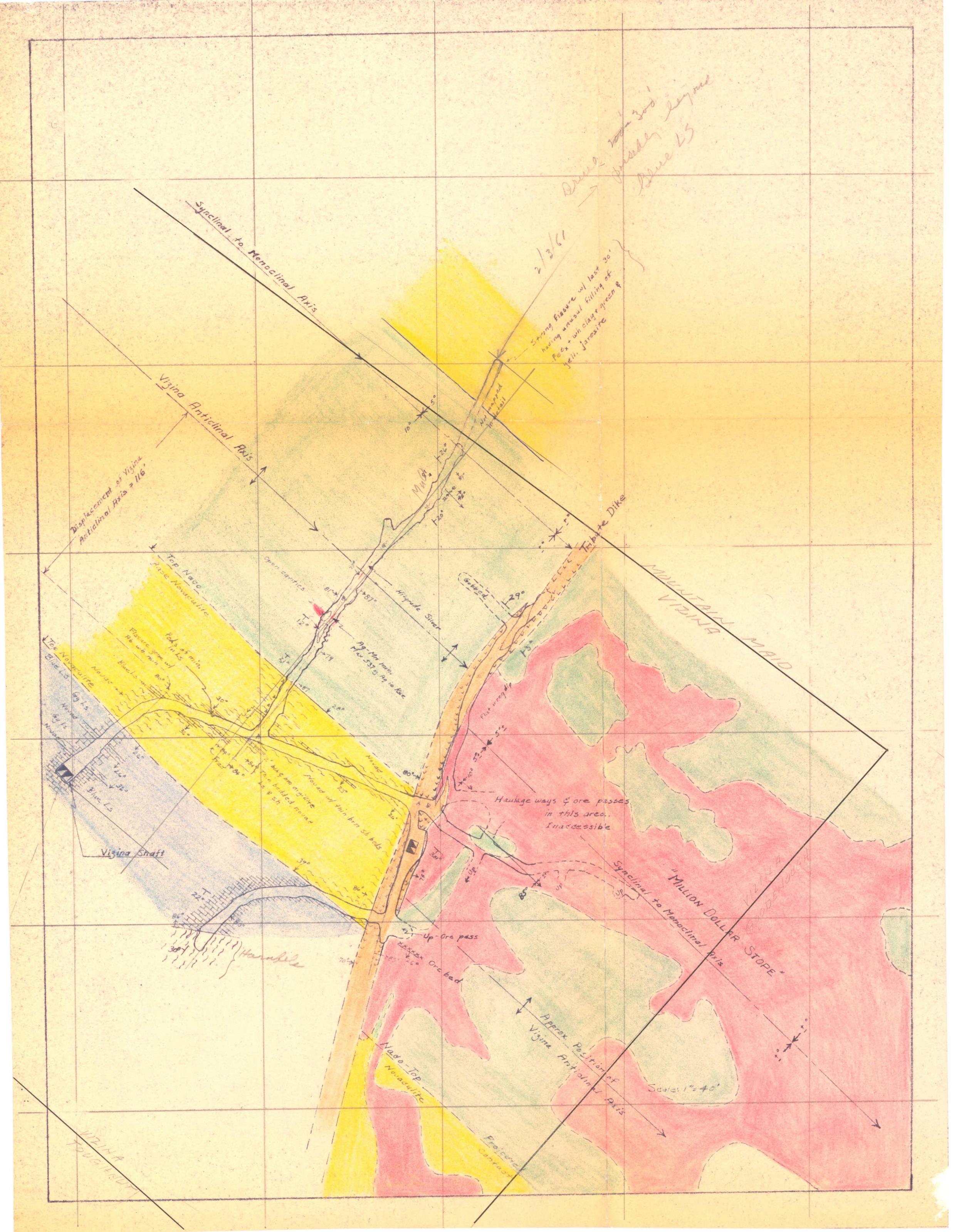
_____
Frank J. Frankovich

Signed by me about Oct. 1959

F. Frankovich



sparent paper over Plate IV). Mine levels are indicated by numerals and stoped areas by dots.


Synclinal to Monoclinal Axis
Vigina Anticlinal Axis
Displacement of Vigina Anticlinal Axis = 116'
Drilled from 300' crosscut, Report Bruce 23
2/3/61
Strong fissure w/ last 30' having unusual filling of FeOx + wh clay + green & yell. jarosite
Not mapped in detail
Tributte Dike
MOUNTAIN MAID
VIGINA
Top Naco
Rise Novaculite
Open cavities
Hi-grade Silver
Ag-Mn min. Max 537 oz Ag to Rec
Gobbed
Top Novaculite
Blue Ls.
Gy Ls.
Novac
Blue Ls
Vigina Shaft
Novac
Novac w/ thin brn sh beds
Thin bedded Novac Ls & Sh
Flat irreg dip
Haulage ways & ore passes in this area. Inaccessible
Up-Ore pass
Ore bed
Hanable
"MILLION DOLLAR STOPE"
Synclinal to Monoclinal Axis
VIGINA GOODENOUGH
Approx. Position of Vigina Anticlinal Axis
Scale: 1" = 40'
Nado-Top Novaculite
Proterozoic Cambrian
VIGINA FOUGTEUM