



## **CONTACT INFORMATION**

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ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: SILVER BELL MINE

ALTERNATE NAMES:

EL TIRO OPEN PIT  
ASARCO SILVER BELL  
OXIDE OPEN PIT

PIMA COUNTY MILS NUMBER: 272

LOCATION: TOWNSHIP 12 S RANGE 8 E SECTION 11 QUARTER C  
LATITUDE: N 32DEG 23MIN 37SEC LONGITUDE: W 111DEG 30MIN 03SEC  
TOPO MAP NAME: VACA HILLS - 15 MIN

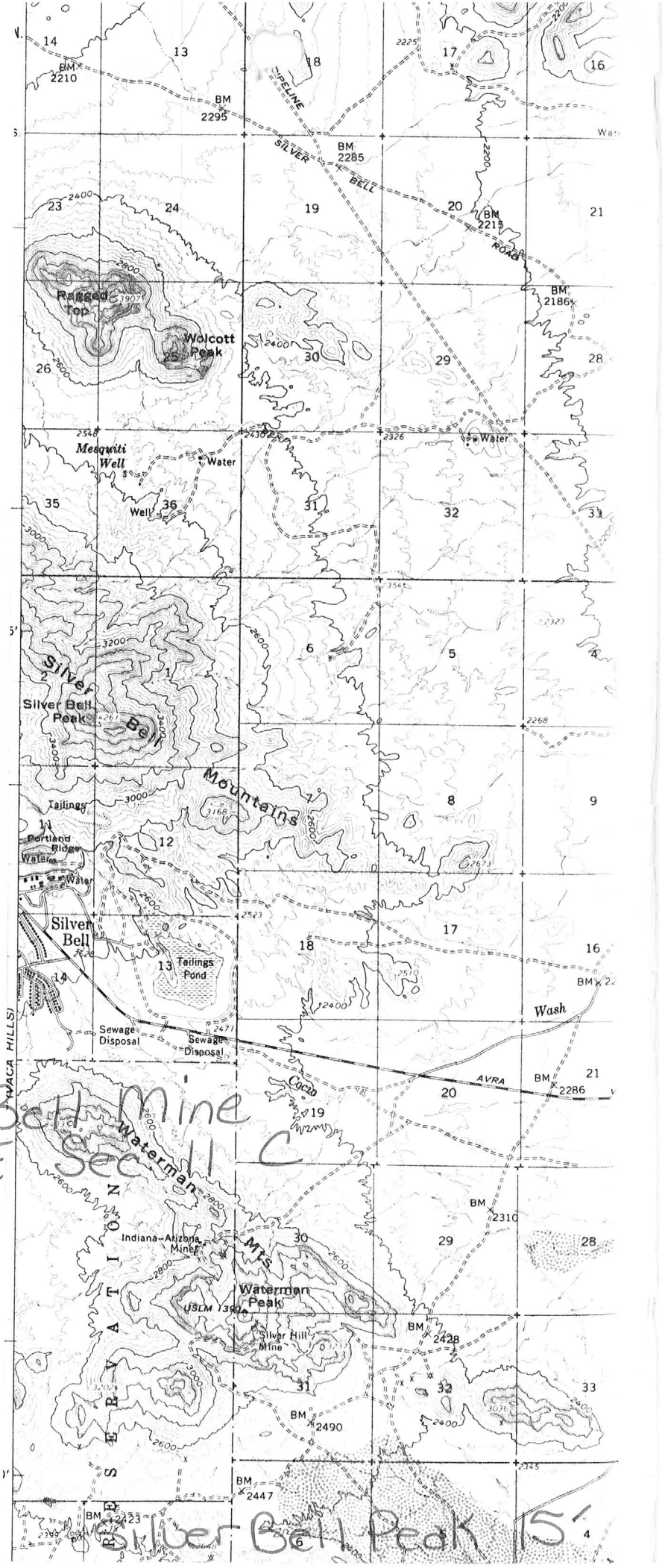
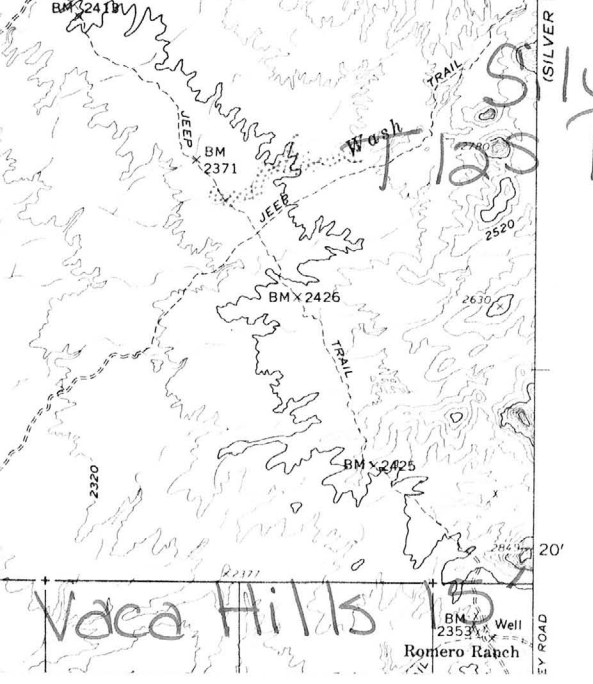
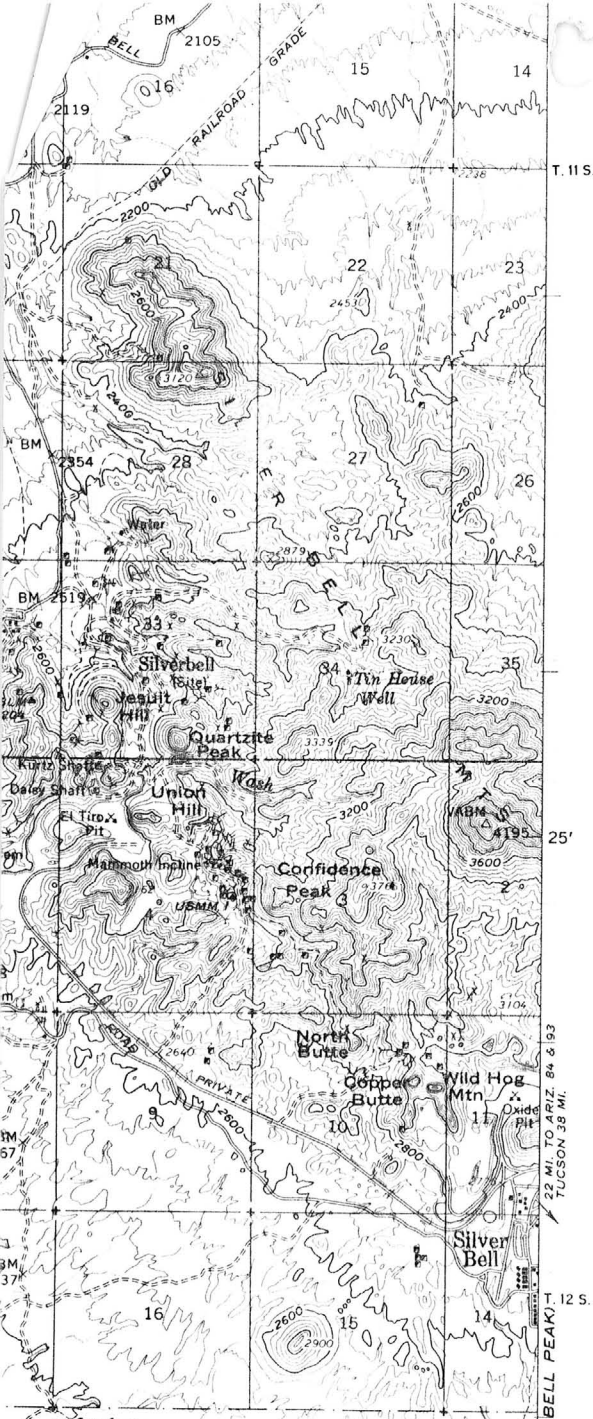
CURRENT STATUS: PRODUCER

COMMODITY:

COPPER SULFIDE  
COPPER OXIDE  
MOLYBDENUM  
SILVER

BIBLIOGRAPHY:

ADMMR SILVER BELL MINE FILE  
E/MJ V. 155, N. 7, P 72-79  
MINING WORLD, APRIL 1958, P. 40-45  
SKILLINGS, JULY 25, 1970, P. 3-5  
E/MJ DEC. 1957, P. 166  
USBM IC 8341, 1968, P. 10-11, 19-23  
WORLD MINING, SEPT. 1977, P. 174  
USBM IC 8153, 1963, 72 PP.  
AIME TRANS. 1954, P 1095-1099, RICHARD, K.E &  
COURTRIGHT, J.H., GEOL. PROPHYRY DEPTS.  
1966, P 157-163  
AIME MEETING MAY 20, 1968, 11 PP. WATSON, B.N.  
ADMMR "U" FILE CU 65  
ASARCO S.E.C. FORM 10-K, 1977  
ASARCO S.E.C. FORM 10-K REPORT DEC. 31, 1976  
P. A3-A5  
KRUPP, LUTHER M., 1956, ASPHALT MIXED SURFACE  
MAT FOR HEAVY-DUTY ORE HAULAGE ROAD AT  
SILVER BELL MINING PROPERTIES OF ASARCO,  
AIME AZ OPEN PIT DIVISION MEETING, GEO. FILE



Silver But Dam  
Pima County

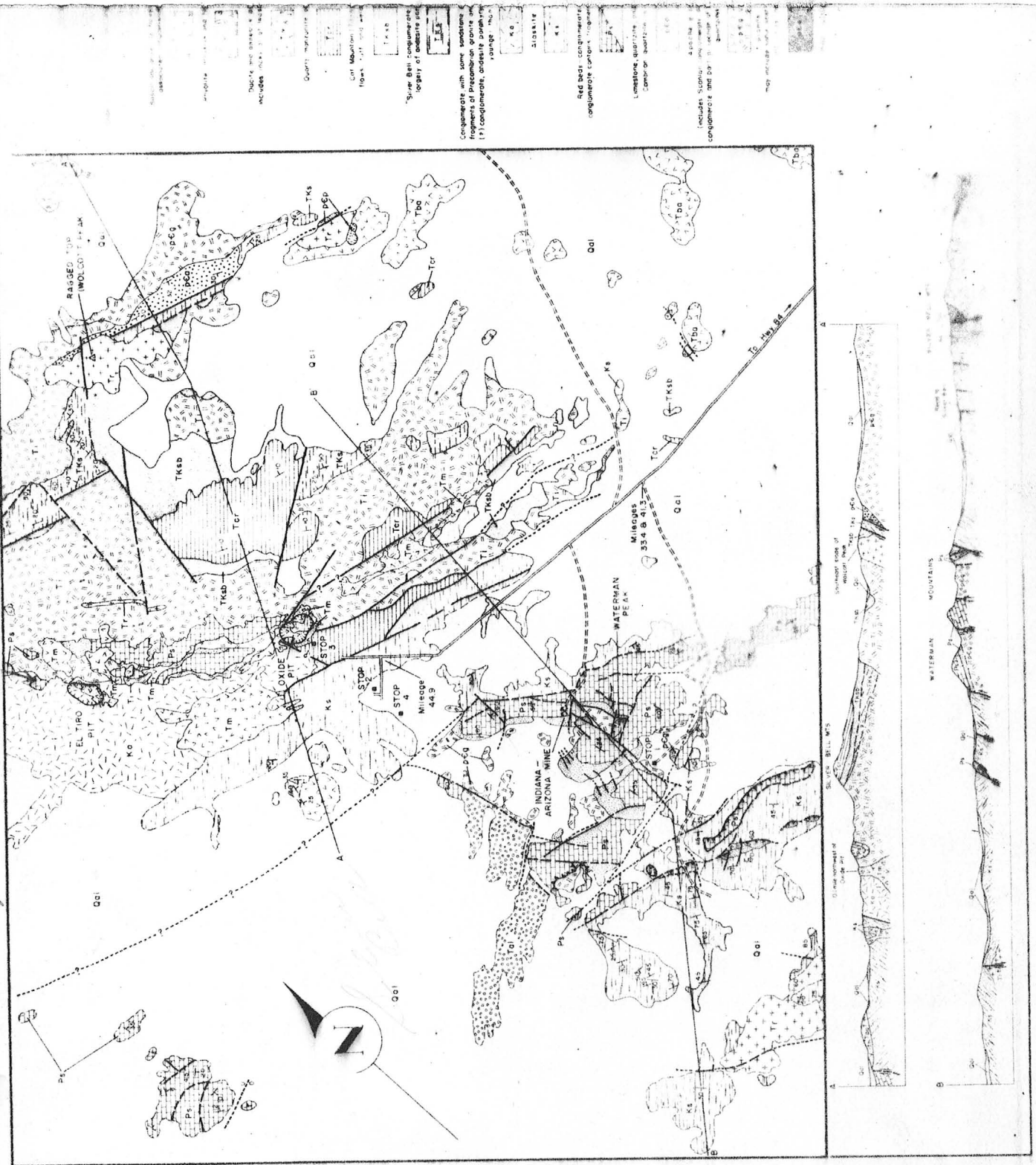
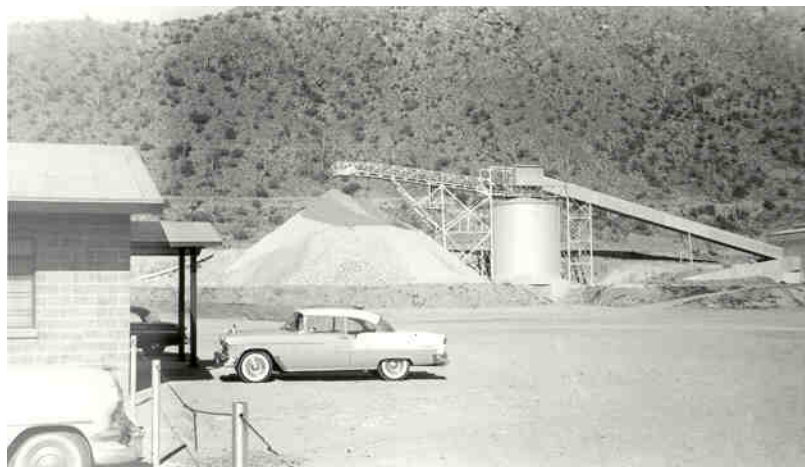


FIGURE 45. Generalized geologic map and diagram of Silver But Dam area, Pima County, Arizona. See also Figure 44.

Geology & the Deposits of Silver But Dam  
P. 240 AIME Vol XLIII (1912) 212















SILVER BELL MINE

PIMA COUNTY

E&MJ Jan. 1963 p. 74

E&MJ Vol 77 p. 639

" February, 1975, p. 117 (cut back prod.)

Mining World July 1963 p. 38

MAPS - Upstairs in the flat storage area - Third drawer

AIME Volume 43

AIME paper 5-20-68 (geology file)

Abstracts From Symposium on Arizona Geology p. 7  
(geology file)

World Mining May 1966 p. 36

Skilling's Mining Review July 30, 1966 p. 12

Skilling's Mining Review Sept. 23, 1972, p. 25

ABM Bull. 180, p. 122, 133, 137, 139, 142, 144, 236, 331

Mining Engineering 4/73, p. 36; February, 1975, p. 20 (prod. cutback)

Mining Annual Review, November, 1973, p. 15

Skilling's Mining Review, March 9, 1974, p. 23

" " " June 15, 1974, p. 8

" " " December 28, 1974, p. 12 (reducing copper output)

" " " March 1, 1975, p. 4 (cutbacks)

Mining Annual Review 1974, p. 295

Metals Week, March 3, 1975, p. 3 (prod. cutbacks)

Mining Congress Journal, January, 1975, p. 10 (cutback)

MAP - Upstairs in the ABM rolled file boxes under Thomas Lode Claim - showing  
adjacent claims, surface and mining symbols

BANKS, N. G. et al, Radiometric Ages of Some Cretaceous and Tertiary Volcanic  
and Intrusive Rocks in South-Central Arizona - 1978, Geology File

Economic Geology, Volume 78, June-July 1983, Number 4, "Remote Sensing for Porphyry  
Copper Deposits in Southern Arizona" by Michael J. Abrams, David Brown, Larry Lepley,  
and Ray Sadowski, Pg. 591

IC 8341

ABM Bull. 125 p. 74

ABM Bull. 129 p. 68

ABM RI #7331

Arizona Mining Journal Issues of  
June 1919 p. 77 Aug. 1919 p. 21  
Jan 1920 p. 41 March 1920 p. 24  
April 1920 p. 61 May 1920 p. 52  
July 1920 p. 21; June, 1918, p. 36;

California Mining Journal, February,  
1975, p. 21 (cutback prod.)

Mining Journal, January 24, 1975, p. 57  
(output reduction)

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

INFORMATION FROM MINE CARDS IN MUSEUM

MILS # 272		CARD 1	
PIMA COUNTY			
SILVER BELL MINE			
2726	chalcopryite	2741	malachite
2727	chalchotrichite	22742	chrysocolla, tenorite
2728	molybdenite	2743	"
2729	pyrite/pyrite	2744	"
2730	chrysocolla, barite	2745	sepiolite
2731	chrysocolla malachite	2746	azurite, malachite
2732	galena	2747	hemimorphite, chrysocolla
2733	malachite	2748	conichalcite, tenorite, aragonite
2734	libethenite	2748	calcite, malachite, tenorite
2735	copper	2750	brochantite
2736	torbernite	2751	galena
2737	smithsonite	2752	allophane, chrysocolla
2738	smithsonite	2752	tenorite ; quartz
2739	cuprite	2753	brochantite
2740	chrysocolla	2754	galena, pyrite
		2755	calcite, chrysocolla, tenorite
		2756	chrysocolla
		2757	"
		2758	hematite
		MM 959	Libethenite on Halloysite

CARD #1

ARIZONA		CARD 2	
PIMA COUNTY			
Town of Silver Bell			
Silver Bell Mine			
MILS # 272			
		MM-5902	Azurite
		MM-5908	Azurite and Malachite
		MM-5909	Malachite
		8528	Sphalerite
		8529	Sphalerite
		958	Lebethaenite; halloysite
		7276	Sphalerite
		1527	Lead ore
		3135	Chrysocolla
		9414	Dry-bone Ore
		L 716	Turquoise

CARD #2

SILVER BELL MINE

PIMA COUNTY

Geology Report - Geoexplorers International, Inc Vol 1

MILS #272

This property believed to include the Mammoth Mine (card) aka: Old Boot



**Arizona Copper Reserves and Resources**  
Compiled by the Arizona Dept. Mines and Mineral Resources

Printed: 06/17/2002  
Last Updated: 06/17/2002

**SILVER BELL**

Alternate name(s):

Company:

Silver Bell LLC.  
2575 E. Camelback Road, Suite 500  
Phoenix, AZ 85016-4240  
602-977-6500  
www.asarco.com

Location:

Township 12 S      Range 8 E      Sec.      11  
Latitude/Longitude:    32.39    111.50  
40 miles NW of Tucson, Pima Co.

Mineralization type and reserve/resource:

Type	Tons (millions)	Grade (%)		
Acid Soluble	146	0.39	ASCu	(a)
Acid Soluble	66	0.41	ASCu	(b)

Reserve information and sources:

(a) Includes El Tiro, Oxide, West Oxide and North Silver Bell deposits.  
(b) Reserves of North Silver Bell deposit only. 1.18:1 life of mine strip.  
SME Preprint 02-069, Brown, Q. and Miller M.

Comments:

July 97 new SX-EW plant begins operation. Silver Bell LLC is owned 75% by Asarco and 25% by Mitsui and Co. Ltd.  
(a) Reserves using a 0.15% cutoff

03/07/94

ARIZONA COPPER RESERVES

COMPILED BY

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

PROPERTY:

SILVER BELL

OPERATOR\OWNER:

Asarco Inc.  
180 Maiden Lane  
New York, NY 10038  
212-510-2000

LOCATION INFORMATION:

TOWNSHIP 12 S RANGE 8 E SECTION 11  
COUNTY - Pima AZMILS - 272  
DESCRIPTION - 40 miles NW of Tucson, Pima Co.

ORE TYPE AND RESERVE INFORMATION:

Sulfide - 101 MILLION TONS AT 0.47% Cu

SOURCES:

Asarco Annual Report 1992 p. 7.

COMMENTS:

No mining at this time but leaching of dumps continues 6/92.

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1992

*Silver Bell Mine file  
Pima*

**ASARCO INCORPORATED**

**Tucson Office**

1150 N. 7th Avenue, P.O. Box 5747, Tucson, AZ 85703 - Phone 792-3010.

**Southwestern Mining Department**

General Manager T. E. Scartaccini

Assistant to General Manager D. F. Skidmore

Accounting Manager G. H. Myers

Chief Environmental Engineer P. J. Maley

**Mining Department/Corporate Office**

Assistant to Vice President A. D. Coumides

Chief Geologist S. A. Anzalone

**Mineral Beneficiation Department**

Director D. E. Crowell

Chief Metallurgist T. D. Henderson

**Exploration Department**

Manager, Western U.S.A W. L. Kurtz

Manager, Southwestern US Division J. D. Sell

**Acid Sales Department**

National Sales Manager G. P. Gillen

**Governmental Affairs**

Manager, State Legislative Affairs R. E. Quick

**Safety Department**

Director of Safety - Mining B. G. Brumbaugh

Director of Safety - Smelting R. Maxwell

**Silver Bell T12S R8E Sec.11**

Marana, AZ 85653 - Phone 622-6751 - Employees: 19 - Open-pit copper mine - 11,000 TPD concentrator - On standby - Dump leach & precipitation plant operating.

Mill Manager D. J. Duncan

Accounting Manager A. J. Robles

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1991

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Maintenance Superintendent ..... D.J. Shea

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Manager, Southwestern US Division ..... J.D. Sell

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**Silver Bell**

T12S R8E Sec.11

Marana 85653 - Phone 622-6751 - Employees 20 - Open-pit copper mine -  
11,000 TPD concentrator (On Standby) - Dump leach & precipitation plant  
operating.

Mill Superintendent ..... D.J. Duncan  
Maintenance Superintendent ..... D.J. Shea  
Chief Accountant ..... A.J. Robles

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1988

**ASARCO INCORPORATED**

**Tucson Office**

1150 N. 7th Avenue, P.O. Box 5747, Tucson 85703 - Phone 792-3010.

**Southwestern Mining Department**

General Manager ..... T.E. Scartaccini  
Assistant to General Manager ..... D.F. Skidmore  
Accounting Manager ..... G.H. Myers  
Chief Environmental Engineer ..... V.C. Martz

**Mining Department/Corporate Office**

Assistant to Vice President ..... A.D. Coumides  
Chief Geologist ..... S.A. Anzalone

**Mineral Beneficiation Department**

Director ..... D.E. Crowell  
Chief Metallurgist ..... T.D. Henderson

**Exploration Department**

Manager, Western U.S.A. .... W.L. Kurtz  
Manager, Southwestern US Division ..... J.D. Sell

**Acid Sales Department**

National Sales Manager ..... G.P. Gillen

**Silver Bell Unit**

T12S R8E Sec.11

Marana 85653 - Phone 622-6751 - Employees 20 - Open pit copper mine -  
11,000 TPD concentrator (On Standby) - Dump leach & precipitation plant  
operating.

Mill Superintendent ..... D.J. Duncan  
Maintenance Superintendent ..... D.J. Shea  
Chief Accountant ..... A.J. Robles

SILVER BELL

PIMA COUNTY

RRB WR 6/24/88: Visited the Silverbell Unit of ASARCO to gather information for Copper Report. Discussed operation with D. J. Duncan, Supt and toured property with Eldon Vickers, Maint. Supt. Cement copper being shipped to Kocide in Casa Grande.

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SILVER BEEL MINE

PIMA COUNTY

MG WR 1/1/81: Visited the Silver Bell mine with Cliff Hicks. Delivered publications. Bruce Malone, the mine manager, said he expects the shutdown to last for a long time. Although no oxide ore is being mined, leaching operations will continue. The cement copper operation normally accounts for 16% of the total copper produced at Silver Bell. Only six men are required.

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MG WR 12/17/82: Prior to 1952, ASARCO leased its Silver Bell Mine (Pima County) to Mr. Sherwood B. Owens. Mr. Owens mined silver-bearing lime flux from this property and shipped it to the smelter owned by ASARCO in Hayden, Arizona.

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MG WR 1/7/83: Delivered a copy of the 1981 copper report to Mr. Bruce Malone, Manager-Silver Bell Unit, ASARCO. Toured the copper precipitation plant. Four hourly workers operate the cement copper plant at the Silver Bell Mine, Pima County. Several dumps are leached and copper-bearing solutions are piped and blended in one natural rock reservoir. From this reservoir the pregnant solution is piped to eight concrete cells containing shredded tin cans. After the copper-iron sludge is washed out of the cells, the sludge is spread on the ground to dry by a crane equipped with a small bucket similar to a drag line. Production has been as much as 1,000,000 pounds of contained copper per month. A contractor hauls the cement copper to the ASARCO smelter at Hayden.

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NJN WR 10/11/85: Asarco's Silver Bell (f) mine reported they have a new mailing address: Silver Bell Unit, Marana 85653.

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NJN WR 4/24/87: Graham Sutton (card) reports the mines Kurtz and Daisy, shown on the Silverbell 15' quad between the El Tiro pit (Silver Bell - file) boundary west to just shy of the Atlas are now consumed in Asarco's Silver Bell pit (file), Pima County.

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KAP WR 10/16/87: While attempting to reach the Atlas Mine from the south, passed through what had been the community of Silver Bell adjacent to the Silver Bell Mine (file) Pima county. The town has been completely razed. The Silver Bell Mine and Silver Bell Mill are adle but appear to be maintained. Enough vehicles were parked in the employee parking lot to indicate at least a maintenance level of employees.

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ASARCO  
(SILVER BELL Unit)

Pima County

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MG WR 5/30/80: Drove to Silver Bell and delivered publications to Bruce Malone, Manager of the Silver Bell Unit of ASARCO, Inc. Met Don Shea, Mechanical Superintendent and arranged for him to assume duties as Beverage Host Chairman of the Tucson Section, AIME.

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SILVER BELL MINE

PIMA COUNTY

The Asarco Silver Bell mine continues production at the usual rate. A new pipeline and storage surge tank have been installed. The line runs from the well field in the Avra Valley to the mill with the tank being located near the Air Force missile site. GWI QR 3-1969

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Active Mine List April 1969 - 377 men - D. R. Jameson, Supt.

Silver Bell mine of Asarco production continuing as usual. GWI QR 9-1969

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Active Mine List Oct. 1969 - 376 men - D. R. Jameson, Supt.

Active Mine List May 1970 - 376 men - " " "

Silver Bell - Asarco - continued as usual. GWI QR 6-30-70

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Active Mine List Oct. 1970 - 385 men - D. R. Jameson, Supt.

One company is reported to be drilling near Silver Bell. GWI QR 12-31-70

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Mine production at Silver-Bell continues as per usual. GWI QR 6-30-71

---

Dir. of Mining - Silver Bell Unit - August 1971 - 385 men.

AMAX and ASARCO have been doing some exploration work near and at Silver Bell. GWI QR 9/71

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Silver-Bell at near capacity. GWI QR 9/71

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The Silver-Bell mine continued producing. GWI Oct-Dec '71

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Silver-Bell continues as usual. GWI QR Jan.-March '72

---

Silver Bell continues production as usual. GWI 4 ¼ '72

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Active Mine List 1972 (1971 figures 3,796,000 T Ore, 9,978,300 T Waste, 23,100 T Cu) Empl. 385

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AWB WR 7/26/80: Wayne A. Thompson of Southwest Minerals Associates, 1723 E. Winter Drive, Phoenix, Arizona 85020, phone 944-6567, reported Southwest is currently working the Silver Bell.

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SILVER BELL MINE

PIMA COUNTY

Silver Bell Mine of AS&R - Production and staff the same as last report. They are contemplating the purchase of a new shovel larger than the one in current use.  
GWI WR 6-19-65

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Active Mine List Nov. 1967 - 320 men

Mine visit to Asarco - Silver Bell, Don Jameson, Supt. Stacking concentrates.  
GWI WR 1-27-68

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Active Mine List April 1968 - 320 men

Active Mine List Oct. 1968 - 365 men

SILVER BELL

PIMA COUNTY

This property active Oct. 1961 and Feb. 1962

American Smelting and Refining Co., Tucson, Arizona, has announced plans for a new molybdenum recovery plant at its Silver Bell mine, 40 miles northwest of Tucson, estimated cost of the plant is \$400,000. The Silver Bell mine has been among the state's major copper producers since full-scale production was started May 1, 1954, at a rate of approximately 7,500 tons of ore daily. The new plant is being erected under contract by Western Knapp Construction Co.

Taken from Mining World - April 1962 - p. 39

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This property active Oct. 1962 - 262 men working  
Active Oct. 1963



SILVER BELL (F), PIMA CO.

HMC  
Rb

## ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Fife Symington, Governor

Russell F. Rhoades, Director

### **NOTICE OF THE PRELIMINARY DECISION TO ISSUE A PERMIT TRANSFER OF AN INDIVIDUAL AQUIFER PROTECTION PERMIT**

Pursuant to Arizona Administrative Code, Title 18, Chapter 9, Article 1, the Director of the Arizona Department of Environmental Quality (Department) intends to transfer the individual Aquifer Protection Program (APP) permit issued to the following applicant:

Public Notice No. 20-96AZAP

On or about May 1, 1996

Silver Bell Copper Leaching (SX-EW) Project  
ASARCO Incorporated  
P.O. Box 5747  
1150 North 7th Avenue  
Tucson, Arizona 85703-0747

Aquifer Protection Permit No. P-100510

Responsibilities for APP permit number P-100510 will be transferred to the following:

Silver Bell Mining, L.L.C.  
ASARCO Incorporated  
P.O. Box 5747  
1150 North 7th Avenue  
Tucson, Arizona 85703-0747

Aquifer Protection Permit No. P-100510

On February 5, 1996, all ASARCO Silver Bell Copper Leaching Project assets, except the metallurgical processing structures, were transferred to a new company named the Silver Bell Mining, L.L.C. ASARCO continues to own 75% of the project and remains the project operator.

The ASARCO Silver Bell Copper Leaching Project site is located approximately 17 miles west of Marana, Arizona in Pima County, Arizona, over groundwater of the Tucson A.M.A. Basin and the Pinal A.M.A. Basin in Township 11S, Range 08E, Sections 32,33, and 34, and in Township 12S, Range 08E, Sections 3,4,5,10,11, and

12, Gila and Salt River Base Line and Meridian. Latitude 32° 22' 56.0" North and Longitude 111° 27' 43.0" West.

The current permit authorizes ASARCO, Inc., to operate a hydrometallurgical base metal leaching facility. This is composed of two (2) leach dumps, four (4) in-situ (rubble) leach areas, four (4) PLS ponds, three (3) raffinate ponds, and solution ditches.

The permit and related materials are available for public review Monday through Friday 8:00 a.m. to 5:00 p.m. at the Arizona Department of Environmental Quality, 3033 North Central Avenue, 4th Floor, Phoenix, Arizona 85012.

Persons may submit comments or request a public hearing on the proposed action, in writing, to Jeff Bryan, Arizona Department of Environmental Quality, 3033 North Central Avenue, Phoenix, Arizona 85012 within thirty (30) days from the date of this notice. Public hearing request must include the reason for such request.



ASARCO

Silver Bell Mine file

March 1979

KGA

PROGRAM FOR  
AIME SILVER BELL TRIP

8-9:00 a.m. Registration

9-9:15 S. A. Anzalone I. Introduction  
II. Historical Review of Silver Bell District

9:15-10:00 F. T. Graybeal I. District Geology  
II. Geology of El Tiro Area

10:00-10:30 C. A. Dilbert I. Oxide Pit Geology  
II. Mining Equipment and Procedures

10:30-11:00 S. R. Davis Geology of North Silver Bell Area

11:00-11:30 S. R. Holsinger Computer Controlled Grinding Circuit at Silver Bell  
Effect of Rock Type on Automated Grinding Circuits

11:30-11:45 S. A. Anzalone Test of Induced Polarization Techniques as a Method to Delineate Ore Trends Within Skarn Zones in the El Tiro East Extension No. 2

12:00-1:00 Lunch

1:00-2:00 Travel to Silver Bell

2:00-2:45 Oxide Pit ①

2:45-3:30 El Tiro pit hypogene zoning - breccia ②

3:30-4:00 El Tiro pit skarns ⑤

4:00-4:30 Daisy area capping ③

4:30-5:30 Return to Tucson

5:30-6:30 Open

6:30-7:30 Cocktails at Hilton Inn

7:30 p.m. Dinner at Hilton Inn

RECEIVED

MAY 23 1979

DEPT. MINERAL RESOURCES  
PHOENIX, ARIZONA

B44

ASARCO Incorporated  
Silver Bell Unit  
Silver Bell, Arizona

March 1979

LOCATION: Silver Bell, Arizona, 40 miles northwest of Tucson, Arizona

PLANT: 2 Pits - Known as Oxide and El Tiro - Approximately 2½ airline miles apart or 3½ miles by haul road.

Crushing Plant - 600 Tons per hour capacity - Ore crushed from maximum size of 48 inches to ½ inch for mill feed.

Mill - 11,400 Tons per day capacity or 4,000,000 Tons/Year.  
Concentrate shipped to Hayden for smelting.

HOUSING: 175 two and three bedroom houses - 24 two and three bedroom apartments. One trailer court for private trailers.

300 Employees, living in Silver Bell, Avra Valley and Tucson.

Recreation Facilities:

Recreation Hall  
Swimming Pool  
Ball Park

Other Facilities:

Post Office  
Grocery Store  
Barber Shop

WATER: Wells drilled on ASARCO land in Avra Valley. 18 inch pipe line from wells to mill - 8 miles. Static Head 950 feet from water level to receiving tank. Estimated present consumption 2000 gals/min.

POWER: Electrical power purchased from The Tucson Gas & Electric Company.  
Consumption: Six million kilowatt hours per month.

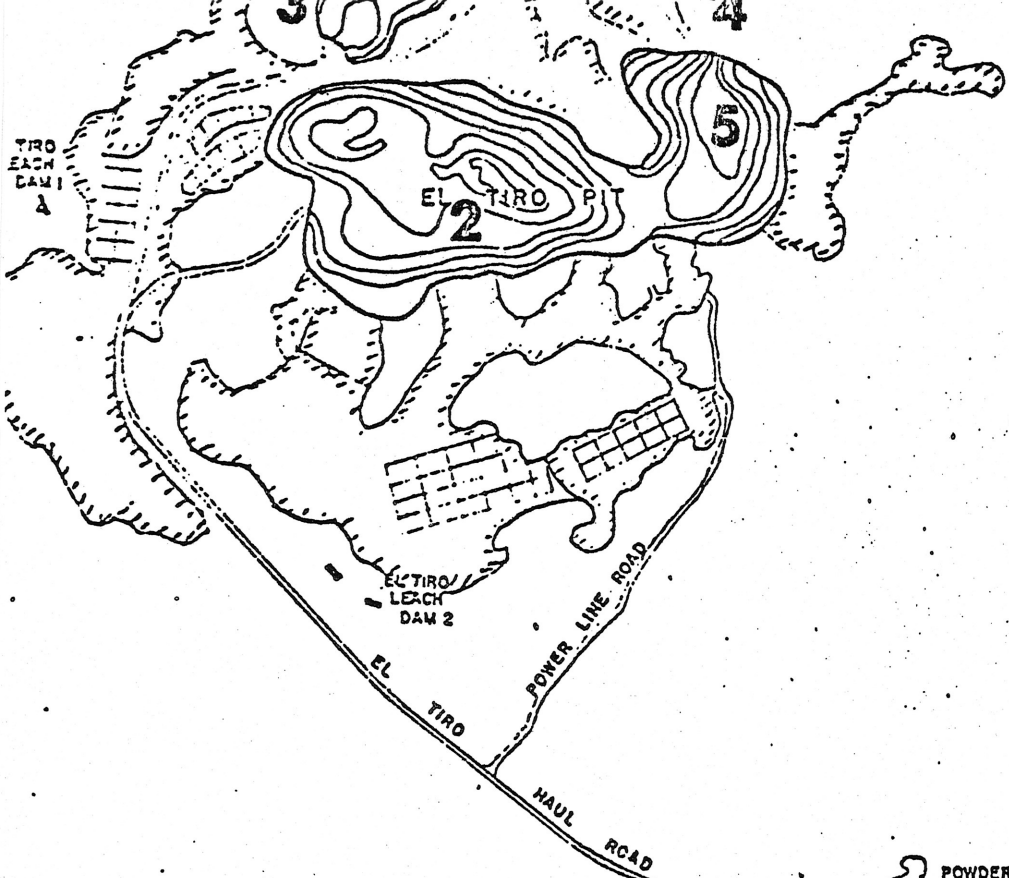
MINE PRODUCTION TO JANUARY 1, 1979

<u>Oxide Pit:</u>	38,042,000 Tons Ore
	20,160,000 Tons Leach
	38,218,000 Tons Waste
	<u>96,420,000 TOTAL TONS</u>

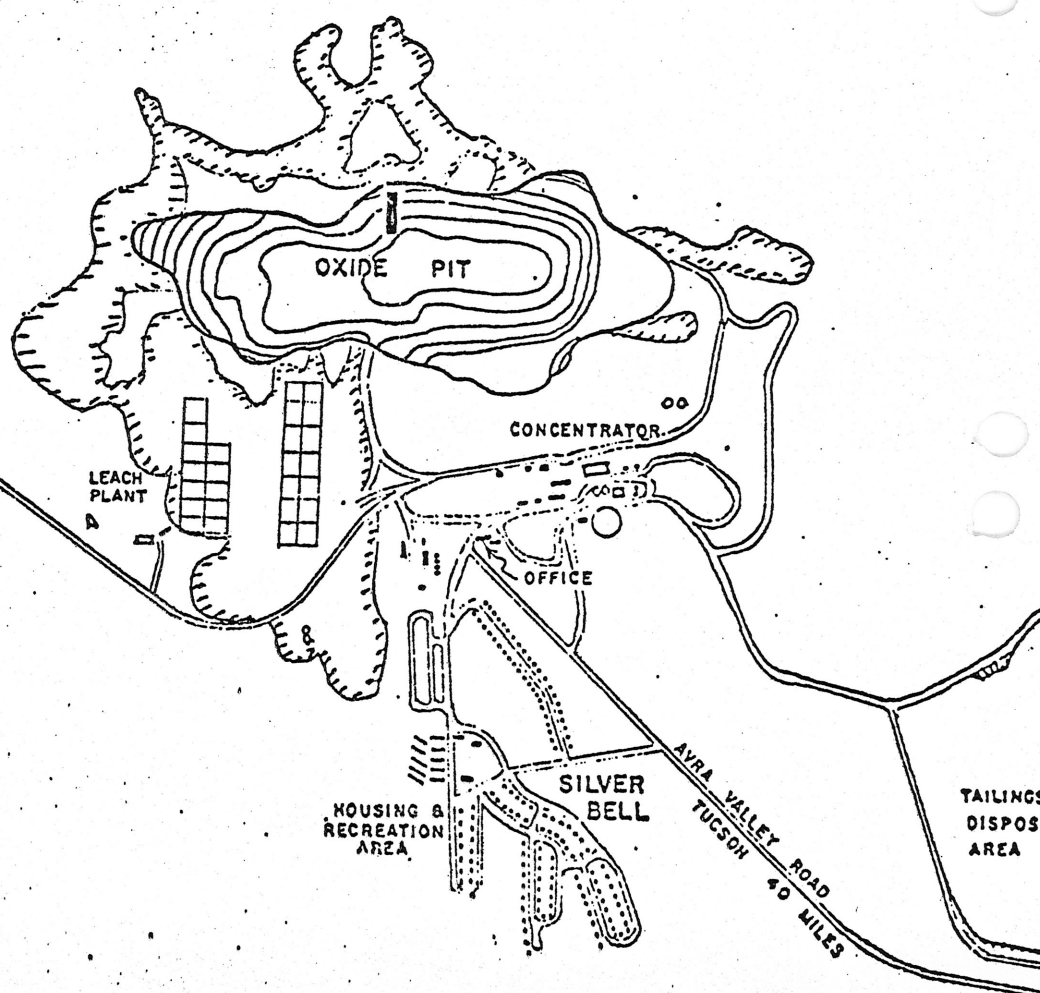
<u>El Tiro Pit:</u>	41,148,000 Tons Ore
	38,059,000 Tons Leach
	89,288,000 Tons Waste
	<u>169,765,000 TOTAL TONS</u>

266,185,000 Total Tons moved to date.

<u>PRODUCT PRODUCED:</u>	Copper Concentrates	64,000 Tons/Year
	Cement Copper	5,600 Tons/Year



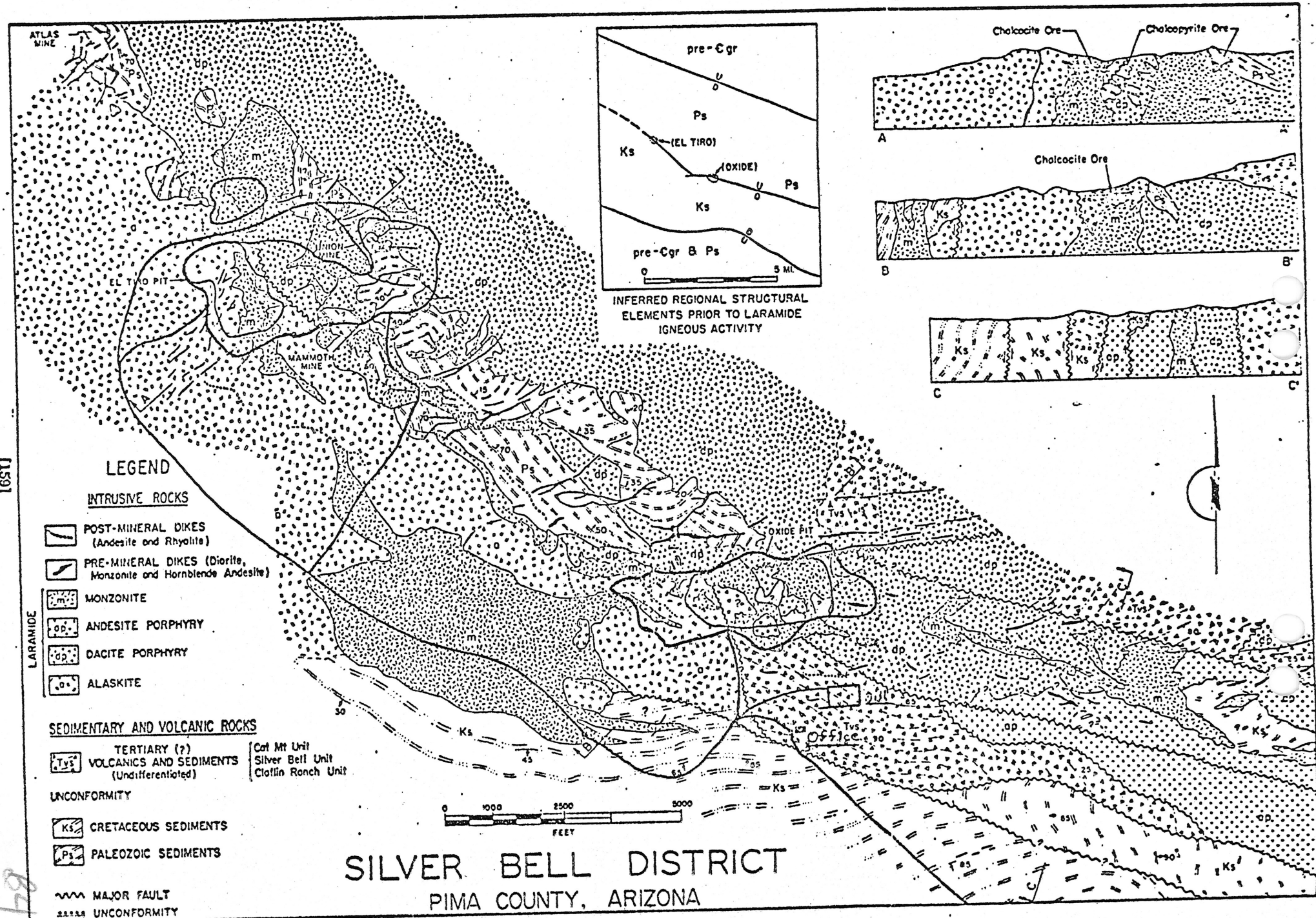
POWDER  
MAGAZINE



ASARCO INC.  
SILVER BELL UNIT  
SCALE 1" = 2000'

BFD  
(-1-76

[159]

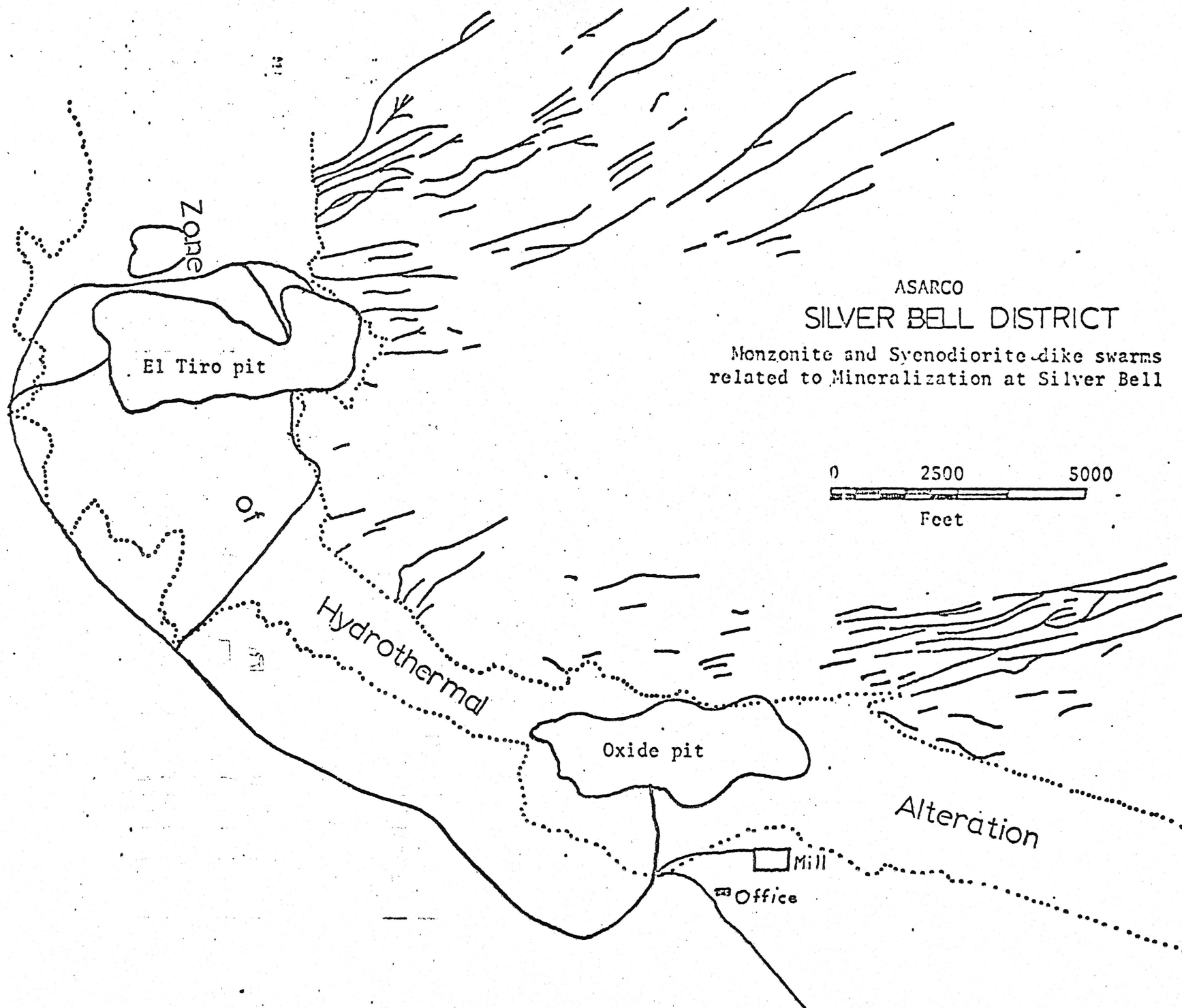


# SILVER BELL DISTRICT PIMA COUNTY, ARIZONA

FIGURE 2.

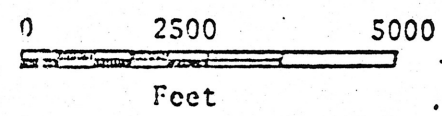






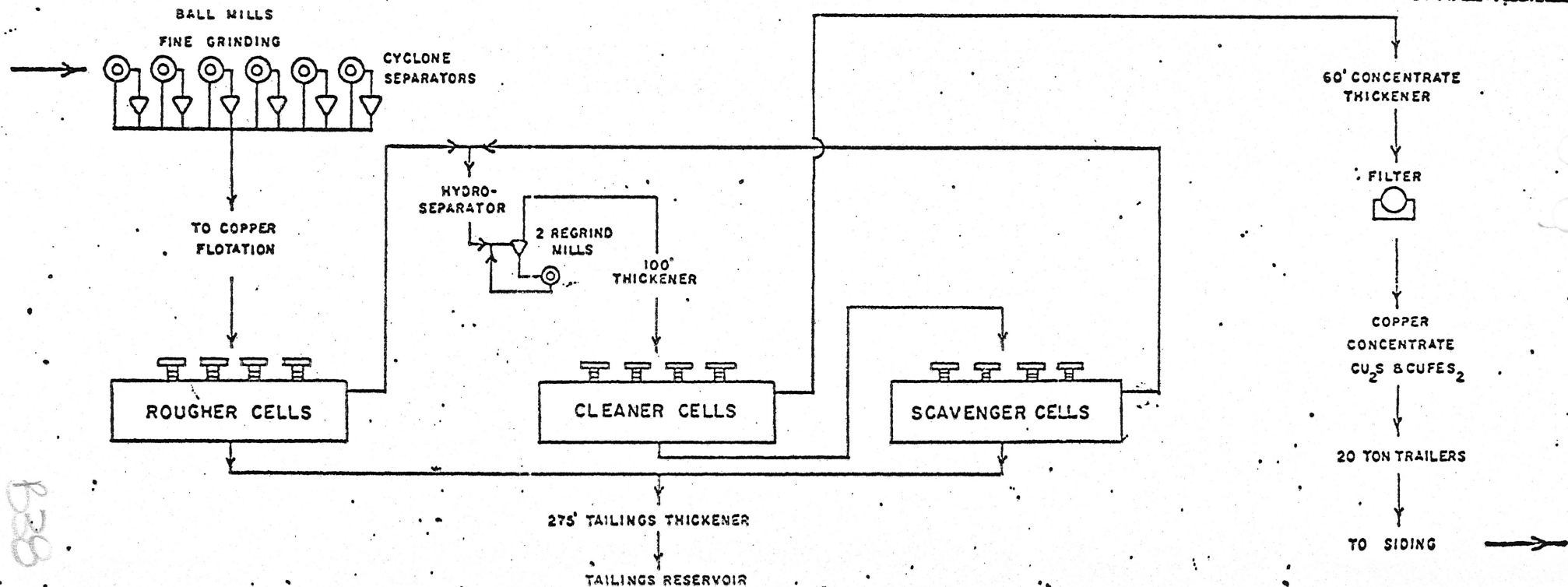
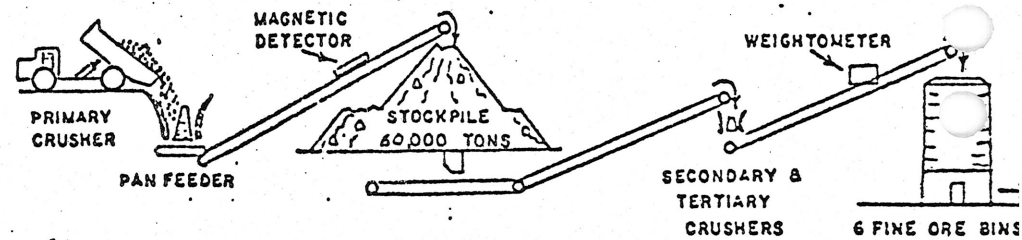
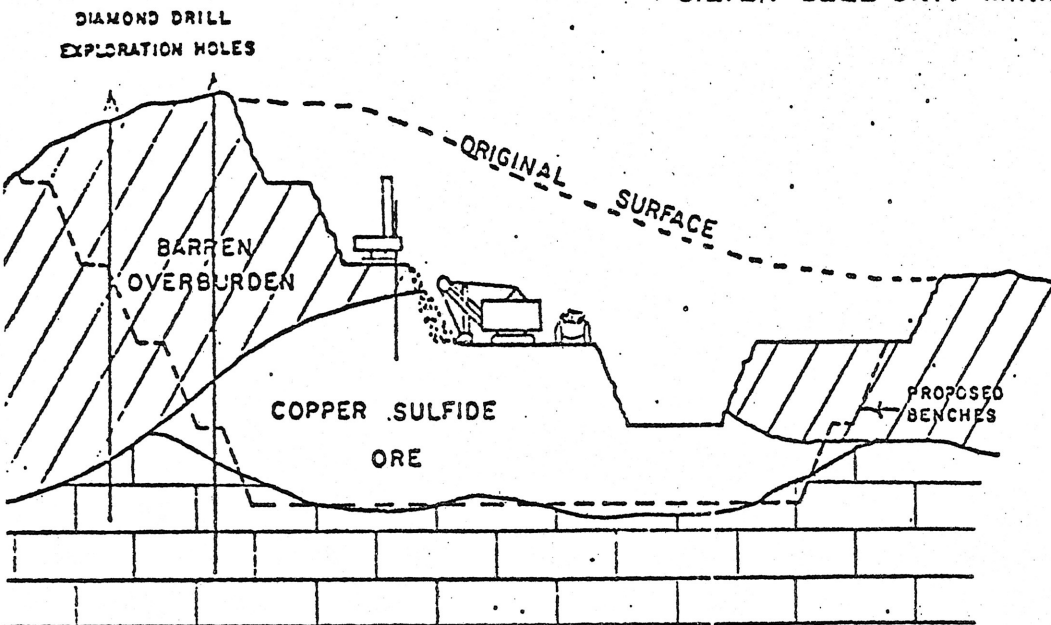
ASARCO  
SILVER BELL DISTRICT

Monzonite and Syenodiorite dike swarms  
related to Mineralization at Silver Bell



B39

ASARCO INC.  
SILVER BELL UNIT MINING & MILLING FLOW SHEET



**ARIZONA DEPARTMENT OF MINERAL RESOURCES**  
**Mineral Building, Fairgrounds**  
**Phoenix, Arizona**

1. Information from: Don Jameson, Supt/  
Address: Silver Bell, Arizona ASARCO
2. Mine: Silver-Bell 3. No. of Claims - Patented 90 or more  
Unpatented ?
4. Location: Silver Bell Mining district Pima County
5. Sec. several Tp. 12S Range 8E 6. Mining District Silver Bell
7. Owner: ASARCO
8. Address: Tucson Arizona
9. Operating Co.: ASARCO
10. Address: As above
11. President: \_\_\_\_\_ 12. Gen. Mgr.: D.R. Jameson Supt.
13. Principal Metals: Copper 14. No. Employed: 377
15. Mill, Type & Capacity: Flotation 12,000 TPD
16. Present Operations: (a) Down ☐ (b) Assessment work ☐ (c) Exploration ☐  
(d) Production ☒ (e) Rate As above tpd.
17. New Work Planned: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
18. Misc. Notes: A new pipe line from the well farm in the Avra Valley has  
just about been completed.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3-26-69

Date: \_\_\_\_\_

HW Jameson  
(Signature)

(Field Engineer)

B28



DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine Silver Bell Mine & Mill Date April 3, 1964  
District Silver Bell District - Pima County Engineer Axel L. Johnson  
Subject Mine visit. Information from Russell Salter, Mill Supt.

References (1) "Copper Dump Leaching at Asarco's Silver Bell Unit, Arizona" by  
Kenneth L. Power, Metallurgist, AS&R Co., Silver Bell, Arizona.  
(2) Mining World -- November, 1963 -- Article on Leaching by George  
O. Argall, Jr. on pages 22 & 23 -- condensed from article above.

Owners American Smelting & Refining Co., 813 Valley National Bank Bldg., Tucson.

Officers D. R. Jameson, Superintendent, Silver Bell Unit  
W. C. Waidler, Asst. Supt.  
Russell Salter, Mill Supt.  
Chas. Haynes, Resident Geologist  
Robert Barnes, Chief Engineer  
Kenneth L. Power, Metallurgist & Leach Plant Foreman

Principal Minerals Copper ores -- both sulphides and oxides.

Present Mining Activity Open pit mining & milling of the sulphide ores.  
Dump leaching of the oxidized ores.

Stripping on SE side of the El Tiro pit, enlarging same.

From 8000 to 8250 tons of ore is milled daily, the mill heads averaging about 0.9% copper. About 50% of this comes from the Oxide Pit and 50% from the El Tiro Pit.

The ores, which are too high in oxides for efficient flotation, are placed on the dumps in leach ore piles for future leaching operations. Three leach dumps are being treated, Upper Oxide Leach Dump and Lower Oxide Leach Dump from the Oxide Pit, and the El Tiro Leach Dump from the El Tiro Pit. Leaching of the El Tiro Leach Dump requires the pumping of the barren solution through a 3½ mile pipeline, and the return of the pregnant solution through another 3½ mile pipeline from the centrally located precipitation plant.

The copper is precipitated in 10 precipitation vats, each vat being 8 ft. wide x 5 ft. deep, x 24 ft. in length, and is divided by a center wall into two- 12 ft. compartments. (See reference (1) on page 14) The copper is precipitated by means of shredded cans, which are purchased from Proler Steel Co., El Paso, Texas.

The production of cement copper varies considerably from day to day, as it is dependent on how long the different leaching ponds on the dumps have been in the leaching cycle. It varies from about 5 to 8 tons per day, and averages about 175 tons per month of 78 to 80% of cement copper.

A total of 303 men are employed at the Silver Bell Unit. Of these, 252 are on the day payroll, and 51 are salaried employees, 9 of the latter being foremen and officers.

627

**DEPARTMENT OF MINERAL RESOURCES**

**STATE OF ARIZONA  
FIELD ENGINEERS REPORT**

Mine Silver Bell Mine & Mill Date Feb. 24, 1961  
District Silver Bell District - Pima County Engineer Axel L. Johnson  
Subject: Present Status. Information from W. C. Waidler, Assistant Supt.

References Report of Nov. 13, 1958

Mining Activity Open pit mining operations and milling.  
Production about 7,500 tons per day.  
Total payroll----228 men.

B26

Information from MINE INSPECTOR'S OFFICE - August 15, 1957

SILVER BELL MINE

Silver Bell Dist., Pima County 6-20-57

A. S. & R. - Marana, Arizona

Pres. R. W. Vaughn

Sec. Herold Howe,

Mgr. D. R. Purvis, " "

R. B. Mein - Supt. " "

COPPER 9000 tons - 94 men

L. A. Smith

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B24

(71)

DEPARTMENT OF MINERAL RESOURCES  
STATE OF ARIZONA  
FIELD ENGINEERS REPORT

Mine      Silver Bell Mine & Mill      Date      Nov. 13, 1958  
District      Silver Bell District, Pima County      Engineer      Axel L. Johnson  
Subject:      Mine Report - Information from D.R. Purvis, Superintendent D. R. Jameson, Supt.  
9-1960

Location:      At Silver Bell, about 45 miles NW of Tucson.

Owners & Operators:      American Smelting and Refining Co.  
813 Valley National Bank Bldg., Tucson, Arizona

Principal Minerals:      Copper ore, all sulphides.

Present Mining Activity:      Open pit mining operations and milling.  
Production about 7,500 tons per day.  
Mine is operated 5 days per week -- 2 shifts per day.  
Mill is operated 7 days per week -- 3 shifts.  
A total of 270 men are employed on all operations.  
About 50% of the production is obtained from each of the two  
open pits -- Oxide & El Tiro.

Ore Values:      Mr. Purvis reports that the ore mined averages about 0.90% Copper, the ore  
in the Oxide pit averaging about 0.96% and that in the El Tiro pit about 0.84%.

Milling & Marketing Facilities:      The ore is milled at the Silver Bell concentrator, near  
the Silver Bell town site. The concentrates are trucked a distance of about 20 miles  
to Plata, a siding on the Southern Pacific near Rillito, and shipped to the A. S. & R.  
Smelter at Hayden.

Present Mining Operations:      Open pit mining operations with shovels and trucks. 3-5 yard  
shovels and 15 Kenworth 25 yard trucks are used in the mining operations. Apache Powder  
Company's "carbomite" is used as an explosive for blasting. This is a mixture of Ammonium  
Nitrate and Carbon Black. Prior to April 1, 1957, the ore was mined on contract by Isbell  
Construction Co. Since that time the mine has been on a full company operation.

B25

## STORY OF SILVER BELL

### ✓ A. S. & R. CO.'S NEW ARIZONA COPPER PROJECT

Full-scale production was started in May, 1954 by the American Smelting and Refining Company at its Silver Bell Unit, 40 miles northwest of Tucson, Arizona.

The Company is mining approximately 7,500 tons of ore daily, with a monthly output of 1,500 tons of refined copper. The ore body is estimated to contain approximately 0.9 percent copper, and at the proposed rate of production will have a life of 12 to 13 years.

The Silver Bell open-pit development was made possible through an agreement with the U. S. Government, which guaranteed the company a market for 177,000,000 pounds of copper out of the first 197,000,000 pounds produced at a floor price of 24.5 cents, plus escalation for higher costs. The entire project was company financed with government assistance limited to rapid amortization of a portion of the investment for tax purposes and the price guarantee for the specified tonnage. This guarantee has terminated without the government purchasing any Silver Bell copper.

Originally, the total cost of the development was estimated at \$17,000,000 and the A. S. & R. Co.'s 1954 Annual Report states that the cost of the project was slightly less than the 17 million dollars. Construction work was completed in March (1954), and production reached the planned rate of 1,500 tons of copper per month by mid-year. At the end of 1953, American Smelting reported \$14,708,000 had been expended in stripping the ore body and in construction of the mill and townsite. Stripping of the ore body started in December of 1951.

The mine is working two shifts daily and the mill three shifts. Concentrates are trucked a distance of 20 miles to Plata, a siding on the Southern Pacific,

B23

then shipped by rail to the El Paso Smelter.

American Smelting and Refining Company has 140 men on its payroll. Mining is handled under contract by a crew of 80 men employed by the Isbell Construction Company. However, the Company's 1956 annual report states that the Silver Bell Unit is acquiring new equipment for the change from the contractor's operation of the open pit to full company operation.

#### HISTORY \*

Mining in the area dates back to 1865 when the Mammoth mine of the Silver Bell Mining Co., also known as the Boot Mine, was opened. Oxide copper ores containing minor silver-lead values mined from replacement deposits in garnetized limestone were treated in local smelters.

During 1909 the disseminated copper possibilities in igneous rocks were recognized and a three-year campaign of churn-drill exploration followed, leading to the partial delineation of two copper sulphide deposits known today as the Oxide and El Tiro. Low copper content of the ore discouraged exploitation of the deposits at that time, but selective mining of orebodies in the sedimentary rocks continued intermittently until 1930.

American Smelting and Refining Company first became interested in the Silver Bell district in 1915, through acquisition of the holdings of the Imperial Copper Company. In 1928 the adjoining properties of El Tiro Corporation were acquired.

The Imperial Copper Company, incorporated in 1903, bought the old Silver Bell mine, built the Arizona Southern Railway line from the Southern Pacific to the mine, erected a smelter at Sasco, through a subsidiary, the Southern Arizona Smelting Company, and built a concentrator at the mine. Mining was stopped in 1913 through the loss of a 450-foot shaft by fire and through inability to furnish sufficient tonnage of high-grade ore to make the property pay with copper below 12.5 cents a pound.

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\* Source: Pay Dirt Dec. 21, 1951, May 21, 1954. E. & M. J. July, 1954

BDD

The El Tiro Copper Company entered the district in 1907 as a successor to the Cleveland-Arizona Copper Company, and was in turn succeeded by El Tiro Leasing Company and El Tiro Corporation. Its properties were acquired under bond and lease by American Smelting and Refining Company in June 1928.

Production records compiled by the Arizona Bureau of Mines show that the Imperial mine, between 1904 and 1926, produced 64,000,000 pounds of copper, plus some gold and silver, for a total value of \$12,125,000. El Tiro, between 1906 and 1927, produced 14,000,000 pounds of copper, 1,000,000 pounds of lead and \$20,000 in silver for a total value of \$2,150,000. The combined properties produced 5,500,000 pounds of copper between 1927 and 1930 with a total value of \$900,000. Total production from the entire Silver Bell District was estimated at \$15,746,000.

The railroad connecting the mine with the smelter at Sasco remained in operation until the 1930's, when it was abandoned and the tracks torn up. The smelter was demolished in the late 1920's.

Reactivation of Silver Bell was considered during World War II, but plans were abandoned when the government lowered its sights on the amount of copper needed for the war effort. The principal reason given for refusal of government support was that it would take too long to get the mine into production.

In 1948 the company began extensive geologic exploration and churn drilling at Silver Bell and in December, 1951, development of two pits, the Oxide and the El Tiro, was started. Since then and up to January 1, 1957 there have been removed from the Oxide pit some 21,000,000 tons of waste and 6,400,000 of ore assaying about .9 copper. From the El Tiro pit, four miles distant by road, some 15,000,000 tons of waste have been stripped and 1,000,000 tons of ore have been mined.

621

### Geology and Mining

The geology of the area and the ore-bodies are described and illustrated in July, 1954 issue of the Engineering and Mining Journal.

The two porphyry orebodies-developed for exploitation consist of rudely tabular accumulations of chalcocite from 100 to 200 ft. in thickness. Lying beneath about 100 feet. of leached capping, they were formed by two-to three-fold enrichment of copper contained in the primary mineralization.

The Oxide is oval shaped measuring roughly 2,100 ft. by 1,500 ft. Entry is by spiral roadway. Six 40-ft. benches have been established so far, the top bench being known as the 2,908, and the lowest as the 2,780. The present pit floor will ultimately go 160 ft. below the 2,780 horizon.

The major fault traversing the pit in about the center in a northeasterly direction is very noticeable. Of the two types of porphyry occurring in the pit, the dacite is hard and the monzonite is fairly soft, influencing drilling speeds and techniques to some extent.

Blast holes are drilled with churn-drills using 9-in. bits. Broken ore and waste are loaded into 37-ton and 22-ton trucks, by a  $5\frac{1}{2}$  yd. electric shovel. Haulage distances to the concentrator average 0.4 mi., and waste haulage about 0.8 mi. Current ore-waste ratio is 1:1. Constant road maintenance has cut equipment repair costs to a minimum. Communication between pit and offices of contractor and company is maintained by a radio-phone short wave FM system.

### Concentrator

Silver Bell's modern concentrator was designed for economical up-keep and low operating costs. Feeders, crushers, vibrating screens, and belts serving them are interlocked both automatic and manual. All plant buildings are equipped with crane installations to speed repairs and handle materials with minimum labor

Crushing to  $1/4$  in. ball mill feed is accomplished in three stages. A 48-in. gyratory crushes to 6 in., a 7-ft. standard secondary cone crusher, set to  $1\frac{1}{4}$  in., and two 7 ft. tertiary cone crushers with vibrating screens fitted with screens

B20



containing  $\frac{1}{2}$  in. square openings. Two large Roto-Clone units represent the dust collecting system at the crushing plant.

Grinding to about 65% minus 200-mesh is done in four  $10\frac{1}{2}$  x 12-ft. ball mills, using 3-and 2-in. balls, operating in closed circuit with 85-in. Akins screw classifiers. The pulp overflowing from the classifiers at 24% solids goes to a central distributor serving four units of rough flotation machines, each made up of two 4-cell-and two 8-cell machines in series. Rougher tailings flow direct to a 275-ft. dewatering thickener, with the overflow going to a 1-million-gal. reservoir, and the underflow via a transite pipe line system to the tailings ponds. The rougher concentrates are pumped to a 26-ft. Hydroseparator. Underflow from this unit is the feed for the regrind section consisting of two 7 x 12-ft. ball mills operating in closed circuit with four DorrClones, and the overflow according to need can either be sent direct to the two 6-cell cleaner machines, or to two 100-ft. middlings thickeners.

Concentrates produced by the cleaner machines are re-cleaned in a 6-cell machine, with the final concentrates receiving successive treatment in a 60-ft. thickener and 6-ft. disc filter installed at the shipping plant. Tailings from the final cleaner machine go to the middlings thickeners, as do the concentrates produced by the scavenger flotation unit handling the tailings from the two cleaner machines. The scavenger unit consists of a 4-cell and an 8-cell flotation machine in series. Underflow from the middlings thickeners is pumped back to the two cleaner machines and the overflow goes to the reservoir mentioned previously.

Re-agents used in the mill circuit include lime, Z-11, Aerofloat 238, pine oil, and Dow froth.

The tailings disposal system operating between the large de-watering thickener at the foot of the concentrator building and the tailings ponds consists of two 16 in. transite pipe lines set at an 0.8% grade and with concrete drop boxes 8 ft. high placed at strategic points. The main line, 8,100 feet long leads to a large

disposal area behind an earth-fill dam 45 ft. high, and the auxiliary line some 1,000 ft. long terminates behind a smaller earth-fill dam 25 ft. high. At the dam sites the pipes are fitted with special valves and rubber distributor pipes. Re-claimed water is pumped back to the large reservoir at the mill.

Water for the camp and plant use is obtained from three wells 500 ft. deep sunk in the valley about 9 miles southeast of the concentrator.

At the townsite there are available 107 modern two-bedroom houses and 68 three-bedroom units, two bunk-houses to accomodate 80 single men, mess hall, 8 apartment buildings.

The Silver Bell Mine is one of the new examples of a hitherto unprofitable orebody being converted to the production of a metal badly needed in both war and peace, by the investment of millions of dollars, and the employment of brains and labor. The low copper content made it a hazardous, marginal operation requiring the application of the latest improvements in equipment and technology, as well as the highest qualities of management.

May, 1957

# STATUS OF DORMANT MINES

MINE NAME: Silver Bell Leases and Copper Stand Mine

LOCATION: Silver Bell District - Casa Grande District

OWNER AND/OR LEASEE: Sherwood B. Owens

ADDRESS: P. O. Box 769 Tucson, Arizona

APPROXIMATE PRODUCTION (Year of 1945):

COPPER 2,160,000 Lbs. LEAD \_\_\_\_\_ Lbs.

ZINC \_\_\_\_\_ Lbs. (OTHER) \_\_\_\_\_

CHECK THE CHIEF CAUSE OF YOUR DISCONTINUED PRODUCTION:

- (A) Easily available ore worked out.
- X (B) Increased costs, but have quantity similar to past grade of ore.
- X (C) Too close a margin to develop more ore.
- (D) \_\_\_\_\_

If you have ore ready to mine please give your estimate of the amount of metal (name each metal) that you could produce in one year (after allowing 60 days to get started) if there were premiums above present market prices. Name amount with a low premium, and amount at a high premium; such as:

Copper at 22½¢ plus 5¢ premium..... 1,000,000 Lbs.

Copper at 22½¢ plus 10¢ premium..... 1,500,000 Lbs.

Present Price plus a 5¢ premium *Copper* 2,500,000 lbs

Present Price plus a 10¢ premium *Copper* 3,500,000 lbs

If you do not have ore ready to mine please discuss the following:

- (A) Do you think a reasonable development program would produce a justified tonnage of commercial ore at above mine?

The above ore is ready to mine but development would unquestionably open up new areas or extend old ones

- (B) With a premium price (guaranteed for one year) could you carry out such a development program yourself? What premium?

A premium price for one year would be worthless to most operators as regards development. It would take them that long to get underway and actually produce in any volume. In our particular case we could be in quantity production within 60 days but the average small mine is not in that condition with proven reserves. Premiums should be for minimum of three years.

(C) If you could not do this yourself, would a quick drilling program by some government agency (at government expense) be sufficient?

---

(D) Or would you prefer a loan plan similar to the arrangements during World War II?

---

How about a combination plan in two stages such as follows?

Stage 1: Government engineers review project and, if a little drilling appears to be justified and a preliminary key to the situation, such drilling program to be agreed upon by owner and government engineer, paid for by the government, but let by contract.

Stage 2: If results of drilling (or without drilling) justify underground development and/or production equipment, same to be obtainable via a mortgage loan on property.

Please discuss the above: I have conducted exploration and development work in so far as I have been financially able and do have considerable ore blocked out ready to go. As an example, we have 200,000 tons to average 2.5% cu at Silver Bell and have 60,000 tons to average 3.0% cu at Copper Stand. Since this has been developed with our own resources, it is certainly reasonable to suppose that additional drilling and/or exploration would result in proving larger reserves. I feel that in the case of properties such as the ones I have, where the owner has definitely made large expenditures of time and money in development, a drilling program at government expense is not only justified but is indicated. On properties which are unproven as to ore, and on which the owners have done nothing but file intentions to hold all these years, any development or drilling should be done via mortgage on the property. In other words, help the operators who are really operating and SUGGESTIONS: have some accomplishments to their credit.

In the case of the ores we mention in this questionnaire, you can readily see that a small amount of premium assistance would bring forth a great deal of copper. The reason is obvious - with marginal ore you simply have to receive enough price to cover production costs or you can't produce. Unfortunately the great amount of low grade we have proven at the moment (for a small operator) is just a little too low to produce at present prices. Since we have this much proven and blocked, I feel confident we could develop several times this amount of ore - IF - we had a market and guaranteed price.

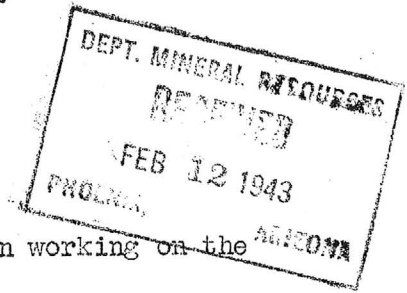
DATE 8/8/50

SIGNATURE Herward B. Owens

13

H. S. & R. Property  
near Tucson  
Pima Co.

Washington, D.C.  
Feb. 10, 1943



SUBJECT: Silver Bell project  
Willis memo Feb. 8

I was interested to get your memo on this as I have been working on the deal for some time.

I have been using Christmas for an example of one type of deal and Silver Bell as the other type.

I think that I told you enough of the background of what is going on so that you will realize that it is not just a case of forcing a particular deal through.... if I can contribute to getting the policy changed, this and other deals will automatically clear.

I had a talk with Charles Wilson's right-hand man today, and am to have further conference with him.... later will get with Wilson when the groundwork is laid.

It is a matter of certain policies, such as the primary vs secondary production I spoke of, also a somewhat deeper policy having to do with cancellation of certain facilities and a vertical freeze on others which Eberstadt favored.

I have been able to set some weighty wheels in motion internally to get a shift in policy and to get the right information to Wilson, who, after all, now has Facilities Bureau.

I drafted a letter to him today which I hope I can get the Senator to send, pointing out the stupidity of the Eberstadt policy and asking him to do, as one of his first actions under the new control, asthorough job of ~~investing~~ investigating the reasons for the copper holdups in Facilities, on which we have a great deal of information. Also asking a reversal of this policy.

The same thing is pointed out in another letter to Donald Nelson from another angle. We have had a number of exchanges with Nelson on this same subject and it is getting hotter by the minute.

I talked to Hayden this afternoon and he promised all the support I need when the time is right.

Howard Young could not do very much in this matter as Copper and Facilities are outside of his jurisdiction. There is one paragraph at the end of section 6, I think(I do not have a copy here) which takes the Copper Division from him and he reports to Calder, out of the Wilson line. I think it will either be necessary to get Young and Wilson together or to transfer the Mining Equipment Branch to Wilson. Wilson is having a tough time as the Eberstadt boys are determined to prevent him using his new authority if they can stymie them.

More later.

Bill Broadgate

B2

DEPARTMENT OF MINERAL RESOURCES

News Items

Date 10/20/42

Mine SILVER BELL

Location DISTRICT PIMA COUNTY

Owner R.C. FRANCE

Address 134 W. JACKSON ST.  
TUCSON.

Operating Co. LEASE & OPTION TO

Address DIETRICH & WIDBY  
TUCSON ARIZ.

Pres. \_\_\_\_\_

Genl. Mgr. LEAD-ZINC ORE

Mine Supt. 4 MEN

Mill Supt. DEVELOPMENT WORK IN

Principal Metals TUNNEL-

Men Employed \_\_\_\_\_

Production Rate \_\_\_\_\_

Mill, Type & Capacity \_\_\_\_\_

Power, Amt. & Type \_\_\_\_\_

Signed JJE

(Over)

SILVER BELL

Pb, Ag, Zn

Pima

10 - 2

T 11 S, R 8 E

✓ R. C. Franco, 134 W. Jackson, Tucson

'42

(Moved, left no address. 8/1/46)