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James Doyle Sell Mining Collection

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WLK

Feb 6, 1985

Mr J.D. Sell
ASARCO, Inc.
1150 North 7th Ave
P.O. Box 5747
Tucson, Arizona 85703

Dear Jim:

The enclosed colored geologic map completes the shipment of items for the Mojave Project.

The colored map has been shipped in three separate sheets, in one tube, for packaging convienience. The three sheets should be spliced together to form one map.

Sincerely,

Julie Faure

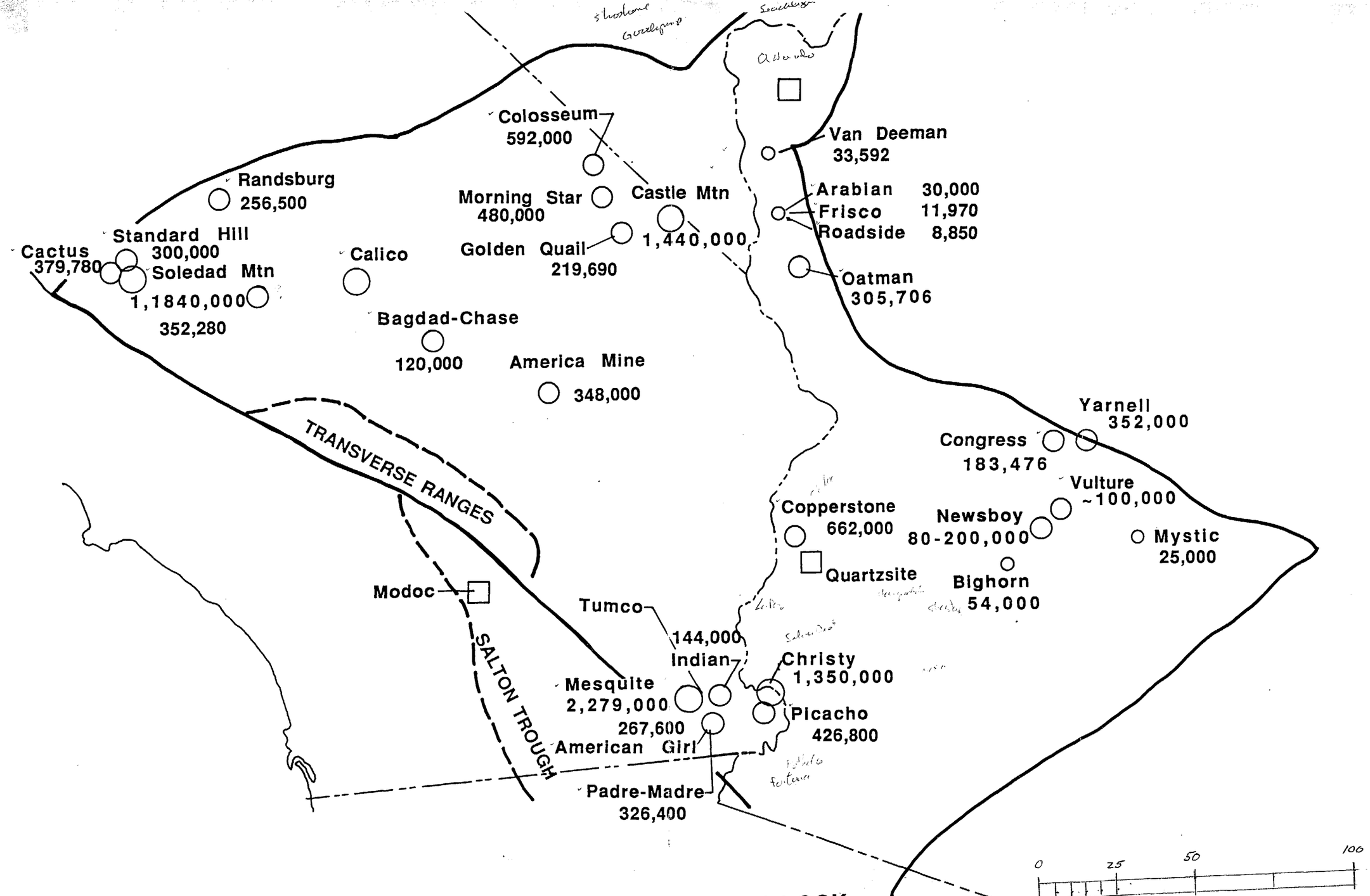
Julie F. Faure

1/4 mile HEM 8-40 sq miles
Cost $500/mi^2

1/4 mile HEM 4-8 ~~sq~~ miles
Cost $2000/m^2

Gold Basin 10 x 10 = 100 sq miles = $200,000 ! at 1/4
= 50000 ! at 1/4
Budget 50K

Mohave 20x20 = 400 x 2000 = 800,000 !
= x 500 = 200,000



MOJAVE-SONORA DESERT BLOCK
GOLD DEPOSITS

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Gold Fields Mining Corporation

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GEOLOGY

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(continued on next page)

Spatial distribution of ore deposits

Carl A. Carlson

WLK - JDS - WDG

ASARCO Incorp

FEB 1 5 1991

SW Exploration

USGS Office of Mineral Resources Newsletter

Winter 1991

Seventh Annual McKelvey Forum Highlights Mineral-Deposit Research

A healthy domestic minerals industry and assurance of a long-term supply of metals are national priorities that require a federal research program into the geology, geochemistry, geophysics, genesis, and some economic aspects of mineral resources. Towards these ends, the USGS Office of Mineral Resources conducts minerals-related research, and highlights of the results of this research are presented biannually at the USGS V.E. McKelvey Forums on Mineral and Energy Resources.

This year's Forum focuses on the interaction of USGS scientists with scientists of other nations as well as from domestic industry.

In this Issue

Research: Domestic & International 1
Vincent E. McKelvey: A Life-long Interest in Man and Mineral Resources 3
Recent Publications 4
News and Comments 6

A Metallogenic View: Domestic and International

The study of domestic ore deposits in the context of regional geologic-tectonic systems has provided new perspectives on the scope and scale of ore-forming processes that can be directly utilized in developing regional exploration strategies. These regional perspectives also allow for better and more rapid mineral-resource assessments of large regions.

The Mid-Continent

USGS research in the mid-continent region on Mississippi Valley-type (MVT) lead-zinc deposits, conducted in cooperation with several State geological surveys, has significantly improved understanding of this important deposit type.

Interdisciplinary studies are at the heart of the MVT research including carbonate petrology, geochemistry, and geophysical interpretations of the subsurface geology and structure.

Significant results pertinent to MVT deposits as a class are emerging from the studies. Deposits in the Tri-State, northern Arkansas, and Viburnum trend mining districts, originally viewed as distinct and unrelated, are now recognized as manifestations of a series of related events linked to plate-tectonic processes. Differences between districts are now viewed as reflecting differing fluid-flow paths, water-rock interactions, and proximity to the basement. Through the application of techniques like cathode

(See Domestic Research, p. 2)

Minerals Research Abroad

The U.S. relies heavily on imports to supply many of its mineral needs. The National Materials and Minerals Policy, Research, and Development Act of 1980 declares it a federal policy to "promote an adequate and stable supply of materials necessary to maintain national security, economic well-being and industrial production." The USGS maintains an active international mineral-resources research program in order to provide the domestic industry with information on areas favorable for overseas exploration, increase our understanding of national critical minerals, and to gain new data important to refining exploration models in the U.S.

Platinum Group Elements

The platinum-group elements (PGEs) are widely used as catalysts in the automobile and refining industries. With the Stillwater Complex in Montana as the most significant domestic source, our import-dependence has led to a concerted effort to understand the modes of occurrence of PGEs. A team of USGS geologists has recently begun a cooperative study with Soviet geologists of the Noril'sk-Talnahk deposits, which contain PGE resources second only to the Bushveld Complex in South

(See International Research, p. 3)

luminescence, the microstratigraphy of dolomite crystals may be correlated over vast regions. Other authigenic phases are similarly correlatable, demonstrating the subcontinental-scale of the hydrothermal systems that formed these deposits.

The regional model developed from the study of MVT deposits can be applied to other types of ore deposits in other geologic settings. Thus, the sedimentary rock-hosted copper-silver deposits of the Belt Basin in the Pacific Northwest were formed by similar processes, but by a different type of fluid. The Mississippi Valley and Belt Basin types of deposits were formed from relatively shallow circulating fluids moving in response to regional tectonic stresses. In contrast, in higher pressure and temperature regimes, deeper, regionally extensive fluids may respond to tectonic stresses in a similar manner producing deposits such as those that occur in the Coeur d'Alene mining district.

Eastern Triassic Basins

Regional studies of the early Mesozoic rift basins in the eastern United States have advanced understanding of the metallogeny of rift environments. The research has resulted in the discovery of base and precious metals (Cu, PGE, and Au), enriched, for example, from 10- to 50-fold in segregations of ferro-gabbro and granophyre in the upper parts of some tholeiitic diabase sheet-like intrusions in basins in New Jersey, Pennsylvania, and Virginia. The enrichments in these metals and other elements, notably sulfur and chlorine, apparently result from high temperature magmatic aqueous fluids.

Within the basin's sedimentary rocks, mineralized zones containing as much as 2.5% Cu and enrichments of Zn and Ag have been identified in specific lacustrine mudstone facies. These zones range from a few cm to two meters in thickness and are traceable locally for at least three miles. Also found in Mesozoic fractures within and near the basins, are polymetallic veins containing base metals, barite, and fluorite.

Western Jurassic Magmatic Arc

Historically, prospecting in the Triassic to Jurassic magmatic-arc rocks of western Nevada and eastern California has turned up little evidence of massive sulfide-type deposits. Is this apparent lack of deposits because the geologic environment was unsuitable or have the wrong areas been searched?

Post -Jurassic arc tectonism exacerbates the problems of unravelling the complex geology. Ongoing studies in cooperation with the Nevada Bureau of Mines and Geology and the University of Nevada-Reno are focusing on possible explanations. The geologic mapping is showing that (a) most of the Jurassic volcanic rocks were deposited in a subaerial to shallow, near-shore environment; (b) although there are thick accumulations of sedimentary rocks indicative of local, deeper water basins, there are no consanguinous volcanic rocks; and (c) even within the marine volcanic rock sequences, there is a general lack of felsic volcanic rocks which, by analogy with known massive sulfide deposits world-wide, are necessary to the occurrence of deposits.

Concurrent gas-geochemistry studies in the same region have focused on pediment areas and basins. For example, in the vicinity of the Lucky Boy mine, in Mineral County, hydrocarbons (predominantly methane and propane) emanating through alluvium have been used to suggest the extension of buried, mineralized vein structures up to one mile from outcrop exposures. ❑

Metallogeny Across the North Pacific Rim

USGS economic geologists are working cooperatively with the Soviet Academy of Sciences and the Ministry of Geology in a systematic study of the metallogeny of the Soviet Far East and Alaska. Through a series of exchange visits, the scientists plan to produce a magmatic-tectonic map of the Soviet Far East and Alaska; define significant metallogenic belts in this region; produce a summary listing of mineral deposits as to type, descriptive information and geology; and do a mineral-resource assessment for a variety of deposit types.

The principal cooperating Soviet agencies are the Far East Geological Institute (Vladivostok), the Institute of Tectonics and Geophysics (Khabarovsk), the Institute of Volcanology (Petropavlovsk), and the Northeast Interdisciplinary Science Research Institute (Magadan).

A unique ore deposit visited by the project scientists is Bor at Dalnegorsk in Primorye, where 95% of the Soviet Union's boron supply is mined from early Tertiary(?) danburite-datelite ores, a low temperature overprint on an older hedenbergite-andradite skarn assemblage.

International Research (continued)

Africa. Magmatic sulfide deposits enriched in Cu, Ni, and PGE at Noril'sk-Talnahk occur in shallow-level intrusions related to flood basalts, analogous in many respects to the Columbia River basalts in the Pacific Northwest, the Keweenawan basalts in the mid-continent, and basalts in the Rio Grande Rift in New Mexico.

Primary PGE production has also come from placer deposits and chromitite schlieren associated with Alaskan-type ultramafic intrusions. In southeastern Kalimantan, Indonesia, cooperative studies have investigated the source regimes of Au-PGE placers and determined that the most likely source are Alaskan-type complexes that have been unrecognized up to now. Chromitite schlieren in discordant dunite bodies were identified, contain PGE concentrations that may exceed 5 ppm, and have compositional features identical to Alaskan-type complexes in the Urals, USSR, and British Columbia, Canada.

South America

Ongoing studies of mineral deposits on the Altiplano of Bolivia have led to the recognition that what once were considered disparate vein types may share a common classification. This includes so-called Ag-veins, Sn-veins, and base-metal veins. Detailed mineralogical study has shown over 50 different Altiplano vein deposits to be common variations on a galena-sphalerite-tetrahedrite polymetallic assemblage. Significantly, none of the deposits should be considered 'epithermal' in character. An implication of this work is that exploration of minor vein systems may lead to the discovery of buried occurrences of economically more significant deposits, thereby expanding the area of search. ❑

Profile

Vincent E. McKelvey: A Lifelong Interest in the Interrelationship of Man and Mineral Resources

by Bill Overstreet

The complex interrelationships between man and natural resources--particularly minerals and mineral fuels--were explored by Vincent E. McKelvey throughout his career in the USGS from geologist (1941) to Director (1971-1978). His curiosity was inspired by C.K. Leith, at the University of Wisconsin, and his early interests were broadened by his associations with colleagues, notably Foster Hewitt, S.G. Lasky, and Tom Nolan. Following his term as Director, Vince continued as senior research geologist to analyze geologic and economic, social, and moral issues fundamental to these interrelationships. He developed a philosophy toward the search for and uses of mineral resources that he outlined under the title "Minerals and Fuels--Cornerstones of Affluence." This outline was for a yet to be published book directed toward both the general reader concerned with public affairs and specialists interested in the interdisciplinary aspects of minerals problems.

McKelvey believed that the mineral resources of raw materials and energy were the physical basis of the advanced society where human purpose, furthered by technical, socioeconomic, and political ingenuity, converted raw materials into useful products. Thus, the value of minerals was in their use, which raised the concern: Can these resources be developed and utilized in ways not damaging to environmental quality? Parallel concerns were how to provide the materials and energy needed to support a rising standard of living for a growing population, and how to bring mineral resources into use in support of economic growth, especially in the less developed countries.

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John Herman
Peter Pleitner

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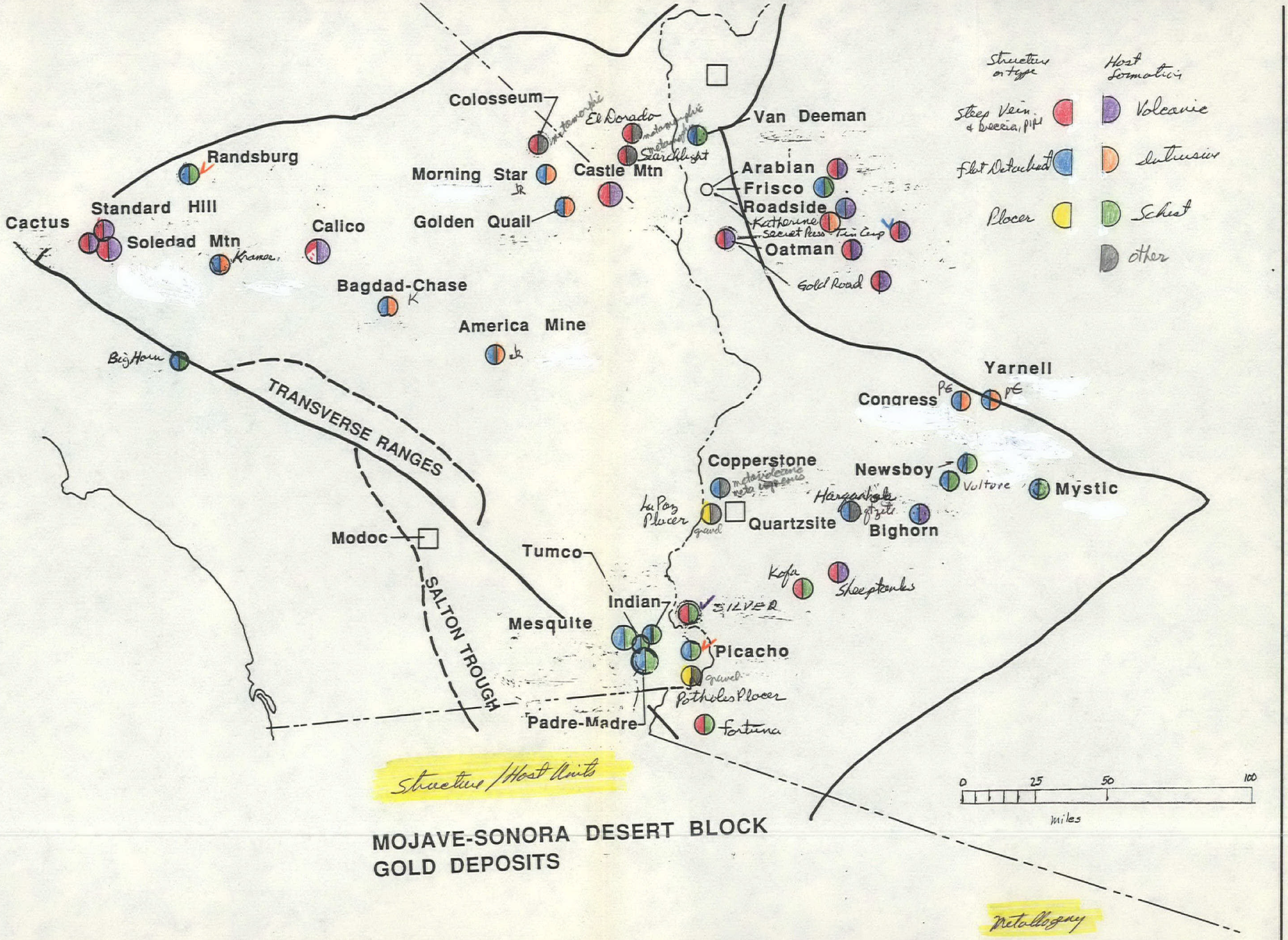
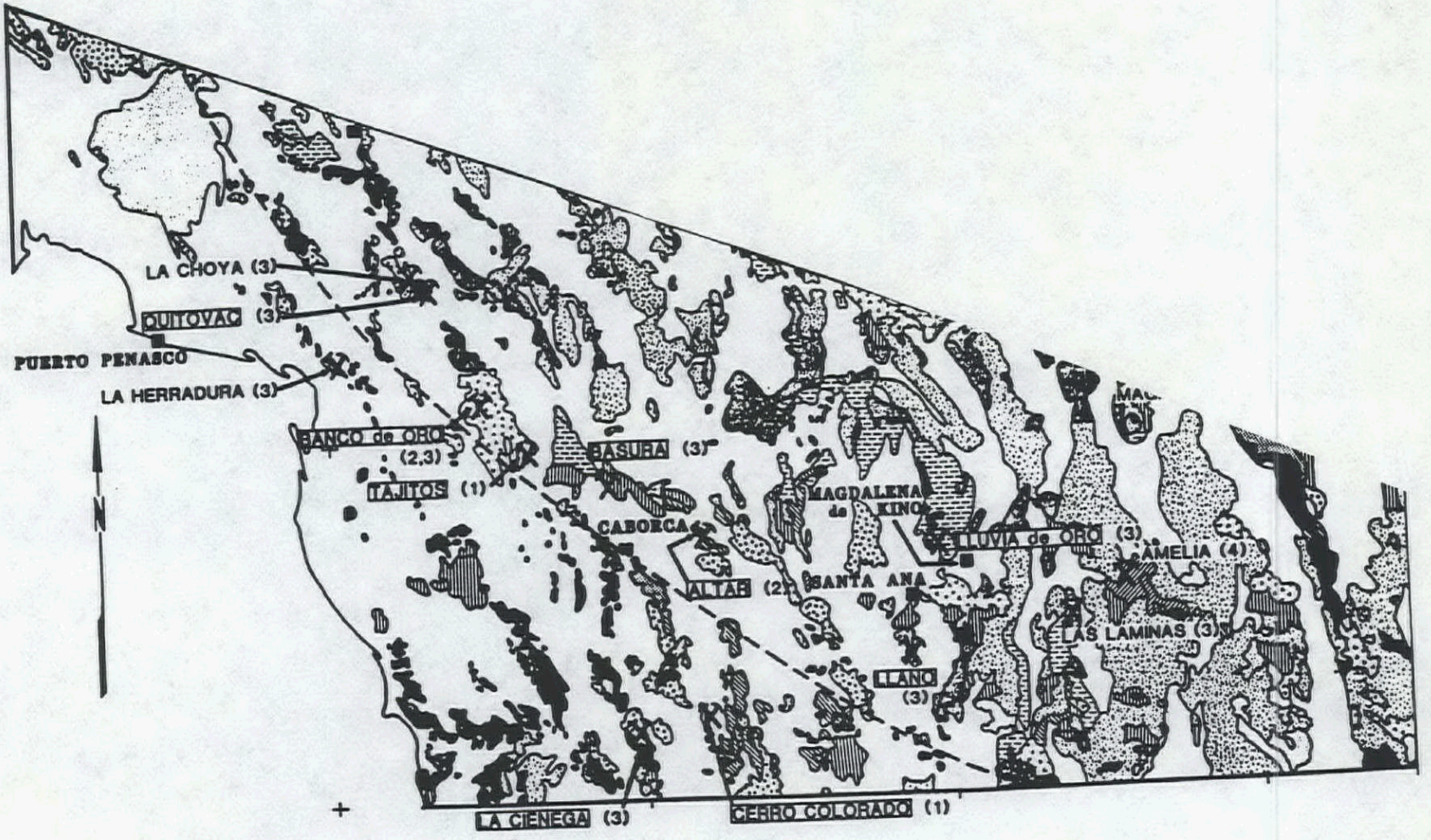
6/25/91 Mojave
Some has all the color separations done.
Will send out for enlargement & ship out
Gbasin. Still working on color separations, will be
a while.



MOJAVE-SONORA DESERT BLOCK
GOLD DEPOSITS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QUITOVAC (3)
PUERTO PENASCO
LA HERRADURA (3)
BANCO de ORO (2,3)
TAJITOS (1)
BASURA (3)
CABORCA
ALTAR (2)
MAGDALENA de KINO
SANTA ANA
LLUVIA de ORO (3)
AMELIA (4)
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LLANO (3)
LA CIENEGA (3)
CERRO COLORADO (1)
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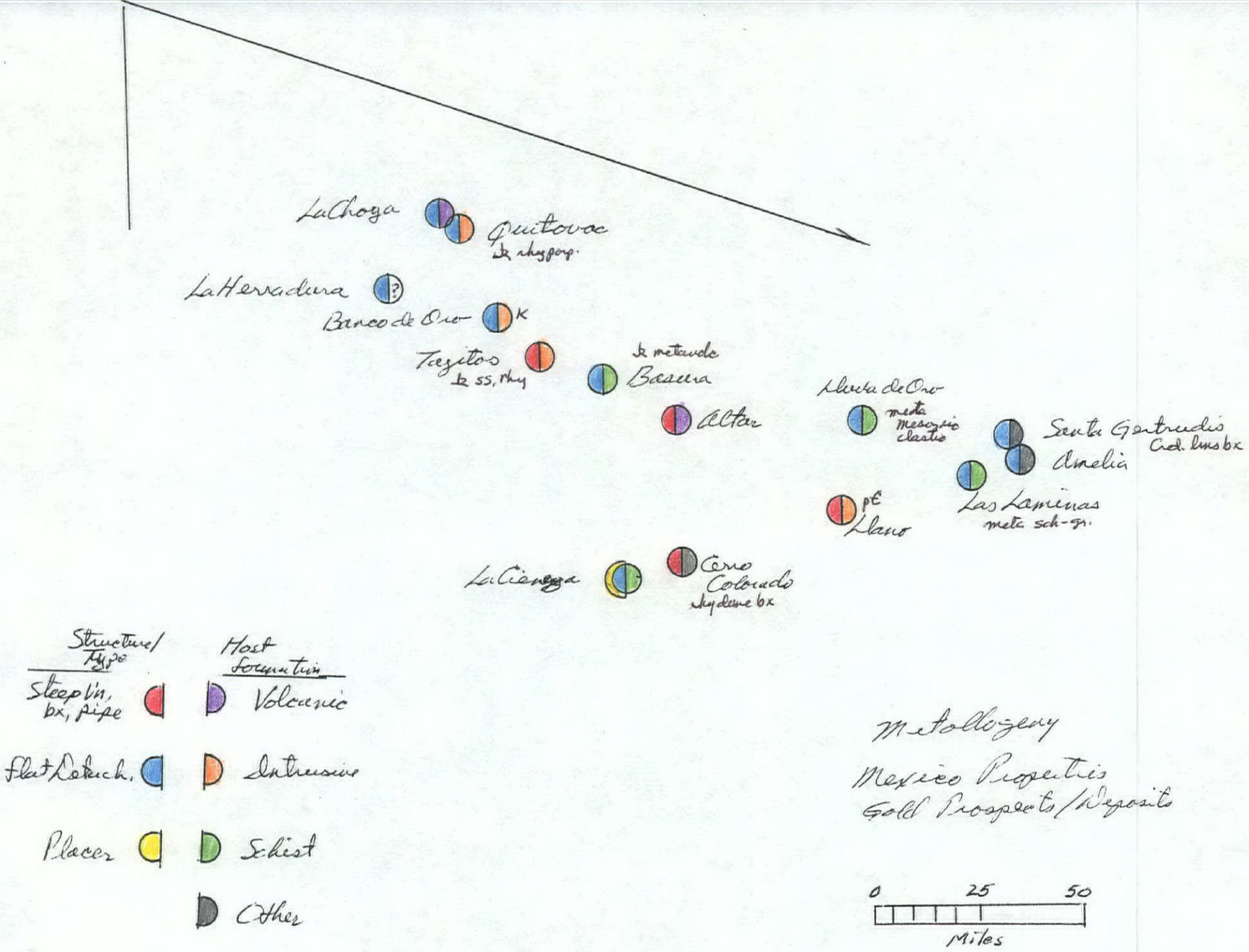
La Choya
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La Herradura
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Tazitos
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Basura
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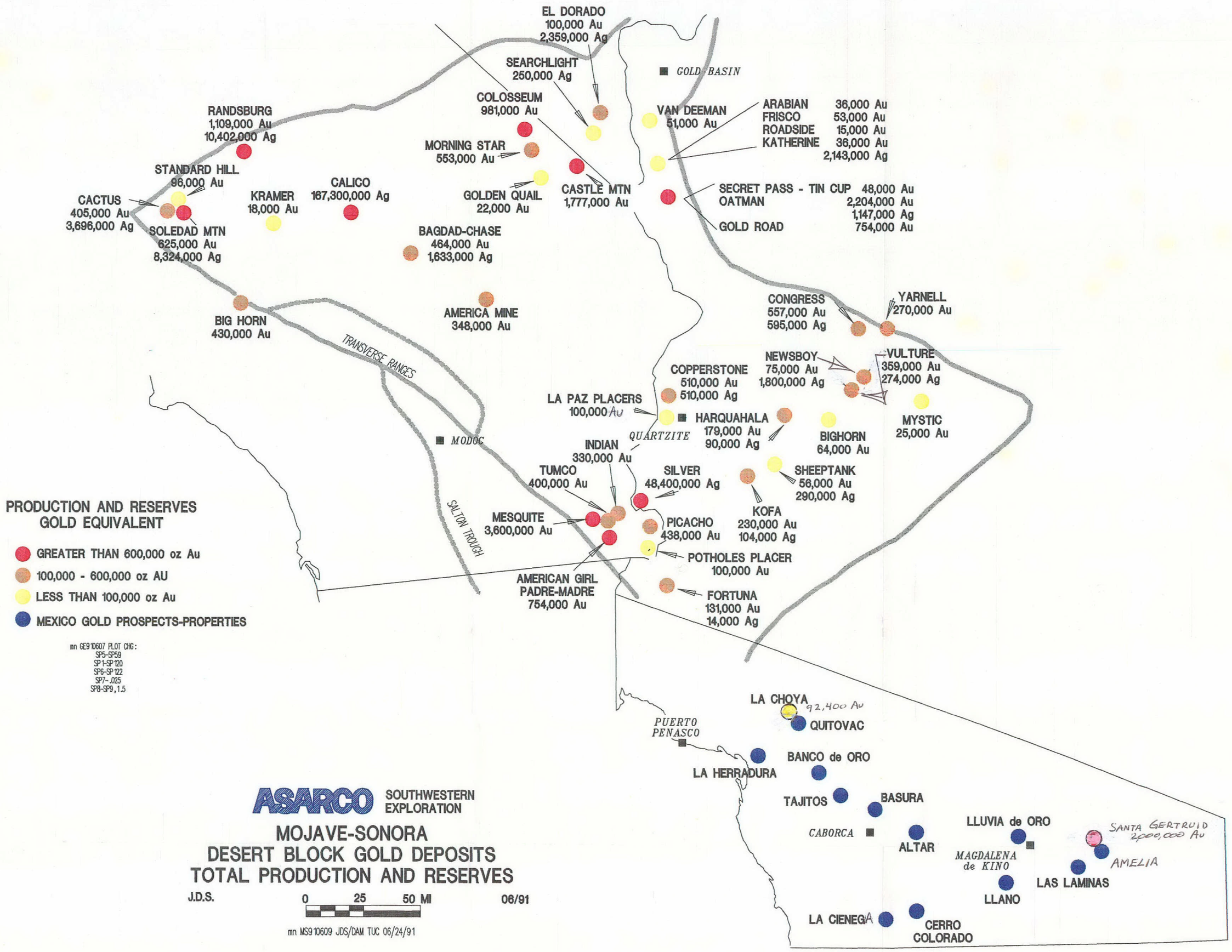
Santa Gertrudis
Crd. lms bx
Amelia
Las Laminas
meta sch-gr.
pЄ
Llano
La Cienega
Cerro Colorado
rhydome bx
Structure/Type
Host formation
Steep Vn, bx, pipe
Volcanic
Flat Detach.
Intrusive
Placer
Schist
Other
Metallogeny
Mexico Properties
Gold Prospects/Deposits
0
25
50
Miles


EL DORADO
100,000 Au
2,359,000 Ag
SEARCHLIGHT
250,000 Ag
GOLD BASIN
COLOSSEUM
981,000 Au
VAN DEEMAN
51,000 Au
ARABIAN 36,000 Au
FRISCO 53,000 Au
ROADSIDE 15,000 Au
KATHERINE 36,000 Au
2,143,000 Ag
RANDSBURG
1,109,000 Au
10,402,000 Ag
MORNING STAR
553,000 Au
STANDARD HILL
96,000 Au
CALICO
167,300,000 Ag
KRAMER
18,000 Au
GOLDEN QUAIL
22,000 Au
CASTLE MTN
1,777,000 Au
SECRET PASS - TIN CUP 48,000 Au
OATMAN 2,204,000 Au
1,147,000 Ag
GOLD ROAD 754,000 Au
CACTUS
405,000 Au
3,696,000 Ag
SOLEDAD MTN
625,000 Au
8,324,000 Ag
BAGDAD-CHASE
464,000 Au
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AMERICA MINE
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BIG HORN
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TRANSVERSE RANGES
CONGRESS
557,000 Au
595,000 Ag
YARNELL
270,000 Au
NEWSBOY
75,000 Au
1,800,000 Ag
VULTURE
359,000 Au
274,000 Ag
COPPERSTONE
510,000 Au
510,000 Ag
LA PAZ PLACERS
100,000 Au
HARQUAHALA
179,000 Au
90,000 Ag
QUARTZITE
BIGHORN
64,000 Au
MYSTIC
25,000 Au
MODOC
INDIAN
330,000 Au
TUMCO
400,000 Au
SILVER
48,400,000 Ag
SHEEPTANK
56,000 Au
290,000 Ag
KOFA
230,000 Au
104,000 Ag
SALTON TROUGH
MESQUITE
3,600,000 Au
PICACHO
438,000 Au
POTHOLES PLACER
100,000 Au
AMERICAN GIRL
PADRE-MADRE
754,000 Au
FORTUNA
131,000 Au
14,000 Ag
PRODUCTION AND RESERVES
GOLD EQUIVALENT
GREATER THAN 600,000 oz Au
100,000 - 600,000 oz AU
LESS THAN 100,000 oz Au
MEXICO GOLD PROSPECTS-PROPERTIES
mn GE910607 PLOT CHG:
SP5-SP59
SP1-SP120
SP6-SP122
SP7-.025
SP8-SP9,1.5
LA CHOYA
92,400 Au
QUITOVAC
PUERTO
PENASCO
BANCO de ORO
LA HERRADURA
TAJITOS
BASURA
CABORCA
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LLANO
LA CIENEGA
CERRO
COLORADO
ASARCO
SOUTHWESTERN
EXPLORATION
MOJAVE-SONORA
DESERT BLOCK GOLD DEPOSITS
TOTAL PRODUCTION AND RESERVES
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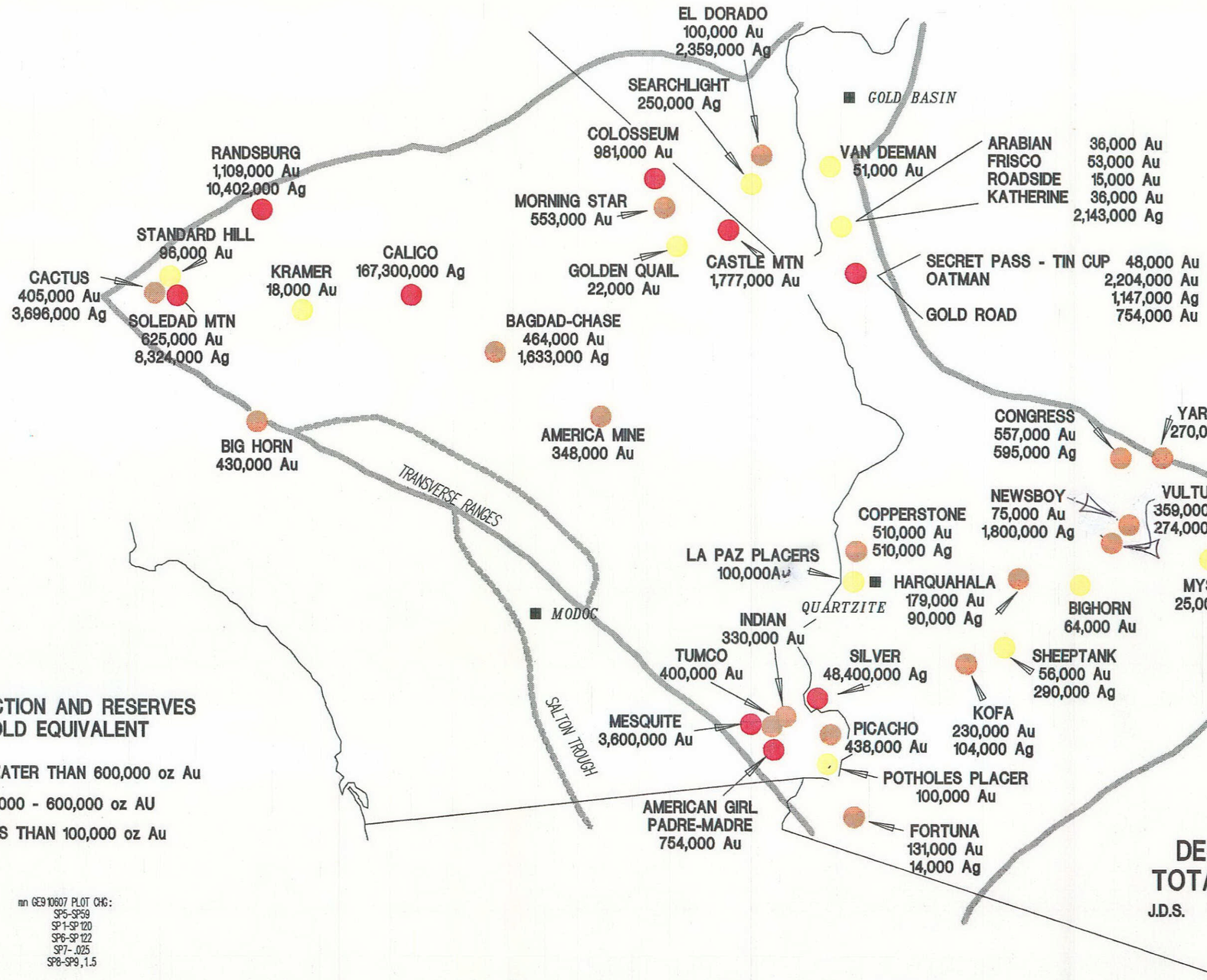
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SP1-SP120
SP6-SP122
SP7-.025
SP8-SP9,1.5
ASARCO
SOUTHWESTERN
EXPLORATION
MOJAVE-SONORA
DESERT BLOCK GOLD DEPOSITS
TOTAL PRODUCTION AND RESERVES
J.D.S.
0 25 50 MI
06/91
mn MS910607 JDS/DAM TUC 06/20/91

Table 1. Property Information.

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
America	0.34 mill. at 0.059 Au mined 5.0 mill. at 0.066 Au indic. 5.34 0.062	20 328 = 348	– –	Sec. 19, T 4N, R 12E (Note: Verbal 5/91, Nerco's drilling may have cut "mining" reserve in half)	San Bernardino	CA
Arabian	0.8 mill at 0.045 Au indic.	36	–	Sec. 20, T 21N, R 20W	Mohave	AZ
Bagdad-Chase	0.4 mill. at 0.33 Au + 1.5 Ag mined 2.1 mill. at 0.16 Au + 0.5 Ag indic 2.5 0.19 0.66	128 336 = 464	583 1,050 = 1,633	Sec. 8, T 6N, R 8E	San Bernardino	CA
Big Horn, CA	0.04 mill. at 0.12 Au mined 1.5 mill. at 0.29 Au indic. 1.54 0.29	5 430 = 435	– –	Sec. 7-8, T 3N, R 8 W	Los Angeles	CA
Bighorn, AZ	0.28 mill. at 0.032 Au mined 1.01 mill at 0.055 Au indic 1.29 0.05	9 55 = 64	– –	Sec. 6, T 4N, R 7W Sec. 1, T 4N, R 8W	Maricopa	AZ
Cactus	8.8 mill. at 0.046 Au + 0.42 Ag mined	405	3,696	Sec. 16-17, T 10N, R 13W	Kern	CA
Calico	0.5 mill at 7.0 Ag mined 49.0 mill at 2.7 Ag indic. 49.5 2.74	– –	3,500 132,300	Sec. 16, 17, 21, T 10N, R 1E	San Bernardino	CA
Castle	24.6 mill at 0.047 Au reserve 13.5 mill. at 0.046 Au indic. 38.1 0.047	1,156 621 = 1,777	– –	Sec. 13, 24, T 14N, R 17E	San Bernardino	CA
Colosseum	7.6 mill at 0.081 Au mined 9.6 mill at 0.038 Au indic. 17.2 0.057	616 365 = 981	– –	Sec. 10, T 17N, R 13E	San Bernardino	CA

Table 1. Property Information. Continued

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Congress	0.99 Mill at 0.48 Au + 0.52 Ag mined	432 = 557	466 = 595	Sec. 23, T10N, R6W	Yavapai	AZ
	0.43 Mill at 0.25 Au + 0.3 Ag indic. (1.42, 0.42, 0.45)	125	129			
Copperstone	6.0 Mill at 0.085 Au + 0.085 Ag mined	510	510	Sec 11, 14, T6N, R20W	La Paz	AZ
El Dorado	0.58 Mill at 0.17 Au + 4.06 Ag mined	100	2,359	Sec 2, 3, T26S, R64E	Clark	NV
Fortuna	0.15 Mill at 0.86 Au + 0.09 Ag mined	131	14	Sec. 20, 21, T10S, R20W	Yuma	AZ
Fresco	0.5 Mill at 0.058 Au mined	29		Sec. 9, T21N, R20W	Mohave	AZ
	0.43 Mill at 0.055 Au indic. (0.93, 0.057)	24 = 53	—			
Golden Quail	0.44 Mill at 0.051 Au indic.	22	—	Sec 7, 18, T13N, R16E	San Bernardino	CA
Gold Road	1.7 Mill. at 0.34 Au mined	578	—	Sec. 11, T19N, R20W	Mohave	AZ
	0.8 Mill at 0.22 Au indic. (2.5, 0.30)	176 = 754	—			
Harquahala	0.14 Mill at 0.90 Au + 0.57 Ag mined	143	90	Sec. 22, 27, T4N, R13W	La Paz	AZ
	0.4 Mill at 0.09 Au indic. (0.56, 0.32)	36 = 179	—			
Indian Rose / Ocotillo	IR 5.2 Mill at 0.023 Au indic	120	—	Sec. 31, T13S, R21E	Imperial	CA
	OC 7.5 Mill at 0.028 Au indic (12.7, 0.026)	210 = 330	—	Sec. 5, T14S, R21E	Imperial	CA
Katherine	0.14 Mill at 0.25 Au + 15.0 Ag mined	36	2,143	Sec. 5, T21N, R21W	Mohave	AZ

Table 1. Property Information. Continued

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Kofa	0.8 Mill at 0.29 Au + 0.13 Ag mined	227	5	Sec. 12, T 25, R 17 W	Yuma	AZ
Kramer Hills	0.5 Mill at 0.036 Au mined	18	–	Sec. 35, 34, T 10 N, R 4 W	San Bernardino	CA
La Paz	Placer mined	100	–	Sec. 25, 24, 33, 34, T 4 N, R 21 W	La Paz	AZ
Mesquite	90.0 Mill at 0.040 Au mining	3,600	–	Sec. 4, 5, 9, T 13 S, R 19 E	Imperial	CA
Morning Star	8.5 Mill at 0.065 Au mining	553	–	Sec. 28, T 15 N, R 14 E	San Bernardino	CA
Mystic	0.06 Mill at 0.42 Au mining	25	–	Sec 11, 12, T 5 N, R 1 W	Maricopa	AZ
Newsboy	N. Zone 2.0 Mill – Subeconomic indic	–	–	Sec. 22, T 6 N, R 4 W	Maricopa	AZ
	S. Zone 1.5 Mill at 0.05 Au + 1.2 Ag indic	75	1,800			
Oatman	4.1 Mill at 0.54 Au + 2.8 Ag mined	2,204	1,147	Sec 10, 15, T 19 N, R 20 W	Mohave	AZ
Padre-Madre, American Girl, Cross Zone	7.8 Mill at 0.058 Au open pit mining	452	–	Sec. 17, 18, 19, T 15 S, R 21 E	Imperial	CA
	1.3 Mill at 0.233 Au UG mining (9.1, 0.083)	302 = 754	–			
Picacho	6.4 Mill at 0.036 Au mined	231	–	Sec. 10, T 14 S, R 22 E	Imperial	CA
	5.6 Mill at 0.037 Au mining (12.0, 0.036)	207 = 438	–			
Potholes	Placer	100	–	Sec. 24, 25, T 15 S, R 23 E	Imperial	CA

Table 1. Property Information. Continued

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Randsburg	3.65 mill at 0.16 Au + 2.78 Ag mined	595 = 1,109	10,133 = 10,402	Sec. 1,2,11,12, T 30S, R 40E	Kern	CA
	17.9 mill at 0.029 Au + 0.015 Ag indic (21.55; 0.05; 0.48)	511	269			
Roadside	0.03 mill at 0.3 Au mined	9 = 15	—	Sec. 12, T 21N, R 21W	Mohave	AZ
	0.20 mill at 0.03 Au indic (0.23; 0.065)	6	—			
Searchlight	0.5 mill at 0.5 Ag mined	—	250	Sec. 35, T 28S, R 63E	Clark	NV
				Sec. 1, 2, 3, T 29S, R 63E	Clark	NV
Secret Pass / Tin Cup	SP 0.17 mill at 0.053 Au indic	9 = 48	—	SP Sec. 2, T 20N, R 19W	Mohave	AZ
	TC 0.55 mill at 0.07 Au indic (0.72; 0.066)	39	—	TC Sec. 12, T 20N, R 19W	Mohave	AZ
Sheeptanks	0.02 mill at 1.24 Au + 2.35 Ag mined	21 = 53	40 = 290	Sec. 1, T 1S, R 15W	Yuma	AZ
	0.15 mill at 0.22 Au + 1.72 Ag indic (0.17; 0.34; 1.79)	32	250			
Silver	1.03 mill at 6.2 Ag mined	—	6,300	Sec. 29,36, T 3S, R 23W	La Paz	AZ
	7.58 mill at 5.5 Ag indic (8.61; 5.58)	—	42,000	Sec 2,11, T 4S, R 23W	La Paz	AZ
Soledad	1.0 mill at 0.23 Au + 2.5 Ag mined	230 = 615	2,500	Sec. 18, T 10N, R 12W	Kern	CA
	10.4 mill at 0.037 Au + 0.56 Ag mining (11.4; 0.054; 0.73)	385	5,824			
Standard Hill	1.2 mill at 0.08 Au mined	96	—	Sec. 32, T 11N, R 12W	Kern	CA
Turnco	1.0 mill at 0.34 Au mined	340 = 400	—	Sec 1, 12, T 15S, R 20E	Imperial	CA
	0.75 mill at 0.08 Au indic. (1.75; 0.23)	60	—			

Table 1. Property Information.

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Van Deeman	1.5 Mill at 0.034 Au indic.	51	—	Sec. 29, T 27N, R 21W	Mohave	AZ
Vulture	1.0 mill at 0.34 Au + 0.26 Ag mined 0.2 mill at 0.08 + 0.07 Ag indic 1.2 0.30 0.23	340 19 = 359	260 14 = 274	Sec. 36, T 6N, R 6W	Maricopa	AZ
Yarnell	0.2 mill at 0.25 Au mined 4.0 Mill at 0.055 Au indic. 4.2 0.064	50 220 = 270	— —	Sec. 14, T 10N, R 5W	Yavapai	AZ
Mexico Properties (Non-Ranked)						
Altar						
Aurelia						
Banco de Oro						
Basura						
Cerro Colorado						
La Choya	2.1 mill at 0.044 Au indicated	92				
La Ciénega						
La Herradura						
Las Lamias						
Llano						
Luvia de Oro						
Quitovac						
Santa Gertrudis	+ 40 Mill at 0.05 Au reported	2,000				
Tejitos						

Table 2. Property Ranking by Production

Name, State	oz Au x1000	oz Ag x1000	Au-eq x1000*	Status
Calico, CA	—	134,000	6,800	Standby
Mesquite, CA	3,600	—	3,600	Producer
Silver, AZ	—	48,400	2,415	Standby
Oatman, AZ	2,204	1,147	2,261	Mined
Castle, CA	1,777	—	1,777	Feasibility
Randsburg, CA	1,109	10,402	1,629	Producer
Soledad, CA	625	8,324	1,031	Producer
Colosseum, CA	981	—	981	Standby
Padre-Madre, etc, CA	754	—	754	Producer
Gold Road, AZ	754	—	754	Mined
Cactus, CA	405	3,696	590	Producer
Congress, AZ	557	595	587	Producer
Morning Star, CA	553	—	553	Producer
Bagdad-Chase, CA	484	1,633	546	Standby
Copperstone, AZ	510	510	537	Producer
Picacho, CA	438	—	438	Producer
Big Horn, CA	430	—	430	Standby
Tuscon, CA	400	—	400	Standby
Vulture, AZ	359	274	373	Mined
America, CA	348	—	348	Standby
Indian Rose-OC, CA	330	—	330	Standby
Kofa, AZ	230	104	235	Mined
El Dorado, NV	100	2,359	218	Mined
Harquahala, AZ	179	90	184	Standby
Newsboy, AZ	75	1,800	165	Standby

Table 2 Continued

Name, State	oz Au x1000	oz Ag x1000	Au eq x1000*	Status
Kalhorne, AZ	36	2,143	142	mined
Fortuna, AZ	131	14	132	mined
La Paz Placer, AZ	100	–	100	mined
Potholes Placer, CA	100	–	100	mined
Standard Hill, CA	94	–	94	mined
Sheegtacks, AZ	56	290	68	mined
Bighorn, AZ	44	–	44	producer
Frisco, AZ	53	–	53	Standby
Van Deerman	51	–	51	Standby
Secret Pass-TC, AZ	48	–	48	Standby
Arabian, AZ	34	–	34	Standby
Mepstic, AZ	25	–	25	Producer
Golden Quail, CA	22	–	22	Standby
Kramer, CA	18	–	18	mined
Roadside, AZ	15	–	15	mined
Searchlight, NV	–	250	13	mined
Mexican Properties (not ranked)				
Altar				
Amelia				
Bance de Oro				
Basura				
Cerro Colorado				
La Choya				

Table 2. Continued

Name, State	oz Au x1000	oz Ag x1000	Au eq* x1000	Status
La Cienega				
La Herradura				
Las Laminas				
Llano				
Lovia de Oro				
Quitovac				
Santa Gertrudis	2,000	—	2,000	
Tagitos				

* Au equivalent = $\frac{\text{oz Au} \times 20 \text{ (silver)}}{\$400 \text{ (gold)}}$ = Au eq.

Table 3. Property – Structure/Geology

Name	Structure	Geology
America	low-angled detachment & bx with hi angled lystric	Jurassic granodiorite, intrusive sill
Arabian	high-angled vein	Tertiary volcanic contact with pt schist
Bagdad-Chase	low angled detachment bx with hi angled lystric	Schist of Tertiary intrusive granodiorite
Big Horn, CA	low angled detachment bx	Schist, "Rand", Jur-Cretac
Bighorn, AZ	low angled detachment bx with hi angled lystric	Tert. volc over Tert granite-schist
Cactus	high angled veins & bx and tuff bed dissem.	Tertiary volc, tuff
Calico	Syn-sedimentary, veining in volcanic tuff, apron	Tert. volcanoclastic
Castle	hi angled veins & tuff dissem under rhyolite sills	Tert. rhyolite tree dome complex
Colosseum	steep bx-pipe development	Pt metamorphics in FW of regional thrust

Table 3 - Continued

Name	Structure	Geology
Congress	moderate dipping vein	pЄ granite
Copperstone	moderate dipping lystric going into deep detachm.	Jurassic metavolcanic
El Dorado	steep veins	metamorphic conglom, pЄ,
Fortuna	steep veins w/ pipe develop	Mesoz. schists
Frisco	low angled detachment	pЄ metaschists under Tert vole.
Golden Quail	low angled detachment	Cretaceous granite
Gold Road	hi angled vein, bx	Tertiary volcanic
Hanguchala	low angled shears cut by high angled veins	quartzite
Indian Rose - Ocotillo	low angled detachment with lystric	schist, Jurassic
Katherine	high angled veins	pЄ granite
Kofa	steep veins, bx	schist, mesozoic

Table 3. Continued

Name	Structure	Geology
Kramer Hills	low angled detachment w/ leptite-high angled flt	Cret. granite FW, with Mesozoic metamorphic HW
La Paz placer	gravels	Tertiary
Mesquite	hi angled flts in detachment terrane	Jurassic metavolcanic + metaschists
Morning Star	moderate angle fault, leptites, HW bx.	Jurassic granite
Mystic	low angled detachment	schist
Newsboy	low angled detachment w/ leptites	granite FW, schist, sheared gr-volc HW.
Oatman	hi angled veins & stockwork	Tertiary volcanics
Padre-Madre, etc	low angled detachment w/ leptite interface	Schist, Jurassic, med-grained biotite diorite HW, coarse grained granite FW
Picacho	low angled detachment, bx pipes, hi angled leptite	Schist, intrusive origin; Tert volc HW.

Table 3 Continued

Name	Structure	Geology
Potholes	Placer, gravels	Tertiary
Randsburg	low angled detachment, leptites, stockwork HW bx	Schist ("Rand") of JK, and Ki granite/granodiorite.
Roadside	low angled detachment with leptites, bx	pt granite FW / Tert volc. HW.
Searchlight	hi angled veins prob leptite into detach.	pt metamorphics.
Secret Pass - TC	high angled veins in detachment terrane	Tertiary volc.
Sheephills	Steep veins, bx	Tertiary volc.
Silver	hi angled veins, bx, prob leptites into detach.	Schist of Mesozoic - Jur. intrusive under Tertiary volc.
Soledad	hi angled veins & stockwork	Tert. volc & tuffs & intrus
Standard Hill	hi angled veins + stockwork	Tert volc, intrusive, tuff

Table 3 Continued

Name	Structure	Geology
Tumco	low angled detachment	Schist, foliated granodiorite metaarhose (Jurassic)
Van Deeman	low angled detachment	schist
Vulture	low angled vein-bx	Cret. gr. sill nose intruding pt schist
Yarnell	low angled thrust-detach	pt granite
Mexican Properties		
Altar	thin-discont veins, steep	
Amelia	folded Cret limestones, silty, cut by hi angle faults, veins, bx	Cret. limestones.
Banco de Oro	steep lyptic qtz-bx veins (mined) going downward into 2-6 meter low angled qtz veins 0.5-2.5 ppm Au	Jurassic SS, rhy porphy in FW, Cret. gr in HW

Table 3. Continued

Name	Structure	Geology
Basura	Steep veins in & over thrust (flat fault) slices, each 5-8 meters wide, local gold values.	Jurassic metaschists of sedimentary & meta felsic units.
Cerro Colorado	Rhy dome w/ bx borders & steep veins. Possibly 100,000 tons mined	Tert. rhyolite dome complex.
La Choya	Steep angled veins, bx, in sheared detachment terrane	Mesoz schists, silic volcanics, tuffs
La Cienega	Placer with bedrock of thin irregular low angled veins (detachment terrane.	Gneiss of pc andesite rhyolite, meta mafic silic units in FW, pc quartzites limestones, Hh
La Herradura	low angled shears	
Las Lamenas	low angled structures	schist-gneiss, metamorph complex.
Llano	steep qtz-tourmaline veins (15 grams), 60 meters depth, low angle shear below	pc granite

Table 3 Continued

Name	Structure	Geology
Llevia de Oro	flat vein 1-3 meters, 1 gm gold in shear zones of granite sill intra beds	Schist of Mesozoic meta lms-SS in close spaced thrust shear zones with granite sills.
Quitovac	low angled shears	Jurassic volcaneclastics FW with granite, phyllite, rhy porphyry in HW.
Santa Gertrudis (PD's - said to have + 40 million tons at 0.05 oz	Folded Cret silty lmst w/massive limestone, cut by hi angle flts, vns, bx along contact & bedding in silts + cont with massive.	Cretaceous limestone
Tejitos	steep angled veins + bx. Look for detachment terrane	Jurassic SS-rhyolite porphyry

	Owner	Reference
Amer	BMR - Nerco	GCNL #2, Jan. 1991
Arab	?	?
B Chase	ch	Sept 22, 1980 rept.
B Horn	Centurion Gold Ltd	GCNL #88, May 1991
Bighorn	Roddy Resources	?
Cactus	Coca Mines/Hecla	1990 brochure
Castle	Viceroy	N. Mines. Feb 18. 1991
Colosseum	?	GCNL #121, June 1986
Congress	Marlantic Hygrade	?
Copperstone	Cyprus	Dec 87 report
Frisco	?	March 16, 1987 report
G Quail	?	?
Gold Rd	Sharon Steel	?
IR-OC	Bema -	N. Mines, Oct 1, 1990, p13.
Katherine	?	Bob Bell (3)

	Owner	Reference
Kramer	?	Sept 22, 1986 rept.
Mesquite	Gold Fields	brochure
M Star	?	April 28, 1986 rept.
Newsboy	Wounded Bull	March 13, 1989 rept.
Oatman	?	?
P. Madre	?	GCNL #80, April 1985 GCNL #220, Nov 1990
Picacho	Glamis	GCNL #7, Feb. 1990
Rands	?	?
Roadside	?	?
*Searchlight		
Sec Pass-Tin C	?	?
Silver	?	?
Soledad	?	GCNL # 134, July 1989 GCNL # 222, Nov. 1990
Std Hill	Billiton Minerals	?
Tremco	?	HGK June 21, 1985 rept.

	Owner	Reference
Van Deam	Kunkles -	?
Vulture	Budge Mining	Details
Waterloo	ASARCO	reports
Yarnell	Bema	reports
~~**~~ Searchlight	Front Range Minerals	letter/proposal Jan 21, 1991

Ranking by Age of Host Unit, from youngest to oldest

Tvg	Au 46.2 mill @ 0.10	= 4,837 K Au	
	Ag 53.6 " @ 2.74	= 147,110 K Ag	
Tvo	Au 21.4 mill @ 0.052 =	= 1,116 K Au	
	Ag 28.8 " @ 2.08 =	= 60,000 K Ag	
Tertiary	Au = 3.8 mill @ 0.14 =	= 540 K Au	
Cret. dist	Au = 13.0 mill @ 0.12 =	= 1,558 K Au	
Jur dist.	Au = 110 mill @ 0.045 =	= 4,993 K Au	
JK Sch "Rand"	Au = 58.4 mill @ 0.059 =	= 3,444 K Au	
M2 sh (≅ JKsh Rand ≅?)	Au = 13.0 mill @ 0.061	= 793 K Au	
	Ag = 9.6 mill @ 5.0	= 48,160 K Ag	
Paleo Seds	Au = 0.56 mill @ 0.32	= 179 K Au	
PC gr	Au = 13.0 @ 0.10	= 1,347 K Au	
	Ag = 1.6 @ 1.71	= 2,739 K Ag	
PC metamorph	Au = 17.8 mill @ 0.06	= 1,075 K Au	
	Ag = 1.08 mill @ 2.4	= 2,605 K Ag	
PC schist	Au = 4.0 mill @ 0.05	= 204 K Au	
includes same tonnage/grade tested twice	Au 301 mill @ 0.067 oz/ton	= 20,120,000 oz Au	
	Ag 94.7 mill @ 2.75 oz/ton	= 260,614,000 oz Ag	

Ranking by Rock Type – Gold Production

Intrusives:			
✓ Jurassic	110.0	0.045 ~~0.12~~	4,993,000
✓ Cretaceous	13.0	0.12	1,558,000
✓ Precambrian	13.0	0.10	1,347,000
✓ Tertiary	3.8	0.14	540,000
	139.8		
Volcanics:			
✓ Tert. younger	44.2	0.10	4,837,000
✓ Tert. older	21.4	0.05	1,116,000
	67.6		
Schist:			
✓ JK Rand	58.6	0.06	3,444,000
✓ Mz ?JK Rand??	13.0	0.06	793,000
✓ Precambrian	4.0	0.05	204,000
	75.6		
✓ Precambrian Metamorphics:	17.8	0.06	1,079,000
✓ Paleozoic Sediments (gold)	0.56	0.32	179,000

Ranking by Rock type - Silver Production

Volcanics

Tert. younger	53.4	2.74	147,110,000
Tert, older	28.8	2.08	60,000,000
	82.4		

Schist

Jur-Cret Rand	21.4	0.48	10,402,000
Mz ? JK Rand ≅ ?	9.6	5.00	48,140,000

Intrusive

Precambrian ~~Intrusive~~		1.6	1.71	2,739,000
Tertiary	2.5	0.66		1,633,000
Cretaceous	1.2	0.23		274,000
Jurassic	6.0	0.085		510,000
Precambrian metamorphic		1.1	2.40	2,605,000

Ranking by Gold Production, oz.

	tons mill, grade	oz Au
Jurassic intrusives	110.0 @ 0.012	4,993,000
Tert. vol. younger	46.2 @ 0.010	4,837,000
JK Sch "Rand"	58.6 @ 0.006	3,444,000
Cret. intrusive	13.0 @ 0.012	1,558,000
pE intrusive	13.0 @ 0.010	1,347,000
Tert. vol. older	21.4 @ 0.005	1,116,000
pE metamorphics	17.8 @ 0.006	1,079,000
M3 sch (≅ JK Sch Rand ≅?)	13.0 @ 0.006	793,000
Tert. intrusive	3.8 @ 0.014	540,000
pE schist	4.0 @ 0.005	204,000
Paleoz seds	0.56 @ 0.032	179,000

Ranking by Silver Production, oz

	tons mill, grade	oz Ag
Tert. volc. younger	53.6 @ 2.74	147,110,000
M3 sh (≅ JK sch Rand ≅?)	9.6 @ 5.00	48,160,000
Tert. volc. older	28.8 @ 2.08	60,000,000
pE intrusive	1.6 @ 1.71	2,737,000
pE metamorphics	1.1 @ 2.40	2,605,000

Tabulation

Tert. volc. younger:

Calico	49.5 @ 2.74 Ag	
Castle Mtn	38.1 @ 0.047 Au	Au = 46.2 mill @ 0.10 Au = 4,837 K
Arabian	0.8 @ 0.045 Au	
Tin Cup	0.2 @ 0.066 Au	Ag = 53.6 mill @ 2.74 Ag = 147,160 K
Oatman	4.1 @ 0.54 Au + 2.8 Ag	
Gold Road	2.5 @ 0.300 Au	

130
6 [illegible]

Tert-volc. older

Cactus	8.8 @ 0.046 Au + 0.42 Ag	Au = 21.4 mill @ 0.052 Au = 1,116 K
Standard	1.2 @ 0.08 Au	
Soledad	11.4 @ 0.054 Au + 0.73 Ag	Ag = 28.8 mill @ 2.08 Ag = 60,000 K
Silver (JKs)	8.6 @ 5.58 Ag	

Tertiary intrusive

Bagdad	2.5 @ 0.19 Au + 0.66 Ag	Au = 3.79 mill @ 0.14 Au = 540 K
Bighorn, AZ	1.29 @ 0.05 Au	

Cret intrusive & M2 metamorphic (in part JKS?)

Kramer	0.5 @ 0.036 Au	Au = 13.0 mill @ 0.12 Au = 1,558 K
Golden Quail	0.44 @ 0.051 Au	
Vulture	1.2 @ 0.30 Au + 0.23 Ag	
Padre-Madre (JKS)	9.1 @ 0.083 Au	
Tumco (JKS)	1.75 @ 0.23 Au	

Jurassic intrusive

America	5.34 @ 0.062 Au	
Morning Star	8.5 @ 0.065 Au	
Copper Stone (volcanoclastic)	6.0 @ 0.085 Au + 0.085 Ag	
Mesquite (volcanoclastic)	90.0 @ 0.040 Au	

Au = 109.8 mill @ 0.045 Au =

= 4,993 K

JKsch "Rand":

Randsburg	21.55 @ 0.05 Au + 0.48 Ag	
Big Horn, CA	1.54 @ 0.29 Au	
Padre-Madre	9.1 @ 0.083 Au	Au = 58.6 mill @ 0.059 Au =
Indian Rose	12.7 @ 0.026 Au	= 3,444 K
Tumco.	1.75 @ 0.23 Au	
Picacho (Mz sch)(PE gr)	12.0 @ 0.036 Au	

Mz sch (maybe ≡ JKsch "Rand).

Kofa	0.8 @ 0.29 Au + 0.13 Ag	Au = 13.0 mill @ 0.061 Au =
Silver (JKs ?)	8.61 @ 5.58 Ag	= 793 K
Picacho (JKs of PE gr)	12.0 @ 0.036 Au	Ag = 9.6 mill @ 5.0 Ag =
Fortuna	0.15 @ 0.86 Au + 0.09 Ag	= 48,160 K

Poley sed.

Harquahala	0.56 @ 0.32 Au

PE granite

Roadside	0.23 @ 0.065 Au	Au = 13.0 mill @ 0.10 Au =
Katherine	0.14 @ 0.25 Au + 15.0 Ag	= 1,347 K
Yarnell	4.2 @ 0.064 Au	
Congress	1.42 @ 0.42 Au + 0.45 Ag	Ag = 1.6 mill @ 1.71 Ag =
Picacho (JKs, Mz sch)	12.0 @ 0.036 Au	= 2,739 K

PE metamorphics

Colossium	17.2 @ 0.057 Au	Au = 17.78 @ 0.06 Au
El Dorado	0.58 @ 0.17 Au + 4.06 Ag	= 1,079 K au
Searchlight	0.5 @ 0.5 Ag	Ag = 1.08 mill @ 2.4 Ag
		= 2,605 K ag

PE schist (Yavapai-penal):

Van Deeman	1.5 @ 0.034 Au	Au = 4.0 mill @ 0.05 au
Frisco	0.93 @ 0.057 Au	= 204 K au
Newsboy	1.5 @ 0.05 Au + 1.2 Ag	
Mystic	0.06 @ 0.42 Au	

Summary

1. Structure is paramount, but may not be obvious in the outcrop you are looking at.

a) Standard, Soledad, Cactus = 1,116,000 oz Au + 12,020,000 oz Ag
94 KAu 615 ~~230~~ KAu + 8,324 KAg 405 K 3,696 K
1.2, 11.4, 8.8 = 21.4 Mill tons @ 0.52 oz Au + 0.56 oz Ag

Hi-angled veins + along tuff beds in Volcanics with Ti all around.

? where might be a detachment near surface to make another Randsburg?

b) Randsburg, Kramer, Big Horn Ca. = 1,562,000 Au + 10,402,000 Ag
1,109 + 10,402 / 18 / 435
21.55 .5 1.54 = 23.6 ~~00,000~~ million tons @ 0.066 Au + 0.44 oz Ag

Rands, BH in JKschist (Orocopia ≅) with Ki nearby, Kramer in Ki, all assoc with detachment style (the Kramer assoc with hi angle zone at surface.).

Abundant diking in N-S zone (dikes to NW & NE), in Ki units suggest underlying (flat fault)?) tect to open zones, ? can JKS be far below?

c) Calico – ~~Big Horn~~ Bagdad Zone. (→ America) = 464,000 Au + 168,933,000 oz Au
~~3~~ 167,300 KAg 464 Au 1,633 Ag 49.5 + 2.5 = 52.0 mill tons @ 0.009 Au + 3.3 oz Ag

Zone of strong, thin gain high angle fault; deposits have hi angled veins plus detach style & Bagdad & growth fault / lateral tuff bed type at major Calico. Abundant Ti & tuffs around in zone, capable of hosting similar mineral zones. Several large, too low grade zones in area may be fringe type to better structural controlled zones.

d.) America – (Bagdad) – Golden Quail – Morning Star = 970,000 oz Au
395 22 553
5.4 .4 8.5 = 14.3 mill tons @ 0.068 oz Au

strong influence of granitic rock units, mainly Jurassic, but Ki & Ti in ~~flat~~ fault contact zone (and at Bagdad Ti-type).

Abundant, similar units, but only faint smoke in circle of area

e) Mesquite - Tumco - Padre - IR - Picacho = 5,522,000 oz Au only

3600	400	254	330	438	
90.0	1.8	9.1	12.7	12.0	= 125.6 mill @ 0.044 oz Au

All assoc with steep vn-bx in close conjunction with flat structures in with variety of rk units (schist) Jurassic, Mesozoic, & Pe? & Ki often called JKS nearly, Thus may be akin to Randsburg & Big Horn, CA.

All at or near lowest visible outcrops near alluvial cover. Thus only careful observations on un-interesting outcrops may be clue to deposits within "stones throw". Placers associated with all, in or about, - See potholes

f) Silver dist. = 8.1 Mill tons @ 5.58 oz Ag = 48,300,000 oz Ag in high angled veins in Tert volc. may be listric type toward basal detach style at shallow angle and a shallow depth below present level. Mesozoic & JK schist + Ji all in district & very favorable for reintegration of flat faulting & heat pump regime.

Should be part of an overall relook at Mesq-Picacho Silver Zone.

g). NW AZ to Searchlight-El Dorado.

Strong vein types/diss. tuff in Volcanic section with known production from flat fault at basement/Tert volcanic boundary and production in FW meta roof &c

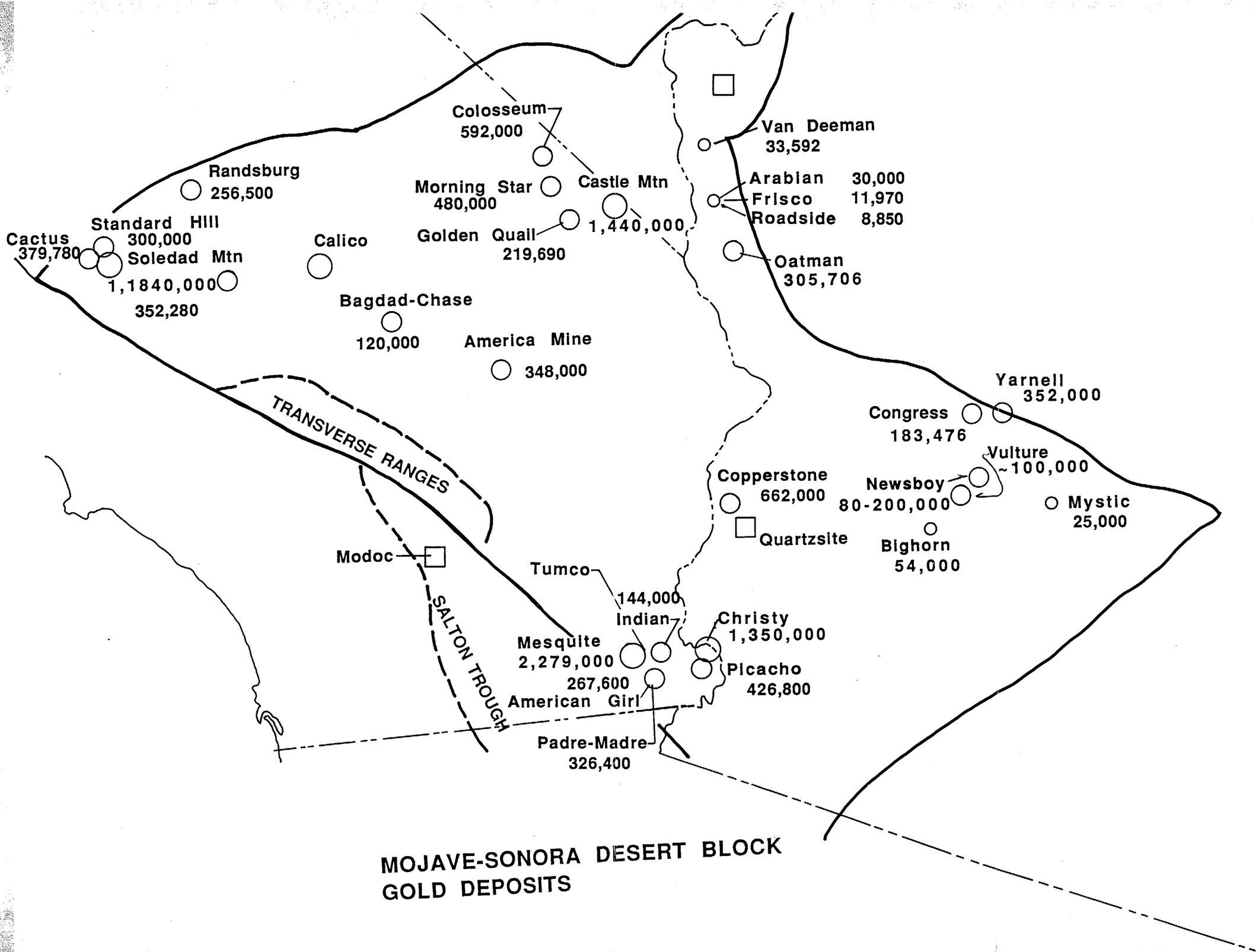
Goes across River in NW strike ing zone.

Vn = Oatman, Gold Rd, ~~Sec Pass~~ Katherine, Roadside, = 6.97 mill tons @ 0.44 Au + 1.95 Ag 3,072,000 Au + 13,580,000 Ag

flat flt = Frisco, Arabian, Secret Pass-Tin Cup = 2.45 Mill @ 0.056 = 134,160 oz Au

Across river Searchlight 0.5 Mill @ 0.5 Ag
El Dorado 0.58 Mill @ 0.17 Au + 4.06 Ag 98,600 oz Au
1.08 Mill @ 0.09 Au + 2.4 Ag = 2,605,000 oz Ag

Tot Au = 3,171,000 oz Au + Ag ∴ total Ag = Au eq of 809,000
total Au eq = 3,980,000 oz



MOJAVE-SONORA DESERT BLOCK
GOLD DEPOSITS

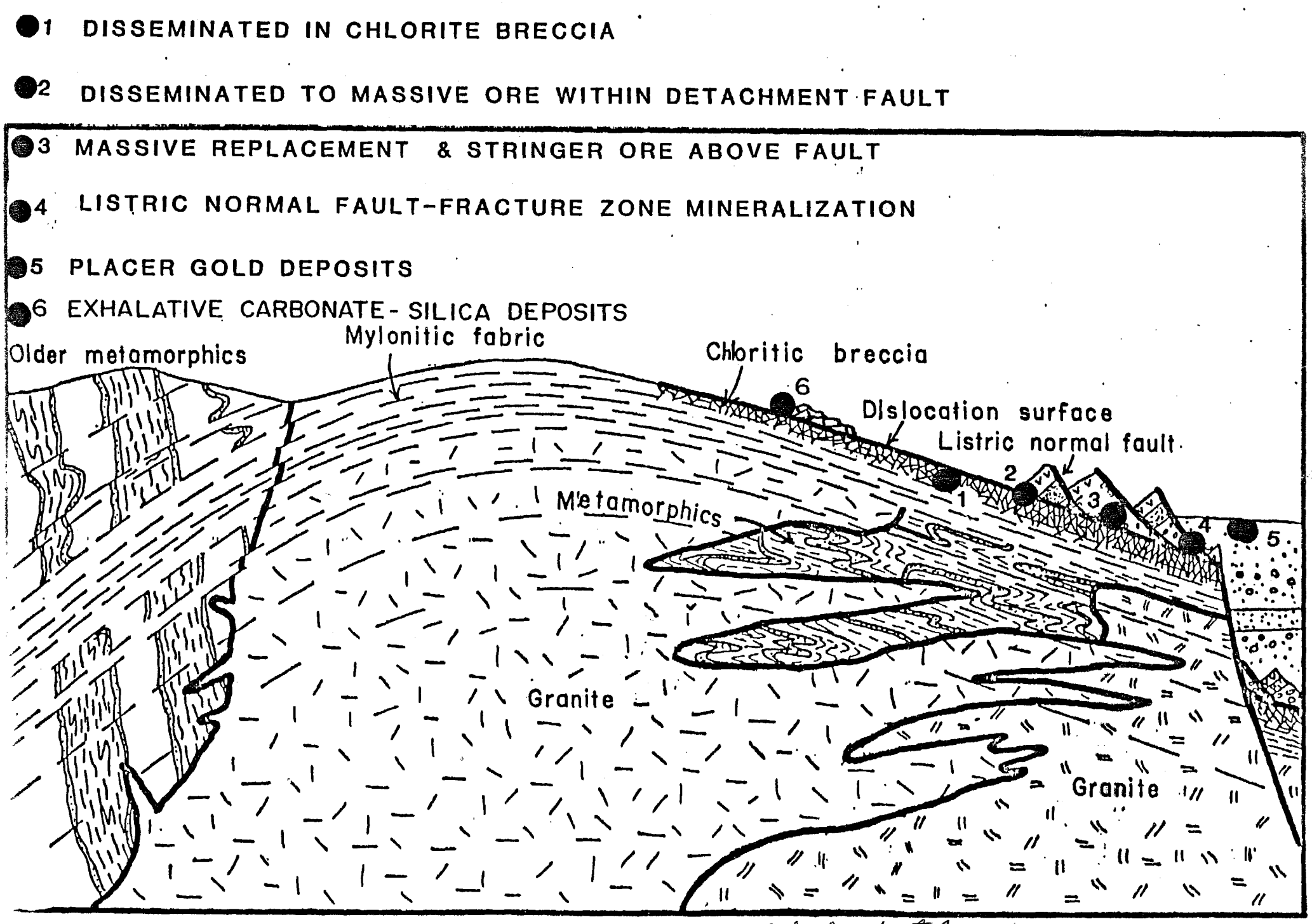


Figure 17. Settings of Mineralization in the detachment style.

ı reinterpretation of the timing, position, and significance of art of the Sacramento Mountains detachment fault, ɔutheastern California

ASARCO

Southwestern Exploration Division

JDS

June 27, 1991

FILE NOTE

Mojave-Sonora
Desert Block Gold/
Silver Deposits
Review
AZ-CA-NV-Mexico

A study was conducted on 21 gold deposits in Arizona, 19 in California, 2 in Nevada, and 14 in Mexico within the Mojave-Sonora Desert block, plotted on $1^0 \times 2^0$ sheets.

From this review it is apparent that structure is the one underlying theme common to all the deposits (except placers) and even though the deposits can be divided into the simple host formation brackets, it is also apparent that the deposits are in a diverse age relation and major deposits are found in Precambrian through younger Tertiary age units.

Table 1 lists these properties and presents the past mined and indicated tonnage/grade, the total ounces of gold/silver, their location, county, and state. No property info was recorded for the Mexican deposits.

Table 2 ranks the properties by total expected production of gold/silver, the gold equivalent, and the present status of the property. Many properties are on "standby" and are either being drilled and studied or found to be of lower-grade than needed and are looking for higher grade reserves.

Table 3 lists the properties and gives the pertinent structure of the property and the geology and age of the hosting unit.

Using the above data, two maps were produced. Plate I plots the deposits and reports the total ounces of gold/silver in production and reserve. The Mexican deposits were only plotted as little reserve data is available.

Plate II is a metallogeny map showing the three styles of structure -- steep vein, flat detachment, or placer and host formation -- volcanic, intrusive, schist, or other. Data was available for the Mexican properties.

Table 4 lists the deposits by age of host unit from youngest to oldest. Some units were listed twice based on the known protolith of host, and also based on field description. The total tonnage/grade of the 41 US deposits listed is:

271.5 million tons at 0.067 opt Au = 18,153,000 oz. Au
119.1 million tons at 1.91 opt Ag = 227,888,000 oz. Ag

Table 5 uses the above Table 4, and tabulates the gold/silver production based on the rock type of the host unit. As noted, the Jurassic intrusives hosted the most gold (nearly 5 million ounces), with the younger Tertiary volcanics producing 4.8 million ounces followed by the Jurassic-Cretaceous "Rand-type" schists with 3.4 million ounces gold. Production of gold from other host units dropped to 1.5 million ounces or less. The silver production was dominated by the younger Tertiary volcanics at 147 million ounces of silver, followed by older Tertiary volcanics with 60 million ounces, and Mesozoic schist (?equal to Rand-type?) of 48 million ounces of silver, and Rand-type schists with 10 million ounces of silver.

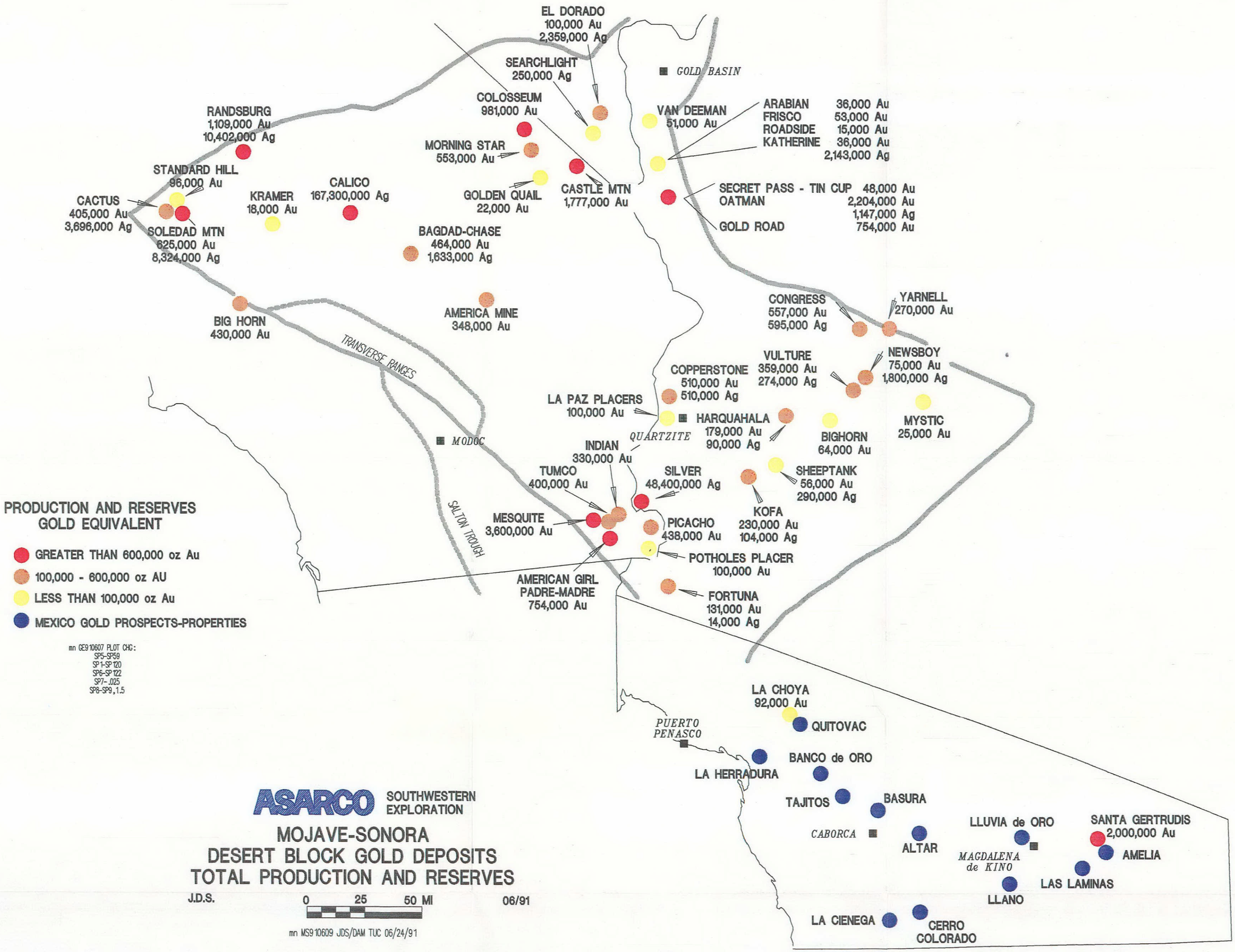
Thus a structurally prepared, schistose Jurassic intrusive in proximity to a structurally prepared younger Tertiary volcanic may host the type deposit with the total gold/silver for a large tonnage operation.

Similar setting is suggested for the Mexico deposits tabulated and shown on Plates I and II.

James D. Sell

JDS:mek
Att.

Plate I



mn GE910607 PLOT CHG:
SP5-SP59
SP1-SP120
SP6-SP122
SP7-.025
SP8-SP9,1.5

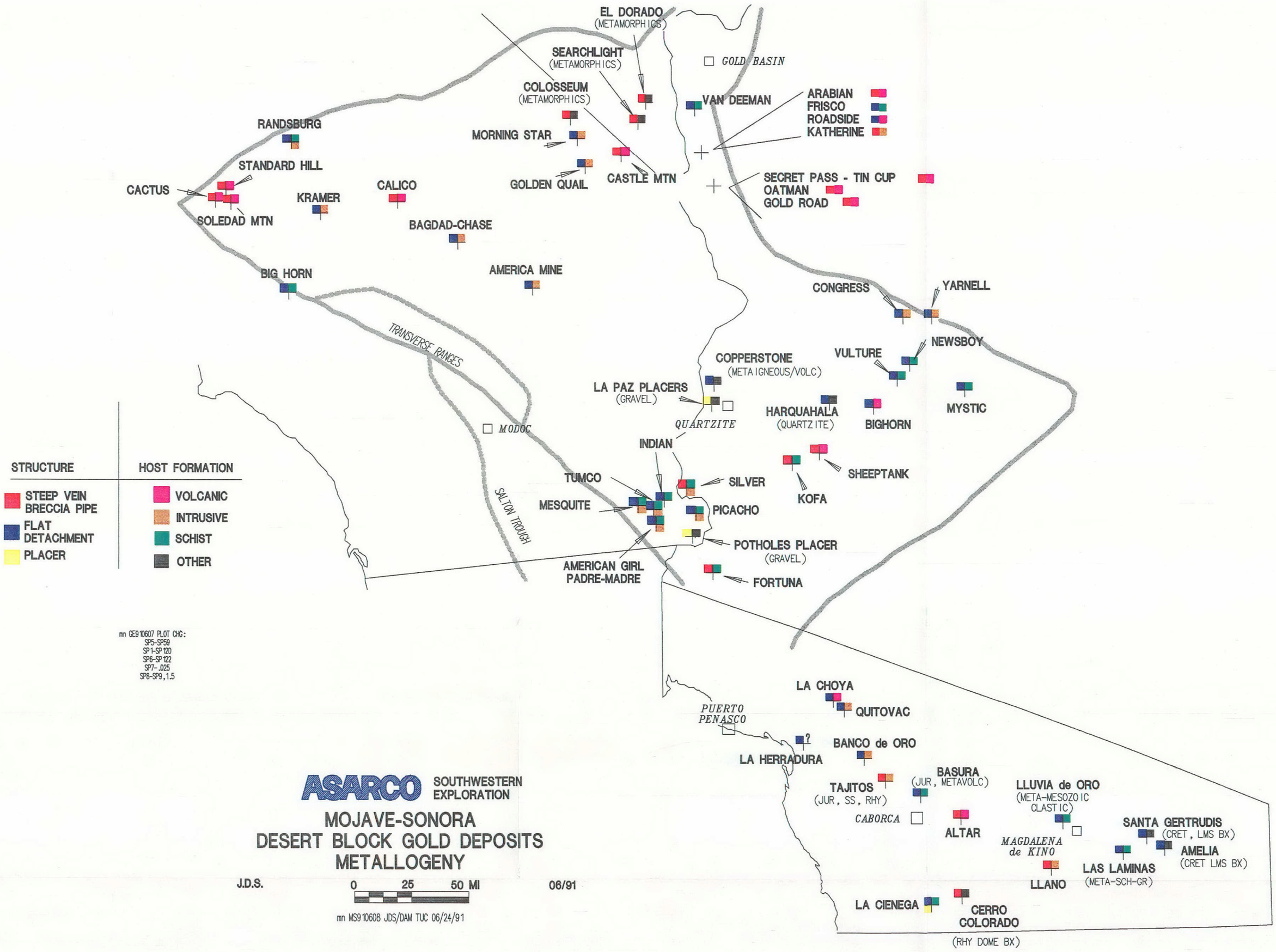
ASARCO SOUTHWESTERN EXPLORATION

MOJAVE-SONORA
DESERT BLOCK GOLD DEPOSITS
TOTAL PRODUCTION AND RESERVES

J.D.S. 0 25 50 MI 06/91

mn MS910609 JDS/DAM TUC 06/24/91

Plate II



mn GE910607 PLOT CHG:
SP5-SP59
SP1-SP120
SP6-SP122
SP7-.025
SP8-SP9,1.5

Table 1. Property Information.

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
America	0.34 mill. at 0.059 Au mined 5.0 mill. at 0.066 Au indic.	20 328 = 348	– –	Sec. 19, T 4N, R 12E (Note: Verbal 5/91, Nerco's drilling may have cut "mining" reserve in half)	San Bernardino	CA
Arabian	0.8 mill at 0.045 Au indic.	36	–	Sec. 20, T 21N, R 20W	Mohave	AZ
Bagdad-Chase	0.4 mill. at 0.33 Au + 1.5 Ag mined 2.1 mill. at 0.16 Au + 0.5 Ag indic	128 336 = 464	583 1,050 = 1,633	Sec. 8, T 6N, R 8E	San Bernardino	CA
Big Horn, CA	0.04 mill. at 0.12 Au mined 1.5 mill. at 0.29 Au indic.	5 430 = 435	– –	Sec. 7 & 8, T 3N, R 8 W	Los Angeles	CA
Bighorn, AZ	0.28 mill. at 0.032 Au mined 1.01 mill at 0.055 Au indic	9 55 = 64	– –	Sec. 6, T 4N, R 7W Sec. 1, T 4N, R 8W	Maricopa	AZ
Cactus	8.8 mill. at 0.046 Au + 0.42 Ag mind	405	3,696	Sec. 16-17, T 10N, R 13W	Kern	CA
Calico	0.5 mill at 7.0 Ag mined 49.0 mill at 2.7 Ag indic.	– –	3,500 132,300	Sec. 16, 17, 21, T 10N, R 1E	San Bernardino	CA
Castle	24.6 mill at 0.047 Au reserve 13.5 mill. at 0.046 Au indic.	1,156 621 = 1,777	– –	Sec. 13, 24, T 14N, R 17E	San Bernardino	CA
Colosseum	7.6 mill at 0.081 Au mined 9.6 mill at 0.038 Au indic.	616 365 = 981	– –	Sec. 10, T 17N, R 13E	San Bernardino	CA

Table 1. Property Information. Continued

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Congress	0.99 Mill at 0.48 Au + 0.52 Ag mined 0.43 Mill at 0.29 Au + 0.3 Ag indic.	432 125 = 557	444 129 = 595	Sec. 23, T10N, R6W	Yavapai	AZ
Copperstone	6.0 Mill at 0.085 Au + 0.005 Ag mined	510	510	Sec 11, 14, T6N, R20W	La Paz	AZ
El Dorado	0.58 Mill at 0.17 Au + 4.06 Ag mined	100	2,359	Sec 2, 3, T26S, R64E	Clark	NV
Fortuna	0.15 Mill at 0.86 Au + 0.09 Ag mined	131	14	Sec. 20, 21, T10S, R20W	Yuma	AZ
Fresco	0.5 Mill at 0.058 Au mined 0.43 Mill at 0.055 Au indic.	29 24 = 53	— —	Sec. 9, T21N, R20W	Mohave	AZ
Golden Quail	0.44 Mill at 0.051 Au indic.	22	—	Sec 7, 18, T13N, R16E	San Bernardino	CA
Gold Road	1.7 Mill. at 0.34 Au mined 0.8 Mill at 0.22 Au indic.	578 176 = 754	— —	Sec. 11, T19N, R20W	Mohave	AZ
Harquahala	0.16 Mill at 0.90 Au + 0.57 Ag mined 0.4 Mill at 0.09 Au indic.	143 36 = 179	90 —	Sec. 22, 27, T4N, R13W	La Paz	AZ
Indian Rose / Ocotillo	IR 5.2 Mill at 0.023 Au indic OC 7.5 Mill at 0.028 Au indic	120 210 = 330	— —	Sec. 31, T13S, R21E Sec. 5, T14S, R21E	Imperial Imperial	CA CA
Katherine	0.14 Mill at 0.25 Au + 15.0 Ag mined	36	2,143	Sec. 5, T21N, R21W	Mohave	AZ

Table 1. Property Information. Continued

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Kofa	0.8 Mill at 0.29 Au + 0.13 Ag mined	227	5	Sec. 12, T 25, R 17 W	Yuma	AZ
Kramer Hills	0.5 Mill at 0.036 Au mined	18	–	Sec. 35, 36, T 10 N, R 4 W	San Bernardino	CA
La Paz	Placer mined	100	–	Sec. 25, 24, 33, 34, T 4 N, R 21 W	La Paz	AZ
Mesquite	90.0 Mill at 0.040 Au mining	3,600	–	Sec. 4, 5, 9, T 13 S, R 19 E	Imperial	CA
Morning Star	8.5 Mill at 0.065 Au mining	553	–	Sec. 28, T 15 N, R 14 E	San Bernardino	CA
Mystic	0.06 Mill at 0.42 Au mining	25	–	Sec 11, 12, T 5 N, R 1 W	Maricopa	AZ
Newsboy	N. Zone 2.0 Mill - Subeconomic indic	–	–	Sec. 22, T 6 N, R 4 W	Maricopa	AZ
	S. Zone 1.5 Mill at 0.05 Au + 1.2 Ag indic	75	1,800			
Oatman	4.1 Mill at 0.54 Au + 2.8 Ag mined	2,204	1,147	Sec 10, 15, T 19 N, R 20 W	Mohave	AZ
Padre-Madre, American Girl, Cross Zone	7.8 Mill at 0.058 Au open pit mining	452	–	Sec. 17, 18, 19, T 15 S, R 21 E	Imperial	CA
	1.3 Mill at 0.233 Au UG mining	302 = 754	–			
Picacho	6.4 Mill at 0.036 Au mined	231	–	Sec. 10, T 14 S, R 22 E	Imperial	CA
	5.6 Mill at 0.037 Au mining	207 = 438	–			
Potholes	Placer	100	–	Sec. 24, 25, T 15 S, R 23 E	Imperial	CA

Table 1. Property Information. Continued

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Randsburg	3.65 mill at 0.16 Au + 2.78 Ag mined 17.9 mill at 0.029 Au + 0.015 Ag indic	598 511 = 1,109	10,133 269 = 10,402	Sec. 1,2,11,12, T 30S, R 40E	Kern	CA
Roadside	0.03 mill at 0.3 Au mined 0.20 mill at 0.03 Au indic	9 6 = 15	— —	Sec. 12, T 21N, R 21W	Mohave	AZ
Searchlight	0.5 mill at 0.5 Ag mined	—	250	Sec. 35, T 28S, R 63E Sec. 1, 2, 3, T 29S, R 63E	Clark Clark	NV NV
Secret Pass / Tin Cup	SP 0.17 mill at 0.053 Au indic TC 0.55 mill at 0.07 Au indic	9 39 = 48	— —	SP Sec. 2, T 20N, R 19W TC Sec. 12, T 20N, R 19W	Mohave Mohave	AZ AZ
Sheeptanks	0.02 mill at 1.24 Au + 2.35 Ag mined 0.15 mill at 0.22 Au + 1.72 Ag indic	21 32 = 53	40 250 = 290	Sec. 1, T 15, R 15W	Yuma	AZ
Silver	1.03 mill at 6.2 Ag mined 7.58 mill at 5.5 Ag indic	— —	6,300 42,000	Sec. 29, 30, T 3S, R 23W Sec 2, 11, T 4S, R 23W	La Paz La Paz	AZ AZ
Soledad	1.0 mill at 0.23 Au + 2.5 Ag mined 10.4 mill at 0.037 Au + 0.56 Ag mining	230 385 = 615	2,500 5,824	Sec. 18, T 10N, R 12W	Kern	CA
Standard Hill	1.2 mill at 0.08 Au mined	96	—	Sec. 32, T 11N, R 12W	Kern	CA
Tumco	1.0 mill at 0.34 Au mined 0.75 mill at 0.08 Au indic.	340 60 = 400	— —	Sec 1, 12, T 15S, R 20E	Imperial	CA

Table 1. Property Information.

Name	Tons / Grade Mined / Reserve	oz Au x 1000	oz Ag x 1000	Location	County	State
Van Deeman	1.5 Mill at 0.034 Au indic.	51	–	Sec. 29, T 27 N, R 21 W	Mohave	AZ
Vulture	1.0 mill at 0.34 Au + 0.26 Ag mined 0.2 mill at 0.08 + 0.07 Ag indic	340 19 = 359	260 14 = 274	Sec. 34, T 6 N, R 6 W	Maricopa	AZ
Yarnell	0.2 Mill at 0.25 Au mined 4.0 Mill at 0.055 Au indic.	50 220 = 270	– –	Sec. 14, T 10 N, R 5 W	Yavapai	AZ
Mexico Properties (Non-Ranked)						
Altar						
Aurelia						
Barreo de Oro						
Basura						
Cerro Colorado						
La Choya	2.1 mill at 0.044 Au indicated	92				
La Ciénega						
La Herradura						
Las Lamias						
Llano						
Luvia de Oro						
Quitovac	PA sap & mill @ 0.07 Au	560				
Santa Gertrudis	+ 40 Mill at 0.05 Au reported	2,000				
Tejitos						

Table 2. Property Ranking by Production

Name, State	oz Au x1000	oz Ag x1000	Au eq x1000*	Status
Calico, CA	—	136,000	6,800	Standby
Mesquite, CA	3,600	—	3,600	Producer
Silver, AZ	—	48,400	2,415	Standby
Oatman, AZ	2,204	1,147	2,261	Mined
Castle, CA	1,777	—	1,777	feasibility
Randsburg, CA	1,109	10,402	1,629	Producer
Soledad, CA	625	8,324	1,031	Producer
Colosseum, CA	981	—	981	Standby
Padre-Madre, etc, CA	754	—	754	Producer
Gold Road, AZ	754	—	754	Mined
Cactus, CA	405	3,696	590	Producer
Congress, AZ	557	595	587	Producer
Morning Star, CA	553	—	553	Producer
Bagdad-Chase, CA	484	1,633	546	Standby
Copperstone, AZ	510	510	537	Producer
Picacho, CA	438	—	438	Producer
Big Horn, CA	430	—	430	Standby
Tumco, CA	400	—	400	Standby
Vulture, AZ	359	274	373	Mined
America, CA	348	—	348	Standby
Indian Rose-OC, CA	330	—	330	Standby
Kofa, AZ	230	104	235	Mined
El Dorado, NV	100	2,359	218	Mined
Harquahala, AZ	179	90	184	Standby
Newsboy, AZ	75	1,800	165	Standby

Table 2 Continued

Name, State	oz Au x1000	oz Ag x1000	Au eq x1000*	Status
Kalhorne, AZ	36	2,143	142	mined
Fortuna, AZ	131	14	132	mined
La Paz Placer, AZ	100	–	100	mined
Potholes Placer, CA	100	–	100	mined
Standard Hill, CA	94	–	94	mined
Sheeptanks, AZ	56	290	68	mined
Bighorn, AZ	44	–	44	producer
Frisco, AZ	53	–	53	Standby
Van Deeman	51	–	51	Standby
Secret Pass-TC, AZ	48	–	48	Standby
Arabian, AZ	34	–	34	Standby
Mystic, AZ	25	–	25	Producer
Golden Quail, CA	22	–	22	Standby
Kramer, CA	18	–	18	mined
Roadside, AZ	15	–	15	mined
Searchlight, NV	–	250	13	mined
Mexican Properties (not ranked)				
Altar				
Amelia				
Banco de Oro				
Basura				
Cerro Colorado				
La Choya				

Table 2. Continued

Name, State	oz Au x1000	oz Ag x1000	Au eq* x1000	Status
La Ciénega				
La Herradura				
Las Laminas				
Llano				
Lovia de Oro				
Quitovac				
Santa Gertrudis	2,000	—	2,000	
Tajitos				

* Au equivalent = $\frac{\text{oz Au} \times 20 \text{ (silver)}}{44.00 \text{ (gold)}}$ = Au eq.

Table 3. Property – Structure/Geology

Name	Structure	Geology
America	low-angled detachment & bx with hi angled lystric	Jurassic granodiorite, intrusive sill
Arabian	high-angled vein	Tertiary volcanics contact with pt schist
Bagdad-Chase	low angled detachment bx with hi angled lystric	Schist of Tertiary intrusive granodiorite
Big Horn, CA	low angled detachment bx	Schist, "Rand", Jur-Cretac.
Bighorn, AZ	low angled detachment bx with hi angled lystric	Tert. volc over Tert granite-schist
Cactus	high angled veins + bx and tuff bed dissem.	Tertiary volc, tuff
Calico	Sem-sedimentary, veining in volcanic tuff, agate	Tert. volcanoclastic
Castle	hi angled veins & tuff dissem under rhyolite sills	Tert. rhyolite tree dome complex
Colosseum	steep bx-pipe development	Pt metamorphics in FW of regional thrust

Table 3 - Continued

Name	Structure	Geology
Congress	moderate dipping vein	pЄ granite
Copperstone	moderate dipping leptric going into deep detachm.	Jurassic metavolcanic
El Dorado	steep veins	metamorphic complex, pЄ,
Fortuna	steep veins w/ pipe develop	Mesoz. schists
Frisco	low angled detachment	pЄ meta schists under Tert volc.
Golden Quail	low angled detachment	Cretaceous granite
Gold Road	hi angled vein, bx	Tertiary volcanic
Harquahala	low angled shears cut by high angled veins	quartzite
Indian Rose - Ocotillo	low angled detachment with leptric	schist, Jurassic
Katherine	high angled veins	pЄ granite
Kofa	steep veins, bx	schist, mesozoic

Table 3. Continued

Name	Structure	Geology
Kramer Hills	low angled detachment w/ leptite-high angled flt	Cret. granite FW, with Mesozoic metamorphic HW
La Paz placer	gravels	Tertiary
Mesquite	hi angled flts in detachment terrane	Jurassic metavolcanics + metaschists
Morning Star	moderate angle faults, leptites, HW bx.	Jurassic granite
Mystic	low angled detachment	schist
Newsboy	low angled detachment w/ leptites	granite FW, schist, sheared gr-volc HW.
Oatman	hi angled veins + stockwork	Tertiary volcanics
Padre-Madre, etc	low angled detachment w/ leptite interface	Schist, Jurassic med-grained biotite diorite HW, coarse grained granite FW
Picacho	low angled detachment, bx pipe, hi angled leptite	schist, intrusive origin; Tert vol HW.

Table 3 Continued

Name	Structure	Geology
Potholes	Placer, gravels	Tertiary
Randsburg	low angled detachment, lyptic, stockwork HW bx	Schist ("Rand") of JK, and Ki granite/granodiorite.
Roadside	low angled detachment with lyptics, bx	pЄ granite FW/Tert volc. HW.
Searchlight	hi-angled veins prob lyptic into detach.	pЄ metamorphics.
Secret Pass-TC	high angled veins in detachment terrane	Tertiary volc.
Sheeplanks	Steep veins, bx	Tertiary volc.
Silver	hi angled veins, bx, prob lyptic into detach.	Schist of mesozoic seds - Jur. intrusive under Tertiary volc.
Soledad	hi angled veins & stockwork	Tert. volc & tuffs & intrus.
Standard Hill	hi angled veins & stockwork	Tert volc, intrusive, tuff

Table 3 Continued

Name	Structure	Geology
Tenco	low angled detachment	Schist, foliated granodiorite metacarbonates (Jurassic)
Van Deaman	low angled detachment	schist
Vulture	low angled vein-bx	Cret. gr. sill nose intruding pt schist
Yarnell	low angled thrust-detach	pt granite
Mexican Properties		
Altar	thin-discont veins, steep	
Amelia	folded Cret limestone, silty, cut by hi angle faults, veins, bx	Cret. limestones.
Banco de Oro	steep lystric qtz-bx veins (mined) going downward into 2-meter low angled qtz veins 0.5-2.5 meters	Jurassic SS, rhy porphyry in FW, Cret. gr in HW

Table 3. Continued

Name	Structure	Geology
Basura	Steep veins in & over thrust (flat fault) slices, each 5-8 meters wide, local gold values.	Jurassic metaschist of sedimentary & meta felsic units.
Cerro Colorado	Rhy dome w/ bx borders & steep veins. Possibly 100,000 tons mined	Tert. rhyolite dome complex.
La Choya	Steep angled veins, bx, in sheared detachment terrane	Mesoz schists, silic volcanics, tuffs
La Ciénega	Placer in wells bedrock of thin irregular low angled veins (detachment terrane.	Gneiss of pc andesite rhyolite, meta mafics silic units in FW, pc quartzites limestones HW.
La Herradura	low angled shears	
Las Lamenas	low angled structures	schist-gneiss, metamorphic complex.
Llano	steep qtz-tourmaline veins (15 grams), 60 meters deep, low angle shear, [illegible]	pc granite

Table 3 Continued

Name	Structure	Geology
Lluvia de Oro	flat vein 1-3 meters, 1 gm gold in shear zones of granite sill intra beds	Schist of Mesozoic meta lms-SS in close spaced thrust shear zones with granite sills.
Quitovac	low angled shears	Jurassic volcanoclastics FW with granite, phyllite, rhy porphyry in HW.
Santa Gertrudis (PD's - said to have + 40 mill tons at 0.05 oz	Folded Cret silty lmst w/massive limestone, cut by hi angle flts, vns, bx along contacts & bedding in silty + cont with massive.	Cretaceous limestone
Tejitos	steep angled veins + bx. Look for detachment terrane	Jurassic SS-rhyolite porphyry

Table 4 - Tabulation by Age, youngest to oldest, Host Unit.*

Tertiary Volcanic, younger

Calico 49.5 mill at 2.74 Ag
Castle 38.1 mill at 0.047 Au
Arabian 0.8 mill at 0.045 Au
Tri Cup 0.2 mill at 0.066 Au
Oatman 4.1 mill at 0.54 Au + 2.8 Ag
Gold Road 2.5 mill at 0.30 Au
Au = 46.2 mill at 0.10 Au = 4,837,000 oz Au
Ag = 53.6 mill at 2.74 Ag = 147,110,000 oz Ag

Tertiary Volcanic, older

Cactus 8.8 mill at 0.046 Au + 0.42 Ag
Standard 1.2 mill at 0.08 Au
Soledad 11.4 mill at 0.054 Au + 0.73 Ag
Silver (JKS)* 8.6 mill at 5.58 Ag
Au = 21.4 mill at 0.052 Au = 1,116,000 oz Au
Ag = 28.8 mill at 2.08 Ag = 60,000,000 oz Ag

Tertiary Intrusive

Bagdad 2.5 mill at 0.19 Au + 0.66 Ag
Bisbee, AZ 1.9 mill at 0.05 Au
Au = 3.79 mill at 0.14 Au = 540,000 oz Au
Ag = 2.5 mill at 0.66 Ag = 1,633,000 oz Ag

Table 4 - Continued

Cretaceous Intrusive

Kramer	0.5 mill at 0.036 Au
Golden Quail	0.44 Mill at 0.051 Au
Vulture	1.2 mill at 0.30 Au + 0.23 Ag
Padre-Madre (JKs)*	9.1 mill at 0.083 Au
Tumco (JKs)*	1.75 Mill at 0.23 Au

Au = 13.0 mill at 0.12 Au = 1,558,000 oz Au

Ag = 1.2 mill at 0.23 Ag = 274,000 oz Ag

Jurassic Intrusive/volcanoclastic (vc)

American	5.34 mill at 0.062 Au
Morning Star	8.5 mill at 0.065 Au
Copper Stone (vc)	6.0 mill at 0.085 Au + 0.085 Ag
Mesquite (vc)	90.0 mill at 0.040 Au

Au = 109.8 mill at 0.045 Au = 4,993,000 oz Au

Ag = 6.0 mill at 0.085 Ag = 510,000 oz Ag

Jurassic-Cretaceous Schist, JKs, "Rand-Orocopia, etc".

Randsburg	21.55 mill at 0.05 Au + 0.48 Ag
Big Horn, CA	1.54 mill at 0.29 Au
Padre-Madre	9.1 Mill at 0.083 Au
Indian Rose	12.7 Mill at 0.026 Au
Tumco	1.75 Mill at 0.023 Au
Picacho (MzSch)*	12.0 mill at 0.036 Au

Au = 58.6 mill at 0.059 Au = 3,444,000 oz Au

Ag = 21.55 mill at 0.48 Ag = 10,402,000 oz Ag

Table 4 - Continued

Mesozoic Schist (maybe ≅ to JKs "Round etc"

Kofa	0.8 mill at 0.29 Au + 0.13 Ag
Silver (JKs)*	8.61 mill at 5.58 Ag
Picacho (JKs)*	12.0 mill at 0.036 Au
Fortuna	0.15 mill at 0.86 Au + 0.09 Ag

Au = 13.0 mill at 0.061 Au = 793,000 oz Au

Ag = 9.4 mill at 5.0 Ag = 48,160,000 oz Ag

Paleozoic Sediment

Harquahala	0.56 mill at 0.32 Au = 179,000 oz Au

Precambrian Intrusive.

Roadside	0.23 mill at 0.065 Au
Katherine	0.14 mill at 0.25 Au + 15.0 Ag
Yarnell	4.2 mill at 0.064 Au
Congress	1.42 mill at 0.42 Au + 0.45 Ag
Picacho (JKs)*	12.0 mill at 0.036 Au

Au = 13.0 mill at 0.10 Au = 1,347,000 oz Au

Ag = 1.6 mill at 1.71 Ag = 2,739,000 oz Ag

Table 4 - Continued

Precambrian Metamorphics

Colosseum 17.2 mill at 0.057 Au
El Dorado 0.58 mill at 0.17 Au + 4.06 Ag
Searchlight 0.5 mill at 0.5 Ag
Au = 17.8 mill at 0.06 Au = 1,079,000 oz Au
Ag = 1.08 mill at 2.4 Ag = 2,605,000 oz Ag

Precambrian Schist (Yavapai - Pinal)

Van Deerman 1.5 mill at 0.034 Au
Fresno 0.93 mill at 0.057 Au
Newsboy 1.5 mill at 0.05 Au + 1.2 Ag
Mystic 0.06 mill at 0.42 Au
Au = 4.0 mill at 0.05 Au = 204,000 oz Au
Ag = 1.5 mill at 1.2 Ag = 1,800,000 oz Ag

* Note: Deposit may be listed twice under separate host formations, based on known protolith.

Total: (Deposit used only one time)

Au = 271.5 mill tons at 0.067 Au = 18,153,000 oz Au
Ag = 119.1 mill tons at 1.91 Ag = 227,888,000 oz Ag

Table 5. Tabulation by Rock Type; Gold/Silver Production

5-A GOLD, rounded tons.

Intrusive	tons/grade		oz gold
Jurassic	110 mill at 0.045	=	4,993,000
Cretaceous	13 mill at 0.12	=	1,558,000
Precambrian	13 mill at 0.10	=	1,347,000
Tertiary	~~4 mill at 0.14~~	~~=~~	~~540,000~~
	~~146 mill at 0.06~~	~~=~~	~~8,438,000~~

Volcanics			
Tertiary, younger	46 mill at 0.10	=	4,837,000
Tertiary, older	21 mill at 0.05	=	1,116,000

Schist			
JK Rand-type	59 mill at 0.06	=	3,440,000
Mz ? JK Rand ?	13 mill at 0.06		793,000
Precambrian	4 mill at 0.05		204,000

Metamorphic, Precambrian	18 mill at 0.06	1,079,000
Sediment (quartzite), Paleozoic	0.6 mill at 0.32	179,000

5-B SILVER, rounded tons

Volcanics	tons/grade		oz silver
Tertiary, younger	54 mill at 2.74	=	147,110,000
Tertiary, older	29 mill at 2.08	=	60,000,000

Table 5. Continued

Schist

Mz ? JK Rand?	10 mill at 5.00	=	48,160,000
JK Rand-Type	22 mill at 0.48	=	10,402,000

Intrusive

Precambrian	2 mill at 1.71	=	2,739,000
Tertiary	3 mill at 0.44	=	1,633,000
Jurassic	6 mill at 0.085	=	510,000
Cretaceous	1 mill at 0.23	=	274,000

Metamorphic Precambrian 1 mill. @ 2.40 = 2,405,000

JDS

GeoSpectra CORPORATION

CONSULTING/DATA PROCESSING/IMAGE INTERPRETATION

July 1, 1991

James Sell
Manager
Southwestern Exploration Division
ASARCO Incorporated
1150 North 7th Avenue
P.O. Box 5747
Tuscon, Arizona 85703

Dear Mr. Sell:

Enclosed are 1:125,000 scale enlargements of the southwest quarter of the Yuma scene covering your Rainbow, Picacho Peak, and Cargo Muchacho areas of interest, as per price quotation in our letter to you dated January 16, 1991. We recommend that you take a closer look at the area within grid location C-2 (the middle of the northern half). In this area, there is an apparent circular concentration of clays and sulfates surrounded by iron oxides, approximately 500 meters in diameter.This area is somewhat similar to a larger circular concentration of clays and iron oxides just south of Picacho Peak, near known gold occurrences.

As soon as processing is done for the other northern quarter scene, those enlargements will be sent down to you.

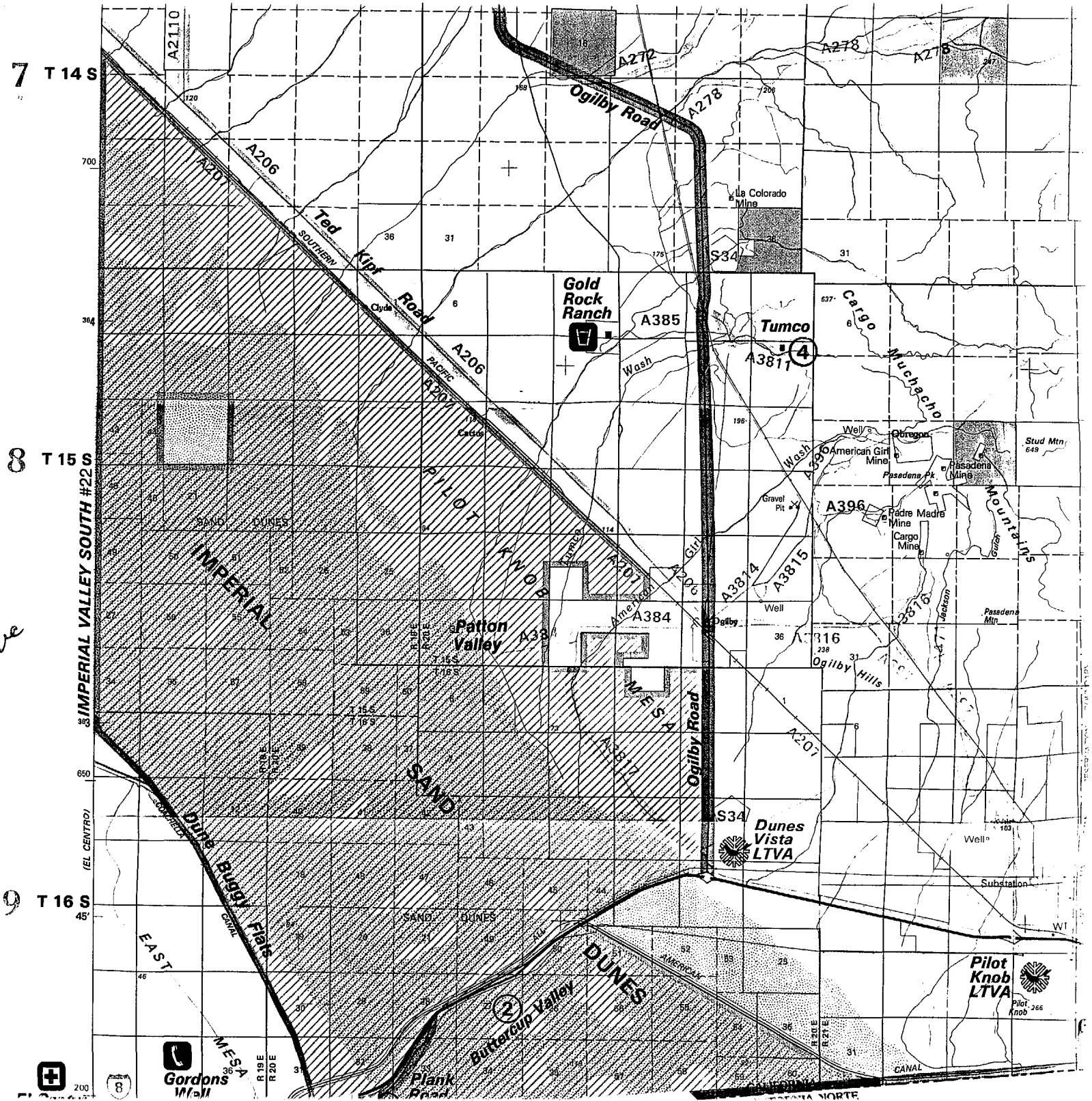
Let me know if you have any questions concerning the imagery.

Sincerely,

John Herman
Exploration Geophysicist

APPLIED REMOTE SENSING FOR COMMERCIAL AND MILITARY APPLICATIONS

GEOSPECTRA CORPORATION
P.O. Box 1387 • 333 Parkland Plaza • Ann Arbor, Michigan 48106-1387, U.S.A.
313/994-3450 • Telex: 467262 • Telecopier: 313/994-3373


7 T 14 S
8 T 15 S
9 T 16 S
IMPERIAL VALLEY SOUTH #22
(EL CENTRO)
Ogilby Road
Ted Kipf Road
SOUTHERN PACIFIC
Clyde
Cactus
Gold Rock Ranch
Tumco
La Colorado Mine
Cargo Muchacho Mountains
American Girl Mine
Pasadena Mine
Pasadena Pk.
Padre Madre Mine
Cargo Mine
Stud Mtn
Gravel Pit
Well
Obregon
Ogilby
Ogilby Hills
Jackson
Pasadena Mtn
Patton Valley
PILOT KNOB MESA
IMPERIAL SAND DUNES
Dune Buggy Flats
EAST MESA
Buttercup Valley
Plank Road
Gordons Well
Dunes Vista LTVA
Pilot Knob LTVA
Pilot Knob
Substation
SAND DUNES
CANAL
AMERICAN
A206
A207
A272
A278
A385
A3811
A3814
A3815
A3816
A3817
A384
A396
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R 20 E
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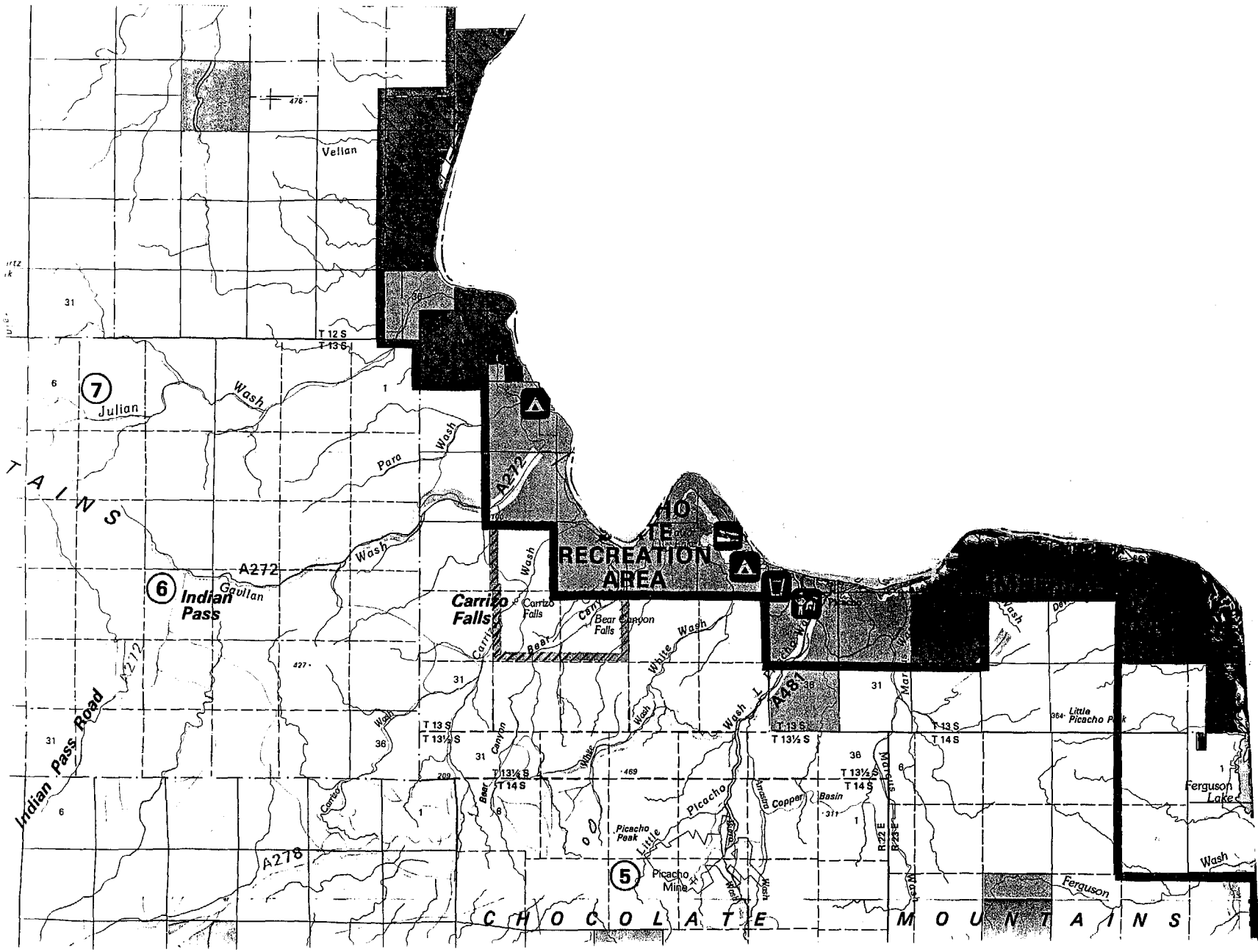
R 18 E
R 20 E
700
650
45'
200

78% value

78% reduction of 1:100,000 map