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Authorization for Moderate Sampling Program and Liability Release

MSM Enterprises, Inc., its employees and authorized representatives are hereby authorized by Jay E. Fuller to conduct a small sampling program on SL-4 unpatented placer claim located in La Paz County, Arizona. MSM further covenants and agrees to the following:

1. To indemnify the claim owners and lessees from any liability as a result of MSM operations on the subject mining property. This liability includes but is not limited to workmen's compensation, public liability, and taxes which may be assessed for any reason, or State and Federal regulations that may be applicable to MSM operations.

2. Results of your sampling program will be made available to Jay E. Fuller when compiled.

3. This Agreement expires thirty (30) days from date of execution below.

Signed this 19th day of Aug., 1986, by:

MSM Enterprises, Inc.

Jeffery N. Wallace
Exploration Manager
9401 E Myra Dr.
Tucson, Az 85730
(602) 296-4087

Jay E. Fuller

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Signed this _____day of _____, 1986, by:

MSM Enterprises, Inc.

_____
Jeffery N. Wallace
Exploration Manager

_____
Jay E. Fuller

MSM Enterprises, Inc.
1500 Kent Tower
100 West Clarendon
Phoenix, Arizona 85013
(602) 277-1666

DRY CONCENTRATOR

PRESENTATION

PROPERTY OF

MSM ENTERPRISES, INC.

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MSM ENTERPRISES, INC.

MSM DRY PROCESSING PLANT CHARACTERISTICS

I. High Recovery and Concentration Ratios

Greater than 90% recovery

Consistent recovery from 10 to 200+ mesh

Concentration ratio of 300:1 or better (post scalped)
- decreased handling costs
- decreased refining and recovery costs
- decreased transportation costs

II. Simple Process

Reliable and consistent
- constant recovery rates
- adjustment free

Easily operated by manual labor

Mobile processing plant
- plant moves from ore body to ore body
- transportable within site
- quick setup on site

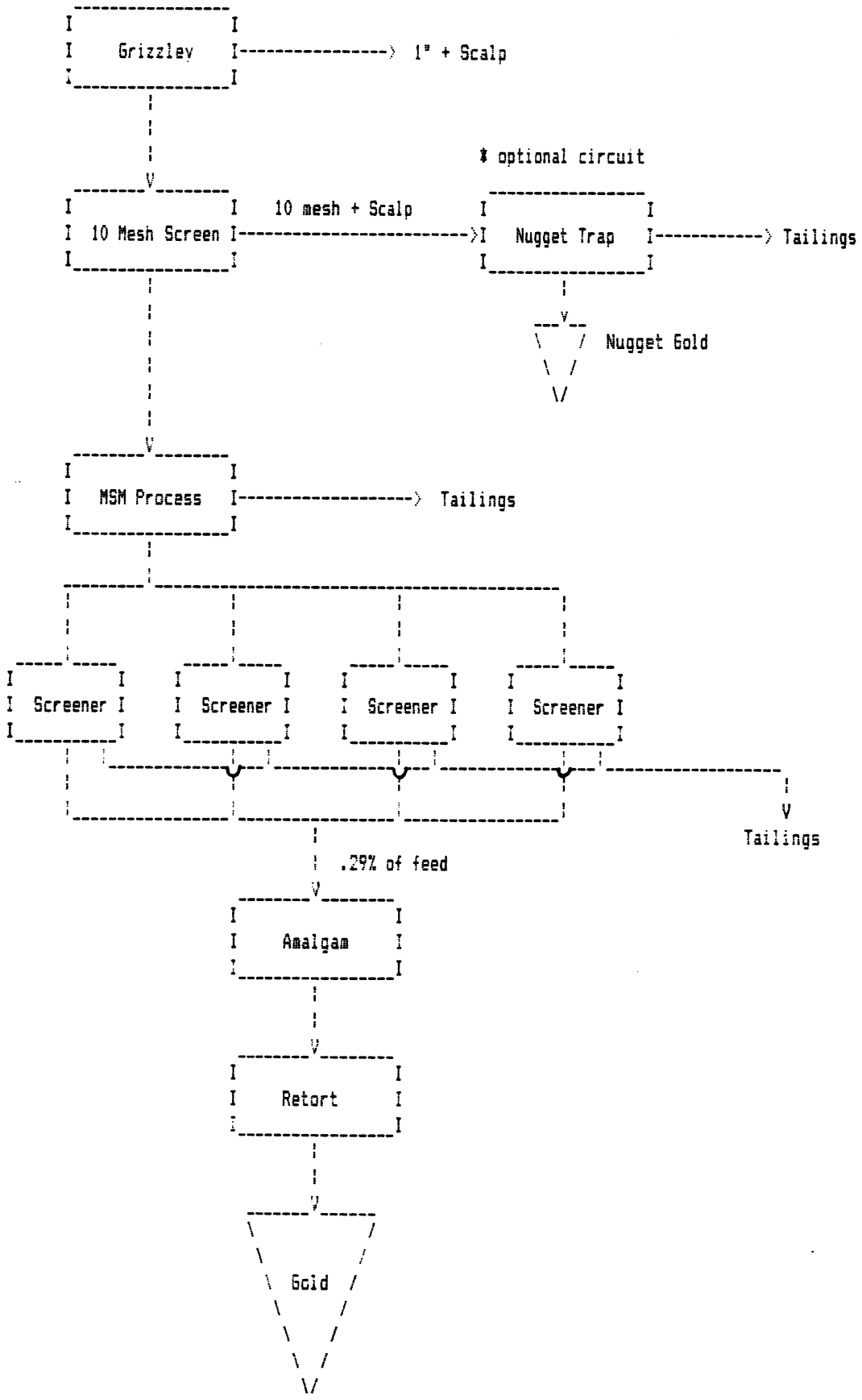
III. Lower Costs

Lower site development costs
- no settling ponds
- no wells
- no pumping stations
- no foundations for processing equipment
- lower exploration and engineering costs

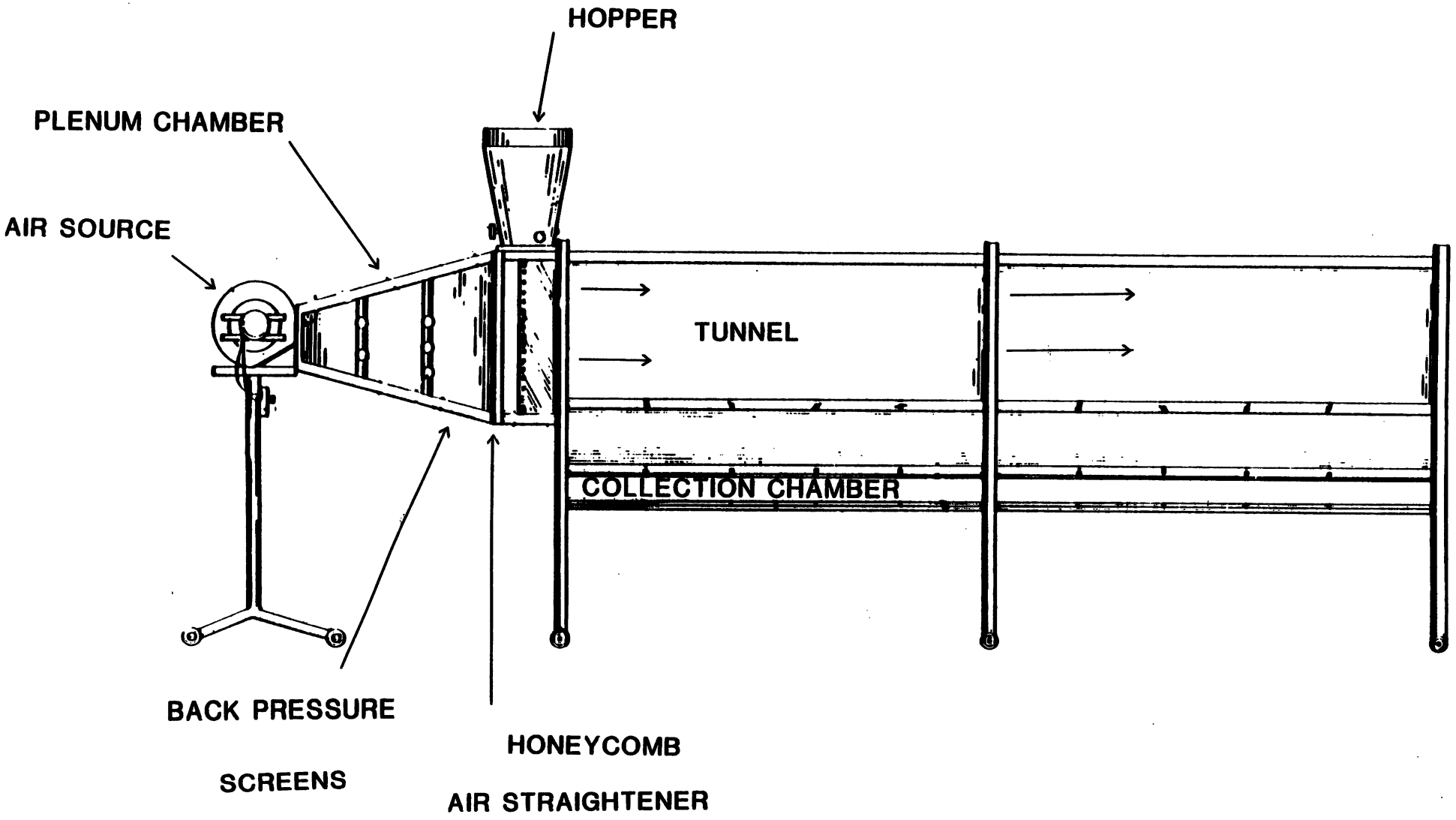
Lower capital costs
- less conveyance of head ore
- less conveyance of tailings
- less excavation equipment
- lower plant costs

Lower processing costs
- no downtime for cleanup; continuous process
- less power consumption (water, conveyance, etc.)
- less labor (one mill equipment operator and one laborer)
- less downtime for maintenance due to less equipment

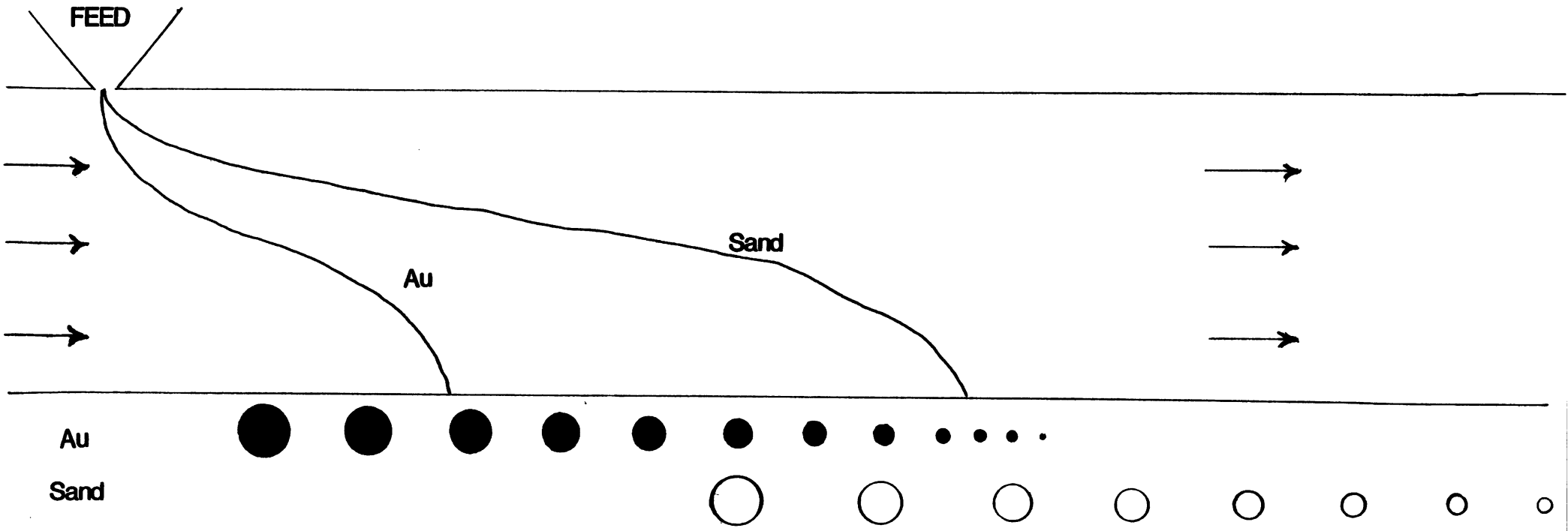
MSM DRY PROCESSING PLANT



MSM DRY CONCENTRATOR



PARTICLE FLOW



Mesh Size							
Au	10		25		50		
Sand			10		25		50

PARTICLE SIZE RECOVERY

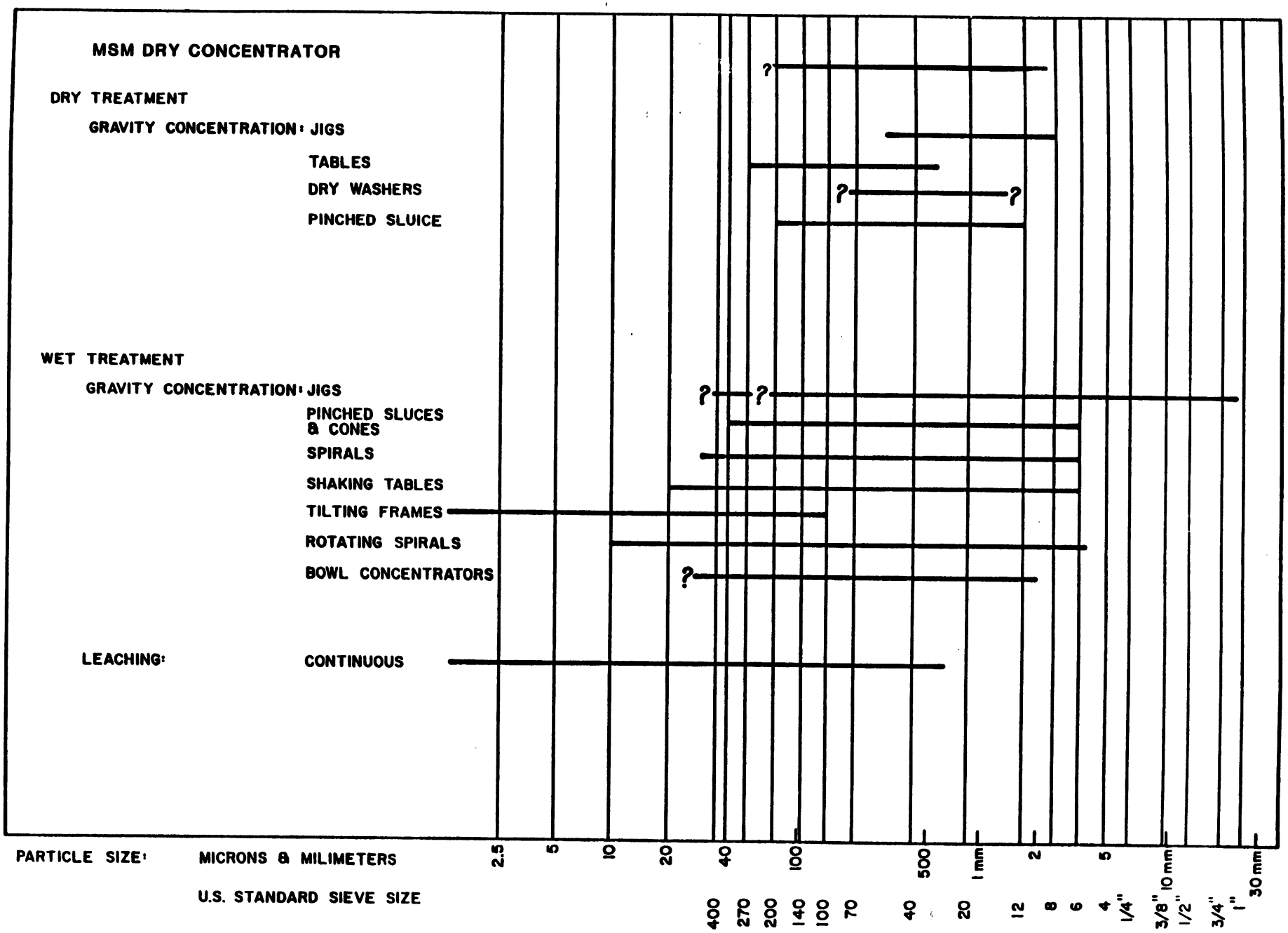
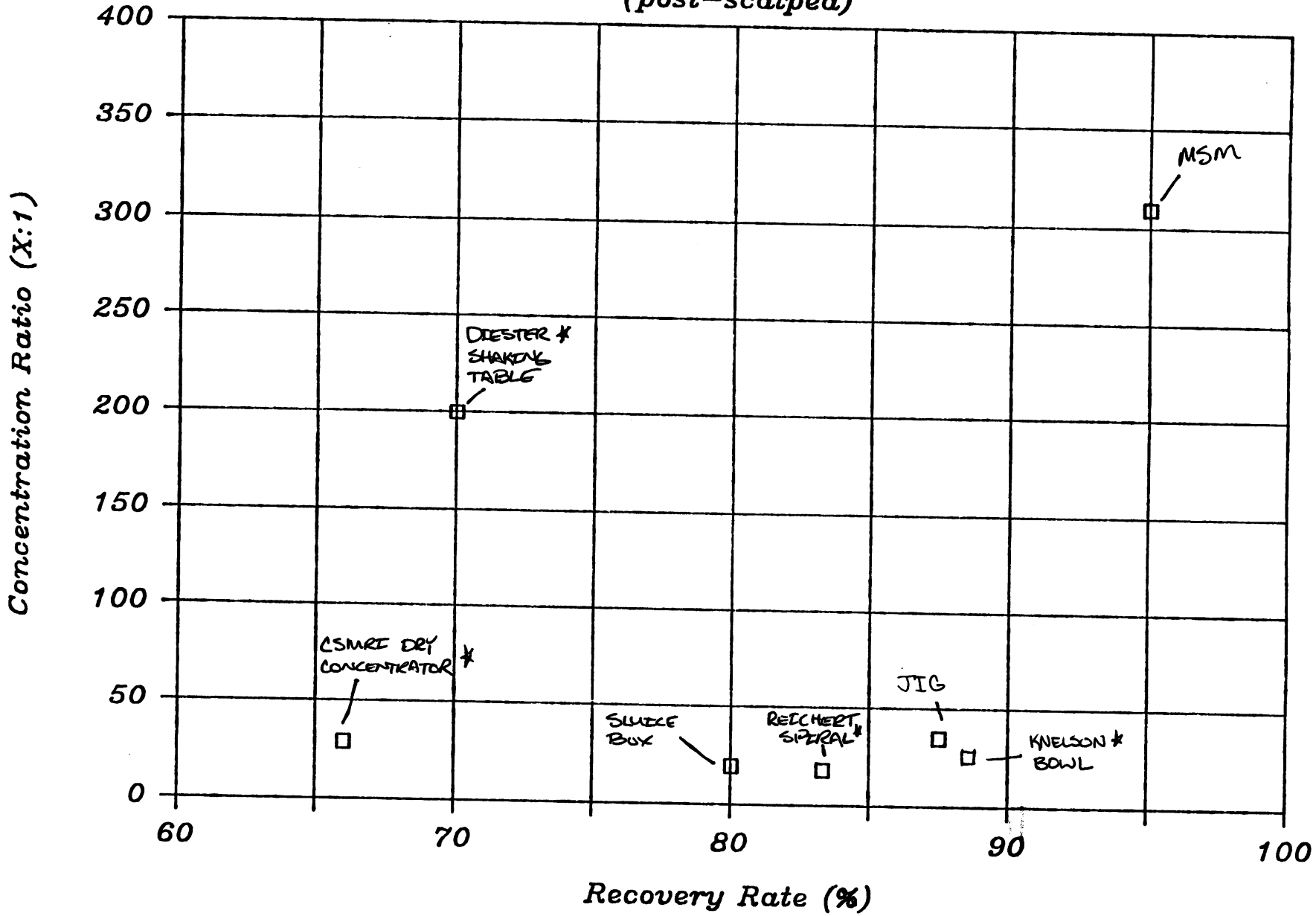


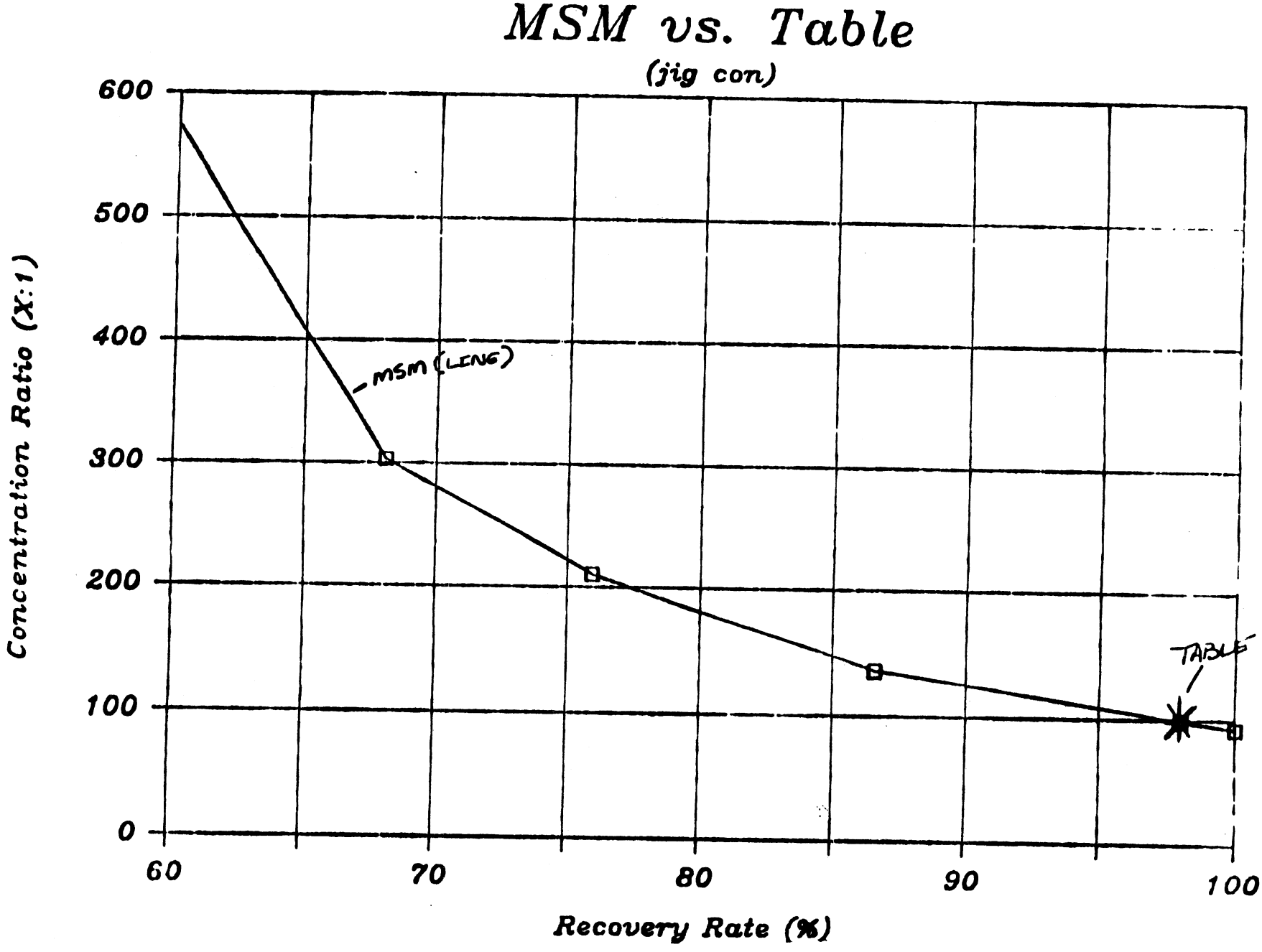
Table 1. Range of particle sizes effectively treated by various types of separation equipment. *Modified from Mildren, 1980.*

MSM vs. Competitors

(post-scalped)



* CSMRI Report



Analysis performed for Ivy Minerals under the supervision of Bill Vanderwall, Ivy's Operations Manager. Inquiries of the test may be referred to Mr. Vanderwall at (602) 763-1030.

Process Flow for Testing Runs
for the
MSM Dry Concentrator

I. Scalp (-3/8")

II. Classify (-25 mesh)

III. MSM Dry Concentrator (collected in 7 containers)

IV. Screen each Container (at 50 & 100 mesh for 3 batches per container - 21 total batches)

V. Combine Batches into 11 Samples

VI. Assay Samples

Prescott
5/02/86

Sample ft mark mesh size	Weight (lbs)	Au oz/ton	Tot Au oz*1000	% of Tot Au	Cummulative Recovery Ratio	Cummulative Concent. Ratio
02-06' (- 50 +100)	0.06	39.167	1.234	27.03%	27.03%	22698
00-04' (- 25 + 50)	0.68	7.182	2.442	53.51%	80.54%	1925
06-08' (- 50 +100)	0.96	0.826	0.396	8.69%	89.23%	840
04-06' (- 25 + 50)	4.41	0.221	0.487	10.68%	99.91%	234
00-06' (-100)	0.41	0.021	0.004	0.09%	100.00%	219
*06-17' (-100)	6.95	0.000	0.000	0.00%	100.00%	106
*08-10' (- 50 +100)	6.38	0.000	0.000	0.00%	100.00%	72
*17-19' (-100)	0.68	0.000	0.000	0.00%	100.00%	70
*10-19' (- 50 +100)	127.1	0.000	0.000	0.00%	100.00%	10
06-19' (- 25 + 50)	1033.2	0.000	0.000	0.00%	100.00%	1
00-02' (- 50 +100)	0.01	0.000	0.000	0.00%	100.00%	1
19- '	249.16	0.000	0.000	0.00%	100.00%	1
Total	1430	0.006	4.564	100.00%		

* - Trace amounts of gold were found in these samples which were considered negligible.

Quartzsite
5/13/86

Sample ft mark mesh size	Weight (lbs)	Au oz/ton	Tot Au oz*1000	% of Tot Au	Cummulative Recovery Ratio	Cummulative Concent. Ratio
02-06' (- 50 +100)	0.16	28.700	2.296	6.10%	6.10%	33688
00-04' (- 25 + 50)	2.75	22.650	31.144	82.74%	88.85%	1852
06-08' (- 50 +100)	0.49	4.257	1.043	2.77%	91.62%	1585
04-06' (- 25 + 50)	10.92	0.324	1.769	4.70%	96.32%	376
06-17' (-100)	10.56	0.260	1.373	3.65%	99.96%	217
00-02' (- 50 +100)	0.16	0.171	0.014	0.04%	100.00%	215
*06-19' (- 25 + 50)	2240.59	0.000	0.000	0.00%	100.00%	2
00-06' (-100)	0.75	0.000	0.000	0.00%	100.00%	2
08-10' (- 50 +100)	0.49	0.000	0.000	0.00%	100.00%	2
17-19' (-100)	4.58	0.000	0.000	0.00%	100.00%	2
10-19' (- 50 +100)	260.21	0.000	0.000	0.00%	100.00%	2
19- '	2858.34	0.000	0.000	0.00%	100.00%	1
Total	5390.00	0.014	37.638	100.00%		

* - Trace amounts of gold were found in these samples which were considered negligible.

Killgore
6/12/86

Sample ft mark mesh size	Weight (lbs)	Au oz/ton	Tot Au oz*1000	% of Tot Au	Cummulative Recovery Ratio	Cummulative Concent. Ratio
02-06' (- 50 +100)	0.01	14.650	0.073	3.75%	3.75%	154000
00-04' (- 25 + 50)	0.17	10.150	0.863	44.21%	47.96%	8556
06-08' (- 50 +100)	0.26	4.730	0.615	31.51%	79.47%	3500
17-19' (-100)	1.29	0.470	0.303	15.53%	95.01%	890
08-10' (- 50 +100)	0.34	0.137	0.023	1.19%	96.20%	744
00-02' (- 50 +100)	0.02	0.118	0.001	0.06%	96.26%	737
06-17' (-100)	6.63	0.022	0.073	3.74%	100.00%	177
00-06' (-100)	0.22	0.000	0.000	0.00%	100.00%	172
04-06' (- 25 + 50)	1.37	0.000	0.000	0.00%	100.00%	149
06-19' (- 25 + 50)	867.72	0.000	0.000	0.00%	100.00%	2
10-19' (- 50 +100)	73.84	0.000	0.000	0.00%	100.00%	2
19- '	588.13	0.000	0.000	0.00%	100.00%	1
Total	1540	0.003	1.951	100.00%		

VanderWall Jig Concentrate
5/29/86

Sample ft mark mesh size	Weight (lbs)	Au oz/ton	Tot Au oz*1000	% of Tot Au	Cummulative Recovery Ratio	Cummulative Concent. Ratio
00-02' (- 50 +100)	0.01	6.544	0.033	1.31%	1.31%	100000
06-17' (-100)	0.61	3.795	1.157	46.27%	47.57%	1613
00-06' (-100)	0.03	0.765	0.011	0.46%	48.03%	1538
02-06' (- 50 +100)	1.05	0.550	0.289	11.54%	59.58%	588
06-08' (- 50 +100)	1.6	0.266	0.213	8.51%	68.08%	303
08-10' (- 50 +100)	1.47	0.266	0.196	7.81%	75.90%	210
00-04' (- 25 + 50)	2.67	0.200	0.267	10.67%	86.57%	134
04-06' (- 25 + 50)	3.36	0.200	0.336	13.43%	100.00%	93
06-19' (- 25 + 50)	218.71	0.000	0.000	0.00%	100.00%	4
17-19' (-100)	1.42	0.000	0.000	0.00%	100.00%	4
10-19' (- 50 +100)	81.54	0.000	0.000	0.00%	100.00%	3
19- '	687.53	0.000	0.000	0.00%	100.00%	1
Total	1000.00	0.005	2.502	100.00%		

Notes on
MSM Dry Concentrator Worksheet

* - Samples are listed by decreasing assay values.

Sample - Each sample is identified by the distance traveled in the air stream and the particle size (U.S. Std. Sieve).

Weight - The weight is given in pounds and is the total weight of the sample.

Au oz/ton - Assays were taken from each sample collected in the concentrator. All assays were performed by Iron King Assays located in Humbolt, AZ.

Tot Au - The calculated weight of gold in each sample. This was calculated by multiplying the weight by the assay value.

% of Tot Au - The percentage of gold in the raw ore found in a sample.

Cummulative Recovery Ratio - The percentage of gold in the raw ore found in all samples having assay values greater than or equal to a sample.

Cummulative Concent. Ratio - The total weight of the raw ore divided by the weight of all samples having assay values greater than or equal to a sample.

EGH

LA PAZ MINING, INC. February 27, 1985
EXPLORATION PHASE I
GONZALES WASH, LA PAZ COUNTY

G.H.

The Phase I exploration program along Gonzales Wash in La Paz County, consisted of the following:

(a) Surveying for location of placer claim corners, for location of rotary drill sites, and for control lines of a geophysical survey.

(b) Drilling and sample collection from a total of 21 rotary holes on 5-foot sample intervals.

(c) Processing the 24.25 tons of samples in a Gold Screw and Gold Hound to produce a concentrate for amalgamation and subsequent determination of gold content.

The purpose of Phase I was to determine the placer gold occurrence with relation to bedrock, with relation to false bedrock caused by caliche layers in the overlying gravel horizon, and with relation to the Gonzales wash drainage.

The area involved in Phase I is covered by placer mining claims JV-1 through JV-5, and SL-9 through SL-13, comprising 710 acres.

Surveying

All the claim corners were reestablished for the claims involved in Phase I. A total of 12,000 feet of control lines were surveyed along lines 1 through 10. These lines were utilized for the geophysical survey and later as control for drill holes.

The surveying expense was $8,992.80, or $1,425 per line mile over 32,900 feet, to include locating the claim corners.

Geophysics

A geophysical survey was undertaken by Heinrichs Geoexploration Company of Tucson, Arizona. The purpose of the survey was to determine bedrock depths and confirm faulting and bedrock types. Three methods were used: Seismic Refraction, Gravity, and Magnetics.

In general, the magnetics, and to a certain extent, the gravity, did confirm the main faulting along Gonzales Wash and helped in locating the drill holes. The seismic survey did not give as accurate a plot on bedrock location as

hoped due to the interference of caliche layers. The magnetometer did not indicate any appreciable magnetic relief. No major magnetite concentrations were identified. Downstream along the Gonzales Wash drainage, a fine red sand that is non gold-bearing lies on top of bedrock. This sand contains abundant caliche layers intercalated throughout its thickness. This sandy material and its caliche layers were the main interference with the seismic readings.

The total cost of the survey was $13,996.19.

Drilling and Sample Collection

Venture Drilling Company drilled a total of 1,200 feet in 21 rotary drill holes. The drill holes were cased with 6-5/8" drill casing as the bit advanced. The cuttings were removed by compressed air, and the samples were collected from an air separator on five-foot intervals. The samples per foot of drilling should have weighed 42 lbs., and they averaged 39.48 lbs. per foot of drilling. However, they varied from 18.1 lbs. per foot to 73.8 lbs. per foot. The large variations from the norm occurred in the non gold-bearing sand where slight moisture became a problem in the sample recovery. Any further drilling should use water for the cuttings removed, with the cuttings discharging into a trommel for processing.

The total cost of the drilling was $15/foot, with a mobilization and demobilization cost of $1,000.

$15/foot at 1,203 feet	$18,045.00
Mobilization and Demobilization	1,000.00
Total	$19,045.00

A D-8 dozer was rented with operator at $95/hour of operating time. This unit was used to prepare roads for the drilling equipment and to level off the drilling sites.

$95/hour	$ 1,425.10
Total	$20,470.10

Each 5-foot interval in the drill hole was placed in bags and labeled for each of the 21 drill holes. The 1,200 feet of drilling resulted in 245 sample intervals or 1,517 bags, with an average weight of 31.97 lbs. per bag. The total samples weighed 24.25 tons, and were stored in Ehrenburg, Arizona, until they were hauled to Tucson.

The total cost of the sample collection was $6,284.25. This includes labor, storage, plastic bags, and truck freight to Tucson. This cost amounted to $5.24 per foot. This cost was excessive because supervision was used to collect the samples and the plastic bags are expensive.

D.H.	Hole	Depth	Line	Intervals	Bags	Cum. Footage	Cum. Bags	Weight	Cum. Weight
1-1	1	20	1	4	16	20	16	818.0	818.0
1-2	2	22	1	5	17	42	33	815.5	1633.5
1-3	3	22	1	5	17	64	50	903.0	2536.5
1-4	4	22	1	5	17	86	67	866.5	3403.0
1-5	5	35	1	7	25	121	92	1298.0	4701.0
3-1	6	15	3	3	14	136	106	621.5	5322.5
3-2	7	22	3	5	20	158	126	907.0	6229.5
8-1	19	70	8	14	101	228	227	3161.5	9391.0
4-1	16	47	4	10	52	275	279	1979.5	11321.5
10-1	20	90	10	18	115	365	395	3678.5	15000.0
9-1	21	90	9	18	227	455	622	3583.5	18523.5
5-1	18	100	5	20	134	555	756	3856.5	22380.0
4-2	17	95	4	19	161	650	917	4165.5	26545.5
7-1	8	35	7	7	31	685	948	1486.0	28031.5
7-2	9	70	7	14	72	755	1020	2749.0	30780.5
7-3	10	72	7	15	73	827	1093	2778.5	33559.0
7-4	11	75	7	15	80	902	1173	2889.0	36448.0
7-5	12	71	7	15	84	973	1257	2723.0	39171.0
7-6	13	70	7	14	82	1043	1339	2782.0	41953.0
7-7	14	85	7	17	102	1128	1441	3423.5	45376.5
7-8	15	72	7	15	76	1200	1517	3129.0	48505.5
				245		1200	1517		24.25 Tons

197.98 lbs./interval
40.42 lbs./foot of hole
31.97 lbs./bag

Sample Treatment

The total cost of treating the samples was $24,183.34. This included labor, chemicals, and Gold Screw. Each of the 245 intervals were treated separately, so the cost per interval was $98.76. In the future with less expensive labor, and no cost on the equipment which La Paz Mining, Inc. owns, the cost per interval should be around $10.00.

The 245 intervals weighing 24.25 tons, were washed through the Gold Screw. The concentrate from the Gold Screw was treated in the Gold Hound and then panned down to approximately 1/2 pound. The magnetite was removed and the coarse gold was removed and weighed. The panned concentrate was amalgamated and the recovered gold was also weighed.

The only intervals that were amalgamated were those intervals that showed visible gold. The fine gold or flour gold weighed from one to four mgs per interval. The major portion of the gold occurred in flakes from one to fifteen mgs. The following table shows the content of each drill hole and the intervals where the gold occurred.

Generally, all the samples contain flakes of what appears to be amalgam; however, this could be silver. Some native mercury was present in the shallow drill hole on Line 1. This is a result of the past placer operations along Gonzales Wash.

D.H.	No.	Depth	Visible Gold Horizon	Visible Gold Present	Flour Gold Horizon	Flour Gold Present	Other
1-1	1	20	0-20'	Zero	0-20'	2 mgs	-
1-2	2	22	0-22'	Zero	0-20'	3 mgs	Mercury
1-3	3	22	0-5'	10 mgs	0-22'	1 mg	-
1-4	4	22	0-22'	Zero	0-22'	1 mg	Mercury
1-5	5	35	20-30'	4 mgs	-	-	-
3-1	6	15	0-15'	Zero	0-15'	3 mgs	Mercury
3-2	7	22	0-22'	Zero	0-22'	2 mgs	-
4-1	16	47	30-40'	61.5 mgs	0-47'	3 mgs	-
4-2	17	95	25-30'	5.0 mgs	0-45'	4 mgs	Native silver Amalgam present
5-1	18	100	25-40'	51.0 mgs	0-45'	6 mgs	Amalgam present
8-1	19	70	30-45'	60.5 mgs	30-45' 15-35'	6 mgs 4 mgs	Native silver Amalgam present
9-1	21	90	25-40'	20 mgs	25-40'	5 mgs	-
10-1	20	90	0-35'	27 mgs	-	-	-
7-1	8	35	15-35'	3 mgs	15-35'	4 mgs	Native silver Amalgam present
7-2	9	70	15-25'	26.5 mgs	15-25'	4 mgs	Amalgam present
7-3	10	72	25-35'	10.5 mgs	25-35'	3 mgs	Amalgam present
7-4	11	75	25-30'	3.0 mgs	25-30'	3 mgs	Amalgam present
7-5	12	71	0-71'	Zero	0-30'	3 mgs	Amalgam present
7-6	13	70	25-35'	7 mgs	25-35'	4 mgs	Amalgam present
7-7	14	85	0-85'	Zero	25-35'	3 mgs	-
7-8	15	72	0-15'	5 mgs	0-15'	3 mgs	Amalgam present

Conclusions

The drilling has shown a placer gold occurrence along the trend of Gonzales Wash through drill holes 4-1(16), 7-2(9), 5-1(18), 8-1(19), 9-1(21), and 10-1(20). The gold occurs from the surface to a depth of 40 feet. No gold occurred below 45 feet to bedrock at an average depth of around 80 feet.

The red sand caliche occurrence from 45 feet to bedrock was apparently deposition from the Colorado River as a depositional basin. The heavy erosion in the Dome Rock Mountains brought in the gold after the sand was deposited.

Phase II will proceed with the arrival of large equipment to bulk sample ten (10) trench sites throughout the area.

The total cost of Phase I was $73,926.58.

Dan E. Lewis

DEL:vh

5/12/86 - Monday

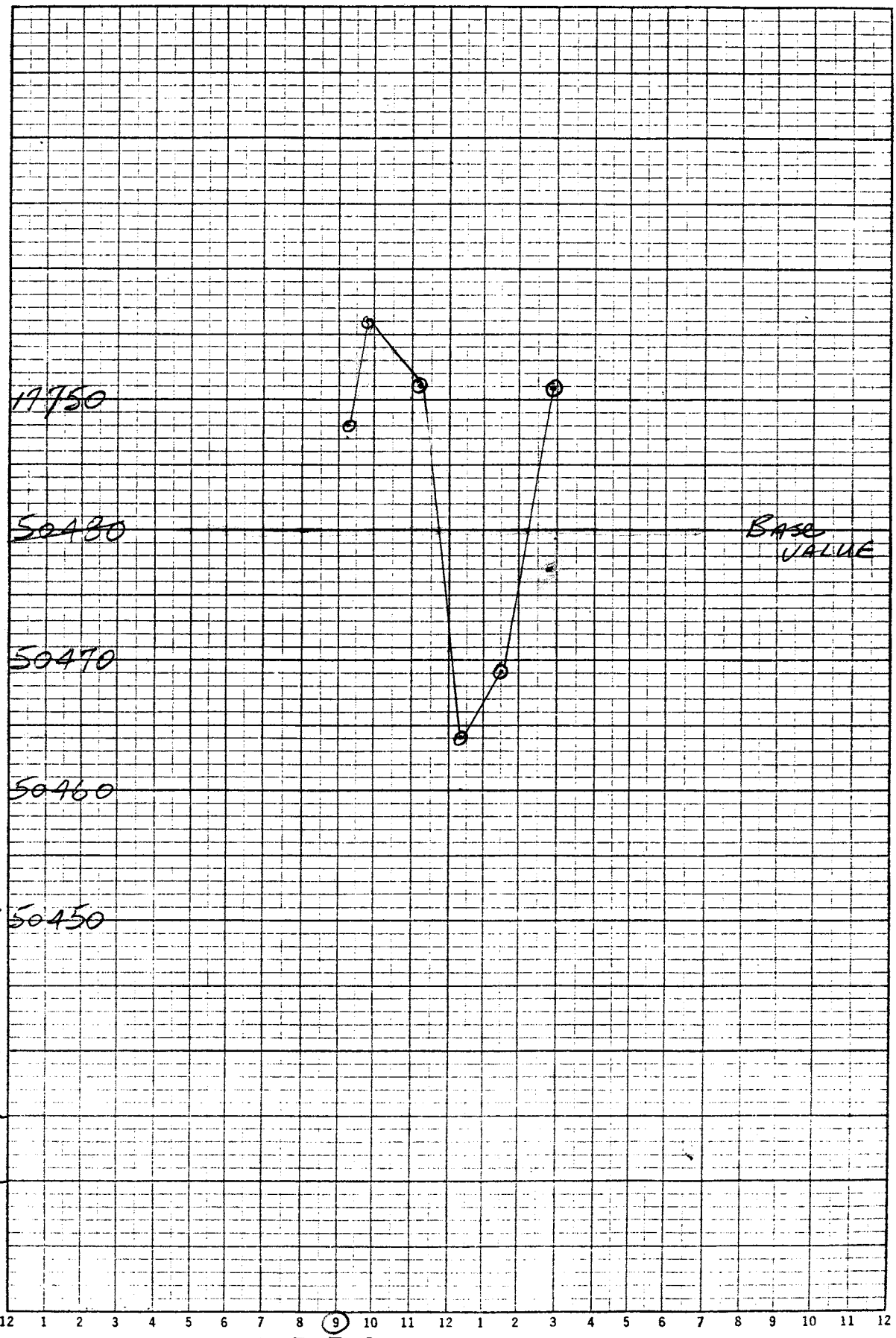
WW-3 WELL DEVELOPMENT

***: Static level 42 Feet

TANK Capacity: 7.5' W x 10' L x 3' D =

$\frac{225 \text{ Cu Ft} \times 7.48}{36"} = 46.75 \text{ gallons / Vertical Inch}$

Test Pressure	Depth	Time Jet-Only	Measurement Intervals	Time Intervals	
35#	156'	12:25P (30 min)	End: 18.25"	End: 1:35P	$\frac{46.75 \times 11"}{30 \text{ Min}} = 17.14 \text{ GPM}$
			Start: 29.25"	Start: 1:05P	
			Inches: 11"	Min: 30	
40#	360'	2PM (30 Min)	End: 10"	End: 3:00P	$\frac{46.75 \times 19"}{30} = 29.6 \text{ GPM}$
			Start: 29.0"	Start: 2:30P	
			Inches 19.0"	Min: 30 Min	
40#	396'	3:10P (30 min)	End 10.75"	End: 4:15P	$\frac{46.75 \times 18"}{30} = 28.05 \text{ GPM}$
			Start 28.75"	Start: 3:45P	
			Inches 18.00"	Min: 30 Min	
45#	621'	4:40P (30 Min)	End 11.00	End: 5:40P	$\frac{46.75 \times 18"}{30} = 28.05 \text{ GPM}$
			Start 29.00	Start: 5:10P	
			Inches: 18.00	Min: 30	

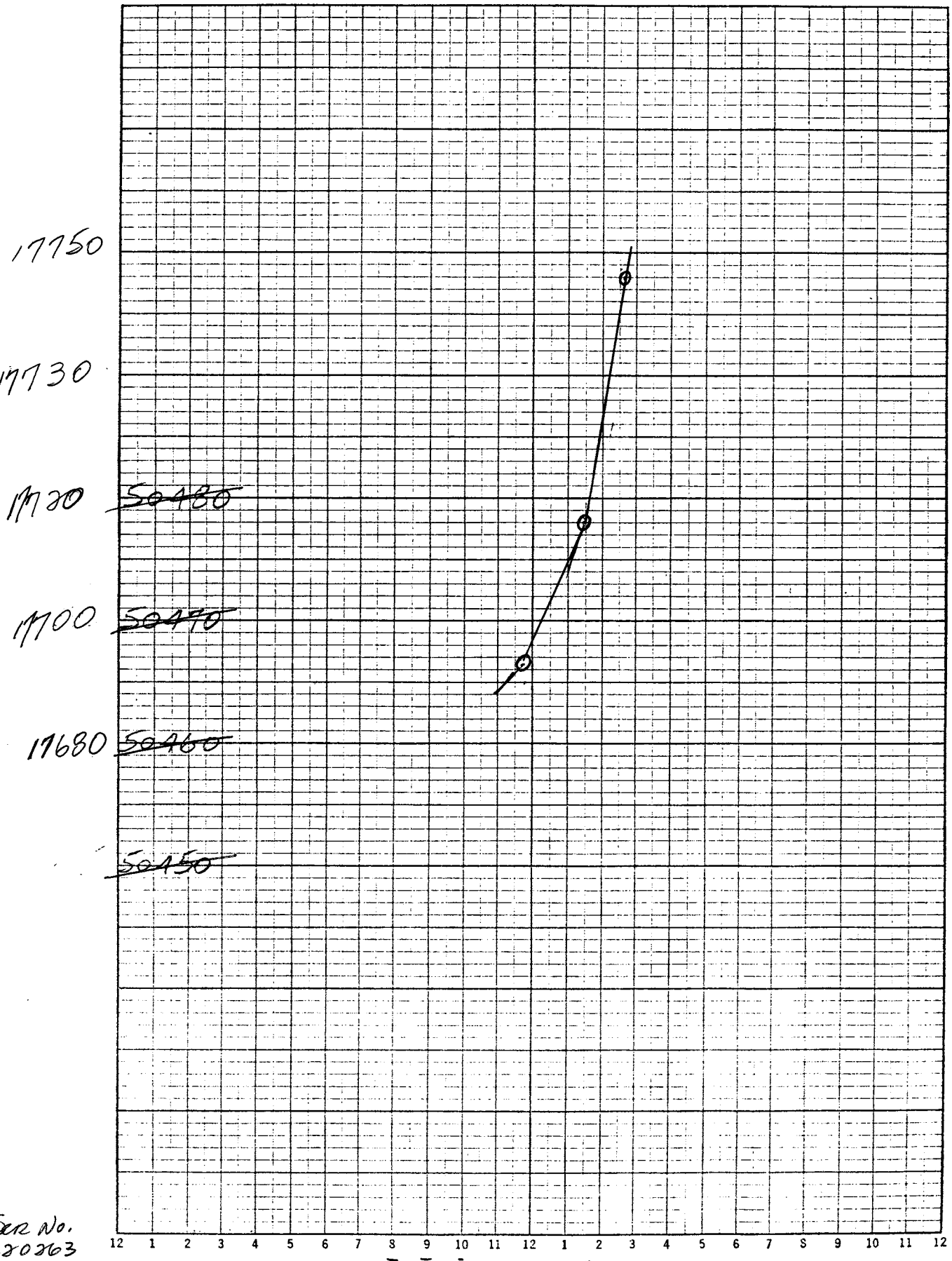


1 DAY BY HOURS
X 100 DIVISIONS
KEUFFEL & ESSER CO.
359-130G
MADE IN U.S.A.

Ser No. 620263 ASKANIA TORSION BALANCE

Diurnal Correction Gonzales Wash Proj

8/13/86



359-130G
1 DAY BY HOURS
X 100 DIVISIONS
KEUFFEL & ESSER CO.
MADE IN U.S.A.

Ser No.
620263

ASKANIA
TORSION BALANCE

DIURNAL CORRECTION
GONZALES WASH

8/14/86

Diurnal Chg. Magnetic

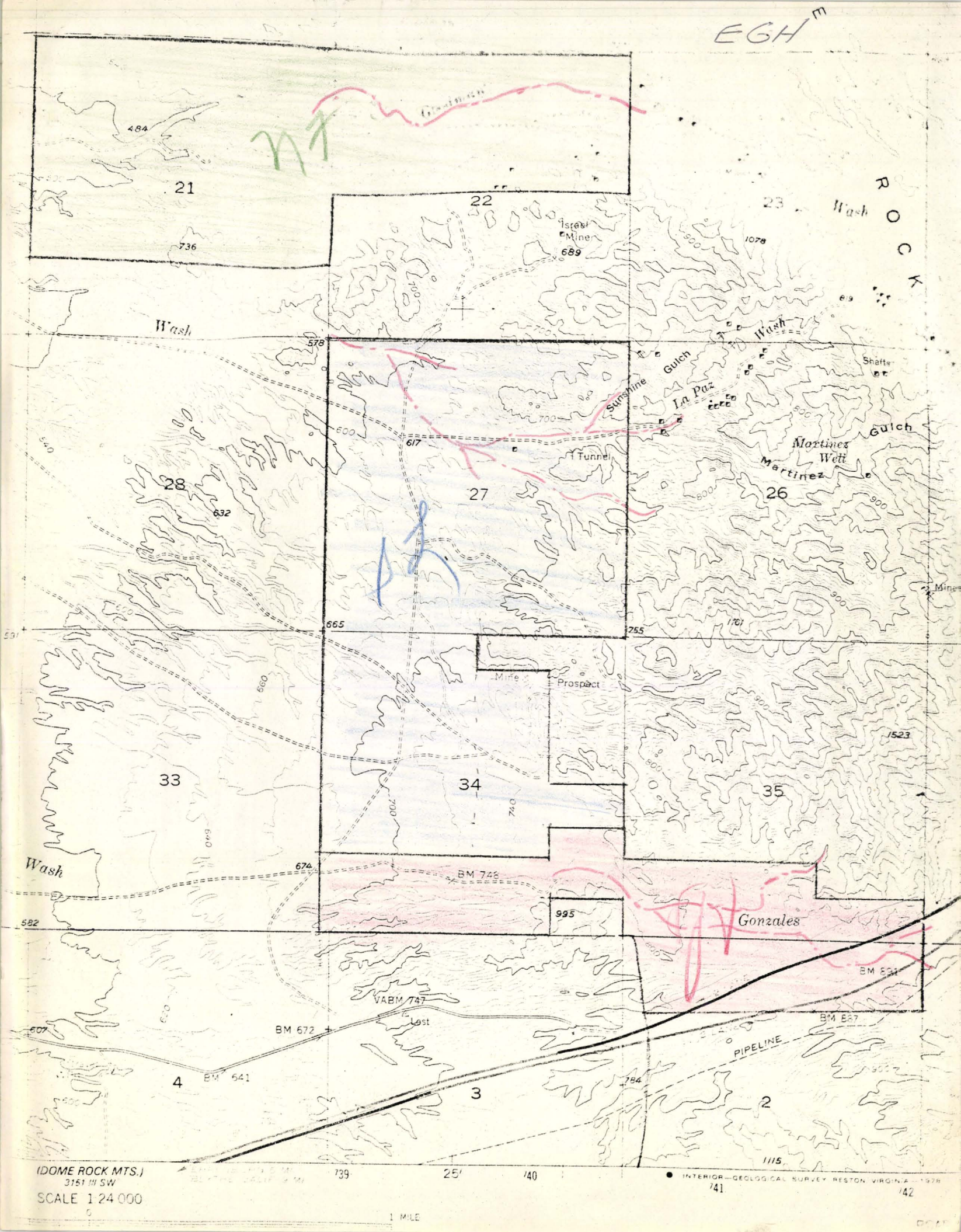
8/14/85 NW JV-4

2:33	8235	17746.42	17746
1:29	8221	17716.75	17716
11:48	8210	17692.55	17693

8/13/85

NW JV-4 Base Magnetic Station

2:53	8237	17750.73	17751
1:43	8227	17729.18	17729
12:20	8225	17724.87	17725
11:21	~~8266~~ ??	~~17813.33~~	~~17813~~
11:15	8237	17750.73	17751
9:40	8286	17856.33	17856
9:18	8282	17847.71	17848



(DOME ROCK MTS.)
3151 III SW

SCALE 1:24 000

0 1 MILE

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1978

JAY E. FULLER CONSTRUCTION CO. — SINCE 1947 —

1301 EAST FORT LOWELL ROAD
TUCSON, ARIZONA 85719
PHONE: AREA CODE 602 325-1505

FEASIBILITY STUDY
JV GOLD PLACER MINE

Reserves: Probable reserves have been estimated at 30 million cu.yds. based on estrapolated past production. A possible addition of 70 million cu.yds. is believed to be reasonable, based upon preliminary rock resistivity depth probes and known extent of auriferous gravel.

Gold Tenor per cu.yd.: According to reports in the 1860s there were a lot of nuggets taken weighing in the 20 oz range, and some weighing up to 47 & 50 oz, and production the first year and subsequent years was estimated at not less than $1 million dollars per year @($17 oz gold), or $14,750,000 @($250 oz), $17,700,000 @($300 oz), $20,650,000 @($350 oz), $23,600,000 @($400 oz), and $29,500,000 @($500 oz). Estimated on published past production it indicates that a conservative average gold tenor per yard of .05 oz would be reasonable, as the records show past production running from .0025 oz to .5 oz per cu.yd.

Financial Analysis: Providing that the work in Stage I is completed satisfactorily with Reserves and Gold Tenor in the range indicated, the following projection is offered.

Plant: The plant facility would consist of various trommels, screens, heavy media tables and support equipment required to obtain a daily processing of 5000 cu.yds. Operating costs per yard of gravel processed has been estimated, utilizing data from aggregate plants in operation.

In the following projected Cash Flow Analysis, these assumptions are made that 30 to 100 million cu.yds. will be available for processing at an average gold tenor of .05 oz per cu.yd.

Projected Cash Flow: Plant (5000 cu.yd./day capacity)

	$250 oz	$300 oz	$350 oz	$400 oz	$500 oz
Average gold .05 oz cu.yd. processed	12.50	15.00	17.50	20.00	25.00
Royalty - 10%	1.25	1.50	1.75	2.00	2.50
Operating Costs cu.yd. processed	3.00	3.00	3.00	3.00	3.00
Gross profit cu.yd.	$ 8.25	$ 10.50	$ 12.75	$ 15.00	$ 19.50
Profit return/operating year (350 days)	$ 14,437,500	$ 18,375,000	$ 22,312,500	$ 26,250,000	$ 34,125,000

EGH

JAY E. FULLER CONSTRUCTION CO. — SINCE 1947 —

1301 EAST FORT LOWELL ROAD
TUCSON, ARIZONA 85719
PHONE: AREA CODE 602 325-1505

CAPITAL REQUIREMENTS

JV GOLD MINE

Stage I

Surveying & Aerial Photography		2,000
Resistivity Survey		11,000
Drilling		100,000
Drill site dozer work		10,000
Royalty property lease, 3 months (minimum)		6,000
Sampling, testing & evaluation		
Salaries & Consulting Fees	62,480	
Travel & Subsistence	19,620	
Trucks (rentals & expenses)	30,100	
Office Rent	1,200	
Accounting expense & insurance	10,300	
Telephone expense	1,300	
Lab. expense for sample analysis	15,000	
Payroll expense	6,800	
Miscellaneous	4,200	
Water Well	70,000	
Contingency	50,000	271,000
Total Estimated Costs Stage I		$ 400,000

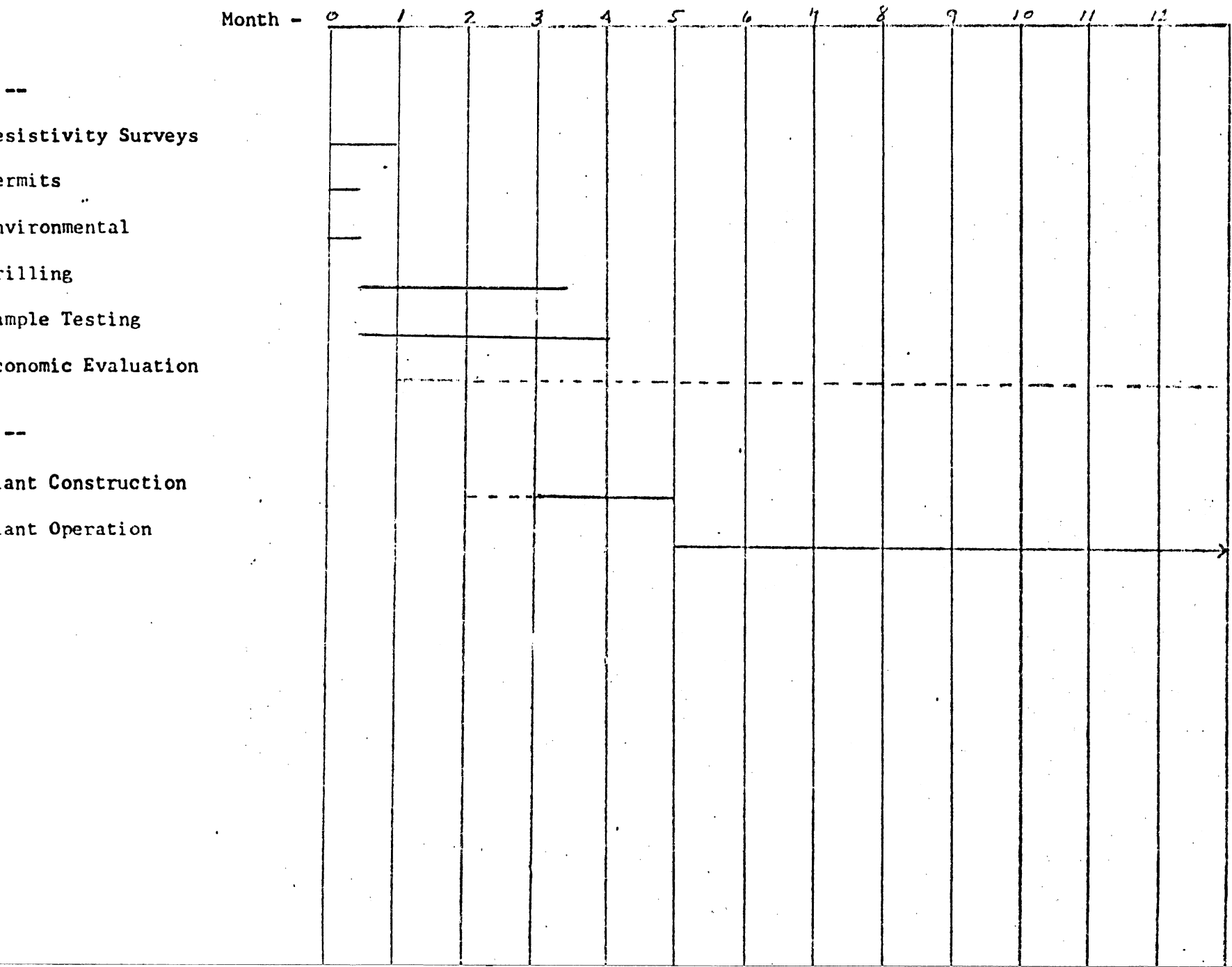
Stage 2

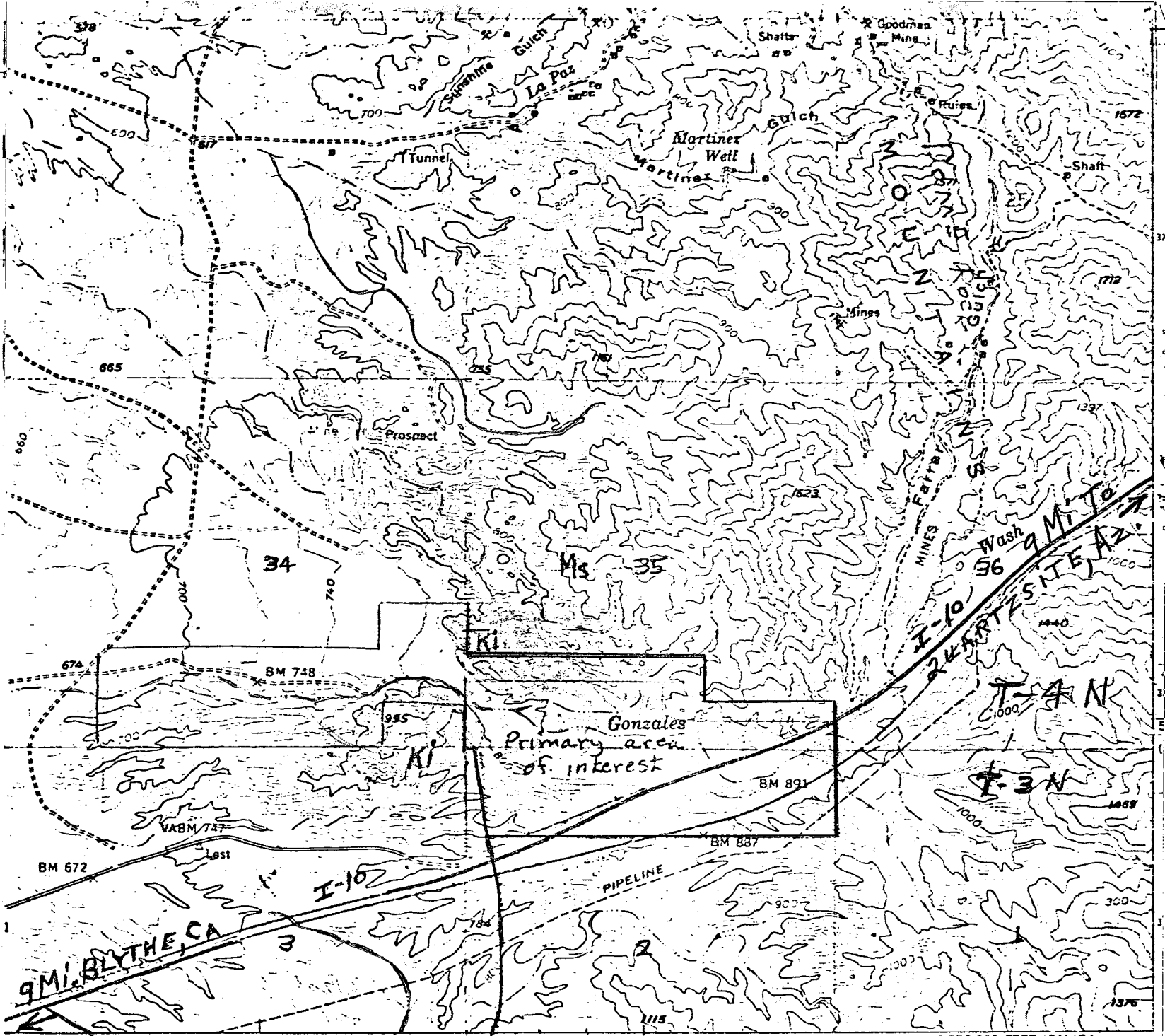
Production Plant estimated to cost (5,000 cu.yd./day)	1,850,000
Total Stage I & 2	$ 2,250,000

16 hrs

JV GOLD PLACER GROUP

Project Schedule





INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1972

2 570 000 FEET (CALIF.)

114°22

Ki - Cretaceous intrusive

Ms - Mesozoic shist

- Known extent auriferous gravel

1 MILE

6000 7000 FEET

1 KILOMETER

ROAD CLASSIFICATION

Heavy-duty — Light-duty

Medium-duty — Unimproved dirt

U. S. Route

ARIZONA

QUADRANGLE LOCATION

LA PAZ MTN., ARIZ.—CALIF.

NW/4 DOME ROCK MTS 15' QUADRANGLE

N3337.5—W11422.5/7.5

1955

AMS 3151 III NW-SERIES V898

DARDS

ASHINGTON, D. C. 20242

E ON REQUEST

La Paz Gold Placers

By Victor V. Livingston

ABSTRACT

Gold bearing gravels exist on the western flank of the Dome Rock Mountains, Yuma County, Arizona as evidenced by historians and production records. Removal of the gold from the gravels has been achieved by inefficient methods, limiting recovery and productivity. In spite of this well over $2 million dollars (at $20.67/oz. gold price) had been recovered. The majority of the gold bearing gravels were not processed, especially the gravels located downstream from the juncture of Ferrar gulch and Gonzales Wash.

Limited sampling and geological reconnaissance has indicated that a potentially productive area exists in Gonzales Wash consisting of 30M cubic yards.

Deposit evaluation and production parameters are standard placer techniques utilizing "off the shelf technology."

Introduction:

Throughout much of the arid southwestern U.S., gold placer deposits are to be found. Exploration of these deposits has been, by and large, confined to desultory attempts by Spanish, Mexican and later Americans utilizing various methods of dry washing necessitated by the lack of large volumes of easily obtainable water.

Placer gold deposits of this type are usually refered to as "bajadas." The usual method of gold "winning" was to sink a small shaft to "bedrock" and extend burrows along this horizon until a pay streak was encountered. Only this material was removed, screened and further concentrated using various forms of air and or mercury. Obviously, only the larger particles of gold are amenable to this type of collection, with 50% of the total gold present lost to rejects.

The La Paz Placer is of this type (bajada) and the full meaning of the term is explained in the following text.

Bajada Placer: a definition

Rock decay and weathering are the causes of release of gold to form any type of placer deposit. Erosional processes, however, differ in effectiveness in different regions and the greatest divergence in their operation and result is probably to be measured between aridity and humidity. In bajada placer formation mechanical weathering is the prime disintegrating feature at work on auriferous outcrops and in the reduction of material to free the gold. In most stream placers

chemical weathering was probably equally important.

Transportation is an important adjunct to concentration in both stream and bajada placers, but is less vitally important in the latter. Transportion of stream gravels in most instances is over a much greater distance than that of bajada gravels, consequently corrosion and attrition were of more importance in reduction of detriters of stream placers and concentration is carried much further by transporting agencies than could be effected under arid conditions.

The characteristics of surficial deposits of bajada placers exhibit considerable divergence from those of stream placers. Where overburden exists on bajada placers it is related directly to the adjacent mountain range. Bajada placer overburden is usually the same kind of material as the placer proper, a coarse angular aggregate of rock spalls. Barren overburden of a stream placer may be caused by a thorough jigging action by the stream, which concentrates the gold in the lower portion of the grand mass. Nothing analogous to this takes place in a bajada placer. Changes in elevation and stream gradient may cause overloading of the stream and deposition of overburden material. A bajada placer occurs at a point of extreme change in gradient and loss of water volume, so that overloading and deposition of all but the finest material is usual. This material is further reduced in size by weathering and removed by wind and water agencies, with a lag of gold that produces a placer, so that overburden indicates lack of balance between accumulation and removal. There is a vague similarity of basic cause and result in accumulation of overburden in stream and bajada placers, but

processes operating on a bajada placer are conditioned by aridity and the result is greatly modified.

The character of the overburden takes the character of the auriferous detritus in both placers. In stream placers well rounded pebbles, gravel, sand and even finer material show the effect of attrition and water sorting. In bajada placers, overburden and auriferous gravels are a rough aggregate of rock spalls and fragments, even the finest of which show pronounced angularity. Usually there is a predominance of larger sizes and sorting of material is seldom evident. Stream gravels usually are of regional derivation and represent many rock types. Bajada gravels are of local origin and represent few rock types.

A comparison of the parts of the placers that contain values, shows several factors of economic importance. In bajada placers as in stream placers the bulk of the gold is on or near bedrock, but in bajada placers extreme concentration on bedrock is rare and a higher proportion of the gold remains disseminated throughout the bulk of the gravels than in stream placers. A stream placer may show several "paystreaks" on bedrock due to meandering of the main channels and paystreaks on bedrock are not uncommon in bajada placers. Runoff channels on a bajada sheet are rapidly shifting in position, so that such paystreaks are usually short and of erratic tenor.

Bajada placers, because of lack of sorting, lack of confinement in any channel and the release of some of the gold in the placer as well as in route, are apt to exhibit a more erratic distribution of values than stream placers, both horizontally and vertically. Bajada

placers usually show an appreciable and even considerable residual enrichment on the surface due to removal of lighter material by wind and sheet floods. This superficial enrichment, unless recognized and discounted, may give rise to serious errors in casual sampling.

Most of the gold of bajada placers is coarse. It is almost entirely rough and angular with adhering quartz and limonite common.

The conditions affecting prospecting and development of bajada placers are mostly adverse. This may not be an unmixed evil, as it has operated to delay the exploration of these placers until gold is at a premium. The factor of greatest moment is the lack of surface water for working gravels. Vegetation is virtually absent in the Sonoran Desert and is considered an advantage in that there is no necessity for clearing minable areas. Prospecting of bajada placers is made difficult by the fact that they represent an irregular and often ill defined area on the debris covered flanks of a mountain range. The range of prospecting a stream placer is often delineated clearly by the banks of an old or recent stream channel. Auriferous gravels of a bajada slope lack this clarity of expression. The question of tenor, quantity and position of the auriferous terrain of a bajada placer is not as easily solved by the drill as in a stream placer, as it presents a geologic problem foreign to stream placers. Since availability of water is of paramount importance, the geologic problem of the placer involves a detailed scrutiny of the water resources of the area. The geologic-economic problem of a bajada placer is amenable to solution through study of the environment and method of formation of the placer, since

its characteristics are largely a reflection of these features.

It is the writer's opinion that any large scale development of a bajada placer will not be attended by any revolutionary advance in methods of dry-washing but is contingent upon an intelligent development and application of the subsurface water resources of the region. The agricultural industry has long solved the problem of desert aridity of sinking deep wells for irrigation water. Six miles west of the Dome Rock Mountains is one of the western U.S. most fertile valleys irrigated by wells, producing up to 2,000 gallons per minute. Investigation into the availability of well water for mineral processing, resulted in the information that the same option is present. Further, strict application of sound engineering principles in earth moving techniques will greatly enhance an undertaking of this type.

Location - Accessibility:

The La Paz Placer covers an unusually large area on the West flank of the Dome Rock Mountains in east central Yuma County, Arizona, located in Ts. 3 and 4N., Rs. 21 and 22W. Access is by Interstate Highway 10, twelve miles east of Blythe, California. The La Paz Mountain 7.5 minute topographic quadrangle sheet encompasses the area.

Topography:

The La Paz Placers lie on the western pediment of the Dome Rock Mountains which rise to approximately 2,000 feet above the surrounding plain. The pediment is widely dissected into benches sloping gently

westward to the Colorado River, 6 miles distant. No perennial streams are present in the placer district, but arroyos drain run-off during the rainy season to the Colorado River. Shallow wells are present in and near the mountain mass but they supply only a very small amount of water.

History:

The presence of placer gold in and near the Colorado River was known by the first inhabitants of the region, the Yuma Indians. Shortly after establishment of American military rule a trapper, Captain Pauline Weaver became aware of the existance of gold in the region. About 1862, Weaver and his party were guided to the La Paz Placer by Indians. They removed some $8,000 worth of nuggets and returned to Yuma for supplies. A gold rush soon followed and the town of La Paz, containing 1,500 people was established 3 miles from the Colorado River. The district flourished until 1864 when apparent exhaustion of the easily accessible higher-grade placers caused a decline in activity. Repeated attempts in the late 1800's and early 1900's to revive the district were frustrated by governmental bureaucratic bungling and low gold prices.

Production:

According to the early historians, (Browne and Jones), on the return to the La Paz Placer by the discoverer Weaver came also many other prospectors. Approximately $1 million in placer gold was recovered during the first year and another $1 million by 1964, when the easily accessable placers were worked out. Since that time, the La Paz district has been at times part of the Colorado River Indian

Reservation, and in consequence, small scale placer mining activity declined and large scale placer mining activities were interrupted. Small scale intermittant drywashing of surface gravel has been the only activity for the last 60 plus years.

The La Paz placers are famous for the large nuggets recovered, although most of the gold occured as pieces ranging in weight from 0.0025 to 0.5 ounces. Browne (1868, P. 454) describes large nuggets from the gravels, some weighing 26, 27 and upwards of 47 ounces. The largest recorded nugget weighed about 65 ounces and assayed 870 fine.

Local Geology:

The Dome Rock mountains in the vicinity of the La Paz Placers consist largely of metamorphic rocks and granite, of Mesozaic to early Tertiary age. For a short distance west of the foot of the range, these rocks floor a dissected pediment (bajada) and constitute the bedrock of the principal placers. The gold in the placers is attributed to erosion of the many gold-bearing veins distributed through the metamorphic rocks in the area. Some of these veins, such as the Goodman vein, which trends northwest-southeast across the north end of Ferrar Gulch and is exposed in Gonzales Wash, have been mined in the past. Although no production records are available gold production is judged to have been small due to the small size of the workings.

Distribution and character of the placer gravel:

The La Paz Placers occur, for the most part, in Goodman Arroyo, Arroyo La Paz and Gonzales Wash, and in tributary gulches such as

Ferrar, Martinez, Garcia and Ravenna. Ferrar gulch, tributary to Gonzales Wash contained the richest and most productive placer of the district. The thickeness of the gold bearing gulches were from a few inches to 20 feet and were readily mined out. Gravel thicknesses in Gonzales Wash, Goodman Wash and Arroyo La Paz are unknown except for small areas in Gonzales Wash probed by the writer utilizing rock resistivity. Depths indicated by this technique were 40 to approximately 250 feet. According to Jones, "shafts have been sunk in the wash to depths of thirty feet without reaching bedrock." By far the greater part of the auriferous material is unworked, especially that in the lower courses of the arroyos, where the gravel is deep.

The gold bearing gravels consist of sand and minor clay inclosing angular rock fragments of greatly variable size. Dry screen testing indicates that about twenty percent of the material will pass a quarter-inch screen, and the largest boulders weigh several hundred pounds. All the material is unassorted and that near the surface is unconsolidated. At depths of twenty feet and greater the gravel is consolidated but readily disintegrates on exposure to air. Jones states, "the gold is distributed throughout the gravel, though in the early workings the richest yield was obtained near bedrock."

No estimate can be made of the probable gold content in the washes of the La Paz district because of lack of detailed data and of uncertainty concerning the limits of the washes. Gold tenor has been variously stated by Jones and Heikes as varying between 50 cents and $1.50 per yard using the $20.67/oz. gold price. At present day gold prices, gold tenor would range between $12.00 and $36.00 per yard.

Recent work:

Reconnaissance surface sampling has indicated gold content ranging from 0 up to 36 mg./.5 feet^3, with an average of 12 mg./.5 feet^3 or .65 gram/yard^3. However, it must be emphasized that the validity of surface samples taken from this type of placer is totally dependant on numerous variables.

Limited attempts have been made by the writer to determine the depth of the gold bearing gravels present in Gonzales Wash. Depth probes utilizing rock resistivity indicates gravel depth to vary up to 250 feet. A surface outcrop map of that portion of Gonzales Wash contained in T.3N, R.21W; Sec. 2 and 3 and T4N, R.21W, Sec. 34 and 35 is included in this report. As indicated on the map Ferrar Gulch is a major tributary. Surface examination has indicated that a paleo-channel exists partially exposed in this area. This is indicated by a linear area containing numerous hematite pebbles and cobbles and higher than average gold content. The presence of hematite debris can be seen to extend over an area 6,000 feet long and 1,500 feet wide.

In Gonzales Wash there is some evidence to suggest that the bajada is undergoing either increased erosion or that the annual runoff from seasonal rains is sufficient to handle normal rock disintegration. Conceivably, this would indicate that the gravels in Gonzales Wash are being removed resulting in a gold "lag" or concentration. This does not appear to have been the case in the less recent geologic past. Examination of the gravels present in the south half of Sections 1, 2 and 3 T.3N, R.21W were derived from the rocks exposed in the southern part of the Dome Rock Mountains. The rocks present there are much

more easily erodable than those from Gonzales wash northward. In effect this restricted Gonzales Wash to the north, limiting gold deposition to that area.

Geological evidence, provided by the train of hematite debris, indicates that the present channel of Gonzales wash where it passes to the north of hill 995 in the southeast corner of section 34, was not the paleo channel. This gorge in the Cretaceous intrusive was a recent geological event. The original channel is interpreted to have passed to the south of hill 995 creating a large bend.

Gravel depths in this area are deep (up to 250 feet) implying a scour basin or depression in the bedrock, creating a natural trap for gold and other heavy minerals.

Deposit evaluation procedure:

The functioning and capacity of a placer system must be keyed to the environmental and natural conditions of climate, water availability, and the physical and geologic characteristics of the deposit.

The two most basic parameters that must be determined as accurately as possible is 1) volume; i.e. how much gravel, containing gold, is available for processing; 2) tenor; i.e. how much gold is recoverable per unit of volume.

The method to be utilized to determine volume is a rock resistivity survey. This survey is designed to determine the depth to bedrock at any given point on the property and has been used with commendable success on other placer properties. The data gathered from this technique will allow a bedrock profile and a volume determination.

The method used to determine tenor is considerable more exacting

and is in fact several interdependent processes. Samples will be obtained by a drilling technique designed to insure that the sample is representative of a particular volume of gravel. Gold content will be extracted by a collection system equating as closely as possible the technique utilized for production.

Processing Parameters:

Gold particle size and gravel characteristics dictate the processing technique and equipment. The governing criteria is that you must move and process large volumes of gravel in not only an efficient manner but one in keeping with environmental requirements.

Basically, the processing plant will consist of a grizzly, trommel, screens, storage bins, hydrocone, gravity tables and various conveyor belts. Earth moving equipment is fairly standard consisting of bulldozers, loaders and scrapers.

Emphasis will be on utilizing "off the shelf gravel plant technology" and obtaining a viable and steady water resource.

Victor V. Livingston

Victor V. Livingston

Mining Engineer